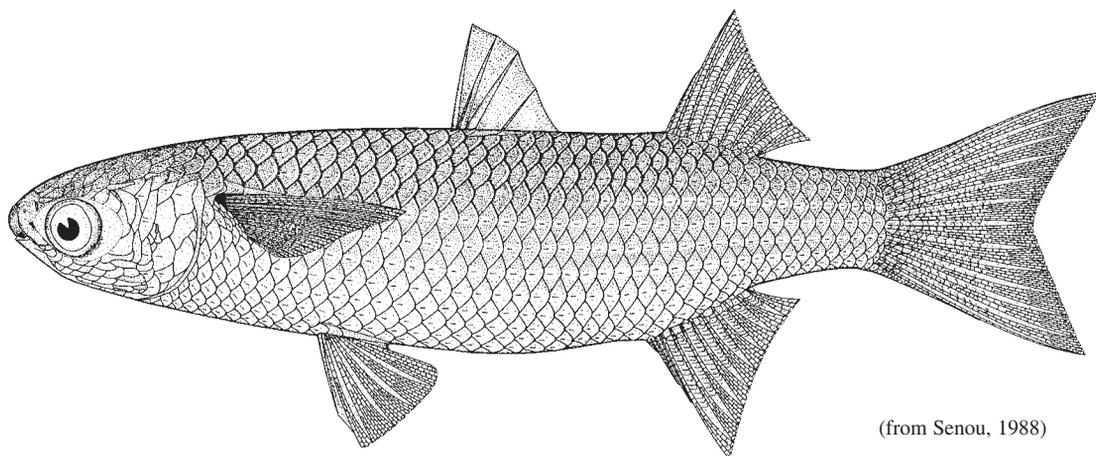


***Crenimugil heterocheilus*** (Bleeker, 1855)

**Frequent synonyms / misidentifications:** None / *Crenimugil crenilabis* (Forsskål, 1755).

**FAO names:** En - Half fringelip mullet.



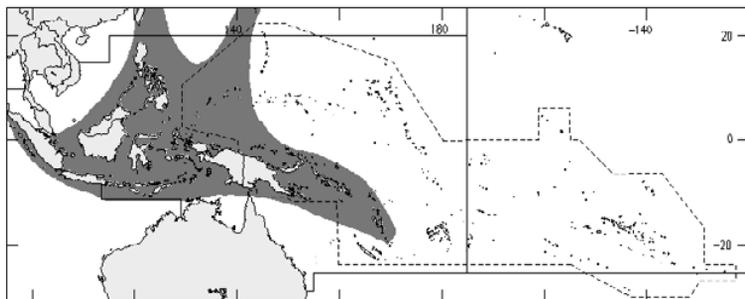
(from Senou, 1988)

**Diagnostic characters:** Gross morphology very similar to *C. crenilabis*. A medium-sized species; body moderately deep. Head relatively flattened dorsally. Snout equal to or shorter than eye diameter, blunt in profile. Dentary symphysis obtuse (blunt). **Upper lip thick; lip thickness at point of snout 6 to 11 times in head length. Ventral part of upper lip with 2 to 5 rows of papillae medially; papillae rows united into file-like ridges on lateral parts of lip. Papillae not distinct in fish less than about 10 cm standard length. Lower lip thin, not papillate or crenate. Lips edentate.** Maxilla curved down, weakly sigmoid near posterior tip. Preorbital weakly concave (**not kinked**) on serrate anteroventral edge and slightly expanded into squarish, posteroventral tip. Anterior and posterior nostrils close together. Adipose eyefold forms narrow rim around eye. Gill rakers on lower limb of first gill arch 37 to 57. Origin of first dorsal fin midway between tip of snout and base of caudal fin, or slightly closer to latter. Origin of fully erected second dorsal fin just posterior to vertical level of origin of anal fin; both fins lightly to moderately scaled. Anal fin with III spines and 9 (rarely 8) soft rays in adults (usually II spines and 10 soft rays in juveniles about 30 mm standard length or less). Caudal fin forked. Pectoral fins with I 'spine' and 15 to 17 (usually 16) soft rays, falcate, **reaching origin of first dorsal fin**; 21 to 27% standard length, 91 to 100% head length. Scales cycloid or very weakly ctenoid; **35 to 41 (rarely 32) scales in longitudinal series; 11 or 12 (perhaps up to 14) in transverse series**; 24 or 25 scales in longitudinal series anterior to origin of second dorsal fin. Pyloric caeca 6 to 8. **Colour:** olivaceous dorsally, flanks and abdomen silvery or white; dorsal fins blackish, second dorsal with orange tip; anal fin whitish with yellow tip; caudal fin pale bluish with tips of lobes orange-yellow; pectoral fins bluish black with orange-yellow tip and dark spot at upper part of base.

**Size:** Maximum reported standard length 50 cm, perhaps commonly to 23 cm standard length.

**Habitat, biology, and fisheries:** Found in coastal waters and ascending rivers into fresh water, penetrating far upstream from river mouth. Found in turbid channels and over gravel-bottoms. No fisheries data, but recorded as a food fish.

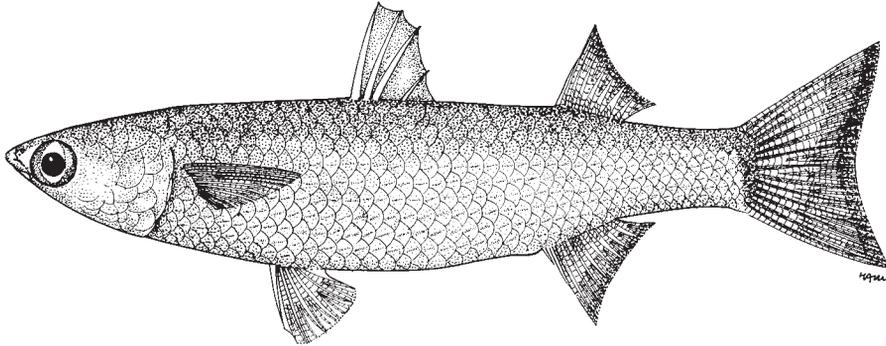
**Distribution:** Tropical Indo-Pacific from Indonesia and Philippines to Vanuatu. North to southern Japanese islands.



*Liza affinis* (Günther, 1861)

**Frequent synonyms / misidentifications:** None / *Liza carinata* (Valenciennes, 1836); *L. klunzingeri* (Day, 1888).

**FAO names:** En - Eastern keelback mullet.

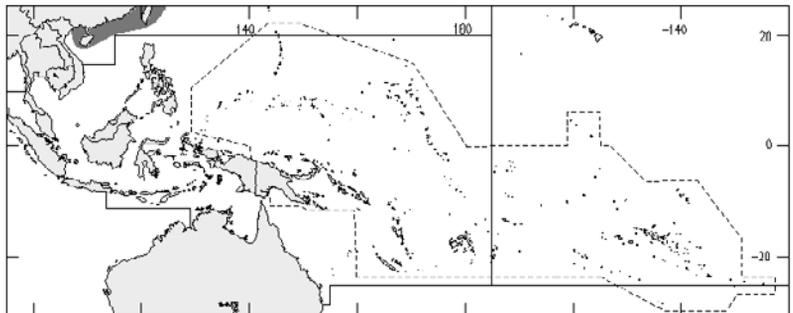


**Diagnostic characters:** A medium-sized species. Body rather elongate; depth at first dorsal fin 19 to 27% standard length; depth at anal fin 17 to 22% standard length. **Mid-dorsal line more or less sharply keeled on scales anterior to first dorsal fin (keel weaker in small specimens); keel between first and second dorsal fins weak or absent.** Head deeper than wide, only weakly convex interorbitally. Eye diameter 22 to 32% head length. Snout shorter than or equal to eye diameter and slightly pointed. Dentary symphysis 90° or more obtuse. Upper lip thin or slightly thickened; **outer row of close-set, fine, recurved, unicuspid teeth; inner row of smaller teeth** (sometimes indistinct). **Lower lip thin, directed forwards, no teeth present.** Vomer edentate. **Maxilla more or less sigmoidally curved near posterior tip, which is visible posteroventral to corner of closed mouth.** **Serrate anteroventral edge of preorbital with distinct kink; posteroventral tip broad and squarish.** Distance between anterior and posterior nostril less than maximum diameter of posterior nostril. **Adipose eyefold relatively well developed, covering about 1 and 2 of iris.** Gill rakers on lower limb of first gill arch 43 to 60, shorter than longest filaments. Origin of first dorsal fin nearer tip of snout than base of caudal fin. Origin of fully erected second dorsal fin on vertical through anterior third of anal fin; **both fins moderately scaled (i.e. basally but not distally) or well scaled (on all parts).** **Anal fin with III spines and 9 (rarely 8 or 10) soft rays in adults** (usually II spines and 10 soft rays in juveniles about 30 mm standard length or less). Caudal fin emarginate. Pectoral fins with I 'spine' and 15 to 18 soft rays; short, not reaching origin of first dorsal fin; pectoral fins 14 to 18% standard length, 67 to 76% head length; pectoral axillary scale rudimentary. Pectoral and pelvic fins shorter than head minus snout. Scales weakly ctenoid on flanks, strongly ctenoid ventrally; **33 to 43 (usually 35 to 40) scales in longitudinal series, 11 to 13 in transverse series;** 7 to 10 scales in longitudinal series anterior to tip of pectoral fins and 23 or 24 anterior to origin of second dorsal fin; **17 to 20 in transverse series entirely around caudal peduncle.** Pharyngobranchial organ with wide sulcus and **2 large, flap-like valves, the lower (anterior) one fimbriate.** Pyloric caeca 4 to 6 (usually 5). **Colour:** bluish or greenish dark dorsally, silver laterally and ventrally; several longitudinal dark stripes along scale rows on middle part of trunk; upper part of iris orange; dorsal fins darkish; caudal fin with broad, dark margin and dark at origin, but pale in middle part; anal fin partially darkish; pectoral fins darkish, basal part of uppermost soft ray black but not forming distinctive spot; pelvic fins white.

