

Literature : Blackburn (1950 - good synopsis, with large bibliography).

Remarks : Blackburn (1950) recognized three subspecies:

- a) *E. australis australis*: mean number of vertebrae 43 to 44; southern Queensland to almost southern boundary of New South Wales
- b) *E. australis antipodum*: mean number of vertebrae 45 to 46; extreme south of New South Wales, Victoria, Tasmania, eastern part of south Australia'
- c) *E. australis fraseri*: mean number of vertebrae 43 to 44; Western Australia

More work is needed to confirm that these really are distinct and not merely a trend to higher meristic counts in cooler waters.

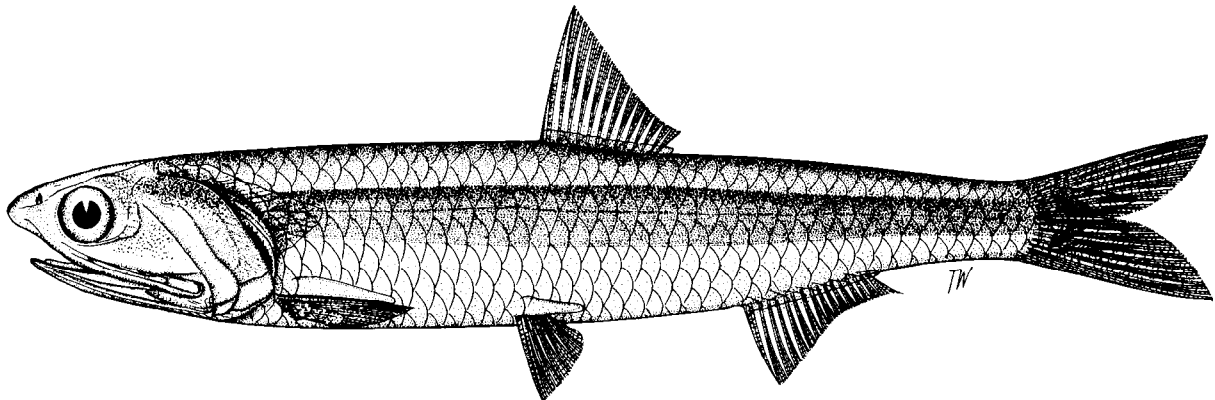
Engraulis capensis Gilchrist, 1913

ENGR Engr 5

Engraulis capensis Gilchrist, 1913, *Mar.biol.Rep.*, Cape Tn, 1:42, fig. (South Africa).

Synonyms : ? *Clupea vittargentea* Lacepède, 1803:424, 458 (Mauritius, on Commerson MS; nomen dubium); *Engraulis encrasicolus*:Pappe, 1853:30 (South Africa); Castelnau, 1861:68 (Cape Town); *Engraulis japonicus*:Smith, 1949:95, fig.123 (synopsis); Wongratana, 1980:219, pls 184, 185 (synopsis, but Japanese material also included); SFSA, 1986:205, fig.55.1 (South Africa); *Engraulis capensis*-Barnard, 1925:116 (Saldanha Bay, Table Bay, False Bay, Natal); Whitehead, 1964c:885 (Seychelles); Anders, 1965:103 (spawning); Baird & Geldenhuis, 1973: unpagged (biology, fishery); King & Macleod, 1976:18 et seq., (food); Brownell, 1983:181 et seq., (laboratory rearing); Boyd & Hewitson, 1983:71 et seq. (distribution of larvae); Whitehead & Bauchot, 1986:47 (*vittargentea* discussed).

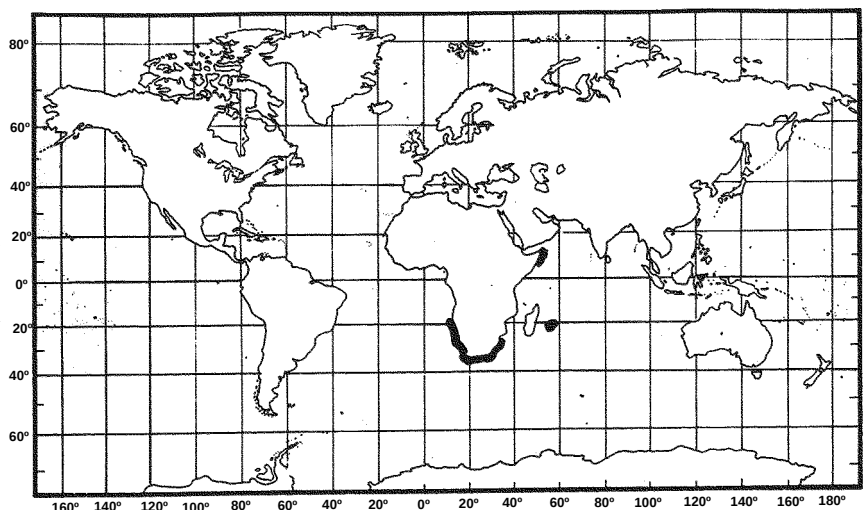
FAO Names : En - Southern African anchovy.



Diagnostic Features : Hardly differs from the European anchovy (*E. encrasicolus*) and can be identified from that description. Of other anchovies in southern and eastern African waters, species of *Stolephorus* have 3 to 7 sharp needle-like scutes along the belly, while species of *Thryssa* have compressed bodies and a keel of scutes along the belly. See ENGR Engr 4 (as *E. japonicus*) Fishing Area 51.

Geographical Distribution : Southeastern Atlantic and western Indian Ocean (Atlantic coasts of southern Africa, from Anbola/Namigia border south to Cape Town, then north to about Lourenço Marques; recorded from Mauritius and the Seychelles, also in upwelling area around Somalia).

