

Oegopsid Squids

Diagnostic Features: No corneal membrane covers the eyes, which are exposed directly to seawater. Head **without tentacle pocket**, except in Bathyteuthidae and Ctenopterygidae. **No suckers** on the **buccal lappets**, except in Bathyteuthidae and Ctenopterygidae. Funnel without lateral adductor muscles. Arms and clubs with suckers **and/or hooks** in some species. Tentacular club usually **with carpal-locking** apparatus. Shell a gladius, that extends the full length of the mantle. Female **gonoducts paired**. **Accessory** nidamental glands **absent**.

Size: From very small-sized (dwarf) squids, e.g. some *Abralia* and *Abraliopsis* species (Enoploteuthidae; maximum recorded size 20 mm ML), to the gigantic *Architeuthis* (Architeuthidae), *Mesonychoteuthis* (Cranchiidae), *Moroteuthis* and *Onychoteuthis* (Onychoteuthidae) squids, for which mantle lengths of over 2 m are not unusual.

Geographical Distribution: Oegopsid squids are widely distributed in all oceans and seas of the world.

Habitat and Biology: Oegopsid squids inhabit virtually all depths and areas of the oceans, from the surface and midwater layers, down to bathyal depths (4 000 to 5 000 m). Many species undergo significant diel vertical migrations, wherein they occur in deep waters during the day, then ascend toward surface waters at night (0 to 200 m). Some nerito-oceanic species are found in association with sea-mounts and submarine ridges, but most species are pelagic. Some oegopsids are very muscular and powerful squids, remarkable hunters, even capable, though rarely, of attacking divers (i.e. *Dosidicus gigas*); on the contrary, many members of the Cranchiidae (also known as glass squid) are transparent, small to medium-sized squids, that spend much of their lives in partially sunlit epipelagic waters, where their transparency provides camouflage. Many oegopsid species bear photophores and bioluminescence occurs almost universally in mesopelagic squids. Spawning often extends throughout the year, but peaks, seasonal spawning seasons, do occur as well. Most oegopsid squids lay eggs in pelagic, floating, neutrally buoyant egg masses, but *Brachioteuthis* species are known to spawn individual eggs into the plankton, and some members of the family Enoploteuthidae are known to produce long, gelatinous strings with eggs embedded in a single series. In many species of the family Gonatidae, maturing and spawning females undergo a rapid degradation of body tissues into a gelatinous consistency, tentacles are lost and locomotion is reduced; females of species in this family hold the egg masses in their arms while the embryos develop. In some oegopsid squids the paralarvae are very characteristic and differ substantially from adults, such as the chiroteuthid *doratopsis* stage, characterized by an elongate, chambered neck, and the ommastrephid *Rhynchoteuthion*, characterized by the fusion of the tentacles into a trunk-like proboscis.

Interest to Fisheries: Members of the oegopsid squids support the major cephalopod fisheries around the world. FAO's Fishery Yearbook (FAO, 2009) reports over 3 200 000 tonnes of oegopsid squids caught in 2007, i.e. about 68.4% of the total squid catch for that year. Also, oegopsid squids undoubtedly constitute the major component of the non-identified-squid fraction reported for the same year, over 658 000 tonnes (FAO, 2009). Among oegopsids, squids of the family Ommastrephidae are the main contributors to the fisheries, totalling about 98% of the total oegopsid catch in 2007; fluctuations in the catches occur yearly, but *Dosidicus gigas* (eastern Pacific Ocean), *Illex argentinus* (southwest Atlantic Ocean) and *Todarodes pacificus* (northwest Pacific) together accounted for about 95% of the total ommastrephid squid catch in 2007 (i.e. about 64% of total loliginid and oegopsid squid catch for that year (FAO, 2009).

Remarks: Currently, 26 families are recognized in the oegopsid squids with over 70 genera and well over 250 species recognized. However, many of these species still are poorly known or undescribed, especially within those families of unknown or no interest to fisheries, due to their inaccessibility, or unsuitable flesh consistency, or size. A total of 72 genera and 247 species are treated in this work.

Literature: Naef (1916, 1923), Roper *et al.* (1984), Nesis (1982/1987), Sweeney and Roper (1998), Norman (2000), Young and Vecchione (2004), Okutani (2005).

2.3 Family ANCISTROCHEIRIDAE Pfeffer, 1912 by Clyde F.E. Roper and Patrizia Jereb

Ancistrocheiridae Pfeffer, 1912, *Ergebnisse der Plankton-Expedition der Humboldt-Stiftung*, 2F(a): 1–815 [174].

Type Genus: *Ancistrocheirus* Gray, 1849.

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

Diagnostic Features: Buccal crown with 8 supports. Buccal connectives attach to dorsal margins of arms IV. No secondary buccal connectives attach to ventral margins of arms I and II. Gladius with pointed conus and elongate cone field; long, pointed rostrum present. **Hooks present on all arms; tentacular clubs with 2 series of hooks on manus; suckers absent**. Photophores present on ventral surface of fins, mantle, funnel, head, arms, and tentacles. Photophores absent from viscera and eyeballs. Nidamental glands present; oviducal glands normal. Oviducts unpaired. **Fins very large, slightly subterminal**, without posterior lobes. **Posterior end of mantle elongate, forms tail**. Head and tail with fleshy, gelatinous tissue; vesicles absent. Nuchal folds present. Tentacles not modified near bases; stalk "ligament" and vein leave tentacle at base and in membrane. Ink sac not embedded in digestive gland.

Remarks: The currently recognized family Ancistrocheiridae formerly was included as a subfamily in the family Enoploteuthidae, ever since Pfeffer (1912) formalized his concept of Enoploteuthidae into 4 subfamilies. The family was considered by Roper *et al.* (1969b) to be comprised of 3 subfamilies (Enoploteuthinae, Ancistrocheirinae, Pyroteuthinae), all of which were elevated to familial status by Clarke (1988b). This classification was thoroughly analyzed and reconfirmed by Young *et al.* (1998a) and Young and Harman (1998). The Ancistrocheiridae is a monotypic family, with *Ancistrocheirus lesueurii* (d'Orbigny, 1842) the sole recognized species at this time.

Literature: Roper *et al.* (1969b), Clarke (1988b), Young *et al.* (1998b), Young and Harman (1998), Sweeney and Young (2003a), Vecchione and Young (2008a).

***Ancistrocheirus* Gray, 1849**

Ancistrocheirus Gray, 1849, *Catalogue of the Mollusca in the Collection of the British Museum, I: Cephalopoda Artepedia*, 164 pp. [49].

Type Species: *Ancistrocheirus lesueurii* (d'Orbigny, 1842).

Frequent Synonyms: *Thelidioteuthis* Pfeffer, 1900.

***Ancistrocheirus lesueurii* (d'Orbigny, 1842)**

Fig. 163

Enoploteuthis lesueurii d'Orbigny, 1842, in Férussac and d'Orbigny, 1834–1848, *Voyage dans l'Amérique Méridionale*, 5(3): 1–758 [339, pl.14]. [Type locality: not designated].

Frequent Synonyms: *Onychoteuthis lesueurii* d'Orbigny, 1842; *Thelidioteuthis alessandrinii* (Verany, 1847); *Abralia megalops* Verrill, 1882b; *Enoploteuthis pallida* Pfeffer, 1884; *Enoploteuthis polyonyx* Troschel, 1857.

Misidentifications: As *Thelidioteuthis alessandrinii* (Verany, 1851).

FAO Names: **En** – Sharpear enope squid;
Fr – Encornet cachalot; **Sp** – Enoploluria róbica.

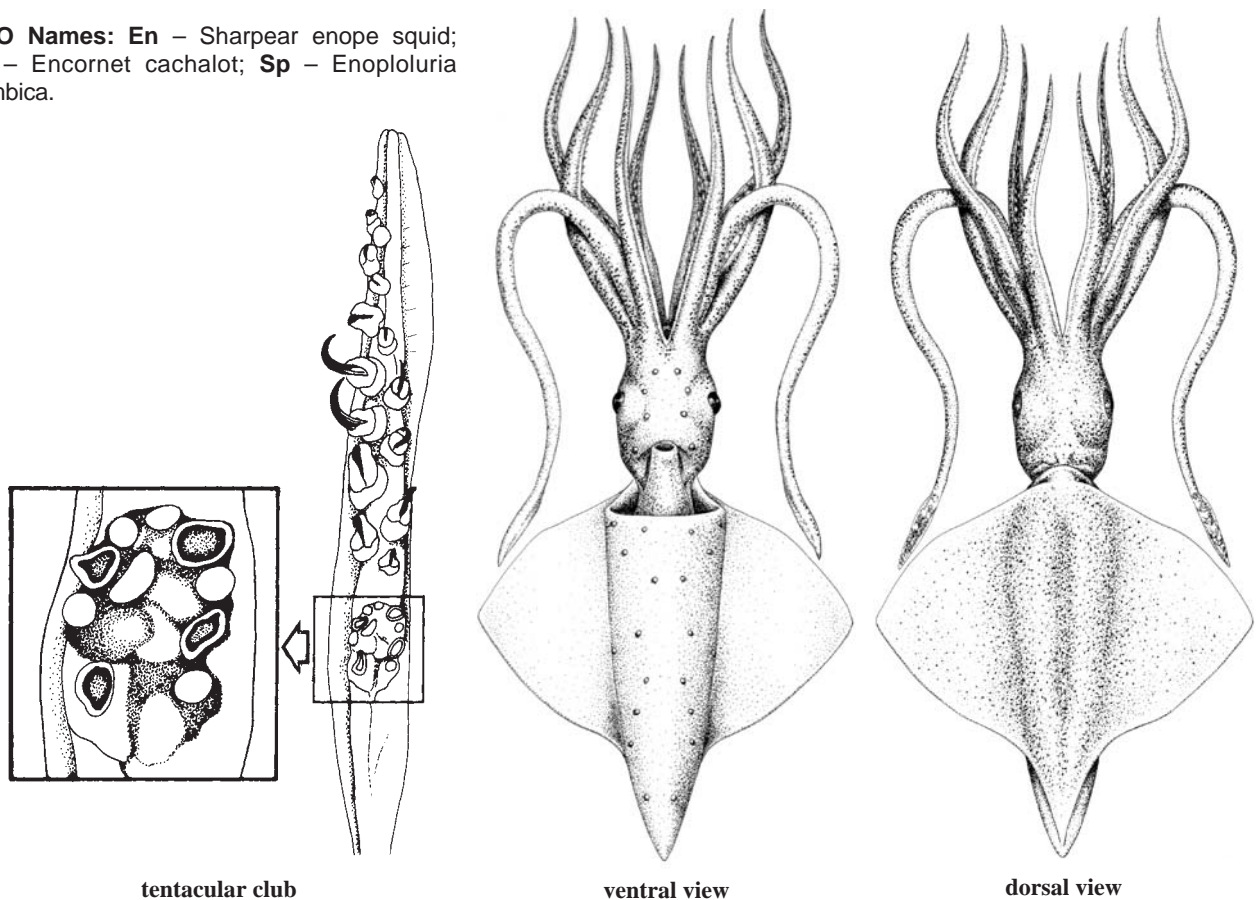


Fig. 163 *Ancistrocheirus lesueurii*

Diagnostic Features: Same as for family, plus as follows: mantle long, broad, conical, thick-walled. **Fins thick, rhomboidal, long (70 to 80% of mantle length); broad (80% of mantle length).** Tentacles robust with 12 photophores along the aboral side of the stalk; clubs narrow, unexpanded, with a distinct carpal cluster; **manus with 2 transverse series of sharp hooks, the 7 or 8 of the ventral series being larger than the 8 of the dorsal series.** Arms robust, with 2 series of hooks; small, stalked suckers may be present on arm tips. Buccal-membrane connectives attach dorsally to arms IV. Nuchal folds present, prominent. **Ventral surface of mantle studded with 20 to 24 relatively large, separated photophores** arranged in transverse rows; ventral surface of head with 8 to 10 similarly arranged photophores; large photophores on funnel, bases of dorsolateral arms and tentacular stalks. Numerous very small photophores on ventral surface of fins, mantle, funnel, head and ventral arms. No photophores on eyeballs or viscera.

Size: The maximum mantle length reaches 410 mm. Gravid females attain 3 kg.

Geographical Distribution: Worldwide in tropical, subtropical and temperate open ocean waters (about 40°N to 30°S); includes the entire Mediterranean Sea (Fig. 164).

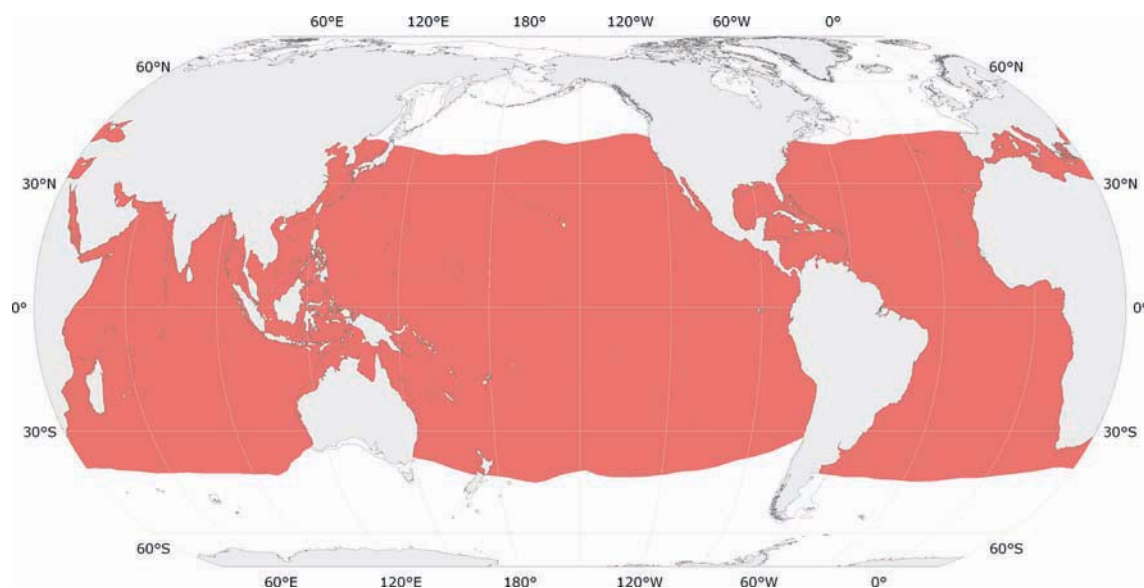


Fig. 164 *Ancistrocheirus lesueurii*

■ Known distribution

Habitat and Biology: An oceanic species, *Ancistrocheirus lesueurii* is lower epipelagic to mesopelagic and bathyal, and it ranges in tropical and temperate waters of the 3 major oceans and the Mediterranean Sea. It undergoes diel vertical migration and consequently is able to regulate its bioluminescent counterillumination. As a neritic-oceanic species it can occur in association with seamounts and submarine ridges. Age and growth studies based on statolith analysis indicate a strong sexual dimorphism: males live about 1 year, females begin to mature at 1 year and spawn at about 1.5 years. Following ontogenetic descent into bathyal waters, at least to 680 m, growth rate decreases to lowest known values for squids. The relative fecundity is 200 000 to 800 000 ova, 2.6 to 1.91 mm diameter, of which 60 to 65% are spawned. Hatching occurs throughout the year; peaks November to March. Sexually mature males captured in southern African waters had nidamental glands in addition to the fully developed male reproductive system. Intersexual males were significantly larger than normal males. The species is preyed upon by swordfish, *Xiphias gladius*, lancetfish, tunas, blue shark, oceanic seabirds, Antarctic fulmar and odontocete cetaceans, e.g. sperm whales, pygmy and dwarf sperm whales, long-finned pilot whale.

Interest to Fisheries: This species is believed to have some fishery potential because of its size, but development of a fishery beyond subsistence levels awaits a better understanding of both geographic and vertical distribution, as well as knowledge about its biology and population structure and density.

Local Names: ITALY: Totano dei capodogli.

Remarks: Marked differences among the paralarvae from different oceans seem to suggest that more than 1 species of *Ancistrocheirus* exists (Young *et al.*, 1992).

Literature: Roper *et al.* (1969b), Roper and Young (1975), Okutani (1976, 1995), Arkhipkin (1997a), Nesis (1999b), Hoving *et al.* (2006c).

2.4

Family ARCHITEUTHIDAE Pfeffer, 1900

by Clyde F.E. Roper and Patrizia Jereb

Architeuthidae Pfeffer, 1900, *Mitteilungen aus dem Naturhistorischen Museum Hamburg*, 17(2): 145–198 [152].

Type Genus: *Architeuthis* Steenstrup, 1857b.

FAO Names: **En** – Giant squids; **Fr** – Encornets monstres; **Sp** – Megalurias.

Diagnostic Features: The Architeuthidae is characterized by a **tetraserial armature on the long, narrow tentacular clubs**, with **conspicuously large suckers in the 2 medial series of the manus** and small suckers in the marginal series; a **distinct cluster of numerous, small, alternating suckers and knobs in 6 or 7 irregular transverse series at the proximal end (carpus)** of the club; **2 longitudinal series of transverse pairs of alternating suckers and pads extend along nearly the entire length of the extremely long tentacular stalks**, increasingly more widely spaced proximally; arms with very numerous suckers in 2 transverse series; a straight simple funnel-locking cartilage; buccal connectives that attach to the dorsal border of arms IV; (apparent) absence of photophores; presence of ink sac; absence of hooks on arms and tentacles; fins proportionally small, ovoid, without free anterior lobes, subterminal posteriorly.

Size: Giant squids; have been reported to total lengths of 18 m and mantle lengths 3 m (to 5 m – questionable record), but animals of this size seldom are recorded. Most specimens are in the range of 6 to 13 m total length. Weight to 500 kg, possibly greater.

Geographical Distribution: Worldwide oceanic in distribution, but the true extent of geographical and depth ranges is yet to be determined. Specimens are excluded from equatorial, tropical and high polar latitudes. One stranded specimen was reported for the first time from the far western Mediterranean Sea.

Remarks: Eight genera have been named, but all of them are synonyms of *Architeuthis*; therefore the family Architeuthidae is monotypic. This family includes the largest of all cephalopods in total length. Specimens occasionally are found moribund at the surface of the ocean, but most records are from strandings, sperm whale stomachs and, increasingly, from deep-sea trawling activity, e.g. for orange roughy (*Hoplostethus atlanticus*).

Literature: Verrill (1879–1880), Roper and Young (1972), Nigmatullin (1976), Roper *et al.* (1984), Roper (1998a), Sweeney and Young (2003b).

Architeuthis Steenstrup, 1857**Plate VI, 32**

Architeuthis Steenstrup, 1857b. *Forhandlinger ved de Skandinaviske Naturforskeres*, 7: 182–185 [183].

Type Species: *Architeuthis dux* Steenstrup, 1857.

Frequent Synonyms: *Architeuthis* (*Architeuthis*) Steenstrup, 1857b; *Architeuthis* Steenstrup, *in* Harting, 1860; *Megaloteuthis* Kent, 1874; *Dinoteuthis* More, 1875; *Mouchezis* Velain, 1877; *Megateuthis* Hilgendorf, 1880; *Plectoteuthis* Owen, 1881; *Steenstrupia* Kirk, 1882; *Dubiateuthis* Joubin, 1900.

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

Diagnostic Features: Because the Architeuthidae is monotypic, the generic characters are the same as those of the family.

Geographical Distribution: As above.

Remarks: Numerous species have been named in the sole genus of the family, *Architeuthis*, but most of the 21 nominal species are based on incomplete, damaged specimens and are so inadequately described and poorly understood that the systematics of the group is thoroughly confused. A complete list of species associated with the Architeuthidae is presented by Sweeney and Young (2003b). Currently, 3 species are considered valid by some authors, while others regard these 3 entities as subspecies of *Architeuthis dux*. The diagnostic morphological features currently are little understood and the entities are distinguished geographically. Molecular and morphological studies indicate that these entities possibly represent a single species of worldwide distribution, precisely, *A. dux* (Carlini and Graves, 1999; Förch, 1998; Roeleveld, 2000). However, the resolution and breadth of the analyses were insufficient to provide conclusive evidence. Genetic studies are underway that will compare characteristics of *Architeuthis* specimens from all major localities throughout its geographical range. Because the species characters and the distributional ranges of the species currently are in flux and unresolved, the species will be treated together here; however, data on the type locality, FAO names and geographical concentration of records are reported individually.

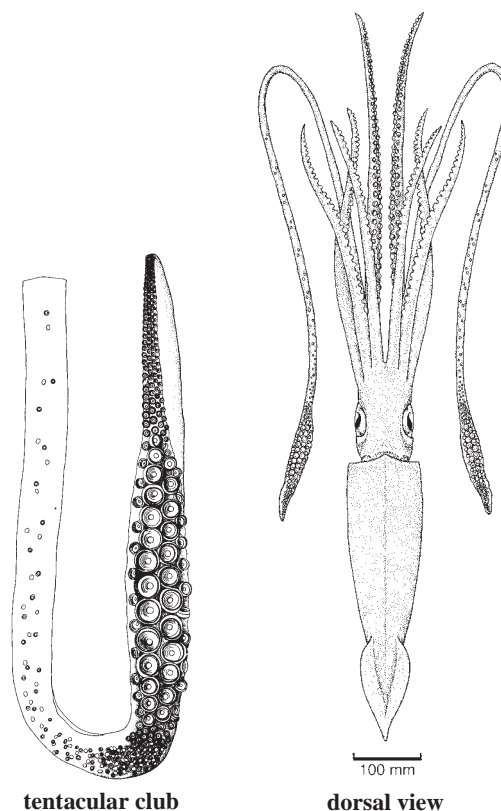
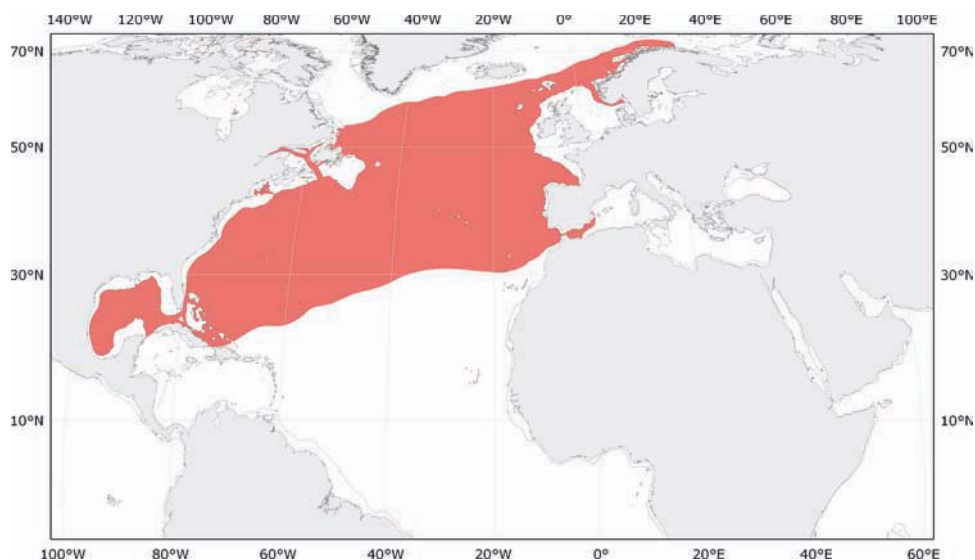
Architeuthis dux Steenstrup, 1857

Fig. 165

Architeuthis dux Steenstrup, 1857b, *Forhandlinger ved de Skandinaviske Naturforskere*, 7: 182–185 [183]. [Type locality: 31°N 76°W, North Atlantic Ocean].

FAO Names: **En** – North Atlantic giant squid; **Fr** – Encornet monstre de l'Atlantique du Nord; **Sp** – Megaluria de l'Atlantico Norte.

Geographical Distribution: Concentrations of records are from the North Atlantic Ocean, especially Newfoundland, Norway, northern British Isles, northern Spanish waters and the oceanic islands of the Azores and Madeira. A number of records now exist from the lower Gulf of Mexico, through the Straits of Florida, Bahamian waters and Bermuda. Also recorded from the western Mediterranean Sea (Fig. 166).

Fig. 165 *Architeuthis dux*Fig. 166 *Architeuthis dux*

■ Known distribution

Architeuthis martensii (Hilgendorf, 1880)

Megateuthis martensii Hilgendorf, 1880, *Sitzungsbericht Gesellschaft naturforschender Freunde, Berlin*, 4:65–67 [65]. [Type locality: Western North Pacific Ocean, Japan].

FAO Names: **En** – North Pacific giant squid; **Fr** – Encornet monstre de le Pacifique Nord; **Sp** – Megaluria del Pacifico Norte.

Geographical Distribution: Concentrations of records are from the North Pacific Ocean, especially around Japan and off northern California.

Architeuthis sanctipauli (Velain, 1877)

Mouchezis sanctipauli (Velain, 1877), *Archives de Zoologie Experimentale et Generale Southern Indian Ocean*, 6:1–143, [8].
[Type locality: 38°43'S, 77°32'E, St Paul Island, southern Indian Ocean, on the beach]

FAO Names: **En** – Southern Ocean giant squid; **Fr** – Encornet monstre de l'Océan Austral; **Sp** – Megaluria de l'Oceano Austral.

Geographical Distribution: Concentrations of records are from the southwestern Pacific around New Zealand, southern Australia and southern South America and circumglobal in the Southern Ocean, including the southern Indian Ocean.

Size: See family discussion. The maximum size of *Architeuthis martensi* appears to be smaller than that of the forms from other regions.

Habitat and Biology: The vertical distribution of *Architeuthis* remains difficult to assess precisely, but captures in deep-sea fishing nets and more accurate information on the foraging behaviour of its principal predator, sperm whales, indicate a range of about 200 to 800 m (perhaps to 1 000 m). The zone of maximum concentration appears to be about 400 to 600 m. These sources also indicate habitats associated with the bottom as well as in deep midwater layers well above very great bottom depths. A specimen of *Architeuthis* was photographed alive for the first time as it attacked a baited camera off Japan at 900 m. It became hooked on the baited jig and pulled the array up to 600 m before a tentacle broke and the squid escaped. *Architeuthis* may be a stronger predator than previously suspected, using vigorous attacks with its tentacles. Juveniles of the species have been reported from both the Atlantic and Pacific Oceans and from Japan. The morphology and temporal, geographic and bathymetric distribution of 17 paralarvae have been described from off New Zealand. Adults and preadults are reported from all major oceans, but verifying their actual habitat is difficult. As with other cephalopods the growth rate of *Architeuthis* is thought to be very rapid, and full adult sizes (up to perhaps 500 kg) may be attained in a maximum of 2 to 3 years based on statolith analysis. However, isotopic analysis using delta super (18) Oxygen suggest a longer life span, perhaps to about 14 years. Analysis of stranded specimens on the northern coast of the Iberian Peninsula, Spain, shows a strong temporal and spatial relationship to geophysical prospecting utilizing high energy air gun (acoustic) arrays in near-by Bay of Biscay waters. Females produce very small eggs, 1.4 mm by 0.7 mm, in enormous numbers; 1 female examined had in excess of 5 kg of eggs in her ovary, numbering more than 1 million eggs. Other calculations suggest a fecundity of 10 million eggs. Males mature at smaller sizes than females; they produce hundreds of spermatophores (up to 500 mm long) that are stored in the large Needham's sac until mating occurs. The terminal end of Needham's sac, termed the penis, is extremely elongate and protrudes out of the mantle opening to the level of the anterior portion of the head. While mating has not been observed, spermatangia from extruded spermatophores have been noted embedded under the skin, into the subcutaneous tissue of the arms and head of females. Adults of *Architeuthis* are consistently preyed upon by sperm whales, subadults by adult sleeper sharks (*Somniosus cf. microcephalus*), while juveniles are subjected to predation by mesopelagic fishes such as lancetfishes, *Aphonopus carbo* and *Alepisaurus ferox*. Prey of *Architeuthis* consist of macrourid fishes (including *Macruronus novaezelandiae*, the blue grenadier), the blue whiting (*Micromesistius poutassou*), squids (including *Architeuthis*, *Nototodarus*) and orange roughy (*Hoplostethus atlanticus*). Analysis of tracers, heavy metals and stable isotopes suggests that *Architeuthis* is a very high level predator, feeding on high trophic level fishes and squids. Stable isotope and trace element analyses of *Architeuthis* beaks indicate aspects of its biology: ontogenetic change in diet early in life history, age of at least 2 years, and sedentary behaviour in adulthood, with gradual ontogenetic descent. Extremely unusual strandings of 9 specimens on the Iberian Peninsula (2001, 2003) have been linked to geophysical prospecting use of sonic explosion air guns, which caused acute tissue damage and death.

Interest to fisheries: While there is no interest in *Architeuthis* as a fishery commodity, many recorded specimens in the past 3 decades have been captured as bycatch in commercial fishery trawls. The principal fisheries involve deep-sea target species such as hoki, orange roughy and scampi, for example, where fishing depths are 400 to 1 000 m. Even if a predictable harvest were possible, which currently seems quite unlikely, the flesh of *Architeuthis* contains ammonium ions that help maintain buoyancy at the desired depth range but also render the musculature very bitter tasting to humans, thus inedible.

Local Names: GERMANY: Kraken, Karke.

Remarks: Recent records from the far western Mediterranean Sea, probably are in association with an increase of specimens reported in the Iberian Peninsula waters. A very small "market" exists for *Architeuthis*, based on the desire of natural history museums, public marine aquaria and marine science centres to have on display a preserved representative of among the largest invertebrates ever to exist in the world. Such specimens with associated exhibition and educational materials and programmes provide marvelous opportunities to teach about the world's oceans and their deep-sea inhabitants and ecosystems. The extensive list of publications in the Appendix is provided because of the broad interest in *Architeuthis*, the giant squid, even though it is not a target species for fisheries. Notations of "survey" and "review" indicate works of broader coverage, both geographically and in detail of morphology of particular specimens. "Locality" denotes a report of a specimen or specimens from a specific locality or region; these also may contain information on anatomy as well as measurements, but in general are less comprehensive than "review" or "survey" publications. Other notations are clearly topical.

Literature: Roper *et al.* (1984), Roeleveld and Lipinski (1991), Aldrich (1992), Förch (1998), Roper (1998a), Sweeney and Young (2003b), Guerra *et al.* (2004a, b, c), Hoving *et al.* (2004), Landman *et al.* (2004), Kubodera and Mori, (2005).

2.5. Family BATHYTEUTHIDAE Pfeffer, 1900

by Clyde F.E. Roper and Patrizia Jereb

Bathyteuthidae Pfeffer, 1900, *Mitteilungen aus dem Naturhistorischen Museum Hamburg*, 17(2): 145–198 [173].

Type Genus: *Bathyteuthis* Hoyle, 1885b.

FAO Names: En – Deepsea squids; Fr – Loutènes abyssales; Sp – Batilurias.

Diagnostic Features: The Bathyteuthidae is distinguished by the presence of a straight funnel-locking cartilage; **buccal connectives that attach to the dorsal borders of arms IV; minute suckers on the 7 buccal lappets; clubs small, unexpanded with many transverse series (6 to 8) of minute suckers, no carpal cluster; round or paddle-like subterminal, lobed fins** (i.e. posterior margins convex); mantle cylindrical, bluntly rounded posteriorly; head wider than mantle; eyes angled slightly anteriorly; suckers on the arms arranged in irregular transverse series (2 series proximally, increase to 4 series distally on arms I to III; 1 or 2 series only on IV); a uniform deep maroon colour over all surfaces. **A single, small, black-pigmented photophore is embedded at the base of each arm I to III** (this is clearly apparent in young specimens but may be obscure in adults).

Size: Small-sized squids; maximum mantle length 75 mm.

Geographical Distribution: Worldwide.

Habitat and Biology: *Bathyteuthis abyssicola*, the most common species, is most abundant between 700 and 2 500 m. While most species of deepsea squids produce ammonium to achieve neutral buoyancy, bathyteuthid squids, *B. abyssicola* and *B. berryi*, instead concentrate high amounts of a low-density cation, as yet unidentified. This results in muscular tissue more comparable to shallow-living squids, which, in turn enables bathyteuthids to be much stronger swimmers than other deep-sea squids. Odontocete cetaceans are known predators. Photosensitive vesicles on the dorsal surface of the head appear to function to detect bioluminescent light from neighbouring organisms beyond the visual field.

Remarks: Bathyteuthidae formerly included a second genus *Chtenopteryx*, because of several shared features. Roper (1969) considered the differences in other characters sufficiently strong as to warrant separate families for the 2 genera. A molecular study by Carlini and Graves (1999) confirmed a close relationship between the 2 families. The single genus, *Bathyteuthis*, contains 3 species: *B. abyssicola*, the most common species, that has been recorded from all major oceans; *B. bacidifera* and *B. berryi*, rather more limited in distribution and infrequently captured.

Literature: Roper (1969), Young (1972a), Nesis (1982, 1987), Roper and Young (1975), Roper *et al.* (1984), Roper and Sweeney (1992a), Clarke and Young (1998), Miske (1998), Sweeney and Roper (1998), Roper (1998d), Carlini and Graves (1999), Sweeney and Young (2003c).

***Bathyteuthis* Hoyle, 1885**

Bathyteuthis Hoyle, 1885b, *Report on the Scientific Results of the Voyage of H.M.S. Challenger*, 1(1): 269–274 [272].