**Size:** Maximum reported standard length 30 cm.

**Habitat, biology, and fisheries:** Inhabits inlet waters and estuaries of rivers. Used as a food fish in Japan but perhaps not commercially fished in the Western Central Pacific.

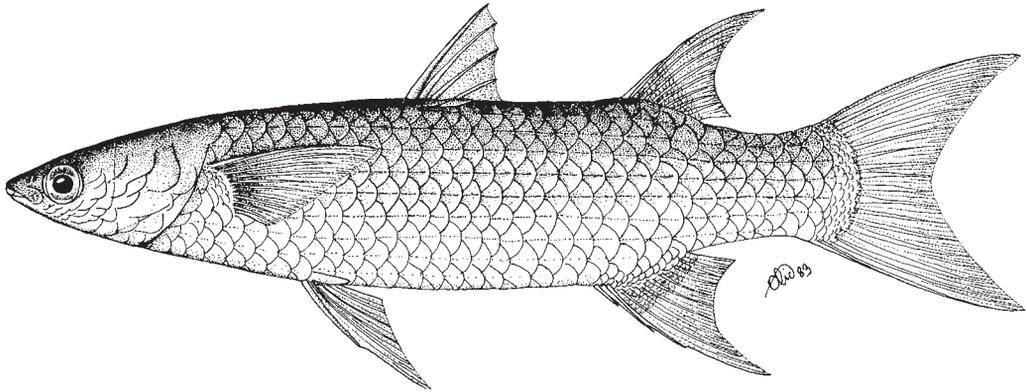
**Distribution:** From Japan (except northern Hokkaido) through to Ryukyu Islands and Taiwan Province of China, and coasts from Shanghai to Peihar and Hainan Island. Might occur as a very rare visitor to the northern extreme of the area.



***Liza alata*** (Steindachner, 1892)

**Frequent synonyms / misidentifications:** *Mugil diadema* Gilchrist and Thompson, 1911; *Pteromugil diadema* (Gilchrist and Thompson, 1911); *Moolgarda (Planiliza) ordensis* Whitley, 1945 / ?*Liza melinoptera* (Valenciennes, 1836).

**FAO names:** En - Diamond mullet; Fr - Mulet diamant; Sp - Lisa diamante.

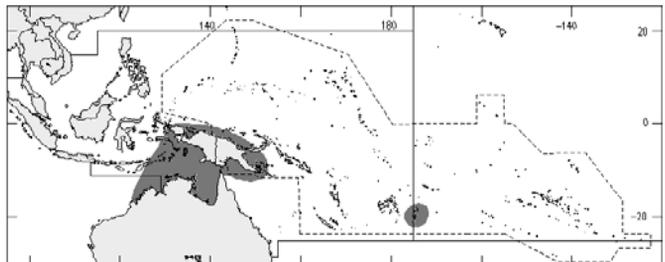


**Diagnostic characters:** A medium to large species. **Body moderately deep, but elongate, and compressed at caudal peduncle;** body depth at first dorsal fin 20 to 25% standard length; depth at anal fin 21 to 22% standard length. Head usually as wide as deep, dorsally flattened. Eye diameter 16 to 20% head length. Snout longer than eye diameter and more or less pointed. Dentary symphysis obtuse (blunt). Lips thin. **Upper lip with outer row of very small, close-set, unicuspid teeth and an inner band of up to 5 irregular rows of smaller teeth; inner band well spaced from outer row.** Lower lip directed forwards with minute ciliiform teeth present or absent. Vomer edentate. **Maxilla sigmoidally curved near posterior tip, which is visible posteroventral to corner of closed mouth. Serrate anteroventral edge of preorbital with weak kink; posteroventral tip broad and squarish.** Distance between anterior and posterior nostril less than maximum diameter of posterior nostril. Adipose eyefold poorly developed as rim around eye. Gill rakers on lower limb of first gill arch 64 to 79, shorter than longest filaments. Origin of first dorsal fin more or less midway between tip of snout and base of caudal fin, or slightly nearer snout. Origin of fully erected second dorsal fin on vertical through anterior one-third to two-thirds of anal fin; **both fins well scaled on all parts and falcate. Anal fin with III spines and 9 soft rays in adults** (II spines and 10 soft rays in juveniles about 30 mm standard length or less). **Caudal fin deeply forked.** Pectoral fins with I 'spine' and 16 soft rays; not reaching origin of first dorsal fin; pectoral fins 18 to 20% standard length, 78 to 95% head length, **falcate, greater than length of head minus snout;** pectoral axillary scale absent. **Pelvic fins almost equal to pectoral-fin length, longer than head minus snout, falcate. Ctenoid scales in longitudinal series 29 to 32; 10 to 12 in transverse series;** 7 scales in longitudinal series anterior to tip of pectoral fins and 19 to 22 (usually 19 or 20) anterior to origin of second dorsal fin; **16 scales in transverse series entirely around caudal peduncle. Pharyngobranchial organ with anterior valve a fleshy swelling, posterior valve a shallow fold.** Pyloric caeca 5. **Colour:** light brown dorsally, flanks silvery, abdomen whitish; **scales on flanks, especially upper part of body, with dark margins giving reticulate appearance, and with dark horizontal streak;** first dorsal fin hyaline with olive spines; second dorsal and pectoral fins grey; anal and caudal fins dusky with yellow or orange margin; pelvic fins bright yellow or orange.

**Size:** Maximum reported total length 75 cm; commonly to 35 cm total length.

**Habitat, biology, and fisheries:** Inhabits coastal waters, estuaries; sometimes ascending rivers into fresh water. Preferring slow moving waters or still lagoons. Water often turbid, over muddy substrate, and with well-substantiated aquatic vegetation; water temperature in range 25° to 35°C. Feeds on microalgae, detritus, terrestrial plant material, and aquatic insects. Perhaps catadromous.

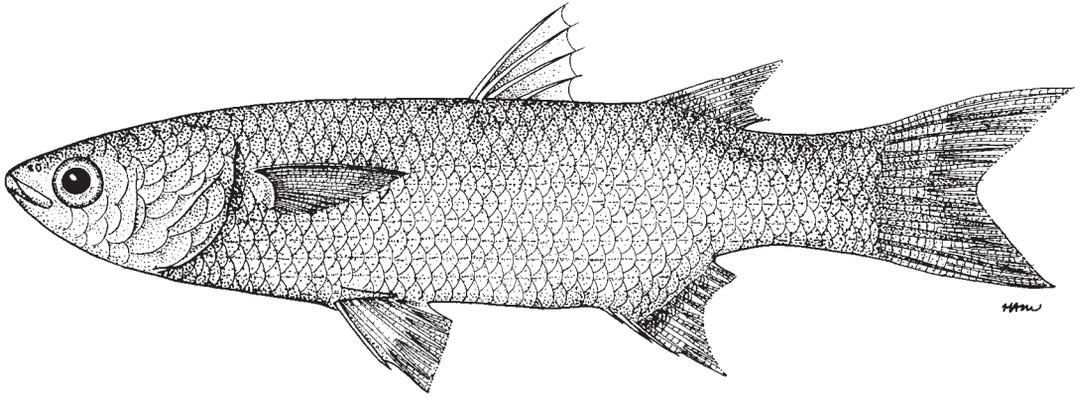
**Distribution:** Reported from South and East Africa, Madagascar, northern Australia (Timor Sea), New Guinea, and Tonga.



***Liza argentea*** (Quoy and Gaimard, 1825)

**Frequent synonyms / misidentifications:** *Mugil australis* Steindachner, 1879; *M. ferrandi* Cuvier, 1929; *M. peronii* Valenciennes, 1836 / *Liza ramsayi* (Macleay, 1883); *Aldrichetta forsteri* (Valenciennes, 1836).