Habitat and Biology : Marine, pelagic, coastal, in shallow inshore waters, but also down to about 200 m, forming large schools. Feeds chiefly on calanoid copepods when juvenile, gradually switching to phytoplankton at about 5 cm standard length. Spawns from early spring to late summer (October to April in southern African waters, with a peak in November/December in the south, but in February off Namibia), in coastal waters and not more than 80 km offshore; eggs ellipsoidal.



Size : To 13 cm standard length.

Interest to Fisheries : Not fully exploited in southern African waters until 1965, but in some years then contributing over half the total pelagic fish catch, but with considerable fluctuations, including a tendency for increased catches as the sardine fishery declined. Caught chiefly by purse seines, the anchovy schools sometimes so dense that up to 100 t could be caught in the early days with a single throw (Robinson, 1966); catches increase from April and reach a peak in May. The total catch for 1982 was 389 615 t.

Local Names : SOUTH AFRICA: Kaapse ansjovis.

Literature : Baird & Geldenhuys (1973 - biology, fishery); King & Macleod (1976 - food).

Remarks : The northern limit of this species along the Atlantic coast of Africa is arbitrary since there is perhaps no distributional break between these populations and those of the European anchovy (*E. encrasicolus*). It is not yet certain that the two are distinct. The Indian Ocean records from Mauritius and the Seychelles may represent strays, but the appearance of *Engraulis* during upwelling off Somalia seems more regular.

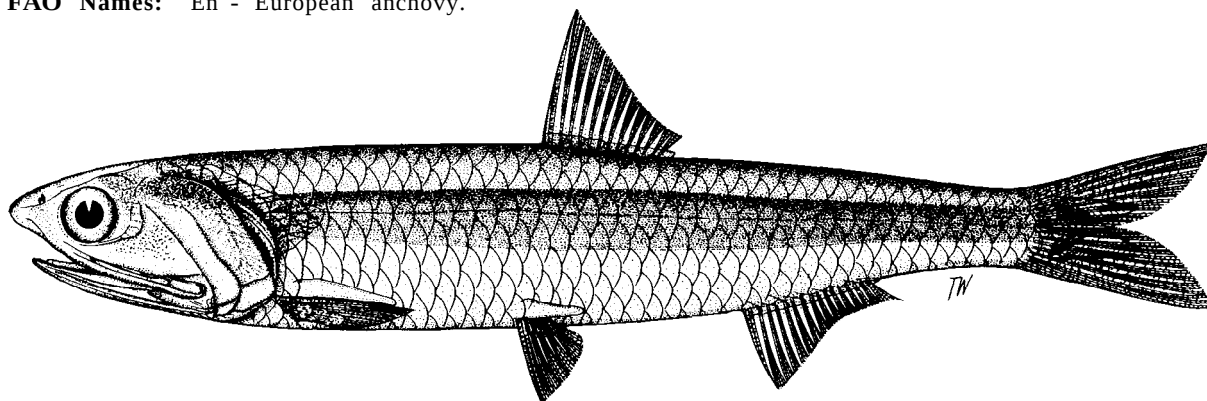
Engraulis encrasicolus (Linnaeus, 1758)

ENGR Engr 1

Clupea encrasicolus Linnaeus, 1758, *Syst.nat.*, 10th ed.:318 (European Seas).

Synonyms : *Engraulis amara* Risso, 1827:456 (southern Europe,? Nice; see Whitehead & Bauchot, 1986:47); *Engraulis meletta* Cuvier, 1829:323 (on Melet of Duhamel, 1772; see Whitehead & Bauchot, 1986:49); *Engraulis vulgaris* Nilsson, 1832:25 (Sweden); *Engraulis argyrophanus* Valenciennes, 1848:49 (Atlantic en route for Cape of Good Hope; see Whitehead, 1969a:125); *Engraulis russoi* Dulzetto, 1947:27, figs 1-6 (Messina); Scuderi, 1957:242 (var. *oliveri* from Lago Verde); *Anchoviella guineensis* Rossignol & Blache, 1961:285 (off Cape Lopez, Gabon and Pointe Noire, Congo); Daget & Iltis, 1965:54, fig.29 (Ebrié lagoon, Ivory Coast); Marchal, 1967:1 et seq. (West Africa, eggs, larvae, key); *Engraulis guineensis*:Fagetti & Marak, 1972:5 (Senegal to Pointe Noire, Congo, larvae); *Anchoa guineensis*:Bravo de Laguna & Santaella Alvarez, 1973:32 (21°30' to 16°45'N); *Engraulis encrasicolus* (misspelt *encrasicholus* by many authors) - Fage, 1920:6, 33 (Atlantic and Mediterranean races, each with two groups; misspelt *encrasicholus*); Pusanov, 1926:93 (subspecies *atlanticus* and *mediterraneus* after the Atlantic and Mediterranean races proposed by Fage, 1920; also subspecies *maeoticus* of Black Sea); Aleksandrov, 1927:77, 98 (subspecies *atlanticus* on Fage's northern group of the Atlantic race and *aquitanicus* on southern group; also *mediterraneus* and *adriaticus* on Fage's eastern and western groups of the Mediterranean race; also *ponticus* for Adriatic); Majorowa, 1934:18, 19 (subspecies *ponticus*, *natia occidentalis* and *orientalis*); Dulzetto, 1940:397, pls I, 11, figs 2,4 (subspecies *symaetensis*, Catania, eastern Sicily); Demir, 1963:1 et seq. (synopsis of biology); Bánárescu, 1964:247, figs 108, 109 (larvae) (Black Sea, subspecies *ponticus*); Svetovidov, 1964a:127, fig.38 (Black Sea, subspecies *ponticus* and *maeoticus*; synopsis, very large bibliography); Demir, 1945a:1 et seq. (revision of 1963 version); Tortonese, 1967:59 (subspecies *ponticus*, *maeoticus*, *symaetensis*, also *E. russoi*); Whitehead, 1967a:125 (types of *argyrophanus*; *meletta* discussed); Wheeler, 1969:126 (Europe, synopsis); CLOFNAM, 1973:III (full synonymy); Wheeler, 1978:71, 74 (fig.) (Europe, synopsis); Bauchot & Pras, 1980:101, p1.10 (synopsis); CLOFRES 1984:43 (Suez Canal, Gulf of Suez); Lloris et al., 1984:60 (list of Catalan refs); FNAM, 1984:282, fig. (synopsis, misspelt *encrasicholus*); Whitehead & Bauchot, 1986:30, 31, 49 (types of *argyrophanus*, *guineensis* and *meletta*); CLOFETA, in press (synonymy).

