

Local Names: CHINA: Yau jai.

Remarks: Norman and Lu (2000) report the species distribution to extend to the gulf of Thailand. According to Manoch, 1998, records from the Gulf of Thailand should be attributed to *Loliolus sumatrensis*. Records of this species from the Bay of Bengal also exist (Yothinayagam, 1987).

Literature: Natsukari (1983), Nesis (1982, 1987), Manoch (1998), Vecchione, *et al.* (1998b), Norman and Lu (2000), Okutani (2005), Vecchione (2008f).

***Lolliguncula* Steenstrup, 1881**

Lolliguncula Steenstrup, 1881, *Danske Videnskabernes Selskabs Skrifter*, 6 Række, Naturvidenskabelig og Matematisk, 1(3): 211–242. [242].

Type Species: *Lolliguncula brevis*.

Diagnostic Features: Tentacular **clubs expanded**, with suckers in 4 series. Arm sucker rings with square, plate-like teeth around entire margin. **Hectocotylus without crest**; suckers reduced, sucker stalks elongated to form papillae on either dorsal or both dorsal and ventral rows. Mantle without posterior tail-like elongation. Posterior of **fins broadly rounded; fins wider than long in adults**. Eggs small. Spermatophores with **long cement body**. Photophores absent.

Size: Small-sized species; maximum mantle length 120 mm.

Geographical Distribution: Tropical and subtropical West Atlantic, and tropical eastern Pacific Ocean.

Remarks: The genus *Lolliguncula* was established to distinguish *L. brevis* from the species of *Loligo* then known, based on body and fin shape and spermatophore deposition site. These characters have since proven to exhibit considerable variability, both within and among species. However, all of the species in this genus are united and distinguished from all other loliginids by the long cement body of their spermatophores. Variability exists in hectocotylus morphology, and this led Berry (1929) to erect the genus *Loliolopsis* and Brakoniecki (1986) to erect *Afrololigo*. This variability is extreme in *L. diomedea*, but Brakoniecki (1986) has pointed out the similarities in hectocotylization between this species and the other species of *Lolliguncula*. Many of the morphological characters of *Afrololigo mercatoris* are shared with species of *Lolliguncula*, the genus in which it was originally described. However, DNA sequence analysis by Anderson (2000a) supports Brakoniecki's (1986) conclusion based on hectocotylus morphology that *Afrololigo* is a distinct genus (Vecchione, 2008a). Two subgenera currently are recognized. Since the type species of the formerly monotypic genus belongs to the subgenus *Lolliguncula*, the subgenus *Lolliguncula* is treated first in this work.

Literature: Brakoniecki (1986), Anderson (2002a), Vecchione *et al.* (2005), Vecchione (2008g).

Key to the subgenera of *Lolliguncula*

- 1a.** Modified portion of hectocotylus less than entire arm, proximal portion not modified . ***Lolliguncula (Lolliguncula)***
1b. Hectocotylus modified along entire arm ***Lolliguncula (Loliolopsis)***

Subgenus *Lolliguncula* Steenstrup, 1881

Lolliguncula Steenstrup, 1881, *Danske Videnskabernes Selskabs Skrifter*, 6 Række, Naturvidenskabelig og Matematisk, 1(3): 211–242. [242].

Type Species: *Lolliguncula (Lolliguncula) brevis* (Blainville, 1823).

***Lolliguncula (Lolliguncula) brevis* (Blainville, 1823)**

Fig. 113

Loligo brevis Blainville, 1823, *Journal Physique Chimie d'Histoire Naturelle*, 96:116–135. [133]. [Type locality: Japan, western North Pacific Ocean].

Frequent Synonyms: *Loligo brevipinna* Lesueur, 1824, *Loligo hemiptera* Howell, 1867.

Misidentifications: *Loligo* spp.

FAO Names: En – Thumbstall squid; Fr – Calmar doigtier commun; Sp – Calamar dedal.

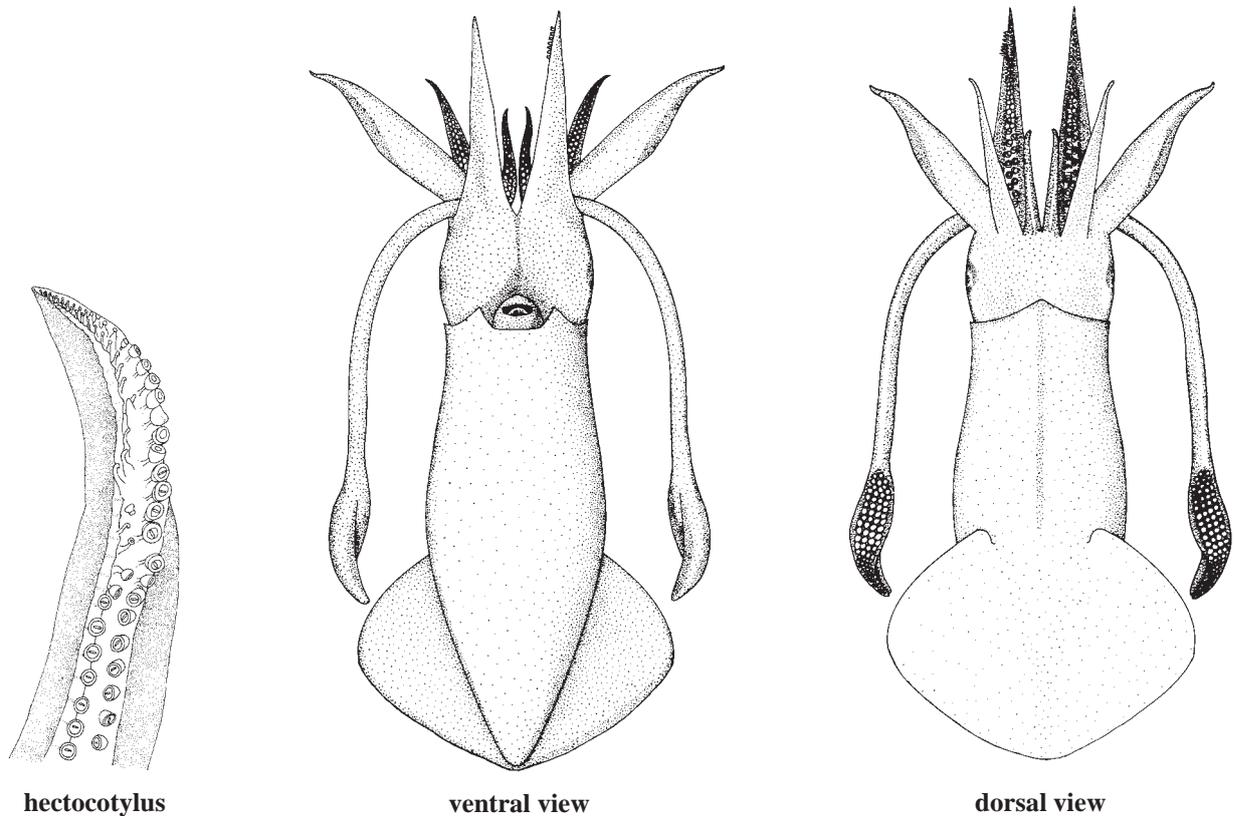


Fig. 113 *Lolliguncula (Lolliguncula) brevis*

Diagnostic Features: Mantle stout, bluntly rounded posteriorly, widest in midportion. **Fins short (50 to 55% of mantle length), broad, wider than long; fin width 75% of mantle length, very rounded.** **Modified portion of hectocotylized left ventral arm occupies distal third of arm and extends to arm tip;** about 24 suckers of dorsal series modified, the proximal 1 to 3 being greatly reduced in diameter, the remaining pedicels distally are greatly enlarged into long, slightly flattened papillae that gradually diminish in size distally; no large, puffy, glandular enlargement of basal area of arm between sucker series. **Colour:** dark reddish brown to brownish yellow with chromatophores over nearly entire animal; chromatophores most dense on ventral surface of mantle and head, except in very large specimens, in which the opposite occurs.

Size: Small-sized squid; maximum reported mantle length 120 mm for females, 85 mm for males.

Geographical Distribution: Western Atlantic Ocean, about 45°N to 28°S; from Nova Scotia, New Jersey and Delaware Bay, southward to Rio de Janeiro, Brazil, including Gulf of Mexico and Caribbean mainland; excluded from the Bahamas and Caribbean Islands except Cuba and Curaçao (Fig. 114).



Fig. 114 *Lolliguncula (Lolliguncula) brevis*

■ Known distribution

Habitat and Biology: A shallow-water euryhaline species, *Lolliguncula brevis* generally is limited to very shallow waters. A notable exception among other cephalopods, the brief squid tolerates low salinities, down to 17.9 PSU, and it withstands a wide range of environmental conditions, having been collected over bottom water temperatures between 8.1° and 29.6°C, salinities between 17.9 and 35 PSU and dissolved oxygen levels between 1.9 and 14.6 mg/l mainly due to the unique characteristics of the species' hemocyanin. This allows the species to inhabit estuarine waters and bays; for example, *L. brevis* is an important component of the Chesapeake Bay ecosystem. Excursions into hypoxic waters, in particular, however short in duration, may provide advantage by avoiding predation or exploiting additional food niches.

Females grow larger and are more robust than males. Males mature earlier; 50% of the male population studied in the Gulf of Mexico becomes mature at approximately 40 mm mantle length; 50% of the female population are mature at about 70 mm mantle length. In Brazilian waters off Santa Catarina Island, autumn/winter spawners mature at larger sizes (males 36 mm mantle length; females 48 mm mantle length) than spring/summer spawners (males 29 mm mantle length; females 42 mm mantle length); however, immature animals may attain larger sizes. Mature individuals are found in all seasons and spawning occurs year round. Small eggs are laid in elongate, terminally rounded, individually-fixed gelatinous capsules attached to the bottom in shallow waters in the Northern Hemisphere, while in Brazilian waters club-like capsules about 1.6 mm long are laid in small clusters/clutches measuring about 65 mm in diameter. Paralarval individuals are most abundant near bottom in inshore coastal waters with a salinity of about 26 PSU and can already tolerate very low oxygen concentrations, having been collected in waters considered to be hypoxic.

Food consists of small crustaceans and fishes, and the Thumbstall squid is preyed upon by fishes and mammals.

Observations on squid attracted by light at night in Brazilian shallow waters, reveal that these small squid often are positioned in the boundary zone of zooplankton and small pelagic fish schools of *Anchoa* spp., also attracted by the lights; here they often display a very unusual behaviour, mimicking the colour, form and swimming pattern of the small fishes nearby, probably as an effective form of hunting technique as previously observed in another squid, *Sepioteuthis sepioidea*. *Lolliguncula brevis* is known to associate with anchovies in Florida estuaries, where they prey upon these fishes; a similar relationship could take place in coastal bays off Brazil, as partially supported by the presence of fish remains in the few stomachs examined.

Interest to Fisheries: Caught sometimes in large quantities as bycatch in otter-trawl fisheries for shrimps and fishes. Catches are common around Cape Canaveral, Florida in winter and progressively farther northward to Cape Hatteras in spring and summer. In the Gulf of Mexico the species is widespread but major concentrations seem to occur in the waters of high productivity around the Mississippi River delta. Commonly present in the Pacific shrimp catches by Mexican trawlers, it is sold fresh in local markets along the Oaxaca coast; it also is abundant in the Venezuelan squid catches, mainly east of the Orinoco Delta, but also in shallow waters around Margarita Island and in the Gulf of Venezuela. Currently, however, no specific commercial fishery exists in spite of the great abundance of this species in several areas.

Local Names: USA: Western Atlantic brief squid, Bay squid, Brief squid; VENEZUELA: Chipiron.

Remarks: Recently, the validity of the species for the entire area of the distribution in the western Atlantic waters was questioned, based on differing morphological features (e.g. Simone, 1997, Martins and Perez, 2002, Zaleski, 2005) and differences in egg deposition (e.g. Perez and Vidal, 1997, Zaleski, 2005) in specimens from Brazil and the Gulf of Mexico. A taxonomic separation of squids from the North and the South Atlantic into two distinct species of *Lolliguncula* (*Lolliguncula*) was proposed (Zaleski, 2005, Zaleski and Perez, 2006), and it currently is under discussion (Vecchione, pers. comm.).

A morphological and morphometric analysis carried out on specimens from 11 localities along the Brazilian coast (Zaleski, 2005) indicated the dominant occurrence of a single species in the entire latitudinal range examined (8°S to 28°S). A few local "morphotypes" were distinguished, possibly in relation to the limited displacement capacity of adults, the low paralarval dispersal and the presence of bays and estuaries where the species may have encountered reproductive isolation, all elements that may have favored the observed intraspecific variation. Studies on *Lolliguncula brevis* from the Gulf of Mexico have determined the osmotic regulatory mechanism that enables this species to inhabit a wide range of salinities. (Lucero and Poulsen, 2005).

Literature: Hendrix *et al.* (1981), Roper *et al.* (1984), Vecchione *et al.* (1994), Jackson *et al.* (1997), Simone (1997), Bartol *et al.* (2002), Lucero and Poulsen (2005), Zaleski (2005), Zaleski and Perez (2006), Martins and Perez (2007), Vecchione (2008g).

***Lolliguncula (Lolliguncula) argus* Brakoniecki and Roper, 1985**

Fig. 115

Lolliguncula argus Brakoniecki and Roper, 1985, *Proceedings of the Biological Society of Washington*, 98(1): 47–53 [47, figs 1–2]. [Type locality: La Plata Island, Ecuador, eastern Pacific Ocean].

Frequent Synonyms: None.

Misidentifications: None.

FAO Names: **En** – Argus brief squid; **Fr** – Calmar doigtier argus; **Sp** – Calamar dedal argus.

Diagnostic Features: Mantle short, stout (width usually >30% mantle length), bluntly pointed posteriorly; fins **small but wide, length <38% mantle length, width >1.5% mantle length**; tentacles short, compressed; clubs with enlarged manus suckers, marginal suckers about half size of median ones; arm suckers with about 5 blunt teeth on distal margin and proximal margin smooth. Suckers absent on buccal membrane lobes; enlarged proximal suckers present on dorsal and lateral arms. Only 1 ventral arm modified in males (no flap on arm opposite hectocotylus): **right ventral arm hectocotylized** with dorsal series of **distal two-thirds** modified into fleshy papillae lacking suckers.

Size: Very small-sized squid; maximum recorded mantle lengths 30 mm for males and 39 mm for females.

Geographical Distribution: Lower Gulf of California, Mexico to La Plata Island, Ecuador (Fig. 116).

Habitat and Biology: A coastal species, characterized by its small size at maturity (males 20.8–26.8 to 29.6 mm mantle length, females 20.6 to 32.3 to 38.8 mm mantle length).

Interest to Fisheries: Unknown. Probably misidentified with its congener *Lolliguncula panamensis*, if captured.

Local Names: None available.

Remarks: It is the only known myopsid to have its primary hectocotylization on the right ventral arm instead of the left.

Literature: Brakoniecki and Roper (1985), Roper *et al.* (1995), Vecchione (2008g).

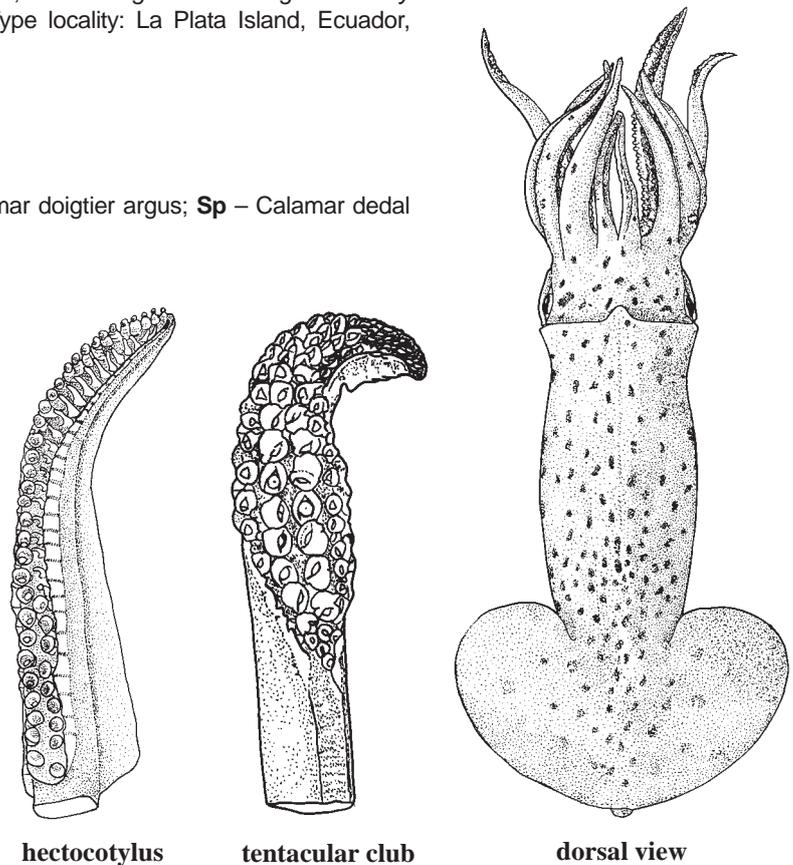


Fig. 115 *Lolliguncula (Lolliguncula) argus*

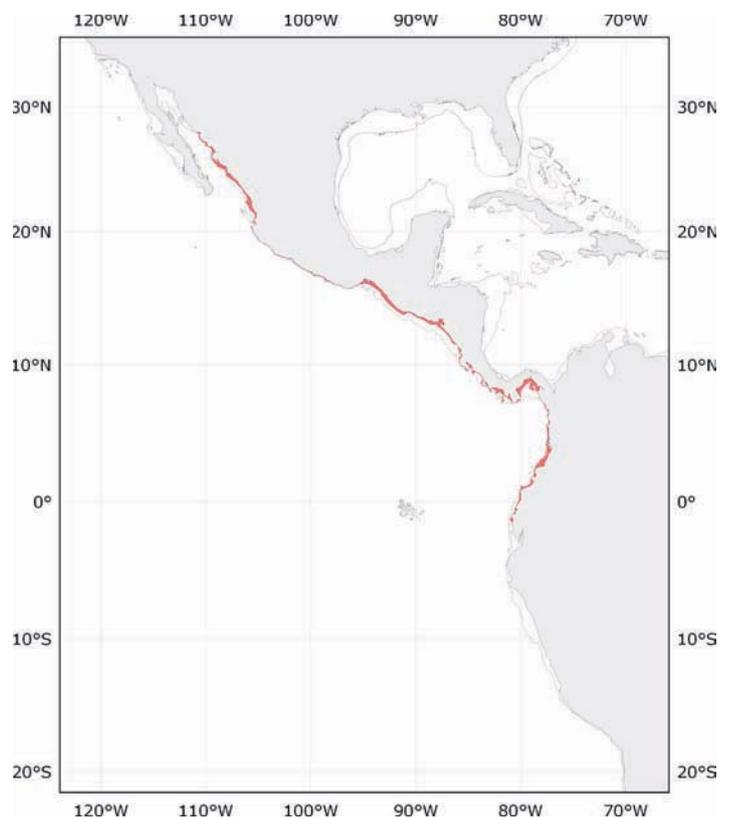


Fig. 116 *Lolliguncula (Lolliguncula) argus*

Known distribution

***Lolliguncula (Lolliguncula) panamensis* Berry, 1911**

Fig. 117

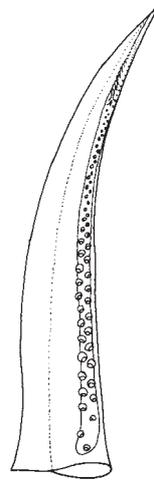
Lolliguncula panamensis Berry, 1911c, *Proceedings of the Academy of Natural Science of Philadelphia*, 63(1):100–105 [100, text-figs 1–7, pl 7]. [Type locality: Panama, eastern Pacific Ocean].

Frequent Synonyms: *Lolliguncula tydeus*, Brakoniecki, 1980.

Misidentifications:

FAO Names: **En** – Panama thumbstall squid; **Fr** – Calmar doigtier Panamien; **Sp** – Calamar dedal Panameño.

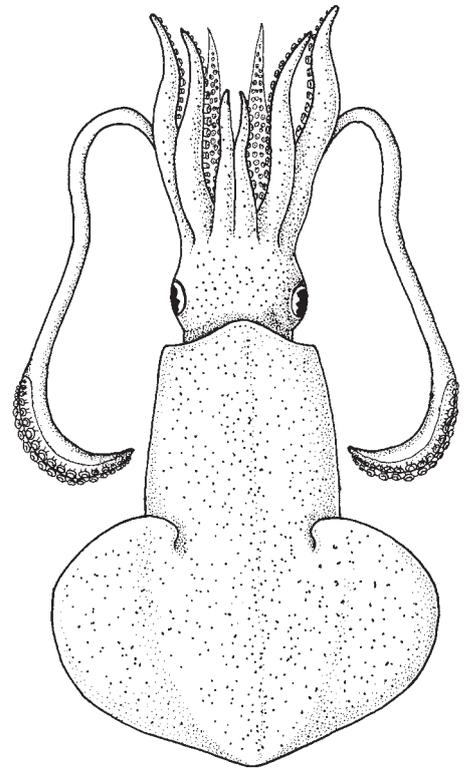
Diagnostic Features: Mantle stout (width usually >30% ML), bluntly rounded posteriorly. **Fins broad, width 50 to 90% mantle length (usually 60 to 70%), length usually greater than 38% mantle length.** Tentacles long, robust; clubs large, expanded, with enlarged suckers on manus, especially median series with 23 to 27 small, sharp, triangular teeth around ring (smaller proximally); arm suckers with 11 to 15 short, broad, truncate teeth, prominent distally and obscure proximally. Suckers present on buccal membrane lobes. **Only left ventral arm hectocotylized** (no flap on arm opposite hectocotylus), with **distal quarter** of dorsal series of suckers modified into long, fleshy papillae; small suckers along entire length; hectocotylus longer than opposite arm. No enlarged proximal suckers on dorsal and lateral arms.



hectocotylus



tentacular club



dorsal view

Fig. 117 *Lolliguncula (Lolliguncula) panamensis*

Size: Small-sized squid; maximum reported mantle length 110 mm in females and 80 mm in males.

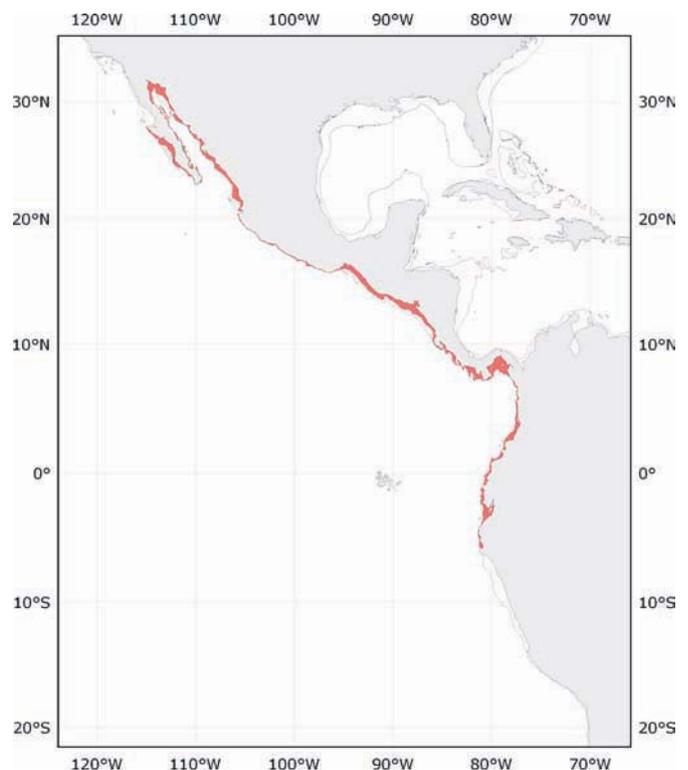
Geographical Distribution: Eastern central Pacific Ocean from the western side of Baja California and Gulf of California, through Mexico to northern Peru (Fig. 118).

