

**Clupeonella** Kessler, 1877

CLUP Clupnla

Clupeonella Kessler, 1877, Ryby Aralo-Kaspiisko-Ponti-cheskoi Oblasti:187, pl. 6, fig. 24 (type: larva of C. grimmi Kessler, 1877).

**Diagnostic Features** : Absence of a pterotic bulla (bony dome on floor of pre-epiotic fossa), distinguishes Clupeonella from all other clupeine genera except Sprattus (which has the pelvic fin origin below or in front of the dorsal fin origin, and the last two anal finrays not enlarged). From other clupeinae that occur sympatrically, Clupeonella species differ in having no notch at the centre of the upper jaw (distinct notch in species of Alosa).

**Biology, Habitat and Distribution** : Pelagic, schooling, in brackishwater and euryhaline or purely fresh-water, some species anadromous. Found only in Sea of Marmara, Black Sea, Sea of Azov, Caspian and certain rivers affluent to these waters; apparently not entering Mediterranean.

**Interest to Fisheries** : One species (C. cultiventris) is among the top commercial fishes of the Sea of Azov; other species of seasonal or local interest.

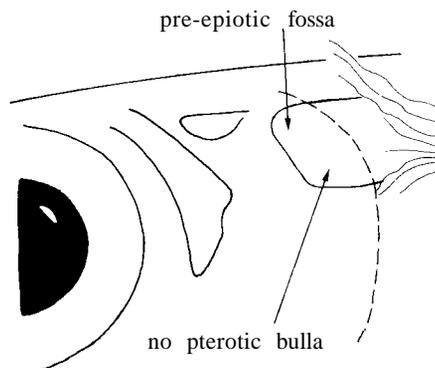
**Species** : Following Svetovidov (1952, 1963), there are 4 species:

C. abrau (Malyatskii, 1930), Mediterranean region

C. cultriventris (Nordmann, 1840), Mediterranean region, Caspian Sea

C. engrauliformis (Borodin, 1904), Caspian Sea

C. grimmi Kessler, 1877, Caspian Sea.

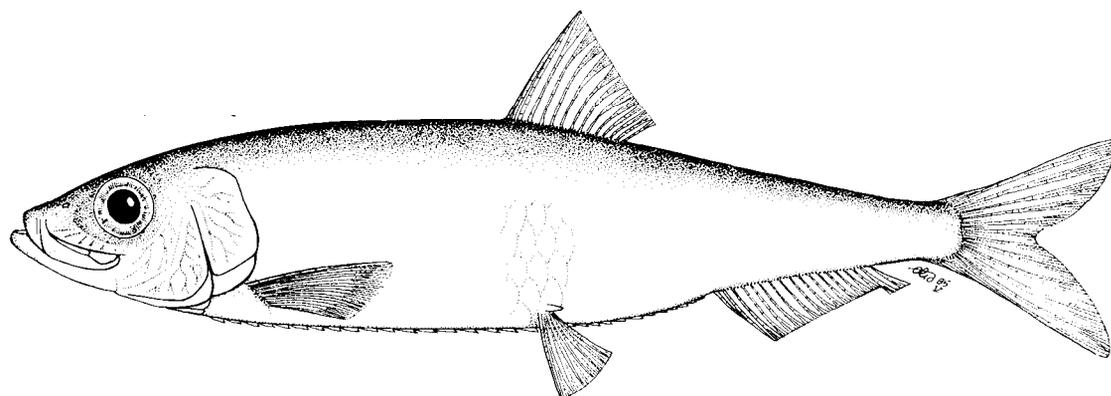
**Clupeonella abrau** (Malyatskii, 1930)

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Harengula abrau Malyatskii, 1930, Trudy azov.-cherno-morsk ryb.Khoz.Stantsii, 6:65 (Lake Abrau, near Novorossiisk).

**Synonyms** : Clupeonella muhlisi Neu, 1934; Clupeonella abrau - Svetovidov, 1952:208, pl. 7, fig. 3; Idem, 1963:228, pl. 7, fig. 3 (in English).

**FAO Names** : En - Abrau sprat.



**Diagnostic Features** : Body moderately slender, its depth about 19 to 23% of standard length; head short and narrow, inter-orbital width not more than 17.5% of standard length; belly sharply keeled, with 23 to 26 scutes Gillrakers 39 to 50. Pectoral fin tips pointed.

**Geographical Distribution :** Lake Abrau (freshwater, landlocked, at 70 m above sea level, near to Novorossiisk); not Lake Apolyont (Turkey), which is linked to Sea of Marmara (Meric, 1984).

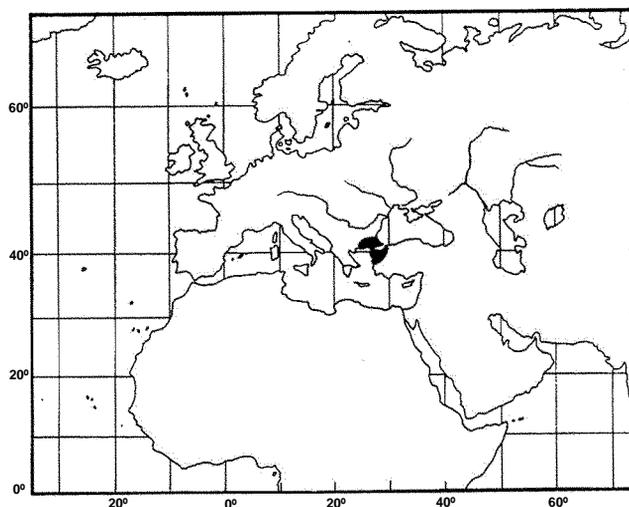
**Habitat and Biology :** Freshwater, pelagic and schooling. Feeds on crustaceans (juveniles feed on copepods, rotifer eggs, plants). Breeds May to October, eggs pelagic, developing rapidly before sinking to bottom. Maturity after one year, at 3.5 to 4.5 cm.

**Size :** To 9.5 cm standard length (or 6 cm in Lake Abuliond).

**Interest to Fisheries :** Nil.

**Local Names :** USSR: Abrauskaya tyul'ka, Sardel'ka

**Literature :** Svetovidov (1952, 1963).



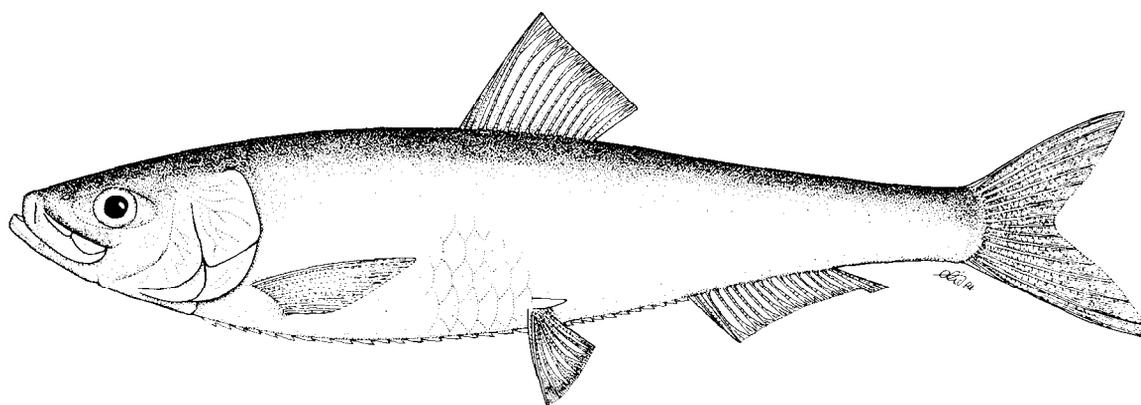
**Clupeonella cultriventris** (Nordmann, 1840)

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Clupea cultriventris Nordmann, 1840, Faune pontique, 3:522 (northern coast of Black Sea).