Type Species: *Bathyteuthis abyssicola* Hoyle, 1885b.

Frequent Synonyms: *Benthoteuthis* Verrill, 1885.

Diagnostic Features: The family is monotypic so the generic characters are the same as those given for the Bathyteuthidae.

Key to the species of *Bathyteuthis* (adults and juveniles)

- 1a. Protective membranes on arms low to well developed, fleshy, with straight to gently scalloped borders; trabeculae not free, enlarged, or elongate → 2
- 1b. Protective membranes reduced or absent; trabeculae free, elongate, finger-like; arm suckers numerous; sucker rings with 18 to 34 protuberances; gills long, broad ***Bathyteuthis bacidifera***
- 2a. Arm suckers relatively few, sucker rings with 8 to 18 protuberances; arms short, blunt; gills short, narrow ***Bathyteuthis abyssicola***
- 2b. Arm suckers extremely numerous; sucker rings with 10 to 14 protuberances; arms long, attenuate; gills long, broad ***Bathyteuthis berryi***

Bathyteuthis abyssicola* Hoyle, 1885*Fig. 167**

Bathyteuthis abyssicola Hoyle, 1885b, *Report on the Scientific Results of the Voyage of H.M.S. Challenger*, 1(1): 269–274 [272]. [Type locality: 46°16'S, 48°27'E, southwestern Indian Ocean].

Frequent Synonyms: *Benthoteuthis megalops* Verrill, 1885.

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

Diagnostic Features: Mantle robust, bluntly rounded posteriorly. Fins round, small, separate, short; eyes orient slightly anteriorly. **Clubs unexpanded, short, with relatively few, small, coequal-sized suckers. Arms short, blunt with few (about 100 on arms I to III) small suckers; protective membranes present, with straight or gently scalloped borders; trabeculae not free, enlarged or elongate;** gills short, blunt, narrow; colour deep maroon.

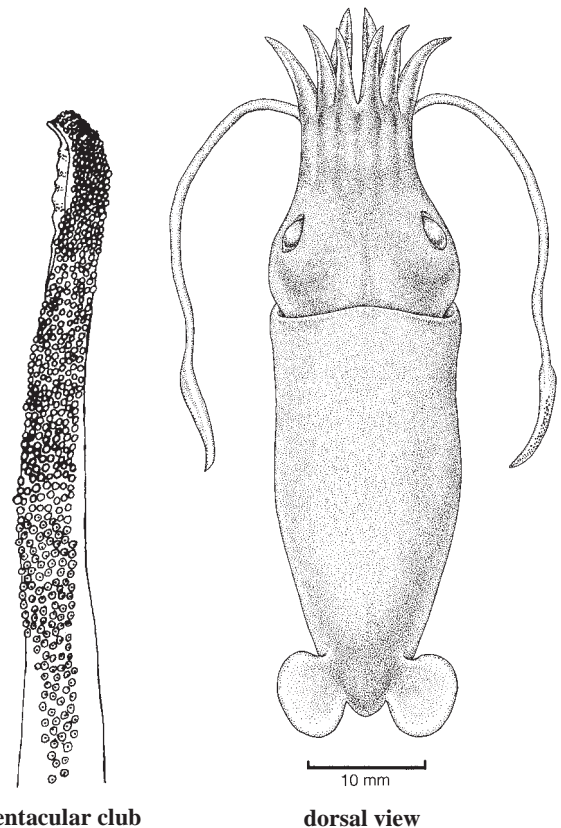
Size: The maximum mantle length is 75 mm.

Geographical Distribution: Circumglobal. Most abundant in the Southern Ocean and in highly productive waters of the eastern Pacific, Atlantic, and Indian oceans. Records from the Mediterranean Sea (Fig. 168).

Habitat and Biology: An oceanic species that occurs between about 100 and 4 200 m depth, but normally it is encountered between 700 and 2 000 m in the Southern Ocean where it carries out a deep vertical diurnal migration. Paralarvae and juveniles tend to live at shallower depths than the adults. The mantle length at first maturity is about 40 to 50 mm in females and 35 mm in males. Diel vertical migration of the population occurs in the eastern tropical-subtropical North Atlantic Ocean with the species concentrated between 100 and 1 000 m. Among predators of *B. abyssicola* are the melon-headed whale in Hawaiian waters.

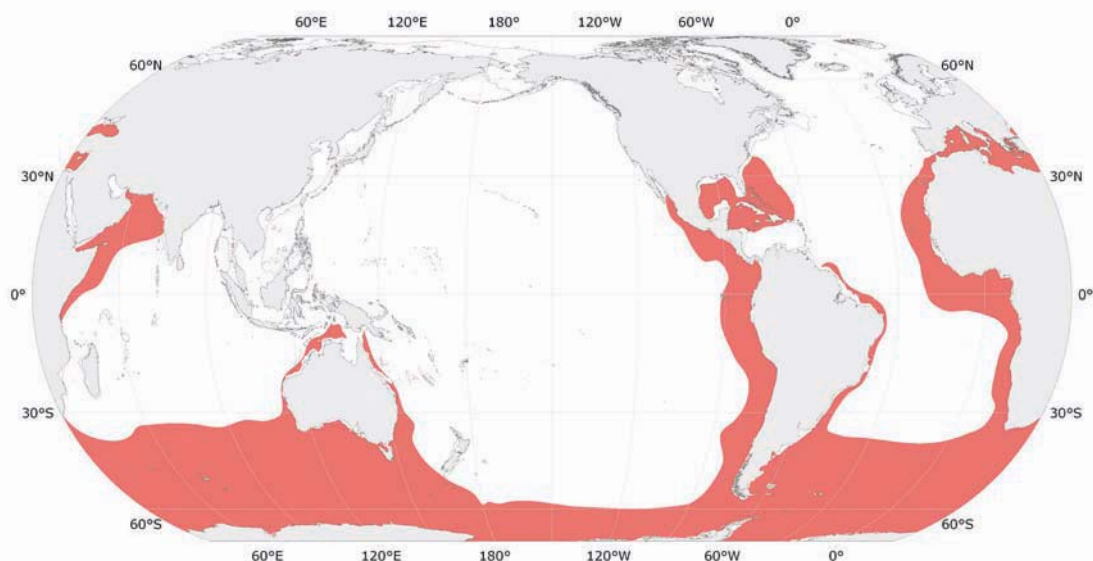
Interest to Fisheries: Although the species is especially abundant in the Southern Ocean, it presently has no commercial value.

Literature: Roper (1968, 1969), Clarke and Lu (1975), Vecchione *et al.* (2001), Seibel *et al.* (2004).



tentacular club

dorsal view

Fig. 167 *Bathyteuthis abyssicola***Fig. 168 *Bathyteuthis abyssicola***

■ Known distribution

Bathyteuthis bacidifera Roper, 1968

Bathyteuthis bacidifera Roper, 1968, *Proceedings of the Biological Society of Washington*, 81: 161–172 [163]. [Type locality: 07°47'S, 81°23'W, eastern South Pacific Ocean].

Size: The mantle length extends to 40 mm.

Geographical Distribution: A mesopelagic to bathypelagic species in the tropical Indo-Pacific region, principally in the productive waters of the eastern Pacific Equatorial Water Mass. Occurs from 600 to 1 550 m in tropical eastern Pacific (open net captures).

Literature: Roper (1968, 1969), Nesis (1982, 1987).

Bathyteuthis berryi Roper, 1968

Bathyteuthis berryi Roper, 1968, *Proceedings of the Biological Society of Washington*, 81: 161–172 [169]. [Type locality: 33°14'45"N, 118°37'20"W, eastern North Pacific Ocean].

Size: The mantle length attains 50 mm.

Geographical Distribution: A bathypelagic species from the eastern North Pacific Ocean, off southern California. Captured in open nets between 800 and 1 200 m, but probably occurs deeper, as well.

Literature: Roper (1968, 1969), Nesis (1982, 1987).

2.6 Family BATOTEUTHIDAE Young and Roper, 1968

by Clyde F.E. Roper and Patrizia Jereb

Batoteuthidae Young and Roper, 1968, *Antarctic Research Series*, 2: 185–202 [185].

Type Genus: *Batoteuthis* Young and Roper, 1968.

FAO names: **En** – Bush-club squids; **Fr** – Encornets piquets; **Sp** – Calamars pestillos.

Diagnostic Features: Funnel-mantle locking apparatus distinctly curved. **Buccal connectives attach dorsally to arm pairs I and II, ventrally to arm pairs III and IV.** Large elongate photophores on aboral tips of arms IV in large subadult males; small aboral photophores on tips of arms IV of large subadult females. Gladius with long slender rachis; true vane lacking. **Conus extremely elongate; midventral fusion apparent. Club 80% or more of tentacle length; 6 distinct transverse series of very small, very numerous suckers; no separate, distinct dactylus and carpus. Head disproportionately small and narrow.** Fins short, about 20% of mantle length. Mantle long, slender, produced into long, pointed tail posteriorly. Viscera compact, located near anterior end of mantle cavity (except gonads).

Size: Mantle length up to 300 to 350 mm, exclusive of the elongate, spindle-like tail (supported by secondary conus of gladius) posterior to the fins.

Geographical Distribution: It occurs in the Antarctic and sub-Antarctic waters of the South Atlantic, South Pacific and southern Indian oceans between approximately 45°S to 60°S.

Habitat and Biology: It is a bathypelagic to abyssopelagic circumglobal form.

Interest to Fisheries: Because of its apparent rarity in deep-sea trawls, this species is of no current interest to fisheries, other than its availability as prey to deep-living fishes of commercial interest.

Local Names: USA: Spike-tail squid.

Remarks: This remarkable monotypic squid has been reported infrequently since its original description.

Literature: Young and Roper (1968), Nesis (1982, 1987), Sweeney and Young (2003d), Young and Roper (2008d).

***Batoteuthis* Young and Roper, 1968**

Batoteuthis Young and Roper, 1968, *Antarctic Research Series*, 2: 185–202 [185].

Diagnostic Features: The diagnostic characters for the sole known genus are the same as those given for the family.

Batoteuthis skolops* Young and Roper, 1968*Fig. 169**

Batoteuthis skolops Young and Roper, 1968, *Antarctic Research Series*, 2: 185–202 [185]. [Type locality: 49°57'S; 169°01'W, South Pacific Ocean, about 1 000 km southeast of Wellington, New Zealand, in the region of the Antarctic Convergence].

Frequent Synonyms: None.

FAO Names: **En** – Bush-club squid; **Fr** – Encornet piquet; **Sp** – Calamar pestillo.

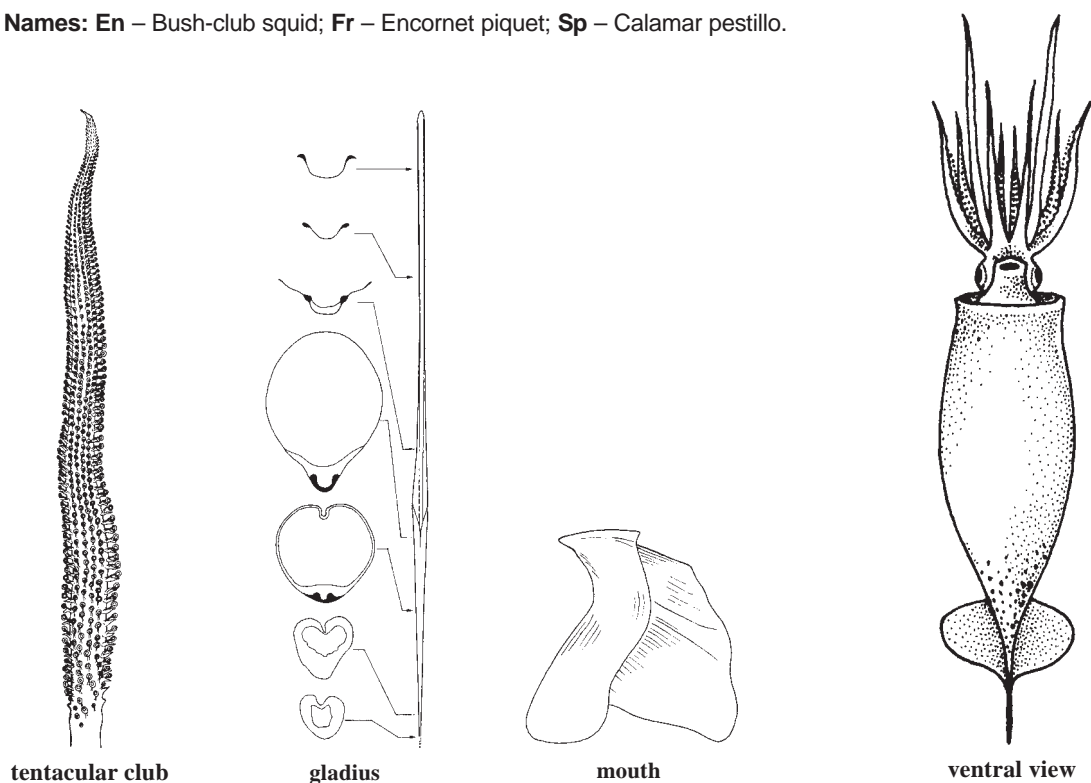


Fig. 169 *Batoteuthis skolops*

Diagnostic Features: The specific characters are those given for the monotypic family, as well as the following additional characters. The mantle wall is thin but muscular, similar to most cranchiids. **The gladius is visible along the dorsal midline and extends far posteriorly as a supporting element of the long, thin, spindle-like tail.** The tail is about 50% of the mantle length, at least in young specimens. The fins are very short, only 20% of the mantle length. **The head is remarkably small and narrow** in comparison with the mantle size. **The eyes are proportionally very large.** The funnel component of the locking apparatus is deeply grooved, slightly broader and deeper posteriorly. Arms are long, slender, very attenuate at tips. The tentacles are relatively short, only 1.5 times longer than the arms, but quite robust. **The clubs are extremely long, 80% of tentacle length,** not appreciably expanded. Numerous pointed trabeculae are present, but only a trace of a protective membrane exists. **Suckers in 6 transverse series are small and very numerous, with small, conical widely-spaced teeth.** The inner horny rings of the arm suckers have broadly spaced, sharp, pointed teeth on the distal half. **No dactylus or carpus exist.**

Size: The total mantle and tail length extends to 350 mm.

Geographical Distribution: Circumpolar in Antarctic to sub-Antarctic waters, from about 45°S to 60°S (Fig. 170).

Habitat and Biology: The species is a bathypelagic to abyssopelagic form. Recorded depth range from 366 m for a 30 mm mantle length juvenile during the day to 1 200 to 2 500 m for larger juveniles and subadults at night (open net captures only). The largest specimen described with intact tentacles is the holotype. A few growth stages have been described. Paralarvae and mature adults are unknown. The southern elephant seal is one known predator.

Local Names: USA: Antarctic spike-tail squid.

Literature: Young and Roper (1968), Nesis (1999b), Golub (2001), Anderson and Rodhouse (2002), Jackson *et al.* (2002), Young and Roper (2008d).

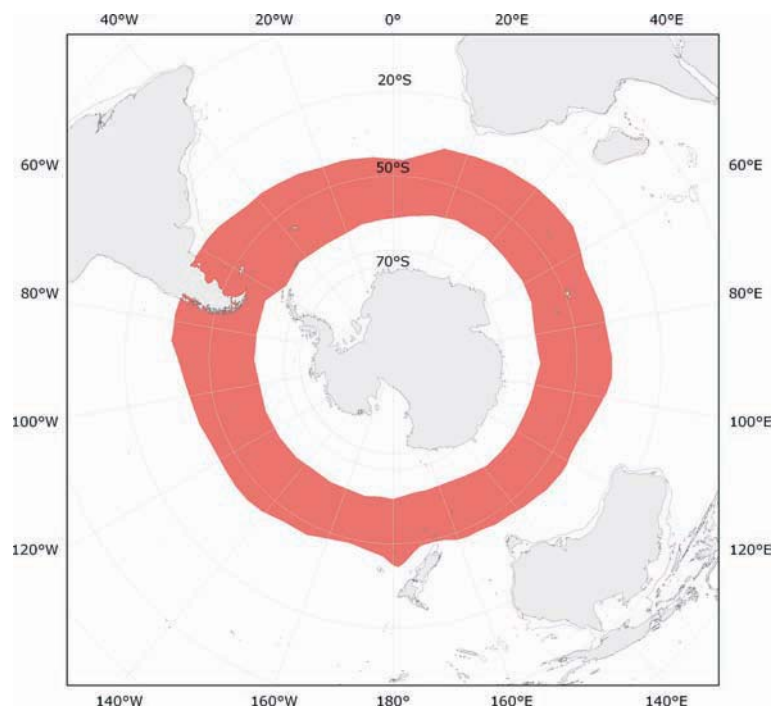


Fig. 170 *Batoteuthis skolops*

Known distribution

2.7 Family BRACHIOTEUTHIDAE Pfeffer, 1908

by Clyde F.E. Roper and Patrizia Jereb

Brachioteuthidae Pfeffer, 1908b, *Nordisches Plankton*, 2(9)(4): 9–116 [78].

Type Genus: *Brachioteuthis* Verrill, 1881: [405].

FAO Names: **En** – Arm squids; **Fr** – Encornets bras courts; **Sp** – Braquilurias.

Diagnostic Features: The adults are characterized primarily by the presence of numerous transverse series (rows) of very small, long-stalked suckers on the greatly expanded proximal portion (manus) of the tentacular clubs; dactylus section with 3 or 4 series of suckers; **carpal-locking apparatus extends along tentacular stalk**; straight, simple groove in funnel-locking cartilage; **ventral attachment of the buccal connectives to ventral margins of arms IV**; 2 series of suckers on the arms; mantle long, slender, muscular, but thin-walled; fins relatively short, terminal, heart-shaped or rhomboidal with free anterior lobes. Gladius with a very thin, narrow rachis, a short vane in the posterior third and a well-developed narrow cone; **photophores present in some species as a single photophore on the ventral surface of each eyeball**; digestive gland compact, displaced well posterior to the cephalic cartilage in the mantle cavity. The diagnostic characters of the paralarvae and juveniles are quite distinct from the adults: mantle elongate to elongate/bulbous; fins separate, terminal, paddle-shaped, transversely oval; distinctive, long, slender neck (no arm-crown stalk); eyes lateral but frequently situated toward ventral part of head; distinctive bump-like swelling on dorsal surface of head; mantle opening wide relative to neck; club suckers develop at hatching and adult-like pattern of numerous suckers on proximal manus well established by about 10 mm mantle length; tentacles large, present at hatching, robust relative to arms.

Size: Small to medium-sized squids up to 200 mm mantle length.

Habitat and Biology: A species of *Brachioteuthis* from Hawaiian waters spawns individual eggs into the plankton, a unique phenomenon outside the enoploteuthid squids. Paralarval *Brachioteuthis* species apparently orient in the water in a head-down posture to resemble a drifting medusoid bell with dangling tentacles to capture prey. Ontogenetic “breakpoints” of morphological characters during growth of paralarval squids were described; these rapid changes in certain characters seem correlated with rapid ecological changes. While few precise data are available on vertical distribution, closing net data for brachioteuthids off Hawaii showed depths of 830 to 975 m during the day and 100 to 150 m at night and open net captures were made at 975 to 1 000 m during daytime and at 50 to 225 m at night. Also, opening/closing net captures in daylight and darkness were made down to 1 000 m in the Scotia Sea. Closing net captures in the Mediterranean of *Brachioteuthis rüsei* at night were at a 150 m. In the Aegean Sea, open net plankton sampling captured juvenile *B. rüsei* most frequently at 350 m, while other specimens were caught by trawl during the daylight at depths between 540 and 615 m. These data collectively suggest an extensive diel vertical migration for *Brachioteuthis* species. *Brachioteuthis* species are prey of numerous epipelagic and mesopelagic fishes, for example, yellowfin tuna and swordfish off eastern Australia.

Interest to Fisheries: The relatively small size, thin-walled mantle and apparent “rarity” of *Brachioteuthis* species make them unsuitable for commercial harvesting. However, research has shown the high value of these species as prey for fishes, marine mammals and other components of the marine fauna; consequently, they are not “rare” species in their deep-sea ecosystem.

Remarks: Until 2001 the family had been considered to be monogeneric for many decades, the 5 other nominal genera having been synonymized with *Brachioteuthis* Verrill (Sweeney and Young, 2003e). Lipinski (2001), described a new genus, *Slosarczykovia*, with 1 species, and a new species of *Brachioteuthis*. Six species currently are recognized as valid in the genus *Brachioteuthis*: *B. beanii* Verrill 1881, (in 1880–1881), *B. behnii* Steenstrup, 1882, *B. bowmani* Russell, 1909 (with some question), *B. picta* Chun, 1910a, *B. linkovskyi* Lipinski, 2001 and *B. rüsei* Steenstrup, 1882. However, the taxonomic status of the new genus has yet to be reviewed and thorough revision of all taxa in the family is required. The unusually long neck in paralarval brachioteuthids distinguishes them from all other families of squids except for the paralarvae of Chiroteuthidae. However, most chiroteuthids have an additional elongation of the arm crown stalk (variable among species). Also, the structure of the elongated neck differs between the 2 families. Brachioteuthids have a neck that appears to be a single, muscular, fluid-filled tube continuous with a large, fluid-filled chamber in the mantle cavity. In contrast, the elongate neck of young chiroteuthids is supported by numerous separate chambers, so the paralarvae and juveniles of the 2 families are easily distinguished (Dunning and Lu, 1998). Even though the systematics of the family are very unsettled, an increasing body of biological information on the species has developed since the early 1990s with regard to geographical distribution, ecology, predation and prey (see Appendix). By far the greatest research information has been attributed to *B. rüsei*, an apparently extremely wide-ranging species. However, because the identification of *Brachioteuthis* species is so challenging, it is difficult to know which species and growth stages actually are represented in published reports, both for distribution and biology. Some identifications might need to be adjusted once the systematics are stabilized.

Literature: Roper and Young (1975), Nesis (1982, 1987), Young *et al.* (1985), Dunning and Lu (1998), Roper and Sweeney (1992c), Rodhouse and Piatkowski (1995), Roper and Vecchione (1996), Vecchione *et al.* (2001), Shea and Vecchione (2002), Salman *et al.* (2003), Sweeney and Young (2003e), Lipinski and Young (2008).

***Brachioteuthis* Verrill, 1881**

Brachioteuthis Verrill, 1881 in 1880–1881, *Transactions of the Connecticut Academy of Sciences*, 5(6): 259–446 [405].

Type Species: *Brachioteuthis riisei* (Steenstrup, 1882).

Frequent Synonyms: *Tracheloteuthis* Steenstrup, 1882; *Entomopsis* Rochebrune, 1884; *Verrilliola* Pfeffer, 1884.

Diagnostic Features: The skin is smooth; a reticulate structure and/or warts may occur in mature males, especially in late subadult and adult stages. The tentacular club has distinctly differentiated suckers; the largest suckers on the proximal manus are at least 50% smaller than those on the proximal dactylus. A carpal (tentacular) fixing apparatus normally present.

Size: The maximum mantle length is 170 to 200 mm.

Remarks: See family discussion.

Interest to Fisheries: See family discussion.

Literature: See family list.

Brachioteuthis riisei* (Steenstrup, 1882)*Fig. 171**

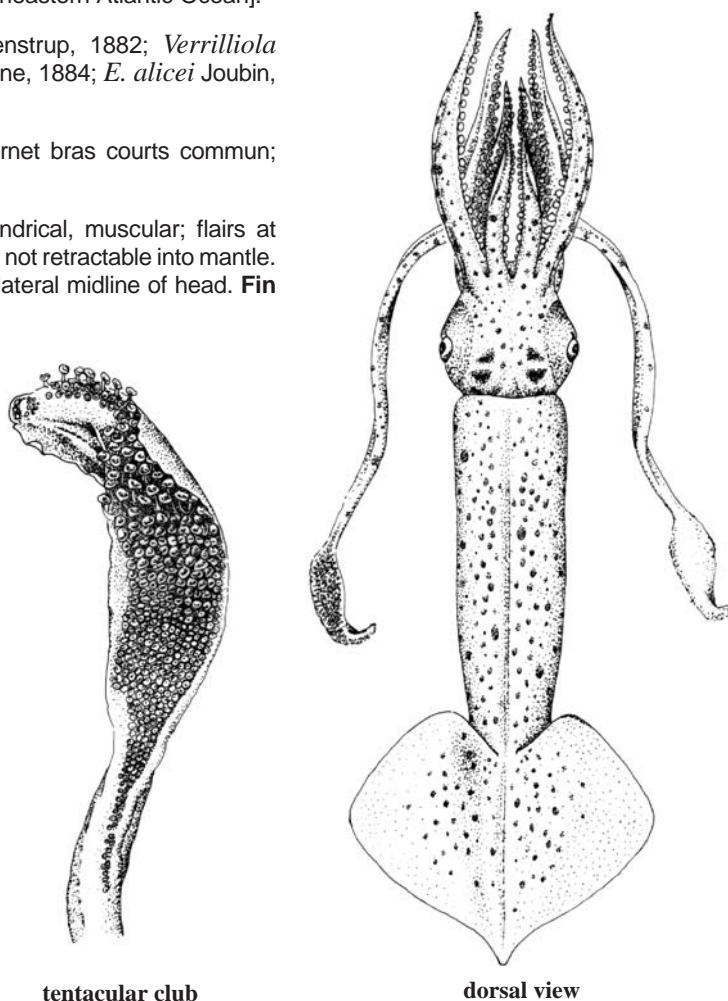
Tracheloteuthis riisei Steenstrup, 1882b, *Videnskabelige Meddelelser fra den Naturhistoriske Forening i Kjøbenhavn*, series 4(3): 293–294 [294]. [Type locality: 34°40'S, 7°W, southeastern Atlantic Ocean].

Frequent Synonyms: *Tracheloteuthis riisei* Steenstrup, 1882; *Verrilliola nympha* Pfeffer, 1884; *Entomopsis velaini* Rochebrune, 1884; *E. alicei* Joubin, 1900.

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

Diagnostic Features: Mantle narrow, elongate, cylindrical, muscular; flairs at mantle opening; conical posteriorly to tip. Head narrow, not retractable into mantle. Neck long to very long in paralarvae; eyes ventral to lateral midline of head. **Fin length from anterior border of fins less than 50% of mantle length and shorter than width**, saggitate to slightly rounded posteriorly, angles rounded, lobes prominent. Tentacles long. **Tentacular clubs wide, with very numerous, minute suckers in the carpal portion; 4 to 6 transverse series of larger suckers in distal portion; 4 series at dactylus.** Tentacles in paralarvae and juveniles proportionally much longer than in adults; tentacular clubs broad with 2 to 4 series of “larger” suckers in carpal area, becoming minute in midportion, then 6 to 8 series of knobs in dactyl region. **Carpal-locking apparatus with 2 irregular series of small suckers** along the oral surface of tentacular stalk. Buccal connectives attach to ventral edge of arms IV. Gladius with very long, thin rachis and narrow vane. **A single photophore on ventral surface of each eye** developed in adults. Paralarvae of *B. riisei* are characterized by a moderately long neck and eyes that are directed anteriorly at acute angles to the longitudinal axis of the head.

Size: Maximum mantle length to 170 mm in Antarctic populations, to 80 mm in other areas.

**Fig. 171** *Brachioteuthis riisei*

Geographical Distribution: A cosmopolitan species. Present in the Atlantic Ocean, from the Norwegian Sea and Iceland (63°N), throughout the Mediterranean Sea (including the Aegean Sea), to the extreme South Atlantic Ocean. (Probably absent in tropical western Atlantic, Gulf of Mexico and Caribbean Sea). In the Indian Ocean, except Arabian Sea and Bay of Bengal; in the South Pacific Ocean, south of central waters; circumglobal in Southern Ocean, but rare in tropics. Zonal designations: boreal, notalian (subantarctic), subtropical, tropical (rare) (Fig. 172).

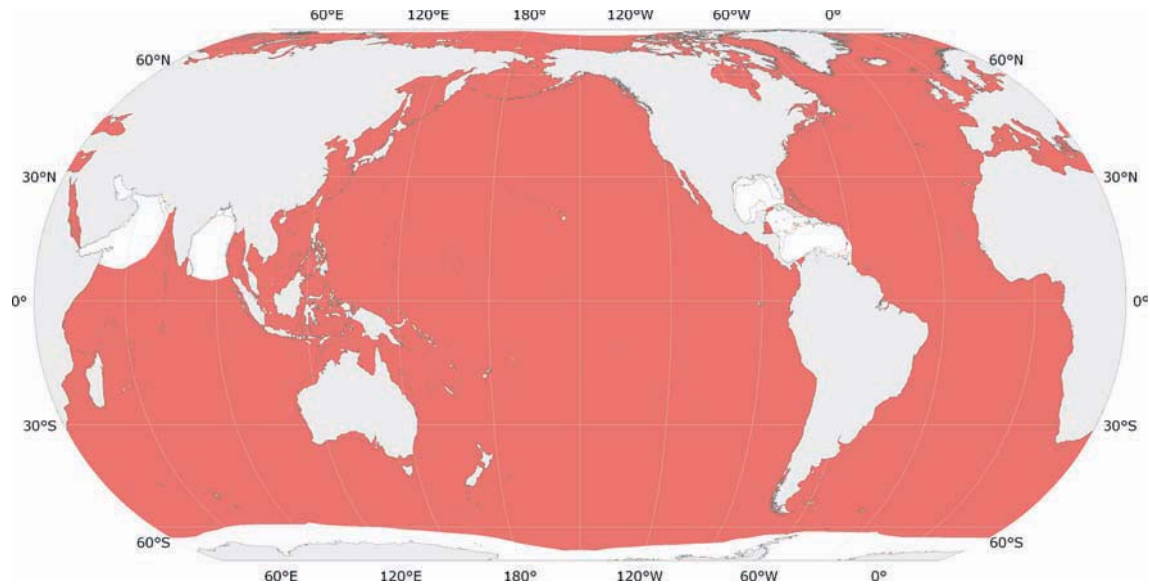


Fig. 172 *Brachioteuthis riisei*

■ Known distribution

Habitat and Biology: An oceanic species that occurs from near the surface through midwaters, the continental slope, to 3 000 m depth. The spawning season appears to be considerably extended with regard to the cosmopolitan distribution of the species complex. Consequently, recently hatched paralarvae and juveniles are found in epipelagic waters throughout the year. In the North Atlantic, paralarvae are particularly abundant from May to August and in February; in the Mediterranean and in upwelling areas off northwestern Africa between 10°N and 30°N, from April to July, September, and from December to February. Paralarvae and juveniles are epipelagic to mesopelagic, then undergo ontogenetic descent to mesopelagic and bathypelagic zones as adults. In the western Atlantic (approximately 39°N 72°W) paralarvae, juveniles and subadults were captured in slope and eddy water masses at 43 to 750 m, with paralarvae and juveniles at less than 300 m and adults greater than 300 m; diurnal vertical migration was indicated. Off Hawaii specimens were caught in closing nets at 830 to 975 m during day and 100 to 150 m at night; open net captures were made at 975 to 1 000 m in daytime and at 50 and 250 m at night. Likewise, in the Mediterranean Sea specimens were caught in closing nets at 150 m during night time, and at 540 to 615 m by trawl nets during the day. Horizontal plankton net sampling at 100 m, 350 m and 650 m during sunrise, noon, sunset and midnight yielded a preponderance of juvenile *B. riisei* at 350 m. Paralarval morphology, taxonomy and distribution of *Brachioteuthis* sp. (? *riisei*) were determined in the eastern and western North Atlantic Ocean. *Brachioteuthis* (?) *riisei* is a frequent prey of sperm whales, striped dolphins, swordfish (*Xiphias gladius*) in Azorean waters, and giant red shrimp (*Aristaeomorpha foliacea*) in the Strait of Sicily, Mediterranean Sea. It is known to prey on krill in Antarctic seas.

Interest to Fisheries: Although this very abundant species/species complex has a nearly cosmopolitan distribution and is a very important food source for higher level predators, it does not appear to have much fishery potential currently.

Local Names: ITALY: Totanello braccio corto.

Remarks: Full extent of distribution undetermined due to uncertain identifications in the literature and probable existence of a currently undifferentiated species complex

Literature: Clarke (1966), Filippova (1972), Roper and Young (1975), Yamamoto and Okutani (1975), Guerra (1992), Nesis (1999b), Lefkaditou *et al.* (2003), Okutani (2005).

Brachioteuthis picta* Chun, 1910*Fig. 173**

Brachioteuthis picta Chun, 1910a, *Scientific Results of the Expedition Valdivia*, 18(1): 1–401 [207]. [Type locality: 5°6'N, 9°58'E, Benguela Current, South Atlantic Ocean].

Frequent Synonyms: Misidentification as *Brachioteuthis riisei*.

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

Diagnostic Features: Mantle long, very slender, slightly flared at mantle opening, abruptly narrows anterior to fins, extends posteriorly into a pointed tail. Fins sagittate, longitudinally rhomboidal; fin length and width about 50% of mantle length; width: length ratio approximately 0.9:1.1. Tentacular clubs expanded, covered with numerous minute suckers in the carpal region that extend proximally along the club. A single sausage-shaped photophore on ventral surface of each eyeball. Integument consists of reticular, fibrous texture. Colour a light purple-brown or chocolate hue.

Size: Maximum mantle length to 90 mm.