Habitat and Biology: The species occurs over a depth range to 120 m, but principally inhabits waters less than 50 m depth, at temperatures from 21° to 27°C, and salinities between 15 and 23 PSU. Spawning takes place throughout the year, apparently in several batches. Maturation occurs at about 80 mm mantle length in females and 40 mm mantle length in males. Prey includes fishes (81%) and crustaceans (>15%).

Interest to Fisheries: Taken as bycatch in shrimp fisheries off Panama, Columbia and Ecuador, but not separately reported in catch statistics. The largest individuals are picked out of the catch, packed and frozen for export to Europe. In spite of their small size, some potential for commercial exploitation for these squids exists.

Local Names: USA: Panama brief squid.

Remarks: *Lolliguncula panamensis* and *Lolliguncula (Loliolopsis) diomedae* overlap for most of their distributional ranges. The species description/distinction is based on morphological characteristics of males, but

Fig. 118 *Lolliguncula (Lolliguncula) panamensis*

■ Known distribution

females or subadults are distinguishable in that the fins of *L. panamensis* are larger and longer than those of *L. diomedea* and the body is comparatively larger and more robust (see Sanchez, 2003). Also, the 2 species rarely are caught in the same trawls, possibly a result of what has been defined a “competitive exclusion” (Barrientos, 1987), and they preferentially inhabit different depth ranges: *L. panamensis* is most abundant in waters less than 50 m, while *L. diomedea* prefers deeper waters, from 50 to 200 m depth (Sanchez, 2003).

Literature: Roper *et al.* (1984), Barrientos (1987), Roper *et al.* (1995), Sanchez (2003), Vecchione (2008g).

Subgenus *Loliolopsis* Berry, 1929

Loliolopsis Berry, 1929, *Transactions of the San Diego Society of Natural History*, 5(18):263–282, 9 figs, 2 pls. [266].

Type Species: *Lolliguncula (Loliolopsis) diomedea* (Hoyle, 1904).

Lolliguncula (Loliolopsis) diomedea (Hoyle, 1904)

Fig. 119

Loligo diomedea Hoyle, 1904, *Bulletin of the Museum of Comparative Zoology, Cambridge*, 43(1): 1–72, 12 plates [29, pls 5-6]. [Type locality: 16°47'30"N, 99°59'30"W, eastern Central Pacific Ocean].

Frequent Synonyms: *Loliolopsis chiroctes* Berry, 1929.

Misidentifications: *Loligo opalescens*.

FAO Names: En – Dart squid; Fr – Calmar fléchette; Sp – Calamar dardo.

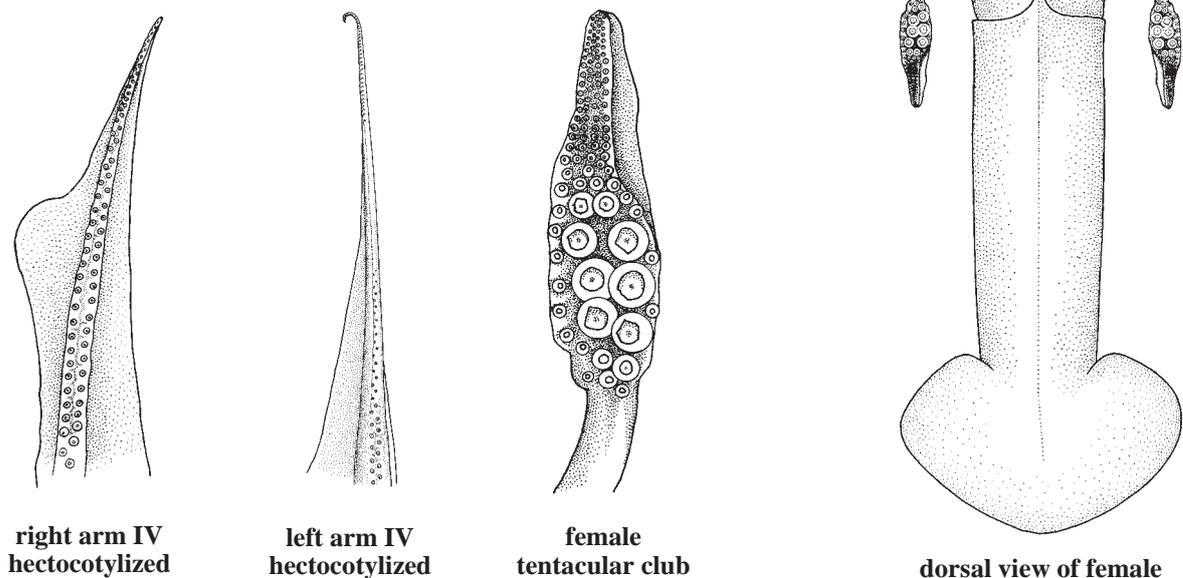


Fig. 119 *Lolliguncula (Loliolopsis) diomedea*

Diagnostic Features: Mantle elongate, narrow (width usually <30% mantle length), bluntly pointed posteriorly. Fins short, length <50% mantle length (usually 30 to 40%). Sexes dimorphic: female with larger body, relatively shorter arms and larger fins than males. Both ventral arms conspicuously modified in males, left ventral arm hectocotylyzed, greatly elongate with suckers minute at base and absent along rest of arm; sucker stalks modified into papillae; right ventral arm with broad, membranous flap and suckers of reduced size.

Size: Small sized-squid; maximum reported mantle length 115 mm.

Geographical Distribution: Eastern Central Pacific Ocean: from western side of Baja California and Gulf of California to Peru (Fig. 120).

Habitat and Biology: Frequently forms large aggregations in the Gulf of Panama. Females appear to outnumber males 2:1 and males remain smaller than females.

Interest to Fisheries: Taken as a bycatch in the Panamanian shrimp fishery, but usually discarded; small quantities reach the local market.

Local Names: USA: Dart squid.

Remarks: Hoyle (1904) described *Loligo diomedae* based on a specimen collected off Acapulco, Mexico. Then, Berry (1929) described another loliginid species, that he named *Loliolopsis chiroctes* from multiple specimens, also from Baja California, on which he based his new genus *Loliolopsis*. As these species are synonymous, Hoyle's species name has priority for the type species of Berry's genus. *Lolliguncula diomedae* and *L. panamensis* overlap for most of their distributional range. The species description/distinction is based on morphological characteristics of males, but females or subadults are distinguishable in that the fins of *L. diomedae* are narrower and shorter than those of *L. panamensis* and the body is comparatively thinner and has a fusiform shape (see Sanchez, 2003). Also, the 2 species are rarely caught in the same trawls, possibly a result of what has been defined a "competitive exclusion" (Barrientos, 1987), and they preferentially inhabit different depth ranges: *L. panamensis* is most abundant in waters less than 50 m, while *L. diomedae* prefers deeper waters, from 50 to 200 m depth (Sanchez, 2003).

Literature: Roper *et al.* (1984) Barrientos (1987), Roper *et al.* (1995), Sanchez (2003), Vecchione (2008g).

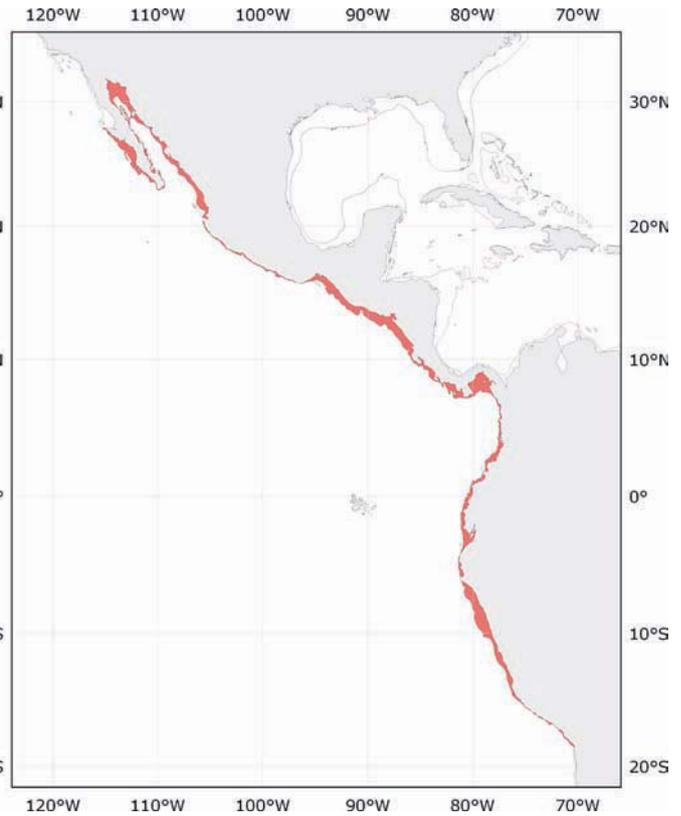


Fig. 120 *Lolliguncula (Loliolopsis) diomedae*

Known distribution

Pickfordiateuthis Voss, 1953

Pickfordiateuthis Voss, 1953, *Bulletin of Marine Science of the Gulf and Caribbean*, 2(4): 602–609. [602].

Type Species: *Pickfordiateuthis pulchella* Voss, 1953.

Diagnostic Features: Tentacular club with biserial suckers on manus. **Fins subterminal, oval**, with free anterior and posterior lobes. **Buccal membrane lappets lack suckers**. Photophores absent.

Size: Dwarf species, maximum recorded sizes between 20 and 26 mm mantle length.

Geographical Distribution: Bahama Islands and Florida Keys to Brazil in Atlantic; along coasts of Baja California in Pacific Ocean.

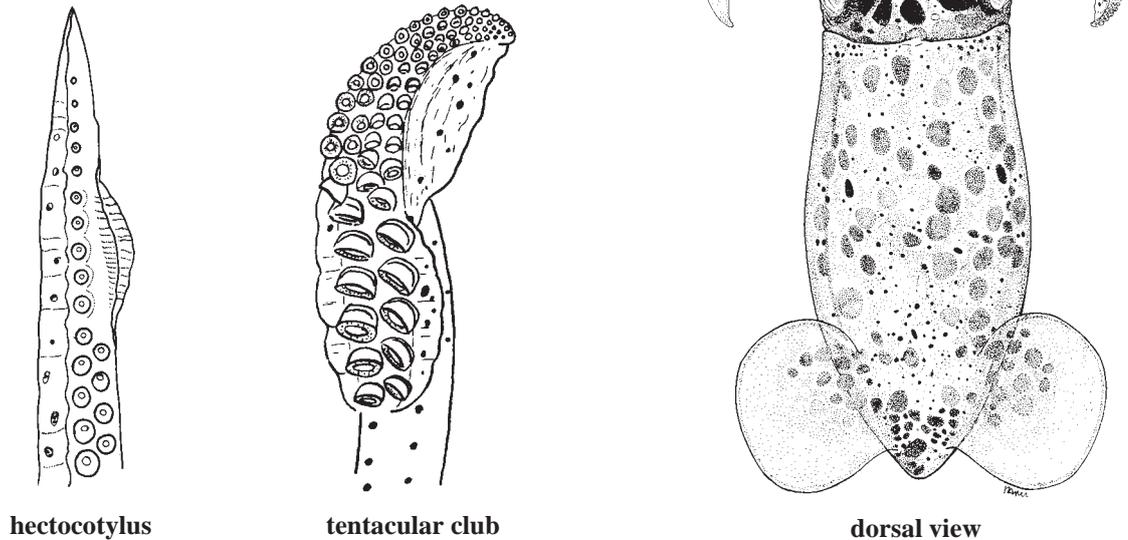
Remarks: *Pickfordiateuthis pulchella* was considered to belong to a monospecific family until Brakoniecki (1996) described a second species, *Pickfordiateuthis vossi*, from the eastern Pacific and submerged the family into the older family of myopsid squids, Loliginidae. At least one other species of *Pickfordiateuthis*, in addition to the 3 listed here, currently is not formally named but designated by Brakoniecki (1996), based on specimens from the western Central Atlantic.

Literature: Voss (1953), Brakoniecki (1996), Vecchione (2008h).

Pickfordiateuthis pulchella* Voss, 1953*Fig. 121; Plate V, 26**

Pickfordiateuthis pulchella Voss, 1953, *Bulletin of Marine Science of the Gulf and Caribbean*, 2(4): 602–609. [602, figs 116]. [Type locality: Old Rhodes Key, Florida, Gulf of Mexico, western Central Atlantic Ocean].

FAO Names: **En** – Grass squid; **Fr** – Calmar herbe mignon; **Sp** – Calamareto yerba.

**Fig. 121** *Pickfordiateuthis pulchella*

Diagnostic Features: Mantle short, bluntly pointed posteriorly. **Chromatophores present on visceral membrane. Fins lateral, large, elliptical to round, sepiolid-like.** Manus of tentacular clubs with suckers in 2 series; dactylus suckers in 4 series.

Size: Very small sized squid; maximum recorded mantle length 22 mm.

Geographical Distribution: Tropical western Atlantic Ocean: South Florida, Florida Keys, Bahama Islands, Caribbean Sea islands and coasts, to Brazil (Fig. 122).

Habitat and Biology: Shallow tropical waters on patch reefs and seagrass beds. In spite of the accessible habitat, the squid is rarely captured and little is known of its biology.

Literature: Voss (1953), Brakoniecki (1996), Arango and Diaz (1996).

**Fig. 122** *Pickfordiateuthis pulchella*

■ Known distribution

Pickfordiateuthis bayeri* Roper and Vecchione, 2001*Fig. 123**

Pickfordiateuthis bayeri Roper and Vecchione, 2001, *Bulletin of the Biological Society of Washington*, 10: 301–310. [302, figs 1–3]. [Type locality: Bahama Islands, western North Atlantic Ocean].

Misidentifications: *Loligo* sp.

FAO Names: **En** – Bayer's grass squid; **Fr** – Calmar herbe de Bayer; **Sp** – Calamar yerba de Bayer.

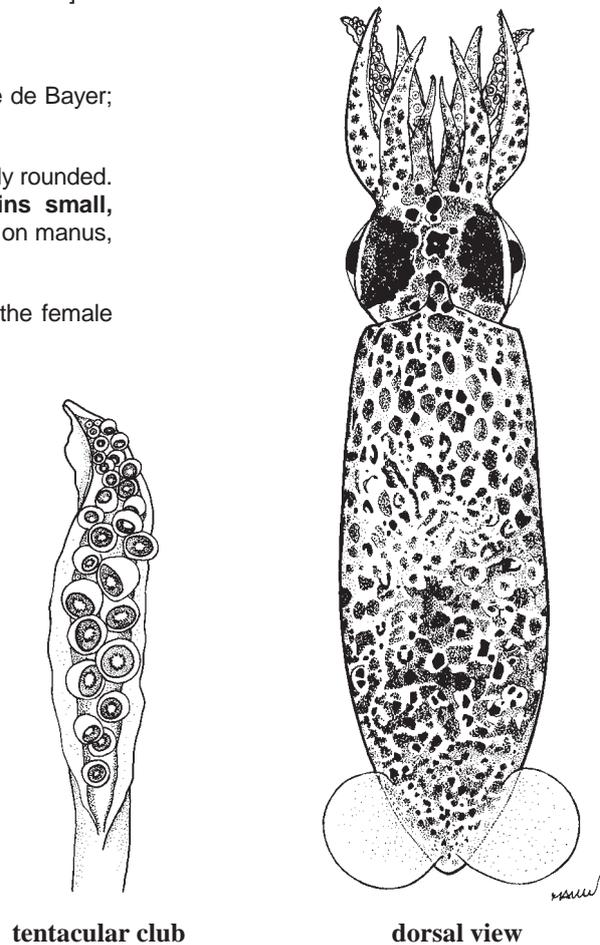
Diagnostic Features: Mantle elongate, posterior end broadly rounded. **Chromatophores absent from visceral membrane. Fins small, subterminal.** Tentacles short, thin. Club suckers in 2 series on manus, crowded on dactylus.

Size: A very small-sized squid, currently known only from the female type specimens, 23 and 26 mm mantle length.

Geographical Distribution: Western North Atlantic Ocean: Bahama Islands (Fig. 124).

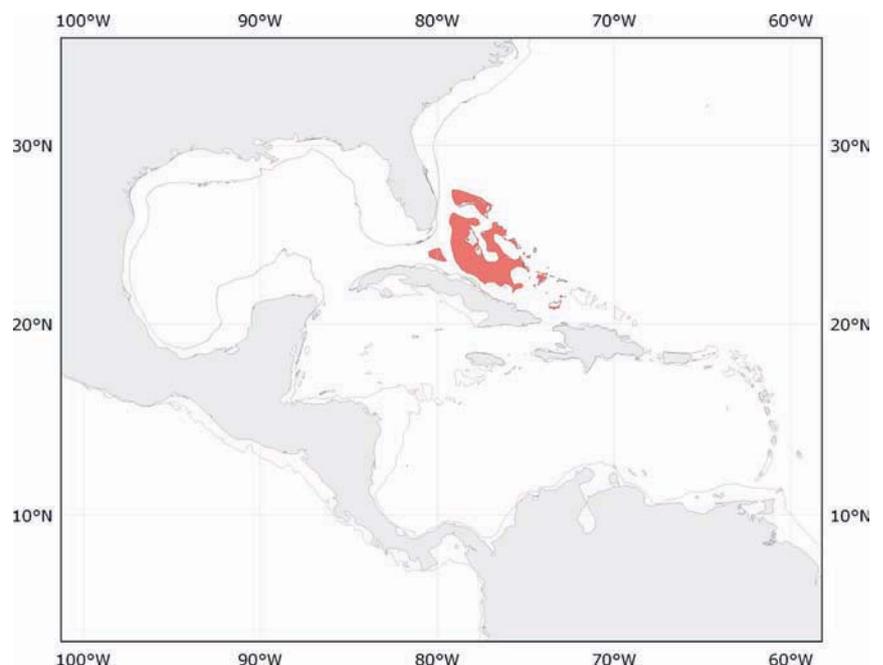
Habitat and Biology: Type specimens collected from a swarm of squids at 110 to 113 m depth during descent by submersible. The squids ceased following the sub at about 274 m. Although the bottom depth at the dive site was about 1 km, the location was about 2 km off Abaco Island, so shallow water was nearby. Since both specimens were fully mature, mated, unspawned females, it was suggested that the occurrence of *P. bayeri* in that habitat, unusual for all known species of the genus, represents an offshore mating migration.

Literature: Roper and Vecchione (2001).



tentacular club

dorsal view

Fig. 123 *Pickfordiateuthis bayeri***Fig. 124** *Pickfordiateuthis bayeri*

■ Known distribution

Pickfordiateuthis vossi* Brakonieccki, 1996*Fig. 125**

Pickfordiateuthis vossi Brakonieccki, 1996, *Bulletin of Marine Science*, 58(1): 9–28 [16, figs 4c, 5–7]. [Type locality: 24.6°N, 112.1°W, Bahia Magdalena, Mexico, eastern Central Pacific Ocean].

FAO Names: **En** – Voss' grass squid; **Fr** – Calmar herbe de Voss; **Sp** – Calamar yerba de Voss.

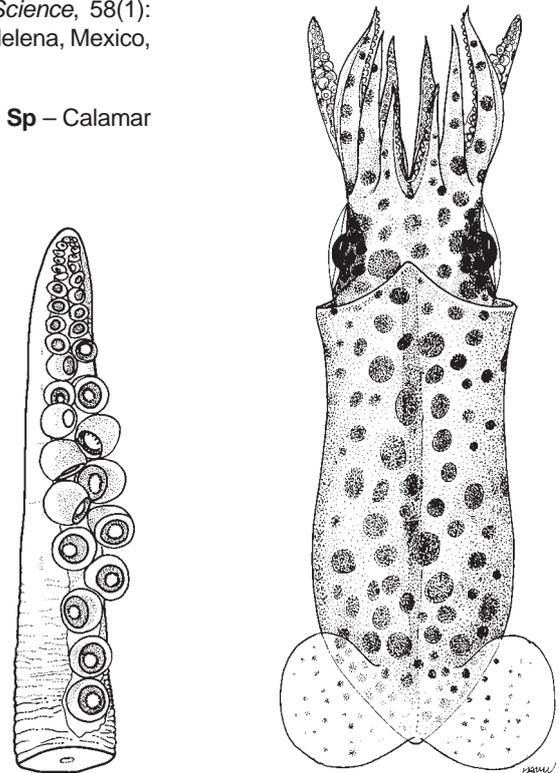
Diagnostic Features: Mantle elongate, posterior end broadly rounded. **Fins round, relatively large**, length about one-quarter mantle length. **Chromatophores absent from visceral membrane.** Left ventral arm hectocotylized on distal third in males; 6 to 9 normal pairs of proximal suckers, followed by absence of suckers in both series; stalks modified into long thick, papillae that decrease in size distally, then completely absent at arm tip. Tentacles short, stout, similar in appearance to arms; **clubs highly modified, elongate, with no visible manus or dactylus**; proximal suckers on clubs in single series, increase to 2 series on remainder of club.

Size: Very small-sized species; mazimum recorded size around 20 mm mantle length.

Geographical Distribution: Eastern Central Pacific Ocean: Pacific and Gulf coasts of Baja California; throughout the Sea of Cortez, Mexico (Fig. 126).

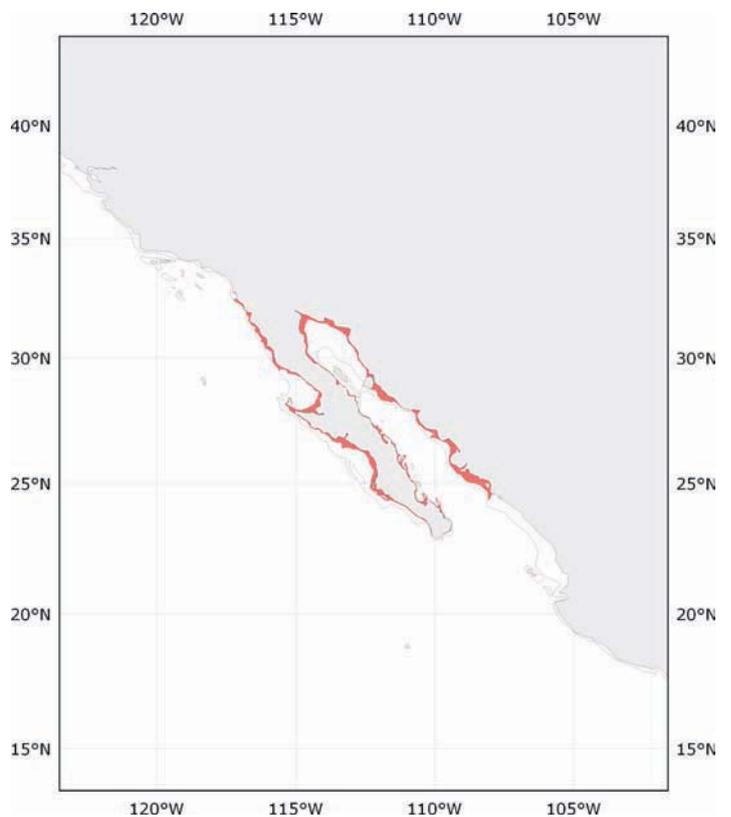
Habitat and Biology: Shallow waters near shore; females are larger than males at maturity; average female mantle length at maturity 15 mm, average male 13 mm.

Literature: Brakonieccki (1996).



tentacular club

dorsal view of female

Fig. 125 *Pickfordiateuthis vossi***Fig. 126** *Pickfordiateuthis vossi*

Known distribution

***Sepioteuthis* Blainville, 1824**

Sepioteuthis Blainville, 1824, *Dictionnaire des Sciences Naturelles*, 32:1–394, Atlas 2, 118 plates. [175].

Type Species: *Sepioteuthis sepioidea* (Blainville), 1823.

Diagnostic Features: Mantle broad, relatively stout, tapered to a blunt posterior end. Tentacular **clubs expanded**, with suckers in 4 series. Arm sucker rings with pointed teeth around entire margin. **Hectocotylus without crest**; sucker stalks elongated along modified portion of arm to form papillae on both dorsal and ventral series; proximal suckers unmodified. Posterior mantle not elongated into tail-like structure. **Fins extend nearly full length of mantle** (except in very young squid). **Eggs longer than 5 mm**, laid in single, straight series in egg strand; strands, attached at bases, form masses. Spermatophore cement body short. Photophores absent.