**Synonyms :** Clupea delicatula Nordmann, 1840:524 (pre-occupied by Clupea delicatula Bennett, 1831 = Spratelloides delicatulus); Clupeonella delicatula:Svetovidov, 1952:194, pl. 8, figs 1, 2, 3; Idem, 1963:212, pl. 8, figs 1, 2, 3 (in English); CLOFNAM, 1973:101 (full synonymy); FNAME, 1984:274, fig. (synopsis)

**FAO Names :** En - Black Sea sprat.



**Diagnostic Features :** Body moderately deep, its depth about 21 to 27% of standard length; head short and wide, inter-orbital width at least 17.5% of standard length; belly sharply keeled, with 24 to 29 scutes. Gillrakers 49 to 62. Pectoral fin tips pointed.

**Geographical Distribution :** Black Sea (north-western parts), Sea of Azov and Caspian Sea, also most of the affluent rivers of the area, reaching as far as 60 km inland. Also, Lake Palaeostomi (Bulgaria) and in Bay of Feodosiya (Romania), also Lake Apolyont (Turkey).

**Habitat and Biology :** Pelagic, euryhaline, essentially a brackishwater species (tolerating salinities up to 34‰), but with semi-anadromous and purely freshwater forms in rivers and lakes; migratory between winter or autumn feeding and summer spawning grounds. Feeds on zooplankton. Breeds in early summer in Sea of Azov (peak in May), and from about May in the lower reaches of rivers (Dnieper, Dneister).

**Size :** To 14.5 cm standard length, usually to 10 cm.

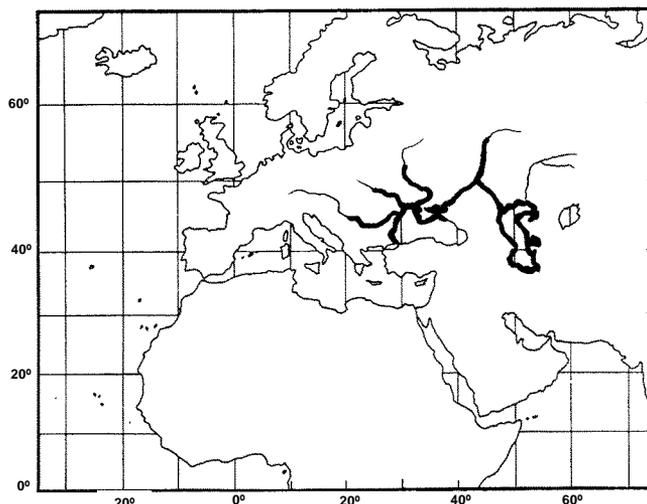
**Interest to Fisheries :** Of major importance in Sea of Azov (one of the top commercial fishes); stocks depleted in southern part of Caspian Sea (Coad, 1980:71 - *C. delicatula*). The total catch in 1983 was 396 731 tons.

**Local Names :** BULGARIA: Tzatz; ROMANIA: Gingirica; USSR: Tyul'ka.

**Literature :** Svetovidov (1952, 1963); Meric (1984 - growth, reproduction, distribution).

**Remarks :** Svetovidov (1952:194; 1963:212) recognized 2 subspecies, based on pectoral and pelvic fin length:

- (a) *C. cultriventris cultriventris*: pectoral and pelvic fins long (17.5 to 21.5% and 11.5 to 14% of standard length respectively); Black Sea, Sea of Azov.
- (b) *C. cultriventris caspia*: pectoral and pelvic fins shorter (15.5 to 19% and 8.5 to 12.5% of standard length respectively); Caspian Sea and basin.



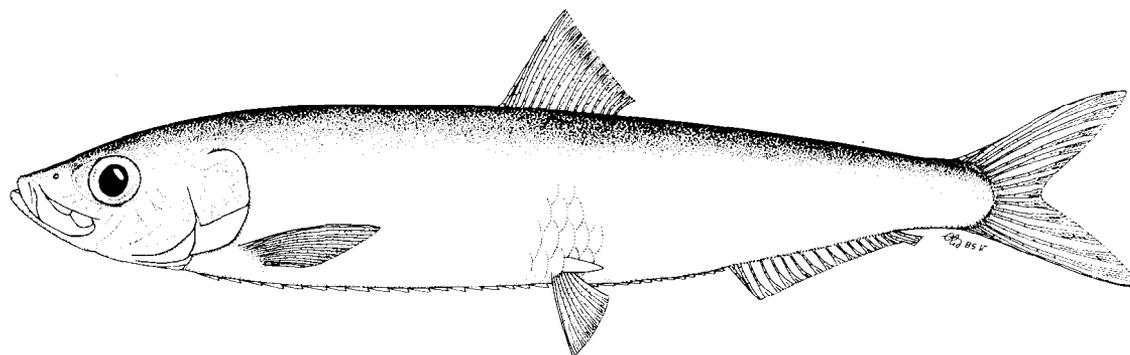
***Clupeonella engrauliformis*** (Borodin, 1904)

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*Clupea engrauliformis* Borodin, 1904, *Vest.Ry̋bopromyshlennosti*, 19(6):335 (Buinaksh, central part of Caspian Sea).

**Synonyms :** *Clupeonella engrauliformis* - Svetovidov, 1952:205, pl. 7, fig. 2; *Idem*, 1963:225, pl. 7, fig. 2 (in English).

**FAO Names :** En - Anchovy sprat.



**Diagnostic Features :** Body slender, its depth about 16 to 19% of standard length; head short and wide, inter-orbital width 16 to 18.5% of standard length; belly rounded, with 23 to 31 scutes. Gillrakers 56 to 67. Pectoral fin tips pointed.

**Geographical Distribution** : Caspian Sea (middle and southern parts).

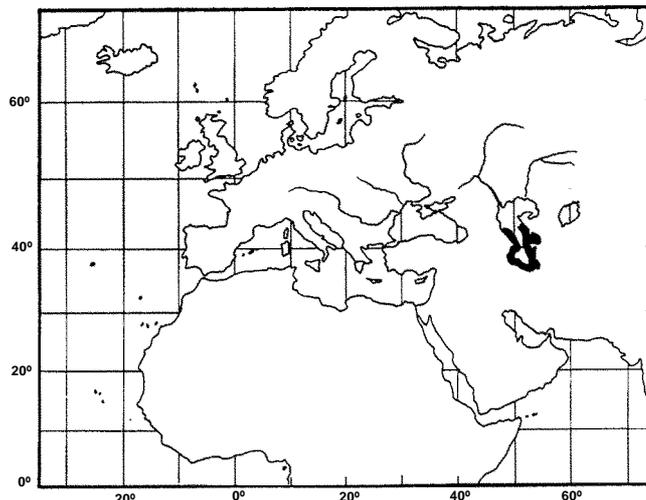
**Habitat and Biology** : Mainly in open sea, only occasionally approaching the shore, sometimes massing in large schools, rising to the surface in the spring months, but descending to as much as 78 m in late summer (apparently rising again in October-November, but descending once more in winter). Breed from end-April to November, mostly in July, intermittently and in the open sea.