**FAO names:** En - Flat-tail mullet.

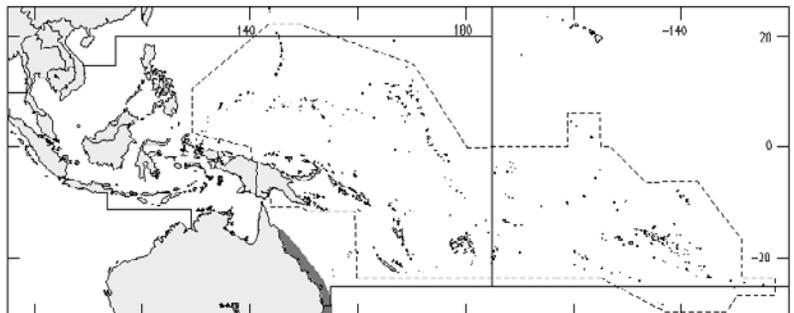


**Diagnostic characters:** A small to medium-sized species. Body rather slender but with deep, moderately compressed caudal peduncle. Head deeper than wide, somewhat flattened dorsally. Eye diameter 21 to 31% head length. Snout length approximately equals eye diameter and is more or less pointed. Dentary symphysis 90° or more obtuse. Lips thin, **each with a single row of minute setiform teeth** (almost invisible to naked eye). Vomer toothed. **Maxilla sigmoidally curved near posterior tip, which is visible posteroventral to corner of closed mouth.** Preorbital relatively large; **serrate anteroventral edge slightly kinked; posteroventral tip broad and squarish.** Anterior and posterior nostrils close together. Adipose eyefold rudimentary, forming narrow rim around eye. **Gill rakers on lower limb of first gill arch 100 to 150, very long, equal to or longer than longest filament.** Origin of first dorsal fin usually nearer base of caudal fin than tip of snout. Origin of fully erected second dorsal fin on vertical through anterior quarter to half of anal fin; **both fins moderately scaled on anterior and basal parts.** Second dorsal fin with 9 or 10 soft rays. **Anal fin with III spines and 10 soft rays in adults** (II spines and 11 soft rays in juveniles about 30 mm standard length or less). Caudal fin forked. Pectoral fins with I 'spine' and 14 to 16 soft rays; not reaching origin of first dorsal fin; 19 to 23% standard length, 71 to 78% head length; pectoral axillary scale absent. Scales weakly ctenoid; **34 to 38 in longitudinal series, 13 to 15 ½ in transverse series;** 10 to 12 scales in longitudinal series anterior to tip of pectoral fins and 23 to 25 scales anterior to origin of second dorsal fin; **18 to 20 scales in transverse series entirely around caudal peduncle.** Pharyngobranchial organ with broad, deep, sulcus and 2 valves. Pyloric caeca 2. **Colour:** dorsally steely-blue or light brown; flanks silvery with dark longitudinal stripes formed by alternating silver and dark on scales; abdomen silvery; gold patch on posteroventral corner of operculum; iris purple with gold flecks; dorsal, caudal and, to a lesser extent, anal fins dusky, but may have golden-yellow margins; origin of pectoral fins dark.

**Size:** Maximum total length perhaps 45 cm; commonly between 15 and 22 cm.

**Habitat, biology, and fisheries:** Adults inhabit brackish waters. Abundant in estuaries; also found in shallows, bogs, and saline lagoons. Fish younger than one year can be found in fresh waters, but not when older. Forms schools and often jumps at surface. Spawning probably occurs at sea. Feeds on benthic microscopic plants and animals. Fished from shallow, coastal waters and estuaries using gill nets and beach seines. Marketed fresh and filleted.

**Distribution:** Southern Australia from Geraldton (Western Australia) to Cooktown (Queensland).

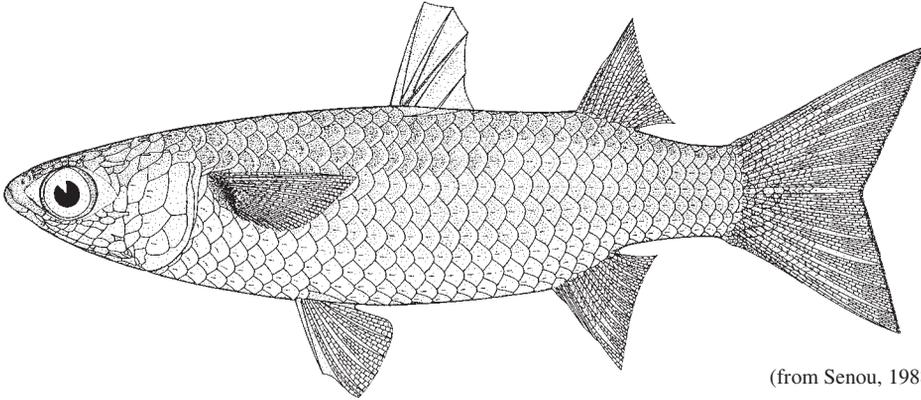


*Liza macrolepis* (Smith, 1846)

LZM

**Frequent synonyms / misidentifications:** *Mugil borneensis* Bleeker, 1851; *M. troscheli* Bleeker, 1858 / *Liza alata* (Steindachner, 1892); *L. melinoptera* (Valenciennes, 1836); *L. parsia* (Hamilton Buchanan, 1822); *L. subviridis* (Valenciennes, 1836).

**FAO names:** **En** - Largescale mullet; **Fr** - Mulet à grandes écailles; **Sp** - Lisa godeya.



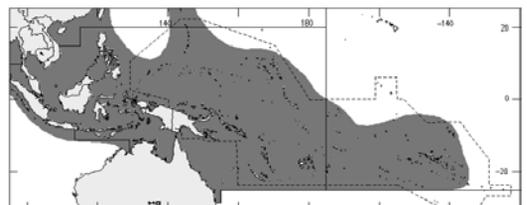
(from Senou, 1988)

**Diagnostic characters:** A medium to large species; body moderately robust; depth at first dorsal fin 26 to 31% standard length; depth at anal fin 23 to 25% standard length. Head depth equal to or greater than width; head flattened dorsally. Eye diameter 21 to 30% head length. Snout length less than or equal to eye diameter, moderately pointed. Dentary symphysis obtuse. Lips thin. **Upper lip with outer row of very close-set, small, peg-like unicuspid teeth, forming fine comb; 1 or 2 irregular rows of smaller, more wide-set teeth; inner rows well spaced from outer row.** Lower lip directed forwards with small ciliiform teeth present or absent. Vomer toothed (sometimes not evident). **Maxilla stocky and sigmoidally curved near posterior tip, which is visible posteroventral to corner of closed mouth. Serrate anteroventral edge of preorbital with moderate to distinct kink; posteroventral tip broad and squarish.** Distance between anterior and posterior nostril less than or equal to maximum diameter of posterior nostril. Adipose eyefold poorly developed as rim around eye or absent. Gill rakers on lower limb of first gill arch 35 to 78, shorter than longest filament. Origin of first dorsal fin closer to base of caudal fin than tip of snout. Origin of fully erected second dorsal fin on vertical through anterior quarter to half of anal fin; **both fins scaled on anterobasal parts and often well scaled on all parts. Anal fin with III spines and 9 (rarely 8 or 10) soft rays in adults** (usually II spines and 10 soft rays in juveniles about 30 mm standard length or less). Caudal fin emarginate. Pectoral fins with I spine and 15 to 18 (usually 16, rarely 14) soft rays; not reaching origin of first dorsal fin; pectoral fins 17 to 23% (usually 20%) standard length, 65 to 85% (usually 75 to 80%) head length; less than length of head minus snout; pectoral axillary scale rudimentary or absent. **Ctenoid scales in longitudinal series 31 to 35 (usually 32 or 33); 10 or 11 in transverse series;** 7 to 9 scales in longitudinal series anterior to tip of pectoral fins and 19 to 23 (usually 21 or 22) anterior to origin of second dorsal fin; **16 scales in transverse series entirely around caudal peduncle.** Pharyngobranchial organ with large denticulate area; broad sulcus with teeth on anterior border slightly larger than other teeth; **anterior and posterior valves are large flaps.** Pyloric caeca 4 to 6. **Colour:** greenish grey dorsally; flanks and abdomen silvery; fins grey or bluish with dusky margins and may appear yellowish at base; pectoral fins with golden base, and perhaps a dark spot.

**Size:** Maximum reported total length about 60 cm; commonly to 26 cm total length.

**Habitat, biology, and fisheries:** Schools in shallow coastal waters, estuaries, and backwaters. Can survive in ponds at 87% salinity; also sometimes enters fresh water. Juveniles might be found in shallow inundated areas along coast. Forms large schools during spawning at sea. Feeds on small algae, diatoms, foraminifera, benthic polychaets, crustacea, molluscs, organic matter and detritus; fry take copepods and floating algae. Fished throughout its range; taken with gill nets, cast nets, stake nets, barrier nets, lift nets, beach seines, and pouch nets during spawning. Marketed fresh; roe also marketed.

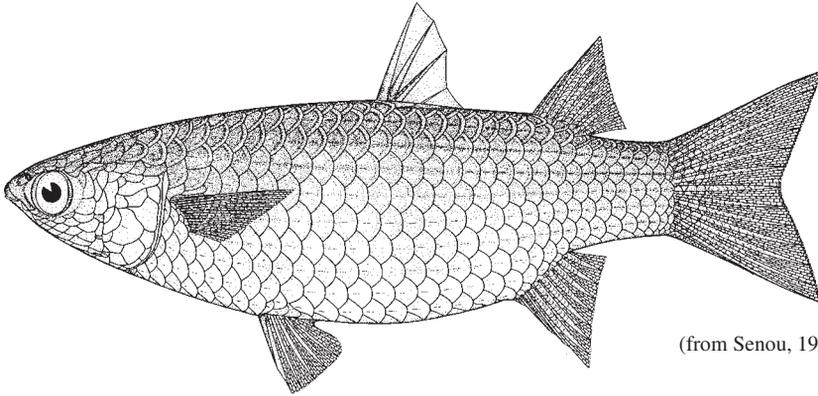
**Distribution:** Common throughout most of Indo-Pacific from East Africa and Red Sea to Marquesas and Tuamotu islands; north to Japan and Marianas Islands.



