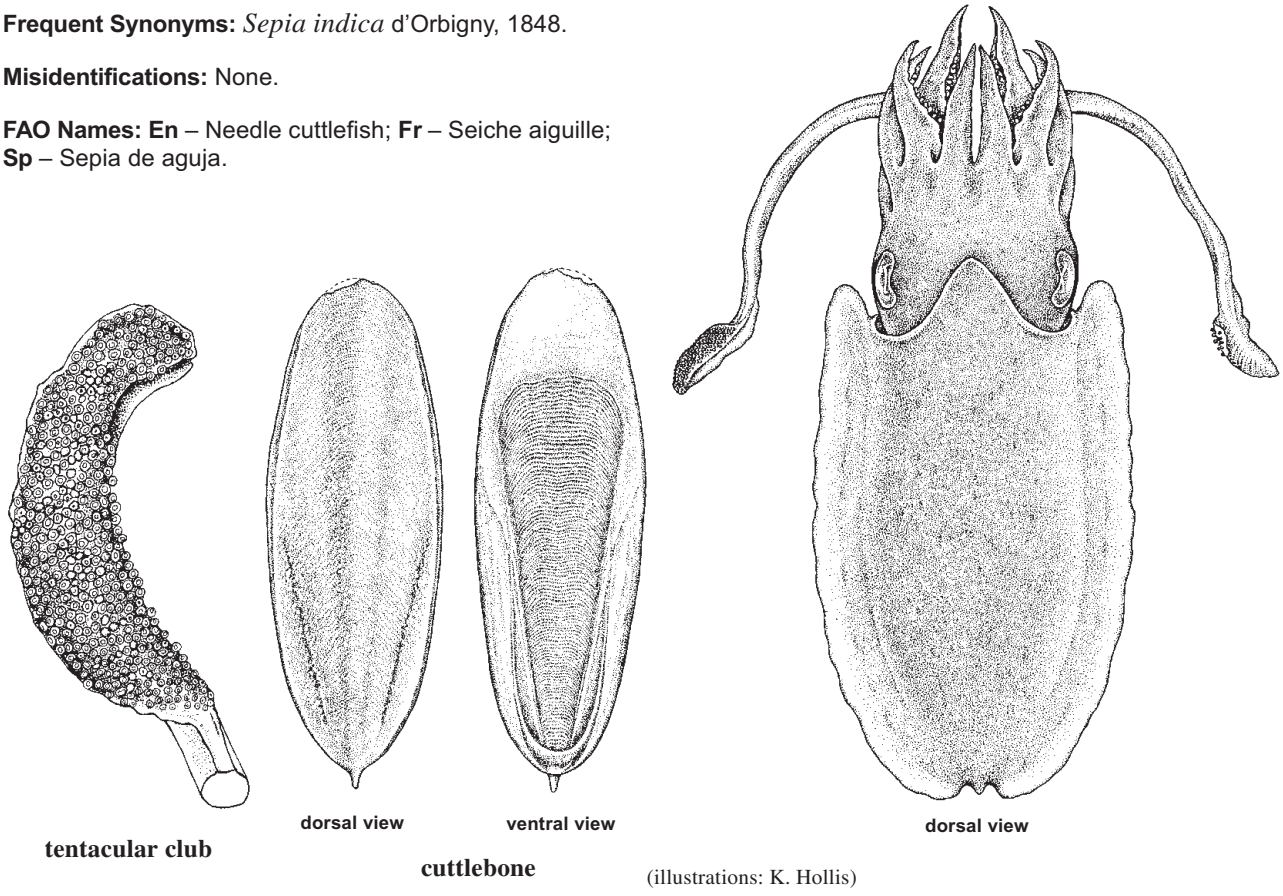
***Sepia aculeata*** Van Hasselt, 1835 (*in* Férussac and d'Orbigny, 1834–1848) **Fig. 112; Plate II, 12–14**

*Sepia aculeata* Van Hasselt, 1835, pl. 5 bis (*in* Férussac and d'Orbigny 1834–1848), *Histoire naturelle générale et particulière des Céphalopodes Acétabuliferes vivants et fossiles* [type locality: Java].

**Frequent Synonyms:** *Sepia indica* d'Orbigny, 1848.

**Misidentifications:** None.

**FAO Names: En** – Needle cuttlefish; **Fr** – Seiche aiguille; **Sp** – Sepia de aguja.




(illustrations: K. Hollis)

**Fig. 112** ***Sepia aculeata***

**Diagnostic Features:** Mantle oblong. Male and female arm lengths subequal. Hectocotylus present on left ventral arm: 3 rows of normal size suckers proximally, 5 or 6 rows of reduced suckers medially, then normal size suckers to arm tip. Suckers of hectocotylus in **the 2 dorsal series are much smaller than those in the 2 ventral series**; suckers in both dorsal and ventral series displaced laterally, with gap between; arm with deep median furrow in adults. Club sucker-bearing surface convex; **males with 10 to 12, females with 13 or 14** club suckers in transverse rows; all club suckers of **similar, minute, size**. Dorsal and ventral protective membranes not joined at base of club, extend proximal to carpus along stalk. Buccal membrane with a few minute suckers. Cuttlebone with distinct dorsal median and lateral ribs. Chitin present as wide glaze-like patch posteriorly; a narrow chitinous rim borders lateral margins of cuttlebone. Spine long, pointed, without keel. Anterior striae are **inverted U-shape**. Inner cone limbs are **narrow anteriorly, broaden posteriorly, then are raised into a thick, round ledge**; outer cone narrow anteriorly, broadens posteriorly. Dorsal mantle with longitudinal row of up to 8 ridge-like papillae and associated, numerous, large papillae along each side, adjacent to base of each fin. Head and arms with scattered, small tubercles. Colour of preserved specimens pale brownish. Dorsal mantle has white blotches, spots or patches, or it has a transverse saddle mark, or a fine, darkly pigmented, transverse reticulate pattern. Fins with **pale reflective line along base**. Live animals are light brown. Arms I to III have a longitudinal orange-red pigmented stripe along their aboral surfaces. Dorsal mantle with pale transverse saddle mark and pattern of bold, broad, zebra stripes during the spawning season; 3 circular, white patches occur mid-dorsally within transverse saddle mark; posteriormost patch composed of a ring of white spots.