Size: Medium- to large-sized squid; maximum reported mantle length 422 mm (male specimen).

Geographical Distribution: Widely distributed in the tropical and subtropical waters of the western Atlantic (from Cape Canaveral to to northeastern Brazil) and Indo-West Pacific Ocean, all around Australia and down to Tasmania. Recorded also in the Mediterranean Sea.

Habitat and Biology: Mostly inhabitants of coastal waters and bays, common in coastal environments on sea grass beds, coral reefs and sandy bottoms.

Remarks: Currently, the genus comprises 3 species: *Sepioteuthis australis*, *S. lessoniana* and *S. sepioidea* (Vecchione *et al.*, 2005). A fourth species, *S. loliginiformis* was described from near Mohila, Red Sea by Rüppell and Leuckart (1828), but there are not adequate observations to confirm it to be a different species from *S. lessoniana* (see also Adam 1938, 1939b, 1959).

Literature: Adam (1939b, 1959), Vecchione *et al.* (2005), Vecchione (2008j).

***Sepioteuthis sepioidea* (Blainville, 1823)**

Fig. 127; Plate VI, 30–31

Loligo sepioidea Blainville, 1823, *Journal de Physique de Chimie et d'Histoire Naturelle*, 96:116–135. [133]. [Type locality: Martinique, Caribbean Sea, tropical western Atlantic Ocean].

Frequent Synonyms: *Sepioteuthis sepiacea*, Blainville, 1824, *Sepia affinis*, D'Orbigny, 1826, *Sepioteuthis biangulata*, Rang, 1837, *Sepioteuthis sloanii*, Gray, 1849, *Sepioteuthis ovata*, Gabb, 1868, *Sepioteuthis ehrhardti*, Pfeffer, 1884, *Sepioteuthis occidentalis*, Robson, 1926b, *Sepia officinalis jurujubai*, Oliveira, 1940.

Misidentifications: *Sepia* sp.

FAO Names: **En** – Caribbean reef squid; **Fr** – Calmar ris; **Sp** – Calamar de arrecife.

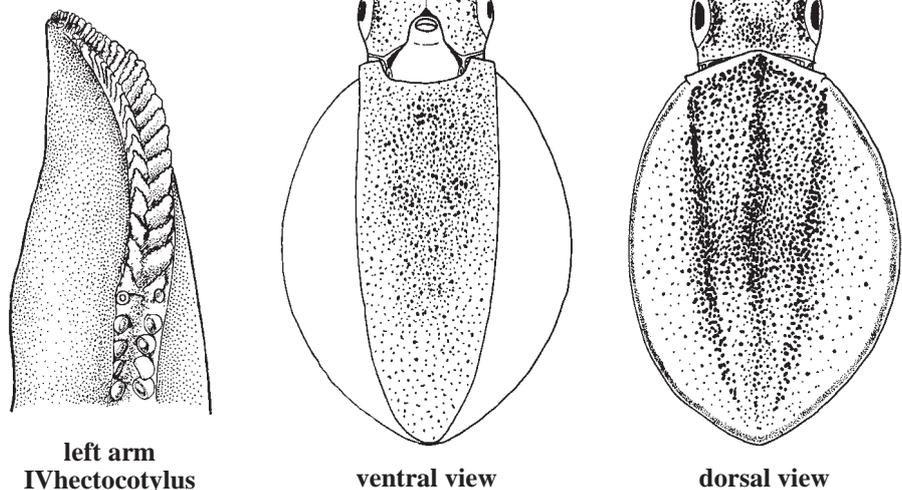


Fig. 127 *Sepioteuthis sepioidea*

Diagnostic Features: Mantle widest at anterior opening; fins elliptical to weakly rhomboidal, their width about 65% of mantle length; buccal lappets without suckers; modified portion of hectocotylized (left ventral) arm occupies distal fourth of arm length and is characterized by a sudden reduction in size of 1 or 2 pairs of suckers, the complete absence of suckers in both series from the remaining distal portion of the arm, and the increase in size of the pedicels into large, fleshy papillae. **Colour:** quite varied in life from translucent with iridescent sheen, through greenish brown to deep reddish brown, depending on location and behavioural situation; may show “eye-spots”, bands, or stripes on mantle, these sometimes outlined in white.

Size: Medium-sized squid; maximum reported size 200 mm mantle length.

Geographical Distribution: Tropical western Atlantic Ocean from Cape Canaveral, Florida, Bermuda and the Bahama Islands, Florida Keys, through the Caribbean Islands, Campeche, Yucatan and Venezuela to Farol de Barra Beach, northeastern Brazil (13°00'S, 38°31'W, Bahia) (Fig. 128).

Habitat and Biology: A truly tropical species that is limited in distribution by the distribution of coral reefs, primarily, and turtle-grass flats (*Thalassia testudinum*). Accordingly, factors such as temperature, salinity, water depth and turbidity that affect turtle grass and coral reef distribution are limiting factors for the Caribbean reef squid, as well. It occurs at depths of 0 to 20 m, mostly 3 to 7 m. As shallow coral reefs are absent from most of the Gulf of Mexico, *S. sepioidea* also appears to be excluded from the Gulf. It occurs in schools of 4 to 50 individuals of about equal size that cruise around the reefs or about the reef flats, or grass beds behind the reefs. Males mature earlier and at smaller sizes than females; the hectocotylus is developed on males at 30 mm mantle length, and between 70 and 85 mm mantle length specimens are ready to mate and fertilize females; the smallest mature females measure 110 mm mantle length and at 140 mm 50% of the studied population is mature. Eggs are very yolky and large, about 5 to 6 mm long; only 3 to 4 eggs are laid in each large, gelatinous capsule, several of which are attached together at their bases; these small clusters are laid under rocks or in conch shells (*Strombus gigas*), mainly on turtle grass beds and coralline formations; breeding apparently occurs year-round. Embryo survival rate and development is strictly related to salinity and temperature. The species feeds on fishes and shrimps. In aquaria, newly hatched juveniles start feeding almost immediately, (i.e. after 10 to 15 h), on mysid shrimps.



Fig. 128 *Sepioteuthis sepioidea*

Known distribution

Interest to Fisheries: Presently *Sepioteuthis sepioidea* is not fished commercially, but it often is a bycatch of other target fisheries. However, the other species of *Sepioteuthis* in the Indo-Pacific are fished extensively and are of excellent quality for eating. Therefore, this species has a potential interest to future fishing activity. In Bermuda, accidentally caught squid are used for bait.

Local names: USA: Tropical squid; VENEZUELA: Chopo.

Remarks: *Sepioteuthis sepioidea* is the only Western Hemisphere species of an otherwise Indo-west Pacific genus. A single record from the waters off Woods Hole, Massachusetts (41°32'N, 70°41'W; Mercer, 1970b), conspicuously far from the normal northern distribution limit of the species, was explained as an example of transportation by the Gulf Stream. A single record from southeastern Brazil waters off Buzios (23°47'S; 45°10'W) also exists (Begossi and Duarte, 1988); the specimen was associated with a rocky and sandy substrate, at about 5 to 6 m deep, in March 1987. However, the species was not reported in the Brazilian waters afterwards, till the recent observations off northeastern Brazil (Nunes de Anchieta *et al.*, 2007).

The Caribbean reef squid exhibits complex patterns of true and false displays and “anti-displays”, disruptive colorations (camouflaging techniques) and deimatic behaviours, during social (including sexual) interactions among individuals of the same species and/or during encounters between the squids and potential predators (Moynihan and Rodaniche, 1982; Hanlon and Messenger, 1996). On the coastal reefs of northeastern Brazil, Nunes de Anchieta *et al.* (2007) reported frequent associations of small groups of juvenile reef fish with large shoals of reef squid. Since no foraging activity was observed, these aggregations were explained as an efficient technique employed by juvenile fish to obtain protection against occasional visual-oriented predators and to increase survivorship.

Literature: Voss (1956), Roper (1978), Moynihan and Rodaniche (1982), Roper *et al.* (1984), Robaina and Voglar (1986), Voglar and Robaina (1987), Hanlon and Messenger (1996), Nunes De Anchieta *et al.* (2007), Vecchione, (2008j).

Sepioteuthis australis* Quoy and Gaimard, 1832*Fig 129; Plate V, 27**

Sepioteuthis australis Quoy and Gaimard, 1832, *Zoologie*, 2(1): 1–320, Atlas of 93 plates (1833) [77, pl 4 fig 1]. [Type locality: New Holland, Australia, probably Port Western].

Frequent Synonyms: None.

Misidentifications: None.

FAO Names: **En** – Southern reef squid; **Fr** – Calmar de roche austral; **Sp** – Calamar roquero austral.

Diagnostic Features: Mantle robust. **Fins very long, exceed 90% of mantle length**, fin width less than 50% of fin length; greatest width of fins at about midpoint. Tentacular **clubs long, not greatly expanded**; suckers moderate sized with 22 to 27 sharp teeth around the rings of the largest suckers. Arm III sucker rings with 25 to 30 sharp teeth. A narrow white to blue line occurs along the base of the fins where they attach to the body. General appearance closely resembles *Sepioteuthis lessoniana*, but lateral margins of fins are weakly angular.

Size: Maximum mantle length 394 mm; maximum weight about 4 kg.

Geographical Distribution: Southwestern Pacific Ocean: Australia and northern New Zealand; from Dampier in Western Australia to Moreton Bay in Queensland, including Tasmania (Fig. 130).

Habitat and Biology: For most of its distribution *S. australis* inhabits coastal waters and bays, usually in depths of less than 70 m, and it is commonly found in depths from the surface to 10 m. In South Australia, offshore nursery and inshore spawning grounds have been identified, with small (<30 mm ML) and large (>150 mm ML) individuals found predominately in shallow, inshore waters, while medium sized animals are more abundant offshore. The distribution and abundance patterns of adult squids in the Gulf St Vincent (South Australia) were found to be highly variable, but they conform to a systematic, seasonal pattern consistent year to year; abundance typically increases for 6 months, peaks and declines for the remainder of the year, with the peak timing varying among regions, following an anti-clockwise direction around the Gulf. Males attain larger sizes than females and trawl data indicate a 1.01:1.0 sex ratio. However, jig data show a markedly higher proportion of

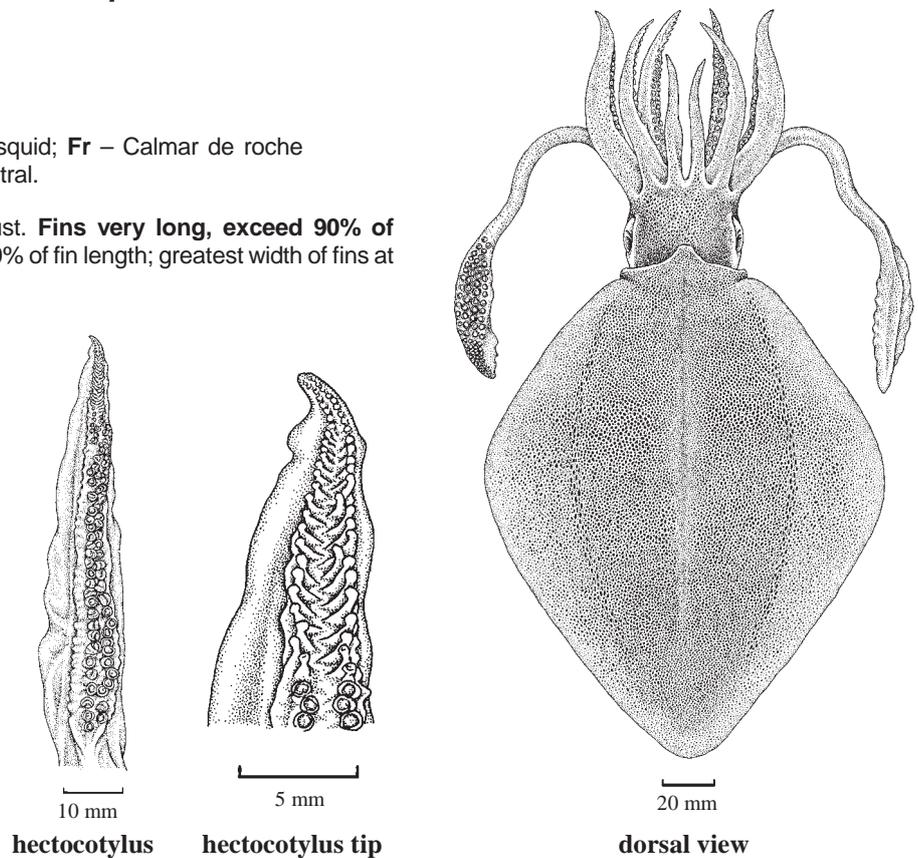


Fig. 129 *Sepioteuthis australis*

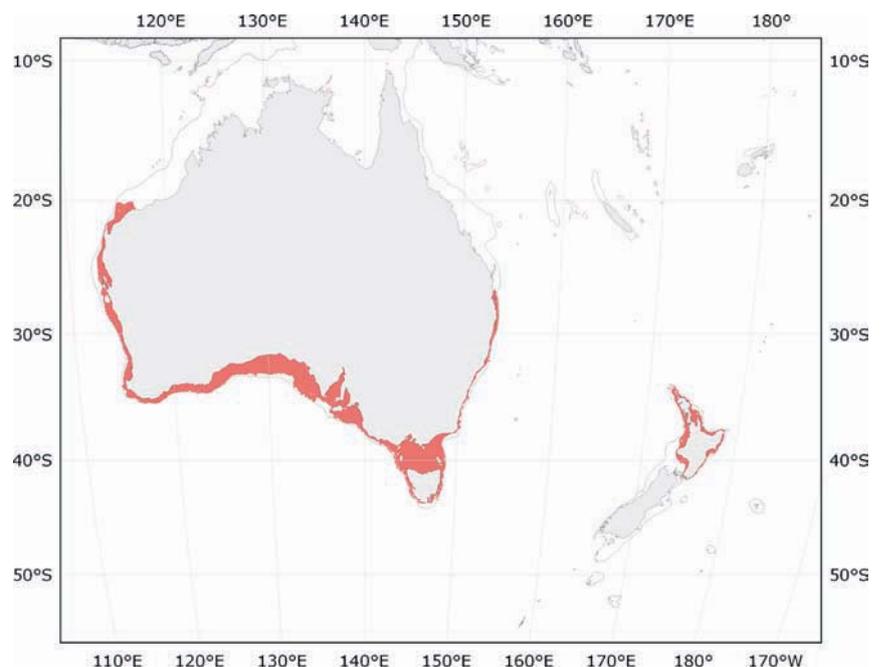


Fig. 130 *Sepioteuthis australis*

■ Known distribution

males in the catches, indicating that this fishery is selective for males and that jig fishing throughout the spawning season can potentially modify the process of sexual selection and the mating behaviours of the individuals within the spawning population, highlighting the need for closures over this crucial period.

The smallest observed mature male measured 88 mm mantle length and the smallest mature female 117 mm mantle length, while size at 50% maturity is about 150 and 160 mm for males and females, respectively. Mature individuals occur year-round indicating that spawning, also, extends throughout the year. Spawning involves complex body patterns and various mating types. Reproductive behaviour may differ among different populations. Eggs are laid in white, finger-like strands, approximately 60 to 70 mm long, each strand containing between 3 and 9 eggs. Since females may store sperm from more than one male, individual egg strands may display considerable genetic diversity through multiple paternities. Clusters of egg strands are attached to macroalgae and seagrass, in sheltered, shallow, inshore areas. Egg mass size varies considerably, ranging from solitary egg strands attached at the end of seagrass blades to large masses containing up to 1 912 strands. Most egg masses contain < 300 egg strands.

Embryonic development takes 61 days at 13°C and 31 days at 20°C. Hatching rates decline significantly with increasing temperature. Embryo mortality rates range between 2 to 25% and are highly variable, both spatially and temporally, depending on egg-mass size, the substrate upon which the mass is attached, the location of the embryo within the mass, and the degree of biofouling. While relatively unaffected by natural temperature fluctuations, embryos may be damaged by sudden salinity changes, like those caused by heavy rainfall and subsequent runoff of freshwater in coastal areas. Also, embryos located deeper within the egg mass suffer higher rates of mortality and abnormal development than those located around the periphery. Embryos hatch at night, reducing the risk of predation by visual predators. Tasmanian *S. australis* hatchlings range in size from 4.3 to 7.3 mm mantle length, slightly larger than those from South Australia (mean 4.75 mm ML). Once hatched, paralarvae are photopositive and actively swim to the surface. Observations on South Australia paralarvae indicate that they remain planktonic on the spawning grounds until approximately 8 mm mantle length, after which they become benthic. Small paralarvae (~7 mm mantle length) have been observed to feed on mysid shrimp and other zooplankton associated with low relief seagrass beds. Although their dietary requirements are unknown, mysid shrimp and crab zoea have been successfully used to rear hatchlings in captivity. Initial hatchling size may, by itself, explain the high variability in size in animals of the same age. Growth is rapid, and the life span is approximately one year; males grow faster and attain larger sizes than females. Water temperature significantly affects growth rates, with individuals hatched in warmer seasons reaching a final size that could surpass that of earlier-hatched therefore older individuals. The effect of temperature is not limited to initial growth stages, but continues to influence growth patterns throughout the adult life cycle. These seasonal differences in growth translate into substantial variations in size-at-age. The dynamic nature of oceanographic conditions in some areas of its distributional range (i.e. Tasmania waters) may result in high variability in both the population structure and stock-recruitment relationship. Also, significant differences in growth occur between genetic types, with the hybrids always growing faster (at least 60% larger at 150 days old) than the 2 parental taxa, a phenomenon commonly referred to as hybrid vigour. Spatial differences in growth also exist, e.g. individuals from Western Australia usually grow faster than those from South Australia and New Zealand. *Sepioteuthis australis* is a key component of the marine ecosystem as a primary consumer of crustaceans and fishes and as a food source for a variety of predatory species.

Interest to Fisheries: *Sepioteuthis australis* is the object of fisheries throughout its distributional range, where it is taken by commercial trawlers as well as by jigging and recreational fishing activities. The South Australian fishery is the most productive and more extensively studied and documented. It began to develop in the early to mid 1970s when squids were taken as a byproduct of the net sector of the marine scalefish and prawn fisheries. Catch and effort in the late 1970s increased, and by 1979/80 total catch had increased four-fold to 193 tonnes, with an estimated value of AUD 540 000. The fishery has continued to expand, and *S. australis* has become South Australia's third most valuable Marine Scalefish (MSF) species behind King George whiting (*Sillaginodes punctata*) and snapper (*Pagrus auratus*). Also, the average price of the southern reef squid has continuously increased to approximately A\$3 per kg and, despite lower catches in 2002/03, the total value peaked that year at an estimated A\$3.0 million. Jigging dominates the fishery and it is permitted in most State waters, with the exception of several aquatic reserves. In New Zealand, relatively low quantities are caught by trawl.

Even though most of the catch is landed by the hand jig and haul net sectors, gill nets and dab nets also are used. Conventional 5 to 6 m fibreglass or aluminium vessels with high-powered motors (>60 hp) are typically used by both the commercial and recreational sectors. Recreational fishers also fish from jetties, breakwaters and other shore-based platforms. Prawn trawlers operating in deeper waters (>10 m) of South Australia's Gulf of St Vincent, Spencer Gulf and Far West Coast continue to take incidental catches of calamary, although the magnitude of this catch is unknown. Currently, no harvest controls exist on the commercial catch of the southern reef squid. High market value, relatively low set-up costs, and open access to all fishers with a Marine Scalefish, or rock lobster licence, suggest that there is considerable latent effort and potential for the fishery to expand rapidly. Since fishing effort for this species focuses on the spawning aggregations, in 1992 the fisheries management agency raised concerns about the increasing popularity of calamary fishing by both recreational and commercial fishers and the potential vulnerability of the spawning stocks (Marine Scalefish White Paper, 1992). Also, the illegal sale of squids has been reported. These influences resulted in the implementation of recreational bag and boat limits in 1995 (i.e. 15 per bag/45 per boat per day). Currently, generic control measures such as spatial and temporal closures and gear restrictions apply to the net sector; also, netting is forbidden in all metropolitan waters and in waters less than 5 metres deep, as well as in numerous bays and marine protected areas. To date, no specific regulations apply to the commercial fishery. The spatial segregations of squid populations in South Australian waters, with juveniles and subadults distributed offshore and adults and spawning individuals aggregated inshore, enables quantification of offshore squid catch rates. This is accomplished by fishery-independent trawl surveys that target prawn and provide a feasible method to forecast inshore recruitment to the fishery.

Local Names: AUSTRALIA: Southern calamary.

Remarks: Allozyme electrophoresis identified three different calamary 'genetic-types' from southern Australian and northern New Zealand waters (Triantafillos and Adams, 2001) that were categorized as 'peripheral', 'central' or 'hybrid' types. The 'peripheral' types were almost exclusively found around the southwestern and southeastern limits of the distributional range (i.e. Perth and Albany on the western coast and Newcastle, New South Wales on the eastern coast), whereas the 'central' type dominated in the gulf waters and the southern Australia Bight. Where these two forms overlap, a third, 'hybrid' form is found. Preliminary morphological and reproductive data support the hypothesis of the existence of two taxa of *Sepioteuthis australis* in South Australian waters, while mitochondrial DNA sequence data are inconclusive.

Observations on spawning individuals in protected areas with acoustic telemetry (Pecl *et al.*, 2007), demonstrate that animals spawn over several months, traveling hundreds of kilometers within the spawning areas during this period, without leaving the protected areas. Consequently, closures of critical spawning regions during periods of reproductive activity may protect spawners and enable undisturbed egg-laying.

Literature: Roper *et al.* (1984) Triantafillos and Adams (2001), Steer *et al.* (2005, 2006, 2007), Pecl and Moltschaniwskyj (2006), Hibberd and Pecl (2007), Moltschaniwskyj and Pecl (2007), Pecl *et al.* (2007), Vecchione (2008j).

***Sepioteuthis lessoniana* Ferussac in Lesson, 1831**

Fig. 131; Plate V, 28–29

Sepioteuthis lessoniana Ferussac, 1831, in Lesson, 1830–1831, *Zoologie*, 2(1): 471 pp. [241, pl 11]. [Type locality: not designated].

Frequent Synonyms: *Sepioteuthis hemprichii* Ehrenberg, 1831, *Sepioteuthis mauritiana* Quoy and Gaimard, 1832, *Sepioteuthis guinensi* Quoy and Gaimard, 1832, *Sepioteuthis lunulata* Quoy and Gaimard, 1832, *Sepioteuthis doreiensis* Quoy in Ferussac and D'Orbigny, 1835, *Sepioteuthis sinensis* D'Orbigny in Ferussac and D'Orbigny, 1848, *Sepioteuthis arctipinnis* Gould, 1852, *Sepioteuthis brevis* Owen, 1881, *Sepioteuthis neoguinaica* Pfeffer, 1884, *Sepioteuthis indica* Goodrich, 1896, *Sepioteuthis sieboldi* Joubin, 1898, *Sepioteuthis malayana* Wülker, 1913, *Sepioteuthis kremphi* Robson, 1928.

Misidentifications: None.

FAO Names En – Bigfin reef squid; Fr – Calmar tonnelet; Sp – Calamar manopla.

