

Diagnostic Features : Body fairly slender, its depth usually less than 30% of standard length; total scutes 29 or 30. Lower gillrakers slender, smooth and numerous, 87 to 134 in fishes 6 to 11 cm standard length (but more data needed). Vertical striae on scales continuous or overlapping, but no perforations on hind part of scale. No dark spot at dorsal fin origin; tips of dorsal and caudal fins dusky or black. Immediately distinguished from all other *Sardinella* species in the area by its high gillraker count, also the overlapping or continuous scale striae and absence of dorsal spot.

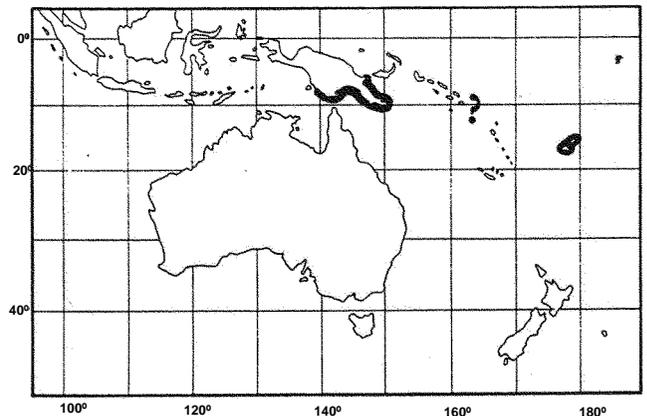
Geographical Distribution : Western Pacific (Papua New Guinea, Fiji).

Habitat and Biology : Coastal, pelagic, schooling. More data needed.

Size : To 11.5 cm standard length.

Interest to Fisheries : Presumably contributes to *Sardinella* catches, but appears not to be abundant.

Local Names : -



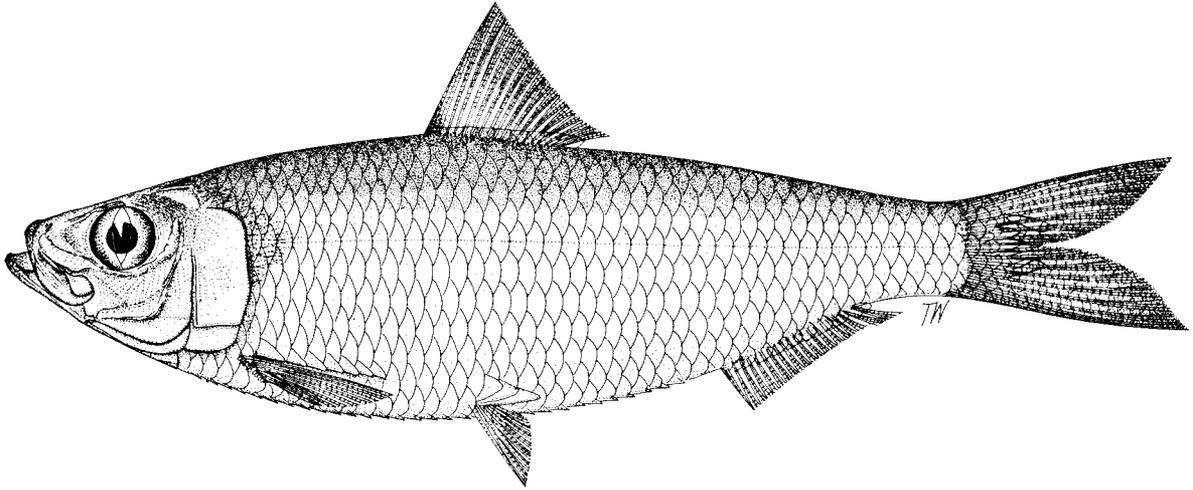
Sardinella fimbriata (Valenciennes, 1847)

CLUP Sardl 7

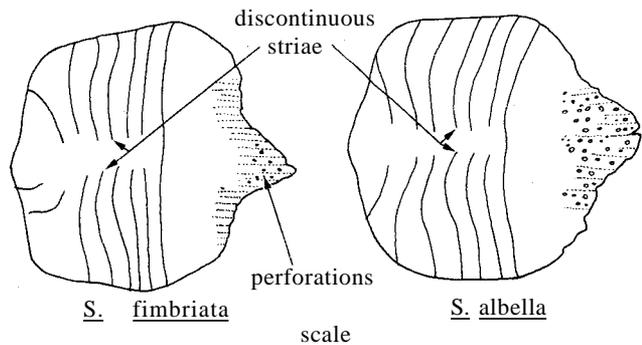
Spratella fimbriata Valenciennes, 1847, *Hist.nat.poiss.*, 20:359 (Malabar).

