

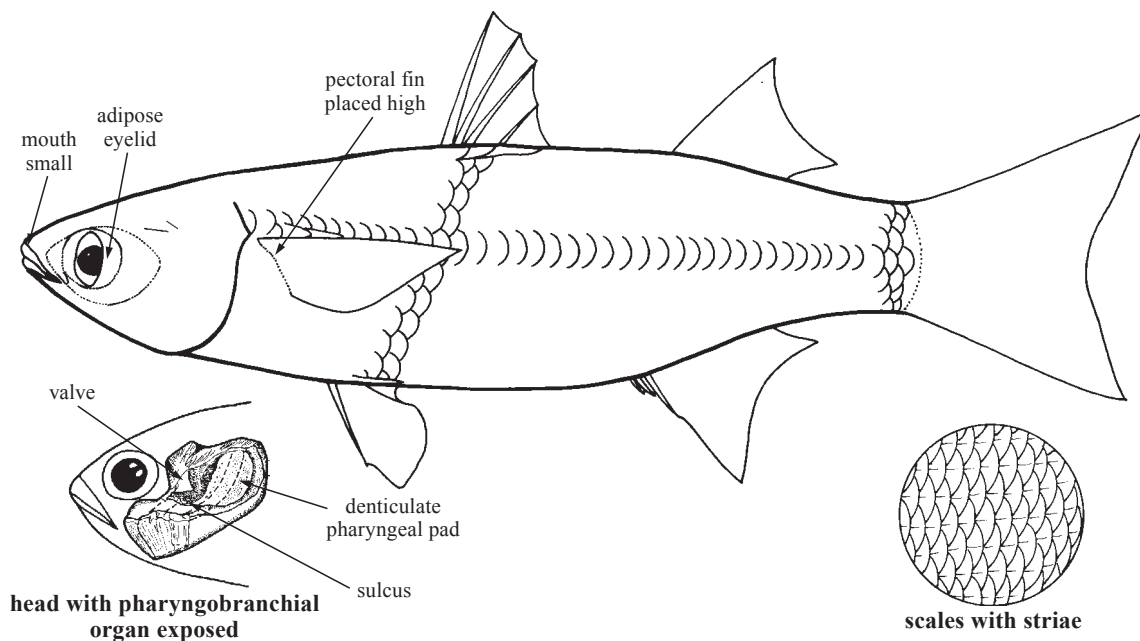
Order MUGILIFORMES

MUGILIDAE

Mulletts

by I.J. Harrison, American Museum of Natural History, New York, USA

Diagnostic characters: Medium- to large-sized fishes, reaching a maximum size of 120 cm standard length, but commonly to about 30 cm standard length; elongate with subcylindrical body. **Head often broad and flattened dorsally** (rounded in *Agonostomus* and *Joturus*). **Eyes partly covered by adipose 'eyefold' tissue** (translucent fatty extensions of anterior and posterior rims of eye socket) that may cover most of eye except for a small area over pupil; **adipose eyefold can be seen by inserting a small pointer between surface of eye and overlying adipose tissue**; adipose eyefold absent in juveniles and in *Agonostomus* and *Joturus*. Snout short; **mouth small or moderate in size, terminal or inferior**; premaxillae protractile; teeth small, hidden, or absent. **Two short dorsal fins, well-separated; first with 4 slender spines**, second with 8 to 10 soft rays; anal fin short with 2 or 3 spines and 7 to 11 soft rays in adults (for species in area); caudal fin emarginate or forked; **pectoral fins inserted high on body, with dorsal ray appearing short and spinous (although not a true spine)**; pelvic fins with 1 spine and 5 soft rays, **inserted subabdominally, about equidistant between insertion of pectoral fin and origin of first dorsal fin. Lateral line absent.** Scales moderate to large size, with 1 or more longitudinal rows of striae (grooves) on each scale; scales ctenoid except for those on anterior predorsal and lateral parts of head, which may be cycloid. Scales in longitudinal series on midline 29 to 47, counted from just behind operculum, above pectoral fin, to point of caudal flexure (i.e., not including scales on caudal fin). Scales in transverse series 10.5 to 15, counted from origin of pelvic fin to origin of first dorsal fin. Scales in circumpeduncular series entirely around caudal peduncle, just anterior to point of caudal flexure, 16 to 23; circumpeduncular series starts at scale row on ventral surface of caudal peduncle, and is taken vertically up scale rows on one flank, over dorsum, and vertically down opposite flank (zig-zagging between adjacent, overlapping scale rows, so that all rows are included in count). **Large, modified scales may be present at insertion of pectoral and pelvic fins (axillary scales) and origin of first dorsal fin (dorsal obbasal scales).** Oral and branchial filter-feeding mechanism involving gill rakers and a **specialized 'pharyngobranchial organ' comprising large, denticulate 'pharyngeal pad' and pharyngeal 'sulcus' on each side of pharyngobranchial chamber** (less developed in *Joturus* and not developed in *Agonostomus*). Pharyngobranchial organ may be seen by lifting operculum and pulling first 3 gill arches forward from fourth arch. The pharyngeal pad is a large, rounded structure with numerous, fine denticulate teeth giving an apparently "furry" surface. The sulcus is deep groove anterior to denticulate pad. In *Mugil* there is a large flap of tissue (a "valve") on lower to midpart of sulcus and lying back against sulcus wall. Sulcus and valve best seen by pulling first 2 gill arches forward from third and fourth arches. **Stomach with muscular "gizzard"** (except in *Agonostomus* and *Joturus*) and pyloric caeca positioned ventrally (2 caeca in all species from area). Stomach and caeca can be seen by cutting fish along abdomen

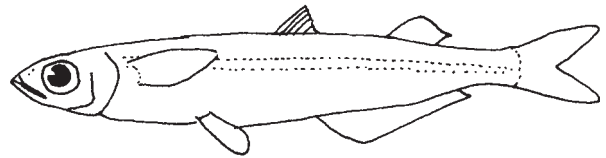


and removing the liver, lying ventral to the alimentary tract. **Intestine elongate and elaborately coiled** (except in *Agonostomus* and *Joturus*). Vertebrae 24 to 26. **Colour:** dorsally greyish blue, or greyish green; head and operculum with bronze or yellowish blotches in some species; **flanks silvery**, often with more or less distinct dark stripes (about 3 to 9) following rows of scales; ventral parts of body also silvery, pale, or yellowish; dorsal and caudal fins usually dusky (sometimes yellowish); anal and pelvic fins may be yellowish; dark spot sometimes dorsally at base of pectoral fins.

Habitat, biology, and fisheries: Most species are euryhaline; inhabiting coastal marine waters, brackish water lagoons, estuaries, and may enter fresh water; usually to depths of 20 m, but have been reported to depths of over 300 m. Some species usually inhabit fresh water but can also be found in brackish waters. Coastal species usually spawn offshore; fresh water species spawn in brackish waters. Feeds by rowing on submerged surfaces and filtering large quantities of benthic detritus; ingesting microalgae, detritus, small invertebrates, microorganisms, and particulate organic material. Relatively important foodfishes; caught with diverse net types. FAO statistics report capture production from 23 789 to 37 659 t from 1995 to 1999. Small-scale and subsistence fisheries are probably also relatively large. The hardiness, simple diet, and rapid growth of mullets has made some species the object of aquaculture.

Similar families occurring in the area

Atherinidae: body more slender with a prominent silvery stripe along the flanks; eyes larger; anal-fin rays usually more than 10 (usually, but not always, less than 10 in Mugilidae).



