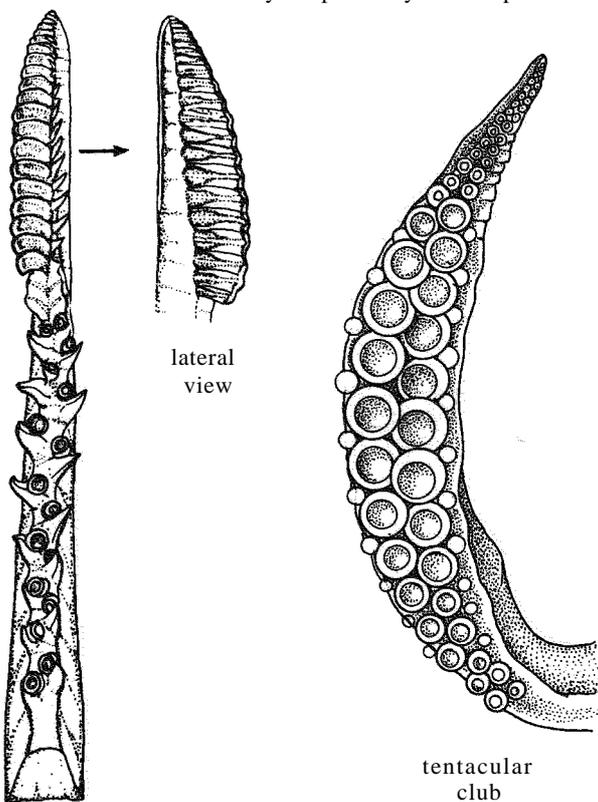


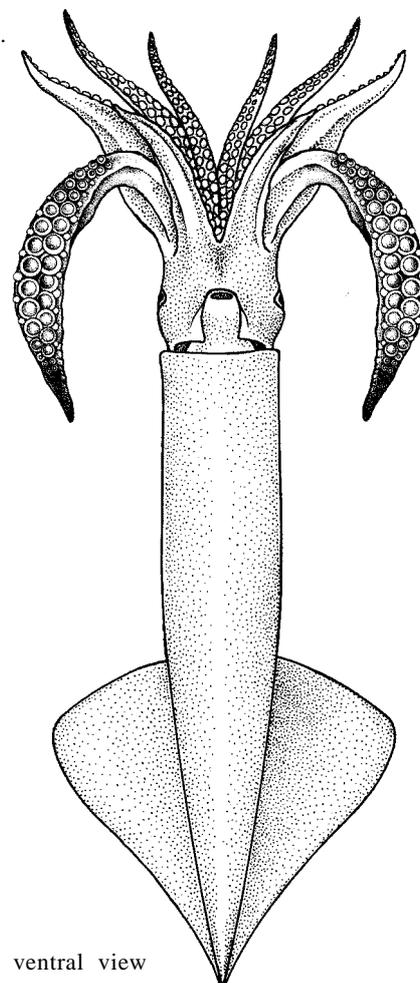
Todarodes filippovae Adam 1975OMMAS *Todarod* 2*Todarodes filippovae* Adam, 1975, *Bull.Inst.Roy.Sci.nat.Belg.*, 50(9):3.**Synonymy** : None.

FAO Names : En - Antarctic flying squid
Fr - Toutenon antarctique
Sp - Jibia antártica

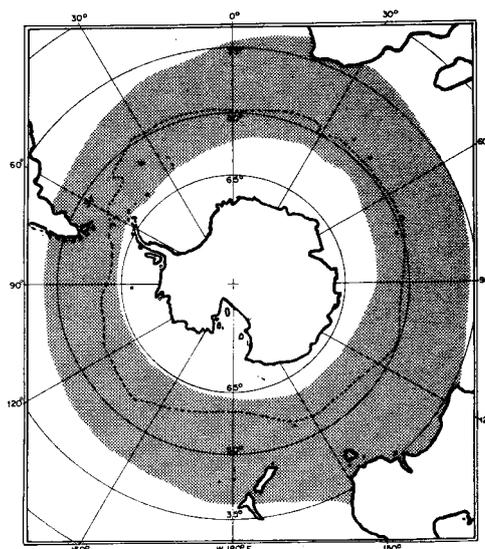
Diagnostic Features : Mantle muscular, long, narrow (width 16 to 24% of mantle length) tapers to a pointed tail. Fins saggittate, length and, width about 50% of mantle length; single fin angle about 30 to 35° (60° to 70° both fins). Tentacles very large and robust. Clubs very expanded occupying nearly entire length of tentacles; only 2 pairs carpal suckers at base of club; largest manal sucker rings with 8 to 11 sharp teeth alternating with low, flat platelets. Arms relatively short, sucker rings with 10 sharp teeth; right arm IV hectocotylyzed along distal 21 to 36% of the arm with suckers transformed to papillae and tubercles, with the ventral protective membrane and trabeculae very expansively developed.



right arm IV of male
hectocotylyzed



ventral view



Geographical Distribution : Circum-polar in the Southern Ocean; south of approximately 35°S; common in the Antarctic Convergence zone.