**Size:** Maximum mantle length 230 mm; weight 1.3 kg.

**Geographical Distribution:** Indo-Pacific: India (Arabian Sea north to off the Gulf of Kutch) to the Andaman Sea and Gulf of Thailand, South China Sea, Taiwan Province of China, East China Sea, Indonesia and possibly the Timor Sea (Fig. 113).

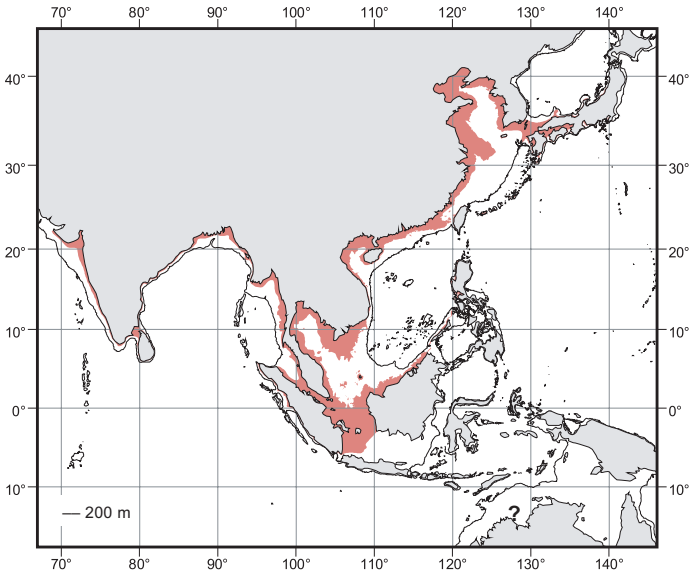



**Fig. 113** ***Sepia aculeata***
Known distribution

**Habitat and Biology:** ***Sepia aculeata*** is a demersal, neritic species that occurs to 60 m depth. Along the Indian coasts maturing and mature animals are present throughout the year, which indicates a prolonged spawning and breeding season; activity peaks occur from January to April and in the second half of the year in the eastern waters, and in April, July and December in the southwestern waters, off Cochin. In the Hong Kong area, a prespawning concentration occurs on the continental shelf, followed by movement inshore to spawn at depths of 5 to 20 m from March to May at water temperatures of 18° to 24°C. In the Gulf of Thailand, spawning occurs all year at depths of 10 to 50 m, with March to April and July to September the peak months. Smallest mature individuals in this region and in the Bay of Bengal (eastern Indian Ocean) were found at 70 mm mantle length, while size at 50% maturity varies between 75 and 100 mm for males and 100 and 120 mm for females, respectively. In the Arabian Sea (western Indian Ocean) the size at 50% maturity is a little higher, i.e. over 120 and 130 mm for males and females, respectively. Growth rates are similar in females and males and the sex ratio is 1:1. Commercially caught animals from the Gulf of Thailand and the Andaman Sea range between 60 and 130 mm mantle length, those caught from the east coast of India range between 50 and 190 mm and on the west coast females of 200 mm mantle length also are captured.

**Interest to Fisheries:** This species is the thirdmost important commercial cuttlefish around Hong Kong where it is caught with setnets and seines during the spawning season. It is also one of the most important commercial cuttlefish in southwest India, where is mainly caught by trawl, with peak landings in October and November. The species is fished commercially in southern China, Taiwan Province of China, Sri Lanka and Thailand, where it is caught by otter trawl, pair trawl, squid light-lures, traps and push nets. Captures by traps in Thai waters are most abundant in January and February, when most animals are fully mature and females are predominantly caught.

**Local Names:** CHINA: Jam Mak Yue; JAPAN: Ami-mom-nkouika.

**Literature:** Adam and Rees (1966), Silas *et al*. (1986), Siraimeetan (1990), Chotiyaputta (1993), Rao *et al*. (1993), Chantawong and Suksawat (1997), Chotiyaputta and Yamrungreung (1998), Nateewathana (1999).

## *Sepia andreana* Steenstrup, 1875 **Fig. 114**

*Sepia andreana* Steenstrup, 1875, *Danske Videnskabernes Selskabs Skrifter, 5 Raekke, Naturvidenskabelig og Mathematisk*, 10(7): 473 [type locality: Japan, Hakodate].