Atherinidae

Key to the species of Mugilidae occurring in the area

1a. Dorsal surface of head convex across posterior interorbit (Fig. 1a) translucent adipose eyefold absent in juveniles and adults (Fig. 2a, b); anal fin with 2 spines and 10 or 11 soft rays; teeth small and rigidly inserted directly onto the premaxilla and dentary bones (Fig. 3a, b); pharyngobranchial organ lacking a large denticulate, pharyngeal pad or a distinct sulcus with valve (Fig. 4a, b); 38 to 46 scales in longitudinal series; adults usually in fresh water → 2

1b. Dorsal surface of head relatively flat across posterior interorbit (Fig. 1b); translucent adipose eyefold present in specimens over about 30 mm (Fig. 2c); anal fin with 3 spines (first spine very short, and may be hidden by overlying scales) and 8 or 9 soft rays in adults (2 spines and 9 or 10 soft rays in specimens less than about 50 mm standard length); teeth attached to the edges of the lips, and small or not visible to naked eye; pharyngobranchial organ with a large denticulate pharyngeal pad, and a distinct sulcus with valve (Fig. 4c); 29 to 47 scales in longitudinal series; adults usually in in-shore coastal waters, estuaries and sometimes entering fresh water → 3

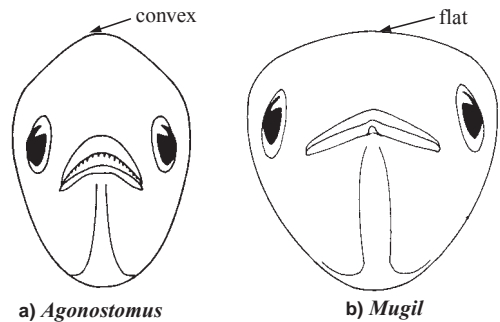


Fig. 1 anterior view of head

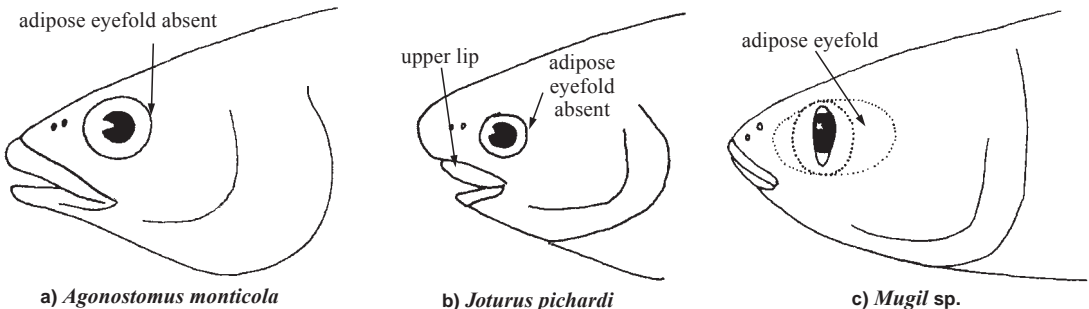


Fig. 2 lateral view of head

- 2a. Mouth terminal (Fig. 2a); 9 soft rays in second dorsal fin; adults with 10 soft rays in anal fin; second dorsal and anal fins with small scales on anterior basal parts, otherwise naked; 16 to 23 gill rakers on lower part of first gill arch; teeth on opposite sides of lower jaw almost meeting at dentary symphysis (Fig. 3a); dorsal fins and caudal fin dusky yellowish, and anal fin pale *Agonostomus monticola*
- 2b. Mouth inferior, snout projecting anteriorly beyond upper lip (Fig. 2b) (except in specimens less than 6 cm); 10 soft rays in second dorsal fin; adults with 11 (rarely 10) soft rays in anal fin; second dorsal and anal fins well-covered by small scales in adults; 27 to 40 gill rakers on lower part of first gill arch; opposite sides of lower jaw with teeth in 2 more or less oval patches, reasonably well separated at dentary symphysis (Fig. 3b); dorsal fins and caudal fin with dark bars and yellowish or green patches *Joturus pichardi*

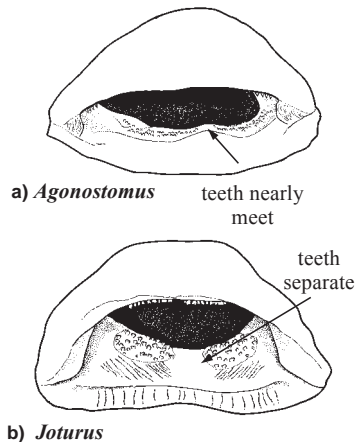


Fig. 3 frontal view of mouth

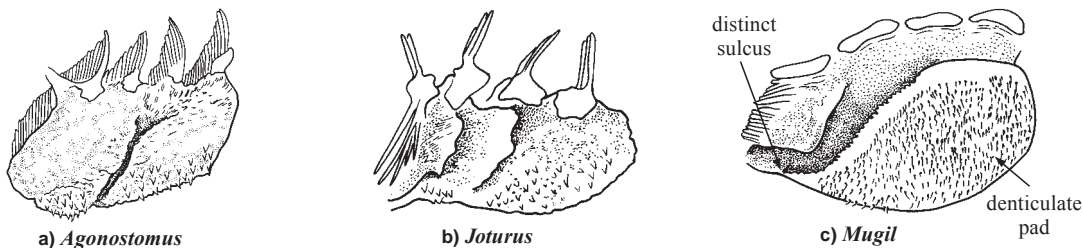


Fig. 4 lateral view of pharyngobranchial organs

- 3a. Anal fin with 3 spines (first spine very short) and 8 soft rays in adults, or 2 spines and 9 soft rays in specimens less than 50 mm standard length → 4
- 3b. Anal fin with 3 spines (first spine very short) and 9 soft rays in adults, or 2 spines and 10 soft rays in specimens less than 50 mm standard length → 7

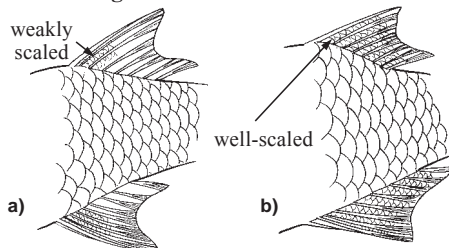


Fig. 5 second dorsal and anal fins

- 4a. Second dorsal and anal fins weakly scaled, with small scales only on anterior basal parts (Fig. 5a); upper lip with very small teeth, either not visible to naked eye, or just visible, appearing as a fine fringe (Fig. 6a); upper lip, when viewed under microscope, with an outer row of unicuspid teeth and 1 to 6 inner rows of bicuspid teeth (Fig. 7) → 5
- 4b. Second dorsal and anal fins well-scaled, with small scales over all parts of the fin (Fig. 5b) (except in specimens under about 60 mm standard length where the distal part of the fin may lack scales); teeth on upper lip usually just visible to naked eye (Fig. 6b, c); upper lip, when viewed under microscope, with an outer row of moderately long and more or less recurved unicuspid teeth, and an inner row of unicuspid teeth present or absent; no bicuspid teeth (Fig. 8) → 6

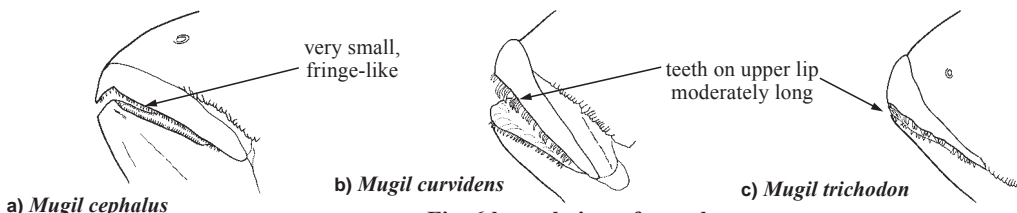


Fig. 6 lateral view of mouth

- 5a. Thirty-six or more scales in longitudinal series; body depth at origin of first dorsal fin usually 24 to 28% standard length; body depth at origin of anal fin usually 20 to 24% standard length; head depth equal to or greater than head width at level of posterior of operculum; origin of fully erected second dorsal fin just posterior to vertical level of origin of anal fin *Mugil cephalus*
- 5b. Thirty-six or fewer (usually 29 to 34) scales in longitudinal series; body depth at origin of first dorsal fin usually 17 to 23% standard length; body depth at origin of anal fin usually 19 to 20%; head depth less than head width at level of posterior of operculum; origin of fully erected second dorsal fin on vertical through anterior quarter to third of anal fin *Mugil liza*

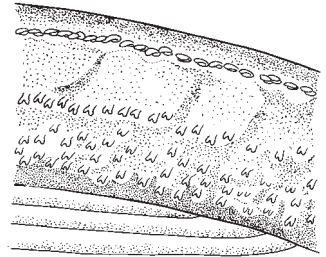


Fig. 7 inner surface of upper lip (*Mugil cephalus*)

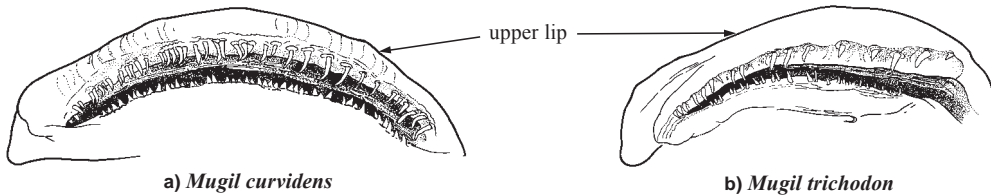


Fig. 8 ventral view of mouth (right side)