FAO Names: En - European anchovy.



Diagnostic Features : Body slender, elongate, oval in cross-section, its depth about 6 times in standard length. Snout pointed; maxilla short, tip blunt, reaching almost to front border of pre-operculum, not projecting beyond tip of second supra-maxilla; tip of lower jaw reaching to below nostril. Lower gillrakers 27 to 43; gillrakers present on hind face of third epibranchial. Pseudobranch longer than eye, reaching onto inner face of operculum. Anal fin short, with iii 13 to 15 finrays, its origin well behind base of last dorsal finray. A silver stripe along flank, disappearing with age. Unmistakable since the only anchovy species in its range. See ENGR Engr 1, Fishing Areas 34, 47 (part), also 37.

Geographical Distribution : Eastern North and Central Atlantic (coasts of Europe south from about Bergen, Norway, but not Baltic and rare in the north; whole Mediterranean and Black and Azov seas, with stray individuals in Suez Canal and Gulf of Suez; southward along coast of West Africa to Angola, also recorded from St. Helena).

Habitat and Biology : Mainly marine, pelagic, coastal and forming large schools, but recorded down to 400 m depth off West Africa and descending in winter to 100 to 150 m depth in the Mediterranean; euryhaline tolerating salinities of 5 to 41‰ and in some areas entering lagoons, estuaries or lakes, especially in the warmer months during the spawning season. A tendency to extend into more northern waters in summer and generally to move into the surface layers, retreating and descending in winter. Feeds on planktonic organisms, especially calanoid copepods, cirripede and mollusc larvae, and fish eggs and larvae. Spawning over an extended period from April to November with peaks usually in the warmest months, the limits of the spawning season dependent on temperature and thus more restricted in northern areas. Eggs ellipsoidal to oval, floating in the upper 50 m, hatching in 24 to 65 hours.

Size : To 20 cm standard length, but usually about 12 to 15 cm, those in tropical waters smaller than those in northern waters.

Interest to Fisheries : Chiefly caught in the Mediterranean and adjacent seas. The total catch in 1982 was 688 016 t (Turkey and USSR both over 200 000 t, but catches of over 50 000 t frequently recorded for Italy and only a little less by Spain). Caught by purse seines, lampara nets, beach seines and also by midwater trawl in winter. Usually canned, salted or processed, but also marketed fresh or frozen in African countries.

Local Names : A long list of names is given by Demir (1963), of which the most common are: ALGERIA: Anchovba; FRANCE: Anchois; ITALY: Acciuga; ROMANIA: Hamsia; SPAIN: Anchoa, Boquerón; USSR: Hamsa.

Literature : Demir (1963, 1965a - excellent summary of biological data, good bibliography), Svetovidov (1964a - Black Sea, very large list of references), Bănărescu (1964 - Black Sea, synopsis); see also CLOFNAM and CLOFETA for large synonymies.

Remarks : The southern limit of the species was formerly considered to be Morocco, with accidental strays south to Cape Blanc (CLOFNAM, 1973:112). Whitehead (1964c) extended the range to West Africa as far south as Angola and St. Helena. The southern limit at the Angola/Namibia border is arbitrary since there is perhaps no distributional break between these populations and those of the Southern African anchovy (here recognized as *E. capensis*).

Attempts to split the European anchovy into races and even subspecies have not been wholly successful. Svetovidov (in CLOFNAM, 1973:111) thought that only *E. russoi* of Aleksandrov (1927) and *E. russoi* var. *oliveri* of Scuderi (1957:242 - Lago Verdi) might prove to be subspecies, but more studies are needed.

The relationship of the *encrasicolus*-group to anchoita, mordax and *ringens* of the New World is discussed under the genus.

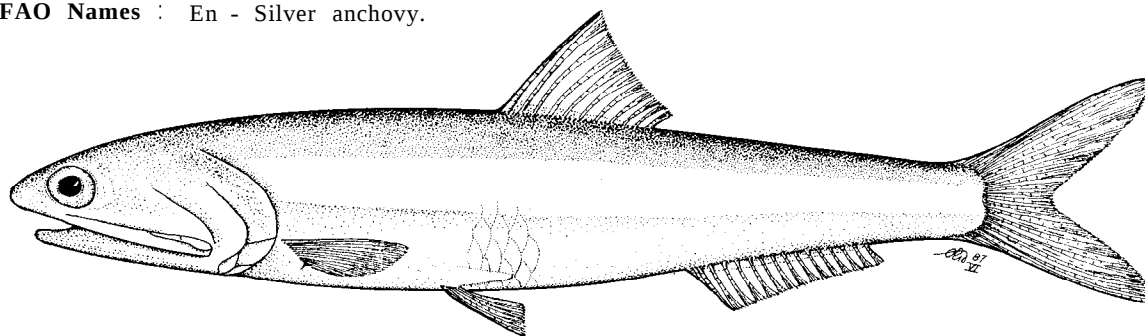
Engraulis eurystole (Swain & Meek, 1884)

ENGR Engr 3

Stolephorus eurystole Swain & Meek, 1884, *Proc.Acad.nat.Sci.Philad.*, 36:35 (Woods Hole, Massachusetts).