**Frequent Synonyms:** None.

**Misidentifications:** *Sepia kobiensis* Hoyle, 1885.

**FAO Names: En** – Andrea cuttlefish; **Fr** – Seiche andreana; **Sp** – Sepia andreana.

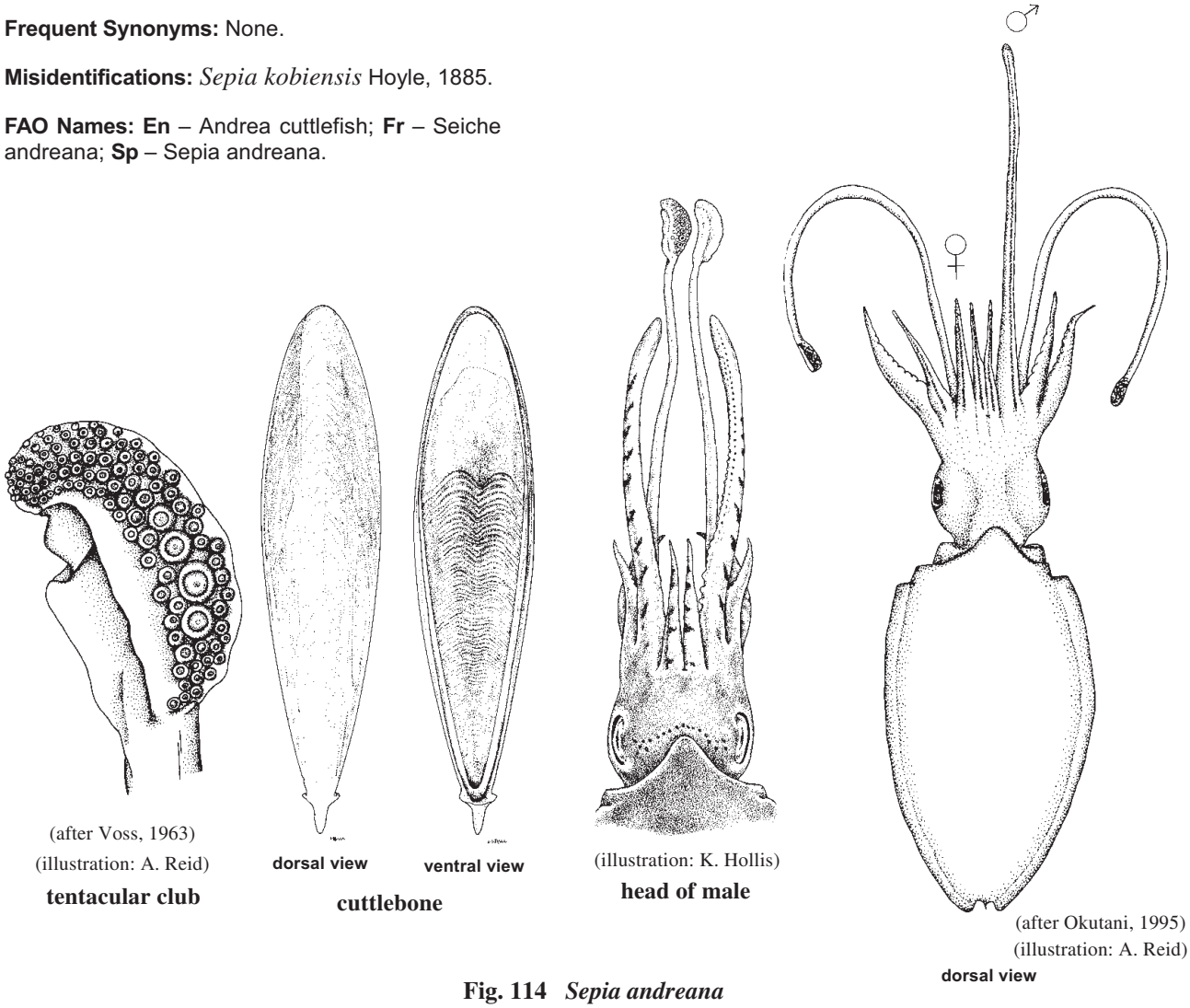



**Fig. 114** *Sepia andreana*

**Diagnostic Features:** Mantle oblong; dorsal anterior margin triangular, acute; ventral mantle margin emarginate. Fins narrow, end in small, auriculate lobes posteriorly, with a small V-shape interstice where posterior spine is located. Male arms II **greatly elongate, 3 times longer than other arms** (except in young specimens), and **bluntly rounded distally**, not tapered. Female arm lengths subequal. Arm sucker arrangement differs between sexes. In males, sucker rows on modified arms II tetraserial on proximal third, biserial distally, becoming rudimentary and sparse at tips; arms I and III tetraserial proximally, biserial only on extreme distal arm tips; arms IV suckers tetraserial. In females, suckers on arms I tetraserial proximally, biserial on slightly expanded distal tips; arms II and III tetraserial proximally, distal third with biserial suckers, arms IV suckers tetraserial; female distal biserial suckers minute, displaced laterally, with gap between, and with distinct medial gap between rows. Hectocotylus present on left ventral arm: 10 rows of normal size suckers proximally, **distal half of arm with rudimentary suckers** on swollen peduncular bases. Club crescent-shaped, sucker-bearing surface convex with **5 or 6 suckers in transverse rows**; suckers differ in size: **4 or 5 slightly enlarged suckers** in longitudinal series towards posterior end of club. Swimming keel of club extends proximally slightly beyond carpus; dorsal and ventral protective membranes **not joined at base of club** but fused to tentacular stalk, terminate at posterior end of carpus. Dorsal membrane forms deep cleft at junction with stalk. Buccal membrane without suckers; in females extends ventrally with 2 spermathecae. Cuttlebone outline **lanceolate**; dorsal median rib indistinct; spine straight; striated zone and last loculus convex; sulcus shallow, narrow, extends entire length of cuttlebone. Anterior striae **shallow m-shape**; inner cone narrow, U-shape; outer cone limbs are expanded posteriorly into 2 short 'wings', directed ventrally, to form a recurved cup-like structure. Dorsal mantle with a longitudinal row of approximately 6 ridge-like papillae along each side, adjacent to base of each fin. **Colour:** Pale brownish. Arms II have oblique bands of chromatophores, **arms I to III have a longitudinal orange-red pigmented stripe along their aboral surfaces**. Dorsal mantle has yellow spots and chromatophores concentrated medially above cuttlebone. Ventral mantle pale with a narrow, longitudinal, iridescent band on each side adjacent to fins.