Synonyms : *Sardinella fimbriata* - Fowler, 1941:609 (the Philippines); Chan, 1965:14, fig. 7a (India, Thailand, the Philippines); Whitehead, 1967:50 (type); Whitehead, 1973b:184, fig. 14 (but not the Western Indian Ocean records); Wongratana, 1980:119, pls 56, 57 (revision); Whitehead & Bauchot, in press (types of *S. fimbriata*).

FAO Names : En - Fringescale sardinella.



Diagnostic Features : Body somewhat compressed but variable, from slender to moderately deep, its depth 25 to 34% of standard length; total number of scutes 29 to 33 (usually 30 to 32). Lower gillrakers 54 to 82 (at 5 to 12 cm standard length, increasing with size of fish). Vertebral striae on scales not meeting at centre, hind part of scale with a few perforations and (in Indian Ocean specimens) somewhat produced posteriorly. A dark spot at dorsal fin origin. Closely resembles *S. albella*, which has fewer lower gillrakers (41 to 68, most specimens less than 60) and many more perforations on the scales. Often confused with *S. gibbosa*, which has more scutes (32 to 34) and fewer gillrakers (45 to 59). Other similar species have more scutes, or more gillrakers or overlapping scale striae or no spot at dorsal fin base or caudal tips black (or a combination of some of these features). See CLUP Sardl 7, Fishing Areas 57, 71.



Geographical Distribution : Indo-West Pacific (not in western Indian Ocean, but from southern India and Bay of Bengal to the Philippines, also eastern tip of Papua New Guinea).

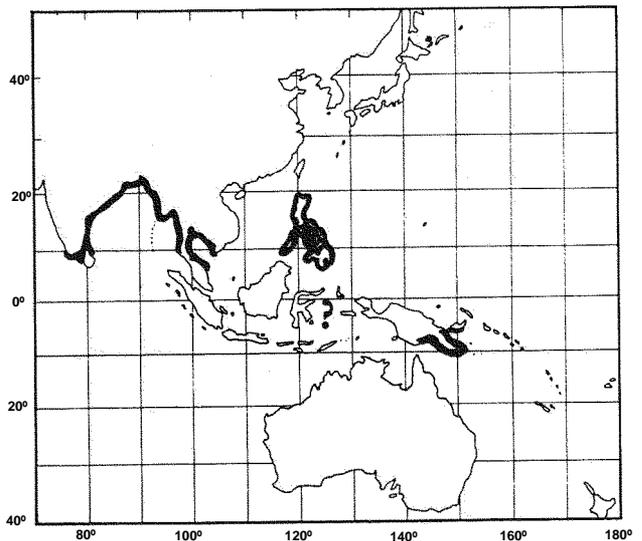
Habitat and Biology : Coastal, pelagic, schooling. Misidentifications (especially with *S. gibbosa* in Indian waters and *S. albella* in the western Indian Ocean) make published biological data potentially unreliable. The biology is summarized by Nair (1960, 1973).

Size : To 13 cm standard length, usually around 11 cm.

Interest to Fisheries : Included in the general statistics for *Sardinella*, but of some importance in southern parts of India (although fishery statistics probably include *S. gibbosa* and/or *S. albella*).

Local Names : INDIA: Chalamathi (Malayalam); Charree addee (Hindi); Erebai, Pedi (Kannada); Hoirā, Khaira (Bengali); Noone kavallu (Telegu); Pedwa, Washi (Marathi); Saudai (Tamil). These names are probably equally applied to similar species in many areas.

Literature : Nair (1960, 1973 - India, synopsis of biology and fisheries).



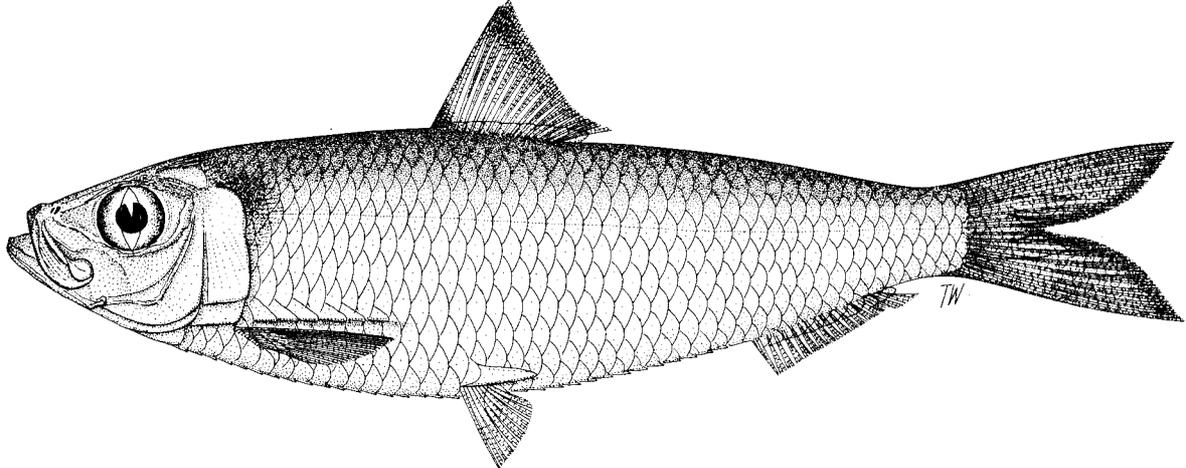
Sardinella gibbosa (Bleeker, 1849)

