

4.13 FAMILY OMMASTREPHIDAE Steenstrup, 1857

OMMAS

Ommastrephidae Steenstrup, 1857, Overs.Vidensk.Selsk.Forh., 1857:12.

FAO Names : En - Flying squids
Fr - Encornets, Calmars
Sp - Jibias, Potas

Diagnostic Features : The family is characterized by an inverted T-shaped funnel locking cartilage, biserial suckers on the arms, tetraserial suckers on the tentacular clubs (except Illex which has 8 rows of suckers on the dactylus), buccal connectives that attach to the dorsal borders of arms IV, photophores in some genera, and a muscular bridge anterior to the funnel locking cartilage which passes from the funnel to the ventral surface of the head.

The inverted T-shaped funnel locking cartilage easily distinguishes this family from all others, even in the youngest stages. One genus, Symplectoteuthis, has the funnel and mantle cartilages fused at a single point, but they are otherwise typical.

Three subfamilies are currently recognized: Ommastrephinae, Todarodinae, and Illicinae.

The Ommastrephinae is distinguished by the presence of a central pocket (foveola) and several side pockets in the funnel groove, and by the presence of photophores which are often deeply buried in the tissue of the mantle, head and arms. It comprises five genera: Ommastrephes, Symplectoteuthis, Dosidicus, Ornithoteuthis and Hyaloteuthis.

The Todarodinae has a foveola, but lacks side pockets in the funnel groove, and lacks photophores. Three genera are known: Todarodes, Nototodarus and Martialia. Nototodarus is known only from the Pacific Ocean, and Martialia only from far southern waters of the Southern Hemisphere.

The Illicinae lacks both central and side pockets in the funnel groove as well as photophores. Two genera are known Illex from the Atlantic Ocean and Todaropsis from the Atlantic and eastern Indian Ocean.

All species of the family in which the developmental stages are known, pass through the "rhyndoteuthis" larval stage recognized by the fusion of the tentacles to form a trunk-like proboscis.

Habitat and Biology : All representatives of this oceanic and neritic family, but particularly the species in the subfamily Ommastrephinae, are very strong, powerful swimmers; most of them undertake diurnal vertical movements between the surface layer at night and deeper layers during the day. Several species school by size and migrate seasonally in response to changes of temperature conditions. Two spawning peaks are often distinguished. Large numbers of small eggs are produced, encapsulated in gelatinous masses that either float on or near the surface or settle on the bottom. Hatching of the "rhyndoteuthis" larvae occurs after a few days to a few weeks. Postspawning mortality is high. Growth is very rapid; in many species the lifespan does not exceed 1 year. Flying squids are active predators on fishes, pelagic crustaceans and other squids. Cannibalism is common. Ommastrephids in turn are preyed upon by sea 'birds, marine mammals and large predacious fishes, such as tunas, billfishes, etc.

Size : Dosidicus, the giant of the family, inhabiting the cold Humboldt Current, reaches a total length of about 4 m; common mantle lengths range between 20 and 40 cm.

Interest to Fisheries : Six of the 10 genera of this family currently support a fishery, and although much of the catch is not broken down between inshore squids and flying squids, it can reasonably be assumed that this family alone accounts for more than half of the world cephalopod catch. Todarodes pacificus supports the largest single fishery with catches fluctuating between 230 000 and 400 000 metric tons in recent years (FAO, 1983). Other important international fisheries are those for Illex illecebrosus in the northwestern Atlantic; Illex argentinus on the Patagonian shelf and upper slope; Todarodes sagittatus off Norway and in the Mediterranean; Ommastrephes bartrami in the western Pacific; Dosidicus gigas in the temperate and cold eastern boundary currents of the eastern Pacific; and Nototodarus in New Zealand and most recently in Australian waters. Japan predominates in most ommastrephid fisheries.

Trawling and jigging are by far the most common fishing methods, results of the latter being greatly improved by light attraction, taking advantage of the positive phototaxis of most species.

Squids are marketed fresh (i.e. sashimi), frozen, or processed in various ways, such as, dried (surume), salted, salted-fermented. Jigged squids fetch the highest prices because the product is usually fresher and undamaged.

Key to Genera :

- 1a. Funnel groove smooth, without foveola or side pockets **Subfamily Illicinae**
- 2a. Dactylus of tentacular club with 8 longitudinal rows of small suckers (Fig. 1a) **Illex**
- 2b. Dactylus of tentacular club with 4 longitudinal rows of small suckers (Fig. 1b) ... **Todaropsis**
- 1b. Funnel groove with foveola or with foveola and side pockets
- 3a. Funnel groove with foveola only, no side pockets (Fig. 2a) **Subfamily Todarodinae**
- 4a. Both arms IV of males hectocotylized (Fig. 3a) **Nototodarus**
- 4b. One arm IV of males hectocotylized (usually the right) (Fig. 3b)
- 5a. Protective membranes on the arms very low, weakly developed, but trabeculae very strongly developed with pointed cirrus-like projections (Fig. 4) **Martialia**
- 5b. Protective membranes on arms normally developed with normal, non-projecting trabeculae (Fig. 5) **Todarodes**
- 3b. Funnel groove with foveola and side pockets (Fig. 2b) **Subfamily Ommastrephinae**

