Sepia elegans Blainville, 1827

Fig. 132

Sepia elegans Blainville, 1827, *Dictionnaire des Sciences Naturelles*, 48: 284 [type locality: Sicily (*S. elegans*); Mediterranean Sea (as *S. biserialis* and *S. italica*); Island of Noirmoutiers and La Rochelle (as *S. rupellaria*).

Frequent Synonyms: *Sepia rupellaria* Férussac and d'Orbigny, 1835–1848; *Sepia biserialis* Blainville, 1827; *Sepia italica* Risso, 1854.

Misidentifications: *Sepia bertheloti* d'Orbigny, 1835.

FAO Names: En – Elegant cuttlefish; **Fr** – Seiche élégante; **Sp** – Sepia elegante.

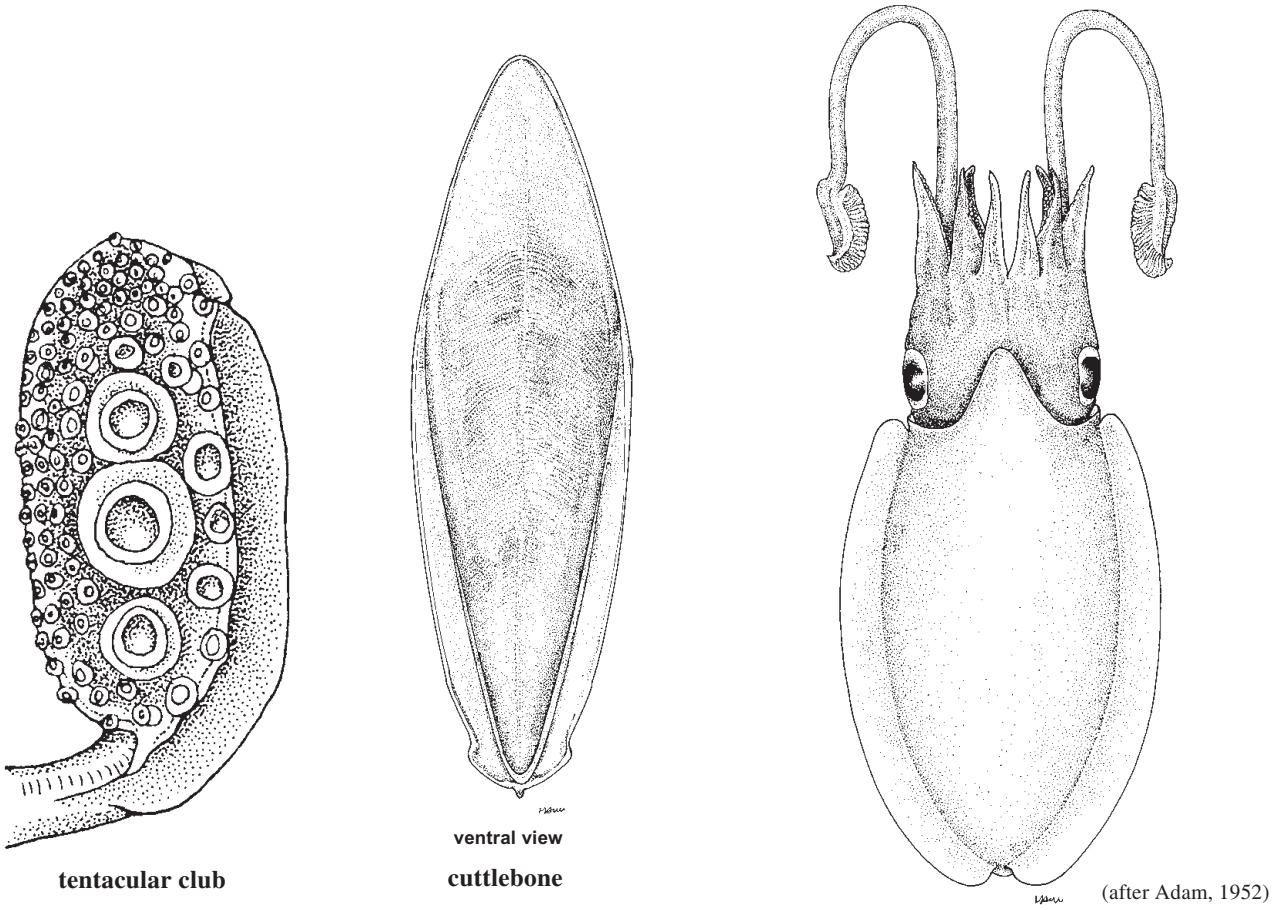

Fig. 132 ***Sepia elegans***

Diagnostic Features: Small species. Mantle oblong; dorsal anterior margin triangular, acute; ventral mantle margin emarginate. Male and female arms subequal in length. Arm sucker arrangement differs between sexes: in males, arm I suckers **biserial for a few rows, rest tetraserial**; arms II and III **suckers tetraserial proximally, biserial at extreme distal tips**; arm IV suckers variously arranged (approximately 10 pairs biserial suckers on arms I to III, arms IV with 2 to 4 rows biserial suckers); in females, suckers biserial proximally, tetraserial distally (5 rows biserial suckers arms I to III, 2 to 4 rows biserial suckers arms IV). Male non-hectocotylized median arm suckers with greater diameter than marginal ones. Hectocotylus present on left ventral arm: **1 or 2 rows of normal size suckers proximally, 9 to 11 rows of reduced minute suckers medially**, then normal size suckers to arm tip; suckers in 2 dorsal and 2 ventral series displaced laterally. Club short, oval; sucker-bearing surface flattened, with **6 to 8 suckers in transverse rows**; suckers differ markedly in size: **3 or 4 greatly enlarged suckers** toward posterior end of club and several dorsal suckers enlarged, but not as large as medial suckers. Buccal membrane in females with single median spermathecae in ventral part. Cuttlebone outline oblong; convex in lateral view; acuminate, acute, anteriorly and posteriorly; recurved ventrally; dorsal surface evenly convex; last loculus convex. Anterior striae are inverted U-shape. Inner cone limbs are uniform width, **narrow V-shape posteriorly**; outer cone narrow throughout; outer cone limbs are **expanded posteriorly into 2 curved 'wings'**, directed ventrally, to form a recurved cup-like structure. **Spine very short**. Dorsoposterior end of cuttlebone with short, rugose, calcareous keel. Ventral mantle with longitudinal row of 6 narrow ridges along each side close to fins; anteriormost pair and posterior 2 pairs shorter than rest. **Colour: Reddish brown**. Head with a few scattered chromatophores. Arms without markings. Dorsal mantle pale, peppered with scattered purple-black chromatophores. Fins and ventral mantle pale. Ridges whitish.

