

Color in alcohol, pale dusky olivaceous, lower parts palest; dorsal and anal with pale purplish brown, mottled with lighter; edge of dorsal and anal each with a narrow blackish border, edged posteriorly with whitish; caudal dirty brownish, narrowly edged with white; ventrals whitish, dusky at tips; pectoral dusky at base, lighter at tip.

The only known examples of this species are the type obtained by Doctor Jenkins at Honolulu in 1889, a single cotype secured by the *Albatross* at Honolulu in 1896, and 2 specimens which we have from Samoa. Length, 12 inches or less.

Acanthurus incipiens Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 480, fig. 32, Honolulu (Type, No. 50707, U. S. N. M.; cotype, No. 7726, L. S. Jr. Univ. Mus.)

327. *Acanthurus brevirostris* (Cuvier & Valenciennes). "Katalolo." Fig. 176.

Head 4 in length; depth 2.5; eye 4 in head; snout 1.6; interorbital 2.9; D. vi, 27; A. ii, 28; P. 16.

Body oblong-ovate, the dorsal and ventral profiles equally curved from vertical at base of pectoral to caudal peduncle; a long pointed horn extending forward and very slightly downward from upper margin of eye, its direction nearly parallel with axis of body, its length equal to distance from tip of snout to anterior edge of pupil, its inferior edge about one-fifth greater than diameter of orbit and pro-

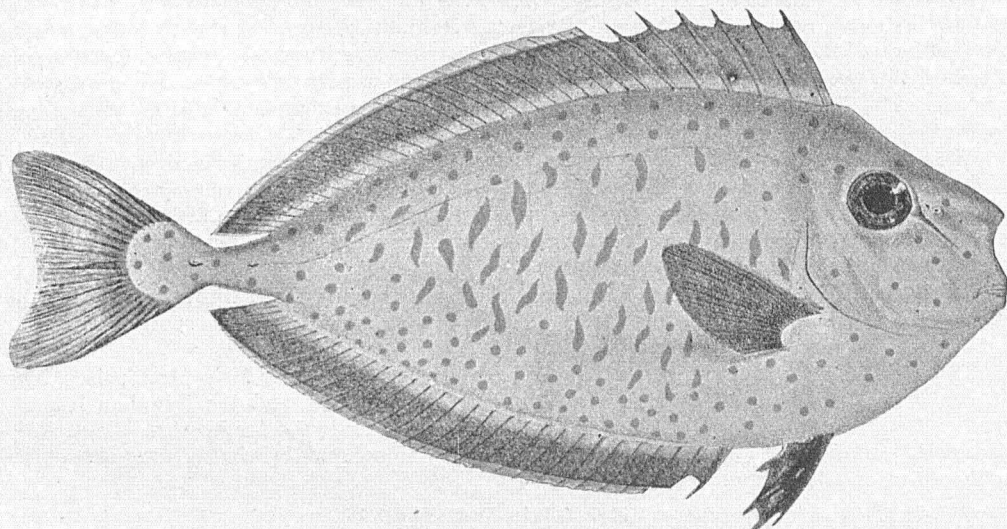


FIG. 176.—*Acanthurus brevirostris* (Cuvier & Valenciennes); after Günther.

jecting beyond snout a distance nearly equal to diameter of eye; mouth very small, horizontal, slightly below axis of body; each jaw with a single series of very short close-set bluntly pointed canines, their edges faintly serrulate; a short, curved groove below nostrils in front of eye, its length 1.4 in eye; gill-opening long and much curved, the anterior arm extending forward to vertical of nostrils, length of slit equal to distance from tip of snout to posterior edge of pupil; a short groove extending upward and forward just back of angle of mouth, its length 1.4 in eye; interorbital space rather broad, convex, the median ridge scarcely appearing until on occiput.

Body and head smooth and velvety when stroked from head backward, but very rough in opposite direction; each side of caudal peduncle with 2 moderate bony plates, each plate with a rather high median keel, highest anteriorly, not hooked in any of our specimens; lateral line complete, appearing as a slight ridge or raised tube, arched somewhat above the pectoral, thence following curvature of the back to caudal peduncle.

First dorsal spine strong, rough laterally, slightly broadened toward base, inserted in front of upper end of gill-opening, its length 2.2 in head; second and third dorsal spines a little longer, fourth to sixth a little shorter, the spines alternately stronger and weaker; dorsal rays weak, their length about equal to that of the spines; anal spines slender, the second the longer, about 1.4 in first

dorsal spine; caudal emarginate, the distal edges of the lobes forming a shallow reentrant angle, the lobes not produced, their length about 1.2 in head; ventral spines slender, their tips reaching base of second anal spine, their length 1.9 in head; pectoral moderate, 1.4 in head.

Color of nearly fresh example (No. 03354), blackish olive; side of head and body covered profusely with small black specks; fins all brownish black; caudal palest, a black blotch on its base, the edge dark; iris pale yellow.

Another example 7 inches long (No. 03398), when fresh, was dark drab, almost dove-color above, paler below; a pale horizontal streak below eye, which shows faintly as a pale lateral streak; caudal peduncle and spines of same color, dorsal and anal unmarked, the spines drab, the membranes darker; caudal dusky at base, then broadly creamy, the posterior edge blackish drab; pectoral and ventrals also drab, the edge paler; no yellow, blue, or red markings or shades anywhere; posterior edge of caudal black.

Still another example (No. 03538) has the general color dark brown with bluish showing through, the blue being evident on lower parts of body, over the head, breast and belly, and on region along edge of opercle; fins with a distinctly bluish tinge; side of body with many transverse rows of dots and short bars of darker brown.

The species shows considerable variation in form and color, the former varying much with age. In our smallest individuals the depth is greater (2.25 in length), the back is somewhat more arched, and the horn is shorter, not projecting beyond the snout. Not until in examples about 8 inches long does it project beyond the snout, and in some individuals 9 inches long it scarcely projects. In the young (7 inches) the caudal spines are very small and weak. They usually, but not always, grow stronger with age. The distance between them varies somewhat. In one example (No. 05668) they are much closer together than in others of the same size.

The color seems to vary without reference to size. Most of our examples in alcohol show few or no dark spots or vertical bars, while one 11-inch example (No. 03354) is profusely covered on head and body with small round black spots which on posterior half of side tend to arrange themselves in vertical bars. Another example 8 inches long (No. 02968) is almost without spots, but has about 25 rather distinct dark-brown vertical lines.

One example (No. 02968), which has been in alcohol a year, still shows tip of tail sulphur-yellow, pale within; side with vertical darker lines. These variations are all within the species.

Description based chiefly on a specimen (No. 05668) 11 inches long.

This fish is of wide distribution, having been recorded from Ceylon, the Malay Archipelago, Macassar, Amboyna, Port Resolution, Aneityum, Kingsmill Island, Tahiti, and the Hawaiian Islands, in which latter region it is not rare, though previously recorded only by Doctor Jenkins. Our collection contains 12 examples (4 obtained by Jenkins), all from Honolulu. Specimens were also obtained by the *Albatross* at Honolulu.

Naseus brevirostris Cuvier & Valenciennes, Hist. Nat. Poiss., X, 277, pl. 291, 1835, no locality; Günther, Cat., III, 349, 1861 (Ceylon; Malayan Archipelago; Macassar; Amboyna; Fort Resolution; Aneityum); *ibid.*, Fische der Südsee, IV, 121, pl. LXXIX, fig. A, 1875 (Kingsmill Island; Tahiti).

Acanthurus brevirostris, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 481 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 534 (Honolulu).

328. *Acanthurus unicornis* (Forskål). "*Kala*."

Head 3.9 in length; depth 2; eye 4 in head; snout 1.2; interorbital 3.4; D. VI, 30; A. II, 28; P. IV; V. I, 3.

Body short, deep, and compressed, elevated anteriorly, highest at beginning of dorsal; snout pointed, usually projecting behind the frontal horn; profile of snout straight from tip to the long bluntly pointed or conic horn which projects forward and downward from preocular region, this horn varying greatly with age, most prominent in the adult, scarcely developed in the young, in which it appears merely as a blunt projection, the upper profile of the snout being concave; teeth small, bluntly pointed canines, not serrated, close-set and slightly recurved; a short, nearly vertical shallow groove in front of eye under nostrils, its length equal to half diameter of eye; gill-opening long, oblique, strongly curved, its length nearly equaling that of head; origin of dorsal fin over upper end of gill-opening; dorsal spines strong, rough, the first 2 in head, the others successively shorter; dorsal rays slender, weak, the longest about equal to first spine; origin of anal fin under base of sixth dorsal

spine; anal spines short, about 2 in first dorsal spine; anal rays short, 1.25 in first dorsal spine; caudal deeply lunate, the lobes pointed; ventral spine rough, sharp pointed, 2 in head; pectoral short, 1.4 in head. Skin uniform, rough velvety; caudal peduncle with 2 low, spiniferous plates on each side, distance between them about two-thirds diameter of eye.

Color in life of a specimen (No. 02980) 12.5 inches long, dirty olive, paler below; top of head and horn dark olivaceous; caudal spines pale blue; dorsal fin pale blue, crossed by about 6 narrow pale yellow lines, curving upward and backward, edge of fin narrowly blue; anal similarly marked, the blue border broader; caudal dirty olive, darkest in the center and on the upper and lower margins, posterior part pale olive; pectoral pale, brownish underneath; axil pale, with 2 or 3 small blue spots; ventrals pale. An example (No. 02997) 7 inches long, did not differ particularly from larger examples; general color pale olive, yellowish anteriorly; snout and top of head back to dorsal blackish; dorsal fin pale orange, crossed by narrow pale blue lines, the fin edged with blue; anal pale orange, with 2 broad pale blue bands, a narrower darker blue band at edge, with a narrow whitish border; caudal dusky; pectoral pale; ventrals whitish, darkish at tips; iris silvery, whitish yellow, a dark spot above and another below. Another example (No. 03449), had the upper part of the body gray, the lower part yellow forward, with golden tinge along region of anal; dorsal fin dirty yellow, with very narrow blue border; anal golden, with 2 narrow bands of bluish white parallel with outline of body, outer border same as dorsal, with narrow blue line; caudal grayish; ventrals yellowish; pectoral colorless. An example from Hilo when fresh was dirty olive, spines violet blue.

Color in alcohol, dusky brownish above, paler below; caudal spines black; dorsal fin dark brown along base, the membranes above lighter brown crossed by pale bluish stripes extending upward and backward; anal similar to soft dorsal; ventrals pale, dusky at tip; pectoral dusky.

This curious and interesting fish is abundant among the Hawaiian Islands, and is widely distributed in the tropical Pacific and the East Indies to the Red Sea. Jenkins obtained 9 examples at Honolulu, and we have 10 from the same place; also 3 specimens from Hilo. The *Albatross* found it at Honolulu and at Puako Bay, Hawaii.

Our specimens are 4.5 to 14 inches long.

Chatodon unicoloris Forskål, Descript. Animal., 63, 1775, Djidda.

Monoceus rati Schneider, Syst. Ichth., 181, 1801, no locality.

Monoceus bleucalcatus Schneider, Syst. Ichth., 180, pl. XLII, 1801, shores of Arabia.

Naso fronticornis Lacépède, Hist. Nat. Poiss., III, 105, 106, pl. VII, fig. 2, 1801, Isle of France.

Acanthurus unicoloris, Shaw, Gen. Zool., IV, 374, pl. 50, 1803 (Indian and Arabian seas); Jenkins, Bull. U. S. Fish. Comm., XXII, 1902 (Sept. 23, 1903), 481 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 534 (Honolulu; Puako Bay, Hawaii).

Aspirurus unicoloris, Rüppell, Atl. Reis. Nörd. Af., Fisch., 60, 1828.

Naseus longicornis Cuvier in Guerm Meneville, Icon. reg. anim., pl. 35, fig. 3, 1830-44.

Naseus fronticornis, Commerson in Cuvier & Valenciennes, Hist. Nat. Poiss., X, 259, 1835 (Isle of France; Waigiu; Bourbon; Tahiti; Carolines; Guam; Sandwich Islands; Red Sea at Djeddah; Cape Mohammed).

Naseus olivaceus Cuvier & Valenciennes, Hist. Nat. Poiss., X, 288, 1835, Tahiti (young).

Chatodon olivaceus, Solander in Cuvier & Valenciennes, Hist. Nat. Poiss., X, 288, 1835.

