

### 3. CUTTLIFISHES

by Amanda Reid, Patrizia Jereb and Clyde F.E. Roper

The families formerly referred to as belonging to the Order Sepioidea (Roper *et al.*, 1984), include the **Sepiidae**, which are of significant commercial value to artisanal and industrial fisheries; the **Sepiolidae**, which are exploited by many artisanal and subsistence fisheries; the **Sepiadariidae**, which are not fished at present (one species might be of potential interest); the **Idiosepiidae** and the **Spirulidae**, which are of no commercial interest. These families are treated herein as separate entities.<sup>1/</sup>

Cuttlefishes *sensu lato* are characterized by the following features: shell calcareous (*Sepia*, *Spirula*) or chitinous (sepiolids); 10 circumoral appendages; 2 tentacles retractile into pockets; suckers with chitinous rings; posterior fin lobes free, not connected at midline; eye covered with a transparent membrane, false eyelids present (except *Spirula*); 1 pair of gills, without branchial canal between afferent and efferent branchial blood vessels; digestive gland (liver) divided or bilobed; each tooth of radula with a single projection; buccal membrane present; olfactory organ a ciliated pit.

The combined catch of the exploited cuttlefishes made up about 12 to 16% of total cephalopod catches in the last 10 years, roughly fluctuating between 300 000 and over 500 000 metric tonnes (FAO, 2000). The most important genus exploited is *Sepia*.

Table 6 summarizes the catch data available for the most important world fishing areas and identifies the major cuttlefish-harvesting countries, which also are the primary consumers and traders. These are mainly the southeast Asian countries, the northwest Indian Ocean regions and the nations that border the Mediterranean Sea. In spite of the progress made in the last decade to ensure the quality of data and information collected, many of the figures above should still be considered as very conservative, because the general tendency is to underestimate the artisanal component of landings, which in fact supports a conspicuous fraction of the fishery but usually is not properly recorded in national statistics.

In the industrial fisheries, cuttlefishes usually are taken only as bycatch to other target species in bottom trawls, even in cases where they make up a sizeable portion of the catch. In the artisanal fisheries, on the other hand, they are actively sought with highly selective gear and fishing techniques based on knowledge of the biology and behaviour of the species. Such techniques include the use of aggregation devices (e.g. light, substrates for egg deposition), live or artificial lures (for example, live sexually mature females are used to attract males), and a variety of fishing gear, such as harpoons, spears, trammel nets, pound nets, hoop nets, lines, jigs, baited pots, etc.

The flesh of most cuttlefishes is tender and excellent for human consumption, as well as in terms of nutrients and protein quality. It is marketed fresh, frozen, canned and dried ('surume').

**Table 6**

Cuttlefishes and bobtail squids captured in 2001 by FAO areas, showing the three leading countries in that year and their share of total area capture

Area	Country	2001	%
Atlantic, Eastern Central	Morocco	17 544	39
	China	8 238	18
	Mauritania	4 744	10
	Area 51 total	45 553	–
Atlantic, Northeast	France	13 814	72
	United Kingdom	2 705	14
	Portugal	1 348	7
	Area 27 total	19 310	–
Atlantic, Southeast	Spain	26	84
	Russian Federation	5	16
	Angola		0
	Area 47 total	31	–
Indian Ocean, Eastern	Thailand	20 819	57
	Malaysia	9 810	27
	Indonesia	5 360	15
	Area 57 total	36 516	–
Indian Ocean, Western	Yemen	9 330	42
	Pakistan	5 256	24
	Oman	3 854	17
	Area 51 total	22 086	–
Mediterranean and Black Sea	Tunisia	7 148	38
	Italy	6 131	32
	Greece	1 623	9
	Area 37 total	18 904	–
Pacific, Northwest	China	310 129	95
	Japan	8 297	3
	Taiwan Province of China	4 546	1
	Area 61 total	324 915	–
Pacific, Southwest	Australia	219	100
	Area 81 total	219	–
Pacific, Western Central	Thailand	44 122	67
	Malaysia	11 657	18
	Indonesia	7 850	12
	Area 71 total	65 766	–
Cuttlefishes and bobtail squids	<b>World Total</b>	<b>533 300</b>	

(Source: FAO, 2000)