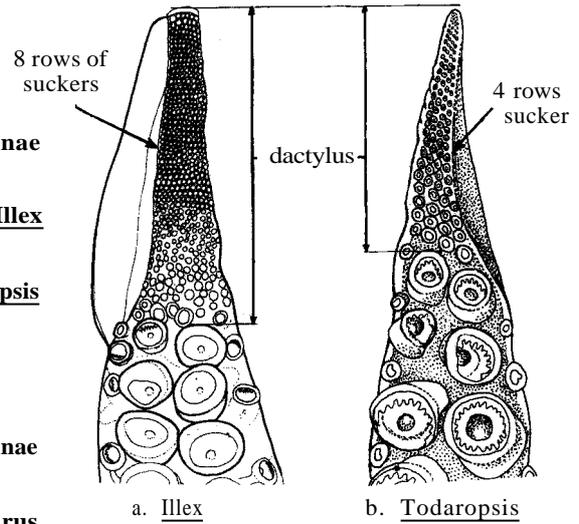


Fig. 1

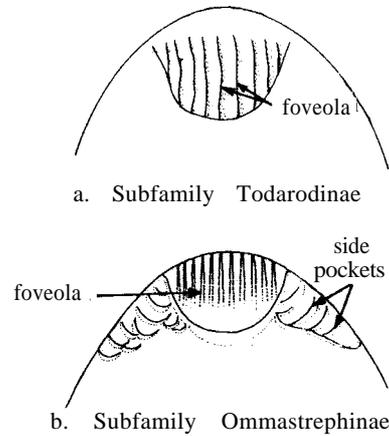
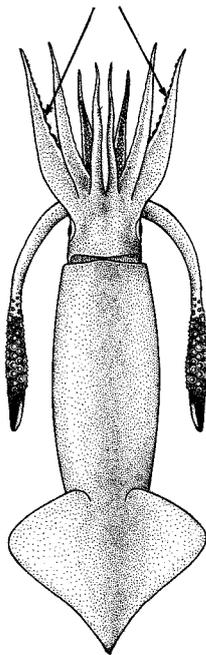
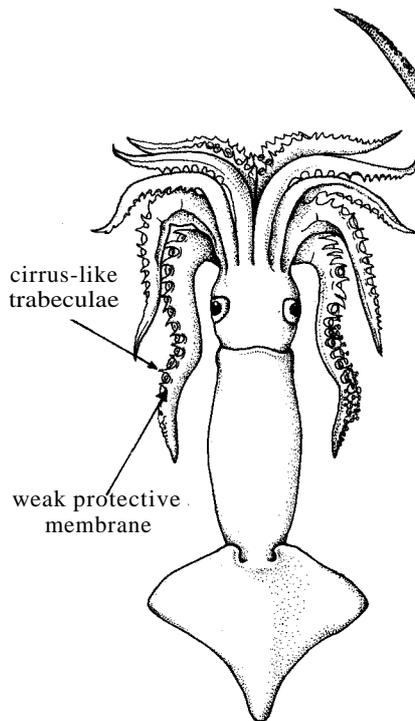


Fig. 2

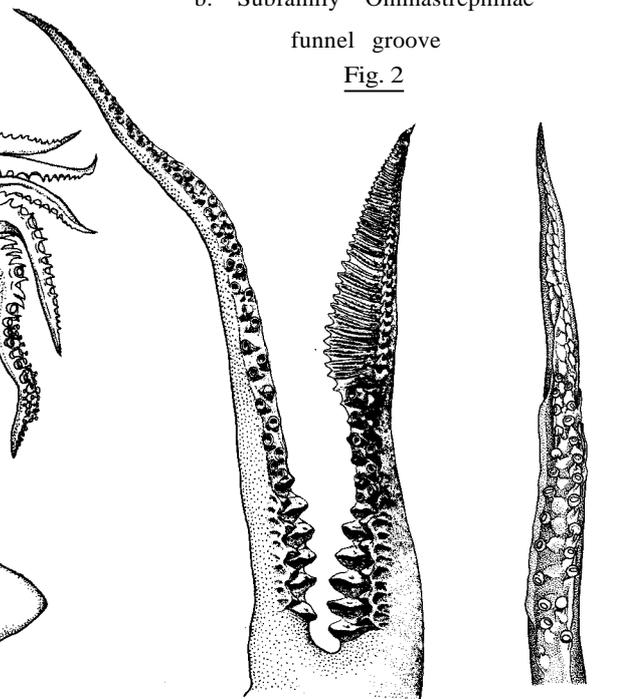
normal protective membrane and trabeculae



dorsal view
Todarodes
Fig. 5



dorsal view
Martialia
Fig. 4



a.
arms IV of male
hectocotylized

b.
right arm I
of male
hectocotylized

Fig. 3

6a. Funnel and mantle components of the locking apparatus are fused together (Figs 6a, 7) Symplectoteuthis

6b. Funnel and mantle components of the locking apparatus are free, not fused (Fig. 6b)

7a. Tips of arms very attenuate with numerous minute, closely packed suckers (Fig. 8) Dosidicus

7b. Tips of arms normal, not attenuate (Fig. 11); suckers not unusually numerous, small or crowded

8a. Nineteen discrete, round light organs in a distinctive pattern on ventral surface of mantle (Fig. 9) Hyaloteuthis

8b. No discrete, round light organs on ventral surface of mantle

9a. Mantle elongate, slender, posteriorly drawn out into a pointed tail (Fig. 10); a stripe of luminous tissue (often pinkish) along ventral midline of viscera; side pockets often obscure Ornithoteuthis

9b. Mantle robust, not drawn out posteriorly in a tail (Fig. 11); no (pinkish) stripe of luminous tissue along ventral midline of viscera (1 or 2 small, round, discrete light organs in region of ink sac in some forms); side pockets distinct . . . Ommastrephes

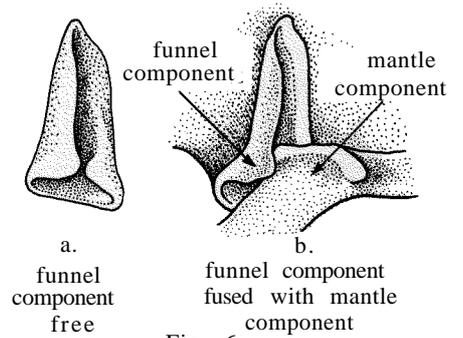
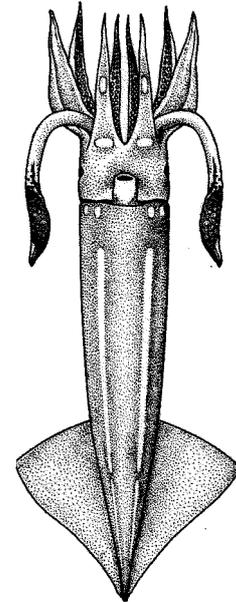
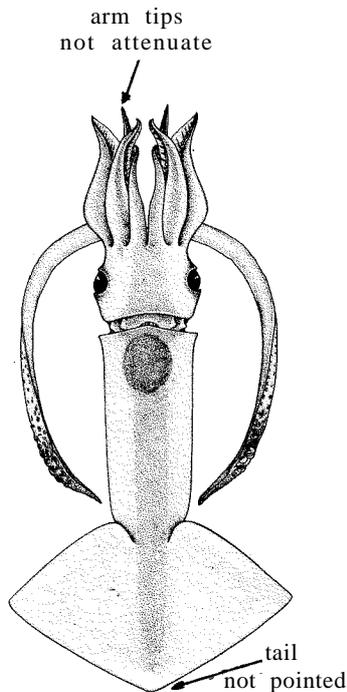


