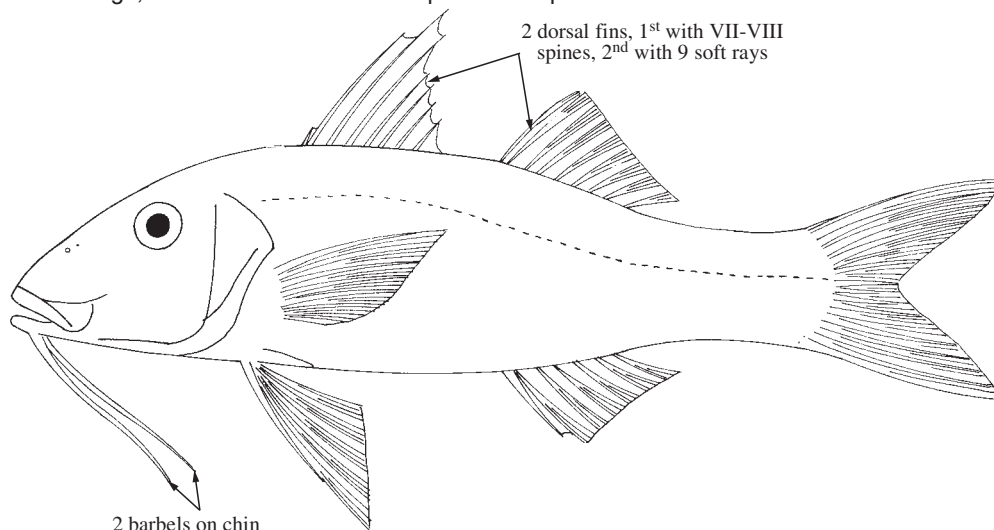


**MULLIDAE****Goatfishes (surmulletts)**

by J.E. Randall

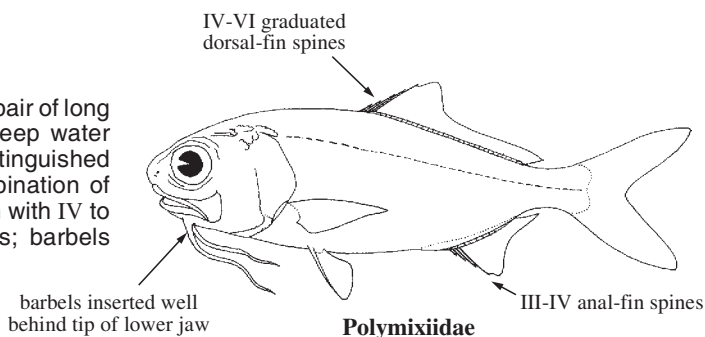
**Diagnostic characters:** Body moderately elongate and somewhat compressed (size to 50 cm). **Two long unbranched barbels on chin**; mouth low on head, the lower jaw inferior, the cleft slightly oblique; dentition variable but teeth conical, either in villiform bands or in 1 or 2 rows, never as enlarged canines (except in adult males of western Atlantic and eastern Pacific species of *Pseudupeneus*, the teeth of which are slightly enlarged). A single flat spine posteriorly on opercle (a second less developed spine may be present); margin of preopercle smooth. **Two well-separated dorsal fins, the first with VII or VIII (usually VIII) slender spines (first spine often very small), the second fin with 9 soft rays (first unbranched); anal fin with I spine and 6 or 7 soft rays; caudal fin deeply forked**, with 13 branched rays; pelvic fins with I spine and 5 soft rays; pectoral fins with 13 to 18 rays. Scales finely ctenoid; head and body completely scaly (except preorbital region of some species of *Upeneus*). Lateral line complete, following contour of back, the pored scales to base of caudal fin 27 to 38. **Colour:** ground colour in preservative usually pale, in life often whitish to light red; most species with distinctive black, brown, red, or yellow markings; median fins often with stripes or oblique bands.



**Habitat, biology, and fisheries:** Most goatfishes inhabit shallow seas. They are usually found on open sand or mud bottoms, at least for feeding (though the species of *Parupeneus* and *Mulloidichthys* are often seen on coral reefs or rocky substrata). The goatfish barbels, with their chemosensory receptors, are actively moved over or into the sediment to find food organisms. Once the prey is located, the fish often roots into the sediment with its snout for the prey. Mullid fishes are carnivorous; they feed on a wide variety of small animals, especially crustaceans and various worms. A few species feed in part on small fishes. The flesh of goatfishes is of good quality and that of some species highly esteemed in certain countries. Most of the catch is marketed fresh. Catch statistics are usually not recorded by individual species. For 1995, the FAO Yearbook of Fishery Statistics reports a total catch of around 44 250 t of Mullidae from the Western Central Pacific.

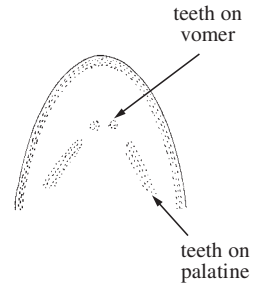
**Similar families occurring in the area**

**Polymixiidae:** the only other family with a pair of long barbels on chin; the species occur in deep water (about 200 to 400 m). They are distinguished from the Mullidae by the following combination of characters: a single, unnotched dorsal fin with IV to VI spines; anal fin with III or IV spines; barbels inserted well behind tip of lower jaw.



**Key to the genera of Mullidae occurring in the area**

- 1a.** No teeth on vomer or palatines . . . . . → **2**
- 1b.** Teeth present on vomer and palatines (Fig. 1) or only on vomer . . . . . → **3**
- 2a.** Teeth in jaws small, in 2 to several rows; lateral-line scales 33 to 39; 5 scale rows between dorsal fins . . . . . *Mulloidichthys*
- 2b.** Teeth in jaws in 1 row, moderately large, bluntly conical, and well spaced; lateral-line scales 27 to 29; 2 or 3 scale rows between dorsal fins . . . . . *Parupeneus*
- 3a.** Teeth on vomer, but none on palatines; no scales basally on second dorsal and anal fins; lateral-line scales 26 to 28 . . . *Upeneichthys*
- 3b.** Teeth on vomer and palatines; small scales basally on second dorsal and anal fins; lateral-line scales 28 to 38 . . . . . *Upeneus*