***Liza melinoptera*** (Valenciennes, 1836)

**Frequent synonyms / misidentifications:** *Mugil ceramensis* Bleeker, 1852; *M. oligolepis* (of Smith, 1935) / *Liza alata* (Steindachner, 1892); *L. macrolepis* (Smith, 1846); *L. parmata* (Cantor, 1850); *L. subviridis* (Valenciennes, 1836); *L. vaigiensis* (Quoy and Gaimard, 1825).

**FAO names:** **En** - Otomebora mullet; **Fr** - Mulet otomebora; **Sp** - Lisa otomebora.



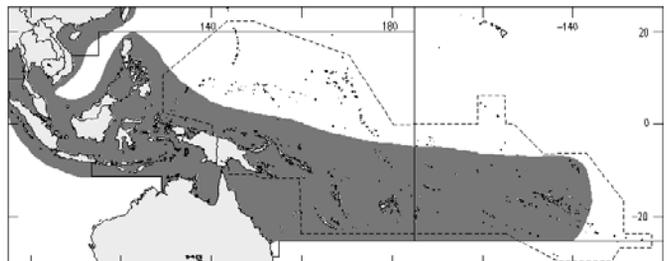
(from Senou, 1988)

**Diagnostic characters:** A small to medium-sized species; body distinctly robust or deep in profile; **caudal peduncle compressed**; **body depth at origin of first dorsal fin 27 to 31% (perhaps up to 34%) standard length**; **depth at origin of anal fin 23 to 29% standard length**. Head wider than deep and depressed. Eye diameter 24 to 28% head length. Snout shorter than eye diameter, blunt in profile. Dentary symphysis obtuse. Lips thin. **Upper lip with outer row of close-set, small setiform teeth and inner row of more sparse teeth, well embedded in lip tissue**. Lower lip directed forwards with **small ciliiform teeth present or absent**. Vomer edentate. **Maxilla stocky and sigmoidally curved near posterior tip, which is often visible posteroventral to corner of closed mouth**. **Serrate anteroventral edge of preorbital with moderate to distinct kink; posteroventral tip broad and squarish**. Distance between anterior and posterior nostril less than maximum diameter of posterior nostril. **Adipose eyefold usually only a narrow rim around eye**. **Gill rakers on lower limb of first gill arch 45 to 59 (perhaps more)**, shorter than longest filaments. Origin of first dorsal fin distinctly closer to base of caudal fin than tip of snout. Origin of fully erected second dorsal fin on vertical through anterior half to three-quarters of anal fin; **both fins moderately scaled (i.e. on all but distal parts) or well scaled on all parts**. **Anal fin with III spines and 9 (rarely 8 or 10) soft rays in adults** (usually II spines and 10 soft rays in juveniles about 30 mm standard length or less). Caudal fin emarginate. Pectoral fins with I 'spine' and 14 or 15 (infrequently 16) soft rays; not reaching origin of first dorsal fin; pectoral fins 18 to 23% standard length, 67 to 80% (infrequently up to 89%) head length, less than or equal to length of head minus snout; pectoral axillary scale rudimentary or absent. Scales ctenoid, **usually 26 to 29 (perhaps up to 31) in longitudinal series; 9 to 11 in transverse series; 7 scales in longitudinal series anterior to tip of pectoral fins** and 18 to 20 anterior to origin of second dorsal fin; **16 in transverse series entirely around caudal peduncle**. Pharyngobranchial organ with large denticulate area; **anterior valve a small finger-like process, posterior valve a large fold with papillate margin**. Pyloric caeca 5 or 6. **Colour:** olive-brown dorsally, silvery or white ventrally; distal margins of dorsal fins and **entire caudal fin dusky**.

**Size:** Maximum reported standard length 30 cm; commonly to 18 cm total length.

**Habitat, biology, and fisheries:** Schools in shallow coastal waters; enters lagoons, estuaries and rivers, to feed; fry may be found in shallower areas of these regions. Feeds on plant detritus, microalgae, minute bottom-living organisms, and organic matter contained in sand and mud; juveniles take planktonic algae. Fished from shallow coastal waters, estuaries, backwaters, and lagoons using cast nets, stake nets, beach seines, and gill nets. Marketed fresh.

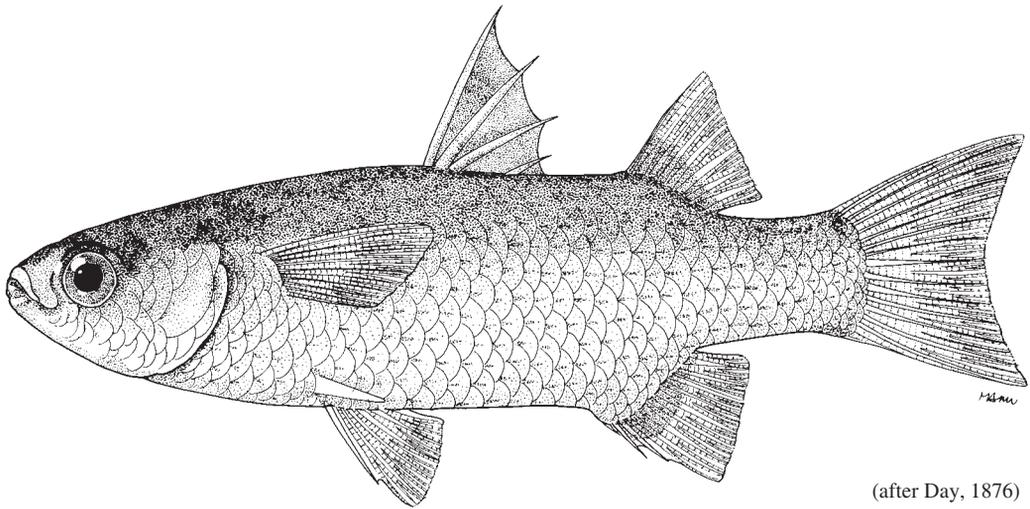
**Distribution:** Indo-Pacific from East Africa to the Marquesas Islands; north to South China Sea and south to tropical Australia and Tonga.



***Liza parmata*** (Cantor, 1850)

**Frequent synonyms / misidentifications:** *Liza oligolepis* (Bleeker, 1859) / *Liza macrolepis* (Smith, 1846); *L. melinoptera* (Valenciennes, 1836); *L. subviridis* (Valenciennes, 1836).

**FAO names:** En - Broadmouthed mullet.



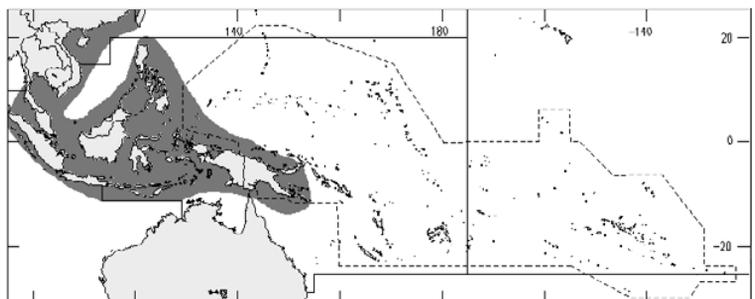
(after Day, 1876)

**Diagnostic characters:** A medium-sized species. **Deep bodied and compressed at caudal peduncle; body depth at first dorsal fin 30 to 37% standard length; depth at anal fin 29 to 33% standard length.** Head deeper than wide and flat dorsally. Eye diameter 24 to 29% head length. Snout length less than or equal to eye diameter, and moderately blunt in profile. Dentary symphysis very obtuse (blunt); **mouth appearing transverse in ventral view.** Lips thin. **Upper lip with 1 row of small, setiform teeth.** Lower lip directed forwards and **lacking teeth.** Vomer edentate. **Maxilla sigmoidally curved near posterior tip, which is visible posteroventral to corner of closed mouth.** **Serrate anteroventral edge of preorbital with distinct kink; posteroventral tip broad and squarish.** Distance between anterior and posterior nostril usually less than or equal to maximum diameter of posterior nostril. Adipose eyefold poorly developed as rim around eye or absent. **Gill rakers on lower limb of first gill arch 30 to 45,** shorter than longest filaments. Origin of first dorsal fin distinctly closer to base of caudal fin than tip of snout. Origin of fully erected second dorsal fin on vertical through anterior quarter to half of anal fin; **both fins scaled on anterobasal parts and may be scaled distally.** **Anal fin with III spines and 9 soft rays in adults** (II spines and 10 soft rays in juveniles about 30 mm standard length or less). Caudal fin emarginate. Pectoral fins with I spine and 14 or 15 (rarely 13) soft rays; almost reaching origin of first dorsal fin; pectoral fins 20 to 26% standard length, 83 to 91% head length; pectoral axillary scale rudimentary or absent. Scales cycloid or ctenoid (thoracic and abdominal scales ctenoid); **23 to 32 (usually 25 to 28) scales in longitudinal series, 9 or 10 (rarely 11) in transverse series; 9 or 10 (rarely 8 or 11) scales in longitudinal series anterior to tip of pectoral fins and 19 to 22 anterior to origin of second dorsal fin; 15 or 16 in transverse series entirely around caudal peduncle.** **Pharyngobranchial organ with anterior valve a long, low fold with a small ventral finger-like process, and posterior valve a moderate size, more or less fimbriate flap.** Pyloric caeca 5 to 9. **Colour:** greenish dorsally, silvery ventrally.