Fig. 6



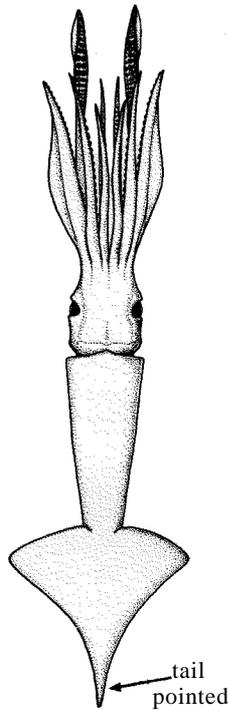
ventral view
Symplectoteuthis

Fig. 7



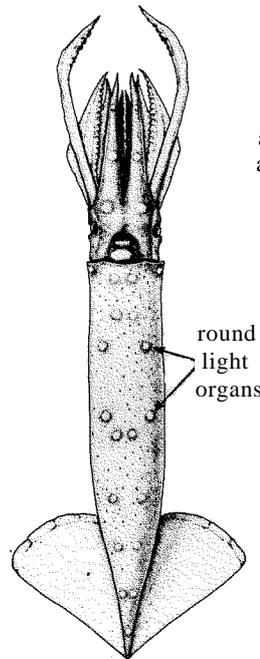
dorsal view
Ommastrephes

Fig. 11



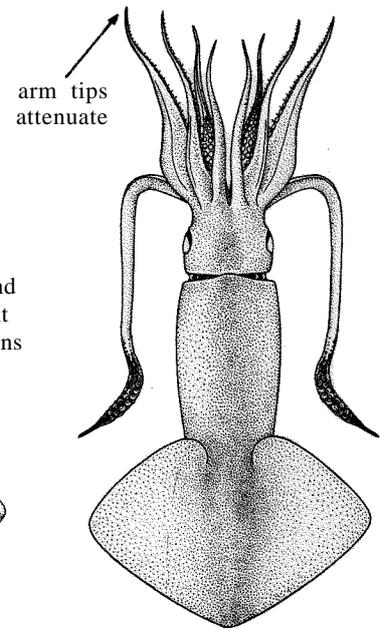
dorsal view
Ornithoteuthis

Fig. 10



ventral view
Hyaloteuthis

Fig. 9



dorsal view
Dosidicus

Fig. 8

Illex argentinus (Castellanos, 1960)

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Ommastrephes argentinus Castellanos, 1960, *Neotropica*, 6(20):55.

Synonymy : *Ommastrephes argentinus* Castellanos, 1960.

FAO Names : En - Argentine shortfin squid
Fr - Encornet rouge argentin
SP - Pota argentina

Diagnostic Features : Mantle long, muscular, widest at mid-point. Fins muscular, relatively short (length 42% of mantle length) and broad (width 57% of mantle length); fin angle broad, 45 to 55° (90 to 110° both fins). Arms very long for the genus, averaging up to 72% of mantle length for arms III in males; all arms of males significantly longer than in females; right (or left) arm IV hectocotyized along more than 50% of its length with suckers and stalks modified into suckerless knobs, truncate lamellae, and narrow lamellae to the tip.

Geographical Distribution : Western South Atlantic: Approximately 30°S to 50°S.

Habitat and Biology : An oceanic and neritic species occurring from the surface to about 800 m depth. In autumn and winter (April to September) it is abundant on the lower shelf (50 to 200 m depth).

The spawning season extends through the summer from December to March. Growth is very fast with total length averaging about 40 cm in the following summer. Longevity is between 1 and 2 years. Argentine shortfin squid prey on fishes (juvenile hakes), pelagic crabs and shrimps. They are in turn preyed upon by finfishes such as adult hake (*Merluccius hubbsi*).

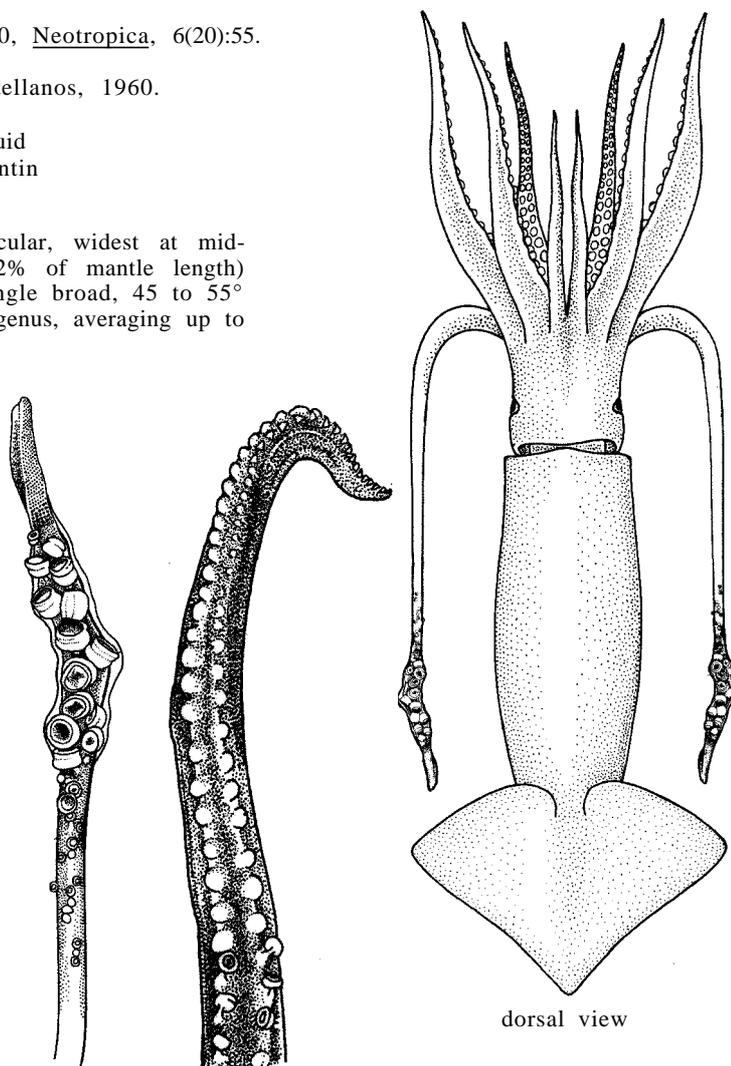
Size : Maximum mantle length 33 cm; sexual maturity is reached at a total length of about 24 cm.

