

## The Marine Gobies of the Hawaiian Islands

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**A total of 34 species of gobies (Teleostei, Gobiidae) are known from the Hawaiian Islands, four of which are freshwater species. All species are treated in a key, but only marine species are illustrated and treated in detail. Information on their nomenclature, counts and measurements, distinctive characters, coloration, distribution and habitat is presented. Two new species, *Cabillus caudimacula*, and *Pleurosicya larsonae* are described. An unidentified species of *Favonigobius* from O'ahu, a possible introduction, is discussed.**

The Gobiidae is the largest family of marine fishes, with many species also occurring in fresh water. J.S. Nelson (pers. commun., September 2003) estimates that there are about 220 genera and 2010 species. Judging from the number of undescribed species of gobies of which we are aware, that number of species will surely be exceeded.

Most gobies are small (the shortest goby is *Trimmatom nanus*, with females maturing at as little as 8 mm standard length; but one species, *Glossogobius giuris*, attains 500 mm standard length). Gobies generally are recognized by their pelvic-fin structure; the fins usually are fused to form a sucking disc which may have an anterior transverse membrane called a frenum that links the spines. When the pelvic fins are separate, they are close together. Gobies and sleepers (family Eleotridae) have been confused in the past, and some gobies with separate pelvic fins have been misidentified as sleepers. Gobies have five branchiostegal rays, whereas the sleepers have six, and the pelvic fins are more broadly separated than in the gobies with the pelvic fins divided. All Hawaiian gobies normally have six spines in the first dorsal fin, except for *Discordipinna griessingeri* with five. Most gobies, and all in Hawaiian waters, also usually have two separate dorsal fins.

The Hawaiian Islands have a total of 34 species of gobies, four of which (*Awaous guamensis*, *Lentipes concolor*, *Sicyopterus stimpsoni*, and *Stenogobius hawaiiensis*) are fresh water. In 1905, Jordan and Evermann recognized eight marine gobies in the Hawaiian Islands. Gosline and Brock (1960) found 13. As a result of collecting since then, the number is now 30. These 30 marine species occur in salt to brackish water from tidepools high in the splash zone to moderate depths. One species was recently taken by trawl in 138–169 m. Although some gobies, such as species of the genus *Bathygobius*, can readily be seen scurrying around tidepools, most are secretive and not easily observed. They are, however, an important part of the communities in which they are present. In a survey of the fishes of Kāne'ohe Bay, Greenfield (2003) found that the most abundant species taken in collections using an ichthyocide was the goby *Eviota epiphanies*. In reference to species of *Eviota*, Greenfield and Randall (1999) wrote "These small gobies may form an important component of the food of larger piscivorous fishes." Other gobies, of course, also serve as prey to larger fishes.



Although all species are treated in our key, only the marine species are included in this paper. Several small individuals of a goby species in the genus *Favonigobius* were taken at Kahana Bay, O'ahu, but were too small to be identified (see Discussion).

MATERIALS AND METHODS

All counts and measurements follow Hubbs and Lagler (1964) except that the last two rays of the dorsal and anal fins are not counted as one unless it is clear that they are joined at the base. Measurements were made to the nearest 0.1 mm using dial calipers, and are expressed as percentages of standard length (SL). Lengths given in figure captions of specimens are standard length (SL), but for underwater photographs, the length is the estimated total length (TL). In the descriptions of the new species, measurement data for the holotype are presented first, followed by the range and mean (in parentheses) for all type material. For other descriptions the count or measurement is followed by the mode or mean, respectively, in parentheses. Color descriptions are from 35-mm slides taken under water of either living individuals or ones recently collected, or fresh specimens out of water. When listing type material for various species, often only those at the Bernice P. Bishop Museum in Honolulu (BPBM) are listed. Institutional abbreviations are as listed in Leviton et al. (1985).

KEY TO THE GOBIES OF HAWAII

- 1a. Pelvic fins separate, inner rays of both fins not connected (Fig. 1.) ..... 2
- 1b. Pelvic fins fused to form a sucking disc, or at least inner rays of both fins connected together (membrane is easily torn, may only be joined at bases of fins) (Fig. 2)..... 5
- 2a.(1a) Preopercle with two or more spines (Fig. 3); pelvic fins not fringe-like, lacking many side branches ..... *Asterropteryx semipunctatus*
- 2b.(1a) Preopercle without spines; pelvic fin with many side branches and fringe-like (Fig. 4) ..... 3
- 3a.(2b.) Unbranched 5<sup>th</sup> pelvic-fin ray not developed (Fig. 4); genital papillae of male and female not ruggose (Fig. 5); subcutaneous dark-brown bar at caudal-fin base (Fig. 6); anteriormost branch of 4<sup>th</sup> pelvic-fin ray short, with fewer than 10 segments; IT pore present (Fig. 7) ..... *Eviota epiphanes*
- 3b.(2b) Unbranched 5<sup>th</sup> pelvic-fin ray developed (about 1/10 length of 4<sup>th</sup> ray) (Fig. 8); genital papillae of male and female ruggose (Figs. 9 and 10); no subcutaneous bar at caudal-fin base; anteriormost branch of 4<sup>th</sup> pelvic-fin ray elongate, with 9 or more segments (usually about 15) (Figs. 8 and 11); IT pore absent (Fig. 7) ..... 4
- 4a(3b) No prominent subcutaneous body bars or spots; POP pores present (Fig. 7); size to 12.8 mm SL. .... *Eviota rubra*
- 4b(3b) Five-6 prominent subcutaneous body bars, ventral surface with 3 broad subcutaneous bars on belly and 4-6 more spots above anal-fin base and on caudal peduncle (Fig. 12); POP pores absent or greatly reduced (Fig. 7); size to 18.5 mm SL ..... *Eviota susanae*
- 5a.(1b) Caudal fin distinctly forked (young of various freshwater gobies) . . . *Vitraria clarescens*<sup>3</sup>
- 5b.(1b) Caudal fin rounded or pointed ..... 6

<sup>3</sup> *Vitraria clarescens* in literature, a synonym of *Sicyopterus stimpsoni* (Greenfield et al. 1998).



6a.(5b) Caudal fin distinctly pointed, more than twice as long as wide (Fig. 13); a well-developed fleshy crest on nape extending forward from first dorsal fin at least past edge of opercle and further in larger specimens (Fig. 14) . . . . . 7

6b.(5b) Caudal fin rounded, not twice as long as wide; no distinct median crest on nape . . . . . 8

7a.(6a) Body with lateral series of elongate blotches; dark spot on superior margin of eye; prominent dark spot on pectoral-fin base (Fig. 14); dark spots on branchiostegal membranes under lower jaw (Fig. 15); 18–21 (usually 20) pectoral-fin rays. . . . . *Oxyurichthys lonchotus*

7b.(6a) Body lacking elongate blotches on sides, spots on eye margin, pectoral-fin base, or branchiostegal membranes; 21–23 (usually 22–23) pectoral-fin rays . . . . . *Oxyurichthys heisei*

8a.(6b) Upper 4–9 pectoral-fin rays terminating in free, silky filaments (Fig.16). . . . . 9

8b.(6b) Upper pectoral-fin rays not terminating in free, silky filaments . . . . . 11

9a.(8a) Pelvic sucking disc about as wide as long (Fig. 17); anterior nostril with a small flap; side of cheek with a deep longitudinal groove, with upper portion of cheek extending down over groove anteriorly, hiding papillae in groove (Fig. 18); predorsal scales extending forward to between eyes; upper 8–10 pectoral-fin rays with free, silky filaments . *Bathygobius cotticeps*

9b.(8a) Pelvic sucking disc clearly longer than wide (Fig. 19); no flap on anterior nostril; side of cheek with a shallow groove anteriorly, with papillae present in groove visible; predorsal scales not extending forward to between eyes; upper 4–6 pectoral-fin rays with free, silky filaments. . . . . 10

10a.(9b) Predorsal scales extending forward of a line drawn up from posterior edge of preopercle, almost to eyes in some (in specimens 28 mm SL and larger); mandibular frenum straight with no free lobes at sides (Fig. 20). . . . . *Bathygobius coalitus*

10b.(9b) Predorsal scales not extending forward to line drawn up from posterior edge of preopercle; mandibular frenum more curved with free lobes at sides (Fig. 21)  
. . . . . *Bathygobius cococensis*

11a.(8b) Lateral scales on back anterior to second dorsal fin smaller than those under second dorsal fin and on caudal peduncle (Fig. 23); interorbital area covered with very small cirri (Fig. 22); no pores on top of head . . . . . *Mugilogobius cavifrons*

11b.(8b) Size of scales (if present) not obviously different between anterior and posterior parts of body; interorbital area lacking small cirri; pores on top of head present or absent . . . . . 12

12a.(11b) About three prominent, knob-like, fleshy projections extending forward from lower portion of shoulder girdle inside gill openings (Fig. 24).(freshwater species). . . . . 13

12b.(11b) No knob-like, fleshy projects on shoulder girdle. . . . . 14

13a.(12a) A black blotch extending down and back from eye; caudal fin not crossed by any dark bars (fresh water) . . . . . *Stenogobius hawaiiensis*

13b.(12a) No black blotch under eye; caudal fin crossed by about 5 dark bars (fresh water)  
. . . . . *Awaous guamensis*

14a.(12b) Origin of first dorsal fin far forward on body, above posterior end of operculum and with five spines; second dorsal-fin spine greatly elongate, extending well back above second dorsal fin . . . . . *Discordipinna griessingeri*

14b.(12b) Origin of first dorsal fin behind origin of pectoral fin and with six spines; second dorsal-fin spine may be elongate or not . . . . . 15



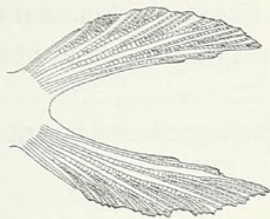


FIGURE 1. Pelvic fins of *Asterropteryx semipunctatus*.

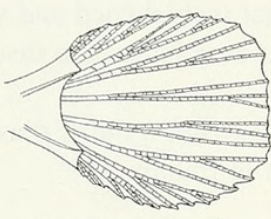


FIGURE 2. Pelvic fins of *Bathygobius coalitus*.



FIGURE 3. Head of *Asterropteryx semipunctatus*.



FIGURE 4. Pelvic fin of *Eviota epiphanes*.

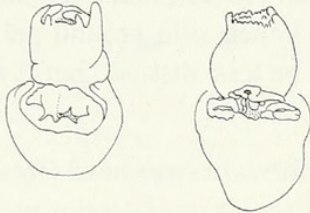


FIGURE 5. Genital papillae of *Eviota epiphanes*, male on left.

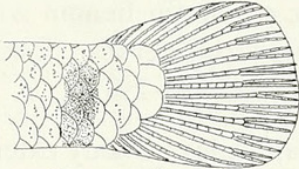


FIGURE 6. Caudal peduncle and fin of *Eviota epiphanes*.

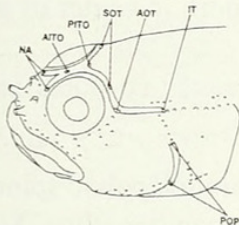


FIGURE 7. Cephalic pores of *Eviota* species, modified from Lachner and Karnella (1980).



FIGURE 8. Pelvic fin of *Eviota rubra*.

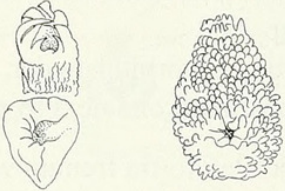


FIGURE 9. Genital papillae of *Eviota rubra*, male on right.

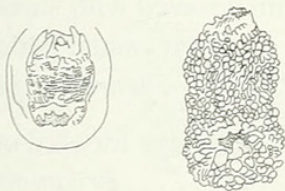


FIGURE 10. Genital papillae of *Eviota susanae*, male on right.



FIGURE 11. Pelvic fin of *Eviota susanae*.

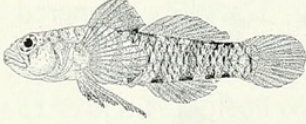


FIGURE 12. *Eviota susanae*.



FIGURE 13. Caudal fin of *Oxyurichthys lonchotus*.

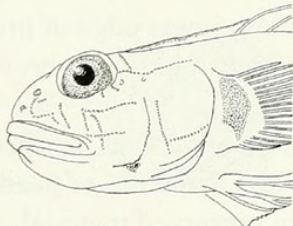


FIGURE 14. Head of *Oxyurichthys lonchotus*.

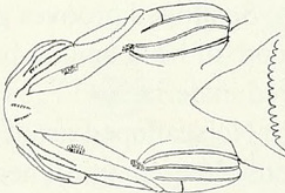


FIGURE 15. Ventral view of head of *Oxyurichthys lonchotus*.

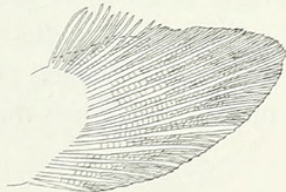


FIGURE 16. Pectoral fin of *Bathygobius coalitus*.

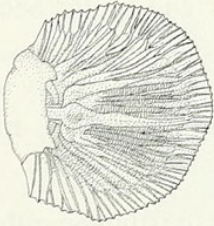


FIGURE 17. Pelvic fins of *Bathygobius cotticeps*.

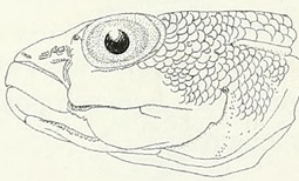


FIGURE 18. Head of *Bathygobius cotticeps*.



- 15a.(14b) Pelvic fins with a frenum that is thickened and variously raised, thickened portion with a folded pocket in the center extending back onto disc (probe may be inserted into pocket at anterior part of disc) (Fig. 25) . . . . . 16
- 15b.(14b) Pelvic fins with or without a frenum, but if present not thickened and raised (usually a thin membrane); no folded pocket in frenum . . . . . 22
- 16a.(15a) Interorbital wide, about one and one-half to two eye diameters; snout broadly rounded from side view (Fig. 26); pelvic-fin frenum lacking pelvic-spine lobes or short papillae . . 17
- 16b.(15a) Interorbital narrow, less than one eye diameter; snout more pointed from side view (Fig. 27); pelvic-fin frenum with thickened skin around pelvic spines, forming lobes that extend posteriorly over disc (lobes may be less distinct, but if so, are covered with many, short papillae) (Figs. 28–29) . . . . . 18
- 17a.(16a) Scales on body extending forward onto head (fresh water) . . . . . *Sicyopterus stimpsoni*
- 17b.(16a) Body naked or with a few scales on posterior part of body near caudal peduncle (fresh water) . . . . . *Lentipes concolor*
- 18a.(16b) Interorbital very narrow, about  $\frac{1}{2}$  pupil diameter; a single pore in center of interorbital (Fig. 30) . . . . . 19
- 18b.(16b) Interorbital wider, slightly narrower than one pupil diameter; two pores in center of interorbital, one next to each eye (Fig. 31) . . . . . 20
- 19a.(18a) Pelvic-fin frenum with two distinct lobes of thickened skin around pelvic spines, extending posteriorly over disc; frenum not broad and covered with short papillae (Fig. 28); dark pigment on lower portion of caudal peduncle extending posteriorly as stripe onto caudal fin . . . . . *Pleurosicya micheli*
- 19b.(18a) Pelvic-fin frenum broader, lobes not as distinct and frenum covered with short papillae (Fig. 32); body peppered with melanophores, no distinct dark stripe on caudal peduncle and caudal fin . . . . . *Pleurosicya larsonae*
- 20a.(18b) Pectoral-fin rays 13 (rarely 12 or 14); a distinct black stripe from eye forward onto snout . . . . . *Bryaninops tigris*
- 20b.(18b) Pectoral-fin rays 14–17 (rarely 13); stripe from eye to snout absent or if present indistinct . . . . . 21
- 21a.(20b) Scalloped grooves present along lower edge of preoperculum (Fig. 33); head depth 50% or more of head length; body bars golden brown to brown when live, generally distinct in preserved material . . . . . *Bryaninops yongei*
- 21b.(20b) No scalloped grooves present along lower preopercular edge (occasionally slight indentations along margin); head depth less than 50% of head length; body bars brownish-orange to red when live; usually indistinct in preserved material . . . . . *Bryaninops amplius*
- 22a.(15b) Body naked, with about 10–11 dark vertical bars separated by narrow white bars; pelvic disc short, space between posterior end of fin and anal-fin origin equal to or greater than pelvic-fin length . . . . . *Kelloggella oligolepis*
- 22b.(15b) Body with scales, at least posteriorly; body without 12 dark vertical bars; pelvic disc longer, space between posterior end of pelvic fin and anal-fin origin clearly less than pelvic-disc length . . . . . 23
- 23a.(22b) Gill membranes broadly fused to isthmus; gill opening not extending anteriorly as far as posterior edge of preopercle . . . . . 24



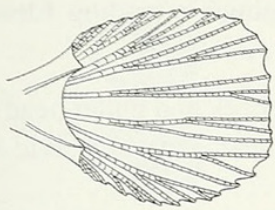


FIGURE 19. Pelvic fins of *Bathygobius coalitus*.

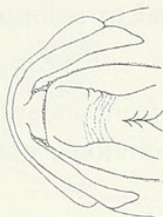


FIGURE 20. Ventral view of head of *Bathygobius coalitus*.

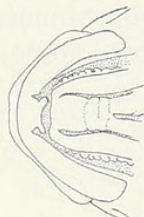


FIGURE 21. Ventral view of head of *Bathygobius cococensis*.



FIGURE 22. Back of *Mugilogobius cavifrons*.

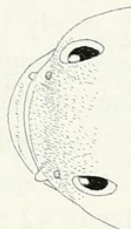


FIGURE 23. Dorsal view of head of *Mugilogobius cavifrons*.



FIGURE 24. Pectoral-fin base of *Awaous guamensis*.

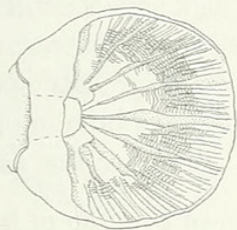


FIGURE 25. Pelvic fins of *Sicyopterus stimpsoni*.

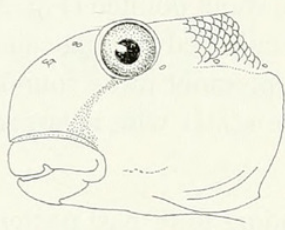


FIGURE 26. Head of *Sicyopterus stimpsoni*.

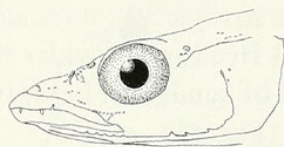


FIGURE 27. Head of *Bryaninops amplus*.

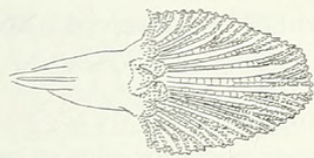


FIGURE 28. Pelvic fins of *Pleurosicya micheli*.

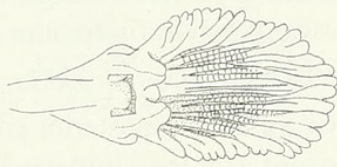


FIGURE 29. Pelvic fins of *Bryaninops yongei*.

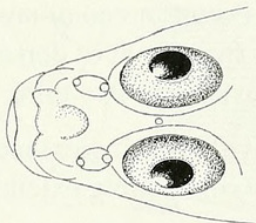


FIGURE 30. Head of *Pleurosicya micheli*.

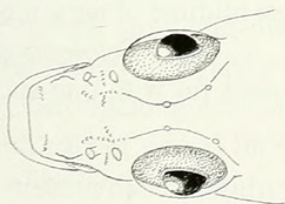


FIGURE 31. Head of *Bryaninops amplus*.

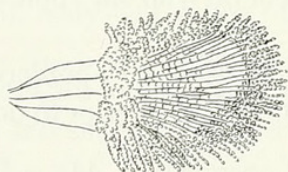


FIGURE 32. Pelvic fins of *Pleurosicya larsonae*.

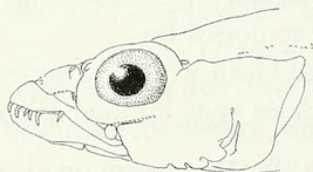


FIGURE 33. Head of *Bryaninops yongei*.

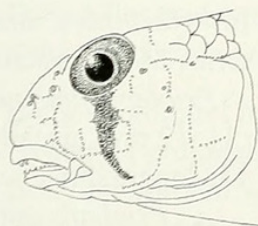


FIGURE 34. Head of *Gnatholepis anjerensis*.

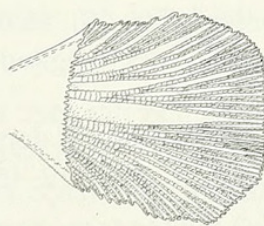


FIGURE 35. Pelvic fins of *Gnatholepis anjerensis*.

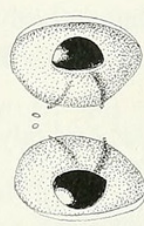


FIGURE 36. Dorsal view of eyes of *Gnatholepis anjerensis*.



