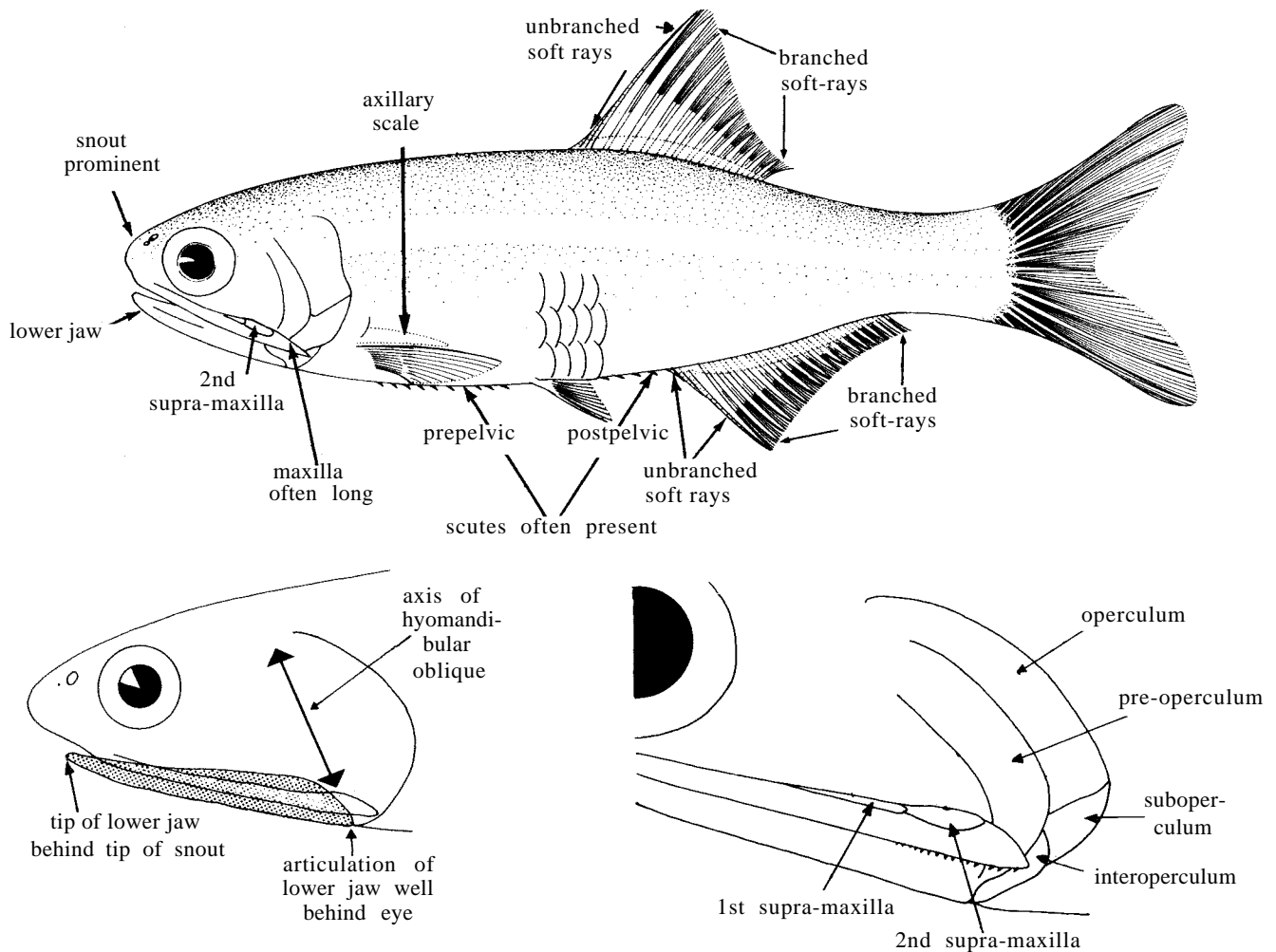


## 2.4 FAMILY ENGRAULIDIDAE

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FAO Names : En - Anchovies.

**Diagnostic Features** : Small or moderate-sized clupeoid fishes (usually 10 to 20 cm standard length, but *Thryssa scratchleyi* to 37 cm and some pygmy freshwater species in the Amazon). Anchovies are characterized by a usually prominent pig-like snout projecting beyond the tip of the lower jaw, the latter almost always long, slender and “underslung”, its articulation behind the eye, usually well behind. Typically, there are 2 supra-maxillae. Jaw teeth are usually small or minute (absent in *Cetengraulis*; large and canine-like in *Lycotrissa* and *Lycengraulis*). Gillrakers are usually short and not numerous (but long and up to 100 or more in *Anchovia*). A pelvic scute with lateral arms is always present; most Indo-Pacific species have pre- and often post-pelvic scutes, and some have a small spine-like scute just before the dorsal fin; *Engraulis* and New World anchovies lack such scutes. The dorsal fin is short and usually near the midpoint of the body (far back in *Pterengraulis*, far forward in *Coilia*); the pectoral fins are low on the body (with 5 to 19 free unbranched upper finrays in *Coilia*); the pelvic fins are before, under or behind the dorsal fin base, with i 6 finrays (except *Coilia ramcarati* with i 9 or 10); the anal fin is usually moderate (about 15 to 25 finrays), but long in *Thryssa* (to 50 finrays), *Setipinna* (to 80) and *Coilia* (to over 100). The scales are moderate, about 30 to 60 in lateral series, very often shed. Typically, the back is blue/green and the flanks silver (sometimes with a distinct silver stripe); fins are hyaline or faint yellow, sometimes chrome or orange, as also the mouth and/or the gill cavity; black markings may occur on fin tips or margins, or just behind the gill opening, but apparently no species has black spots on the flanks (cf. the clupeids).



**Biology, Habitat and Distribution** : Anchovies are typically marine coastal and schooling fishes, occurring in all seas from about 60° N to 50° S, but some species enter brackish or freshwater to feed or spawn and some live permanently there and are found high up the Amazon. Most species feed on small planktonic animals (especially crustaceans), either by locating individual prey or by more indiscriminate filter-feeding (e.g. *Cetengraulis*). Most, perhaps all, scatter quite large numbers of eggs from which hatch planktonic larvae.