**Fig. 1****Key to the species of *Mulloidichthys* occurring in the area**

- 1a.** Peritoneum transparent to silvery white; head length 3.2 to 3.6 times in standard length; colour, including fins, red, without any dark or light markings, shading to pale red or whitish ventrally . . . . . *Mulloidichthys pflugeri*  
(Hawaii and Society Islands to Ryukyu and Mascarene islands - all localities insular)
- 1b.** Peritoneum dark brown to black; head length 2.95 to 3.45 times in standard length; body with 1 or more blue or yellow stripes . . . . . → **2**
- 2a.** Lateral-line scales 38 to 39; body depth 3.1 to 3.5 times in standard length; colour yellow, including fins, the body with 5 narrow blue stripes, the upper 4 continuing anteriorly onto head . . . . . *Mulloidichthys mimicus*  
(Marquesas Islands and Line Islands)
- 2b.** Lateral-line scales 33 to 36; body depth 3.4 to 4.8 times in standard length; colour whitish with a yellow stripe on upper side . . . . . → **3**
- 3a.** First gill arch with 18 to 22 gill rakers on lower limb; body depth 3.7 to 4.8 times in standard length; snout length 1.9 to 2.2 times in head length; barbel length 1.4 to 1.65 times in head length; pectoral-fin length 1.45 to 1.7 times in head length; a blackish spot usually present on yellow stripe of body below first dorsal fin; fins whitish to pale yellowish . . . *Mulloidichthys flavolineatus*  
(Indo-Pacific)
- 3b.** First gill arch with 23 to 26 gill rakers on lower limb (for West Pacific specimens; 20 to 25 in Indian Ocean); body depth 3.4 to 4.5 times in standard length; snout length 2 to 2.45 times in head length; barbel length 1.2 to 1.5 times in head length; pectoral-fin length 1.35 to 1.55 times in head length; no black spot in yellow stripe on body; fins yellow . . . . . *Mulloidichthys vanicolensis*  
(Indo-Pacific)

**Key to the species of *Parupeneus* occurring in the area**

- 1a.** A dark brown to dark reddish stripe on upper side of body ending anteriorly on caudal peduncle; a dark spot larger than eye on side of caudal peduncle. . . . . → **2**
- 1b.** No dark stripe on upper side of body; no dark spot on side of peduncle, or if present, not preceded by a dark stripe on body . . . . . → **3**
- 2a.** Pectoral-fin rays 16 to 18 (usually 17); last dorsal- and anal-fin ray equal to or slightly longer than penultimate ray; barbels equal to or shorter than snout plus eye; peduncular dark spot round, centred on lateral line at base of caudal fin; no dark band at base of second dorsal fin . . . . . *Parupeneus barberinus*  
(East Africa to French Polynesia)
- 2b.** Pectoral-fin rays 15 to 17 (usually 16, rarely 17); last dorsal- and anal-fin ray distinctly longer than penultimate ray; barbels very long, much longer than snout plus eye; peduncular dark spot not round, anterior to base of caudal fin, and more above than below lateral line; a blackish band at base of second dorsal fin, continuing to distal end of last ray . . . . . *Parupeneus macronemus*  
(Red Sea and coast of East Africa to Indonesia)

- 3a. Posterior end of maxilla evenly convex (Fig. 2a) . . . . . → 4
- 3b. Posterior end of maxilla oblique, the dorsoposterior corner more acute (Fig. 2b) . . . . . → 5

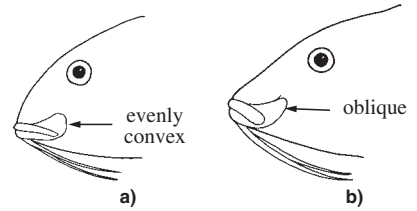


Fig. 2

- 4a. Body moderately elongate, its depth 3.6 to 4.4 times in standard length; pectoral-fin rays 15 or 16 (rarely 16); colour pink with a yellow stripe following lateral line anteriorly and passing above and adjacent to lateral line posteriorly; no dark spot on side of body . . . . . *Parupeneus janseni*  
(Seychelles and India to Indonesia and Philippines)
- 4b. Body less elongate, its depth 3 to 3.55 times in standard length; pectoral-fin rays 15 to 17 (usually 16, rarely 15); a dark reddish spot about the size of pupil usually present just below lateral line above outer third of pectoral fin; edges of scales dull orange-red on about upper three-fourths of body, white below, the scales of upper 4 rows with a pale bluish spot . . . . . *Parupeneus heptacanthus*  
(Red Sea south to South Africa, east to western Pacific from the Ryukyu Islands to Lord Howe Island and New Caledonia)
- 5a. Two or more dark bars extending ventrally from dorsal margin of body; first gill arch with 27 to 33 gill rakers on lower limb . . . . . → 6
- 5b. At most 1 dark bar extending ventrally from dorsal margin of body (then only on caudal peduncle); first gill arch with 18 to 26 gill rakers on lower limb (except 28 to 30 in *P. moffitti*) . . . . . → 7
- 6a. A broad dark bar below each dorsal fin, a faint third bar sometimes present on caudal peduncle, and a large dark area on head enclosing eye; barbels short, 1.65 to 1.9 times in head length; body depth 2.5 to 3.4 times in standard length; dorsal profile of snout distinctly concave; last 2 rays of second dorsal and anal fins subequal . . . . . *Parupeneus bifasciatus*  
(Indo-Pacific)
- 6b. Four or 5 dark bars on body, only the last 2 (below second dorsal fin and on caudal peduncle) heavily pigmented, the one below interdorsal space narrowest; barbels long, 1.1 to 1.35 times in head length; body depth 3.15 to 3.65 times in standard length; dorsal profile of snout straight to slightly concave; last ray of second dorsal and anal fins clearly longer than penultimate ray . . . . . *Parupeneus multifasciatus*  
(Central and western Pacific)
- 7a. First gill arch with 28 to 30 gill rakers on lower limb; colour red with a lighter red stripe on back below dorsal fins, bordered above and below by a row of indistinct small dark brown spots . . . . . *Parupeneus moffitti*  
(Guam, from depths of 120 to 230 m)
- 7b. First gill arch with 18 to 26 gill rakers on lower limb; colour not as above . . . . . → 8
- 8a. First gill arch with 18 to 21 gill rakers on lower limb; a round black spot as large or larger than eye posteriorly on side of peduncle, more above than below lateral line (but not reaching dorsal edge of peduncle); a large horizontally-elliptical yellow spot centred on lateral line above tip of pectoral fin . . . . . *Parupeneus indicus*  
(East Africa to Samoa and the Caroline Islands)
- 8b. First gill arch with 21 to 26 (rarely 21) gill rakers on lower limb; colour not as above (a black spot, if present on caudal peduncle, small or saddle-like) . . . . . → 9