CLUP Sardl 8

Clupea gibbosa Bleeker, 1849, *J.Ind.Arch.*, 3:72 (Macassar).

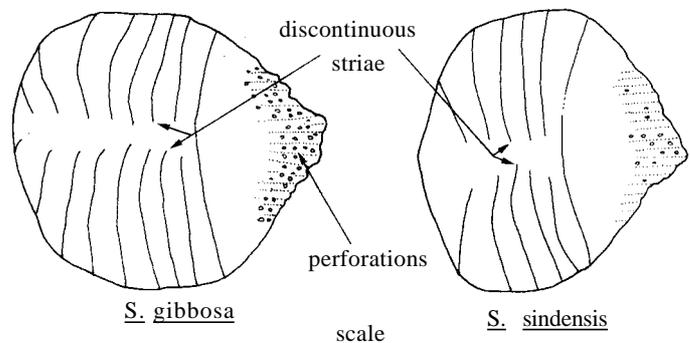
Synonyms : *Clupanodon jussieu* Lacepède, 1803:469, ? pl. 11 (Mauritius; nomen dubium); *Spratella tembang* Bleeker, 1851:214 (name only to replace *Clupea gibbosa*); *Clupea immaculata* Kishinouye, 1907:96, pls 19, fig. 1, 21, fig. 4 (Saga, Kyushu, Amoy, Swatow, China; types destroyed); *Sardinia immaculata*:Chyung, 1961:135 (Korea); *Fimbriclupea dactylolepis* Whitley, 1940:399, fig. 5 (northwestern Australia); *Sardinella dactylolepis*:Munro, 1956:23, fig. 157; *Sardinella taiwanensis* Raja & Hiyama, 1969:90, pl 26 (Taiwan); *Sardinella jussieu*:Fowler, 1941:611 (the Philippines); Whitehead, 1965:252 (Gulfs of Aden and Oman); *Sardinella jussieu*:Chan, 1965:9, fig. 20 (Thailand to Hong Kong); Whitehead *et al.*, 1966:56, 58 (*gibbosa*, *tembang* types); Whitehead 1967:54 (*jussieu* problem); *Sardinella gibbosa* - Losse, 1968:98 (East Africa); Whitehead, 1973b:185, fig. 15; Wongratana, 1980:117, pls 54, 55 (revision, *immaculata* identified); SFSA, in press (southern Africa).

FAO Names : En - Goldstripe sardinella.



Diagnostic Features : Body moderately slender, its depth usually 24 to 30% standard length; total number of scutes 32 to 34. Lower gillrakers 45 to 59 (at 6 to 17 cm standard length, not increasing with size of fish after 6 cm standard length). Vertical striae on scales not meeting at centre, numerous small perforations on hind part of scale. A golden midlateral line down flank (at least in Gulf of Thailand); dorsal and caudal fin margins dusky; a dark spot at dorsal fin origin. Closely resembles *S. sindensis* (Arabian Sea and the "Gulf"), which has fewer perforations on the scales. Most often confused with *S. fimbriata* which has fewer scutes (usually 29 to 32) and more gillrakers (54 to 82).

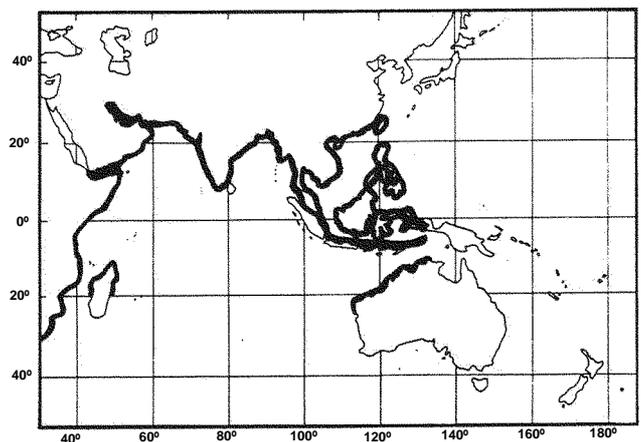
Other similar species have fewer scutes or more gillrakers or overlapping scale striae or deeper bodies or no spot at dorsal fin base or caudal tips black (or a combination of some of these features). See CLUP Sardl 8, Fishing Area 57. (Sheet for Fishing Areas 57, 71 not-accurate).



