19 Aspects of taxonomy and life history traits of engraulids in the context of biodiversity conservation and fisheries management

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Engraulids are a major small pelagic resource abundant in the tropical and temperate seas of the world. The prominent snout which is characteristic of this family carries a unique organ called the "rostral organ". They are small, silvery coloured small pelagics with more than 16 genera and 139 species identified worldwide (Nelsen, 1984) of which 4 genera namely, Anchoa (35 species), *Anchoviella* (15 species), *Stolephorus* (19 species) and *Thryssa* (25 species) constitute the majority of species. They form a major fishery resource in the coastal fisheries of the Indian EEZ. In 2013 the dominant group among anchovies contributing to commercial fisheries were the whitebaits with an estimated 69500 t landed, followed by the other anchovies such as *Thryssa* (42000 t), *Coilia* (30767 t) and *Setipinna* (8507 t). Correct identification of fishes, their eggs and larvae are thus crucial in fisheries management.

Classification

Class: Actinopterygii
Order Clupeiformes
Suborder Clupeoidei
Family: Engraulidae

Diagnostic characters: A characteristic projecting upper jaw and a slender lower jaw extending well behind eye and giving it a "pig snout" appearance, a single short-based dorsal fin at about mid-body, pectoral fins low on the sides, abdominal pelvic fins originating before or below the dorsal-fin base, a forked tail (except in rattail anchovy *Coilia*) and a wide silvery stripe along the mid-sides. The body has no lateral line and is covered in smooth, often weakly attached cycloid scales.

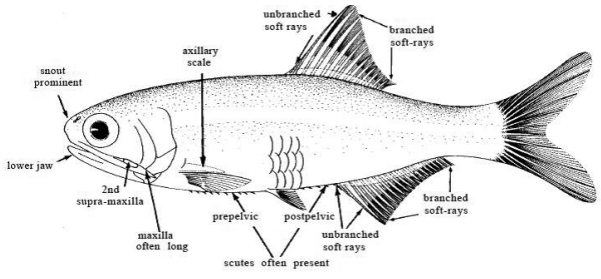


Fig. 1 A typical engraulid fish

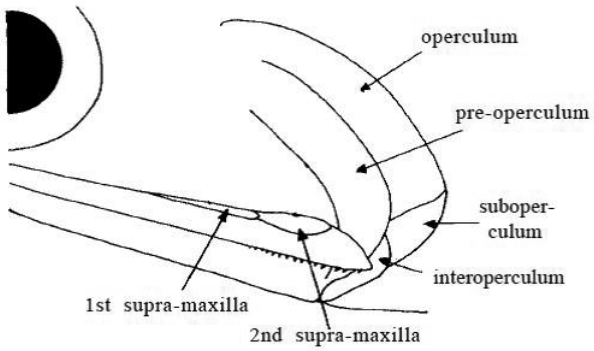


Fig. 2. An enlarged view of typical head region of engraulids

5 genera of engraulids occur in the Indian seas which include the whitebaits (*Encrasicholina, Stolephorus*), and other anchovies (*Setipinna*, *Thryssa* and *Coilia*). Some of the differentiating characters among the genera are as follows

Encrasicholina: Needle like scutes in the pre-pelvic region only; isthmus not reaching hind border of gill membrane and urohyal exposed

Stolephorus: Needle like scutes in the pre-pelvic region only; isthmus reaching hind border of gill membrane and urohyal not exposed

Thryssa: one spine like predorsal scute; keeled scutes on abdomen and present from before pectoral fin base to anus; first pectoral fin ray normal and not filamentous; anal fin long

Setipinna : one spine like pre dorsal scute; all scutes in abdominal region keeled, only the first pectoral fin ray filamentous; only 2nd supramaxilla present