Habitat and Biology : An oceanic species, occurring between the surface and about 500(?) m depth, but more abundant to about 200 m. Positive phototaxis is strongly developed.

Size : Maximum mantle length over 50 cm; common between 20 and 40 cm.

Interest to Fisheries : Taken as bycatch to the recently developed extensive Japanese jig fishery for *Nototodarus sloani* off New Zealand and southern Australia; in 1978 it was caught in commercial quantities off northeast Tasmania. Also taken with jigs off the Falkland Islands. The species is believed to have some fishery potential.

Local Names :

Literature : Okutani (1977, fishery potential; 1980); Dunning (1982, fishery potential, Australia); Lu & Dunning (1982, identification, Australia).

Todarodes pacificus (Steenstrup, 1880)

OMMAS *Todarod* 3

Ommastrephes pacificus Steenstrup, 1880, *Danske Viden.Selsk.Forh.*, 1880:79.

Synonymy : *Ommastrephes pacificus* Steenstrup, 1880; *Ommastrephes sloani pacificus* Sasaki, 1929.

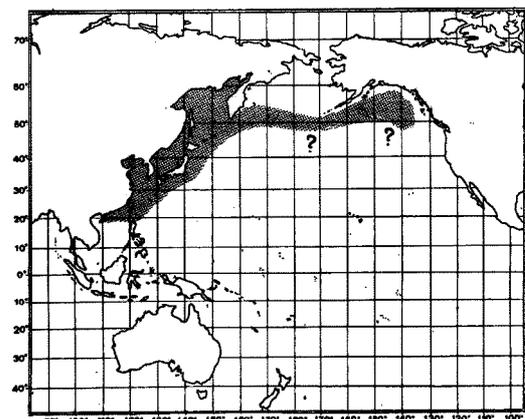
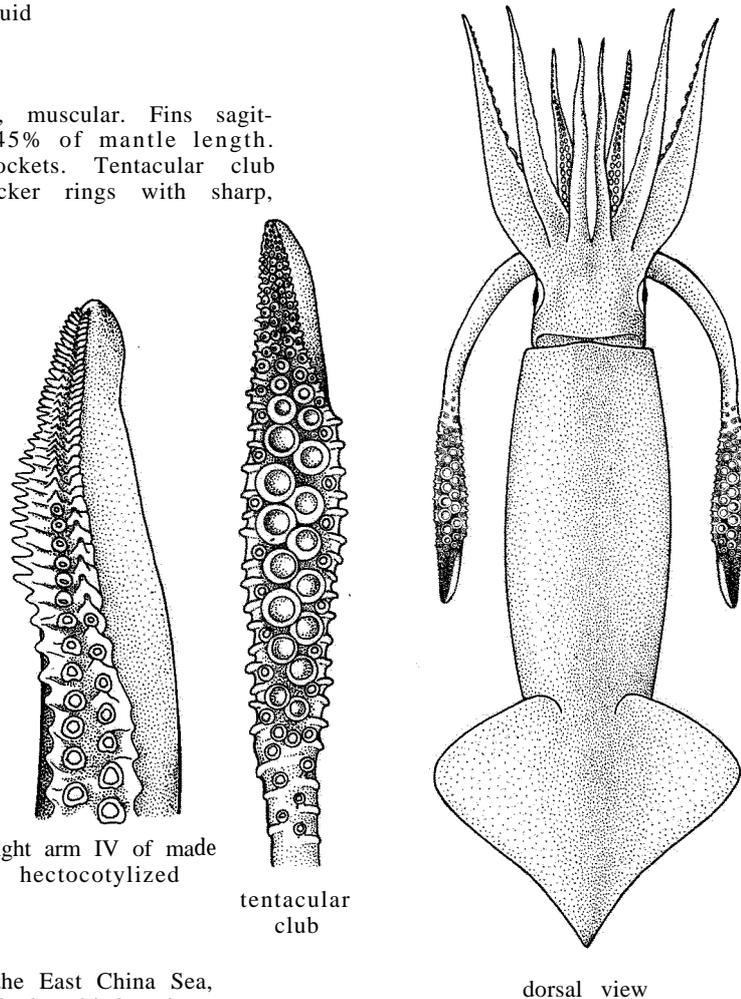
FAO Names : En - Japanese flying squid
Fr - Toutenon japonais
SP - Pota japonesa

Diagnostic Features : Mantle slender, muscular. Fins sagittate, relatively short, length about 40 to 45% of mantle length. Funnel groove with foveola, no side pockets. Tentacular club expanded, robust, long; median manal sucker rings with sharp, triangular teeth alternating with flat, truncate platelets. Arms relatively short; arm sucker rings smooth proximally, toothed with about 10 to 14 graded, sharp teeth distally; right arm IV hectocotylyzed in distal third with suckers and stalks modified into low, conical papillae and comb-like protective membrane.