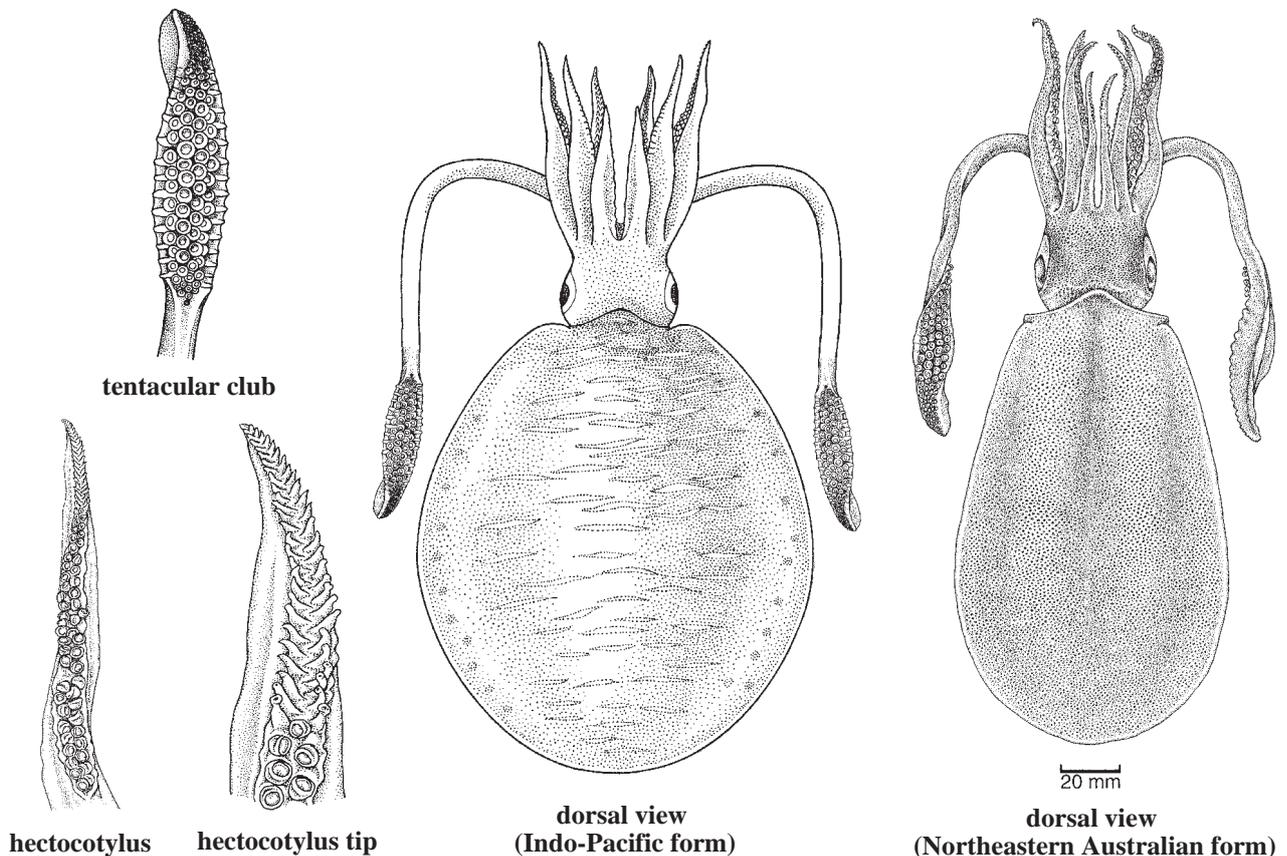


Fig. 131 *Sepioteuthis lessoniana*

Diagnostic Features: Mantle long, robust, **width about 40% of length. Fins very large, broadly oval in outline, fin length over 90% up to nearly 100% of mantle length**, their **width up to 75% of mantle length**; the greatest width occurs posterior to the midpoint of the fins. Tentacular **clubs long, expanded**; median manal suckers enlarged, rings with 14 to 23 sharp teeth. Arm sucker rings with 18 to 29 sharp, triangular teeth. Tentacles long, robust. Left ventral arm hectocotylized along distal one-third to one-fourth of arm where the 2 series of suckers are transformed into long, conical, fleshy papillae with a minute sucker with smooth chitinous ring on each tip; long, fleshy papillae connected by low folded ridge that extends along arm between the series of papillae; papillae on dorsal series thicker and longer than those on ventral series.

Size: Medium to large-sized squid; maximum reported mantle length 422 mm in males; females smaller, 382 mm mantle length; commonly 200 to 300 mm mantle length. Weight to about 2 kg.

Geographical Distribution: One of the most widely distributed loliginid squids of the Indo-West Pacific region. It occurs from Japan to northern Australia and New Zealand and from Hawaii to the east African coast, north into the Red Sea and south to southern Mozambique and Madagascar. Records from the eastern Mediterranean (Fig. 132).

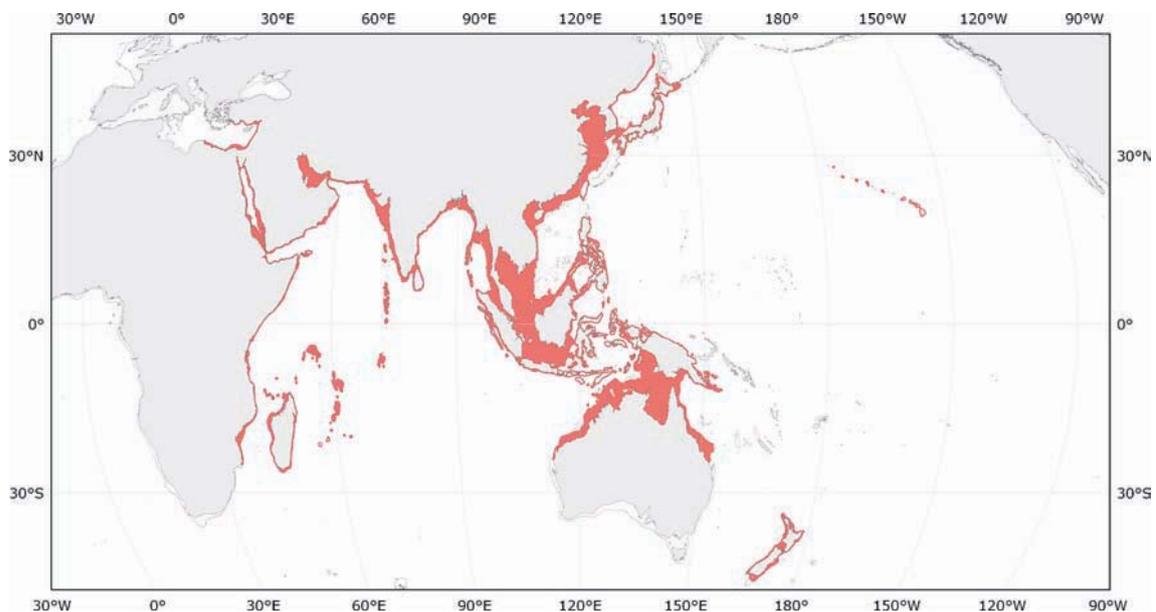


Fig. 132 *Sepioteuthis lessoniana*

■ Known distribution

Habitat and Biology: *Sepioteuthis lessoniana* occurs from the surface to about 100 m depth throughout its area of distribution. Rather common in coastal environments on sea grass beds, coral reefs and sandy bottoms, it consistently migrates inshore after winter to start mating and spawning in spring. During mating, squid form close pairs, and paired males exhibit characteristic agonistic colour patterns against other intruding males. The spawning season depends on the hydrographic conditions and can extend to all year-round. Spawning occurs from January to June off southern India and from mid-June to late August and September in the cooler southern Japanese waters. Several peaks of 2 to 3 months during the year are reported for the Andaman Sea and the Gulf of Thailand populations.

Significant spatial and temporal variation occurs in growth rates and maturity of the equatorial, tropical and subtropical Indo-Pacific populations. In the "hot", shallow, equatorial waters of the Gulf of Thailand, *S. lessoniana* grow faster and mature earlier, at a much smaller size, than *S. lessoniana* that inhabit the "cool" subtropical waters of southern Australia. The tropical population off Townsville, northeastern Australia, show an intermediate situation between the 2 extremes, as well as an alternation of generations that depends on the season of hatching.

Flexible reproductive strategies exist in this species and it is able to spawn multiple batches of eggs at discrete times throughout the adult life span. While field observations of spawned-out females show a consistent degeneration of the tissues of the whole body and confirm that egg-laying is the final event of the life cycle, the spawning phase itself may be quite prolonged (as also indicated by rearing observations). Eggs are embedded in milky white, soft, gelatinous, slender, finger-like capsules, each of which contains up to 13 eggs in a row. These capsules are attached in clusters to the substrate. Hatchlings are planktonic and range in size between 4.5 and 6.5 mm mantle length. The number of eggs in a single capsule, the mode of capsule attachment to the substrate, the spawning season and hatchling chromatophore number and arrangement, all are elements that supported the existence of a complex of populations in Japanese waters, and of different morphs in other areas, e.g. Thai waters and Western Australian waters. This was supported also by genetic studies. The taxonomic status of these populations, however, remains unresolved (see Remarks).

While length frequency analyses and field observations indicated a life span of 1 to 3 years, subsequent rearing experiments and field studies indicate a considerably shorter life cycle; females may reach sexual maturity and spawn at ages of 110 to 115 days, at mantle lengths between 105 and 145 mm. Direct ageing techniques (i.e. statolith reading and analysis) used on field-captured animals reveal that *S. lessoniana* of tropical Australian waters grow at an even faster growth rate. Individuals reach maturity and complete the whole life cycle in less than 100 days, at a size of about 180 to 200 mm mantle length.

Such a rapid growth rate is one of the characteristics that makes *S. lessoniana* especially suitable to laboratory experiments and to aquaculture projects. The life cycle in captivity is completed in 4 to 6 months with adult weights between 0.4 and 2.2 kg; feeding rate is high. A variety of prey items, e.g. live fishes and crustaceans, is eaten, and late juveniles and adults also can be trained to accept and ingest prepared food pellets. Crowding in captivity can be a problem during the crucial juvenile phase, but it is tolerated afterwards; the incidence of disease and cannibalism is low; reproduction is easily achieved in captivity. All these biological characteristics make *S. lessoniana* promising for aquaculture projects focused on the needs of biomedical research as well as on human food production. Successful cephalopod mass-culture experiments in Thailand on 3 cephalopod species, including *S. lessoniana*, have led to the production and release of a consistent amount of cephalopod paralarvae (about 2 million each year since 1990) to enhance natural stocks. Furthermore, *S. lessoniana* has been cultured through several successive generations in a large-scale, experimental culture system in Thailand. Marketable size is attained about four months after hatching, so the production of three crops annually is possible.

In the natural environment this species preys primarily on prawns and fishes, occasionally on stomatopods and crabs. Cannibalism is not very common.

Interest to Fisheries: *Sepioteuthis lessoniana* is of commercial interest throughout its distributional range, and it is marketed mostly fresh but also dried. Over its entire range it is captured throughout the year with a variety of gears, including lure-hooks, set nets, spears, beach seines, purse seines, jigs and even traps (which they enter to spawn, attracted by the clusters of eggs placed in the traps by the fishermen) in inshore waters, and by trawlers on the continental shelf. Most squids in Japanese waters are caught by directed trawl fishery and also as a trawl bycatch. A directed purse seine fishery for *S. lessoniana* occurs from May to September around Hong Kong, where squid jigging also is efficiently practiced. The bigfin reef squid is one of the several loliginid species caught in the waters of the South China Sea, and it probably represents one of the main components of the captures in Indonesian waters, as evidenced by local studies. It also is one of the cephalopod species that supports a small domestic fishery in northern Australian waters. This species is highly abundant in the Gulf of Thailand and the Andaman Sea, where it represents one of the most important commercial species for the cephalopod fishery. It is caught in smaller quantities all along the east coast of India, and it supports a fishing industry in the Madras state. *Sepioteuthis lessoniana* accounts for around 7% of Indian east coast cephalopod landings, all from Palk Bay and the Gulf of Mannar. The species is reported as moderately abundant in Sri Lankan waters but rather scarce on the west coast of India. Very poor information is available for the remaining part of the Arabian Sea and the eastern African waters, although significant local fishery production is likely to occur.

Local Names: AUSTRALIA: Oval squid; CHINA: Daai mei yau yue; INDIA: Kanava; JAPAN: Aoriika, Akaika, Bashouika, Izuika, Kuaika, Kutsuika, Mizuika, Moika, Shiroika.

Remarks: Both morphological and molecular evidence indicate that *S. lessoniana* may be a complex of cryptic species, and a number of "types" are morphologically distinct, even in hatchlings. In Japan, local populations around the coast of Okinawa were long classified by the fisherman into three groups, based on their general appearance and meat quality and therefore market price (Okutani, 1984). Segawa *et al.*, (1993a) suggested the existence of 2 different populations based on the difference between the egg capsules and the way these are laid. Subsequent isozyme analysis confirmed the existence of 3 reproductively isolated groups: Akaika (Red squid), Shiroika (White squid) and Kuaika (Quacking squid) (Izuka *et al.*, 1994), which show different distributional patterns (Izuka *et al.*, 1996a). In spite of their spatial segregation, it was impossible to separate the 3 populations morphologically until Izuka *et al.* (1996b) described different chromatophore patterns on the ventral side of funnel in the 3 "forms". Now, significant differences, mainly associated with the size, number and configuration of chromatophores on hatchlings, (Jivaluk *et al.*, 2005) are recognized for the Thai type and the 3 Japanese forms. Okutani (2005) reports 3 different forms in his recent monograph on the cuttlefishes and squids of the world: 1) *Sepioteuthis lessoniana sensu stricto*, widely distributed throughout the Indo-Pacific, including the southern waters off Japan; 2) *Sepioteuthis lessoniana* form "Akaika", distributed in the Japanese waters south of Shikoku and the Nansei-Shoto Islands; 3) *Sepioteuthis lessoniana* form "Kwaika", in Japanese waters from the Ogasawara and the Nansei-Shoto Islands. Also, genetic evidence indicates that *Sepioteuthis lessoniana* from the northwestern waters off Australia may be a species complex (Triantafillos and Adams, 2005). Based on the above-mentioned observations, further studies need to be carried out to better understand the systematics of the Australasian and the Indo-Pacific forms of this valuable and important species. The complete mitochondrial genome of *Sepioteuthis lessoniana* has been determined (Akasaki *et al.*, 2006).

Initial studies on the development of statoliths in embryos and hatchlings reared under different regimes of temperature, salinity and photoperiod indicate a variable number of growth increments under different environmental conditions; this result indicates the necessity to verify the hypothesis of daily growth increments being reflected in the rings of statoliths (Chung and Lu, 2005) in this species.

Literature: Okutani (1984), Roper *et al.* (1984), Segawa *et al.* (1993a), Dunning (1998d), Salman (2002), Okutani (2005), Jivaluk, *et al.* (2005), Nabhitabhata *et al.* (2005), Triantafillos and Adams (2005), Jereb and Roper (2006), Vecchione (2008j).

***Uroteuthis* Rehder, 1945**

Uroteuthis Rehder, 1945, *Proceedings of the Biological Society of Washington*, 58:21–26, 1 plate. [21].

Type Species: *Uroteuthis bartschi* Rehder, 1945.

Diagnostic Features: Tentacular **clubs expanded**, with suckers in four series. Proximal margin of arm sucker rings with semi-crescent plate; distal margin with square teeth. Hectocotylus with two rows of papillae. Spermatophore cement body short. Eggs small. **Pair of photophores on ventral surface of ink sac.**

Size: Medium-sized squid; mantle length up to 200 mm.

Geographical Distribution: Indo-West Pacific Ocean.

Remarks: The pair of photophores on the ventral surface of the ink sac in all *Uroteuthis* species is perhaps the strongest indication of a close relationship among species to be found in this family. This relationship is further supported by similarities in the hectocotylus and arm-sucker dentition. These characters led Natsukari (1984a) to establish the genus *Photololigo* for the Indo-West Pacific species with photophores, formerly assigned either to *Loligo* or *Doryteuthis*. However, *Uroteuthis bartschi* also has similar photophores, a similar hectocotylus and arm suckers, and an Indo-West Pacific distribution. The elongation of the posterior mantle, which was given generic status in the description of *Uroteuthis*, is the extreme example in a cline of mantle elongation, similar to that found in the eastern Atlantic where *Alloteuthis* is the extreme example. This elongation is so extreme in *Uroteuthis* as to cause a discontinuity in the cline, which warrants separate taxonomic status, but the sole recognized species in this taxon possesses all of the generic characters of *Photololigo*. Thus, it should be included in the genus that Natsukari described. However, nomenclatural priority belongs to *Uroteuthis* as the name of the genus, rather than the more descriptive *Photololigo*. Aside from the photophores, *Uroteuthis* and *Alloteuthis* can be separated based upon position of the fins - lateral versus terminal, respectively - and tentacular ring dentition. Therefore, elongation of the posterior mantle in these 2 taxa appears to be analogous, not homologous (from Vecchione *et al.*, 1998b, Vecchione, 2008k). Following the general consensus reached in Phuket in 2003, 15 nominal species, divided into 3 subgenera and 3 species with undetermined subgenus, are presently included in *Uroteuthis* (Vecchione *et al.*, 2005); however, this generic and subgeneric arrangement is controversial. Yeatman (1993) and Yeatman and Benzie (1994) presented evidence that some species of *Uroteuthis* (*Photololigo*) actually are species complexes.

Since the type species of the formerly monotypic genus belongs to the subgenus *Uroteuthis*, the subgenus *Uroteuthis* is treated first in this work.

Literature: Vecchione *et al.* (1998b), Vecchione *et al.* (2005), Vecchione (2008k).

Key to the subgenera of *Uroteuthis*

- 1a.** Tail-like elongation of posterior mantle extends beyond fins ***Uroteuthis (Uroteuthis)***
1b. Elongation of posterior mantle variable but not tail-like, fins extend along sides to posterior mantle tip → **2**
- 2a.** Modified portion of hectocotylus less than entire arm, proximal portion not modified . . . ***Uroteuthis (Photololigo)***
2b. Hectocotylus modified along entire arm ***Uroteuthis (Aestuariolus)***

Subgenus *Uroteuthis* Rehder, 1945

Uroteuthis Rehder, 1945, *Proceedings of the Biological Society of Washington*, 58:21–26, 1 plate. [21].

Type Species: *Uroteuthis bartschi* Rehder, 1945.

***Uroteuthis (Uroteuthis) bartschi* Rehder, 1945**

Uroteuthis bartschi Rehder, 1945, *Proceedings of the Biological Society of Washington*, 58:21–26, 1 pl. [22, pl. 3]. [Type locality: Jolo Harbour, Jolo Island, Philippine Islands, western Pacific Ocean].

Frequent Synonyms: None.

Misidentifications: None.

FAO Names: En – Bartsch's squid; Fr – Calmar tépo; Sp – Calamarete.

Diagnostic Features: Mantle very narrow, elongate, with **very long, pointed tail**; **more pronounced in males**. Fins rhomboidal, their lateral angles rounded, posterior borders concave, generally fins extend the entire length of tail (occasionally only as a minute membrane). Head relatively small, narrow. **Arm suckers with broad, plate-like teeth in the distal margin, smooth proximally**. Large medial tentacular club suckers with long, square-tipped teeth. **Left ventral arm hectocotylied in distal half** by abrupt transformation of suckers into long, stout papillae.

Size: Medium-sized squid; maximum mantle length 200 mm.

Geographical Distribution: Western Pacific Ocean: in Philippine and Indonesian waters (Fig. 134).

Habitat and Biology: Upper and lower limit of depth distribution undetermined.

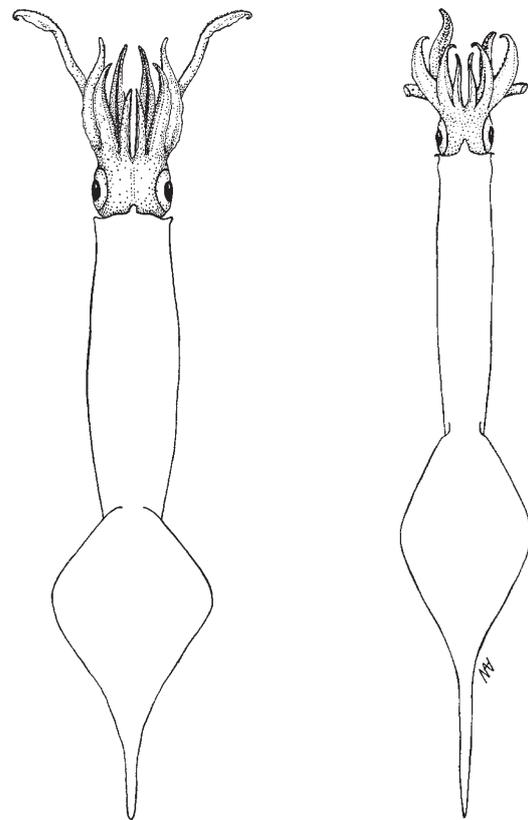
Interest to Fisheries: Taken as bycatch in local trawl fisheries. Utilized mostly fresh.

Local Names: None available.

Remarks: None.

Literature: Roper *et al.* (1984), Dunning (1998d).

Fig. 133



dorsal view of female

dorsal view of male

Fig. 133 *Uroteuthis (Uroteuthis) bartschi*

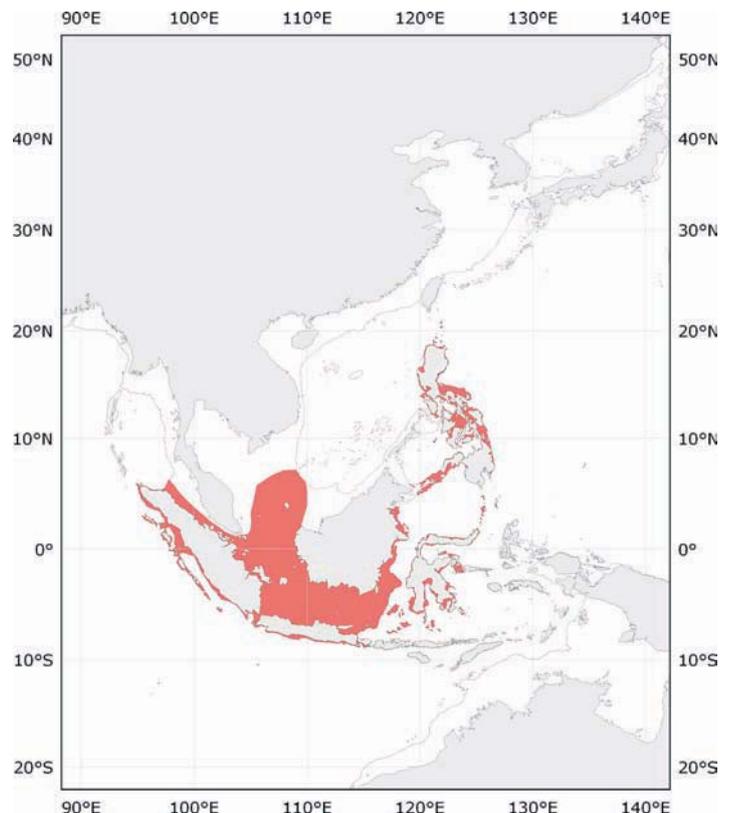


Fig. 134 *Uroteuthis (Uroteuthis) bartschi*

Known distribution

Subgenus *Aestuariolus* Alexeyev, 1992

Aestuariolus Alexeyev, 1992, *Zoologicheskij Zhurnal*, 71(11):12–23, 2 figures. [21].

Type Species: *Aestuariolus noctiluca* (Lu, Roper, and Tait, 1985).

Uroteuthis (Aestuariolus) noctiluca (Lu, Roper, and Tait, 1985)

Fig. 135

Loliolus noctiluca Lu, Roper, and Tait, 1985, *Proceedings of the Royal Society of Victoria*, 97(2): 59–85. [59, figs 1–6]. [Type locality: North Port Phillip Bay, Australia].

Frequent Synonyms: None.

Misidentifications: None.

FAO Names: En – Luminous bay squid; Fr – Calmar lumineux; Sp – Calamar luminoso.

Diagnostic Features: Mantle cylindrical; mantle width about 28 to 30% mantle length. **Fins roundish.** Arms short; arm sucker rings with 4 to 7 teeth. Tentacles relatively short, robust, **clubs large, broadly expanded; medial manal suckers 3 to 6 times the diameter of marginal manal suckers;** large manal-sucker rings smooth. **Left ventral arm of males hectocotylized along the entire length;** suckers modified into conspicuous elongate interconnected papillae with minute apical suckers.

Size: Small-sized squid; maximum reported mantle length 90 mm.

Geographical Distribution: Australian waters from the Gulf of Carpentaria, along the eastern Australian coast, south to Tasmania (Fig. 136).