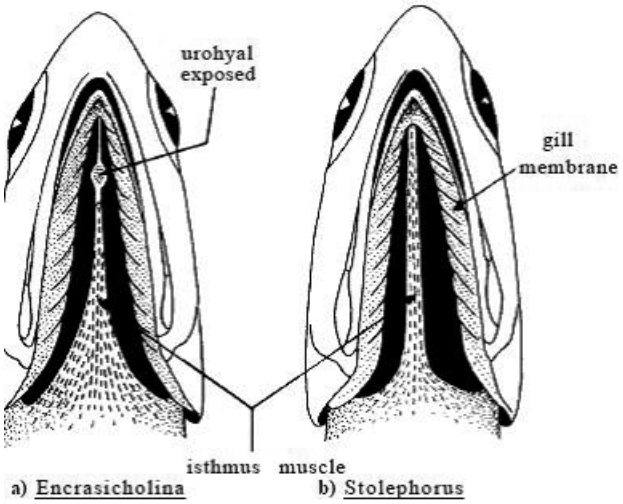


Fig. 3: Distinguishing among the whitebait genera based on the urohyal exposure

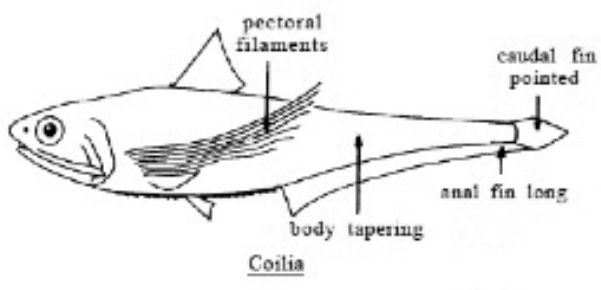
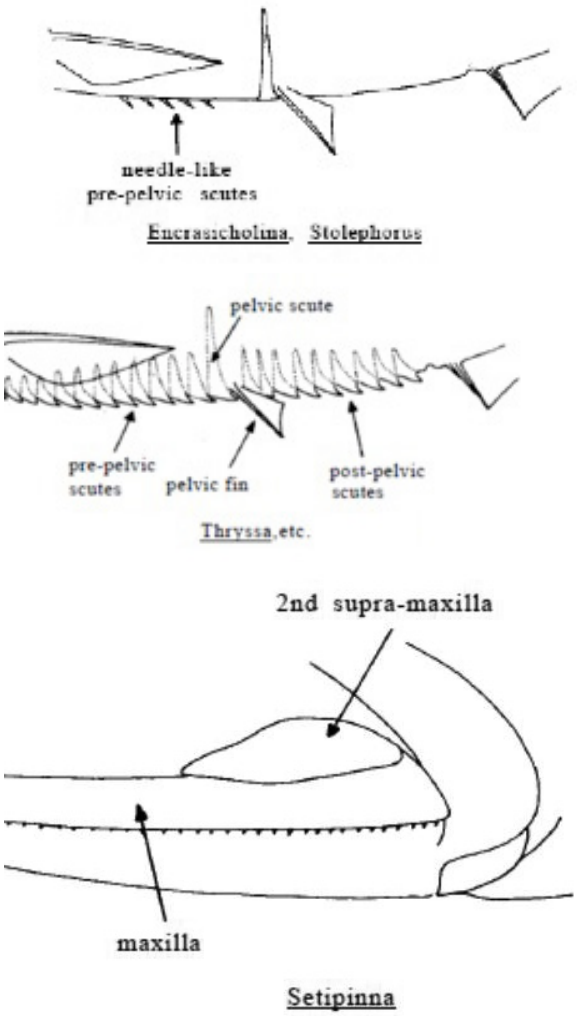


Fig. 4. Some distinguishing caharacters of various engraulids in the Indian seas : whitebaits (genera *Stolephorus* and *Encrasicholina*); *Thryssa*, *Setipinna* and *Coilia*

Coilia: body tapering to a slender tail, very small caudal fin that is not forked with anal fin joined to caudal fin, dorsal fin far in in front of the body; Upper pectoral fin rays (4- 7) filamentous

Among white baits, the shape and length of the 2 supramaxilla, number of pre-pelvic scutes etc are the major distinguishing characters among species as illustrated in the figures below.