Harpurus monoceus Forster, Descript. Animal., Ed. Lichtenstein, 219, 1844, Tahiti.

Acronurus aegyptius Gronow, Syst. Nat., Ed. Gray, 191, 1854, Red Sea.

Acronurus corniger Gronow, Syst. Nat., Ed. Gray, 192, 1854, Red Sea.

Naseus unicoloris, Günther, Cat., III, 348, 1861 (Ceylon; Frankland Island; Red Sea, Anceityum), Günther, Fische der Südsee, IV, 118, taf. LXXVIII, figs. 1 to 4, 1875 (Tahiti; Lat. 13° S., Long. 146° W., north of Society Islands (Red Sea to Sandwich Islands); Streets, Bull. U. S. Nat. Mus., No. 7, 68, 1877 (Honolulu); Steindachner, Denks. Ak. Wiss. Wien, LXX, 495, 1900 (Honolulu; Laysan).

Monoceus unicoloris, Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 513, (Sandwich Islands).

Genus 183. CALLICANTHUS Swainson.

This genus differs from *Acanthurus* in having no horn upon forehead. Tail with 2 bony plates, with or without spines; dorsal spines 5 or 6; teeth not serrulate. Not very distinct from *Acanthurus*.

Callicanthus Swainson, Nat. Hist. Fishes, etc., II, 256, 1839 (*elegans*).

- a. Caudal spines scarlet interorbital comparatively narrow, about 3.4 in head; head with an orange or yellow line from eye to angle of mouth *lituratus*, p. 401
- aa. Caudal spines gray; interorbital wider, 3 in head; head without orange or yellow line *metoposophron*, p. 406

329. *Callicanthus lituratus* (Forster). Plate LX,^a and Fig. 177.

Head 3.8 in length; depth 2.2; eye 5 in head; snout 1.2; interorbital 3.4; D. vi, 29; A. ii, 30; P. 16.

Body oblong-ovate, the greatest depth at base of third dorsal spine; dorsal outline nearly straight from tip of snout to origin of dorsal fin, thence in a long low curve to caudal peduncle; no horn or prominence on forehead; ventral outline strongly convex from posterior part of chin to origin of anal, thence curved uniformly with the back; chin strongly concave, the snout projecting; mouth small, horizontal, in line with axis of body; jaws each with a single series of close-set, bluntly pointed canines of moderate size, the edges not serrulate; groove in front of eye short, not half length of orbit; gill-opening long and oblique, equaling snout, its upper end in line between upper base of pectoral and base of second dorsal spine; interorbital evenly convex, the preocular edge of orbit somewhat prominent. Body velvety; each side of caudal peduncle with 2 strong horny plates each with a strong, broad flat spine curved forward, these little developed in the young; in the example upon which this description is chiefly based (No. 03493, 12.25 inches long), these spines are nearly as wide at base as high, the chord of the posterior edge being longer than orbit; distance between tips 3 in head; first dorsal strong, broad at base, rugose, its length about 2.1 in head; dorsal spines heteracanthous, alter-

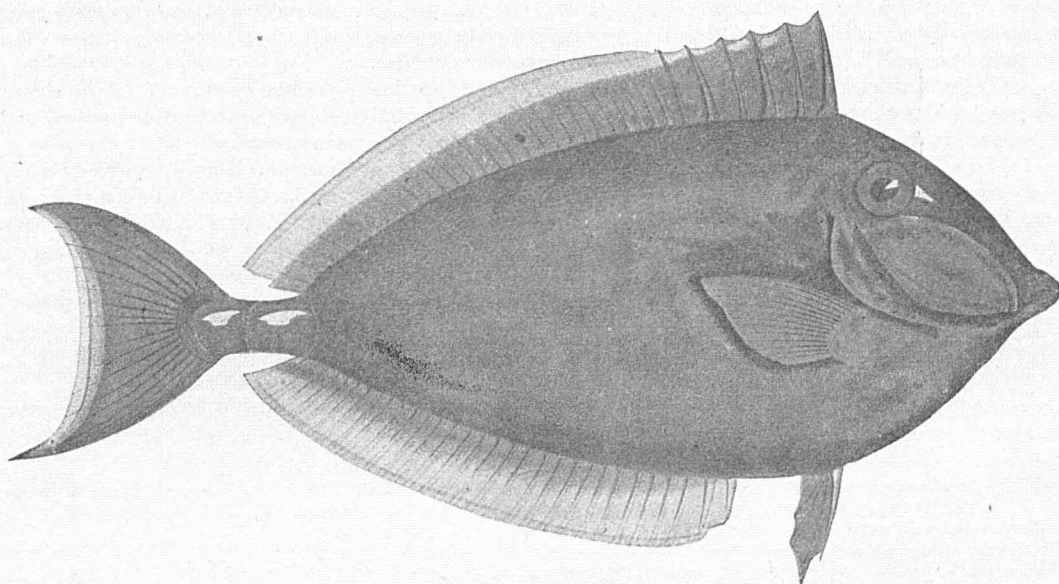


FIG. 177.—*Callicanthus lituratus* (Forster); after Günther.

nately strong and weak on opposite sides; dorsal rays somewhat longer than the spines, especially anteriorly; anal spines shorter, of about equal length, about 3.6 in head; ventral spines strong, reaching midway between bases of first and second anal spines, their length 2 in head, pectoral longer, 1.2 in head; caudal evenly lunate, the lobes greatly produced and filamentous in the adult male the filaments in an example 12.25 inches long (No. 03493) being 3.5 times length of middle rays; in specimens Nos. 05379 and 05381, which are nearly of equal size, the former has the lobes more than 3 times the middle rays, while in the latter they are not at all filamentous, the fin being simply lunate.

Color in life (No. 03386), nearly uniform black, slightly olivaceous below, a lemon-yellow stripe in front of eye forward on snout and curving downward just back of angle of mouth; another yellow stripe beginning behind eye extending downward as a narrow line along edge of preopercle, then curving forward and joining the other near angle of mouth; lips orange; breast and belly to anal with a lemon-yellow stripe blending into the general color; base of anal burnt umber, then changing to yellowish, then very black, the edge tipped with light blue; spines on caudal peduncle set in a deep orange-yellow blotch, the spines themselves blackish; caudal blackish, the produced rays entirely

^aBy error named *Acanthurus unicornis* on plate.

blackish, but the rest of the crescent with a band of yellowish-green about as wide as pupil, the edge tipped with white; dorsal black, with white stripe on distal portion extending from first ray to end of fin, outside of which is a very narrow black stripe, the edge narrowly tipped with white; dorsal spines black, the membranes black except edge of last 3 membranes which is whitish. An example (No. 03505), taken at Honolulu July 27, had the body dark brown; an orange-yellow line from eye to angle of mouth; lips orange; line on breast and belly orange; postocular region and between eyes somewhat yellowish, anal plates orange, the interspace white, the spines brownish; dorsal fin black, a bright blue line on body at base, a narrow white line near margin, the edge black; caudal dirt brown, a subterminal yellowish-green crescent; anal orange on outer half, shading to yellow on inner third; ventrals orange; pectoral dirt brown.

Another example (No. 03493) had color in life olivaceous, blackish above, a golden patch about and behind eye, a golden line thence forward and down to angle of mouth, joining the white edge of opercle and the orange jaws, a pale blue stripe at base of dorsal, fin black with broad white upper part and some yellowish streaks on the white, edge blackish; caudal spines deep orange; caudal blackish-olive, edged with olive within and then white; anal yellowish-olive, then bright orange, its edge black, tipped with white; ventrals dirty orange; pectoral olive and black.

The colored plate in Günther's *Fische der Südsee* belongs to *Callicanthus garretti* (Seale). We have both *garretti* and *lituratus* from Samoa, but can not decide whether they are really distinct species. The blue line at base of dorsal is characteristic of *lituratus*. It is wanting in *garretti*. If *garretti* is valid we have specimens from Hawaii.

This appears to be one of the most common fishes of this family among the Hawaiian Islands, though it has been previously recorded only by Günther, Steindachner, and Jenkins. It is a species of wide distribution, ranging from the Red Sea throughout Polynesia. Günther recorded it from Tahiti, Aneityum, Malayan Archipelago, Red Sea, and the Hawaiian Islands, and Quoy and Gaimard from Guam.

It is represented in our collections by 26 specimens from Honolulu (7 obtained by Jenkins, 1 by Wood, and 3 by the *Albatross* in 1896), 1 from Honuapo, Kona, and 3 from Hilo. Others are in the *Albatross* collections from Honolulu and Puako Bay. Our 30 examples are 5 to 12.25 inches long. Known also from Johnston Island.

Acanthurus lituratus Bloch & Schneider, Syst. Ichth., 216, 1801, no locality; after Forster.

Acanthurus harpurus Shaw, Gen. Zool., IV, 381, 1803, Indian Seas.

Aspisurus carolinianum Quoy & Gaimard, Voy. de l'Uranie, Zool., 375, pl. 63, fig. 1, 1824, Guam.

Aspisurus elegans Rüppell, Atl. Reis. Nördl. Af. Fisch., 61, taf. 16, fig. 2, 1828, Red Sea.

Prionurus conus Lesson, Voy. Coquille, Zool., II, 151, 1830, Tahiti.

Nasus lituratus, Cuvier & Valenciennes, Hist. Nat. Poiss., X, 282, 1835 (Tahiti; New Ireland; Ulea; Gulf of Suez; Isle of France); Günther, Fische der Südsee, IV, 124, pl. LXXXII, 1875 (Society and Sandwich Islands); Smith & Swain, Proc. U. S. Nat. Mus., V, 189, 1882 (Johnson Island); Steindachner, Denks. Ak. Wiss. Wien, LXX, 495, 1900 (Honolulu).

Harpurus lituratus, Forster, Descript. Animal., 218; Forster in Cuvier & Valenciennes, Hist. Nat. Poiss., X, 282, 1835.

Nasus carolinianum, Cuvier & Valenciennes, Hist. Nat. Poiss., X, 287, 1835 (Guam).

Aspisurus lituratus, Rüppell, Neue Wirbelthiere, Fisch., 130, 1838.

Monoceros lituratus, Seale, Occasional Papers Bishop Museum, Vol. I, No. 3, 113, 1901 (Agaña, Guam).

Callicanthus lituratus, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 481 (Honolulu); Snyder, l. c. (Jan. 19, 1904), 534 (Honolulu; Puako Bay, Hawaii).

?*Monoceros garretti* Seale, Occ. Papers Bishop Mus., Vol. I, No. 3, 112, 1901, Agaña, Guam. (Type, No. 216, B. P. B. M. Coll. A. Seale.)

330. *Callicanthus metoposphron* Jenkins. Fig. 178.

Head 4 in length; depth 2.5; eye 3.5 in head; snout 1.9; interorbital 3; D. VI, 29; A. II, 30.

Body rather oblong, greatly compressed, the greatest depth under last dorsal spine; anterior dorsal profile strongly and evenly convex from tip of snout to about fourth dorsal ray, entirely without horn or protuberance of any kind, thence less convex to caudal peduncle; ventral outline similar, but less convex; snout rather short; mouth small, horizontal, slightly below axis of body; teeth small, slender, close-set, and pointed, not serrulate, in a single series in each jaw; a short lunate groove in front of eye, its length equaling that of maxillary; gill-opening long and oblique, the lower arm extending far forward, the upper end on a level with lower edge of orbit and directly above upper base of pectoral; interorbital space moderately broad, the 2 sides meeting at a broad, rounded angle. Entire body and head finely granulated or velvety; each side of caudal peduncle with 2 weak, keeled horny plates, the

distance between them 1.4 in eye. First dorsal spine strong, roughened laterally, inserted above gill-opening; other dorsal spines slender, nearly smooth, pointed, the third longest, its length about equaling that of snout; dorsal rays slender and weak; shorter than the spines, the longest about 2.8 in head; anal spines slender and pointed, the second a little the longer, its length equaling diameter of eye; anal similar to soft dorsal but somewhat lower; caudal deeply lunate, the lobes not greatly produced, the upper slightly the longer; ventral spines long, rather strong, reaching base of second anal spine, their length equaling that of longest dorsal spine; pectoral of moderate length, 4 in head.