- 23b.(22b) Gill membranes not broadly fused to isthmus, gill openings extending forward to or beyond posterior edge of preopercle . . . . . 27
- 24a.(23a) Narrow black bar extending down from under eye across cheek and under head (Fig. 34); pelvic-fin frenum well-developed and obvious, extending to near ends of pelvic-fin spines (Fig. 35) . . . . . 25
- 24b.(23a) No narrow black bar under eye; pelvic-fin frenum weak, thin and often not obvious, and not extending to near ends of pelvic-fin spines . . . . . 26
- 25a.(24a) Pectoral-fin rays 15–17 (modally 16, rarely 15); a narrow dark bar dorsally on eye, centered over posterior half of pupil, not crossing interorbital space (Fig. 36); small scales usually present on cheek anterior to dark eye bar; size to 64 mm SL . . . . . *Gnatholepis anjerensis*
- 25b.(24a) Pectoral-fin rays 16–18 (modally 17, rarely 16 or 18); narrow dark bar dorsally on eye, centered at pupil, often crossing midinterorbital space (Fig. 37); small scales rarely present on cheek entirely anterior to dark eye bar; size to 42 mm SL . . . . . *Gnatholepis cauerensis hawaiiensis*
- 26a.(24b) Head about as deep as wide; snout pointed (Fig. 38); small dark spot at center of caudal-fin base (Fig. 39); no scales with enlarged cteni at caudal-fin base . *Coryphopterus duospilus*
- 26b.(24b) Head much wider than deep; snout more rounded (Fig. 40); large dark spot covering most of caudal-fin base; two large scales with enlarged cteni at top and bottom of caudal-fin base (Fig. 41) . . . . . *Cabillus caudimacula*
- 27a.(23b) Posterior end of jaws extending to or past posterior margin of eye; top of head lacking scales; pelvic-fin frenum very well-developed, extending posteriorly one-third to one-half length of fin (Fig. 42). . . . . *Psilogobius mainlandi*
- 27b.(23b) Posterior end of jaws not reaching posterior margin of eye; top of head with at least some scales from front of dorsal fin forward; pelvic-fin frenum absent or less developed, not extending posteriorly one-third length of fin . . . . . 28
- 28a.(27b) Gill opening extending forward to near posterior edge of preopercle . . . . . 29
- 28b.(27b) Gill opening extending forward to at least midway between posterior edge of preopercle and eye . . . . . 32
- 29a.(28a) Head with a series of prominent, dark-bordered light lines radiating out from eye across cheek and top of head (Fig. 43); anal fin with one spine and 7 rays; midline of nape naked anterior to dorsal fin . . . . . *Priolepis farcimen*
- 29b.(28a) Head without a series of prominent, dark-bordered lines; anal fin with one spine and 8 or more rays; midline of nape with scales anterior to dorsal fin . . . . . 30
- 30a.(29a) Scales present on cheek and opercle (Fig. 44); a deep interorbital trench present between eyes (Fig. 45); fins generally dark . . . . . *Priolepis eugenius*
- 30b.(29a) Cheek and opercle lacking scales; interorbital without a trench; fins not dark . . . . . 31
- 31a.(30b) Scales on body with dark borders (Fig. 46); second dorsal fin with 9 rays; anal fin with 8 to 9 rays, usually 8; predorsal scales 5 to 8; longitudinal scale series 24–26, usually 25 . . . . . *Priolepis limbatosquamis*
- 31b.(30b) Scales on body lacking dark borders; second dorsal fin with 11–12 rays, usually 11; anal fin with 9–10 rays, usually 9; predorsal scales 12–16, usually 15; longitudinal scale series 28–30, usually 28 . . . . . *Priolepis aureoviridis*
- 32a.(28b) Gill opening extending forward only to posterior margin of eye; first spine in second part



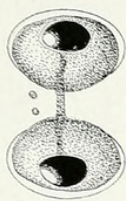


FIGURE 37. Dorsal view of eyes of *Gnatholepis cauerensis hawaiiensis*.

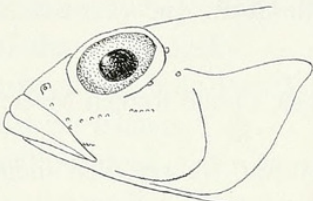


FIGURE 38. Head of *Coryphopterus duospilus*.

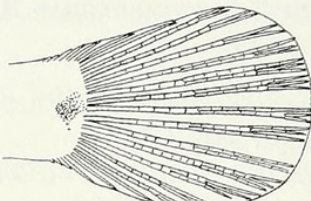


FIGURE 39. Caudal peduncle and fin of *Coryphopterus duospilus*.

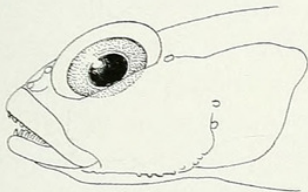


FIGURE 40. Head of *Cabillus caudimacula*.

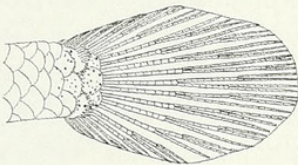


FIGURE 41. Caudal peduncle and fin of *Cabillus caudimacula*.

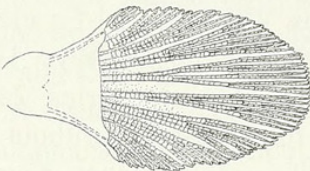


FIGURE 42. Pelvic fins of *Psilogobius mainlandi*.

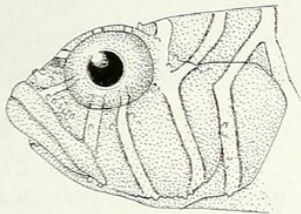


FIGURE 43. Head of *Priolepis farci-men*.



FIGURE 44. Head of *Priolepis eugenius*.

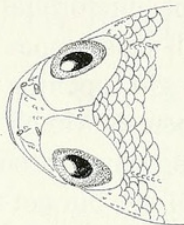


FIGURE 45. Dorsal view of head of *Priolepis eugenius*.

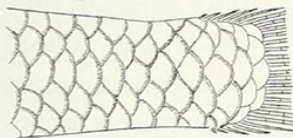


FIGURE 46. Scales on side of body of *Priolepis limbatoquamis*.

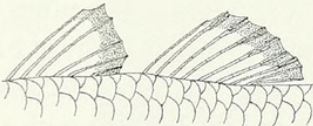


FIGURE 47. Dorsal fins of *Trimma unisquamis*.

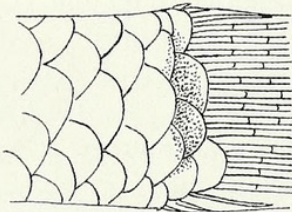


FIGURE 48. Caudal-fin base of *Trimma unisquamis*.

- of dorsal fin stout and sharp-tipped; body with a line of dash-like dark marks down side and several fainter lines above. . . . . *Opua nephodes*
- 32b.(28b) Gill opening extending far forward to under chin and anterior part of eye; first spine in second part of dorsal fin not stout and sharp-tipped; series of dash-like marks not present on side of body . . . . . 33
- 33a.(32b) Both dorsal fins with a black border , more obvious in first (Fig. 47); a dark band at base of caudal fin (Fig. 48); dorsal-fin spines not elongate. . . . . *Trimma unisquamis*
- 33b.(32b) Dorsal fins without black borders; no dark band at base of caudal fin; dorsal-fin spines may or may not be elongate. . . . . 34
- 34a.(33b) Bony interorbital narrow, less than half pupil diameter; pectoral-fin rays 17–18; second dorsal spine not prolonged; soft dorsal rays 9, soft anal rays 8. . . . . *Trimma milta*
- 34b.(33b) Bony interorbital wider, about equal to pupil diameter; pectoral-fin rays 13–15; second dorsal spine long and filamentous (may reach caudal-fin base in males); soft dorsal rays 10–11, soft anal rays 9–10. . . . . *Trimma taylori*



*Asterropterix semipunctatus* Rüppell, 1830

(Figs. 3 and 49)

*Asterropterix semipunctatus* Rüppell, 1830, Fische Rothen Meeres 1828–30:138, pl. 34, fig. 4. Red Sea. Holotype: SMF 1691.

*Brachyeleotris cyanostigma* Bleeker, 1855, Nat. Tijdschr. Ned. Indië 8:452. Cocos-Keeling Is., Indian Ocean. Syntypes: RMNH 4756(2).

**DIAGNOSIS.**— Counts based on 20 individuals, 24.0–34.6 mm SL. Dorsal-fin elements VI-I,10. Anal-fin elements I,8-I,9 (I,9). Pectoral-fin rays 17–19 (18). Longitudinal scale series 24–25 (24). Pelvic fins separate, without numerous fringe-like side branches. Lower part of preopercle with two or more spines. Scales ctenoid, covering body; head scaled except interorbital space, snout, and chin. Gill membranes broadly united to isthmus; gill opening ending under middle of opercle. Mouth oblique, lower jaw protruding; jaws extending past anterior margin of eye but not to pupil. Small conical teeth in bands in jaws, the outer row at the front enlarged. Interorbital narrow, about equal to pupil diameter. Third dorsal spine prolonged to a long filament in large adults. Caudal fin rounded, shorter than head. Body depth 3.0–3.6 in standard length. Reported to 65 mm TL.

**COLOR IN ALCOHOL.**— Male- Background color either light cream or medium brown. Light color morph: body with five longitudinal stripes from head back to caudal-fin base, one at midline, two above, and two below. A dark brown spot at top of pectoral-fin base. Caudal-fin base with dark-brown bar. Top of caudal peduncle dark brown. Head with small dark-brown spot at posteriodorsal margin of eye. A diffuse light-brown bar from anteroventral margin of eye to posterior end of jaws. A dark bar on chin from mandible to mandible. Pectoral fins clear. Pelvics, caudal, anal, and second part of dorsal fin with scattered melanophores. First part of dorsal fin with a dark-brown spot at posterior portion. Dark-color morph: basic color pattern as for light morph except less distinct because of dark background. Pectoral fins with scattered melanophores. Other fins as in light morph except more melanophores and thus darker. Female- Color the same as dark-color morph of male.

**LIVE COLOR.**— (from photograph taken at Kâne'ohe Bay) Background color gray with pattern of black markings, entire body overlaid by small, iridescent blue spots. Body crossed by six, irregular, black saddles that extend down to ventral surface: First from top of pectoral-fin base up to origin of first dorsal fin; second from base of posterior half of first dorsal fin; third from elements three to seven of second dorsal fin; fourth from last few rays of second dorsal fin and onto caudal peduncle; fifth at middle of caudal peduncle; and sixth at caudal-fin base. Ventral surface at anal-fin base black, joining bases of saddles together. A separate black blotch extending up from anal-fin origin to midline between saddles two and three. Nape and top of head mottled black and gray, lower half of side of head black. Pupil of eye black surrounded by a narrow golden ring, remainder of iris mottled black and gray. Pectoral-fin base black except for a gray patch at center that extends out onto fin-ray bases; remainder of fin dusky. Pelvic, anal, and caudal fins dusky. First



FIGURE 49. *Asterropterix semipunctatus*, 50 mm TL, Kâne'ohe Bay, O'ahu.



dorsal fin dusky with alternating black and gray bars on spines. First spine of second dorsal fin with alternating black and gray bars, remainder of fin dusky.

**DISTRIBUTION.**— Throughout most of the Indo-Pacific region from the Red Sea and Indian Ocean to the Society Islands and Hawaiian Islands.

**REMARKS.**— Usually lives in shallow protected waters of bays and lagoons, often on dead reefs (Greenfield, 2003). Classified in the earlier literature as an eleotrid because of the divided pelvic fins. Privitera (2001, 2002) studied its reproductive biology in the Hawaiian Islands. Spawning occurs at various times during the day, year-around, with a peak from May to July. Clutch size varied from 296–1552 (mean 886), independent of length of the female. Eggs are ellipsoidal and varied from 0.67–0.84 mm in length, hence unusually small for a body of this size. Eggs were laid beneath coral; they were tended by the male who periodically fanned them with its pectoral fins. Eggs hatched in laboratory aquaria shortly after lights were turned off, four to six nights after being deposited in the nest. Newly hatched larvae had a mean notochord length of 1.88 mm. Minimum age at maturity, 17.5–19 mm, estimated as four and one-half to five months after hatching. Also known as the bluespotted goby.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: O'ahu: CAS 218097 (10), CAS 218089 (10), BPBM 5471 (7), BPBM 22621 (10), BPBM 37315 (9), BPBM 37316 (3); Hawai'i: 28719 (6); Midway Atoll: BPBM 35370 (6).

***Bathygobius coalitus* (Bennett, 1832)**

(Figs. 2, 16, 19–20, and 50)

*Gobius coalitus* Bennett, 1832, Proc. Zool. Soc. London 1830–31(pt 1):166. Mauritius. Holotype: BMNH 1856.2.15.20.

**DIAGNOSIS.**— Counts based on 26 individuals, measurements on 10 individuals 40.2–77.6 mm SL. Dorsal-fin elements V-VI-I,8-9 (VI-I,9). Anal-fin elements I,7-I,9 (I,8). Pectoral-fin rays 18–20 (19), the upper 4–6 (5) rays filamentous, branched to base with membrane-free ends. Longitudinal scale series 34–37 (36). Predorsal scales 15–20. Pelvic sucking disc longer than wide,



FIGURE 50. *Bathygobius coalitus*, 50 mm TL, Maui Ocean Center.

space between end of fin and anal-fin origin less than one fin length; broad frenum with an obvious spine on each side of frenum pointing posteriorly. Body covered with ctenoid scales, becoming cycloid on abdomen, chest, and nape; extending forward on head past a line drawn up from posterior edge of preopercle, almost to eyes in some individuals. No scales on opercle or cheek. Gill membranes broadly united to isthmus. Jaws extending posteriorly to mid-pupil. Interorbital narrow, about equal to pupil diameter. No flap on anterior nostril. Side of cheek with a shallow groove anteriorly, with papilla in groove visible. Mandibular frenum straight with no free lobes at sides. Caudal fin rounded, about equal to head length. Head depressed, its width greater than its depth. Body depth 4.3–4.7 in standard length. Reported to 120 mm TL.

**COLOR IN ALCOHOL.**— Head and body light cream. Upper half of body with four dark brown saddles: First from fourth spine of dorsal fin posterior to just past end of fin base and down to meet mid-side blotches; second saddle from third element of second dorsal fin posterior to base of seventh element and down to meet mid-side blotches; third saddle from base of last element posterior



onto three scales of caudal peduncle and down to meet mid-side blotches; last saddle covering last two scales of caudal peduncle prior to caudal fin and down to meet mid-side blotches; first and third saddles darkest and most prominent. Midside of body with a series of about eight to nine interconnected dark brown blotches that do not reach ventral surface of body. Dark area on top of head immediately in advance of first dorsal-fin spine. Head with four dark brown blotches around eye: one, the most prominent, posterior to orbit at level of top of opercle; second anterior to this; third at posteroventral margin of orbit; fourth at anteroventral margin of orbit extending onto premaxilla; two additional dark brown blotches posterior to most prominent spot posterior to orbit, first midway between eye and top of opercle and second at top of opercle. A distinct dark brown spot on middle of opercle adjacent to edge of preopercle. Cheek with mottled pattern. Eye with clear pupil and black iris. Pectoral fin covered with scattered melanophores, a distinct spot present at bases of rays 6–8 and a second more diffuse spot over bases of rays 12–15. Anal fin with scattered melanophores, darker on distal  $\frac{2}{3}$  of membranes. Caudal fin of female with dark brown blotch at center of base and then crossed by four to five indistinct bars. Caudal fin of male with dark brown blotch at base, proceeded by light area containing two blotches. A circle of dark spots out past  $\frac{1}{2}$  of fin length. Fin posterior to this with one dark bar and then generally dusky. First part of dorsal fin covered with melanophores concentrated into dark spots on basal half of membranes between spines four to six. Second part of dorsal fin crossed by six bars angling dorsoventrally across fins. Pelvic fins covered with melanophores in males, fewer in females.

**COLOR OF FRESH SPECIMEN.**— (from photograph of specimen collected at Kâne'ohe Bay) Background color golden brown with dark brown to gray mottled pattern scattered over body, darker on back, nape, top and sides of head. Body with scattered, small, white spots, some arranged into irregular rows. Side of head with many scattered, small, white spots. Ventral surface of head and body white with scattered peppering of melanophores, isthmus with dark gray blotches. Eye with black pupil and iris dark brown with an orange tinge. Pelvic fins white with a peppering of melanophores. Caudal-fin membranes dusky, rays dark brown with white spots on basal three-quarters. Anal fin dusky with dark gray distal margin. Pectoral-fin membranes dusky, rays brown with white spots on basal one-half. First dorsal fin with rows of white spots along base with a narrow dark brown bar distal to spots. Another row of white spots above brown bar. Middle third of fin dusky with additional row of white spots. Distal third of fin membrane clear with an orange margin. Second dorsal fin similar to first dorsal fin.

**DISTRIBUTION.**— East coast of Africa to the Hawaiian Islands and Marquesas; Japan to the Great Barrier Reef.

**REMARKS.**— Typically found in the intertidal zone in rock and tidepools. Shafer (1998) reported that this species spawns throughout the year, has a larval duration of 29–50 days, settles at 7.02–10.6 mm total length, and reaches its maximum size in 20–30 days.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: O'ahu: CAS 218099 (13), uncataloged, (G91-11), CAS 218100- (3), CAS 218099 (13); BPBM 5490 (1), BPBM 34559 (1); Hawai'i: BPBM 34622 (2); Necker: BPBM 4863 (1).

### *Bathygobius cocosensis* (Bleeker, 1854)

(Figs. 21 and 51)

*Gobius cocosensis* Bleeker, 1854, Nat. Tijdschr. Ned. Indië 7:47. Cocos-Keeling Islands, Indian Ocean. Holotype: lost. Neotype: RMNH 4533, selected by Akihito and Megura (1980); location of neotype unknown.

*Mapo fuscus*: Jordan and Evermann, 1905, Bull. U.S. Fish Comm. 23(1):483, fig. 212 (misidentification).

**DIAGNOSIS.**— Counts based on 25 individuals, measurements on 10 individuals 28.5–56.3 mm



SL. Dorsal-fin elements VI-1,7-VI-1,10 (VI-1-9). Anal-fin elements 1,7-1,9 (1,8). Pectoral-fin rays 17-20 (18), the upper 4-6 (5) rays filamentous, branched to base with membrane-free ends. Longitudinal scale series 34-38 (35). Predorsal scales 10-12. Pelvic sucking disc longer than wide, space between end of fin and anal-fin origin less than one fin length; broad frenum with an obvious spine on each side of frenum pointing posteriorly. Body covered with ctenoid scales, becoming cycloid on abdomen, chest, and nape; scales extending forward on head to a line drawn up from posterior edge of opercle. No scales on opercle or cheek. Gill membranes broadly united to isthmus. Jaws extending posteriorly to posterior margin of pupil. Interorbital narrow, about equal to pupil diameter. No flap on anterior nostril. Side of cheek with a shallow groove anteriorly, with papillae in groove visible. Mandibular frenum curved with free lobes at sides. Caudal fin rounded, about equal to head length. Head depressed, its width greater than its depth. Body depth about 5 in standard length. Reported to 60 mm TL.

**COLOR IN ALCOHOL.**— Head and body light cream; upper half of body with four dark brown saddles, first from third spine of dorsal fin posterior to just past end of fin base and down to meet midside blotches; second saddle from second element of second part of dorsal fin posterior to base of 6th element and down to meet midside blotches; third saddle from base of 8th element posterior onto three scales of caudal peduncle and down to meet midline blotches; last saddle covering last two scales of caudal peduncle prior to caudal fin down to meet midline blotches. Midside of body with a series of about eight to nine interconnected dark brown blotches that do not reach ventral surface of body. Dark area on top of head immediately in advance of first dorsal spine, resembling a saddle. Head with a prominent dark brown blotch posterior to orbit at level of top of opercle; a second spot posterior to this spot midway between eye and top of opercle, third spot at top of opercle. An additional spot on posteroventral margin of orbit. A diffuse dark brown spot on middle of opercle adjacent to edge of preopercle. Pectoral fin covered with scattered melanophores, with no distinct spots. Anal fin evenly covered with melanophores. Caudal fin of female crossed by seven distinct bars. Caudal fin and first and second dorsal fins of males evenly covered with melanophores. First dorsal fin of female crossed by four bars angling dorsoventrally across fin. Second dorsal fin of female crossed by six similar bars.

**COLOR OF FRESH SPECIMEN.**— (from photograph of specimen taken at Kāne'ohe Bay) Background color golden brown with dark brown mottled pattern scattered over body, darker on top of back by first dorsal fin, nape, top and sides of head. Body with about five irregular rows of small, white spots from pectoral-fin base to caudal-fin base. Ventral surface of head and body white with scattered peppering of melanophores. Side of head with scattered small, white spots. Eye with black pupil and iris dark brown, lips gray with white spots. Pelvic fins white basally, remaining two-thirds dusky. Caudal fin dark brown with white spots on basal one-third of rays, rays darker than membranes. Anal-fin membranes light gray on basal two-thirds, distal one-third dark brown. Pectoral fin dark brown with small, white spots on basal one-half. First dorsal fin with a peppering of melanophores, crossed by three rows of white spots, distal margin orange. Basal half of second dorsal fin with a peppering of melanophores, distal half dark brown, fin crossed by four to five rows of white spots.



FIGURE 51. *Bathygobius cocosensis*, BPBM 33489, 41 mm SL, Kāne'ohe Bay, O'ahu.



**DISTRIBUTION.**— Widespread throughout the tropical Indo-Pacific region.

**REMARKS.**— Typically found in tidepools, shallow reef flats, and sheltered patch reefs. Often misidentified in recent literature (including Gosline and Brock, 1960) as *B. fuscus* (Rüppell).

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: O'ahu: CAS 218101 (12), CAS 218102 (13), CAS 218103 (28), CAS 218104 (3), CAS 218105 (16), CAS 218106 (19), CAS 218107 (4) BPBM 5483 (49), BPBM 5486 (23), BPBM 5488 (43).

***Bathygobius cotticeps* (Steindachner, 1879)**

(Figs. 17–18 and 52)

*Gobius cotticeps* Steindachner, 1879, Sitzungsber. Akad. Wiss. Wien. 80(1 Abth.):137. Society Islands.

Holotype: NMW 30439.

*Chlamydes laticeps* Jenkins, (1903), Bull. U.S. Fish. Comm. 22(1902):503, Fig. 43, O'ahu, Hawaiian Islands.

Holotype: USNM 50716.