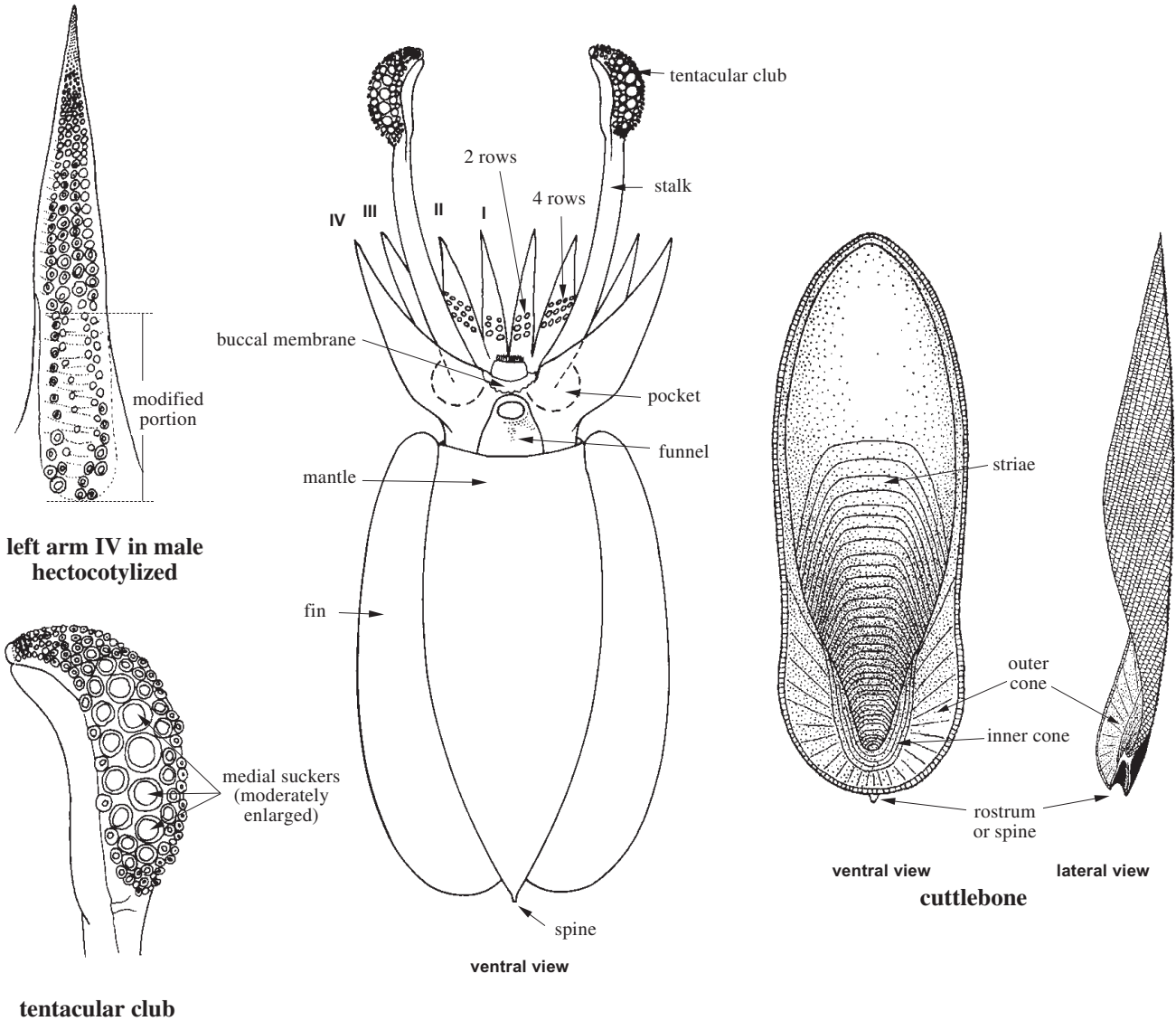
<sup>1/</sup> The order of presentation of the sepioid families, *sensu lato*, in the text does not necessarily reflect phylogenetic or other systemic sequence.

### 3.1 Family SEPIIDAE Keferstein, 1866

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Sepiidae Keferstein, 1866, *Bronn's Klass. Ordn., Thierreichs*, 1862–66: 1441.