Color in alcohol, nearly uniform olivaceous brown, paler below; dorsal fin darker brown, crossed by 3 broad longitudinal lighter bands; on the spinous portion the lighter and darker markings are broken up into more or less vertical bars; membrane between first and second dorsal spines with a pale or transparent area on distal portion, the edge of fin narrowly black; anal similar to dorsal, but with less distinct bands; caudal uniform dusky; pectoral dusky, paler at tip; ventrals dusky.

This species was not obtained by us. The only known examples are the type and one cotype secured by Jenkins at Honolulu in 1889, length 9 and 10 inches, and another example 11.2 inches long, recently obtained by Mr. Berndt at Honolulu.

Callicanthus metoposophron Jenkins, Bull. U. S. Fish Com., XXII, 1902, 481 (Sept. 23, 1903), fig. 31, Honolulu. (Type, No. 50706, U. S. N. M.; cotype, No. 7727, L. S. Jr. Univ. Mus.)

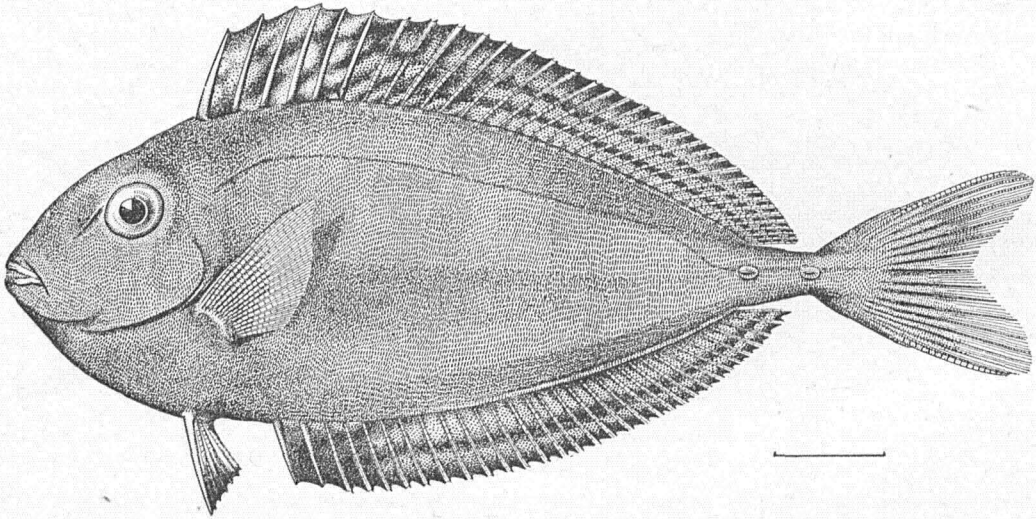


FIG. 178.—*Callicanthus metoposophron* Jenkins; from the type.

Group PLECTOGNATHI.—The Plectognathous Fishes.

One of the most important offshoots of the *Acanthopteri* is the group or order *Plectognathi*, including the 3 suborders of *Sclerodermi*, *Ostracodermi*, and *Gymnodontes*. The extremes of this group show a remarkable divergence from the usual type of spiny-rayed fishes. The more generalized forms are, however, very close to the group called *Squamipinnes*, and especially to the family of *Teuthididae*. There can be no doubt of the common origin of *Balistidae* and *Acanthuridae* and that the divergence is comparatively recent. The close connection of these groups leads us to subordinate the *Plectognathi* to the *Acanthopteri* and to place its 3 suborders in their natural position as an offshoot from the *Squamipinnes*. The *Plectognathi* may be thus defined:^a

Scapula suspended to the cranium by a post-temporal which is short, undivided, and ankylosed to the epiotic. Premaxillaries usually coossified with the maxillaries behind and the dentary bones with the articular; interopercle a slender rod; lower pharyngeal bones distinct; upper pharyngeals laminar, usually vertical and transverse; skin usually with rough shields or scales or bony plates;

^aThe definition of this group is modified chiefly from Doctor Gill. (Proc. U. S. Nat. Mus., 1884, 412.)

skeleton imperfectly ossified, the number of vertebrae usually small, typically fewer than 24 (usually 14 to 20), rarely considerably increased. Gill-openings restricted to the sides; ventral fins reduced or wanting, the pelvic bones usually elongate; spinous dorsal small or wanting; air-bladder without duct. Fishes chiefly of the Tropics, mostly inactive and depending on their tough skin or bony or spinous armature for their protection.

- a. Jaws with distinct teeth.
 - b. Spinous dorsal present; body with scales or movable plates..... *Sclerodermi*, p. 407
 - bb. Spinous dorsal wanting; body encased in an immovable carapace of hexagonal plates; the jaws, bases of fins, and tail only free..... *Ostracodermi*, p. 441
- aa. Jaws modified into a sort of beak, each with an enamel-like covering and without distinct teeth; scales rhomboid or spiniform, with root-like insertions; spinous dorsal wanting..... *Gymnodontes*, p. 424

Suborder SCLERODERMI.

The Sclerodermi may be defined as Plectognathous fishes with a spinous dorsal composed of one or more spines inserted just behind the cranium; body of the normal fish-like shape; scales rough, or spinigerous, of regular form; jaws with distinct teeth, conical or incisor-like.

- a. Ventral fins obsolete, or the pair represented by a single spine at the end of the long pelvic bone; scales rough, rhombic, or spiniform.
- b. Vertebrae in small number, 17 to 21; no barbel at chin; gill-opening not before the eyes.
- c. First dorsal composed of 3, rarely 2, spines; the first spine very large, the second locking it in erection; scales comparatively large, bony, rough, forming a coat of mail; vertebrae 17..... *Balistidae*, p. 407
- cc. First dorsal of a single spine, with a rudiment at its base; scales minute, not bony, the edges spinosecent, so that the surface of the body is rough velvety; vertebrae 18 to 21..... *Monacanthidae*, p. 418

Family LXXVI. BALISTIDÆ.—Trigger-fishes.

Body oblong or ovate, moderately compressed, covered with rather large, rough scales or scutes of various forms, not forming an immovable carapace; lateral line obscure or wanting; mouth small, terminal, and low; jaws short, each with about 1 series of separate, incisor-like teeth; eye near occiput; preorbital very deep; no barbels; gill-openings small, slit-like, above or in front of pectoral fins, not before eyes; dorsal fins 2, the anterior of 2 or 3 spines, the first highest and very strong, the second locking it in erection; second dorsal remote from the first, of many soft rays. Shore fishes of the tropical seas, of rather large size, carnivorous or partly herbivorous, very rarely used as food, many of them reputed to be poisonous.

- a. Caudal peduncle compressed.
- b. Teeth white or pale, not red.
- c. Teeth unequal, oblique, each one deeply notched.
- d. Gill-opening with a number of enlarged bony plates or scutes behind it; ventral flap movable, supported by a series of spines, more or less free at tip and resembling fin rays; cheeks entirely sealed, without naked grooves or patches.
- e. Eye with a preocular groove..... *Balistes*, p. 407
- cc. Eye without preocular groove; caudal scales spinous..... *Balistapus*, p. 413
- dd. Gill-opening with only ordinary scales behind it.
- h. Chin not projecting; cheeks closely sealed; dorsal spines 3; scales of posterior parts unarmed or keeled..... *Canthidermis*, p. 415
- hh. Chin much projecting; cheek with 3 to 5 narrow parallel grooves; dorsal spines 2; scales of posterior parts more or less keeled..... *Xanthichthys*, p. 416
- cc. Teeth even, incisor-like..... *Melichthys*, p. 417

Genus 184. BALISTES (Artedi) Linnæus. Trigger-fishes.

Body compressed, covered with thick, rough scales or plates of moderate size, 50 to 80 in a lengthwise series; a naked groove before eye below nostrils; lateral line more or less developed, very slender, undulate, conspicuous only when the scales are dry, extending on the cheeks; pelvic flap large, movable, supported by a series of slender, pungent spines; caudal peduncle compressed, its scales armed or unarmed, with or without spines or differentiated tubercles similar to those on rest of body; gill-opening with enlarged bony scutes behind it; cheeks entirely scaly, without naked patches or grooves; each jaw with irregular, incisor-like teeth, usually 4 on each side in each jaw; first dorsal of 3 spines, the anterior of which is much the largest, the second acting as a trigger, locking the first when erected;

the third nearly as large as second and remote from it; second dorsal and anal long, similar to each other; caudal fin rounded, with the outer rays much produced in the adult; branchiostegals 6; vertebrae 7+10. Species rather few, chiefly American; some of them straying to the old world.

Balistes (Artedi) Linnaeus, Syst. Nat., Ed. X, 327, 1758 (*vetula*).

Capriscus Rafinesque, Medec. 41, 58, 1810 (*porcus=capriscus*).

Chalisoma Swainson, Nat. Hist. Class'n Fishes, II, 325, 1839 (*pulcherrima*).

Capriscus Swainson, op. cit., II, 326, 1839 (*capriscus*); after *Capriscus* of Willughby.

Pachymathus Swainson, op. cit., II, 326, 1839 (*triangularis=capistratus*); the name evidently in error for *Pachygnathus*, but not so spelled; not *Pachygnathus*, an earlier name of a genus of spiders.

- a. Scales more than 60 (about 80); dorsal not highest in front; color black.....*nycteris*, p. 408
 aa. Scales 60 or fewer (50 to 60); dorsal with anterior rays more or less elevated.
 b. Origin of spinous dorsal midway between eye and gill-opening; side with dark streaks.....*fuscolineatus*, p. 409
 bb. Origin of spinous dorsal over or behind gill-opening.
 c. Dorsal and anal somewhat elevated in front; scales 60; black, the fins pale.....*vidua*, p. 409
 cc. Dorsal and anal not elevated in front; a dark streak through eye; scales 50 to 56.
 d. Scales about 50.....*bursa*, p. 410
 dd. Scales about 56; a broad pale streak behind mouth.....*capistratus*, p. 411

333. *Balistes nycteris* (Jordan & Evermann). Fig. 179.

Head 3.5 in length; depth 1.9; eye 5 in head; snout 1.25; interorbital 2.6; preorbital 1.5; D. III-33; A. 29; scales about 80.

Body short, stout, deep and greatly compressed; head short, the dorsal and ventral profiles about equally curved; caudal peduncle short, compressed, its least depth about twice diameter of eye, its

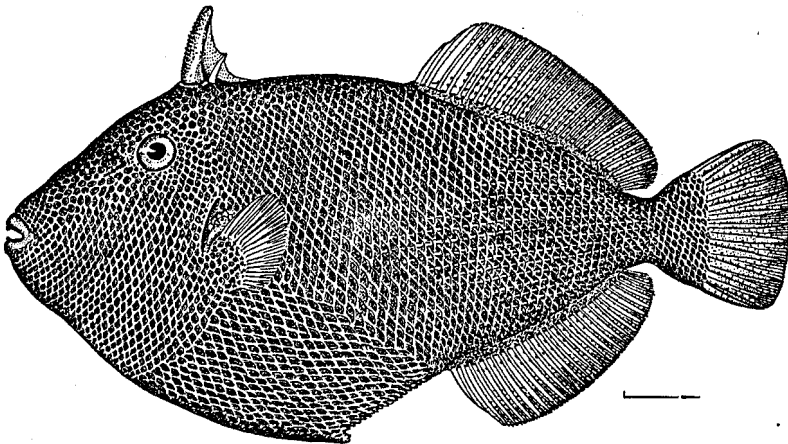


FIG. 179.—*Balistes nycteris* (Jordan & Evermann); from the type.

least width about equal to diameter of eye; a short horizontal groove in front of eye below nostrils; nostrils small, close together, in front of upper part of eye; teeth broad, close set, forming a continuous plate, teeth not united, however; lips thin; mouth small, horizontal, in axis of body, lower jaw very slightly the longer; gill-opening short, nearly vertical; a group of bony scutes under pectoral back of gill-opening, one of these considerably enlarged; scales regularly arranged in rows, their surfaces granular; lateral line beginning at posterior edge of eye, ascending to within 7 scales of spinous dorsal and continuing to near origin of soft dorsal, where it disappears; scales on posterior portion of body and on caudal peduncle each with a slightly raised crest at center, these forming series of ridges along the side. First dorsal spine strong, blunt and rough, its length about 2 in head; second dorsal spine shorter and much weaker, its length scarcely more than one-third that of first; third dorsal spine remote from the second and very short, not extending above the dorsal groove; soft dorsal gently rounded, its rays of approximately equal length, the longest equaling distance from tip of snout to posterior edge of eye; base of soft dorsal slightly greater than distance from tip of snout to posterior base of first dorsal spine, or equaling distance from tip of snout to lower base of pectoral axil; anal

similar to soft dorsal, the rays somewhat longer, the base somewhat shorter; caudal short and rounded, the rays about 1.75 in head; pectoral short, the upper rays longest, about 3 in head.