Interest to Fisheries : Taken as by-catch to the otter trawl fishery for hake or alternating with the hake fishery off Argentina and Uruguay on the continental shelf in depths between 30 and 200 m. Catches in the latter country increased from some 100 to 200 metric tons between 1968 and 1974, to 4 600 metric tons in 1979 (Leta, 1981), but deteriorated to 3 000 metric tons in 1981 (FAO, 1983). Argentinian catches, accounting for more than 90% of the 92 000 metric tons taken in Fishing Area 41 in 1979, were largely accounted for by Japanese vessels fishing in Argentinian waters under joint venture arrangements, and most of the catch was frozen and exported to Japan and Spain. Due to the strengthening of restrictions on foreign fisheries, Japanese vessels have started directing their effort to squids outside the 200 mile limit. Subsequently Argentine catches decreased to about 9 000 and 10 600 metric tons in 1980 and 1981 respectively (FAO, 1983). It is also suspected that the sustainable yield of the species may be lower than suggested by previous estimate which did not account for the fact that there was no "virgin stock" when fishing started, because the squids were already heavily "exploited" through predation by hake.

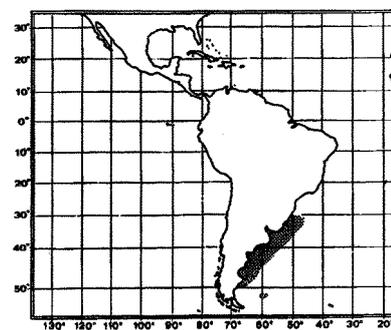
The flesh of *Illex argentinus* is lower in water content than that of *I. illecebrosus*, but its taste is not highly appreciated in Japan. It commands an intermediate price between *I. illecebrosus* and *Ommastrephes bartrami*.

Local Names : ARGENTINA: Calmar; JAPAN: Argentina matsuka; URUGUAY: Calmar.

Literature : Okutani (1980); Leto (1981, fishery, Uruguay); Sato & Hatanaka (in press, stock assessment).



tentacular club arm IV of male hectocotyized



There was no "virgin stock" when fishing started, because the squids were already heavily "exploited" through predation by hake.

Illex coindetii (Verany, 1839)

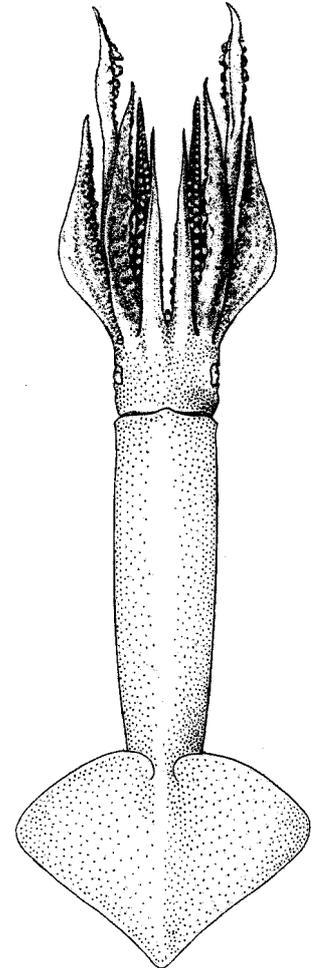
OMMAS III 1

Loligo coindetii Verany, 1839, Mem.Reale Accad.Sci.Torino, (2):94.

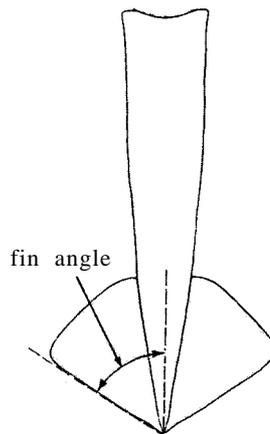
Synonymy : *Loligo brogniartii* Blainville, 1823; *Loligo coindetii* Verany, 1839; *Loligo pillae* Verany, 1851; *Loligo sagittata* Verany, 1851; *Todaropsis veranyi* Jatta, 1896; *Illex illecebrosus coindetii* Pfeffer, 1912.

FAO Names : En - Broadtail shortfin squid
Fr - Encornet rouge
Sp - Pota voladora

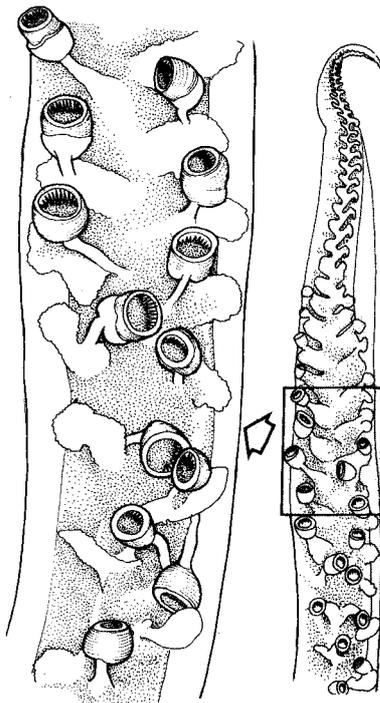
Diagnostic Features : Mantle widest at anterior end (except in fully ripe females), moderately long and narrow; tail pointed, moderately drawn out. Fin angle broad, exceeding 50° (100° in both fins), fin width greater than fin length. Head large and robust, especially in males, length about equal to width; funnel groove without foveola or side pockets. Dactylus of tentacular club with 8 longitudinal rows of small suckers. Arms very long, especially in males where second and third also are very robust; hectocotyized arm (in males) longer than the opposite ventral (IV) arm, its modified portion about 25% of arm length, distal trabeculae modified to papillose, fringed flaps; 1 or 2 knobs on dorsal row of lamellae of modified arm tip.



female dorsal view

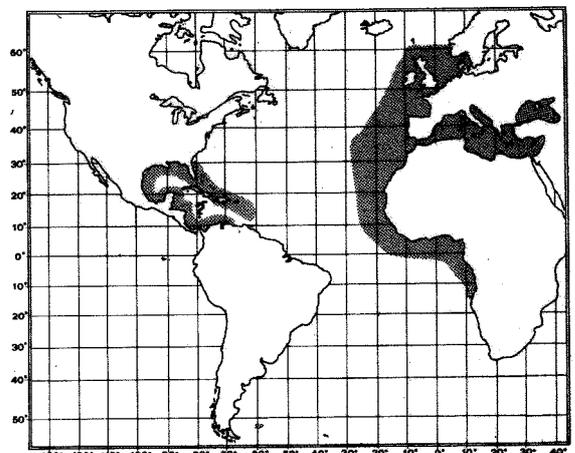


male, ventral view of mantle and fins



arm IV of male hectocotyized

tentacular club



Geographical Distribution : Eastern Atlantic: 15°S to 60°N, Mediterranean and Black Sea. Western Atlantic: Caribbean Sea, Gulf of Mexico and southeast Florida; 10°N to 27°N.