**Size:** Up to 120 mm mantle length, 200 g total weight.

**Geographical Distribution:** Western Pacific: Japan (Pacific coasts of southern Hokkaido, Tsugaru Strait, northern and central Honshu), Japan Sea, Yellow Sea, along south China coast, South China and East China Seas to northern Philippines. (Fig. 115).

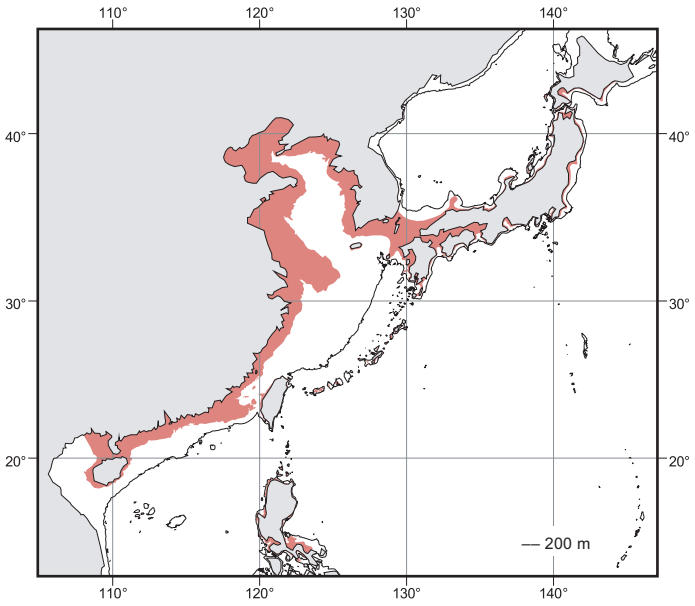



**Fig. 115** ***Sepia andreana***
Known distribution

**Habitat and Biology:** Depth to 50 m. This demersal species occurs in coastal waters. In the Yellow Sea the spawning season is very long, with two spawning peaks, one in spring and one in autumn, the main spawning occurring in March and April. It feeds on fishes and small crustaceans.

**Interest to Fisheries:** Taken as bycatch in trawl and setnet fisheries. It consistently supports a fishery in the Yellow Sea.

**Remarks:** ***Sepia andreana*** may be confused with ***S. kobiensis*** Hoyle, 1885. Mature male ***S. andreana*** can be distinguished by the greatly elongate second arm pair, with biserial, rather than tetraserial, suckers on the distal half. All arms are of similar length in ***S. kobiensis*** and suckers on all arms are tetraserial. The hectocotylus sucker arrangement differs between the two species: ***Sepia andreana*** has 10 proximal rows of normal size suckers, and the remainder of the arm has rudimentary suckers on swollen peduncular bases; ***Sepia kobiensis*** has 6 to 12 series of normal suckers proximally, 7 to 10 series medially are reduced, with those on the distal remainder of the arm normal in size. The club suckers differ only slightly in size in ***S. kobiensis***, while in ***S. andreana*** they differ markedly in size. Adult ***Sepia kobiensis*** are also slightly smaller. ***Sepia andreana*** was misidentified in Voss (1963) and Roper *et al*. (1984). The species referred to in those works could be ***S. kobiensis***. ***Sepia andreana*** lives in cooler water than the distributions in these publications would suggest.

**Literature:** Okutani *et al*. (1987), Cheng (1997), Kubodera and Yamada (1998).

***Sepia apama*** Gray, 1849 **Fig. 116; Plate III, 15–20**

*Sepia apama* Gray, 1849, *Catalogue of the Mollusca in the British Museum. Part I. Cephalopoda Antepedia*, 103 [type locality: South Australia, Port Adelaide, 34°50'S 138°30'E].

**Frequent Synonyms:** *Sepia palmata* Owen, 1881; *Amplisepia verreaux* (non Rochebrune, 1884) Iredale, 1926; *Amplisepia parysatis* Iredale, 1954.

**Misidentifications:** None.

**FAO Names: En** – Giant Australian cuttlefish; **Fr** – Seiche géante australienne; **Sp** – Sepia gigante australiana.