Synonyms : *Stolephorus perfasciatus*: Swain, 1883:55 (Woods Hole); *Stolephorus argyrophanus*: Jordan & Evermann, 1896:444 Gulf Stream, occasionally northward); *Anchovia argyrophana* Sumner, Osborn & Cole, 1913:743 (Woods Hole); *Anchoviella argyrophanus* Jordan & Seale 1926:402 (Provincetown, Massachusetts); Jordan, Evermann & Clark, 1930:48 (*eurystole* a synonym); *Anchoviella estauquae* Hildebrand, 1943:115, fig.48 (Gulf of Venezuela); FWNA 1964:211, fig.45 (repeat); Cervigón, 1966:145 (Venezuela); Whitehead, 1964c:884 (Tobago; spelling corrected to *estauquae* following Hubbs, 1953); *Anchovia eurystole*: Fowler, 1906:109 (New Jersey); *Anchoviella eurystole*: Hildebrand, 1943:112 fig.47 (Woods Hole to Beaufort, North Carolina); FWNA, 1964:208, fig.44 (synopses); Daly, 1970:100 (Miami, Florida; also *E. estauquae*); *Engraulis eurystole*-Whitehead, 1973a:91, figs 32, 33 (jaws) (Tobago, Trinidad, Guyana, Surinam); Hastings, 1977:116 (northern Gulf of Mexico at Choctawhatchee Bay, Florida).

FAO Names : En - Silver anchovy.

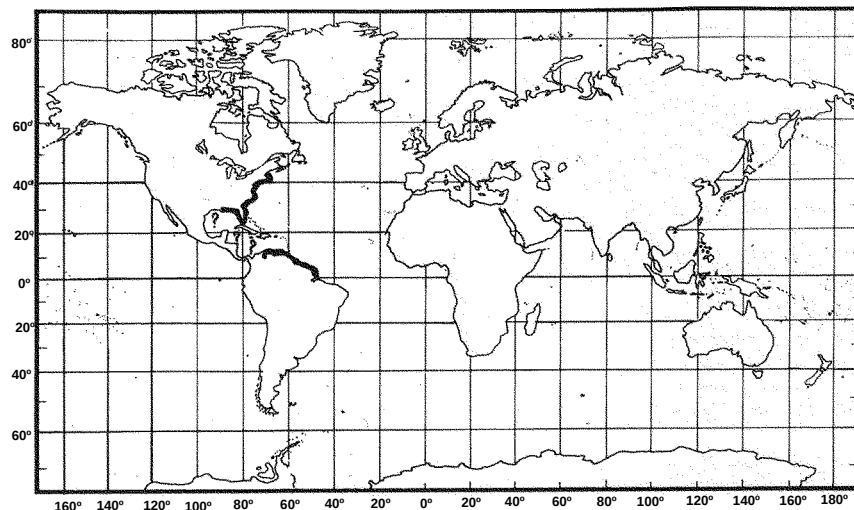


Diagnostic Features : Hardly differs from the European anchovy (see *E. encrasicolus*) and can be identified from that description. Differs from Atlantic species of *Anchoviella* by its much longer pseudobranch (more than eye diameter and reaching onto inner face of operculum); differs from Atlantic species of *Anchoa* in its short and blunt-tipped maxilla (cf. pointed and reaching onto pre-operculum or beyond). See ENGR Engr 3, Fishing Area 31.

Geographical Distribution : Western North and central Atlantic (from Massachusetts south to Florida, north-eastern Gulf of Mexico - at least to about Mississippi Sound, but not recorded elsewhere - and Venezuelan coast south to northern Brazil at 2°19'N).

Habitat and Biology : Marine, pelagic, coastal and forming compact schools; down to about 65 m depth, but commonly in shallow sheltered waters, harbours, etc. Soawmino peak in July/August (Nichols & Breder, 1927:44); eggs ellipsoidal.

Size : To 10.7 cm standard length.



Interest to Fisheries : Little or none in northern areas, but perhaps enters artisanal fisheries in the southern part of its range.

Local Names :

Literature : FWNA (1964 - synopsis, notes on eggs and larvae).

Remarks : Hildebrand (1943) separated the northern *eurystole* from the southern *estanquae*, but Whitehead (1973a:94) found no consistent differences. The separation of *E. eurystole* from *E. encrasicolus* is similarly difficult to define, especially when comparing fishes from the warmer waters (which seem to reach a smaller adult size).

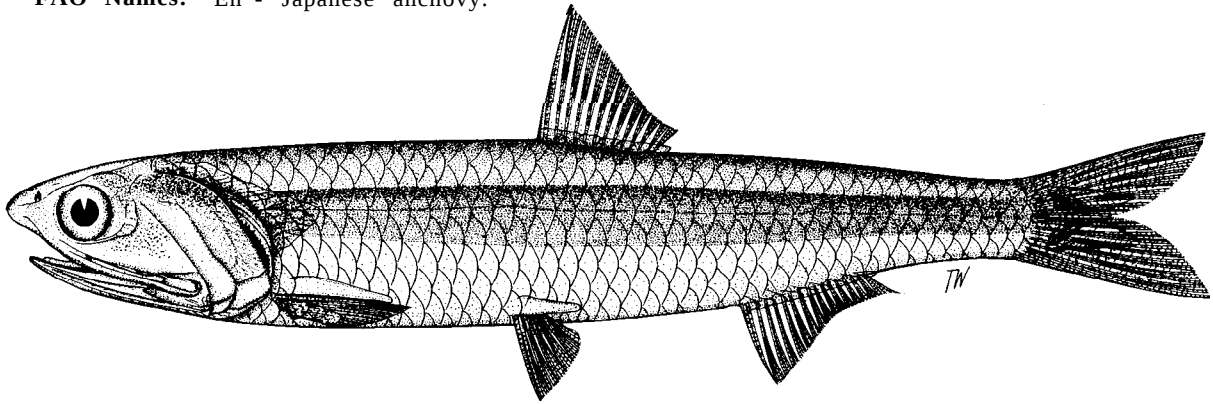
***Engraulis japonicus* Temminck & Schlegel, 1846**

ENGR Engr 4

Engraulis japonicus Temminck & Schlegel, 1846, *Fauna Japonica*, Poiss., pt.13:239, pl. 108, fig.3 (southwest Japan).