Size: Males up to 72 mm mantle length; females up to 89 mm mantle length. Total weight between 50 and 60 g.

Geographical Distribution: Eastern Atlantic and Mediterranean Sea: around British Isles, western Scotland, Ireland, Dingle Bay, Co. Kerry and the English Channel, from 50°N through the Mediterranean (including Ligurian Sea, Tyrrhenian Sea, Aegean Sea, Sea of Marmara and Levantine Sea), west Africa: Endeavour Bank to 15°S, and possibly Agulhas Bank (Fig. 133).

Habitat and Biology: Depth to 500 m, although records below 450 m are sporadic. ***Sepia elegans*** is a sublittoral species. It spends the winter in deep water (200–400 m), then migrates into the shallows in spring and summer to spawn. It feeds mainly on molluscs, small crustaceans, fishes and polychaetes. In the Sea of Marmara (Mediterranean Sea), this species has been found in brackish waters (salinity between 18 and 25‰), which indicates a high degree of tolerance. In the Mediterranean Sea, mature males and females are present throughout the year, which suggests a continuous spawning period. As a consequence of this, a continuous recruitment also occurs, with observed peaks in several Mediterranean areas. Smallest mature males have been observed at 20 mm, and females at 30 mm mantle length. The eggs are laid in clusters of 12 to 25 (diameter 5 mm) attached to alcyonarians (sea fans), shells, etc., on muddy bottoms. After hatching, juveniles immediately adopt a benthic lifestyle. A rough estimate of growth in mantle length of 2.8 mm per month for males and 3.0 mm for females is reported for animals in the Sicilian Channel. A negative allometric length–weight relationship has been found for both sexes in all seasons and different locations, with females heavier than males at any given mantle length. Females also have longer tentacular clubs and heavier stomach contents than males. Off west Africa, spawning extends almost throughout the year in shallow inshore waters, with peaks in summer and autumn. Maturity is attained at about 1 year of age. Males may carry about 95 spermatophores and females about 250 eggs. Spawning occurs at temperatures of 13° to 18°C. In Portuguese waters mature animals are also present throughout the year, but with minimum numbers in summer. The lifespan of this species is about 12 to 18 months.