**Interest to Fisheries :** Anchovies yielded 4 046 105 tons in 1982, or 21.4% of the total clupeoid catch. This figure was considerably higher during the boom years of the Peruvian anchovy, which alone in 1970 yielded 13 059 900 tons or 61.4% of the total clupeoid catch. Only 8 anchovy species were individually reported in 1982: the Peruvian anchovy and five other species of Engraulis (3 570 522 tons, or 88.2% of the total anchovy catch) and the two species of Cetengraulis (70 063 tons, or less than 2%), the remainder being unidentified species of Stolephorus (231 344 tons, or about 6%) or unidentified anchovies (4.3%). Almost certainly individual statistics for species (or groups of species) of Thryssa in the Indo-Pacific region are justified.

**Remarks :** The family name Engraulidae has been used in almost all previous literature, but it is an incorrect derivation from Engraulis; the correct (but less euphonic) derivation is Engraulididae (as explained by Steyskal, 1980:170).

Anchovies are essentially clupeids with a different head: the mesethmoid projects well forward of the vomer (and well forward of the pre-maxillae) and supports a paired rostral organ (Nelson, 1984a), while the suspensorium of the lower jaw (essentially the hyomandibular) is inclined obliquely backward and not vertical (Grande & Nelson, 1985:fig.2). The group was given the status of superfamily (Engrauloidea) by Grande (1985:261).

Unlike clupeids, with over a hundred fossil species described and a history reaching back to the Palaeocene (Grande, 1985), the anchovies have yielded only 4 definite fossil species (2 based on skeletons, 2 merely on otoliths), of which the oldest is from the Miocene:

Lower Miocene of New Zealand	: <u>Anchoa nitida</u> Schwarzans, 1984 (otoliths only)
Miocene - Lower Pliocene of Cyprus	: <u>Engraulis tethensis</u> Grande & Nelson, 1985
Pliocene of Borneo/Sumatra	: <u>Setipinna retusa</u> Stinton, 1962 (otoliths only)
Pliocene - Pleistocene of Italy	: <u>Engraulis macrocephalus</u> (Lindini & Menesini, 1978).

Nevertheless, Grande & Nelson (1985) considered the Engraulididae to be as old a group as the Clupeidae, believing that there must have been ecological reasons for the lack of fossil anchovies.

Relationships within the Engraulididae have until recently been based on a subfamily Engraulinae and a subfamily Coiliinae (the rat-tailed Coilia only) (Whitehead, 1985:12). Since only one genus, Engraulis, is common to both the Indo-West Pacific and the New World (also the eastern Atlantic), there appeared to be a clear division between the New and Old World anchovies. Lance Grande and Gareth Nelson have questioned this by relating the Indo-Pacific genera Stolephorus and Encrasicholina more closely to Engraulis and all the New World genera than to the other Indo-Pacific genera (Thrissina, Thryssa, etc.) (Grande & Nelson, 1985; also Nelson, 1983).

Some 139 anchovy species are listed here, placed in 16 genera, but more species will be described and no doubt there could be some splitting of the genera. For convenience, and until relationships become clearer, the genera will be placed in a single family, Engraulididae.

## KEY TO THE GENERA :

New and Old World genera are separated since only Engraulis occurs in both areas (included in each key).

### A. New World Genera

The genus Amazonsprattus is not included in this key; it can be recognized by the small size of adults (mature at 1.5 cm standard length), only 5 pelvic finrays, and maxilla reaching only just to front of eye (see Fig.11).

1a. Dorsal fin origin in front of anal fin origin or only slightly behind, near to midpoint of body

2a. Jaw teeth small and even, not canine-like in lower jaw

3a Anal fin origin under or behind base of last dorsal finray (Fig.1); body not strongly compressed, usually oval or nearly round in cross-section

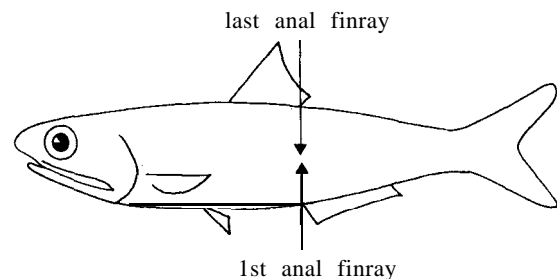


Fig.1

4a. A few short gillrakers present on hind face of 3rd epibranchial (Fig.2)

5a. Pseudobranch shorter than eye, not reaching onto inner face of operculum (Fig.3); maxilla tip blunt, not reaching onto pre-operculum (Fig.4). . . . . Anchoviella  
(part, see 11a below)

5b. Pseudobranch longer than eye, reaching onto operculum (Fig.5)

6a. Maxilla tip pointed, reaching onto pre-operculum (Fig.6). . . . . Anchoa  
(subgenus Anchovietta)

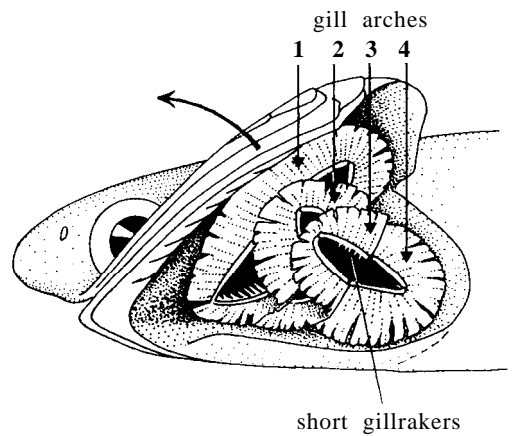
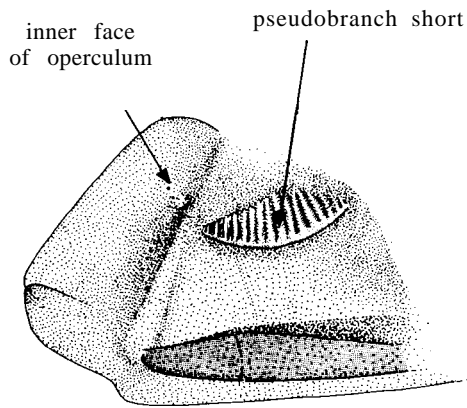