- 9a. Barbels very long, their length from longer than head to 1.2 times in head length; snout long, 1.6 to 1.9 times in head length; 2 colour phases, one bluish grey with a saddle-like yellow spot on caudal peduncle, the other yellow with a brighter yellow spot dorsally on peduncle; attains 50 cm . . . . . *Parupeneus cyclostomus*  
(Indo-Pacific)
- 9b. Barbels not very long, their length 1.3 to 1.9 times in head length; snout not as long, 1.7 to 2.15 times in head length; colour not as above; maximum length 25 to 38 cm . . . . . → 10
- 10a. Pectoral-fin rays 15 to 17 (usually 16, rarely 15); last dorsal- and anal-fin ray of adults distinctly longer than penultimate ray of these fins; body depth 3.45 to 3.95 times in standard length; colour whitish to pink with a black spot about 4 scales in width on lateral line below rear of first dorsal fin, followed by a large oval white spot; base of second dorsal fin broadly blackish . . . . . *Parupeneus pleurostigma*  
(Indo-Pacific)
- 10b. Pectoral-fin rays 14 to 16 (usually 15); last dorsal- and anal-fin ray subequal to penultimate ray of these fins; body depth 2.95 to 3.55 times in standard length; colour not as above . . . . . → 11
- 11a. Head and anterior half of body dark reddish brown, abruptly white and yellow on posterior half; 2 diagonal white bands in dark part of head and body, the uppermost running from front of snout, through upper part of eye and along back; an irregular black spot a little smaller than eye on lateral line just behind rear base of second dorsal fin . . *Parupeneus barberinoides*  
(western Pacific to Samoa and islands of Micronesia)
- 11b. Body not divided into very dark anterior and abruptly pale posterior zones, but 2 diagonal whitish bands present from snout through eye (1 through upper part, the other through lower), parallel with dorsal contour of body, ending below second dorsal fin . . . . . → 12
- 12a. Barbels short, 1.55 to 1.9 times in head length; first gill arch with 24 to 27 gill rakers on lower limb; colour light red, the scale edges reddish brown to dark brown except ventrally; a slight intensification of dark pigment to form a blotch dorsally on caudal peduncle, preceded by a narrow pale blotch . . . . . *Parupeneus ciliatus*  
(Society Islands and Rapa to New South Wales, north to southern Japan and west to Seychelles and Réunion)
- 12b. Barbels not short, 1.3 to 1.6 times in head length; first gill arch with 21 to 24 gill rakers on lower limb; colour similar, with or without a black spot dorsally on caudal peduncle . . . . . → 13
- 13a. A black spot as large or larger than eye dorsally on caudal peduncle, its lower edge resting on lateral line, its upper edge near top of peduncle, usually not meeting spot of other side (or if it does, the intervening pigment is generally less intense) . . . . . *Parupeneus spilurus*  
(southern Japan to New South Wales, New Caledonia, and northern New Zealand; also Western Australia south to Rottneest Island)
- 13b. No black spot on caudal peduncle (a faint dusky spot may be present dorsoposteriorly); 3 brown and 2 whitish stripes on upper half of body distinct, the lowermost brown stripe midlateral from opercle at level of lower part of eye . . . . . *Parupeneus biaculeatus*  
(southern Japan to Viet Nam)


**Key to the species of *Upeneus* occurring in the area**

- 1a. First dorsal fin with VII spines, the first longest; pectoral-fin rays 13 or 14 (usually 13); total gill rakers on first gill arch 27 to 29; upper lobe of caudal fin with 3 narrow oblique dark bands, the lower lobe with 6 or 7; a midlateral dark stripe; a dark brown saddle-like spot on caudal peduncle just posterior to second dorsal fin . . . . . *Upeneus asymmetricus*  
(Philippines to Indonesia and northwestern Australia)
- 1b. First dorsal fin with VIII spines, the first minute (may be adherent to second spine); pectoral-fin rays 13 to 17; total gill rakers on first gill arch 19 to 30; colour not entirely as above . . . . . → 2

- 2a.** Second dorsal-fin spine very prolonged, extending when depressed beyond base of second dorsal fin; pectoral-fin rays 13; light red, shading through pink on sides to white ventrally; cheek and operculum suffused with yellow; barbels yellow . . . . . *Upeneus filifer*  
(southern Queensland and Chesterfield Islands)
- 2b.** Second dorsal-fin spine about equal to or slightly longer than third; pectoral-fin rays 13 to 17; colour not as above . . . . . → **3**
- 3a.** Second dorsal-fin spine long, 1.1 to 1.3 times in head length; total gill rakers on first gill arch 19 to 22; lateral-line scales 31 or 32; a narrow brown to brownish yellow stripe on body at level of upper part of eye containing 3 darker zones, 1 under each dorsal fin and 1 below anterior caudal peduncle; upper lobe of caudal fin with 3 or 4 dark cross bands (may be faint), the lower lobe with a broad dusky posterior border, with or without faint dark cross bands . . . . . *Upeneus sundaicus*  
(Philippines to northern Australia and Persian Gulf)
- 3b.** Second dorsal-fin spine not long, 1.3 to 1.65 times in head length; total gill rakers on first gill arch 20 to 30; lateral-line scales 29 to 38; colour not entirely as above . . . . . → **4**
- 4a.** Lobes of caudal fin without dark cross bands; bronze dorsally, silvery on sides with 2 narrow brassy yellow stripes; first dorsal fin with 2 broad dusky yellowish stripes separated by narrow white stripes, the tip broadly black; lateral-line scales usually 34 or 35; total gill rakers on first gill arch 26 to 30 . . . . . *Upeneus sulphureus*  
(Red Sea south to Mozambique and Madagascar, east to Fiji)
- 4b.** One or both lobes of caudal fin with dark cross bands; colour not as above; lateral-line scales 28 to 38; total gill rakers on first gill arch 20 to 30 . . . . . → **5**
- 5a.** Dorsal lobe of caudal fin with 6 or 7 dusky orange oblique bands, the lower lobe without dark cross bands . . . . . → **6**
- 5b.** Both lobes of caudal fin with dark cross bands . . . . . → **7**
- 6a.** A golden yellow stripe as wide as pupil from behind eye to upper base of caudal fin; back above stripe iridescent silvery pink, below silvery; total gill rakers on first gill arch 26 to 30 . . . . . *Upeneus moluccensis*  
(Red Sea to Madagascar east to the western Pacific from southern Japan to northern Australia)
- 6b.** Silvery with 3 close-set iridescent pink stripes on back and 2 narrow brassy yellow stripes on side; total gill rakers on first gill arch 25 to 29 . . . . . *Upeneus quadrilineatus*  
(southern Japan to Indonesia)
- 7a.** Pectoral-fin rays 15 to 17 (usually 16); total gill rakers on first gill arch 25 to 30; peritoneum blackish . . . . . → **8**
- 7b.** Pectoral-fin rays 12 to 15 (usually 13 or 14); total gill rakers on first gill arch 21 to 25; peritoneum whitish . . . . . → **9**
- 8a.** Silvery with 4 distinct narrow brassy yellow stripes on upper two-thirds of body; lower lobe of caudal fin with 3 dark cross bands (not counting tip, sometimes black) the distal band nearly twice as broad and more intensely black than middle band; first dorsal fin broadly tipped with black; total gill rakers on first gill arch 27 to 31 . . . . . *Upeneus vittatus*  
(Indo-Pacific)
- 8b.** Silvery without distinct yellow stripes on body; lower lobe of caudal fin with 4 dark cross bands of about equal width; tip of first dorsal fin narrowly black; total gill rakers on first gill arch 25 to 29 . . . . . *Upeneus subvittatus*  
(southern Japan to Indonesia and Red Sea to Mozambique)