Habitat and Biology : A semidemersal, oceanic and neritic species occurring from the surface to about 1 000 m depth, common in the Caribbean between 180 and 450 m, in the western Atlantic between 200 and 600 m, in the eastern Atlantic between about 150 and 300 m, and in the Mediterranean between 60 and 400 m depth.

The squids are known to carry out diel vertical movements: they are associated with the bottom (usually muddy to silty grounds) during the day and disperse into the water column at night. They also migrate seasonally between deeper waters in winter and shallower waters in the summer. In the western Mediterranean, large mature or maturing individuals migrate towards the coast (from their overwintering areas in 200 to 400 m depth) where, at that time, temperatures tend to be cooler than in greater depths offshore. At an interval of several weeks, they are followed by smaller-sized squids that spend most of spring and summer in shallow waters, while migrating back to offshore areas in autumn. Two peaks can be distinguished during the extended spawning season, one in spring corresponding to the group of large sized individuals and one in autumn corresponding to the smaller sized group. Large females carry up to 12 000 eggs (diameter 1 to 2 mm), the number of eggs being a function of the size of spawners. Individuals hatching in summer usually participate in the autumn spawning in the following year while fall hatchlings tend to spawn in spring of their second year of life, this resulting in an alternation between the two major groups. Post-spawning mortality is high and the lifespan consequently ranges between 1 1/2 and 2 years. The species feeds on euphausiid crustaceans and fishes; it is in turn preyed upon by tunas, rays, toothed whales and other larger carnivores.

Size : Maximum mantle length 37 cm in the northern part of its distributional range; 26 cm in females, and 22 cm in males off West Africa. Females grow larger than males. In the Gulf of Guinea, all females larger than 17 cm and males larger than 11.5 cm are mature. In the western Mediterranean, length at first maturity is 18.5 cm in females, and 11 cm in males.

Interest to Fisheries : Taken throughout the year in depths between 100 and 400 m in international bottom trawl fisheries in the western Mediterranean, off West Africa and Spain. Separate statistics are not reported, but it is believed that a sizeable portion of the 1981 catches reported in the FAO Yearbook of Fisheries (FAO, 1983) for Fishing Areas 34 and 37 (23 700 and 39 000 metric tons respectively) under the category "unidentified loliginids and ommastrephids" are attributable to this species.

Local Names : FRANCE: Faux encornet; ITALY: Totano volatore; JAPAN: Taiseiyoitekkususurume, Taiseiyosurume, Yoroppairekkusu; MALTA: Totlu hammari; MOROCCO: Passamas; SPAIN: Volador; USSR: Kalmas.

Literature : Mangold-Wirz (1963, biology, growth, western Mediterranean); Clarke (1966, biology); Fischer (ed., 1973, Species Identification Sheets, Mediterranean and Black Sea, fishing area 37); Zuzuki (1976, bycatch, Gulf of Guinea); Roper (1978, Species Identification Sheets, western central Atlantic, fishing area 31); Tomiyama & Hibiya (1978); Okutani (1980); Roper & Sweeney (1981, Species Identification Sheets, eastern central Atlantic, fishing areas 34/47 in part).

Illex illecebrosus (LeSueur, 1821)

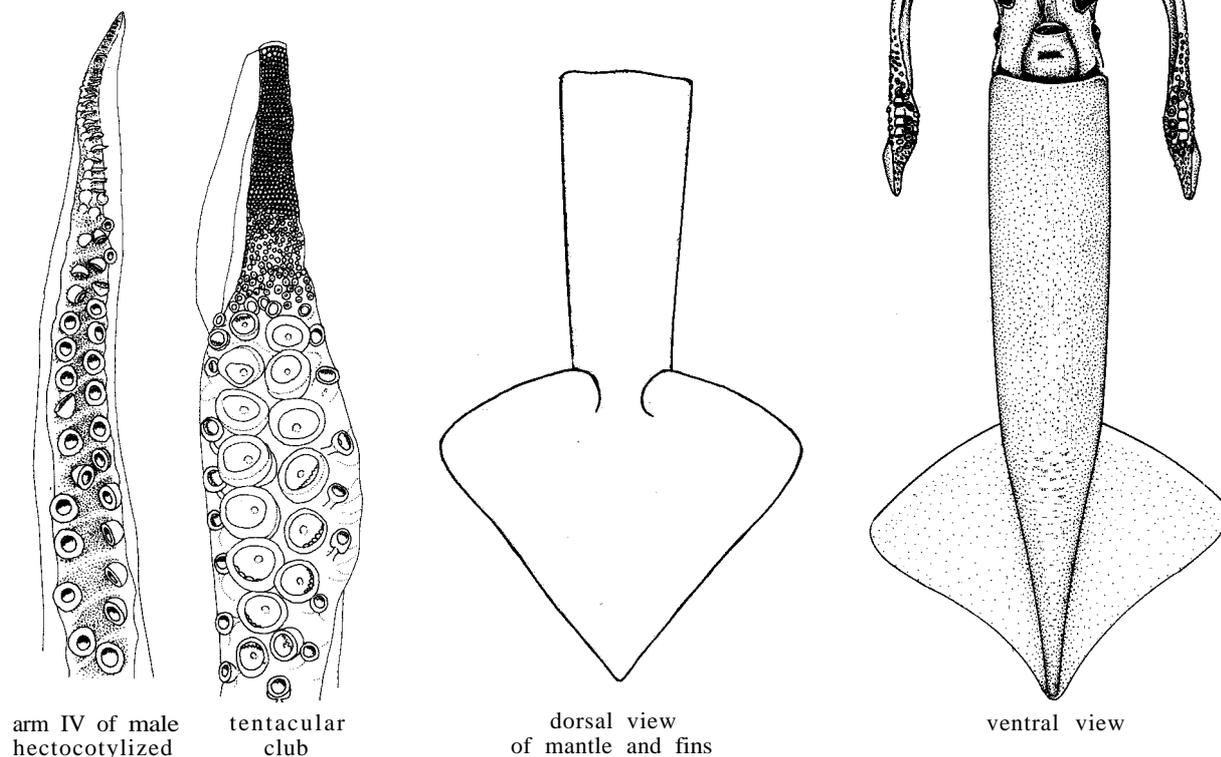
OMMAS III 2

Loligo illecebrosus LeSueur, 1821, J.Acad.Nat.Sci.Phila, 2(1):95.