**Size** : To 15.5 cm standard length, usually 11.5 to 12.5 cm (females a little larger than males).

**Interest to Fisheries** : Caught together with *C. cultriventris caspia* by coastal fisheries or separately by light fishing in open sea. May rival or exceed catches of *C. cultriventris caspia*, although stocks claimed to be depleted in southern part of Caspian Sea (Coad, 1980:71).

**Local Names** : USSR: Anchousoidnaya tyul'ka.

**Literature** : Svetovidov (1952, 1963).



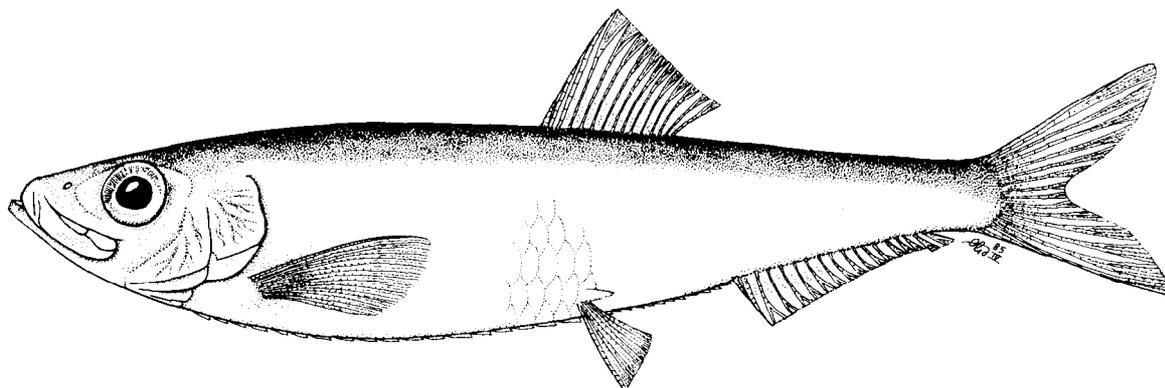
***Clupeonella grimmi* Kessler, 1877**

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*Clupeonella grimmi* Kessler, 1877, Ryb.Aralo-Kapiiskoi-Ponticheskoi Oblasti:187, pl. 6, fig. 24 (larvae, central part of Caspian Sea).

**Synonyms** : *Clupeonella grimmi* - Svetovidov, 1952:209, pl. 7, fig.1; *Idem*, 1963:230, pl. 7, fig. (in English).

**FAO Names** : En - Southern Caspian sprat.



**Diagnostic Features** : Body moderately slender, its depth about 17 to 22% of standard length; head long and narrow, inter-orbital width 13 to 15% of standard length; belly sharply keeled, with 26 to 32 scutes. Gillrakers 42 to 51. Pectoral fin tips rounded.

**Geographical Distribution** : Caspian Sea (mainly in south, absent in north).

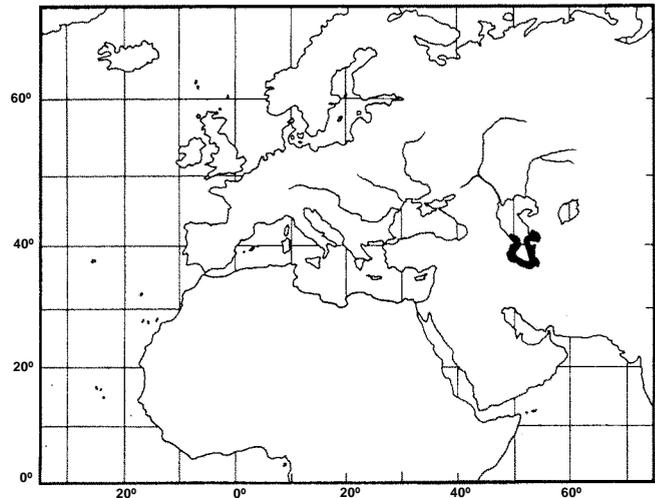
**Habitat and Biology** : In open sea, not approaching shores; in winter, found mainly in southern part, migrating to middle parts of sea in spring (especially the eastern half), returning south in November-December; occurs in upper layers in March-April, but descend to 16 to 32 m in summer and autumn. Feeds mainly on copepods, also pelagic mysids and small fishes. Breeds in January-September, intermittently and in the open sea.

**Size** : To 14.5 cm standard length, usually 10.5 to 11 cm (females a little larger than males).

**Interest to Fisheries** : Of potential value, but not caught by coastal fisheries; stocks said to be depleted in southern part of Caspian Sea (Coad, 1980:71).

**Local Names** : USSR: Bolsheglazaya tyul'ka.

**Literature** : Svetovidov (1952, 1963).



**Sardina** Antipa, 1906

CLUP Sardi

Aregus Cornide, 1788, Ens.hist.peces...Galicia:91 (suppressed, Opinion 799, Int.Comm.Zool.Nomencl.); Sardina Antipa, 1906, Denkschr.Akad.Wiss.Wien, 78:54 (after Sardina Antipa, 1904) (type: Sardina dobrogica Antipa, 1906).

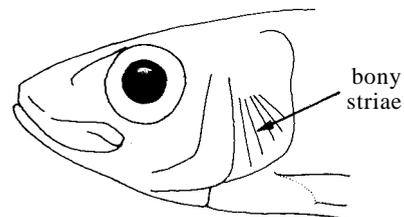
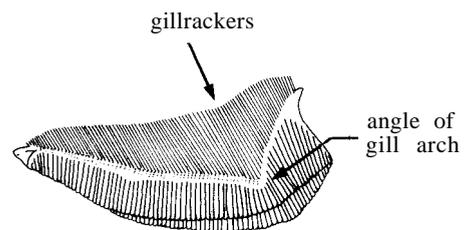
**Diagnostic Features** : Resembles Sardinops (non-European) in having lower part of gill cover with distinct bony striae radiating downward (in addition to the normal fleshy radiating canals), but lower gillrakers not shortened at angle of first arch, maxilla not reaching to eye centre and scales on flank of uneven sizes (smaller scales hidden beneath the larger ones).

**Biology, Habitat and Distribution** : Marine, pelagic and schooling fishes, especially of coastal waters; restricted to Northern Hemisphere (northeastern Atlantic and Mediterranean region).

**Interest to Fisheries** : Abundant in some areas and of considerable commercial importance, both as adults (pilchards) and as juveniles (sardines).

