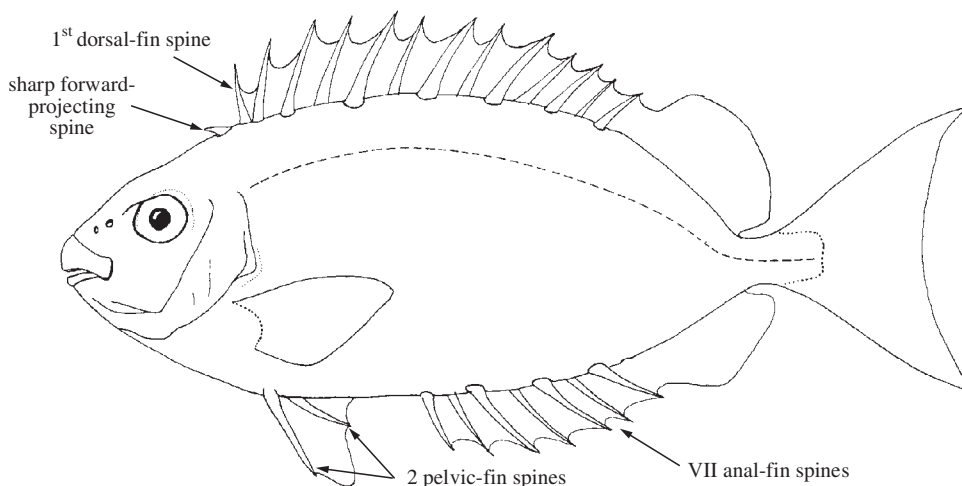


SIGANIDAE**Rabbitfishes (spinefoots)**

by D.J. Woodland

Diagnostic characters: Body laterally compressed, oval, deep, or slender (size to 55 cm). Snout tubulate in a few species. **Mouth terminal, very small; jaws not protrusible.** Single row of compressed, incisiform teeth in both jaws; teeth close-set, overlapping slightly, simulating a denticulated beak. **Dorsal fin with XIII strong spines and 10 soft rays; preceded by a short, sharp, forwardly projecting spine,** usually protruding slightly from its pocket but sometimes completely hidden. **Anal fin with VII strong spines and 9 soft rays** (individual variation in number of dorsal- and anal-fin spines and rays extremely uncommon). **Pelvic fins with II spines (I strong inner and I outer spine, with 3 soft rays in between), a character unique to this family;** membrane extending from inner spines to belly, the anus lying between these membranes. Fin spines with a pair of lateral grooves containing venom glands. **Scales cycloid and very small,** sometimes absent from isthmus and midthoracic region, and if present on head restricted to suborbital area of cheek. **Colour:** coral-reef species usually brightly coloured and ornately patterned; others often drab and becoming mottled with brown at death.

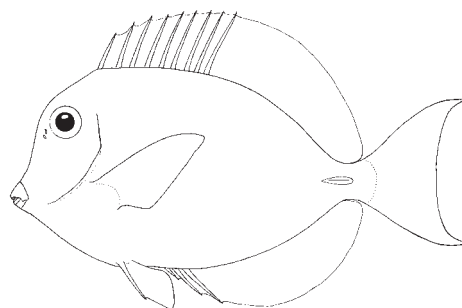


Habitat, biology, and fisheries: About bottom in shallow coastal waters to a depth of 50 m. Some species live in pairs among corals, others in schools around rock and coral reefs, mangroves, estuaries, and brackish lagoons. Some move with tides to feed in flooding areas of rock and coral reefs. Sleep at night. Primarily herbivorous; progress from feeding on zoo- and phytoplankton as larvae to finer algae as small juveniles and to coarser seaweeds and encrusting algae, and occasionally sea grasses, as adults. However, most will take an animal bait; and 2 species feed extensively on sponges and sessile colonial tunicates. Spawning in schooling species is by pairing from massed congregations at certain phases of the moon. Reproduction in permanently pairing species not recorded. Eggs adhesive. Taken in bottom trawls, traps, and set nets of numerous kinds, and by spearing. From 1990 to 1995, the FAO Yearbook of Fishery Statistics reports a range of yearly catch of around 15 700 to 25 800 t of Siganidae from the Western Central Pacific. Mostly marketed fresh, but juveniles of some schooling species dried or processed into fish paste. Selected schooling species used in aquaculture. A few brightly coloured reef species valued by aquarium trade.

Similar families occurring in the area

All other families have at most I pelvic-fin spine.

Acanthuridae: resemble the deeper bodied siganids in general shape, and often occur together in mixed catches from coral reefs, but have bony plates or lancet-like spines on caudal peduncle, only II or III anal-fin spines, only IV to IX dorsal-fin spines, and only I pelvic-fin spine.

**Acanthuridae**

Key to the species of Siganidae occurring in the area

- 1a.** Snout not strongly tubulate, but may be pointed (Fig. 1a) → 2
- 1b.** Snout strongly tubulate (Fig. 1b) → 17
- 2a.** A line projected through anterior and posterior nostrils passing through lower third of posterior margin of eye (Fig. 2a); sides yellow, usually completely covered with pinhead-sized blue ocelli, but sometimes these missing from lower and/or posterior flanks; occasionally ocelli totally absent, especially in very small juveniles; no ocelli on caudal fin. *Siganus corallinus*
- 2b.** A line projected through anterior and posterior nostrils passing above midpoint of posterior margin of eye (Fig. 2b); coloration not as above; if ocelli present, they extend onto caudal fin. → 3

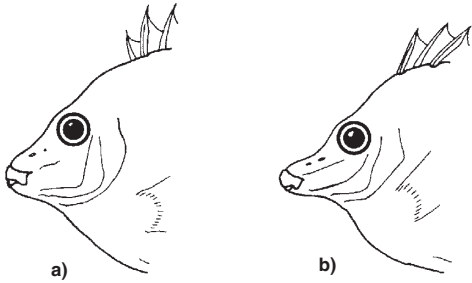


Fig. 1

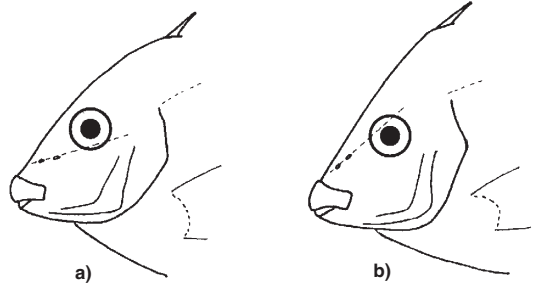


Fig. 2

- 3a.** Midline of thorax in front of pelvic fins scaleless; dorsal- and anal-fin spines stout or slender (Fig. 3a, b) → 4
- 3b.** Midline of thorax in front of pelvic fins scaly (Fig. 4); dorsal- and anal-fin spines stout (Fig. 3b) → 7

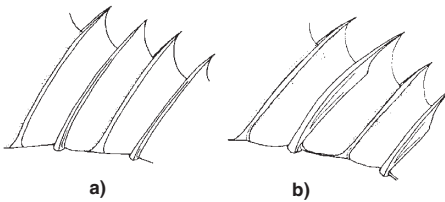


Fig. 3 dorsal-fin spines

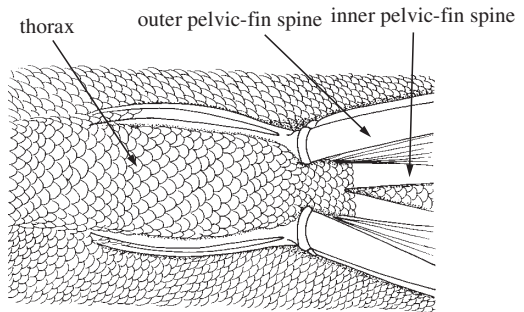


Fig. 4 ventral view of thoracic region
(after Woodland, 1990)

- 4a.** Soft parts of dorsal and anal fins tall, the third dorsal-fin ray longer than distance from anterior nostril to posterior extremity of orbit; anal- and at least posterior dorsal-fin spines stout; caudal fin truncate or barely emarginate; head and body boldly marked with blue to cream labyrinthine lines on light brown to grey; caudal peduncle distinctly barred, bands dark brown and whitish (retained in preservative). *Siganus spinus*
- 4b.** Soft parts of dorsal and anal fins short, the third dorsal-fin ray shorter than distance from anterior nostril to posterior extremity of orbit; dorsal- and anal-fin spines slender; caudal fin emarginate in young (about 10 cm standard length) of some species, otherwise forked; no labyrinthine pattern on head or body, marked with spots and/or wavy lines which may disappear on preservation → 5