Geographical Distribution : Indo-West Pacific (the "Gulf", but apparently not Red Sea; East African coasts, Madagascar eastward to Indonesia, north to Taiwan and Korea south to northern Australia, possibly also western coasts of Australia). One of the most abundant *Sardinella* species in the Indo-West Pacific region.

Habitat and Biology : Coastal, pelagic, schooling. Possible or even probable confusion with other species (especially *S. fimbriata* in Indian waters) makes published biological data potentially unreliable. The biology is summarized by Nair (1973:39 to 48).

Size : To 17 cm standard length, usually to 15 cm.



Interest to Fisheries: Included in the general statistics for Sardinella, but of some importance in southern parts of India (Andhra Pradesh, Tamil Nadu, Kerala) and entering markets throughout southeast Asia. It is usually caught in association with other species of Sardinella.

Local Names : HONG KONG: Hwang lum; INDIA: Chalamathi (Malayalam); Choodai, Nonalai (Tamil); Erebai (Kannada); Kavallu (Telugu); INDONESIA: Tembang; TAIWAN ISLAND: Ju shi sha-tin; THAILAND: Pla lang keo. These names are probably equally applied to similar species in many areas.

Literature : Nair (1960, 1973 - India, synopsis of biology and fisheries); Losse (1968 - East Africa); Okera (1974 - East Africa).

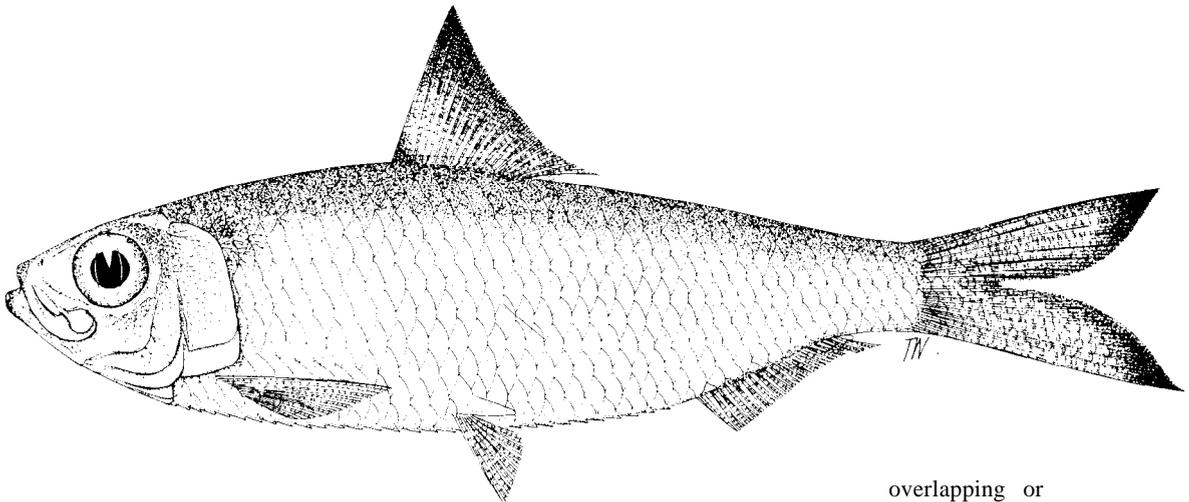
Sardinella hualiensis (Chu & Tsai, 1958)

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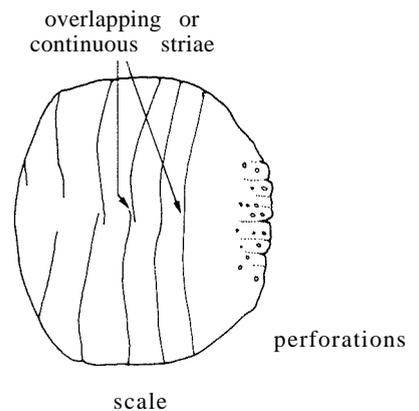
Harengula hualiensis Chu & Tsai, 1958, Quart.J.Taiwan Mus., 11(1-2): 16, pl. 3, figs 2, 3, 4 (Hualien, Taitung, east coast of Taiwan Island).

Synonyms : Sardinella brachysoma: Chan, 1965:19 (the China and perhaps Hong Kong specimens); Sardinella hualiensis: Wongratana, 1980:126 pls 65, 66 (revision).

FAO Names : En - Taiwan sardinella.