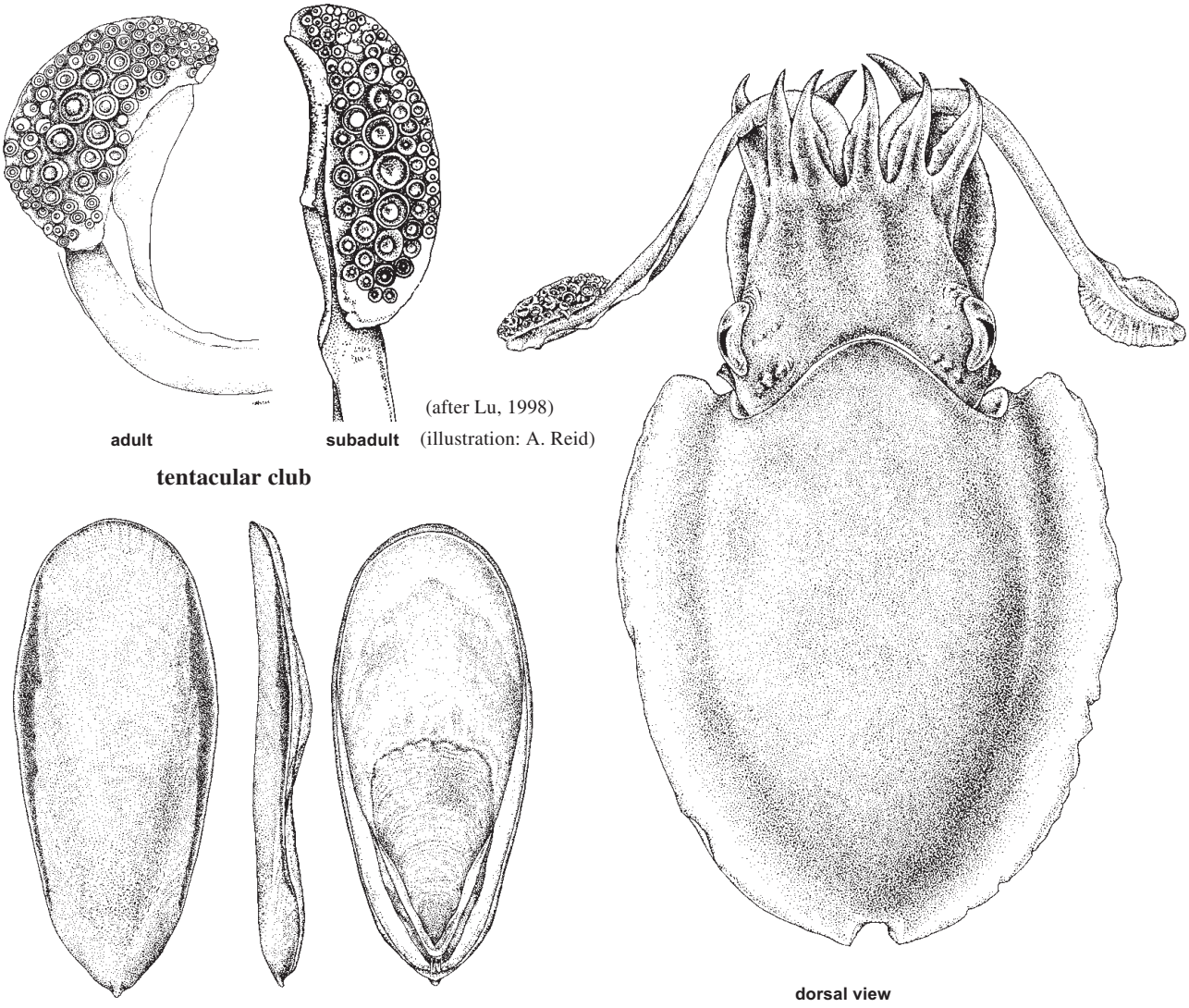



**Fig. 116** ***Sepia apama***

**Diagnostic Features:** Very large, robust species. Mantle broadly oval. Fins wide, extend anteriorly slightly beyond mantle margin, rounded posteriorly, with wide gap between them. Funnel long, broad-based, extends to level of anterior rim of eye. Funnel organ dorsal elements inverted V-shape, with a small anterior papilla; ventral elements oval with acute anterior tips. Head short, broad, narrower than mantle. Male and female arms subequal in length; protective membranes wide, well developed. Arm suckers tetraserial. Hectocotylus present on left ventral arm: proximal end of arm with **6 to 10 rows of slightly reduced, equal sized suckers**; oral surface of modified region not wide, fleshy, but normal, as on opposite arm. Club crescent-shaped, moderate length; sucker-bearing surface flattened, with **4 or 5 suckers in transverse rows**; suckers differ markedly in size: **some median suckers greatly enlarged**; dorsal marginal longitudinal series of suckers slightly larger than those in ventral marginal series. Swimming keel of club very broad, extends well proximal to carpus; dorsal and ventral protective membranes joined at base of club; separated from stalk by membrane; dorsal membrane

forms shallow cleft at junction with stalk. Buccal membrane without suckers; in females with single median spermathecae in ventral part. Eggs spherical. Cuttlebone outline oval, or oblong (juveniles broadly oval, wider in anterior half, becoming elongate in adults); bone bluntly rounded anteriorly; acuminate, rounded posteriorly; dorsal surface creamy white, evenly convex posteriorly, flat anteriorly; dorsal surface slightly granulose with irregular longitudinal ridges; indistinct dorsal median rib present in large specimens, broadens anteriorly, bordered laterally by indistinct grooves; lateral ribs indistinct. Chitin borders lateral and anterior margins of cuttlebone. Spine present in juveniles, lost in adults. Striated zone flat, or slightly concave; last loculus flat in large animals, or convex in smaller ones; shallow, wide, sulcus extends along striated zone only, or sulcus absent. Anterior striae are **inverted U-shape in smaller specimens, becoming straight in large specimens**. Inner cone limbs are narrow anteriorly, broaden slightly posteriorly; in large specimens **thickened into rough callus** on inner margin of outer cone, which narrows anteriorly, broadens posteriorly. **Three flat, semicircular, flap-like papillae** posterior to eyes. **Colour:** Reddish brown. All arms have whitish transverse bars and spots bordered by darker pigment. Dorsal mantle with fine, irregular, reticulate, white bands and spots, some fused to form irregular transverse bands; bands joined laterally into longitudinal broken white band adjacent to fins. Fins pale, with narrow white band along outer margin.

**Size:** Maximum size up to 500 mm mantle length and weight in excess of 10.5 kg. This is the worlds' largest cuttlefish.

**Geographical Distribution:** Southern Indo-Pacific: southern Australia from Moreton Bay 27°25'S 153°20'E, possibly as far north as Shoalwater Bay, Queensland (22°30'S) to Point Cloates, Western Australia (22°43'S 113°40'E). Lord Howe and Norfolk Islands. Australian endemic (Fig. 117).