**FAO Names :** En – Cuttlefishes; Fr – Seiches; Sp – Sepias, Jíbias, Chocos, Choquitos.



**Fig. 102** Diagram of basic cuttlefish features

**Diagnostic Features:** Small to medium-sized cephalopods. Mantle robust, slightly flattened dorsoventrally, may be broad or slender; oval, oblong or nearly circular in outline; anterior dorsal mantle margin projected forward, not fused with head. Fins narrow, located dorsolaterally on mantle, approximately equal to mantle length; **posterior fin lobes free**, not connected to each other. Head robust, slightly narrower than mantle; eyes prominent, covered by a transparent membrane and a conspicuous secondary fold on the eyelid. Mouth surrounded by 10 appendages (8 arms and 2 tentacles). Arms with 2 to 4 suckers in transverse rows. Males of some species with hectocotylized ventral arm(s) IV for holding and transferring spermatophores; when present, the hectocotylius usually consists of a region of reduced suckers; hectocotylized region also may be swollen and crenulated by transverse folds. Tentacular clubs with 4 or more suckers in transverse rows; **tentacles retractile into pockets on the ventrolateral sides of the head between arms III and IV**. Arm and club suckers with chitinous rings. Mantle-locking apparatus angular or curved in shape. Internal **calcareous cuttlebone** located dorsally in the mantle underneath the skin; cuttlebone length usually equal to mantle length (*Metasepia* is an exception); cuttlebone shape ranges from lanceolate to oval or diamond-shaped; dorsal side a calcareous plate (dorsal shield); ventral side finely laminate, porous, and comprised of thin, transverse septa supported by transverse calcareous rods. One pair of gills; no branchial canal between afferent and efferent branchial blood vessels. 'Liver' (digestive gland) divided or bilobed. Buccal membrane present, with or without suckers; each radula tooth unicuspid (with a single projection). Olfactory organ a ciliated pit.

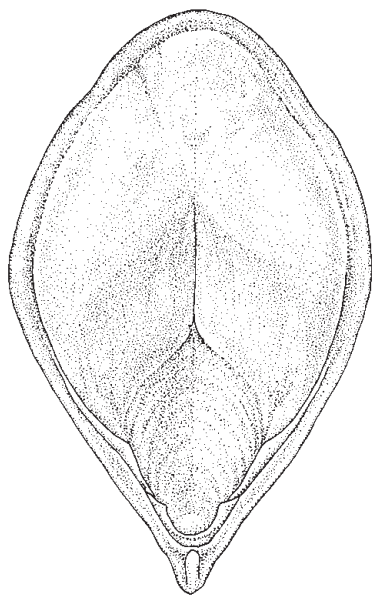
**Size:** Up to 500 mm mantle length, and 12 kg in weight.

**Habitat and Biology:** Cuttlefishes inhabit the continental shelf and upper slope to a maximum depth of approximately 1000 m. They are primarily bottom-dwellers over a range of habitats, including rocky, sandy, and muddy substrates, seagrass, seaweed and coral reefs. They are slower swimmers than the more streamlined squids. Cuttlefishes are able to attain neutral buoyancy by regulating the relative amounts of gas and fluid in the chambers of the cuttlebone, and they are able to hover in midwater, with fins acting as stabilizers. The cuttlebone length, width, septal spacing and structural morphology are correlated to maximum habitat depth: the deepest living species known, including *Sepia australis*, *S. elegans*, *S. orbignyana* and *S. hieronis*, all are capable of descending to depths in excess of 400 m; all share the characteristics of cuttlebones with closely packed septa and modified sutures. Large species such as *Sepia latimanus*, *S. officinalis* and *S. pharaonis* are restricted to much shallower depths, usually less than 200 m, and show very different septal spacing and sutures than the deeper water species. Some species migrate seasonally in response to temperature changes and aggregate, usually in shallow water, at spawning time. Within a species, individuals may attain sexual maturity at very different sizes, depending upon the combined effects of a number of factors including temperature, light and diet. Eggs, relatively few in number, are individually attached to various substrates in clusters; the time required for development depends upon temperature. The lifespan is between 18 and 24 months, although males of some species may live longer. Post-spawning mortality is high in females. Cuttlefishes feed on a wide range of invertebrates and bony fishes.

**Literature:** Hoyle (1886), Adam (1939a), Adam and Rees (1966), Roeleveld (1972), Adam (1979), Nesis (1987), Ward (1991), Oka *et al.* (1989), Okutani (1995), Khromov *et al.* (1998) and Lu (1998a).