Diagnostic Features : Body moderately deep and compressed, its depth 29 to 34% of standard length; total scutes 30 to 32. Lower gillrakers 51 to 66, hardly increasing with size of fish. Vertical striae of scales overlapping or sometimes continuous at centre of scale, numerous small perforations on hind part of scale. Tips of caudal fin lobes black. Closely resembles S. brachysoma from Indonesia, etc., which does not have black caudal fin tips. From other deep-bodied species in the area which have overlapping or continuous scale striae it differs in having a dark spot at dorsal fin origin (absent in S. richardsoni and S. zunasi).



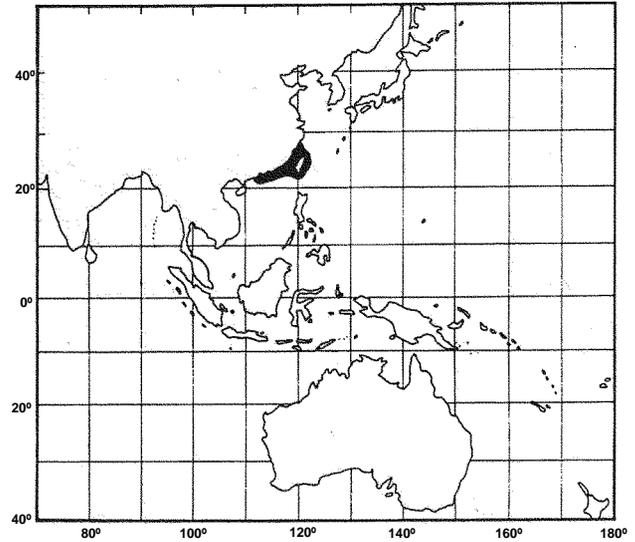
Geographical Distribution : Western Pacific (Taiwan Island, possibly south to Hong Kong).

Habitat and Biology : Coastal, pelagic, schooling. More data needed.

Size : To 12.5 cm standard length, usually to about 10 cm.

Interest to Fisheries : Probably makes a small local contribution to Sardinella catches.

Local Names : -



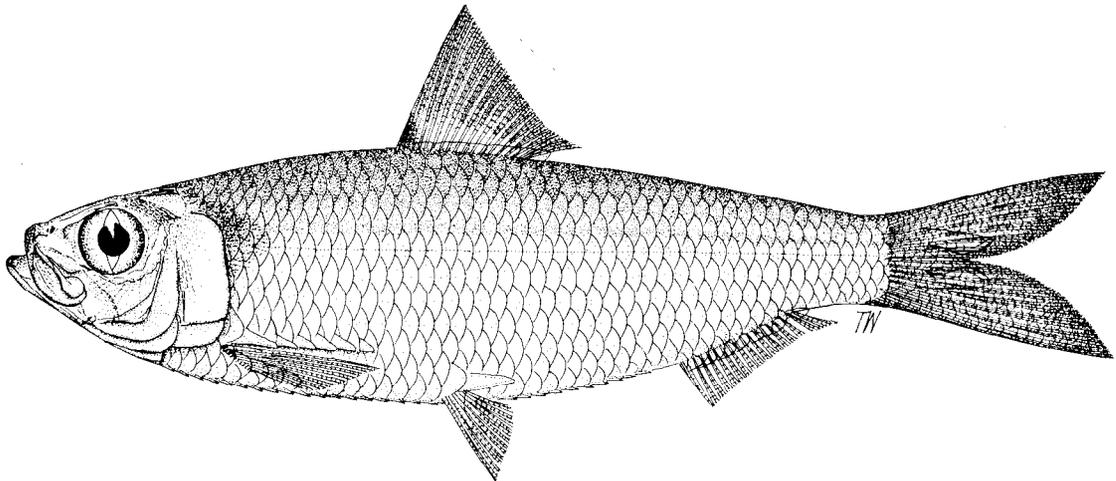
Sardinella jussieui (Valenciennes, 1847)

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Clupeonia jussieui Valenciennes, 1847, Hist.nat.poiss., 20:346, pl. 599 (Mauritius).

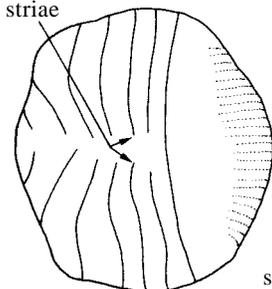
Synonyms : Clupeonia jussieui: Sauvage, 1891:495 (Madagascar); Sardinella dayi Regan, 1917:381 (India); Chan, 1965:12, fig. 22 (Ceylon); Whitehead, 1973b:181, fig. 10; Raja & Lazarus, 1975:114, figs 1, 2 (Karwar, Tuticorin, Vizhinjam); Wongratana, 1980:124, pl. 60 (revision); Sardinella jussieui: Whitehead, 1967:59 (type); Idem, 1973b:181 fig. 11; Wongratana, 1980:114, pls 50, 51 (revision). note: the Calicut specimens of Fowler (1941:604, fig. 16) are Hilsa kelee; Whitehead & Bauchot, in press (type of jussieui).

