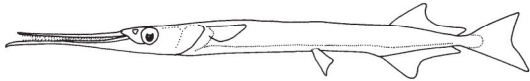


KEY TO FAMILIES

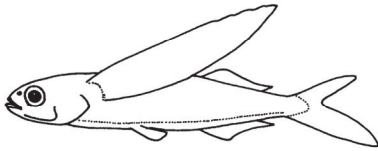
- 3a Dorsal and anal fins each followed by 4–6 separate finlets; jaws subequal to or shorter than head as measured from the corner of mouth **SCOMBERESOCIDAE**



- 3b No finlets behind dorsal and anal fins; jaws longer than head as measured from the corner of mouth **BELONIDAE**

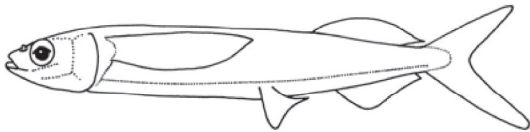
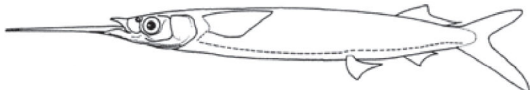


- 4a Jaws not elongate or projecting forward from snout; pectoral fins longer than head **EXOCOETIDAE**



- 4b Lower jaw elongate (except in adult *Oxyporhampus*) and upper jaw triangular, projecting forward from snout; pectoral fins shorter than head as measured from the tip of upper jaw (except in *Euleptorhampus*) 5

- 5a Nasal papilla rounded or fan-shaped, mostly confined to nasal fossa; caudal fin emarginate or forked; anal-fin rays of males not modified **HEMIRAMPHIDAE**



- 5b Nasal papilla elongate and pointed, extending well out of nasal fossa; caudal fin rounded or truncate; some anal-fin rays of males modified, may be greatly elongate **ZENARCHOPTERIDAE**



GLOSSARY

- adductor mandibulae** – main muscle that closes the jaw.
afferent circulation – taking blood to an organ.
cyprinodontiforms – an order of small, mostly freshwater fishes.
dorsal hypohyal, interhyal, epibranchials, ceratobranchials and pharyngobranchial – bones of the pharyngeal arch.
efferent circulation – taking blood from an organ.
interarcual cartilage – a cartilage in the pharyngeal arch.
nasal fossa – the cavity or pit, containing nasal papillae, into which the nostrils open.
parietals, dermosphenotic, ethmoid – bones of the cranium.
pleural rib – the ribs of the ‘rib cage’ around the viscera.
saccus vasculosus – an organ associated with the hypothalamus of many jawed fishes, that seems to be able to sense the seasons.
spermatogonia – cells produced early on in the formation of spermatozoa.
supracleithrum – the dorsalmost bone of the pectoral girdle in bony fishes, usually articulated with the posttemporal bone of the skull.
vegetal pole – the side of an egg opposite to the ‘animal’ pole; cell growth is slower in the vegetal pole which contains more yolk.
zona pellucida or chorion – the layer of tissue surrounding an oocyte, egg, or embryo.

FAMILY **ADRIANICHTHYIDAE**

Ricefishes

Lynne R Parenti

Tiny to small-sized (~2–19 cm SL) with laterally compressed body. Eyes moderate to relatively large. Mouth terminal, small to large, not protrusile. Teeth small, unicuspid, in single or multiple rows on premaxilla and dentary; males and/or females may have several enlarged teeth on distal portion of upper and lower jaws. One soft-rayed dorsal fin, set posteriorly; pectoral fins falcate, set relatively high on sides; caudal fin rounded, truncate or lanceolate, forming incipient lobes. Dorsal- and anal-fin rays of males longer and thicker than those of females, and often with bony tubercles (contact organs) on distal segments of anal-fin rays, and anal-fin rays form gonopodium in males of one species. Scales small to moderate, cycloid; LSS 24–85; no pored LL scales. Body translucent or transparent in life, sometimes scattered

with tiny melanophores concentrated at pectoral-fin bases, and males may be more darkly pigmented than females; typically with dark brown or black line on dorsal surface of head to dorsal-fin origin, midlateral black line from head to caudal-fin base, black line along anal-fin base, and black submarginal line on dorsal and ventral portion of caudal fin.

Surface-feeding, schooling, and mostly lacustrine in fresh and brackish waters. Omnivorous, yet feed principally on copepods, insect larvae, small molluscs and crustaceans. Oviparous with internal or external fertilisation; females may carry a cluster of fertilised eggs near urogenital opening prior to depositing eggs on foliage. Of limited importance in the aquarium trade. One species, *Oryzias latipes* (Temminck & Schlegel 1846), is widely used in experimental biology. Two genera and ~37 species; 1 genus and 3 species in WIO.