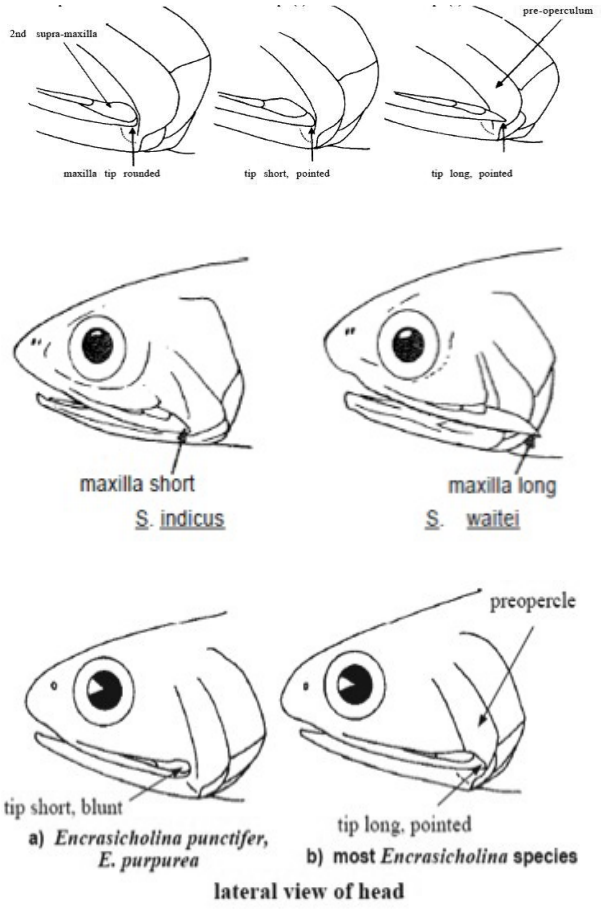


Fig. 5. Shape and length of maxilla in whitebaits used in species identification

Among *Thryssa* species the distinction is usually made based on the combination of characters such as length of the maxilla (which may either reach the pre opercular border, upto gill opening or to the pectoral fin base and in some even to the pelvic fin base); those with or without first supramaxilla and the level of tip of snout with a line drawn through mid-eye. In most *Thryssa* species the first supramaxilla is minute or lost while the second supramaxilla is prominent.

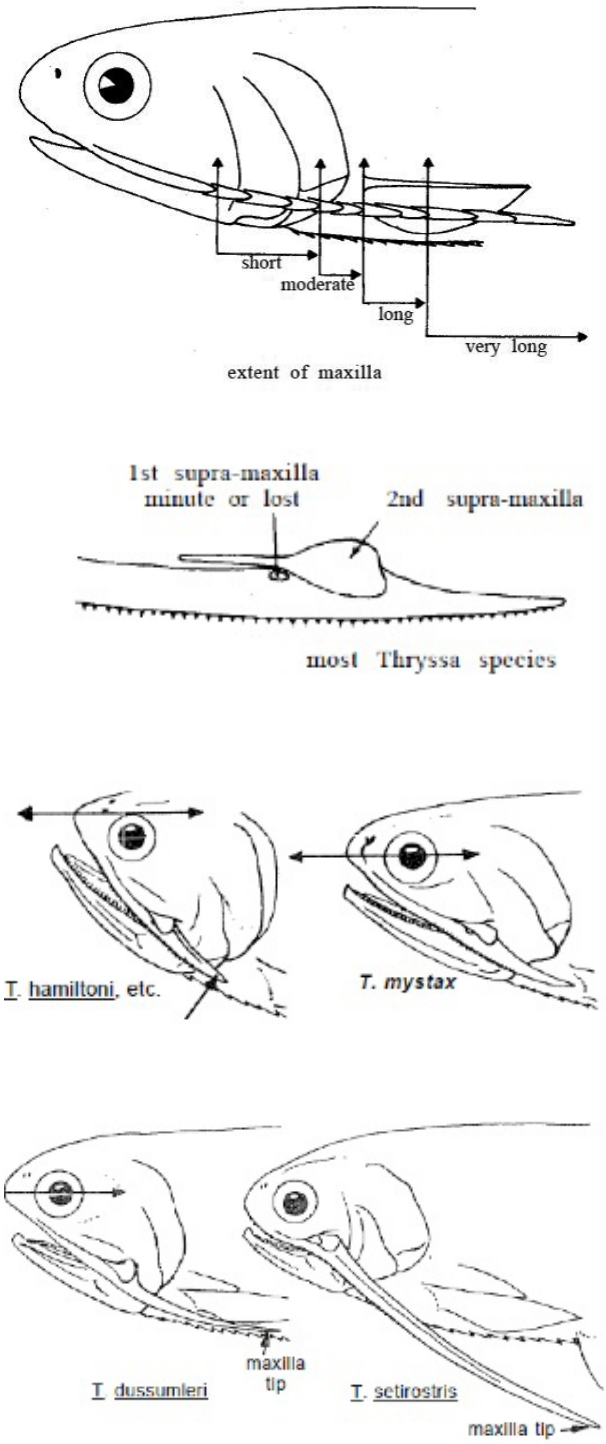


Fig.6 Identifying characters for *Thryssa* species

Fig 7A. Thryssa species (from top to bottom): *Thryssa malabarica, T.mystax, T.hamiltoniii*