Color in alcohol, rich brownish or velvety black; spinous dorsal black; soft dorsal pale yellowish or whitish, margined with black, the lower half crossed by 4 narrow parallel black lines; anal similar to soft dorsal, but with only 2 narrow black lines on its basal half; caudal dusky, yellowish at tip; pectoral yellowish.

Only one specimen obtained, type, No. 50821, U.S.N.M. (field No. 05089), 6.25 inches long, Honolulu.

Pachynathus nycteris Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (April 11, 1903), 199, Honolulu.

332. *Balistes fuscolineatus* Seale.

Head 3.5 in length; depth 2; eye 4.5 in head; snout 1.65; interorbital 2.3; D. III-33; A. 30; scales 54, 30 from vent to spinous dorsal; first dorsal spine 1.65 in head, equal to snout; longest dorsal ray 2.2; longest anal ray 2.2; longest pectoral 2.25.

Body oblong, compressed, blunter anteriorly; head short, deep, compressed, upper and lower outlines evenly arched; eye small, high, posterior; snout blunt; mouth small, terminal; jaws equal; lips thick; teeth incisor-like, with sharp notches, giving some of them a canine-like appearance; origin of spinous dorsal midway between eye and gill-opening, first spine strong, blunt, with 4 rows of decurved short spines, 2 rows on anterior face and 1 on each side; second dorsal spine 3 in first; dorsal and anal low, outlines slightly rounded, last rays 2 in longest rays; dorsal base equal to distance from anterior base of spinous dorsal to lower edge of lower lip; anal base equal to distance from origin of spinous dorsal to origin of soft dorsal; caudal rounded, its middle ray about 2 in head, slightly shorter than first dorsal spine; ventral spine short, broad, and movable only at tip; pectoral short, broad, and rounded; body and head entirely covered with scales, those of anterior portion of body and head slightly enlarged; 6 or 7 enlarged osseous plates, each with straight lines from center to edge, behind gill-opening; 6 or 7 rows of small spines or raised tubercles on the center of each scale on posterior portion of body.

Color in life, silvery, with more or less opalescent reflections; 3 narrow dusky lines extending from anterior margin of orbit horizontally forward over snout; another dusky line over snout just above upper lip; 2 dusky lines over interorbital space; 2 rather indistinct dusky lines along base of dorsal fins, the lower of these lines beginning at orbit; also a narrow indistinct dusky line extending from posterior margin of orbit obliquely back and down to slightly above anal fin; another short dark line from upper posterior edge of orbit to axis of pectoral; 2 narrow dusky lines extending along bases of ventral and anal fins; spinous dorsal black; soft dorsal, pectoral, ventral spine, and anal fin white; caudal dusky. (Seale.)

Color in alcohol, grayish olivaceous above, lighter below; the narrow stripes across snout and interorbital dark; soft dorsal and anal pale, with indications of dark mottling; spinous dorsal dark brown; caudal color of upper part of body; pectoral pale.

One specimen, No. 03559, 5.65 inches long, from Honolulu. This and the type are the only known specimens.

Balistes fuscolineatus Seale, Occ. Papers Bernice Pauahi Bishop Museum, I, No. 4, 9, fig. 4, 1901, Honolulu. (Type, No. 664. B. P. B. M., coll. A. Seale.)

333. *Balistes vidua* Solander. "*Humuhamu hiukole*;" "*Humuhamu uli*." Plate LXI.

Head 3.5 in length; depth 2; eye 5.4 in head; snout 1.5; interorbital 2.5; D. III, 34; A. 30; scales 60, 38 from vent to origin of spinous dorsal; first dorsal spine 2 in head; longest dorsal ray 1.3; longest anal ray equal to snout; pectoral 2.25 in head.

Body oblong, compressed, more blunt anteriorly; head short, deep, compressed; eye small, high, posterior; snout thick and blunt; mouth small, terminal; jaws equal; teeth notched, incisor-like, the 2 anterior teeth of lower jaw not notched, but broad and sharp, the next 2 teeth with the anterior portion produced and hooked backward, their inner side with a grinding process; origin of spinous dorsal over gill-opening; soft dorsal and anal slightly concave, the anterior rays being produced; caudal truncate; ventral spine very short and blunt; pectoral short, slightly rounded; scales covering entire body and head, those on median portion of body largest; a distinct groove in front of eye (inadvert-

ently omitted by the artist in the drawing); a series of osseous plates behind gill-opening; a slight evidence of rows of small spines on median rows of scales on posterior part of body. Young examples have spines on side of caudal peduncle.

Color in life, uniformly dark brown with tinge of olive; membranes of spinous dorsal olive; soft dorsal and anal white, with a narrow black border along anterior and distal margins; distal portion of caudal peduncle white, fin light red, the upper and lower margins each with a narrow black line; pectoral rays bright yellow; faint violet at angles of mouth; iris yellow.

A specimen from Hilo showed in life, body blackish olive with obsolete traces of rows of yellowish spots below, which fade at death; first dorsal and pectoral dull olive; caudal broadly white at base, the rest of fin bright flesh color, its upper and lower edge narrowly blackish; second dorsal and anal pure translucent white with broad black edge.

Color in alcohol, dark brown; spinous dorsal dark brown; dorsal and anal white, edged with black; caudal white, upper and lower edges black; pectoral white.

The above description based chiefly upon No. 03140, a specimen 9.5 inches long, from Honolulu.

Balistes vidua Solander in Richardson, Voy. Sulphur, Fishes, 128, pl. 59, figs. 9 and 10, 1843, Otahiti; Günther, Cat., VIII, 216, 1870; Streets, Bull. U. S. Nat. Mus., No. 7, 57, 1877 (Honolulu); Steindachner, Denks, Ak. Wiss. Wien, LXX, 516, 1900 (Honolulu); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 482 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 534 (Honolulu).

Melichthys vidua, Bleeker, Atlas Ichth., V, 109, pl. 217, fig. 2, 1865 (Nova-Selma; Halmahera; Amboyna; Tahiti; Borabora).

334. *Balistes bursa* Lacépède. "Humuhumu lei." Fig. 180.

Head 3 in length; depth 2.1; eye 5 in head; snout 1.35; interorbital 3.3; D. III, 27 (27-29); A. 24 (24-27); scales 50, 29 from vent to first dorsal spine; length of first dorsal 1.75 in head, equal to outer caudal rays; longest dorsal ray equal to longest anal or pectoral, 2.5 in head.

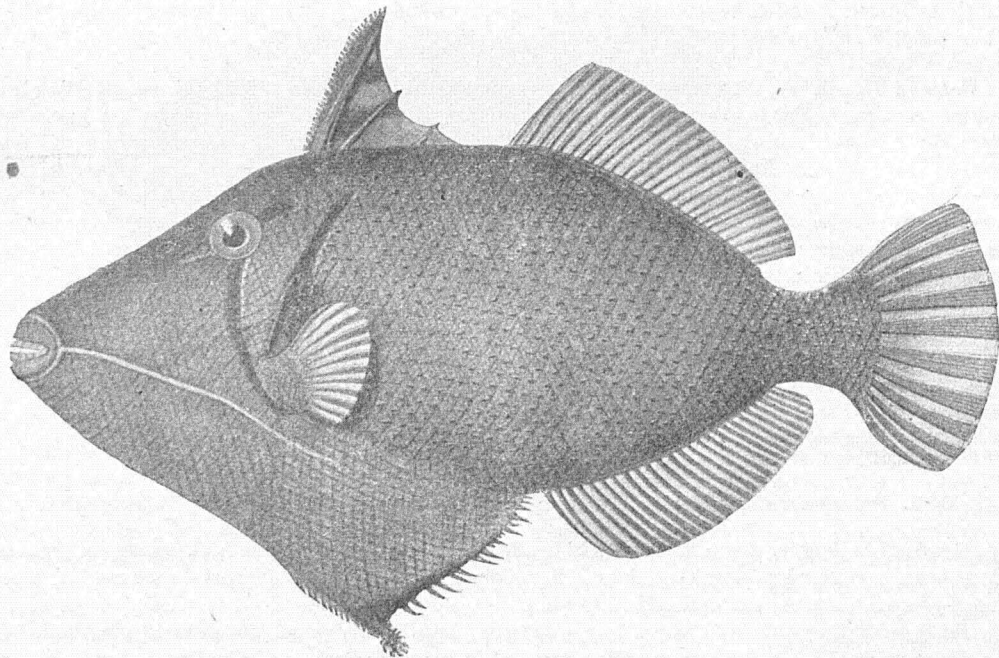


FIG. 180.—*Balistes bursa* Lacépède; after Bleeker.

Body oblong, compressed; head short, deep, compressed; eye small, high, posterior; snout thick, blunt; mouth small, terminal; lips thick; jaws equal; sharp, uneven, incisor-like teeth, those of upper jaw more distinctly notched, in the 2 anterior ones the inner notch is produced to a point, giving the teeth a canine appearance; origin of spinous dorsal slightly posterior to base of pectoral;

first spine short, thick, blunt, and rugose; soft dorsal low, ends slightly rounded, rest of outline nearly straight; anal similar to dorsal; caudal subtruncate, slightly convex; ventral spine short, broad, movable; scales covering the entire body and head; a patch of osseous plates behind gill-opening; the median part of each scale on posterior part of body with spinous tubercles, these forming stout, short, sharp spines posteriorly, weakening anteriorly, the tubercles and spines forming elevated lines along each series of scales, extending anteriorly to pectoral region.

Color in life, light drab, with darker cloudings; a narrow distinct white line from near angle of mouth to near origin of soft anal, which returns along base of ventral to base of ventral spine; an olivaceous dash extending in a curve from upper part of base of pectoral upward and backward toward middle of, but not quite reaching, the first dorsal fin; another from above and through the eye downward and backward to lower part of base of pectoral; throat and belly, below white line, light; first dorsal olivaceous with white; second dorsal and anal transparent; caudal dusky; inside of mouth black. (Jenkins.)

A color note taken from No. 03503 when alive, gives the general color light olive; the markings about eye dark olive; eye blue; line from mouth to anal bright white, area within this line white; membrane of anterior part of spinous dorsal dark olive, membrane and posterior part white; soft dorsal and anal transparent, their bases with a dark olive line; caudal dusky.

Another example, No. 03518, showed in life, in addition to the above markings, a bright yellow area along back in region under spine back as far as under posterior portion of soft dorsal. This color soon disappeared.

A specimen from Hilo showed body blackish drab; a curved blackish bar below eye, and another meeting it at an acute angle from eye across gill-opening; a blackish bar across base of pectoral; a bluish white line across mouth; a curved line from mouth to above vent then turned forward across pelvic flap, bounding the pale drab color of belly; first dorsal blackish, edge of pelvic flap black; dorsal and anal grayish white with a blackish line at base; pectoral and caudal drab, blackish at base.

Color in alcohol, brownish olivaceous, lighter below; a fine grayish white line from angle of mouth to vent, where it forms an edge to a black spot covering the vent and anal region to base of anal spine; rest of region within this line grayish white; a vertical crescent-shaped black band across posterior portion of eye, backward to below base of first dorsal and downward to lower base of pectoral; another similar band through upper base of pectoral, behind gill-opening and upward toward second dorsal spine, reaching a line on upper edge of orbit; first and second dorsal spines and membrane brown, upper part of rest of fin and edge of membrane between first and second spines white; soft dorsal and anal pale; caudal dusky. Description based chiefly upon No. 03518, a specimen 7.75 inches long, from Honolulu.

We have 16 specimens 4.75 to 8 inches long, all from Honolulu, where the species is common about the reefs.

Baliste bourse Lacépède, Hist. Nat. Poiss., I, 335, 375, 1798, Indies.

Balistes bursa, Bloch & Schneider, Syst. Ichthy., 476, 1801 (Indian Ocean); Bleeker, Atlas, V, 116, pl. 223, fig. 3, 1865; Günther, Cat. Fishes, VIII, 219, 1870 (Indian and Pacific oceans).

Balistapus bursa, Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 514 (Hawaiian Islands).