Fig. 2



gill cover seen from inside Fig. 3

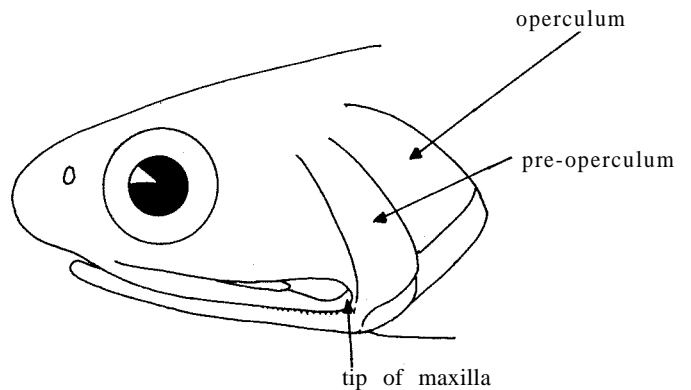
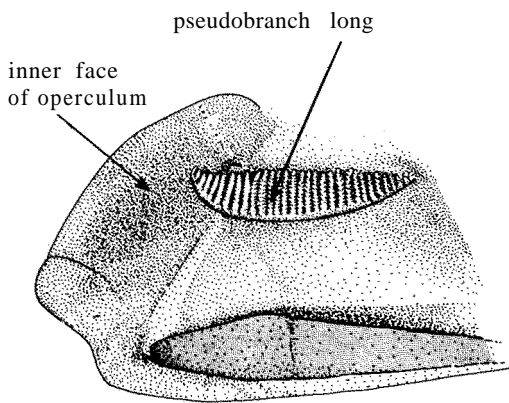


Fig. 4



inner face of gill cover

Fig. 5

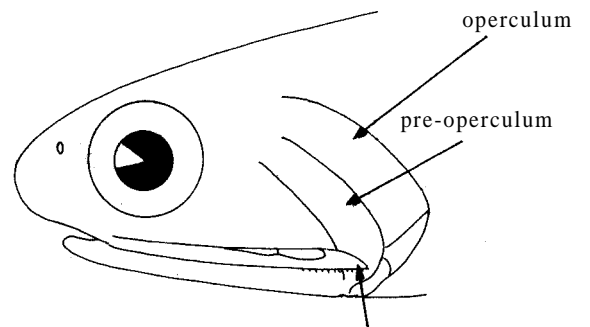


Fig. 6

6b. Maxilla tip blunt, not reaching onto pre-operculum (Fig.7). . . . . **Engraulis** (encrasicolus group)

4b. No gillrakers on hind face of 3rd epibranchial (Fig.8)

7a. Pseudobranch longer than eye, reaching onto inner face of operculum

8a. Western South Atlantic . . . . . **Engraulis** (anchoita only)

8b. Eastern South Pacific. . . . . **Engraulis** (rigens only)

7b. Pseudobranch shorter than eye

9a. Eastern North Pacific. . . . . **Engraulis** (mordax only)

9b. Amazon system. . . . . **Jurengraulis** gen.nov.

3b. Anal fin origin below dorsal fin base, usually well in front of base of last dorsal finray

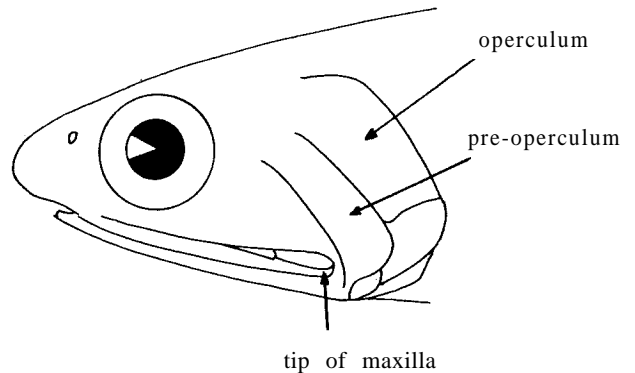
10a. Lower gillrakers 12 to 35; a few short gillrakers on hind face of 3rd epibranchial

11a. Maxilla short, tip blunt, not reaching onto pre-operculum (also Anchoa analis, but branched anal finrays 28 to 34, cf. 10 to 24) . . . . . **Anchoviella** (part, see also 5a above)

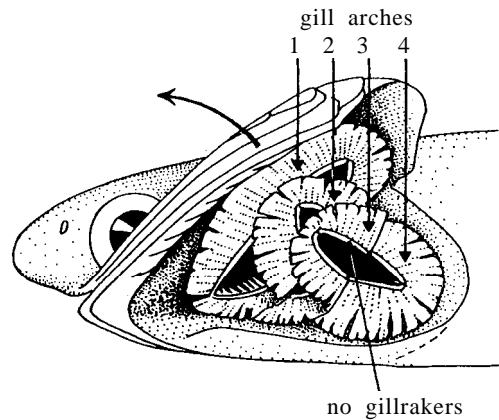
11b. Maxilla long, tip pointed, reaching onto pre-operculum (except in A. analis, see 11a above) . . . . . **Anchoa** (subgenus Anchoa)

10b. Lower gillrakers 45 to 135 (except in juveniles); no gillrakers on hind face of 3rd epibranchial

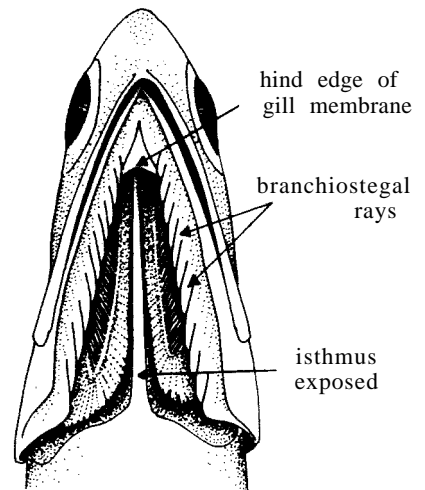
12a. Gill membrane normal, branchiostegal rays 9 or more (Fig.9) . . . . . **Anchovia**