Geographical Distribution : Western Pacific: 20°N to 60°N, excluding the Bering Sea. Northern and eastern Pacific; Japan north and east to Canada (disjunct?).

Habitat and Biology : An oceanic and neritic species occurring within a broad temperature range from about 5° to 27°C, usually in surface waters to 100 m depth and, to a minor extent, down to 500 m depth. During its lifespan of about 1 year a northward migration occurs first, followed by another one in southward direction, usually in close correlation with changes of the main surface currents. Large aggregations occur in small gyres and along oceanic fronts. Three independently breeding subpopulations can be distinguished in Japanese waters. The main group spawns in winter in the East China Sea, the second in autumn, west of Kyushu, and the third, minor group in spring/summer in the Sea of Japan as well as off northeastern Japan. Postspawning mortality is very high.

The males of all 3 subpopulations mature before the females and transfer their spermatophores on the still immature females (in water temperatures of 13 to 18°C). With the progressing southward migration, females mature and spawn 300 to 4 000 small, elliptical or semi-spherical eggs (greatest diameter 0.7 to 0.8 mm) embedded in a gelatinous capsule (egg mass). Spawning occurs usually at water temperatures between 15 and 20°C, and, depending on the temperature, the larvae hatch after an incubation period of 102 to 113 hours. Growth rates are directly related with temperature and inversely with size. Main food items are myctophids, anchovies (i.e., *Engraulis japonica*), crustaceans, gastropod larvae, and chaetognaths. Cannibalism is common. Predators include rays, dolphins (*Coryphaena hippurus*), balaen whales, and the northern fur seal.



Size : Maximum mantle length 50 cm in females, somewhat smaller in males; maximum weight at least 0.5 kg, common 0.1 to 0.3 kg. Females attain sexual maturity at 20 to 25 cm mantle length, males at 17 to 19 cm.

Interest to Fisheries : Well-developed fisheries for this species exist primarily in the northwestern Pacific (Fishing Area 61) around Japan and to a lesser extent off the Korean Peninsula and off China. After a peak of 600 000 tons in 1952, which at that time amounted to 91.5% of the entire Japanese cuttlefish and squid catch, the overall landings declined and have been fluctuating in the last few years between about 200 000 and less than 400 000 tons annually. 1981 catches were down to 230 000 metric tons from 380 000 metric tons in the preceding year, but they still accounted for about 18% of world cephalopod catches (FAO, 1983). Japan continued to take the lion's share although that of the Republic of Korea steadily increased from approximately 10 to 15% to more than 33% in 1981.

Up to the forties, the Japanese Todarodes pacificus fishery was only a small-scale activity with unpowered boats of 1 to 2 tons, taking less than 100 000 metric tons per year. In the fifties, well equipped engine-powered boats of 10 to 30 tons were introduced. They deployed more-jigging lines as well as battery-powered lamps for light attraction. In the sixties, these boats were in turn substituted by even larger vessels operating with jigging machines and generator-driven lamps, this evolution going hand in hand with the development of improved handling and processing techniques. Furthermore, a 'fishery forecast' has been established for all fishing grounds in the Japan Sea and the western Pacific. Parallel to the decline of catches of T. pacificus, other species such as Ommastrephes bartrami are becoming more heavily exploited.

Initially T. pacificus was processed into a dried product (surume) for both domestic consumption and export, but with the expansion of the fishery, other production lines evolved, such as raw squid (sashimi), a cooked and processed product (sakiika), frozed and canned squid.

Local Names : CHINA: Yat boon yau yue (Japanese softfish); JAPAN: Akaika, Ganzeki, Matsuika, Mugiika, Surumeika, Tonkyu.

Literature : Clarke (1966, biology); Okiyama (1965, feeding habits); Hamabe et al. (1975, biology; 1976, fishery resources); Murata et al. (1973, ecology); Araya (1976, migration); Okutani 1977 resources; 1980); Pavlychev & Shevstov (1977, relationship between hydrographical conditions and catchability); Hibiya (1978); Kasahara (1978, jigging and forecasting techniques); Arnold (1979, biology and fisheries).

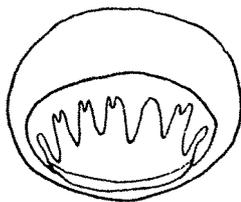
Todarodes sagittatus angolensis Adam, 1962

Todarodes sagittatus angolensis Adam, 1962, Mem.Jun.Invest.Ultr., (2)33:32.