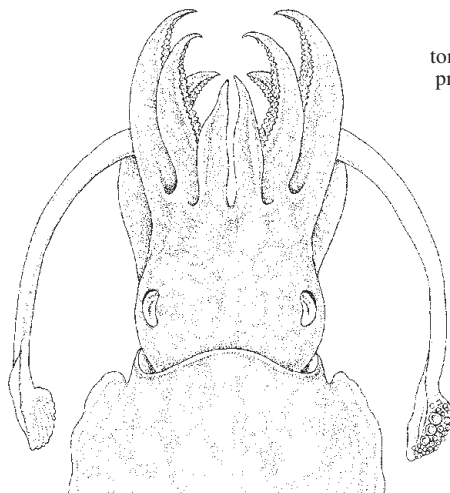
**Key to genera in the family Sepiidae**

- 1a. Cuttlebone diamond-shaped in outline (Fig. 103); cuttlebone much shorter than mantle, located in the anterior 1/2 to 2/3 of mantle; dorsal anterior edge of mantle without tongue-like projection (Fig. 104a) . . . . . ***Metasepia***
- 1b. Cuttlebone outline elliptical to lanceolate; cuttlebone length approximately equal to mantle length; dorsal anterior edge of mantle usually with tongue-like projection (Fig. 104b) . . . . . → 2

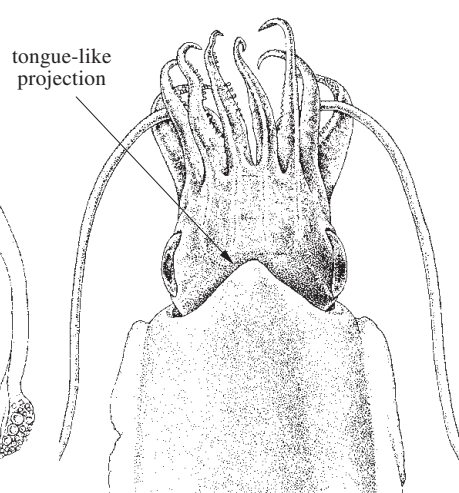


cuttlebone (ventral view)

**Fig. 103 *Metasepia pfefferi***  
(illustration: K. Hollis/ABRS)



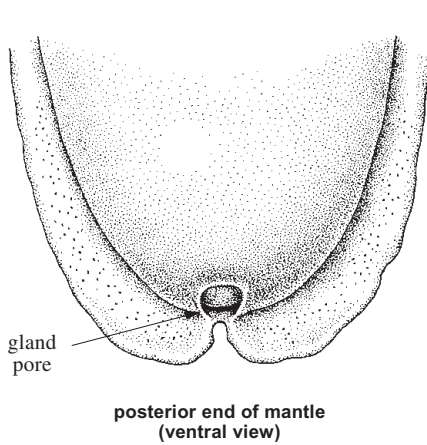
**a) *Metasepia pfefferi***



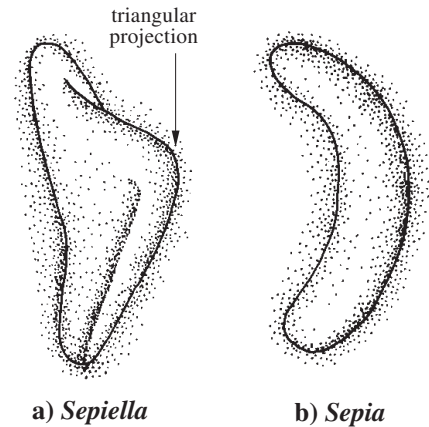
**b) *Sepia, Sepiella***

**Fig. 104 Head and anterior mantle (dorsal view)**  
(illustrations: K. Hollis/ABRS)

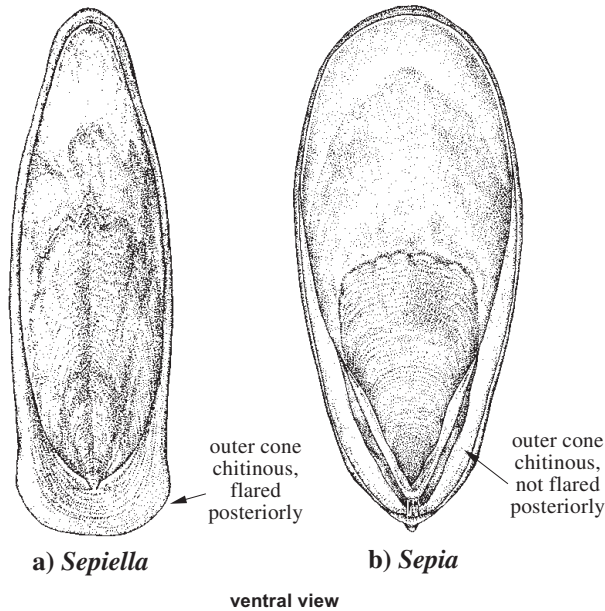
- 2a. A gland and gland pore located on the ventral side of the posterior end of the mantle (Fig. 105); mantle-locking apparatus with triangular projection (Fig. 106a); cuttlebone inner cone with very short limbs; outer cone a wide, spatulate, chitinized border around posterior end of cuttlebone (Fig. 107a) . . . . . ***Sepiella***
- 2b. Gland and gland pore absent; mantle-locking apparatus semicircular, without triangular projection (Fig. 106b); cuttlebone inner cone with relatively long limbs; outer cone usually calcareous, not obviously spatulate posteriorly (Fig. 107b) . . . . . ***Sepia***