- 9a.** No scales on side of snout; lateral-line scales 35 to 37; silvery, the scales dorsally on body edged with green or orange-pink; 2 narrow orange-yellow stripes on side of body; upper lobe of caudal fin of adults with 6 to 8 and the lower lobe with 4 to 6 dusky orange to black cross bands . . . . . *Upeneus arge*  
(central and western Pacific to Seychelles and Mozambique)
- 9b.** Scales on side of snout; lateral-line scales 28 to 30; a dark reddish brown to blackish stripe from behind eye to base of caudal fin; body above stripe brownish to greenish grey, flecked with small dark reddish brown to blackish spots; upper lobe of caudal fin with 4 to 6 blackish cross bands, and lower lobe with 5 to 7; outer third to half of first dorsal fin with an irregular dark red to black spot containing 2 to several small yellow spots . . . . . *Upeneus tragula*  
(Indo-Pacific)

### List of species occurring in the area

The symbol  is given when species accounts are included.

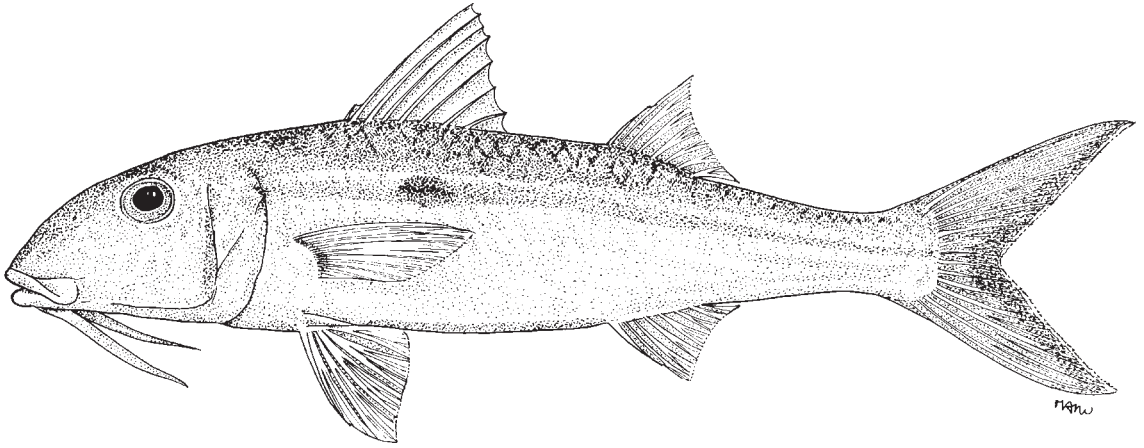
-  *Mulloidichthys flavolineatus* (Lacepède, 1801)
- Mulloidichthys mimicus* Randall and Guézé, 1980
-  *Mulloidichthys pflugeri* (Steindachner, 1900)
-  *Mulloidichthys vanicolensis* (Valenciennes, 1831)
-  *Parupeneus barberinoides* (Lacepède, 1801)
-  *Parupeneus barberinus* (Bleeker, 1852)
- Parupeneus biaculeatus* (Richardson, 1846)
-  *Parupeneus bifasciatus* (Lacepède, 1801)
-  *Parupeneus ciliatus* (Lacepède, 1802)
-  *Parupeneus cyclostomus* (Lacepède, 1801)
-  *Parupeneus heptacanthus* (Lacepède, 1802)
-  *Parupeneus indicus* (Shaw, 1803)
- Parupeneus janseni* (Bleeker, 1856)
-  *Parupeneus macronemus* (Lacepède, 1801)
- Parupeneus moffitti* Randall and Myers, 1993
-  *Parupeneus multifasciatus* (Quoy and Gaimard, 1824)
-  *Parupeneus pleurostigma* (Bennett, 1831)
-  *Parupeneus spilurus* (Bleeker, 1854)
- Upeneichthys lineatus* (Bloch and Schneider, 1801)
-  *Upeneus arge* (Jordan and Evermann, 1902)
- Upeneus asymmetricus* Lachner, 1954
- Upeneus filifer* (Ogilby, 1910)
-  *Upeneus moluccensis* (Bleeker, 1855)
- Upeneus quadrilineatus* Cheng and Wang, 1968
- Upeneus subvittatus* (Temminck and Schlegel, 1843)
-  *Upeneus sulphureus* Cuvier, 1829
-  *Upeneus sundaicus* (Bleeker, 1855)
-  *Upeneus tragula* (Richardson, 1846)
-  *Upeneus vittatus* (Forsskål, 1775)

### References

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- Randall, J.E. and P. Guézé. 1992. *Upeneus francisi*, a new goatfish (Perciformes: Mullidae) from Norfolk Island and New Zealand. *Cybius*, 16(1):21-29.
- Randall, J.E., G.R. Allen, and R.C. Steene. 1990. *Fishes of the Great Barrier Reef and Coral Sea*, 506 p.
- Stepien, C.A., J.E. Randall, and R.H. Rosenblatt. 1994. Genetic and morphological divergence of a circumtropical complex of goatfishes: *Mulloidichthys vanicolensis*, *M. dentatus*, and *M. martinicus*. *Pac. Sci.*, 48(1):44-56.

***Mulloidichthys flavolineatus*** (Lacepède, 1801)

(Plate XXV, 186)

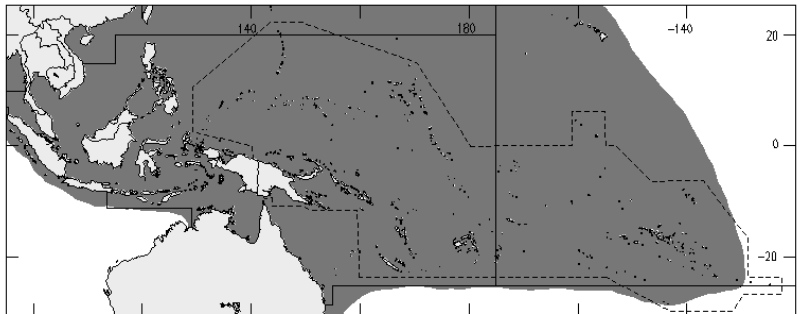
**Frequent synonyms / misidentifications:** *Mulloidichthys samoensis* (Günther, 1802) / None.**FAO names:** **En** - Yellowstripe goatfish; **Fr** - Capuciva à bande jaune; **Sp** - Salmonete de banda amarilla.