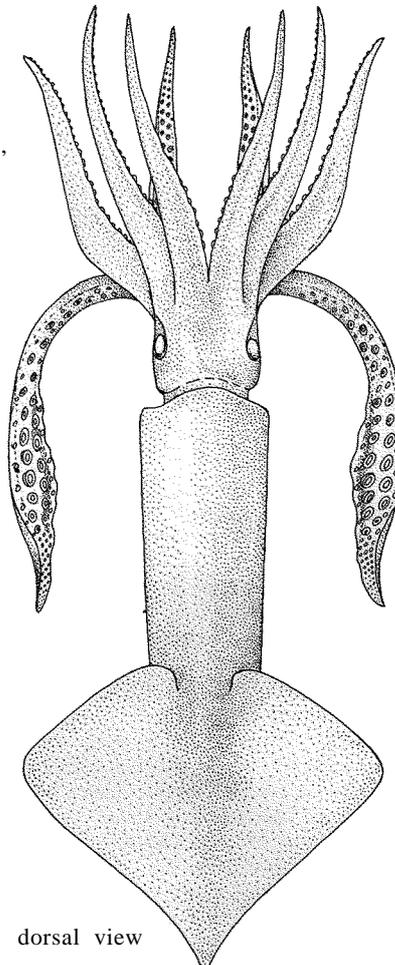
Synonymy : None.

FAO Names : En - Angola flying squid
Fr - Toutenon angolais
SP - Pota angolense

Diagnostic Features : Funnel groove with foveola, no side pockets; no light organs on viscera. Carpal area of club very short with 4 pairs of suckers. Arm sucker rings with large distal teeth alternating with very small teeth; right arm IV of male hectocotylized in distal 40% with suckerless, thick pedicels nearly completely connected by the ventral protective membrane; dorsal row of pedicels flattened.



arm sucker ring



dorsal view

OMMAS Todarod 1a



tentacular club

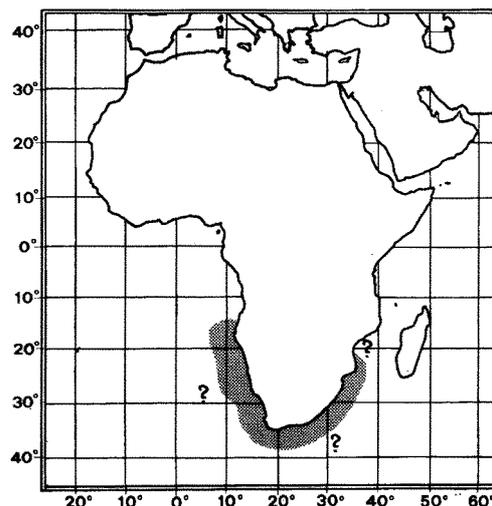
Geographical Distribution : Limited to the eastern Atlantic South of 13°S occurs around South Africa and reaches into the Indian Ocean; limits unknown.

Habitat and Biology : Unknown.

Size : Maximum mantle length in females 35 cm, in males unknown.

Interest to Fisheries : Currently there is no directed fishery for this species. Caught as bycatch in otter trawl fisheries, but separate statistics are not reported.

Local Names:



Todarodes sagittatus sagittatus (Lamarck, 1798)

OMMAS Todarod 1b

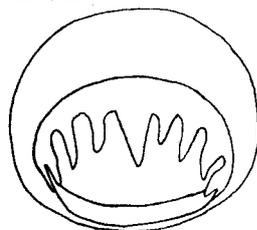
Loligo sagittatus Lamarck, 1798, Mem.Soc.Hist.Nat.Paris, 1:13.

Synonymy : Loligo sagittatus Lamarck, 1798; Ommastrephes sagittatus Lamarck, 1798; Ommatostrephes sagittatus (Lamarck, 1798); Loligo todarus Verany, 1851.

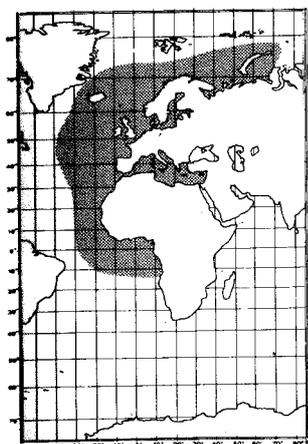
FAO Names : En - European flying squid
Fr - Toutenon commun
SP - Pota europea

Diagnostic Features : Funnel groove with foveola and without side pockets. Club suckers on dactylus in 4 rows, suckers on elongate carpus in 10 to 12 pairs; entire club relatively very long, extending along stalk. Arm suckers with enlarged central tooth, 7 to 9 regular teeth and virtually no small alternating teeth. No light organs on viscera.

Geographical Distribution : Eastern Atlantic: entire area to approximately 40°W and from 13°S to the Arctic Ocean: Mediterranean Sea.