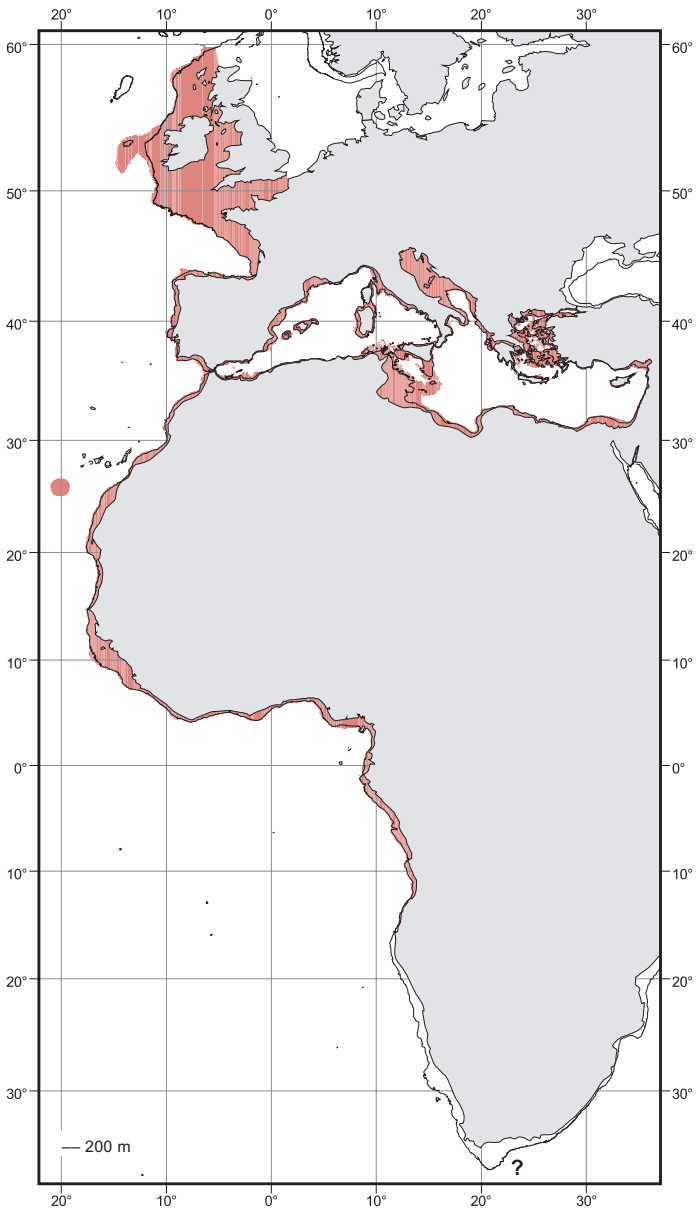

Fig. 133 ***Sepia elegans***
Known distribution

Interest to Fisheries: ***Sepia elegans*** is taken mainly as a bycatch in Mediterranean and west African trawl fisheries. It is most abundant at about 150 m depth, hence a little deeper than ***S. officinalis*** Linnaeus, 1758 and ***S. bertheloti*** d'Orbigny, 1835. Separate statistics are not reported for this species, which, however, represent a very significant percentage of the catches in some areas of its distributional range. In the Mediterranean Sea it is marketed along with ***S. orbignyana*** Férussac *in* d'Orbigny, 1826 and small ***S. officinalis*** and constitutes a valuable resource locally. In the Sicilian Channel, research studies showed an exploitation rate of 0.73 for the species, which suggests a very intense fishing pressure on this resource. It is marketed fresh and frozen.

Local Names: ITALY: Seppia elegante, Castagnola; SPAIN: Castaño.

Remarks: This species resembles ***S. australis*** Quoy and Gaimard, 1832, but differs in the arrangement of arm suckers, club and hectocotylus. ***Sepia elegans*** differs from ***S. officinalis*** in having a reddish, rather than brown, coloration and because it generally inhabits deeper water and does not bury in the sand during the day.

Literature: Mangold-Wirz (1963), Adam and Rees (1966), Guerra and Castro (1989), Bello (1990a), Jereb and Ragonese (1991), Ragonese and Jereb (1991), Wurtz *et al*. (1991), Guerra (1992), Filippova *et al*. (1995), Sanjuan *et al*. (1996), Neige and Boletzky (1997), Sanchez *et al*. (1998), Belcari (1999a), Unsal *et al*. (1999), Salman *et al*. (2002), Sobral (2002).

Sepia elliptica Hoyle, 1885

Fig. 134

Sepia elliptica Hoyle, 1885, *Annals and Magazine of Natural History*, (series 5)16: 189 [type locality: Arafura Sea, south of Papua, 09°59'S 139°42'E, and 08°56'S 136°05'E].

Frequent Synonyms: None.

Misidentifications: *Sepia esculenta* Hoyle, 1885; *Sepia madokai* Adam, 1939a; *Sepia stellifera* Homenko and Khromov, 1984.

FAO Names: En – Ovalbone cuttlefish; **Fr** – Seiche à sepion ovale; **Sp** – Sepia de sepión oval.