**Diagnostic characters:** Body elongate, its depth 3.7 to 4.8 times in standard length, and moderately compressed; head length 3.1 to 3.45 times in standard length. **Chin with a pair of slender barbels which usually do not reach posterior margin of preopercle, their length 1.4 to 1.65 times in head length;** snout long, its length in adults 1.9 to 2.2 (to 2.4 in young) times in head length; mouth small, maxilla not reaching front edge of eye; villiform teeth in a band in jaws; no teeth on roof of mouth. **First gill arch with 8 or 9 (rarely 7 or 10) gill rakers on upper limb, 18 to 22 on lower limb (total 25 to 30).** Two well-separated dorsal fins, the first with VIII slender spines (initial spine very small), and the second with 9 soft rays; anal fin with I spine and 7 soft rays; **pectoral-fin rays 16 to 18** (very rarely 15 or 19). **Lateral-line scales 33 to 36;** 5 rows of scales between dorsal fins, and 11 or 12 rows along upper part of caudal peduncle. **Colour:** silvery white with a yellow stripe on side of body at level of eye, usually containing a blackish spot above posterior part of pectoral fins; barbels white; fins whitish to pale yellowish; peritoneum blackish.

**Size:** Maximum reported total length 40 cm, commonly to 28 cm.

**Habitat, biology, and fisheries:** A shallow-water species usually found in lagoons and bays. Tends to occur in aggregations by day over coral reefs or at times resting on sand bottom. Although observed to feed by day, most of the feeding appears to commence with the onset of darkness (then as individual fish). Feeds on a wide variety of small invertebrates such as small crabs, shrimps, polychaetes, sipunculids, small pelecypods and gastropods, hermit crabs, heart urchins, and foraminifera; occasionally captures small fishes. Caught by nets, traps, hook-and-line, and by spearing. The young are taken by seines or cast nets; they are consumed fresh, dried, or used as bait.

**Distribution:** Occurs throughout the Indo-Pacific region; in the western Pacific from southern Japan to Montague Island, New South Wales (36°S); in Oceania to Hawaii and Pitcairn Group.

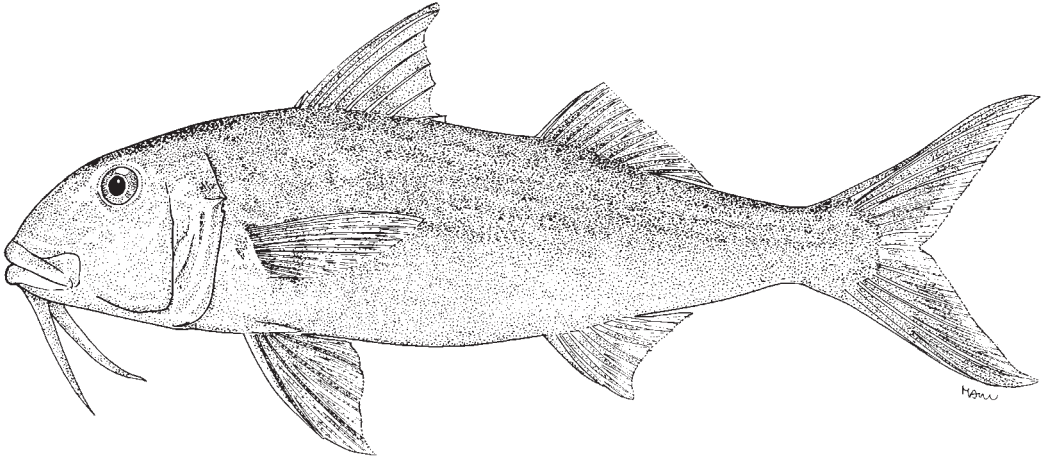


*Mulloidichthys pflugeri* (Steindachner, 1900)

(Plate XXV, 187)

**Frequent synonyms / misidentifications:** None / None.

**FAO names:** En - Red goatfish.

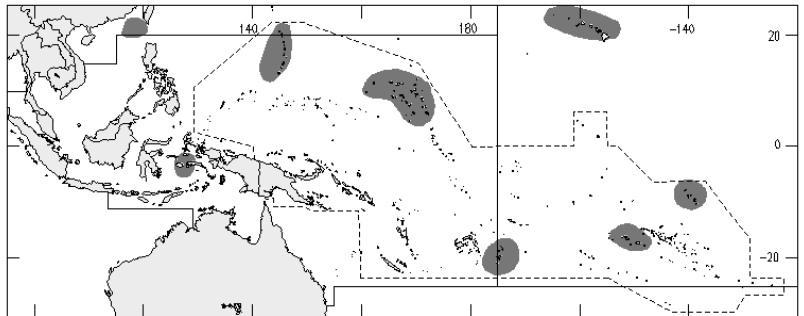


**Diagnostic characters:** Body moderately elongate, its depth 3.5 to 4.25 times in standard length, and moderately compressed; head length 3.2 to 3.6 times in standard length. **Chin with a pair of slender barbels which usually do not reach rear margin of preopercle, their length 1.45 to 1.6 times in head length;** snout moderately long, its length in adults 1.85 to 2.2 times in head length; mouth small, maxilla not reaching front edge of eye; villiform teeth in a band in jaws; no teeth on roof of mouth. **First gill arch with 7 or 8 gill rakers on upper limb, 19 to 22 on lower limb (total 27 to 30).** Two well-separated dorsal fins, the first with VIII slender spines (initial spine very small), and the second with 9 soft rays; anal fin with I spine and 7 soft rays; **pectoral-fin rays 17 or 18. Lateral-line scales 34 to 37;** 5 rows of scales between dorsal fins, and 11 or 12 rows along upper part of caudal peduncle. **Colour: orange-red, shading to pale orange-red or whitish ventrally;** barbels white; fins light orange-red; **peritoneum transparent to silvery white.**

**Size:** Largest specimen examined 48 cm, commonly to 35 cm.

**Habitat, biology, and fisheries:** Tends to occur deeper than other species of the genus (to at least 110 m), but may be found in as little as 15 m. Usually encountered as solitary individuals or in pairs over sand flats near coral reefs. When feeding, it may take on a strong pattern of 4 broad dark bars (darker red than rest of body, not with black pigment). Not commonly seen in fish markets.