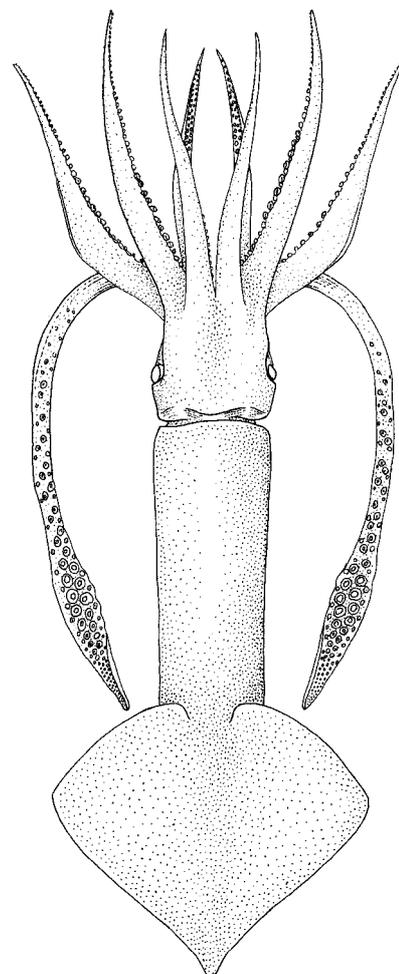
arm sucker ring



arm IV of male hectocotylized



tentacular club



dorsal view

Habitat and Biology : A neritic and oceanic species occurring from the surface to about 1 000 m depth. It is known to carry out diel vertical movements between the surface at night and near bottom waters during the day.

From June onwards, large schools appear off the south and southwest coast and in the northwestern fjords of Iceland, the Faroer Islands, Norway and, in some years, Scotland, where they stay until about December. Stranding of great numbers of squid is relatively common during this period. In early winter, the squids migrate into deeper offshore waters. In the western Mediterranean, no evidence was found for a similar migration pattern, but around Madeira and other parts of the eastern central Atlantic, the species is only found between March and May in large numbers on the fishing grounds.

Spawning probably takes place on the continental slope, in late winter or early spring off northern Europe, in March and April off France, and between September and November in the western Mediterranean. Ripe males seem to be present throughout the year, while mature females are found exclusively during the spawning period. Each female may produce up to about 15 000 eggs. Individuals in the Mediterranean and the southern part of the distributional range mature at sizes much inferior than those in the North Atlantic. Females always greatly outnumber males. Individuals larger than 50 cm are believed to be at least 2 years old.

In northern waters, the species feeds primarily upon small herring (Clupea harengus), and cod (Gadus morhua) and is in turn preyed upon by tunas (Thunnus obesus, T. alalunga), cod, lancetfish (Alepisaurus ferox), dolphins and sperm whales.

Size : Maximum mantle length at least 75 cm; males off northern Europe grow at least to 64 cm; females to 49 cm, while in the Mediterranean the maximum sizes recorded are 32 cm and 37 cm respectively. Common sizes range between 25 and 35 cm.

Interest to Fisheries : A directed fishery for this species exists off Norway where some 10 000 metric tons were taken in 1981 about 3 times as much as in the preceding year (FAO, 1983). In the Mediterranean, the main fishery is operated by Italian vessels, with annual catches stabilized around 3 000 metric tons in the last few years (FAO, 1983). In other parts of its distributional range, it is taken as bycatch in trawl fisheries. In some Mediterranean countries, the commercial value of this species is relatively high, although the flesh of large individuals is described as tough. It is consumed fresh or boiled; also marketed frozen, salted or dried and used as bait in the cod and halibut fisheries. Apart from large-scale predation on commercial finfish species, it has occasionally been considered a nuisance because of its competition with finfishes for baited hooks.

Local Names : CYPRUS: Thrapsallo; FRANCE: Calmar; GREECE: Kalamari; ITALY: Totano; JAPAN: Hokkaisurumeika, Taiseiyosurume, Yoroppasurumeika; MALTA: Totlu bajdani; MOROCCO: Passamar; SPAIN: Pota; USSR: Kalmar; YUGOSLAVIA: Lignjun.

Literature : Mangold-Wirz (1963, biology, western Mediterranean); Clarke (1966, biology); Fischer (ed., 1973, Species Identification Sheets, Mediterranean and Black Sea, fishing area 37); Tomiyama & Hibiya (1978); Arnold (1979, biology); Okutani (1980); Roper & Sweeney (1981, Species Identification Sheets, eastern central Atlantic, fishing areas 34/47 in part).