- 5a. Caudal fin strongly forked, longest ray at least 2 times the length of median rays, up to 3 times as long in adults; median caudal-fin rays shorter than outer spine of pelvic fins; last anal-fin spine very short, less than 1/2 length of longest anal-fin spine (prejuveniles without scales) *Siganus argenteus*
- 5b. Caudal fin emarginate in young to forked in adults, longest ray at most 2 times the length of median rays and then only in very large specimens (far more than 25 cm standard length), usually much less than twice length; median caudal-fin rays longer than outer spine of pelvic fins; last anal-fin spine short, but not less than 1/2 length of longest anal-fin spine → 6

- 6a. Pearly blue spots over side of head and body 100 to 200, numbers increasing with size of fish; 2 to 3 rows of spots between lateral line and base of anterior half of dorsal fin; spots round, of pinhead size on nape, between lateral line and base of dorsal fin becoming ovoid and progressively larger posteriorly than those on nape (by 10 cm standard length, some spots between lateral line and base of anterior half of dorsal fin larger than pinhead size, much more than 2 mm long); below lateral line, spots mostly ovoid or rod-shaped; usually spots in row immediately below lateral line larger on average than spots in row immediately below base of dorsal fin; in fish displaying fright pattern, pattern on side described above partly obscured by 5 or 6 diagonal zones of darker tones of brown containing flecks of chocolate brown, and dappled all over with pale spots both slightly larger and smaller than basic spots, but basic pattern of spots usually still discernible above lateral line (spots often lost on preservation, replaced by light and dark brown dappling) *Siganus canaliculatus*
- 6b. Pearly spots over side of head and body 180 to several hundred, numbers increasing with size of fish; 4 to 6 rows of spots between lateral line and base of anterior half of dorsal fin; spots round, of pinhead size on nape, those between lateral line and base of anterior half of dorsal fin of similar size and shape but at most only very slightly larger than largest on nape (never larger than pinhead size); below lateral line, spots a mixture of round and rod-shaped; spots in row immediately below lateral line not appreciably larger than spots in row immediately below base of dorsal fin; in fish displaying fright pattern, pattern on side described above partly obscured by 5 or 6 diagonal zones of darker tones of brown containing flecks of chocolate brown, and dappled all over with pale spots of similar size to basic spots, but basic spot pattern still discernible above lateral line (spots usually preserved as dark brown points on nape; frequently, however, spots lost and replaced by dappling of larger light and dark brown patches) . . . *Siganus fuscescens*

- 7a. Body slender, its depth 2.3 to 2.6 times in standard length; about 9 to 12 prominent, evenly dispersed black spots above eye within a dark diagonal band which extends from chin to nape (spots persistent after preservation) *Siganus puellus*
- 7b. Body deep, its depth 1.8 to 2.3 times in standard length; no prominent black spots above eye (if dark diagonal band from chin to nape present, wavy lines within this band) → 8

- 8a. Shortest distance between bony orbit and upper lip equal to or less than 1/2 diameter of bony orbit; more than 29 scale rows between lateral line and base of second to fourth dorsal-fin spines *Siganus javus*
- 8b. Shortest distance between bony orbit and upper lip greater than 1/2 diameter of bony orbit; fewer than 29 scale rows between lateral line and base of second to fourth dorsal-fin spines → 9

- 9a. No dark bands on head and anterior body → 10
- 9b. A dark diagonal ocular band from chin to nape; another band of similar width (shoulder band) running parallel to it from base of pelvic fins to base of dorsal fin (bands may fade in preservative, but previous presence of posterior band indicated by pair of dark lines which mark its border) (Fig. 5) → 13




Fig. 5 *Siganus doliatus*, *S. virgatus*

- 10a. Both head and body completely covered with light or dark spots (spots smaller than scales in a single species); caudal fin of large specimens (15 cm standard length) very deeply forked, the median rays shorter than outer spine of pelvic fins (caudal fin of smaller specimens either deeply forked or emarginate, the median rays shorter than or subequal to outer spine of pelvic fins) → 11
- 10b. Head and body not completely covered with spots (meandering or vermiculating lines also present); caudal fin emarginate to only moderately forked, the median rays longer than outer spine of pelvic fins → 14
- 11a. Head and body covered with pale, minute spots, 1 per scale (spots difficult to see, particularly in some preserved specimens; superficially the fish appears uniform brown); caudal fin very deeply forked, longest rays 2 to 3 times the length of median rays; trailing edge of upper lobe of caudal fin concave, the lobe with recurved tip (upper lobe like a scythe blade); caudal fin not conspicuously marked with large spots, minute spots like those on sides on basal two-thirds of fin *Siganus punctatissimus*
- 11b. Head and body covered with numerous close-set spots which are larger than individual scales, largest about size of pupil in young fish, reducing to half that in old fish; caudal fin emarginate at 5 cm standard length, progressing to deeply forked in adults; trailing edge of upper lobe of caudal fin straight or, more usually, convex (paddle-shaped upper lobe); caudal fin conspicuously marked with large spots, reducing in size progressing from sides onto fin → 12
- 12a. Head and body covered with golden or bronze spots (in preservative, spots paler than background) *Siganus punctatus*
- 12b. Head and body covered with dark spots on paler background (retained in preservative) *Siganus stellatus*
- 13a. Pattern on side of body posterior to shoulder band consisting of slender bars, alternately blue and yellow; few spots present, if any (in preservative, bars alternately light and dark brown) *Siganus doliatus*
- 13b. Pattern on side of body posterior to shoulder band consisting of many blue spots, matchhead to pinhead size, sometimes restricted to anterior portion of sides (in preservative, spots dark brown on paler background) *Siganus virgatus*
- 14a. A large round yellow spot (size of orbit) below rear base of soft portion of dorsal fin (spot sometimes surviving in preservative as a grey patch); colour pattern on sides dominated by bold, golden, wavy stripes and/or spots, no large areas of meandering or vermiculating lines → 15
- 14b. No large yellow spot below rear base of soft portion of dorsal fin; at least part of sides of body with an extensive area of vermiculating lines → 16
- 15a. Golden stripes along sides of body, breaking into spots near bases of dorsal and anal fins (pattern of lines persisting in preservative) *Siganus lineatus*
- 15b. Bronze to orange spots equal to or larger than interspaces over most of body, close-packed on nape to form wire-netting or honeycomb pattern (often only honeycomb pattern on nape visible after preservation) *Siganus guttatus*
- 16a. All of head and body covered with a regular pattern of pale blue to silver vermiculating lines on brown background; caudal fin emarginate, marked with columns of dark spots *Siganus vermiculatus*
- 16b. Only posterior half of body with a regular pattern of blue vermiculating lines on brown background; head and anterior half of sides with pale blue, pinhead-sized spots on brown (spots darker than background in preservative and usually only persisting in nape region); caudal fin emarginate, marked with columns of dark spots *Siganus randalli*
- 16c. Head and body yellow to golden red, covered with irregular pattern of fine, dark blue lines, variously meandering and breaking up in to spots, trending horizontally on lower sides; caudal fin slightly forked (at least in adults) *Siganus labyrinthodes*

- 17a.** Body mostly yellow (in some specimens, a dark spot or patch on upper side below posterior spinous part of dorsal fin), much paler than brown to black thorax; spinous parts of dorsal and anal fins yellow (pale in preservative) → **18**
- 17b.** All or at least anterior two-thirds of body dark chocolate brown (same colour as thorax); spinous parts of dorsal and anal fins chocolate brown (blackish in preservative) → **19**
- 18a.** No distinct, large, sharply defined black spot on upper side of body (though sometimes a diffuse, dusky, oblong patch in this area) *Siganus vulpinus*
- 18b.** Very distinct, large, sharply defined black or chocolate spot on upper side below posterior spinous part of dorsal fin; spot round, oblong, or pear-shaped, infrequently as 2 spots) *Siganus unimaculatus*
- 19a.** Anterior two-thirds of body dark chocolate brown, posterior third yellow; caudal fin and soft parts of dorsal and anal fins yellow *Siganus uspi*
- 19b.** Body entirely very dark chocolate brown; all median fins chocolate brown *Siganus niger*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Siganus argenteus* (Quoy and Gaimard, 1825)
-  *Siganus canaliculatus* (Park, 1797)
-  *Siganus corallinus* (Valenciennes, 1835)
-  *Siganus doliatus* Cuvier, 1830
-  *Siganus fuscescens* (Houttuyn, 1782)
-  *Siganus guttatus* (Bloch, 1787)
-  *Siganus javus* (Linnaeus, 1766)
-  *Siganus labyrinthodes* (Bleeker, 1853)
-  *Siganus lineatus* (Valenciennes, 1835)
-  *Siganus niger* Woodland, 1990
-  *Siganus puellus* (Schlegel, 1852)
-  *Siganus punctatissimus* Fowler and Bean, 1929
-  *Siganus punctatus* (Schneider, 1801)
-  *Siganus randalli* Woodland, 1990
-  *Siganus spinus* (Linnaeus, 1758)
-  *Siganus stellatus* (Forsskål, 1775)
-  *Siganus unimaculatus* (Evermann and Seale, 1907)
-  *Siganus uspi* Gawel and Woodland, 1974
-  *Siganus vermiculatus* (Valenciennes, 1835)
-  *Siganus virgatus* (Valenciennes, 1835)
-  *Siganus vulpinus* (Schlegel and Müller, 1845)