**Distribution:** Indo-Pacific, but distribution spotty, and all known localities insular: Hawaii, Society Islands, Marquesas, Tonga, Marshall Islands, Mariana Islands, Ryukyu Islands, Indonesia, Mauritius, and Réunion.



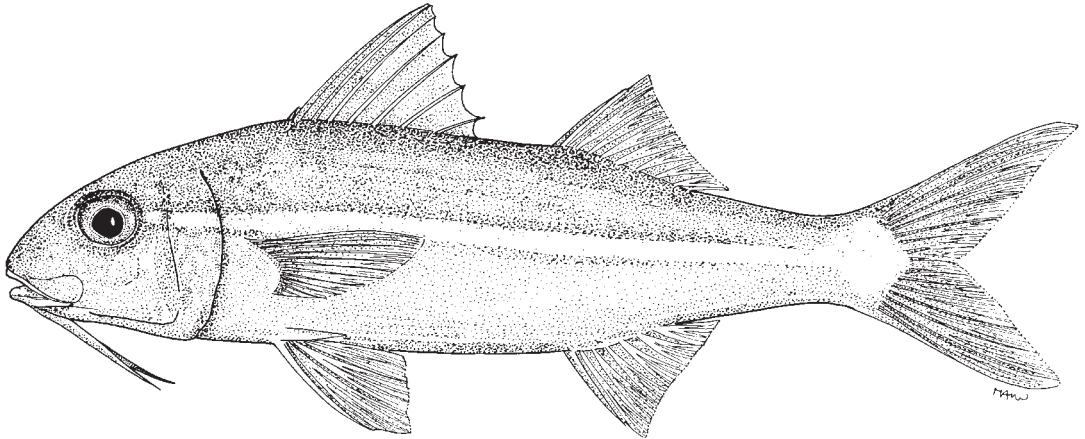


***Mulloidichthys vanicolensis*** (Valenciennes, 1831)

(Plate XXV, 188)

**Frequent synonyms / misidentifications:** *Mulloides vanicolensis* (Valenciennes, 1831); *M. auriflamma* (non Forsskål, 1775); *M. erythrinus* Klunzinger, 1884 / None.

**FAO names:** En - Yellowfin goatfish; Fr - Capucin de Vanicolo; Sp - Salmonete vanicolense.

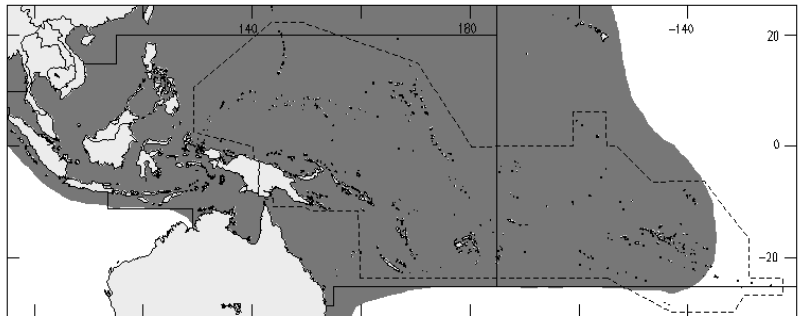


**Diagnostic characters:** Body moderately elongate, its depth 3.4 to 4.5 times in standard length, and moderately compressed; head length 2.95 to 3.4 times in standard length. **Chin with a pair of slender barbels which reach posterior to rear margin of preopercle, their length 1.2 to 1.5 times in head length;** snout not long, its length in adults 2 to 2.45 times in head length; mouth small, maxilla not reaching front edge of eye; villiform teeth in a band in jaws; no teeth on roof of mouth. **First gill arch with 8 to 10 gill rakers on upper limb, 23 to 26 on lower limb (total 32 to 36).** Two well-separated dorsal fins, the first with VIII slender spines (initial spine very small), and the second with 9 soft rays; anal fin with I spine and 7 soft rays; **pectoral-fin rays 16 to 18. Lateral-line scales 33 to 36;** 5 rows of scales between dorsal fins, and 11 or 12 rows along upper part of caudal peduncle. **Colour:** whitish to pink with a **yellow stripe edged in pale blue on body at level of upper end of gill opening;** no black spot within yellow stripe; barbels white to yellowish; **fins yellow.**

**Size:** Maximum total length, 38 cm, commonly to 25 cm.

**Habitat, biology, and fisheries:** A shallow-water species usually found in lagoons and bays, but generally in deeper water than *Mulloidichthys flavolineatus*. Tends to occur in aggregations by day on coral reefs, but disperses individually at night to feed on sand flats. Food habits similar to those of *M. flavolineatus*: small crabs, shrimps, and other crustaceans, polychaetes and other worms, ophiuroids, small molluscs, heart urchins, and foraminifera. Able to take on a disruptive pattern of broad irregular red bars, especially at night.

**Distribution:** Widespread in the Indo-Pacific region; in the Indian Ocean from the Red Sea south to southern Mozambique and Mauritius; in the western Pacific from Kyushu to central New South Wales; in Oceania east to Hawaii, Tuamotu Archipelago, and Marquesas. The population in the Indian Ocean has fewer gill rakers (29 to 34) from that of the Pacific, and fish there are able to change colour to yellow with blue stripes, hence a mimic of the snapper *Lutjanus kasmira* (with which it may school). Comparison of the Indian Ocean and Pacific populations of *M. vanicolensis* by enzyme electrophoresis failed to show a genetic divergence comparable to the gill-raker difference.

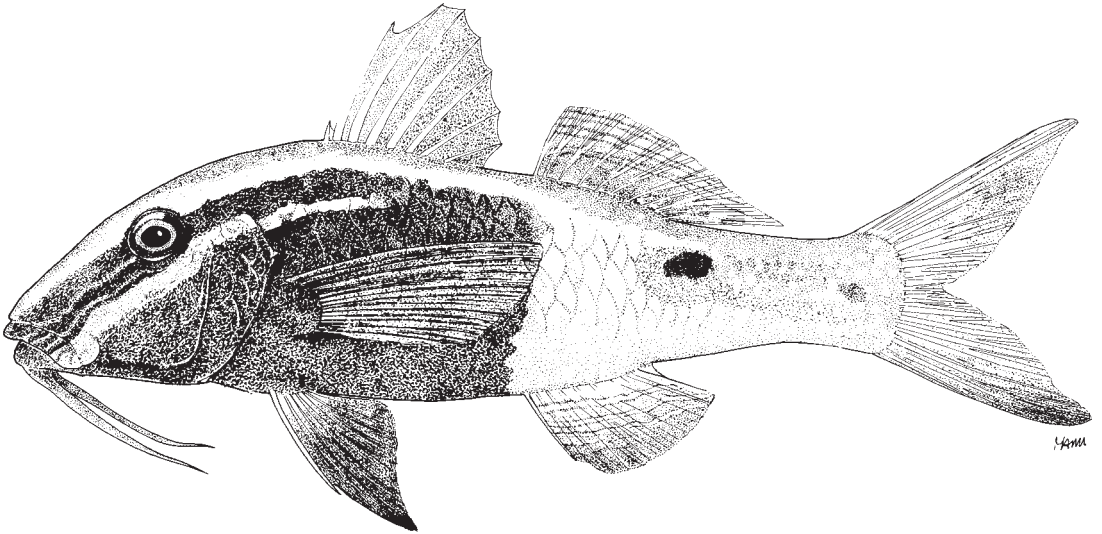


*Parupeneus barberinoides* (Bleeker, 1852)