- 6a. Nine soft rays in second dorsal fin; usually 34 to 37 (rarely 33) scales in longitudinal series and 18 (rarely 17) in circumpeduncular series (Fig. 9a); upper lip, when viewed under a microscope, with an outer row of close-set, long, unicuspid teeth which have their tips recurved in towards the mouth; lower lip, viewed under a microscope, with a single row of close-set, usually long, unicuspid teeth with recurved tips (Figs 6b, 8a); depth of medial part of upper lip 5% or less of head length *Mugil curvidens*
- 6b. Eight (or very rarely 9) soft rays in second dorsal fin; 28 to 34 scales in longitudinal series and 16 in circumpeduncular series (Fig. 9b); upper lip, when viewed under a microscope, with an outer row of moderately large and sturdy unicuspid teeth, reasonably spaced from each other and usually with the tips only weakly recurved; lower lip, viewed under a microscope, with single row of smaller unicuspid teeth, with weakly recurved tips (Figs 6c, 8b); depth of medial part of upper lip 5 to 8% of head length *Mugil trichodon*

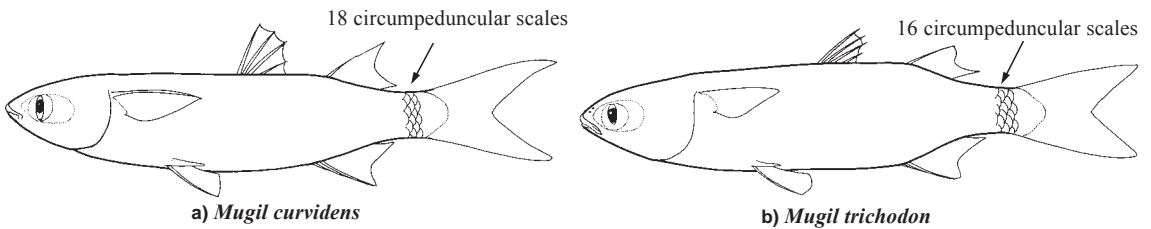


Fig. 9 lateral view

- 7a. Forty-three to 47 scales in longitudinal series and 21 to 23 in circumpeduncular series; origin of first dorsal fin usually slightly closer to tip of snout than to base of caudal fin (Fig 10a). ***Mugil incilis***
- 7b. Thirty-five to 40 scales in longitudinal series and 17 to 19 in circumpeduncular series; origin of first dorsal fin midway between tip of snout and base of caudal fin or slightly closer to base of caudal fin (Fig. 10b, c) → 8

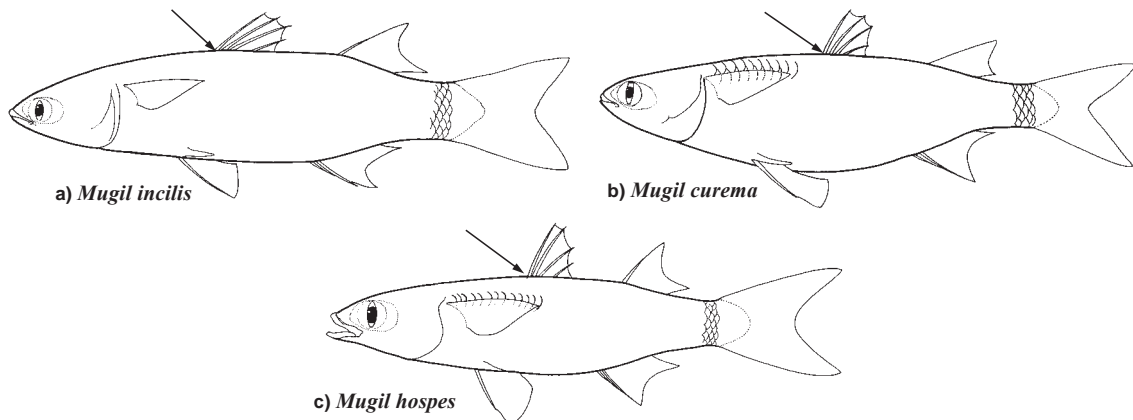


Fig. 10 lateral view

- 8a. Body depth at origin of first dorsal fin usually 26 to 30% standard length; body depth at origin of anal fin usually 21 to 27% standard length; pectoral fin with 15 to 17 soft rays, usually not quite reaching level of origin of first dorsal fin (pectoral fin 16 to 21% standard length, 70 to 82% head length); 8 to 10 scales in longitudinal series anterior to tip of pectoral fin (Fig. 10b); upper lip with very small teeth, either not visible to naked eye, or just visible, appearing as a fine fringe (Fig. 11a); upper lip, when viewed under microscope, with an outer row of moderately close-set unicuspid teeth, and an inner row of less closely-set and slightly smaller teeth sometimes present (Fig. 12a) ***Mugil curema***
- 8b. Body depth at origin of first dorsal fin usually 22 to 26% standard length; body depth at origin of anal fin usually 21 to 23% standard length; pectoral fin with 13 or 14 soft rays, long, reaching level of origin of first dorsal fin or extending just beyond this (pectoral fin 21 to 24% standard length, 80 to 96% head length); 11 to 13 scales in longitudinal series anterior to tip of pectoral fin (Fig. 10c); upper lip with minute teeth (Fig. 11b), usually not visible to naked eye; upper lip, when viewed under microscope, with an outer row of moderately spaced, very fine teeth, and an inner row of extremely small teeth sometimes present (Fig. 12b). ***Mugil hospes***

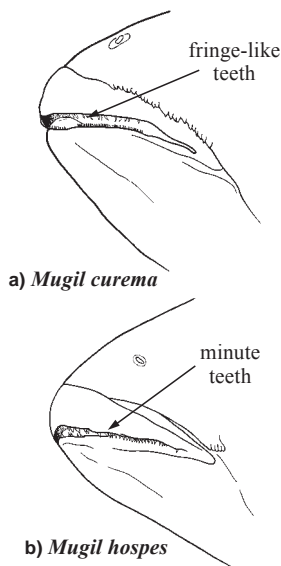


Fig. 11 lateral view of mouth

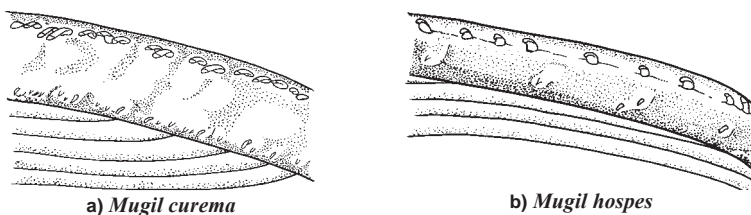




Fig. 12 inner surface of upper lip


List of species occurring in the area

The symbol  is given when species accounts are included.


 *Agonostomus monticola* (Bancroft in Griffith and Smith, 1834).

 *Joturus pichardi* Poey, 1860.

 *Mugil cephalus* Linnaeus, 1758.


 *Mugil curema* Valenciennes in Cuvier and Valenciennes, 1836.

 *Mugil curvidens* Valenciennes in Cuvier and Valenciennes, 1836.

 *Mugil hospes* Jordan and Cuvier in Jordan, 1895.

 *Mugil incilis* Hancock, 1830.

 *Mugil liza* Valenciennes in Cuvier and Valenciennes, 1836.

 *Mugil trichodon* Poey, 1875.

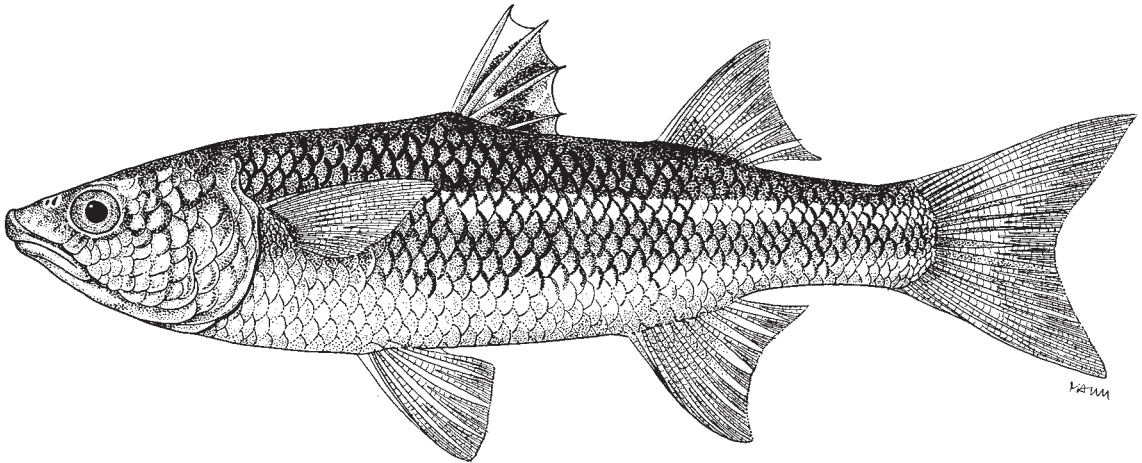
References

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- Harrison, I.J. 1993. Comment on the proposed conservation of the specific names of *Mugil curema* and *M. liza* Valenciennes in Cuvier and Valenciennes, 1836 (Osteichthyes, Perciformes). *Bull. Zoo. Nom.*, 50(2):144-147.
- Menezes, N.A. 1983. Guia prático para conhecimento e identificação das tainhas e paratis (Pisces, Mugilidae) do litoral brasileiro. *Revista Brasileira de Zoologia, São Paulo* 2(1):1-12.
- Thomson, J.M. 1997. The Mugilidae of the World. *Mem. Queens. Mus.*, 41(3):457-562.