**Size:** Maximum reported total length 30 cm.

**Habitat, biology, and fisheries:** Found in seas, estuaries, and rivers. No other available data.

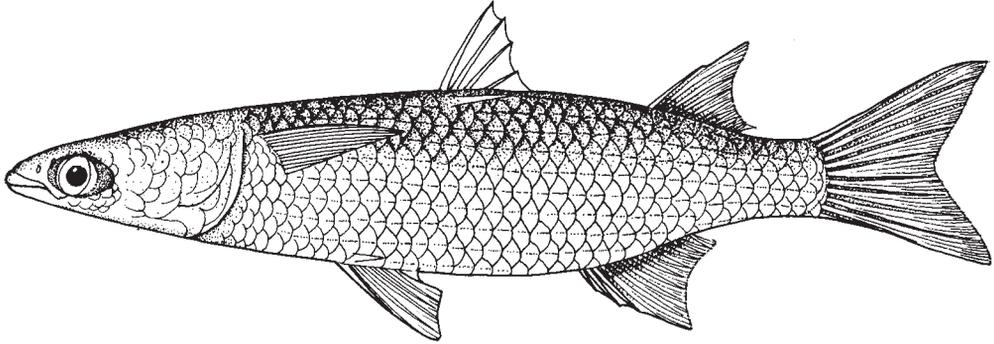
**Distribution:** Malaysia, Indonesia, New Guinea, Philippines, and South China Sea.



***Liza planiceps*** (Valenciennes, 1836)

**Frequent synonyms / misidentifications:** *Mugil belanak* Bleeker, 1857; *M. tade* Forsskål, 1775; *Liza tade* (Forsskål, 1775) / *Liza parsia* (Hamilton Buchanan, 1822); *L. subviridis* (Valenciennes, 1836); *L. vaigiensis* (Quoy and Garmard, 1825).

**FAO names:** En - Tade mullet; Fr - Mulet tade; Sp - Lisa tade.

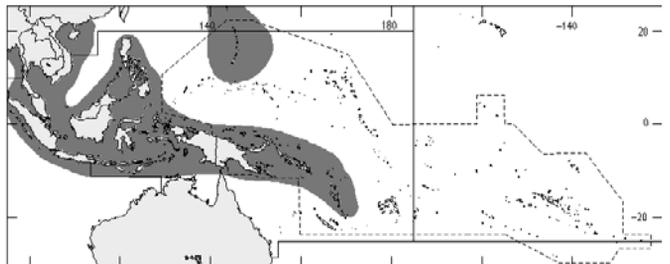


**Diagnostic characters:** A medium to large species. **Body elongate; depth at first dorsal fin 20 to 22% standard length; depth at anal fin 19 to 20% standard length. Head broad, depressed, pointed; head width greater than or equal to depth; head may appear somewhat bulging laterally. Eye diameter 14 to 33% head length, usually less than 20%. Snout length greater than or equal to eye diameter; pointed in profile. Dentary symphysis distinctly obtuse (blunt). Lips thin. Upper lip with outer row of fine, unicuspid, setiform teeth; inner band of 2 to 4 (perhaps 8) rows of smaller, finer, unicuspid setiform teeth. Lower lip directed forwards with 1 row of sparse ciliiform teeth present or absent. Vomer toothed. Maxilla sigmoidally curved near posterior tip, which is often visible posteroventral to corner of closed mouth. Serrate anteroventral edge of preorbital with distinct kink; posteroventral tip broad and squarish. Distance between anterior and posterior nostril less than maximum diameter of posterior nostril. Adipose eyefold more or less developed, covering up to 1 and 2 of iris. Gill rakers on lower limb of first gill arch 48 to 70. Origin of first dorsal fin midway between tip of snout and base of caudal fin or slightly nearer the latter. Origin of fully erected second dorsal fin on vertical through anterior third to half of anal fin; both fins well scaled basally but distal parts are sometimes weakly scaled. Anal fin with III spines and 9 soft rays in adults (II spines and 10 soft rays in juveniles about 30 mm standard length or less). Caudal fin forked. Pectoral fins with I 'spine' and 15 to 16 soft rays; short, not reaching origin of first dorsal fin; pectoral fins 16 to 20% standard length, 70 to 80% head length, less than length of head minus snout; pectoral axillary scale rudimentary or absent. Pelvic fins shorter than head minus snout. Scales ctenoid, sometimes very weakly so; 30 to 35 in longitudinal series; 10 or 11 in transverse series; 8 or 9 scales in longitudinal series anterior to tip of pectoral fins and 21 to 23 anterior to origin of second dorsal fin; 16 scales in transverse series entirely around caudal peduncle. Pharyngobranchial organ with reduced denticulate area; broad sulcus; anterior valve a low fold and posterior valve a small, thin flap. Pyloric caeca 5. **Colour:** greenish brown dorsally, whitish ventrally; flanks with 5 to 7 indistinct longitudinal lines along scale rows.**

**Size:** Maximum reported total length 70 cm; commonly to 33 cm standard length.

**Habitat, biology, and fisheries:** Usually marine, found in schools in shallow coastal waters and lagoons. Also enters estuaries and rivers to feed. Juveniles might be found in rice fields and mangrove swamps. Spawning occurs at sea. Feeds on floating algae, minute benthic organisms, and organic material in sand and mud. Fished in shallow coastal waters, estuaries, and backwaters using gill nets, stake nets, beach seines, and cast nets. Marketed fresh, salted; perhaps also boiled (Thailand), canned or frozen (Australia). Roe marketed salted.

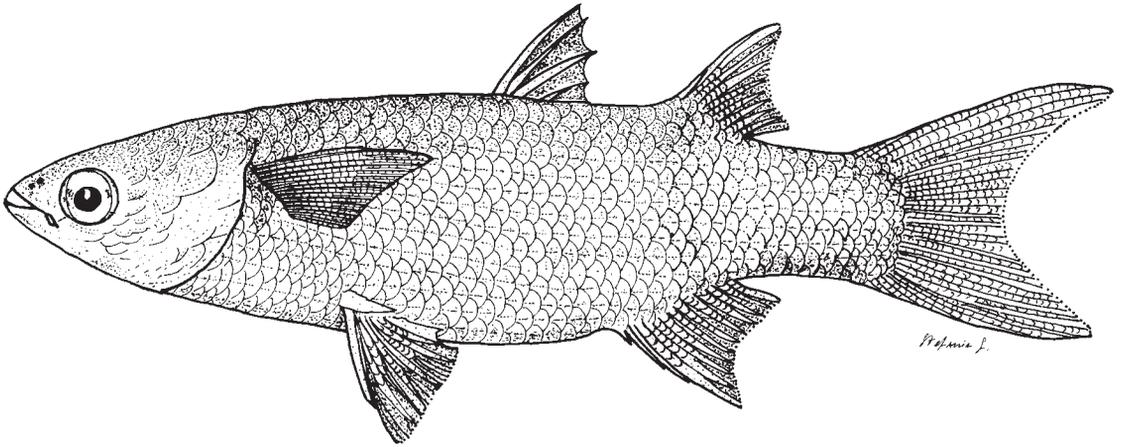
**Distribution:** Indo-Pacific; from Red Sea in west to China and Marianas Islands in north, and Vanuatu in south. Reports from tropical Australia might be misidentifications of other species.



***Liza ramsayi*** (Macleay, 1883)

**Frequent synonyms / misidentifications:** *Gracimugil ramsayi* (Macleay, 1883); *Trachystoma ramsayi* (Macleay, 1883) / *Liza argentea* (Quoy and Gaimard, 1825).