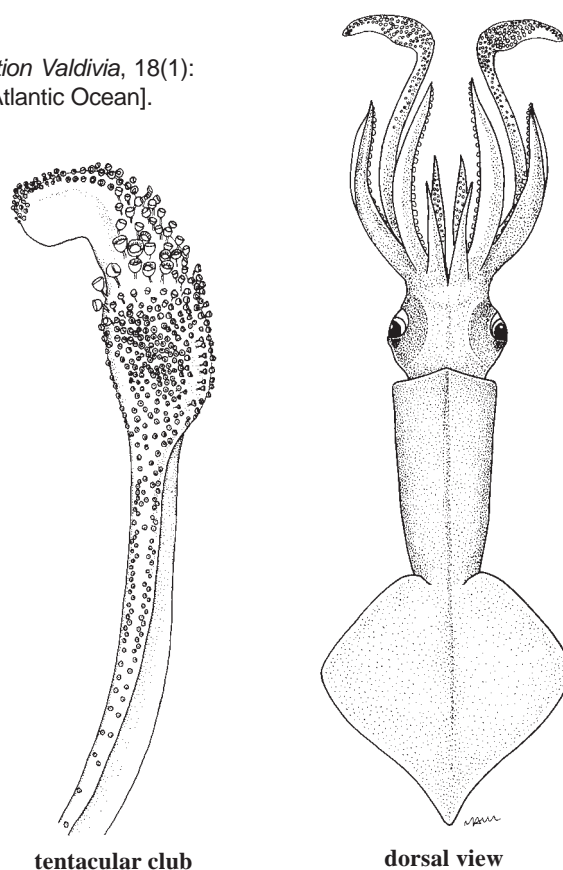
Geographical Distribution: Circumglobal, oceanic from about 30°N to at least 40°S to 45°S (Fig. 174).

Habitat and Biology: An oceanic species occurring in equatorial, southern subtropical, southern peripheral water masses. Paralarvae are epipelagic and mesopelagic; adults are lower epipelagic, mesopelagic and bathypelagic. Predators include the dwarf sperm whale, *Kogia sima*, off Brazil, pygmy sperm whale, *K. breviceps*, off New Zealand, the southern elephant seal, *Mirounga leonina*, and fishes, such as hakes and macrurids. A principal prey item seems to be krill.

Interest to Fisheries: Undetermined.

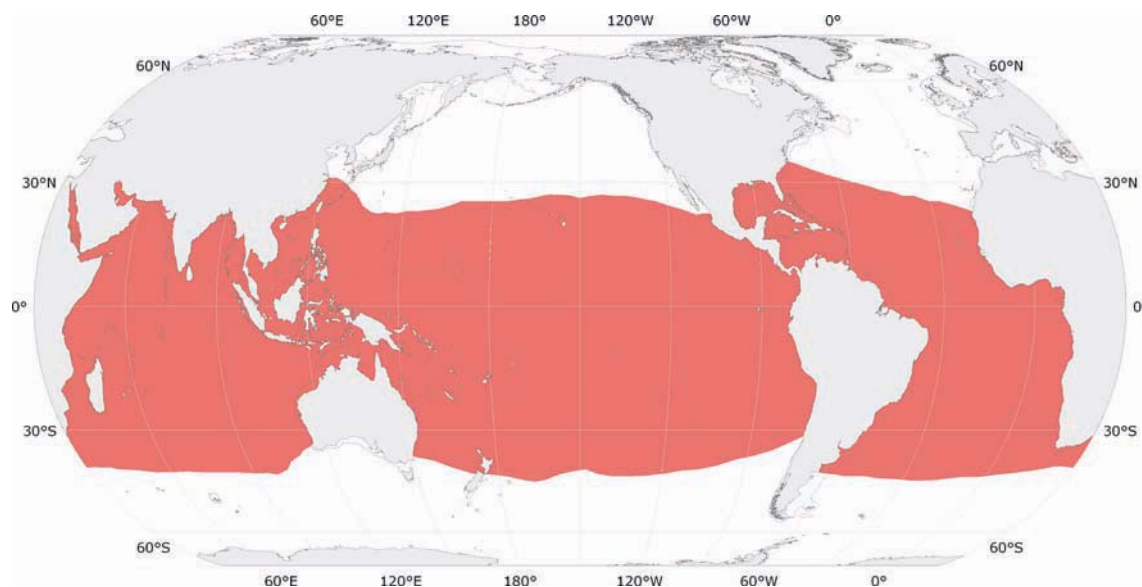
Remarks: Records of confidence for accurate identification include those from South African waters (e.g. Chun, 1910; Pfeffer, 1912; Nesis, 1982, 1987, 1999b) and from the Antarctic (e.g. Rodhouse, 1989; Piatkowski *et al.* 1994; Rodhouse and Piatkowski, 1995; Roeleveld, 1998).

Literature: Roper (1969), Roper *et al.* (1985), Nesis (1982, 1987), Piatkowski *et al.* (1994), Rodhouse and Piatkowski (1995), Okutani (2005).



tentacular club

dorsal view

Fig. 173 *Brachioteuthis picta***Fig. 174 *Brachioteuthis picta***

Known distribution

***Brachioteuthis beanii* Verrill, 1881**

Brachioteuthis beanii Verrill, 1881 in 1880–1881, *Transactions Connecticut Academy of Science*, 5(6): 259–446 [406]. [Type locality: 39°57'N, 69°19'W and 39°56'N, 69°24'W, western North Atlantic Ocean].

Frequent Synonyms: None.

Size: Maximum mantle length to 100 to 130 mm.

Geographical Distribution: Northwestern Atlantic Ocean off North American east coast, encompassing approximately the region west of 60°W and north of 26°N.

Habitat and Biology: Depths for adults to at least 1 000 m. Although little information exists on this species, its probable mating behaviour was observed and video-taped during 5 submersible dives off Cape Hatteras, North Carolina. The observations were made at 5 to 60 m above the bottom at depths of 500 to 860 m. The squid occurred in schools, and aggregations of 40 to 60 individuals were visible from the submersible at any given time. Three pairs of squid were observed in a tandem position, where the posterior individual grasped the posterior mantle of the anterior squid in its arm crown. The grasped squid bent its head and body posteriorly and vigorously moved its arms around the head and mantle opening of the grasping squid. The coupling had begun prior to the videotaping and continued after the 10-minute sequence was shot, so coupling must continue for an extended period of time.

Literature: Roper and Sweeney (1992c), Roper and Vecchione (1996), Vecchione *et al.* (2001), Okutani (2005).

***Brachioteuthis behnii* (Steenstrup, 1882)**

Tracheloteuthis behni Steenstrup, 1882b, *Videnskabelige Meddelelser fra den Naturhistoriske Forening i Kjøbenhavn*, series (4)3: 293–294 [294]. [Type locality: Indian Ocean (purchased); west coast of New Guinea, western Pacific Ocean; no locality].

Frequent Synonyms: *Tracheloteuthis behnii* Steenstrup, 1882; *Entomposis clouei* Rochebrune, 1884; *Verrilliola gracillis* Pfeffer, 1884.

Size: Mantle length to 60 mm.

Geographical Distribution: Currently considered present in the equatorial and central waters of the Indo-Pacific Ocean, as well as in the equatorial Atlantic.

Habitat and Biology: *Brachioteuthis behnii* is considered a tropical-subtropical circumglobal species. Paralarvae are characterized by a very long neck and laterally directed eyes.

Remarks: The species, while currently considered valid, requires further study to confirm its validity or its status as a synonym (Nesis, 1982, 1987).

Literature: Nesis (1982, 1987, 1999b).

***Brachioteuthis bowmani* Russell, 1909**

Brachioteuthis bowmani Russell, 1909, *Annals and Magazine of Natural History*, series 8, 3: 446–455 [449]. [Type locality: northeastern Atlantic Ocean, off Scotland, near the Faeroe-Iceland Ridge; the holotype is not extant (Toll, 1985)].

Frequent Synonyms: None.

Size: Mantle length 61 mm on holotype.

Geographical Distribution: Northeastern Atlantic Ocean, off Scotland near the Faeroe-Iceland Ridge.

Remarks: The systematic status of this species is not resolved, but it is considered to be very closely similar to or synonymous with *B. beanii* of the western North Atlantic Ocean (Nesis, 1982, 1987).

Literature: Pfeffer (1912), Nesis (1982, 1987), Sweeney and Young (2003e).

***Brachioteuthis linkovskyi* (Lipinski, 2001)**

Slosarczykovia linkovskyi Lipinski, 2001, *Bulletin of the Sea Fisheries Institute, Gdynia*, 152: 3–14 [5]. [Type locality: 600 miles southeast of Montevideo, Uruguay, South Atlantic Ocean].

Size: The only specimen, a mature male, was 120 mm mantle length.

Geographical Distribution: South Atlantic Ocean.

Remarks: This brachioteuthid (a mature male), known only from the holotype, was collected at night in 720 m water depth in a krill trawl. Characters that differentiate it from other brachioteuthids include: a fibrous integumentary network with warts covers the mantle (at least in mature males), reticulate but without warts on the head, arms and fins. Sucker dentition on arms with 9 to 12 teeth; tentacular clubs and tentacle very long.

Literature: Lipinski (2001).

***Slosarczykovia* Lipinski, 2001**

Slosarczykovia Lipinski, 2001, *Bulletin of the Sea Fisheries Institute, Gdynia*, 152: 3–14 [5].

Type Species: *Slosarczykovia circumantarctica*, Lipinski 2001.

Diagnostic Features: Surface integument of **mantle, head, arms and fins of both sexes are covered with reticulate fibrous, delicate tissue**. The **tentacular club has only weakly differentiated suckers**; the largest suckers on the proximal manus are about 33% (or slightly larger) of those on the proximal dactylus. **No carpal (tentacular) fixing apparatus exists**.

Remarks: *Slosarczykovia* is a monotypic genus, with *Slosarczykovia circumantarctica* Lipinski, 2001 the sole recognized species at present. The systematic status of the genus has not yet been reviewed.

Literature: Lipinski (2001).

***Slosarczykovia circumantarctica* Lipinski, 2001**

Slosarczykovia circumantarctica, Lipinski, 2001, *Bulletin of the Sea Fisheries Institute, Gdynia*, 152: 3–14 [6]. [Type locality: the waters adjacent to Wilkes Land, Antarctica].

Frequent Synonyms: *Brachioteuthis picta*, Roper, 1969; *Brachioteuthis* species, Filippova, 1972; *Brachioteuthis* species, Nesis, 1982/1987; *Brachioteuthis picta*, Rodhouse, 1989.

Diagnostic Features: Since the genus is monotypic, the characters of the species are the same as the characters of the genus.

Size: Mantle length 159 mm.

Geographical Distribution: The waters around the Antarctic continent.

Remarks: This brachioteuthid, which often has puzzled teuthologists and has been reported previously from the Antarctic waters, is one of the most common squids in this vast region.

Literature: Lipinski (2001).

2.8

Family CHIROTEUTHIDAE Gray, 1849

by Clyde F.E. Roper and Patrizia Jereb

Chiroteuthidae Gray, 1849, *Catalogue of the Mollusca of the British Museum*, 1: 1–164 [42].

Type Genus: *Chiroteuthis* d'Orbigny, 1841.

FAO Names: **En** – Chiroteuthid squids; **Fr** – Chirocalmars; **Sp** – Quirolurias.

Diagnostic Features: Funnel-locking apparatus oval, generally with 1 or 2 knobs (tragus, anti-tragus) directed toward the centre of the concavity; variable among genera, fused in *Grimalditeuthis*. Neck elongate. Mantle narrow, elongate (usually), up to 800 mm mantle length. Tentacles generally extremely long, vermiform (absent in *Grimalditeuthis*). Club suckers usually in 4 transverse series (suckers/tentacles absent in *Grimalditeuthis*); (suckers in 6 series in an undescribed genus). Arm suckers in 2 series. Paralarva very distinctive, called *doratopsis* stage. Arms, head and mantle with numerous chambers filled with ammonium chloride, a light-weight fluid that provides near-neutral buoyancy; tissues semi-gelatinous. Eyelid sinus indistinct; nuchal folds absent; olfactory organs are long, slender papillae.

All *doratopsis* paralarvae possess all of these characters during some phase of their development (Young and Roper, 1999a):

1. Elongate, chambered neck.
2. Chambered brachial pillar.
3. Gladius that extends posteriorly beyond fins and supports floatation structures or “ornamentation”.
4. Vesicular tissue in posterior region of mantle, just anterior to tip.
5. Vesiculate arms in advanced stages.
6. Ventral arms greatly elongate in advanced stages.
7. Tentacular clubs of advanced stages with keels parallel to dorsal protective membrane along most of club length.

Size: Small- to large-sized squids; maximum mantle length to about 800 mm.

Geographical Distribution: Members of the family are represented in all geographic zones of all oceans of the world, from sub-Arctic to sub-Antarctic, circumglobally.

Habitat and Biology: Chiroteuthids are bathypelagic or meso-bathypelagic squids and occasionally occur on or in association with the bottom at bathyal depths. Many species have photophores in various configurations on the eyes, ink sac (viscera), ventral arms, tentacular stalks and tips of clubs. No hectocotylus is present, and the penis is developed into an elongate, spearheaded structure. The duration of the *doratopsis* stage is unknown. *Doratopsis* paralarvae occur in oceanic waters in the upper 200 to 300 m; most attain a relatively huge size for a larval form (up to 90 mm mantle length), then gradually transform into the very different-looking subadult stage. Some changes involve the loss of the larval clubs and formation of new clubs, extensive elongation of the tentacular stalks, development of photophores in some species, loss of the remarkable tail in most species, and generally a marked change in proportions of body components. A loosely defined ontogenetic descent occurs following the *doratopsis* stage until adults of various species may occur as deep as 2 000 to 3 000 m. Chiroteuthid species are very important as prey of odontocete cetaceans, e.g. sperm whales, Frasier's dolphin, pygmy and dwarf sperm whales, pilot whales, as well as blue sharks, tunas, toothfish and seabirds.

Interest to Fisheries: The relatively gelatinous consistency and ammoniacal tissue, the dispersed, deep-sea distribution and the generally small size preclude any significant fishery potential.

Remarks: Considerable morphological differences exist among the 4 chiroteuthid genera, *Chiroteuthis*, *Asperoteuthis*, *Planctoteuthis* and *Grimalditeuthis*, all of which in the past were placed in separate families. The Chiroteuthidae at present consists of about 20 species, 2 or 3 as yet undescribed. In addition, 2 undescribed new genera exist. The species level taxonomy is poorly understood and the group is very much in need of a comprehensive monograph. The presence of a *doratopsis* paralarva is the only character that is unique to the family. The gladius of the *doratopsis* paralarvae and of the adults of some species extends well posterior to the fins and supports an unusual elongate “tail” that may have oval, fin-like flaps or a series of small flaps and/or oval bulbs, all of unknown function. The bulbs contain canals that are filled with lightweight fluid that probably function as a buoyancy mechanism (Hunt, 1996). The remarkable similarity of some of these ornately-tailed *doratopsis* paralarvae with some siphonophores has been described (Vecchione, *et al.*, 1992).

Key to the genera of Chiroteuthidae

- 1a. Funnel-mantle locking cartilages (apparatus) fused; nuchal-mantle connective not fused; tentacular clubs without suckers *Grimalditeuthis*
- 1b. Funnel-mantle locking cartilages free, not fused; tentacular clubs with suckers → 2

- 2a.** Mantle covered with numerous, minute “cartilaginous” tubercles; fins together oval to elongate/oval with long axis parallel to mantle; arms IV no longer nor thicker than arms II and III *Asperoteuthis*
- 2b.** Mantle without tubercles; fins together circular or oval with long axis transverse to mantle; arms IV longer than arms II and III → **3**
- 3a.** Fins together roughly oval with long axis transverse to mantle and lobed both posteriorly and anteriorly; arms IV not appreciably thicker than arms II and III; funnel valve absent; funnel-locking apparatus without tragus *Planctoteuthis*
- 3b.** Fins together approximately circular, not lobed posteriorly; arms IV usually much thicker than arms II and III; funnel valve present; funnel-locking apparatus with distinct tragus present *Chiroteuthis*

Table 2
Key Characters for Genera of Chiroteuthidae^{1/}

Character	<i>Chiroteuthis</i>	<i>Asperoteuthis</i>	<i>Grimalditeuthis</i>	<i>Planctoteuthis</i>
Funnel valve	Present	Present	Present	Absent
Tentacle pads	Present	Present	Absent	Absent
Arm IV photophores	Present	Absent	Absent	Absent
Arms IV	Enlarged	Not enlarged	Not enlarged	Variable
Visceral photophores	Variable	Absent	Absent	Absent
Funnel-locking apparatus	Tragus & Antitragus	Variable	Fused	Antitragus
Arm IV suckers	Present	Present	Present	Absent distally
Club suckers	Present	Absent proximally	Absent	Present
Club sucker series	4	4	0	4

^{1/} from Young and Roper (1998).

Remarks: Two additional genera, yet to be described, have been recognized, but the details of all of their distinguishing characteristics have not been elucidated because so few specimens are available for analysis.

Literature: Nesis (1982, 1987), Young (1992 [1991]), Young and Roper (1998, 1999a), Young *et al.* (1999b), Sweeney and Young (2003f).

***Chiroteuthis* d’Orbigny, 1841**

Plate VI, 34

Chiroteuthis d’Orbigny, 1841 in Férussac and d’Orbigny, 1834–1848, *Voyage dans l’Amérique Méridionale*: 96 pp. + 1 vi pp. 361 pp. [xxxii].

Type Species: *Chiroteuthis veranyi* (Férussac, 1834).

Frequent Synonyms: *Doratopsis* Rochebrune, 1884; *Leptoteuthis* Verrill, 1884; (*Chiridioteuthis*) Pfeffer, 1912; (*Tankaia*) Sasaki, 1929; *Diaphanoteuthis* Tomlin, 1931; *Chiropsis* Joubin, 1932; *Bigelowia* MacDonald and Clench, 1934.

Diagnostic Features: Funnel-mantle locking cartilage present, with tragus and antitragus; **tentacular club oral surface with suckers in 4 series** throughout length; **fins together circular**, not lobed posteriorly; **arms IV much longer, thicker than arms I to III**; funnel valve present; **photophores** present on arms IV, often present on viscera.

Literature: Verrill (1884), Nesis (1982, 1987), Roper and Young (1998).

Chiroteuthis veranyi (Ferussac, 1834)**Fig. 175**

Loligopsis veranii Ferussac, 1834, *L'Institut, Journal General des Societes et Travaux Scientifiques de la France et de l'Etranger*, 2(77): 355. [Type locality: from dolphin stomach, Mediterranean Sea].

Frequent Synonyms: *Loligopsis vermicularis* Rüppel, 1844; *L. perlatus* Risso, 1854; *Onychoteuthis perlopsis* Risso, 1854; *Chiroteuthis lacertosa* Verrill, 1881a; *Leptoteuthis diaphana* Verrill, 1884.

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

Size: Mantle length from 100 to 200 mm.

Geographical Distribution: Tropical, subtropical to sub-Antarctic; circumglobal; 55°N to 23°S in Atlantic (Fig. 176).

Habitat and Biology: A mesopelagic to bathypelagic species as adults, *Chiroteuthis veranyi* frequently is found in stomach contents of several species of bony fishes, sharks, mammals and seabirds; this confirms that the species is common in its distributional areas, even though seldom captured by commercial fishing gear (e.g. trawls). Its biology is poorly known; paralarvae and juveniles are epipelagic to mesopelagic and widespread in the water column. It has been hypothesized that the species is gregarious, because frequently in deep net tows numerous specimens are captured together, generally an uncommon characteristic with deep sea squids.

Interest to Fisheries: No direct interest for human consumption, but exceedingly important as prey to marine mammals, fishes, other squids and sea birds.

Local Names: ITALY: Totanello volante.

Literature: Verrill (1884), Young (1972a), Nesis (1982, 1987), Vecchione and Roper (1992 [1991]), Roper and Young (1999a).

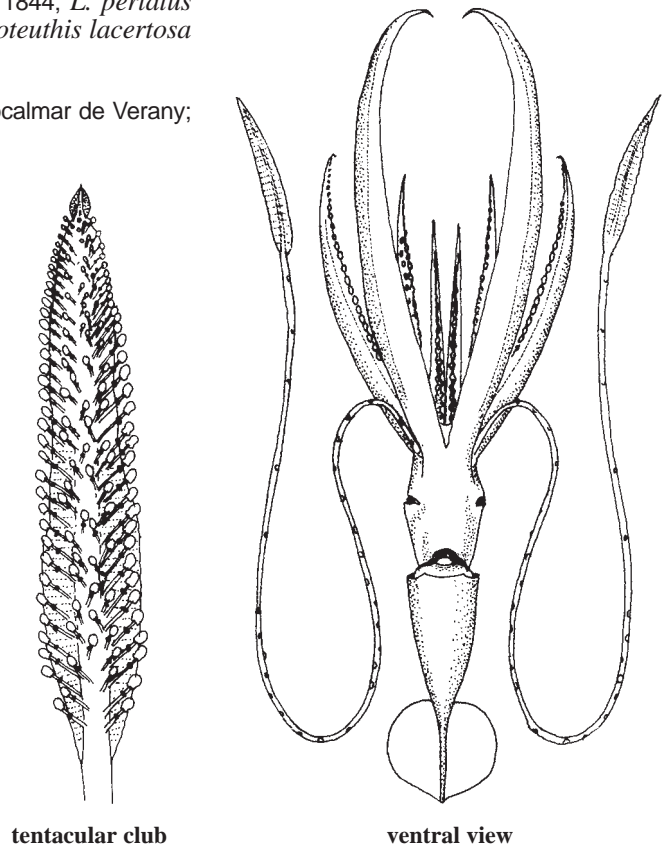


Fig. 175 *Chiroteuthis veranyi*

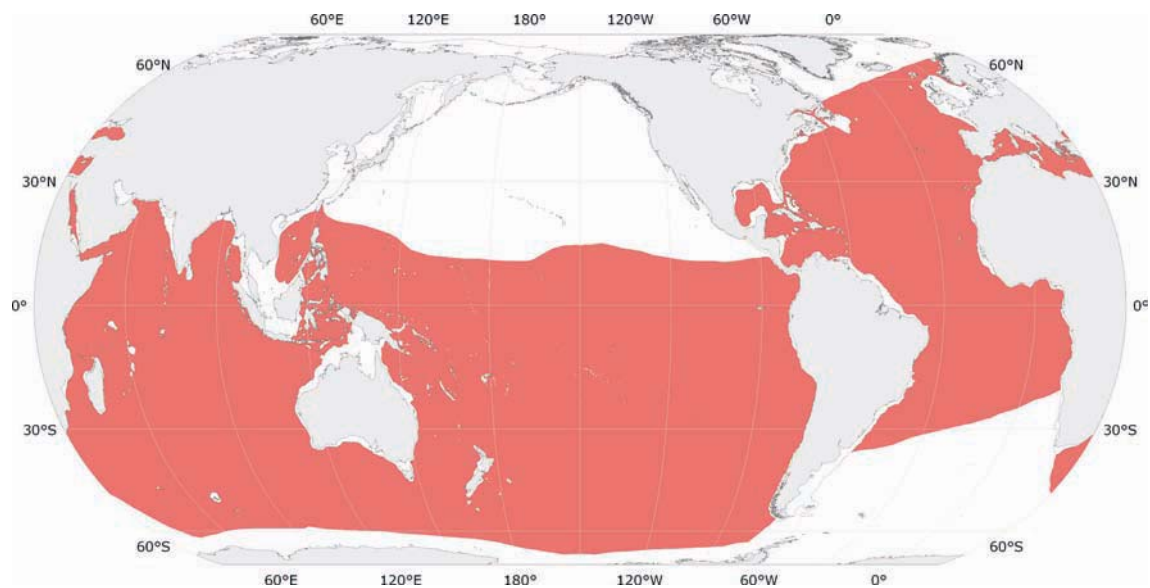


Fig. 176 *Chiroteuthis veranyi*

Known distribution

***Chiroteuthis calyx* Young, 1972**

Chiroteuthis calyx Young, 1972a, *Smithsonian Contributions to Zoology*, 97: 1–159 [69]. [Type locality: “Santa Catalina Basin?”, eastern North Pacific Ocean].

Frequent Synonyms: None.

Size: Mantle length to 100 mm.

Geographical Distribution: North Pacific Ocean boreal; southern Bering Sea, Gulf of Alaska, Sea of Okhotsk, northeastern Honshu, eastern North Pacific Ocean to southern California (to about 30°N).

Habitat and Biology: A mesopelagic to bathypelagic species. Vertical distribution for smallest stages, 20 to 30 mm mantle length, is in the upper 100 m or so in the eastern Pacific off California. The 30 to 50 mm size group predominates at 300 to 400 m, while the 40 to 60 mm mantle length group is concentrated at 500 to 700 m. Metamorphosis from paralarval to subadult stage occurs at 50 to 60 mm mantle length. Subadults occur at 500 to 800 m during the day, migrate shallower to 100 to 500 m at night.

Interest to Fisheries: No direct interest for human consumption.

Literature: Young (1972a), Nesis (1982, 1987), Roper and Young (1999b).

***Chiroteuthis imperator* Chun, 1908**

Chiroteuthis imperator Chun, 1908, *Zoologischer Anzeiger*, 33(2): 86–89 [88]. [Type locality: 0°15'N, 98°08'E, Sumatra, Indonesia, eastern Indian Ocean].

Frequent Synonyms: None.

Size: Mantle length to 250 mm, possibly to 400 mm.

Geographical Distribution: Indo-Pacific Ocean from Hawaii, Japan, Philippines, Indonesia to 60°E in the Indian Ocean; Australia, Tasman Sea, New Zealand.

Habitat and Biology: Mesopelagic and bathypelagic to bathybenthic. Ontogenetic descent from upper few hundred metres as paralarvae and juveniles to 2 000 m or more as adults. Some adults are captured on the bottom in deep slope waters.

Remarks: Chun (1908) described *C. imperator* from off Sumatra, Indonesia, close to the type locality of *C. picteti* Joubin, 1894. Recent examination of the type specimens of *C. imperator* by Roper and Young (1999e), however, showed non distinguishing features between the two species. Therefore, *C. imperator* is considered a synonym of *C. picteti* by these authors.

Literature: Yamamoto and Okutani (1975), Young (1995).

***Chiroteuthis joubini* Voss, 1967**

Chiroteuthis joubini, Voss 1967a, *Annals of the South African Museum*, 50(5): 61–68 [79]. [Type locality: 8°19'N, 44°35'W, western North Atlantic Ocean].

Frequent Synonyms: None.

Size: Mantle length to approximately 100 mm.

Geographical Distribution: Northern subtropical and tropical Atlantic Ocean, Sargasso Sea; western and southern Indian Ocean, 0°S to 45°S, southeastern Africa, southwestern Australia; Banda Sea.

Habitat and Biology: Mesopelagic to bathypelagic.

Literature: Voss (1967a), Clarke (1980), Nesis (1982, 1987), Roper and Young (1999c), Vecchione and Pohle (2002).

Chiroteuthis mega (Joubin, 1932)

Chiropsis mega Joubin, 1932, *Bulletin Société Zoologie France*, 57: 288–291 [289]. [Type locality: 25°50'N, 76°55'W, western North Atlantic Ocean].

Frequent Synonyms: *Bigelowenia atlanticus* MacDonald and Clench, 1934; *Chiroteuthis capensis* Voss, 1967a.

Size: Mantle length to approximately 100 mm.

Geographical Distribution: Western North Atlantic and eastern South Atlantic in tropical to subtropical waters.

Habitat and Biology: Mesopelagic to bathypelagic.

Literature: Voss (1967a), Roper and Young (1999d), Vecchione *et al.* (2001).

Chiroteuthis picteti Joubin, 1894

Chiroteuthis picteti Joubin, 1894, *Revue Suisse de Zoologie, Genève*, 2: 23–64 [40]. [Type locality: Amboina, Indonesia, eastern Indian Ocean].

Frequent Synonyms: *Chiroteuthis macrosoma* Goodrich, 1896; *C. pellucida* Goodrich, 1896; *C. imperator* Chun, 1908.

Size: Mantle length to approximately 100 mm.

Geographical Distribution: Tropical Indo-West Pacific from Gulf of Aden to southern Honshu, Indonesia and Hawaii; eastern Atlantic (?); southern African waters (?).

Habitat and Biology: Mesopelagic to bathypelagic.

Remarks: Considerable geographical variability has been observed in this species. More detailed studies could indicate that this is a species complex. Salcedo-Vargas (1996) described a subspecies, *Chiroteuthis picteti somaliensis*, from the western Indian Ocean. (*) *Chiroteuthis imperator* Chun, 1908 is considered a synonym of *C. picteti* by an authoritative fraction of the scientific community (Roper and Young, 1999e).

Literature: Nesis (1979b), Roeleveld (1998), Bower *et al.* (1999c), Roper and Young (1999e).

Chiroteuthis spoeli Salcedo-Vargas, 1996**Plate VI, 35**

Chiroteuthis spoeli, Salcedo-Vargas, 1996, *Beaufortia*, 46(2): 91–108 [17]. [Type locality: Coast of Somalia, western Indian Ocean].

Frequent Synonyms: None.

Size: Mantle length unknown; only small *doratopsis*/juvenile stages known.

Geographical Distribution: Off Somalia, Indian Ocean.

Habitat and Biology: Mesopelagic to bathypelagic.

Literature: Roeleveld (1998), Roper and Young (1999f).

***Asperoteuthis* Nesis, 1980**

Asperoteuthis Nesis, 1980, *Biuletyn Moskovskoe Obshchestvo Ispytatelei Prirody, Otdel Biologicheskii*, 85(4): 59–66 [59].

Type Species: *Asperoteuthis acanthoderma* (Lu, 1977).

Frequent Synonyms: *Chiroteuthis*, Lu, 1977.

Diagnostic Features: Mantle elongate, slender; integument of mantle, head, arms covered with minute, conical, “cartilaginous” tubercles; coloration deep violet; funnel valve present; funnel-locking apparatus with deep, narrow, curved groove that bifurcates at posterior end; photophores present on extremely long tentacular stalk, absent on arms IV and ink sac; fins elongate, longitudinally oval, without lobes; lanceolate secondary fins present; arms extremely long, thin; arms IV not enlarged, are subequal to arms II and III; tentacular stalks with numerous knobs/pads along aboral surface; tentacular clubs short, suckers in 4 transverse series, occupy only distal half of club.

Literature: Nesis (1980).

Asperoteuthis acanthoderma* (Lu, 1977)*Fig. 177**

Chiroteuthis acanthoderma Lu, 1977, *Steenstrupia*, 4: 179–188 [179]. [Type locality: 6°37'N, 122°02'E, Celebes Sea, western Pacific Ocean].

Frequent Synonyms: None.

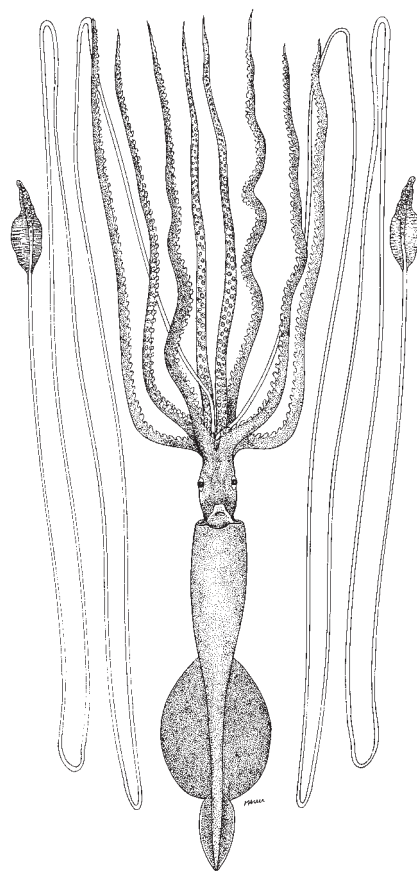
FAO Names: En – Thorny chiroteuthid squid; Fr – Chirocalmar épineux; Sp – Quiroluria espinosa.

Size: Mantle length to 800 mm.