Pachymathus bursa, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 483 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 534 (Albatross Station 4032, off Diamond Head, Oahu Island).

335. *Balistes capistratus* Shaw. "*Humuhumu mimi*." Fig. 181.

Head 3 in length; depth 2.1; eye 7 in head, —5.5 in smaller examples; snout 1.4; interorbital 3.4; D. III, 30; A. 27; scales 56, 33 from vent to first dorsal spine; longest dorsal spine 2 in head, equal to depth of caudal at root of rays; longest dorsal ray equal to longest anal ray, 3 in head; pectoral 3 in head.

Body oblong, compressed; head blunt, compressed; eye small, high, posterior; snout blunt, thick; mouth small; lips thick; jaws equal; teeth incisor-like, with a sharp projection on the anterior side; this more marked in upper jaw, giving the teeth a somewhat hooked canine appearance. Origin of first dorsal slightly posterior to upper base of pectoral (this base being midway between eye and dorsal); first spine strong, blunt, and rugose; dorsal and anal low, outline slightly rounded; caudal truncate, subtruncate, or slightly doubly convex in smaller examples; ventral spine short, broad, and blunt.

Scales cover entire head and body; osseous scutes behind gill-opening; a tubercle on the anterior median portion of scales on the posterior median part of body and caudal peduncle, forming 7 or 8 rows of tubercles.

Color in life, body uniform light brown, fins same color, plain; rosy line beginning slightly behind and below angle of mouth, extending backward and slightly downward to vertical from eye, here joined by another of same color extending under chin. Another specimen showed membrane of first dorsal olivaceous, with a black blotch; scaled skin pushed back from the chin shows bright orange-yellow; outer margins of soft dorsal and anal light.

A specimen from Hilo showed body dirty olive-brown; fins dirty olive-brown, dorsal and anal somewhat paler along the edge; a golden half ring along lower jaw, a faint whitish half ring behind it, then another on chin still fainter, this prolonged backward a little at the angle, sometimes forming a distinct stripe back to breast.

Color in alcohol, brown; dorsals, caudal and anal a slightly darker brown than body with tips of fins lighter; a black blotch on upper part of first membrane of spinous dorsal; pectoral dusky at base, tips pale dusky whitish; a yellowish white ring around lower jaw a short distance from the lip; a

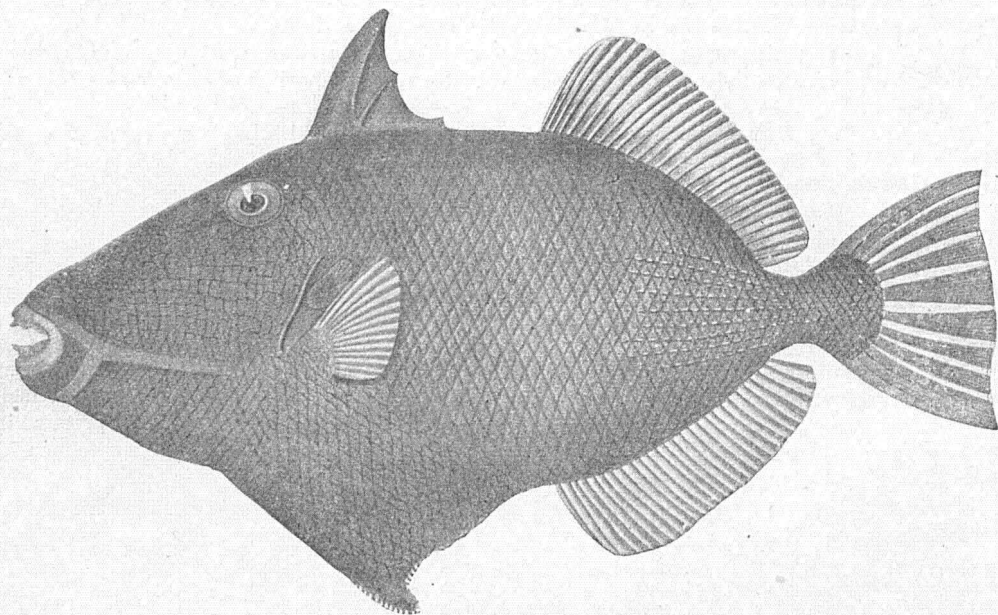


FIG. 181.—*Balistes capistratus* Shaw; after Bleeker.

straight yellowish white stripe from angle of mouth through upper edge of ring and toward lower base of pectoral, not quite reaching the pectoral; this ring and stripe not very evident on some examples, and easily overlooked. Description based chiefly on No. 03139, from Honolulu. This species is common about Honolulu, from which place we have 4 other specimens. They are 8.5 to 11.75 inches long.

Le Baliste bridé Lacépède, Hist. Nat. Poiss., I, 1798, p. 335; **without locality**; on a drawing by Commerson.

Balistes capistratus Shaw, Genl. Zool., V, 1804, 417 (after Lacépède; not *Pachynathus capistratus*, Jordan & Evermann, Bull.

47, which is a distinct species found along the Mexican coast, with smaller scales, = *Balistes verres* Gilbert & Starks).

Balistes mitis Bennett, Proc. Comm. Zool. Soc., I, 1831, 169, **Mauritius**; Günther, Cat., VIII, 218, 1870.

Balistes amboinensis Gray, in Hardwicke, Illus. Indian Zool., I, 1832, Pisces, taf. VIII, fig. 2; **Amboyna**.

Pachynathus triangularis Swainson, Classn. Fishes, II, 326, 1839, **Vizagapatam**; after Russell, pl. xx.

Balistes hihpe Richardson, Voy. Sulphur, Fishes, 127, 1843, **East Indies**.

Balistes frenatus Richardson, Voy. Sulphur, Fishes, 129, 1843, **East Indies**.

Balistes schmittii Bleeker, Verh. Bat. Gen., XXIV, 37, 1852, **Sumatra**.

Balistes (Balistapus) frenatus, Bleeker, Atlas Ichth., V, 114, pl. 223, fig. 2, 1865 (Java; Sumatra; Celebes; Amboyna; Oöl).

Pachynathus capistratus, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 483 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 534 (Honolulu).

Genus 185. **BALISTAPUS** Tilesius.

This genus has the head and body closely scaled, the scales of the posterior parts more or less spinous; enlarged scales behind the gill-opening, the lateral line obsolete and no groove before the eye. Species numerous in the Indian and tropical seas, small and rather brightly colored.

Balistapus Tilesius, Mem. Ac. Nat. Sci. Petersb., VII, 1820, 302 (*capistratus* of Tilesius, not of Shaw, *undulatus*).

Rhinccanthus Swainson Classn. Anim., II, 325, 1839 (*ornatissimus*=*aculeatus*).

- a. A broad black band on side, extending downward and backward, from eye and lower base of pectoral, to vent and fourth from last anal ray; a wedge-shaped black band covering entire caudal peduncle, pointed anteriorly, and bounded by narrow greenish lines *rectangulus* p. 413
 aa. No black band on side; no black wedge-shaped band on caudal peduncle; 4 or 5 oblique stripes on lower posterior side of body; a pale patch under caudal spines *aculeatus*, p. 414

336. *Balistapus rectangulus* (Bloch & Schneider). "*Humuhumu mukumuku apua'a*." Plate LXIII.

Head 2.6 in length; depth 2; snout 1.25 in head; eye 5.3; interorbital 3.75; D. III, 26 (24 to 26); A. 20; first dorsal spine 2.3 in head, equal to length of pectoral; longest dorsal ray 2.8; base of soft dorsal equal to snout; longest anal ray 3, base of anal 1.65 in head; scales 40, 28 from anterior base of spinous dorsal to vent; interorbital space prominent, equal to cleft of mouth.

Body oblong, compressed, dorsal and anal outlines similarly and evenly arched; head large; snout long, thick and blunt; mouth small, with thick lips; a single row of 8 sharp-notched, incisor-like teeth in each jaw; eye small, high, posterior; first dorsal commencing above the gill-opening, the first spine blunt and strong, its anterior edge rugose; soft dorsal and anal moderate, with rounded profile; caudal slightly rounded; ventral spine movable, supported by a series of slender sharp spines; pectorals broad, rounded; entire body and head scaled, some osseous plates behind the gill-opening; three and a half rows of sharp recurved spines on side of caudal peduncle. In a smaller example, 5 inches long, the upper row is the short row, in the larger examples, 8 inches long, the rows are irregular and sometimes as many as 6 are present; the number of rows does not seem to be uniform.

Color in life, upper part of body and head light brown, becoming lighter toward snout; 3 narrow black bands reaching from one eye to the other, the borders and spaces, wider than the bands, green; the posterior band on head passing downward, and after an abrupt bend backward just above gill-opening, becoming a violet line running along middle of body to a vertical from tip of third dorsal spine, where it forms an acute-angled fork, each prong a brilliant yellow line, the upper ending at about base of third from last dorsal ray, the lower ending at a corresponding position on base of anal; within the fork are 2 other bright yellow lines parallel with the prongs of the fork, forming anteriorly an acute angle on a vertical through the first third of dorsal.

Color in life of another example (No. 03358, Honolulu), top of head, back, and upper half of side dusky light orange-brown, interocular region dusky greenish-blue, brighter blue on anterior and posterior edges, crossed by 3 narrow black lines, one ending at middle of orbit above and one each at anterior and posterior border; below eye a black area at first as broad as eye, then widening, inclosing pectoral and extending downward and backward to vent and as broad as to fourth from last anal ray, this bounded anteriorly by 2 pale blue bars separated by a narrow dull orange one; a similar blue border along upper margin to near middle of side, where it changes to a bright greenish-yellow band extending to base of last anal ray but 2; at point where this line changes from blue to yellow, a similar line leaves it and passes across side to third dorsal ray from the last; caudal peduncle jet black, extending forward in a sharp point and bounded in front and behind by narrow greenish-yellow lines; snout brownish-white, a rather broad pale blue band over snout and down to angle of mouth on each side; soft dorsal, anal, and caudal pale, the latter with a broad light brown bar on basal part; spinous dorsal dusky, brownish, or black; vent black; pectoral jet black at base, then a rich red crescent, outer part of fin blackish-white; iris dull brown; belly white.

Color in alcohol, grayish brown above, becoming lighter below; a very dark blackish brown band passing through and downward from eye, widening below eye to lower base of pectoral, continuing backward to vent, its width on body being from vent to posterior third of anal; a small, narrow, similarly colored line extending from anterior part of eye to upper anterior base of pectoral, curving slightly forward; a light narrow violet band extending over snout from cleft to cleft of mouth; the 3

narrow bands between eyes almost black, the lines edging the broad band on side and the acute-angled dark brown spot on caudal grayish blue; spinous dorsal brown; soft dorsal, anal, and pectoral light; caudal dusky; base of pectoral black. Description based chiefly on No. 03714, a specimen 8 inches long, from Honolulu.

We have 9 examples, 4.85 to 9 inches long, all from Honolulu, where the species is common.

Balistes rectangulus Bloch & Schneider, Syst. Ichthy., 465, 1801, Indian Ocean; Günther, Cat., VIII, 225, 1870; Day, Fishes of India, 691, pl. CLXXVIII, fig. 2, 1878; Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 517 (Honolulu).

Balistes cinctus Bleeker, Atlas, V, 119, pl. 228, fig. 1, 1865, East Indies.

Balistapus rectangulus, Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 514 (Hawaiian Islands); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 483 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 534 (Honolulu; Puako Bay, Hawaii).

337. *Balistapus aculeatus* (Linnaeus). “*Humuhumu nukunuku apua*.” Plate LXII.

Head 2.75 in length; depth 2.2; snout 1.15 in head; eye 7; interorbital 3.75, equal to cleft of mouth; D. III, 24; A. 22; first dorsal spine 2.3 in head, equal to length of pectoral; longest dorsal ray 3 in head, base of soft dorsal 1.3 in head; longest anal ray 3.5 in head, base of anal 1.5 in head; scales 38, 24 from anterior base of spinous dorsal to vent.

Body oblong, compressed; dorsal and anal outlines similarly and evenly arched; head large; snout thick and blunt; mouth small, with thick lips; teeth rather long, incisor-like, notched, those in lower jaw the longer, those of upper jaw more notched; eye small, high, posterior; origin of first dorsal slightly posterior to gill-opening, the first spine blunt and strong, its anterior edge rugose; soft dorsal and anal moderate, with rounded profile; caudal slightly rounded; ventral spine movable, supported by a series of slender sharp spines; pectorals broad, rounded; scales covering entire head and body, those under soft dorsal slightly enlarged; some osseous plates behind gill-opening; usually 2½ rows of sharp recurved spines on caudal peduncle, in some examples 2 full rows and from 1 to 3 shorter broken rows.