**FAO names:** En - Ramsay's mullet.

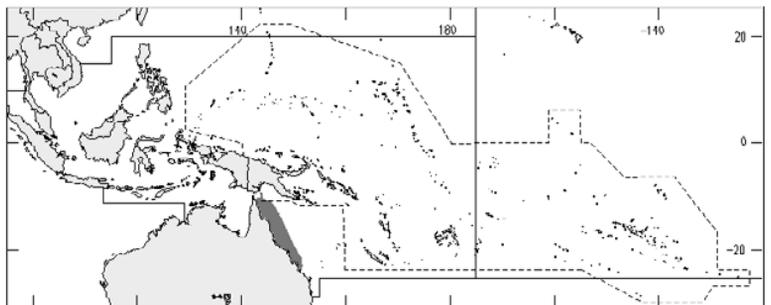


**Diagnostic characters:** A small to medium-sized species; morphologically very similar to *Liza argentea*, hence considered by some biologists as conspecific. Body moderately deep. Eye diameter 25% head length. Snout length more or less equals eye diameter and is pointed. Dentary symphysis 90° or more obtuse. Upper lip perhaps slightly thickened; lower lip thin. **Each lip with a single row of minute setiform teeth** (almost invisible to naked eye). Vomer toothed. **Maxilla sigmoidally curved near posterior tip, which is visible posteroventral to corner of closed mouth.** Preorbital relatively large; **serrate anteroventral edge slightly kinked; posteroventral tip broad and squarish.** Anterior and posterior nostrils close together. Adipose eyefold rudimentary, forming narrow rim around eye. **Gill rakers on lower limb of first gill arch extremely numerous and as long as gill filaments.** Origin of first dorsal fin nearer base of caudal fin than tip of snout. Origin of fully erected second dorsal fin on vertical through anterior half of anal fin; **both fins moderately scaled. Second dorsal fin with 9 or 10 soft rays. Anal fin with III spines and 11 (rarely 10) soft rays in adults** (usually II, 12 in juveniles about 30 mm standard length or less). Caudal fin forked. Pectoral fins with I 'spine' and 15 soft rays, not reaching origin of first dorsal fin; pectoral fins 21 to 25% standard length, 77 to 91% head length; pectoral axillary scale very small or absent. Scales cycloid dorsally, weakly ctenoid laterally and more distinctly ctenoid ventrally; **36 or 37 in longitudinal series, about 12 to 15 in transverse series; 10 scales in longitudinal series anterior to tip of pectoral fins and 23 anterior to origin of second dorsal fin.** **Colour:** bluish dorsally, silvery on flanks and abdomen; dark spot at origin of pectoral fins.

**Size:** Maximum reported fork length 26.1 cm.

**Habitat, biology, and fisheries:** Brackish waters. No fisheries data.

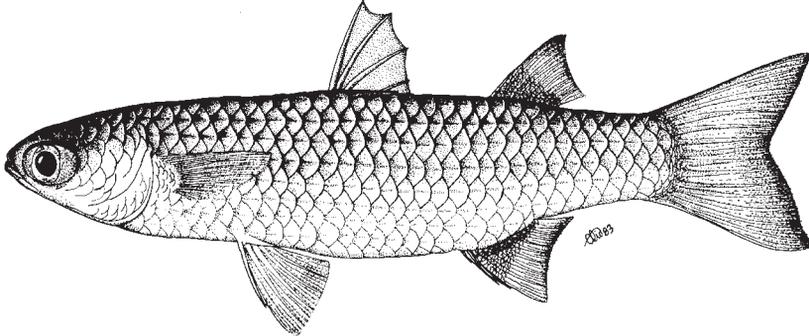
**Distribution:** Tropical Australia; all records coming from Queensland.



***Liza subviridis*** (Valenciennes, 1836)

**Frequent synonyms & misidentifications:** *Mugil alcocki* Ogilby, 1908; *M. dussumieri* Valenciennes, 1836; *M. javanicus* Bleeker, 1852; *M. jerdoni* Day, 1876; *M. sudanensis* Bleeker, 1853 / *Liza macrolepis* (Smith, 1846); *L. parmata* (Cantor, 1850); *L. parsia* (Hamilton Buchanan, 1822); *L. planiceps* (Valenciennes, 1836); *L. vaigiensis* (Quoy and Gaimard, 1825).

**FAO names:** **En** - Greenback mullet; **Fr** - Mulet dos vert; **Sp** - Lisa lomo verde.

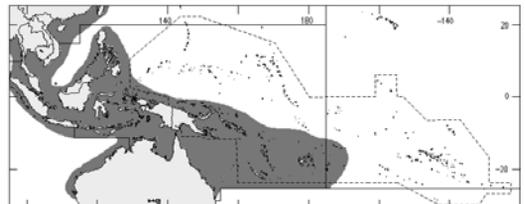


**Diagnostic characters:** A medium-sized species; body fusiform or not distinctly deep; **depth at first dorsal fin usually 22 to 26% standard length (but may reach 27 to 30%)**; **depth at anal fin 21 to 24% standard length (perhaps up to 26%)**. Head broad, but head depth usually equal to or greater than width; head dorsally flattened. Eye diameter 21 to 30% head length. Snout short and blunt, usually shorter than eye diameter. Dentary symphysis obtuse (blunt). Lips thin. **Upper lip with an outer row of very small, close-set unicuspid teeth and 1 or 2 irregular, inner rows of smaller, ciliiform teeth**. Lower lip directed forwards with 1 row of fine ciliiform teeth present or absent. Vomer edentate. **Maxilla sigmoidally curved near posterior tip, which is often visible posteroventral to corner of closed mouth. Serrate anteroventral edge of preorbital with moderate to distinct kink; posteroventral tip broad and squarish**. Distance between anterior and posterior nostril less than maximum diameter of posterior nostril. **Adipose eyefold moderately developed, covering up to 1 and 2 of iris** (less distinct in specimens smaller than about 10 cm standard length). **Gill rakers on lower limb of first gill arch 40 to 68 (rarely 41 to 44)**, shorter than longest filaments. Origin of first dorsal fin midway between tip of snout and base of caudal fin, or just closer to latter. Origin of fully erected second dorsal fin on vertical through anterior one to two-thirds of anal fin; **both fins well scaled on all parts. Anal fin with III spines and 9 (rarely 8) soft rays in adults** (usually II spines and 10 soft rays in juveniles about 30 mm standard length or less). Caudal fin emarginate. Pectoral fins with I 'spine' and 14 to 16 (usually 14 or 15) soft rays; short, not reaching origin of first dorsal fin; pectoral fins 16 to 22% standard length, 70 to 78% head length, less than length of head minus snout; pectoral axillary scale rudimentary or absent. **Ctenoid scales in longitudinal series 28 to 32 (rarely 26, 27, or 33); 9 to 11 (rarely 12) in transverse series; 7 or 8 (rarely 9) scales in longitudinal series anterior to tip of pectoral fins and 18 to 21 (usually 19 or 20) anterior to origin of second dorsal fin; 16 or 17 (rarely 15) in transverse series entirely around caudal peduncle. Pharyngobranchial organ usually with anterior valve as one or more small, finger-like processes, and posterior valve a small fold; but some putatively conspecific specimens have both valves developed as moderate size flaps**. Pyloric caeca 4 to 6. **Colour:** dark greenish dorsally, brownish over head, white ventrally; 3 to 6 indistinct, dark stripes along upper rows of scales; first dorsal fin greyish; second dorsal fin yellowish grey, with dusky margin; anal fin also with dusky margin; **caudal fin bluish with black margin**; pectoral fins yellowish and may have a blue spot at fin origin.

**Size:** Maximum reported standard length 40 cm; commonly to 25 cm total length.

**Habitat, biology, and fisheries:** Schools in shallow coastal waters and enters lagoons, estuaries, and fresh waters to feed. Juveniles might be found in rice fields and mangroves. Adults feed on microalgae, filamentous algae, diatoms, and benthic detrital material taken in with sand and mud; fry take zooplankton, diatoms, detrital material, and inorganic sediment. Fished using gill nets, cast nets, stake nets, lift nets, and beach seines. Marketed fresh and salted; perhaps also boiled (Thailand), canned or frozen (Australia). Roe marketed salted. Also used as a bait-fish.

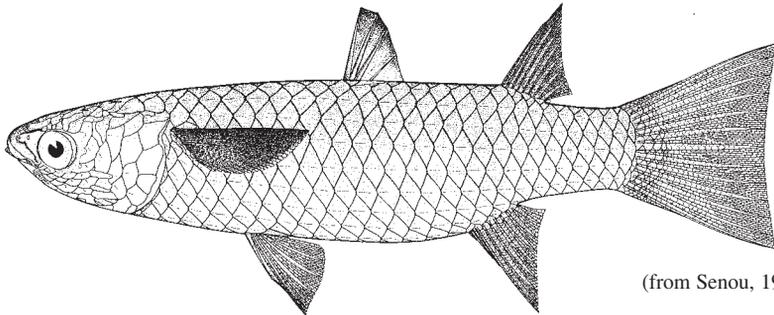
**Distribution:** Indo-Pacific from Red Sea to Samoa; north to Japan, where it is rare.



*Liza vaigiensis* (Quoy and Gaimard, 1825)

**Frequent synonyms / misidentifications:** *Liza waigiensis* (Quoy and Gaimard, 1825); *Ellochelon vaigiensis* (Quoy and Gaimard, 1824) / ? *Liza melinoptera* (Valenciennes, 1836); *L. parmata* (Cantor, 1850).

**FAO names:** **En** - Squartail mullet (= Diamond-scale mullet, Fishing Areas 57 and 71); **Fr** - Mulet mopiropi; **Sp** - Lisa mopiropi.