FAO Names : En - Mauritian sardinella.



Diagnostic Features : Body compressed and deep, its depth 28 to 37% of standard length; total numbers of scutes 31 or 32. Lower gillrakers 88 to 126 (in fishes 9.5 to 11 cm standard length, strongly increasing with size of fish). Vertical striae on scales not meeting at centre. The only other species of Sardinella with such a high gillraker count (more than 87) is S. fijiense (black caudal tips, western Pacific).

discontinuous
striae



scale

Geographical Distribution : Indo-West Pacific (western coasts of southern India, from Bombay south to Sri Lanka; also to Madagascar, Mauritius).

Habitat and Biology : Coastal, pelagic, schooling. More data needed.

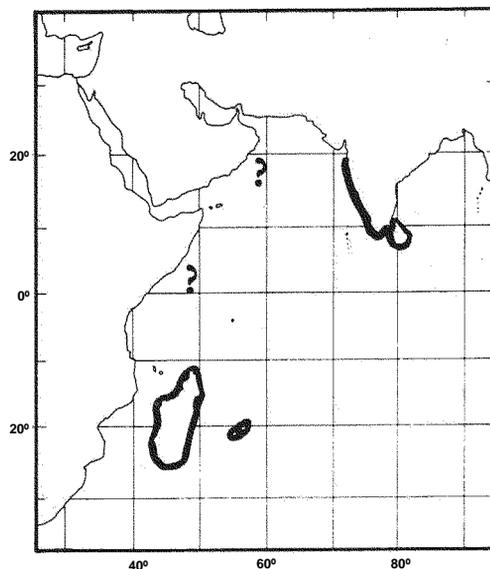
Size : To 12 cm standard length, usually to about 10 cm.

Interest to Fisheries : Enters markets in southern India (e.g. at Cochin), but probably not sufficiently abundant to make any significant contribution to Sardinella catches.

Local Names : -

Literature : See under synonyms.

Remarks : All meristic counts of S. dayi of southern India overlap those of S. jussieui of Mauritius. Wongratana (1980:45 - key) separated the two on scute counts, but his counts do not support this (30 to 32 versus 31 or 32). There is a great variation in body depth, even in specimens from the same batch, and a similar variation in gillrakers numbers. More material should be studied.



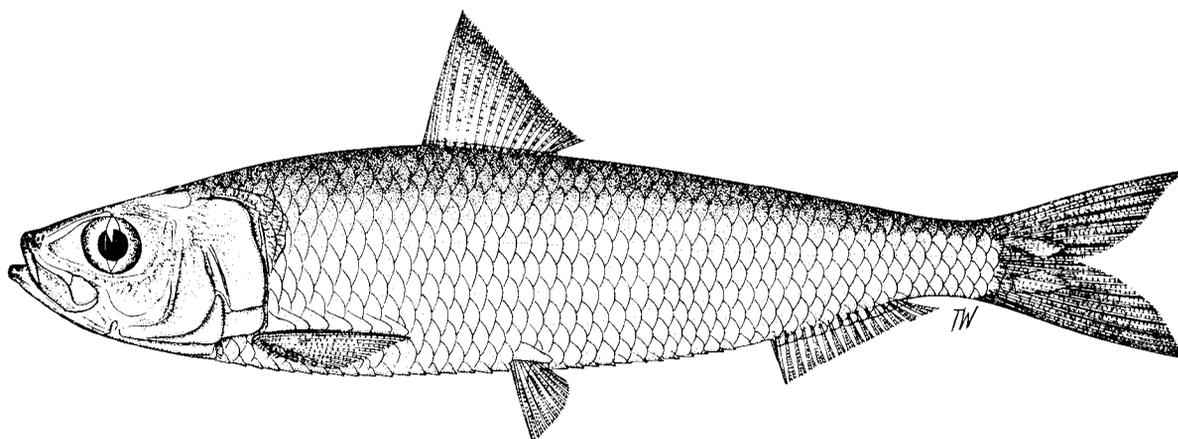
Sardinella lemuru Bleeker, 1853

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Sardinella lemuru Bleeker, 1853, Natuurk.Tijdschr.Ned.-Indië, 4:500 (Batavia).