Reference

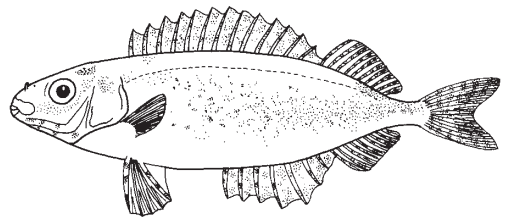
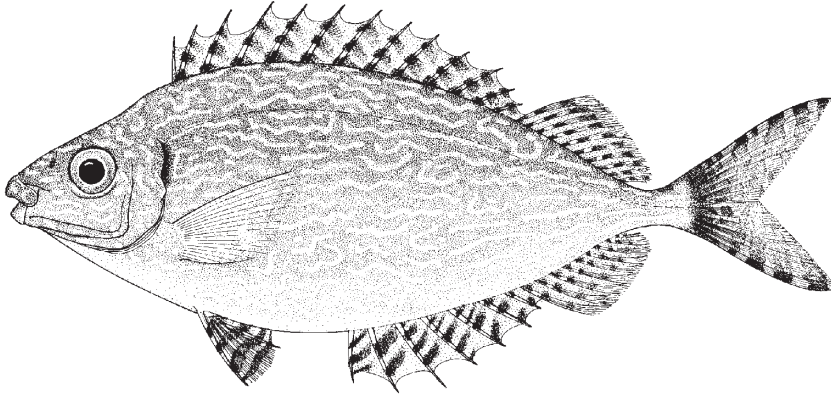
Woodland, D.J. 1990. Revision of the fish family Siganidae with descriptions of two new species and comments on distribution and biology. *Indo-Pac. Fishes*, (19):136 p.

Siganus argenteus (Quoy and Gaimard, 1825)

(Plate XV, 112)

Frequent synonyms / misidentifications: *Siganus rostratus* (Valenciennes, 1835) / None.

FAO names: En - Streamlined spinefoot; Fr - Sigan vermiculé; Sp - Sigano veteadó.



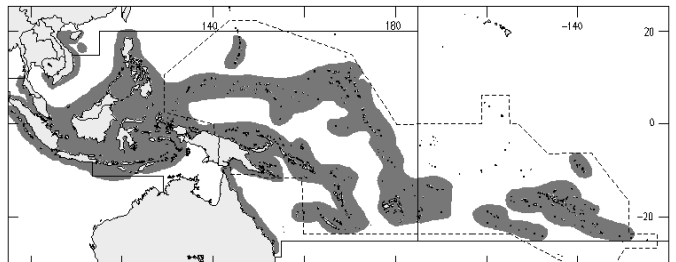
prejuvenile

Diagnostic characters: Juveniles and adults with body oval and compressed, slender, fusiform, its depth 2.4 to 3 times in standard length. Dorsal profile of head not descending steeply, head small, profile pointed; anterior nostril with a long flap reaching to or past posterior nostril. A forward-directed spine in front of dorsal fin, imbedded in nape; third to eighth dorsal-fin spine longest; last dorsal-fin spine very short, 2.6 to 3.5 times in longest dorsal-fin spine; last anal-fin spine shortest, 2.1 to 3.1 times in longest (second or third) anal-fin spine; caudal fin deeply forked, with pointed lobes, median rays 1/3 to 1/2 length of longest rays. Scales minute; anterior half of cheek scaly; 16 to 22 scale rows between lateral line and bases of leading dorsal-fin spines. Prejuveniles (smaller than about 7 cm standard length; see small figure above): body depth nearly 4 times in standard length; anterior nostril flap reaches only half-way to posterior nostril; caudal fin less deeply forked; scales absent. **Colour:** juveniles/adults: deep-sea blue above to paler blue below; head and trunk usually covered with small yellow spots, bars, and commas, much larger than interspaces and quarter to 1/2 size of pupil; frequently spots joining to form horizontal wavy lines, particularly on lower sides; in life, dorsal-fin spines and rays and midline of trunk at base of dorsal fin yellow, expanding into a yellow saddle on caudal peduncle; caudal fin blue, yellow spots on base and outer rays, central rays yellow; spinous part of anal fin mottled with white, yellow, and brown; membrane of soft part of anal fin silvery, rays mottled light and dark brown; pelvic fins with 5 whitish, alternating with 4 dusky, cross bars; pectoral fins hyaline yellow; colours fade rapidly at death so that head and trunk may be solid brown. Prejuveniles: said to be yellow-brown above to silver below; fins hyaline.

Size: Maximum total length about 46 cm, commonly to 25 cm.

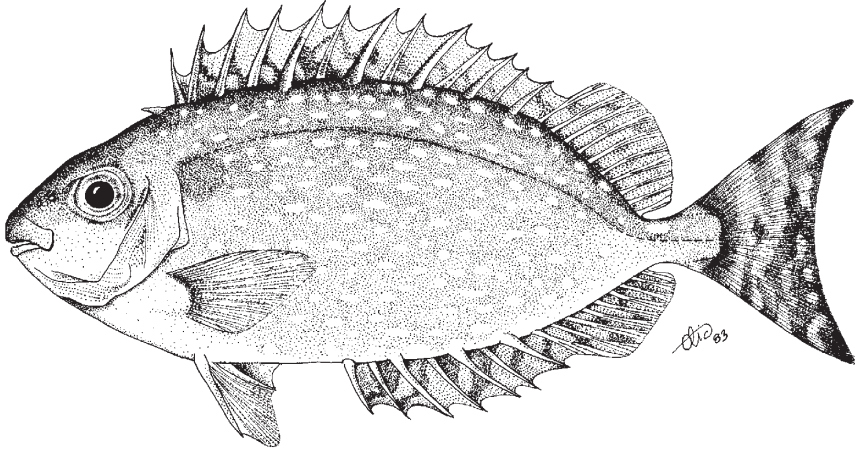
Habitat, biology, and fisheries: Juveniles and adults live in small schools (2 to 100) around coral reefs, down to 40 m but typically in surge zone at reef edge. Prejuveniles live near the surface in dense aggregations up to several km offshore, migrating to reef flats just prior to metamorphosis. Juveniles and adults infrequent in markets; but prejuveniles form a brief but important fishery when migrating onto the reef flat, e.g. combined catch (with *Siganus spinus* fry) of 16 t in one season at Guam. Prejuveniles are eaten fresh, pickled in brine, or made into fish paste.

Distribution: The most widely distributed spinefoot; from East Africa and the Red Sea throughout the tropical Indo-West Pacific, north to the Ryukyu Islands, east to French Polynesia; often the only siganid species present on remote islands, e.g. Pitcairn, Rapa, Line Islands.



Siganus canaliculatus (Park, 1797)

(Plate XV, 113)

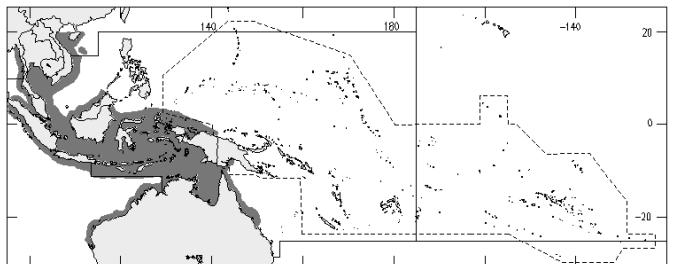
Frequent synonyms / misidentifications: *Siganus oramin* (Schneider, 1801) / None.**FAO names:** En - Whitespotted spinefoot; Fr - Sigan pintade; Sp - Sigan pintado.