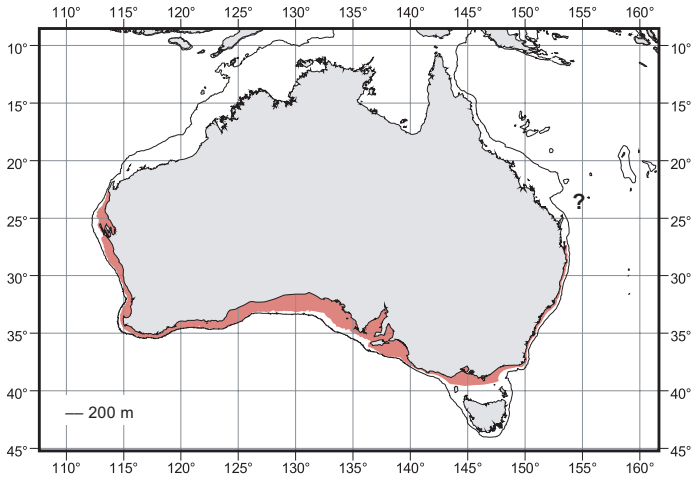



**Fig. 117** ***Sepia apama***
Known distribution

**Habitat and Biology:** Depth range from 1 to 100 m. ***Sepia apama*** is a neritic demersal species with cryptic habits; it occurs in coral areas, seagrass beds and on open trawl grounds. It feeds on fishes, crabs and other crustaceans. During a highly ritualized and stereotyped courtship, males display broad bands of dark chromatophores that pulsate across the dorsal mantle as part of their visual display. Males often guard females to ward off other males. Small males have been observed to mimic the coloration and behaviour of females, using this diversion to sneak close to females to mate with them without the awareness of the larger aggressive males. Mating takes place head-to-head and spermatophores are placed in the female's spermathecae on the buccal membrane ventral to the mouth. Southern Australian animals spawn from April to September. Mass spawning occurs in the Spencer Gulf from April to June, with peak spawning during May to June. The lemon-shaped eggs are laid in subtidal crevices and hatch after 3 to 5 months. Low incubation temperatures around 12°C (which mitigate potential problems of diffusive gas exchanges) may be a factor that limits the distribution of the species to cool southern waters.

**Interest to Fisheries:** The species is taken as bycatch in prawn and mixed species trawl fisheries, by hook-and-lines or speared by divers. It is commonly available in fish markets along the southern coast of Australia, sold for human consumption and as bait. Few details on quantities or origin of catches are available.

**Local Names:** AUSTRALIA: Giant Australian cuttlefish.

**Remarks:** Recent morphological and molecular analyses have shown that specimens of ***Sepia apama*** from the east coast and southern Australia comprise two very divergent populations. However, these populations are not geographically isolated. The data suggests that populations of ***S. apama*** may have been geographically isolated in the past and have come into secondary contact.

**Literature:** Adam and Rees (1966), Lu (1998a), Cronin and Seymour (2000), Norman (2000), Kassahn *et al*. (2003).

***Sepia arabica*** Massy, 1916 **Fig. 118**

*Sepia arabica* Massy, 1916, *Records of the Indian Museum*, 12(part 5)(16): 228 [type locality: Laccadive Sea, 11º14'30"N 74º57'15"E and Persian Gulf, 26º20'N 53º54'E].