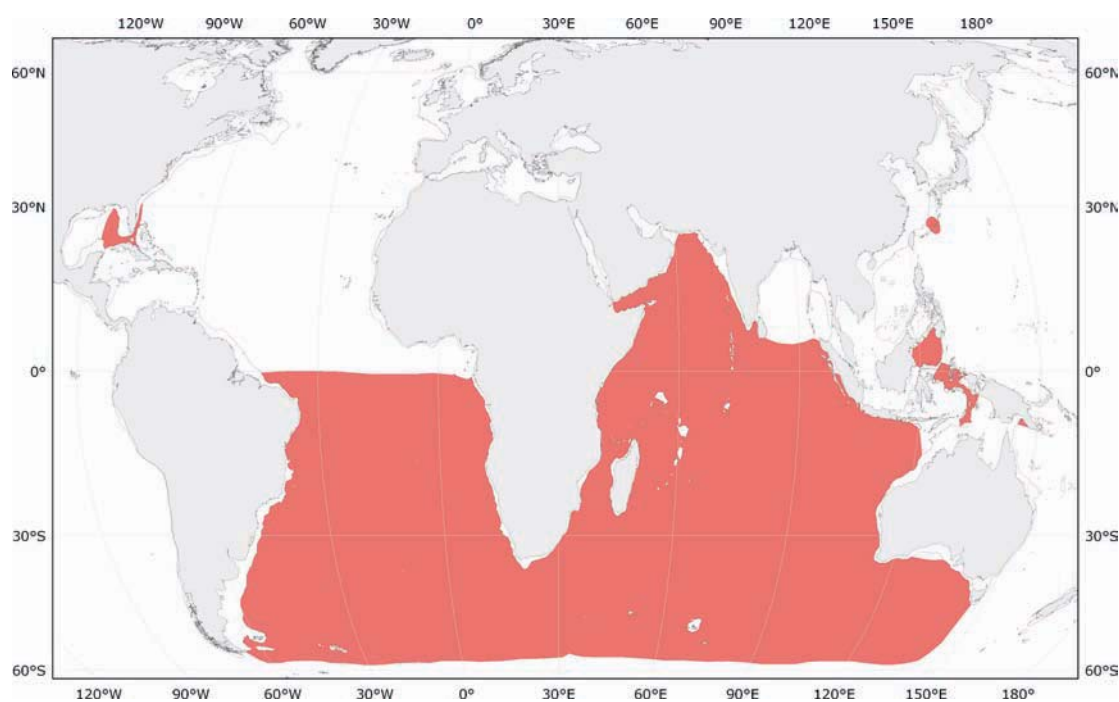
Geographical Distribution: Indo-West Pacific; Celebes Sea, Ryuku Islands, Molucca Sea, New Guinea, southern Africa; eastern Gulf of Mexico, Gulf Stream Florida, South Atlantic Ocean (Fig. 178).

Habitat and Biology: Mesopelagic to bathypelagic.

Literature: Roper and Lu (1990), Young and Roper (2007), Judkins *et al.* (2009).



ventral view

Fig. 177 *Asperoteuthis acanthoderma***Fig. 178** *Asperoteuthis acanthoderma*

■ Known distribution

***Asperoteuthis lui* Salcedo-Vargas, 1999**

Asperoteuthis lui Salcedo-Vargas 1999, *Mitteilungen aus dem Museum fur Naturkunde in Berlin, Zoologische Reihe*, 75:47-49. [Type locality: Cook Straight, New Zealand. Taken from the stomach of a ling (*Molva molva*)].

Frequent Synonym: None.

Geographical Distribution: Cook Straight, New Zealand.

Remarks: This species is known from a single damaged specimen that was taken from the stomach of a fish (a ling). The specimen was without a funnel or mantle, but had arms, one tentacle and eyes.

Literature: Salcedo-Vargas (1999).

***Asperoteuthis mangoldae* Young, Vecchione and Roper 2007**

Asperoteuthis mangoldae Young, Vecchione and Roper, 2007, *Reviews in Fish Biology and Fisheries*, 17(2–3): 353–365 [354, figs 1–14]. [Type locality: 21°25'N, 158°20.5'W, Hawaiian waters, eastern North Pacific Ocean].

Frequent Synonyms: None.

Size: Mantle length 80 to 128 mm (a mature male at 100 mm mantle length).

Geographical Distribution: Central tropical Pacific Ocean around the Hawaiian Islands at depths of 820 to 900 m.

Literature: Young *et al.* (2007), Young *et al.* (2008c).

***Grimalditeuthis* Joubin, 1898**

Grimalditeuthis Joubin, 1898c, *Bulletin Societé Zoologie France*, 23: 101–113. [111].

Type Species: *Grimalditeuthis bonplandi* (Verany, 1839).

Frequent Synonyms: None.

Diagnostic Features: Mantle elongate, gelatinous, conical anteriorly, very narrow, long, attenuate posteriorly from anterior margin of fins; funnel valve present; **funnel-locking apparatus fused with mantle component; dorsal nuchal mantle-apparatus free**; photophores absent from tip and along arms IV and from viscera; a single, **elongate photophore on tips of arms I to III; fins large, elliptical, 50% of mantle length; secondary fins extend posterior to mantle per se on needle-like extension of the gladius**, elongate, heart-shaped (frequently broken off at juncture with primary fins); arms of about equal-length, slender, not extremely long; tentacular stalks do not bear knobs/pads along aboral surface; **tentacular club reduced, entirely devoid of suckers**; (tentacles fragile, frequently lost on adult specimens). Monotypic genus.

Remarks: Monotypic genus.

Grimalditeuthis bonplandi (Verany, 1839)

Loligopsis bonplandi Verany, 1839, *Memorie della Reale Accademia delle Scienze di Torino*, (series 2)1: 99–101 [99]. [Type locality: 29°N, 39°W, eastern Central Atlantic Ocean].

Frequent Synonyms: *Grimalditeuthis richardi* Joubin, 1898; *Doratopsis sagitta* Chun, 1908.

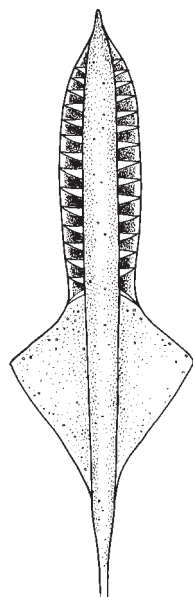
FAO Names: **En** – Grimaldi's chiroteuthid squid; **Fr** – Chirocalmar de Grimaldi; **Sp** – Quiroluria de Grimaldi.

Size: Mantle length to 250 mm.

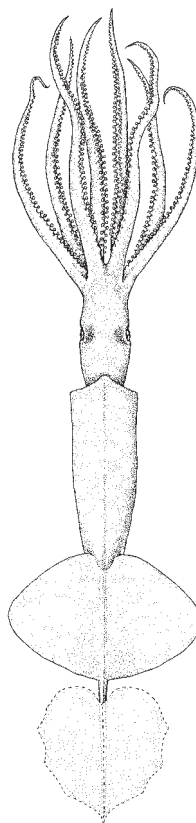
Geographical Distribution: Circumglobal in tropical, subtropical, temperate waters (Fig. 180).

Habitat and Biology: Mesopelagic to bathypelagic.

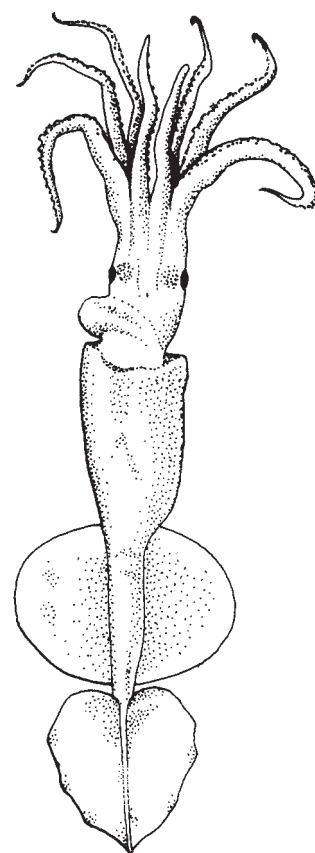
Literature: Young (1992 [1991]), Nesis (1982, 1987), Young and Roper (1998, 2008a).



tentacular club

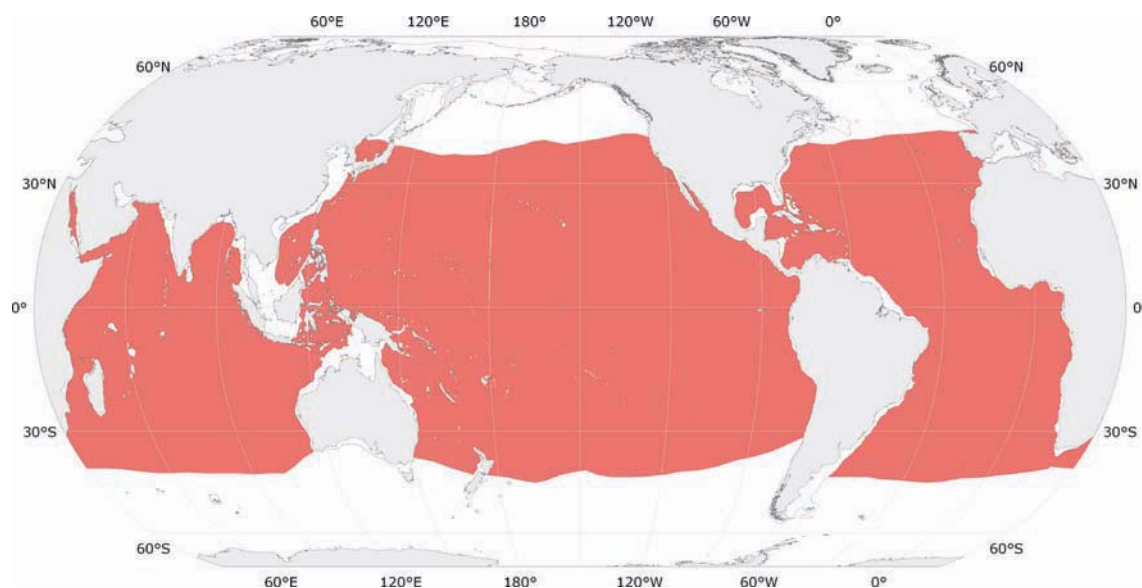


dorsal view



ventral view

Fig. 179

Fig. 179 *Grimalditeuthis bonplandi*Fig. 180 *Grimalditeuthis bonplandi*

■ Known distribution

***Planctoteuthis* Pfeffer, 1912**

Planctoteuthis Pfeffer, 1912, *Ergebnisse der Plankton Expedition der Humboldt-Stiftung*, 2F(a): 1–815 [571,554].

Type Species: *Planctoteuthis exophthalmica* (Chun, 1908).

Frequent Synonyms: *Valbyteuthis* Joubin, 1931.

Diagnostic Features: Mantle elongate, goblet-shaped, narrows abruptly around anterior third of fin, so the posterior part of mantle is affixed to the narrow conus of the gladius; only integument continues posteriorly over the gladius; eyes project ventrally from the head; **funnel valve absent**; funnel component of locking apparatus with posterior distinct antitragus, oval, deeply concave (tragus absent); mantle component human nose-shaped with tip directed posteriorly and it curves laterally to conform to the deep lateral depression of the funnel component; **photophores entirely absent** on arms IV, viscera, tentacular stalks, club tips; fins subterminal, transversely broad, proportionally large, muscular, width about 85% of mantle length, length about 50% of mantle length; **pronounced anterior and posterior fin margins (lobes)**; arms I to III short, subequal in length, weakly developed; **arms IV extremely long, slender**; **suckers absent distally, a few suckers proximally in uneven single series**; tentacular stalks without knobs/pads or photophores; **tentacular clubs very short, simple, compact, without distinct keels** (except in *P. lippula*), protective membranes or trabeculae; club suckers present, few in number, in 4 transverse series, on short stalks.

Remarks: Species of *Planctoteuthis* usually are rather small and very fragile deepseas squids that often are badly damaged during capture. As a result, few species have been described. Unlike other chiroteuthids, the subadult retains the peculiar doratopsid paralarval tentacular club (Young *et al.*, 2008d).

Literature: See species accounts.

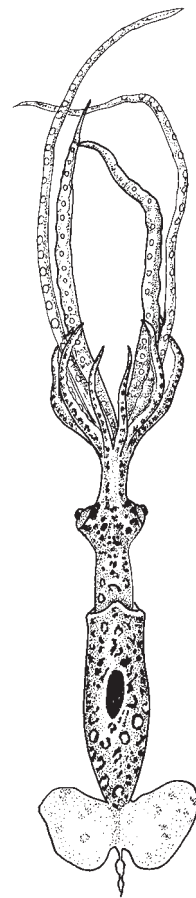
Planctoteuthis exophthalmica* (Chun, 1908)*Fig. 181**

Doratopsis exophthalmica Chun, 1908, *Zoologisches Anzeiger*, 33: 86–89.
[Type locality: 43°13'S, 80°30'E, South Indian subtropical calm zone].

Frequent Synonyms: *Doratopsis exophthalmica* Chun, 1908.

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

Size: Mantle length 30 mm, including “spike” tail.



dorsal view

Fig. 181 *Planctoteuthis exophthalmica*

Geographical Distribution: Eastern Atlantic Ocean, Canaries Current; Indian Ocean (Fig. 182).

Remarks: *Planctoteuthis exophthalmica* may eventually prove to be a junior synonym of *P. levimana*.

Literature: Chun (1910a), Young and Roper (1999b), Young *et al.* (2006b).

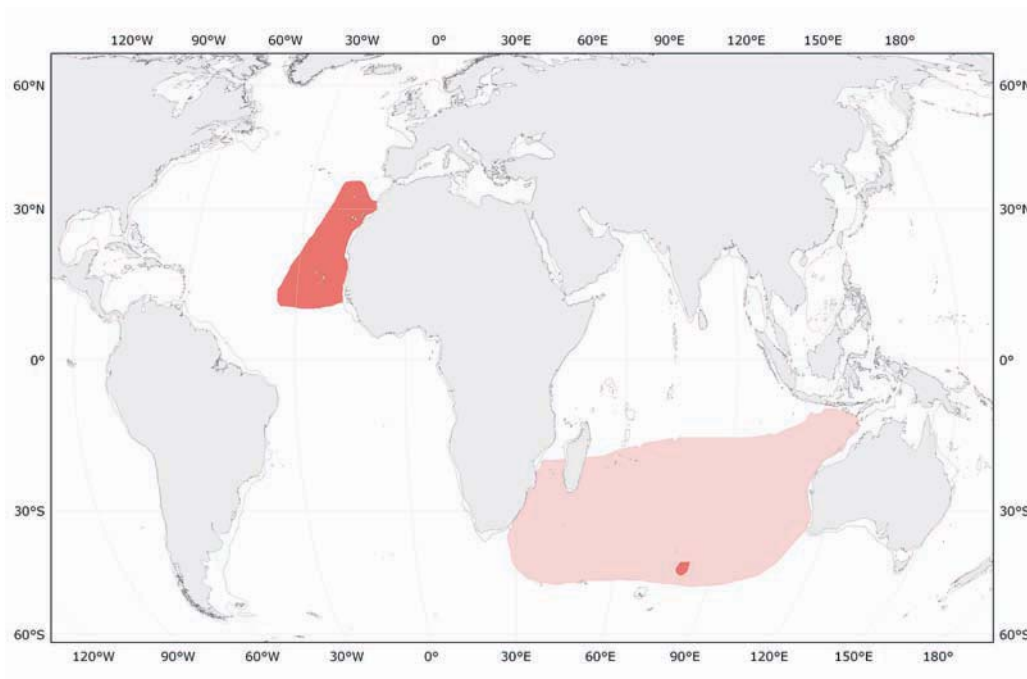


Fig. 182 *Planctoteuthis exophthalmica*

■ Known distribution

■ Probable presence

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

Valbyteuthis danae Joubin, 1931, *Annales de l'Institut Océanographique, Monaco*, 10(7): 169–211 [188]. [Type locality: 7°30'N, 79°19'W, eastern Central Pacific Ocean].

Frequent Synonyms: *Valbyteuthis danae* Joubin, 1931.

Size: Mantle length to 55 mm.

Geographical Distribution: Cosmopolitan in tropical and temperate waters; especially in eastern Pacific Ocean to eastern Polynesian Islands.

Habitat and Biology: A bathypelagic species, rarely mesopelagic. Very rarely captured.

Literature: Young (1972a), Roper and Young (1967), Clarke and Lu (1975), Young (1992 [1991]), Young and Roper (1998, 2008b).

***Planctoteuthis levimana* (Lönnerberg, 1896)**

Mastigoteuthis levimana Lönnerberg, 1896, *Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar*, 53(8): 603–612 [605]. [Type locality: 43°30'N, 24°30'W, Central Atlantic Ocean].

Frequent Synonyms: *Valbyteuthis levimana*, Young, 1972a.

Size: Mantle length 70 mm.

Geographical Distribution: North Atlantic Ocean temperate.

Habitat and Biology: Mesopelagic to bathypelagic. Depths of capture for 2 specimens in midwater trawls fished at 800 to 1 800 m and 0 to 2 400 m.

Remarks: Known only from the 4 specimens captured in the North Atlantic, Azores and northward.

Literature: Young *et al.* (1999b), Young *et al.* (2006b).

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

Doratopsis lippula Chun, 1908, *Zoologischer Anzeiger*, 33(2): 86–89 [89]. [Type locality: 11°28'S[sic], 10°24'E, Benguela Current, eastern South Atlantic Ocean].

Frequent Synonyms: *Doratopsis lippula* Chun, 1908.

Size: Known only from *doratopsis*/juvenile; adults unknown.

Geographical Distribution: Eastern South Atlantic Ocean, Benguela Current.

Literature: Pfeffer (1912), Nesis (1982, 1987), Sweeney and Young (2003f), Young *et al.* (2006b), Young and Roper (2008c).

***Planctoteuthis oligobessa* (Young, 1972)**

Valbyteuthis oligobessa Young, 1972, *Smithsonian Contributions to Zoology*, 97: 1–159 [72]. [Type locality: 32°27'N, 120°27'W, eastern North Pacific Ocean].

Frequent Synonyms: *Valbyteuthis oligobessa* Young, 1972.

Size: Mantle length to 76 mm.

Geographical Distribution: Eastern North Pacific Ocean off southern California; equatorial Pacific Ocean to Indonesia.

Habitat and Biology: Bathypelagic. Very rarely captured.

Literature: Young (1972a), Young and Roper (1999c), Young *et al.* (2006b).

2.9 Family CHTENOPTERYGIDAE Grimpe, 1922

by Clyde F.E. Roper and Patrizia Jereb

Chtenopterygidae Grimpe, 1922, *Sitzungsberichte der Naturforschenden Gesellschaft zu Leipzig*, 45: 36–52 [36].**Type Genus:** *Chtenopteryx* Appellöf, 1890: 1–34[4].**FAO Names:** En – Comb-finned squids; Fr – Calmars pectiné; Sp – Calamars pectinados.

Diagnostic Features: Fins fused posteriorly, extend anteriorly the full length of the mantle in adults; posterior end of mantle broadly rounded; fins attach to lateral walls of muscular mantle, are comprised of slender muscle bundles (fin ribs) connected by their membranes, to produce a comb-like appearance. Fins very short in hatchlings, paralarvae; undergo strong ontogenetic growth in length. Arms I to III with suckers in transverse series of 6 to 14 at some point on distal halves of arms. Arms IV with very few small suckers in zig-zag pattern. **Tentacular club suckers small to minute, in 8 to 20 irregular transverse series. Tentacles narrow, clubs not expanded, no carpus (fixing apparatus).** Large oval photophore on viscera (except in *Chtenopteryx sicula* and *C. canariensis*). Large photogenetic patches on ventral surface of eyeballs, (except in *C. canariensis*). Mature females with an accessory nidamental gland. **Minute suckers on lappets of buccal membrane.** Buccal connectives attach to ventral borders of arm IV. Funnel-locking apparatus straight, simple. **Males without hectocotylus.** Mature males develop a large, dorsally directed photophore in posterior mantle cavity, possibly for mate-attraction.

Size: Small squids to 100 mm mantle length.

Remarks: Members of this monogeneric family are small, muscular, midwater squids that occupy tropical to subtropical waters at depths of 500 to 1 000 m during the day and migrate into near-surface waters at night (upper 200 m). Several undescribed species are present in this genus. Species-level systematic characters in *Chtenopteryx* currently seem limited to the following: a) the maximum number of sucker series on the arms and tentacular clubs, b) the presence/absence of visceral and eyeball photophores, c) the relative size of the visceral photophore, d) the mantle width relative to mantle length. Two confirmed species are recognized: *C. sicula* (Verany, 1851) and *C. sepioloides* Rancurel, 1970. Two other species are currently of undetermined status: *C. chuni* Pfeffer, 1912 and *C. canariensis* (Salcedo-Vargas and Guerrero-Kommritz, 2000); both species are based on very few, small specimens. Little is known of the biology of any species. Species are preyed upon by lancetfishes (*Alepisauris*), albacore, dolphin fish and mesopelagic viper fishes (Clarke, 1966; Rancurel, 1970; Fujita and Hattori, 1976). The generic name formerly was spelled *Ctenopteryx*, but that name was preoccupied by a coleopteran. Consequently, Appellöf (1890) spelled the genus *Chtenopteryx* and subsequently that spelling has been upheld by the International Code of Zoological Nomenclature (ICZN, 1995) through a petition by Bello and Giannuzzi-Savelli (1993).

Literature: Roper (1969), Nesis (1982, 1987), Roeleveld *et al.* (1992), Bower *et al.* (1999c), Shea and Vecchione (2002), Sweeney and Young (2003g), Young and Vecchione (2008a).

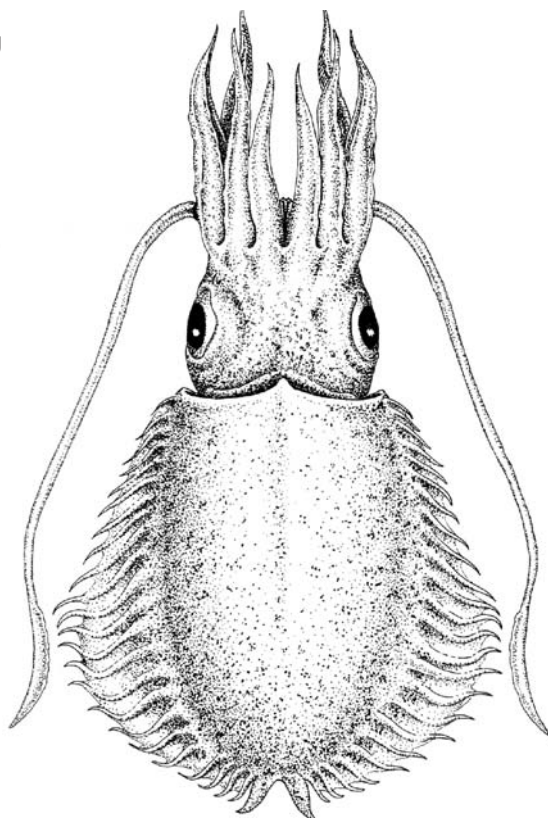
***Chtenopteryx* Appellöf, 1890**

Chtenopteryx Appellöf, 1890, *Bergens Museums Aarsberetning*, 1889(3): 1-34 [3].

Type species: *Chtenopteryx sicula* (Verany, 1851).***Chtenopteryx sicula* (Verany, 1851)****Fig. 183****Type Species:** *Chtenopteryx sicula* (Verany, 1851).

Sepioteuthis sicula Verany, 1851, *Mollusques Méditerranéens observé décrits figurés et chromolithographiés d'après le vivant ouvrage dédié à SM le Roi Charles Albert*, 1: 1–132.

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

Size: Maximum mantle length to 100 mm.

dorsal view

Fig. 183 *Chtenopteryx sicula*

Geographical Distribution: Cosmopolitan (circumglobal) in tropical and subtropical waters. Paralarvae epipelagic; adults descend to mesopelagic and bathypelagic depths, undergo strong diel vertical migrations (Fig. 184).

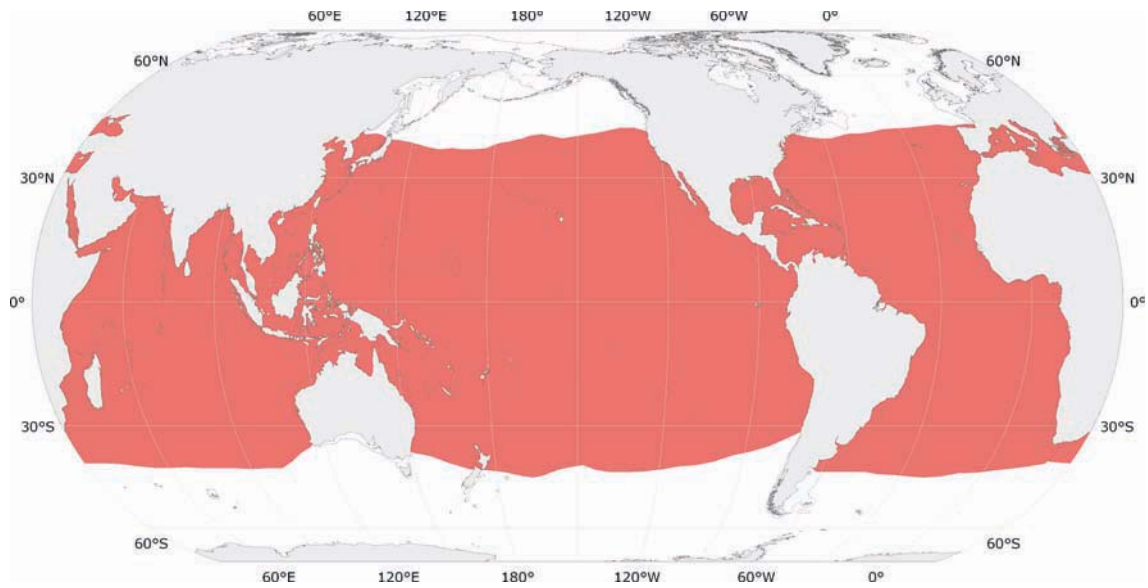


Fig. 184 *Ctenopteryx sicula*

■ Known distribution

Local Names: ITALY: Totanello pinnidentato.

Literature: Roper (1969), Young and Vecchione (2006a), Shea and Vecchione (2002), Diekmann and Piatkowski (2002b). See additional references in the family section.

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

Ctenopteryx canariensis Salcedo-Vargas, and J. Guerrero-Kommritz, 2000. *Mitteilungen aus dem Hamburgischen zoologische Museum und Institut, Hamburg*, 97: 31–44 [32]. [Type locality: 26° 20'N, 19° 21'W, south of Canary Islands. Other records: 12° 16'N, 23° 05'W; 0° 20'N, 25° 20'W. All known specimens were caught in nets that fished down to 1 000 m depth].

Size: Mantle length to 65 mm, the maximum of only 14 known specimens.

Geographical Distribution: Tropical eastern Atlantic Ocean.

Literature: Salcedo-Vargas and Young (2001a).

***Ctenopteryx sepioloides* Rancurel, 1970**

Ctenopteryx sepioloides Rancurel, 1970, *Cahiers O.R.S.T.O.M., Océanographique*, 8(4): 1–87 [39].

Size: Mantle length less than 100 mm.

Geographical Distribution: Central to western Pacific Ocean, Hawaii to Tuamotu Islands. Paralarvae epipelagic; adults mesopelagic to bathypelagic.

Literature: Rancurel (1970), Young and Vecchione (2001). See additional references in family section.

2.10 Family CRANCHIIDAE Prosch, 1847

by Clyde F.E. Roper and Patrizia Jereb

Cranchiidae Prosch, 1847, *Kongelige Danske Videnskabernes Selskabs Skrifter*, (5)1: 71.**Type Genus:** *Cranchia* Leach, 1817: 140.**FAO Names:** **En** – Cranch squids; **Fr** – Encornets-outres; **Sp** – Cranchilurias.

Diagnostic Features:^{1/} The family Cranchiidae contains a great diversity of species which exhibit a wide variety of basic characters, as well as significant variation in size, from small (about 100 mm mantle length) to gigantic (over 2 000 mm mantle length). One prominent character, however, easily distinguishes all members of the group from all other species of squids: **the mantle is fused to the head at the nuchal cartilage and to the funnel at its 2 posterolateral corners in the locus of the funnel-mantle locking apparatus.** Mantle cavity is divided into a dorsal and a ventral chamber by a broad horizontal membrane formed by a modification of the funnel retractor muscles. **Buccal membrane is provided with 8 connectives (7 lappets) that attach to the ventral borders of arms IV (formula: DDVV);** the armature of the tentacular clubs generally is in 4 transverse series of suckers (hooded hooks in median series in *Galiteuthis* and *Mesonychoteuthis*); tentacular stalks, variable in length and diameter among species, with 2 to 4 series of alternating carpal suckers and pads for most of tentacle length; the short to medium-length muscular arms have biserial suckers with wide apertures, often without dentition; (hooded hooks occur on midarm in *Mesonychoteuthis*); well-developed trabeculate protective membranes occur along both margins of all arms; **either right or left ventral arm (IV) hectocotylied (absent in some species);** photophores are present on the ventral one-half to two-thirds (or more) of the eyes and on the arm tips ("brachial end organs") and ink sac/digestive gland of some species; large buoyancy chamber extends around viscera for entire length of mantle cavity; digestive gland usually spindle-shaped, well posterior to cephalic cartilage. The mantle is stout to elongate, cylindrical, conical or spindle-shaped; the posterior end varies from blunt, rounded (*Bathothauma*) to sharply-pointed, filiform (*Taonius*). **Mantle thin walled, sometimes termed "leathery" but usually muscular; some species develop cartilaginous-like tubercles on external surface of mantle;** midline of rachis and conus of gladius usually visible through skin. Fins normally quite thin (except very thick, muscular in *Mesonychoteuthis*), insert laterally along lanceola and conus of gladius; shape varies greatly among species: widely separated, small, paddle-shaped, subterminal; medium-sized to large, rounded, terminal; ovate or lanceolate, terminal or terminal-lateral. Gladius with long, narrow rachis, dorsal keel weak or absent anteriorly (except strong in *Leachia*), bordered posteriorly with short to long vanes that form into a long lanceola (spindle-shaped to broad or diamond-shaped; weakly to strongly keeled) with short, broad to long, filiform, usually hollow, conus (exceptions in *Helicocranchia* and *Bathothauma*). Funnel moderately to very large; funnel valve variably present or absent; dorsal pad of funnel organ an inverted V- or U-shape, normally with 2 or 3 papillae or flaps or both (up to 7 papillae in *Leachia*); 2 small to very large ventral pads of various shapes: oval, kidney, crescent, L-shaped, etc. **Head short, frequently dominated by large eyes that are sessile, prominent or protruding, usually oriented anteriorly or anterolaterally; eyes with photophores.**

Size: Very diverse among species; adults range from 10 to well over 200 cm mantle length.

Geographical Distribution: A family with high species diversity, the Cranchiidae is represented in virtually all of the world's oceans and seas, with the notable exception of the Arctic Ocean. Species diversity predominates in the subtropical and tropical waters. All genera occur circumglobally in tropical and subtropical waters, except *Egea*, restricted to the tropics, and *Teuthowenia*, uniquely restricted to the sub-Arctic, north temperate and eastern tropical waters of the Atlantic Ocean and to circumglobal transition waters of the Southern Subtropical Convergence. *Taonius* and *Galiteuthis* occur in temperate and subpolar waters circumglobally; *Galiteuthis glacialis* and *Mesonychoteuthis hamiltoni* are circumglobal, but mainly restricted to Antarctic regional waters. Details of geographic and vertical distributions are given in Voss, 1988, Voss, *et al.* 1992b, Nesis, 1999b.

Habitat and Biology: Squids of the Family Cranchiidae are ubiquitous, both in geographical and vertical distribution. The species range in the sub-Arctic, proliferate into the subtropics and tropics and occur even in Antarctic waters. As paralarvae and juveniles they occur in the epipelagic zone, then, with growth, undergo gradual ontogenetic descent into mesopelagic and bathypelagic realms; adults of some species are known to inhabit depths in excess of 2 000 m. Many cranchiid species exhibit varying degrees of diel vertical migration; some seem not to migrate vertically at all. Other species occur in transitional zones and a few even are associated with near-coastal pelagic habitats. The paralarvae and young of cranchiids are characterized by stalked eyes and a stalked arm crown of variable lengths; very short arms and long tentacles; frequently a ventrally-directed rostrum on the eyes; absence of photophores. They do not closely resemble the adults of their species; historically the paralarvae were not connected with their conspecific adults. This has resulted in considerable overnaming, creation of synonyms and taxonomic confusion. The combined characters uniquely possessed by cranchiids have enabled them to develop increased buoyancy and very efficient respiration; these are the fusions of the mantle, head and funnel and the partitioning of the mantle cavity and coelom into 2 chambers in which a weak solution of low density ammonium chloride (NH₄Cl) provides near-neutral buoyancy. Prior to the onset of ontogenetic descent, paralarval/juvenile cranchiids live in near-surface waters where they are readily identified by their long eyestalks. Marked morphological changes occur during ontogenetic descent and maturation, including change of eye shape and position, change of fin shape, increased pigmentation, development of photophores on arm tips, modification of arm structure, and loss of tentacles. A few species of cranchiids have been observed alive in their deep-sea habitats from submersibles. Among other observations, several species have been

^{1/} Much of the information and data in this chapter has come from the thorough, comprehensive revisionary and monographic works of N.A. Voss (1974, 1980, 1985, 1988), to whom the authors are most grateful.

observed in a stereotypic resting position, with their arms and tentacles held tightly together in a bundle and held dorsally over their heads. This position is known as the “cockatoo” posture because of its general resemblance to the cockatoo bird. Additional observations have been made on behaviour, positions, locomotion, chromatophore patterns, etc. Cranchiids are prey in varying degrees of importance to a number of pelagic predators, e.g. numerous cetacean species including sperm whales, pygmy sperm whales, Orca whales, pot-head whales, dolphins, Dall’s porpoise; also swordfish, tunas, lancetfish, smooth and scalloped hammerhead sharks, blue sharks, tiger sharks and albatrosses.

Interest to Fisheries: Currently no directed fishery of any sort is conducted on any species of Cranchiidae. Indeed, it seems doubtful that a fishery would ever develop, because all species possess a large buoyancy chamber in the mantle cavity filled with low density ammoniacal fluid. Furthermore, the mantle tissue on most species, while “muscular”, is very thin and leathery. The musculature of the mantle in *Mesonychoteuthis hamiltoni*, which grows in excess of 2 m mantle length, is significantly thicker than on other cranchiids, but its rather soft, gelatinous consistency makes it unsuitable for human consumption. However, future research might reveal other uses, e.g. pharmaceutical, biochemical.