Synonyms : *Atherina japonica* Houttuyn, 1782:340 (= *nomen dubium* - see Note below); *Engraulis zollingeri* Bleeker, 1849c:69,73 (Macassar, = Ujung Pandang, Sulawesi, Indonesia; *zollingeri* of subsequent authors is *Encrasicolina punctifer*); *Stolephorus celebicus* Hardenberg, 1933a:262 (Manado, Sulawesi); *Engraulis japonicus* (or incorrectly *japonica*; *Engraulis* is masculine) Fowler, 1941d:694 (Japan, Korea, large synonymy); Hayashi & Tadokoro, 1962b:30, figs 1,2 (heads) (Japan, comparison with '*Stolephorus zollingeri*'); Whitehead, 1964c:885 (Sulawesi, *zollingeri* = *japonicus*); Whitehead, Boeseman & Wheeler, 1966:109, pl.14 fig.2 (Bleeker's fig.) (types of *zollingeri*); Hayashi, 1967:44 *et seq.* (Japan, biology, fishery); Shen, 1969:21, figs 3,4 (gillrakers), 5 (gut) (gill structure and food); *Idem.*, 1971:101 *et seq.* (Taiwan Island, synopsis of biology, fishery). **Note:** Houttuyn's name *japonica*, variously applied to species of *Engraulis*, *Stolephorus* and *Spratelloides* with consequent confusion, was considered a *nomen dubium* by Whitehead, 1963b and was subsequently suppressed by the International Commission by Opinion 749 of 1965.

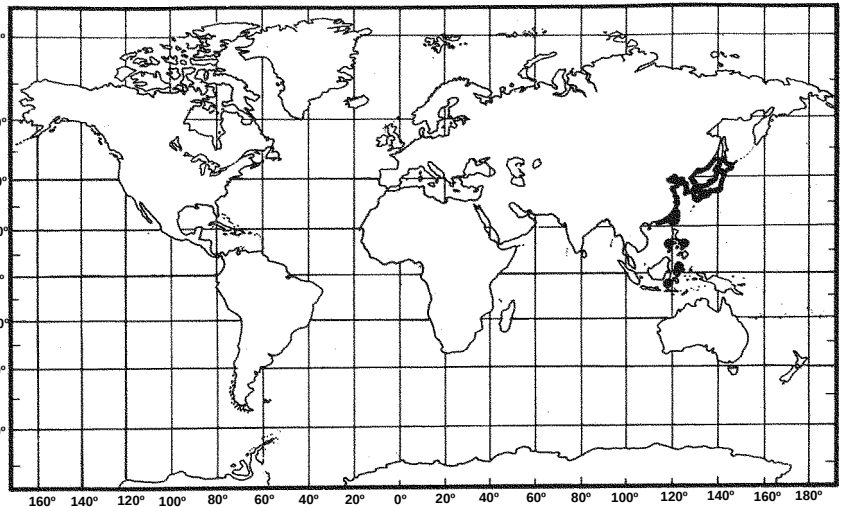
FAO Names: En - Japanese anchovy.



Diagnostic Features : Differs very little from the European anchovy (see *E. encrasicolus*) and can be identified from that description. Of other anchovies found in the southern part of its-distribution, only species of *Encrasicolina* and *Stolephorus* are similar in appearance (slender, rather round-bodied), but all have small spine-like scutes before the pelvic fins (usually 2 to 7 scutes, but occasionally 1 or very rarely none in *S. commersonii*). Species of *Thryssa* have compressed bodies and a keel of scutes along the belly.

Geographical Distribution :

Western North and central Pacific (southern Sakhalin Island, Sea of Japan and Pacific coasts of Japan, and south to almost Canton/Taiwan Island; rare records off Philippine coasts (Luzon, western Mindanao) and from Manado and Ujung Pandang, Sulawesi, Indonesia).



Habitat and Biology : Marine, pelagic and near the surface, mainly coastal, but to over 1000 km from the shore, forming large schools, tending to move more northward and inshore (into bays and inlets) in spring and summer, but without well-defined migrations. Feeds on copepods (the post-larvae chiefly taking the eggs and nauplii), but also on other small crustaceans, and molluscan larvae, as well as fish eggs and larvae; the data given by Shen (1969:tab.3) suggest that diatoms form an important food item in juveniles and adults, as might be expected by analogy with *E. capensis*. Spawns throughout the year, with peaks in winter and early spring in southern parts of Japan, and in spring and in autumn in the Pacific waters of central Japan and off northern Taiwan Island, mainly in the second year of life; eggs ellipsoidal, hatching in about 30 hours at 20 to 25° C, or 48 hours at 18° C.

Size : To about 16 cm standard length, usually about 12 to 14 cm.

Interest to Fisheries : Fished commercially in Japan since the 10th century; abundant catches from about 1890 to 1912, fluctuating to 1930, a decline, followed by an increase and further fluctuations, usually inversely correlated with fluctuations in the catch of sardines (*Sardinops melanostictus*). Not only adults, but post-larval stages (*sirasu* in Japan) exploited. Mostly caught by two-boat purse seines (60%) and boat seines, in autumn in northern parts of Japan, in spring and autumn in the Sea of Japan. The total catch in 1982 was 359 709 t.

Local Names : JAPAN: Katakuchi-iwashi.

Literature : Uchida *et al.* (1958 - good illustration of eggs and larvae), Hayashi (1967 - synopsis of biology and fishery), Shen (1969, 1971 - feeding, general biology), Jiang & Zheng (1984 - eggs and larvae).