Synonymy : Illex illecebrosus illecebrosus (LeSueur, 1821); Loligo illecebrosus LeSueur, 1821; Loligo piscatorum La Pylaie, 1825; Ommastrephes illecebrosus Verrill, 1880.

FAO Names : En - Northern shortfin squid
Fr - Encornet rouge nordique
SP - Pota norteña

Diagnostic Features : Mantle robust, widest at midpoint between anterior end and beginning of fins; tail not sharply pointed. Fin angle moderate, 40° to 50°, mostly 45°, fin width greater than fin length. Head small, short and narrow. Arms relatively short, of about equal length in both sexes; hectocotyized arm (in males) shorter than the opposite ventral arm (IV), its modified portion very short, about 22% of arm length; trabeculae (lamellae) without papillose fringed flaps; 1 or 2 knobs on dorsal row of lamellae on modified arm tip. Colour: reddish-brown to deep purple, more intense on head, arms and dorsal surface of mantle and fins; paler on ventral surfaces; a brilliant yellowish-green tint.



arm IV of male
hectocotyized

tentacular
club

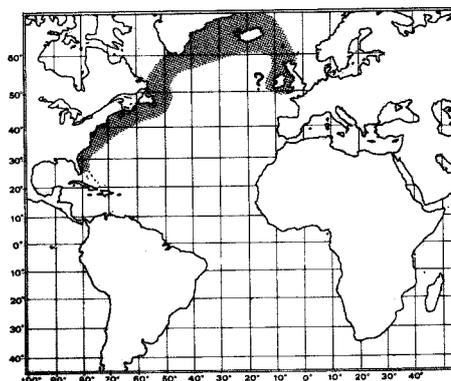
dorsal view
of mantle and fins

ventral view

Geographical Distribution : Western Atlantic: 25°N to 60°N
Northern and eastern Atlantic: British Isles north to Iceland and Greenland.

Habitat and Biology : An oceanic and neritic species, its total depth range extends from the surface to about 1 000 m, but varies seasonally.

In the western Atlantic, seasonal northward - inshore and southward - offshore migrations take place in correlation with environmental conditions, feeding and reproductive cycles. Two groups of spawners one in spring/summer and the other in autumn/winter can be distinguished. Spawning apparently takes place offshore in deeper waters.



Females produce large, spherical, gelatinous egg masses that may reach 1 mm in diameter containing up to 100 000 eggs. Post-spawning mortality is very high. Fertilization of eggs is more efficient at higher temperatures (range 7 to 21°C). Eggs require temperatures between 12 and 22°C for complete development. Hatching occurs after 9, 13 or 16 days at temperatures of 21°, 16°, and 13°C respectively.

Larvae hatching from the winter brood between January and February grow to adult size in little more than 1 year, and spawn after approximately 18 months in summer. Summer hatchlings achieve a mantle length of about 18 or 19 cm after 1 year (females are slightly larger than males) and are ready to spawn in winter at an age of about 1½ years (Mesnil, 1977). Growth rates vary directly with temperature and inversely with size. Small-sized

northern shortfin squids feed mainly on euphausiids (*Meganyctiphanes* and *Thysanoessa*) but switch to finfishes (capelin, herring, and juvenile mackerel) as they grow larger. Squid bites may render unsaleable the finfish part of mixed trawl catches. Squids are in turn preyed upon by cod, adult mackerel, pilot whales and dolphins.

Size : Maximum mantle length 31 cm in females, 27 cm in males in the northern part of its distributional range, but 20 cm in females and 18 cm in males in the southern part.

Interest to Fisheries : This species is almost exclusively fished in the northwestern Atlantic. Catches deteriorated from a 1979 peak of almost 180 000 metric tons to only about 38 000 metric tons in 1981 (FAO, 1983). Two large international fisheries exist: one in the bays of Newfoundland using jigs and jigging machines in depths from 0 to 30 m, and occasionally otter trawls (during summer and early autumn); and an extensive otter trawl fishery along part of eastern Canada and the USA on the shelf and upper slope, and around submarine canyons in depths from 100 to 250 m. Japan and Canada are the two countries taking the greatest share of these catches. The species is in high demand as bait in the autumn cod fishery off Newfoundland because it does not soak and fall off the hooks as fast as finfish bait. Its flesh is also of good food quality although it is high in water content and deteriorates easily. It is therefore processed (but not as salted-fermented 'siokara') or sold immediately fresh. It commands a price approximately 60% of that for *Todarodes pacificus*.

Local Names : JAPAN: Kanadairekkusu, Taiseiyoirekkususurume, Taiseiyosurume; USA: Northern shortfin squid, Short-finned squid.

Literature : Clarke (1966, biology); O'Dor, Durward & Balch (1977, maintenance in tanks); Mesnil (1977, life history and growth); Testaverde (1977, squid attacks on trawl captured finfish); Roper (1978, Species Identification Sheets, western central Atlantic, fishing area 31); Tomiyama & Hibiya (1978); Amaratunga (1980, growth); Durward *et al.* (1980, reproduction); O'Dor *et al.* (1980, reproduction); Okutani (1980); O'Dor *et al.* (1982, effect of temperature on development rates); Lange & Sissenwine (in press, resources).