Nototodarus gouldi (McCoy, 1888)

OMMAS Noto 1

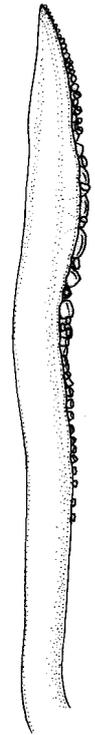
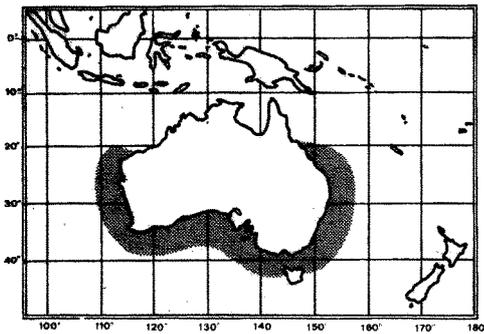
Ommastrephes gouldi McCoy, 1888, Decade, 17:227.

Synonymy : Nototodarus sloani gouldi (McCoy, 1888); Ommastrephes gouldi McCoy, 1888.

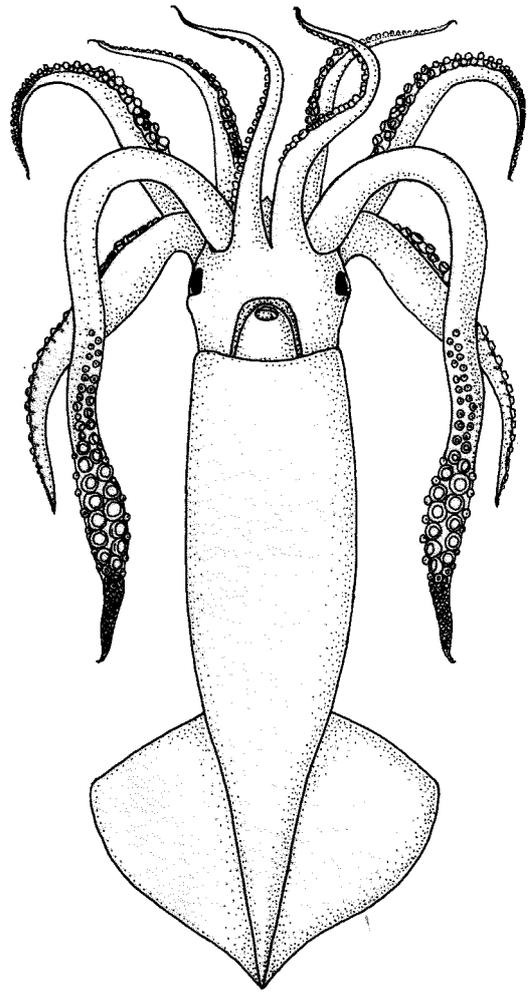
FAO Names : En - Gould's flying squid
Fr - Encornet éventail
SP - Pota australiana

Diagnostic Features : Mantle robust, heavily muscled, tapers gradually then very acutely to a point posteriorly. Fins strong, about 45% as long as mantle length; angle broad, 90 to 110° (45 to 55° single fin). Funnel groove with foveola and 6 to 8 low longitudinal ridges apically. Tentacular club long, 60 to 70% of tentacle length; about 8 pairs of enlarged manal suckers in median rows, marginal suckers small, subequal; largest sucker rings toothed all around with 15 separated, stout, triangular, pointed teeth interspersed with low, side platelets. Arm sucker rings with 12 or 13 sharp, triangular teeth graded to a single large central tooth distally; proximal 1/3 smooth, without teeth or denticles; both ventral arms (IV) in males hectocotylized: the right arm with a heavily tuberculate basal region, a narrow sucker-bearing mid-part, and a distal part with very broadly expanded, pectinate protective membrane; the left ventral arm 1/4 longer than right IV, with 5 proximal-most pairs of suckers modified into large, swollen tubercles.

Geographical Distribution : Temperate to subtropical areas off Australia.



tentacular club



ventral view

Habitat and Biology : A neritic and oceanic, mostly epipelagic species occurring from the surface to about 500 m depth. Its abundance in surface waters is correlated with the lunar cycle; in full moon nights the squids tend to remain in deeper waters where they are less vulnerable to the fishing gear. Individuals in all maturity stages are encountered throughout the year, but at least one major spawning season, from February to March can be identified. Large aggregations are formed in this period. Individuals ready to spawn seem to stay close to the bottom. Hectocotylization of both ventral arms in males starts at a minimum size of about 14 cm. Males usually outnumber females.

The species feeds predominantly on ommastrephid squids (with a high rate of cannibalism) and fishes (primarily pilchards). It is in turn preyed upon by tunas and other large carnivores.

Size : Maximum mantle length 40 cm in females, 35 cm in males; weight about 0.8 kg. Females grow larger than males, but males tend to be heavier at a given length.