Engraulis (encrasicolus group) **Fig. 7**



**Fig. 8**

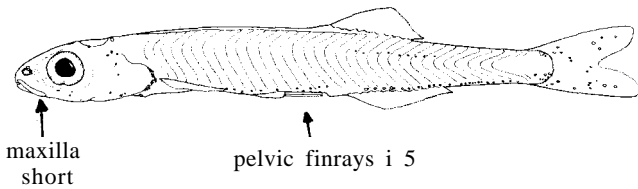


Anchovia **Fig. 9**

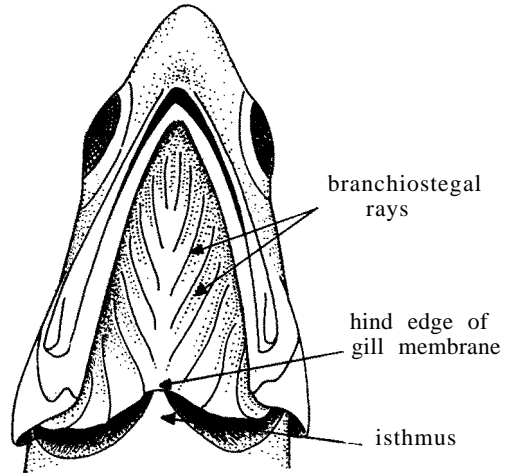
12b. Gill membrane broadly covering isthmus, branchiostegal rays 8 (Fig.10). . Cetengraulis

2b. Jaw teeth enlarged, canine-like in lower jaw . . . . . Lycengraulis

1b. Dorsal fin origin well behind anal fin origin, Well behind midpoint of body . . . . . Pterengraulis



Amazonsprattus Fig.11



Cetengraulis Fig.10

**B. Old World Genera**

1a. Body normal, not greatly tapering and “rat-tailed”, caudal fin large, forked (Fig.12) and anal fin not joined to caudal fin; upper pectoral finrays not detached from each other

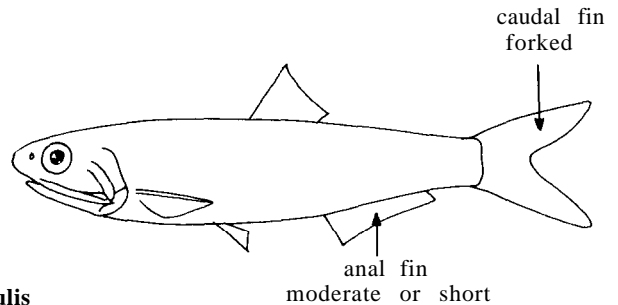
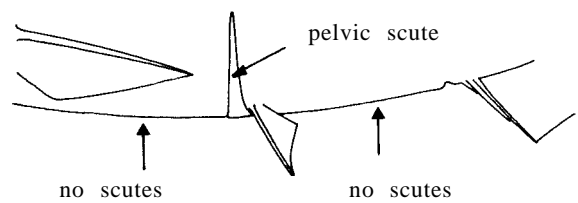


Fig.12

2a. No pre- or post-pelvic scutes (Fig.13); also, body somewhat cylindrical, little compressed. . . . . Engraulis

2b. Pre-pelvic scutes present, often also post-pelvic scutes and a spine-like scute before dorsal fin

3a. Pre-pelvic scutes only, needle-like (Fig.14) (but sometimes absent in the Hawaiian Encrasicholina purpurea); anal fin short, with less than 25 fin-rays



Engraulis Fig.13



needle-like pre-pelvic scutes

Encrasicholina, Stolephorus Fig.14

- 4a. Isthmus muscle not reaching forward to hind edge of gill membrane, the urohyal exposed (Fig. 15a) . . . . . **Encrasicholina**
- 4b. Isthmus to and beyond gill membrane (Fig.15b) . . . . . **Stolephorus**
- 3b. Post-pelvic as well as pre-pelvic scutes present (Fig.16); anal fin long, 27 to 81 finrays
- 5a. Teeth normal (small or minute)
- 6a. Upper pectoral finray not extended as a filament
- 7a. Dorsal fin normal, at least 12 finrays; post-pelvic scutes strong, sharply keeled . . . . . **Thryssa**
- 7b. Dorsal fin minute, only 5 or 6 finrays; post-pelvic scutes membranous, hidden by scales . . . . . **Papuengraulis**
- 6b. Upper pectoral finray a filament; a single supra-maxilla (Fig.17) . . . . . **Setipinna**
- 5b. Teeth in jaws canine-like (Fig. 18) . . . . . **Lycotrissa**
- 1b. Body tapering, "rat-tailed", caudal fin small, rhomboid; 5 to 19 upper pectoral finrays unbranched and free from each other (Fig.19) . . . . . **Coilia**