Agonostomus monticola (Bancroft in Griffith and Smith, 1834)

Frequent synonyms / misidentifications: *Agonostomus hancocki* Seale, 1932 / None.

FAO names: En - Mountain mullet; Fr - Mulet de fleuve; Sp - Lisa de río.



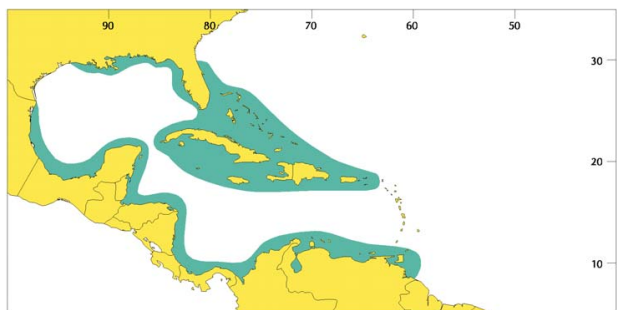
Diagnostic characters: Body depth greater at origin of first dorsal fin (24 to 30% standard length) than at origin of anal fin (20 to 25% standard length). **Head deeper than wide at level of posterior of operculum; dorsal surface of head convex across posterior interorbit** (head flattened across interorbit in *Mugil*). **Teeth small and attached directly to jaw bones (not born on edge of lip). Upper jaw (under microscope) with several rows of teeth with unicuspid, bicuspid, or tricuspid tips. Lower jaw (under microscope) with 2 or more rows of unicuspid or bicuspid teeth; teeth on opposite sides of lower jaw almost meeting at dentary symphysis. Translucent adipose eyefold absent** (present in *Mugil* over 30 mm standard length). **Gill rakers on lower part of first gill arch 16 to 23** (27 or more in other mullets). **Second dorsal and anal fins with small scales on anterior basal parts, otherwise naked.** Second dorsal fin with 9 soft rays. **Anal fin with 2 spines and 10 soft rays in adults.** Pectoral fin with 1 'spine' and 14 or 15 soft rays, reaching to level of origin of first dorsal fin or just anterior to this; pectoral fin 17 to 22% standard length, **70 to 78% head length. Scales in longitudinal series 38 to 45 (mode 40); 11 to 13 in transverse series;** 9 to 11 scales in longitudinal series anterior to tip of pectoral fin; 20 to 22 scales in circumpeduncular series. Pharyngobranchial organ not developed (well developed with large denticulate area, broad sulcus, and valve in *Mugil*). **Colour:** brownish dorsally, flanks silvery and abdomen off-white; silvery band may be present from base of pectoral fin to caudal fin. First dorsal fin yellowish, with darker pigmentation over spines; second dorsal fin yellowish, dusky along distal margin. Anal fin pale, with indistinct dark band near distal margin. Caudal fin dusky yellowish, with dark spot at centre of its origin, and with dark distal margins. Pectoral fins with small dark spot at origin.

Size: Reported to about 36 cm total length.

Habitat, biology, and fisheries: Adults inhabit fresh-water streams but probably spawn in lower reaches of rivers or the sea. Spawning is correlated with peak rainfall. Larval and juvenile specimens have been collected from river mouths and offshore waters. Omnivorous, feeding mainly on insects, prawns, fruits, and algae. Small commercial and subsistence fishery in the West Indies and Central America.

Distribution: Fresh-water streams of the Bahamas, Greater Antilles (perhaps also the Lesser Antilles), the Atlantic and Pacific slopes of Central America and Colombia, and Atlantic draining rivers of Venezuela. Rarely reported from rivers and streams of the southern USA (Florida and Louisiana). Also known from the Galapagos Islands.

Remarks: It is possible that *A. monticola*, as currently recognized, includes more than 1 species.

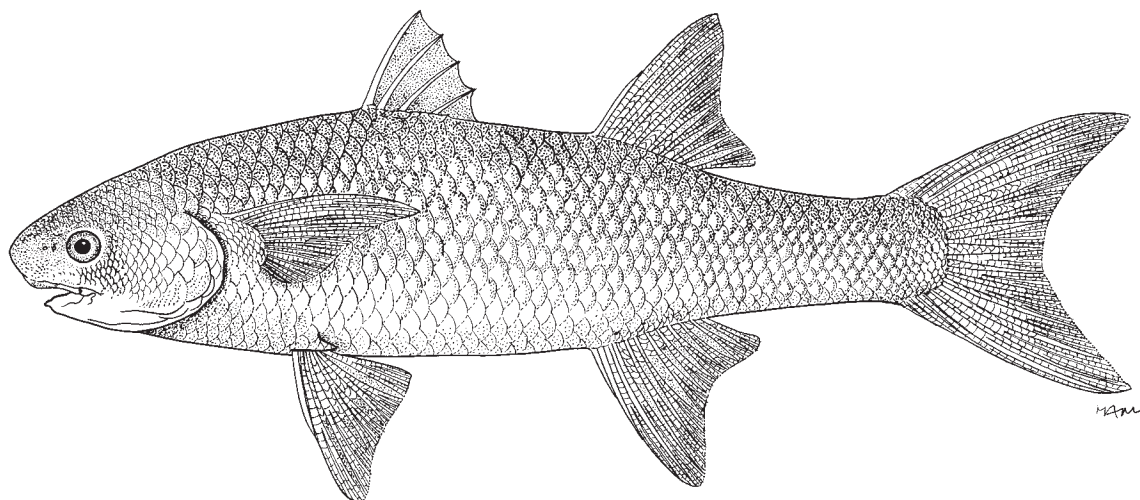


Joturus pichardi Poey, 1860

MUA

Frequent synonyms / misidentifications: None / None.

FAO names: En - Bobo mullet; Fr - Mulet bobo; Sp - Lisa bobo (Cuyamel).

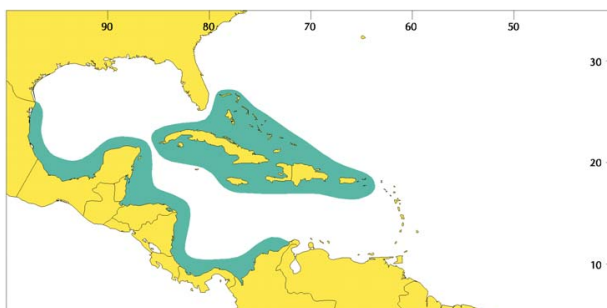


Diagnostic characters: Body depth greater at origin of first dorsal fin (about 28% standard length) than at origin of anal fin (about 24% standard length). **Head considerably deeper than wide at level of posterior of operculum; dorsal surface of head distinctly convex across posterior interorbit** (head flattened across interorbit in *Mugil*). **Mouth inferior, with snout projecting anteriorly beyond upper lip (except in specimens less than 6 cm).** **Teeth small and attached directly to jaw bones (not born on edge of lip).** **Upper jaw (under microscope) with about 3 rows of multicuspoid teeth. Opposite sides of lower jaw with a more or less oval patch of teeth; these 2 patches reasonably well separated at dentary symphysis.** **Translucent adipose eyefold absent.** **Gill rakers on lower part of first gill arch 27 to 40.** **Second dorsal and anal fins well-covered by small scales in adults.** **Second dorsal fin with 10 soft rays.** **Anal fin with 2 spines and 11 (rarely 10) soft rays in adults.** **Caudal fin forked.** **Pectoral fin with 1 'spine' and around 15 to 18 soft rays, reaching to level of origin of first dorsal fin; pectoral fin 19 to 22% standard length, 80 to 99% head length.** **Scales in longitudinal series 42 to 46; 13 or 14 in transverse series; 11 to 13 scales in longitudinal series anterior to tip of pectoral fin; 20 scales in circumpeduncular series.** **Pharyngobranchial organ very poorly developed, represented only by a shallow, rudimentary sulcus between the second and third pharyngobranchials (well developed with large denticulate area, broad sulcus, and valve in *Mugil*).** **Colour:** specimens less than 15 cm are silvery white, with dark bars on the dorsal, anal, and caudal fins. Body coloration changes with growth to a silvery grey, and later dark greenish grey; ventral parts of head may be yellowish. Dorsal fins dark at base (perhaps reddish on second dorsal fin), with yellowish green margins; anal and caudal fins also dark at base and covered with irregular black and yellow blotches. Pelvic and pectoral fins dark at base (perhaps reddish on pectoral fin) and yellowish near tips.