GENUS *Oryzias* Jordan & Snyder 1906

Body slender to deep, laterally compressed, often translucent in life. Eyes moderate to relatively large, and orbits meet dorsal surface of head. Dorsal surface of head slightly convex just anterior to eyes. Anal fin with 13–32 rays, and males may have bony contact organs (tubercles) on distal segments of rays; first 6 anal-fin rays form a gonopodium in males of one species. Both pelvic fins present in males; right pelvic fin absent in females of one species. Maxilla present or absent. Total vertebrae ≤34. Attain <6 cm SL. Inhabit principally brackish waters, estuaries and mangroves. About 33 species, 3 in WIO. *Oryzias carnaticus* and *O. dancena* have been confused in the literature and have been referred to *O. melastigma*, a junior synonym of the latter, as demonstrated by Roberts (1998). *Oryzias setnai* had been known since its description as *Horaichthys setnai*; the new combination was published in a phylogenetic analysis and taxonomic revision of the family by Parenti (2008), on which the following accounts are based.

KEY TO SPECIES

- 1a Body deep, laterally compressed, translucent in life; anal fin 19–24 rays; anal-fin rays of males may have bony contact organs on distal portion, but rays not forming gonopodium; males and females with both pelvic fins; maxilla present 2
- 1b Body slender, elongate, nearly transparent in life; anal fin 27–32 rays; first 6 rays of males elaborate and elongate, separated from rest of anal fin as gonopodium, but no bony contact organs on distal portion of rays; males with both pelvic fins, females with left pelvic fin only; maxilla absent *O. setnai*

Continued ...

KEY TO SPECIES

- 2a Moderately deep-bodied, body depth at least 3.5 in SL; pectoral fins 11–13 rays; upper jaw with strongly convex upper margin and no dark brown to black outline or median notch; if present, broad mid-dorsal stripe not well-defined; females with enlarged teeth on posterior portion of premaxilla; vertebrae 28–30 *O. carnaticus*
- 2b Very deep-bodied, body depth <3 in SL; pectoral fins 10 or 11 rays; upper jaw with nearly straight or slightly convex transverse margin with dark brown or black outline, and some specimens with median notch; broad dark brown to black mid-dorsal stripe from occiput to dorsal-fin origin; no enlarged teeth on posterior portion of premaxilla in females; vertebrae 28 or 29 *O. dancena*

Oryzias carnaticus (Jerdon 1849)

Spotted ricefish

Aplocheilus carnaticus Jerdon 1849: 331 (river passing by Vaniyambadi, Carnatic region, India).

?*Panchax cyanophthalma* Blyth 1858: 288 (Kolkata market, India).

?*Panchax argenteus* Day 1868: 706 (near Chennai, India); Whitehead & Talwar 1976; Ferraris *et al.* 2000.

?*Haplochilus argenteus*: Day 1873.

Oryzias melastigma: Smith 1938; Herre 1939, 1941; Hubbs 1941;

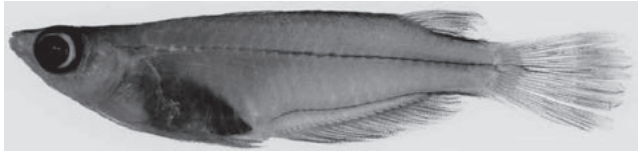
Rosen 1964; Schrey 1978*; Rahman 1989; Pethiyagoda 1991; Talwar & Jhingran 1991; Seegers 1997*.

Oryzias carnaticus: Labhart 1978; Schrey 1978; Roberts 1998; Menon 1999; Parenti 2008*.

Deep-bodied and laterally compressed, body depth at least 3.5 in SL; dorsal body profile relatively straight from head to dorsal-fin origin, ventral body profile somewhat convex from head to anal-fin origin; dorsal fin and anal fin project slightly beyond primary body profile. Dorsal fin 6 or 7 rays; anal fin 21–24 rays; pectoral fins 11–13 rays; pelvic fins 6 rays, innermost rays connected proximally by membrane to body; caudal fin truncate. Mouth terminal; jaws subequal or lower jaw projecting slightly beyond upper jaw. Teeth enlarged on posterior portions of premaxilla and dentary in males, and only on premaxilla in females. Scales relatively large, cycloid; LSS 26–30. Branchiostegal rays 5. Genital papilla short and tubular in males, large and bilobed in females. Males with filamentous dorsal- and anal-fin rays, and anal-fin rays with bony contact organs distally. Vertebrae 28–30.