**DIAGNOSIS.**— Counts based on 25 individuals, measurements on 10 individuals 27.8–57.8 mm SL. Dorsal-fin elements VI-I,8-I,9 (VI-I,9). Anal-fin elements I,7-I,8 (I,8). Pectoral-fin rays 21–25 (24), upper 8–10 (9) rays filamentous, branched to base with membrane-free ends. Longitudinal scale series 35–39 (37). Predorsal scales 21–32. Pelvic sucking disc about as wide as long, moderately long, space between end of fin and anal-fin origin less than one fin length; broad frenum with an obvious spine on each side of frenum pointing posteriorly. Body covered with ctenoid scales, becoming small and cycloid on head and anterior body, extending forward onto head to between eyes, onto upper portion of opercle and onto cheek under eye in larger individuals. Gill membranes broadly united to isthmus. Jaws extending posteriorly to anterior part of pupil. Interorbital narrow, about equal to pupil diameter. Anterior nostril with a small flap. Side of cheek with a deep longitudinal groove, with upper portion of cheek extending down over groove anteriorly, hiding papillae in groove. A small fleshy lobe projecting posteriorly from front of chin, without a posterior projection on each side. Caudal fin rounded, shorter than head. Head strongly depressed. Body depth 4.2–5.0 in standard length. Reported to 110 mm TL.

**COLOR IN ALCOHOL.**— Head and body light cream. Body crossed by four brown saddles: first from second spine of first dorsal fin posterior past end of fin base to end of depressed last spine and down to belly; second saddle from first ray of second part of dorsal fin posterior to base of 5<sup>th</sup> ray and down to midline of body where it joins third saddle; third saddle from base of 7<sup>th</sup> ray posterior about two scales past end of fin base and down to midline of body; posterior third of third saddle extends posteroventrally to end of last depressed anal-fin ray on ventral surface of caudal peduncle; fourth saddle encircles caudal peduncle just anterior to caudal-fin base. Head with a dark bar extending posteroventrally from posterior part of ventral surface of eye across cheek  $\frac{2}{3}$  distance to edge of preopercle; second shorter bar extending from anteroventral portion of eye onto premaxilla; distinct round spot at posterior edge of eye, second spot posterior to this spot midway between eye and top of opercle, third spot at top of opercle. Pectoral fin with scattered melanophores on basal  $\frac{2}{3}$ . Anal fin with scattered melanophores on basal  $\frac{3}{4}$ . Caudal fin crossed by six faint bars composed of separate spots on fin rays. First part of dorsal fin with a dark spot covering membrane between spines five and six continuing past sixth spine to end of fin. Second part of dorsal fin crossed by six faint bars angling dorsoventrally across fin. Pelvic fin lacking pigment.



FIGURE 52. *Bathygobius cotticeps*, BPBM 38464, 57 mm SL, Waikiki, O'ahu.



**COLOR OF FRESH SPECIMEN.**— (from photograph of specimen taken at Waikîkî). Background color medium brown with dark brown edges on scales on sides of body and head, entire scales dark brown on dorsal surface of body and head. Ventral surface of head and body white with scattered melanophores. Eye with black pupil, iris brown with gold reflections. Grooves on cheek cream, contrasting with darker background of cheek. Lips dark brown. Pectoral, anal, and caudal fins uniform dark brown to gray. Pelvic fins tan. First dorsal fin with a clear area on basal one-fifth between spines two and six. Remainder of fin darker, spines orange-brown and membranes dusky brown, an intense black spot between spines five and six and extending slightly posterior to sixth spine. Second dorsal-fin membranes dusky brown, spine and rays orange-brown.

**DISTRIBUTION.**— Found in the Indo-Pacific from East Africa to the Hawaiian Islands and Pitcairn Islands; in the western Pacific from Japan to the Great Barrier Reef.

**REMARKS.**— Usually found in tidepools and rocky shores. This species is more abundant in the low intertidal, in areas that do not get cut off from the ocean during low tide (D.J. Shafer, pers. commun., March 1998)

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: O'ahu: BPBM 4869 (2), BPBM 5492 (1), BPBM 5493 (3), BPBM 5494 (2), BPBM 11659 (3), BPBM 15354 (8), BPBM 15370 (7), CAS 218109 (2), CAS 218165 (1); uncat. Univ. Hawaii (2), uncat. Univ. Hawaii (2), Univ. Hawaii 2018 (4).

### *Bryaninops amplus* Larson, 1985

(Figs. 27, 31, and 53)

*Bryaninops amplus* Larson, 1985, The Beagle (Occ. Pap. N. Terr. Mus. Arts Sci.) 2(1):66, figs. 5–6. Lagoon off east tip of Palfrey I., Lizard I., Great Barrier Reef, Australia. Holotype: AMS I.22916-001. Paratypes: BPBM 27979 (1), Hawai'i, BPBM 29319 (9), Hawai'i, other paratypes at various museums.

**DIAGNOSIS.**— Counts based on two individuals 23.9–25.2 mm SL. Dorsal-fin elements VI–I, 8. Anal-fin elements I, 9. Pectoral-fin rays 15. Longitudinal scale series 46–49. Body variably scaled, the scales extending forward to between end of pectorals and below fourth dorsal-fin spine, abdomen naked. Snout pointed and bill-like, longer than eye diameter. A large curved canine tooth at midside of lower jaw. Gill opening reaching ventrally a little below pectoral-fin base. Pelvic sucking disc slightly longer than wide, but short, space between posterior end of fin and anal-fin origin greater than pelvic-fin length. Pelvic-fin frenum with thickened skin around pelvic spines, forming lobes that extend posteriorly over disc. Interorbital slightly narrower than one pupil diameter with two pores in center of interorbital, one next to each eye. No scalloped grooves along lower preopercular edge. Head depth less than 50% of head length. Body depth at anal-fin origin 6.2–9.0 in standard length. Caudal fin slightly emarginated to truncate with rounded corners. No dark bars on back. Reported to 56 mm TL.

**COLOR IN ALCOHOL.**— Background color light cream. Body with a few scattered melanophores on back with slight concentrations in front of first dorsal fin, between spines five and six, at first three elements of second dorsal fin, at fifth ray of second dorsal fin, behind second dor-



FIGURE 53. *Bryaninops amplus*, 45 mm TL, on seawhip, Kaua'i.



sal fin, and at end of caudal peduncle. Lower half of body with heavier concentration of melanophores, becoming more dense towards caudal-fin base and extending onto basal one-third of caudal fin. Remainder of caudal fin without pigmentation. Top of head with scattered, larger dark brown spots. Cheek and opercle with a few scattered melanophores and a heavy concentration of melanophores on anterior end of upper and lower jaws. Pectoral-fin base with scattered melanophores, no pigmentation on fin. Both dorsal fins, anal and pelvic fins lack pigmentation.

**COLOR IN LIFE.**— (from a photograph taken at 21 m at Kaua'i) Body translucent with most apparent color showing through from internal pigmentation. Internal coloration: A bright white line running along backbone. Area below backbone dark brown with two distinct white bars running across gut area from backbone to ventral surface. A series of about eight bright white spots spaced on ventral portion of body above anal-fin base. Red gills show through side of head, inner surface of eye balls and brain white. External coloration: An orange-red stripe extending the length of body just ventral to backbone. Six evenly spaced, orange-red triangles extending dorsally from stripe to top of back. A small patch of orange-red pigment with a few scattered melanophores on top of head over brain and a similar color combination in front of eyes across snout onto upper jaw. Dorsal surface of center of upper jaw with a white spot. Iris of eye black surrounded by a narrow white ring, remainder of iris orange-red. A few larger scattered melanophores on pectoral-fin base. All fins lacking color.

**DISTRIBUTION.**— Reported from the Great Barrier Reef, Western Australia, Northern Territory, Philippines, Okinawa, Palau, Guam, Hawaiian Islands, Seychelles, and Madagascar.

**REMARKS.**— Usually found on seawhips of the genus *Juncella*, but also found on mooring lines. Male-female pairs often occur on a single seawhip; eggs are laid in an encircling band on the seawhip. Has been taken in Hawaiian waters from Ni'ihau, Kaua'i, and Kona, Hawai'i.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: Ni'ihau: BPBM 37292 (1); Kaua'i: BPBM 37904 (1), 10 paratypes listed above.

### *Bryaninops tigris* Larson, 1985

(Fig. 54)

*Bryaninops tigris* Larson, 1985, The Beagle (Occ. Pap. N. Terr. Mus. Arts Sci.) 2(1):70, Figs. 7–8. On dropoff halfway between Bird and South Islands, Lizard I., Great Barrier Reef. Holotype: AMS I.20730-017. Paratypes: BPBM 18073(6), other paratypes at various museums.

**DIAGNOSIS.**— From Larson (1985). Dorsal-fin elements VI-I, 7-8. Anal-fin elements I, 8-9. Pectoral-fin rays 12–14 (usually 13), the lower three or four rays unbranched and thickened. Longitudinal scale series 32–59 (mean 47), the scales usually reaching to above pectoral-fin base, occasionally a little anterior to it. Midline of nape usually naked (rarely a few predorsal scales), abdomen naked midventrally, and usually the sides as well. Body slender, the depth at anal-fin origin 6.9–8.6 in standard length. Head width about equal to head depth. Snout length about equal to orbit diameter.



FIGURE 54. *Bryaninops tigris*, 30 mm TL, on black coral, Wetar, Indonesia.



Caudal fin truncate. Interorbital narrower than pupil diameter. Gill opening short, ending at or slightly anterior to lower edge of pectoral-fin base. Pelvic fins short and cup-like. Reported to 55 mm TL.

**COLOR IN ALCOHOL.**— Background color light cream. Sides of body lacking pigment. A slight concentration of brownish pigment immediately anterior to first dorsal-fin spine, and between spines three and four, and at base of spine six. Brownish spots also present along base of second dorsal fin between rays one and two, three and four, and at bases of rays five, six and seven. Scattered melanophores present on top of caudal peduncle. There is a series of seven brownish spots spaced along the anal-fin base and ventral surface of caudal peduncle. Scattered melanophores present on top of head behind eyes. A brownish bar extending from front of eye forward onto upper jaw. Caudal-fin base dark brown with less intense pigment extending out to end of fin. First dorsal fin with scattered melanophores, more concentrated anteriorly and distally. Second dorsal fin and anal fin with scattered melanophores.

**COLOR IN LIFE.**— Lower side of body blackish to dusky red or orange. Back transparent except for six or seven narrow dusky orange or red bars that are continuous with color of lower side, and a series of small spots of the same color dorsally on the body, one in each space between the bars. A white line along top of vertebral column. A dusky orange or red stripe from front of snout through eye and across postorbital head. Two transverse dusky orange bands on occiput. A prominent black blotch at caudal-fin base.

**DISTRIBUTION.**— Known from the Chagos Archipelago, Gulf of Thailand, Solomon Islands, Great Barrier Reef, Tahiti, and the Hawaiian Islands.

**REMARKS.**— Commensal on black coral (*Antipathes*). Reported from depths of 15–53 m. The only Hawaiian specimens were collected in 53 m off Kauai on *A. dichotoma*.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: Kaua'i: PBM 18073 (6) paratypes, specimens small and dried. INDONESIA: BPBM 37376 (7).

***Bryaninops yongei* (Davis and Cohen, 1968)**

(Figs. 29, 33, and 55)

*Cottogobius yongei* Davis and Cohen, 1969, Bull. Mar. Sci. 18(4):752, Figs. 1, 4–6. Darvel Bay, Borneo. Holotype: USNM 200402.

**DIAGNOSIS.**— From Larson (1985). Dorsal-fin rays VI-I, 7–10 (usually 8 or 9). Anal-fin rays I, 8–9. Pectoral-fin rays 13–17 (usually 15–17, mode at 16). Posterior half of body covered with ctenoid scales, those above midline extending forward to first dorsal fin. Longitudinal scale series 26–58 (mean 40). Body depth at anal-fin origin 5.4–8.1 in standard length. Head width greater than head depth. Snout slightly longer than orbit diameter. Gill opening reaching ventrally to below pectoral-fin base. Pelvic disc usually cup-like and short, not reaching anus, the spines with fleshy lobes. Recorded to 40 mm TL.



FIGURE 55. *Bryaninops yongei*, 35 mm TL, on seawhip, Molokini, Maui.



**COLOR IN ALCOHOL.**— Background color light cream. Body and fins lacking markings except for a few scattered melanophores on the pectoral-fin base, on the top of the head just behind the eyes, and immediately in front of the first and second dorsal fins.

**COLOR IN LIFE**— (from photograph of fish taken at Molokini, Maui in 27 m). Body translucent with backbone showing through as a silver stripe. Sides of body with a series of six dark brown triangular-shaped blotches, their apices pointing dorsally. Apex of first triangle located just anterior to first dorsal fin; second at end of first dorsal fin; third at second dorsal-fin origin; fourth at posterior third of second dorsal fin; fifth on caudal peduncle; and sixth at caudal-fin base. Coloration of head variable, one individual, with snout, mouth, cheeks and lower two-thirds of opercle dark brown to black and top of head white. Head of second fish translucent yellow with scattered melanophores on preorbital, snout, premaxilla and occiput. Pupil of eye black, surrounded by a narrow lemon yellow ring, remainder of iris orange-red, with a scattering of irregular black pigment on the outer perimeter. First dorsal-fin spines black, membranes clear. Rays of second dorsal, anal, caudal, and pelvic fins reddish, membranes clear. Pelvic-fin ray reddish and membranes clear except for white distal margin that rests on seawhip.

**DISTRIBUTION.**— Red Sea to the Hawaiian Islands, Marquesas, Society Islands, and Rapa; Japan to Great Barrier Reef. Only Hawaiian specimens taken were three in 1967 (O'ahu, Lahilahi Point: USNM 203238; Moku Manu, O'ahu: BPBM 5571), two in 1968 (Hawai'i, Puakō: USNM 203237); and four in 2001 at Kāne'ohe Bay, O'ahu: CAS 218903.

**REMARKS.**— Lives on the antipatharian seawhip *Cirrhipathes anguina* at depths of three to at least 45 m, typically with one male and female pair per seawhip, sometimes with a few juveniles as well.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: Oahu: BPBM 5571 (1), Moku Manu; CAS 218903 (4), Kāne'ohe Bay. SEYCHELLES: BPBM 35540 (2).

***Cabillus caudimacula* Greenfield and Randall, sp.nov.**

(Figs. 40–41 and 56–57)

**MATERIAL EXAMINED.**— Holotype: CAS 218110, male, 16 mm SL, Hawaiian Islands, O'ahu, Kāne'ohe Bay, sand field at seaward edge of spur and groove habitat outside of barrier reef, adjacent to rubble patch and pavement, (15.2–16.8 m), collected by R.C. Langston, 29 August 2002, field number L02-28. Paratypes: CAS 218111, 14.8 mm SL, USNM 375433, 16.8 mm SL, FMNH 113491, 14.8 mm SL, NTM S.15733-001, 13.3 mm SL, AMS I.42940-001, 14.3 mm SL, NSMT-P 67809, 14.2 mm SL, all taken with the holotype. BPBM 37261, 18 mm SL, Hawaiian Islands, O'ahu, Kāne'ohe Bay, Sampan Channel near buoy, spur and groove, 12–13.5 m, 30 August, 1991, D.W. Greenfield and G. Cockrell (field number G91-26). BPBM 39246, 16.5 mm SL, Hawaiian Islands, O'ahu, Kahe Point, sand and rubble, (14.5 m), R.R. Holcom, 18 November 1998. BPBM 22628 (3) (former UH 1708) 15.0–17.4 mm SL, Hawaiian Islands, O'ahu, off Waikiki reef, W.A. Gosline, V.E. Brock, J.E. Randall et al., December 1952.

**DIAGNOSIS.**— A small (largest 18.0 mm SL), light colored goby with a depressed head (width 1.4–1.8 into head length and always wider than deep); a bilobed tongue; pelvic-fin frenum greatly reduced, flat and not raised and turned back (outer margins about one-third pelvic spine length, shorter in center and easily torn), and the pelvic spines not thickened; a terminal mouth; chin with a small, slightly curved mental frenum, and no barbels present on underside of head; tips of upper pectoral-fin rays not free; cheeks without prominent vertical fleshy flaps that bear papillae; dorsal-fin origin behind pectoral-fin base; no spines on preopercle; dorsal-fin spines thin and flexible; no dermal crest anterior to first dorsal fin; body scaled forward to pectoral fin; first gill slit open.



Dorsal-fin elements VI-I,8-9. Anal-fin elements I,8-9. Pectoral-fin rays 16-18. Longitudinal scale series 24-25. Branched caudal-fin rays 13-16, usually 15. Two to three gill rakers on lower arch. Large dark spot covering caudal-fin base and out onto basal portion of fin. Pelvic disc longer than wide, reaching anal-fin origin. Body covered with scales, extending forward to pectoral-fin base. Two large scales with enlarged cteni at top and bottom of caudal-fin base, extending over fin rays. Scales absent from base of first dorsal fin and from head. Gill membranes fused to isthmus, gill openings not extending forward of pectoral-fin base. Caudal fin rounded. Jaws extending posteriorly to anterior margin of pupil. Interorbital very narrow, less than one pupil diameter. Largest specimen 22.3 mm TL.

**DESCRIPTION.**— Data for holotype presented first, followed by range for all specimens and mean or mode. Measurements as percentage of standard length.

Data from 12 specimens, 13.3-17.9 mm SL. Dorsal-fin elements VI-I,9 (VI-I,8-9, usually I,9). Anal-fin elements I,8 (I,8-I,9, usually I,8). Pectoral-fin rays 17 (16-18, usually 17). Branched caudal-fin rays 15 (13-16, usually 15). Lateral scales 25 (24-25, usually 25). Gill rakers in four paratypes 1 + 2 (2), 1 + 3, 2 + 2. Head length 31.2 (30.3-34.7: 32.1). Head width 20.3 (17.3-24.1: 20.7). Head depth 13.7 (12.2-16.5: 14.4). Eye diameter 10.3 (9.2-11.5: 10.8). Snout length 6.2 (4.6-6.2: 5.6). Body depth 13.1 (12.6-18.9: 15.6). Caudal-peduncle depth 9.4 (9.3-10.9: 10.0). Caudal-peduncle length 21.6 (15.5-22.3: 19.3). First dorsal-fin base 15.6 (10.4-18.3: 13.9). Second dorsal-fin base 25.9 (21.3-28.5: 25.4). Anal-fin base 20.3 (16.9-23.3: 20.6). Caudal-fin length 26.6 (26.3-31.2: 27.9). Pectoral-fin length 25.6 (25.3-31.1: 28.2). Pelvic-fin length 23.1 (23.1-36.1: 29.3). Anterior nostrils tubular, extending anteriorly to upper lip. Posterior nostril with a low, raised ridge. A band of cardiform teeth present in both jaws, outer row the largest. Cheek with four rows of longitudinal sensory papillae: one directly under the eye, two in the center of the cheek, and the fourth at the bottom of the cheek. The following head pores are present: paired nasal pores, anterior interorbital, posterior interorbital, paired supraotics, paired anterior otics; intertemporal, a pore between the anterior otic and intertemporal, three preopercular pores.

**COLOR IN ALCOHOL.**— Background color of head and body white, with color pattern of black pigment. A distinctive dark blotch posteriorly on side of caudal peduncle and extending onto caudal-fin base. Four small blotches on midline of side of body, evenly spaced between front of second dorsal fin and blotch at caudal-fin base. A wide band running from ventral base of pectoral-fin axil posteriodorsally to first dorsal-fin base. Small blotches at base of second dorsal fin at elements three, five, eight, nine and 10, with scattered pigment extending onto dorsum to lateral midline from each blotch. A diffuse saddle on top of caudal peduncle joining blotch at caudal-fin base. A band running posteriorly from top of pectoral-fin base to join wide band under first dorsal fin; a

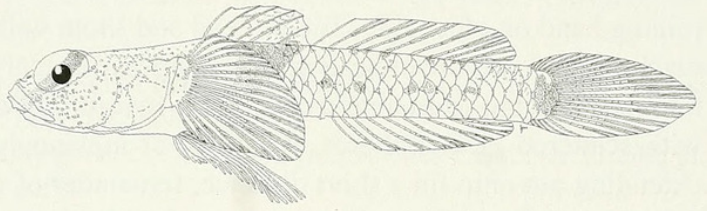


FIGURE 56. *Cabillus caudimacula*, out of BPBM 39246 (specimen lost); about 16 mm SL.



FIGURE 57. *Cabillus caudimacula*, paratype, BPBM 39246, 16.5 mm SL, Kahe Point, O'ahu.



narrow extension from the band extending up to dorsal surface, crossing anterior to first dorsal fin, joining band on other side. Top of head and snout with scattered melanophores. An intense narrow black spot on midline of head midway between dorsal-fin origin and top of pectoral-fin base. A distinct bar running from anteroventral eye margin forward onto jaws. Cheek under eye and opercle with scattered melanophores. A cluster of melanophores on dorsal quarter of pectoral-fin base, extending out onto fin a short distance, remainder of fin lacks pigment as does the pelvic and anal fins. Caudal fin without pigment except for blotch at its base. Second dorsal fin with blotches at its base as previously described. First dorsal fin of one specimen with scattered blotches, the other almost completely black, an extension of the wide band running up from the body, with only the basal half of the first few spines lacking pigment. (Black pigment fades rapidly in preservation.)

**COLOR IN LIFE.**— (from photograph of live specimen from Kahe Point, O'ahu). Background color of head and body white. A distinctive black triangle on side of caudal peduncle and extending onto caudal-fin base, the apex of the triangle pointing anteriorly and the base extending onto the rays and membranes. A cluster of melanophores on body under pectoral fin. Three small, black spots on body midline spaced under second dorsal fin. A dusky blotch on top of nape and on top of head behind eyes. An oblique black band extending across eye and continuing onto upper and lower jaws. Pupil black, iris white. First dorsal fin clear except for a few black pigment spots at base of membrane behind last spine. Second dorsal fin clear except for small black spots on bases of elements three to five. Caudal, anal, pectoral and pelvic fins clear.

**ETYMOLOGY.**— The specific epithet, *caudimacula*, is a compound adjective from the Latin *cauda* for tail and *macula* for spot, in reference to the prominent black blotch posteriorly on the body and caudal-fin base, the most distinctive color marking of the species.