General color in life (taken from No. 03455) yellowish green above, whitish below; lips pale yellow; a narrow blue stripe extending from back of angle of mouth over snout to opposite side; snout and side of head pale greenish yellow, becoming paler below; 4 bright blue lines across top of head between eyes, these separated by greenish lines of similar width; three narrow blue lines extending from eye downward to lower anterior base of pectoral, the first and last somewhat convex, the middle one nearly straight, the space between first and second yellowish white, that between second and third greenish; an irregular club-shaped band of orange-yellow from base of pectoral to snout, the posterior end somewhat expanded and more reddish, the anterior end gradually broadening and passing on each side into the blue band across nose; side below spinous dorsal pale yellow, somewhat dusky at base of spines; back of this an oblique broad, brick-red bar, then a shorter greenish-yellow one which is followed by a broader bluish-green bar, these all encroaching upon the soft dorsal and extending downward and forward, merging into an irregular broad longitudinal dusky area on middle of side, from which extend downward and backward 5 narrow curved greenish-yellow projections, separated by whitish spaces of similar width which are encroachments from the general color of the ventral surface; side of caudal peduncle with a broad longitudinal pale bluish band in which are set the 4 series of small spines; base of caudal fin and tip of peduncle pale rosy; soft fins all dirty whitish, somewhat washed with rosy and yellowish; first dorsal spine dusky in front, bluish on side; membranes connecting spines pale, with slight bluish wash; base of pectoral with a narrow black vertical line.

Color in alcohol, grayish with a large ragged-edged dark spot on side of body, one of the long edges extending to anal, broadening around anal region; 4 dark bluish black bands, divided by 3 narrower brown ones, between eyes; 3 narrow bluish gray lines from eye to base of pectoral, the anterior one curved forward and extending from front part of eye to lower part of pectoral base, the other 2 are separated by a darkish brown band as wide as eye and extending to base of pectoral; a bluish gray band over front of snout, ending just posterior to cleft of mouth; the edges of dark spot on side edged with violet gray, these nearly filling the spaces and giving the appearance of 4 or 5 bands extending from the axis downward to anal fin; a large grayish spot under spinous dorsal, another under anterior half of soft dorsal, these separated by an arm of the dark spot on side; violet gray on the anterior region covered by spines of caudal peduncle; spinous dorsal brown; other fins pale. Description chiefly from No. 03456, a specimen 8.5 inches long, from Honolulu.

We have 6 examples, 8 to 9.25 inches long, all from Honolulu, where the species is rather common, though less so than in Samoa. Known also from Johnston Island.

Balistes aculeatus Linnæus, Syst. Nat., 10th ed., 328, 1758, India; Bleeker, Atl. Ichthy., V, 120, 1865, pl. 216, fig. 3 (East Indies on all islands); Günther, Cat. Fish., VIII, 223, 1870 (Ile de France, Johanna, Zanzibar, Molucca, Amboyna, China, Fiji, Seychelles); Day, Fishes of India, 690, 1878, pl. CLXXVIII, fig. 3; Smith & Swain, Proc. U. S. Nat. Mus., V, 1882, 139 (Johnston Island).

Balistes ornatus Lesson, Voy. Coquille, II, 119, 1830, pl. x, fig. 1, Borabora.

Balistes armatus Cuvier, Règne, Anim., Illust., pl. cxii, fig. 2, 1846, Indian Seas.

Balistes striatus Gronow, Syst. Nat. Ed. Gray, 32, 1854, American Seas.

Balistapus aculeatus, Jordan & Fowler, Proc. U. S. Nat. Mus., XXV (Sept. 17, 1902), 259 (Naha, Japan); Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 534 (Honolulu).

Genus 186. CANTHIDERMIS Swainson.

This genus differs from *Balistes* chiefly in having the gill-openings surrounded by ordinary scales, there being no developed bony scutes behind them. Body much more elongate than in *Balistes*; dorsal spines 3; dorsal and anal elevated in front; caudal with its angles acute; scales moderate, not very rough; scales of caudal peduncle unarmed, or with a median spine; cheek completely scaled; a naked groove before eye. Species inhabiting both Indies.

Canthidermis Swainson, Class'n. Anim., II, 325, 1839 (*angulosus*).

a. Dorsal III, 26; scales 55 or 56; color brown, with round or ovate whitish spots *angulosus*, p. 415
aa. Dorsal III, 28; scales 44; color uniform brownish above, sides shining golden *aureolus*, p. 415

338. *Canthidermis angulosus* (Quoy & Gaimard).

D. III, 26; A. 24; scales 55 or 56.

Tail without spines or tubercles; scales very conspicuously granulated and provided with a larger prickle at the base, which is prominent in young examples, but disappears more or less with age. From 31 to 39 scales in a transverse series running from the origin of the dorsal fin to the vent; no enlarged scales behind the gill-opening; anterior parts of the dorsal and anal fins much elevated, more so in the adult than in young examples; caudal subtruncate; ventral spine short, somewhat ankylosed with the pelvic bone.

Color brown, with round or ovate whitish spots, in young examples these spots more indistinct and mixed with darker spots of the same size, and pure white dots; sometimes uniform brown or uniform deep black (Günther). (Description of *Canthidermis rotundatus*, called "*Balistes maculatus*").

The only record of *Canthidermis* from the Hawaiian Islands is that of Quoy and Gaimard, who described as a new species, *Balistes angulosus*. The following is a translation of their description:

"*Balistes*, with black body; blunt snout; short sharp antrorse dorsal spine; dorsal and anal fins triangular; caudal short, rounded.

"2° D. 23; p. 15; A. 20; C. 12.

"The form of this balistes is subovoid; its forehead is broad, with a small keel in the middle; its snout rounded; its teeth are incisor-like and pointed; the mouth and the eye are small. It is somewhat behind the latter that the short and strong spine of the first dorsal rises, which presents in front three lines of spines.

"The dorsal and anal fins are elevated, triangular, obtuse, directed backward, and one is nearly as large as the other; however, the first has twenty-three rays and the second has only twenty; the lobe of the tail is quadrilateral and the fin rounded; the pectorals very small, directed upward, are composed of fifteen rays. The body is black and covered with small scattered prickles, with a triangular base and bent backward.

"The length of this fish is 3 inches; its depth 20 lines, and its thickness 6. It inhabits the waters of the Sandwich Islands." It is perhaps different from *C. rotundatus* of the East Indies and *C. maculatus* of the West Indies.

Balistes angulosus Quoy & Gaimard, Voy. Uranie, Zool., 210, 1824, Sandwich Islands.

339. *Canthidermis aureolus* (Richardson).

Dorsal III, 28; anal 25; lateral line 44; tail without spines or tubercles, but with indistinct raised lines along the series of scales; no enlarged scales behind the gill-opening; dorsal and anal fins not elevated, caudal truncated; ventral spine not movable, short. Uniform brownish above, sides shining golden; fins without color. Dorsal spine of young examples (1 inch) with recurved spinelets.

The only record of the occurrence of this species within our limits is that given by Steindachner. Its relation to other nominal species of the genus is somewhat uncertain.

Balistes aureolus Richardson, Voy. Sulphur, 126, pl. 59, figs. 1 and 2, 1843, East Indies?; Günther, Cat., VIII, 215, 1870.

Balistes (Liurus) aureolus, Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 517 (Laysan Island).

Genus 187. **XANTHICHTHYS** Kaup.

Body oblong, covered with moderate-sized smoothish scales, those on posterior part of body usually with blunt keels; no enlarged scutes behind gill-opening; no lateral line, or only a trace at the shoulder; a groove before the eye; 3 to 5 narrow grooves on the cheek; caudal peduncle deeper than broad; dorsal spines 2, comparatively small; soft dorsal and anal moderately elevated, the tips acute; caudal lunate; mouth small, placed high, the teeth as in *Balistes*; lower jaw much projecting; ventral flaps undeveloped, immovable, and scaled over. Chiefly American; allied to *Canthidermis*, but differing in several respects, especially in the grooved cheeks, projecting chin, and fewer dorsal spines.

Xanthichthys (Kaup) Richardson, Encyclopedia Britannica, Ed. XII, 313, 1856 (*curassavicus*).

340. **Xanthichthys lineopunctatus** (Hollard). Fig. 182.

Head 3.5 in length; depth 2.5; eye 4.75 in head; snout 2; interorbital 3; D. 11-1, 29; A. 1, 27; scales 37, 23 from anal to origin of spinous dorsal; first dorsal spine 2 in head, equal to snout; third dorsal ray longest, 1.6 in head, equal to longest caudal ray, last caudal ray shortest, 4.5 in longest; third anal ray 1.9 in head, 2 in soft dorsal base; last anal ray shortest, 4.5 in longest; pectoral 2.3 in head.

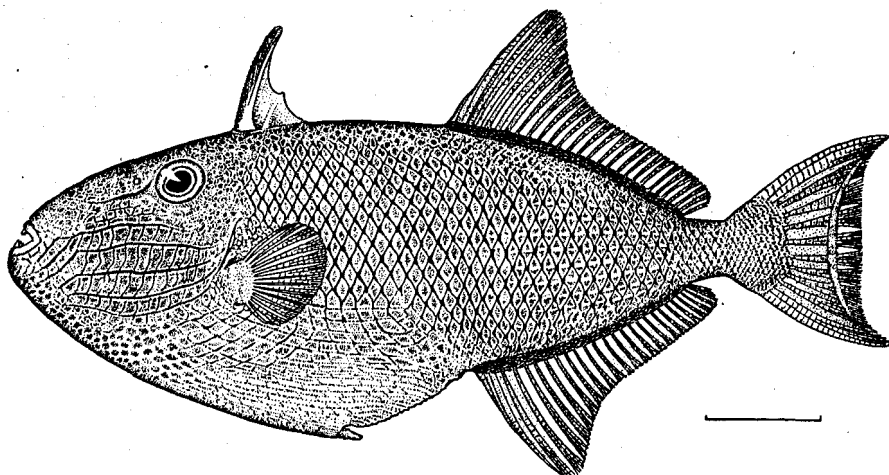


FIG. 182.—*Xanthichthys lineopunctatus* (Hollard).

Body oblong, compressed, blunter anteriorly; dorsal and ventral outline similarly curved; head compressed, deep, blunt; eye small, high, posterior; snout blunt, deep, about half of head; mouth small, terminal, high, its width equal to eye; jaws unequal, the lower, below the lip, produced, making the chin prominent; teeth pale brownish, notched, incisor-like; the 2 front lower teeth not so greatly notched as the next 2, the anterior edge of the latter being produced, making this part canine-like; upper teeth not so greatly notched, smaller, and shutting outside lower teeth; groove in front of eye about equal to eye; the 5 grooves on cheek are below eye, extending from near angle of mouth and below, backward to gill-opening and base of pectoral; scales comparatively large, largest on middle portion of body, those from pectoral region running downward and backward and not as those on body; a slight tubercle on center of scales on posterior portion of side, forming low lines or ridges on median part of scales; gill-opening surrounded by small scales, no large plates; origin of spinous dorsal over gill-opening, first spine short, stout, wedge-shaped, roughly rugose anteriorly, top incisor-like, sometimes saw-like; second spine about half first; soft dorsal and anal concave, the rays shortening posteriorly

evenly and gradually from about the tenth; caudal lunate; pectoral short, broad, slightly falcate, almost rounded; ventral spine short, blunt, slightly movable.

Color in alcohol, grayish olivaceous, lighter below, head darker, the center of each scale darker, making weak brownish gray lines on sides; the edges of the scales are also brown, making narrow oblique lines, upward and forward and upward and backward over body; grooves on head brown; spinous dorsal brown, its membrane lighter; soft dorsal, anal, and pectoral pale; caudal dusky yellowish, its margin, for about width of pupil, white; scaly base of soft dorsal, anal, and belly to ventral spine, dark brown.

The above description from No. 05411, a specimen 8.25 inches long. We have other examples, No. 05412, 5 inches long, No. 05413, 7.75 inches long, No. 03557, 7.5 inches long, from Honolulu, and No. 03723, 8 inches long, from Hilo.