Body translucent in life. Preserved specimens with diffuse row of faint melanophores on dorsal surface of head to dorsal-fin origin (specimens from Odisha State, India, with small, relatively dense dark brown chromatophores on dorsal surface of head and body sometimes forming small discrete blotches); midlateral black line from head to caudal-fin base

continuing onto caudal-fin membrane of rays just above and below midline; discrete black line along anal-fin base; dorsal- and anal-fin membranes with scattered melanophores; area of black peritoneum subrectangular in females, smaller and subtriangular in males. Attains ~32 mm SL.



Oryzias carnaticus, 27 mm SL, male. © T Britt Griswold

DISTRIBUTION Indian Ocean. WIO: Sri Lanka; elsewhere, east coast of India, Bangladesh and Andaman Is. (probably introduced).

REMARKS Found principally in coastal and brackish waters, but also in freshwater habitats, such as paddy fields and canals.

Oryzias dancena (Hamilton 1822)

Deep-bodied ricefish

PLATE 57

Cyprinus dancena Hamilton 1822: 342, 393 (estuary below Kolkata) [based on an unpublished drawing].

?*Aplocheilus melastigmus* McClelland 1839: 301, 427, Pl. 42, Fig. 3 (Kolkata, India).

Aplocheilus maclellandi Bleeker 1854: 323 (India) [based on McClelland 1839: Pl. 55, Fig. 4, as Hamilton's lost figures of *Cyprinus dancena*]; Bleeker 1860 [as *maclellandi*].

?*Panchax cynaophthalma* Blyth 1858: 288 (Kolkata market, India).

?*Panchax argenteus* Day 1868: 706 (Chennai, India); Whitehead & Talwar 1976; Ferraris *et al.* 2000.

?*Haplochilus argenteus*: Day 1873.

Haplochilus melastigmus: Day 1873.

Haplochilus melastigma: Day 1877; Duncker 1912.

Oryzias melastigma: Smith 1938; Rosen 1964; Schrey 1978*; Rahman 1989; Pethiyagoda 1991*; Talwar & Jhingran 1991; Seegers 1997*; Menon 1999.

Panchax melastigma: Munro 1955.

Oryzias melanostigma: Jayaram 1981.

Oryzias dancena: Roberts 1998*; Parenti 1999, 2005*, 2008*; Magtoon & Termvidchakorn 2009.

Panchax cyanophthalmus: Menon 1999.

Body laterally compressed and relatively deep, body depth ~3 in SL; ventral body profile convex from head to anal-fin origin, especially in larger specimens; dorsal fin and anal fin do not project significantly beyond primary body profile. Dorsal fin 6–8 rays; anal fin 19–24 rays; pectoral fins 10 or 11 rays; pelvic fins 6 rays, innermost rays connected proximally by membrane to body; caudal fin truncate to slightly rounded. Mouth terminal; jaws subequal or lower jaw projecting slightly

beyond upper jaw. Teeth enlarged on posterior portion of premaxilla and dentary in males only. Scales relatively large, cycloid; LSS 25–28. Branchiostegal rays 4 or 5. Genital papilla short and tubular in males, large and single-lobed in females. Males with filamentous dorsal- and anal-fin rays, and anal-fin rays with bony contact organs distally. Vertebrae 28 or 29.

Body translucent in life or may be greyish brown in males, pale brown in females; dorsal-fin margin white; anal-fin margin white distally, with thin bright blue submargin distally. Preserved specimens with discrete row of melanophores on dorsal surface of head to dorsal-fin origin; midlateral black line from head to caudal-fin base continuing onto caudal-fin membrane of rays just above and below midline; faint black line along anal-fin base; dorsal- and anal-fin membranes with scattered melanophores; area of black peritoneum subrectangular in females, smaller and subtriangular in males. Attains ~30 mm SL.

DISTRIBUTION Indian Ocean. WIO: Sri Lanka; elsewhere, east coast of India, Bangladesh, Myanmar and Thailand.

REMARKS Found principally in coastal and brackish waters such as estuaries and mangroves, but also freshwater habitats such as paddy fields.

Oryzias setnai (Kulkarni 1940)

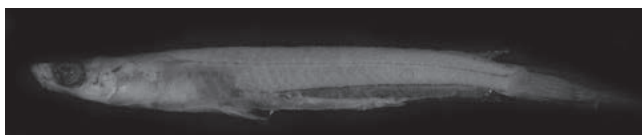
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Horaichthys setnai Kulkarni 1940: 385, Figs. 2–4 (creeks near Mumbai, India); Hubbs 1941; Hubbs & Hubbs 1945; Silas 1959; Rosen 1964; Menon & Yazdani 1968; Parenti 1987; Talwar & Jhingran 1991; Menon 1999; Jayaram 2010; Kottelat 2013.