Size: Largest reported specimen is 49.1 cm standard length (61.4 cm total length).

Habitat, biology, and fisheries: Adults inhabit fresh-water streams but probably spawn in lagoons or the sea. Spawning perhaps correlated with peak rainfall. Juvenile *J. pichardi* feed on insects and algae; adults are principally herbivorous, browsing algae from rock surfaces. FAO statistics report capture production from 283 to 572 t from 1995 to 1999.

Distribution: Fresh-water streams of the Bahamas and Greater Antilles (perhaps also the Lesser Antilles), and the Atlantic and Pacific slopes of Central America and Colombia.

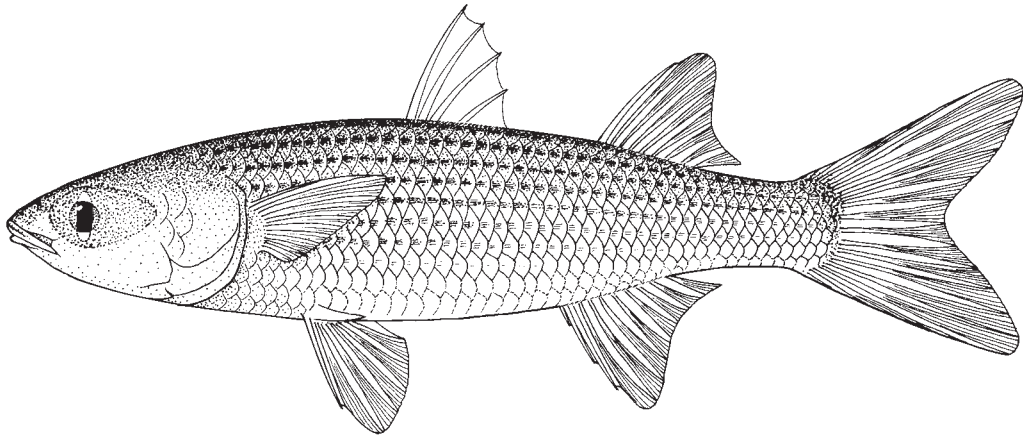


Mugil cephalus Linnaeus, 1758

MUF

Frequent synonyms / misidentifications: *Mugil our* Forsskål, 1775; *Mugil platanus* Günther, 1880 / *Mugil brasiliensis* Spix in Spix and Agassiz, 1831.

FAO names: **En** - Flathead mullet (AFS: Striped mullet); **Fr** - Mulet à grosse tête; **Sp** - Lisa pardete.

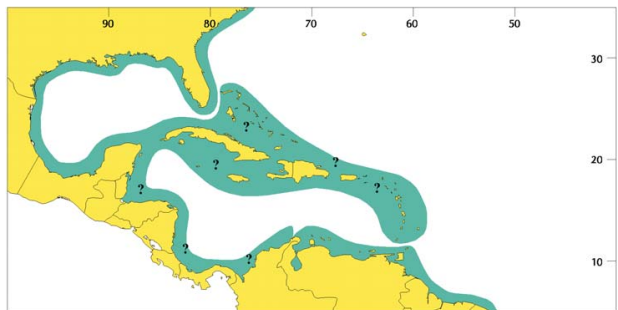


Diagnostic characters: Body depth greater at origin of first dorsal fin (24 to 28% standard length) than at origin of anal fin (20 to 24% standard length). Head depth equal to or greater than head width at level of posterior of operculum. Teeth very small, either not visible to naked eye, or just visible, appearing as a fine fringe. Upper lip (under microscope) with outer row of moderately close-set, unicuspid teeth, and 1 to 6 inner rows of smaller, bicuspid teeth. Lower lip (under microscope) with outer row of moderately close-set unicuspid teeth, and 1 to 6 inner rows of smaller, bicuspid teeth either present or absent (these rows usually less numerous than the inner rows of bicuspid teeth of the upper lip). Origin of fully erected second dorsal fin just posterior to vertical level of origin of anal fin. Second dorsal and anal fins with small scales on anterior basal parts, otherwise naked. Anal fin with 3 spines and 8 soft rays in adults (first spine very short, and may be hidden by overlying scales); usually 2 spines and 9 soft rays in juveniles about 30 mm or less in standard length. Pectoral fin with 1 'spine' and 15 or 16 (rarely 17) soft rays, not reaching level of origin of first dorsal fin; pectoral fin 16 to 19% standard length, 67 to 76% head length. Longitudinal series scale count usually 36 to 40 (mode 38) for specimens from Western Central Atlantic (global range is 36 to 44); 13 to 15 in transverse series; 8 to 11 scales in longitudinal series anterior to tip of pectoral fin; 19 or 20 scales in circumpeduncular series. **Colour:** specimens from sea greyish olive or greyish brown dorsally, flanks silvery, and abdomen off-white; about 7 to 10 longitudinal dark stripes along flanks, following rows of scales; these stripes less conspicuous ventrally. Estuarine fish may be a duller blue or dirty brown dorsally and flanks are duller. Dorsal fins and caudal fin dusky; pelvic and anal fins pale. Pectoral fins with dark spot at origin.

Size: Maximum reported length is 120 cm (standard length); common to 35 cm total length.

Habitat, biology, and fisheries: Adults in inshore marine waters, estuaries, lagoons, and rivers. Forms schools. Juveniles feed on plankton; adults feed on organic detritus. Large fisheries from Venezuela and Atlantic coast of Mexico (5 151 and 4 872 t respectively in 1999). Commercial fishery off Florida. Caught using gill nets, seines, etc. Used in aquaculture in the Gulf of Mexico. Marketed fresh, salted, and frozen; roe sold fresh or smoked. May be marketed as "lisa."

Distribution: Worldwide from 51 N to 42 S, although less abundant in tropics. In western Atlantic from Nova Scotia to Argentina, including Gulf of Mexico. Usually reported as absent from the Bahamas, Antilles, and Caribbean coast of Central America and Colombia (but perhaps misidentified as *M. brasiliensis*).

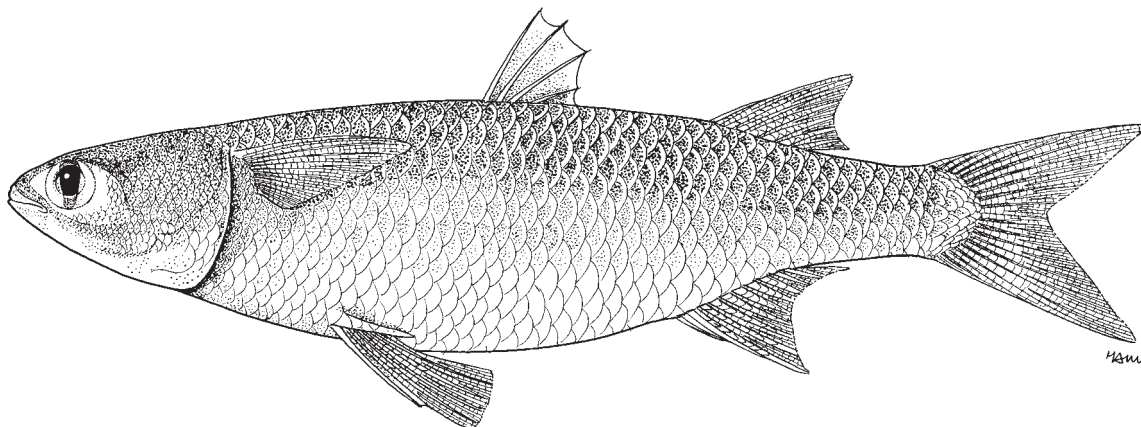


Mugil curema Valenciennes in Cuvier and Valenciennes, 1836

MGU

Frequent synonyms / misidentifications: *Querimana harengus* (Günther, 1861) / *Mugil brasiliensis* Spix and Agassiz, 1831; *Mugil gaimardianus* Desmarest in Bory de Saint-Vincent, 1831.

FAO names: En - White mullet; Fr - Mulet blanc; Sp - Lisa blanca.