Interest to Fisheries : Initially, the species was only taken as bycatch in the Australian prawn fishery. Feasibility fishing started in summer 1978/1979, with 19 Japanese jiggers operating in southeast Australian waters. In the light of promising catch rates, exploratory fishing was subsequently expanded. Chinese jigging vessels (from Taiwan) operate intermittently in the area. Catches are best in the waters around Tasmania and the western Bass Straits, particularly from December to March. In recent years, the annual catch fluctuated between 4 000 and 5 000 metric tons (Dunning, 1982).

Local Names : AUSTRALIA: Gould's squid.

Literature : Machida (1980, squid survey); Dunning (1982, fishery resources); Smith (1983, biology and fishery); Chikuni (in press, resources).

Nototodarus hawaiiensis (Berry, 1912)

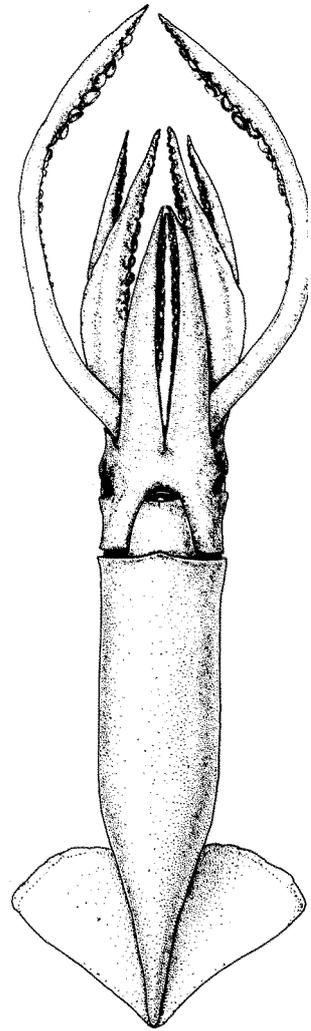
OMMAS Noto 2

Ommastrephes hawaiiensis Berry, 1912, *Proc.Acad.Nat.Sci.Phila.*, 64(2):434.

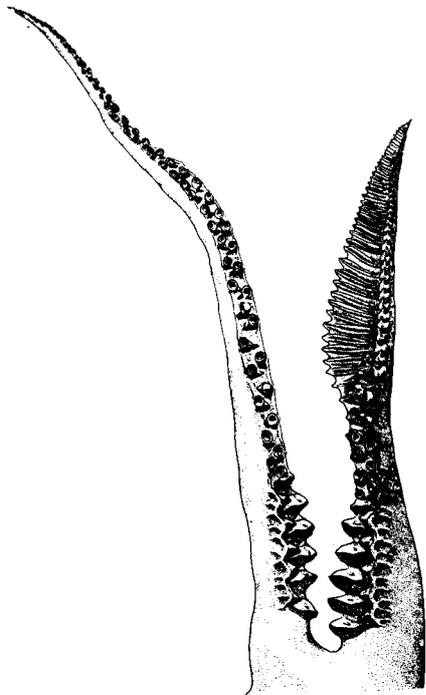
Synonymy : *Ommastrephes hawaiiensis* Berry, 1912; *Nototodarus sloani hawaiiensis* (Berry, 1912).

FAO Names : En - Hawaiian flying squid
Fr - Encornet bouquet
SP - Pota hawaiana

Diagnostic Features : Mantle cylindrical, muscular, tapering to a conical tip. Fins muscular, length 38 to 40% of mantle length, single fin angle 54° (50 to 57°). Funnel groove with foveola, no longitudinal ridges. Tentacular club, especially carpal area, occupies most of tentacle length (about 70%); largest median sucker rings with 15 or 16 large conical, pointed teeth with low, truncated platelets between each tooth; distal, central tooth quite enlarged. Arm sucker rings toothed all around with 19 to 21 small, conical (distally) to rounded (proximally) teeth; distal, central tooth quite enlarged; small denticles between some distal teeth; both arms IV hectocotyized in males, right especially so - longer and larger than left; proximal 1/4 of each have enlarged trabeculae and thickened protective membranes; distal right arm trabeculae, sucker stalks and suckers modified by enlargements, reductions, etc.



ventral view



arms IV of male
hectocotyized

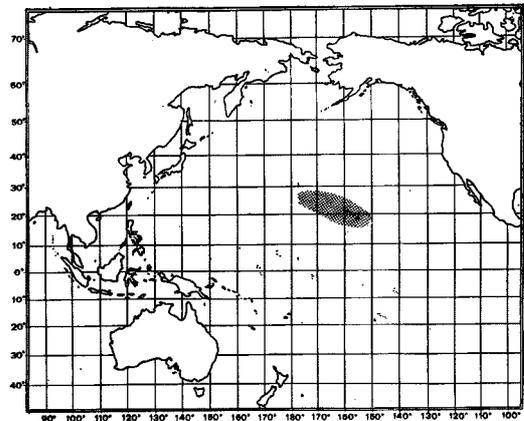


tentacular
club

Geographical Distribution : Central Pacific Ocean: Hawaiian Islands to Midway Island.