Habitat and Biology: This species occurs in shallow coastal habitats on sandy bottoms with seagrass beds, to depths of about 50 m. It can enter estuarine water with bottom-water salinities as low as 24 PSU, surface salinities as low as 17 PSU and a temperature of approximately 11°C. A short-lived species, it can complete its life cycle in northern Australian waters in less than 4 months; here, winter-caught individuals show faster growth than summer- or autumn-caught individuals. Also, females grow faster than males during winter. A comparison between tropical North Queensland and the temperate New South Wales populations indicates that temperate individuals live longer and have slower growth rates than tropical forms. Females grow larger than males.

Interest to Fisheries: Caught incidentally in inshore prawn trawls along the northeastern Australian coast.

Local names: AUSTRALIA: Bottle squid.

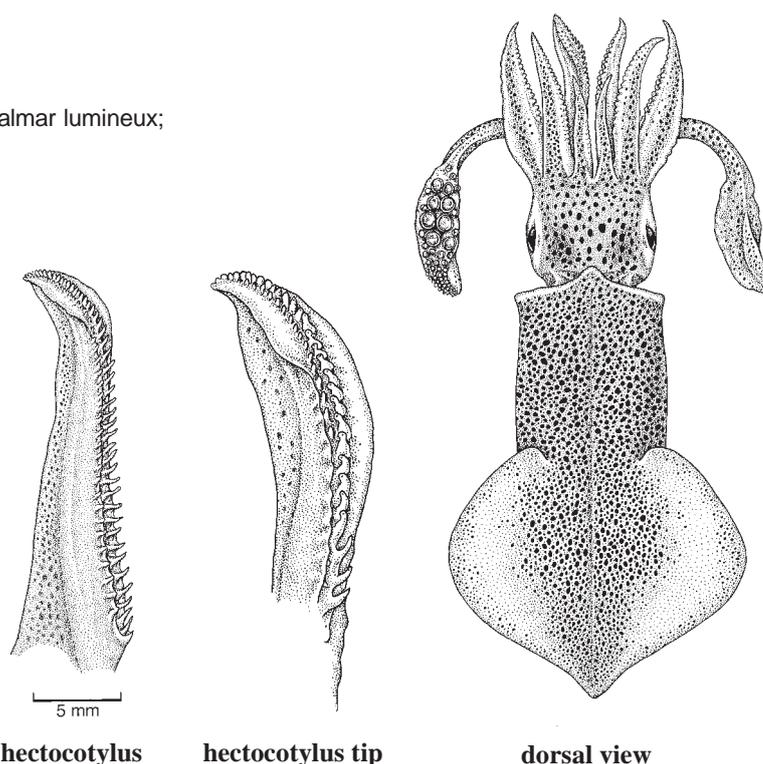


Fig. 135 *Uroteuthis (Aestuariolus) noctiluca*

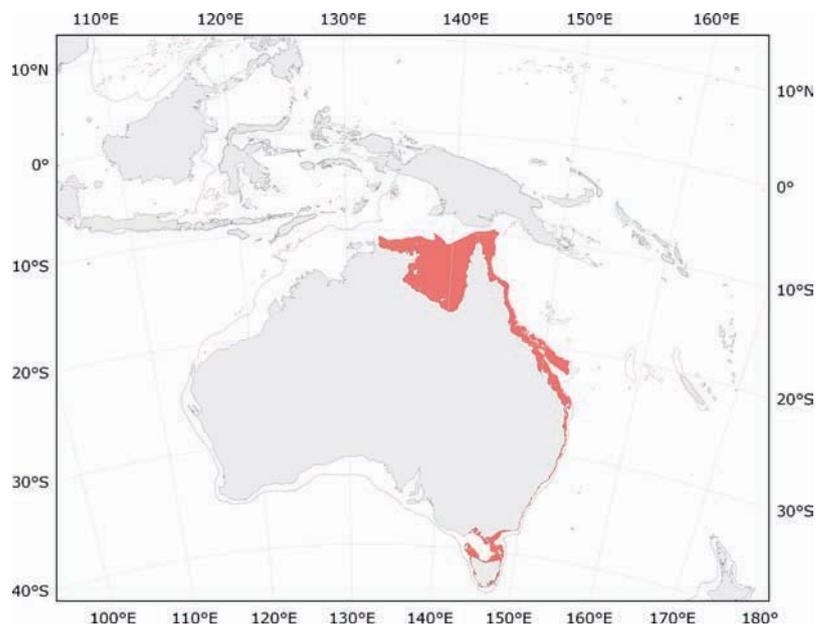


Fig. 136 *Uroteuthis (Aestuariolus) noctiluca*

Known distribution

Remarks: This species may be confused with juveniles of other, larger, more commercially important species from which it can be separated by fin shape and, in freshly caught specimens, by the presence of yellow and pink chromatophores on the fin margins and mantle. Two forms exist on the eastern Australian coast, with males differing by the sucker rings on right ventral arms. However, no difference in females is known. The luminous bay squid appears to be the ecological equivalent to *Lolliguncula brevis*. Similar in body size and shape, they both inhabit shallow inshore waters and are highly tolerant of salinity and temperature variations, an unusual characteristic among cephalopods.

Literature: Lu *et al.* (1985), Dunning (1998d), Okutani (2005).

Subgenus *Photololigo* Natsukari, 1984

Photololigo Natsukari, 1984a, *Venus, Japanese Journal of Malacology*, 43: 229–239. [230].

Type Species: *Photololigo edulis* Hoyle, 1885.

Uroteuthis (Photololigo) edulis (Hoyle, 1885)

Fig. 137; Plate VI, 33

Loligo edulis Hoyle, 1885a, *Annals and Magazine of Natural History*, Series 5 (16):181–203. [186]. [Type locality: purchased in market, Yokohama, Japan].

Frequent Synonyms: *Doryteuthis kensaki* Wakiya and Ishikawa, 1921, Okutani, 1973, *Loligo budo* Wakiya and Ishikawa, 1921, Okada, 1927a, Roper *et al.*, 1984, Nesis, 1982, Okutani *et al.*, 1987, *Loligo chinensis*, Sasaki, 1914, Wakiya and Ishikawa, 1921, non Gray, 1849, *Loligo edulis*, Hoyle, 1885, as form *grandipes* and *nagasakiensis*, Sasaki, 1929, *Loligo kensaki* Wakiya and Ishikawa, 1921, *Loligo singhalensis*, Adam, 1954 (fide Korzun and Alekseyev, 1991), non Ortmann, 1891.

Misidentifications: *Uroteuthis sibogae*, *Uroteuthis (Photololigo) chinensis*.

FAO Names: En – Swordtip squid; Fr – Calmar épée; Sp – Calamar espada.

Diagnostic Features: Mantle moderately stout, elongate, slender in mature males. **Fins rhombic, attain 70% of mantle length** in adults, anterior margin slightly convex, posterior margin gently concave, lateral angles rounded; fins slightly longer than wide in adults, width 60% of mantle length (usually slightly larger in females). Gladius long, moderately narrow, about 6 to 7 times longer than wide; vanes distinctly curved laterally; free rachis length about 20% of gladius length. Arms moderately long, 25 to 45% of mantle length. Arm formula variable: 3>4>2>1 or 4>3>2>1. **Suckers on arms II and III of mature males noticeably enlarged** as a secondary sexual character (Brakoniecki, 1986). Arm sucker rings with up to 12 (more often 6 to 8) long, slender, square-cut (bluntly-pointed) teeth on the distal margin; the proximal margin smooth or only irregularly denticulate with inconspicuous teeth. Tentacles moderately long, slender; tentacular clubs expanded, lanceolate; about 16 medial manal suckers slightly larger than the marginal suckers, approximately equal in diameter to largest arm suckers, with 30 to 40 sharp conical teeth, 20 to 30 small teeth interspersed between 10 large teeth. **More than 50% of left ventral arm** (up to 65 to 80%, Jereb and Roper 2006), **hectocotylized** by enlargement of at least 50 pairs of sucker stalks into swollen papillae, each with a minute rudimentary sucker on the tip; papillae slightly larger in ventral series. **Mature males have a cutaneous ridge on their ventral mantle surface.**

Size: Medium to large sized squid; maximum mantle length 502 mm for males, 410 mm for females; common size in commercial catches between 150 and 250 mm.

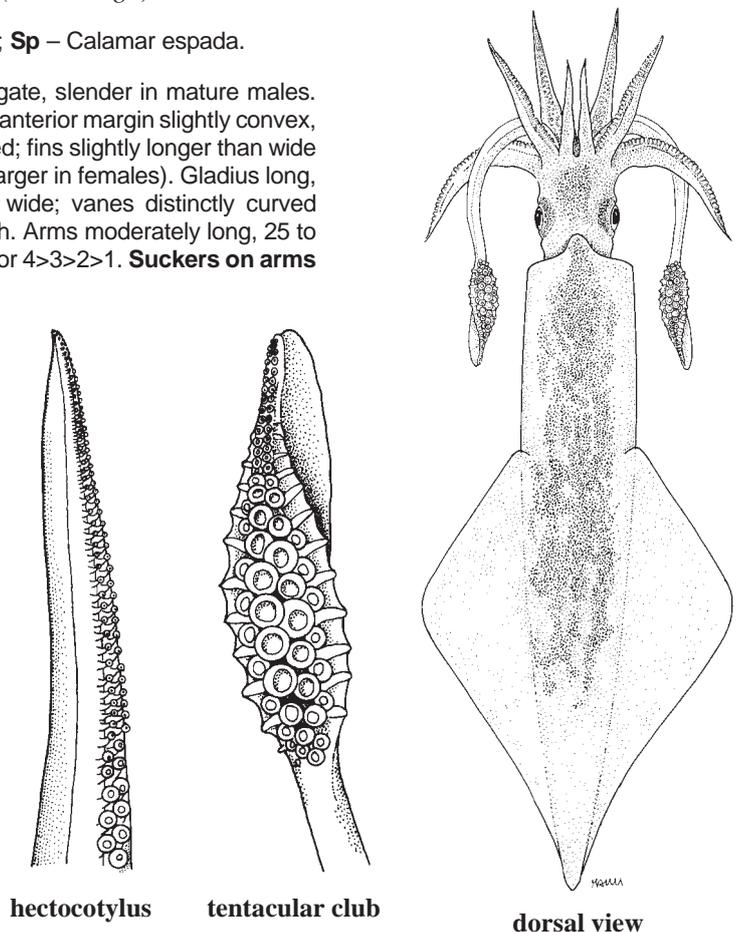
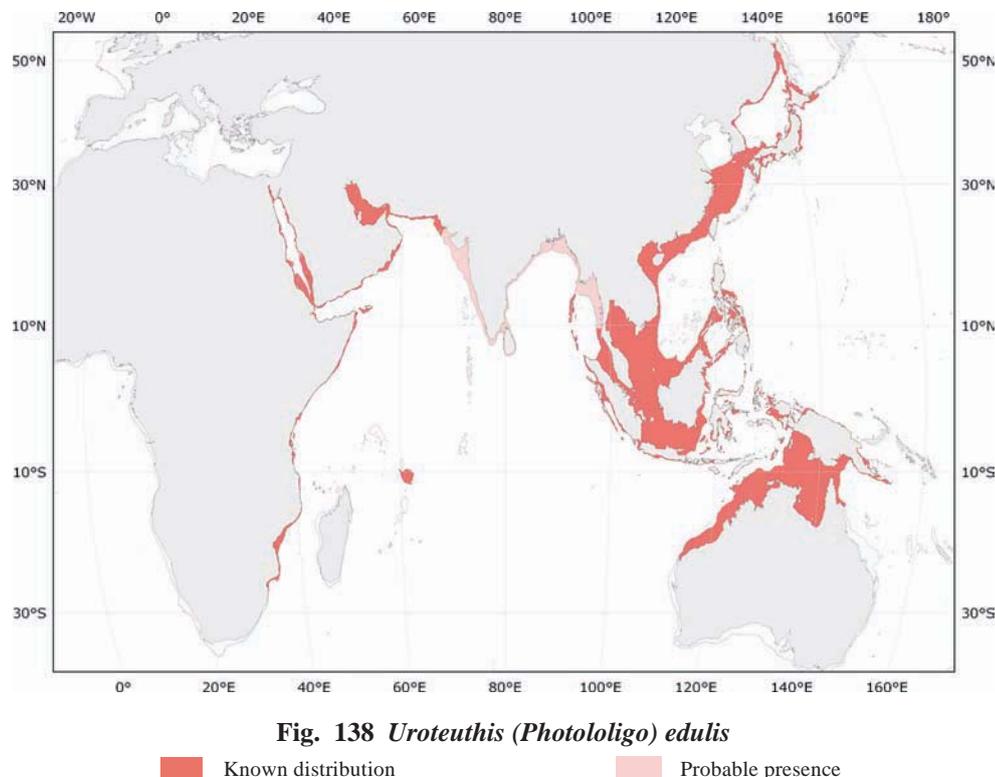


Fig. 137 *Uroteuthis (Photololigo) edulis*

Geographical Distribution: An Indo-Pacific species, *Uroteuthis edulis* is common and relatively abundant in the western Pacific, from its northern waters (East China Sea, Japan Sea) to tropical seas (Indonesia, Java Sea, Malaysia, Thailand), south to northern Australia. The distribution of *U. edulis* also extends throughout the Indian Ocean, from its southeastern waters, i.e. the Andaman Sea, Thailand, and the southeastern Bay of Bengal, to the Arabian Sea, including the Gulf of Aden, the Gulf of Oman, and the Persian Gulf, the Red Sea, and southward to Mozambique (East African coast, Saya de Malha Bank) (Fig. 138).



Habitat and Biology: *Uroteuthis edulis* inhabits continental shelf waters in Japan and winters inshore in shallow water. Although reported as one of the most oceanic species of the Japanese loliginids, it does not occur in the waters beyond the continental shelf.

The spawning season extends throughout the year, with 3 main peaks in spring, summer and autumn. Spawning and feeding migrations occur in the western region of the Japan Sea. The size at which individuals become sexually mature is very variable, depending on the season and locality. Most specimens of both sexes reach full maturity by 150 to 200 mm mantle length. The smallest size recorded for full maturity was 52 and 59 mm mantle length for males and females, respectively, while some specimens were not sexually mature at a size larger than 300 mm mantle length. Spawning occurs from 30 m down to 100 m, on sandy bottoms in coastal waters where warm oceanic currents inflow. Data from northern Australia support an extended spawning season for the species and show that in the Gulf of Carpentaria it reaches sexual maturity at smaller sizes (70 to 80 mm mantle length) than in the northern waters of the western Pacific. On the northwestern side of the Indian Ocean it also reaches sexual maturity at a small size, 70 to 80 mm mantle length or even smaller, 50 to 60 mm mantle length. The spawning period extends from autumn to spring or even to the beginning of summer.

Juveniles feed preferentially on crustaceans, while adults are mainly piscivorous. The life span is about one year. Length-weight relationships obtained for the species in different seasons and locations of the northwestern Pacific indicate a highly variable growth depending on season and area.

Interest to Fisheries: *Uroteuthis edulis* has excellent flesh quality, and it is exploited throughout its distributional range. One of the principal commercial squid species of the Japanese market, it constitutes one of the most important resources for the coastal fisheries of Kyushu and the southwestern Japan Sea. It is caught throughout the year by jig, set net, bottom trawl and other gears. This species is very abundant in the Yellow and East China Seas, and in the northern waters of Taiwan (Province of China), where, together with *U. chinensis*, it is believed to account for the majority of the Chinese squid catch; it is vigorously exploited by the Hong Kong fishery and it is believed also to be rather abundant in the South China Sea. Fished also in Malaysian waters, it is not mentioned, however, among the squid resources of Thai waters in the Gulf of Thailand. It is one of the main species of the Philippine and Indonesian fisheries and constitutes one of the most important commercial cephalopod species in northern Australian waters. Highly abundant in the Andaman Sea, where it represents one of the main Thai squid resources, it is not mentioned among the cephalopod resources of India. Its apparent absence from Indian waters probably is a matter of misidentification rather than of disjunct distribution. The presence of this species in the western Indian Ocean (i.e. Arabian Sea, Red Sea, East African waters) is confirmed; however, its potential to the fishery there is still unknown. This species is sold at high prices both fresh and frozen, processed into a dried product and also used for sashimi in Japan.

Local Names: CHINA: Tor yau yue; JAPAN: Gotouika, Kensakiika, Mawashikko (juveniles), Mehikariika.

Remarks: *Uroteuthis edulis* is characterized by a marked polymorphism, both by locality and by season. The existence of such a variety of “forms”, the taxonomic relationships of which still are not clear, makes the confident identification of the species and the assessment of populations (stocks) difficult. After the original description by Hoyle (1885a), who referred to 1 male specimen from the Yokohama Fish Market (Japan), the condition of maturity of which was not specified, the species was repeatedly redescribed by subsequent authors (see Jereb and Roper, 2006 for a review). While there is still no general consensus on the status of the species complex, at least 3 different seasonal ‘forms’ are indicated for the Indian Ocean and the northwestern Pacific: form ‘*budo*’, form ‘*edulis*’ and form ‘*kensaki*’ (Nesis, 1982, 1987, Natsukari and Tashiro, 1991, Natsukari *et al.*, 1986, 1988, Okutani, 2005). While form “*budo*” is characterized by very large clubs, long arms and large suckers in comparison with the typical *U. edulis*, the 2 other forms differ essentially in the structure of the hectocotylyzed arm: a) 7 or 8 pairs of normal suckers at the base of the arm, no small suckers on the papillae of the modified portion (form “*edulis*”), versus b) 20 to 27 pairs of normal suckers and rudimentary suckers on the papillae of the modified portion (form “*kensaki*”). Also, fin length in adults differ: they occupy up to 50 % of the mantle length in form “*edulis*”, while they reach up to 70% of the mantle length in form “*kensaki*” (Okutani, 2005).

In Australian waters, four different species of *Uroteuthis (Photololigo)* from the northern area were identified using allozymes (Yeatman and Benzie, 1994). Two of these species fit the gross morphology of *U. edulis* from Japan, while the other 2 share the distinguishing features of *U. chinensis*. However, no major population genetic structuring was evident in any of the species over the geographical range sampled. It was suggested that depth constraints, or factors associated with depth, may act as effective barriers to gene flow and, therefore, provide mechanisms for allopatric differentiation in this genus. All these observations support the opinion that widely distributed loliginid species, such as *U. edulis*, may in fact represent a series of morphologically similar sibling species; also, they underline the need for more detailed observations, information and clarification on *U. edulis* throughout the Indian Ocean, especially because of its well-documented importance as a fisheries resource in the western Pacific (Jereb and Roper, 2006).

Literature: Voss (1973), Chikuni (1983), Roper *et al.* (1984), Natsukari and Tashiro (1991), Okutani (2005), Jereb and Roper (2006).

***Uroteuthis (Photololigo) abulati* (Adam, 1955)**

Fig. 139

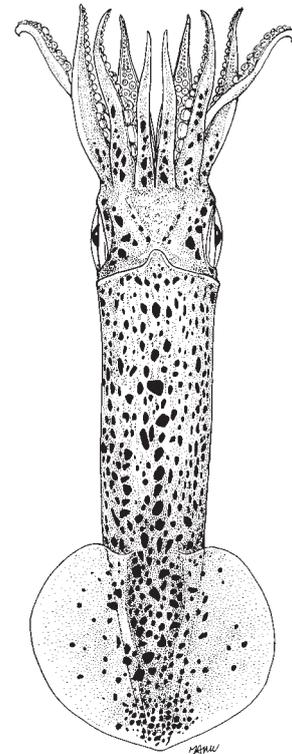
Loligo abulati Adam, 1955, *Annales de l'Institut Océanographique*, 30:185–194, 1 pl. [185, pl 50 fig 1]. [Type locality: Ile Abulat, Saudi Arabia, Red Sea].

Frequent Synonyms: None.

Misidentifications: None.

FAO Names: **En** – Red Sea squid; **Fr** – Calmar de la Mer Rouge; **Sp** – Calamar del Mar Rojo.

Diagnostic Features: Mantle slender, mantle width about 25% mantle length. Fin length and width both up to 40% mantle length. **Fourth to sixth suckers on arms II enlarged; sixth and seventh suckers on arms III enlarged.** Chitinous sucker rings with 5 to 7 quadrangular teeth on distal margin, proximal margin smooth. Hectocotylyzed arm with 6 pairs of proximal suckers, followed by biserial papillae to distal end. Chitinous rings of tentacular suckers with about 20 sharp teeth.



dorsal view

Fig. 139 *Uroteuthis (Photololigo) abulati*

Geographical Distribution: Red Sea (Fig. 140).

Remarks: After a general consensus was reached in Phuket in 2003 by worldwide experts on the loliginid family re-organization (Vecchione *et al.*, 2005), the status of this species was questioned (Roeleveld, pers. comm.) on the basis of new studies which suggest *Uroteuthis abulati* is closely related to *Afrololigo mercatoris*. However, this species is too poorly known at present to enable a determination of specific status; therefore, the species is retained herein as it was designated by Vecchione *et al.* (2005).

Literature: Adam (1955) Okutani (2005), Vecchione *et al.* (2005).

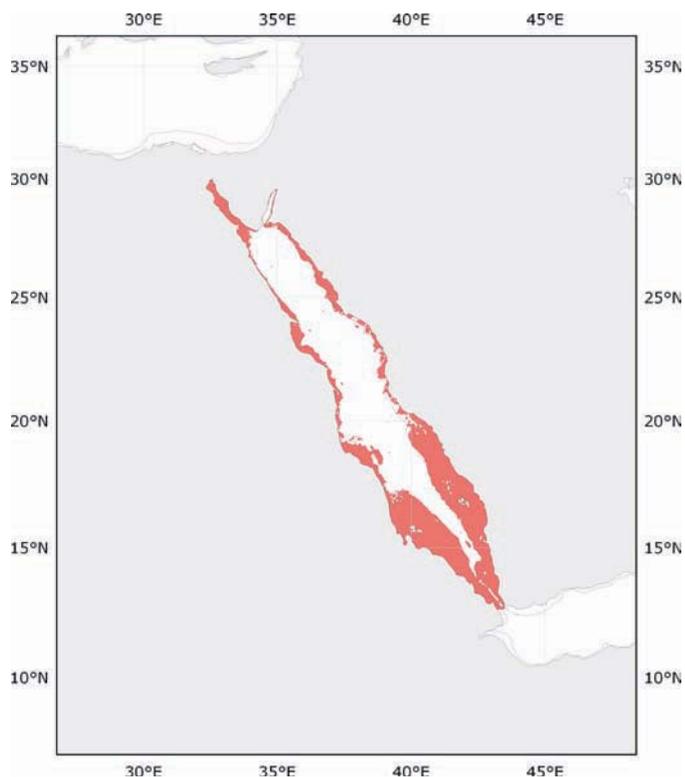


Fig. 140 *Uroteuthis (Photololigo) abulati*

■ Known distribution

***Uroteuthis (Photololigo) arabica* (Ehrenberg, 1831)**

Pteroteuthis arabica Ehrenberg, 1831, in C.G. Ehrenberg, 1828–1845. *Symbolae Physicae, seu Icones et descriptiones Corporum Naturalium novorum aut minus cognitorum... P.C. Hemprich et C.G. Ehrenberg... Pars Zoologica*, [4]: 6, unnumbered pages. Berlin. [Type locality: Red Sea].

Frequent Synonyms: None.

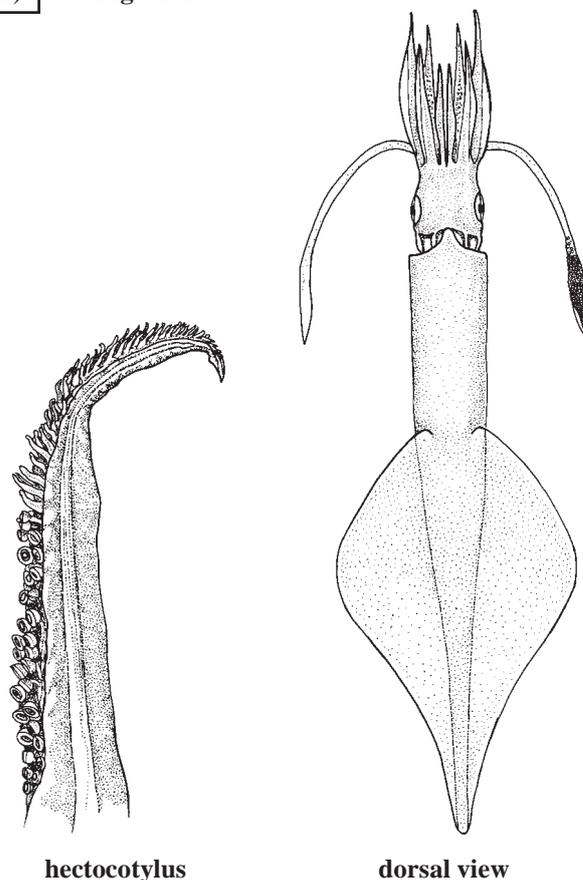
Misidentifications: None.