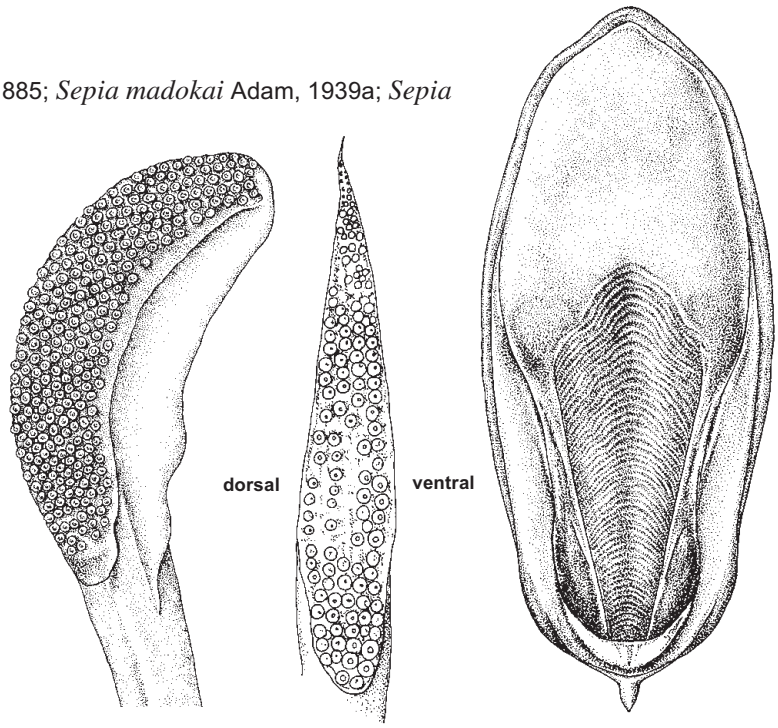

Fig. 134 *Sepia elliptica*

Diagnostic Features: Mantle oval; dorsal anterior margin triangular, acute. Male and female arm lengths subequal; protective membranes narrow. Arm suckers tetraserial. Hectocotylus present on left ventral arm: **7 or 8 rows of normal size suckers proximally**; **7 rows of reduced suckers medially**, then normal size suckers distally to arm tip. Suckers of hectocotylus in **2 dorsal series are smaller than ventral reduced suckers**; reduced suckers only slightly smaller than normal arm suckers; oral surface of modified region not wide, fleshy, but normal, as on opposite arm. Club sucker-bearing surface flattened, with **10 to 12 minute suckers in transverse rows**; suckers all similar size. Swimming keel of club extends well proximal to carpus; dorsal and ventral protective membranes joined at base of club; dorsal membrane forms shallow cleft at junction with stalk. Cuttlebone outline **oval**; bone **very angular, V-shape anteriorly**; bluntly rounded posteriorly; dorsal surface creamy white; dorsal surface evenly convex; texture smooth, not pustulose; dorsal median rib indistinct, broadens anteriorly; lateral ribs indistinct. Chitin surrounds entire margin of cuttlebone. Spine short, pointed, curves dorsally, keel(s) absent. Striated zone concave; last loculus convex; sulcus deep, wide. Anterior striae are **inverted U-shape**. Inner cone limbs are narrow anteriorly, broaden posteriorly; outer margin of inner cone **raised into flat posterior ledge**; ledge whitish (sometimes with a thin rim of chitin on outer margin); **ledge not thickened**; outer cone calcified.

Size: Up to 175 mm mantle length.

Geographical Distribution: Tropical Indo-Pacific: northern Australia from Western Australia, Exmouth Gulf, 22°23'S 114°06'E, to Queensland, Capricorn Island Group, 23°30'S 152°00'E, including Gulf of Carpentaria. Viet Nam and India (doubtful records) (Fig. 135)

Habitat and Biology: Depth range from 16 to 142 m. ***Sepia elliptica*** occurs mainly in coastal waters. This species was collected between 10 and 62 m in Gulf of Carpentaria surveys. A broad size range of both sexes was found to occur in the Gulf over most of the year, indicative of an extended spawning season. Several experimental studies were carried out on growth of this species in captivity; results showed that both water temperature and feeding levels affect somatic growth but with different effects on the muscular tissue development and protein composition. No direct relationship was found between individual growth rates and food availability.

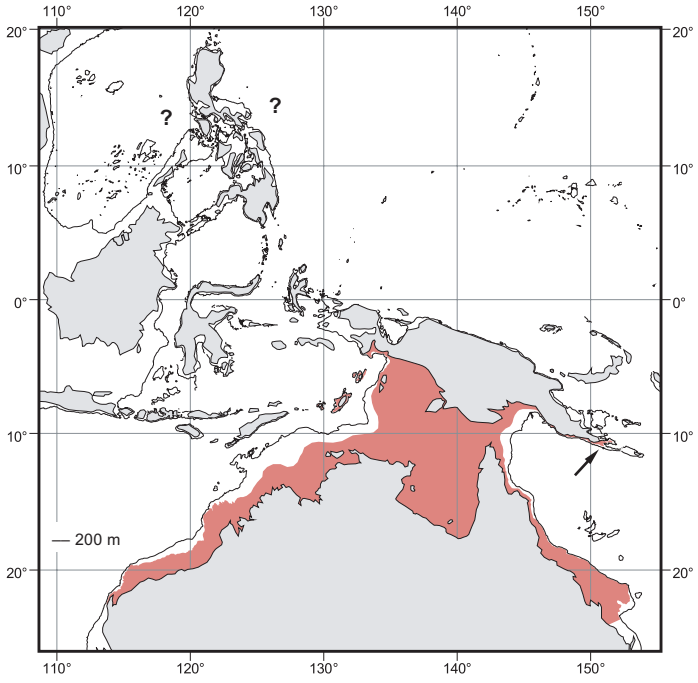

Fig. 135 *Sepia elliptica*
Known distribution

Interest to Fisheries: ***Sepia elliptica*** is taken as bycatch of prawn and mixed species trawl fisheries in most of its distributional area. The observed population structure in the Gulf of Carpentaria (Australia) by experimental trawl surveys and the relative high catch rates of trawlers in some areas suggest that ***S. elliptica*** is a promising resource for fishery there.