**Species** : A single species recognized:

S. pilchardus (Walbaum, 1792), northeastern Atlantic, Mediterranean.



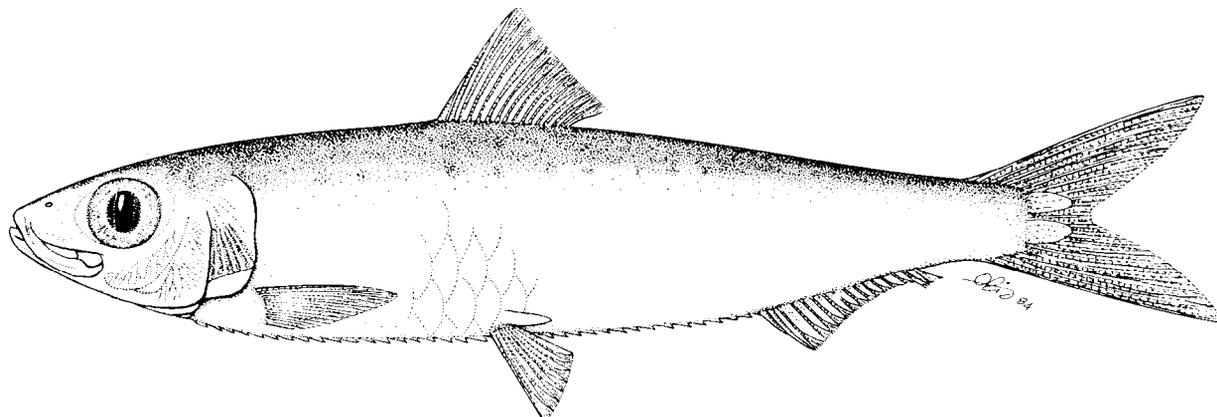
**Sardina pilchardus** (Walbaum, 1792)

CLUP Sardi 1

Clupea pilchardus Walbaum, 1792, in Artedi, Gen.pisc.:38 (Cornwall, on Pennant, 1769).

**Synonyms** : Aregus minor Cornide, 1788:91 (suppressed by Opinion 799, Int.Comm.Zool.Nomencl.); Clupanodon sardina Risso, 1827:452 (Nice); Clupea sardina (cheironym?):Lowe, 1837:189 (Madeira); Clupea laticosta Lowe, 1843:90 (Madeira); Clupea pilchardus var.2 sardina:Günther, 1868:440 (Madeira); Sardina dobrogica Antipa, 1906; Sardina pilchardus - Svetovidov, 1952:188, pl. 6, fig. 2; Idem, 1963:205, pl. 6, fig. 2; CLOFNAM, 1973:102; FNAM, 1984:276, fig. (synopsis); CLOFETA, in press.

FAO Names : En - European pilchard.



**Diagnostic Features** : Body subcylindrical, belly rather rounded (but body more compressed in juveniles). Hind margin of gill opening smoothly rounded (without fleshy outgrowths); 3 to 5 distinct bony striae radiating downward on lower part of operculum; lower gillrakers 44 to 106, not becoming shorter at angle of first gill arch, the upper series not overlapping the lower. Pelvic fin insertion well behind dorsal fin origin; last two anal finrays enlarged. A series of dark spots along upper flanks, sometimes with a second or even third series below. See CLUP Sardi 1, Fishing Areas 34, 47 (in part):

**Geographical Distribution** : Coasts of eastern North Atlantic, from Iceland (rare) and North Sea, southward to Bay de Gorée Senegal (14°43'N) (extension of southern limit by about 15° m the last decade); also Mediterranean (common in western part and in Adriatic, rare in eastern part), Sea of Marmara and Black Sea.

**Habitat and Biology** : Coastal, pelagic, usually at 25 to 55 or even 100 m by day, rising to 10 to 35 m at night, schooling, migratory. Feeds mainly on planktonic crustaceans, also larger organisms. Breeds at 20 to 25 m, near the shore or as much as 100 km out to sea from April (English Channel), June to August (North Sea, also Black Sea), September to May (off European coasts of Mediterranean) and November to June (off African coasts of Mediterranean).

**Size** : To 25 cm standard length, usually to 20 cm.

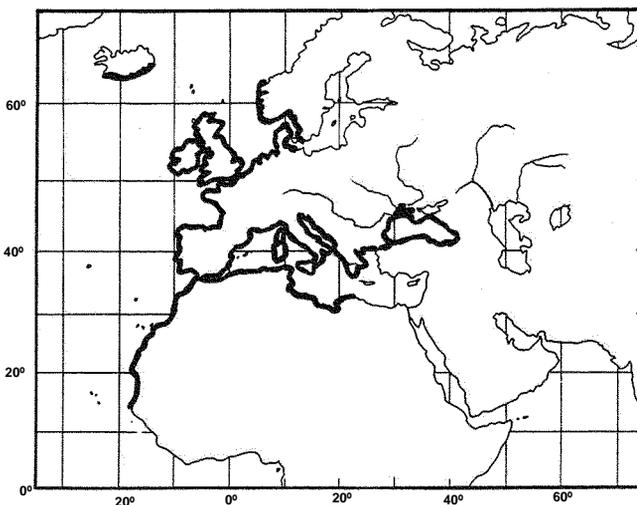
**Interest to Fisheries** : The total catch for 1983 was 930 310 tons (Area 27, eastern North Atlantic, 202 599 tons; Area 34, eastern central Atlantic, 484 061 tons; Area 37, Mediterranean, 243 650 tons). *Sardina pilchardus* was the fourth most important commercially exploited clupeoid species in that year. Caught with purse seines and lamparas (light fishing), also gillnets, beach seines, trap nets and occasionally high opening bottom trawls (French Mediterranean coast).

**Local Names** : Variations on Sardele, Sardina, Sardine, etc. (see CLUP Sardi 1, Fishing Area 37; also Gómez Larrañeta, 1960:140).

**Literature** : Svetovidov (1952, 1963 - Russia); Gómez Larrañeta (1960 - biology, synopsis); Banarescu (1968 - Black Sea); Wheeler (1969 - UK); Bini (1970 - Mediterranean), FNAM (1984 - synopsis).

**Remarks** : Authors (e.g. Svetovidov, 1952, 1963) have often recognized two subspecies, based mainly on gillrakers counts and head length, but the separation is not satisfactory:

- (a) *S. pilchardus pilchardus*: lower gillrakers more than 60, head length 20 to 23% of standard length; Atlantic (Bergen to Gibraltar).
- (b) *S. pilchardus sardina*: lower gillrakers 44 to 70 (but sometimes to 106), head length :18.5 to 21.0% of standard length; Mediterranean, Black Sea, Atlantic (Gibraltar to C. Blanc). However, specimens from Gorée Bay, Senegal, have 59 to 90 lower gillrakers and head length 24.5½ to 28.2% of standard length (Freon & Stequert, 1978).



Other races, forms, varieties and possible subspecies have been suggested for populations in the western Mediterranean (reviewed by Gómez Larrañeta, 1960), off western Sahara (Furnestin, 1955) and off Mauritania (Maurin, 1968).

**Sardinops** Hubbs, 1929

CLUP Sardop

Sardinops Hubbs, 1929, Proc. Calif. Acad. Sci., (4)18(11):264 (type: Meletta caerulea Girard, 1854). Note that Article 30(a)(ii) of the International Code considers all genera ending in -ops to be masculine, hence caeruleus, not caerulea, etc.