FAO Names: En – Needle squid; Fr – Calmar aiguille; Sp – Calamar aguja.

Diagnostic Features: Mantle long, narrow. **Mantle width about 20% mantle length (minimum 12%).** Fin length commonly 60 to 65% mantle length. Fin width in adults 33 to 50% mantle length. Edges of gladius thickened, almost straight. **Club sucker rings with 20 to 40 teeth alternating in size between large and small.** Arm sucker rings with 18 to 24 blunt teeth distributed all around the ring. Hectocotylized arm with 15 proximal pairs of normal suckers followed by fine, dense biserial papillae distally.

Size: Medium-sized squid, mantle length up to 270 mm.

Fig. 141



hectocotylus

dorsal view

Fig. 141 *Uroteuthis (Photololigo) arabica*

Geographical Distribution: Gulf of Aden, Red Sea, Mozambique (Fig. 142).

Habitat and Biology: None available.

Interest to Fisheries: Currently, no data available.

Local names: None available.

Remarks: None.

Literature: Ehrenberg, 1831, Okutani, 2005.

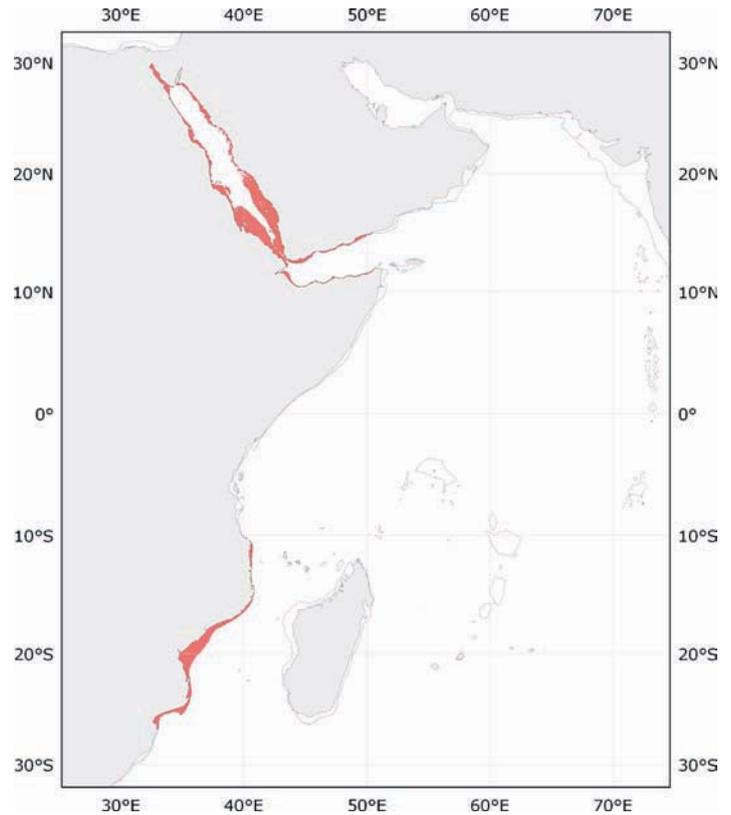


Fig. 142 *Uroteuthis (Photololigo) arabica*

■ Known distribution

***Uroteuthis (Photololigo) bengalensis* (Jothinayagam, 1987)**

Loligo bengalensis Jothinayagam, 1987, *Zoological Survey of India, Technical Monograph*, 15:1–85 [48, text; fig 17, pl 3]. [Type locality: Bay of Bengal].

Frequent Synonyms: None.

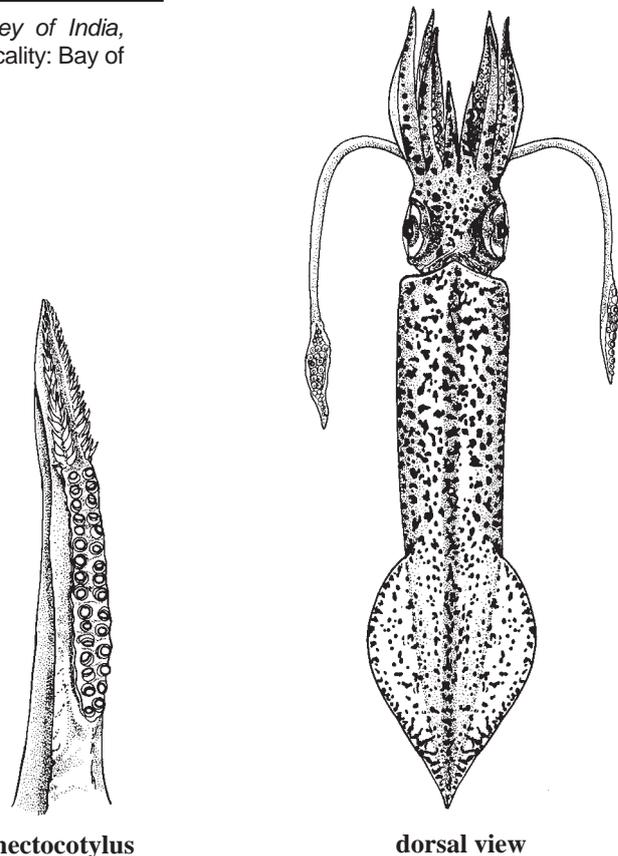
Misidentifications: *Uroteuthis chinensis*, *Uroteuthis singhalensis*.

FAO Names: **En** – Bengal squid; **Fr** – Calmar du Bengala; **Sp** – Calamar del Bengala.

Diagnostic Features: Mantle narrow, slender, pointed at posterior end; mantle width about 23% mantle length. Vane of gadius broadest at anterior area; **vane without thickened edges. Fins short and narrow; fin angle very low (about 30°).** Tentacle long, club narrow. **Large and small teeth alternate along distal portion** of tentacular club sucker rings, whereas along proximal portion teeth are small and subequal. Male left IV arm hectocotylized: 15 to 16 pairs of normal suckers in proximal two-thirds, sucker pedicels swollen and transformed into biserial papillae in the distal third.

Size: Medium-sized squid; mantle length to 150 mm.

Fig. 143



hectocotylus

dorsal view

Fig. 143 *Uroteuthis (Photololigo) bengalensis*

Geographical Distribution: Bay of Bengal (Fig. 144).

Habitat and Biology: No data available.

Interest to Fisheries: Currently unknown.

Local Names: None available.

Remarks: This species is separable from other sympatric squids, in particular from *Uroteuthis singhalensis*, by the different shape and size of the fins, by sucker teeth configuration and by the gladius vane devoid of thickened edges (Jothinayagam, 1987).

Literature: Jothinayagam, 1987, Okutani, 2005.

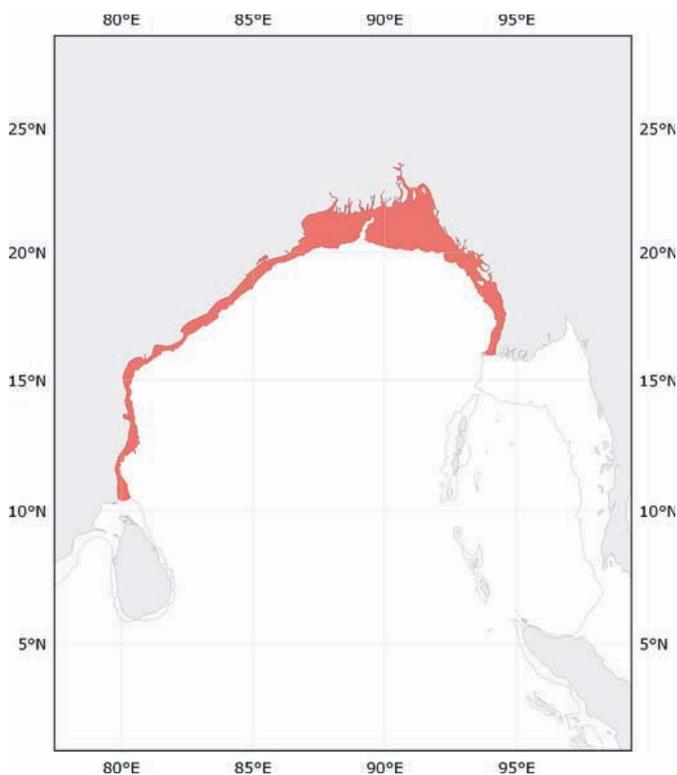


Fig. 144 *Uroteuthis (Photololigo) bengalensis*

Known distribution

***Uroteuthis (Photololigo) chinensis* Gray, 1849**

Fig. 145

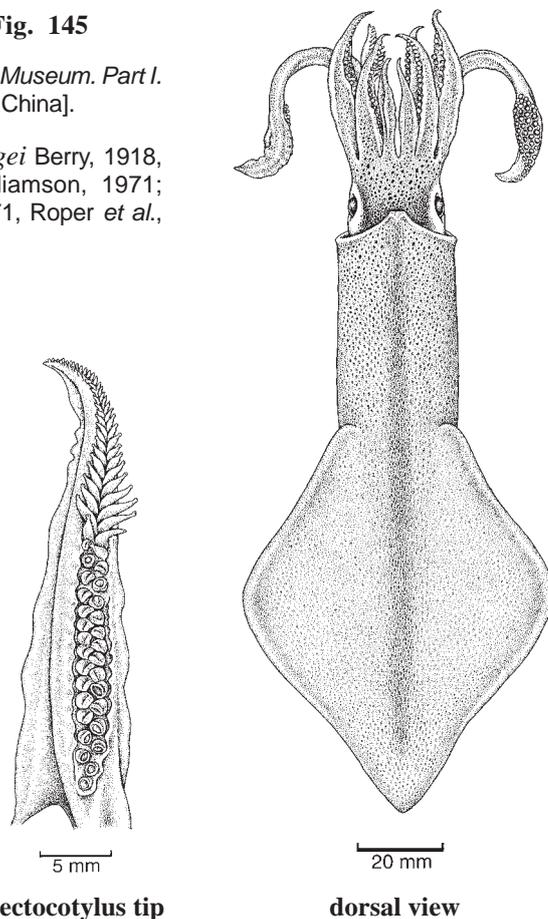
Loligo chinensis Gray, 1849, *Catalogue of the Mollusca in the British Museum. Part I. Cephalopoda Artepedia*, 164 pp. [74]. [Type locality: Canton market, China].

Frequent Synonyms: *Loligo indica* Hoyle, 1886; *Loligo etheridgei* Berry, 1918, Adam, 1954; *Loligo formosana* Sasaki, 1929, Voss and Williamson, 1971; *Doryteuthis singhalensis*, Voss, 1963a, Voss and Williamson, 1971, Roper *et al.*, 1984, Silas, 1986; *Loligo singhalensis*, Okutani, 1980.

Misidentifications: None.

FAO Names: En – Mitre squid; Fr – Calmar mitre; Sp – Calamar mitrado.

Diagnostic Features: Mantle elongate, slender, bluntly pointed posteriorly. Mantle width about 20 to 30% of mantle length, widest in its anterior part. A cutaneous ridge may be present or absent on the ventral surface of mantle in adult males. Fins rhombic, long, over two-thirds of mantle length. Gladius rather narrow: gladius width 6 to 8% of gladius length. Edges of gladius arched, not thickened. **About 12 medial manal suckers of tentacular clubs enlarged to one and a half times the diameter of the lateral suckers and 2 times the largest arm sucker;** large rings with 20 to 30 sharp, separate teeth **very unequal in size: 6 to 12 larger ones usually interspersed with 1 to 4 smaller ones.** Larger sucker rings of lateral arms with 10 to 18 sharp teeth distally, smooth or with a few plate-like teeth proximally; left ventral arm hectocotylyzed at distal one-third to one-half (hectocotylyzed arm index, HcLI, up to 70%) by modification of more than 30 suckers and stalks in each series into slender, conical papillae that are larger in the ventral series. **A secondary sexual modification of enlarged proximal suckers on arms II and III in mature males.**



hectocotylus tip

dorsal view

Fig. 145 *Uroteuthis (Photololigo) chinensis*

Size: Large-sized species; maximum reported size 490 mm mantle length for males, 310 mm for females (as *Doryteuthis singhalensis*); commonly to 200 mm mantle length.

Geographical Distribution: An Indo-Pacific species, extending from the western Pacific (Japan, South China Sea, Hong Kong, Philippines, Indonesia, northern, western and eastern Australian waters), to the Indian Ocean (Andaman Sea, Thailand and the Bay of Bengal) (Fig. 146).

Habitat and Biology: The biology of the species still is poorly known, and most basic biological information is lacking. Found from approximately 15 to 170 m depth, like many other congeneric species, *U. chinensis* is positively phototactic and forms large aggregations at certain periods of the year. Spawning occurs throughout the year, but peaks are observed in spring and autumn (February to May-June and August to November). Fecundity varies from 3 000 to 11 000 eggs. Mantle length at 50% maturity is 160 and 140 mm mantle length for males and females, respectively. Age analyses suggest that maturity is governed more by individual size than by age. This is one of the largest loliginid species of the Indo-Pacific region. It feeds on a variety of fishes and crustaceans.

Interest to Fisheries: *Uroteuthis (Photololigo) chinensis* is a target species or a welcome bycatch of numerous commercial and small-scale fisheries throughout its range. It is reported to be exploited currently in the Yellow Sea and the East and South China Seas, and it probably constitutes, together with *U. edulis*, the majority of the Chinese squid catch. It is extensively exploited by the Hong Kong fishery and Taiwanese trawlers. Of occasional commercial relevance in Japanese waters, *U. chinensis* is likely to represent a small part of the squid catch around the Philippine Islands, as well, and it constitutes about half of the trawl catch of squid in the South China Sea. It is also likely to constitute a substantial portion of the catch in the Malaysian waters, where it is reported as the dominant squid species for some local fisheries. It is probably well represented in the Indonesian fisheries (Arafura Sea, Java Sea), and is one of the most important commercial cephalopod species in Northern Australian waters, where it is taken also by Taiwanese trawlers, along with *U. singhalensis*. It is one of the major squid species in the Gulf of Thailand, where it is taken in waters between 15 and 30 m depth and amounts to between 15 and 40% of the trawl catch. Concurrently with the decrease of finfish catches in that area, squids have become an increasingly important resource since the mid-1960s and early 1970s and even during recent problems with overfishing, loliginid squid still are abundant in Thai waters. Catches also occur in other countries that border the Bay of Bengal (Thai coasts, Andaman Sea), and *U. chinensis* is reported among the commercially exploited squid species of India and Sri Lanka. This species is captured with a variety of gears, various bottom trawls, purse seines, dip-, and cast nets, hook-and-line, scoop nets, and bamboo stake nets, sometimes involving light attraction with torches and lamps. Usually it is marketed dried, but also it is sold fresh or frozen, processed into cleaned "hoods" and rings.

Local Names: CHINA: Tor yau yue; JAPAN: Hirakensakiika.

Remarks: Following its original description, this species has been redescribed several times under different names, as summarized by Natsukari and Okutani (1975), who also give a redescription of the type-specimen, along with a taxonomic review. The long-term confusion inherent in the convoluted regional loliginid nomenclature makes it very difficult to assess the true importance of *U. chinensis sensu stricto* to the fisheries, and it seems probable that it is under-reported, at least in the westernmost areas of its range. For example, it is assumed to be present in the Arabian Sea (Chikuni 1983, Siraimetan 1990, as *Doryteuthis singhalensis*), but it is not clear to what extent these records are due to confusion in the loliginid nomenclature. As is the case with other congeners, it is now acknowledged that specific investigations are needed to clarify a potential species complex among squids currently considered to be *U. chinensis* throughout the tropical Indian and western Pacific Ocean (e. g. Yeatman and Benzie, 1994). Recent studies indicate that extracts from ink of *U. chinensis* show potent antitumor activity and low toxicity (Su *et al.*, 2005).

Literature: Voss (1963a), Natsukari and Okutani (1975), Natsukari (1984a), Natsukari and Tashiro (1991), Chotiyaputta (1993a, b), Jackson (1993), Chantawong and Suksawat (1997), Dunning (1998d), Jereb and Roper (2006).

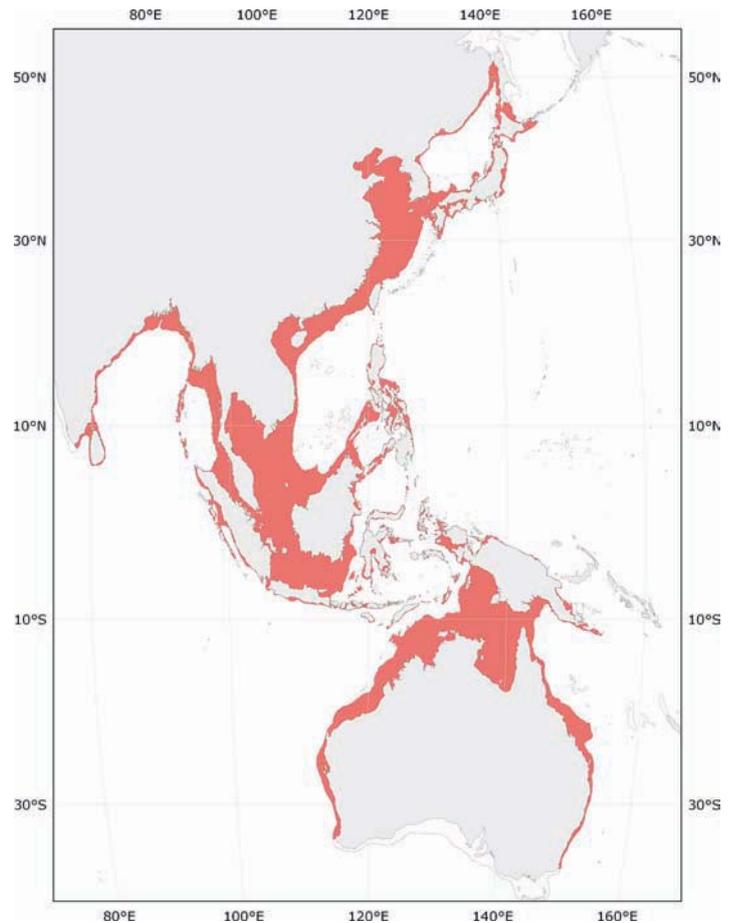


Fig. 146 *Uroteuthis (Photololigo) chinensis*

■ Known distribution

***Uroteuthis (Photololigo) duvaucelii* (Orbigny, 1835)**

Fig. 147

Loligo duvaucelii D'Orbigny, 1835 In Ferussac and D'Orbigny, 1834–1848, *Histoire Naturelle Generale et Particuliere Cephalopodes Acetabuliferes Vivants et Fossiles*, 361 pp, Atlas of 144 Plates. [318, Calamar pls 14, 20]. [Type locality: India].

Frequent Synonyms: *Loligo indica* Pfeffer, 1884, Goodrich, 1896, Massy, 1916; *Loligo galathea* Hoyle, 1885a; *Loligo oshimai* Sasaki, 1929; *Loligo sumatrensis*, Brock, 1887.

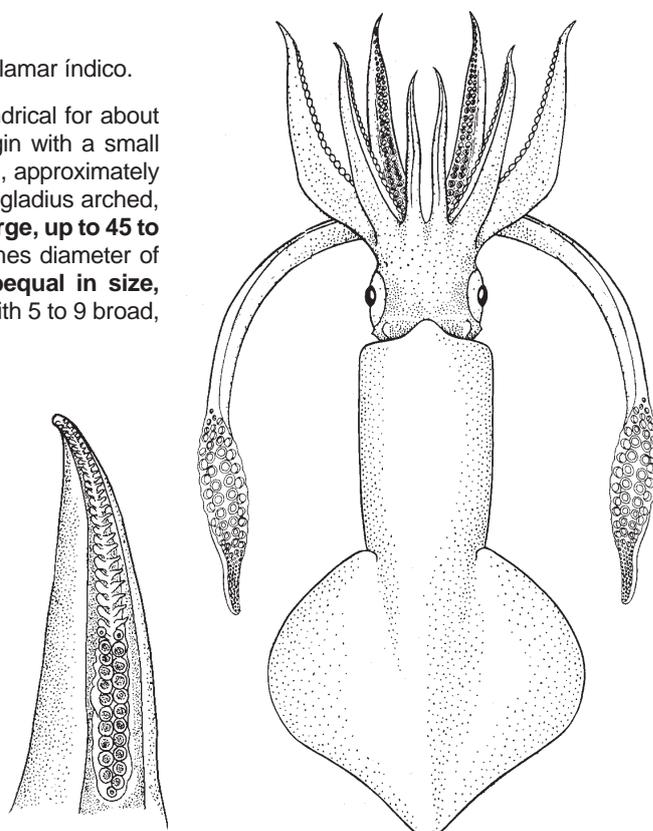
Misidentifications: None.

FAO Names: En – Indian squid; Fr – Calmar indien; Sp – Calamar índico.

Diagnostic Features: Mantle moderately long, slender, cylindrical for about half its length; it tapers gently into a blunt tip. Anterior margin with a small rounded lobe in the dorsal midline. Fins gently rhombic, broad, approximately 50% of mantle length (up to 60% of mantle length). Edges of gladius arched, not thickened. Tentacles long; **tentacular clubs expanded, large, up to 45 to 50% of mantle length**; large median manal suckers, (<2 times diameter of marginal suckers), **with 14 to 22 short, sharp teeth, subequal in size, regularly spaced around the entire margin**. Arm suckers with 5 to 9 broad, large, square teeth on the distal margin in females and up to 18 teeth around the entire ring in males. Left ventral arm of male hectocotylized for more than half its length (up to 75%), with two series of large papillae, some with minute suckers on tips; ventral series of papillae larger, turned outward, comb-like.

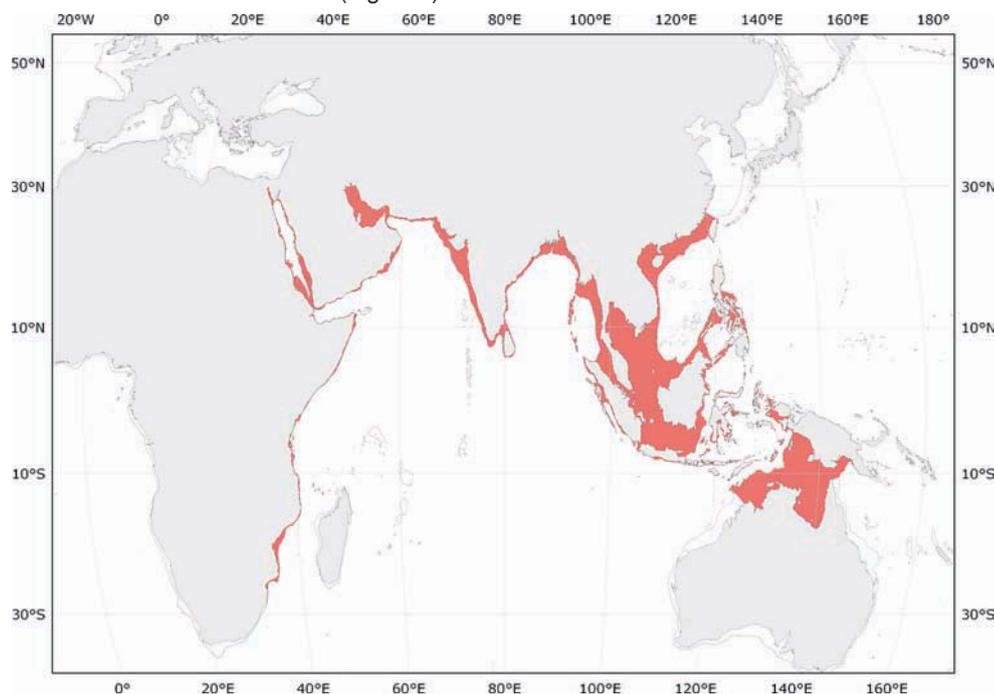
Size: Medium-sized species; maximum reported size 320 mm mantle length from Thai waters and 330 mm mantle length along the west coast of India, for males; commonly to 150 mm mantle length. Maximum weight 1.5 kg.