**DISTRIBUTION.**— Known at present only from O'ahu, Hawaiian Islands.

**COMPARISON.**— *Cabillus tongarevae* (Fowler, 1927) from Tongareva (an atoll also known as Penrhyn Id.) in the northern Cook Islands, the only other described species of the genus in the islands of Oceania, differs in having 13 branched caudal rays, 1 + 4 gill rakers, not having the two strongly ctenoid scales overlapping the base of the caudal fin, and in color; it lacks the large black spot below the dorsal fin and has prominent black spots on the dorsal fins (still visible on the holotype in the Bishop Museum). There is an excellent color photograph of *C. tongarevae* from the Ryukyu Islands in Masuda et al. (1984:274, pl. 354, fig. I). It is also positively known from Kanton Island in the Phoenix Islands (Schultz 1943), Marshall Islands (Randall and Randall 1987), and Great Barrier Reef, Australia (Russell, 1983). *Cabillus macrophthalmus* (Weber, 1909) was captured in Indonesia at a depth range of 120–400 m. The drawing (Fig. 31) in Koumans (1953), shows that it has a dark spot on the base of the front of the first dorsal fin, has a broad dark mark under the first dorsal fin that runs forward onto the nape, and lacks the large black spot at the caudal-fin base. *Cabillus lacertops* (Smith, 1959) has been reported from Mozambique, the Ryukyu Islands, and the east coast of northern Australia (Masuda et al. 1984), and Tonga (Randall et al. 2004). In the key to the species, Nakabo (2002) illustrated the coloration of *C. lacertops*, showing a distinct black mark at the caudal-fin base that turns upward. This species also lacks any black pigment on the body under the first dorsal fin. Hayashi and Shiratori (2003) also have photographs of *C. lacertops* and *C. tongarevae* (page 116).

**REMARKS.**— Specimens were collected from sand near reefs at depths of 1.5–15 m.

**MATERIAL EXAMINED.**— *Cabillus tongarevae*: MARSHALL ISLANDS, ENEWETAK ATOLL: BPBM 10980 (1); ANDAMAN SEA, SIMILAN ISLANDS (NW of Phuket): BPBM 22803 (1); CORAL SEA, CHESTERFIELD BANK: BPBM 33709 (1).



***Coryphopterus duospilus* (Hoese and Reader, 1985).**

(Figs. 38–39 and 58–59)

*Fusigobius duospilus* Hoese and Reader, 1985, J.L.B. Smith Inst. Ichthyol., Spec. Publ. No. 36:1-9. Escape Reef, Great Barrier Reef, Australia. Holotype: AMS I.22619-026.

*Fusigobius neophytes africanus* Smith, 1959, Ichthyol. Bull., Dept. Ichthyol., Rhodes Univ. No. 13:208, pl. 11F (in part, Aldabra and Pinda, Mozambique only).

**DIAGNOSIS.**—Counts based on 27 individuals, 16.0–49.7 mm SL. Dorsal-fin elements VI-I,9. Anal-fin elements I,8. Pectoral-fin rays 18–19 (19). Longitudinal scale series 24–25. Pelvic fins united to form a sucking disc that is longer than wide, reaching to anal-fin origin. Frenum weak and easily torn. Interorbital very narrow, less than  $\frac{1}{2}$  pupil diameter. Scales on body ctenoid, becoming cycloid anterior to paired fins. No scales on operculum and no median predorsal scales. Jaws extending posteriorly to between anterior eye margin and pupil. Gill opening extending forward nearly to edge of preopercle. Head about as deep as wide, snout pointed. Body depth 4.3–5.8 in SL. Caudal fin rounded, slightly shorter than head. A small dark spot at center of caudal fin. First dorsal fin usually with dark markings on outer part, one on membrane between first and second spine, and second on membrane between second and third spine, angling to base of third spine. Largest specimen 57 mm TL.

**COLOR IN ALCOHOL.**—Background color of head and body pale cream. Body with five irregular lines of light brown spots running length of body, upper two lines extending onto nape and head. A distinct dark brown spot on caudal-fin base, covering bases of five central fin rays. A light brown spot, filling most of the center of a scale, above and slightly posterior to dorsal surface of pectoral-fin base. A second more diffuse spot posteroventral to previous spot, located under pectoral fin. Top of head with series of small, light brown spots continuing forward from lines on body and a series of spots running forward from insertion of first dorsal fin onto nape, the one closest to dorsal fin the largest and most distinct. Side of head and snout with scattered small, dark brown spots. Eye with black pupil surrounded by silver iris, with small dark brown spots on upper two thirds, lower third under pupil lacking spots. Skin on top of eye with three dark brown lines running towards interorbital area. Pectoral-fin base with two light brown blotches, one on the upper third, the other on the lower third. Upper blotch narrowing and extending onto about four fin rays. A distinct dark brown bar on inside of fin at same location as bar on outside. Remainder of pectoral fin immaculate. Pelvic and anal fins clear. Caudal fin clear except for a few scattered light brown spots on membranes of basal half. First dorsal fin usually clear except for a dark brown spot at middle of second spine extending onto fin membranes anteriorly to first spine and posteriorly as

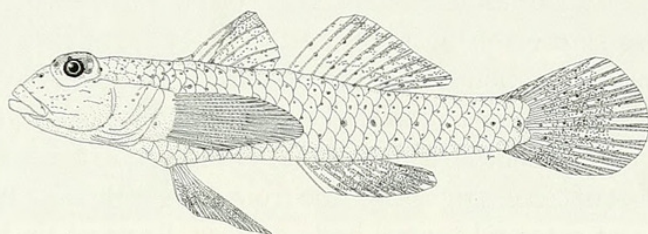


FIGURE 58. *Coryphopterus duospilus*, BPBM 19657, 45.2 mm SL.



FIGURE 59. *Coryphopterus duospilus*, 32 mm TL, Kahe Point, O'ahu.



lighter spots across fin. Distinct dark brown spots at base of third spine and on body between spines five and six. First spine of second dorsal fin crossed by three evenly spaced dark brown bars. Remainder of fin with a few scattered light brown spots on membranes. Distinct dark brown spots at bases of rays two and six of second dorsal fin.

**COLOR IN LIFE.**— (from underwater photograph of fish taken at Kona in 18m) Background color of head and body translucent white. Five subcutaneous black blotches along backbone which has silver reflections: first under origin of first dorsal fin; second between first and second dorsal fins; third under posterior half of second dorsal fin; fourth behind second dorsal fin; fifth at caudal-fin base (blotches not visible in fresh specimens when clear tissue turns opaque white). About five irregular lines of small orange-brown spots running length of body, upper two lines extending onto nape and head. A series of silvery spots running along back at fin bases. Another row of silvery spots running along side from caudal-fin base to pectoral-fin axil about midway between midline of side and ventral body surface. Pectoral-fin base with two yellow-orange blotches, one on upper third, other on the lower third. Side of head with scattered yellow-orange spots of varying size. A row of small yellow-orange spots running anteriorly from anteroventral margin of eye across upper lip. Pupil of eye black, iris silver-yellow with a series of evenly spaced brown spots on upper two-thirds; lower third under pupil lacking brown spots. Pectoral, pelvic, and anal fins clear with silvery reflections. Caudal fin clear with scattered small silvery reflections and scattered orange-brown spots. Spinous dorsal fin clear on basal half, upper half with a yellowish tinge. A dark brown spot at middle of second spine extending onto fin membranes anteriorly and posteriorly. Second dorsal fin clear on basal half, upper half with a yellowish tinge, a few scattered orange-brown spots on membranes.

**DISTRIBUTION.**— East coast of Africa to the Hawaiian Islands and Marquesas; Japan to Great Barrier Reef.

**REMARKS.**— Typically found on sand and rubble next to reefs where it seeks shelter under coral or stones. Collected from 1–46 m. Hawaiian specimens of *Coryphopterus* were misidentified as *Fusigobius neophytes* (Günther) by Gosline and Brock (1960), a valid non-Hawaiian species. Randall (1995) placed *Fusigobius* in synonymy of *Coryphopterus*, a decision followed here; however, Thacker and Cole (2002) have argued that both genera are valid. The second, posterior, dark spot on the first dorsal fin appears to be less developed in specimens from the Hawaiian Islands than from other areas, but we were unable to find any morphological characters to separate the Hawaiian population.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: O'ahu: CAS 218112(1), CAS 218113 (2), CAS 218114 (1), CAS 218115 (2), CAS 218116 (1), CAS 218117 (1), CAS 218118 (2), BPBM 19657 (3), BPBM 37262 (1), BPBM 37858 (1); Hawai'i: BPBM 15171 (1), BPBM 28733 (2); Maui: BPBM 28710 (5); Midway Atoll: BPBM 34769 (2). OGASAWARA ISLANDS: BPBM 35085 (2), BPBM 35159 (1), BPBM 35205 (3), BPBM 35237 (2). MARQUESAS: BPBM 12097 (1), BPBM 12766 (1). PALAU: BPBM 19714 (1), BPBM 37722 (1). MALDIVES: BPBM 32978 (2).

### *Discordipinna griessingeri* Hoese and Fourmanoir, 1978

(Fig. 60)

*Discordipinna griessingeri* Hoese and Fourmanoir, 1978, Japan. Jour. Ichthyol. 25(1):21, figs. 1–4. Holotype: USNM 214889. Paratypes: BPBM 5884 (1); BPBM 11266 (1).

**DIAGNOSIS.**— Count for one Hawaiian specimen presented first, followed by counts from literature. Dorsal-fin elements V-I,8 (I,7–8, rarely 7). Anal-fin elements I,8. Pectoral-fin rays 18 (17–19). Longitudinal scale series 26 (22–25). Scales ctenoid posteriorly, cycloid anteriorly. Large



cycloid scales on top of head, no scales on cheek or opercle. Body depth 5.2–5.8 in standard length. Head distinctly broader than deep. Origin of first dorsal fin far forward on body, above posterior end of opercle, and widely separated from the second dorsal fin. First two dorsal spines greatly prolonged in both sexes, the second longest, about 1.5 in standard length, extending well back above second dorsal fin. Pectoral fins large, about 2.3 in standard length, the rays with free tips. Pelvic sucking disc longer than wide, extending to anus. Caudal fin somewhat pointed, 2.5–3.0 in standard length. Jaws extending posteriorly to anterior margin of pupil. Interorbital narrower than pupil diameter. Gill openings extending forward to edge of preopercle. Reported to 29 mmTL.

**COLOR IN ALCOHOL.**—A broad dark brown stripe running from pectoral-fin base to caudal-fin base, covering most of lower half of body; body above midline cream with three narrow light brown stripes running posteriorly from above pectoral-fin base; ventralmost stripe joining dark brown stripe on lower body where cycloid scales end and ctenoid scales begin; middle stripe running back to caudal-fin base; dorsalmost stripe running back to top of caudal peduncle. Head cream with distinct dark brown spots on top, sides and ventral surface including spots on snout and upper and lower jaws. Pectoral-fin base with a median dark brown stripe extending out onto about half of fin, fin posterior to and below this stripe cream. Dorsal portion and remainder of fin dark brown. First part of dorsal fin uniform dark brown. Second part of dorsal fin with dark-brown stripe on lower one-third of fin; central third of fin cream with scattered melanophores on rays; distal third dark brown. Central rays of caudal fin cream, dorsal and ventral rays dark brown. Anal fin covered with scattered melanophores. Pelvic fins cream.

**COLOR OF FRESH SPECIMEN.**— (photograph of specimen from Kāneʻohe Bay-CAS 218119) Background color of head and body off-white. Upper half of body with three longitudinal light brown stripes running from above pectoral-fin base to caudal-fin base. Lower half of body from behind pectoral-fin base to caudal-fin base black. Sides and top of head covered with distinct black spots, a larger, oblong spot running from top of preopercle ventrally onto opercle. Pupil of eye black with a golden yellow rim, iris off-white with seven, evenly spaced, black spots. Pectoral-fin base black, extending out onto central rays and membranes of fin. Dorsal third of pectoral fin brick red, distal margin black with white edge. Portion of fin between black center and dorsal red part white; ventral portion below central black area white. Anal fin brick red with some dusky black except for white basal line and white distal margin. First spine of first dorsal fin white, remainder of fin brick red with overlay of black except for tips of spines which are white. Basal one-quarter of second dorsal fin black, next distal quarter white, remainder of fin brick red with two black ocelli, margin of fin white. Caudal fin with three distinct sections: dorsal third brick red with three black ocelli; central third white; ventral third brick red near white center grading into black ventrally, entire fin with narrow, white margin.

**DISTRIBUTION.**—Known from the Red Sea, St. Brandon's Shoals, Cocos-Keeling Islands, Papua New Guinea, Great Barrier Reef, Fiji, Tonga, Tahiti, Tuamotu Archipelago, Marquesas, Japan, and the Hawaiian Islands.



FIGURE 60. *Discordipinna griessingeri*, CAS 218119, 28 mm TL, Kāneʻohe Bay, Oʻahu.



**REMARKS.**— Collected from depths of 1–37 m. Cryptic in coral, known only from collections made with ichthyocide. The second author collected the first specimen of this species in 1967 in Tahiti from 27 m. The first Hawaiian specimen was collected by W. A. Gosline and his class at Kahe Point, O'ahu in 1968 with rotenone; the label states, "caught emerging from *Porites* near base." We both collected the second Hawaiian specimen in Kāne'ohe Bay, O'ahu in 3 m. The Tahitian specimen was brilliant red, and some others for which the life color is known have also been bright red. The drab red coloration of the Hawaiian specimen is in sharp contrast; it is not known if this is representative of the population in Hawai'i or if the shallow bay habitat influenced the color.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: O'ahu: CAS 218119 (1).

***Eviota epiphanes* Jenkins, 1903**

(Figs 4–6 and 61)

*Eviota epiphanes* Jenkins, 1903, Bull. U.S. Fish Comm. 22(1902):501. O'ahu, Hawaiian Islands. Holotype: USNM 50720; Paratypes: SU 8707 (6).

**DIAGNOSIS.**— Counts based on 20 individuals 12.3–14.7 mm SL. Dorsal-fin elements VI-I,8-VI-I,9 (VI-I,9). Anal-fin elements I,7-I,8 (I,8). Pectoral-fin rays 15–17 (17). Longitudinal scale series 23–24 (23). Pelvic fins separate with many side branches and finger-like; small, unbranched fifth pelvic-fin ray absent. Antermost branch of fourth pelvic-fin ray short, with fewer than 10 segments; Genital papillae not rugose. IT pore present. Spines in first dorsal fin not prolonged as filaments. A dark midpeduncular subcutaneous spot present towards midbase of caudal fin. Pectoral-fin rays



FIGURE 61. *Eviota epiphanes*, 17 mm TL, Kāne'ohe Bay, O'ahu.

10–16 may be branched. Body covered with scales, extending anteriorly to a line between top of pectoral-fin base and origin of first dorsal fin. No scales on head. Caudal fin rounded. Interorbital very narrow, less than  $\frac{1}{2}$  pupil diameter. Jaws extending posteriorly about to posterior margin of pupil. Gill opening extending forward to a point midway between posterior margin of opercle and preopercle edge. Greatest body depth 4.0–5.3 in SL. Largest specimen 20 mm TL.

**COLOR IN ALCOHOL.**— Background color of head and body cream. Body with six faint subcutaneous bars, often only the most posterior one on caudal peduncle obvious. Base of scales pigmented with a line of several small brown spots, often more obvious on dorsal half of body. Four bars made up of small brown spots crossing head and nape. Antermost bar extending ventrally onto cheek. Area behind eyes anterior to first bar densely packed with small black spots. A distinct bar from ventral eye margin extending ventrally across cheek. Mouth and snout cream with few or no spots. Eye with black iris, pupil clear. Pectoral-fin base with scattered small brown spots on upper half, remainder of fin immaculate. Caudal and pelvic fins immaculate. First dorsal fin darker than second, pigment variable, almost solid black in some, to pigment only present on membranes between a few spines. Second dorsal fin with scattered pigment along base. Anal fin variable, from immaculate to a few scattered pigment spots.



**COLOR OF FRESH SPECIMEN.**— (taken from underwater photograph at Kāne'ohe Bay) Background color of head and body off-white. All markings on head and body composed of small black spots enclosed in a larger orange-brown area defining a spot or bar. Base of scales on body pigmented as above, forming rows of chevrons along sides. Head and nape crossed by four rows of blotches forming bars, the anterior one extending ventrally onto cheek. Cheeks with small spots and a distinct bar from ventral eye margin down across cheek. Snout and jaws orange-brown. Pectoral-fin base with blotch on upper half, fin immaculate. First dorsal fin orange-brown along base and darker distally, membranes before and after sixth spine black. Second dorsal fin lighter than first, with several orange-brown blotches along base. Pelvic and anal fins immaculate. Caudal fin with red on rays and membranes. A series of six subcutaneous bars on body: first anterior to first dorsal spine, second under first dorsal fin, third at second dorsal fin origin, fourth at center of second dorsal fin, fifth just posterior to second dorsal fin, and sixth on caudal peduncle just anterior to caudal fin. Iris and pupil of eye black.

**DISTRIBUTION.**— Hawaiian Islands, Johnston Island, Line Islands, Ogasawara Islands, and southern Japan.

**REMARKS.**— In a survey of the fishes of Kāne'ohe Bay, O'ahu, this was the most abundant species taken (Greenfield 2003). Boehlert and Munday (1996) reported that species in the genus *Eviota* composed the most abundant taxon in their ichthyoplankton samples taken near O'ahu. Because of their small size, these gobies are seldom seen by divers, but because of their numbers they must play an important role in reef ecology.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: O'ahu: CAS 218096 (276), BPBM 38391 (33).

### *Eviota rubra* Greenfield and Randall, 1999

(Figs 8–9 and 62)

*Eviota rubra* Greenfield and Randall, 1999, Copeia 1999: 439–446. Kāne'ohe Bay, O'ahu, Hawaiian Islands.

Holotype: BPBM 38385. Paratypes: BPBM 35422 (3), BPBM 35424 (11), BPBM 37257 (3), BPBM 38386 (3), BPBM 38387 (14).

**DIAGNOSIS.**— Counts based on 16 individuals 10.4–14.9 mm SL. Dorsal-fin elements VI-I,8-VI-I,9 (VI-I,8). Anal-fin elements I,7-I,9 (I,8). Pectoral-fin rays 15–17 (16). Longitudinal scale series 22–25 (25). Pelvic fins separate with many side branches and fringe-like; small unbranched fifth pelvic-fin ray present, about one-tenth length of fourth ray (often poorly ossified and difficult to see). Anterormost branch of fourth pelvic-fin ray elongate, with nine or more segments. Genital papillae of male and female rugose. IT pore absent, POP pore present. No dark ventral-midline spots or midpeduncular subcutaneous spot towards midbase of caudal fin. Spines in first dorsal fin not prolonged as filaments. Pectoral-fin rays 9–16, may be branched. Body covered with scales, extending anteriorly to a line between top of pectoral-fin base and origin of first dorsal fin. No scales on head. Caudal fin rounded. Greatest body depth 4.1–5.6 in SL. Interorbital very narrow, less than  $\frac{1}{2}$  pupil



FIGURE 62. *Eviota rubra*, 15 mm TL, off Kāne'ohe Bay, O'ahu, 25 m.

Caudal fin rounded. Greatest body depth 4.1–5.6 in SL. Interorbital very narrow, less than  $\frac{1}{2}$  pupil



diameter. Jaws extending posteriorly about to posterior margin of pupil. Gill opening extending forward to a point midway between posterior margin of opercle and preopercle edge. Largest specimen 19 mm TL.

**COLOR IN ALCOHOL.**— Background color of body and head light cream, without pigment. Subcutaneous bars absent in specimens from deeper water, but specimens from shallower stations (12–15 m) with faint subcutaneous bars. Head with a few, scattered, tiny red-brown pigment spots. Elements and membranes of first and second dorsal, anal and caudal fins covered with small, distinct reddish brown spots. No pigment on pectoral or pelvic fins.

**COLOR OF LIVE AND FRESH SPECIMENS.**— Body translucent with bright red markings when alive, but translucent areas turn white at death. Two distinct color forms, male with lemon-yellow on head and a second (females and perhaps immature males) without yellow. Following description of female color is from a live specimen photographed by R.R. Holcom at Pûpûkea, O'ahu: Body translucent, backbone, neurocranium and body cavity showing through as white with silver reflections. Silver reflections also scattered along dorsal and ventral margins of body, most likely ends of neural and haemal spines. Series of nine red, subcutaneous bars extending from dorsal to ventral side of body overlying silver backbone and body cavity. First bar above pectoral-fin base; second at center of first dorsal fin; third between spines five and six of dorsal fin; fourth at rays two-six of second dorsal fin; fifth at rays eight and nine; sixth at last two rays of second dorsal fin; seventh, eight and ninth on caudal peduncle. Additional red pigment on surface of body at locations of subcutaneous bars and also joining bars at midline to form H-like patterns. Pectoral-fin base red, with a silver stripe running dorsoventrally across base separating red into upper and lower portions. Nape to top of head crossed by four red bars. Upper and lower jaws and snout red. Upper half of operculum red, lower half and remainder of cheek translucent except for a narrow red bar from ventral margin of eye down to lower surface of head. Pupil of eye black, iris silver with blotches of bright red. Pectoral-fin rays pinkish, membranes without pigment. Pelvic fins lack pigment. Fin elements of first and second dorsal, anal and caudal fins with alternating red and pink bands, membranes with heavy scattering of tiny reddish brown pigment spots.

Color of male taken from slide of specimen photographed underwater at Kâne'ohe Bay shortly after capture. Color pattern on body as in female except that translucent areas now are white due to death. Subcutaneous color pattern still partially visible. Cheek, snout, underside of head and gill membranes bright lemon-yellow. A wash of red over the yellow upper and lower jaws. Bar under eye red. Top of head with scattered larger melanophores. Fin color as in female except that distal two-thirds of both dorsal fins and anal fin with heavy peppering of black pigment. Basal third of second dorsal and anal fins yellow.

**DISTRIBUTION.**— Hawaiian Islands.

**REMARKS.**— Of the three species of *Eviota* known from Hawaiian waters, this is the deepest dwelling, usually being taken at ledge and deep spur and groove habitats (12.2–28.7 m) at Kâne'ohe Bay, and was the only *Eviota* species taken at depths greater than 18.3 m (Greenfield, 2003). The species typically is red, hence the name *rubra*, and can be separated from *E. epiphanes*, with which it coexists in the deep spur and groove habitat, because it lacks the black midpeduncular subcutaneous spot toward the midbase of the caudal fin that is present in *E. epiphanes*.