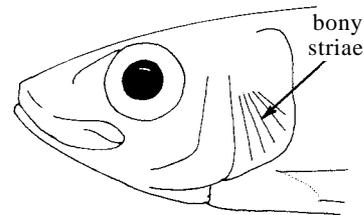
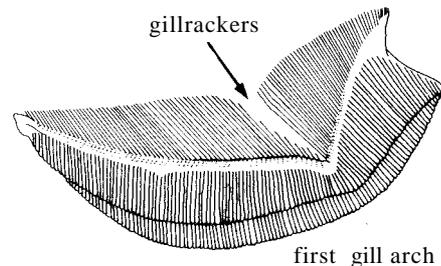
**Diagnostic Features** : Resembles Sardina of European waters in having lower part of gill cover (operculum) with distinct bony striae radiating downward (in addition to the normal fleshy radiating canals), but lower gillrakers are shortened at angle of first arch and overlapped by upper gillrakers, maxilla reaches or almost reaches eye centre and scales on flank of even size (no smaller ones hidden beneath). No other clupeoid fishes have bony striae on the operculum.

**Biology, Habitat and Distribution** : Marine, pelagic and schooling fishes, especially of coastal waters; antitropical distribution (eastern North and South Pacific, southern Africa, Australia, New Zealand).

**Interest to Fisheries** : The five species (or subspecies) of Sardinops contributed about 1/4 of all clupeoid fishes caught, making this the most productive of all clupeoid genera (8 250 201 tons in 1983); Sardinops was exceeded only by the Peruvian anchovy during the peak of the latter's exploitation (1962 to 1971).

**Species** : Svetovidov (1952:178; 1963:193) considered that the published differences between the five 'species' of Sardinops were not significant, except perhaps in the case of the Australian pilchard; he preferred to recognize five subspecies of Sardinops sagax, at least until more detailed comparative studies were made. Recent (unpublished) electrophoretic studies of proteins by Dr Stuart Grant have tended to show that at least S. caeruleus, S. neopilchardus, S. melanostictus and S. ocellatus hardly differ genetically. Nevertheless, the five populations are so widely separated geographically that any exchange of genetic material is either impossible or highly unlikely. For this reason 5 species are given here:

- S. caeruleus (Girard, 1854), eastern North Pacific
- S. melanostictus (Temminck & Schlegel, 1846), western North Pacific
- S. neopilchardus (Steindachner, 1879), western South Pacific
- S. ocellatus Pape, 1854), southern Africa
- S. sagax (Jenyns, 1842), eastern South Pacific.



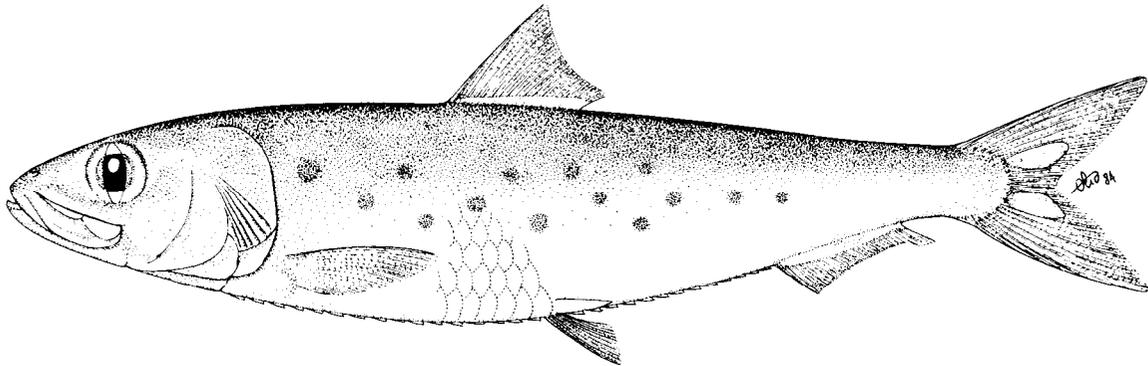
**Sardinops caeruleus** (Girard, 1854)

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Meletta caerulea Girard, 1854, Proc. Acad. nat. Sci. Philad., 7:138 (San Francisco).

**Synonyms** : Alausa californica Gill, 1862:33; Sardina sagax (part):Regan, 1916:13 (combined with sagax, melanosticta and ocellata); Clemens & Wilby, 1961:101, fig. 35 Canada, Pacific); Hart, 1973:100, fig. (Canada Pacific, synopsis); Sardinops caeruleus - Hubbs, 1929:265 (doubted species status, however); Ahlstrom, 1960:417 (synopsis); Fitch & Lavenberg, 1971:54, fig. 16 (California); Miller & Lea, 1972:54.

**FAO Names** : En - California pilchard.



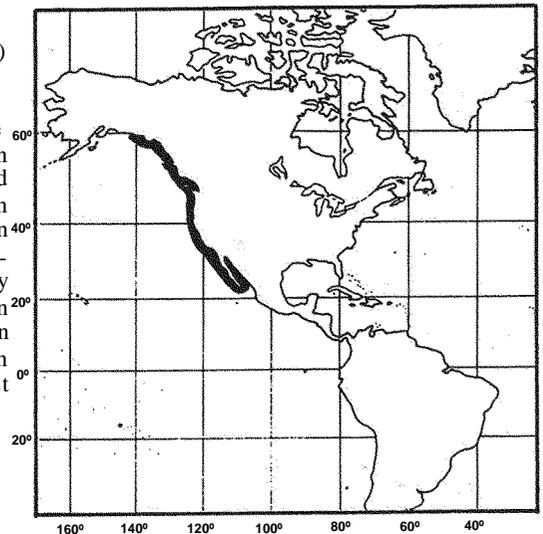
**Diagnostic Features :** The radiating bony striae on the operculum distinguishes this species from all other clupeids in the area; in addition, Clupea pallasii has the pelvic fin insertion before the dorsal fin origin and lacks spots on the flanks; Etrumeus teres lacks scutes along the belly; and Alosa sapidissima is deeper-body and has a distinct median notch in the upper jaw.

**Geographical Distribution :** Alaska (southeastern coast) south to C. San Lucas and throughout the Gulf of California.

**Habitat and Biology :** Coastal, pelagic, in large (or in the past very large) schools (up to 10 million individuals estimated in times of abundance); migratory, with a definite northward movement between California and British Columbia waters in summer and return (autumn, winter). Feeds on zooplankton (chiefly small crustaceans), also phytoplankton, mainly by filter-feeding; also by 'pecking' at individual animals. Breeds mainly off the southern California coast about 80 km offshore between Point Conception and San Diego; January to June, but a peak in April to May (at night); eggs pelagic; some individuals spawn in their first year, but most in their second; scale studies suggest that some fishes live 20 to 25 years.

**Size :** To about 36 cm standard length; usually to 25 cm.

**Interest to Fisheries :** Landings (variously 70 to 100% from California) reached a peak in 1936 (791 100 tons), but from 1944 declined until the California fishery collapsed and a moratorium was declared (1967). The total catch for 1983 was 31 601 tons.