Remarks: This species may be confused with ***S. esculenta*** Hoyle, 1885 but it can be distinguished by the following characters: the hectocotylus of ***S. esculenta*** has 5 or 6 series of normal size-suckers, followed by 6 series of reduced suckers; in ***S. esculenta*** the dorsal and ventral protective membranes are not joined at the base of the club; in ***S. esculenta***, the cuttlebone is bluntly rounded anteriorly, the striae are inverted V-shape and the inner cone limbs are thickened posteriorly. Duc (1978, 1993) refers to ***S. elliptica*** in Vietnamese waters; however, this probably is a misidentification of ***S. esculenta***. The occurrence of ***S. elliptica*** in Indian waters is yet to be confirmed.

Literature: Adam and Rees (1966), Dunning *et al*. (1994), Lu (1998a), Moltschaniwskyj and Martinez (1998), Martinez *et al*. (2000), Moltschaniwskyj and Jackson (2000).

Sepia elobyana Adam, 1941 **Fig. 136**

Sepia elobyana Adam, 1941a, *Memoires du Musée royal d'Histoire naturelle de Belgique*, (2)21: 121 [type locality: Africa: west Africa, Gulf of Guinea, Eloby Island, 01°01'N 09°29'E].

Frequent Synonyms: None.

Misidentifications: None.