**Frequent Synonyms:** None.

**Misidentifications:** None.

**FAO Names: En** – Arabian cuttlefish; **Fr** – Seiche d'Arabie; **Sp** – Sepia arábiga.

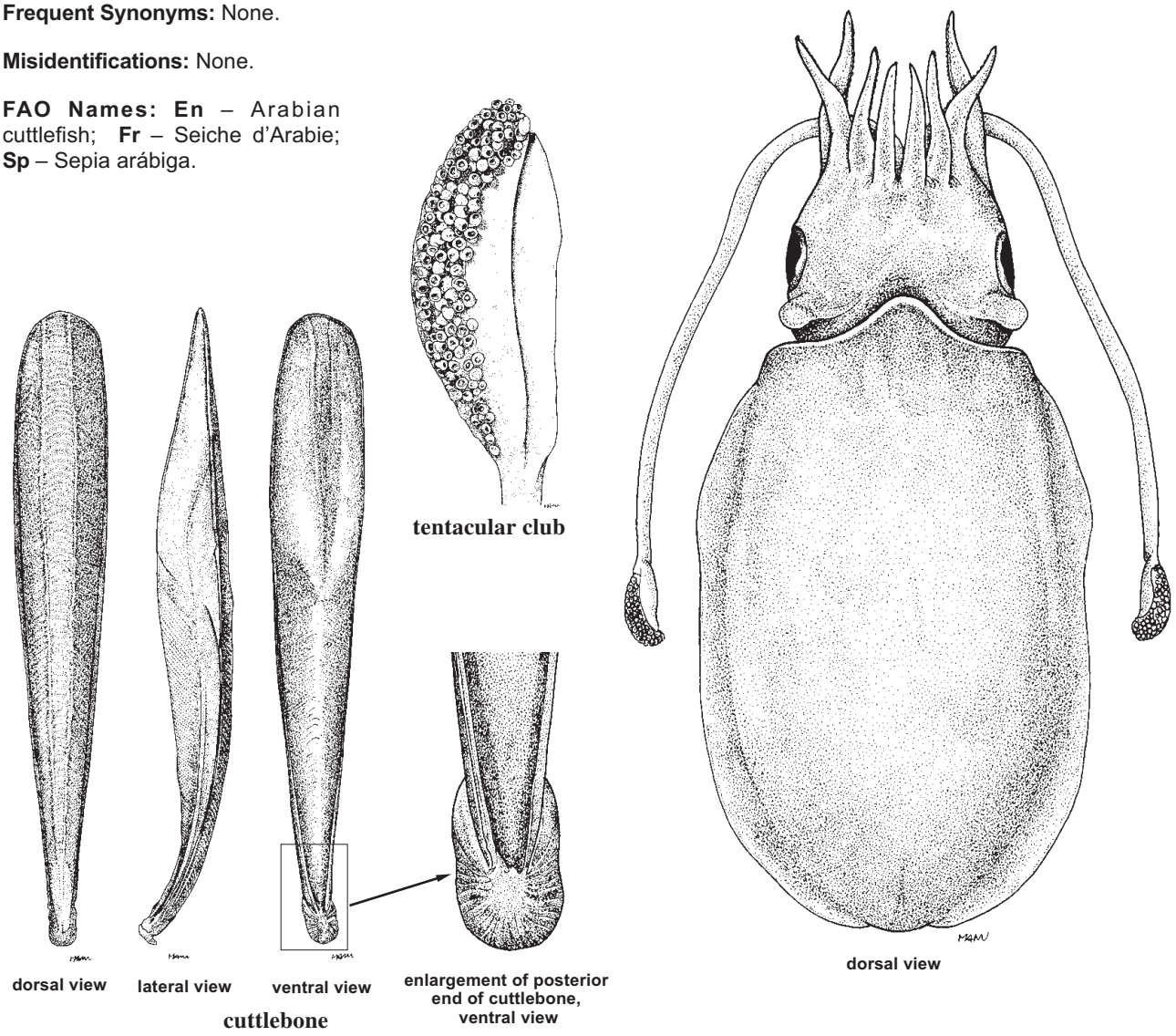



**Fig. 118** ***Sepia arabica***

**Diagnostic Features:** Mantle oval. Fins widest in posterior third; anterior origin posterior to mantle margin, posteriorly with wide gap between them. Head slender, narrower than mantle. Male and female arms subequal in length. Arm suckers tetraserial in both sexes, suckers small and widely spaced. Arm sucker rims smooth. Hectocotylus present on left ventral arm: with **greatly reduced suckers**, much smaller than normal arm suckers; oral surface of modified region wide, swollen, fleshy, with transversely grooved ridges; suckers in 2 dorsal and 2 ventral series displaced laterally, with gap between them. Both ventral arms of males with sucker-bearing surfaces folded together and nearly completely covered by the protective membranes. Club crescent-shaped, small; with **5 or 6 small, similar sized suckers** in transverse rows. Swimming keel of club extends proximally slightly beyond carpus; dorsal and ventral protective membranes **not joined** at base of club; dorsal membrane much wider than ventral membrane. Cuttlebone **outline lanceolate**; bone bluntly rounded anteriorly, **very narrow, strongly tapered posteriorly**; **recurved ventrally**; granulose dorsally; dorsal median rib indistinct, broadens anteriorly. Chitin present as wide bands bordering lateral sides of cuttlebone, extending to median rib. Spine absent; dorsoposterior end of cuttlebone with **short median longitudinal ridge**. Striated zone and last loculus convex; sulcus shallow, narrow, extends entire length of cuttlebone. Anterior striae **V-shape**; inner cone lateral limbs are separated from outer cone by smooth zones; inner cone limbs are uniform width, narrow V-shape posteriorly; slightly raised into rounded posterior ridge; inner cone posteriorly with irregular ribs radiating into outer cone (ribs calcareous medially and chitinous toward margin of outer cone); outer cone narrow anteriorly, broadens posteriorly; outer cone limbs are expanded into **2 rounded 'wings'**, directed ventrally, to form a recurved cup-like structure. Dorsal mantle has pale circular tubercles between median row of dark patches dorsal to base of fins and has a series of elongate papillae along each side, adjacent

to base of each fin. Head with **large, fleshy ear-shaped projections posterior to eyes**. **Colour:** Reddish purple. Head with chromatophores concentrated over eye orbits. Dorsal mantle chromatophores are irregularly distributed in patches; base of fins on posterior half with 10 to 12 patches of concentrated reddish purple chromatophores.

**Size:** Up to 88 mm mantle length.

**Geographical Distribution:** Indian Ocean: Red Sea, Gulf of Aden, Persian Gulf, western and southern India, Laccadive Islands (Fig. 119).

**Habitat and Biology:** Depth range from 80 to 272 m.

**Interest to Fisheries:** Presently undetermined. The species has been reported from bottom trawl resource surveys.

**Literature:** Adam and Rees (1966), Filippova *et al*. (1995), Nateewathana (1996).

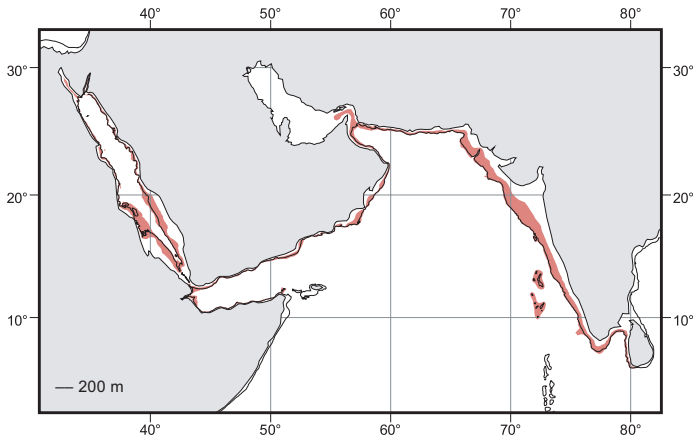



**Fig. 119** ***Sepia arabica***
Known distribution

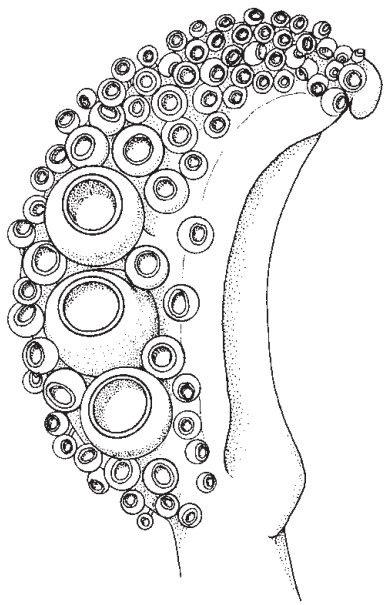
## *Sepia australis* Quoy and Gaimard, 1832 — Fig. 120

*Sepia australis* Quoy and Gaimard, 1832. *Voyage de découvertes de l'Astrolabe pendant les annees 1826–1827–1828–1829, Zoologie*, 2(1): 70 [Type locality: Agulhas Bank, South Africa].