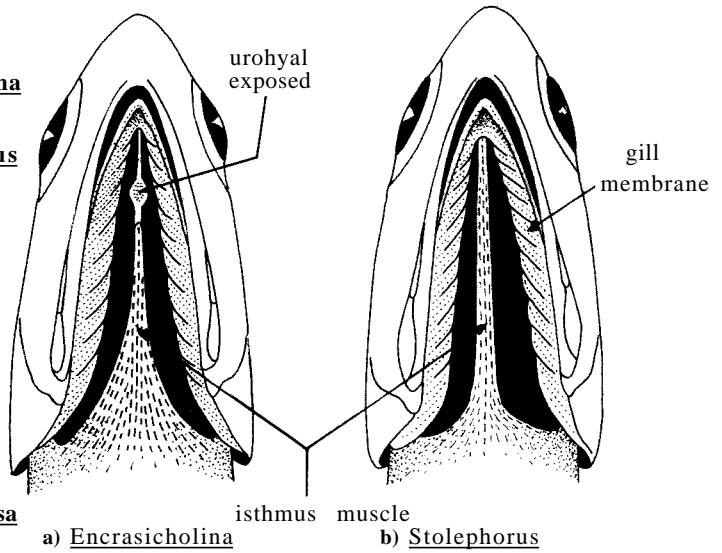
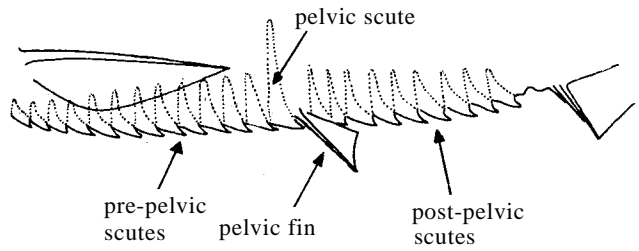
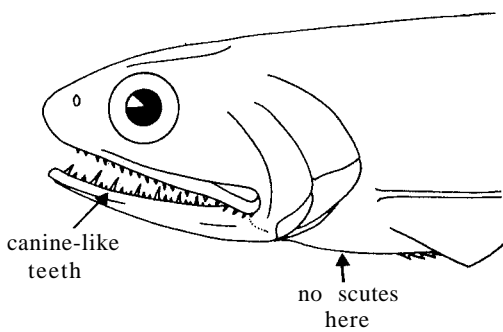


Fig.15



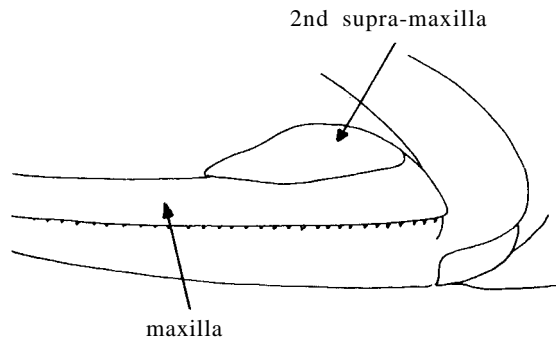
Thryssa, etc.

Fig.16



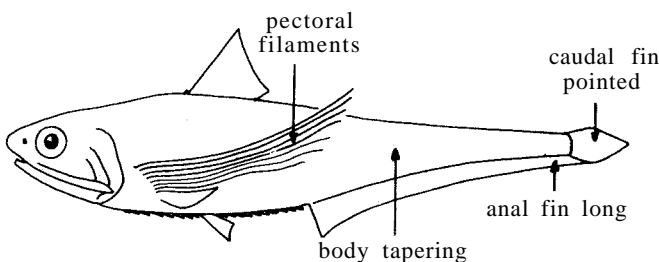
Lycotrissa

Fig.18



Setipinna

Fig.17



Coilia

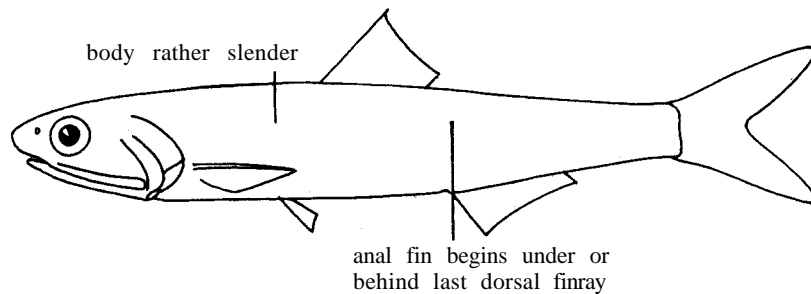
Fig.19

**Engraulis** Cuvier, 1816

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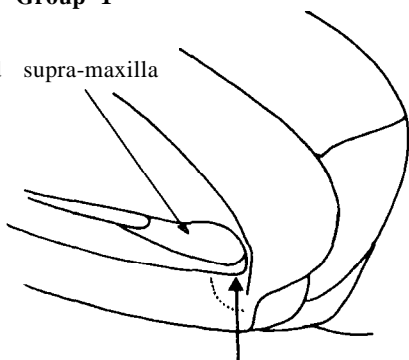
*Engraulis* Cuvier, 1816, *Règne animal*, 1st ed., 2:174 (type: *Clupea encrasicolus* Linnaeus). *Engraulis* Bosc, 1816, *Nouv.dict.hist.nat.* (nouv.ed.), 1:493 (on *Engraulis* Cuvier, MS, no type). *Encrasicolus* Fleming, 1828, *Hist.Brit.anim.*:183 (type: *Clupea encrasicolus* Linnaeus; corrigenda states "for *Encrasicolus* read *Engraulis*"; for Lacepède's use of *Encrasicolus*, see Whitehead, 1967a:136). *Alpismaris* Swainson, 1838, *Nat.hist.anim.*, 1:90 (as a subgenus of *Engraulis*, name only, two Mediterranean species, not named). *Austranchovia* Whitley, 1931, *Aust.Zool.*, 6:311 (type: *Atherina australis* Shaw).

**Diagnostic Features** : Moderate, rather round-bodied anchovies (to 20 cm standard length, usually about 12 to 15 cm), oval in cross-section and little compressed. Snout pointed and prominent; maxilla short, just reaching to front margin of pre-operculum, tip blunt, barely extending beyond tip of second supra-maxilla (but somewhat pointed in *anchoita*, *ringens* and *mordax* and reaching well onto pre-operculum in *mordax*); fine teeth on lower jaw; gillrakers slender and numerous (lower gillrakers 27 to 45); gillrakers present on posterior face of third epibranchial (except *anchoita*, *mordax*, *ringens*). Pseudobranch longer than eye and reaching onto inner face of operculum (except *mordax*). Dorsal fin origin at about midpoint of body; anal fin short, with iii 13 to 20 finrays, its origin under base of last dorsal finray or somewhat behind.



**Group 1**

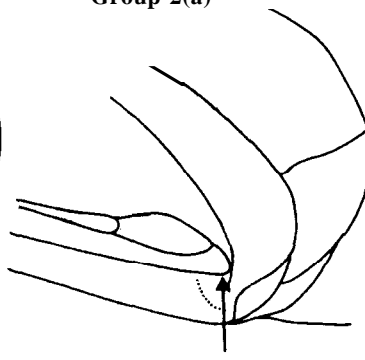
2nd supra-maxilla



maxilla tip rounded

*E. encrasicolus*, etc.