Synonyms : Clupea nymphaea Richardson, 1846, Ichthyol.China Japan:304 (China Sea) (name suppressed by International Commission in 1970, Opinion 901, Bull.Zool.Nomencl., 26(5-6):217); Amblygaster posterus Whitley, 1931:144 (Western Australia); Amblygaster postera:Munro, 1956:22, fig. 154; Sardinella samarensis Roxas, 1934:275, pl. 2, fig. 11 (Samar, the Philippines); Sardinella longiceps:Fowler, 1941:603 (Philippine material); Chan, 1965:3, fig. 17 (Philippine material); Sardinella aurita Raja & Hiyama, 1969:78 (the Philippines, Hong Kong, Taiwan Island; the Hong Kong specimens designated S. aurita terrae i.e. terrasae Lozano y Rey, a supposed West African subspecies); Sardinella lemuru:Wongratana, 1980:111, pls 47, 48 (revision). See Remarks for further western Pacific S. aurita references.

FAO Names : En - Bali sardinella.



Diagnostic Features : Body elongate, subcylindrical, its depth less than 30% of standard length, belly rounded. The pelvic finray count of i 8 distinguished S. lemuru from all other clupeids in the eastern Indian Ocean and western Pacific. Very closely resembles S. longiceps (whose range it may overlap in the Andaman Sea), but head shorter (26 to 29% of standard length; cf.79 to 35% in S. longiceps) and lower gillrakers fewer (77 to 188 in fishes of 6.5 to 22 cm standard length; cf. 150 to 253 in S. longiceps of 8 to 15.5 cm, usually more than 180). A faint golden spot behind gill opening, followed by a faint-golden midlateral line; a distinct black spot at hind border of gill cover (absence of pigment).

Geographical Distribution : Eastern Indian Ocean (Phuket, Thailand, southern coasts of East Java and Bali; Western Australia) and western Pacific (Java Sea north to the Philippines, Hong Kong, Taiwan Island to southern Japan - see Remarks).

Habitat and Biology : Coastal, pelagic, schooling, strongly migratory. Feeds on phytoplankton, also zooplankton (chiefly copepods). In the Bali region spawning probably occurs at the end of the annual rainy season migration into the Bali Strait (usually September-February, but a peak mainly in December-January, at least judging by numbers caught), but the spawning grounds are not known. As in the case of the related species (*S. aurita*, *S. longiceps*), spawning and major migrations appear closely linked with hydrological conditions (especially temperature), but sudden appearances or disappearances of shoals have no ready explanation. Spawning in the East China Sea reaches a peak in late March to May, but continues through August.

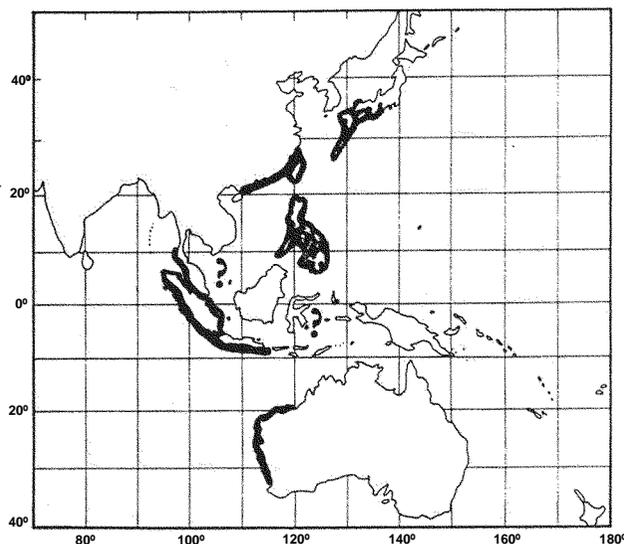
Size : To 23 cm standard length, usually to 20 cm .

Interest to Fisheries : Of major interest in the East China Sea (100 000 tons in 1971) mainly off southern Fujian and eastern Guangdong provinces; and in Indonesia, the bulk of the catch being from the Bali Strait. The total catch in 1983 was 59 980 tons (all from Indonesia).

Local Names : HONG KONG: Hwang tseih; INDONESIA: Lemuru; TAIWAN ISLAND: Hwang sha-tin.

Literature : Soerjodinoto (1960 - biology, fishery); Li Kwan-Ming (1960 - biology, fishery); Ritterbush (1974 - Bali, population biology); Chiu & Tsongchion (1982 - East China Sea, biology fishery).

Remarks : Regan (1917:378) included two Japanese specimens in his wideranging *S. aurita*, while Fowler (1931:116) included Chinese specimens (Amoy, Swatow, Canton; he later added a Japanese specimen (Fowler, 1941:602 - as *S. allecia*). It seems much more likely that *S. lemuru* extends its range northward from the Philippines to China and southern Japan. Much more work is needed before it can be definitely stated that *S. lemuru* is not merely an eastern form of *S. aurita*, from which, given the variation in body shape and gillraker numbers in Atlantic *S. aurita*, it cannot be distinguished as yet on morphological grounds.