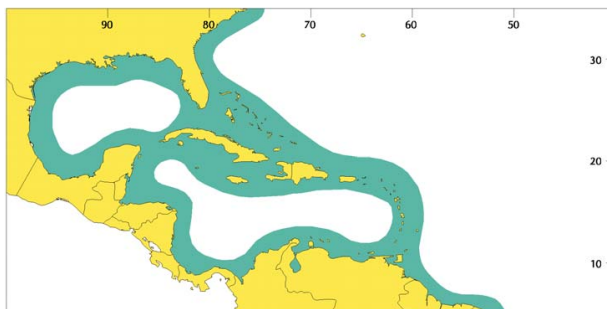


Diagnostic characters: Body depth greater at origin of first dorsal fin (26 to 30% standard length) than at origin of anal fin (21 to 27% standard length). Head deeper than wide at level of posterior of operculum. Teeth very small, either not visible to naked eye or just visible, appearing as a fine fringe. Upper lip (under microscope) with outer row of moderately close-set, unicuspid teeth, and an inner row of less closely-set and slightly smaller teeth may be present just posterior to the outer row. Lower lip (under microscope) with single row of unicuspid teeth, which are usually smaller than teeth in outer row on upper lip. Origin of first dorsal fin midway between tip of snout and base of caudal fin, or slightly closer to latter. Second dorsal and anal fins well-scaled in adults, with small scales over all parts of the fins (less densely scaled in specimens under about 50 mm standard length). Anal fin with 3 spines and 9 soft rays in adults (first spine very short, and may be hidden by overlying scales); usually 2 spines and 10 soft rays in juveniles about 30 mm or less in standard length. Pectoral fin with 1 'spine' and 15 to 17 (usually 16) soft rays, usually not quite reaching level of origin of first dorsal fin (see remarks below); pectoral fin 16 to 21% standard length, 70 to 82% head length. Scales in longitudinal series 35 to 40 (mode 37) for specimens from Western Central Atlantic; 11.5 to 13 (rarely 14.5) in transverse series; 8 to 10 scales in longitudinal series anterior to tip of pectoral fin; 17 to 19 scales in circumpeduncular series. **Colour:** specimens from sea bluish green or olive dorsally, flanks silvery, and abdomen off-white. Yellowish blotch between eye and upper edge of operculum. Dorsal fins dusky, second dorsal fin may be slightly darker than first dorsal fin. Caudal fin yellowish at origin and with blackish margin. Anal and pelvic fins pale yellowish. Pectoral fins with dark spot at origin.

Size: Maximum reported total length about 91 cm, but more common to 35 cm total length.

Habitat, biology, and fisheries: Adults in inshore marine waters and estuaries; not usually found in fresh waters. Forms schools; spawns offshore. Juveniles feed on plankton; adults feed on organic detritus and small particulate materials. Major commercial fishery; caught using gill nets, seines, etc. Used in aquaculture in Caribbean, Colombia and Brazil. Marketed fresh, salted, and frozen; roe sold fresh or smoked. May be marketed as "lisa."

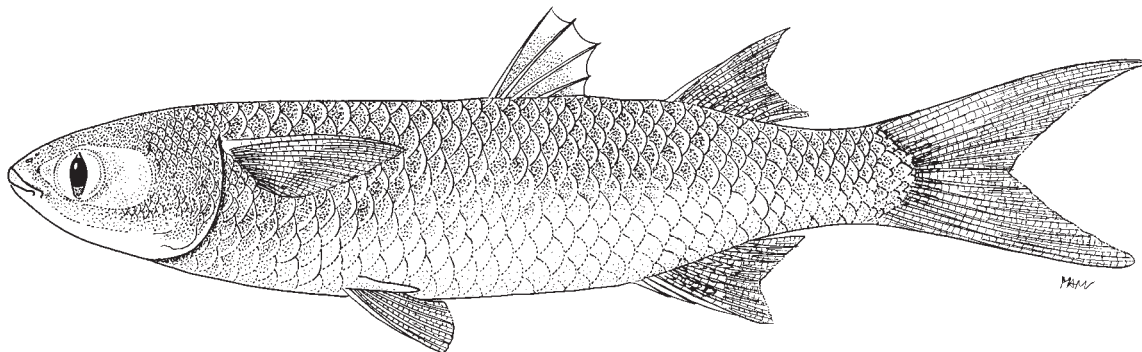
Distribution: Common through the Western Central Atlantic, including Bermuda, the Caribbean, and the Gulf of Mexico. Reported in the western Atlantic from Nova Scotia to southern Brazil. Also found in the eastern Atlantic from Senegal and the Cape Verde Islands to Namibia at about 20° S.



Mugil curvidens Valenciennes *in* Cuvier and Valenciennes, 1836

Frequent synonyms / misidentifications: *Myxus curvidens* (Valenciennes *in* Cuvier and Valenciennes, 1836); *Querimana curvidens* (Valenciennes *in* Cuvier and Valenciennes, 1836) / *Mugil trichodon* Poey, 1875.

FAO names: **En** - Dwarf mullet; **Fr** - Mulet mignon; **Sp** - Lisa enana.

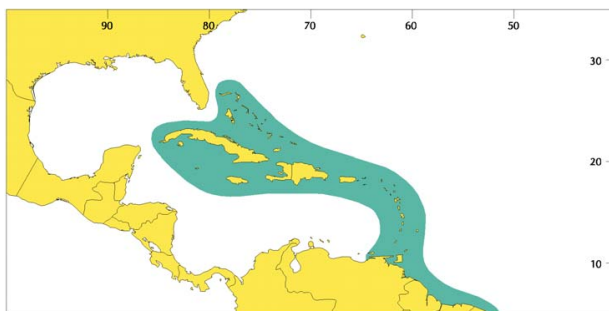


Diagnostic characters: Body depth greater at origin of first dorsal fin (usually 25 to 29% but may reach 33% standard length) than at origin of anal fin (usually 21 to 25% but may reach 27% standard length). Head deeper than wide at level of posterior of operculum. Depth of medial part of upper lip 5% or less of head length; lower lip may have its anterior margin slightly turned out and down. Teeth usually just visible to naked eye (except in small specimens). Upper lip (under microscope) with outer row of close-set, long, unicuspid teeth which have their tips recurved in towards the mouth (these teeth usually visible to naked eye as fringe along the lip), and an inner row of less closely-set and smaller unicuspid teeth. Lower lip (under microscope) with single row of close-set, long, unicuspid teeth with recurved tips (teeth on lower lip sometimes smaller than those on upper lip). Second dorsal and anal fins well-scaled in specimens over 60 mm standard length, with small scales over all parts of the fins; in specimens under 60 mm standard length the distal parts of the fins may not be scaled. Second dorsal fin with 9 soft rays (usually 8 in *Mugil trichodon*). Anal fin with 3 spines and 8 (rarely 7) soft rays in adults (first spine very short, and may be hidden by overlying scales); 2 spines and 9 soft rays in some specimens under 58 mm standard length. Pectoral fin with 1 'spine' and 14 or 15 (rarely 16) soft rays in adults; pectoral fin not quite reaching level of origin of first dorsal fin; pectoral fin 20 to 23% standard length, 70 to 80% head length. Scales in longitudinal series 34 to 37 (mode 35), rarely 33 or 38; 11.5 to 12.5 in transverse series; 9 or 10 (rarely 8) scales in longitudinal series anterior to tip of pectoral fin; 18 (rarely 17) scales in circumpeduncular series. **Colour:** dark bluish grey dorsally, flanks silvery and abdomen off-white. Pectoral fins with dark bluish spot at origin.

Size: Largest observed specimen for Western Central Atlantic area is 18 cm standard length (27 cm specimen collected from Brazil). More common under 10 cm.

Habitat, biology, and fisheries: An uncommon species. Perhaps caught incidentally with other mullets.