Diagnostic characters: **Body compressed, moderately slender, its depth 2.3 to 2.8 times in standard length.** Head profile slightly to markedly concave above eye; snout pointed rather than blunt; anterior nostril with a long flap in juveniles, shortening with age, absent in old fish; nostril flap reaching less than half-way to posterior nostril in specimens larger than 12 cm standard length. A forward-directed spine in front of dorsal fin; fourth to seventh dorsal-fin spine longest, much longer than (1.7 to 2.2 times) the last; **last anal-fin spine 1.2 to 1.5 times in longest anal-fin spine (usually the third); soft parts of dorsal and anal fins low, longest dorsal-fin ray 0.7 to 1 times in longest dorsal-fin spine; caudal fin almost emarginate in specimens under 10 cm standard length, forked in larger fish** (but median rays never less than 1/2 length of longest rays). Scales minute; cheeks scaleless, or with few to many very fine scales; **16 to 26 (rarely 27) scale rows between lateral line and bases of leading dorsal-fin spines.** **Colour:** highly variable, especially affected by mood of fish; basic pattern, silvery grey above to silvery below with touch of green on nape and upper surface of head; **numerous (100 to 200) pearly blue to whitish spots on nape and trunk, match-head size on lower sides** but often smaller above lateral line and only pinhead size on nape, round, ovoid or rod-shaped, much smaller than interspaces, arranged more or less in horizontal rows, **2 to 3 rows between first spine of dorsal fin and lateral line (area of eye would cover about 6 spots in this region), and about 10 rows between highest point of lateral line and base of first anal-fin spine;** frequently a dark patch, a little smaller than eye, just below origin of lateral line; **whole of sides of frightened and injured fish mottled light and dark brown and cream, creating 6 or 7 regularly spaced, dark diagonal zones with paler zones of similar width between them,** which pattern may obscure part of the "basic" pattern of spots; brown bar under chin, another across isthmus, and a broader one across thorax (this camouflage pattern not unique to *Siganus canaliculatus*, also present in *S. fuscescens* and *S. argenteus*); caudal fin with 4 to 6 incomplete, irregular pale bars on brown background.

Size: Maximum total length about 25 cm, commonly to 20 cm.

Habitat, biology, and fisheries: In shallow coastal waters to depths of 50 m. Compared with the very similar *S. fuscescens*, it seems to tolerate more turbid waters, occurring in and about the mouths of rivers especially around seagrass beds but also caught in traps up to several kilometres offshore in deep, clear waters. Juveniles live in very large schools in shallow bays and also on coral reef flats; school size reduces with age, with groups of around 20 adults not uncommon. Much larger aggregations appear to occur around spawning times. Feeds on benthic seaweeds and to a much lesser extent on seagrasses. Fished by trawling and seine netting; bycatch in traps set in deep water. Marketed fresh in very large numbers.

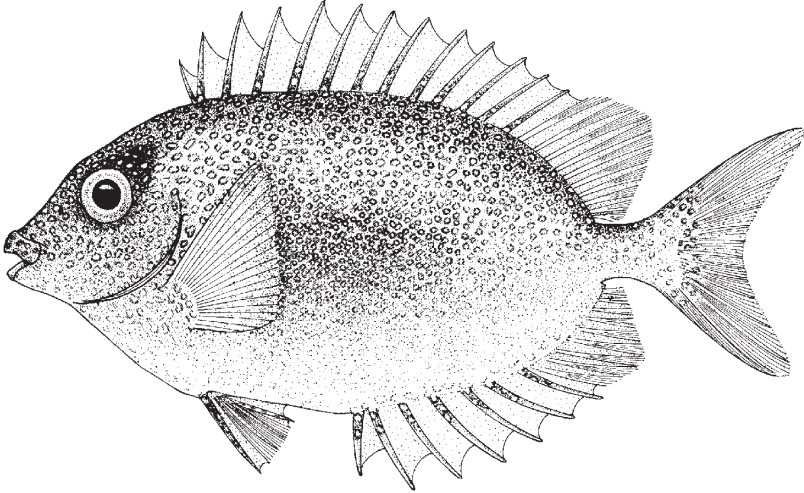
Distribution: Persian Gulf to the Indo-Malayan area, north to Ryukyu Islands and south to northern half of Australia.



Siganus corallinus (Valenciennes, 1835) (Plate XV, 114)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Bluespotted spinefoot; Fr - Sigan corail; Sp - Sigano coral.

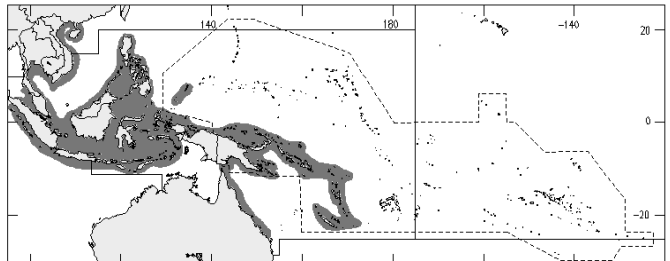


Diagnostic characters: Body deep and compressed, its depth 1.7 to 2.4 times in standard length. Profile of head descending at an angle of about 45°, strongly concave before eyes and behind chin so that snout protrudes prominently. A forward-directed spine in front of dorsal fin; last dorsal-fin spine 1.1 to 1.4 times in longest dorsal-fin spine; soft part of dorsal and anal fins high, longest dorsal-fin ray 1 to 1.3 times the length of longest dorsal-fin spine; caudal fin emarginate in small juveniles (about 5 cm standard length) but increasingly forked with age so that deeply forked in subadults; caudal-fin lobes acutely pointed. Scales minute; cheeks almost or completely covered with strong scales; 16 to 23 scale rows between lateral line and bases of leading dorsal-fin spines. **Colour:** head, body, and fins orange yellow; head, breast, and sides covered with pale blue ocelli with darker blue margins, which may cover whole of sides or may be absent from posterior and lower sides; ocelli about pinhead size and about same size as interspaces, larger and more crowded on head, sometimes smaller on sides and much smaller than interspaces, extending onto bases of dorsal- and anal-fin spines, first pelvic-fin spine, and first pelvic-fin ray, and if present on caudal peduncle, extending only onto bases of caudal-fin rays, not over whole fin. Some small specimens (about 4 cm total length) have vertical blue lines on sides which later fragment into the ocelli. A diffuse, dark, triangular smudge adjacent to and above orbit in living specimens. Iris unspotted, orange-brown. (Similar small, plain yellow, unspotted fishes found in Indonesia are of uncertain status; they may be juveniles of this species or a separate species, *Siganus tetrazona*; sometimes with 4 narrow brown bars on the upper sides, extending downward from base of dorsal fin.)

Size: Maximum total length about 30 cm, commonly to 20 cm.

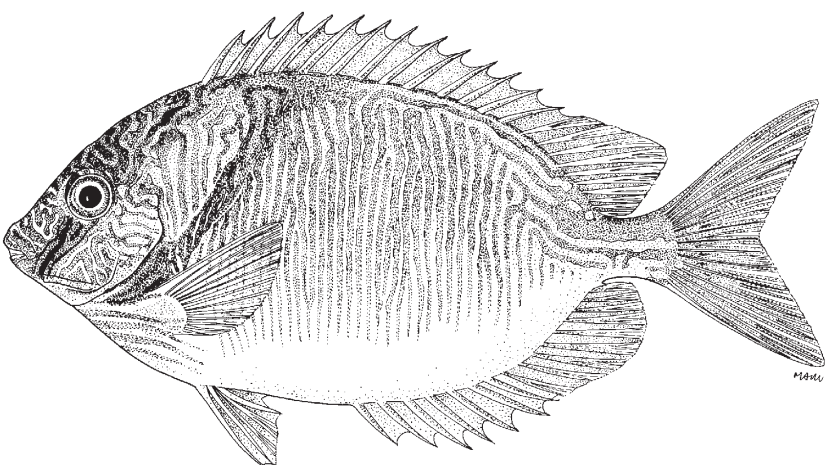
Habitat, biology, and fisheries: Inhabits coral reefs; smallest juveniles (2 to 3 cm) often in sea-grass beds in schools of around 20; by 6 cm, in schools in branching corals at depths of around 2 m; pairing begins at around 6 cm; paired adults sedentary about branching corals to depths of about 6 m. In some localities pairs migrate in groups to flooding areas to feed; juveniles may form mixed schools with scarids and other siganid species. Smallest juveniles browse on epiphytic growth on seagrasses, adults on coarser benthic seaweeds. Caught by spearing, and with set nets and traps. Regularly appear in small numbers in markets; marketed fresh.