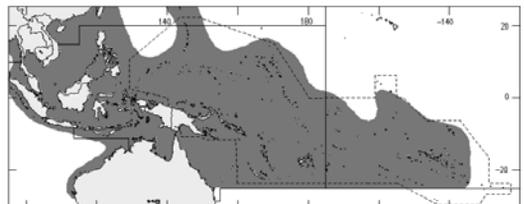


**Diagnostic characters:** A medium to large species. Body robust; depth at first dorsal fin 20 to 27% standard length; depth at anal fin 23 to 25% standard length. Caudal peduncle deep. **Head broad, wider than deep (except in young)** and dorsally flattened. Eye diameter 17 to 33% head length. Snout longer than eye diameter in adults but shorter in juveniles. Dentary symphysis obtuse (blunt). Lips thin. **Upper lip with 1 or 2 rows of very short, unicuspid, setiform teeth** (absent in specimens over about 25 cm standard length). **Lower lip directed forwards with 1 row of fine ciliiform teeth** (absent in specimens over 10 cm standard length). Vomer edentate. **Maxilla slightly sigmoidally curved near posterior tip, which is visible posteroventral to corner of closed mouth. Serrate anteroventral edge of preorbital with weak kink; posteroventral tip broad and squarish.** Distance between anterior and posterior nostril less than or equal to maximum diameter of posterior nostril. Adipose eyefold poorly developed as rim around eye. Gill rakers on lower limb of first gill arch 40 to 67, shorter than longest filaments. Origin of first dorsal fin distinctly closer to base of caudal fin than tip of snout. Origin of fully erected second dorsal fin on vertical through anterior third to half of anal fin in advance of second dorsal fin; **both fins always well scaled basally, and more or less heavily scaled on distal parts. Anal fin with III spines and 8 soft rays (rarely 7 or 9) in adults** (usually II spines and 9 soft rays in juveniles about 30 mm standard length or less). **Caudal fin square.** Pectoral fins with I 'spine' and 15 to 18 (usually 15) soft rays; short, just reaching origin of first dorsal fin; pectoral fins 19 to 26% standard length, 77 to 92% head length; greater than length of head minus snout; pectoral axillary scale absent. Scales weakly ctenoid (cycloid in juveniles), **25 to 29 (commonly 26) in longitudinal series, 8 to 10 in transverse series**; 7 to 9 scales in longitudinal series anterior to tip of pectoral fins and 17 to 20 (usually 17 or 18) anterior to origin of second dorsal fin; **16 scales in transverse series entirely around caudal peduncle.** Pharyngobranchial organ with broad sulcus; **anterior valve a large fleshy lobe and posterior valve a small papilla. Pyloric caeca much divided; up to 23 in about 2 bunches.** **Colour:** olive-brown dorsally, flanks silvery, abdomen white or suffused pale yellow; **about 6 longitudinal stripes on flanks formed by longitudinal marks on scales**; scales also with darkened margins giving slight chequered appearance to flanks; iris with yellow patches; margins of fins dusky, otherwise yellowish white; pelvic fins pale except for darker margins; **caudal fin distinctly yellow; pectoral fins completely black in small fish; lower section yellowish in adults.**

**Size:** Maximum reported total length about 60 cm; commonly to 35 cm total length.

**Habitat, biology, and fisheries:** Common along shallow coastal areas and protected sandy shores in lagoons, reef flats, estuaries, and coastal creeks. Usually within tidal influence, but may enter fresh water, ascending up to about 10 km into rivers. Juveniles might be found in rice fields and mangroves. Forms shoals. Spawning probably occurs at sea. Feeds on small algae, diatoms, benthic polychaets, molluscs, crustaceans, as well as living and detrital organic matter; fry take copepods and floating algae. Caught in cast nets, stake nets, beach seines, and gill nets. Marketed fresh and salted; perhaps also boiled (Thailand), canned or frozen (Australia). Roe marketed salted. Juveniles used as bait fish.

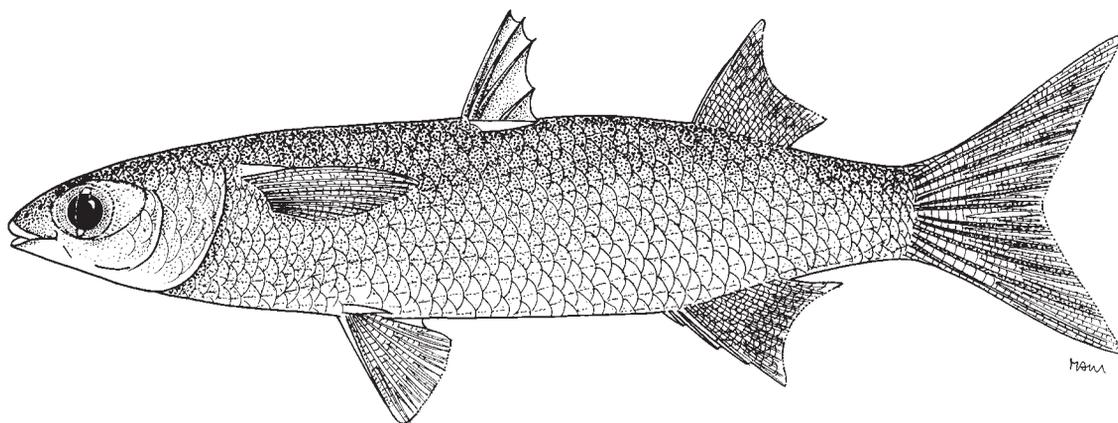
**Distribution:** Throughout the Indo-Pacific from East Africa to Tuamotu Islands; north to southern Japan, south to southern Great Barrier Reef and New Caledonia.



***Mugil broussonneti*** Valenciennes, 1836

**Frequent synonyms / misidentifications:** *Mugil macrolepidotus* of Richardson, 1846; *?Myxus malayanus* Herre, 1936 / *?Mugil cephalus* Linnaeus, 1758; *?Valamugil speigleri* (Bleeker, 1859).

**FAO names:** En - Broussonnet's mullet.



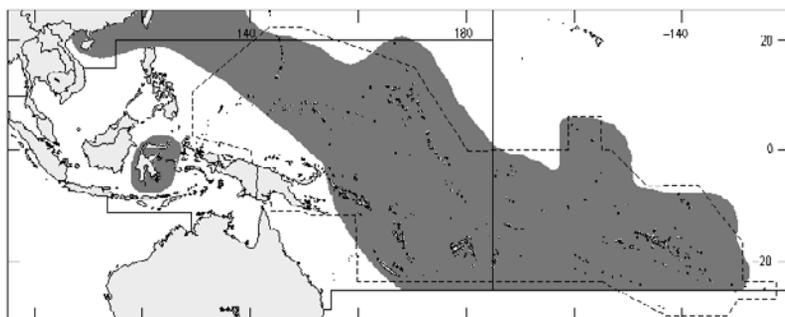
**Diagnostic characters:** Apparently a small species, but may grow larger than reported. Head dorsally broad and flat, but deeper than wide. Snout length equal to or less than eye diameter; snout more or less blunt in profile. **Dentary symphysis acute (pointed)**. Lips thin, lower lip directed forwards. **Upper lip with 2 rows of small, close-set, unicuspid, setiform teeth; tips of teeth in outer row recurved. Lower lip with 1 row of small, unicuspid, setiform teeth.** Vomer edentate. **Maxilla and serrate anteroventral edge of preorbital straight. Preorbital posteroventrally slender with pointed tip.** Distance between anterior and posterior nostril equal to or greater than maximum diameter of posterior nostril. **Adipose eyefold extensive over iris (except in specimens about 30 mm standard length or less).** Gill rakers on lower limb of first gill arch 32 to 68. Origin of fully erected second dorsal fin on vertical through anterior third of anal fin; **both fins moderately or well scaled on all parts.** Second dorsal fin with 9 or 10 soft rays. **Anal fin with III spines and 9 soft rays in adults** (II spines and 10 soft rays in juveniles about 30 mm standard length or less). Caudal fin emarginate. Pectoral fins with I 'spine' and 16 soft rays, not reaching origin of first dorsal fin; pectoral fins 18 to 21% standard length, 68 to 80% head length. **Moderately long pectoral axillary scale.** Scales ctenoid, not covered by minute secondary, cycloid scales. **Scales in longitudinal series 37 to 39; about 12 or 13 in transverse series; 24 or 25 scales in longitudinal series anterior to origin of second dorsal fin; 18 scales in transverse series entirely around caudal peduncle.** Pharyngobranchial organ with large denticulate area; broad, deep, sulcus; **single, large valve**, often shorter than depth of its base. Pyloric caeca 2. **Colour:** dark dorsally, flanks silvery, whitish ventrally.

**Size:** Maximum reported standard length 19.4 cm.

**Habitat, biology, and fisheries:** Apparently a rare species with little or no available data.

**Distribution:** Very difficult to determine due to paucity of records. Perhaps ranging from south China through south Pacific. Possibly from Celebes, but no confirmed reports from Indonesia.

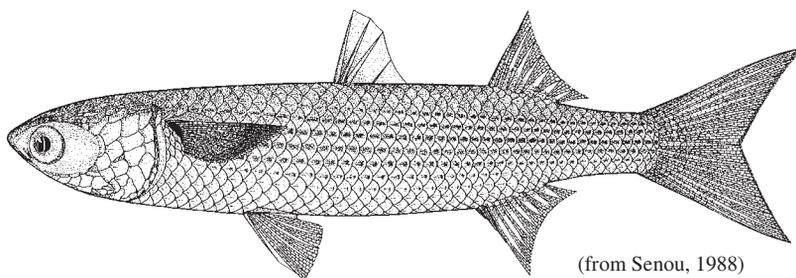
**Remarks:** Considered by some biologists as conspecific with *Mugil cephalus* because of the close morphological similarity.