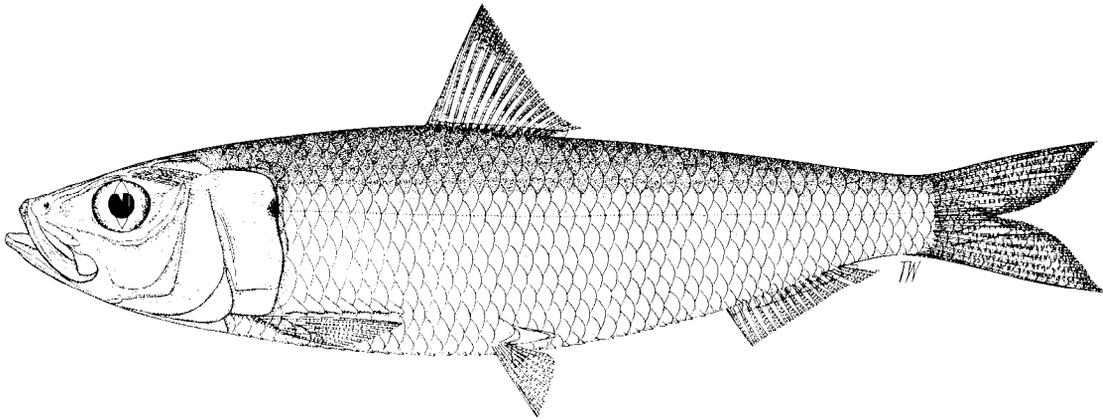
Sardinella longiceps Valenciennes, 1847

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Sardinella longiceps Valenciennes, 1847, *Hist.nat.poiss.*, 20:273 (Pondicherry).

Synonyms : *Sardinella neohowii* Valenciennes, 1847, *Hist.nat.poiss.*, 20:274 (Cannanore); *Alausa scombrina* Valenciennes, 1847, *Hist.nat.poiss.*, 20:442 (Cannanore); *Sardinella longiceps* - Whitehead, 1965:249 (Gulfs of Aden and Oman, not Red Sea); Chan 1965:3, fig. 17; Whitehead, 1967:44-46 (types of *longiceps*, *neohowii*, *scombrina*); Losse, 1968:96, pl. 1d (East Africa); Whitehead, 1973b:177, fig. E1 (N. Indian Ocean record- Nair, 1973:4 (India, synopsis); Wongratana, 1980:108, pts 43, 44 (revision); Whitehead & Bauchot, in press (types of *longiceps*, *neohowii*, *scombrina*).

FAO Names : En - Indian oil sardine.



Diagnostic Features : Body elongate, subcylindrical, its depth less than 30% of standard length, belly rounded. The pelvic finray count of 8 distinguishes *S. longiceps* from all other clupeids in the northern Indian Ocean. Very closely resembles *S. neglecta* of East African coasts, but head longer (29 to 35% of standard length; cf. 26 to 29% in *S. neglecta*) and more lower gillrakers (150 to 253 in fishes of 8 to 15.5 cm standard length, usually more than 180; cf. 143 to 188 in *S. neglecta* of 9.5 to 13 cm standard length, usually less than 185). Distinguished in the same way from *S. lemuru* (whose range it may overlap in the Andaman Sea), but the latter has even fewer gillrakers (77 to 188 in *S. lemuru* of 6.5 to 22 cm standard length). A faint golden spot behind gill opening, followed by a faint golden midlateral line; a distinct black spot at hind border of-gill cover (absence of pigment).

Geographical Distribution : Indian Ocean (northern and western parts only, Gulf of Aden, Gulf of Oman, but apparently not Red Sea or the "Gulf" eastward to southern part of India, on eastern coast to Andhra; possibly to Andamans).

Habitat and Biology : Coastal, pelagic, schooling, strongly migratory. Feeds mainly on phytoplankton (especially diatoms), both as juveniles and adults, but also on zooplankton (especially copepods by the juveniles). Breeds once a year, the spawners arriving off western coasts of India in June-July when temperatures and salinity are low during the southwest monsoon months; an extended spawning season, but most intense in August-September; exact spawning grounds not located (Nair, 1973:18 - who summarized the biology of the species).

Size : Perhaps to 23 cm standard length, usually to 20 cm.

Interest to Fisheries : The most important and abundant clupeoid in Indian waters (up to 30% of all marine fishes), although with considerable variations in catches from year to year, e.g. 7 400 tons in 1956, but 189 000 tons in 1960 (Jhingran, 1982:527). The total catch for 1983 402 586 tons, of which 350 260 tons came from India.

Local Names : INDIA: Mathi (Malayalam), Boothai (Kannada), Taralai, Haid (Marathi).

Literature : Nair (1960, 1973 - the best summary of biological data); other references to biological studies summarized by Whitehead (1973b:178).