Distribution: From the western Indian Ocean, where it appears to be confined to oceanic island groups such as the Seychelles and Maldives, to the western Pacific; found from Ryukyu Islands in the north to southern Queensland in the south, and as far east as New Caledonia.



Siganus doliatus Cuvier, 1830

(Plate XV, 115)

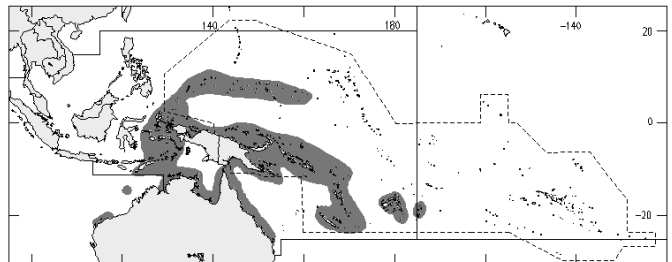
Frequent synonyms / misidentifications: None / *Siganus virgatus* (Valenciennes, 1835).**FAO names:** En - Barred spinefoot.**Diagnostic characters:****Body deep and compressed, its depth 1.8 to 2.2 times in standard length.** Dorsal profile of head convex; anterior nostril with a prominent rim or short tube, a little higher and pointed posteriorly. A forward-directed spine in front of dorsal fin, imbedded in nape; fourth to eighth dorsal-fin spine longest, 1.1 to 1.4 times the length of last dorsal-fin spine; longest anal-fin spine typically the last, but subequal to second to fourth anal-fin spines which may be occasionally fractionally longer;soft parts of dorsal and anal fins moderately high, longest dorsal-fin ray 1 to 1.4 times the longest dorsal-fin spine; caudal fin emarginate in juveniles to moderately forked in adults. Scales minute; **cheeks fully covered with strong scales**; 19 to 26 scale rows between lateral line and bases of leading dorsal-fin spines. **Colour:** a seal brown band running from nape through eye to chin ("ocular"), another from base of fourth to fifth dorsal-fin spines to just below base of pectoral fins ("shoulder"); at death, brown colour of ocular and shoulder bands often fades, but the blue lines within the bands usually develop to a deeper blue, and the paler blue lines which define the margins of the shoulder band and that part of the ocular band below eye remain distinct; within the shoulder band blue lines, either vertical or running parallel to sides of band, residual area orange; **ocular band below eye almost invariably contains a pair of dark blue lines running from orbit to corner of mouth**; area between ocular and shoulder bands with a labyrinthine pattern of blue and yellow lines. Snout yellow; about 10 blue lines running transversely across nape and snout; upper lip yellow, with 2 or 3 transverse blue lines; posterior to shoulder band **sides of trunk blue above to silvery white below, decorated with about 30 evenly spaced yellow bars** variously joined below base of dorsal fin and tapering away to nothing on lower sides, a rosy flush to these yellow lines on the midsides; 4 ephemeral yellow lines from base of pectoral fins across thorax. **Fish from northwestern Australia differ in having fewer (15 to 20) lines on sides of trunk, lines being absent posteriorly; the lines wavy and often broken or bifurcating, and posterior ones sometimes capped with a spot.** Dorsal-fin spines yellow with a blue streak, in a yellow membrane; soft part of dorsal fin and caudal fin yellow; anal-fin spines and rays dusky yellow, membrane bluish; pectoral fins hyaline with traces of yellow.


Size: Maximum total length about 25 cm, commonly to 20 cm.

Habitat, biology, and fisheries: Inhabits shallow areas of coral reefs down to about 5 m. Very small juveniles school in seagrass or in branching coral invaded by seaweeds, at depths of 1 to 2 m. Pair bonds develop at 7 cm; but these pairs still form loose schools, sometimes with juvenile scarids, to feed in areas being flooded by the tide. By 20 cm, isolated pairs living in permanently deep water in lagoons or on drop-off face at reef edge; feed on benthic seaweeds. Caught by spearing and with set nets and traps. Marketed fresh in small numbers.

Distribution: Western Pacific and north-western Australia; scarcely entering the Indo-Malayan area but present in eastern Indonesia; in the northern part of the area from Palau to Kosrae, in the south to Tonga.

(after Woodland, 1990)



Siganus fuscescens (Houttuyn, 1782) (Plate XV, 116)

Frequent synonyms / misidentifications: *Siganus nebulosus* (Quoy and Gaimard, 1825) / *Siganus canaliculatus* (Park, 1797); *S. oramin* (Schneider, 1801).

FAO names: En - Mottled spinefoot.

Diagnostic characters:

Body compressed, fairly slender, its depth 2.3 to 2.9 in standard length.

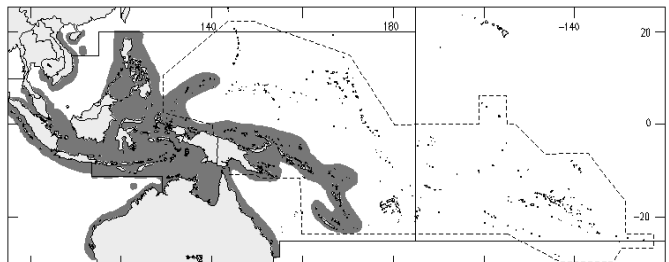
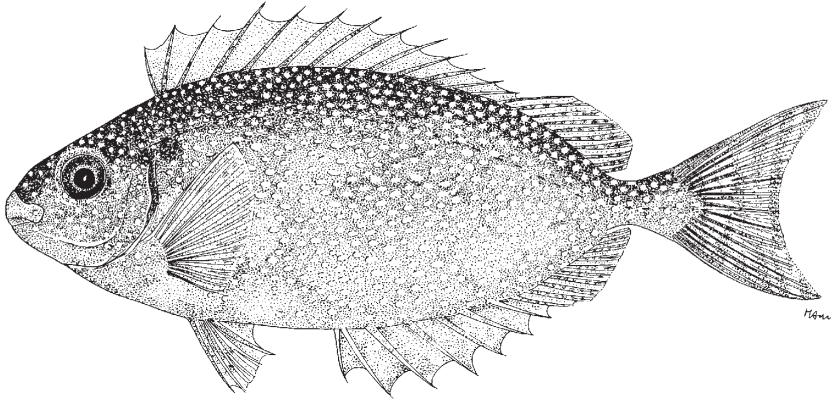
Head profile slightly to markedly concave above eye; snout convex, arched and blunt in some specimens, more gently sloping and pointed in others; anterior nostril with a short flap, shortening further with age, may occasionally reach half-way to posterior nostril at 10 cm standard length but usually reduced to a minute peak by that size. A forward-directed spine in front of dorsal fin;

fourth to seventh dorsal-fin spine longest, much longer than (1.8 to 2.5 times) the last; **last anal-fin spine 1.3 to 1.5 times in longest (third) anal-fin spine; soft parts of dorsal and anal fins low, longest dorsal-fin ray 0.5 to 1 times in longest dorsal-fin spine; caudal fin almost emarginate in specimens under 10 cm standard length, more forked in larger fish, very deeply forked in the largest (but median rays never less than 1/2 length of longest rays).** Scales minute; cheeks rarely scaleless, usually lower half to two-thirds covered with weak, scattered scales; **16 to 21 scale rows between lateral line and bases of leading dorsal-fin spines.** **Colour:** highly variable, especially affected by mood of fish; basic pattern olive green or brown above to silvery below; **180 to several hundred pearly blue spots on head and trunk, mainly round and pinhead size** but those on mid- to lower sides may be slightly or strongly elongated horizontally; least distance between neighbouring spots about same as their diameter, **4 to 6 rows of spots between first spine of dorsal fin and lateral line (area of eye would cover about 12 spots in this region), and about 18 to 20 staggered rows of spots between highest point of lateral line and base of first anal-fin spine;** frequently a dark patch, a little smaller than eye, just below origin of lateral line. **Whole of sides of frightened and injured fish mottled with splotches of light and dark brown and whitish, creating 7 regularly spaced, dark diagonal zones with paler zones of similar width between them,** which pattern may obscure "basic" pattern of spots; brown bar under chin, another across isthmus, and a broader one across thorax (this camouflage pattern not unique to *Siganus fuscescens*, also present in *S. canaliculatus* and *S. argenteus*); caudal fin with 6 or 7 incomplete pale bars on brown background. **Neither spots nor mottling survive in some market specimens which are plain brown with traces of bars on outer rays of caudal fin.**

Size: Maximum total length about 40 cm, commonly to 25 cm.