**Local Names :** USA: Pacific sardine (AFS list).

**Literature :** Ahlstrom (1960 - biology, fishery, synopsis); Marr (1960 - fishery); Radovich (1960 - fishery); Clemens & Wilby (1961 - Canada, synopsis); Fitch & Lavenberg (1971 - California, synopsis), Hart (1973 - Canada, synopsis, biology an excellent summary).

**Remarks :** Hildebrand (1946:87) compared Peruvian and Californian pilchards and failed to find significant differences. Of all the pilchards, these two are most likely to be the same species, in which case the name Pacific pilchard should be given to both. Nevertheless, Miller & Lea (1972:212) stated that J.E. Fitch had discovered significant otolith and other differences suggesting that S. caeruleus and S. sagax are distinct species and not subspecies.

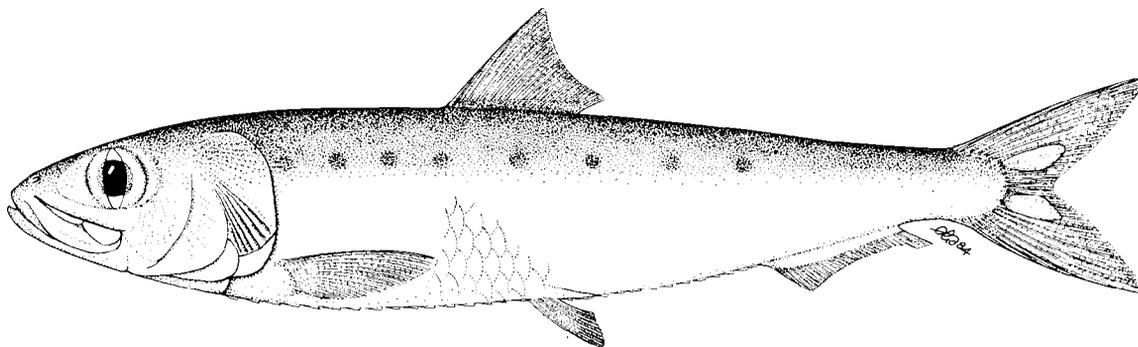
**Sardinops melanostictus** (Schlegel, 1846)

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Clupea melanosticta Temminck & Schlegel, 1846, Fauna Japonica, Poiss., pt. 5, inst. 13:237, pl. 108, fig. 3 (Japan).

**Synonyms :** Sardina sagax (part): Regan, 1916:13 (combined with sagax, ocellata and caerulea); Sardinops melanosticta - Hubbs, 1929:265; Anon., 1960:213 (synopsis); Sardinops sagax melanosticta: Svetovidov 1952:178, pl. 6, fig. 1; Idem, 1963:193, pl. 6, fig. 1.

**FAO Names :** En Japanese pilchard.



**Diagnostic Features** : The radiating bony striae on the operculum distinguish this fish from all other clupeoids in the area; in addition, species of *Sardinella* and *Herklotsichthys* have two fleshy outgrowths on the hind margin of the gill opening and no series of dark spots along the flank (*Amblygaster sirm* has similar spots, but seems to be rare north of Taiwan Island, possibly to Okinawa); *Clupea pallasii* has the pelvic fin insertion before the dorsal fin origin and lacks spots on the flank; and *Etrumeus teres* and *Dussumieria elopsoides* lack scutes along the belly, also no spots.

**Geographical Distribution** : USSR (western coast of Sea of Japan, rarely to Sea of Okhotsk near eastern coasts of Sakhalin and in Bering Sea to coasts of Kamchatka Peninsula, absent in winter), Japan (all coasts), the Koreas (east coast only), China (Taiwan Island, Hong Kong).

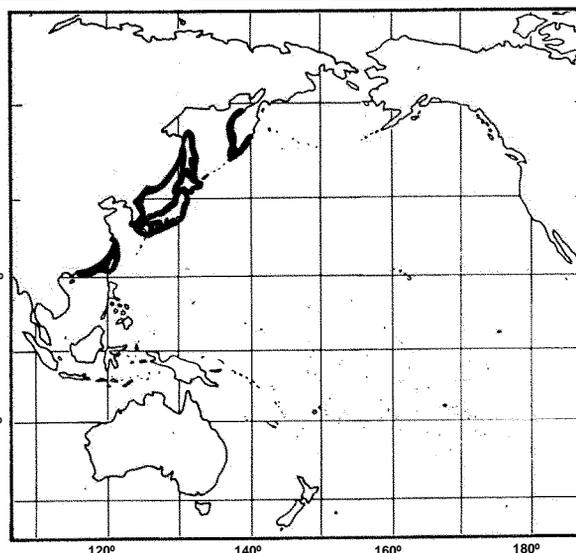
**Habitat and Biology** : Coastal pelagic, forming large schools, migratory, moving northward in summer and tending also to move more inshore, the reverse as temperatures begin to drop. Feeds mainly on zooplankton, especially copepods, but also phytoplankton. Breeds from December to the beginning of May, earlier in the southern than the northern parts of range, in bays and in coastal parts of open sea; fishes mostly mature in second year.

**Size** : To 24 cm standard length, usually 15 to 20 cm.

**Interest to Fisheries** : One of the most important commercial fishes of Japan. The total catch for 1983 was 4 219 677 tons. Record catches in 1934-39 (over 2 000 000 tons) were succeeded by a sharp decline around 1941, with only partial recovery from 1945 and then further decline. Fluctuations in the catches and their relationship to the Kuroshio current were reviewed by Kawasaki (1979) and Watanabe, Honjo & Okutani (1979).

**Local Names** : JAPAN: Maiwashi; THE KOREAS: Chong-o-ri; USSR: Ivasi; see Anon. (1960:217) for local vernacular names.

**Literature** : Svetovidov (1952, 1963 - full synopsis of biology); also, see Anon. (1960 - biology, synopsis); Nakai (1960 - fisheries); Kurita (1960 - fisheries); Uda (1960 - fisheries); Hayashi (1960 - fisheries). A great deal of Japanese literature is available, summarized to 1959 by the papers cited here.



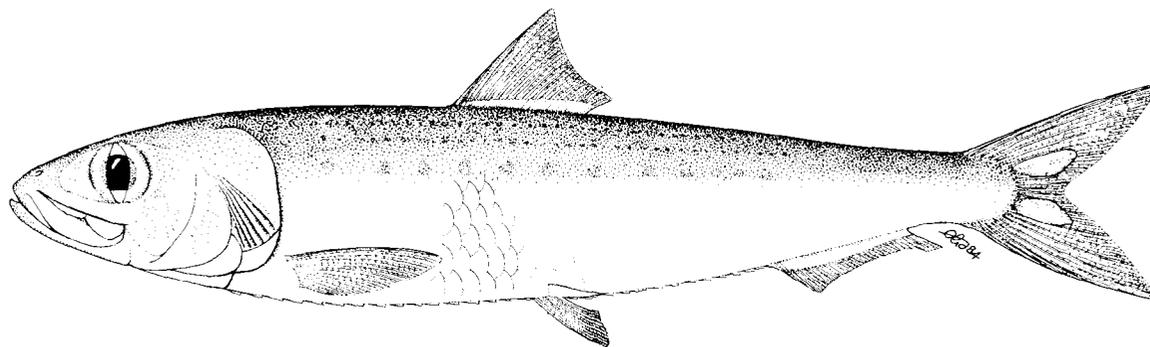
**Sardinops neopilchardus** (Steindachner, 1879)

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*Clupea neopilchardus* Steindachner, 1879, *Denkschr.Akad.Wiss.Wien*, 41(1):12 (Hobson's Bay, Victoria, Australia).