Habitat and Biology : A demersal species taken in open nets fishing down to depths between 400 and 570 m, but it probably occurs also in shallower waters because it is an important food item in the diet of sea birds and fishes. Its biology is little known.

Size : Maximum mantle length 16 cm; males and females mature at 11 or 12 cm mantle length.



Interest to Fisheries : An artisanal fishery exists off Hawaii (Big Island) out of the Port of Hilo. Exploratory fishing with jigs and gillnets is in progress and the species is believed to have sufficient potential for an expansion of the fishery. Used for human consumption and as bait.

Local Names :

Nototodarus philippinensis Voss, 1962

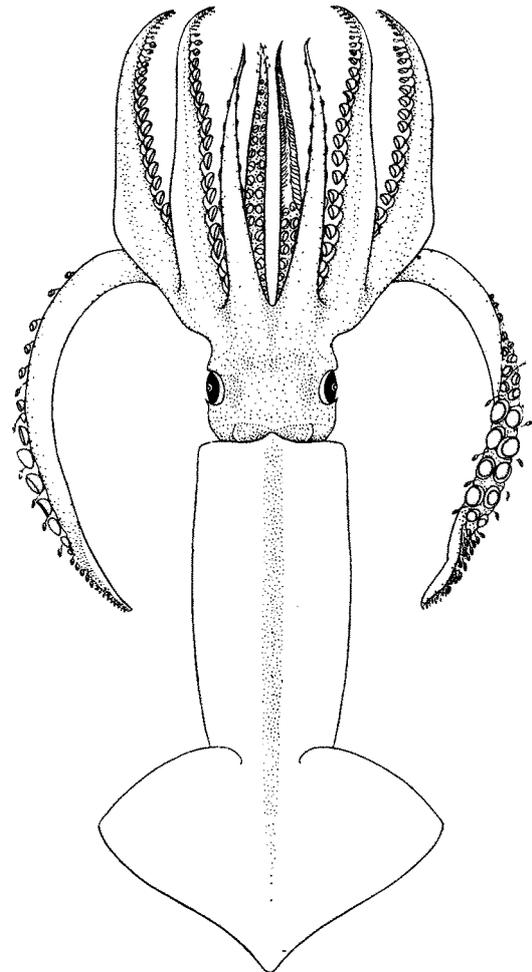
OMMAS Noto 3

Nototodarus sloani philippinensis Voss, 1962, Proc.Biol.Soc.Wash., 75:171.

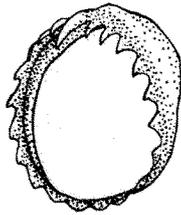
Synonymy : Nototodarus sloani philippinensis Voss, 1962

FAO Names : En - Philippine flying squid
Fr - Encornet fuiripin
SP - Pota filipina

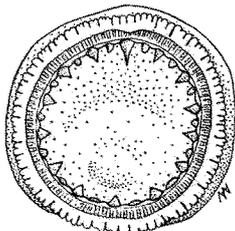
Diagnostic Features : Mantle thick, muscular, tapering to a narrow, pointed tip posteriorly. Fins muscular, broad, short, length about 50% of mantle length; a dark stripe of thickly set chromatophores along dorsal midline. Funnel groove with foveola and longitudinal ridges. Tentacular club occupies about 3/4 of tentacle; carpal area indistinct; about 12 median manal suckers 3 or 4 times larger than marginal suckers, with 14 to 18 large, sharp teeth, the central one enlarged. Arms large, robust; largest arm sucker rings with about 20 teeth all around; proximally, teeth are flattened broad platelets that grade distally into sharp, pointed teeth, the distal central tooth much enlarged, pointed and curved; both arms IV in males hectocotylized basally by protective membranes and trabeculae modified into thick, saw-like processes; right arm further modified to tip by greatly reduced suckers and stalks enlarged, closely set, comb-like.



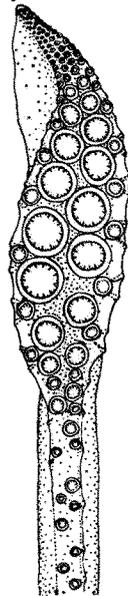
dorsal view



arm sucker ring



tentacular ring



tentacular club

Geographical Distribution : South China Sea: Philippines, Hong Kong; limits undetermined.

Habitat and Biology : A demersal species in depths of 275 to 650 m.

Size : Maximum mantle length 18 cm, weight 0.2 kg.

Interest to Fisheries : Apparently very common, believed to have a high fishery potential because of its abundance and the consistency of the muscle which makes it fit for human consumption. Its occurrence in relatively deep waters may limit access by common trawling techniques.

Local Names : JAPAN: Fuiripinsurumeika.