Habitat, biology, and fisheries: In shallow coastal waters to depths of 50 m. Compared with the very similar *S. canaliculatus*, it seems to prefer clear water, being common on coral reefs; at higher latitudes, where coral reefs absent, found around rock reefs and enters harbours. Fry arrive on coral reef flats in schools averaging 200 individuals, but up to 5 000; by 3 months, average school size has fallen to around 12. Adults feed on brown and green algae, juveniles on filamentous algae and seagrasses. Fished with small seine nets, set nets, traps, and by spearing. Adults marketed fresh; juveniles often dried and sold in very large numbers.

Distribution: Indo-Malayan region from Andaman Islands eastward to New Caledonia, north to the Ryukyu Islands, and south across the northern half of Australia; but extending to higher latitudes during summer, e.g. southern Honshu and southern New South Wales.



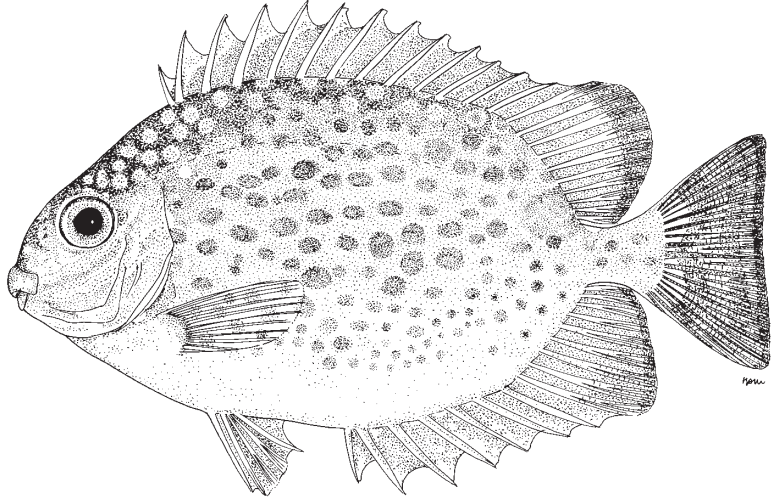
Siganus guttatus (Bloch, 1787)

(Plate XV, 117)

Frequent synonyms / misidentifications: *Siganus concatenatus* (Valenciennes, 1835) / *Siganus lineatus* (Valenciennes, 1835); *S. stellatus* (Forsskål, 1775).

FAO names: En - Orangespotted spinefoot.

Diagnostic characters: **Body deep and compressed, its depth 1.8 to 2.3 times in standard length.** Dorsal profile of head descending fairly steeply, slightly concave in front of eye; anterior nostril with a low rim, slightly expanded posteriorly. A forward-directed spine in front of dorsal fin, imbedded in nape; **fifth to eighth dorsal-fin spine longest, only a little longer than (1.1 to 1.3 times) last dorsal-fin spine;** last anal-fin spine longest, slightly longer than (1 to 1.3 times) longest dorsal-fin spine; caudal fin emarginate, moderately forked in largest fish. Scales minute; cheeks covered with prominent scales; 20 to 25 scale rows between lateral line and bases of leading dorsal-fin spines. **Colour:** blue above to silver below; **large, roundish,**

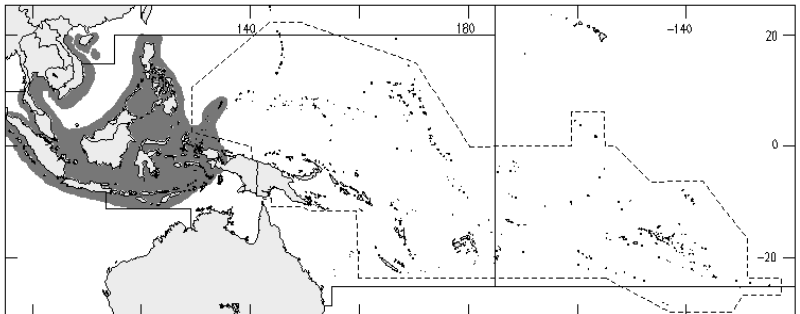


bronze-gold spots over sides (except for thorax and, sometimes, lower belly), largest on midside where same size as pupil and slightly larger than interspaces, slightly smaller on lower sides. A bright yellow spot about size of orbit on sides at base of last few rays of dorsal fin (also in *Siganus lineatus*). Head golden with sinuous blue lines radiating from mouth to eye and across cheeks, the most constant being **a line from corner of mouth across cheek to behind the eye,** (also in *S. lineatus*). Iris plain yellow, not spotted. Dorsal-fin spines and rays bluish; membrane of spinous portion of fin plain bronze; membrane of soft portion bluish, between each ray a bronze spot at base and a bronze streak extending outward; anal-fin spines dusky and bronze on dark bronze membrane; soft portion of anal fin with same colour pattern as soft portion of dorsal fin. Bronze gold spots on sides extending onto caudal fin, reducing in size towards trailing edge, arranged in columns, appearing as 4 or 5 bars when fin is not expanded (similar to *S. lineatus*); outer spine and ray of pelvic fins silvery, remainder bluish; pectoral fins hyaline. In market specimens, spots rust red to orange, background dusky blue above to grey below and the large yellow spot below the soft dorsal fin often faded to grey.

Size: Maximum total length about 45 cm, commonly to 25 cm.

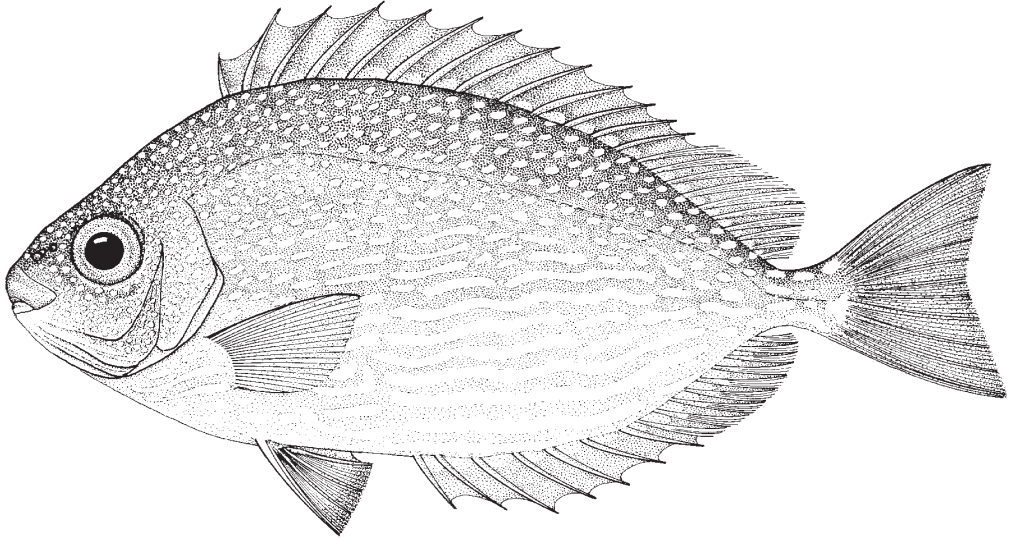
Habitat, biology, and fisheries: Inhabits shallow coastal areas; tolerates or even prefers low salinities; fry settle in seagrass beds around river mouths and adults enter and leave rivers with the tide, but also found on the drop-offs of inshore fringing reefs down to 6 m. Schools throughout life; school size for adults around 10 to 15. Feeds on benthic algae. Caught with set nets and traps and reported to be, unlike other siganids, active at night; common in markets where sold fresh.

Distribution: Southeast Asia, from Andaman Islands and west coasts of Peninsular Malaysia and Sumatra to Irian Jaya; northern limit, southern Ryukyu Islands; rare in Palau.