**Fig. 105 *Sepiella***  
(illustration: K. Hollis/ABRS)



**Fig. 106 Mantle-locking apparatus**



**Fig. 107 Cuttlebones**  
(illustrations: K. Hollis/ABRS)

***Metasepia pfefferi* (Hoyle, 1885)****Fig. 108; Plate II, 11**

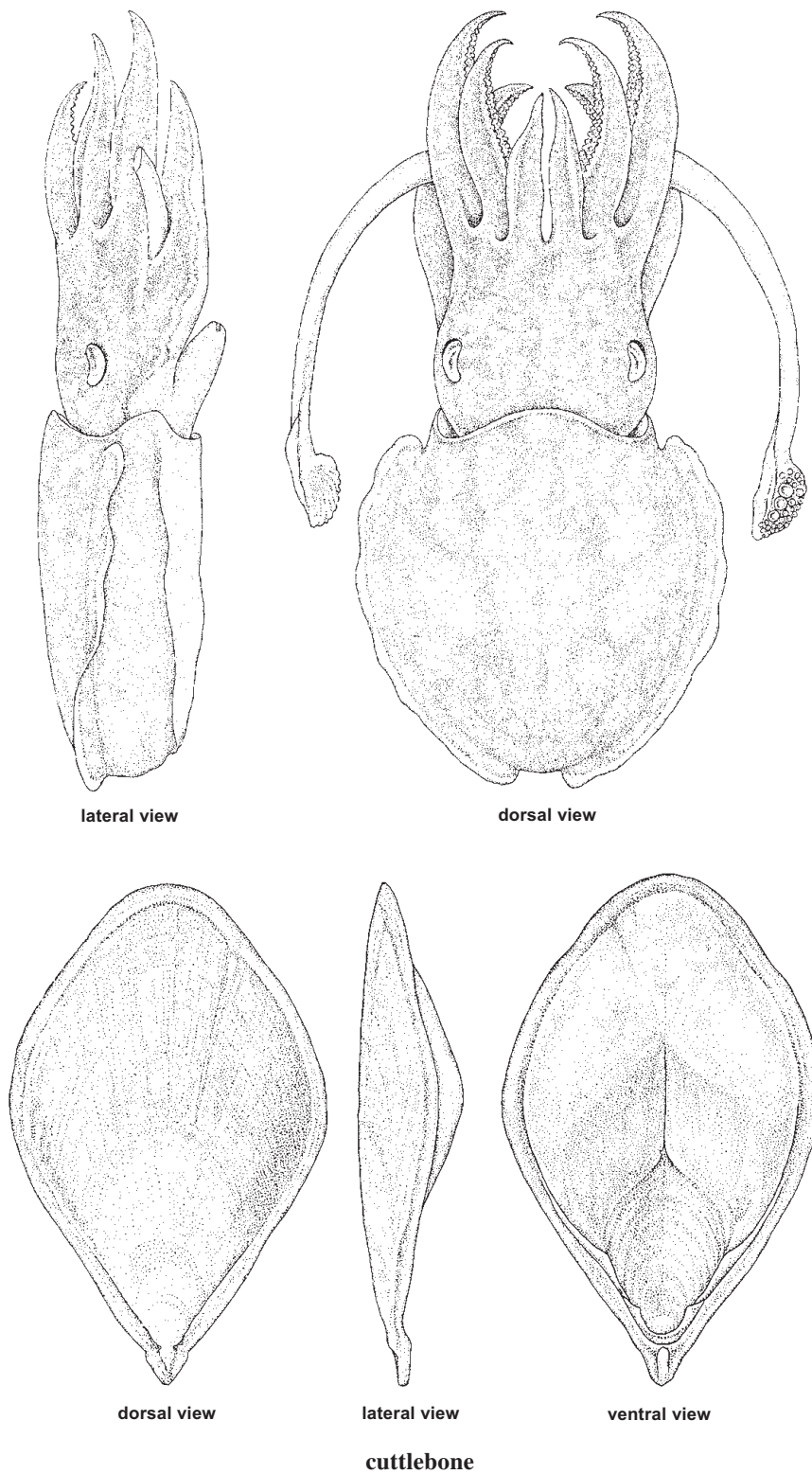
*Sepia (Metasepia) pfefferi* Hoyle, 1885, *Annals and Magazine of Natural History*, Series 5, 16: 199 [type locality: Challenger Stn. 188, 09°59'S 139°42'E, South of Papua, Arafura Sea].