Geographical Distribution: An Indo-West Pacific species, *Uroteuthis duvaucelii* extends its distribution throughout the Indian Ocean, from the South African coasts (Kei River, South Africa; Mozambique), the Red Sea and the Arabian Sea, eastward to the Bay of Bengal, Sri Lanka and the Andaman Sea. A common Malaysian squid (Sumatra, Malaysia, Thailand), *U. duvaucelii* also is very abundant in Philippine waters and moderately abundant in the South China Sea, having been recorded in the West Pacific north to Formosa Island and the Taiwan Strait and south to the Java and Arafura Seas (Fig. 148).



hectocotylus

dorsal view

Fig. 147 *Uroteuthis (Photololigo) duvaucelii*Fig. 148 *Uroteuthis (Photololigo) duvaucelii*

Known distribution

Habitat and Biology: Considerable attention has been paid to the biology of this species, due to its importance in the fisheries in Indian (both west and east coasts) and Thai waters. *Uroteuthis duvaucelii* occurs at depths between 30 and 170 m, and it forms large aggregations during the spawning season.

The spawning period appears to be prolonged, almost year-round, with peaks in different months, principally in spring and autumn. Spawning aggregations occur in the post-monsoon months along the west coasts of India, and spawning seems to be dependent on the southwest and northeast monsoons in the western part of the Gulf of Thailand. Size at 50% maturity ranges between 90 and 130 mm mantle length for females and 70 to 150 mm mantle length for males. Observations on growth after sexual maturity is reached support an extended reproductive phase within the life cycle, i.e. not a strictly semelparous reproduction, as it is the case in other squid. Egg mops (masses) consist of many egg capsules, each of which, in turn, contains 125 to 290 eggs. Eggs are about 2 mm long and 1.75 mm wide and very yolky. Eggs take between 7 and 10 days to develop at a temperature range between 28° to 32°C. Hatchlings are about 1 to 1.8 mm mantle length and are planktonic.

Growth is allometric; females grow faster than males and are heavier at the same length; however, males ultimately attain a greater size and age. Maximum reported size is 330 mm mantle length from Indian waters. According to statolith-based age analysis, the life cycle of the species is one year, which is shorter than estimates obtained by length frequency analysis.

The Indian squid feeds on crustaceans, fishes and squids, and it is preyed upon by a variety of predators, including fishes and marine mammals. Cannibalism is common.

Interest to Fisheries: *Uroteuthis duvaucelii* is exploited throughout its distributional range, mainly by artisanal fisheries. It is caught by various fishing gears, such as otter trawl, pair trawl, night-light luring, push net, hook and line. One of the most common species among the Indo-Pacific loliginids, it was considered the most promising species for the Indian dried squid industry, and it probably constitutes, along with *U. chinensis*, the main fraction (up to 90%) of the squid catches of Thailand. It is known to be fairly important for the fisheries of the eastern Arabian Sea, as well as off the Gujarat (northwest coastal India) and Karnataka coasts (northeast coastal India). Cuttlefishes constitute the dominant species group for all capture techniques in the Indian cephalopod fisheries, but *U. duvaucelii* represents up to 68% of the catches off central west India. It also constitutes a significant fraction of the total cephalopod production off southern India, where it is caught by shore seine, boat seine, and hook-and-line. The Indian squid is important for all the main eastern Indian landing places (i.e. Waltair, Kakinada, Madras, Mandapam, Vishakhapatnam), where it constitutes the most abundantly caught squid species. It also represents the most commonly landed species along the Andaman Sea coast of Thailand, where it can contribute up to 45% of the squid landed. *Uroteuthis duvaucelii* is one of the main commercial squid species for the Philippine fishery, and it is reported among the 5 major squid species known in the Malaysian area, as well as among the most common squid species caught in the Java Sea. It is abundant in the South China Sea, and it is reported among the commercial squid species of the Hong Kong fishery. However, very little information is known about the abundance and landings of this species in the Yellow and East China Seas. This species probably is exploited above its optimum level in Indian waters and increase in cod end mesh size and reduction in the fishing effort have been suggested as management measures to sustain the fishery.

Local Names: CHINA: Chin sui yau yue, Yau jai; INDIA: Narsinga, Narasingha, Bondas, Koonthal, Oosikanava, Kumutimuna, Samudra shasha.

Remarks: *Uroteuthis duvaucelii* is another loliginid species that exhibits polymorphism and possibly is a species complex, which is not surprising considering its wide distributional range. Different forms are recognized in the commercial fishery: a very slender form and a chubby/stout form occur in the eastern Indo-Pacific region (Okutani, 2005), and a large form and small form are reported from the Gulf of Aden and the Arabian Sea (Nesis, 1982, 1987). First attempts to culture the Indian squid were made from eggs collected in the field (Prinngennies *et al.*, 2000), and the species currently is hatched and reared in a large-scale cephalopod culture system in Thailand, in research aimed to determine the feasibility of commercial culture (Nabhitabhata *et al.*, 2005).

Literature: Voss (1963a), Chikuni (1983), Roper *et al.* (1984), Silas (1986), Kripa *et al.* (1996), Mohamed (1996), Chotiaputta (1997), Dunning (1998d), Okutani, (2005), Jereb and Roper (2006).

***Uroteuthis (Photololigo) machelae* Roeleveld and Augustine, 2005**

Uroteuthis (Photololigo) machelae Roeleveld and Augustine, 2005, *Phuket Marine Biological Center Research Bulletin*, (66): 97–107, 10 figs [98]. [Type locality: 19°49'S, 36°5'E, off Beira, Mozambique, western South Indian Ocean].

Frequent Synonyms: *Loligo (Doryteuthis) pickfordae* Nesis, 1982: 146, fig. 38 E-K; 1987:155, fig. 38 H-J, non Adam, 1954.

Misidentifications: None.

FAO Names: **En** – Mozambique squid; **Fr** – Calmar du Mozambique; **Sp** – Calamar del Mozambique.

Diagnostic Features: **Suckers on arms II to III greatly enlarged in males**, much larger than median manus suckers on clubs; **arm sucker rings of both sexes with wide, rough teeth distally and laterally, proximal edge smooth**; arm length index 19 to 41% mantle length; left arm IV hectocotylized with 13 to 16 pairs of proximal suckers, 35 to 65% arm length modified distally, proximal papillae elongate conical; fin length 39 to 46% mantle length; **club length 18 to 28% mantle length, 26 to 36% tentacle length**.

Size: Small-sized squids; maximum reported mantle length 110 mm.

Geographical Distribution: Mozambique and western Madagascar, Seychelles, Saya de Malha Bank (Fig. 150).

Habitat and Biology: Specimens have been captured with bottom trawls at depths of 54 to 200 m. Smallest mature males measure 61 mm mantle length, smallest females 83 mm mantle length.

Interest to Fisheries: None.

Local Names: None.

Remarks: Specimens were originally identified as *Uroteuthis pickfordi*, the species described by Adam (1954), from 2 small specimens (mantle length less than 100 mm) collected in Indonesian waters off Flores Islands, and subsequently reported by Nesis (1982, 1987) from the Mozambique waters (Roeleveld and Augustine, 2005). However, *U. machelae* differs from *U. pickfordi* by having shorter fins, longer arms, hectocotylized arm modified over shorter section, with more proximal suckers; also, its tentacles and clubs are longer in relation to mantle length, and clubs are shorter in relation to tentacle length. *Uroteuthis machelae* also differs in having smooth proximal edges on the arm sucker rings in both sexes, while in *U. pickfordi* the arm sucker rings are toothed all around the whole edge. It seems that the specimens mentioned by Nesis (1982, 1987) from Mozambique, the Seychelles and the Saya de Malha Bank (Western Indian Ocean) may belong to *U. macheale* rather than to *U. pickfordi*.

Literature: Roeleveld and Augustine, 2005.

Fig. 149

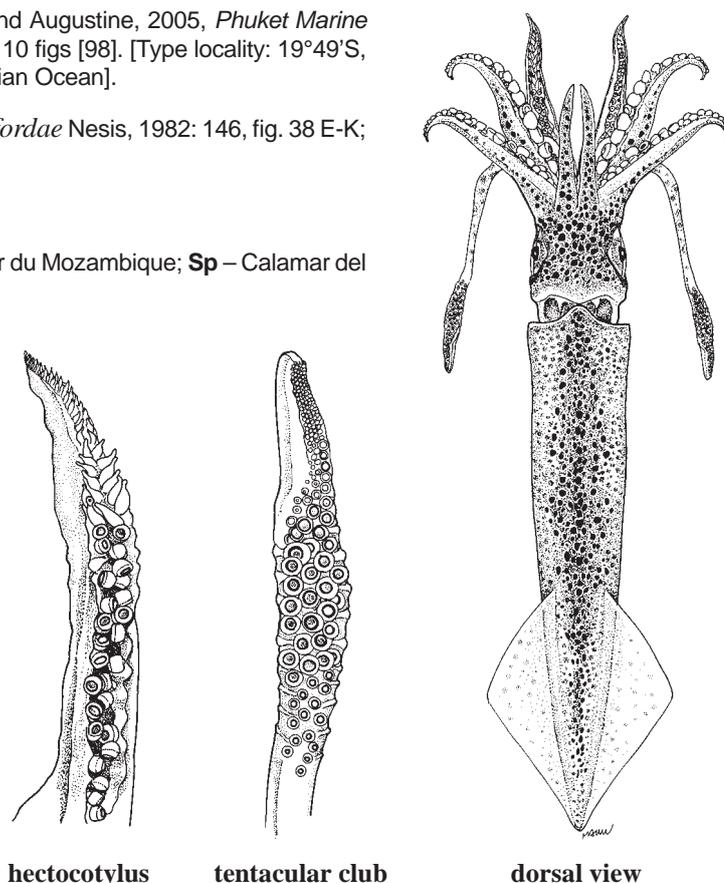


Fig. 149 *Uroteuthis (Photololigo) machelae*

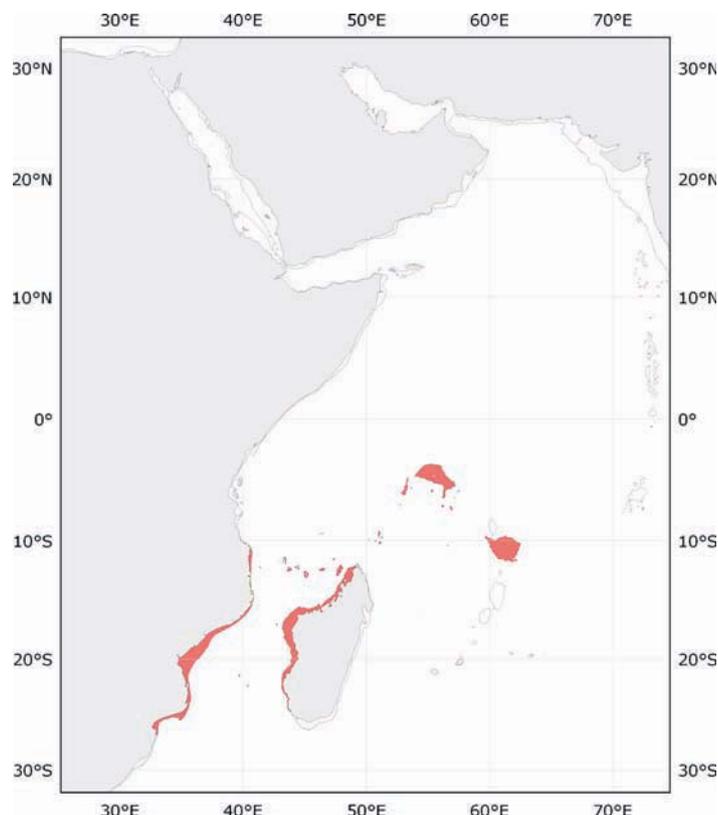


Fig. 150 *Uroteuthis (Photololigo) machelae*

■ Known distribution

Uroteuthis (Photololigo) robsoni* Alexeyev, 1992*Fig. 151**

Uroteuthis robsoni Alexeyev, 1992, *Zoologicheskij Zhurnal, Moscow*, 71(11): 12–23, 2 figs [13, fig. 1]. [Type locality: 19°45'S, 36°22'E, off Mozambique, western South Indian Ocean].

Frequent Synonyms: None.

Misidentifications: None.

FAO Names: **En** – Robson's squid; **Fr** – Calmar de Robson; **Sp** – Calamar de Robson.

Diagnostic Features: Mantle slender, elongate; mantle width about 20% mantle length. **Fleshy midventral ridge present.** Fins rhombic, elongate; fin length 60% of mantle length, fin width 50% mantle length. **Arm sucker rings with about 20 sharp, triangular teeth.** Hectocotylied arm modified on its distal one-third (modified section 33 to 37% arm length). **Tentacular club-sucker rings similar in size, with irregularly alternating large and sharp teeth.** Gladius vane lateral margins not thickened.

Size: Medium-sized squid, mantle length to 240 mm.

Geographical Distribution: Western Indian Ocean: coastal Mozambique (Fig. 152).

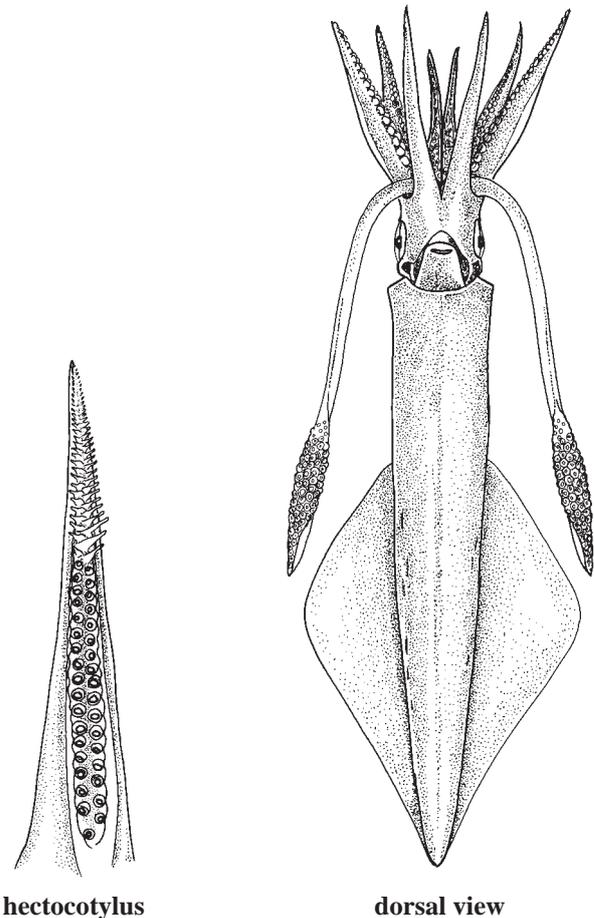
Habitat and Biology: No data available.

Interest to Fisheries: Currently, unknown.

Local names: None available.

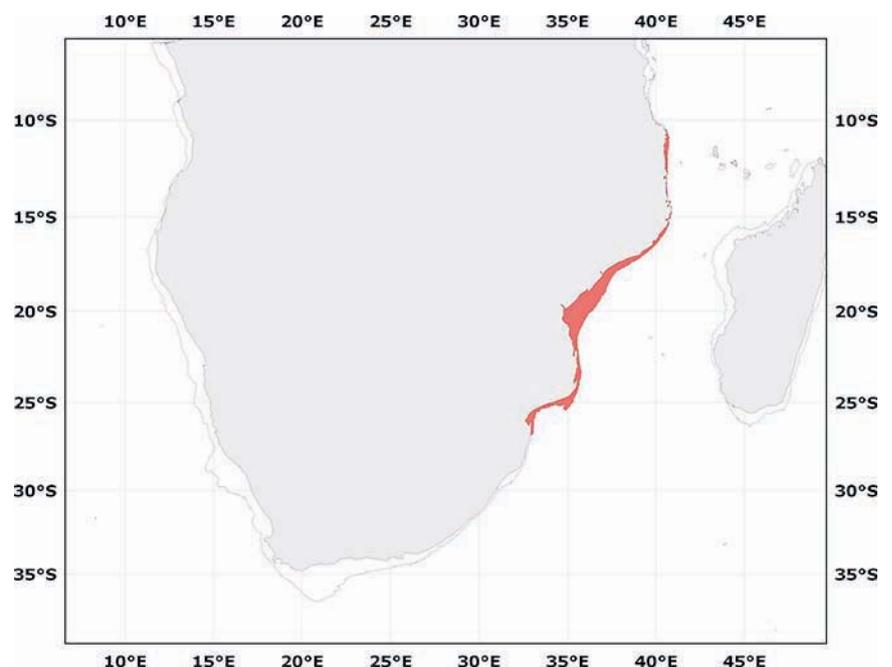
Remarks: This species resembles *Uroteuthis arabica* and *U. chinensis*; however, in males the shorter modified portion of the hectocotylus (32 to 37% instead of 40 to 50% of the arm length) is distinctive.

Literature: Alexeyev, 1992, Roeleveld, 1998, Okutani, 2005.



hectocotylus

dorsal view

Fig. 151 *Uroteuthis (Photololigo) robsoni***Fig. 152** *Uroteuthis (Photololigo) robsoni*

Known distribution

Uroteuthis (Photololigo) sibogae* (Adam, 1954)*Fig. 153**

Doryteuthis sibogae Adam, 1954, *Siboga Expedition, Monographie*, 55(c):123–193, 40 figs, 4 pls. [146, text-figs 16, 18, pl. 1]. [Type locality: off southeast coasts of Soemba, Indonesia, eastern Indian Ocean].

Frequent Synonyms: None.

Misidentifications: None.

FAO Names: En – Siboga squid; Fr – Calmar siboga; Sp – Calamar siboga.

Diagnostic Features: Mantle very long, slender; width one-fifth to one-seventh of length. Fins narrow, relatively short, length <50% of mantle length. Edges of gladius straight, thickened. Tentacles short, slender, clubs short; **medial suckers on manus slightly enlarged, the largest with 15 to 20 conical, sharp, teeth around entire ring; teeth subequal in size.** The largest suckers from the clubs and ventrolateral arms are about equal in size. Arms relatively very short; **arm-sucker rings smooth proximally, with 7 to 9 plate-like, truncate (squared) teeth distally,** the central 1 or 2 narrowest; left ventral arm hectocotylized for 30 to 45% of its length with the distal suckers and stalks modified into cone-shaped fleshy papillae, those in the ventral series the longest.

Size: Maximum mantle length 160 mm.

Geographical Distribution: Indian Ocean: southern African waters, India, Thailand, Andaman Sea; Western Pacific Ocean: eastern Indonesia and South China Sea (Fig. 154).

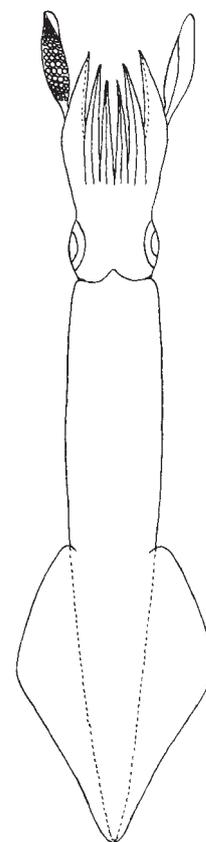
Habitat and Biology: The depth range of this species is undetermined. Sexually mature squids occur during August off the Pescadore Islands. The biology of this species is very poorly known.

Interest to Fisheries: This species is fished commercially in India and Thailand, and it is taken as bycatch in the fisheries for larger squids in Taiwan (Province of China).

Local Names: INDIA: Olaikanava, Soochikanava.

Remarks: *Uroteuthis sibogae* was synonymized with *Uroteuthis singhalensis* by Korzun and Alexeyev (1991) and, as such, it is not mentioned in the species listed by Okutani (1995, 2005) for the western Pacific. However, no general consensus on this synonymy was reached in the Phuket CIAC meeting (Vecchione *et al.*, 2005); therefore, for the sake of consistency, we list it here, until the species status is resolved.

Literature: Adam (1954), Roper *et al.* (1984), Nesis (1982, 1987), Korzun and Alexeyev (1991), Nateewathana (1992), Roeleveld (1998), Narasimham (2005), Vecchione *et al.* (2005).



dorsal view

Fig. 153 *Uroteuthis (Photololigo) sibogae*

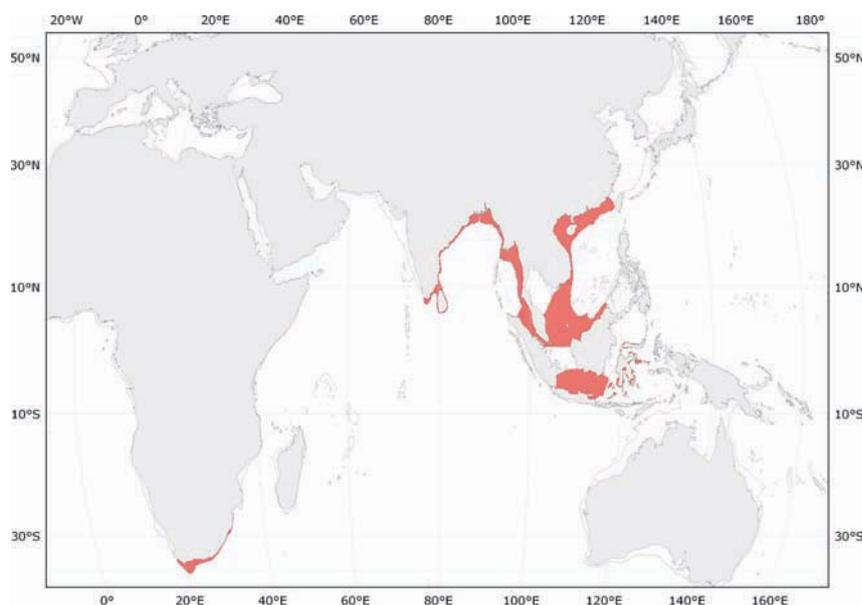


Fig. 154 *Uroteuthis (Photololigo) sibogae*

■ Known distribution

Uroteuthis (Photololigo) singhalensis* (Ortmann, 1891)*Fig. 155**

Loligo singhalensis Ortmann, 1891, *Zoologische Jahrbücher (Systematisches)*, 5: 669–678. [676, pl 46 fig. 3a-d]. [Type locality: Sri Lanka, Indian Ocean].

Frequent Synonyms: non *Doryteuthis singhalensis* Adam, 1939b, 1954, (= *Loligo edulis*), non *Doryteuthis singhalensis* Voss, 1963a, Voss and Williamson, 1971, Roper *et al.*, 1984, Silas *et al.*, 1986a, (= *Loligo chinensis*), *Doryteuthis* sp. Silas *et al.*, 1982, Mohan and Rayudu, 1986; *Loligo singhalensis* var. *beryllae* Robson, 1928, *Doryteuthis sibogae* Adam, 1954, Natsukari, 1976, Silas *et al.*, 1985, Silas 1986a; *Loligo sibogae* Natsukari, 1976, Nesis, 1982, 1987, Roper *et al.*, 1984, Alekseyev, 1989, non *Loligo singhalensis* Okutani, 1980, Nesis, 1982, 1987, Alekseyev, 1989 (= *Uroteuthis (Photololigo) chinensis*), *Photololigo sibogae* Natsukari, 1984a, Dunning, 1998d, non *Photololigo singhalensis* Natsukari, 1984a (= *L. chinensis*).

Misidentifications: *Uroteuthis (Photololigo) chinensis* (Gray, 1849).

FAO Names: **En** – Long barrel squid; **Fr** – Calmar baril; **Sp** – Calamar buril.