Siganus javus (Linnaeus, 1766)

(Plate XV, 118)

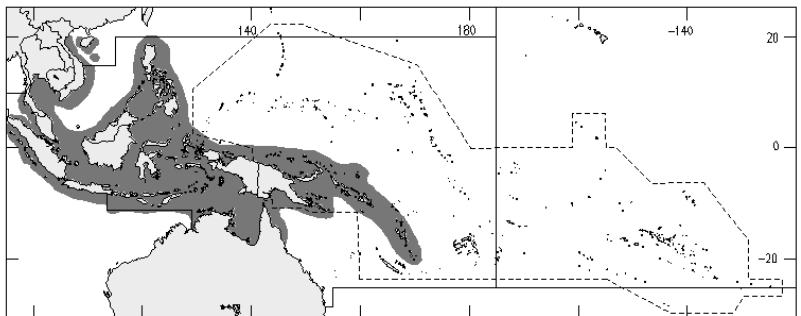
Frequent synonyms / misidentifications: None / None.**FAO names:** En - Streaked spinefoot; Fr - Sigan ondulé; Sp - Sigano ondulado.

Diagnostic characters: Body deep and compressed, its depth 2 to 2.3 times in standard length. Head relatively smaller than in other deep-bodied species, its dorsal profile slightly concave above orbit, snout short and blunt; anterior nostril with a small triangular flap reaching half-way to posterior nostril. A forward-directed spine in front of dorsal fin, imbedded in nape; **fourth to sixth dorsal-fin spine longest, 1.2 to 1.6 times the length of last dorsal-fin spine; apart from short first spine, all anal-fin spines of similar length and subequal to or slightly shorter than longest anal-fin spine;** soft parts of dorsal and anal fins of only moderate height, e.g. longest anal-fin ray subequal to longest anal-fin spine; **caudal fin emarginate.** Scales minute; cheeks covered with prominent scales; **30 to 35 scale rows between lateral line and bases of leading dorsal-fin spines.** **Colour:** back dark bronze, to paler below; **numerous gun-metal blue spots on head and upper sides,** about pinhead size on head but posteriorly just slightly smaller than pupil, coalescing into paler **silvery blue undulating lines on mid- and lower sides.** Spines and rays of dorsal, anal, and pelvic fins golden, membranes dusky or golden; pectoral fins golden hyaline; **caudal fin dusky sometimes, with faint vertical bars.**

Size: Maximum total length 55 cm, commonly to 30 cm.

Habitat, biology, and fisheries: Inhabits shallow coastal waters, brackish lagoons, and rock or coral reefs (but not a coral-reef species, as evidenced by its restricted distribution). Lives in small schools of up to around 10 individuals as adults. Feeds from the bottom on benthic seaweeds, or in midwater on fragments dislodged by wave action. Caught with seines, gill nets, and in fixed traps. Marketed fresh.

Distribution: From the Persian Gulf through the Indo-Malayan Archipelago to Vanuatu.



Siganus lineatus (Valenciennes, 1835) (Plate XVI, 120)

Frequent synonyms / misidentifications: None / *Siganus guttatus* (Bloch, 1787).

FAO names: En - Goldenlined spinefoot; Fr - Sigan raies dor; Sp - Siganos rayas doradas.

Diagnostic characters:

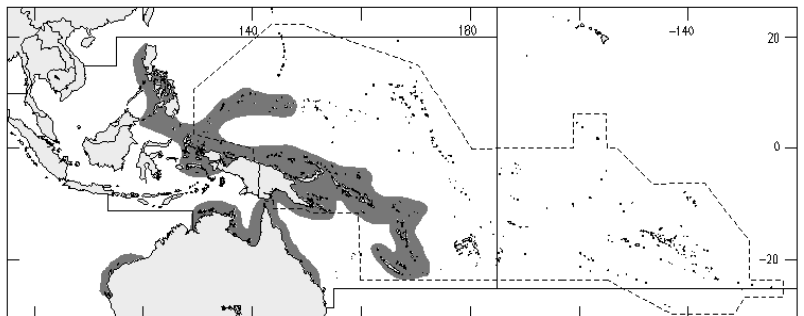
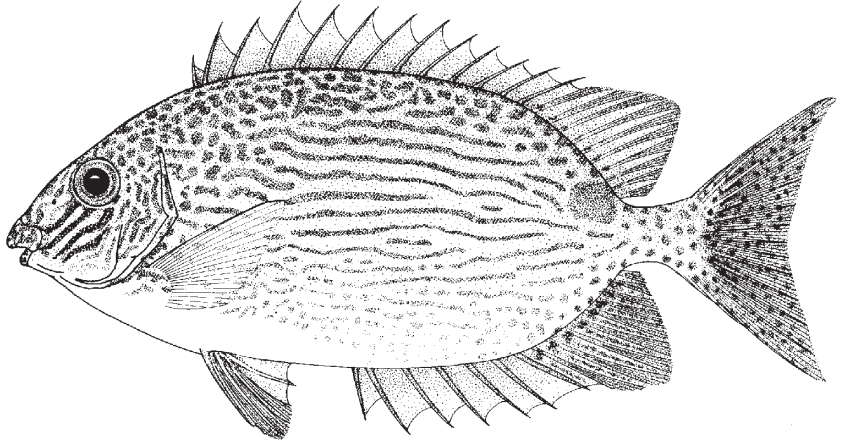
Body deep and compressed, its depth 1.9 to 2.2 times in standard length. Dorsal profile of head descending fairly steeply, slightly concave in front of eye; anterior nostril with a low flange slightly expanded posteriorly. A forward-directed spine in front of dorsal fin, imbedded in nape; **fourth to eighth dorsal-fin spine longest, only a little longer (1.1 to 1.3 times) than last dorsal-fin spine;** last anal-fin spine longest, slightly longer (1.1 to 1.2 times) than longest dorsal-fin spine; caudal fin emarginate to moderately forked.

Scales minute; cheeks covered with prominent scales; 18 to 27 scale rows between lateral line and bases of leading dorsal-fin spines. **Colour:** blue above to silver below; **horizontal golden bronze bands, some broken, running along single sides of trunk, breaking up into spots near bases of dorsal and anal fins and on caudal peduncle, and (except in specimens from South India) spots also on nape.** Head golden with blue spots and lines convoluted into various shapes, the most constant being a **diagonal line across cheek from below orbit to corner of mouth** (also in *Siganus guttatus*). **Iris silvery, unspotted. A bright yellow spot about size of orbit on sides at base of last few rays of dorsal fin** (also in *S. guttatus*). Dorsal-fin spines golden on a dusky bronze membrane; dorsal-fin rays silvery on a bluish membrane, with a row of golden spots at bases of rays; anal-fin spines golden bronze on dusky blue membrane; anal-fin rays bluish, membrane dusky with a golden spot at base and a bar above it in each cell of the membrane. **Caudal fin bluish with rows of golden spots which appear as 3 or 4 cross bars on the folded fin** (also in *S. guttatus*); outer spine and ray of pelvic fins silvery, remainder dusky blue; pectoral fins hyaline. In market specimens, golden and bronze areas become yellow and the large yellow spot below soft dorsal fin often fades to grey.

Size: Maximum total length about 45 cm, commonly to 25 cm.

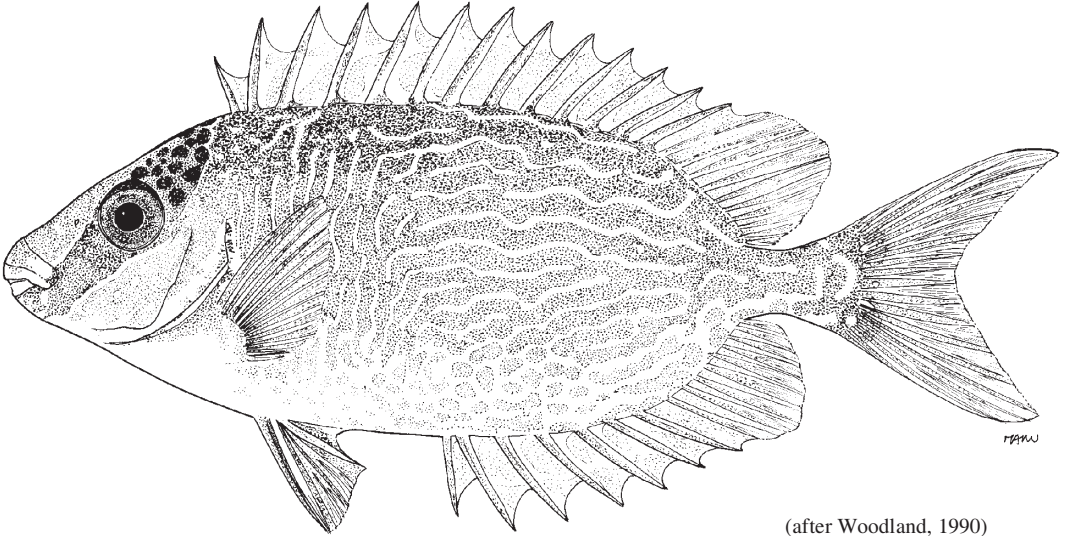
Habitat, biology, and fisheries: Inhabits shallow coastal areas, typically to 5 m. Young common around estuarine areas including seagrass flats and mangroves, larger fish invade flooding coral reef flats to feed, retiring to rubble or sandy bottoms, e.g. in lagoons, to rest. Schooling, school size diminishing with age, down to 10 to 25 fish by adult stage, but at spawning time congregations may consist of several thousand fish. Feeds by scraping encrusting algae from beach rock or pavement areas of corals reefs, or by browsing on larger coarse algae. Caught mainly with set nets and fixed traps; common in markets, where sold fresh.