Remarks : The Philippine and Indonesian records seem to represent stray fishes; as yet there is no indication that the Japanese anchovy is geographically linked to the Australian anchovy.

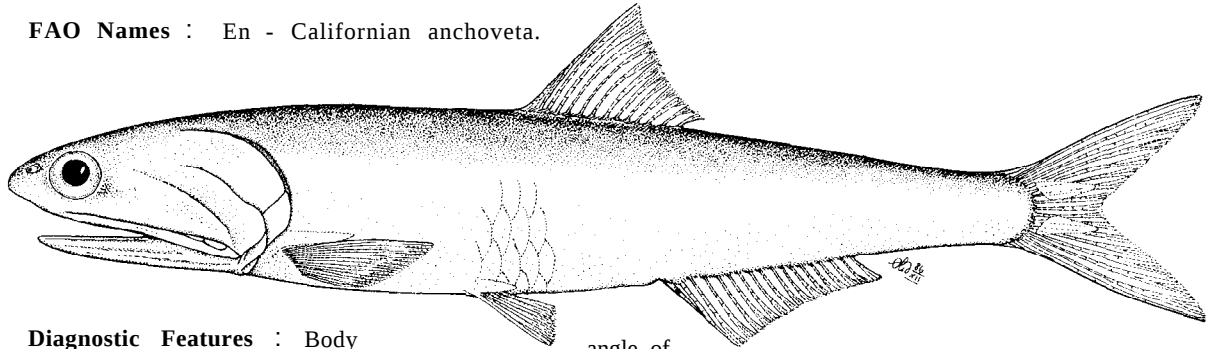
Engraulis mordax Girard, 1856

ENGR Engr 8

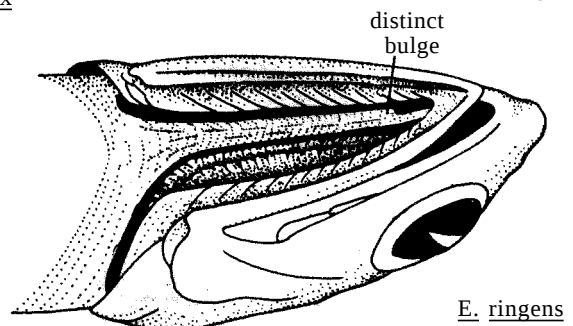
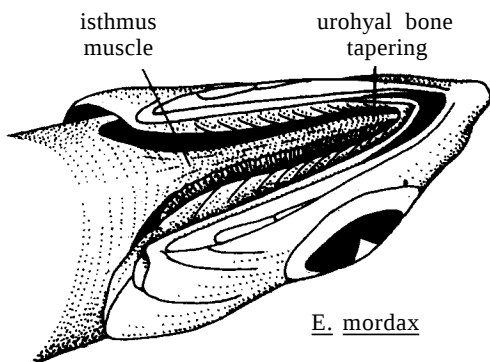
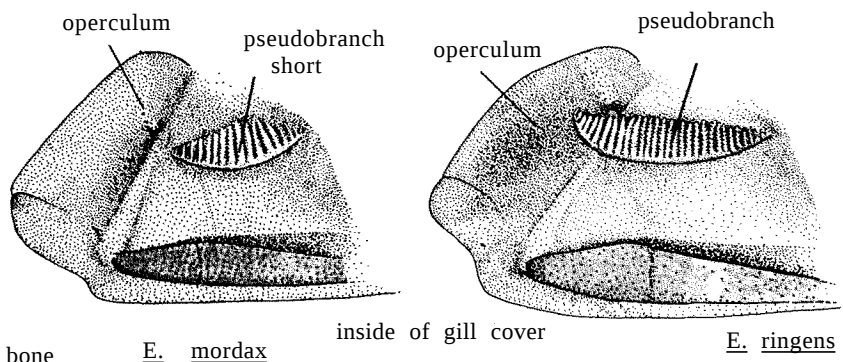
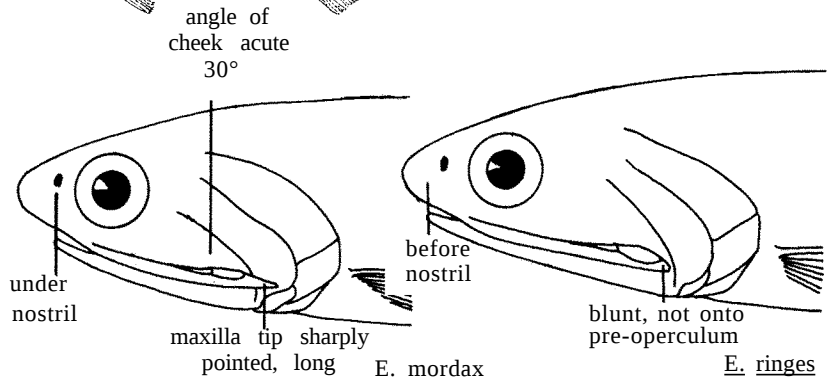
Engraulis mordax Girard, 1856, Proc.Acad.nat.Sci.Philad., 7:138 (San Francisco; not Shoalwater Bay, Washington as sometimes stated).