**Synonyms** : *Clupea lata* Richardson & Gray, 1843:221 (*nomen nudum*); *Sardina neopilchardus*:Regan, 1916:14, pl. 1, fig. 1 *Sardinops neopilchardus* - Hubbs, 1929:265; Blackburn, 1941 (biology); *Idem*, 1949:9 (biology); *Idem*, 1960:247 (synopsis); Baker, 1972:15 (New Zealand).

**FAO Names** : En - Australian pilchard.



**Diagnostic Features** : The radiating bony striae on the operculum distinguish this fish from all other clupeids in the area; in addition, species of *Sardinella* and *Herklotsichthys* have two fleshy outgrowths along the hind margin of the gill opening and no series of dark spots along flank (*Amblygaster sirm* has similar spots, but occurs off the northern coasts of Australia); *Etrumeus teres* lacks scutes along the belly. See CI-UP Sardop 1, Fishing Areas 57, 71.

**Geographical Distribution** : Australia (southern coasts, to 24° S on the western side and to 25° S on the eastern side, reaching southward to 43°S off eastern Tasmania) and New Zealand (north to 34°S, down entire eastern and most of western coasts, also Cook Strait, southward to Auckland Island at 57°S).

**Habitat and Biology** : Coastal pelagic, forming large schools (at surface during breeding season and in southern New South Wales at surface also when juveniles leave bays to join the adult schools). Feeds mainly on crustaceans (copepods, ostracods, euphausiids, mysids), also mollusc larvae and phytoplankton (diatoms). Breeds in spring and summer in southern part of range, and in winter in northern part, apparently related to seasonal movement of the limiting 14° and 21°C isotherms. Mature at 8 to 13 cm, mostly at 12 cm or above in New Zealand.

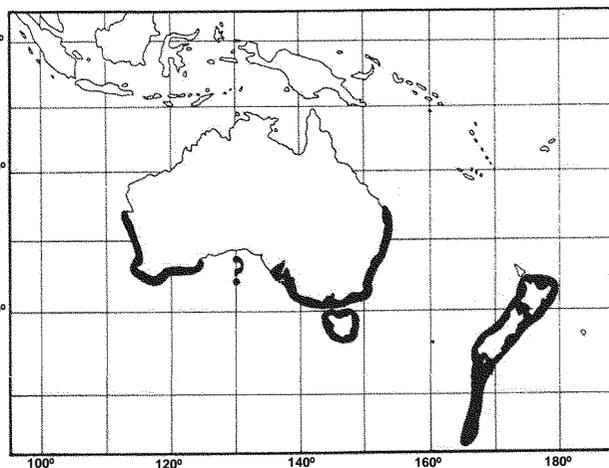
**Size** : To 21.3 cm standard length, usually to 18 cm.

**Interest to Fisheries** : Insignificant, but sometimes used for bait. Caught with various forms of seine net.

**Local Names** : AUSTRALIA: Pilchard; NEW ZEALAND: Pilchard.

**Literature** : Blackburn (1941, 1949, 1950, 1951, 1960 - biology, fisheries); Baker (1972 - New Zealand, breeding, growth).

**Remarks** : In New Zealand the species appears to grow larger (21.3 cm standard length; cf. 19.7 cm), has slightly larger eggs and a higher mean number of vertebrae (50.52; cf. 49 to 50.08 in various samples) (Baker, 1972:17).



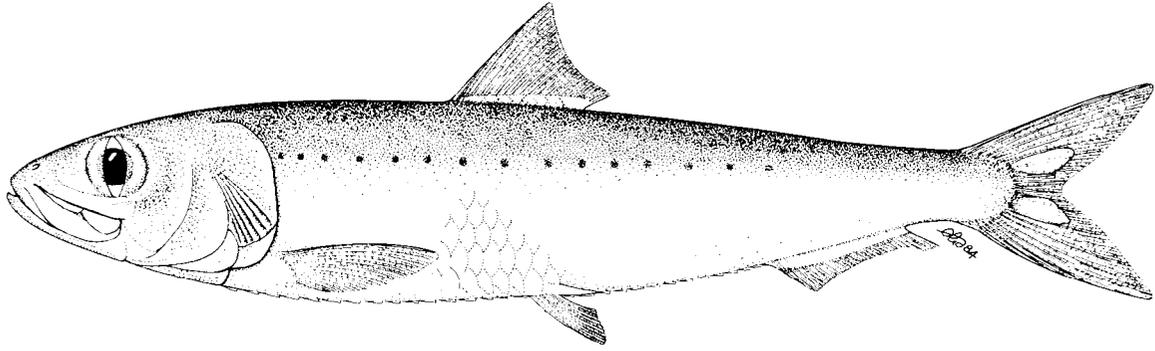
***Sardinops ocellatus*** (Pappe, 1854)

CLUP Sardop 2

*Clupea ocellata* Pappe, 1854, *Syn.edible fish Cape of Good Hope*: 20 (Cape of Good Hope).

**Synonyms** : *Sardinops sagax* (part) Regan, 1916:13, pl. 1, fig. 1 (combined with *sagax*, *melanosticta* and *caerulea*); *Sardinops ocellata* - Hubbs, 1929:265; Smith, 1953:92, pl. 5 (as *Arenagus sagax* in Smith, 1969:92); Monteiro, 1960:1105 (Angola), CLOFETA, in press; SFSA, in press (southern Africa)

**FAO Names** : En - Southern African pilchard.



**Diagnostic Features** : The radiating bony striae on the operculum distinguish this fish from all other clupeids in the area; in addition, species of *Sardinella* and *Herklotsichthys* have two fleshy outgrowths along the hind margin of the gill opening and no series of dark spots along flank (*Amblygaster* sirm has similar spots, but not recorded from South African coasts); *Hilsa kelee* has spots on flanks but is deeper-bodied and has a distinct median notch in the upper jaw; and species of *Etrumeus* and *Dussumieria* lack scutes along the belly. See CLUP Sardop 2, Fishing Areas 34 and 51.

**Geographical Distribution** : Angola (Baia dos Tigres, Porto Alexandre) southward to Cape Town and north to Natal (Durban); possibly to Mauritius.