Diagnostic Features: Mantle long, slender, cylindrical, about 4 to 7 times as long as wide, widest at the midpoint of its length; tapers posteriorly into a sharply-pointed tip. Fins narrow, rhombic in outline, anterior margin slightly convex, posterior margin slightly concave; relatively short in young specimens, up to 50 to 60% of mantle length in adults. Gladius narrow, widest in anterior one-third, with thickened, nearly straight vane margins. Tentacular clubs short, slightly expanded; **suckers in medial series of manus only about 25% larger than those on lateral series; with 15 to 25 conical, sharply-pointed teeth around the entire margin, occasionally interposed with small, almost inconspicuous, pointed teeth.** Arms relatively short; sucker rings **with 6 (5) to 11 long, wide, squared, plate-like teeth distally, smooth proximally.** Left ventral arm hectocotylized over 45 to 50% of total arm length with slender, uniform, cone-shaped, pointed, fleshy papillae, devoid of minute suckers on tips; papillae on ventral series only slightly longer than papillae on dorsal series.

Size: Large-sized squid; maximum mantle length 500 mm in males, 310 mm in females; weight about 1 kg in males, 800 g in females.

Geographical Distribution: An Indo-Pacific species, widely distributed in the western Pacific from the South China Sea and Singapore (Indonesian waters) north to Formosa Island, into the Indian Ocean from the Andaman Sea, Thailand and the Bay of Bengal, westward to the Arabian Sea and the eastern African coasts (Somalia, Seychelles, Mozambique, Madagascar and South Africa east coast) (Fig. 156).

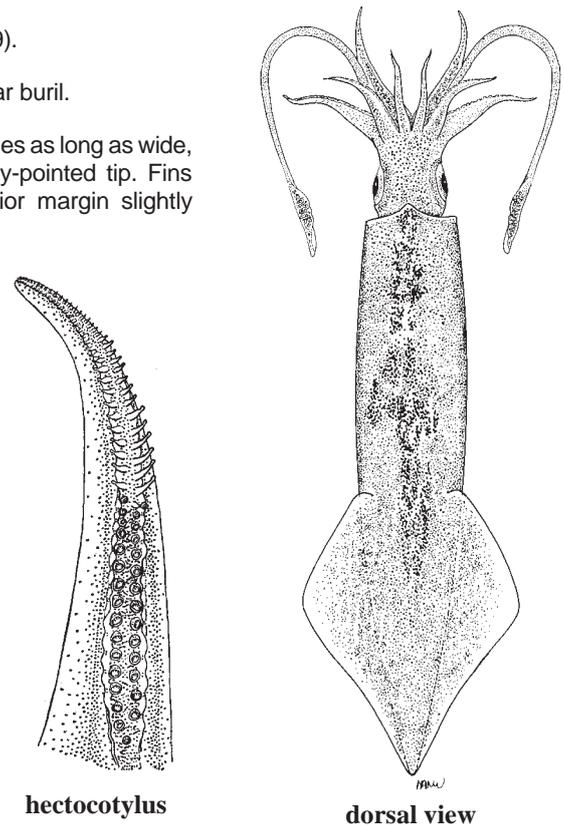


Fig. 155 *Uroteuthis (Photololigo) singhalensis*

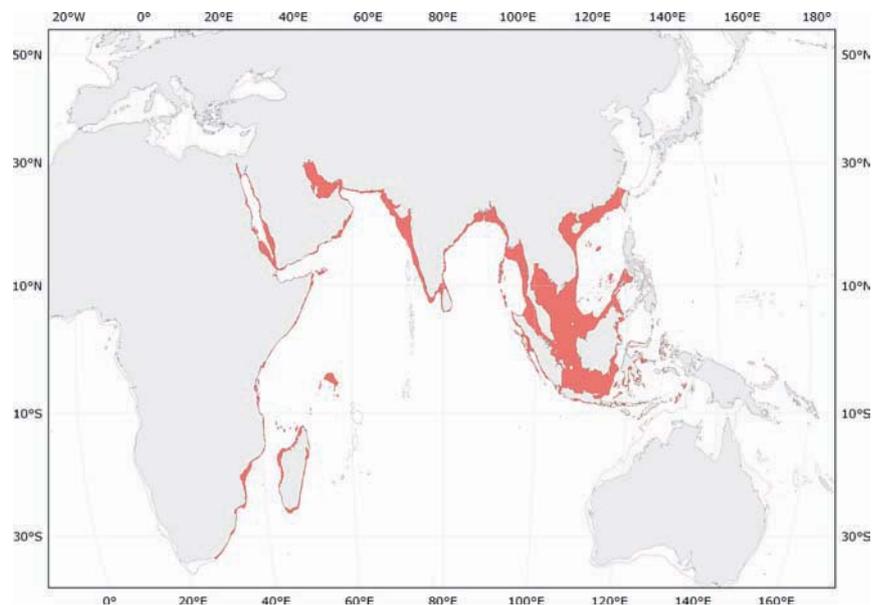


Fig. 156 *Uroteuthis (Photololigo) singhalensis*

Known distribution

Habitat and Biology: This species usually occurs at depths from 30 to 120 m, but extends to bottom depths of 220 m. The biology of *Uroteuthis singhalensis* is still poorly known. Data from the southwest coast of India indicate that males in this area attain sexual maturity at a size range of 70 to 170 mm mantle length (50% mature at 97 mm mantle length), and females mature at a size range of 70 to 130 mm mantle length (50% mature at 84 mm mantle length). All males and females are fully mature at a size of 170 and 130 mm, respectively. Mature specimens of both sexes occur from October to April, suggesting a protracted spawning season. They aggregate in large schools in summer, probably for a peak of mating and spawning. Juveniles are caught along the coast from January/February to June (in some years). Data from the southeastern slope of the Mascarene submarine ridge, western Indian Ocean, indicate that the species is represented there by 2 sympatric groups that differ slightly in the size at first maturity. Males of the first group, which is widespread over the distributional area, reach sexual maturity at a size range of 80 to 210 mm mantle length and females at a size range of 100 to 170 mm mantle length. The second group occurs only in the northern part of the area, where males and females become mature at a size of 100 to 230 mm mantle length and 110 to 170 mm mantle length, respectively.

Uroteuthis singhalensis is positively phototactic, a feature that is utilized in the fishery by attracting it to artificial light for capture. Based on seasonal abundance data, some migrations are possible.

Interest to Fisheries: Reported mainly as a bycatch in the Indonesian and South China Sea finfish fisheries, *U. singhalensis* is the third most important squid trawled in Hong Kong waters after *Uroteuthis edulis* and *U. chinensis*, and it is likely to be rather important to the fisheries in the Indian Ocean waters, even though the extent of its contribution is difficult to assess, because of taxonomic confusion (see Remarks). For example, the long barrel squid is listed among the major species of loliginid squid that occur in the Indo-Pacific region, with small catches recorded from the China Sea to the eastern Arabian Sea, but it is not clear to what extent this pattern refers to different species. Included among the important species for the commercial squid fishery of Thailand, *U. singhalensis* seems consistently present in the Andaman Sea, where it is one of the target species of a light-attraction fishery in Phuket and Phang-Nga provinces. Among the important species for the Indian fishery, it is reported on both coasts of India, and it is particularly important for the local fisheries off the southwestern coast. It also contributes to the small local pelagic fishery in Sri Lankan waters and probably is important in the northern part of the Bay of Bengal. However, it is not clear to what extent this species comprises the second most important squid resource of India, in general, and off the northwestern coast, in particular, because of potential misidentification. It is taken by jigs, purse seines, and dip-nets using light attraction together with *Photololigo chinensis* and other large loliginids.

Local Names: CHINA: Cheung woo chak, Cheung yau tung.

Remarks: The systematic position of this species has been the object of several discussions and various contradictions during the past (see Jereb and Roper, 2006 and Okutani, 2005 for reviews) and the nomenclature applied to it varies greatly. Consensus exists among several scientists that *Doryteuthis sibogae* Adam, 1954 is a junior synonym of *Loligo singhalensis* Ortmann, 1891 (e.g. Okutani, 2005). In spite of recent efforts to clarify the nomenclature, many references, mainly those that report fishery statistics, remain doubtful, and their validation requires knowledge about species-specific characters. The subgeneric status of this species is unsettled. The first major revision of Loliginidae, placed the species in the genus *Uroteuthis*, within the subgenus *Photololigo* (i.e. *Uroteuthis (Photololigo) singhalensis*) (Vecchione *et al.* 1998). This was not modified during the last major meeting of scientific experts held in Phuket (Vecchione *et al.* 2005). However, during that meeting, molecular data against this placement were discussed and the proposal to establish a new subgenus for the species was made, but this recommendation has not yet been accomplished. Clearly, further studies are required to clarify the problematic systematics of the *Uroteuthis (Photololigo)* species (complicated as it is by both sexual dimorphism and ontogenetic variation), and the status of *U. singhalensis* in particular.

Literature: Voss (1963a), Okutani (1970, 1980), Roper *et al.* (1984), Nesis (1982, 1985, 1987), Silas *et al.* (1985), Alekseyev (1991), Korzun and Alexeyev (1991), Nateewathana (1992), Chotiyaputta (1993a), Chantawong (1994), Okutani (2005), Jereb and Roper (2006), Vecchione (2008k).

Uroteuthis (Photololigo) vossi (Nesis, 1982)

Fig. 157

Loligo vossi Nesis, 1982, *Moscow, Light and Food Industry Publishing House*, 385 p. [144]. [Type locality: Dumaran Island, Philippine Islands, South China Sea].

Frequent Synonyms: *Loligo* sp. A Voss (1963a).

Misidentifications: None.

FAO Names: **En** – Voss' squid; **Fr** – Calmar de Voss; **Sp** – Calamar de Voss.

Diagnostic Features: Mantle slender; mantle width up to 20% of mantle length; fin length up to 60% of mantle length, fin width up to 50% of mantle length. Edges of gladius arched, not thickened. **Medial manal suckers 2 to 3 times the diameter of the lateral suckers; large sucker rings with 15 to 20 sharp, equally spaced teeth;** 2 to 4 distal teeth occasionally fused together. Teeth of club sucker rings subequal in size, somewhat larger distally. Arm suckers with 7 to 11 teeth on distal margin of rings.

Size: To 136 mm mantle length in males.

Geographical Distribution: Philippine Islands, Sri Lanka to the Arabian Sea (Fig. 158).

Habitat and Biology: No data available.

Interest to Fisheries: Currently unknown.

Local Names: None available.

Remarks: Nesis (1982) published this name for *Loligo* sp. A of Voss (1963a).

Literature: Voss (1963a), Nesis (1982), Okutani (2005), Vecchione (2008k).

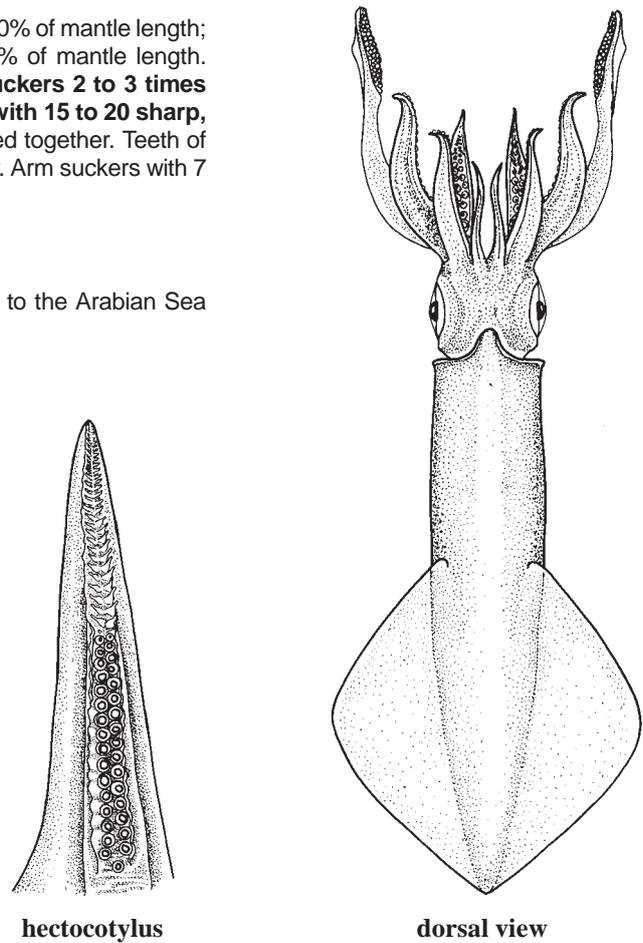


Fig. 157 *Uroteuthis (Photololigo) vossi*

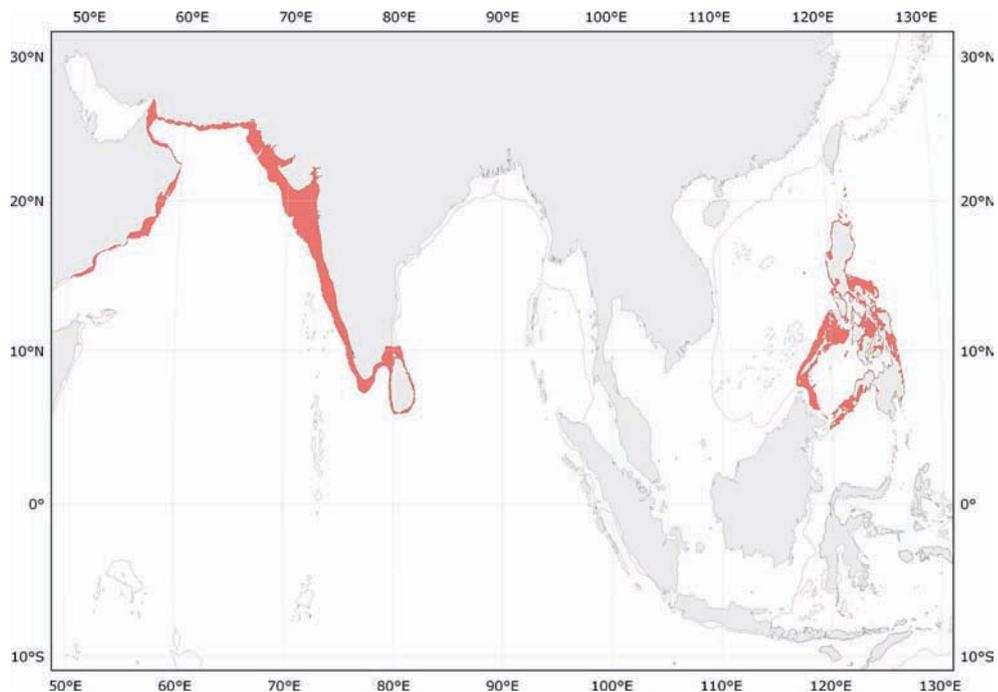


Fig. 158 *Uroteuthis (Photololigo) vossi*

■ Known distribution

Subgenus undetermined

Uroteuthis pickfordi (Adam, 1954)

Fig. 159

Doryteuthis pickfordi Adam, 1954, *Siboga-Expeditie, Monographie*, 55(c): 123–193. [149, text-figs 19–21, pl 1]. [Type locality: southern coast of Flores, Sawu Sea, Indonesia].

FAO Names: En – Flores Island squid; Fr – Calmar de Flores Island; Sp – Calamar de Flores Island.

Diagnostic Features: Fin length <50% mantle length. **Edges of gladius** straight, thickened. **Teeth of club sucker rings subequal in size.** Arm sucker rings with wide teeth around entire ring. Large suckers of lateral arms much larger than club suckers.

Size: Small-sized squid, 110 to 140 mm mantle length.

Geographical Distribution: Flores Island, Indonesia (Fig. 160).

Remarks: *Uroteuthis pickfordi* was described by Adam (1954), from two small specimens (less than 100 mm mantle length) collected in Indonesian waters off Flores Islands; subsequently, the species has been reported from Mozambique waters by Nesis (1982, 1987). However, it is possible that the specimens mentioned by Nesis (1982, 1987) from Mozambique, the Seychelles and the Saya de Malha Bank (Western Indian Ocean) belong to *Uroteuthis machelae* rather than to *U. pickfordi* (Roeleveld and Augustine, 2005). The 2 species differ by fin length, hectocotylyzed arm configuration, tentacular club length and arm sucker rings dentition (see remarks in *Uroteuthis machelae*). Confusion about the name of the species exists (i.e. *pickfordae* versus *pickfordi*).

Usually a species named after a female should end in “ae” rather than “i” (art 31.1.2, ICZN, 1999). However, Adam’s original description ended in “i”. According to art 32 (ICZN, 1999) original spelling is correct unless it is in one of the categories listed in 32.5 as “spellings that must be corrected”. In our opinion, this is not the case and the change in ending is an unjustified emendation. According to 33.2.3.1 (ICZN, 1999) an unjustified emendation in prevailing usage is considered to be a justified emendation. However, since the specific name “*pickfordi*” is in prevailing usage and it is the original designation, this is the name used in this Catalogue.

Literature: Adam (1954), Nesis (1982, 1987), Roeleveld (1998), Okutani (2005), Roeleveld and Augustine (2005).

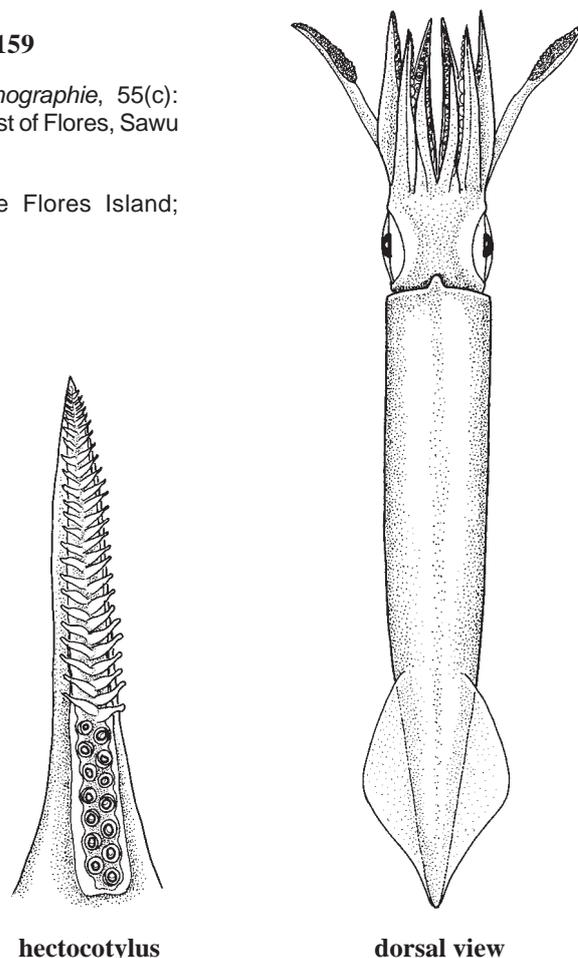


Fig. 159 *Uroteuthis pickfordi*



Fig. 160 *Uroteuthis pickfordi*

Known distribution

Uroteuthis reesi (Voss, 1962)**Fig. 161**

Doryteuthis reesi Voss, 1962a, *Proceedings of the Biological Society of Washington*, 75: 169–176. [173]. [Type Locality: off Port Maricaban, southern Luzon, Philippine Islands].

FAO Names: **En** – Rees' squid; **Fr** – Calmar de Rees; **Sp** – Calamar de Rees.

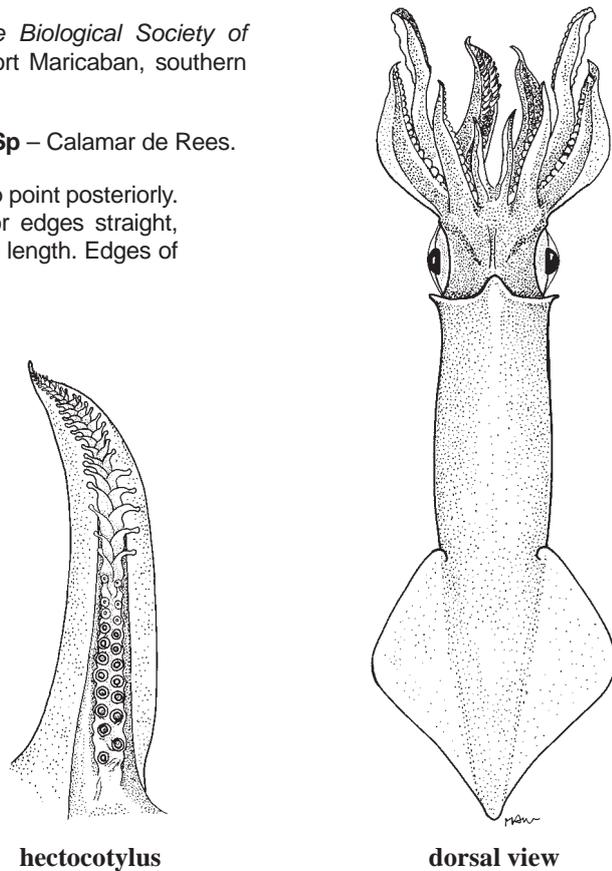
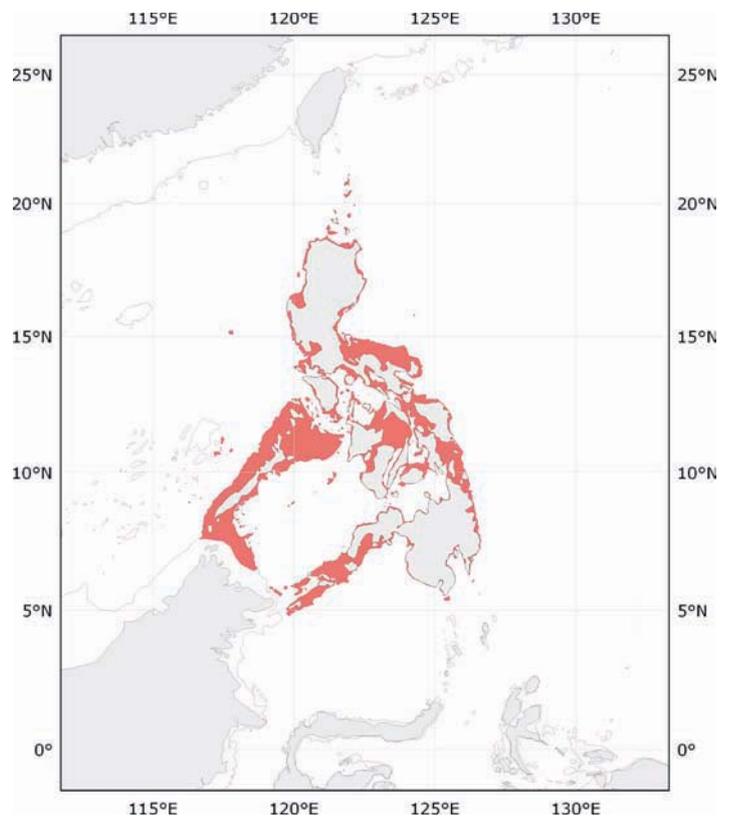
Diagnostic Features: Mantle long, slender, with a sharp point posteriorly. Fins small, fin length <50 % of mantle length, anterior edges straight, posterior edges concave; fin width about 45% of mantle length. Edges of gladius straight, thickened. Tentacles short, only a little longer than the longest arm. **Club suckers quadriserial, the largest ones with 11 to 12 sharp, slender teeth subequal in size, on rings.** Arms short, about 25% mantle length; arm suckers approximately equal in size to manal club suckers; **arm sucker rings with 7 to 9 wide teeth distally.** **Both arms IV modified in males:** left arm longer than right, biserial row of papillae with small ringless suckers on the tip occupy more than distal half of the arm; on right arm eighth to sixteenth suckers abruptly reduced, followed by only pedicels distally.

Size: Maximum reported size 72 mm mantle length for males, 63 mm mantle length for females.

Geographical Distribution: Philippine Islands (Fig. 162).

Remarks: Males of this small loliginid may easily be distinguished from those of the other small species in the Indo-Malayan region by the hectocotylization of both ventral arms.

Literature: Voss (1962a), Voss (1963a), Okutani (2005).

**Fig. 161** *Uroteuthis reesi***Fig. 162** *Uroteuthis reesi*

■ Known distribution