The species is rare. We can not distinguish our specimens from others taken off the coast of Mexico.

Balistes lineo-punctatus Hollard, Ann. Sci. Nat. (4th ser.), I, 1854, 65, Reunion Island.

Balistes mento Jordan & Gilbert, Proc. U. S. Nat. Mus. 1881, 228, Clarion Island, Revillagigedo Group. (Type, No. 28387 U. S. N. M., Coll. Lieut. H. E. Nichols.)

Xanthichthys mento, Jordan & Evermann, Fishes North and Mid. Amer., II, 1710, 1898.

Genus 188. MELICHTHYS Swainson.

This genus differs from *Balistes* chiefly in the presence of a series of even, white, incisor-like teeth, instead of the irregular incisors of *Balistes*. The tail is unarmed or the scales only slightly keeled; a groove is present before the eye below the nostrils, and the cheeks are wholly scaled. The vertical fins are angulated, but not produced in filaments; ventral flap small, immovable, and covered with rough scales. Tropical seas.

Melichthys Swainson, Class. Anim., II, 325, 1839 (*ringens*, Bloch; not of Linnaeus).

Melanichthys Günther, Cat., VIII, 227, 1870; corrected spelling.

341. *Melichthys radula* (Solander). "*Humuhumu elele*." Plate LXIV.

Head 3.75 in length; depth 2; eye 5.25 in head; snout 1.65; D. III, 33; A. 29; interorbital 2.5; first dorsal spine 1.75; longest dorsal ray 1.3; longest anal ray 1.5; depth caudal peduncle 3; pectoral 2; scales 53, 33 from vent to anterior base of spinous dorsal.

Body oblong, more bluntly shaped anteriorly than posteriorly; head short, deep; eye small, posterior, high; snout blunt; mouth small; lower jaw slightly produced; 8 teeth in each jaw, the 2 anterior ones of each jaw broad truncate, incisors without notch, the other teeth in lower jaw notched; posterior tooth of upper jaw truncate; other 2 lateral teeth but slightly notched; anterior teeth even, not notched; teeth of lower jaw with a strong horizontal backward process; origin of spinous dorsal over gill-opening; first dorsal spine strong, blunt, and heavy, its front rugose; second spine very slender, about two-thirds of first; last spine very short and blunt, its tip just even with edge of groove, easily overlooked; in the small examples it is quite evident, in large examples it is blunt and not so evident (Doctor Gilbert evidently had a large example and thought there were but 2 spines, hence called it *bispinosus*, a new species); the fourth dorsal and anal rays the longest, then uniformly shortening posteriorly, the last one-third length of longest; caudal fin slightly convex, almost truncate, the tips produced for a distance equal to orbit; in the young the caudal is convex, no tips evident; ventral spine short, slightly movable; pectoral short, broad, and rounded; body nearly uniformly scaled, scales around mouth, eye, pectoral and ventral regions, and caudal peduncle smaller; osseous plates behind gill-opening; rough median spinous crests on 8 or 9 rows of scales on posterior portion of body.

Color in life, uniformly black, with slight show of bluish; a very distinct, conspicuous, narrow line of light blue running longitudinally on bases of dorsal and anal. Another specimen, when taken alive, was light green, with golden longitudinal narrow bands along spines of scales; stripe along base of dorsal and anal light blue; the whole fish turning black when dead.

Color in alcohol, bluish black, the fins darker; a narrow white longitudinal stripe at base of dorsal and anal; a narrow white line within arch of caudal about half diameter of eye from its edge, this line not evident in the young.

The above description based chiefly upon No. 03325, a specimen 9 inches long, from Honolulu, where it is common. The specimens from the offshore islands of Mexico, called *Melichthys bispinosus*, seem to be the same.

We have 11 examples, 4.75 to 11.75 inches long, all from Honolulu. Recorded also from Johnston Island.

Balistes radula Solander in Richardson, Voy. H. M. S. *Samarang*, Fishes, 21, 1848, no locality.

Melichthys ringens Bleeker, Atlas, v, 108, pl. 220, fig. 2, 1865; East Indies, not of Linnaeus.

Balistes bunira, Günther, Cat., VIII, 227, 1870; Streets, Bull. U. S. Nat. Mus., No. 7, 56, 1877 (Honolulu), not of Lacépède nor of Risso; Smith & Swain, Proc. U. S. Nat. Mus., v, 1882, 140 (Johnston Island).

Balistes (Melanichthys) bunira, Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 517 (Honolulu and Laysan).

Balistes (Parabalistes) ringens, Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 517 (Laysan Island).

Melichthys bispinosus Gilbert, Proc. U. S. Nat. Mus. 1890, 125, Clarion and Socorro Islands.

Melichthys radula, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 483 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 534 (Hawaiian Islands).

Family LXXVII. MONACANTHIDÆ.

Body much compressed, covered with very small rough scales, forming a rough or velvety covering; males sometimes with spines on the caudal peduncle, these either robust or needle-like. Upper jaw with a double series of incisor-like teeth, 6 in the outer and 4 in the inner series; lower jaw with 6 similar teeth in a single series; first dorsal with a single strong spine and generally a rudimentary one behind it; second dorsal long, similar to anal; ventral fins reduced to a single osseous, fixed or movable, small appendage at the end of the long pelvic bone, this appendage often rudimentary or entirely absent; no barbel; vertebrae 7+11 to 14=18 to 21. Herbivorous shore fishes of the warm seas closely allied to the *Balistidae*, differing chiefly in having the first dorsal represented by a single spine, behind which is sometimes a rudiment; scales small, spinigerous, the skin mostly rough velvety. The species are mostly small in size and are not used for food, having little flesh and that of a bitterish taste.

- a. Pubic bone with a small spine at its end; gill-opening short, nearly vertical; dorsal and anal moderate, each with fewer than 40 rays.
- b. Ventral spine immovable; dorsal spine barbed or not..... *Cantherines*, p. 418
- bb. Ventral spine movable; dorsal spine armed with strong retrorse barbs, usually in 2 series.
- c. Ventral flap only moderately developed, not reaching beyond pelvic spine; no spines on caudal peduncle. *Stephanolepis*, p. 420
- aa. Pubic bone without spine at its end; gill-openings long, oblique; dorsal and anal long, each of 40 or more rays.
- d. Caudal fin elongate, the angles rounded; upper profile of snout concave; coloration not uniform... *Osbeckia*, p. 422
- dd. Caudal fin short, subtruncate, anterior profile convex..... *Alutera*, p. 423

Genus 189. CANTHERINES Swainson.

This genus differs from *Monacanthus* chiefly in having the ventral spine immovably ankylosed to the pelvis. The barbs on the dorsal spine, if distinct, are usually in 4 series; vertebrae 19 or 20. In the genus *Cantherines* the gradation is perfect from those species without barbs (*Cantherines*) to those with 4 equidistant series of strong barbs (*Pseudomonacanthus*).

Cantherines Swainson, Nat. Hist. Fishes, etc., II, 327, 1839 (*nasutus*=*sandwichiensis*).

Pseudomonacanthus Bleeker, Atlas, V, 134, tab. 228, fig. 2, 1865 (*macrurus*).

Liomonacanthus Bleeker, Ned. Tydskr. Dierk., III, 13, 1866 (*pardalis*).

Canthorhinus Gill; corrected spelling.

- a. D. 1-36; A. 30; no white spots..... *sandwichiensis*, p. 418
- aa. D. 11-38; A. 33; body everywhere with round white spots..... *albopunctatus*, p. 420

342. *Cantherines sandwichiensis* (Quoy & Gaimard). "*O'ililepa*," "*Ohua*." Fig. 183.

Head 3.3; depth 1.9; eye 4.4; snout 1.1; interorbital 3.65; D. 1-36; A. 30; P. 14.

Body oblong, moderately elevated; snout long; mouth low, below axis of body; anterior profile rising in a slightly concave line to dorsal spine, a little convex in front of eye; from dorsal spine to caudal peduncle the dorsal outline is in a long low curve; ventral outline slightly convex from tip of snout to pelvic plate, thence in a straight line to origin of anal fin; base of anal gently and evenly rounded; upper jaw with an outer series of 8 strong close-set incisors, the 6 anterior ones rather pointed, the lateral one on each side much broader, lower jaw with a single series of 6 similar teeth fitting inside the upper in the closed mouth; teeth white, the tips brownish; lips thin; eye high up,

the interorbital space strongly convex; nostrils in a rounded shallow pit; gill-slit slightly oblique upward and backward, its lower end in front of upper base of pectoral, its length 1.5 times diameter of orbit.

Body uniformly rough sandpapery, 2 rows each of 2 short, recurved spines on caudal peduncle in males, none in females. Dorsal spine long, slender and somewhat roughened, its insertion slightly anterior to middle of orbit, its length 1.2 in head; dorsal groove deep anteriorly or shallow posteriorly, not quite reaching soft dorsal; distance between origin of soft dorsal and posterior base of dorsal spine slightly greater than snout to eye; anterior dorsal rays somewhat elevated, their length a little more than half head; anal similar to soft dorsal, the rays about equally long; caudal when spread slightly convex; pectoral short, its edges nearly parallel, its length 2.3 in head; pelvic spine short, stiff, not movable.

Color in life, but somewhat faded (No. 03352), uniform rich brownish black; jaws whitish; dorsal spine olive-brown; soft dorsal with the rays rich orange, the membranes pale; caudal with membranes pale, flesh color, the rays brownish black, tipped with reddish orange; anal like soft dorsal; pectoral with the membranes colorless, the rays rich orange; iris dirty greenish.

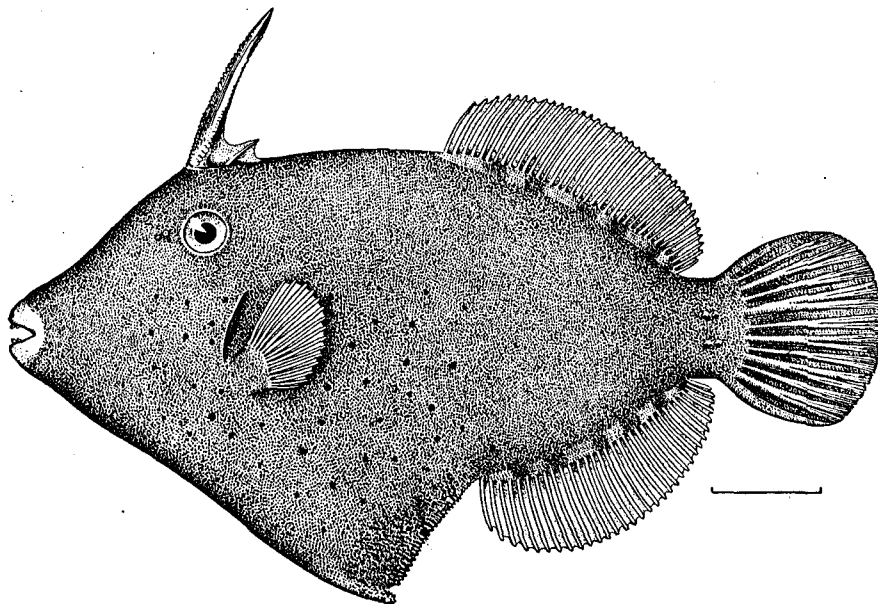


FIG. 183.—*Cantherines sandwichiensis* (Quoy & Gaimard).

Color in spirits variable, but usually a dull satiny brown, uniform over head and body; dorsal spine dusky; the series of scales sheathing the bases of dorsal and anal abruptly brownish black; the fins yellowish white; caudal dusky brown; pectoral yellowish white, the base dark brown; side of body and head sometimes with scattered small round black spots, these showing on only one (No. 05418) of our specimens.

This species is represented in our collection by 14 specimens, 1 from Hilo, the others from Honolulu; of the latter 5 were collected by Doctor Jenkins and 4 by Doctor Wood. Other examples were obtained by the *Albatross* at Honolulu and at Puako Bay, Hawaii. Also recorded from Socorro Island.

Balistes sandwichiensis Quoy & Gaimard, Voy. l'Uranie, Zool., 214, 1824. Sandwich Islands.

Cantherines nasutus Swainson, Nat. Hist. Class, Fishes, 11, 327, 1839; substitute for *B. sandwichiensis* Quoy & Gaimard.