***Mugil cephalus* Linnaeus, 1758**

**Frequent synonyms / misidentifications:** *Mugil cephalotus* Valenciennes, 1836; *M. chaptalii* Eydoux and Souleyet, 1841; *M. dobula* Günther, 1861; *M. japonicus* Temminck and Schlegel, 1845; *M. oeur* Forsskål, 1775; *M. öur* Forsskål, 1775 / None.

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



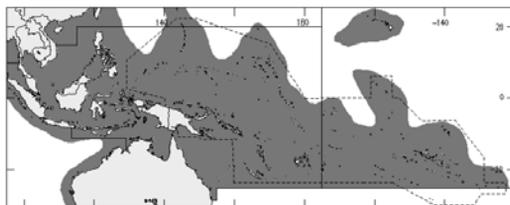
(from Senou, 1988)

**Diagnostic characters:** Medium to large species. Head dorsally broad and flat, but deeper than wide. Snout length equal to or less than eye diameter; snout more or less blunt in profile. **Dentary symphysis 90° or more acute.** Lips thin, lower lip directed forwards. **Upper lip with 1 or 2 outer rows of moderately close-set, unicuspid teeth and 1 to 5 inner rows of smaller, bicuspid teeth; inner, bicuspid teeth well spaced from outer, unicuspid teeth. Lower lip with outer row of moderately close-set unicuspid teeth; 1 or more inner rows of smaller, bicuspid teeth present or absent.** Vomer edentate. **Maxilla and serrate anteroventral edge of preorbital straight. Preorbital posteroventrally slender with pointed tip.** Distance between anterior and posterior nostril equal to or greater than maximum diameter of posterior nostril. **Adipose eyefold extensive over iris (except in specimens about 30 mm standard length or less).** Gill rakers on lower limb of first gill arch 50 to 90. Origin of fully erected second dorsal fin just posterior to vertical level of origin of anal fin; **both fins scaled only anterobasally.** Second dorsal fin with 9 soft rays. **Anal fin with III spines and 8 (rarely 9) soft rays in adults** (usually II spines and 9 soft rays in juveniles about 30 mm standard length or less). Caudal fin forked. Pectoral fins with I 'spine' and 15 to 17 soft rays, not reaching origin of first dorsal fin; pectoral fins 16 to 21% standard length, 61 to 83% head length. **Long pectoral axillary scale.** Scales very weakly ctenoid; **minute cycloid scales superimposed on main body scales, particularly on occipital region.** Longitudinal series scale count can vary from 36 to 44 in *Mugil cephalus*, but **usually in range 38 to 42** for specimens from the area; **13 to 15 (rarely 16) in transverse series;** 25 or 26 in longitudinal series anterior to origin of second dorsal fin; **19 to 21 scales in transverse series entirely around caudal peduncle.** Pharyngobranchial organ with large denticulate area; broad, deep, sulcus; **single, large valve,** often shorter than depth of its base. Pyloric caeca 2. **Colour:** specimens caught from sea olive-green dorsally, flanks silvery and abdomen off-white; **about 7 longitudinal dark stripes along flanks, following rows of scales; these stripes less conspicuous ventrally;** fish from estuarine waters have duller flanks and suffused deep blue or dirty brown dorsally; fins dusky; dorsal fins perhaps greyish blue; anal and caudal fin may be yellowish green; pectoral fins have whitish margin and distinct, dark purple spot at origin; pelvic fins pale yellow.

**Size:** Maximum reported total length 91 cm; commonly to 35 cm total length.

**Habitat, biology, and fisheries:** Inhabits inshore marine waters, estuaries, lagoons, and rivers; tolerant of water temperatures from 12° to 25°C and salinities from hypersaline to fresh water. Adults roaming; forming schools and sometimes jumping; but fish forage singly. First spawning in third year; mature fish group in estuaries, form shoals, and move out to sea to spawn in surface waters. Spent fish return to brackish and fresh waters of estuaries, rivers, or lakes. Newly hatched fry migrate to estuaries and swim upstream. Juveniles found in sheltered lagoons and bays. Immature "hardgut" fish make preliminary migrations out to sea but do not spawn, and return without feeding (hence "hardgut"). Adults feed on fine particulate material, detritus, microscopic algae, and animals. Major commercial fishery; represents 1/2 to the entire mullet landings in eastern Australia and Tonga. Caught from beaches and estuaries using gill nets, cast nets, stake nets (barrier nets), lift nets, beach seines, fish corrals. Also used in aquaculture. Marketed fresh, salted, and frozen; roe sold fresh or smoked.

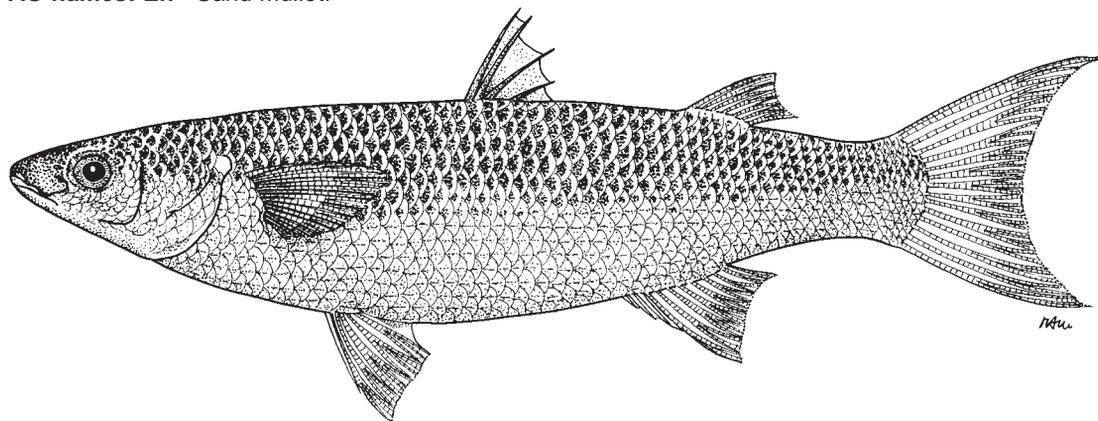
**Distribution:** Worldwide in tropical, subtropical, and warm temperate waters, although less abundant in tropics and apparently rare in Indonesia.



***Myxus elongatus*** Günther, 1861

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

**FAO names:** En - Sand mullet.



**Diagnostic characters:** A small to medium-sized species; body moderately slender. Head relatively flattened dorsally. **Snout long, longer than eye diameter, pointed in profile.** Dentary symphysis obtuse (blunt) in large specimens (less so in small specimens). Lips thin. **Upper lip with 1 row of spatulate teeth with constricted tips.** Lower lip with 1 row of fine ciliiform teeth at edge of lip; a few, scattered teeth sometimes present behind these. Vomer toothed. **Maxilla stocky, only slightly sigmoidally curved near posterior tip. Preorbital large; serrate anteroventral edge weakly concave; posteroventral tip blunt or squarish.** Anterior and posterior nostrils close. **Adipose eyefold absent. Gill rakers on first gill arch as long as longest gill filaments.** Origin of first dorsal fin approximately midway between tip of snout and base of caudal fin, or nearer the latter. Origin of fully erected second dorsal fin on vertical through anterior third of anal fin; both fins scaled only anterobasally. Anal fin with III spines and 9 soft rays in adults (II spines and 10 soft rays in juveniles about 30 mm standard length or less). Caudal fin forked. Pectoral fins with I 'spine' and 15 or 16 soft rays, short, not reaching origin of first dorsal fin; pectoral fins 17 to 19% standard length, **67 to 71% head length; pectoral axillary scale absent. Scales cycloid except for those on breast, which are ctenoid. Scales in longitudinal series 43 to 46; 13 ½ to 16 in transverse series; 29 or 30 scales in longitudinal series anterior to origin of second dorsal fin; 19 or 20 scales in transverse series entirely around caudal peduncle.** Pharyngobranchial organ with large denticulate area; wide sulcus; **valve as ventrally placed, double papillose pad.** Pyloric caeca 2. **Colour:** dark olive-green or reddish brown dorsally, greenish wash on upper flanks, lower flanks silvery; gold blotch on operculum; golden-yellow iris around dark eye; fins greenish brown, except anal fin with white margin; black spot at base of pectoral fins.

**Size:** Maximum reported total length 40 cm, but this is unusual; certainly commonly to 20 cm total length, and specimens up to 28 cm total length might not be rare.

**Habitat, biology, and fisheries:** Inhabits open coastline and bays. Common in brackish water, over shallow-water sand bars, river mouths, ocean inlets, offshore island lagoons, and seagrass meadows; preferring cleaner conditions than other estuarine mullets. Found at depths of 1 to 10 m, forming schools. Perhaps spawning near estuary mouths or in sea. First year fish found in fresh water, but seldom thereafter. Feeds during the day, sifting sand and ingesting small crustacea, molluscs, and microscopic algae. Fished in shallow coastal waters and estuaries; caught using gill nets, seines, and on lines. Marketed fresh or filleted, with other rare mullets.

**Distribution:** Generally restricted to temperate waters of Australia, Lord Howe Island, and Norfolk Island. Specimens might be found at the southern extreme of the area, in coastal waters of southern Queensland.