***Eviota susanae* Greenfield and Randall, 1999**

(Figs. 10–12 and 63)

*Eviota susanae* Greenfield and Randall, 1999, Copeia 1999:439–442. O'ahu, Hawaiian Islands. Holotype: BPBM 38379. Paratypes: BPBM 38380 (1), BPBM 38381 (7), BPBM 38382 (3), BPBM 38383 (2).



**DIAGNOSIS.**— Counts based on 12 individuals 14.7–19.8 mm SL. Dorsal-fin elements VI-I,8-VI-I,9 (VI-I,8). Anal-fin elements I,6–I,8 (I,8). Pectoral-fin rays 15–18 (16). Longitudinal scale series 24–26 (25). Pelvic fins separate with many side branches and finger-like; small, unbranched fifth pelvic-fin ray present, about one-tenth length of fourth ray (often poorly ossified and difficult to see). Antermost branch of fourth pelvic-fin ray elongate, with 10 or more segments. Genital papillae of male and female rugose. IT pores absent and POP pores absent or greatly reduced. Spines in first



FIGURE 63. *Eviota susanae*, 19 mm TL, off Kāne'ohe Bay, O'ahu, 1 m.

dorsal fin not prolonged as filaments. Four to six (usually six) large dark spots on ventral midline posteriorly from anal-fin origin; subcutaneous bars associated with some ventral-midline spots. No dark midpeduncular subcutaneous spot towards midbase of caudal fin. Pectoral-fin rays 9–17, may be branched. Body covered with scales, extending anteriorly to a line between top of pectoral-fin base and origin of first dorsal fin. No scales on head. Interorbital narrow, less than  $\frac{1}{2}$  pupil diameter. Caudal fin rounded. Greatest body depth 4.2–6.8 in SL. Jaws extending posteriorly about to posterior margin of pupil. Gill opening extending forward to a point midway between posterior margin of opercle and preopercle edge. Largest specimen 25 mm TL.

**COLOR IN ALCOHOL.**— Background color of head and body cream. Scale pockets from origin of first dorsal fin back to caudal-fin base with crescents of dark brown pigment. A narrow dark brown line running along middle of body. Four-six (usually six) dark brown spots on ventral surface of body from anal-fin origin to caudal-fin base. An additional, smaller, less intense spot may be present near insertion of ventral procurrent caudal-fin elements. Corresponding dark brown spots on dorsal surface of body. Some of these external spots are at ends of subcutaneous bars (more obvious in fresh specimens) extending from dorsal to ventral surface of trunk. Pectoral-fin base peppered with melanophores, often concentrated into darker upper and lower blotches. Four dark brown bars crossing back anterior to first dorsal fin and top of head, either distinct or indistinct. Ventral side of body with scattered melanophores. Side of head mottled in females with indications of a bar from anterior ventral margin of eye down across cheek; in males the bar is narrower and there is less pigment on cheek. Upper and lower jaws with scattered melanophores, pigment under chin. Pectoral fins with light scattering of melanophores on membranes. Pelvic fins lack pigment. Caudal fin with bar across base where scales are present, remainder of fin with heavy peppering of melanophores. Anal and second dorsal fins with heavy peppering of melanophores. First dorsal fin with heavy peppering of melanophores and black spot on membrane posterior to last spine.

**COLOR OF FRESH SPECIMEN.**— (from photograph of specimen taken at Kāne'ohe Bay, male) Lower side of head lemon yellow, including below eye, all of upper and lower jaw, snout onto interorbital, lower half of cheek and opercle, all of gill membranes, and under lower jaw. Markings on head rust-orange over yellow, a distinct bar from ventral margin of eye down across cheek. Pupil of eye black, iris golden-silver with blotches of reddish brown. Top half of head and rest of body white with rust orange markings. Pectoral-fin base rust orange overlaid with scattered melanophores except for a white bar on central portion angling anterodorsally up onto opercular



membrane. Base of scales on body with rust orange pigment. Genital papilla white. Basal three-fourths of caudal fin peppered with mixed red and black pigment spots giving an overall reddish appearance, distal one-quarter white with fewer black pigment spots. Anal fin with similar mixture of red and black pigment spots, but more black than red; base of fifth ray with a red spot, tips of spine and rays white. First dorsal-fin spines with alternating red and white sections, membranes with same mix of red and black pigment as caudal and anal fins, but more black than in second dorsal-fin membranes; black spot on membrane behind sixth spine. Second dorsal fin with mixture of red and black spots as in anal fin, but more red than black, basal one-half more red, tips of rays white. Pectoral fins with red pigment on basal two-thirds of rays, scattered black and red spots on membranes of basal three-fourths, distal one-fourth clear, tips of rays white. Females-color same as males except no yellow on head which is white with more rust orange bars radiating out on cheek from eye.

**DISTRIBUTION.**—Hawaiian Islands.

**REMARKS.**—This is a species that typically is found in very sheltered areas, often part of the fouling community (Greenfield, 2003). In fact, the type locality of this species is the floating boat dock at the Hawaii Institute of Marine Biology in Kāne'ohe Bay. It is the largest of the *Eviota* species in the Hawaiian Islands, reaching a length of 18.5 mm SL.

***Gnatholepis anjerensis* (Bleeker, 1851)**

(Figs. 34–36 and 64)

*Gobius anjerensis* Bleeker, 1851, Nat. Tijdschr. Ned. Indië 1:251, fig. 11. Java. Holotype unknown; Neotype BPBM 26651.

*Gobius ophthalmotaenia* Bleeker, 1854, Nat. Tijdschr. Ned. Indië 7:46 (type locality, New Selma, Cocos-Keeling Islands).

*Gobius capistratus* Peters, 1855, Monats. Akad. Wiss. Berlin 1855:443. (type locality, Ibo, Mozambique).

*Gobius deltoides* Seale, 1901, Occ. Pap. B.P. Bishop Mus. 1(3):125 (type locality, Guam).

*Gnatholepis knighti* Jordan and Evermann, 1903, Bull. U.S. Fish Comm. 22:204 (type locality, Hilo, Hawai'i); 1905:487, pl. 58.

*Gnatholepis corlettei* Herre, 1936, Zool. Ser., Field Mus. Nat. Hist. 21:356, fig. 20 (type locality, Bushman Bay, Malekula Island, Vanuatu).

**DIAGNOSIS.**—Counts based on 25 individuals 30.0–47.8 mm SL. Dorsal-fin elements VI–I, 10–11 (I, 11). Anal-fin elements I, 11. Pectoral-fin rays 15–17 (70% 16, 13% 17). Longitudinal scale series 30; ctenoid scales on body extending anteriorly to below origin of spinous dorsal fin (sometimes forward on side of nape to above middle of opercle); predorsal scales extending to posterior interorbital space, cycloid scales ventrally on abdomen, on prepelvic and prepectoral areas, and on opercle and cheek (rarely a few ctenoid scales posteriorly on opercle of large specimens); usually a few small scales on cheek entirely anterior to dark bar below eye. Narrow (less than pupil diameter) subcutaneous black bar extending down from under eye across cheek and under head. Pelvic fins united to form



FIGURE 64. *Gnatholepis anjerensis*, 58 mm TL, Kāne'ohe Bay, O'ahu, 1.5 m.



a disk, longer than wide, almost reaching anal-fin origin; frenum broad. Gill membranes broadly united to isthmus, opening ending just below pectoral-fin base. Jaws extending posteriorly to between anterior margin of eye and pupil. Interorbital very narrow, less than one pupil diameter. Body depth 3.9–4.6 in SL. Caudal fin rounded, usually slightly longer than head. Largest specimen 105 mm, but rarely exceeds 80 mm TL.

**COLOR IN ALCOHOL.**— Color varies greatly depending on the habitat, with individuals from sand areas being much lighter and those from dark habitats such as mangrove mud, much darker. Color descriptions of specimens from both habitats are given.

**SAND HABITAT.**— Background color of head and body light cream. Head with a narrow, subcutaneous, dark brown to black bar running from ventral margin of eye, down across cheek to its ventral margin. Remainder of head covered with very small, scattered melanophores. A light brown blotch above pectoral fin, extending forward to eye as a line. Body with six elongate light-brown blotches along midline. A seventh blotch at caudal-fin base. Lighter bars extending up to dorsal surface from each blotch. Two of these blotches are at base of first part of dorsal fin, one on caudal peduncle and remainder at second part of dorsal fin. Scattered dark brown spots on blotches. Pectoral, pelvic and anal fins covered with small, dark brown chromatophores. First dorsal fin with a dark brown stripe running along basal one-third of fin, a narrow less pigmented stripe above this; remainder of fin dark brown. Second dorsal fin dark brown on membranes between rays that lack pigment. Caudal fin either without pigment or a few scattered dark brown spots.

**MANGROVE HABITAT.**— Background color of head and body medium cream. Subcutaneous dark bar under eye as in light form. A dark stripe running from posterior margin of eye posteriorly to above pectoral-fin base. A dark brown to black subcutaneous blotch running from margin of central portion of preoperculum onto operculum. Remainder of head covered with dense, small, dark brown spots, some coalesced into small blotches. Upper lip crossed by five dark brown bars, first at midline, one on each side midway between midline and end of premaxilla and another fainter bar at ends of premaxillas. Body blotches as in lighter color form except pigment darker and denser. Blotches at midline joined together resembling a stripe. A series of dark-brown spots arranged in rows running from pectoral-fin base back to caudal fin. Three rows above midline stripe and two below. Pectoral, pelvic, and anal fins as in lighter color form only darker. First dorsal fin as in lighter form except distal half of fin with an additional clear stripe in its center. Second dorsal fin with distinct dark spots arranged in five bars across fin. Caudal fin crossed by about eight rows of distinct spots.

**COLOR IN LIFE.**— (from color photograph taken of a 50-mm individual in shallow water on sand in Kāneʻohe Bay) Body white with silvery reflections on some scales. All markings referred to as “dark” are black-brown. A bright yellow humeral spot, the anterior half of yellow humeral spot surrounded by dark pigment that then runs forward to eye as a line. Pupil black, surrounded by a narrow yellow ring. Iris white, with a small dark spot at center at both the front and back of eye. A dark bar running from ventral edge of pupil down across cheek. A narrow, dark bar dorsally on eye, centered over posterior half of pupil. Snout with reticulated dark markings. Both upper and lower jaws with some dark markings. Opercle with a dark line extending from center of pectoral-fin base to edge of preopercle where it widens. Six dark blotches running along side of body, just ventral to midline. A series of much smaller, distinct, dark spots scattered along dorsal half of body anteriorly, and extending to lower half of body from second dorsal fin posteriorly to caudal-fin base. Pectoral and pelvic fins immaculate. Dorsal fins with a few, scattered small, dark spots. Caudal fin crossed by a number of rows of small, dark spots.

**DISTRIBUTION.**— Red Sea and east coast of Africa to the Hawaiian Islands and islands of French Polynesia; southern Japan to Great Barrier Reef and Lord Howe Island.



**REMARKS.**— *Gobius anjerensis* was described by Bleeker (1851) from a simple drawing without color markings of a specimen that had been collected in the period of 1821–1823 by Kuhl and van Hasselt from Anjer (now Anyer) in the Sunda Strait, Java. No specimen is extant. Bleeker (1874) selected *Gobius anjerensis* as the type species of the subgenus *Gnatholepis*, later elevated to a genus. Although one might guess that the drawing of *Gobius anjerensis* represents a species of *Gnatholepis*, it certainly cannot be identified to any known species. Were it not its selection as the type species of *Gnatholepis*, it would surely have been regarded as a *nomen dubium*. Randall and Greenfield (2001) have described a neotype of *Gnatholepis anjerensis* collected in the Java Sea off the southwest end of Sulawesi. It is one of the two most common species of the genus in Indonesia, and the species most often found in shallow water.

The Bishop Museum has 95 lots of *Gnatholepis anjerensis* ranging from the Red Sea and coast of East Africa to the Hawaiian Islands and Society Islands. Of the 62 lots for which there is information on the depth of capture, the specimens of 36 lots were collected from less than 2 m. Some were taken from tidepools, one from a brackish pool (salinity 12 o/oo). The deepest collection was from 46 m in the Red Sea; the deepest collection in the Hawaiian Islands was 26 m. Typically this species lives on sand very near coral reefs or rocky substrata into which it can seek shelter with the approach of danger. Of the 12 lots listed below that were collected around the island of O'ahu, seven were from Kane'ohe Bay.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: Hawai'i: BPBM 28720 (1); Maui: BPBM 38359 (11) Moloka'i-BPBM 15132 (3); O'ahu: BPBM 1846 (1), BPBM 5495 (1), BPBM 7306 (5), BPBM 15040 (5), BPBM 15046 (13), BPBM 15130 (1), BPBM 15042 (21), BPBM 17800 (1), BPBM 19665 (10), BPBM 22649 (49), BPBM 31319 (1), BPBM 31320 (28), CAS 218120 (18), CAS 218121 (121), CAS 218122 (56); Kaua'i: BPBM 15041 (6); Midway Atoll: BPBM 34795 (1), BPBM 34873 (5). JOHNSTON ISLAND: BPBM 15043 (6), BPBM 15134 (3), BPBM 38361 (1).

***Gnatholepis cauerensis hawaiiensis* Randall and Greenfield, 2001**

(Figs. 37 and 65)

*Gnatholepis cauerensis hawaiiensis* Randall and Greenfield, 2001, Ichthyol. Bull. J.L.B. Smith Inst. Ichth., no. 69:10, pl. II C, D. [Described as a subspecies of *Gnatholepis cauerensis* (Bleeker)].

*Gobius cauerensis* Bleeker, 1853. Nat. Tijdschr. Ned. Indië 4:269, (type locality, Cauer = Kauer, Sumatra).

*Gnatholepis scapulostigma* Herre, 1953, Philip. Jour. Sci. 82(2):193 (type locality, Enewetak Atoll, Marshall Islands).

*Gnatholepis inconsequens* Whitley, 1958, Proc. Roy. Zool. Soc. N.S.W. 1956–57:44 (type locality, Heron Island, Capricorn Group, Great Barrier Reef).

*Acentrogobius cauerensis*, Bleeker, 1983, Atlas Ichthyologique, unpublished plates for vols. XI–XIV. Smithsonian Inst. Press, Washington, D.C. Pl. 435b, fig. 1 (reproduction of previously unpublished color figure, without final corrections).

**DIAGNOSIS.**— Counts based on 26 individuals 14.0–42.0 mm SL. Dorsal-fin elements VI–I, 11. Anal-fin elements I, 11. Pectoral-fin rays 16–18 (92% 17, 2% 16). Longitudinal scale series 30; ctenoid scales on body extending at least as forward as below origin of spinous dorsal fin, exceptionally on side of nape to above posterior margin of preopercle; predorsal scales extending to posterior interorbital space, cycloid scales ventrally on abdomen, on prepelvic and prepectoral areas, and on opercle and cheek (rarely a few ctenoid scales posteriorly on opercle); usually no scales on cheek entirely anterior to dark bar below eye. Narrow (less than pupil diameter) subcutaneous black bar extending down from under eye across cheek and under head. Pelvic fins united to form a disk, longer than wide, almost reaching anal-fin origin; frenum broad. Gill membranes broadly united to isthmus; gill opening ending slightly ventral to pectoral-fin base. Interorbital very narrow,



less than one pupil diameter. Body depth 4.2–5.1 in SL. Caudal fin rounded, usually slightly longer than head. Largest specimen, BPBM 15131, 56 mm TL, from Maui.

**COLOR IN ALCOHOL.**— Body whitish to pale yellowish brown with a row of six large dusky blotches on lower side and brown longitudinal lines following center of scale rows (two rows darker when superimposed on dusky spots); a dark brown to black blotch above pectoral-fin base containing a small pale spot; a narrow blackish bar dorsally on eye from above center of pupil, crossing midinterorbital space; a prominent narrow black bar extending ventrally and slightly posteriorly from below middle of eye; dorsal fins with longitudinal rows of dusky dashes; large specimens developing dark lines, one per membrane, parallel to rays, in soft dorsal fin; caudal fin with a dark brown line in membranes between rays.

**COLOR IN LIFE.**— (from color photograph taken of 50-mm individual at 28.5 m on dark sand in Kona, Hawai'i) Body gray with six dark (brownish black) blotches running along side of body, just ventral to midline, with a large, blue area around and below each blotch. A cream to yellowish stripe running along midline just above blotches. A series of about six longitudinal lines along sides, running along center of scale rows. Lines dark brown in this specimen, but may be red or orangish-brown. Numerous small, blue spots along ventral half of sides, extending from caudal peduncle forward to front of eye. A bright yellow humeral spot present, surrounded by a black spot. A narrow, dark brown line running forward from humeral spot to eye, where it widens slightly. Iris of eye cream, pupil black, surrounded by a narrow golden ring. A prominent black bar starting at top of eye, across iris, through center of pupil, and continuing ventrally across cheek as the diagnostic feature for the genus. The bar across the cheek is as wide as the pupil (narrower in specimens living on a light-colored background). A dark brown line running from center of pectoral-fin base to preopercle where it widens. Snout and both jaws with reticulated black markings. Pectoral fins immaculate. Both dorsal fins gray with longitudinal rows of dark brown dashes. Caudal fin with reddish brown lines on membranes.

**DISTRIBUTION.**— Hawaiian Islands and Johnston Island.

**REMARKS.**— *Gnatholepis cauerensis* was first reported from the Hawaiian Islands by Randall and Greenfield (2001). It ranges from the coast of East Africa to the islands of Oceania; however, it has differentiated into at least four subspecies: wide-ranging from East Africa to the Society Islands; islands of the southeastern Pacific (Rarotonga, Austral Islands, Rapa, and Pitcairn Group), Easter Island, and the Hawaiian Islands. The Hawaiian population is distinct from the Indo-Pacific subspecies in having a slightly longer caudal peduncle (1.5–1.7 in head length, compared to 1.7–1.9), a dark line on membranes of the caudal fin instead of small dark spots, and numerous small blue spots on the lower side of the body. Also it rarely has small scales on the cheek entirely anterior to the dark eye bar.

The population at Johnston Island differs from the Hawaiian in having a slightly shorter caudal peduncle (1.6–1.8 in head) and by consistently having small scales on the cheek anterior to the dark eye bar. Knowledge of the life color is lacking.



FIGURE 65. *Gnatholepis cauerensis hawaiiensis*, 50 mm TL, Kona, Hawai'i, 29 m.



Of the eight lots of *Gnatholepis cauerensis* taken in Hawaiian waters, one was obtained in 2 m, the others all from 14–29 m. As in *G. anjerensis*, this species is usually found on sand near the shelter of rock or reef.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: Hawai'i: BPBM 28734 (1), BPBM 37860 (1), BPBM 37861 (3); Maui: BPBM 15131 (14); O'ahu: BPBM 7930 (1), BPBM 12284 (1) BPBM 37847 (1), BPBM 37859 (1); Midway Atoll: BPBM 15137 (1), BPBM 34770 (2).

***Kelloggella oligolepis* (Jenkins 1903)**

(Fig. 66)

*Enypnias oligolepis* Jenkins, 1903, Bull. U.S. Fish Comm. 22 (1902):504, Fig. 45. O'ahu, Hawaiian Islands. Holotype: USNM 50715.

**DIAGNOSIS.**— Counts based on 20 specimens 10.1–24.0 mm SL. Dorsal-fin elements VI–I, 10–12 (I, 11). Anal-fin elements I, 6–8 (I, 7). Pectoral-fin rays 12–13 (13). Body naked, with 10–11 dark vertical bars separated by narrow white bars. Snout rounded, its end either reaching upper jaw or slightly overhanging mouth. Gill membranes broadly united to isthmus. Jaws extending to under pupil. Interorbital narrow, about equal to pupil diameter. Pelvic sucking disc longer than wide, space between end of fin and anal-fin origin equal to or greater than pelvic-fin length; frenum broad. Greatest body depth 5.6–7.2 in SL. Caudal fin rounded. Maximum size 29 mm TL.



FIGURE 66. *Kelloggella oligolepis*, BPBM 39151, 17 mm SL, Barber's Point, O'ahu.

**COLOR IN ALCOHOL.**— *Mature male color pattern*: Background color cream. A distinct dark-brown spot on side of head above operculum, often joined by a light brown bar across top of head. An additional light brown bar across top of head anterior to first at preopercle. Diffuse dark brown spot at dorsoposterior margin of eye. Cheek variously marked with light brown bars reaching from posteroventral margin of eye and under chin. Body crossed by 10 light brown bars from anterior of first dorsal fin to caudal peduncle, eleventh bar on caudal peduncle present or absent: Bars separated by narrow white bars, narrow bars about  $\frac{1}{2}$  width of dark bars; first bar across back in advance of first dorsal fin extending to belly; second bar from front of first dorsal fin back to base of fourth spine and down to belly; third bar from bases of fifth to sixth spine down to lower part of side, lighter or absent on ventral surface; fourth bar from posterior end of first dorsal fin to origin of second dorsal fin, down to lower part of side, lighter or absent on ventral surface; sixth bar from posterior base of third dorsal-fin ray to base of sixth ray and down to anal fin; seventh bar extends from posterior of ray six to ray seven and down to anal fin; eighth bar from front of base of eighth ray to base of ninth ray and down to anal fin; ninth bar from bases of rays nine and ten down to ventral surface of caudal peduncle; tenth bar from base of last rays to behind end of fin down to ventral surface of caudal peduncle; eleventh bar, if present, encircling caudal peduncle. A diffuse spot at caudal-fin base. Ventral surface of body either cream or with a light scattering of melanophores. Pectoral, pelvic, anal, and caudal fins with scattered melanophores. First dorsal fin with scattered melanophores with distal half of fin darker in some specimens. Second dorsal fin with interspersed light and dark areas on membranes between every other fin element.