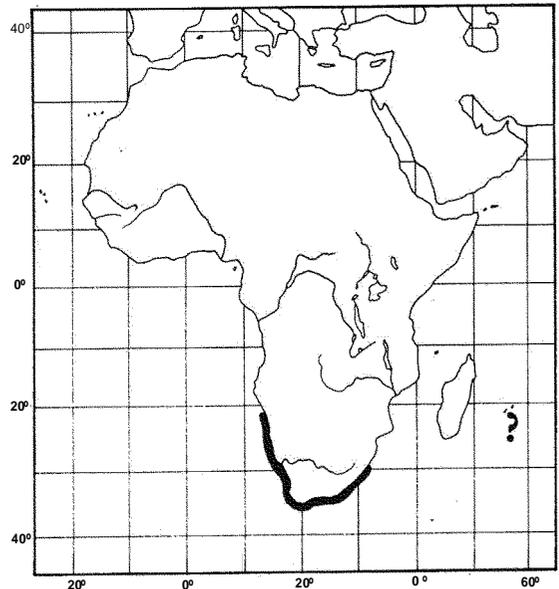
**Habitat and Biology** : Coastal pelagic, forming large schools, migratory (but northern stocks perhaps rarely moving south of Orange River, thus South African stocks separate; on east coast, seasonal migration northward to Durban in June/July). Feeds on zooplankton (mainly copepods) when young, but on phytoplankton (mainly diatoms) from about 10 cm standard length; a non-selective filter feeder. Breeds mainly from September to February.

**Size** : To 28 cm standard length, usually to 25 cm.

**Interest to Fisheries** : The total catch for 1983 was 110 229 tons (South Africa 61 814 tons; Namibia 44 014 tons), virtually all from the western and southern coasts. Small catches by foreign nations, chiefly Poland.

**Local Names** : SOUTH AFRICA: Sud Afrikaanse pelser.

**Literature** : Davies (1957 - biology, synopsis); Du Plessis (1960 - fishery); De Jager (1960 - biology); Mathews (1960, 1964 - biology); King & Macleod (1976 - feeding). Biology and fishery data are given in many of the Investigational Reports of the Sea Fisheries Branch of the South African Department of Industries from 1954 onward.



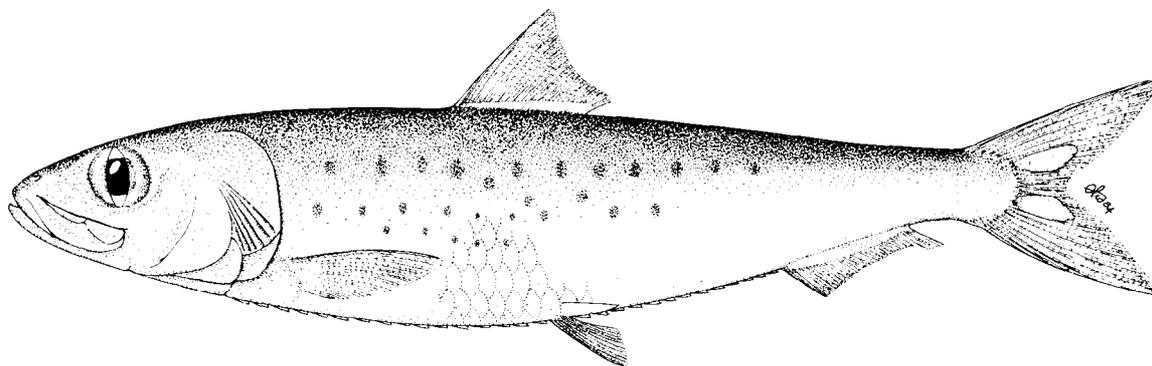
***Sardinops sagax*** (Jenyns, 1842)

CLUP Sardop 3

*Clupea sagax* (Jenyns, 1842, Zool.voy.Beagle, fishes:134 (Lima, San Lorenzo Island, Peru).

**Synonyms** : *Alosa musica* Girard, 1854:199 (Chile); *Clupea advena* Phillippi, 1879:161, pl. 10 (Chile); *Arengus sagax*:Fowler, 1945:3 (all Chile refs); *Sardinops sagax* - Mann, 1954:131; Hildebrand, 1946:86; de Buen, 1960:265 (synopsis); Boré & Martinez, 1981:unpaged (synopsis) ; Leible & Alveal, 1982:18 (synopsis).

**FAO Names** : En - South American pilchard.



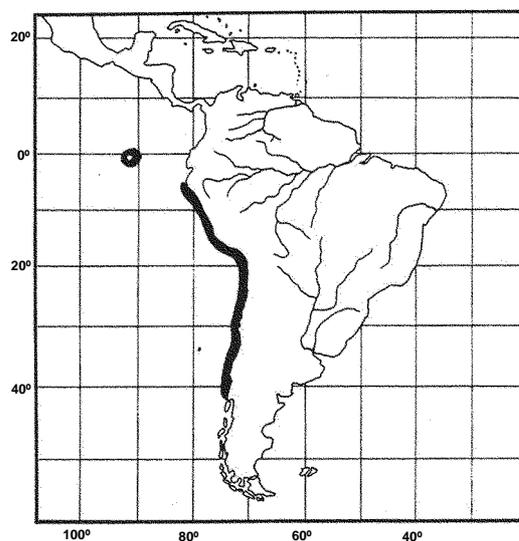
**Diagnostic Features** : The radiating bony striae on the operculum distinguish this species from all other clupeids in the area; in addition, *Ethmidium maculatum* has dark spots on the flank, but is deeper-bodied and has a distinct median notch in the upper jaw; *Strangomera bentincki* has a slender body, but lacks the spots and last two anal finrays not enlarged.

**Geographical Distribution** : Peru and Chile (Sechura Bay at 5°S southward to Mocha Island, Chile, at 38°30'S; also Galapagos Islands).

**Habitat and Biology** : Coastal pelagic, caught down to depths of about 40 m, in summer at 16° to 23°C, in winter at 10° to 18°C. Forms large schools in the Peru Current. Feeds mainly on planktonic crustaceans. Breeds twice in one year (at least off Chile), from July to September and a lesser spawning from February to March throughout the area between Africa and southwest of Antofagasta (eggs also recorded off Valparaiso); mature from about 24 cm.

**Size** : To about 30 cm standard length, usually around 20 cm.

**Interest to Fisheries** : The total catch for 1983 was 3 888 694 tons (Peru 1 064 448 tons, Chile 2 823 424 tons). Caught with purse seines; in 1979, there were 3 ships operating in the northern zone of Chile (Arica, Iquique, Antofagasta) and 41 from Talcahuano; and of the total catch (1 618 937 tons), 90% was used for fishmeal or oil, 4% was canned and the rest marketed fresh or frozen.



**Local Names** : CHILE: Sardina española; ECUADOR: Sardina; PERU: Sardina.

**Literature** : Hildebrand (1946 - Peru); de Buen (1960 - biology, synopsis); Alberti (1960 - fishery, Antofagasta and Iquique); Bore & Martinez (1981; Chile, synopsis, fishery data).

**Remarks** : De Buen (1958, 1960:270) recognized two subspecies and suspected that the Galapagos population represented at least an isolated stock:

*S. sagax sagax*: head length 27 or 28.5% of standard length, pre-dorsal distance 47 to 50% of standard length, pectoral fin length 53 to 55.5% of head length; Peru.

*S. sagax musica*: head length 25.5 to 26.1% of standard length, pre-dorsal distance 45.1 to 47.6% of standard length, pectoral fin length 51.5 to 58% of head length; Chile.