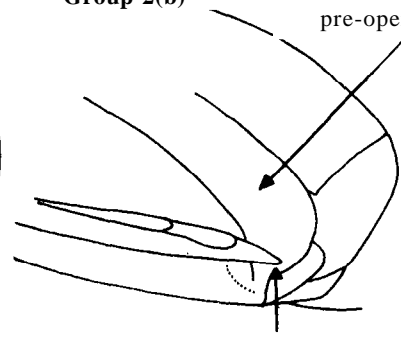
**Group 2(a)**



tip short, pointed

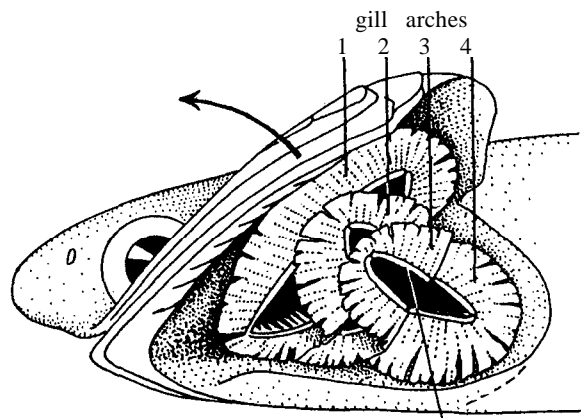
*E. anchoita*  
*E. ringens*

**Group 2(b)**



tip long, pointed

*E. mordax*



short gillrakers on hind face of 3rd epibranchial  
(*E. encrasicolus*, etc.)

**Biology, Habitat and Distribution** : Marine, but in some cases entering estuaries and tolerating salinities down to only 5‰; virtually worldwide, in tropical as well as temperate waters. Mainly filter-feeders, but also 'pecking' at small planktonic organisms. Forming large or in some cases enormous schools which support important fisheries. Except in the Western Atlantic, those in temperate water occur with a species of Sardina or Sardinops whose abundance seems to vary inversely with that of the anchovy, the two presumably competing for food (at least at some stage in their life history).

**Species** : Careful revisionary work may show that the five members of the encrasicolus-group (encrasicolus, eurystole, capensis, japonicus, australis) are a single species; the differences between them appear to be slight and overlapping. The three New World species (anchoita of the Atlantic, mordax and ringens of the Pacific) differ in important characters, which would justify recognition of a distinct subgenus were it not that mordax shows further departures that bring it close to the subgenus Anchoiella of Anchoa (see Remarks under E. mordax). Until such problems can be resolved, 8 species of Engraulis are recognized here:

**Group 1** (lower gillrakers 27 to 43, a few small ones present on hind face of third epibranchial; tip of maxilla blunt, not extending beyond tip of second supra-maxilla; branched anal finrays 13 to 15; pseudobranch longer than eye)

- E. australis (Shaw, 1790) Southern Australia
- E. capensis Gilchrist, 1913 Southern Africa, also western Indian Ocean
- E. encrasicolus (Linnaeus, 1758) Eastern Atlantic
- E. eurystole (Swain & Meek, 1884) Western North and central Atlantic
- E. japonicus Temminck & Schlegel, 1846 Western North and central Pacific

**Group 2** (lower gillrakers 37 to 49, no gillrakers on hind face of third epibranchial; tip of maxilla pointed, extending beyond tip of second supra-maxilla; branched anal finrays 16 to 22)

Subgroup **a** (maxilla short, just reaching to pre-operculum; pseudobranch longer than eye; tip of lower jaw before nostril)

- E. anchoita Hubbs & Marini, 1935 Western South Atlantic
- E. ringens, 1842 Eastern South Pacific

Subgroup **b** (maxilla longer, reaching onto pre-operculum; pseudobranch shorter than eye or just equal to it; tip of lower jaw to below nostril)

- E. mordax Girard, 1856 Eastern North Pacific.

**Engraulis anchoita** Hubbs & Marini, 1935

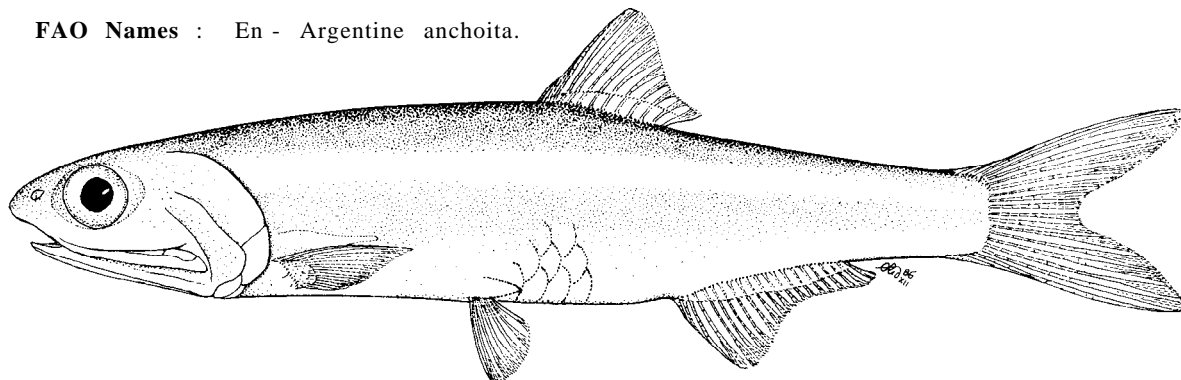
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Engraulis anchoita Hubbs & Marini, in Marini, 1935, Physis B.Aires, 11:448, fig.2 (Mar del Plata, Argentina).