Local Names: USA: Bathyscapoid squids, Glass squids (Plate VII, 37).

Remarks: The systematics of the group remained in a very confused, unsettled state for most of its history, beginning in the early to mid-nineteenth century. Only since the monumental, critical, monographic works of N.A. Voss in the late twentieth century have the systematics, relationships, distributions been thoroughly enough determined to allow a high degree of understanding and stability to occur (Voss, 1974, 1980, 1985, 1988; Voss and Voss 1983; Voss, *et al.* 1992b).

The Cranchiidae as currently understood consists of 13 genera and in excess of 60 species, a number of which are very poorly known or undescribed. The genera are grouped under 2 subfamilies, the Cranchiinae and the Taoniinae.

Because none of the species of the Cranchiidae appears to have any potential for fishery development at this point, all species in principle are Level 3 Species. However, greater detail than normally provided for in Level 3 taxa is included here when literature is available, because of the ubiquitous occurrence of the family throughout all the world’s oceans and seas, to all bathymetric zones, and to its massive nutritive contribution to the thousands of species of marine mammals, fishes, invertebrates, cephalopods and sea birds that prey on them.

The literature on the Cranchiidae is vast and scattered. Consequently, references cited here for the family level are those with greatest current relevance to systematics and biology and those that are representative of particular aspects of biology, e.g. prey-predator relationships, *in situ* behaviour.

Literature: Voss, N. A. (1974, 1980, 1985, 1988), Voss and Voss (1983), Seapy and Young (1986), Vecchione and Roper (1992 [1991]), Voss *et al.* (1992b), Young and Mangold (2008a), Nesis (1999b), Sweeney and Young (2003h).

Key to the genera of Cranchiidae (adults) (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) → 2**
- 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 Taoniinae) → 4**

- 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 photophore present on all arms in near-mature and mature females; suckers in 4 series on midportion of hectocotylized 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 photophore present only on arms III in near-mature and mature females; suckers in 2 series on midportion of hectocotylized right or left IV in males **Liocranchia**

- 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; glacial 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; glacial conus filiform ***Taonius***
- 10a. Arms without hooded hooks; fins lanceolate becoming attenuate posteriorly ***Galiteuthis***
- 10b. Arms with hooded hooks on midportion; fins stout, ovate (nearly round in combined outline in juvenile), do not become attenuate posteriorly ***Mesonychoteuthis***
- 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***

2.10.1 Subfamily CRANCHIINAE Pfeffer, 1912

Cranchiinae Pfeffer, 1912, *Ergebnisse der Plankton-Expedition der Humboldt-Stiftung*, 2: [644].

Type Genus: *Cranchia* Leach, 1817.

Cranchia Leach, 1817, *Zoological Miscellany*, 3(30): 137–141 [140].

Diagnostic Features: The **Cranchiinae** is characterized by the presence on the ventral surface of the mantle of **1 or 2 cartilaginous strips** (with cartilaginous tubercles) that originate at each funnel-mantle fusion and extend posteriorly along the line(s) of the lateral fusion of the funnel/mantle; funnel fused to head laterally; **1 or more rows of 4 or more small, round to oval photophores** on the eyes; right or left IV hectocotylized in males; secondary sexual modification may be present on tips of arms III (or absent); adult females may have brachial photophore on tip of arm III (or on all 4 pairs); ceacum larger than stomach.

Remarks: This subfamily contains the genera *Cranchia*, *Leachia* and *Liocranchia*.

Literature: See references listed for the family and for *Cranchia scabra*.

***Cranchia* Leach, 1817**

Cranchia Leach, 1817, *The Zoological Miscellany; being Descriptions of New or Interesting Animals*, 3(30): 137–141 [140].

Type Species: *Cranchia scabra* Leach, 1817.

Frequent Synonyms: None.

Diagnostic Features: Mantle stout, spindle-shaped, covered with variable-sized, complex, cartilaginous tubercles, with tops bearing spines; tapers to broad posterior point; 2 short cartilaginous strips of co-equal length from each funnel-mantle fusion, V-shaped with complex multipoint tubercle at apex; each fin nearly oval with free posterior lobe; each eye with 14 photophores; brachial end organ (photophore) present on tips of all arms of premature and mature females; suckers in 4 series on midportion of hectocotylyzed right arm IV; funnel valve present; gladius with short conus.

Size: Mantle length to 150 mm.

Geographical Distribution: It is distributed circumglobally in subtropical and tropical epipelagic to mesopelagic waters.

Habitat and Biology: Prey to numerous oceanic predators.

Remarks: The genus *Cranchia* is monotypic, represented only by *C. scabra*.

Literature: See references listed for the family and for *C. scabra*.

Cranchia scabra* Leach, 1817*Fig. 185; Plate VII, 36**

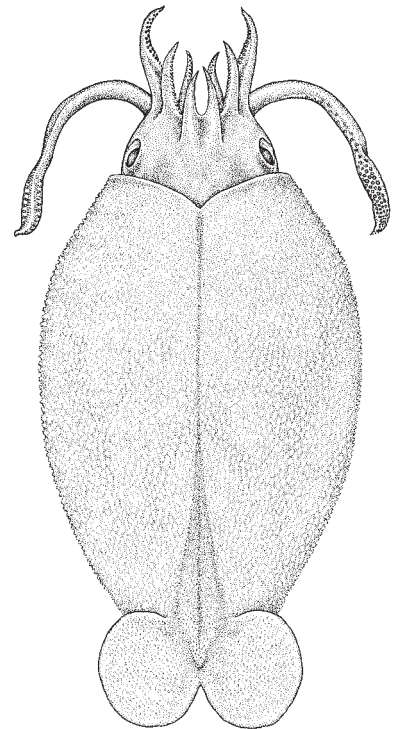
Cranchia scabra Leach, 1817, *Zoological Miscellany*, 3(30): 137–141 [140]. [Type locality: off Congo, West Africa].

Frequent Synonyms: *Loligo cranchia* Blainville, 1823; *Octopus (Philonexis) eyelais* d'Orbigny, 1834; *Cranchia hispida* Pfeffer, 1884; *C. tenuitaculeta* Pfeffer, 1884.

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

Diagnostic Features: See generic account.

Size: Maximum mantle length to 150 mm.



dorsal view

Fig. 185 *Cranchia scabra*

Geographical Distribution: This species is circumglobal, oceanic waters in tropical and subtropical open oceanic waters; known from 43°N to 35°S as generally proscribed by the north and south subtropical convergences (Fig. 186).

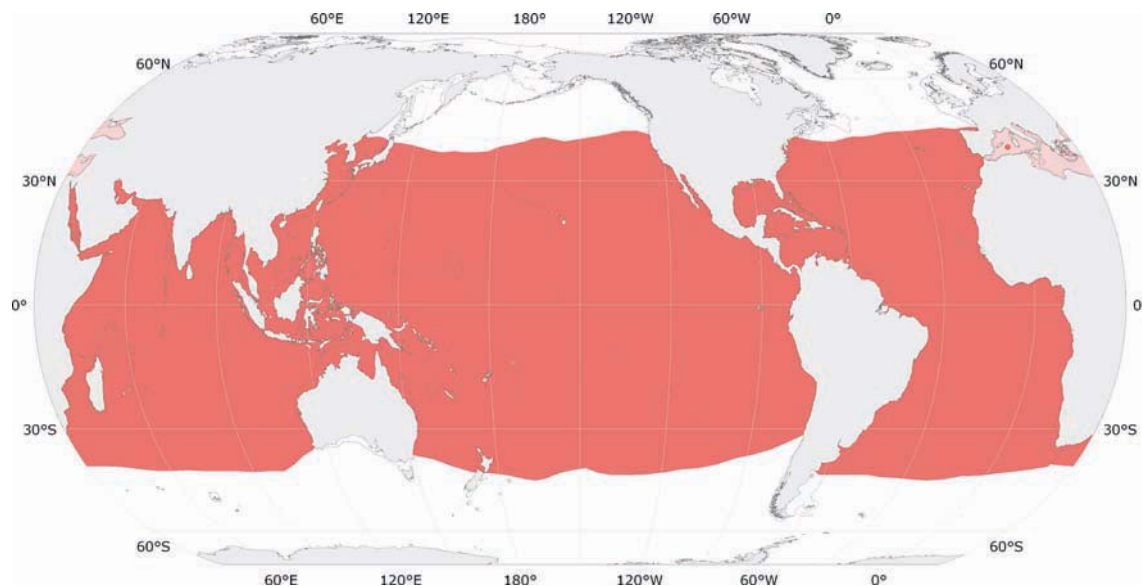


Fig. 186 *Cranchia scabra*

■ Known distribution

■ Probable presence

Habitat and Biology: Paralarvae and juveniles are epipelagic to upper mesopelagic (upper 400 m), while adults descend to mesopelagic and bathypelagic zones, perhaps to 2 000 m.

Literature: Clarke and Lu (1974, 1975), Lu and Clarke (1975b), Roper and Lu (1990), Roeleveld *et al.* (1992), Arkhipkin (1996c), Quetglas *et al.* (1999a, 2000b).

Leachia Lesueur, 1821

Leachia Lesueur, 1821, *Journal of the Academy of Natural Sciences of Philadelphia*, 2(1): 86–107 [89].

Type Species: *Leachia cyclura* Lesueur, 1821.

Frequent Synonyms: *Perothis* Rathke, 1833; *Perotis* Gray, 1849 (erroneous spelling of *Perothis* Rathke, 1833); *Dyctydiopsis* Rochebrune, 1884; *Dictydiopsis* Hoyle, 1885a (erroneous spelling of *Dyctydiopsis* Rochebrune, 1884); *Pyrgopsis* Rochebrune, 1884; *Drechselia* Joubin, 1931.

Diagnostic Features: Mantle elongate, slender, spindle-shaped, tapers posteriorly to sharp point; **ventral surface with a single cartilaginous strip that extends posteriorly from the apex of each funnel-mantle fusion**; funnel fused to head laterally; **funnel valve absent**; gladius with long, slender conus; fins barely unite posterior to gladius; fins together transversely elliptical; **eyes with 5 to 21 oval photophores** (species dependent); **brachial photophores present on tips of arms III** in mature or nearly mature females; **median suckers on manus of club greatly enlarged** (unique to the family).

Size: Small to medium-sized squids, mantle length up to 200 mm.

Geographical Distribution: *Leachia* is a circumglobal genus in tropical and subtropical waters.

Habitat and Biology: It occurs from the epipelagic (surface) to the bathypelagic zone, to around 2 000 m.

Remarks: Of the 14 nominal species in the genus *Leachia*, at least 6 species are valid, one 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. Currently, geographical location is a most important “character” for identifying species. *Leachia* is the only genus in the subfamily Cranchiinae in which the paralarvae have stalked eyes. The cartilaginous tubercles consist of hyaline cartilage and they are covered with epidermis. Some species have been photographed alive, *in situ*.

Literature: Roper and Lu (1990), Voss *et al.* (1992b). See also references listed for the family and for *Leachia* species.

Leachia cyclura* Lesueur, 1821*Fig. 187**

Leachia cyclura Lesueur, 1821, *Journal of the Academy of Natural Sciences of Philadelphia*, 2(1): 86–107 [90]. [Type locality: southern Indian Ocean at 33°S, 37°E, off South Africa].

Frequent Synonyms: *Loligo leachi* Blainville, 1823; *Perothis eschascholtzi* Rathke, 1833; *Loligopsis guttata* Grant, 1833.

FAO Names: **En** – Leach's cranch squid; **Fr** – Encornet-outré de Leach; **Sp** – Cranquiluria de Leach.

Diagnostic Features: Length of **cartilaginous tubercle strip** about **20 to 30% of mantle length**; **8 eye photophores**, 5 in outer row, 3 near pupil (at 60 to 70 mm mantle length).

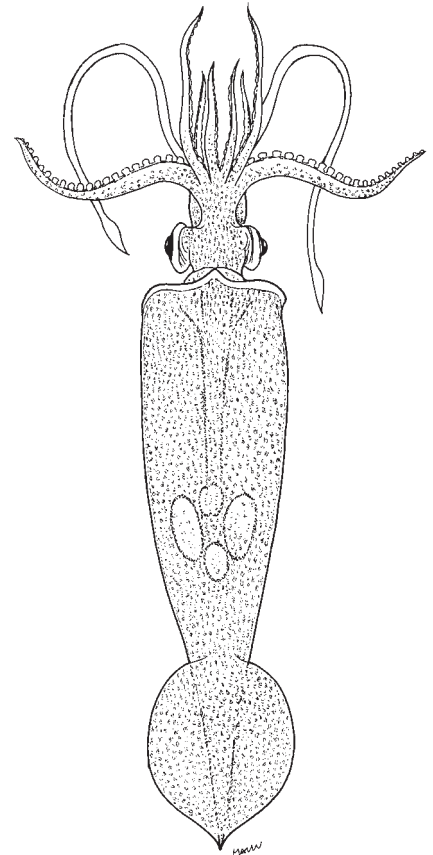
Size: Maximum mantle length 150 to 200 mm.

Geographical Distribution: *Leachia cyclura* inhabits tropical and southern subtropical Indo-West Pacific oceanic waters (Fig. 188).

Habitat and Biology: Bathymetric range from surface waters to bathypelagic, around 2 000 m, following a gradual process of ontogenetic descent.

Remarks: The species apparently was originally described from an illustration of the specimen drawn at sea and has not been recorded extensively in the literature.

Literature: Voss (1980), Nesis (1982, 1987).



dorsal view

Fig. 187 *Leachia cyclura*

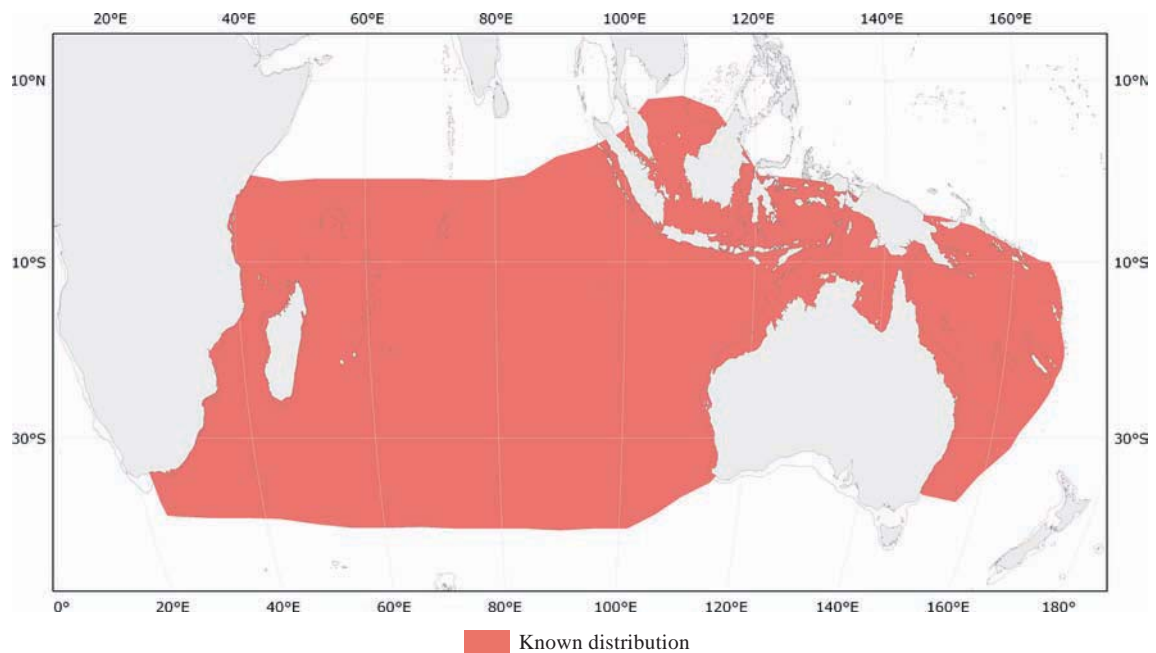


Fig. 188 *Leachia cyclura*

Leachia atlantica (Degner, 1925)

Pyrgopsis atlantica Degner, 1925, *Report of the Danish Oceanographic Expeditions, 1908 to 1910, Mediterranean and Adjacent Seas*, 2(9): 1–94 [54]. [Type locality: 36°13'N, 09°44'W (Atlantic Ocean)].

Frequent Synonyms: None.

Diagnostic Features: Length of cartilaginous tubercular strip 14 to 15% of mantle length; 6 photophores on eye, 5 in outer row, 1 near pupil; large elongate photophore on tips of arms III in maturing and mature females.

Size: Maximum mantle length to 100 mm.

Geographical Distribution: Broadly distributed in the Atlantic Ocean subtropical and tropical regions; recorded from 50°N to 21°S (carried by the Gulf Stream, meanders as far as the Grand Banks off Newfoundland); Bay of Biscay, Gulf of Mexico, northern Caribbean Sea, Straits of Florida).

Habitat and Biology: An open ocean species, paralarvae and juveniles inhabit epipelagic to mesopelagic zones, while adults occupy mesopelagic to bathypelagic depths to greater than 1 000 m. Some diel vertical dispersal may occur; numerous night and early morning captures of mature and spent females at or near the surface indicate that spawning occurs in near-surface waters. Closing net captures off Bermuda of *Leachia* cf. *atlantica* juveniles and subadults were recorded at 50 to 60 m during the day; at night most specimens occurred at 50 to 100 m, but largest specimens (26 to 48 mm mantle length) were taken at 135 to 230 m; most large specimens taken during daytime were the deepest captures.

Remarks: This species is sympatric with *Leachia lemur* in Atlantic subtropical waters.

Literature: Guerra (1992), Herring *et al.* (2002), Vecchione (2002).

Leachia danae (Joubin, 1931)

Drechselia danae Joubin, 1931, *Annales de l'Institut Océanographique*, (N.S.), 10(7): 169–211 [197]. [Type locality: 06°40'N, 80°47'W, Gulf of Panama, eastern Pacific Ocean].

Frequent Synonyms: None.

Diagnostic Features: Eyes with 21 photophores, 8 in outer row, 5 in middle row, 8 in inner row near the pupil.

Size: Maximum mantle length from 180 to 190 mm.

Geographical Distribution: This species has been recorded in equatorial waters of the eastern tropical Pacific Ocean, between 23°N to about 14°S and west to about 145°W.

Habitat and Biology: Paralarvae and small juveniles occur in the upper few hundred metres of the epipelagic zone, while larger animals descend ontogenetically to depths greater than 1 000 m in the bathypelagic zone. Some diel movement occurs.

Literature: Voss *et al.* (1992b), Young and Mangold (2007a).

Leachia dislocata Young, 1972

Leachia dislocata Young, 1972a, *Smithsonian Contributions to Zoology*, 97: 1–159 [80]. [Type locality: 32°35'N 118°06'W, off southern California, eastern North Pacific Ocean].

Frequent Synonyms: None.

Diagnostic Features: Cartilaginous tubercular strip length occupies 12 to 17% of mantle length; second complex tubercle at anterior end of strip noticeably displaced medially; eyes with 15 photophores, 8 in outer row, 7 in inner row (3 large, 4 small).

Size: Maximum mantle length to 150 mm.

Geographical Distribution: This species occurs in oceanic waters of the eastern North Pacific Ocean in the California Current between approximately 25°N and 45°N and westward in North Pacific central waters to 160°W, including the Hawaiian Islands; in the Peru-Chile Current between about 15°S and 25°S.

Habitat and Biology: Juveniles occur in the upper few hundred metres of the epipelagic zone; then with ontogenetic growth they descend into the bathypelagic depths of 1 000 m or more. Mating and spawning appear to occur in the upper 200 m, based on captures of mature males and a spent female in those upper epipelagic waters.

Literature: Young (1972a), Roper and Young (1975).

***Leachia lemur* (Berry, 1920)**

Pyrgopsis lemur Berry, 1920a, *Proceedings of the United States National Museum*, 58(2335): 293–300 [298]. [Type locality: 35°27'N 73°14'W, east of Cape Hatteras, western North Atlantic Ocean].

Frequent Synonyms: None.

Diagnostic Features: Cartilaginous tubercular strip occupies about 35% of mantle length; eyes with 5 photophores, 4 outer, 1 inner.

Size: Maximum mantle length to 70 mm.

Geographical Distribution: *Leachia lemur* seems restricted to the North Atlantic subtropical region west of about 50°W in the northern and southern Sargasso Sea.

Habitat and Biology: Paralarvae and juveniles occur in the upper few hundred metres of the epipelagic zone, while larger animals descend progressively with growth (ontogenetic growth) to bathypelagic depths in excess of 1 000 m. Matures at 60 to 70 mm mantle length; apparently mates and spawns in deep water. Very extensive sampling in the western North Atlantic yielded *L. lemur* only in the winter months; the species frequently is captured along the offshore edge of the Gulf Stream in its more poorly defined interface with Sargasso Sea water.

Literature: Lea (1985), Vecchione and Roper (1986), Diekmann and Piatkowski (2002a).

***Leachia pacifica* (Issel, 1908)**

Zygaenopsis pacifica Issel, 1908, *Monitore Zoologico Italiano*, 19(4): 102–104 [103]. [Type locality: 14°32'S, 167°43'W, between Tahiti and Pago Pago Islands, central western Pacific Ocean].

Frequent Synonyms: *Liocranchia brocki* Pfeffer, 1884; *L. elongata*, Issel, 1908; *Fusocranchia alpha* Joubin, 1920; *Liocranchia intermedia* Robson, 1924.

Diagnostic Features: Large brachial photophores develop on arms III of mature females. Eyes with 6 photophores, 5 outer, 1 inner; tubercular strips with a second, large anterior tubercle noticeably offset medially from the linear pattern.

Size: Maximum mantle length to 60 mm.

Geographical Distribution: This small oceanic species is geographically broadly distributed in the tropical waters of the North Pacific and Indo-Pacific oceans, and westward into equatorial waters of the Indian Ocean.

Habitat and Biology: The vertical distribution for juveniles is very shallow in the epipelagic zone, from near surface to about 150 m. As sexual maturity occurs, the subadult squid undergo a sudden ontogenetic descent; animals of about 45 to 55 mm mantle length may be found throughout the water column between about 200 to 1 300 m; mature animals occur at depths from about 1 200 to 1 800 m (possibly to 2 300 m) where they become fully mature, mate and spawn.

Remarks: The species co-occurs with *Leachia dislocata* in the Indian Ocean.

Literature: Young (1975b, 1978), Young and Mangold (2007a).

***Liocranchia* Pfeffer, 1884**

Liocranchia Pfeffer, 1884, *Abhandlung aus dem Gebiete der Naturwissenschaften, Hamburg*, 8(1): 1–30 [25].

Type Species: *Liocranchia reinhardti* (Steenstrup, 1856).

Frequent Synonyms: *Fusocranchia* Joubin, 1920.

Diagnostic Features: Mantle elongate, spindle-shaped, tapers posteriorly to narrow point, **not covered with cartilaginous tubercles**; 2 moderately long **cartilaginous strips studded with cartilaginous tubercles** extend from each funnel-mantle fusion **in inverted-V pattern, co-equal in length or ventral component the longest**; fins unite posterior to gladius, ovoid to nearly circular; funnel valve present; gladius with short conus; **eyes with 4 or 14 oval photophores**; brachial photophores present only on tip of arms III in premature and mature females; suckers in 2 series on midportion of hectocotylized right or left arm IV in males.

Size: Medium-sized squids up to 250 mm mantle length.

Geographical Distribution: The species are circumglobal in tropical to subtropical oceanic waters.

Habitat and Biology: *Liocranchia* squids occupy epipelagic to bathypelagic depth zones. They are prey to numerous oceanic predators.

Remarks: *Liocranchia* is comprised of 2 species, *L. reinhardti* and *L. valdiviae*, medium-sized squids up to 250 mm mantle length. The species are circumglobal in tropical to subtropical oceanic waters; they occupy epipelagic to bathypelagic depth zones. Prey to numerous oceanic predators.

Literature: See references listed for family and *Liocranchia* species.

Liocranchia reinhardti* (Steenstrup, 1856)*Fig. 189**

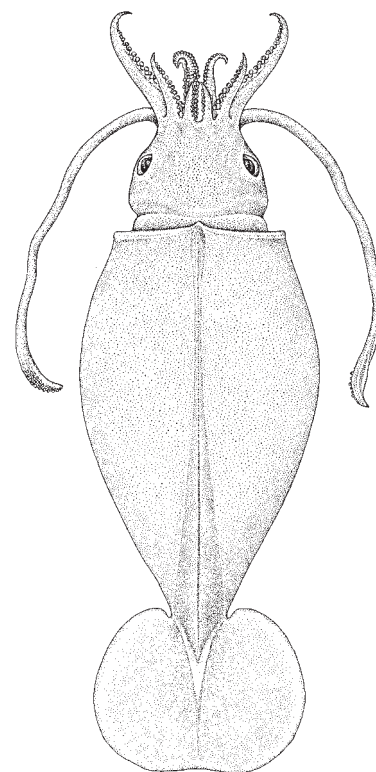
Leachia reinhardti Steenstrup, 1856, *Kongelige Danske Videnskabernes Selskabs Skrifter, series 5*, 4:185–216 [200]. [Type locality: North Atlantic Ocean, 15° 19'N, 24°54'W and 23°N, 32°W].

Frequent Synonyms: *Liocranchia brocki* Pfeffer, 1884; *L. elongata*, Issel, 1908; *Fusocranchia alpha* Joubin, 1920; *Liocranchia intermedia* Robson, 1924.

FAO Names: En – Reinhardt's cranch squid; Fr – Encornet-oultre de Reinhardt; Sp – Cranquiluria de Reinhardt.

Diagnostic Features: Possesses **cartilaginous tubercles along dorsal midline**, overlaying gladius; **14 oval photophores on eye**.

Size: Maximum mantle length to 250 mm.



dorsal view

Fig. 189 *Liocranchia reinhardti*

Geographical Distribution: *Liocranchia reinhardti* is distributed circumglobally in tropical and subtropical waters, recorded from 50°N to about 35°S, generally bounded by the north and south subtropical convergences (Fig. 190).

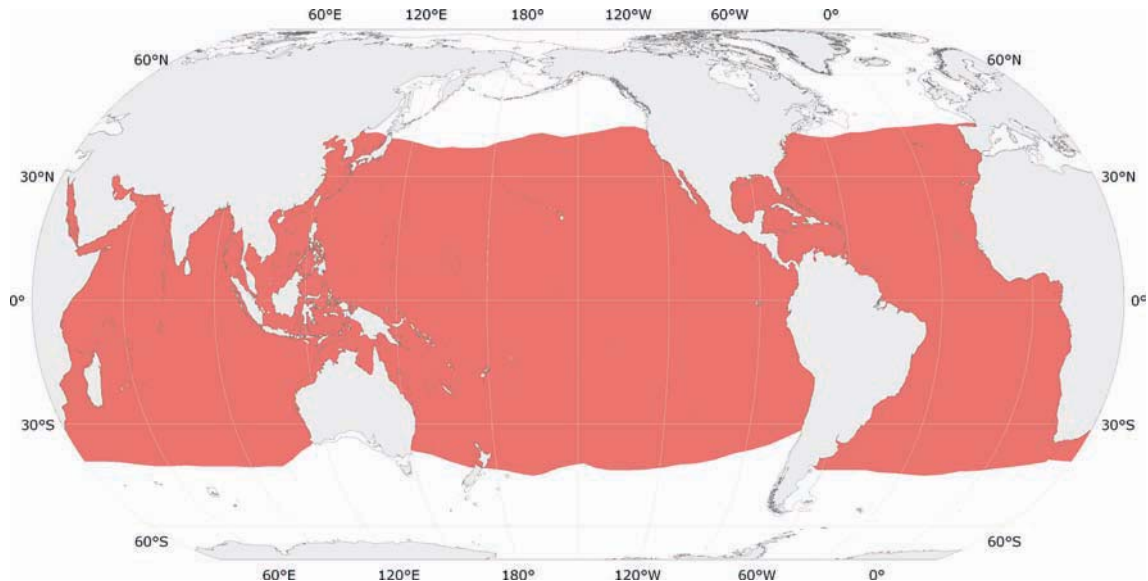


Fig. 190 *Liocranchia reinhardti*

■ Known distribution

Habitat and Biology: Its vertical distribution as paralarvae and juveniles is epipelagic to upper mesopelagic, while the adults occur at lower epipelagic, mesopelagic and bathypelagic depths; surface to 1 200 m. In Hawaiian waters, at least, *L. reinhardti* appears to be a strong vertical migrator, probably a component of the mesopelagic boundary fauna where it is most common over bottom depths of 700 m or less, rather than in deeper offshore waters.

Literature: Young (1972a, 1995), Lu and Roper (1979), Piatkowski and Welch (1992 [1991]), Roper and Lu (1990), Voss *et al.* (1992b), Guerra (1992), Arkhipkin (1996c), Chesalin and Zuev (2002b).

Liocranchia valdiviae Chun 1910

Liocranchia valdiviae Chun, 1910, *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition dem Dampfer Valdivia, 1898-1899*, 18(1): 1–401 [337]. [Type locality: 04°45'S, 48°58'E, Indian Ocean].

Diagnostic Features: The species is distinguished from *Liocranchia reinhardti* by the absence of cartilaginous tubercles along dorsal midline and the presence of only 4 oval photophores on eyeball.

Size: Maximum mantle length unknown, perhaps from 200 to 250 mm.

Geographical Distribution: *Liocranchia valdiviae* occurs principally in the Indian and Pacific oceans; it also is present in the southeastern South Atlantic in the Benguela Current off South Africa; it is confined primarily to tropical and equatorial oceanic waters.

Habitat and Biology: The young (of 5 to 15 mm mantle length) are epipelagic, concentrated in the upper few hundred metres; juveniles of approximately 15 to 25 mm mantle length descend to mesopelagic depths of 500 to 700 m and animals greater than 25 mm mantle length are bathypelagic, progressively deeper to in excess of 1 200 m. The species does not undergo a diel vertical migration, but occasional wanderers occur in shallower depths at night off Hawaii.

Literature: Roper and Young (1975), Voss *et al.* (1992b).

2.10.2 Subfamily TAONIINAE Pfeffer, 1912

Taoniinae Pfeffer, 1912, *Ergebnisse der Plankton-Expedition der Humboldt-Stiftung*, 2: [644].

Type genus: *Taonius* Steenstrup, 1861.

Diagnostic Features: The Taoniinae is characterized by the **absence of cartilaginous strips** that extend posteriorly along the lines of the funnel-mantle fusions; the presence of a funnel that is free laterally (not fused to the head); and the presence on the eyes of **1 to 3 markedly dissimilar-sized and -shaped photophores, the largest one usually crescent-shaped**. Hectocotylus absent in males; secondary sexual modifications may occur on arms I, II, III or all 4 pairs of arms or absent entirely; adult females may have brachial photophore on tips of arms I, II, III (or on all 4 pairs), or absent altogether; ceacum smaller than stomach.

Remarks: This subfamily contains numerous and diverse species that are arranged in several genera, many of which were based on paralarval or juvenile forms (e.g. *Fusocranchia*, *Teuthowenia*, *Taonidium*). The currently recognized genera are: *Taonius*, *Bathothauma*, *Belonella*, *Egea*, *Galiteuthis*, *Helicocranchia*, *Liguriella*, *Megalocranchia*, *Mesonychoteuthis*, *Sandalops* and *Teuthowenia*.

Literature: See references listed in the family section and *Helicocranchia*.

Taonius Steenstrup, 1861

Taonius Steenstrup, 1861, *Oversigt over det Kongelige Danske Videnskabernes Selskabs Forhandlinger*, 1861: 69–86 [83].

Type Species: *Taonius pavo* (Lesueur, 1821).

Frequent Synonyms: *Desmoteuthis* Verrill, 1880–1881; *Toxeuma* Chun, 1906; *Belonella* Lane, 1957.

Diagnostic Features: **Mantle** very long, slender, widest anteriorly, tapers to sharply filiform posteriorly, **not covered with cartilaginous tubercles**, somewhat gelatinous in adults; funnel-mantle fusion cartilages small, narrow (to stout), oval, without tubercles (a single tubercle may be present in juveniles); mantle-nuchal fusion cartilage oval, extends onto head, tubercles absent; fins long, terminal, narrow, lanceolate, anterior lobes small, very attenuate posteriorly, extend to tip of gladius; funnel large, dorsal pad of funnel organ small, stout, inverted U-shape with 3 short, fat, round papillae, the central one with a thin terminal flap; **funnel valve absent**; eyes very long and stalked in paralarvae, become tubular in juveniles and then huge, nearly spherical in adults, where they dominate head, protruding, anteriorly directed; **2 photophores on ventral surface of eyes: a large posterior crescent-shaped organ that engulfs the small anterior crescent-shaped photophore**; arm-tip photophores absent; **tentacular club without hooded hooks, with enlarged suckers with 1 or 2 large, hook-like central teeth distally**; marginal suckers not reduced in size or lost; tentacular stalk with 2 series of alternating suckers and knobs on distal two-thirds; **conus of gladius very filiform**.

Size: Medium- to large-sized squids, up to 660 mm mantle length.

Geographical Distribution: The genus is oceanic cosmopolitan in tropical, subtropical, temperate and subpolar regions.