Synonyms : Engraulis nanus Girard, 1858:335 (San Francisco); Anchovia maui Fowler & Bean, 1923:4 (Maui, Hawaii; error, presumably eastern Pacific); Engraulis mordax-Hubbs, 1925:14 (California Bay to Coronado; subspecies mordax and nanus); Jordan & Seale, 1926:389 (San Francisco); Hildebrand, 1943:14, 15, figs 1,2 (mordax and nanus) (probably full range of species); Miller, 1956:20 et seq. (fishery biology); Ahlstrom, 1956:33 et seq., figs 14, 15 (very good drawings of eggs and larvae) (Point Conception to Point San Juanico); Loukashkin & Grant, 1965:635 et seq. (reactions to light); Messerschmidt, 1969:17 et seq. (various contributions on abundance, distribution and exploitation); Whitehead, 1973a:89 (relationships); Hart, 1973:104, fig. (synopsis, good bibliography); Hubbs et al., 1979:7 (California; subspecies mordax and nanus); Hewitt, 1980:2 to 101 (figs of larval distribution); Horn & Allen, 1981:53 (upper Newport Bay, California, ecology); Eschmeyer, Herald & Hamman, 1983: 74, pl. 7 (synopsis).

FAO Names : En - Californian anchoveta.

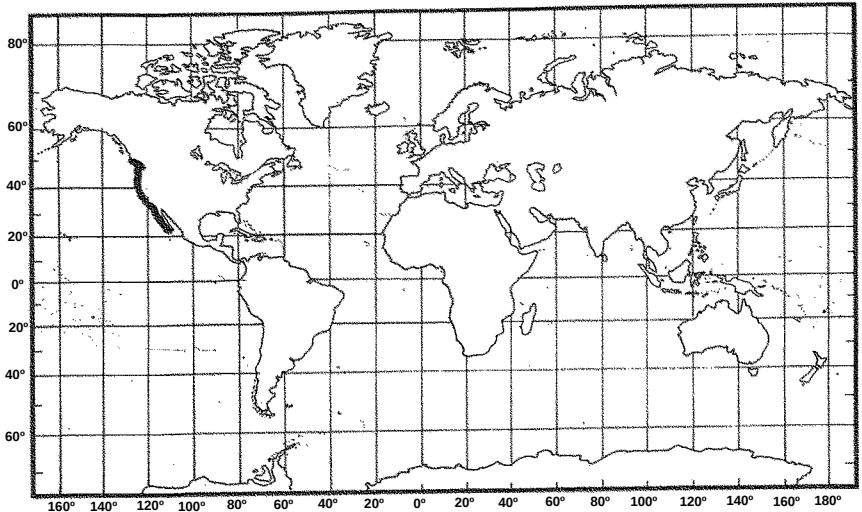


Diagnostic Features : Body slender, elongate, rather round in cross-section, its depth about 5 to 6 times in standard length. Snout quite sharply pointed; maxilla moderate, tip sharply pointed, reaching to or almost to hind border of pre-operculum, projecting well beyond tip of second supra-maxilla; tip of lower jaw below nostril. Lower gillrakers 37 to 45, long and slender; no gillrakers on hind face of third epibranchial. Anal fin origin under about base of last dorsal finray or a little behind. A silver stripe along flank in young individuals, disappearing with age. The high number of gillrakers distinguishes it from all Pacific species of Anchoa (to 32 in A. delicatissima, but maxilla longer and sharply pointed and anal fin origin under front part of dorsal fin base). Anchoviella balboae (gillrakers to 33) is not found north of Panama.

E. mordaxE. ringens

Geographical Distribution : Eastern North Pacific (northern part of Vancouver Island south to Cape San Lucas, Baja California).

Habitat and Biology : Marine, pelagic, usually coastal and within about 30 km of shore, but to 480 km and down to 219 m depth, forming large tightly packed schools; enters bays and inlets (e.g., to about 2 km up Newport Bay, mainly in July and September - Horn & Allen, 1981:53). Feeds on euphausiids, copepods and decapod larvae (at least in British Columbia - Hart, 1973:105), both by random filter-feeding and by 'pecking' at individual prey. Spawns from British Columbia south to Magdalena Bay, Baja California, but most abundantly between Point Conception and Point San Juanico (about 35° S to 25° S); spawns throughout year, either in inlets or offshore, mainly in winter and early spring (January to March or April), but depending on hydrological conditions (preferred temperatures 10 to 23.3°C in upper water layers and around 22.00 hours); eggs ellipsoidal, floating perpendicular at first, later horizontal, hatching in 2 to 4 days.



Size : To 24.8 cm total length (about 20.5 cm standard length), usually about 12 and 14 cm standard length at 2 and 3 years.

Interest to Fisheries : Restricted by law solely as a baitfish in California in 1949 to 1955, but since then also used for canning or processing into fishmeal or oil, as also in British Columbia in the 1940s when very abundant. Wide fluctuations in populations, partly in relation to hydrology, but complicated by the relation with the also fluctuating populations of the California pilchard (*Sardinops caeruleus*). The recorded catch in 1982 was 294 859 t (247 997 t by Mexico), fished with lampara nets, but after about 1946 mainly by purse seines.

Local Names : FAO Yearbook: North Pacific anchovy; USA: Northern anchovy (AFS list).

Literature : Hart (1973 - good summary).

Remarks : Three subpopulations were proposed by McHugh (1952), but Miller (1956:23) doubted this. Hubbs (1925) and Hildebrand (1943) recognized two subspecies:

- (a) *E. mordax mordax*: body more elongate, its depth 5 to 6 times in standard length; head shorter, about 3.25 to 3.75 times in standard length; vertebrae usually 45 or 46; adults to 14 cm standard length or more; British Columbia to Baja California.
- (b) *E. mordax nanus*: body rather deeper, its depth 4.75 times in standard length; head longer, about 3 times in standard length; vertebrae usually 43 or 44; adults generally to less than 8 cm standard length; Bays of California.