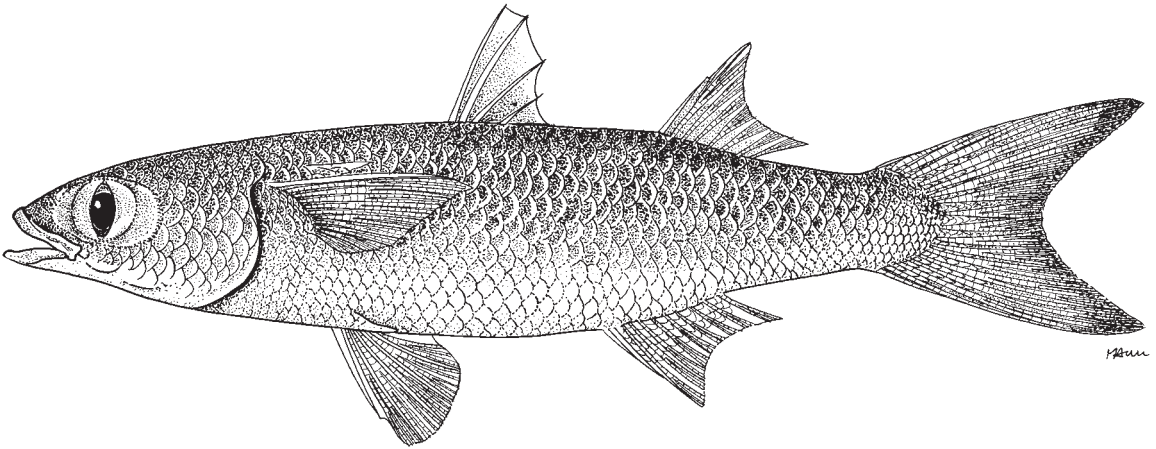
Distribution: In the western Atlantic from Bermuda, the Bahamas, the Antilles, and south to Rio de Janeiro, Brazil. Also collected from Ascension Island in the mid-Atlantic.



Mugil hospes Jordan and Cuvier in Jordan, 1895

Frequent synonyms / misidentifications: None / *Mugil curema* Valenciennes in Cuvier and Valenciennes, 1836.

FAO names: En - Hospe mullet; Fr - Mulet hospe; Sp - Lisa hospe.

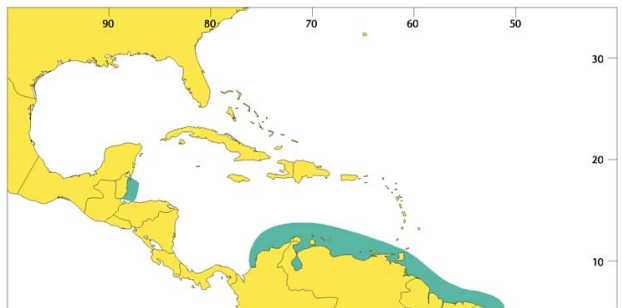


Diagnostic characters: Body elongate, snout appears slightly pointed. Body depth usually slightly greater at origin of first dorsal fin (22 to 26% standard length) than at origin of anal fin (21 to 23% standard length). Head deeper than wide at level of posterior of operculum. Upper and lower lips with a row of moderately spaced, minute teeth, not usually visible to naked eye. Usually only 1 row of teeth visible on both lips (under microscope), but upper lip sometimes has an inner row of extremely small teeth. Origin of first dorsal fin usually midway between tip of snout and base of caudal fin. **Second dorsal and anal fins with small scales over most or all parts of the fins in adults** (less densely scaled in specimens under about 50 mm standard length). **Anal fin with 3 spines and 9 (rarely 8) soft rays in adults** (first spine very short, and may be hidden by overlying scales); usually 2 spines and 9 soft rays in juveniles about 30 mm or less in standard length. **Pectoral fin with 1 'spine' and 13 or 14 soft rays in adults; pectoral fin long, reaching level of origin of first dorsal fin or extending just beyond this; pectoral fin 21 to 24% standard length, 80 to 96% head length. Scales in longitudinal series 37 to 40 (mode 38, rarely 36); 11.5 to 14 in transverse series; 11 to 13 scales in longitudinal series anterior to tip of pectoral fin; 19 scales in circumpeduncular series.** **Colour:** dark green or grey dorsally, flanks silvery, and abdomen off-white. Dorsal fins and caudal fin dusky; distal tips of anterior rays of second dorsal fin slightly darker; pelvic and anal fins pale. Pectoral fins with dark spot at origin.

Size: Reaching about 25 cm standard length.

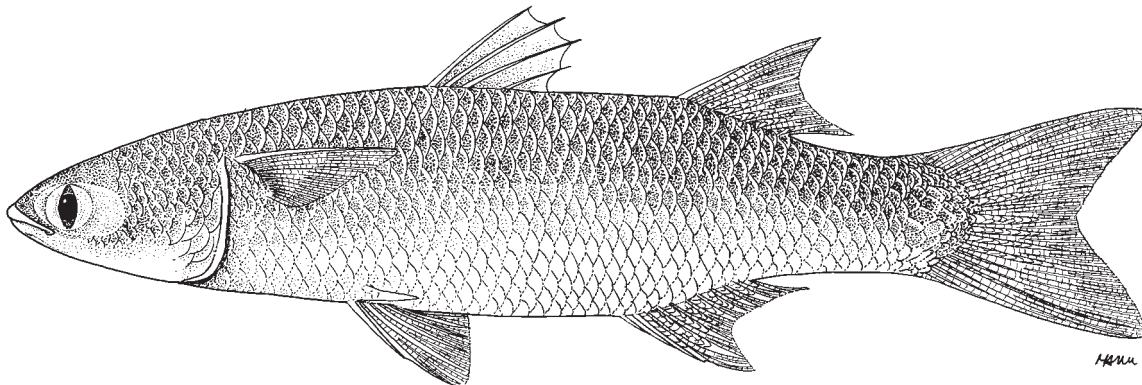
Habitat, biology, and fisheries: Adults inhabit inshore marine waters and may enter river mouths; reported over sand and mud bottoms. No fisheries data; apparently caught incidentally along the Atlantic coast of South America from Venezuela to French Guiana.

Distribution: Usually found in Atlantic coastal waters of South America, from Colombia to Brazil; the presence of *M. hospes* in the West Indies is not confirmed. Also collected from coastal waters around Belize City, and reported in the eastern Pacific from Mexico to Ecuador.



Mugil incilis Hancock, 1830

MGI

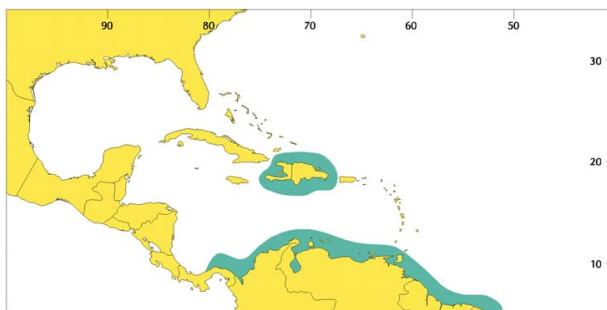
Frequent synonyms / misidentifications: None / None.**FAO names:** **En** - Parassi mullet (Trench mullet); **Fr** - Mulet parassi; **Sp** - Lisa rayada.

Diagnostic characters: Body depth greater at origin of first dorsal fin (21 to 28% standard length) than at origin of anal fin (20 to 24% standard length). Head usually deeper than wide at level of posterior of operculum. Teeth very small, not visible to naked eye or just visible, appearing as a fine fringe. Upper lip (under microscope) with an outer row of slightly recurved, unicuspid teeth, which are slightly spaced from each other, and an inner row of smaller teeth may be present just posterior to the outer row. Lower lip (under microscope) with single row of fine teeth, smaller than teeth in outer row on upper lip and sometimes absent. Origin of first dorsal fin usually slightly closer to tip of snout than base of caudal fin. Second dorsal and anal fins well-scaled in adults, with small scales over all parts of the fins. Anal fin with 3 spines and 9 soft rays in adults (first spine very short, and may be hidden by overlying scales); usually 2 spines and 9 soft rays in juveniles about 30 mm or less in standard length. **Pectoral fin with 1 'spine' and 15 or 16 soft rays, usually not quite reaching level of origin of first dorsal fin;** pectoral fin 19 to 22% standard length, 78 to 87% head length. **Scales in longitudinal series 43 to 47 (mode 45); 13 to 15 in transverse series; 10 or 11 (rarely 9) scales in longitudinal series anterior to tip of pectoral fin; 21 to 23 scales in circumpeduncular series.** **Colour:** bluish grey or olivaceous dorsally, flanks silvery, and abdomen off-white. Dorsal fins and caudal fin dusky; distal tips of anterior rays of second dorsal fin are slightly darker; pelvic and anal fins pale. Pectoral fins with dark spot at origin.

Size: Reaching about 40 cm total length.

Habitat, biology, and fisheries: Adults inhabit inshore marine waters and estuaries; may enter fresh water. No fisheries data; apparently caught incidentally throughout its range.

Distribution: Reported in the Caribbean from Haiti and Panama, and on the western Atlantic coast of South America to southeastern Brazil.