*Immature and female color patterns* (specimens 13.7 mm SL and less [immature]): Trunk of body without pigment, but about eight subcutaneous pigment bars visible through body. A series of 15 black spots on dorsal surface, two on top of head, two anterior to first dorsal fin, two along base of first dorsal fin, one between first and second dorsal fin, six along base of second dorsal fin and two on dorsal surface of caudal peduncle. Four black spots along anal-fin base and two on ventral surface of caudal peduncle. Distinct black spot on head above opercle. A series of black bars radiating out from behind and below eye. Pectoral, pelvic, anal, and caudal fins clear. Distal margin of first dorsal fin black and spots on body extending up onto fin. Second dorsal fin with black bars extending up onto fin from body spots. Specimen 17.8 mm (female): Body bars developing as external black spots along midline, dorsal surface, and adjacent to anal-fin base, at locations of subcutaneous pigment bars. A series of distinct black blotches on top, side and ventral surface of head. Pectoral, pelvic, anal, and caudal fins with some scattered melanophores and dark areas on dorsal fins more distinct.

**COLOR OF FRESH SPECIMENS.**— (from color photograph of BPBM 39151, captured from tidepools at Barber's Point, O'ahu) Mature male color pattern as in color in alcohol except that background color of body white, bars and spots on body and head a dusky black, and background color of head yellowish-cream. Light areas on fins are clear and dark areas are dusky black, except for spot on posterior portion of first dorsal fin that is intense black. Female color pattern as in color in alcohol except that background color of body is cream and that of head yellowish cream. Pigment spots on body, head and fins intense black.

**DISTRIBUTION.**— Hawaiian Islands and Easter Island. Although previously recorded from the Ryukyu Island, Japan, the *Kelloggella* species there is *K. quindecimfasciata*.

**REMARKS.**— This species occurs in tidepools high in the splash zone. It seems improbable that there would be sufficient gene flow between fishes found in splash zone tidepools at the Hawaiian Islands and Easter Island; however, Hoese (1975) examined specimens from both localities and was unable to find any differences except that the bands on the body are slightly narrower in Easter Island specimens. We also have examined specimens from Easter Island and the Hawaiian Islands, and also were unable to determine any differences other than the color character mentioned by Hoese. Three other fish species are known to have this unusual antitropical distribution, and a number of mollusks found at Easter Island are also only known from the Hawaiian Islands. One can postulate that these are species that were once more widespread when waters were cooler in the past, and now have been isolated to the north and south.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: O'ahu: BPBM 5499 (14), BPBM 26370 (2), BPBM 31259 (1), BPBM 39151 (7), CAS 218123 (4). EASTER ISLAND: BPBM 6741 (2), BPBM 6742 (2).

### *Mugilogobius cavifrons* (Weber, 1909)

(Figs. 22, 23, and 67)

*Gobius cavifrons* Weber, 1909, Notes Leyden Mus. 31 (note 4). Sula Takomi, Ternate, Moluccas, Indonesia. Syntypes: ZMA 112616 (43).

**DIAGNOSIS.**— Counts based on 12 individuals 21.8–49.0 mm SL. Dorsal-fin elements V-I,7-VI-I,8 (VI-I,8). Anal-fin elements I,7-I,8 (I,8). Pectoral-fin rays 15–16 (16). Lateral scales 37–46 (39–40). Interorbital wide, greater than one eye diameter in individuals 37 mm SL or larger, and covered with very small cirri that extend onto snout and under eye on cheek. Pelvic sucking disc longer than wide, but short, space between posterior end of fin and anal-fin origin greater than pelvic-fin length; frenum broad. Body covered with scales, lateral scales anterior to second dorsal



fin smaller than those under second dorsal fin and on caudal peduncle. Scales extending onto top of head meeting cirri on interorbital and onto operculum. No scales on cheek. Caudal fin rounded. Depth of body about five in SL. Jaws extending to posterior margin of eye. Gill membranes broadly united to isthmus. Attains 58 mm TL.

**COLOR IN ALCOHOL.**— Background color dark cream, entire body and head overlaid by a heavy peppering of small, dark brown spots. A pattern of dark brown marks on upper half of body: the first a line angling posteroventrally from top of head above top of pectoral-fin base down to midline at line down from second dorsal-fin spine; a blotch between this line and front of first dorsal fin, sometimes blotch extends up to nape; second line from second dorsal-fin spine extending posteroventrally to body midline; third line from sixth dorsal-fin spine extending posteroventrally to body midline. Five bars on posterior half of body extending from dorsal surface to body midline: first at second element of second dorsal fin; second at fourth element; third at elements seven and eight; last two across caudal peduncle. A blotch at caudal-fin base. Two dark brown bars from posteroventral eye margin across cheek, upper bar reaching preopercular margin, lower bar midway to margin. Center of opercle near preopercular margin with a dark brown spot. Body patterns may be more diffuse in larger individuals. First dorsal fin with a dark brown stripe angling from front of fin down to base of last spine and following membrane; stripe beginning on upper third quarter of fin, with clear areas on lower half and upper quarter. Larger males may have scattered pigment on lower half of fin and black on distal fin margin. Second dorsal fin with dark brown pigment on lower three quarters being more concentrated on membranes midway up fin. Dark pigment on fin more extensive on larger males. Pectoral, pelvic, and anal fins densely covered with melanophores. Caudal fin crossed by four to five bars.

**COLOR IN LIFE.**— (from photograph of living specimen taken at Kāneʻohe Bay) Background color tan, color patterns overlaying tan are black. Head with a series of distinct lines: One from snout to anterodorsal portion of eye; another from middle of side of upper jaw to ventral margin of eye; a line from posteroventral eye margin to edge of preopercle; a long wavy line from end of jaws across ventral portion of cheek onto opercle. Opercle, preopercle and nape with scattered irregular marks. Side of body with a number of irregular, broken narrow bars. Ventral surface of body light tan. Pectoral, pelvic, and anal fins dusky. Caudal fin crossed by four irregular, black bars. First dorsal fin crossed by two black bars, the first on distal one-quarter of fin and second on second quarter up from base, expanded to cover basal one-half posteriorly. Second dorsal fin dusky with some darker areas.

**DISTRIBUTION.**— Known from Indonesia, Papua New Guinea, Philippines, Taiwan, Ryukyu Islands, Kosrae (Caroline Islands), Guam, and Oʻahu, Hawaiian Islands.

**REMARKS.**— This species was most likely unintentionally introduced into Hawaiian waters perhaps via ballast water of a ship. It was first recorded from the mangroves at Coconut Island, Kāneʻohe Bay, Oʻahu by Randall et al. (1993) as *M. parvus*, which is a synonym of *M. cavifrons* (Larson, 2001). This species now is widespread on Oʻahu, being most common in shallow mangrove, brackish and freshwater habitats.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: Oʻahu: BPBM 32479 (1), BPBM 33492 (1), BPBM 33931 (4), BPBM 34569 (2), BPBM 34997 (5).



FIGURE 67. *Mugilogobius cavifrons*, BPBM 33492, 22 mm SL, Kāneʻohe Bay, Oʻahu, 0.1 m.



***Opua nephodes* E.K. Jordan, 1925**

(Fig. 68)

*Opua nephodes* E.K. Jordan, 1925, Proc. U.S. Nat'l. Mus. 66(2570):36, pl. 2, fig. 2. O'ahu, Hawaiian Islands. Holotype: USNM 87419.

**DIAGNOSIS.**— Counts based on 11 individuals 20.5–33.3 mm SL. Dorsal-fin elements VI-I,9-VI-I,11 (VI-I,10). Anal-fin elements I,10-I,11 (I,10). Pectoral-fin rays 17–19 (19). Longitudinal scale series 27–29 (28). First spine in second dorsal fin stout and sharp-tipped, first spine of first dorsal fin also stouter than following spines. Body with a line of dash-like dark marks running along midline of side and four fainter lines above. Pelvic sucking disc longer than wide, almost reaching to genital papillae, frenum broad. Body covered with scales extending forward on top of head to eyes. No scales on opercle or cheek. Gill openings extending forward to below posterior margin of eye. Jaws extending posteriorly to between front of eye and pupil. Interorbital very narrow, less than one pupil diameter. Caudal fin rounded, shorter than head. Greatest body depth 4.8–5.6 in SL. Largest specimen 57 mm TL.

**COLOR IN ALCOHOL.**— Head and body light cream with light brown markings. A series of five dash-like dark marks running along midline of side, first under middle of first dorsal fin; second under first third of second dorsal fin; third under last third of second dorsal fin; fourth at center of caudal peduncle; fifth at caudal-fin base. Four stripes above midline dashes, lower two running from caudal peduncle forward to above pectoral-fin base. Third stripe running from top of caudal peduncle forward onto head and top stripe from base of second dorsal fin onto head. Side of head with diffuse bar under eye that extends posteriorly across cheek and onto opercle. Pectoral-fin base with diffuse pigment on upper half, no pigment on pectoral-fin rays or membranes. Pelvics, anal, and both dorsal fins with scattered melanophores. Caudal fin crossed by three light, indistinct bars.

**COLOR IN LIFE.**— (from photograph of live fish taken at Kāne'ohe Bay) Background color of head and body white. Body with six dark brown, longitudinal lines composed of separate dashes running the body length. Ventralmost line begins behind pectoral-fin base and joins the line above below second dorsal-fin origin. The latter line continues to caudal-fin base and has five prominent, evenly spaced, dark brown blotches on it, the last blotch at caudal-fin base. Two dorsalmost lines extending posteriorly from top of head onto body. Entire body and head overlaid with iridescent white blotches. Ventral surface of head and body white. Sides and top of head with scattered dark brown blotches. Eye with black pupil surrounded by golden ring, iris dark brown. Dark brown blotch on upper portion of pectoral-fin base. First dorsal fin peppered with melanophores. Second dorsal fin also peppered with melanophores, but with dark brown blotches on basal third of some rays. Anal fin peppered with melanophores. Caudal fin crossed by three irregular rows of dark brown blotches. Pectoral and pelvic fins clear, overlaid with small, scattered, iridescent white spots.

**DISTRIBUTION.**— Hawaiian Islands.

**REMARKS.**— Specimens have been collected from depth of 1–11.5 m on silty sand and also mud bottom. This species is common on the mud bottom of Kāne'ohe Bay, where along with



FIGURE 68. *Opua nephodes*, 35 mm, Kāne'ohe Bay, O'ahu, 2m.



*Oxyurichthys lonchotus*, it is a common food item of hammerhead shark pups. The Honolulu Laboratory of the National Marine Fisheries Service has recently collected this species using a shrimp trawl from deep water (138–169 m) north of Moloka'i. The deep water specimens appear to have larger eyes than those taken in shallow water. Jennifer K. Schultz (pers. commun., April, 2004) compared tissue samples preserved in 70% ethanol of deeper water and shallow specimens using mitochondrial DNA cytochrome b and concluded that they are the same species. More specimens are needed to confirm the apparent larger eye of this goby from deeper water. This species has incorrectly been placed in the genus *Hazeus*.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: Oahu: CAS 218124 (3), CAS 218125 (16), BPBM 4838 (1), BPBM 14648 (6), BPBM 17820 (21), BPBM 22641 (5) cleared and stained, UH 1772 (9); Maui: BPBM 34920 (5); Moloka'i: 39132 (3).

### *Oxyurichthys heisei* Pezold, 1998

(Fig. 69)

*Oxyurichthys heisei* Pezold, 1998, Copeia 1998(3):687–689. Holotype: BPBM 15473. Paratypes: BPBM 34513 (4), BPBM 24145 (3), BPBM 24151 (2), BPBM 24140 (1), BPBM 24084 (1), CAS 74809 (2), LIAIP 1968466 (1), LIAIP 1968467 (1), NLU 64915 (2).

**DIAGNOSIS.**— Counts from Pezold (1998) based on type material (49.4–63.7 mm SL). Dorsal-fin elements VI–I, 12. Anal-fin elements I, 13. Pectoral-fin rays 21–23 (22–23). Longitudinal scale series 50–64. Caudal fin distinctly pointed, more than twice as long as wide. Well-developed fleshy crest on nape extending forward from first dorsal fin to preopercle. Pelvic sucking disc longer than wide, not reaching beyond anus; frenum broad.

Body covered with small scales extending forward to above midopercle on nape, but with naked median. No scales on cheek and opercle. Gill membranes fused to isthmus at level of middle of opercle. Jaws extending posteriorly to below middle or posterior third of orbit diameter in females, to below posterior margin of orbit in males. Interorbital very narrow, less than one pupil diameter. Greatest body depth 5.5–7.0 in SL. Largest specimen 118 mm TL.

**COLOR IN ALCOHOL.**— From Pezold (1998): Figure 69. *Oxyurichthys heisei*, 54 mm SL, off NW Moloka'i, 124 m (specimen lost). "No spot on eye; no spots on gular fold beneath preopercle or anterior process of quadrate; anterior nares not darkly pigmented; body uniformly yellowish brown with faint pigment on cheek beneath posterior portion of orbit (in one specimen, five faint midlateral patches of melanophores are discernible with a microscope); D1 lightly pigmented, but with dark streak between first and second spines, variably indicated (weakly represented in holotype); D2 lightly pigmented; caudal fin with scattered melanophores, dusky distally and between lowermost rays; anal fin lightly pigmented basally and marginally, with clear zone between bands; pelvic fins with few melanophores on connecting membrane, dusky in patches but primarily concentrated between distal branches of rays and proximally; between rays 2/3 and 4/5 in some specimens; pectoral fins unpigmented."

**COLOR IN LIFE.**— Unknown.

**DISTRIBUTION.**— All known specimens are from deep water (124–143 m) off the coast of Moloka'i, Hawaiian Islands.

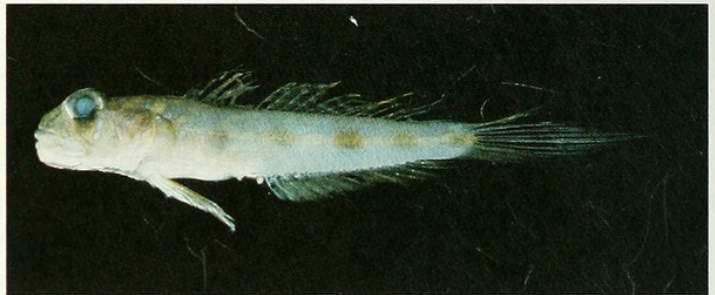


FIGURE 69. *Oxyurichthys heisei*, 54 mm SL, off NW Moloka'i, 124 m (specimen lost).



**REMARKS.**— This is one of only two deep-dwelling gobies known from Hawaiian waters.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: Moloka'i: CAS 218155 (1).

***Oxyurichthys lonchotus* (Jenkins, 1903)**

(Figs. 13–15 and 70)

*Gobionellus lonchotus* Jenkins, 1903, Bull. U.S. Fish Comm. 22(1902):503, fig. 44. O'ahu, Hawaiian Islands. Holotype: USNM 50698.

**DIAGNOSIS.**— Counts based on 20 individuals, 28.7–39.1 mm SL. Dorsal-fin elements VI-I,12-VI-I,13 (VI-I,12). Anal-fin elements I,12-I,14 (I,13). Pectoral-fin rays 18–20 (19). Longitudinal scale series 77–88. Caudal fin pointed, more than twice as long as wide. Well-developed fleshy crest on nape extending forward from first dorsal fin at least past edge of opercle and farther in larger individuals. Body with a lateral series of elongate blotches. Dark spot on superior margin of eye. Prominent dark spot on pectoral-fin base and dark spots on branchiostegal membranes under lower jaw. Pelvic sucking disc longer than wide, almost reaching anal-fin origin; frenum broad with fringe on edge. Body covered with small scales extending forward on top of head to a line up from edge of preopercle. No scales on opercle or cheek. Gill membranes fused to isthmus at level of midopercle. Jaws extending posteriorly to mid pupil. Interorbital very narrow, less than one pupil diameter. Greatest body depth 5.3–5.7 in SL. Attains 130 mm TL.



FIGURE 70. *Oxyurichthys lonchotus*, BPBM 37084, 47 mm SL, Kahana Bay, O'ahu, 0.1 m.

**COLOR IN ALCOHOL.**— Background color of head and body cream. Sides of body with a series of light brown marks corresponding to dark gray marks in color description for fresh specimen. Top of head with a narrow dark brown line extending from posterior margin of one eye to the other eye; two faint, light brown bars crossing top of head posterior to this line. A dark brown blotch below posteroventral eye margin. A small dark brown spot on cheek above end of upper jaw. Anterior tubular nostrils black. Distal margin of crest on nape dark brown. Black spot on superior eye margin. Side of head with diffuse brown pigment on opercle. Isthmus with scattered brown chromatophores. Branchiostegal membranes under lower jaw with one or two dark brown blotches. Upper two-thirds of pectoral-fin base with a dark brown blotch. Pectoral, caudal, dorsal, and anal fins with scattered light brown chromatophores on rays and membranes. Pelvic-fin membranes dark brown, rays cream or with a few light brown chromatophores.

**COLOR OF FRESH SPECIMEN.**— (from photograph of specimen taken at Kahana Bay, O'ahu) Background color of body, top and sides of head grayish brown, ventral surface of head and body light gray. Body and head with small, scattered, iridescent blue spots. Sides of body with a series of dark gray marks, the first as seven narrow bands under the pectoral fin that almost reach dorsal and ventral surfaces. A dark blotch under end of pectoral fin. Four more blotches on side posterior to end of pectoral fin, the first under fourth element of second dorsal fin; second under seventh to ninth; third under 12<sup>th</sup> to 13<sup>th</sup> and past end of fin; and fourth on caudal-fin base. Another series of dark gray blotches along bases of both dorsal fins: first at first dorsal spine; second at third spine; third at fifth; fourth anterior to first spine of second dorsal fin; fifth at second element of second dorsal fin; sixth between elements five and six; seventh between elements six and seven; eighth



between elements ten and 11; and ninth at base of 12<sup>th</sup> element. Top of head with a black bar extending from posterior margin of one eye to the other; two blotches between this bar and first dorsal-fin origin. Side of head with a narrow dark gray bar running across center of opercle at a slight posterodorsal angle. A second lighter bar on preopercle paralleling opercular bar. A distinct, small, round, black spot on cheek above end of upper jaw. Dusky area between anteroventral margin of eye and upper jaw, black pigment on both nostrils. Eye with black pupil and orange iris, a black triangular-shaped mark on posteroventral margin of eye, narrow portion of triangle pointing anteriorly. Pelvic fins dusky. Pectoral fins with dark gray blotch on upper two-thirds of base, rays and membranes dusky. First dorsal fin with a dusky stripe on basal one-quarter, a white stripe distal to that on next one-quarter, and a narrow white stripe distal to the dark stripe. Ends of spines with an orange tinge. Second dorsal fin crossed by seven dusky stripes alternating with white stripes angling dorsoventrally across fin. Margin of fin with an orange tinge. Dorsalmost leading caudal-fin ray with alternating black and white bars, remainder of fin dusky, with darker pigment on posteroventral margin of fin and orange on margins in mature individuals. Anal-fin rays white basally with dusky blotches on membranes between rays on basal third of fin. Remainder of anal fin dusky with a white distal margin.

**DISTRIBUTION.**—Hawaiian Islands.

**REMARKS.**—This species is common in areas with soft mud bottoms such as that found around mangroves and at the bottom of Kane'ohe Bay, O'ahu. A series of collections using a small seine were made at Kahana Bay, O'ahu, and snapping shrimp (*Alpheus malabariacus*) were consistently taken along with the gobies. It is possible that *O. lonchotus* uses shrimp burrows for shelter.

**MATERIAL EXAMINED.**—HAWAIIAN ISLANDS: O'ahu: CAS 218126 (26), CAS 218139 (115); BPBM 1884(1), BPBM 1885 (1), BPBM 1886 (1), BPBM 4884 (2), BPBM 5520 (1), BPBM 5521 (1), BPBM 15382 (13), BPBM 15386 (1), BPBM 37084 (2), BPBM 38854 (1).

***Pleurosicya larsonae* Greenfield and Randall, sp. nov.**

(Figs. 32, 71–72)

**MATERIAL EXAMINED.**—HOLOTYPE: CAS 218127, 11.4 mm SL, female, Hawaiian Islands, O'ahu, Kane'ohe Bay, patch reef N. of Sampan channel, 1.2–3.1 m, 17 Nov. 2000, field no. G00-06, D.W. Greenfield, J.E. Randall, R.C. Langston, D.B. Eckert. PARATYPES: CAS 218128 (6) 8.0–14.7 mm SL, taken with holotype. CAS 218129 (2) 12.9–15.9 mm SL, Hawaiian Islands, O'ahu, Kane'ohe Bay, patch reef N. of Sampan Channel, 0–3.1 m, 8 Oct. 1992, field no. G92-03, D.W. Greenfield and N. Burke; BPBM 39152 (5) 12.1–13.5 mm SL, Hawaiian Islands, O'ahu, Kane'ohe Bay, patch reef NE of Crashboat channel, 0–3.1 m, 15 Apr. 1993, field no. G93-01, D.W. Greenfield; NTM S.15734-001 (3) 14.9–15.7 mm SL, same data as BPBM 39152; NTM S.15735-001 (2) 13.0–13.6 mm SL, Hawaiian Islands, O'ahu, Kane'ohe Bay, patch reef N. of Sampan Channel, 2.4–3.1 m, 20 May 1993, D.W. Greenfield and K. Cole; USNM 375434 (1) 15.6 mm SL, Hawaiian Islands, O'ahu, Kane'ohe Bay, patch reef at Crashboat Channel, 0–4.6 m, 4 May 1991, field no. G91-07, D.W. Greenfield, T. A. Greenfield, R.K. Johnson; FMNH 113492 (1) 14.7 mm SL, taken with holotype.; BPBM 39544 (1) 11.3 mm SL, Hawaiian Islands, O'ahu, Haleiwa, 6 m, 21 August 2004, R. R. Holcom.

**DIAGNOSIS.**—Small *Pleurosicya* with a broad head and moderate snout, eyes set dorsolaterally. Second dorsal- and anal-fin rays I,7–I,8 (usually I,8). Pectoral-fin rays 17–18 (usually 17). Longitudinal scales 24. TRB 6. Nape naked. Pelvic fin rounded, cup-like, with fleshy, rounded pelvic spine lobes. Tongue round. Lower gill opening margin attached at level of preopercular mar-



gin. Gill membranes broadly joined to isthmus. Live color translucent with orange markings and some melanophores.