**Frequent Synonyms:** None.

**Misidentifications:** None.

**FAO Names:** **En** – Flamboyant cuttlefish; **Fr** – Seiche flamboyante; **Sp** – Sepia llamativa.

**Diagnostic Features:** Mantle oval, very broad. Arms **broad, blade-like; arms I shorter than rest**. Protective membranes in both sexes narrow. Arm suckers tetraserial. Hectocotylus present on left ventral arm: oral surface of modified region wide, swollen, fleshy, with transversely grooved ridges and deep median furrow. Club sucker-bearing surface flattened, with **5 or 6 suckers in transverse rows**; suckers differ markedly in size: **3 or 4 median suckers greatly enlarged, occupying most of median portion of club**. Swimming keel of club extends well proximal to carpus; dorsal and ventral protective membranes **not joined at base of club** but fused to tentacular stalk. Dorsal and ventral membranes **differ in length**; extend proximal to carpus along stalk. Dorsal membrane forms shallow cleft at junction with stalk. Cuttlebone much shorter than mantle, located **in anterior 2/3 to 3/4 of mantle**; outline **rhomboidal; acuminate, acute, anteriorly and posteriorly**; dorsal surface yellowish, evenly convex; texture smooth, not pustulose; dorsal median rib absent. Chitin present as a **thin film over entire dorsal surface of cuttlebone**. Spine **absent, or small, chitinous**. Striated zone concave; last loculus strongly convex, thick in anterior third; sulcus deep, wide, extends along striated zone only. Anterior striae are inverted V-shape; limbs of inner cone are very short, uniform width, narrow, U-shape thickened slightly posteriorly; outer cone absent. Dorsal mantle has **3 pairs of large, flat, flap-like papillae**. Head with **papillae over eyes**. **Colour:** Base colour of dark brown with mobile patterns of white and yellow; purple-pink along arms.



**Size:** Up to 60 mm mantle length.

(illustrations: K. Hollis/ABRS)

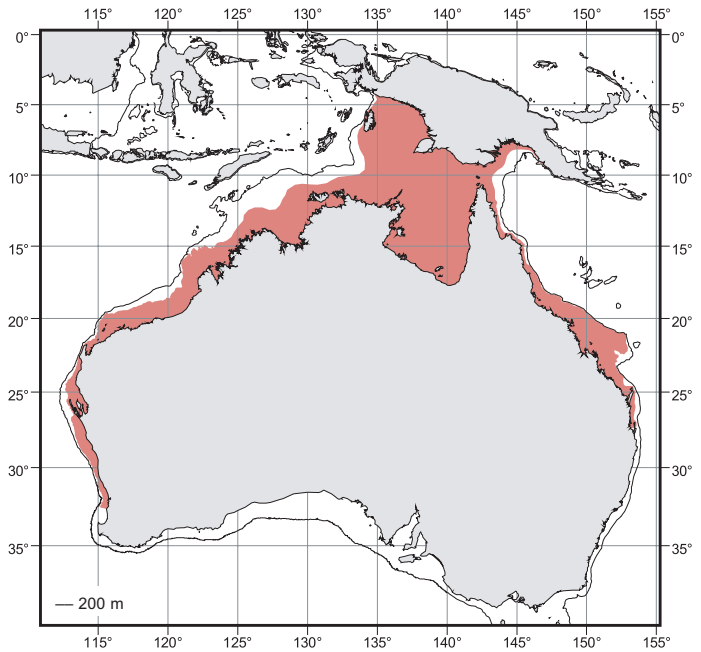
**Fig. 108** *Metasepia pfefferi*

**Geographical Distribution:** Tropical Indo-Pacific: northern Australia from Mandurah, Western Australia, 32°33'S 115°04'E, northeastward to Moreton Bay, southern Queensland, 27°25'S 151°43'E. New Guinea (Fig. 109).