Habitat and Biology: Vertical distribution extends from the upper 200 m for paralarvae to the mid-depths of 600 m for juveniles; ontogenetic descent continues until the mature adults occur at 2 000 m and deeper. A diel vertical migration does not seem to occur. Spawning appears to occur suddenly, very near the surface at night.

Remarks: *Taonius* currently consists of 3 species, although at least 2 other species are thought to exist in the contiguous geographical distributions that seem to occur among congeners of the genus (Voss *et al.*, 1992a; Voss pers.com).

Literature: Voss (1980, 1992); Young and Mangold (2008e). See additional references listed in the species accounts.

Taonius pavo (Lesueur, 1821)**Fig. 191**

Loligo pavo Lesueur, 1821, *Journal of the Academy of Natural Sciences of Philadelphia*, 2(1): 86–101 [96]. [Type locality: Sandy Bay, off Massachusetts, western North Atlantic Ocean].

Frequent Synonyms: None.

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

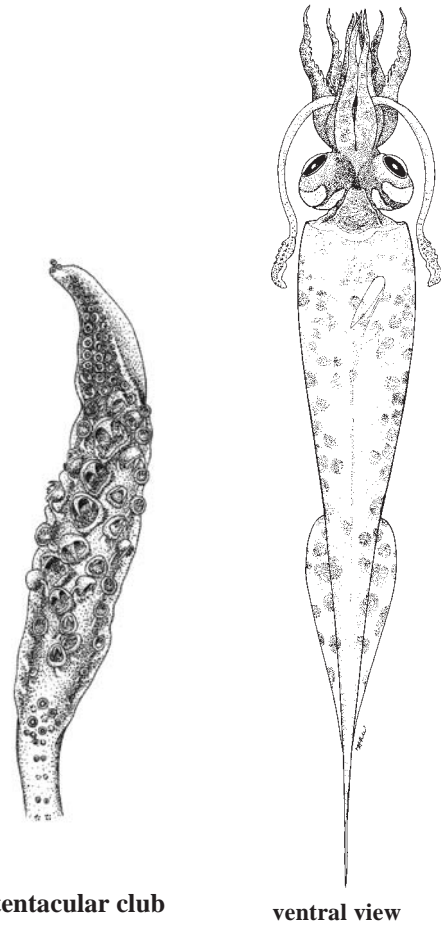
Diagnostic Features: Mantle elongate, thin, tapers posteriorly. **Fins lanceolate, extend half the mantle length. Head small, eyes bulbous.** Arms with biserial, spherical suckers. Tentacles a little longer than arms. **Club with 4 series of suckers; mesial sucker rings with 2 hook-like curved teeth.** Marginal sucker rings with several sharp teeth.

Size: Maximum mantle length to 660 mm.

Geographical Distribution: *Taonius pavo* is known to be widely distributed in the open Atlantic Ocean midwaters from about 45°N to the Southern Subtropical Convergence; it may extend into the Indian Ocean in association with the Agulhas Current (Fig. 192).

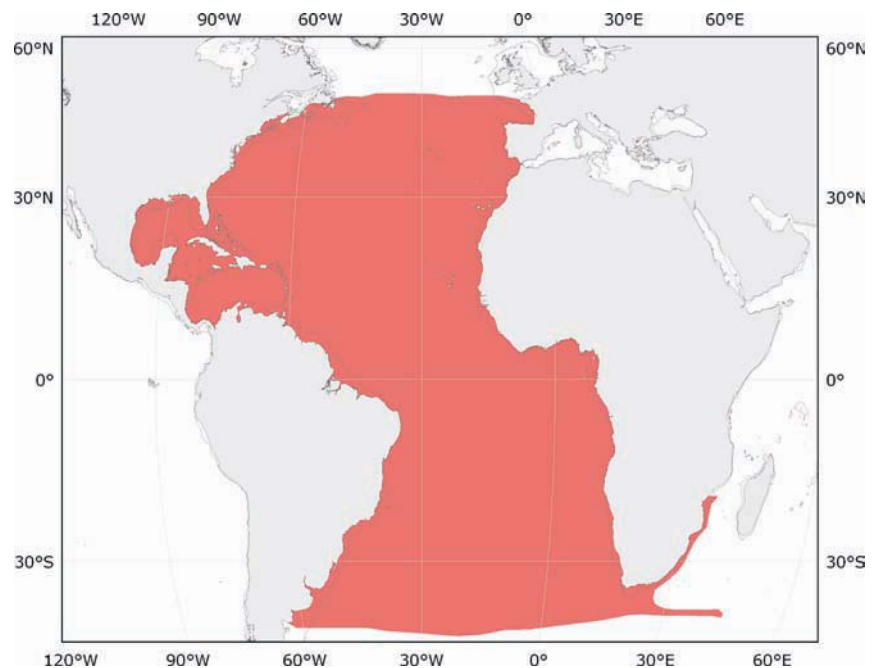
Habitat and Biology: Vertical distribution as noted for the genus. See Literature.

Literature: Clarke and Lu (1974, 1975); Roper and Young (1975), Vecchione and Roper (1992 [1991]), Roeleveld *et al.* (1992), Moreno and Pereira (1998), Vecchione (2002).



tentacular club

ventral view

Fig. 191 *Taonius pavo***Fig. 192 *Taonius pavo***

■ Known distribution

Taonius belone (Chun 1906)

Toxeuma belone (Chun, 1906), *Zoologischer Anzeiger*, 31(2): 92–86 [86]. [Type locality: 10°08'S, 97°14'E, central Indian Ocean].

Frequent Synonyms: *Belonella pacifica pacifica* Nesis, 1972a, *Belonella belone* Nesis (1982, 1987).

Diagnostic Features: Mantle very slender, thin, leathery; fins long, width about 15% of mantle length. Eyeball large, with lunate and bilobal crescent photophore. Arms short; sucker rings with broad, low teeth. Mesial 6 pairs of manal suckers transformed into 2 hooks; lateral accessory denticles vestigial.

Size: Maximum mantle length to about 530 mm.

Geographical Distribution: North subtropical and tropical/equatorial waters of the Pacific and Indian Oceans.

Remarks: Chun (1906) named *Toxeuma belone* from the Indian Ocean at 10°08'S, 97°14'E on the basis of a single specimen of 51 mm mantle length. Lane (1957) pointed out that the generic name *Toxeuma* was preoccupied and proposed the name *Belonella belone*. Nesis (1972a) maintained a generic separation between *Belonella* and *Taonius* based in part on his observation of the different consistency of the tissues (gelatinous in *Taonius* and leathery in *Belonella*). *Belonella* and *Taonius* were synonymised by Voss (1980), even though some authors did not accept this action (e.g. Nesis, 1982, 1987; Okutani, 2005). The identity/validity of Chun's species, however, was long considered uncertain; ongoing research (Voss, pers. comm.), supporting previously published data (Nesis, 1982, 1987; Voss, 1988; Voss *et al.*, 1992b) and working hypotheses (Young and Mangold, 2008e), strongly indicate that *Taonius belone* be synonymised with *T. pacificus*, the latter species name obtained by synonymising *Belonella pacifica pacifica*, Nesis, 1972a with *Taonius*. Thus, the new combination is derived, *Taonius belone* (Chun, 1906), the specific name *belone* having priority (Jereb and Roper *in* Young and Mangold, 2008e).

Literature: Chun (1906), Lane (1957), Voss (1980), Nesis (1982, 1987), Voss (1988), Voss *et al.* (1992b), Young and Mangold (2008e).

Taonius borealis (Nesis, 1972)

Belonella borealis Nesis, 1972a, *Zoologicheskij Zhurnal*, 51(3): 341–350 [343]. [Type locality: 44°07.8'N, 150°26.7'E, North Pacific Ocean].

Frequent Synonyms: None.

Diagnostic Features: Mantle leathery; photophores on eyeball crescent-shaped. Sucker rings dentate. Tentacular suckers with 1 or 2 major hooks and 1 to 3 accessory small lateral hooks.

Size: Maximum mantle length to about 500 mm.

Geographical Distribution: *Taonius borealis* is an oceanic species that occurs in the boreal, sub-Arctic region of the North Pacific Ocean, from the Bering Sea to eastern Honshu, Japan, Sea of Okhotsk to southern California.

Habitat and Biology: Paralarvae occur in the upper 200 m, undergo ontogenetic descent as juveniles to 400 to 600 m, then with continued growth descend to in excess of 2 000 m where sexual maturity occurs. Some diel vertical movement might occur.

Literature: Nesis (1982, 1987), Arkhipkin (1996b), Katugin *et al.* (2006b).

Bathothauma Chun, 1906

Bathothauma Chun, 1906, *Zoologischer Anzeiger*, 31(2): 82–86. [86].

Frequent Synonyms: *Leucocranchia* Joubin, 1912.

Diagnostic Features: Medium-sized taoniids. Mantle elongate cylindrical, sac-shaped, rounded posteriorly. Cartilaginous tubercles absent (or nearly so) on funnel/mantle fusion. Fins small, widely separated, rounded, paddle-shaped, subterminal, inserted on lateral expanded ends of transverse extensions of posterior end of gladius (unique to this genus). Funnel valve absent, funnel organ with inverted V-shaped dorsal pad. Eyes large to huge, protruding, anteriorly oriented, nearly spherical; most of posteroventral surface covered with a single, very large, half-round photophore (unusual in family, shared only with *Helicocranchia*), indented in midanterior margin. Brachial photophores on arm tips of adult females unknown. Paralarva and juvenile exceptionally distinct with very long eye stalks, distinct rostrum on each eye, a long brachial pillar, widely separated fins.

Size: Medium-sized species: maximum mantle length to 200 mm.

Geographical Distribution: The genus is circumglobal in tropical and subtropical zones.

Habitat and Biology: *Bathothauma* occupy the open oceans and occur from the near-surface epipelagic waters, as young, to the bathypelagic realm in excess of 2 000 m, as adults. The paralarval stage is extended to a very large size, about 100 mm mantle length, while adults attain 200 mm mantle length.

Remarks: *Bathothauma* currently is monotypic; the only species is *B. lyromma*. However, ongoing research indicates that at least 4 very closely related species exist throughout their contiguous distributions.

Literature: Voss (1980), Voss *et al.* (1992b).

***Bathothauma lyromma* Chun, 1906**

Fig. 193

Bathothauma lyromma Chun, 1906, *Zoologischer Anzeiger*, 31(2): 82–86. [86].
[Type locality: 17°28'N, 29°42'W, West of Cape Verde Islands, southeastern Atlantic Ocean.

Frequent Synonyms: *Leucocranchia pfefferi* Joubin, 1912.

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

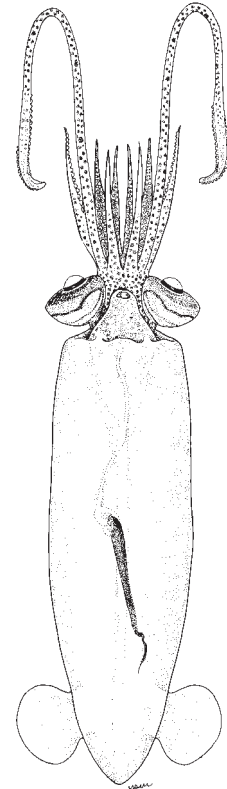
Diagnostic Features: As given for the genus.

Size: Maximum mantle length to 200 mm.

Geographical Distribution: *Bathothauma lyromma* is an extremely broadly distributed oceanic species throughout the world oceans in tropical and subtropical zones; in the Atlantic known from 35° to 45°N to 35° to 40°S (Fig. 194).

Habitat and Biology: Its vertical range extends from subsurface epipelagic depths as paralarvae and undergoes very clear ontogenetic descent through the mesopelagic zone and into the bathypelagic waters to in excess of 2 000 m.

Literature: See references listed for the genus. Young (1970), Aldred (1974), Roper and Young (1975), Vecchione *et al.* (1989), Kubodera (1994).



ventral view

Fig. 193 *Bathothauma lyromma*

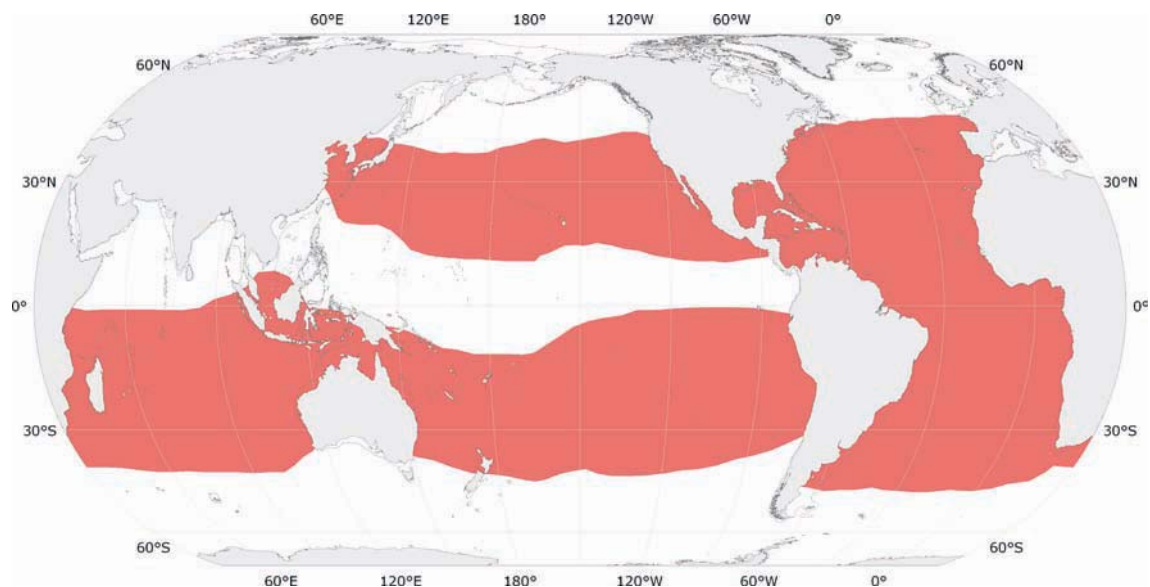


Fig. 194 *Bathothauma lyromma*

Known distribution

***Egea* Joubin, 1933**

Egea Joubin, 1933, *Annales de l'Institut Océanographique*, 13(1): 1–49 [43].

Frequent Synonyms: None.

Diagnostic Features: Mantle long, narrow, spindle-shaped, thin-walled, leathery, tapers posteriorly to attenuated tip; funnel-mantle fusion cartilage elongate, triangular, without tubercles; nuchal fusion cartilage conspicuous, spindle-shaped without tubercles; internal funnel-mantle fusion lines appear externally as non-cartilaginous, non-tubercular, inverted-V marks that originate on the mantle-funnel cartilages; fins lanceolate, terminal lateral, taper posteriorly to tip of gladius, no anterior lobes; fins attach laterally on mantle for one-third or more of mantle length (unusual in subfamily, shared only with *Teuthowenia*); funnel moderately large; **dorsal pad of funnel organ large**, inverted V-shaped, broad anterior margin, **triangular flap on each lateral limb**, no midanterior papilla, ventral pads with anterior V-shaped notch; funnel valve present, well developed (unusual in subfamily, shared only with *Megalocranchia*); **eyes spherical, protruding**, anterolaterally oriented, ventral surface **with 2 long, narrow photophores: 1 long, crescent-shaped, posterior (medial); 1 anterior (lateral) encircles two-thirds of lens, crescent-shaped with out-curved terminal curve at posterior end**; brachial end organs (photophores) present on arms III in subadult females (adult females unknown); hectocotylus absent in mature males, all arm tips secondarily modified with 4 transverse series of minute suckers; tentacles medium length, muscular, stalk with 2 series of suckers and pads on distal three-fourths; clubs slightly expanded, without carpal cluster, suckers on manus medium-sized, set on long stalks; gladius with very long, delicate, narrow rachis without anterior expansion; delicate vanes on posterior third of rachis form narrow, elongate lanceola; distal posterolateral margins of vanes in-roll ventrally without fusing to form hollow needle-like conus.

Size: Moderately large cranchiids; maximum reported mantle length 420 mm.

Geographical Distribution: Circumglobal in equatorial, tropical to subtropical waters (35°N to 42°N, to 25°S), in the Atlantic, Indian and western Pacific oceans. It occurs in the Gulf of Mexico, the western North Atlantic Gulf Stream system and the western North Pacific Kuroshiro Current system.

Habitat and Biology: The vertical distribution of paralarvae to approximately 35 mm mantle length is epipelagic, concentrated in subsurface water to 200 m both day and night. With growth and metamorphosis (around 35 to 40 mm mantle length) juveniles broaden their range in the mesopelagic zone to 800 m or more. One subadult female was captured in a closing net at night at 800 to 600 m in the western North Atlantic. Subadults and adults descend into the bathypelagic zone where maturation occurs in the 2 000 m zone. Captures of juveniles and large subadults at night in subsurface waters to about 300 m suggests that a portion of the population undergoes a diel vertical migration.

Remarks: The genus *Egea* currently is monotypic, represented by *Egea inermis*, but Voss *et al.* (1992b) indicate that a second species may exist.

Literature: Voss *et al.* (1992b), Young and Mangold (1999a).

Egea inermis* Joubin, 1933*Fig. 195**

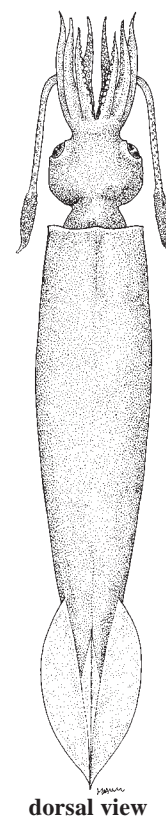
Egea inermis Joubin, 1933, *Annales de l'Institut Océanographique*, 13(1): 1–49 [48]. [Type locality: 33°51'N, 66°43'W, North Atlantic Ocean].

Frequent Synonyms: *Phasmatopsis lucifer* Voss, 1963b.

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

Diagnostic Features: See under *Egea*.

Size: Maximum mantle length to 420 mm.



dorsal view

Fig. 195 *Egea inermis*

Geographic Distribution: See under *Egea* (Fig. 196).

Habitat and Biology: See under *Egea* generic account.

Literature: Zuev and Nesis (1971), Voss (1974), Lu and Roper (1979), Vecchione *et al.* (1989). Additional references are listed under *Egea*.

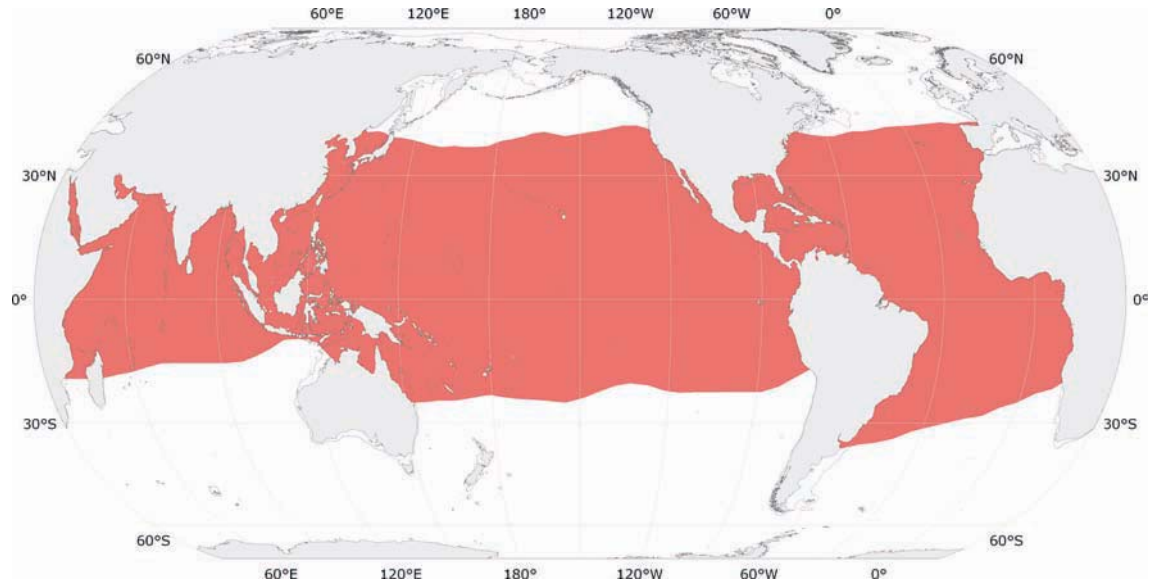


Fig. 196 *Egea inermis*

■ Known distribution

Galiteuthis Joubin, 1898

Galiteuthis Joubin, 1898a, *Annals of Scientific Naturalist, Zoology, series 8*, 6: 279-292 [292].

Type Species: *Galiteuthis armata* Joubin, 1898a.

Frequent Synonyms: *Taonidium* Pfeffer, 1900; *Crystalloteuthis* Chun, 1906; *Phasmatoteuthion* Pfeffer, 1912; *Crystalloteuthis* Naef, 1921a (erroneous spelling of *Crystalloteuthis* Chun, 1906).

Diagnostic Features: Mantle long, slender, broadest in anterior half, tapers posteriorly to long, slender, pointed tip; mantle spindle shape, fins small in juvenile; numerous rounded cartilaginous tubercles present on mantle from about 10 mm mantle length, occasionally very numerous with growth (species-dependent); comma-shaped mantle-funnel fusion cartilages may have 2 elongate tubercles each with 2 or 3 cusps present on anterior portions; broad, triangular mantle-nuchal fusion cartilage, with 2 small tubercles on each side with 2 or 3 cusps; **fins terminal**, medium to long, **lanceolate**, **variously attenuate posteriorly**, with **stout gladiol spine** and low delicate fringe to tip of gladius; anterior margin of fins insert on posterolateral margins of lanceola; funnel medium-sized, extends to mid-eye level; dorsal pad of funnel organ approximately inverted U-shape with 3 large, slightly flattened papillae; **funnel valve absent**; **large, protruding, anterior laterally-directed eyes** dominate head, their ventral (medial) surface with **1 large, very elongate, crescent-shaped posterior photophore that envelopes 1 small, slightly crescent-shaped to round anterior (lateral) photophore**; **arms short**; **arms without hooded hooks**; arm tips without brachial end-organ photophores; tentacles short to medium, muscular, 2 series of carpal suckers in pairs along distal two-thirds to three-fourths of stalk, carpal cluster present; club short, slightly expanded, **4 to 8 pairs median suckers on manus** that with growth (from about 35 to 60 mm mantle length) **become conspicuous, large, hooded hooks**; suckers on lateral rows greatly reduced or lost; medium-width protective membrane with weak trabeculae; gladius with long, slender rachis, long narrow vanes that in-roll posteriorly, overlap, and form long, hollow, needle-like conus.

Size: Moderately large-sized squids. Some species may attain a large size to nearly 2 m total length (unconfirmed).

Geographical Distribution: Species within the genus are oceanic, pelagic, found variously circumglobally in all oceans in tropical, subtropical, temperate, subpolar and Antarctic waters; absent in Arctic Ocean.

Habitat and Biology: Squids vertical range extends from immediate subsurface depths as paralarvae into depths in excess of 1 500 m as adults.

Remarks: *Galiteuthis* is comprised of 5 nominal species and at least 1 or 2 additional species are yet to be validated.

Literature: Voss (1980), Rodhouse *et al.* (1992a). Additional references listed in individual species sections.

Galiteuthis armata* Joubin, 1898*Fig. 197**

Galiteuthis armata Joubin, 1898a, *Annals of Scientific Naturalist, Zoology, series 8*, 6: 279–292 [292]. [Type locality: ?Nice, Mediterranean Sea].

Frequent Synonyms: *Taonidium pfefferi* Russell, 1909.

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

Diagnostic Features: Mantle long, lanceolated, fused with funnel and head in the occipital area. **Mantel surface smooth.** Fins lanceolated, reach the pitted tail of the mantle. **Two to 4 small conical tubercles** on the mantle-funnel fusion sites.

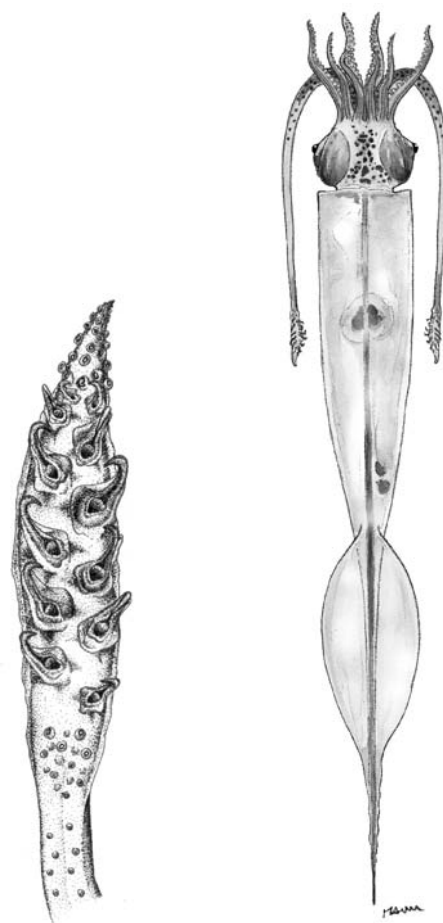
Size: Maximum mantle length to 610 mm.

Geographical Distribution: *Galiteuthis armata* occurs in the North Atlantic Ocean to 62°N southward to about 25°S, in tropical, northern subtropical, northern temperate waters; Straits of Florida, Gulf of Guinea, Bay of Biscay and Mediterranean Sea (Fig. 198).

Habitat and Biology: This species occurs over a very broad vertical range of depths and demonstrates a definite ontogenetic descent. Juveniles and paralarvae less than 30 mm mantle length have been captured in closing nets from subsurface depths to 1 000 m, with greatest concentrations in the upper 200 m. By about 35 mm mantle length, juveniles descend below 600 m, while large subadults have been captured between 500 to greater than 2 500 m, with greatest numbers deeper than 1 300 m.

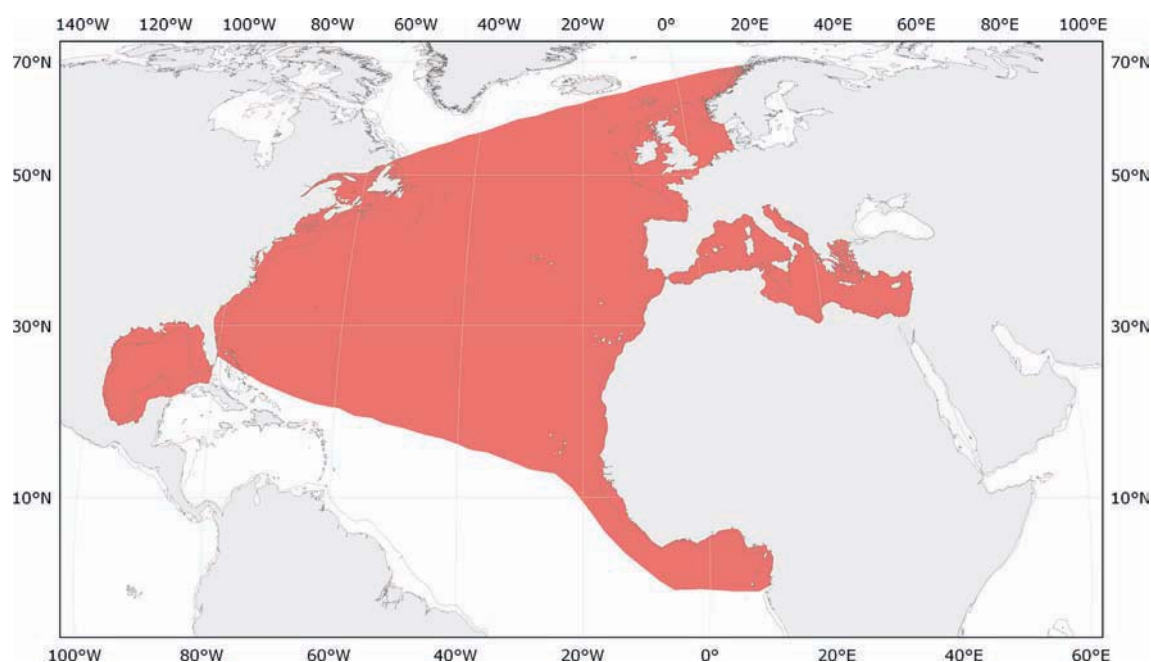
Local Names: ITALY: Totano armato.

Literature: Berdar and Cavallaro (1975), Lea (1985), Lefkaditou and Maiorano (2001), Vecchione and Pohle (2002), Okutani (2005).



tentacular club

dorsal view

Fig. 197 *Galiteuthis armata***Fig. 198** *Galiteuthis armata*

■ Known distribution

***Galiteuthis glacialis* (Chun, 1906)**

Crystalloteuthis glacialis Chun, 1906, *Zoologischer Anzeiger*, 31(2): 82–86 [85]. [Type locality: 59°16'S, 40°13'E, Antarctic Drift Current].

Frequent Synonyms: *Teuthowenia antarctica* Chun, 1910; *Galiteuthis aspera* Filippova, 1972.

Diagnostic Features: Two linear, multicuspid tubercles at each funnel-mantle fusion; 2 or 3 small, conical tubercles/cusps on each side of nuchal head-mantle fusion. Mantle surface rough, with many rounded cartilaginous tubercles in subadults.

Size: Maximum mantle length to 500 mm.

Geographical Distribution: *Galiteuthis glacialis* occurs in oceanic Antarctic circumpolar water masses (45°S to 70°S) and northward only where great masses of Antarctic intermediate waters flow out northward of the Antarctic Convergence (Fig. 199).

Habitat and Biology: The vertical distribution of paralarvae and juveniles extends from the lower epipelagic zone, concentrated around 200 m, but as shallow as around 75 m. With continued growth ontogenetic descent finds larger juveniles concentrated at 300 to 1 000 m, subadults to 2 000 m; then sexual maturation occurs in very deep water in excess of 2 500 m. Significant diel vertical shifting appears to occur. *Galiteuthis glacialis* is one of the most abundant of Antarctic species of squid and is significant prey for albatrosses, Patagonian toothfish, southern elephant seals and cetaceans and it is a predator on *Euphausia superba* krill.

Literature: Roper (1969), Filippova (1992 [1991]), Rodhouse and Piatkowski (1995), Piatkowski *et al.* (2002), Laptikhovsky and Arkhipkin (2003a).

***Galiteuthis pacifica* (Robson, 1948)**

Taonidium pacificum Robson, 1948, *Zoologica, Scientific Contributions of the New York Zoological Society*, 33(3): 115–132 [130]. [Type locality: off Cocos Island, eastern tropical Pacific Ocean].

Frequent Synonyms: None.

Diagnostic Features: Lateral (near lens) ocular photophore, circular. No tubercles at fusion of mantle-locking apparatus.

Size: Maximum mantle length to 200 mm.

Geographical Distribution: *Galiteuthis pacifica* is widely distributed throughout the equatorial tropical Indo-Pacific waters, from northern Chile (north of about 30°S) to southern California waters (about 34°N) in the eastern Pacific; Hawaii and the central Pacific Ocean to about 28°N and westward to New Caledonia and through to the eastern Indian Ocean.

Habitat and Biology: The vertical distribution for paralarvae of less than 20 mm mantle length extends from very shallow subsurface depths to about 800 m. The eyes become sessile at around 45 mm mantle length by which time these larger paralarvae concentrate around 600 to 800 m. Ontogenetic descent continues as juveniles and subadults occur increasingly deeper from 700 to 2 000 m. This species appears not to undergo diel vertical migration.

Literature: Young (1972a), Roper and Young (1975), Okutani (1995).

***Galiteuthis phyllura* Berry, 1911**

Galiteuthis phyllura Berry, 1911b, *Proceedings of the United States National Museum*, 40(1838): 589–592 [592]. [Type locality: off Point Piños, Monterey Bay, California].

Frequent Synonyms: *Crystalloteuthis beringiana* Sasaki, 1920.

Diagnostic Features: Lateral (near lens) ocular photophore bar-shaped. Two to 4 small, conical tubercles at mantle-funnel fusion; none at mantle-nuchal fusion.

Size: Maximum mantle length reported to be 2.7 m, but this is considered a doubtful record that might refer to total length; probably the maximum mantle length is less than 400 to 500 mm.

Geographical Distribution: *Galiteuthis phyllura* is distributed in the temperate eastern North Pacific Ocean from off Baja California, about 25°N, and boreal, northward to the Bering Sea, westward to northern Japan and the Sea of Okhotsk.

Habitat and Biology: The vertical distribution of the species extends from shallow subsurface depths in the upper 100 m for the paralarvae around 10 mm mantle length, while larger paralarvae descent to 500 to 600 m. Juveniles with sessile eyes developed, generally occur deeper than 800 m. Ontogenetic descent continues as juveniles and subadults extend to over 1 200 m. No clear diel vertical migration has been confirmed, but a vertical wandering of larger individuals occurs into shallower depths at night, to 500 m or so.

Literature: Young (1972a), Nesis (1989b), Arkhipkin (1996b), Katugin *et al.* (2006b).

Galiteuthis suhmi (Hoyle, 1886)

Taonius suhmi Hoyle, 1886, *Report of the Scientific Results of the Voyage of the HMS Challenger, Zoology*, 16(44): 1–245 [192]. [Type locality: 47°25'S, 130°22'E in the southern Ocean from about 20°S to 45°S].