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

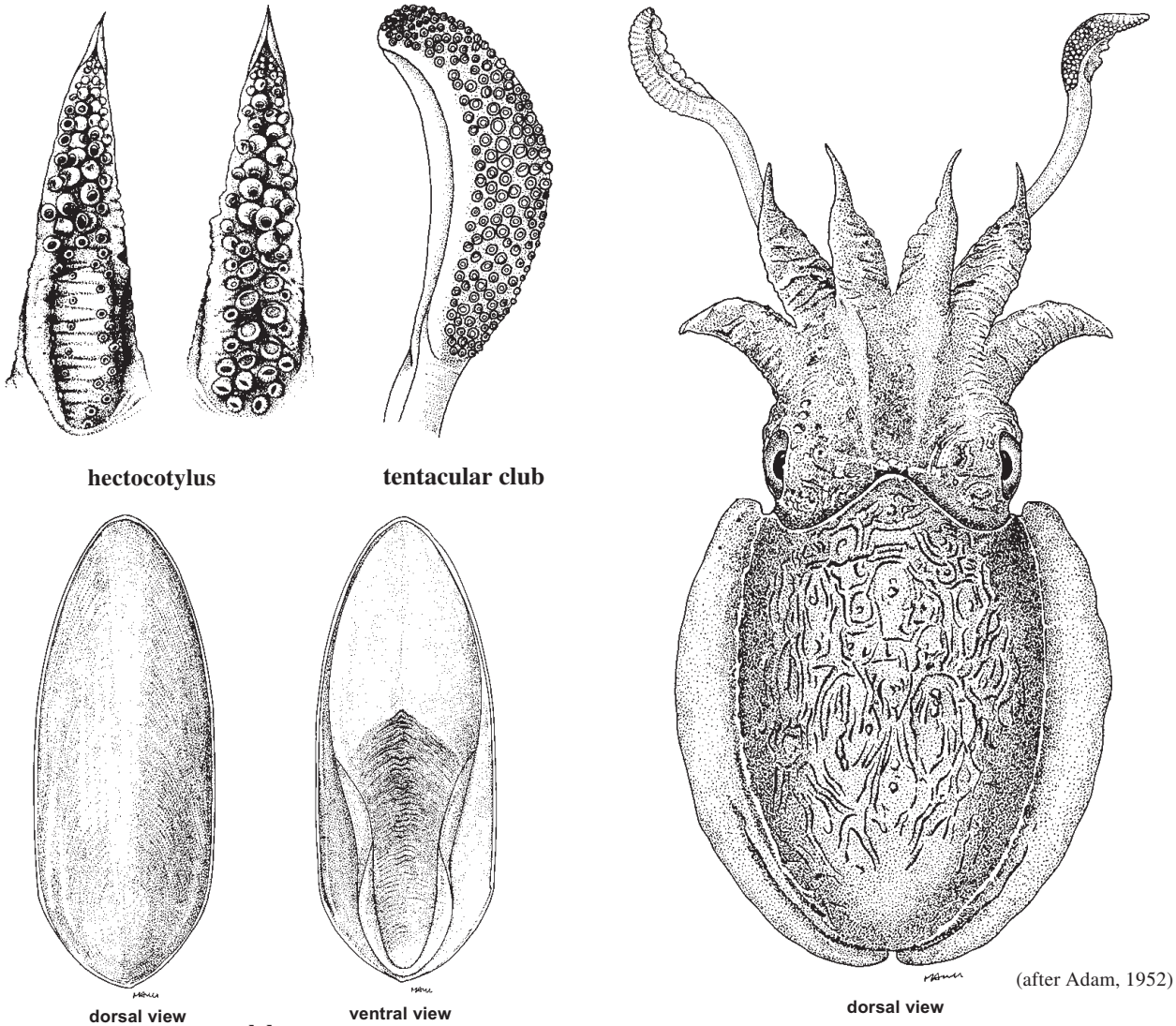

Fig. 136 ***Sepia elobyana***

Diagnostic Features: Small species. Mantle broad, oval; ventral mantle margin emarginate, with distinct lateral angles. Fins wide. Male and female arms subequal in length; protective membranes wide, well developed, particularly on modified portions of arms I and II in males. Distal tips of arms I and II **attenuate in both sexes**, with about 20 rows of globular suckers in males. Arm sucker arrangement differs between sexes: in males, **arms I to III suckers tetraserial proximally, biserial distally**; in females, **arms I and II suckers tetraserial proximally, biserial distally**. Male median arm suckers larger than dorsal and ventral marginal series on proximal end of arms. Hectocotylus present; **both ventral arms modified**. Left ventral arm with **7 or 8 rows of greatly reduced suckers** proximally, suckers normal size distally with suckers in **2 dorsal series smaller than 2 ventral rows** on modified portion of arm. Suckers in 2 dorsal and 2 ventral series displaced laterally, with gap between, 2 ventral series close together, rows alternate, dorsal and ventral marginal suckers at base of protective membranes. Male right ventral arm suckers normal proximally for 2 transverse rows, followed distally by **4 or 5 rows of transformed suckers: median and sometimes lateral sucker rings wide (covering whole diameter of sucker) and thick**; teeth and infundibulum absent from these suckers. Club with **8 suckers in transverse rows**; suckers all of similar, small, size. Cuttlebone outline oval; acuminate, acute, anteriorly; bluntly rounded posteriorly; dorsal surface evenly convex; calcified with reticulate sculpture; dorsal median rib and lateral ribs absent. Spine a **blunt knob**. Striated zone separated from outer cone by broad, smooth, marginal zones; sulcus shallow, wide, bordered by some irregular grooves, extends along striated zone only. Anterior striae are **inverted U-shape** (slightly irregular due to grooves); limbs of inner cone extend anteriorly to end of striated zone. Inner cone limbs are narrow anteriorly, broaden posteriorly. Dorsal mantle has **scattered tubercles and reticulate pattern of ridges**.

Size: Up to 53 mm mantle length.

Geographical Distribution: Eastern Atlantic: along west African coast from Senegal to Gulf of Guinea and Gabon (southern limit undetermined) (Fig. 137).

Habitat and Biology: Unknown.

Interest to Fisheries: Possibly taken with other cuttlefishes off west Africa, but not distinguished from similar species.

Remarks: Very rarely reported species.

Literature: Adam and Rees (1966).

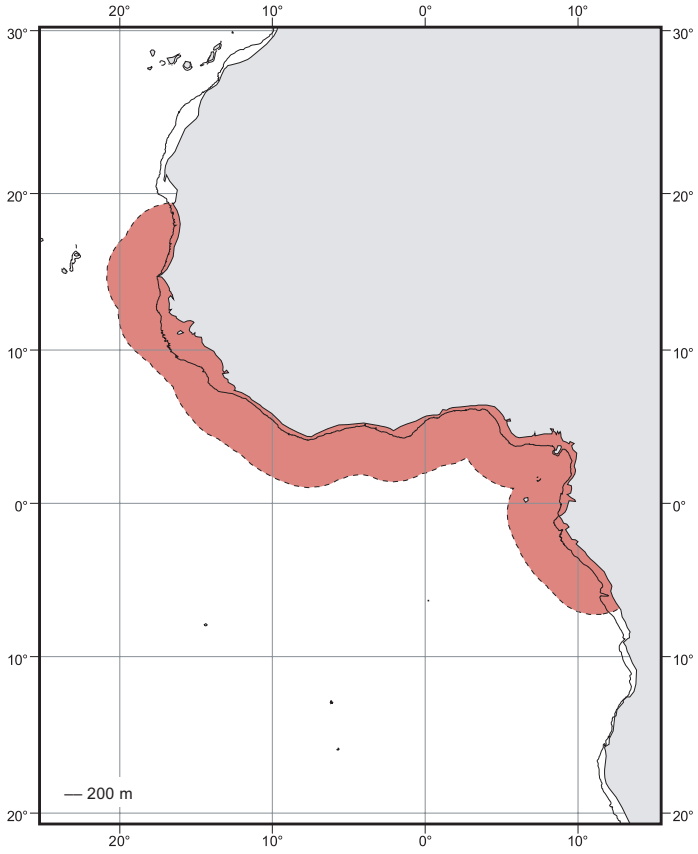

Fig. 137 ***Sepia elobyana***
Known distribution

Sepia esculenta Hoyle, 1885 **Fig. 138**

Sepia esculenta Hoyle, 1885, *Annals and Magazine of Natural History*, (series 5)16: 188 [type locality: Japan].

Frequent Synonyms: None.

Misidentifications: *Sepia elliptica* Hoyle, 1885; *S. hoylei* Ortmann, 1888.

FAO Names: En – Golden cuttlefish; **Fr** – Seiche dorée; **Sp** – Sepia dorada.