**Habitat and Biology:** Depth range from 3 to 86 m. Sand and muddy substrate. Active during the day, hunting fishes and crustaceans. Capable of excellent camouflage while stalking prey. If disturbed or attacked, it quickly changes to a dramatic colour pattern of dark brown, black, white and yellow patches and may show bright red on the arm tips. It has been observed to 'amble' along the sea floor in this colour pattern, rhythmically waving the wide protective membranes on the arms. Eggs are laid singly in crevices or ledges in coral, rock or wood. One female has been observed squeezing her eggs through the hole of a coconut husk. The round white eggs turn clear as they develop. Juveniles are capable of the same bright colour pattern as adults from birth.

**Interest to Fisheries:** None as food. But this species is spectacular in its colour and textural displays and would make an excellent aquarium species.

**Literature:** Adam and Rees (1966), Roper and Hochberg (1987), Roper and Hochberg (1988), Lu (1998a).



**Fig. 109** *Metasepia pfefferi*  
■ Known distribution

***Metasepia tullbergi* (Appellöf, 1886)**

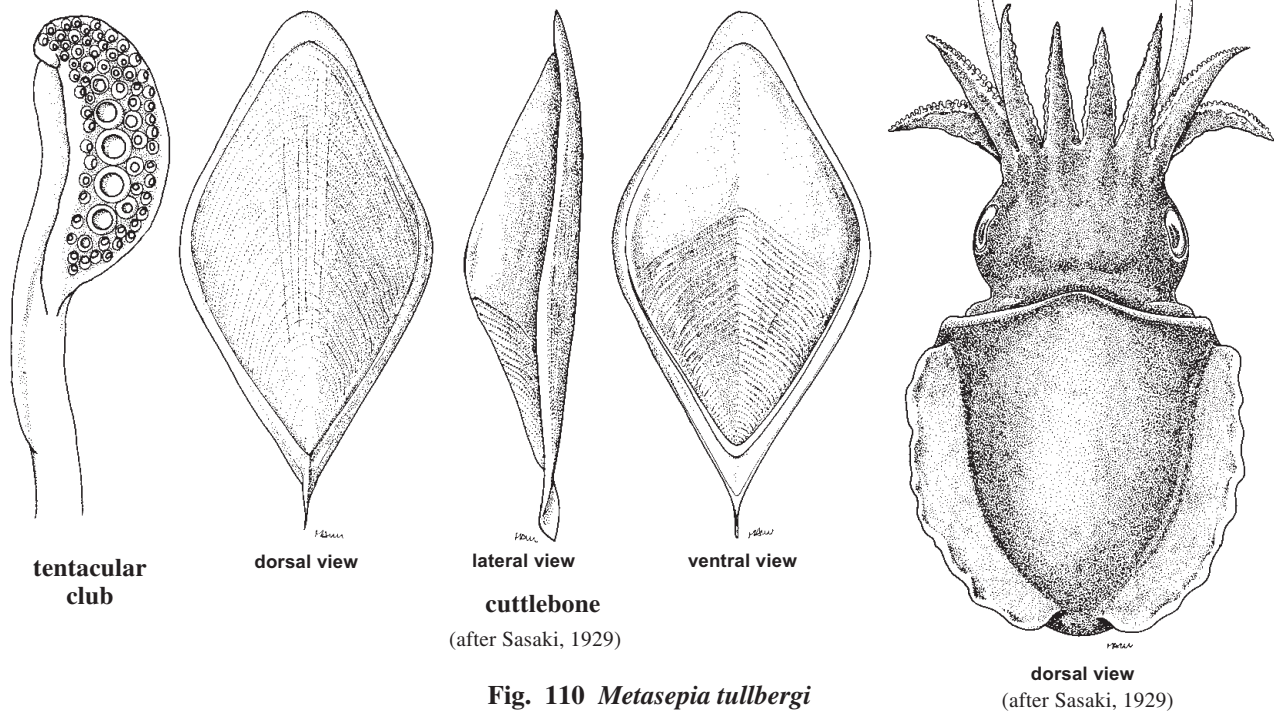
**Fig. 110**

*Sepia tullbergi* Appellöf, 1886, *Svenska Vetenskaps-Akademiens Handlingar*, 21(13): 26 [type locality: Japan, Nagasaki].