Frequent Synonyms: None.

Diagnostic Features:

Size: Maximum mantle length 300 to 400 mm.

Geographical Distribution: *Galiteuthis suhmi* is a very rarely reported species that occurs in the southern subtropical to sub-Antarctic circumglobal waters.

Habitat and Biology: *Galiteuthis suhmi* is a mesopelagic to bathypelagic species.

Literature: Nesis (1982, 1987), Lipinski *et al.* (2000).

Helicocranchia Massy, 1907

Helicocranchia Massy, 1907, *Annals and Magazine of Natural History (series 7)*, 20: 377–384 [382].

Type Species: *Helicocranchia pfefferi* Massy, 1907.

Frequent Synonyms: *Ascocranchia* Voss, 1962b.

Diagnostic Features: Mantle long, slender, cylindrical, most stout in midportion; tapers posteriorly to blunt terminal point that is not supported by the gladius. **Fins very small, paddle-shaped, subterminal, fused distally**, insert on short rostrum of gladius that projects dorsally free of end of gladius (free posterior lobes). **Eyes small to medium with 1, usually large, oval to round, protruding, anteriorly-oriented photophore. Funnel very large, long, broad.** Funnel-mantle fusion broad, indistinct cartilage, no tubercles. Funnel valve absent. Sexual dimorphism in arms and suckers; males with all arms more robust than on females, all arms with enlarged suckers (especially arms III); ends of male arms I to IV also secondarily modified with multiple series of suckers, variably expanded protective membranes, especially on arms I to II. Females occasionally with a few pairs of enlarged suckers on arms III; brachial photophores absent.

Size: Small-sized cranchiids; maximum mantle length to 100 mm.

Geographical Distribution: *Helicocranchia* members are circumglobal squids, widely distributed in tropical, subtropical and temperate (at least in the Atlantic Ocean) waters.

Habitat and Biology: Paralarvae and juveniles typically occur in upper epipelagic waters then with growth gradually undergo ontogenetic descent through the mesopelagic stratum and into the upper bathypelagic zone. Diel vertical migrations, if they occur at all, apparently are weak.

Remarks: *Helicocranchia* currently consists of 3 species considered valid; an additional 11 species throughout the world's oceans are recognized as valid, but they all are undescribed. The genus is easy to identify because of the **exceptionally large funnel** that extends anteriorly well anterior to the beaks and the very small, paddle-like fins that attach to the posterior gladius that projects dorsally above the mantle musculature.

Literature: See references listed for the family and for species, as well as the following: Voss, (1980), Young and Mangold (2008b).

Helicocranchia pfefferi* Massy, 1907*Fig. 199**

Helicocranchia pfefferi Massy, 1907, *Annals and Magazine of Natural History*, series 7, 20: 377–384. [382]. [Type locality: 51°44'N, 11°57'W, off the southwestern Irish coast, temperate western North Atlantic Ocean].

Frequent Synonyms: *Helicocranchia beebei*, Nesis (1982, 1987).

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

Diagnostic Features: **Absence of cartilaginous papillae on the mantle, no enlarged suckers on the arms III of adult females** (or on tentacular clubs), presence of bands of orange/brown chromatophores on sides of mantle; moderately long, robust tentacles, less than 100% of the mantle length; **L-shaped ventral pads on funnel organ**.

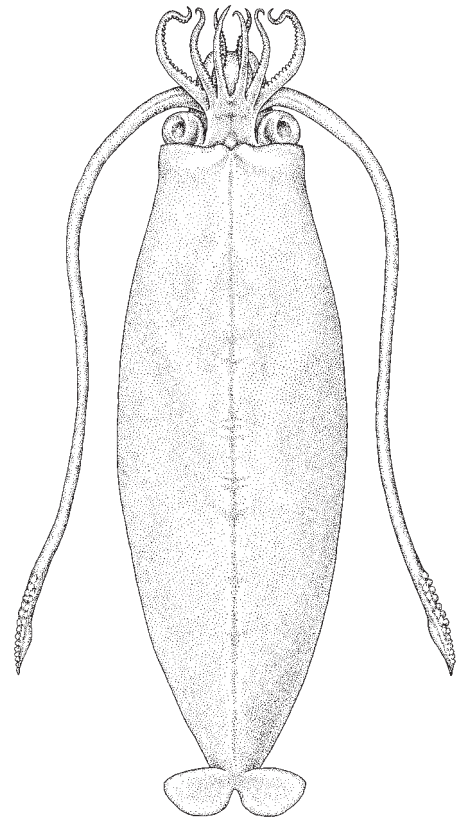
Size: Maximum mantle length to 90 to 100 mm.

Geographical Distribution: *Helicocranchia pfefferi* probably is a complex of species that together are circumglobal in open oceanic waters of the tropical, subtropical and North Atlantic temperate zones. In the Atlantic it occurs from 50° to 55°N to 30° to 35°S. Complete distributional pattern as yet undetermined (Fig. 200).

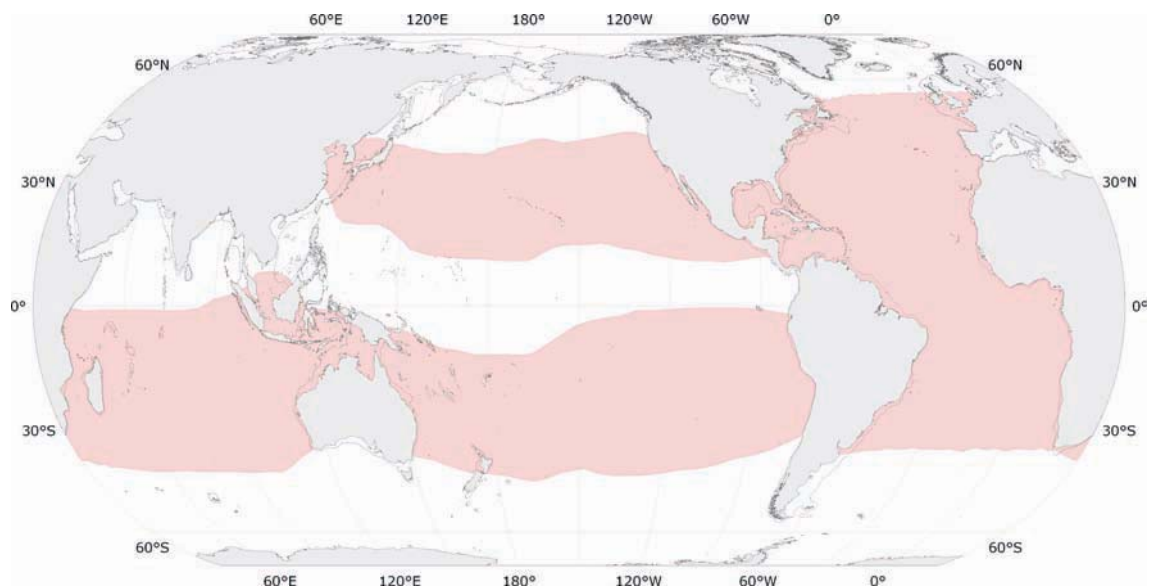
Habitat and Biology: Paralarvae and juveniles occur in the upper few hundred metres of the epipelagic zone, then descend gradually to the upper mesopelagic; finally, adults descend into the lower mesopelagic and the bathypelagic zones to at least 2 000 m. Some diel vertical migration might occur; paralarvae and mated/spent females captured at or near the surface suggest that adults return to the surface to mate and spawn.

Remarks: A considerable body of literature exists for *H. pfefferi* that documents details of geographic and vertical distribution, as well as other aspects of development and biology.

Literature: See generic references as well as the following: Lu and Clarke (1975a), Cairns (1976), Okutani and Tsukada (1988), Guerra (1992), Young and Mangold (2008b, c).



dorsal view

Fig. 199 *Helicocranchia pfefferi***Fig. 200** *Helicocranchia pfefferi*

Probable presence

Helicocranchia joubini (Voss, 1962)

Ascocranchia joubini Voss, 1962a, *Bulletin de l'Institut Océanographique, Monaco*, 1242: 1–6. [2]. [Type locality: 45° 02'N, 13° 05'W Sargasso Sea, western North Atlantic].

Frequent Synonyms: None.

Size: Maximum mantle length from 50 to 60 mm.

Geographical Distribution: It occurs in the tropical and subtropical Atlantic and the southwestern Pacific ocean in mesopelagic and bathypelagic realms.

Remarks: This poorly known species, considered by Nesis (1982, 1987) to be valid, but not listed in Voss *et al.* (1992b), possibly it is a synonym of *Helicocranchia pfefferi*.

Literature: Nesis (1982, 1987), Voss *et al.* (1992b).

Helicocranchia papillata (Voss, 1960)

Megalocranchia papillata Voss, 1960, *Feldiana, Zoology*, 39(40): 419–446. [430]. [Type locality: 32°05'N, 64°38'W, Sargasso Sea, off Bermuda, subtropical western North Atlantic Ocean].

Frequent Synonyms: None.

Diagnostic Features: Distinguishing characters include enlarged suckers on midportion of arms III and on ventral row of tentacular club; long, narrow tentacles more than 100% of mantle length in paralarvae and juveniles; ventral pads of funnel organ oval, elongate, crescent-shaped.

Size: Maximum mantle length from 50 to 60 mm.

Geographical Distribution: The geographical distribution of *H. papillata* occupies a broad portion of the western, central and eastern subtropical North Atlantic Ocean; Caribbean Sea and Gulf of Mexico, northeastern African waters.

Habitat and Biology: Vertical distribution of paralarvae and juveniles occurs in the upper 300 m, followed by ontogenetic descent of individuals into the mesopelagic zone with growth. Adults mature in the bathypelagic waters of 2 000 m or more; shallow depth captures of paralarvae and nearly spent females in the upper 100 m point to an epipelagic spawning habit.

Literature: Voss (1960), Clarke and Lu (1974), Nesis (1982, 1987), Vecchione *et al.* (2001).

Liguriella Issel, 1908

Liguriella Issel, 1908, *Monitore Zoologico Italiano*, 19(4): 102–104 [103].

Type Species: *Liguriella podophthalma* Issel, 1908.

Frequent Synonyms: *Vossoteuthis* Nesis, 1974a.

Diagnostic Features: **Mantle** elongate, moderately stout, tapers to blunt point posteriorly; anterodorsal mantle margin free, except at midline cartilaginous fusion; **without tubercles**; funnel-mantle fusion small, slightly curved, with 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**; gladius with long, slender, delicate rachis, vanes along distal third expand to form diamond-shaped lanceola; posterolateral margins at very posterior tip infold, fuse to form short, narrow conus; **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: Medium-sized squids; maximum mantle length to over 240 mm.

Remarks: *Liguriella* contains 1 recognized species to date, *L. podophthalma*, but as many as 2 or more additional mesopelagic species may exist (Voss *et al.* 1992b).

Literature: Voss (1980), Voss *et al.* (1992b), Young and Mangold (1999c).

***Liguriella podophthalma* Issel, 1908**

Liguriella podophthalma Issel, 1908, *Monitore Zoologico Italiano*, 19(4): 102–104[103, by monotypy]. [Type locality: 28°38'S, 47°31'W, South Atlantic Ocean].

Frequent Synonyms: None.

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

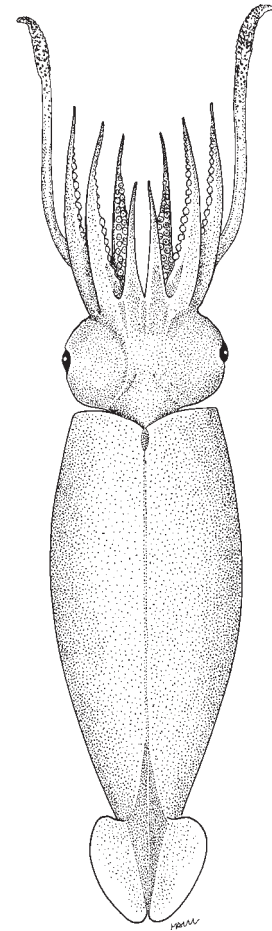
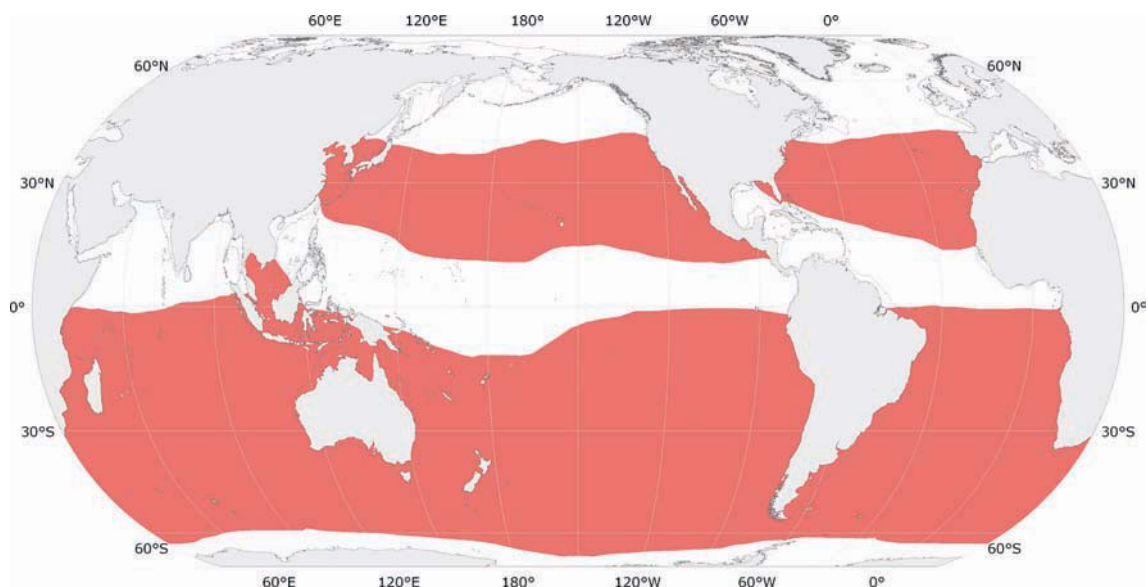
Diagnostic Features: See generic account.

Size: Maximum mantle length known 243 mm.

Geographical Distribution: *Liguriella podophthalma* occurs circumglobally in tropical, subtropical and northern sub-Antarctic waters (Southern Subtropical Convergence) of the world's oceans (Fig. 202).

Habitat and Biology: 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.

Literature: Nesis (1982, 1987), Voss *et al.* (1992b), Moreno and Pereira (1998).

Fig. 201**dorsal view****Fig. 201 *Liguriella podophthalma*****Fig. 202 *Liguriella podophthalma***

Known distribution

***Megalocranchia* Pfeffer, 1884**

Megalocranchia Pfeffer, 1884, *Abhandlung aus dem Gebiete der Naturwissenschaften, Hamburg*, 8(1): 1–30 [24].

Type Species: *Megalocranchia maxima* Pfeffer, 1884.

Frequent Synonyms: *Corynomma* Chun, 1906; *Xenoteuthis* Berry, 1909; *Ascoteuthis* Berry, 1920a; *Carynoteuthis* Voss, 1960.

Diagnostic Features: Mantle slender, elongate, tapers dramatically posteriorly to thin, sharp tip; mantle wall very thin, leathery, transparent; paralarvae (to about 50 mm mantle length) with thick, gelatinous dermis on mantle (unique within family); tubercles absent on elongate, subtriangular mantle-funnel fusion cartilages and conspicuous spindle-shaped mantle nuchal fusion cartilage; **fins long** (about 50% of mantle length), lanceolate, terminal-lateral, **anterior 10 to 15% insert along lateral margin of mantle for about one-half mantle length**, no anterior lobes (fusion of anterior 10 to 15% of fins to mantle is unique in family; only *Egea* and *Teuthowenia* fins are fused to mantle but for 30% or more of their length; all other cranchiid fins attach to the gladius); funnel well developed, with well-developed funnel valve, funnel organ dorsal pad large, stout, with triangular flap on each lateral limb, anterior margin broad; head dominated by **very large, spherical, protruding, anterolaterally oriented eyes**; most of **ventral hemisphere of eyes covered with 2 photophores: one large, crescent-shaped posterior (medial) organ with irregularly shaped inner margin and central bulge, and within its concavity one smaller narrow, roughly elongate, irregularly S-shaped, anterior (lateral) organ**; arm tips I to III in large males secondarily modified by abrupt attenuation and reduced-size suckers, minute suckers in 2 series; subadult and adult females with brachial end organ (photophore) on I to III, or only on III, or occasionally only on II; tentacle short, strong, with 2 series of carpal suckers on mid-third of stalk then 4 transverse series distally to merge into a strong carpal group; clubs moderately long, strong, slightly expanded, with suckers in 4 series only moderately enlarged, on short to medium stalks; **a complex, bilobed, large, multilens (4) visceral photophore occurs on the ventral surface of the digestive gland and ink sac** (unique within the family); gladius with very slender, long rachis without anterior expansion; long, moderately expanded vanes border posterior half of rachis, dorsolateral margins roll-inward, fuse and form long, hollow, needle-like conus.

Size: Species of *Megalocranchia* are moderately to very large, up to 1.8 m mantle length.

Geographical Distribution: *Megalocranchia* species occur circumglobally in equatorial and bicentral tropical and subtropical waters.

Habitat and Biology: Paralarvae are epipelagic from very near-surface waters to about 200 m day and night. Juveniles metamorphose at about 40 to 50 mm mantle length, are concentrated in the upper 200 m at night, then descend to 600 to 800 m during the day. Subadults undergo further ontogenetic vertical descent through the mesopelagic and into the bathypelagic zone to greater than 2 000 m during daytime and some appear to migrate at night back toward lower epipelagic and mesopelagic depths (about 100 to 700 m). While adults probably mature in the bathypelagic water, they apparently reverse migrate back into epipelagic waters to spawn, as indicated by specimens caught at or near the surface at night. The species of *Megalocranchia* are neutrally buoyant.

Remarks: The systematics of this complex genus needs considerable additional research and material to be clarified. Current thoughts agree in recognizing 2 valid named species, *Megalocranchia maxima* Pfeffer, 1884 and *M. oceanica* Voss, 1960 (Okutani, 2005, Young and Mangold, 2008d, Voss, pers. comm). At least 4 other entities were recognized and designated by letters but not named by Voss (1988), Voss *et al.* (1992b), Clarke (1986); one of these entities is considered, by part of the scientific community, to be a validly named species: *M. fisheri* (Berry, 1909), from the central North Pacific Ocean, particularly Hawaii (Young and Mangold, 2008e).

Literature: Young (1978), Clarke *et al.* (1979), Vecchione and Roper (1992 [1991]), Young and Mangold (1996a), Okutani (1998), Bello and Biagi (1999), Young and Mangold (2008d)

Megalocranchia maxima* Pfeffer, 1884*Fig. 203**

Megalocranchia maxima Pfeffer, 1884, *Abhandlung aus dem Gebiete der Naturwissenschaften, Hamburg*, 8(1): 1–30 [24]. [Type locality: off Cape of Good Hope, South Africa].

Frequent Synonyms: None.

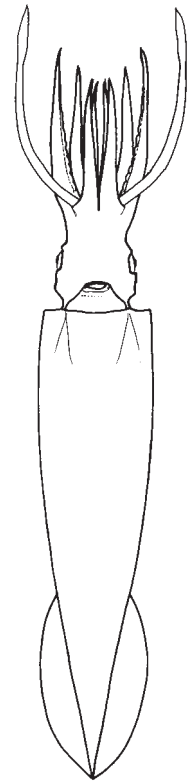
FAO Names: En – Large cranch squid; Fr – Encornet-outré grand; Sp – Cranchiluria grande.

Diagnostic Features: See generic account.

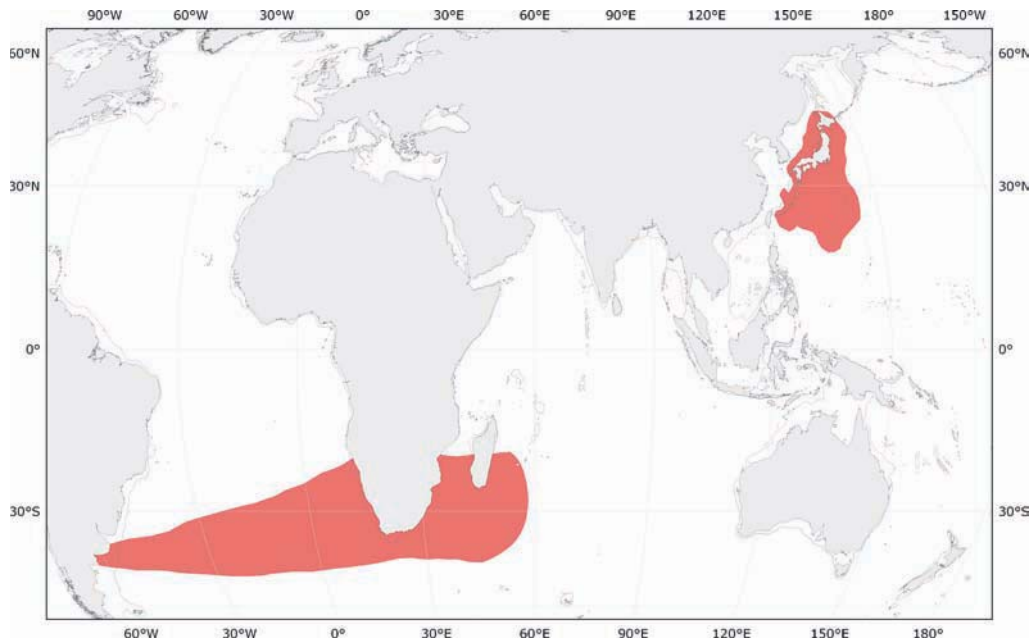
Size: Maximum mantle length to 1.8 m.

Geographical Distribution: *Megalocranchia maxima* ranges the subtropical waters of the South Atlantic, sub-Antarctic and into the southwestern Indian Ocean. Japanese waters (Fig. 204).

Literature: Kubodera (in Okutani) (2000), Okutani (2005).



ventral view

Fig. 203 *Megalocranchia maxima***Fig. 204 *Megalocranchia maxima***

■ Known distribution

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

Carymoteuthis oceanica Voss, 1960, *Feldiana, Zoology*, 39(40): 419–446 [434]. [Type locality: 32°08'N, 64°33'W, western North Atlantic Ocean].

Frequent Synonyms: None.

Diagnostic Features: See generic account.

Size: Maximum mantle length to 810 mm.

Geographical Distribution: *Megalocranchia oceanica* is a tropical to subtropical species in the North and South Atlantic Oceans from about 40°N to 35°S.

Habitat and Biology: Paralarvae were captured with closing nets off Bermuda between 50 and 200 m day and night. Ontogenetic descent occurs when paralarvae in the epipelagic zone gradually descend through the mesopelagic zone as juveniles and subadults; late subadult and adult stages occur in bathypelagic waters to 2 000 m or deeper. Two specimens were observed *in situ* from submersibles at 800 to 900 m in the Bahamas during daytime.

Literature: Vecchione and Roper (1992 [1991]), Nesis (1999b), Okutani (2005).

***Mesonychoteuthis* Robson, 1925**

Mesonychoteuthis Robson, 1925, *Annals and Magazine of Natural History, series 9*, 16: 272–277 [272].

Type Species: *Mesonychoteuthis hamiltoni*, Robson, 1925.

Frequent Synonyms: None.

Diagnostic Features: The mantle is elongate, moderately stout in anterior quarter, tapers sharply anterior to fins then tapers gradually to form long, very narrow posterior half; **mantle wall thin, muscular to leathery and tough in juveniles and adults**, semigelatinous in mature females, up to 50 mm thick in adults, smooth; funnel-mantle fusion cartilages short, stout, curved, a complex of 4 to 6 conical cartilaginous tubercles anteriorly in paralarvae and juveniles; **nuchal fusion cartilage triangular, without tubercles in adults**, a single anterior tubercle in paralarvae and early juveniles; fins terminal, large, stoutly ovate, without anterior lobes, taper posteriorly to broad point at tip of gladius, anterior fin insertions extend along posterolateral margins of lanceola, except at anterior most margin; length up to 60% of mantle length in adults, **fins very muscular medially, taper to thin lateral margins; funnel valve absent**, inverted V-shaped dorsal pad of funnel organ with a short, stout papilla on each lobe and a long, narrow conical papilla on the midanterior section; **head large, dominated by huge, nearly spherical, protruding anterolaterally directed eyes; 2 photophores on ventral hemisphere of each eye, a small, oblong anterior one encircled by a large, wide, crescent-shaped posterior one**; arms robust, moderately long, about 50% of mantle length, subequal; arm suckers in 2 series with dentate rings, about **3 to 10 pairs in midarm section develop into large, hooded hooks** beginning at about 45 mm mantle length (increasing numbers of hooks in arms I through IV), a unique character within the Cranchiidae; **brachial end organs (photophores) absent**; tentacles moderately long, robust; stalks with diagonally oriented pairs of suckers and pads along distal two-thirds, carpal cluster present, **club short**, strongly built, slightly expanded, with all suckers in medial series of manus developed into about **12 pairs of large, hooded hooks**; suckers of lateral series minute; gladius with long, moderately wide vanes that border posterior three-fourths of narrow rachis, posterolateral margins roll in ventrally, overlap posteriorly and fuse into long, narrow, strong, hollow conus.

Size: This is a gigantic squid with maximum mantle lengths of 2.25 to about 3 m, maximum recorded weight of 495 kg.

Geographical Distribution: It occurs circumglobally in Antarctic waters to 70°S, only rarely crossing the Antarctic Convergence to about 40°S, or very occasionally into southern waters off South Africa.

Habitat and Biology: This is a fully oceanic squid that occurs as shallow as 20 m for paralarvae, down to mesopelagic depths around 500 m. Larger paralarvae, juveniles and subadults range into the bathypelagic realm of around 500 m to in excess of 2 000 m. Nearly mature female *Mesonychoteuthis hamiltoni* have been taken in Antarctic waters hooked on long lines set to fish the upper few hundred metres. This suggests that the females at least, like females of other, better known species of cranchiids, may migrate vertically from great depths to near-surface waters to spawn; mating depths are unknown. *Mesonychoteuthis hamiltoni* is the major source of prey for sperm whales that migrate into Antarctic waters in summertime to crop the seasonal population explosions of cephalopods and fishes.

Remarks: *Mesonychoteuthis* is monotypic, represented only by *M. hamiltoni*, one of the largest squids known.

Literature: Voss (1980), Roper *et al.* (1984), Rodhouse and Clarke (1985), Young and Mangold (2008a).

Mesonychoteuthis hamiltoni* Robson, 1925*Fig. 205**

Mesonychoteuthis hamiltoni Robson, 1925, *Annals and Magazine of Natural History*, (series 9), 16: 272–277 [272]. [Type locality: 50 miles south of Smith Island, South Shetland Islands, from the stomach of a sperm whale].

Frequent Synonyms: None.

FAO Names: **En** – Colossal squid; **Fr** – Encornet-outré colossal; **Sp** – Cranquiluria colossal.

Diagnostic Features: See generic account.

Size: Maximum mantle length around 3 m; total length approaches 9 to 10 m; maximum weight recorded 495 kg (1 089 pounds).

Geographical Distribution: This broadly distributed species occurs in the Southern Ocean, circumpolar region, primarily south of the Antarctic Convergence, occasionally north in cold waters to off South Africa. See generic section for additional details and for vertical distribution (Fig. 206).

Habitat and Biology: A mesopelagic to bathypelagic species in late juvenile, subadult and adult stages that range in depth from 500 m, then through ontogenetic descent to greater than 2 000 m; a relatively passive swimmer. Matures at mantle lengths greater than 1 m and 25 to 30 kg weight; spermatophores are 170 to 270 m long. It has a potential fecundity of 4 to 4.2 million oocytes. Feeds on mesopelagic fishes (Myctophidae, Paralepididae), Patagonian toothfish, sleeper shark and squids, and it is very heavily preyed upon by sperm whales at 400 to 600 m during the sperm whale feeding migration to the Southern Ocean in summertime; other predators include Patagonian toothfish. Juveniles also are preyed upon by albatrosses and Antarctic fulmars.

Interest to Fisheries: This species is believed to have some potential for a fishery. The flesh is rumored to be of “excellent quality and very flavourful”, but this needs to be reconfirmed in view of changes in world cephalopod fishery exploitation since the 1970s and 1980s. It has been estimated that 1 or 2 million tonnes could easily be harvested in view of the reduced sperm whale predation at the time, due to that major predator’s population decline. However, with the restoration of sperm whale populations to significantly higher levels in the late twentieth and early twenty-first centuries, such estimates might be invalid. Total reserves were estimated at 90 million tonnes (biomass), but no specific fishing methods have been developed yet, nor has any directed fishery been reported.

Local Names: RUSSIA: Antarkticheskiy gigantskiy kalmar.

Literature: Clarke (1980), Roper *et al.* (1984), Rodhouse and Clarke (1985), Filippova (1992 [1991]), Anderson and Rodhouse (2002), Xavier, *et al.* (2002c). Additional references are listed in the generic section.

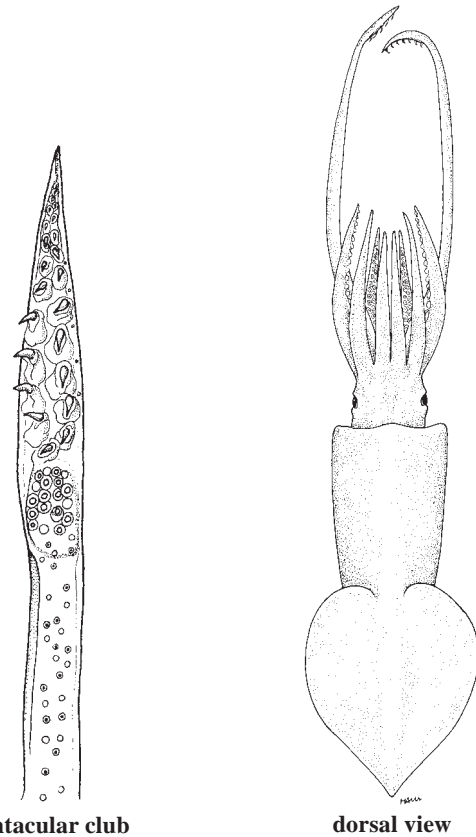


Fig. 205 *Mesonychoteuthis hamiltoni*

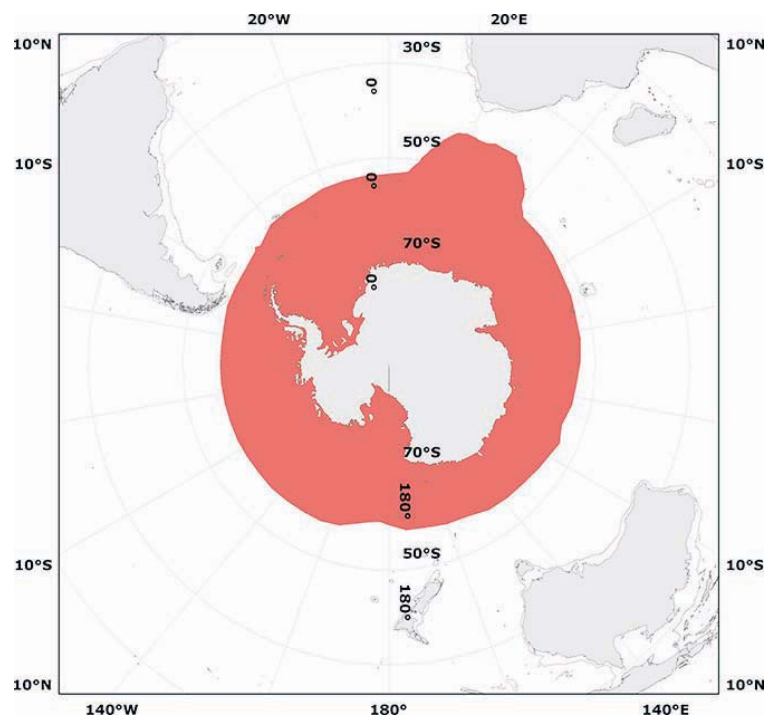


Fig. 206 *Mesonychoteuthis hamiltoni*

■ Known distribution

***Sandalops* Chun, 1906**

Sandalops Chun, 1906, *Zoologischer Anzeiger*, 31(2): 82–86. [86].

Type Species: *Sandalops melancholicus* Chun, 1906.

Frequent Synonyms: *Uranoteuthis* Lu and Clarke, 1974.

Diagnostic Features: The mantle is stout, broadest at about one-third from anterior end, cylindrical, tapers gradually to broad posterior point; **no tubercles present on narrow funnel-mantle fusion or on small nuchal cartilage**. Fins small, short, oval to round, subterminal, with anterior and posterior lobes, posterior insertion does not reach terminal end of gladius, anterior insertion at broadest point on vanes of gladius (attach to posterolateral margins of lanceola). Conus short. Funnel valve absent; **dorsal pad of funnel organ with 2 large triangular flaps**. **Eyes large, protruding, nearly spherical, anteriorly oriented, each with 1 very large, round posterior photophore and 1 very small, round to elliptical anterior photophore contiguous with and indented into anterior margin of posterior photophore**. Brachial photophores absent.

Size: A medium-sized taoniid. Maximum mantle length known to 110 mm.