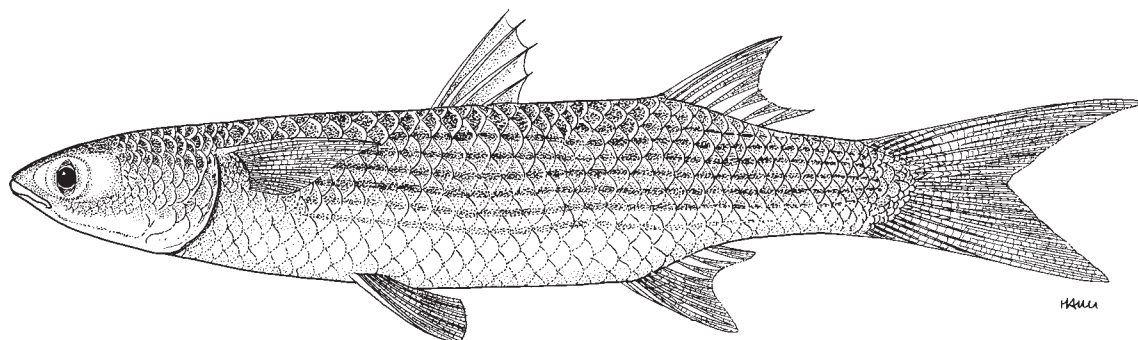


Mugil liza Valenciennes in Cuvier and Valenciennes, 1836

MUB

Frequent synonyms / misidentifications: *Mugil lebranchus* Poey, 1860 / *Mugil brasiliensis* Spix in Spix and Agassiz, 1831.

FAO names: **En** - Lebranche mullet (AFS: Liza); **Fr** - Mulet lébranche; **Sp** - Lebranche.

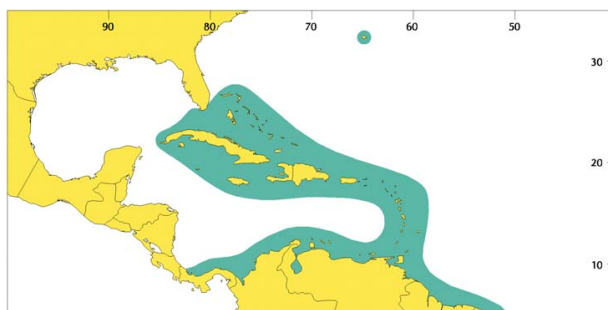


Diagnostic characters: Body moderately elongate; body depth usually slightly greater at origin of first dorsal fin (17 to 23% standard length) than at origin of anal fin (19 to 20% standard length). Head wider than deep at level of posterior of operculum. Teeth very small, either not visible to naked eye, or just visible, appearing as a fine fringe. Upper lip (under microscope) with outer row of moderately close-set, unicuspid teeth, and 1 to 6 inner rows of bicuspid teeth. Lower lip (under microscope) with outer row of close-set unicuspid teeth, and 1 to 5 inner rows of bicuspid teeth usually present (these rows are usually less numerous than the inner rows of bicuspid teeth of the upper lip, or may be absent). Origin of fully erected second dorsal fin on vertical through anterior quarter to third of anal fin. Second dorsal and anal fins with small scales on anterior basal parts, otherwise naked. Anal fin with 3 spines and 8 soft rays in adults (first spine very short, and may be hidden by overlying scales); usually 2 spines and 9 soft rays in juveniles about 30 mm or less in standard length. Pectoral fin with 1 'spine' and 15 to 17 (usually 16) soft rays, not reaching level of origin of first dorsal fin; pectoral fin 16 to 19% standard length, 67 to 76% head length. Scales in longitudinal series 29 to 34 (mode 33, rarely 35 or 36); 10.5 to 13 in transverse series; 7 to 9 scales in longitudinal series anterior to tip of pectoral fin; 17 to 20 scales in circumpeduncular series. **Colour:** dusky bluish dorsally, flanks silvery, and abdomen off-white; several indistinct longitudinal dark stripes along flanks, following rows of scales. Pelvic fins pale or yellowish, all other fins dusky.

Size: Maximum reported total length is 100 cm, but more common to about 40 cm total length.

Habitat, biology, and fisheries: Adults inhabit inshore marine waters and brackish water lagoons; may occasionally enter fresh water but never ascends far upriver. Diet probably similar to *M. cephalus*. Fisheries also reported for Colombia, Cuba, and Brazil (Rio de Janeiro state). Large recorded fishery in Venezuela (2 855 t in 1999). Probably caught throughout its range with gill nets, seines, etc. Aquaculture of *M. liza* has been attempted in Cuba and Colombia. Marketed fresh and salted.

Distribution: Present in inshore waters around Bermuda and southern Florida, the West Indies, the Caribbean coast of Panama, Colombia and Venezuela, and the Atlantic coast of South America, extending south as far as Rio de Janeiro.

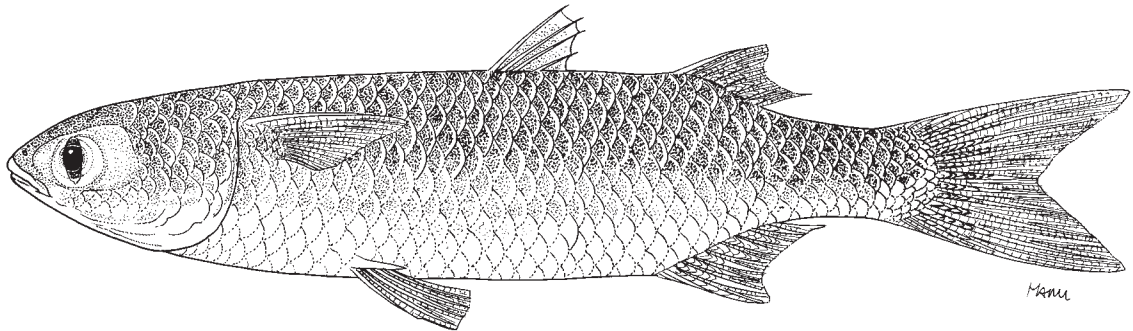


Mugil trichodon Poey, 1875

MMW

Frequent synonyms / misidentifications: ?*Querimana gyrans* Jordan and Gilbert, 1884; *Mugil brasiliensis* (of Jordan and Swain, 1884) / *Mugil curvidens* Valenciennes in Cuvier and Valenciennes, 1836).

FAO names: En - Fantail mullet; Fr - Mulet éventail; Sp - Lisa amarilla.



Diagnostic characters: Body depth greater at origin of first dorsal fin (26 to 32% standard length) than at origin of anal fin (25 to 29% standard length). Head deeper than wide at level of posterior of operculum. Depth of medial part of upper lip 5 to 8% of head length. Teeth usually just visible to naked eye (except in small specimens). Upper lip (under microscope) with outer row of moderately large and sturdy unicuspid teeth, reasonably spaced from each other and usually with the tips only weakly recurved; inner row of smaller, less recurved teeth sometimes present just posterior to the outer row. Lower lip (under microscope) with single row of unicuspid teeth, smaller than those on the upper lip and weakly recurved at tips. Second dorsal and anal fins well-scaled in specimens over 70 mm standard length, with small scales over all parts of the fins; in specimens under 70 mm standard length, distal parts of fins may not be scaled. Second dorsal fin with 8 (or very rarely 9) soft rays (usually 9 in other *Mugil*). Anal fin with 3 spines and 8 soft rays in adults (first spine very short, and may be hidden by overlying scales); 2 spines and 9 soft rays in specimens under 30 mm standard length. Pectoral fin with 1 'spine' and 15 or 16 (rarely 14 or 17) soft rays in adults; pectoral fin not quite reaching level of origin of first dorsal fin; pectoral fin 18 to 22% standard length, 69 to 84% head length. Scales in longitudinal series 28 to 34 (mode 32); 10.5 to 12 in transverse series; 8 to 10 scales in longitudinal series anterior to tip of pectoral fin; 16 scales in circumpeduncular series. **Colour:** olive grey dorsally, with bluish reflections; flanks silvery, abdomen off-white. Dorsal fins dusky, anterodorsal margin of second dorsal fin and margin of caudal fin dusky. Anal and pelvic fins pale or yellowish. Pectoral fins with a dark bluish spot at origin. Young fish (less than 14 cm) reported with gold opercular spot and with dark stripes on flanks, which are absent in larger specimens.

Size: Reported to 25 cm standard length.

Habitat, biology, and fisheries: Adults inhabit inshore marine waters, brackish lagoons, and river mouths; perhaps entering fresh water. Apparently caught incidentally along the Atlantic coast of South America from Venezuela to French Guiana. No fisheries data, but an important component of the mullet fishery in the Caribbean and perhaps Colombia. Marketed fresh and salted.

Distribution: Present from Bermuda and southern Florida, through the Gulf of Mexico, the Bahamas, and Antilles, extending south to northeastern Brazil.