**Synonyms** : Engraulis anchoita-Hildebrand, 1943:18, fig.4 (on the types); Fowler, 1943:311, fig.1 (Punta Jose, Maldonado, Uruguay); Hildebrand & Carvalho, 1948:285 (São Sebastião Island, São Paulo, Brazil); Ciechomski, 1965:6, figs 1-3 (Mar del Plata, eggs); Idem, 1967a:58 (Mar del Plata, synopsis); Idem, 1967b:67 (Mar del Plata, eggs and larvae); Idem, 1967c:72 (Mar del Plata, food); Whitehead, 1973a:89, fig.30b(maxilia)(relationships); Roux, 1973:51 (just southwest of Rio de Janeiro); Weiss, Feijó de Souza & Santos, 1976:12 et seq., figs 2,4,6 (breeding); Weiss & Feijó de Souza, 1977:2 et seq., figs 1-3,5 (larvae); Figueiredo & Menezes, 1978:29, fig.38 (compiled); Stehmann, 1979:62, fig.56 (Argentina); Bellisio, López & Torno, 1979:55, fig.20 (photo) (Argentina, synopsis); Matsuura & Nakatani, 1980:48, fig.4 (off Santos, Brazil; abundance of eggs); Hansen, Cousseau & Gru, 1984:29 et seq., figs 1-7 (Argentina, growth, mortality); Sanchez & Ciechomski, 1984:52 et seq., fig.1 (Argentina, biomass of spawners); Nelson, 1984:425, tabs 1,2 (relationships, anal finrays, vertebrae); Acuña & Castello, 1986:32 (S.Brazil, pop., growth, reprod.).



FAO Names : En - Argentine anchoita.

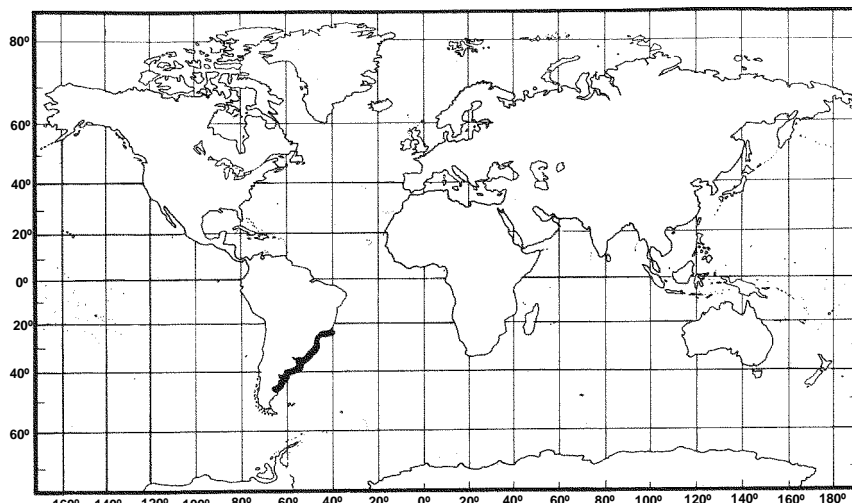


**Diagnostic Features** : Body slender, oval in cross-section, its depth about 5.5 times or more in standard length. Snout prominent, pointed, about 3/4 eye diameter; maxilla moderate, tip bluntly tapering or a little rounded, reaching to front margin of pre-operculum, extending a little beyond tip of second supra-maxilla; teeth in jaws small, numerous. Lower gillrakers 38 to 45, long and slender; no gillrakers on hind face of third epibranchial; pseudobranch long, reaching onto inner face of operculum. Anal fin short, with iii 17 to 20 finrays, its origin a little behind base of last dorsal finray. A broad silver stripe along flank, disappearing in adults. *Anchoa marinii* also has a long pseudobranch and just overlaps in anal finray count, but anal fin origin below midpoint of dorsal fin base; *A. filifera* and *A. lyolepis* have a long pseudobranch and a posterior anal fin origin, but like *A. marinii* have a longer and more sharply pointed maxilla (to or almost to hind border of pre-operculum); also, no species of *Anchoa* has more than 30 lower gillrakers.

#### Geographical Distribution :

Western South Atlantic (from a little north of Rio de Janeiro at 22°S to San Jorge Gulf, Argentina, at about 47°S).

**Habitat and Biology** : Marine, pelagic, coastal and to about 800 km or more from the shore; forming dense schools at about 30 to 90 m depth in summer off Argentina, but down to 100 to 200 m depth in winter (Bellisio, López & Torno, 1979:56). Feeds as juveniles on zooplankton (copepods, their eggs and larvae, especially calanoids), but with phytoplankton becoming increasingly important. Spawns throughout year, most intensely and close to shore in October/November and again but more offshore and less intensely in May/June (distinct spring and autumn spawners proposed by Fuster de Plaza, 1964; situation perhaps more complex according to Ciechomski, 1967a). Schools around southern Uruguay and northern Argentina move offshore toward the end of the year and northward in March to June, moving south again and close to shore in August to October.



**Size** : Reported to reach 22 cm total length, i.e., about 17 cm standard length.

**Interest to Fisheries** : Mainly exploited seasonally by small Argentinian fishing boats over the shelf, chiefly during the migration period September to October. The total reported catch for 1982 was 10 137 t, but according to Bellisio, López & Torno (1979:57) the annual sustainable catch could be increased to between 786 000 and 1 180 000 t. Some consumed fresh, the rest canned.

**Local Names** : ARGENTINA: Anchoita.

**Literature** : Ciechomski (1967a,b,c - a good synopsis, with some detailed information on breeding and feeding, also a number of further references to earlier work), Bellisio, Lopez & Torno (1979 - synopsis), Acuña & Castello (1986 - good summary of literature).

**Remarks** : The relationship of this species to 'true' *Engraulis* (*E. encrasicolus*, *E. eurystole*, etc.) or to the Pacific species (*E. ringens*, *E. mordax*) is not yet clear. Unlike *Clupea* which is confined to the Northern Hemisphere and is 'replaced' by *Strangomera* in the southern Hemisphere (eastern South Pacific), *Engraulis encrasicolus* and related species occur in the Southern Hemisphere (African and Australian waters), thus it is surprising to see *E. anchoita* 'replacing' the 'true' *Engraulis* in the South Atlantic. This seems to argue that its real affinities are with the eastern Pacific *E. ringens* and *E. mordax*.