Geographical Distribution: *Sandalops* occurs circumglobally in oceanic tropical and subtropical waters at depths from the upper epipelagic into the lower mesopelagic and bathypelagic, following ontogenetic descent. In the Atlantic it occurs roughly between 40°N and 37°S.

Remarks: Currently only 1 species, *Sandalops melancholicus*, is described, but Voss *et al.* (1992b) indicate that the genus is comprised of 3 or 4 closely related species.

Literature: Voss *et al.* (1992b), Young and Mangold (1996c), Nesis (1999b).

***Sandalops melancholicus* Chun, 1906**

Sandalops melancholicus Chun, 1906, *Zoologischer Anzeiger*, 31(2): 82–86. [86]. [Type locality: 32°08'S, 08°28'W, off Tristan da Cunha Island, central South Atlantic Ocean].

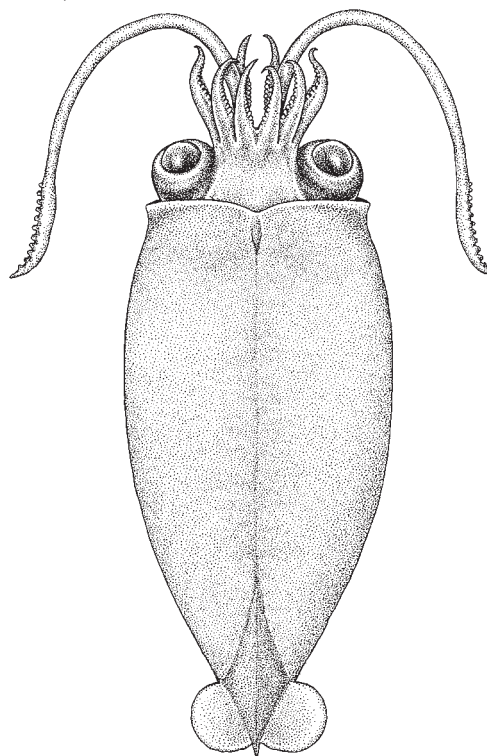
Frequent Synonyms: *Uranoteuthis bilucifer* Lu and Clarke, 1974.

FAO Names: **En** – Melancholy cranch squid; **Fr** – Encornet-outre mélancolie; **Sp** – Cranquiluria affligida.

Diagnostic Features: 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.

Fig. 207; Plate VII, 38



dorsal view

Fig. 207 *Sandalops melancholicus*

Geographical Distribution: The species is cosmopolitan in tropical and subtropical waters (Fig. 208).

Habitat and Biology: *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.

Literature: Okutani (1974a), Kubodera (1996), Vecchione (2002). Additional references are listed in the generic section.

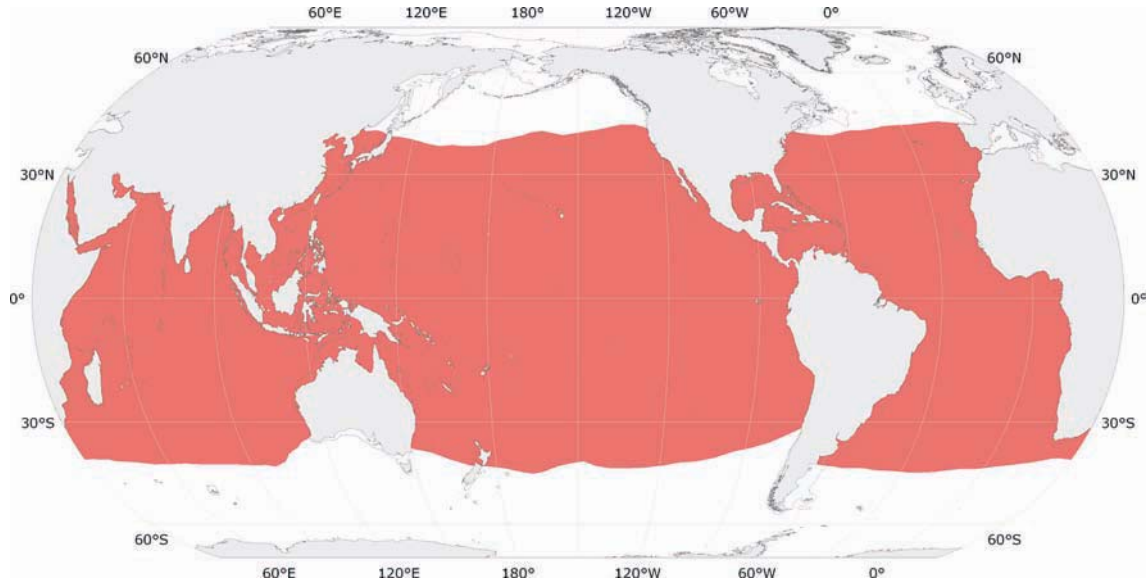


Fig. 208 *Sandalops melancholicus*

■ Known distribution

Teuthowenia Chun, 1910

Teuthowenia Chun, 1910a, *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition dem Dampfer Valdivia, 1898–1899*, 18(1): 1–401 [376].

Type Species: *Teuthowenia megalops* (Prosch, 1847).

Frequent Synonyms: *Owenia* Prosch, 1847; *Teuthowenia* Chun, 1910a; *Verrilliteuthis*, Berry, 1916; *Anomalocranchia* Robson, 1924.

Diagnostic Features: Mantle conical, elongate, tapers gradually posteriorly to narrow posterior tip, **mantle wall thin, leathery; funnel-mantle fusion cartilages small, oval to spindle-shaped, with 1 to 4 cartilaginous tubercles** at mantle margin; nuchal-mantle fusion cartilage small, elongate, diamond-shaped, without tubercles; fins long, narrow, terminal-lateral, taper gradually posteriorly, terminate in small lobes that extend posterior to tip of gladius and fuse with median cleft, anterior lobes absent, anterior one-third or more of fins insert on lateral margin of mantle for 40 to 60% of mantle length (unusual in family, shared only with *Egea*) rather than on the shell sac of the gladius; funnel large, long, broad; funnel valve absent; **funnel organ dorsal pad with 3 long papillae, 1 lanceolate in middle section, 2 spatulate on narrow lateral arms**; head dominated by **huge eyes, anteriorly oriented, with 3 photophores each (unique in the family)**: 1 large crescent-shaped posterior (medial) organ with 1 smaller, narrow, crescent-shaped anterior (lateral) organ within concavity of larger, 1 small, oval organ on inner anterodorsal margin near lens; brachial end-organ (photophore) present on arms I to IV of maturing and mature females; tentacles short, muscular, **4 series of carpal suckers and pads in zig-zag pattern on distal one-half to one-third of stalk** (unique in family, but see other digressions in *Megalocranchia* and *Bathothauma*); no carpal cluster; club slightly expanded, with suckers on long pedestals; gladius with long, narrow-rachis, vanes moderately wide along posterior one-third to one-half, in-fold ventrally, edges overlap without fusing, extend posteriorly into narrow, non-needle-like, hollow conus.

Size: Medium-sized to moderately large cranchiids. Maximum reported mantle length about 380 to 400 mm.

Geographical Distribution: *Teuthowenia* is comprised of 3 species that in aggregate display allopatric (disjunct) distributions circumglobally in the Southern Subtropical Convergence Zone, and the sub-Arctic, north temperate and eastern tropical waters of the Atlantic Ocean.

Habitat and Biology: The vertical distributions of *Teuthowenia* species in general show ontogenetic descent from the near-surface, epipelagic to upper mesopelagic waters, to about 200 to 300 m for paralarvae; mesopelagic for juveniles (300 to 600 m) and increasingly deeper into the upper bathypelagic for early subadults to around 1 000 m; late subadults and adults range to 1 500 m and maturation occurs from there to around 2 700 m. A degree of diel vertical movement also is evident in these near-neutrally buoyant species. *Teuthowenia* species are prey for large pelagic fishes (swordfish, tuna, lancetfish, blue shark, goblin shark, scalloped hammerhead shark, sooty albatrosses and cetaceans, e.g. sperm whales, pilot whales, northern bottlenose whales, dolphins).

Remarks: Typical of most genera in the family, *Teuthowenia* has undergone numerous nomenclatural changes, with the following genera now considered synonymous: *Owenia* Prosch, 1847, *Verrilliteuthis* Berry, 1916, *Desmoteuthis* Verrill, 1881 (in 1880–1881), *Anomalocranchia* Robson, 1924, *Hensenioteuthis* Thiele, 1934. The chromatophore pattern and number and configuration of tubercles on the funnel-mantle fusion cartilage are useful characters for distinguishing species.

Literature: Voss (1985), Vecchione and Roper (1992 [1991]), Sweeney and Young (2003h).

***Teuthowenia megalops* (Prosch, 1847)**

Fig. 209; Plate VII, 39

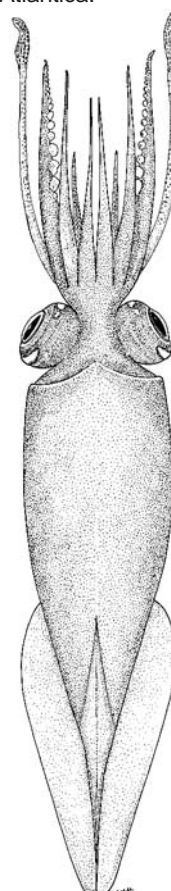
Cranchia (*Owenia*) *megalops* Prosch, 1847, *Kongelige Danske Videnskabernes Selskabs Skrifter, series 5, 1* [1849]: 53–72 [71] (published as separate, 1847). [Type locality: off the Faeroe Islands, eastern North Atlantic Ocean].

Frequent Synonyms: *Leachia hyperborea* Steenstrup, 1856; *Desmoteuthis tenera* Verrill, 1881 (in 1880–1881); *Desmoteuthis thori* Degner, 1925; (See Voss, 1985: 15 for complete synonymy).

FAO Names: **En** – Atlantic cranch squid; **Fr** – Encornet-oultre Atlantique; **Sp** – Cranquiluria Atlantica.

Diagnostic Features: See generic account.

Size: Maximum mantle length to 400 mm.



dorsal view

Fig. 209 *Teuthowenia megalops*

Geographical Distribution: *Teuthowenia megalops* occupies the highly productive waters of the sub-Arctic and northern temperate Atlantic Ocean. In the western North Atlantic it occurs from the northern limit of the subtropical waters off Bermuda (31°N to 33°N) to 55°N, or so, off Labrador in sub-Arctic water. In the eastern Atlantic, *T. megalops* occurs from between Greenland and Iceland (65°N to 66°N) to about 44°N to 45°N in the Azores-Britain region of the North Atlantic temperate zone. Possibly down to 32° to 35°N. One record from the Mediterranean Sea (Fig. 210).

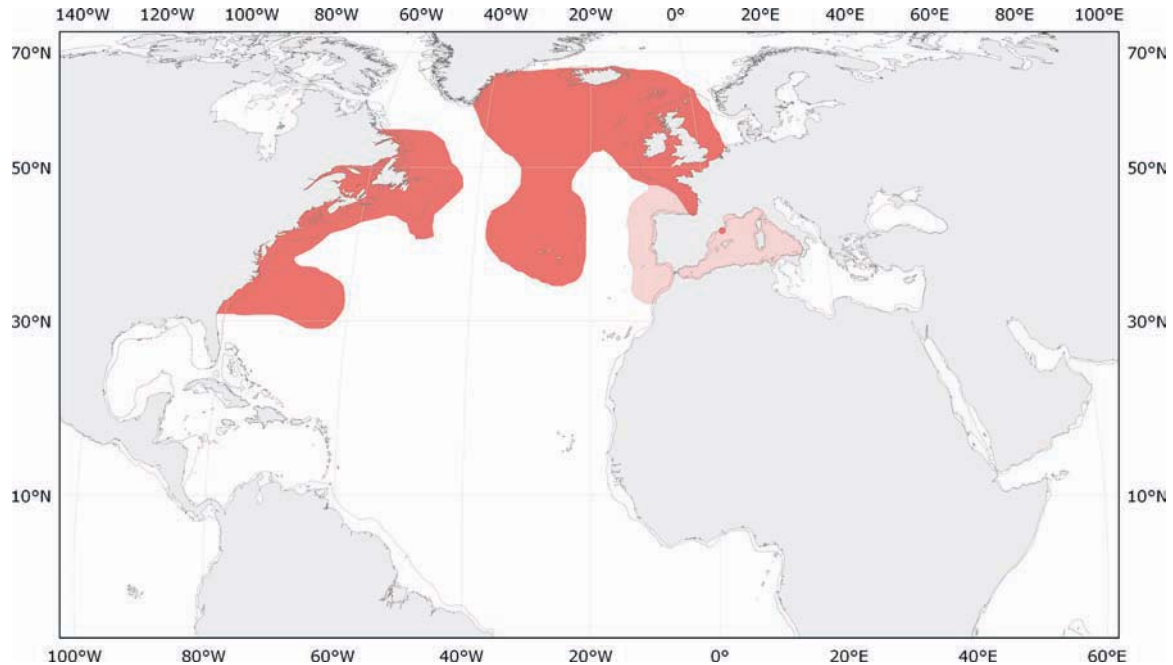


Fig. 210 *Teuthowenia megalops*

■ Known distribution ■ Probable presence

Habitat and Biology: The vertical distribution ranges from about 40 m to nearly 2 700 m with evidence of both significant ontogenetic descent as well as some diel vertical movement. Juveniles, subadults and adults inhabit waters where bottom depth exceeds 1 000 m. The species is heavily preyed upon by sperm whales, northern bottlenose whales, Cuvier's beaked whales, swordfish, blue shark.

Local Names: ITALY: Totano tutt'occhi.

Literature: Zuev and Nesis (1971), Dilly (1972), Lu and Roper (1979), Nixon (1983), Vecchione and Roper (1992 [1991]), Santos *et al.* (1999), Unger *et al.* (2006), Young and Mangold (2007b).

Teuthowenia maculata (Leach, 1817)

Cranchia maculata Leach, 1817, *Zoological Miscellany*, 3(30): 137–141 [140]. [Type locality: 01°36'S, 08°47'E, eastern equatorial South Atlantic Ocean].

Frequent Synonyms: *Cranchia* (*Cranchia*) *maculata* Prosch, 1847; ?*Verrilliteuthis hyperborea* Adam, 1962a; *Taonius megalops* Lu and Clarke, 1975b; *Teuthowenia megalops* Morales and Guerra, 1977.

Diagnostic Features: See generic account.

Size: Maximum mantle length known estimated to 370 mm (calculated from beaks in sperm whale stomachs).

Geographical Distribution: *Teuthowenia maculata* has a relatively limited distribution, restricted to the moderately to highly productive waters of the tropical, subtropical eastern North and South Atlantic Ocean. The species is limited to east of 20°W to 23°W and occurs from about 20°N to 22°N southward to around 20°S and eastward to about 11°E.

Habitat and Biology: The vertical distribution of *T. maculata* extends from 25 m to about 2 000 m. Truly an oceanic species, as all captures have occurred in waters where bottom depth exceeds 1 000 m. The paralarvae and juveniles undergo ontogenetic descent during growth and some diel vertical movement seems to occur.

Literature: Voss (1985), Young and Mangold (2007b).

Teuthowenia pellucida (Chun, 1910)

Desmoteuthis pellucida Chun, 1910, *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition dem Dampfer Valdivia, 1898–1899*, 18(1): 1–401 [357]. [Type locality: 33°20'S, 15°58' W in the Benguela Current, South Atlantic Ocean].

Frequent Synonyms: *Megalocranchia megalops australis* Voss, 1967a; *Anomalocranchia impennis* Robson, 1924; *Megalocranchia richardsoni* Dell, 1959; (see Voss, 1985: 41 for complete synonymy).

Diagnostic Features: See generic account.

Size: Maximum mantle length recorded is 210 mm (unsexed) and 201 mm for mature females and 140 mm for mature males.

Geographical Distribution: *Teuthowenia pellucida* occurs in a circumglobal belt centred on a band width of about 6° to 7° associated with the Southern Subtropical Convergence and to a certain extent into the boundary waters that fringe the Convergence zone to the north and south. The total north-south extent of distribution is about 32°S to 48°S in the waters with the hydrologic characteristics of the Convergence.

Habitat and Biology: The vertical distribution extends from the surface to 2 400 m, with ontogenetic descent. Juveniles and subadults appear to undergo diel vertical displacement from 700 to 800 m during the day into the upper 300 m at night. Mature adults seem to occur below about 1 500 m and remain from there down to 2 400 m or more. This species is prey to sperm whales, goblin shark, scalloped hammerhead shark, sooty albatross.

Literature: Voss (1985), Roeleveld (1998), Smale and Cliff (1998), Dunning and Lu (1998), Nesis (1999b).

2.11 Family CYCLOTEUTHIDAE Naef, 1923

by Clyde F.E. Roper and Patrizia Jereb

Cycloteuthidae Naef, 1923, *Fauna e Flora del Golfo di Napoli*, 35, 1(1,2): 149–863 [312].**Type Genus:** *Cycloteuthis* Joubin, 1919.**FAO Names:** En – Discfin squids; Fr – Discoloutènes; Sp – Discolurias.

Diagnostic Features: Mantle broadly conical, goblet-shaped. Fins long, broad, disk-like, greater than 70% of mantle length in adults (including tail when present). Funnel component of funnel-mantle locking apparatus subtriangular to irregularly oval, with deep pit to receive prominent, protruding, nose-shaped or tubercular mantle cartilage component; mantle component does not reach anterior mantle margin. Arm suckers biserial. Tentacular club suckers tetraserial. Club compact, expanded with well-defined manus and dactylus, ill-defined carpus, with about 7 small knobs and suckers. Buccal connectives attach to ventral borders of arms IV. **Photophores present variously on eyes, head, mantle, ink sac. Hectocotylus absent.**

Size: Moderate to large-sized squids; maximum mantle length about 600 mm.**Geographical Distribution:** Cosmopolitan in tropical and subtropical waters.

Habitat and Biology: Very little is known about the biology of any species in the family. Members of the family occur in lower epipelagic to mesopelagic zones, occasionally to the bottom in bathyal waters. While records are relatively few, species of cycloteuthids appear to undergo diel vertical displacement; specimens have been taken in the upper 200 m at night and at 500 to 1 000 m during daytime. Members of the family provide significant prey to numerous predatory species, e.g. sperm whales, swordfish, blue shark, short-finned pilot whale.

Interest to Fisheries: The small size of most species, the soft consistency of the flesh and the relative rarity of specimens in deep-set trawls preclude an interesting potential for fisheries. Species, however, are heavily preyed upon by cetaceans, fishes, sea birds and other cephalopods.

Local Names: USA: Roundfin squids, Cycloteuthids.

Remarks: The family Cycloteuthidae contains 2 rather dissimilar genera, *Cycloteuthis* and *Discoteuthis*. These 2 genera are united principally by the single character of the subtriangular funnel-locking component. Otherwise there is little morphological evidence for a close relationship. Molecular analysis, however, confirms the close relationship of these genera in the Cycloteuthidae (Carlini, 1998). Although 4 species currently are recognized, recent findings suggest that other species may be included in the 2 genera in the future. Familial treatments of systematics, distribution, paralarvae and juveniles are presented in Nesis (1982, 1987, 1999b) and Jefferts and Roper (1992) and Young (1999a). The genera are distinguished in the key below.

Literature: Young and Roper (1969a), Roper and Young (1975), Jefferts and Roper (1992), Dunning and Lu (1998), Young (1999a), Vecchione (2002), Sweeney and Young (2003i).

Key to the genera of Cycloteuthidae

- 1a.** Mantle in adults drawn out posteriorly into tail; fin length in adults to 75% of mantle length, including tail; suckers in 4 series on manus of club of equal/subequal size; a single photophore present on ink sac; a series of 15 to 30 very small, irregularly-shaped photophores on iris of eye around pupil; no photophores embedded on surface of body; gladius thin, narrow, with long, terminal cone *Cycloteuthis*
- 1b.** Mantle in adults not drawn out into a tail; fin length equals or slightly exceeds mantle length in adults; suckers in central 2 series on clubs greatly enlarged, suckers in the 2 marginal rows greatly reduced in size; no photophore on ink sac; 1 to several photophores embedded on surface of body; vane of gladius wide, heavily thickened, posteriorly rounded, terminal cone absent or minimal *Discoteuthis*

Cycloteuthis* Joubin, 1919Cycloteuthis* Joubin, 1919, *Bulletin de l'Institut Océanographique, Monaco*, 351: 7 pp. [1].**Type Species:** *Cycloteuthis sirventi* Joubin, 1919.**Frequent Synonyms:** None.**Diagnostic Features:** See generic key.

Remarks: Two species are recognized in the genus, but they are poorly known because they are relatively rare in collections. They are cosmopolitan in mesopelagic waters in tropical, subtropical (*C. sirventi*) and tropical, subtropical to subantarctic (*C. akimushkini*) waters.

Literature: See family list.

***Cycloteuthis sirventi* Joubin, 1919**

Cycloteuthis sirventi Joubin, 1919, *Bulletin de l'Institut Océanographique, Monaco*, 351: 7 pp. [1]. [Type locality: 30°45'40"N, 25°47'W, off Madeira, eastern North Atlantic Ocean].

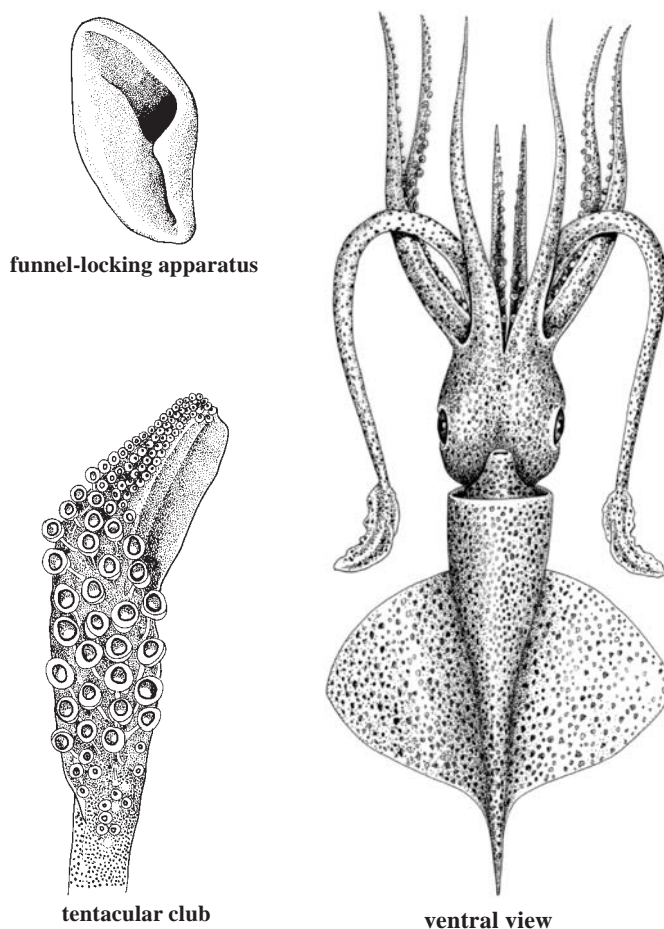
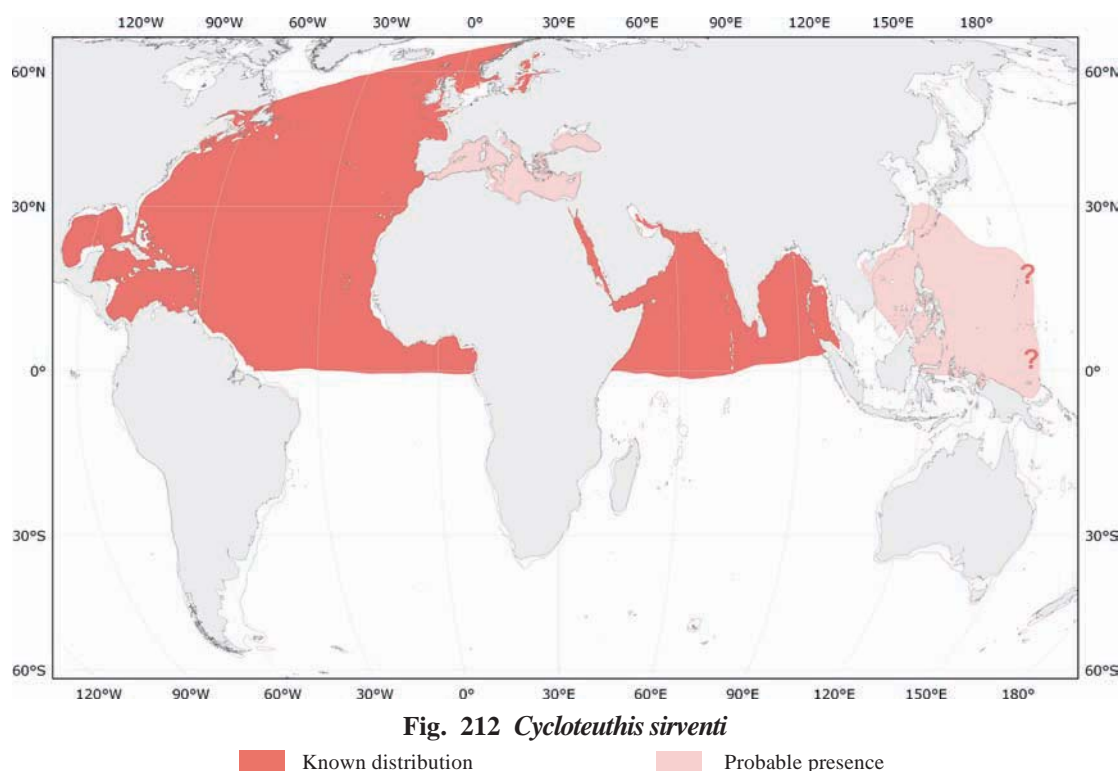
Frequent Synonyms: None.

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

Size: Mantle length to about 500 mm.

Geographical Distribution: Tropical, subtropical, temperate waters of the Atlantic, Mediterranean, Indo-West Pacific. Lower epipelagic, mesopelagic, rarely bathybenthic (Fig. 212).

Literature: Young and Roper (1969a), Nesis (1982, 1987, 1999b), Guerra (1992). See also family literature list.

Fig. 211**Fig. 211 *Cycloteuthis sirventi***

Cycloteuthis akimushkini Filippova, 1968

Cycloteuthis akimushkini Filippova, 1968a, *Malacological Reviews*, 1: 119–124 [119]. [Type locality: 9°57'S, 91°31'E, eastern Indian Ocean].

Frequent Synonyms: None.

Size: Mantle length to 600 mm.

Geographical Distribution: Tropical, subtropical to subantarctic Indian and western Pacific Oceans, southern subtropical Atlantic. Lower epipelagic to mesopelagic.

Literature: Nesis (1982, 1987, 1999b), Jefferts and Roper (1992). See also family literature list.

Discoteuthis Young and Roper, 1969

Discoteuthis Young and Roper, 1969a, *Smithsonian Contributions to Zoology*, 5: 24 pp. [5].

Type Species: *Discoteuthis discus* Young and Roper, 1969.

Frequent Synonyms: None.

Diagnostic Features: See generic key.

Remarks: *Discoteuthis* currently is represented by 2 species *D. discus* and *D. laciniosa*, each of which is rare in collections. However, an unusual specimen of *Discoteuthis* that has a distinctive array of photophores was recently described (Salcedo-Vargas and Guerrero Kommritz, 2000) that may represent a third species in the genus (Salcedo-Vargas and Young, 2001a). Further, another badly damaged, immature male squid recently was taken in the Atlantic Ocean in which the large suckers of the club remains had an unusual dentition. This, also, may turn out to represent another species in the genus (Young and Vecchione, 2005c).

Literature: Young (1999c), Young and Vecchione (2005c).

Discoteuthis discus Young and Roper, 1969

Discoteuthis discus Young and Roper, 1969a, *Smithsonian Contributions to Zoology*, 5: 24 pp. [5]. [Type locality: 3°50'N, 2°37'W, eastern Atlantic Ocean].

Frequent Synonyms: None.

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

Size: Mantle length to 90 mm.

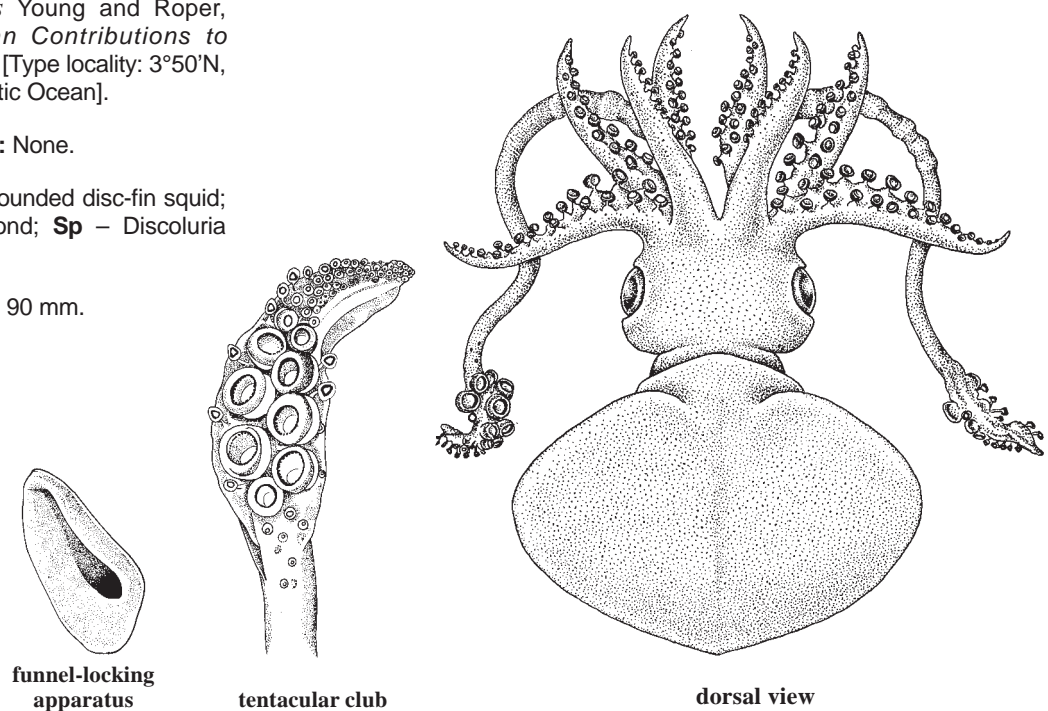


Fig. 213

Fig. 213 *Discoteuthis discus*

Geographical Distribution: Tropical and subtropical Atlantic, Pacific and Indian Oceans. Lower epipelagic to mesopelagic (Fig. 214).

Literature: Young and Roper (1969a), Roper and Young (1975), Vecchione (2002). See also family literature list.

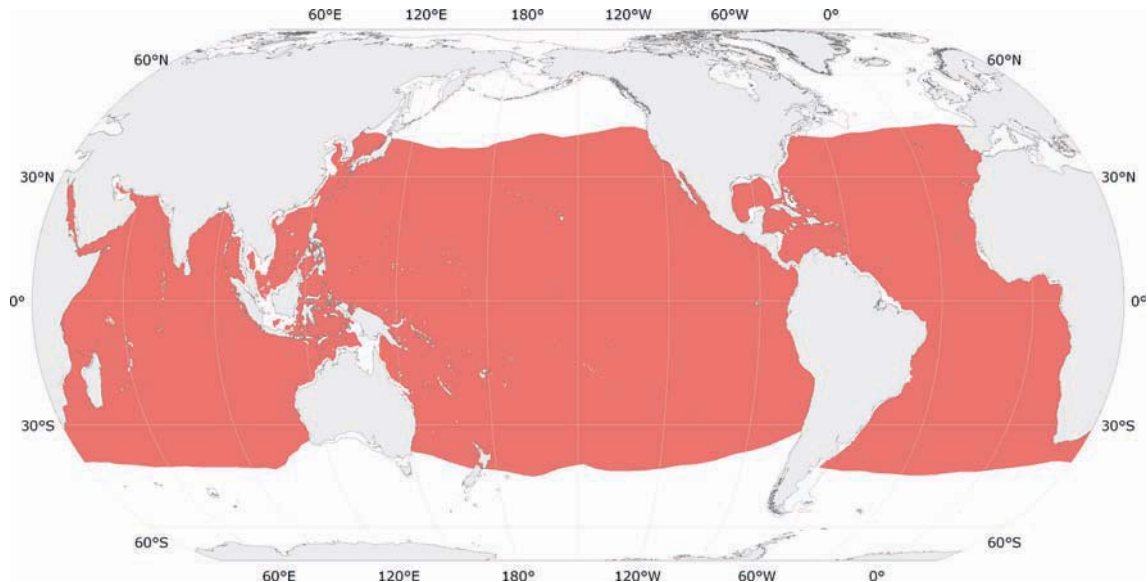


Fig. 214 *Discoteuthis discus*

■ Known distribution

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

Discoteuthis laciniosa Young and Roper, 1969a, *Smithsonian Contributions to Zoology*, 5: 24 pp. [9]. [Type locality: 33°04'N, 64°37'W, western Atlantic Ocean].

Frequent Synonyms: None.

Size: Mantle length to 70 mm.

Geographical Distribution: Tropical, subtropical Atlantic, Pacific and Indian Oceans.

Literature: Young and Roper (1969a), Jefferts and Roper (1992), Vecchione, (2002). See also family literature list.