Although the Californian anchoveta is superficially very similar to the Peruvian anchoveta (*E. ringens*) and appears to have a similar biology, the two differ in characters which fully justify their separation at species level:

E. mordax

E. ringens

- | | |
|--|--|
| (a) Tip of lower jaw reaching only to below nostril | Tip of lower jaw reaching to midpoint of snout, i.e. before nostril |
| (b) Maxilla tip sharply pointed, reaching to <u>hind</u> border of pre-operculum | Maxilla tip blunter, reaching only to <u>front</u> border of pre-operculum |
| (c) Angle of cheek very acute (about 30°) | Angle of cheek less acute (about 40°) |
| (d) Pseudobranch as long as eye, not reaching onto inner face of operculum | Pseudobranch longer than eye, reaching onto inner face of operculum |
| (e) Urohyal bone (attachment of isthmus muscle) only slightly bulging anteriorly | Urohyal bone with a very strong bulge on lower edge at point where isthmus muscle ends |

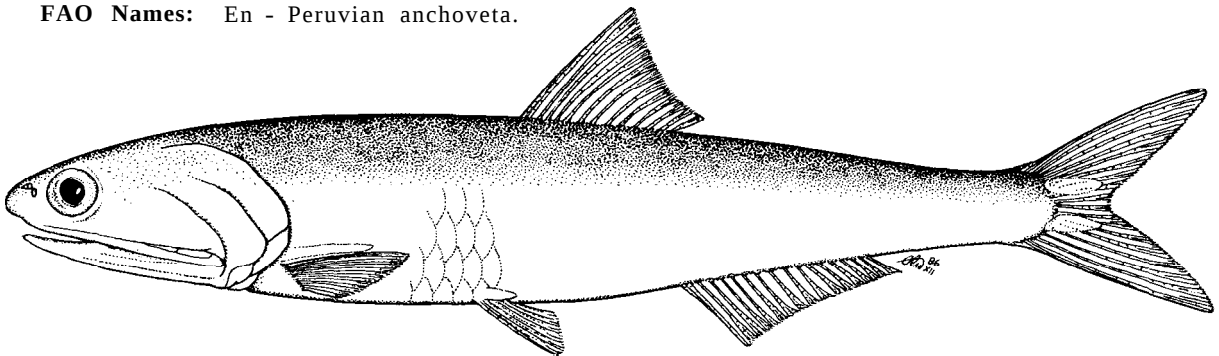
Engraulis ringens Jenyns, 1842

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Engraulis ringens Jenyns, 1842, Zool.voy.Beagle, fishes:138 (Callao, Peru).

Synonyms : Engraulis pulchellus Girard, 1856:199 (Caldera Bay, Chile); Engaulis tapirulus Cope, 1877:45 (Pacasmayo Bay, Peru - identification given by Böhlke, 1984:101 based on Type); Stolephorus tapirulus: Abbott, 1899:335 (types); Anchoviella tapirulus:Fowler, 1941a:235 (listed); Engraulis ringens:Delfin, 1901:41 (Chile refs); Jordan & Seale, 1926:390 (Callao, Peru; Panama fish = Anchoa arenicola); Hildebrand, 1943:16, fig.3 (various localities in Chile and Peru); Fowler, 1944:19 (large list of Chile refs);Hildebrand, 1946; 97, fig.20 (off Cañete, Chimbote, Lobos de Tierra, Peru); Mann, 1954:137, fig. (synopsis); Fischer, 1958:111 et seq., figs 1 to 3 (Chile, eggs and larvae); De Buen, 1958:102 (Chile, good list of Chile refs); Jordan, 1963:27 et seq. (Peru, vertebrae); Einarsson & Rojas de Mendiola, 1963:5 et seq. (Peru, eggs and larvae); Saetersdal & Valdivia, 1964:88 et seq. (Chile, fecundity, maturation); Whitehead, 1973a:89, fig.30c (maxilla) (relationships); Pequeño & Moreno, 1979:98, fig.59 (bad) (synopsis); Bore & Martinez, 1981: unpagged fig. (photo) (synopsis); Leible & Alveal, 1982:20, fig. (Concepción, Chile, synopsis); Sharp & Csirke (eds), 1983:987, 1011, 1027 (three papers on growth, recruitment, egg mortality and distributions).

FAO Names: En - Peruvian anchoveta.



Diagnostic Features : Body slender, elongate, rather round in cross-section, its depth about 4.5 to 5.5 times in standard length. Snout pointed; maxilla short, tip bluntly rounded, reaching to but not beyond front border of pre-operculum, projecting beyond tip of second supra-maxilla; tip of lower jaw in front of nostril. Lower gillrakers 38 to 49, long and slender, increasing with size of fish; no gillrakers on hind face of third epibranchial. Anal fin origin well behind base of last dorsal finray. A silver stripe along flank in young individuals, disappearing with age. The high number of gillrakers distinguishes it from all Pacific species of Anchoa; other anchovies that may be sympatric in northern Peru are deeper-bodied and more compressed (Anchoa, Cetengraulis).

Geographical Distribution : Eastern South Pacific (northern Peru from about Aguja Point at 6° S southward to Chiloé, Chile at 42° 31' S, the distribution dependant on the coastal extent of the Peru Current).

Habitat and Biology : Marine, coastal, mainly within 80 km of coast, but occasionally as far out as 160 km, forming huge schools, chiefly in surface waters (descending in daytime to up to 50 m, rising at night). Entirely dependant on the rich plankton of the Peruvian Current, its northern distribution limited in Peruvian waters in years when a 'tongue' of warmer and less saline surface water extends southward over the northbound coastal Peru Current (the so-called El Niño phenomenon). Feeds on plankton by filter-feeding, with up to 98% diatoms recorded in some studies (chiefly Coscinodiscus, Schroderella, Skeletonema and Thalassothrix); copepods, euphausiids, fish eggs and dinoflagellates also taken. Breeds throughout year along entire coast of Peru, but with a major spawning in winter/spring (July to September) and a lesser one in summer (February and March); also throughout year off Chile, with peaks in winter (May to July) and the end of spring (especially December); mature at about 1 year (about 10 cm standard length); eggs ellipsoidal. Attains about 8 cm standard length in 6 months, 10.5 cm in 12 months and 12 cm in 18 months; longevity about 3 years.