**DESCRIPTION.**— Description format follows Larson (1990) for ease of comparison. An asterisk indicates counts of the holotype. First dorsal-fin spines VI\*. Second dorsal-fin elements I,7 (1), I,8(12)\*. Anal-fin elements I,7(3), I,8(10)\*. Pectoral-fin rays 17(8)\*, 18(2). Lowermost pectoral-fin rays unbranched and thickened distally 4(3),5(7)\*. Branched caudal-fin rays 10(7)\*, 11(4). Scales ctenoid. Longitudinal scale count 23(1), 24(5)\*,25(4). Nape naked. Gill rakers on outer face of first arch 2+1+6(1), 2+1+4(3) (holotype not counted). Gill rakers short. Lowermost half of lower limb of first gill arch bounded by membrane to opercle.

Measurements in percentage of SL based on 10 specimens 11.5–16.1 mm SL. Data for holotype presented first, followed by range and mean of all specimens. Head and anterior half of body roughly triangular in cross-section (apex dorsal) posterior half of body compressed. Body depth at anus 17.5 (13.2–17.5:15.3). Head length 34.1 (31.6–34.7:33.1). Head rather broad, width always greater than depth. Head width 19.2 (16.3–20.6:17.9.) [56 (48.2–60:54.3% of HL)]. Head depth 16.1 (14.7–17.2:15.9) [47 (42.3–51:47 % of HL)]. Snout moderate 10.9 (8.6–11.7:10.3) [32 (24.7–35:27.6% of HL)], rounded when viewed from above. Mouth subterminal, ending at point below anterior part of pupil of eye, 13.1 (13.1–17.5:14.8) [38 (38–54:44.7% of HL)]. Large upper lip overhanging mouth anteriorly, 3.9 (2.3–4.4:3.4) [11.5 (7–13:10.4% of HL)]. Lower lip very narrow. Eyes moderate 9.2 (7.9–11.2:9.5) [27 (24–35.3:28.8% of HL)]. Eyes set dorsolaterally, high on head. Interorbital space narrow, 2.2 (1.8–3.3:2.5) [6.4 (5.4–10:7.5% of HL)]. Anterior nostril in a short tube, posterior nostril in a larger tube, directly anterior to eye margin. Tongue rounded. Lower margin of gill opening attached at level of preopercular margin. Gill membranes broadly joined to isthmus at line between posterior eye margin and preopercular edge. Fins low, first dorsal shorter than anterior rays of second dorsal. Anal rays unbranched. Caudal fin rounded. Pectoral fins slightly pointed, reaching to gap between dorsals. Pelvic disc round, cup-like, just reaching anus. Frenum and pelvic spine lobes fleshy and fimbriate, lobes rounded.

Upper-jaw teeth very small, fine, and pointed; arranged in a band broader anteriorly, narrowing at sides. Four or five enlarged, slender, curved teeth present on each side of upper jaw spaced from front to side, mostly hidden by upper lip. Lower jaw with band of very small, fine, pointed teeth across front; band extending over edge of jaw, so that outermost enlarged and curved teeth angle outward. Sides of lower jaw with row of larger slightly posteriorly curved teeth; and one or two large curved canine teeth at each side of jaw symphysis. Lateral-line canals as for genus (Larson 1990: Fig. 5). Nape naked, scales on body extending anteriorly to area between top of pectoral-fin base and origin of first dorsal fin. Belly midline under pelvic fins naked. Male genital

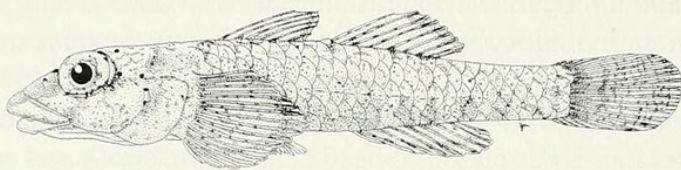


FIGURE 71. *Pleurosicya larsonae*, holotype, CAS 218127, 16.0 mm SL, Kāne'ohe Bay, O'ahu.



FIGURE 72. *Pleurosicya larsonae*, 15 mm TL, Kāne'ohe Bay, O'ahu, 2.5 m.



papilla moderately long, flattened, with several tiny lobes at expanded tip. Female genital papilla short, cylindrical to slightly flattened, with several small lobes on either side of tip. Largest specimen 19.5 mm TL.

**COLOR IN ALCOHOL.**—Most color lost in alcohol, body straw yellow. A few scattered melanophores on top of head behind eye, cheek and on pectoral-fin base. A fine, short, dark line on middle of nape midway between eyes and first dorsal fin sometimes present (not in holotype). A few scattered melanophores sometimes present on body. Some dark markings as in Figure 71 retained on dorsal fins. Pigmentation shown in Figure 71 taken from underwater photograph showing fresh coloration.

**COLOR OF FRESH SPECIMEN.**—(from photograph taken underwater of freshly collected specimen at Kâne'ohe Bay) Head and body translucent with digestive tract and vertebrae clearly visible. Body overlaid with a pattern of orange markings as well as some melanophores. Head with a distinct orange band running anteriorly from front of eye to end of snout and across jaws, the most obvious color feature. An orange stripe running along length of lower jaw, and a fainter orange bar running up from end of maxilla to ventral eye margin. Scattered orange pigment extending along preopercular edge to eye. A narrow orange stripe extending from posterior eye margin posteriorly along midline, the stripe breaking up past pectoral-fin base into a series of about 10 dashes. Top of head with a distinct pattern of orange markings. A pair of stripes running from the anterodorsal eye margin towards the ascending process of the premaxilla as a V. Interorbital with two dashes centered along its length and a U-shaped marking at posterior portion of interorbital space with closed end posteriorly. A narrow orange stripe running anteriorly from dorsal-fin origin onto nape, splitting into a V that almost meets the U-shaped mark. Secondary stripes running from V to posterior eye margins. Nape directly posterior to eyes with scattered large melanophores. Pupil of eye black, iris silver-yellow with an orange ring around pupil. Digestive tract with distinct black spots showing through body. Spaces between vertebrae orange with orange pigment extending along neural and haemal spines. Body with some faint orange marbling. Pectoral-fin base with distinct large melanophores, base of pectoral-fin rays orange, remainder of fin clear. Pelvic disc clear, caudal fin clear with scattered orange spots. Anal fin clear with four orange spots with some scattered melanophores spaced along its base. First dorsal fin clear with an orange spot at the base of the first three spines, the fin crossed by three narrow black bars angling from the first spine posteriorly to fin base. Second dorsal fin clear, crossed by four orange bars with a few scattered melanophores at the base of last two fin rays.

**ETYMOLOGY.**—Named in honor of Helen K. Larson of the Northern Territory Museum of Arts and Sciences, Darwin, Australia, whose revision of *Pleurosicya* laid the foundation for all future work on the genus.

**COMPARISONS.**—Separated from the following species with scaled napes because of its naked nape: *P. annandalei*, *P. australis*, *P. boldinghi*, *P. elongata*, *P. labiata*, *P. micheli*, *P. mossambica*. Separated from *P. prognatha* by lacking its distinctive elongate, pointed upper lip; from *P. spongicola* by lacking its very short, steep snout. From *P. plicata* by lacking its elongate pelvic-spine lobes and having a round rather than a trilobed tongue; from *P. bilobata* by lacking a distinct black blotch at rear of soft dorsal fin, lacking a bilobed tongue and differing in live coloration; from *P. fringilla* by lacking a black spot on anal fin anteriorly; from *P. carolinensis* by lacking large curved teeth at middle of each side of lower jaw and by having more pectoral-fin rays (17–18 versus 14–15, usually 15 in *P. carolinensis*); from *P. muscarum* by having the upper lip overhanging the lower jaw, versus a more terminal mouth in *P. muscarum*, by lacking the scattering of melanophores over body and five pairs of red lines radiating out from eye, and by having four to five lowermost unbranched pectoral-fin rays versus usually three or fewer in *P. muscarum*.



*Pleurosicya larsonae* is most similar to *P. occidentalis* and *P. coerulea*. It differs from *P. occidentalis* by lacking the intense elongate black spot on center of nape; however, like *P. coerulea*, it sometimes has a fine, short, dark line on the center of the nape. It differs from *P. coerulea* by having a narrower head (mean width 54.3% HL versus 72% in *P. coerulea*), shorter snout (mean length 27.6% HL versus 35% in *P. coerulea*). It also has a narrower upper lip, 7–13, mean 10.4% of HL versus 13.5, 13, and 12 in three paratypes (ANSP 165112) of *P. coerulea*. *Pleurosicya coerulea* is “translucent bluish to blue-green with two reddish stripes on head” (Larson, 1990:20), whereas *P. larsonae* is translucent gray with orange markings.

**DISTRIBUTION.**— Known only from Kāneʻohe Bay, and Haleiwa, Oʻahu, Hawaiian Islands.

**REMARKS.**— This species is most certainly more widespread in the Hawaiian Islands but appears to be extremely cryptic. It was only collected five times in a total of 75 general ichthyocide collections, with four of those collections from a specific habitat, shallow patch reefs (0–4.6 m) with good circulation. Our sixth collection from that specific habitat only occurred after a number of futile attempts to collect more individuals for photographs. Members of the genus *Pleurosicya* generally are commensal with invertebrates or found on seagrasses and algae. Despite hours of searching we have never seen this species alive and thus do not know its specific association; however, Ronald R. Holcom (pers. commun., August, 2004) observed and caught a specimen at Haleiwa, Oʻahu, that was living on *Porites compressa*.

***Pleurosicya micheli* Fourmanoir, 1971**

(Figs. 28, 30, and 73)

*Pleurosicya micheli* Fourmanoir, 1971, Cah. ORSTOM Ser. Oceanogr. 9(4):499, fig. 8. Caban I., Philippines. Neotype: AMS I.21918-071.

**DIAGNOSIS.**— Counts based on 10 individuals 14.0–17.1 mm SL. Dorsal-fin elements VI–I, 8. Anal-fin elements I–8–I, 9 (I, 8). Pectoral-fin rays 16–18 (17). Longitudinal scale series 25–28 (27). Dark pigment on lower portion of caudal peduncle extending posteriorly as stripe onto caudal fin. Pelvic sucking disc longer than wide, almost reaching anus. Pelvic-fin frenum with thickened skin around pelvic spines that extend posteriorly over disc. Interorbital very narrow, about one-half pupil diameter, a single pore in center of interorbital space. Snout pointed from side view, jaws extending posteriorly to below about center of pupil. Body covered with scales, extending forward onto nape. No scales on opercle or cheek. Gill membranes free from isthmus, gill openings extending forward to posterior margin of pupil. Caudal fin rounded. Greatest body depth 5.0–7.1 in SL. Attains 25 mm TL.

**COLOR IN ALCOHOL.**— Background color of head and body light cream. Scattered melanophores on lower half of body from anal-fin origin extending as a stripe onto lower half of caudal fin, becoming denser posteriorly. A line of melanophores running on dorsal surface of body along sides of both dorsal fins. A line of melanophores extending anteriorly from origin of first dorsal fin, extending anteriorly to cover area over brain. Scattered melanophores extending posteriorly from



FIGURE 73. *Pleurosicya micheli*, 25 mm TL, Kona, Hawaiʻi, 18m.



posterior margin of eye onto top of preopercle. A few melanophores at top of pectoral-fin base. First dorsal fin clear except for a few large melanophores on lower half of membranes between spines four and six. Second dorsal, pectoral and pelvic fins clear. Anal fin with scattered melanophores between spine and first ray, remainder of fin clear. Lower three segmented rays of caudal fin clear, next four segmented rays dorsal to those densely pigmented dark brown, remaining rays of fin clear.

**COLOR IN LIFE.**— (from a photograph taken in 18 m at Kona, Hawai'i) Head and body translucent with internal coloration along backbone visible. A series of six dusky red blotches along backbone, with white areas on top of backbone between the blotches. A dusky red stripe running from end of backbone coloration onto lower middle part of caudal fin. A reddish area on side of head behind eye and a red to yellow stripe running from front of eye across snout to upper lip. Scattered black spots overlaid by red on top of head behind eyes. Eye with black pupil, iris silver with continuation of red stripes in front of and behind eye onto iris, top of iris with black edge. Fins clear except for a few scattered black spots on membranes of lower half of first dorsal fin.

**DISTRIBUTION.**— Seychelles and Maldives to Hawaiian Islands and Society Islands; Ryukyu Islands and Taiwan to Great Barrier Reef, New Caledonia, and Loyalty Islands.

**REMARKS.**— This species is commensal on a variety of hard corals, and appears to be the most common species of the genus over most of its range. It has been collected from depths of 15–38 m.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: Hawai'i: BPBM 28736 (34).

### *Priolepis aureoviridis* (Gosline, 1959)

(Figs. 74–75)

*Quisquilius aureoviridis* Gosline, 1959, Pac. Sci. 13(1):68, fig. 1. O'ahu, Hawaiian Islands. Holotype: USNM 175013. Paratypes: BPBM 14203 [ex UH 1703] (8).

**DIAGNOSIS.**— Counts based on 14 individuals 20.5–31.1 mm SL. Dorsal-fin elements VI-I, 11–VI-I, 12 (VI-I, 11). Anal-fin elements I, 9–I, 10 (I, 9). Pectoral-fin rays 18–20 (19). Longitudinal scale series 28–30 (28). Predorsal scales 12–16. Body covered with scales, extending on top of head to eyes. No scales on opercle or cheek. Interorbital very narrow (less than  $\frac{1}{2}$  pupil diameter) but not forming a deep trench between eyes. Pelvic fin longer than wide, reaching past anus; frenum completely absent. Jaws extending posteriorly to anterior margin of pupil. Gill openings extending forward just past edge of preopercle. Greatest body depth 4.0–4.5 in SL. Caudal fin rounded. Largest specimen 47 mm TL.

**COLOR IN ALCOHOL.**— Background color of head and body cream overlaid with a peppering of scattered melano-phores that are more concentrated at scale margins. Body crossed by six faint brown bars extending from dorsal to ventral surface: first under fifth spine of first dorsal fin; second at origin of second dorsal fin; third at fifth element of second dorsal fin; fourth at tenth element; fifth about three scales past posterior end of second dorsal fin; sixth bar at caudal-fin base. Side of head with two faint light brown bars; first under center of pupil extending down across cheek; second from posterior eye margin across cheek to ventral margin of preopercle. Dorsal, anal, and caudal fins with scattered melanophores, no pigment on other fins.

**COLOR OF FRESH ADULT SPECIMEN.**— (from underwater photograph of freshly collected specimen at Kâne'ohe Bay) Background color of head and body lemon yellow. Head and body crossed by a series of narrow light gray bars. A bar under center of pupil extending down across cheek. Another bar extending from posterior eye margin down across cheek and also dorsally across top of head behind eyes. Three more bars between eyes across interorbital. Eye with black pupil, surrounded by a bright yellow ring, iris lemon yellow. Nape crossed by two bars, anteriormost at pos-



terior edge of preopercle, second one directly anterior to first dorsal fin. Six more bars on body, extending from dorsal to ventral surface: first under fifth spine of first dorsal fin; second at origin of second dorsal fin; third at fifth element of second dorsal fin; fourth at tenth element; fifth about three scales past posterior end of second dorsal fin; sixth bar at caudal-fin base. Scales on body with light brown margins. All fins lemon yellow with a peppering of melanophores on basal portions.

**COLOR OF FRESH JUVENILE SPECIMEN.**—Head and body lemon yellow with a heavy peppering of melanophores. Light gray bars as in adult. Second dorsal, anal, caudal, and pelvic fins lemon yellow with a heavy peppering of melanophores on membranes between yellow elements. Fin margins with a narrow band of black edged with white distally. First dorsal fin similar to other fins except for a black ocellus ringed with white on anteroventral portion of fin covering first five spines (Fig. 75). Pectoral fins lemon yellow with light peppering of melanophores.

**DISTRIBUTION.**—Hawaiian Islands, Johnston Island, and Caroline Islands (Pohnpei and Ant Atoll).

**REMARKS.**—This attractive, yellow species is found on outer reefs, but is not usually seen because it is secretive. In Kāne'ohe Bay it was most common at the deep spur and groove and ledge habitats (Greenfield 2003).

**MATERIAL EXAMINED.**—HAWAIIAN ISLANDS: O'ahu: CAS 218901 (1), CAS 218902 (3), CAS 218899 (3), CAS 218170 (1), CAS 218169 (3), CAS 218168 (1), CAS 218132 (2), CAS 218898 (8), CAS 218900 (1), BPBM 7902 (6), BPBM 9860 (1), BPBM 12289 (4), BPBM 15461 (1), BPBM 24455 (1), BPBM 31017 (1), BPBM 34570 (1), BPBM 34571 (2), BPBM 34573 (1), BPBM 34535 (2), BPBM 35427 (5), BPBM 35778 (4), BPBM 37267 (4); Hawai'i: BPBM 10901 (2), BPBM 17825 (1), BPBM 17826 (1), BPBM 24799 (1), BPBM 28711 (1).

### *Priolepis eugenius* (Jordan and Evermann, 1903)

(Figs. 44–45, and 76)

*Quisquilius eugenius* Jordan and Evermann, 1903, Bull. U.S. Fish Comm. 22(1902):203. O'ahu, Hawaiian islands. Holotype: USNM 50674 (missing). Paratypes: CAS-SU 7483 (3).

*Gobiomorphus eugenius*, Jordan and Evermann, 1905, Bull. U.S. Fish Comm. 23(pt. 1)(1903):357.

**DIAGNOSIS.**—Counts based on 20 individuals 21.3–38.5 mm SL. Dorsal-fin elements VI-I,9-VI-I, 11 (VI-I,11). Anal-fin elements I,9. Pectoral-fin rays 18–20 (19). Longitudinal scale series



FIGURE 74. *Priolepis aureoviridis*, 35 mm TL, Kona, Hawai'i, 20 m.



FIGURE 75. *Priolepis aureoviridis*, 25 mm TL, Kona, Hawai'i, 18 m.



27–29 (27). Body covered with scales, extending anteriorly on top of head to eyes and ventrally on head to at least upper half of cheek and opercle. Interorbital very narrow (less than  $\frac{1}{2}$  pupil diameter), forming a deep trench between the eyes. Pelvic fin longer than wide reaching to anus, frenum completely absent. Jaws extending posteriorly to anterior margin of pupil. Gill openings extending forward to edge of preopercle. Caudal fin rounded. Greatest body depth 3.6–4.4 in SL. Largest specimen 54 mm TL.

**COLOR IN ALCOHOL.**— Background color of head and body light brown. Body crossed by six dark brown, wide bars, positions as in fresh specimen described below. Pattern of dark brown bars on head as in fresh specimen. Eye with gray pupil, surrounded by black iris. First and second dorsal and caudal fins dark brown to black. Anal and pelvic fins dark brown to black with white margins. Pectoral fins light brown.

**COLOR OF FRESH SPECIMEN.**— (from underwater photograph of freshly collected specimen from Kāne'ohe Bay) Background color of head and body gray, overlaid with dark brown color pattern. Body crossed by six wide bars: first under first four spines of first dorsal fin; second from behind fifth spine to end of membrane of first dorsal fin; third under second to fourth elements of second dorsal fin; fourth under elements seven to nine; fifth behind last ray of fin onto caudal peduncle; sixth at center of caudal peduncle. Caudal-fin base with blotch. A wide bar crossing nape in front of dorsal fin and running down anterior to pectoral-fin base. Two narrow bars across head between posterior margin of eyes and bar on nape. Two narrow bars extending down from ventral eye margin across cheek, one from anteroventral margin of pupil and other from posteroventral pupil margin. Pupil black, surrounded by a red-orange ring, iris gray with bands dark brown radiating out from pupil. First and second dorsal fins, anal fin and pelvic fins black with a narrow white margin. Pectoral fins gray.

**DISTRIBUTION.**— Hawaiian Islands and Johnston Island.

**REMARKS.**— This species can be found in shallower water than the other species in the genus in Hawaiian waters. In Kāne'ohe Bay it was collected most often in the shallow spur and groove habitat, open patch reefs and even in tidepools, all areas with considerable water movement (Greenfield 2003).

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: O'ahu, CAS 812130 (2), CAS 218166 (6), CAS 812131 (1), CAS 218167 (15), BPBM 8513 (1), BPBM 15349 (3), BPBM 19662 (6), BPBM 22626 (49), BPBM 22640 (4), BPBM 22671 (5), BPBM 37263 (2); Moloka'i, BPBM 4794 (2), BPBM 30225 (1); Midway Atoll, BPBM 34784 (2), BPBM 34799 (4), BPBM 34822 (1), BPBM 34855 (1), BPBM 34874 (6), BPBM 34891 (1), BPBM 35371 (1).

### *Priolepis farcimen* (Jordan and Evermann, 1904)

(Figs. 43 and 77)

*Gobiopterus farcimen* Jordan and Evermann, 1904, Bull. U.S. Fish Comm. 22(1902):205. Hawai'i, Hawaiian Islands. Holotype: USNM 50654.



FIGURE 76. *Priolepis eugenius*, 32 mm TL, Kāne'ohe Bay, O'ahu, 1.5 m.



*Zonogobius farcimen*, Gosline and Brock, 1960, Handbook of Hawaiian fishes. University Press of Hawai'i, Honolulu, p. 270.

**DIAGNOSIS.**— Based on 7 individuals 10.1–15.5 mm SL. Dorsal-fin elements VI-I,8-VI-I,10 (VI-I,9). Anal-fin elements I,7-I,8 (almost always I,7). Pectoral-fin rays 17–18 (18). Longitudinal scale series 25–28 (26, often lost). Body covered with scales, extending anteriorly no farther than second spine of first dorsal fin. No scales on head or predorsal area. Interorbital narrow (about  $\frac{1}{2}$  pupil diameter). Pelvic fins longer than wide, reaching past anus, frenum completely absent. Jaws extending posteriorly to below middle of pupil. Gill openings extending forward just past edge of preopercle. Caudal fin rounded. Greatest body depth 3.6–4.4 in SL. Largest specimen 26 mm TL.