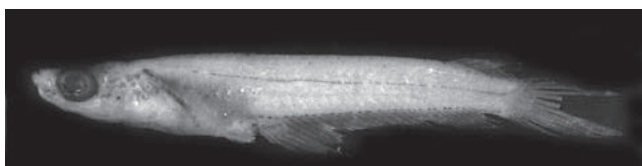
Oryzias setnai: Parenti 2008.

Body elongate, slender, compressed laterally; ventral body profile relatively straight from head to anal-fin origin; dorsal fin and anal fin do not project significantly beyond primary body profile. Dorsal fin 6 or 7 rays; anal fin 27–32 rays; pectoral fins 10 rays; pelvic fins 5 rays, and innermost rays connected proximally by membrane to body; caudal fin with elongate middle rays. Mouth subterminal; lower jaw projecting slightly beyond upper jaw; maxilla absent. Teeth enlarged on posterior portion of premaxilla in both males and females. Scales relatively large, cycloid; LSS 32–34; no pored LL scales. Branchiostegal rays 4. Females bilaterally asymmetrical with only left pelvic bone and pelvic-fin rays, and urogenital opening left of ventral midline in most specimens. Males with first 6 anal-fin rays elaborate and elongate, separated from rest of anal fin as gonopodium, but rays without bony contact organs. Vertebrae 31–34.

Body nearly transparent in life. Preserved specimens with diffuse row of melanophores on dorsal surface of head to dorsal-fin origin; upper jaw, body, and dorsal- and anal-fin membranes scattered with minute melanophores; midlateral black line from head to caudal-fin base continues onto caudal-fin membrane of rays just above and below midline; interrupted, horizontal dark brown bar from eye to tip of the lower jaw in some specimens; faint black line along anal-fin base; urogenital region with dense brown to black spots. Attains ~22 mm SL.



Oryzias setnai, ~20 mm SL, male. SJ Raredon © Smithsonian Institution



Oryzias setnai, ~20 mm SL, female. SJ Raredon © Smithsonian Institution

DISTRIBUTION WIO: India (west coast, from near Gulf of Kutch to Thiruvananthapuram, Kerala).

REMARKS Among the smallest known fish species in India. Transparent, surface-dwelling, in fresh and brackish waters of quiet creeks, backwaters, puddles and stagnant brackish pools. Males produce small encapsulated sperm bundles; females lay eggs after internal fertilisation. Feeds on the larvae of mosquitoes and other insects, as well as crustaceans (including copepods) and diatoms.

GLOSSARY

bony contact organs – in *Oryzias*, dermal bony outgrowths that project from a fin ray, surrounded by epidermis through which the bony outgrowths may protrude.

gonopodium – the modified anal-fin rays of males of certain fishes with internal fertilisation, and is used to transfer sperm bundles or spermatophores to females.

lacustrine – living in lakes.

FAMILY EXOCOETIDAE

Flyingfishes

Iliia B Shakhovskoy and Bruce B Collette

Body elongate, subcylindrical to laterally compressed, and usually flattened ventrally. No fin spines; dorsal and anal fins posterior in position, their bases opposite; pelvic fins abdominal, with 6 rays; pectoral fins enlarged, high on sides, very long, extending past dorsal-fin origin; caudal fin forked, lower lobe longer than upper lobe. Jaws short, upper jaw rounded; teeth very small or absent. Nasal organ a pit with protruding lobate tentacle. Gill rakers well-developed. Lower pharyngeal bones fused; 3rd pair of upper pharyngeal bones not fused. Scales large, cycloid, easily detached. Lateral line along ventral contour of body. Juveniles often with a single or pair of chin barbels, and usually quite unlike adults in colour pattern and relative size of fins. Vertebrae 35–52.

Occur in coastal waters and open ocean as typical members of the epipelagic fish community, in surface waters to ~20 m deep. They tend to emerge rapidly from the water and glide over a fairly long distance by means of their expanded pectoral fins (and also enlarged pelvic fins in ‘four-winged’ species) before dropping back into the sea. The pectoral fins are usually held flat against the body in the water, but are quickly erected and held perpendicular to the body when a fish leaps into the air. Feed mostly on small crustaceans and other planktonic animals; can be attracted to lights at night. Eggs of most species are demersal, with sticky filaments that attach to floating or anchored vegetation; larvae pelagic. Size range 11–38 cm SL. Known in tropical to temperate seas; locally abundant in warm seas and commercially fished and used for food in some areas.

Six or 7 genera (*Cheilopogon* is included in *Cypselurus* by some authors) and 65–70 species; 6 genera and at least 23 species in WIO. Generic classification revised by Parin (1961); western Pacific species were reviewed by Parin (1960, 1961, 1996, 1999), WIO species by Parin (1984), and South African species by Heemstra & Parin (1986).