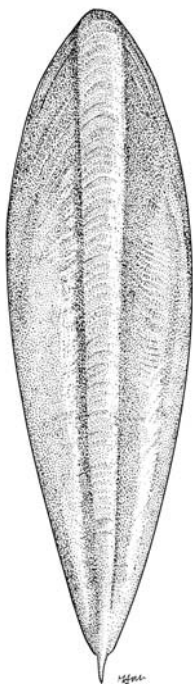
**Frequent Synonyms:** *Sepia capensis* d'Orbigny, 1845; *Sepia sinope* Gray, 1849.

**Misidentifications:** None.

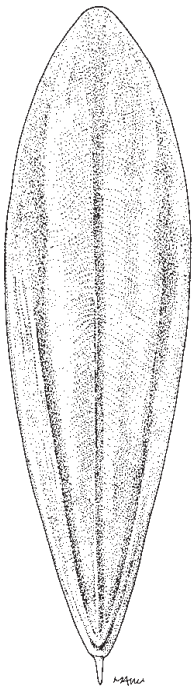
**FAO Names: En** – Southern cuttlefish; **Fr** – Seiche australe; **Sp** – Sepia austral.



**tentacular club**



**dorsal view**



**ventral view**

**cuttlebone**

**Fig. 120** ***Sepia australis***

**Diagnostic Features:** Fins rounded posteriorly, with wide gap between them. Arm suckers tetraserial; median suckers larger than marginal suckers (more so in males). Hectocotylus present on left ventral arm: **2 rows of normal size suckers proximally, 6 or 7 rows of greatly reduced suckers medially**, then normal size suckers to arm tip; suckers in 2 dorsal and 2 ventral series displaced laterally, with gap between them. Club crescent-shaped, short, with **5 suckers in transverse rows**; suckers differ markedly in size with **3 greatly enlarged suckers** towards proximal end of club. Swimming keel of club extends proximally slightly beyond carpus; dorsal and ventral protective membranes **not joined at base of club**. Cuttlebone outline oval; bone bluntly rounded anteriorly; tapers abruptly posteriorly, **acuminate, acute, sharply pointed**; strongly recurved ventrally; dorsal surface creamy white; evenly convex; texture smooth. Spine and posterior end (approximately one quarter) of bone covered with ochre-coloured, smooth, glaze-like substance. Dorsal median rib indistinct; broadens slightly anteriorly; ribs bordered laterally by distinct grooves; lateral ribs distinct. Chitin surrounds entire margin of cuttlebone. Spine long, straight, directed dorsally; dorsoposterior end of cuttlebone with **short, median longitudinal ridge anterior to, and separate from spine**. Striated zone and last loculus convex; sulcus **deep, narrow, flanked by rounded ribs**, extends entire length of cuttlebone. Anterior striae are **inverted U-shape**. Inner cone limbs are uniform width, narrow, U-shape posteriorly; slightly raised into rounded posterior ledge; thickened slightly; dull, not shiny; outer cone chitinous, not calcified, narrow. **Colour:** Purplish brown. Fins pale with **broad orange-pink band along base dorsally**; ventral pigment present; chromatophores concentrated near fins as for dorsum.

**Size:** Up to 85 mm mantle length, 50 g total weight.

**Geographical Distribution:** Southeastern Atlantic and western Indian Ocean: from Namibia (27ºS) to Port Elizabeth, South Africa (few records east of Port Elizabeth). Possibly Red Sea, Gulf of Aden and Somalia. Occurrence in China (as ***S. sinope*** Gray 1849), is extremely doubtful (Fig. 121).

**Habitat and Biology:** Depth range from 45 to 345 m (most abundant from 60 to 190 m). ***Sepia australis*** is able to thrive in areas of depleted oxygen concentrations (to as low as 1.5 ml $l^{-1}$) as is found in shallow northern waters of the west coast of southern Africa; here the best catches are associated with oxygen concentrations between 1.5 ml $l^{-1}$ to 3.5 ml $l^{-1}$ and temperatures around 9ºC. Off the south coast of South Africa, mature animals occur in early winter and the main spawning grounds are likely to be located in deeper water on the western side of the Agulhas Bank. ***Sepia australis*** is an important prey item of fur seals, hake, skates and other groundfishes. It preys mostly upon stomatopod crustaceans. On the west coast of South Africa, the largest recorded female measured 85 mm (weight 50 g) and the largest recorded male was 62 mm (weight 23 g), while on the south coast, the largest recorded female measured 67 mm (weight 15 g) and the largest recorded male 57 mm (weight 11 g).

**Interest to Fisheries:** This is one of the most common sepiid species found off the South African coast. The importance of the species, defined on the basis of 'survey abundance' (including commercial fisheries) and its trophic links with other organisms, indicate that ***Sepia australis*** is sufficiently abundant to be exploited by fisheries. This, along with its tasty flesh, gives it excellent commercial potential. Unknown factors are dispersal, availability and market considerations.


**Fig. 121** ***Sepia australis***
Known distribution

**Literature:** Adam and Rees (1966), Roeleveld (1972), Lipinski *et al*. (1991), Sánchez and Villanueva (1991), Lipinski (1992), Lipinski *et al*. (1992a), Lipinski *et al*. (1992b), Roeleveld *et al*. (1993), Augustyn *et al*. (1995).

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