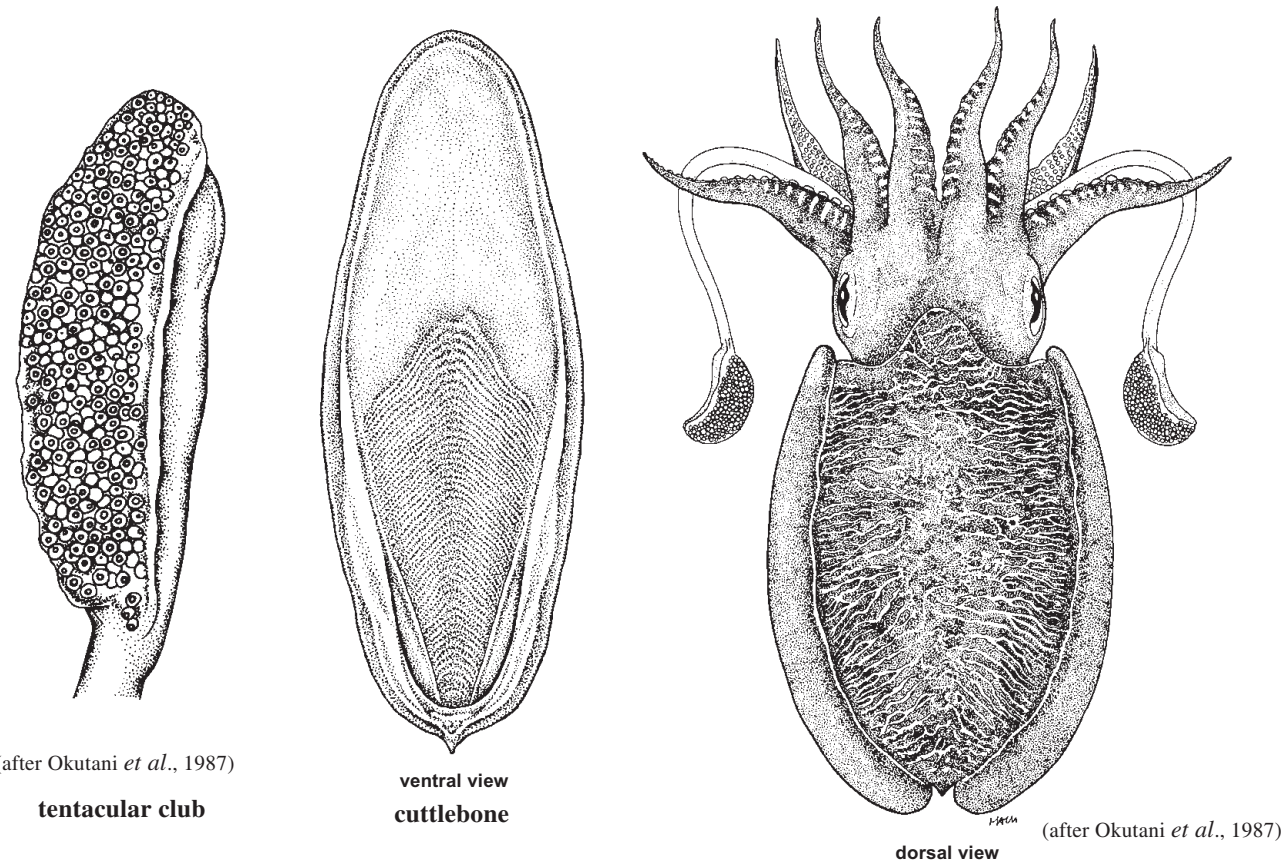

Fig. 138 ***Sepia esculenta***

Diagnostic Features: Mantle broadly oval; dorsal anterior margin triangular, obtuse; ventral mantle margin emarginate. Arm suckers tetraserial. Hectocotylus present on left ventral arm: **5 or 6 rows of normal size suckers proximally, 6 rows of reduced suckers medially**, then normal size suckers to arm tip. Club sucker-bearing surface flattened, with **10 to 16 suckers in transverse rows**; all club suckers of **similar, minute, size** (except for 2 enlarged suckers in anteriodorsal corner). Dorsal and ventral protective membranes **not joined** at base of club, extend proximal to carpus along stalk. Buccal membrane without suckers. Cuttlebone outline elliptical; bone bluntly rounded anteriorly and posteriorly; dorsal surface convex posteriorly, flat anteriorly; dorsal median and lateral ribs indistinct. Chitin present as wide patch posteriorly and a narrow chitinous rim borders lateral margins of cuttlebone. Spine present. Striated zone concave; last loculus flat; sulcus **deep, wide**. Anterior striae are **inverted V-shape**. Inner cone limbs are **narrow anteriorly, broaden posteriorly**; **raised into flat, thickened posterior ledge**; outer cone calcified, narrow anteriorly, broadens posteriorly. Dorsal mantle with longitudinal row of **6 or 7 yellowish, fleshy tubercles** at base of each fin. **Colour:** Light brown with whitish mottle. Dorsal mantle has faint light-coloured wavy transverse stripes and dark spots or blotches, sometimes studded with yellowish tubercles. Arms I to III have spots and a longitudinal orange-red pigmented stripe along their aboral surfaces. Fins with **pale golden** iridescent line along base, both dorsally and ventrally.

Size: Up to 180 mm mantle length, 600 g total weight.