(Plate XXV, 189)

**Frequent synonyms / misidentifications:** None / None.

**FAO names:** En - Bicolour goatfish.

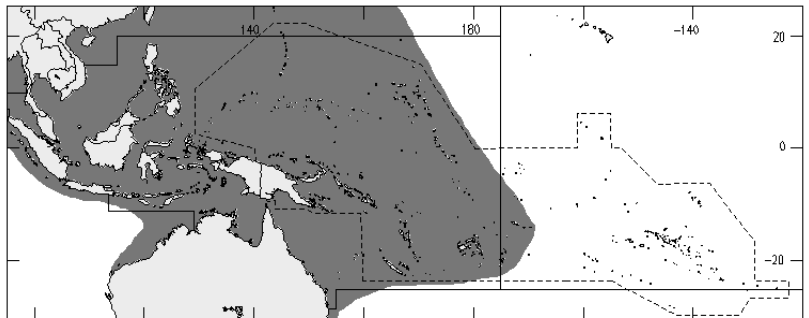


**Diagnostic characters:** Body moderately elongate, its depth 3.1 to 3.6 times in standard length, and moderately compressed. **Chin with 2 slender barbels usually reaching posterior to rear edge of preopercle, their length 1.25 to 1.5 times in head length; head length 2.75 to 3.2 times in standard length; snout moderate, its length 1.75 to 2 times in head length; dorsal profile of snout straight to slightly concave;** mouth small, maxilla reaching from 2/3 to 3/4 distance to anterior edge of eye; a single row of well-spaced, stout, conical teeth in jaws; no teeth on roof of mouth. **First gill arch with 6 or 7 gill rakers on upper limb, 21 to 25 on lower limb (total 28 to 33).** Two well-separated dorsal fins, the first with VIII spines, the second fin with 9 soft rays; first dorsal-fin spine very short; longest dorsal-fin spine 1.4 to 1.8 times in head length; last ray of second dorsal and anal fins distinctly longer than penultimate ray; anal fin with I spine and 6 soft rays; **pectoral-fin rays 15 or 16 (usually 15).** Lateral-line scales 27 or 28; 3 rows of scales between dorsal fins; 9 rows of scales along upper part of caudal peduncle. **Colour:** head and anterior half of body dark reddish brown, abruptly white and yellow on posterior half; 2 diagonal white bands in dark part of head and body, the uppermost running from front of snout, through upper part of eye and along back; **an irregular black spot a little smaller than eye on lateral line just behind rear base of second dorsal fin;** barbels red.

**Size:** Maximum total length 25 cm, commonly to 18 cm.

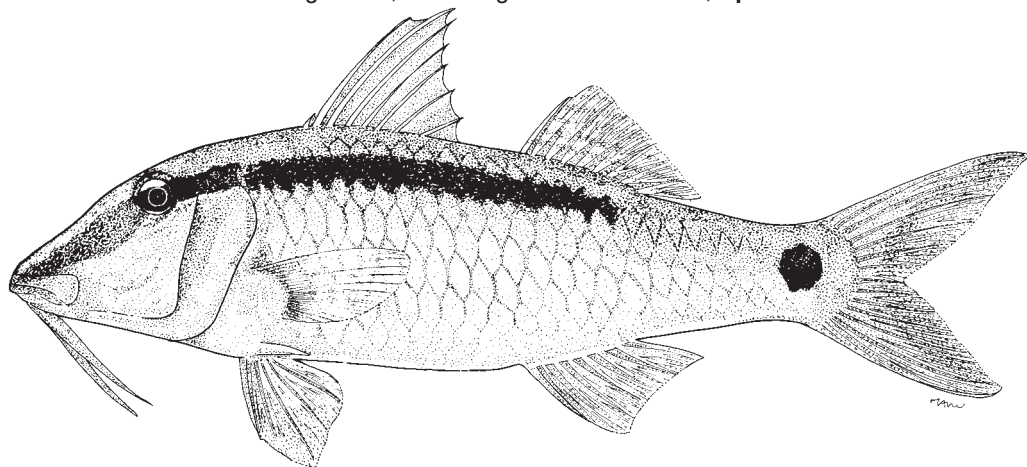
**Habitat, biology, and fisheries:** Occurs on coral reefs and adjacent habitats, generally in protected areas like bays or lagoons; juveniles often seen in seagrass beds. Adults are usually solitary, but juveniles generally form small schools.

**Distribution:** Western Pacific from New South Wales to southern Japan, east to Samoa and the Marshall Islands.



***Parupeneus barberinus*** (Lacepède, 1801)

(Plate XXV, 190)

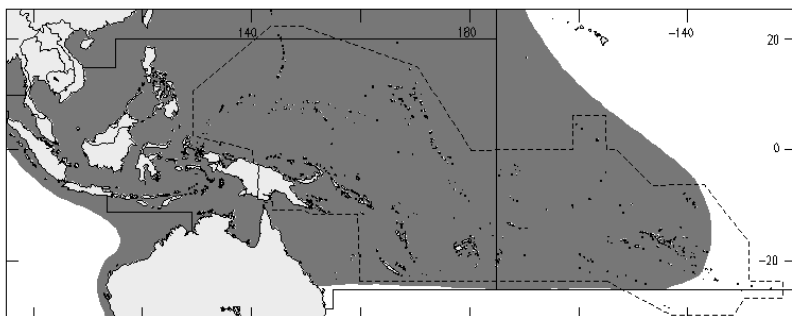
**Frequent synonyms / misidentifications:** None / None.**FAO names:** En - Dash-and-dot goatfish; Fr - Rouget-barbet barberin; Sp - Salmonete.