Distribution: Disjunct: a single population in southern India region the other in the West Pacific, eastern Indonesia to New Caledonia; records for the Ryukyu and Ogasawara islands could be based on strays.



Siganus puellus (Schlegel, 1852)

(Plate XVI, 122)

Frequent synonyms / misidentifications: None / None.**FAO names:** En - Masked spinefoot.

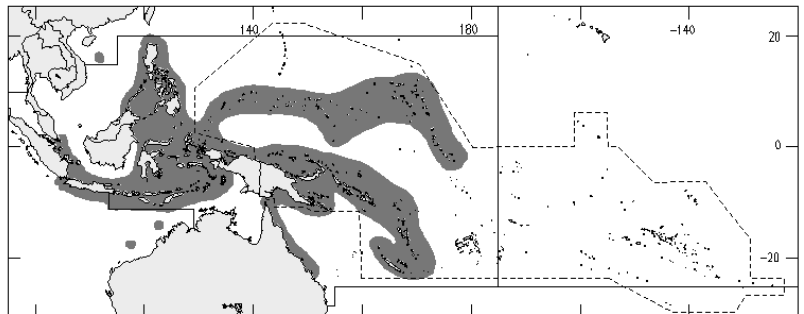
(after Woodland, 1990)

Diagnostic characters: Body compressed, not particularly deep, its depth 2.3 to 2.6 times in standard length. Anterior profile wedge-shaped, more or less symmetrical about its midline; snout slightly protuberant; anterior nostril with a small flange, expanded into a short, broad triangular flap posteriorly. A forward-directed spine in front of dorsal fin; fourth to ninth dorsal-fin spine longest, slightly longer than (1.1 to 1.3 times) the last; longest anal-fin spine typically the last but occasionally the third subequal with it; soft parts of dorsal and to a lesser extent, anal fin high, longest dorsal-fin ray 1 to 1.4 times the longest dorsal-fin spine; caudal fin prominently forked, more so in adults, the lobes acutely pointed. Scales minute, cheeks covered with prominent scales; 18 to 25 scale rows between lateral line and bases of leading dorsal-fin spines. **Colour:** body orange-yellow; trunk marked with an intricate pattern of fine wavy lines grading from bluish above to silvery below, lines vertical from behind gill opening back to level of tip of depressed pectoral fins, elsewhere horizontal, with increasing age variously joined on lower sides to create yellow spots; head orange-yellow with blackish bar, from chin through eye to nape, large black spots above eye in bar; pelvic fins silvery; spines and rays of all other fins yellow or orange-yellow, membranes of spinous parts yellow, of soft rayed parts hyaline.

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

Habitat, biology, and fisheries: Inhabits coral reefs to depths of 30 m. Up to 7 cm standard length it lives in large schools in shallows of lagoons and outer reef flats, particularly about areas dominated by luxurious growths of *Acropora*, often forming loose feeding schools with *Siganus corallinus*, *S. doliatus*, *S. spinus*, and scarids. Pairing begins about 7 cm when fish move to deeper water such as faces of the drop-offs of reefs. Juveniles feed on finer algae, adults on coarser algae and monaxonid sponges. Caught by spearing and in traps; small numbers consistently found in markets supplied from coral reefs.

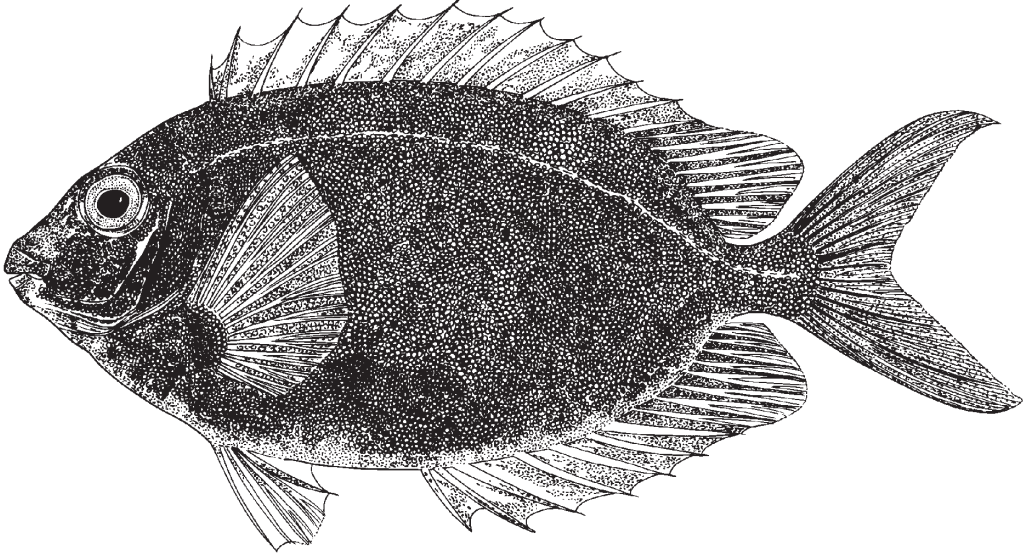
Distribution: In the Indian Ocean known from Cocos (Keeling) Islands and outer reefs of northwestern Shelf of Western Australia; in the western Pacific from Indonesia to Ryukyu Islands and Kiribati, southward to southern Great Barrier Reef and New Caledonia.



***Siganus punctatissimus* Fowler and Bean, 1929** (Plate XVI, 123)

Frequent synonyms / misidentifications: None / *Siganus sutor* (Valenciennes, 1835).

FAO names: En - Pepered spinefoot.



Diagnostic characters: Body deep and compressed, its depth 2 to 2.2 times in standard length. Dorsal profile of head gently convex, but slightly concave in front of eye and also below chin so that snout protuberant; anterior nostril with low rim expanded posteriorly into a broad flap reaching half-way to posterior nostril. A forward-directed spine in front of dorsal fin, imbedded in nape; fifth to seventh dorsal-fin spine longest and only a little longer than (1 to 1.2 times) last dorsal-fin spine; last anal-fin spine longest, only marginally longer than (1 to 1.1 times) last dorsal-fin spine; soft dorsal and anal fins high, longest dorsal-fin ray 1.1 to 1.4 times the longest dorsal-fin spine; **caudal fin very deeply forked**, at least in specimens larger than 15 cm standard length, presumably almost emarginate at 5 cm standard length since this is the pattern of growth in other siganids with forked caudal fins; **caudal-fin lobes narrow with pointed tips, the upper lobe with a recurved tip like a scythe blade**. Scales minute; cheeks covered with strong scales; 17 to 21 scale rows between lateral line and bases of leading dorsal-fin spines. **Colour:** head and body dark chocolate brown with a purplish hue, everywhere minute, bluish white spots, 1 spot per scale in scaly areas; in many specimens a darker brown patch about size of eye immediately below origin of lateral line; iris pale rose-brown, with a ring of the minute spots. Dorsal and anal fins rusty brown; fin membrane between each dorsal-fin spine with 3 S-shaped whitish lines; caudal fin brown, completely edged in black, the central area with a yellowish tinge and basal two-thirds invaded by the pattern of minute spots found on body.

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

Habitat, biology, and fisheries: About coral on outer reef slopes and in the deep channels which penetrate from there into the lagoons; at depths of 3 to 30 m but prefers the deeper areas; adults live in pairs and feed on benthic seaweeds; habits and habitat of earlier stages not recorded. In small numbers in Philippine markets; said to be trawled.

Distribution: Central Indo-Malayan area, from southern Ryukyu Islands southward through the Philippines, Palau, eastern Indonesia, and New Guinea to the reefs of the north-western shelf of Australia and northern Great Barrier Reef.