Illex oxygonius Roper, Lu & Mangold, 1969

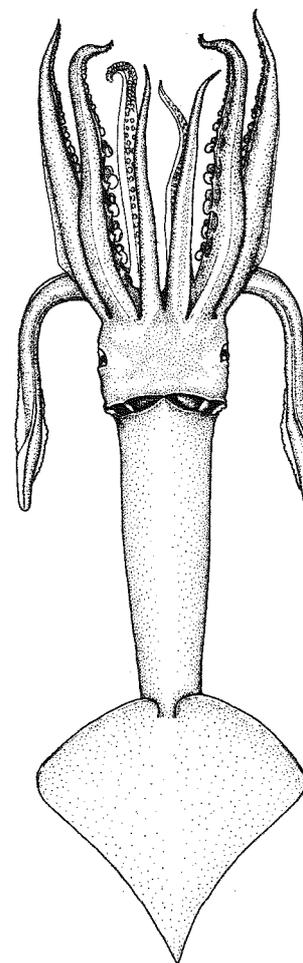
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Illex oxygonius Roper, Lu & Mangold, 1969, Proc.Biol.Soc.Wash., 82:295.

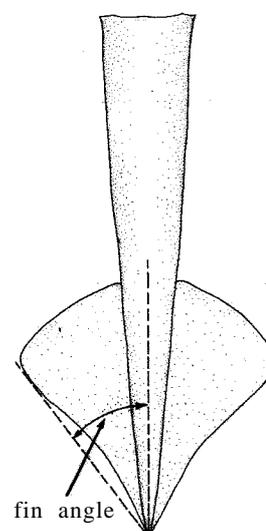
Synonymy : None.

FAO Names : En - Sharptail shortfin squid
Fr - Encornet rouge à pointe
SP - Pota puntiaguda

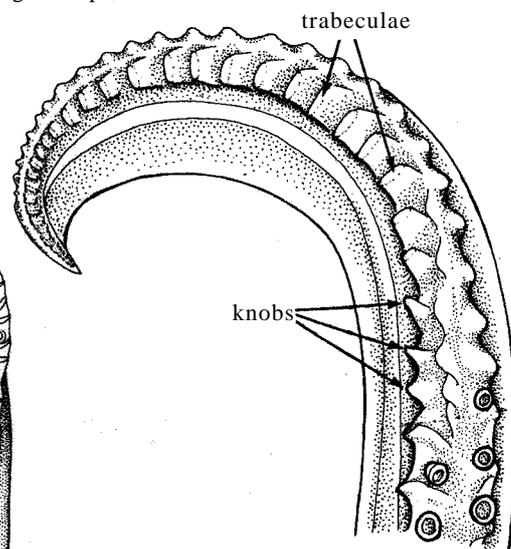
Diagnostic Features : Mantle widest at anterior end; long, narrow, drawn out to a pointed tail posteriorly; males with a sharp, distinct triangular dorsal lobe at mantle opening. Fin angle acute, 25° to 35° (very occasionally to 40° (50° to 80° both fins)); fin width equal to or slightly greater than fin length. Head medium-sized, wider than long. Arms moderately long and robust, especially the second and third in males; hectocotylized arm (in males) longer than the opposite ventral arm (IV); modified portion about 29% of arm length; trabeculae (lamellae) without papillose, fringed flaps; 3 knobs on dorsal row of lamellae of modified arm tip.



dorsal view



ventral view
of mantle and fins



arm IV of male
hectocotylized



tentacular club

Geographical Distribution : Western Atlantic: Chesapeake Bay to southern Florida and southeastern Gulf of Mexico. Eastern Atlantic: Gulf of Guinea, limits undetermined.

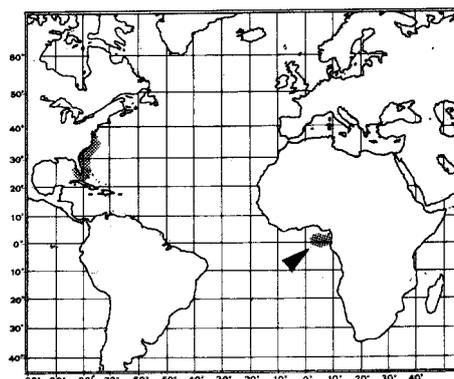
Habitat and Biology : A primarily neritic species occurring in depth between 50 and 550 m within a temperature range from 6 to 13°C. It is associated with the bottom during daylight hours but disperses into the water column at night. Its biology is largely unknown; believed to feed on crustaceans and fishes.

Size : Maximum mantle length 23 cm in males, 21 cm in females.

Interest to Fisheries : At present, the species is only taken as bycatch in bottom trawl fisheries; may co-occur with *I. illecebrosus*.

Local Names : USA: Sharptail shortfin squid.

Literature : Roper (1978, Species Identification Sheets, western central Atlantic, fishing area 31).



Todaropsis eblanae (Ball, 1841)

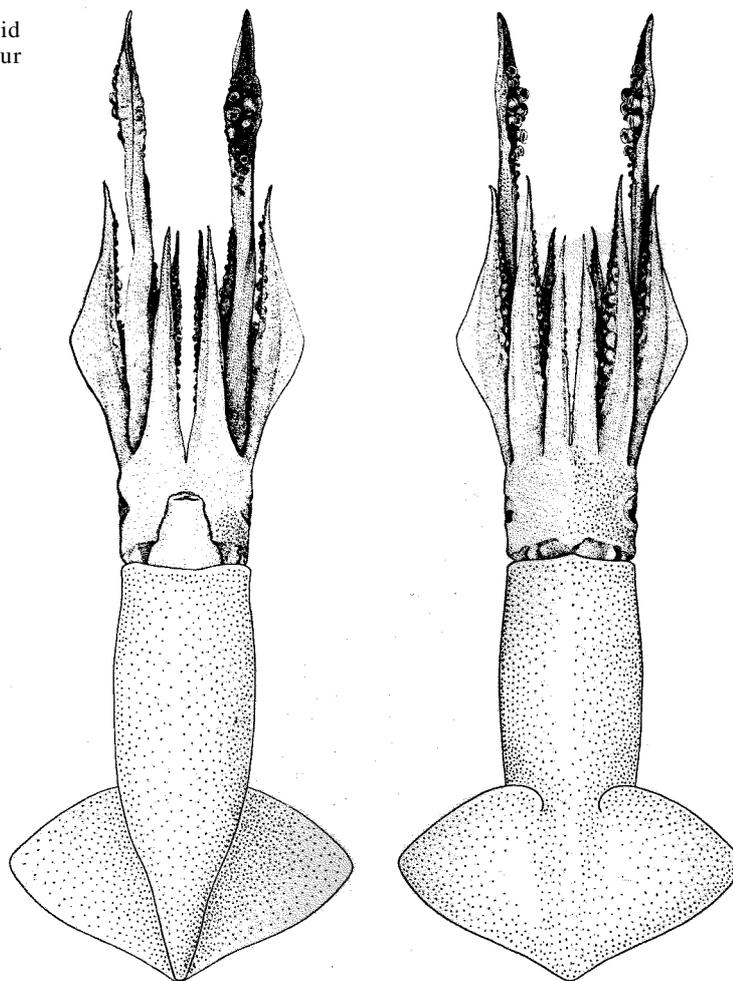
OMMAS Todarop 1

Loligo eblanae Ball, 1841, *Proc.Roy.Irish Acad.*, 19:364.