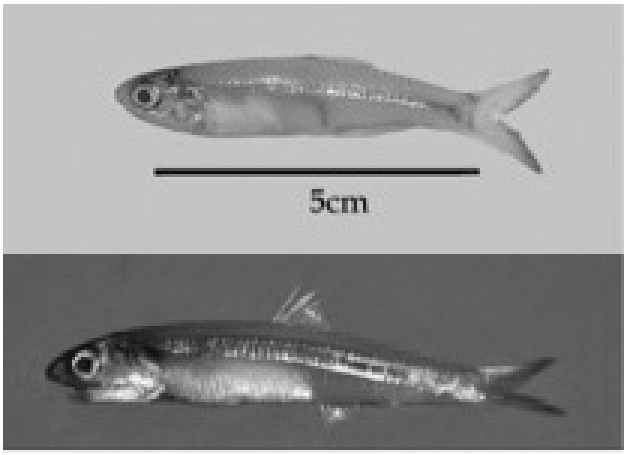


Fig. 8. Whitebaits S.*commersonii, E. punctifer* (= S.buccaneeri),

Species of whitebaits occurring in the Indian seas include *Encrasicholina devisi, E.heterolobus, E.punctifer (= Stolephorus buccaneeri), S.andhraensis, S.baganensis (= S.macrops), S. commersonii, S.indicus, S.insularis and S.waitei (= S.bataviensis)*. The Golden anchovy *Coilia dussumieri* is a major fishery resource on the northwest coast of India and to a lesser extent on the north east coast also. The *Setipinnna* species (*S. taty* and *S. tenuifilis*) are more common in the coastal seas and the Hoogly estuary of the northeast coast. The other anchovies such as *Thryssa mystax, T. malabarica T. dussumieri* and *T. setirostris* also are of fishery importance and have a more wide distribution along the Indian coast.

Exploring the phylogenetic relationships Grande and Nelson (1985) revised the family engraulidae dividing into two clades. The first clade family Coliidae comprises 6 indo-Pacific genera *(Coilia, Lycothrissa, Papuengraulis, Setipinna,*

Thryssa and Thrissina (currently synonym of *Thryssa*) and the second clade comprising the Indo-Pacific marine genera (*Encrasicholina* and *Stolephorus*; worldwide temperate water genus *Engraulis*; the New World anchovies comprising genera *Anchoa, Anchoviella*, *Anchovia, Cetengraulis, Jurengraulis, Lycengraulis* and *Pterengraulis*. According to them, *Stolephorus* diverged first followed by *Encrasicholina*, new world anchovies and *Engraulis*.

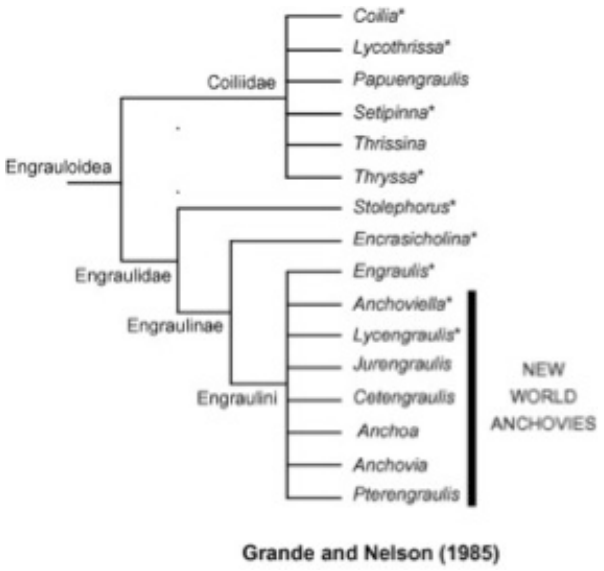


Fig. . Phylogenetic relationships in Engraulidae

The seasonal movement of whitebaits along the southwest and southeast coast of India is related to water currents with shoals moving southwards starting in April and culminating by June- July when they concentrate in huge dense shoals in the Gulf of Mannar region. After the monsoon season these shoals again disperse and migrate northwards towards north Kerala and Karnataka coasts. Current patterns play an important role in their distribution as noted by the presence of warm temperate water species like *Engraulis capensis* off Northern Madgascar and Seychelles and the "Lessespian migration" recorded for *Stolephorus insularis* in the Mediterranean (Rass, 1973; Fricke et al., 2012). Being small sized species with high turnover rates and distribution affected by environmental factors they are also considered as indicator species of climate change phenomenon which makes studying their distribution and abundance patterns on large scales both spatially and temporally, interesting.

Suggested reading

Young et al., 1994. A revision of the family Engraulida (Pisces) from Taiwan. *Zoological Studies* 33(3): 217 – 227.

Rass, T.S. 1973. Some features in the biogeography of the ichthyofauna of the Indian Ocean. *J. Mar. Biol. Ass. India Spl. Publn* dedicated to Dr. N.K. Panikkar, p. 250 – 254.

Fricke et al., 2012. First record of the Indian Ocean anchovy *Stolephorus insularis* Hardenberg 1933 (Clupeiformes Engraulidae) in the Mediterranean. *Bioinvasion Reords* 1 (4): 303 – 306.

Lavoue et al., 2007. Phylogenetic relationships among anchovies, sardines, herrings and their relations (clupeiformes) inferred from mitogenomic sequences. *Mol. Phylogenet. Evol.*, 43: 1096 – 1105.