**Diagnostic characters:** Body moderately elongate, its depth 3.3 to 3.7 times in standard length, and moderately compressed. **Chin with 2 slender barbels which usually reach posterior to rear margin of preopercle (barbels equal to or longer than snout plus eye), their length 1.4 to 1.6 times in head length; snout long, its length 1.5 to 2.1 times in head length** (snout relatively longer with growth); dorsal profile of snout straight; mouth small, maxilla reaching only about 1/2 distance to front edge of eye; a single row of well-spaced, stout, conical teeth in jaws; no teeth on roof of mouth. **First gill arch with 6 or 7 gill rakers on upper limb, 20 to 25 on lower limb (total 26 to 32).** Two well-separated dorsal fins, the first with VIII spines, the second fin with 9 soft rays; first dorsal-fin spine very short; longest dorsal-fin spine 1.15 to 1.7 times in head length (relatively longer in larger fish; third and fourth spines prolonged in large adults); last ray of second dorsal and anal fins equal to or a little longer than penultimate ray; anal fin with I spine and 6 soft rays; **pectoral-fin rays 16 to 18 (usually 17).** Lateral-line scales 27 or 28; 3 rows of scales between dorsal fins; 8 or 9 rows of scales along upper part of caudal peduncle. **Colour: a black stripe from snout through lower part of eye and along back to below rear base of second dorsal fin;** back above stripe light grey-brown to yellow, below whitish, the scale edges narrowly grey to reddish brown; **a round black spot, larger than eye in adults, posteriorly on midside of caudal peduncle;** diagonal pale blue lines alternating with brownish yellow extending dorsoposteriorly and ventroanteriorly from eye, with 1 or 2 parallel blue lines on cheek. Fish taken from deeper water are more red than those from the shallows; the dark stripe on body and spot on peduncle of the deep-dwelling fish may be red.

**Size:** Maximum reported total length about 50 cm, commonly to 30 cm.

**Habitat, biology, and fisheries:** This large goatfish is primarily a shallow-water species, but it is known to reach a depth of 100 m. It is generally found in the vicinity of coral reefs, but feeds over sand bottoms, sometimes excavating deeply into the sand. Stomach contents of 19 specimens examined by the present author consisted of crabs (including portunids, xanthids, and raninids), shrimps, polychaetes, sipunculids, pelecypods, small gastropods, isopods, brachiopods, and one had eaten a small eel.

**Distribution:** Occurs throughout most of the Indo-Pacific region; unknown from the Red Sea, Gulf of Oman, Persian Gulf, and Hawaii. Ranges in the western Pacific from southern Japan to the southern Great Barrier Reef.

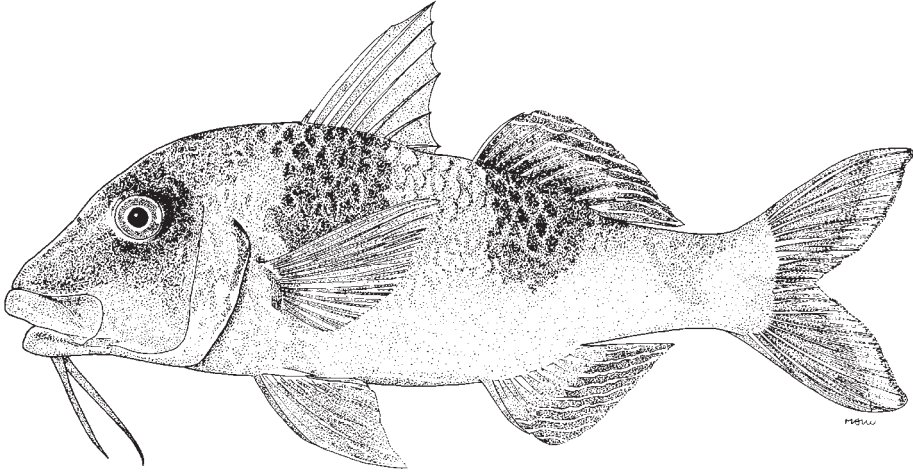


*Parupeneus bifasciatus* (Lacepède, 1801)

(Plate XXV, 191 and 192)

**Frequent synonyms / misidentifications:** *Parupeneus trifasciatus* (Lacepède, 1801); *P. crassilabris* (Valenciennes, 1831) / None.

**FAO names:** En - Doublebar goatfish; Fr - Rouget-barbet double-tauche; Sp - Salmonete de dos manchas.



**Diagnostic characters:** Body not elongate (for a mullid), its depth 2.65 to 3.4 times in standard length (larger individuals deeper bodied), and moderately compressed. **Chin with 2 slender barbels which usually do not reach rear margin of preopercle, their length 1.65 to 1.9 times in head length; snout not long, its length 1.7 to 2 times in head length;** dorsal profile of snout concave; mouth small, maxilla reaching at most a vertical through posterior nostril; a single row of well-spaced, stout, conical teeth in jaws; no teeth on roof of mouth. **First gill arch with 7 to 9 (usually 8) gill rakers on upper limb, 27 to 31 on lower limb (total 35).** Two well-separated dorsal fins, the first with VIII spines, the second fin with 9 soft rays; first dorsal-fin spine very short; longest dorsal-fin spine 1.45 to 1.6 times in head length; last 2 rays of second dorsal and anal fins subequal; anal fin with I spine and 6 soft rays; **pectoral-fin rays 15 to 17 (usually 16).** Lateral-line scales 27 or 28; 3 rows of scales between dorsal fins; 8 or 9 rows of scales along upper part of caudal peduncle. **Colour:** yellowish grey to brownish red, the centres of scales paler than edges, shading to whitish ventrally, with a broad saddle-like dark brown bar centred below anterior part of first dorsal fin, a second broad bar below second dorsal fin, and often a third faint bar dorsally on caudal peduncle (bars reaching slightly below midside of body, those of juveniles more strongly marked and those of large adults may be obscure); a large dark brown area on side of head, enclosing eye, and extending onto side of snout (obscure in large adults); irregular blue lines and spots usually present on side of head (including within dark area); second dorsal and anal fins often with oblique yellow and purple or blue lines. Individuals from deeper water more red than those from the shallows.

**Size:** Maximum total length about 35 cm, commonly to 25 cm.

**Habitat, biology, and fisheries:** A coral-reef species known from a depth range of a few to at least 60 m. Analysis of stomach contents of 17 specimens revealed feeding mainly on crabs (44% of contents), shrimps, octopuses, mantis shrimps, amphipods, other crustaceans, fishes, and polychaetes.

**Distribution:** Gulf of Aden and Gulf of Oman south to Natal, east throughout Oceania, including Hawaii and Pitcairn Group. In the western Pacific from the Ryukyu Islands to the Great Barrier Reef. Differences in colour, particularly with respect to the dark bars, may be seen among individuals from the western Indian Ocean, western Pacific, and Hawaii, indicating population differentiation. This merits further study.