Synonymy : *Loligo eblanae* Ball, 1841; *Loligo sagittata* Verany, 1851; *Todaropsis veranyi* Girard, 1889; *Todaropsis veranii* Nobre, 1936.

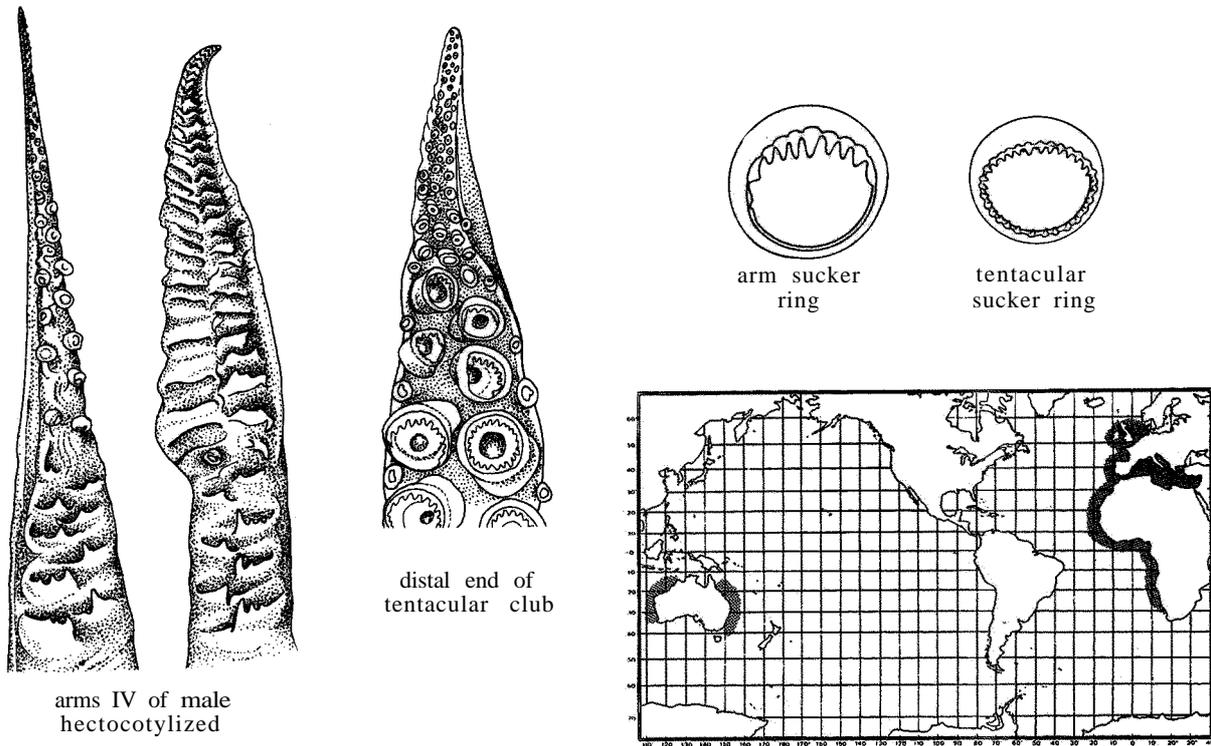
FAO Names : En - Lesser flying squid
Fr - Toutenon souffleur
Sp - Pota costera

Diagnostic Features : Fins with anterior border more convex than posterior border; length of fin less than 50% of dorsal mantle length, width of both fins equal to 90% of dorsal mantle length. Head large and broad, 4 nuchal folds on posterior of head; funnel groove without foveola or side pockets. Dactylus of tentacular club with 4 longitudinal rows of small suckers; manus of club with 6 transverse rows of 4 suckers, each with median pairs up to four times larger in diameter than lateral suckers; sucker rings of largest median suckers with about 30 short, pointed teeth, occasionally alternating with minute teeth. Left and right ventral arms (IV) hectocotylized by modification of suckers into cirrated lappets with transverse lamellae and expanded protective membrane; sucker rings of largest arm suckers with one large pointed median tooth and 3 or 4 smaller pointed teeth.



ventral view

dorsal view



Geographical Distribution : Very disjunct: Eastern Atlantic: 36°S to 60°N, including around British Isles and Mediterranean Sea; southwest Pacific Ocean off Australia; Southeast Indian Ocean off Australia.

Habitat and Biology : A demersal species, usually associated with sandy to muddy bottoms within a temperature range from 9 to 18°C in depths between about 20 and 700 m (but confined to depths less than 200 m in the North Sea). There is evidence on seasonal migrations. The spawning season seems to be very extended. In the western Mediterranean, mature females (in their second year) are found from March to November, but are more abundant in summer. They carry up to 10 000 eggs (1 to 2 mm in diameter) which are laid in a large egg capsule secreted by the greatly enlarged nidamental glands. Males, which mature within their first year, produce some 200 spermatophores. Predators of this species include albacore (*Thunnus alalunga*) and sevengill sharks (*Heptranchias*).

Size : Maximum mantle length 27 cm in females, 16 cm in males; common to 20 cm in females, 13 cm in males. Length at first maturity is about 18 cm in females, 11.5 cm in males.

Interest to Fisheries : Taken as bycatch in otter trawl fisheries, very abundant in some years; catches are usually better in winter. In the western Mediterranean the principal catches are made in depths between 200 and 250 m, while on the Sahara Banks, off northwest Africa, fishing depths range from 100 to 400 m (mostly 200 m). Separate statistics are not reported for this species. Recently reported from Australia.

Local Names : AUSTRALIA: Golden arrow squid.

Literature : Mangold-Wirz (1963, biology, western Mediterranean); Clarke (1966, review, biology); Cooper (1979, length-mass relationship); Okutani (1980); Roper & Sweeney (1981, Species Identification Sheets, eastern central Atlantic, fishing areas 34/47 in part); Lu & Dunning (1982, identification, Australia).

Remarks : Recently recorded in Australian waters.