Geographical Distribution: Indo-Pacific: East China Sea, Japan from central Honshu (Sea of Japan and Pacific sides) south to China and Hong Kong, Taiwan Province of China, South China Sea (north of central Philippines), Viet Nam and possibly Singapore and western Indonesia. The southernmost extent of its range is yet to be determined (Fig. 139).

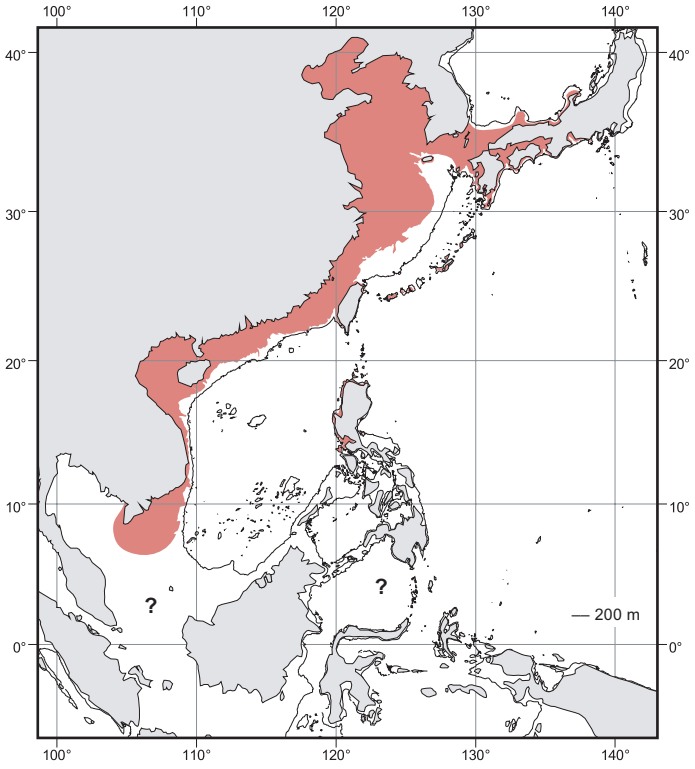

Fig. 139 ***Sepia esculenta***
Known distribution

Habitat and Biology: Depth range from 10 to 100 m, mainly inner shelf. This is a demersal neritic species found on sand, sometimes burrowing into the substrate. After overwintering in deeper water, animals migrate into shallower coastal waters where they spawn when the water temperature increases in spring. Males often guard females to ward off competing males. Before mating begins, the brilliance of the body colours of males increases dramatically, with coloration changing rhythmically from green to red and gold and the iridescent lines along the base of the fins appear to be fluorescent. Mating takes place head-to-head and spermatophores are placed in the female's buccal membrane ventral to the mouth. The eggs are of an amber colour immediately after laying, covered by a pear-shaped egg case, milky white and translucent. They are deposited on macrophytic algae and other substrates, such as sunken branches. The sticky, clear, outermost layer of the egg cases accumulates sand and other debris for camouflage as the embryonic development proceeds. Studies in captivity indicate that females prefer long, fine, and immobile materials as spawning substrates. The spawning season extends from spring to early summer. Hatching occurs after about 30 to 80 days, depending on the water temperature. Newly hatched animals already have schooling and benthic tendencies and bury themselves in the sand. ***Sepia esculenta*** feeds mainly on crustaceans and small fishes.

Interest to Fisheries: ***Sepia esculenta*** supports localized and subsistence fisheries in the Philippines, with animals collected in waters including the Visayan and Samar Seas, the Lingayen Gulf and Carigara Bay. It is the dominant ***Sepia*** species landed around the Shantung and Kiangsu provinces of China and off western Japan (East China Sea). Studies off Korea determined that maximum fishing conditions were characterized by a temperature range from 10° to 15°C and bottom salinity between 33.2 and 34.45‰. The principal capture techniques are otter trawls, pound nets, hoop nets and hook-and-line. The flesh is highly prized as food, especially in Japan, South Korea and China. In Japan, large-sized animals are consumed as sashimi, while smaller animals are marketed packed and frozen ready for cooking. This species has been reared to market size in experiments under laboratory conditions, at growth rates well above those in natural populations.

Local Names: CHINA: Gam woo chak, Jam mak yue; JAPAN: Hariika, Kouika, Maika, Sumiika.

Remarks: ***Sepia esculenta*** can be confused with ***S. elliptica*** Hoyle, 1885. In ***S. esculenta***, the inner cone ledge is thick and directed anterioventrally. In ***S. elliptica***, the ledge is much thinner, flatter and it points anteriorly, covering the posterior end of the phragmocone. The cuttlebone striae of ***S. elliptica*** are U-shaped and the bone is very angular, V-shaped anteriorly. The hectocotylus of ***S. elliptica*** differs in having 7 or 8 series of normal sized suckers, followed by 7 series of reduced suckers.

Literature: Adam and Rees (1966), Choe (1966), Baik and Park (1985), Fujita *et al*. (1997), Okutani *et al*. (1987), Natsukari and Tashiro (1991), Watanuki *et al*. (1993).