**Frequent Synonyms:** None.

**Misidentifications:** None.

**FAO Names:** En – Paintpot cuttlefish; Fr – Seiche encrier; Sp – *Sepia tintero*.



**Fig. 110** *Metasepia tullbergi*

**Diagnostic Features:** Mantle broad, oval. Ventral surface of mantle with 10 to 13 pores on each ventrolateral surface. Fins joined posteriorly. Arm suckers tetraserial. Hectocotylus present on left ventral arm: suckers normal proximally, 10 to 12 rows reduced suckers medially, followed by some enlarged suckers, then reduced suckers to arm tip; reduced suckers much smaller than normal arm suckers. Oral surface of modified region is wide, swollen, fleshy, and has transversely-grooved ridges. Suckers of hectocotylus in 2 dorsal and 2 ventral series displaced laterally, with gap between them. Club crescent-shaped, sucker-bearing surface flattened, with 4 to 6 suckers in transverse rows; suckers differ markedly in size: **4 or 5 suckers in second dorsal series enlarged and 3 or 4 suckers in third series from dorsal side slightly enlarged**. Swimming keel of club extends well proximal to carpus; dorsal and ventral protective membranes not joined at base of club; dorsal membrane broad, much wider than ventral membrane. Cuttlebone much shorter than mantle, located in anterior 2/3 to 3/4 of mantle; outline rhomboidal, broad; bone strongly convex in lateral view; acuminate, acute, anteriorly and posteriorly; dorsal surface evenly convex. Chitin present as a thin film over entire dorsal surface of cuttlebone; bone extends posteriorly into **sharp spine with chitinous plate on dorsal side**. Cuttlebone nearly completely chitinized anteriorly, calcareous posteriorly; sulcus shallow, narrow, extends along striated zone only; limbs of inner cone are very short; outer cone absent. Head and dorsal and lateral mantle rugose with numerous papillae and tubercles; pair of broken longitudinal ridges on dorsum. Dorsum dark in colour lateral to fleshy ridges, with **bright yellow patches on head, dorsal mantle and arms**. Protective membranes on arms red.

**Size:** Up to 70 mm mantle length, from 30 to 40 g total weight.

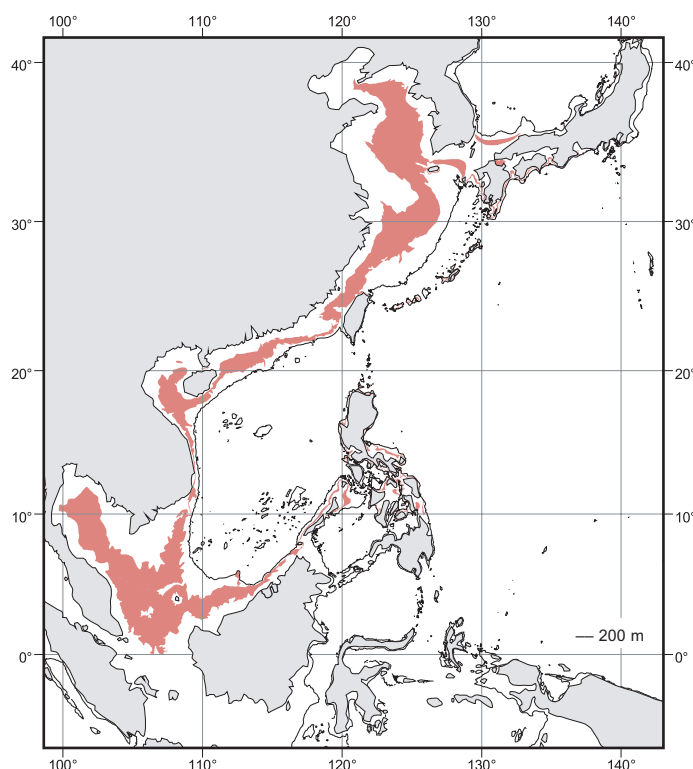
**Geographical Distribution:** Indo-Pacific: Japan from southern Honshu, Sea of Japan, Yellow Sea, East China Sea to Taiwan Province of China and Hong Kong, South China Sea, Philippines, Gulf of Thailand (Fig. 111).

**Habitat and Biology:** Depth range from 20 to 100 m. This neritic demersal species occurs on the continental shelf on sandy to muddy substrate; it also has been collected from among sea pens on rocky substrate. Eggs hatch in summer in rocky areas at about 20 m depth. Hatchlings migrate to deeper, sandy-mud areas (down to 80 m) in August to September; mature individuals migrate to shallower rocky areas from March to May to spawn.

**Interest to Fisheries:** Currently there is no known fishery for this small, colourful species, but it does occur occasionally as bycatch. Its relevance in artisanal fisheries is undetermined. If its supply were steady, it undoubtedly would be a popular, colourful aquarium species.

**Local Names:** CHINA: Mak dau; JAPAN: Hana-ika.

**Literature:** Okutani *et al.* (1987), Nomura *et al.* (1997).



**Fig. 111** *Metasepia tullbergi*  
■ Known distribution