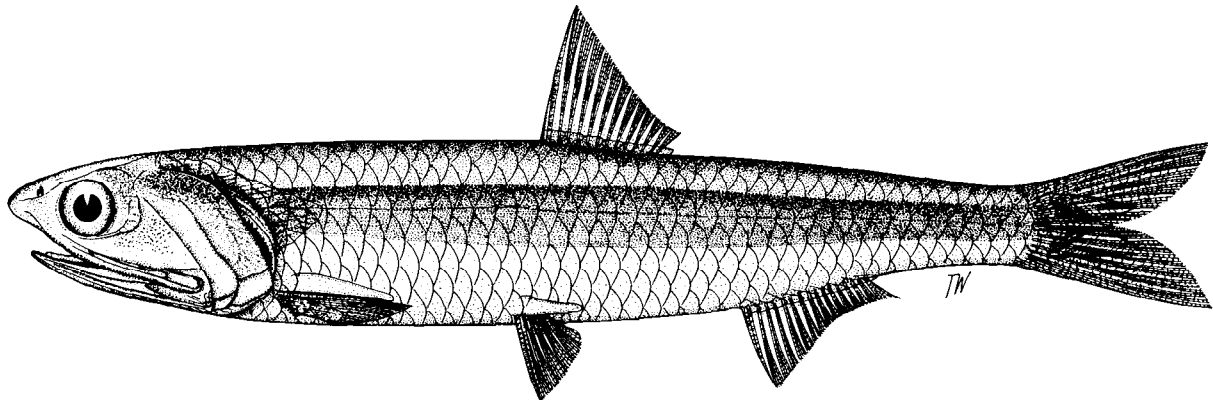
**Engraulis australis** (Shaw, 1790)

ENGR Engr 2

Atherina australis Shaw, 1790, in White's Voy.N.S.Wales:296, pl.1.64, fig.1 (New South Wales).

**Synonyms** : Engraulis encrasicolus var. antipodum Günther, 1868:386 (Van Diemen's Land and New Zealand); Engraulis antipodum:Jordan & Seale, 1926:382 Victoria, Australia); Engraulis antarcticus Castelnau, 1872:186 (Melbourne); Engraulis australis-Blackburn, 1950:4 et seq., (biology; fraseri subsp.nov., W. Australia); Ogilby, 1954:5, fig.4 (Queensland); Munro, 1956:26, fig.182 (Australia, synopsis; subspecies australis, antipodum, fraseri); Scott, Glover & Southcott, 1974:72, fig. (South Australia, as subspecies antipodum ; Grant, 1978:92, fig. (on Munro); Ayling, 1982:105, fig. (New Zealand, synopsis); Hutchins & Thompson, 1983:18, fig.56 (southwestern Australia); Last, Scott & Talbot, 1983:174, fig.13.4 (Tasmania, synopsis); Whitehead & Bauchot, 1986:31 (types of antarcticus).

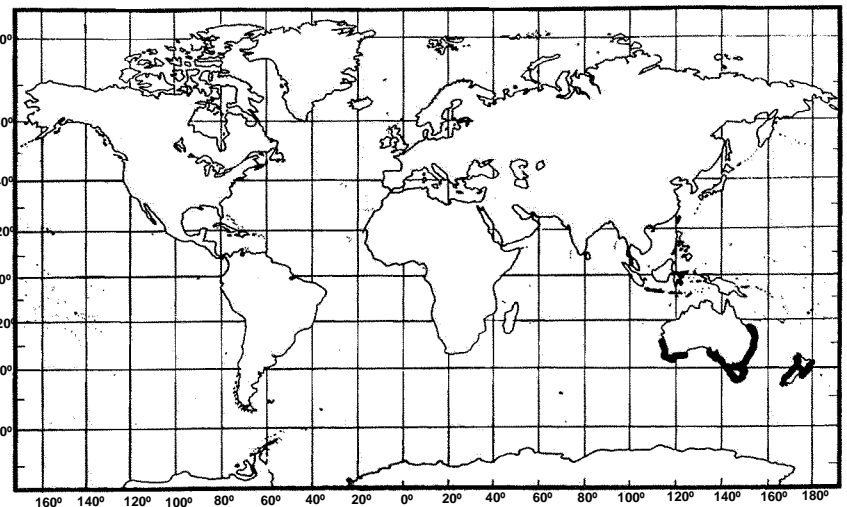
**FAO Names** : En - Australian anchovy.



**Diagnostic Features** : Hardly differs from the European anchovy (E. encrasicolus) and can be identified from that description. For most of its range it is the only anchovy present, but in the extreme north it may overlap with species of Encrasicolina or Stolephorus, which have small needle-like scutes before the pelvic fins; species of Thryssa have compressed bodies and a keel of scutes along the belly.

**Geographical Distribution** :

Southern Australia (from Queensland at about Cape Capricorn south to southern Tasmania; entire southern coast of Australia (except for Great Australian Bight) and north to about Red Bluff, Western Australia), also New Zealand (most of the North Island and all but the southeast coast of the South Island, where it appears to be replaced by Sprattus).



**Habitat and Biology** : Marine, pelagic, mostly inshore, forming compact schools (much preyed upon by larger fishes, common dolphins and birds); chiefly found in bays, inlets and estuaries, sometimes in lowered salinities, but older fishes tending to move out to sea in winter and back in the spring. Feeds on plankton. Spawns in inlets, bays and also estuaries, probably throughout the year but mainly in late spring to early autumn and especially in the warm summer months (about November to February); eggs ellipsoidal.

**Size** : Perhaps to as much as 14 cm standard length, but usually to 8 to 12 cm.

**Interest to Fisheries** : In Australia, mainly exploited in Victoria (especially in Port Phillip Bay), in earlier times chiefly as a baitfish for anglers and caught by liftnet; after 1946 caught in greater quantities by beach seine and used for fish paste, but never a large fishery. No special fishery in New Zealand. Catches not recorded by FAO and probably rarely more than about 100 t.

**Local Names** : AUSTRALIA and NEW ZEALAND: anchovy, Australian anchovy.