FIGURE 77. *Priolepis farcimen*, 16 mm, Kāne'ohe Bay, O'ahu, 1 m.

**COLOR IN ALCOHOL.**— Background color of head and body light cream. Body, head and fin membranes covered with a fine peppering of brown chromatophores. Color pattern on head (as described in color in life) fades easily in preservative but represented by faint brown lines. Distal margin of first dorsal fin dusky.

**COLOR OF FRESH SPECIMEN.**— (from underwater photograph of freshly collected specimen at Kāne'ohe Bay). Background color of head red-orange, overlaid by a series of distinct white lines edged in black: three lines crossing interorbital between eyes; a single line from anterior margin of eye running anteriorly to upper jaw; two lines extending ventrally from ventral margin of eye; a line crossing top of head posterior to eyes and continuing down across side of head to ventral surface, this line branching posteriorly to eye and extending as an additional line across top of head; a line crossing top of head at level of top of opercle, splitting above top of opercle, with one branch extending down along preopercular margin to ventral surface, the other branch extending down across pectoral-fin base. A short line crossing nape directly anterior to origin of first dorsal fin. Eye with black pupil, iris brunt orange. A series of about seven very short lines extending from bases of both dorsal fins ventrally to where distinct scale pattern begins. Background color of body gray (red-orange when alive) from pectoral-fin base back to origin of second dorsal fin where background color fades to a yellowish hue. Margins of scales with dark brown (black-orange when alive) edges forming a lattice pattern. Pectoral fin burnt orange at base grading into yellow distally. Spines of first dorsal fin with alternating clear and red-orange bands, membranes clear except for distal margin which is black. Second dorsal fin with alternating clear and burnt orange bands, membranes clear. Anal fin similar to second dorsal fin. Caudal fin with yellow tinge.

**DISTRIBUTION.**— Hawaiian Islands and Johnston Island.

**REMARKS.**— This is the smallest species of *Priolepis* in Hawaii, and can easily be separated from the other species in our area by the distinctive dark-bordered light lines that radiate out from the eye across the cheek and top of the head. We took fewer individuals of this species at Kāne'ohe Bay than of the other *Priolepis* species. It usually was found at the outer reefs in deeper water (Greenfield 2003).

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: O'ahu: CAS 218133 (2), CAS 218134 (3), CAS 218135 (1), CAS 218135 (1), CAS 218136 (1), CAS 218137 (1), CAS 218138 (1); BPBM 15456



(4), BPBM 15468 (3), BPBM 19663 (7), BPBM 22625 (2), BPBM 22629 (6), BPBM 35426 (1), BPBM 38477 (1); Midway Atoll: BPBM 22627 (1), BPBM 34783 (1), BPBM 34856 (1), BPBM 34867 (1), BPBM 34942 (1).

***Priolepis limbatosquamis* (Gosline, 1959)**

(Figs. 46 and 78)

*Quisquilius limbatosquamis* Gosline, 1959, Pac. Sci. 13(1):69, fig. 2. Oahu, Hawaiian Islands. Holotype: USNM 175012. Paratypes: BPBM 14201 [ex UH 1704] (8), additional paratype at USNM.

**DIAGNOSIS.**— Counts based on 10 individuals 15.0–22.5 mm SL. Dorsal-fin elements VI-I,8-VI-I,9 (VI-I,9). Anal-fin elements I,7-I,8 (I,8). Pectoral-fin rays 17–19 (18). Longitudinal scale series 25–27 (26). Body covered with scales, extending anteriorly at most  $\frac{3}{4}$  of distance to eyes. No scales on opercle or cheek. Interorbital very narrow (less than  $\frac{1}{2}$  pupil diameter) but not forming a deep trench between eyes. Pelvic fin longer than wide, reaching anus, frenum completely absent. Jaws extending posteriorly to below anterior margin of pupil. Gill openings extending forward just past edge of preopercle. Caudal fin rounded. Greatest body depth 4.4–4.9 in SL. Largest specimen 28 mm TL.



FIGURE 78. *Priolepis limbatosquamis*, 30 mm TL, Kāne'ohe Bay, O'ahu, 10 m.

**COLOR IN ALCOHOL.**— Background color of head and body cream. Scales on body with dark brown margins forming a distinct lattice pattern; scales usually lost leaving only this pattern on scale pockets and no body bars as described in color of fresh adult specimen. Ends of bars often evident on dorsal surface on head and bases of fins. Ventral surface of body cream with peppering of melanophores. Head heavily peppered with melanophores, with a brown bar slightly narrower than pupil diameter under center of eye extending down to posterior end of jaw. A second wider bar extending from posteroventral eye margin across cheek to ventral surface. A third bar running along preopercular margin up and across top of head. A fourth bar extending from pectoral-fin base onto dorsal surface of head. Pectoral and pelvic fins with scattered melanophores on basal membranes, clear distally. Caudal fin with scattered melanophores. Membranes of first and second dorsal fins and anal fin with scattered melanophores.

**COLOR OF FRESH ADULT SPECIMEN.**— (from underwater photograph of freshly captured specimen at Kāne'ohe Bay) Background color of body clear, with six subcutaneous, dark brown bars running from dorsal to ventral surface showing through body: first bar under first dorsal fin; second between first and second dorsal fins; third under anterior portion of second dorsal fin; fourth under center of fin; fifth at end of fin; sixth at center of caudal peduncle. Scales on body with dark brown margins forming a distinct lattice pattern. Ventral surface of belly light cream. Background color of head cream with an orange wash. A distinct orange bar under center of eye extending down to posterior end of jaws. A more diffuse orange bar extending from posteroventral eye margin across cheek to ventral surface. A diffuse orange bar on posterior preopercular margin running onto



top of head. A similar bar extending from pectoral-fin base onto dorsal surface of head. A distinct clear area extending from behind pectoral-fin base onto nape anterior to first dorsal fin. Spines and rays of first and second dorsal fins white with orange spots forming oblique rows, membranes peppered with small, white, iridescent white spots. Caudal-fin rays white with orange spots, forming five or six irregular bars. Basal two-thirds of anal fin orange, distal one-third white. Pectoral and pelvic fins clear.

**COLOR OF FRESH YOUNG SPECIMEN.**— (from photograph of specimen collected at Kâne'ohe Bay) Background color of head and body clear. Head and body crossed by nine broad brown bands: anteriormost from preopercle across top of head; second across nape anterior to first dorsal fin; third band at anterior portion of first dorsal fin; fourth at posterior end of first dorsal fin; fifth at anterior portion of second dorsal fin; sixth at center of second dorsal fin; seventh at posterior portion of second dorsal fin; eighth and ninth bands across caudal peduncle. A red internal band angling posteroventrally from sixth to seventh band (retained from larva). A brown band across head at posterior eye margin and two brown bands under eye. Eye with black pupil, iris silver.

**COLOR OF NEWLY SETTLED LARVA.**— (from photograph of specimen collected at Kâne'ohe Bay) Body clear with a distinctive red bar running posteroventrally from middle of second dorsal fin. A red blotch at caudal-fin base. A red line along lower jaw. Red chevron marks on body under pectoral fin. Black on posteriodorsal part of gut showing through body. Eye with black pupil, iris silver.

**DISTRIBUTION.**— Hawaiian Islands and Johnston Island.

**REMARKS.**— This is a species that usually is found in the deeper outer part of Kâne'ohe Bay, being most abundant in the deep spur and groove habitat of the bay (Greenfield 2003). It is secretive and not usually seen while diving.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: O'ahu: CAS 218140 (2), CAS 218141 (1), CAS 218142 (1), CAS 218143 (1), CAS 218144 (1), CAS 218145 (1), CAS 218146 (1), CAS 218147 (1), CAS 218148 (2), CAS 218149 (1), CAS 218150 (1), CAS 218151 (2), CAS 218152 (3), CAS 218153 (1), CAS 218154 (1), BPBM 10038 (1), BPBM 17811 (2), BPBM 31016 (1), BPBM 37264 (1); Midway Atoll: BPBM 34802 (1), BPBM 34823 (2), BPBM 34857 (1).

### *Psilogobius mainlandi* Baldwin, 1972

(Figs. 42 and 79)

*Psilogobius mainlandi* Baldwin, 1972, Pac. Sci. 26(1):126, fig. 4. O'ahu, Hawaiian Islands. Holotype: USNM 206174. Paratypes: BPBM 5522-25 (1, 2, 17, 11), BPBM 10862 (1), BPBM 10864 (26), BPBM 10865 (4).

**DIAGNOSIS.**— Counts from Watson and Lachner (1985) based on 59 individuals 8.5–37.5 mm SL. Dorsal-fin elements VI-I,9-VI-I,11 (VI-I,10). Anal-fin elements I,8-I,10 (I,9). Pectoral-fin rays 15–19 (16). Longitudinal scale series highly variable, 32–78. Jaws extending posteriorly to or past posterior eye margin. Third (sometimes also second and fourth) dorsal-fin spines elongate, reaching past origin of second dorsal fin when depressed. Pelvic sucking disc longer than wide, reaching or almost reaching anal-fin origin. Pelvic-fin frenum very well-developed, extending to ends of pelvic spines (about one-third to one-half of fin length). Body covered with small scales that are partially embedded anteriorly near pectoral-fin base. No scales on head or nape. Gill openings extending forward to preopercular margin. Interorbital narrow, less than one pupil diameter. Caudal fin broad and pointed, as long as or a little longer than head length. Greatest body depth 5.0–7.1 in SL. Attains 58 mm TL.

**COLOR IN ALCOHOL.**— Background color of head and body light cream. Body with a series of 10 midlateral brown blotches of varying sizes extending from pectoral-fin base to caudal-fin base.



Six blotches are larger with smaller blotches in between larger blotches. A second series of brown blotches along dorsal side of body at fin bases. Six of these blotches larger and extend into fin bases: two under first dorsal fin, three under second dorsal fin, and sixth on caudal peduncle. Five smaller brown spots spaced between larger spots, not crossing back. A brown band, about width of pupil across nape above pectoral-fin base. Pectoral-fin base with a light brown blotch on upper half. Cheek with a brown bar from top of upper jaw to top of preopercular margin. A

second bar from ventral margin of center of eye forward onto upper jaw. Top of head with two brown blotches in advance of band on nape. Pectoral, pelvic, and anal fins with scattered melanophores. First dorsal fin with scattered melanophores on membranes, with extension of large body spots onto basal portion of fin. Dorsal spots also extending onto basal portion of second dorsal fin. Branchiostegal membranes black in males.

**COLOR IN LIFE.**— (from underwater photograph of living fish at Kâne'ohē Bay) Background color of head and body grayish white, ventral surface lighter. Small, iridescent blue spots scattered over head and body. Five distinct, vertical, white lines on side of body: first three under first dorsal fin; remaining two under anterior portion of second dorsal fin; all except last under pectoral fin. A series of six dark orange-brown blotches along midline of body: first between first two white lines; second between lines four and five, remaining posterior spots evenly spaced along side with last one at caudal-fin base. Corresponding dark brown blotches dorsal to those at midline, running along dorsal-fin bases. An orange-brown blotch at center of pectoral-fin base. Another blotch anterior to that blotch on opercle. Side of head with a dark brown line from posterior end of jaws to top of opercle. A dark brown line from upper jaw to anteroventral margin of eye. Pectoral fins clear. Pelvic fins dusky, posterior margin dark brown. First and second dorsal fins dusky with scattered, small, iridescent blue spots on basal third of fins. Second dorsal fin with an iridescent blue margin. Caudal fin dusky with a yellowish tinge, a few small iridescent, blue spots on central rays, and iridescent blue margin.

**DISTRIBUTION.**— Hawaiian Islands.

**REMARKS.**— This species lives in shallow, protected areas on silty sand. It has a symbiotic relationship with the snapping shrimp, *Alpheus rapax*, living in the burrow usually with a pair of shrimp. The shrimp build and maintain the burrow, and the goby, with its superior vision and lateralis system, serves as the sentinel. When the shrimp emerge to deposit sediment or repair the burrow entrance, they usually make contact with the goby with one of their antennae. In return, the goby is provided with a home and perhaps food that is pushed up by the shrimp.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: O'ahu: CAS 218156 (14), CAS 218157(3), CAS 218158 (2), 62 BPBM paratypes listed above, BPBM 22624 (4), BPBM 22644 (1), BPBM 31323 (43); Maui: BPBM 32844 (1).



FIGURE 79. *Psilogobius mainlandi*, 35 mm TL, and *Alpheus rapax*, Kâne'ohē Bay, O'ahu, 2 m.



***Trimma milta* Winterbottom, 2002**

(Fig. 80)

*Trimma milta* Winterbottom, 2002, Aqua, Jour. Ichthyology and Aquatic Biol. 5(2):45–52. Moorea, Society Islands. Holotype: ROM 59750. Paratypes: BPBM 8617 (5), BPBM 9410 (2), other paratypes at various museums.

**DIAGNOSIS.**— Dorsal-fin elements VI–I, 9. Anal-fin elements I, 8. Pectoral-fin rays 17–18 (usually 17). Longitudinal scale series 22–24. Predorsal scales 6–8. Ctenoid scales on body extending a little anterior to origin of first dorsal fin; nape, opercle, pectoral-fin base, chest, and mid-line of abdomen with cycloid scales, those on opercle in a single dorsal row (may be absent in juveniles). Pelvic fins united by membrane only basally, the membrane one-tenth length of fifth pelvic rays; fin longer than wide, extending at least to anal-fin origin; fifth pelvic ray unbranched and only about half length of longest pelvic ray; no pelvic frenum. Gill opening extending forward to pupil. Jaws extending posteriorly to below front of pupil. Interorbital slightly wider than one-half pupil diameter. Caudal fin slightly rounded. Greatest body depth 4.0–4.5 in SL. Largest specimen 28 mm TL.

**COLOR IN ALCOHOL.**— Head and body cream. Scale pockets with dark brown pigment at edges so scales strongly outlined on body. Head and pectoral-fin base peppered with very small dark brown pigment spots. Pupil of eye cream, iris black. Spines and rays of dorsal and anal fins with orange-brown pigment, some similar pigment on fin membranes towards base of fins. Pectoral, pelvic, and caudal fins clear.

**COLOR IN LIFE.**— (from photograph of live specimen from Pûpûkea, O'ahu taken by R.R. Holcom-BPBM 38706 also Fig. 4 in Winterbottom, 2002) Head and body orange-red. Scale pockets rimmed with dark brown pigment so scales strongly outlined on body, making body darker than head. Pupil of eye black, surrounded by a yellow ring. Iris dusky yellow with neon blue pigment above and below pupil. Fin rays of both dorsal, anal, and pectoral fins orange-red, membranes clear. Caudal fin yellowish.

**DISTRIBUTION.**— Reported from Society Islands, Hawaiian Islands, Marshall Islands, Caroline Islands, Fiji, Solomon Islands, Great Barrier Reef, Papua New Guinea, Indonesia, Philippines, Taiwan, and western Australia.

**REMARKS.**— Specimens have been collected from depths of 9–29 m from coral reefs and sand-rubble substratum. Our only Hawaiian specimen (BPBM 38706) was collected on O'ahu off Hale'iwa (N.W. side of Pûpûkea reef) in 23 m of water under ledges and in small holes at a dropoff by R.R. Holcom. Holcom reported that the species was sometimes in pairs, side by side.



FIGURE 80. *Trimma milta*, BPBM 38706, 18.7 mm SL, Pûpûkea, O'ahu, 23 m.

***Trimma taylori* Lobel, 1979**

(Fig. 81)

*Trimma taylori* Lobel, 1979, Breviora (456):3, fig. 1. Oahu, Hawaiian Islands. Holotype: BPBM 19919. Paratypes: BPBM 19920 (1), BPBM 19921 (2), BPBM 19922 (8).



**DIAGNOSIS.**— Dorsal-fin elements VI-I,10-11 (rarely 11). Anal-fin elements I,9-10 (rarely 9). Pectoral-fin rays 13-15. Longitudinal scale series 23-24 (usually 24). Predorsal scales 6-8. Head naked, scales on body ctenoid, becoming cycloid on pectoral-fin base, chest, and ventrally on abdomen. Second dorsal spine elongate and filamentous, sometimes the third as well. Pelvic fins united by membrane for about one-third length of fins; fin longer than wide, usually extending to base of third anal soft ray; fifth pelvic ray branched, about four-fifths length of fourth ray; no pelvic frenum. Gill opening extending forward to below pupil. Jaws extending posteriorly to below front of eye. Interorbital about as wide as pupil diameter. Caudal fin truncate. Greatest body depth 4.4-5.6 in SL. Reaches 25 mm TL.

**COLOR IN ALCOHOL.**— Head, body, and fins all cream colored, no dark pigment in preserved material.

**COLOR OF FRESH SPECIMEN.**— (from photographs taken at Kona and Kan'eohe Bay) Body and head translucent pale yellow or pale red. Backbone visible through body with alternating black and white sections on top; these alternating sections extending down below midline on anterior half of body. Head yellow dorsally behind eyes, overlaid by small reddish brown spots; a white bar in this area crossing between eyes. Eye with black pupil, surrounded by golden iris that has reddish blotches on it. Surface of body, head, and fins covered with tiny yellow spots.

**DISTRIBUTION.**— Red Sea, Chagos Archipelago, and Maldive Islands to Hawaiian Islands, and Society Islands.

**REMARKS.**— Generally found in caves or under ledges, mostly in 20-50 m, often in small aggregations above the bottom. Named from O'ahu for Leighton Taylor, former director of the Waikiki Aquarium.

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: O'ahu: CAS 218159 (1), BPBM 31038 (9), BPBM holotype and three paratypes listed above.

### *Trimma unisquamis* (Gosline, 1959)

(Figs. 47, 48, and 82)

*Hazeus unisquamis* Gosline, 1959, Pac. Sci. 13(1):70, fig. 3. O'ahu, Hawaiian Islands. Holotype: USNM 175009.

**DIAGNOSIS.**— Counts based on 20 individuals 13.3-17.1 mm SL. Dorsal-fin elements VI-I,6-7 (VI-I,7). Anal-fin elements I,6-7 (I,7). Pectoral-fin rays 18-19 (19). Longitudinal scale series 24-25. A dark band at caudal-fin base. Both dorsal fins with a black border. Pelvic sucking disc longer than wide, reaching anal-fin origin; frenum well developed. Body covered with scales extending forward onto top of head to eyes. Scales on opercle but not cheek. Gill membranes not fused to isthmus, gill opening extending forward to below anterior margin of eye. Jaws extending posteriorly to mid pupil. Interorbital space very narrow, less than one pupil diameter. Caudal fin truncate. Greatest body depth 4.0-4.3 in SL. Attains about 26 mm TL.

**COLOR IN ALCOHOL.**— Background color of head and body cream. Dorsal half of body, nape, and sides of head overlaid with scattered melanophores. A distinct dark brown bar at caudal-fin



FIGURE 81. *Trimma taylori*, 23 mm TL, Waikiki Aquarium, Honolulu.



base. Eye with black pupil surrounded by silver iris, edged with black. Pectoral, pelvic, and anal fins lacking pigment. Caudal fin clear with dusky area on distal one-third. First and second dorsal fins with scattered melanophores and black distal margins.

**COLOR OF FRESH SPECIMEN.**— (from photograph of freshly collected specimen from Kāne'ohe Bay) Background color of body lemon yellow. Dorsal half of body

and nape overlaid by diffuse black pigment, somewhat more concentrated on scale margins. A distinct black bar at caudal-fin base. Background color of head red, overlaid by dusting of melanophores. Eye with black pupil surrounded by golden ring, iris red. Pectoral and pelvic fins yellow. First dorsal fin with reddish orange spines, membranes on basal three-quarters clear, distal one-quarter black. Some black pigment on membranes at bases of spines one through four. Second dorsal fin with same color pattern as first. Anal fin yellow with some black pigment distally. Caudal fin yellow, anterior dorsal and ventral margins red, distal half of fin dusky.

**DISTRIBUTION.**— Hawaiian Islands, Easter Island, Society Islands, Tonga, and Guam.

**REMARKS.**— This species typically is found in more open offshore reefs, being most abundant in the deep spur and groove habitat at Kāne'ohe Bay (Greenfield 2003).

**MATERIAL EXAMINED.**— HAWAIIAN ISLANDS: O'ahu: CAS 218160 (18), CAS 218164 (43), CAS 218161 (12), CAS 218163 (46), BPBM 22653 (1), BPBM 37265 (4); Maui: BPBM 14208 (1); Midway Atoll: BPBM 34824 (7).



FIGURE 82. *Trimma unisquamis*, BPBM 37265, 18.5 mm SL, Kāne'ohe Bay, O'ahu, 12 m.

## DISCUSSION

Several small specimens (about 14 mm SL) of a goby (CAS 218162) were taken at Kahana Bay, O'ahu in 1990 while seining with the University of Hawaii ichthyology class. We could not identify the specimens and thus sent them to Helen Larson in Australia, who placed them in the genus *Favonigobius*. This genus is not known from Hawaii, and thus is most likely an introduction, perhaps through bilge water. Attempts to collect more specimens were not successful, and it is not known if it has become established. This species keys to 28a in our key (*Priolepis*), but it clearly is not within that genus. Whereas *Priolepis* species have horizontal rows of papilla across the cheek and above the upper jaw, they are lacking in *Favonigobius*. In addition, the mouth is much more oblique in *Priolepis* than in *Favonigobius*. A drawing of one of the *Favonigobius* specimens is presented (Fig. 83) to aid in its identification if future specimens are collected.

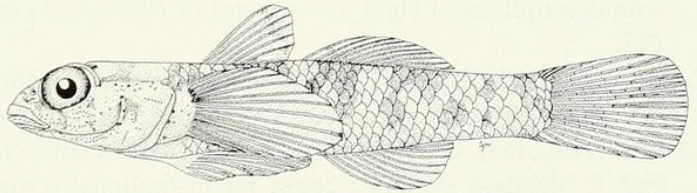


FIGURE 83. *Favonigobius* sp., CAS 218162, 13.5 mm SL, Kahana Bay, O'ahu, less than 0.5 m.

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