Monacanthus pardalis Rüppell, N. W. Fisch., 57, pl. 15, fig. 3, 1855; Günther, Cat., VIII, 230, 1870, in part; Steindachner, Denks, Ak. Wiss. Wien., LXX, 517 (Honolulu).

Cantherines carole Jordan & McGregor in Jordan & Evermann, Fishes North and Mid. Amer., II, 1713, 1898, Clarion Island, by error; Socorro Island meant (type, No. 11995, Stanford Univ. Mus. Coll. R. C. McGregor); Jordan & McGregor, Rept. U. S. Fish Comm., XXIV, 1898 (1899), 281, Pl. 6, Socorro Island.

Cantherines sandwichiensis, Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 514 (Sandwich Islands); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 484 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 534 (Honolulu; Puako Bay, Hawaii).

347. *Cantherines albopunctatus* (Seale).

Head 3 in length; D. 11-38; A. 33; P. 15; eye 5 in head; snout 1.2, its profile concave.

First dorsal spine long and strong, about equal to snout, with 4 rows of small barbs directed down, insertion of spine directly over anterior half of eye; uneven cutting incisors in each jaw; a single row of 3 on each side of lower jaw; an additional row of small inner teeth in upper jaw; caudal peduncle with 4 short round spines on each side; skin without distinct scales, but everywhere rough with a velvety feeling to the touch; caudal rounded, its longest ray 1.75 in head; ventral spine coalesced to the pelvic bone, the membrane rather well developed, extending slightly beyond the spine; dorsal and anal rays of about equal length; base of the anal 1.2 in base of dorsal; pectorals short, 2.5 in head.

Color light gray, with slight silvery gloss, everywhere covered with scattered round, white spots about size of pupil; on lower half of body a small number of scattered black dots, smaller than the white dots; dorsal and anal with the basal fourth black, the remaining yellowish white; caudal dusky; iris white. Honolulu (Seale); also recorded from Tahiti.

Monacanthus albopunctatus Seale, Occ. Papers Bishop Mus., I, No. 4, 13, fig. 6, 1901, Honolulu (type, no. 667, B. P. B. M.).

Pseudomonacanthus multimaculatus Regan, Proc. Zool. Soc. Lond., II, Part II, 1902 (Nov.), 298, pl. xxv. fig. 1, Tahiti.

Genus 190. *STEPHANOLEPIS* Gill.

This genus differs from *Monacanthus* in having the ventral flap, even in the adult, only moderately developed, not reaching beyond pelvic spine, and in having no recurved spines on caudal peduncle. *Stephanolepis* Gill, Proc. Ac. Nat. Sci. Phila. 1861, 78 (*setifer*).

a. No enlarged spines on caudal peduncle; body and head not white spotted.

b. Body with minute but distinct spinuliferous scales; dorsal rays 38; anal 34; body color yellow or olive with dark bars on head and spots on body.....*spilosomus*, p. 420

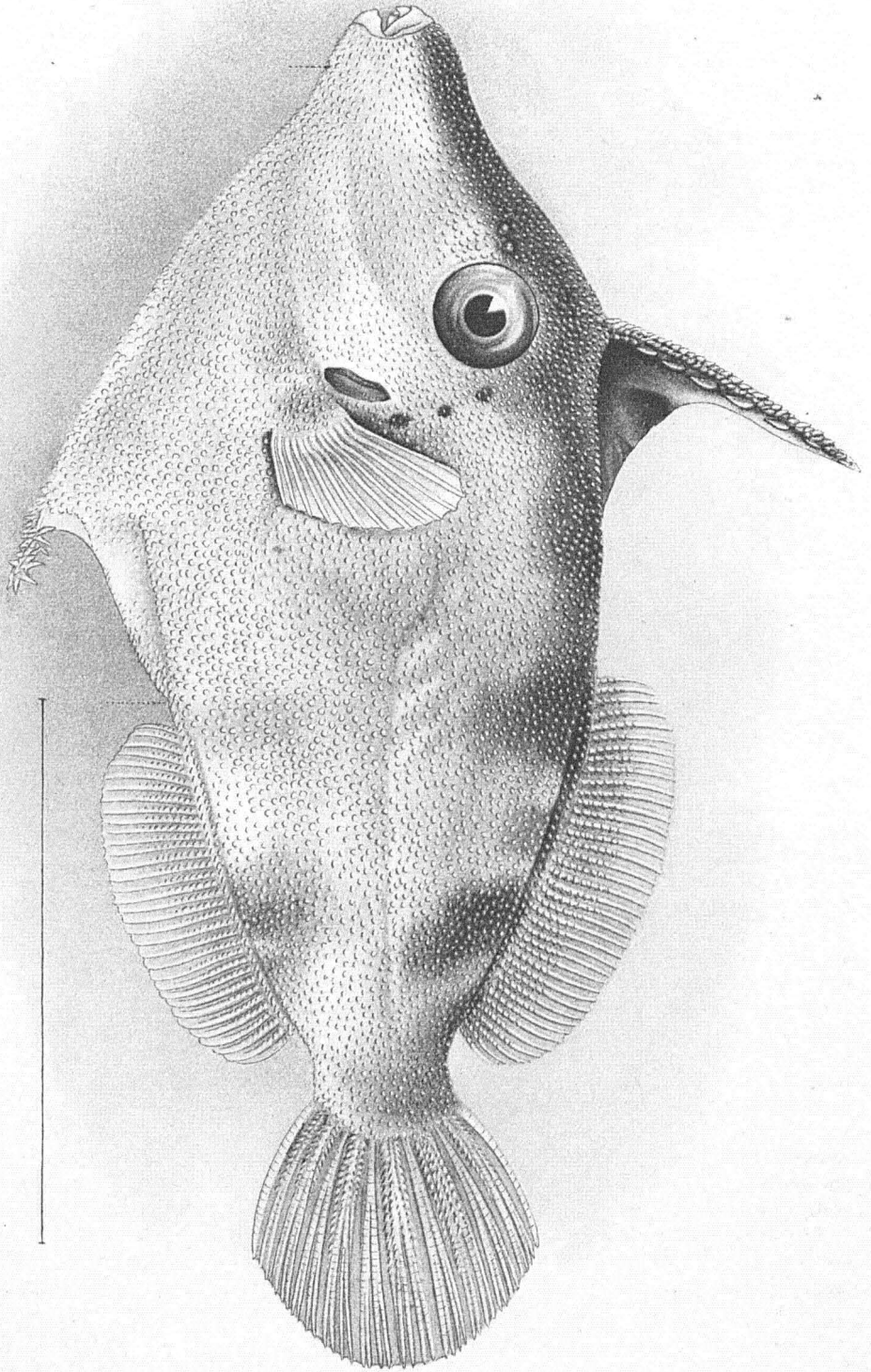
bb. Body prickly, without distinct scales; dorsal rays 39; anal 36; body color silvery, clouded, without spots excepting a row of 3 from behind eye downward toward base of pectoral.....*priezi*, p. 421

345. *Stephanolepis spilosomus* (Lay & Bennett). "*Oili uvivi*." Plate LXV.

Head 3.4 in length; depth 2.1; eye 3.7 in head; snout 1.3; interorbital 3.3; height of spine over eye equal to snout; D. 38; A. 34.

Body oblong, deep, strongly compressed, covered with minute scales, the posterior edge of each scale with 1 to 3 little spines, the center one the largest, these spines larger posteriorly over the peduncle, forming a cardiform patch, all hooked forward; mouth very small, teeth incisor-like, broadest in the sides of the jaws; outline of head, from snout to dorsal spine, slightly concave; dorsal spine rough anteriorly, its posterior edges each armed with a row of rather long retrorse barbs or spines; ventral spine small, movable, armed similarly to dorsal; caudal rounded.

Color in life (No. 03499, taken at Hilo), ground-color of body yellow; black spots of various sizes and shapes closely set in irregular rows on tail and back, those on belly being more sparse; nape and base of dorsal dark brown; a pale patch about size of suborbital space over the abdominal cavity, the black spots in this patch being paler than those on the yellow ground, this white patch probably absent in most living examples; interorbital and suborbital regions dark yellowish-brown, with black streaks running obliquely from ridge to pectoral region; armed dorsal spine orange-yellow, purplish-black spots on the membrane; ridge of snout very dark, obscuring all marks if there were any; lips flesh or pale pinkish color; a yellow streak with bright purple spots running along the median line of throat to ventral spine; from the ventral spine to vent a bright yellow line on the edge of keel, and 2 bright bluish-purple lines running along with the yellow one; space between 2 latter lines pale black; ventral spine yellow with purple spots; soft dorsal yellow, with 10 or 11 pale purple bars of equal width running longitudinally throughout entire length of fin; caudal fin bright yellow, the proximal half with black spots in rows, these spots becoming oblong as they spread toward the end, and forming more distinct rows, gradually fading into bright orange, and filling up the yellow ground color, imparting to the entire fin a bright orange aspect; rays yellow at base, merging into orange near the end; a black bar near tip of fin, a thin purple streak running through the black bar near its outer margin; a bright yellow streak along tip of fin; anal same as soft dorsal.



STEPHANOLEPIS PRICEI SNYDER.

Another specimen had the following coloration in life: Head and belly pearly blue, shading into light brassy, the color of other parts of the body; head and body with lines and spots of brownish black; membrane of dorsal deep orange with brownish black spots, the spine bluish; dorsal and anal banded with lemon and pearly blue; caudal deep orange, narrowly bordered with lemon; a subterminal band of black; fin spotted with black; iris brassy; teeth orange.

An example from Hilo, when fresh, was mottled olive-green with traces of lighter horizontal light olive streaks, about 5 in number; fins soiled olive; caudal with 2 blackish bars; iris golden yellow; jaws flesh-color.

General color in alcohol, brownish olivaceous, darker above; body covered with small spots as large as pupil and smaller, arranged in about 14 or 15 irregular lengthwise series; over the cheek these spots formed into lines making 6 or 7 small narrow lines running upward and forward; dorsal spine with small dark spots on its anterior portion, pale posteriorly; soft dorsal pale, with about 10 narrow dusky stripes; caudal white, a dark band, width of pupil, on its edge, this band tipped with white, about 10 rows of small dark spots arranged in bars; anal similar to soft dorsal; pectorals pale.

Description chiefly from a specimen (No. 2557) 5.25 inches long, from Honolulu.

According to Mr. Johann Hering, of Hilo, this fish comes occasionally in great numbers, but otherwise is very rare. The natives believe its appearance to prophesy the demise of some great personage, such as a king or chief. There is another red fish, which seems, according to Mr. Hering's description, to be a species of *Holocentrus*, whose appearance is viewed with the same belief.

Our collection contains 26 specimens from Honolulu and 1 from Hilo, ranging from 2.14 to 5.4 inches in length. The *Albatross* obtained specimens at Honolulu; at station 4180, near Niihau, from the stomach of a *Coryphaena*; at Necker Island, carried in by a bird; at station 4147, near Bird Island, in 26 fathoms; at station 4167, near Bird Island, in 18 to 20 fathoms, and at station 4148, near Bird Island, in 26 to 33 fathoms.

Monacanthus spilosoma Lay & Bennett, Zool. Beechey's Voy., 70, pl. 22, fig. 1, 1839, Hawaiian Islands; Günther, Cat., VIII, 243, 1870 (Hawaiian Islands); Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 514 (Hawaiian Islands); Steindachner, Denks. Ak. Wis. Wien, LXX, 517 (Laysan Island).

Stephanolepis spilosomus, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 484 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 534 (Honolulu; Albatross Station 4180, Niihau; Necker Island; stations 4147, 4148, 4167, near Bird Island).

346. *Stephanolepis pricei* Snyder. Plate 48.

Head 3 in length measured to base of caudal fin; depth between insertion of dorsal and anal 2.6; eye 3.3 in head; interorbital space 3.3; snout 1.4; depth of caudal peduncle 2.4; D. 39; A. 36.

Snout rather pointed, upper and lower contours concave; gill-slit small and narrow, its height equal to width of base of pectoral, two-thirds diameter of eye; ventral flap notably narrow, its width equal to half diameter of eye; dorsal spine inserted above pupil, its length equal to distance between angle of mouth and upper edge of gill-opening, reaching the insertion of dorsal fin when depressed; 6 lateral spines which project downward and slightly backward; 3 or 4 small granules in a row below the spine; anterior part of spine with prickles which point upward; length of base of dorsal about equal to length of head; height of fin equal to diameter of eye; length of base of anal equal to distance between tip of snout and posterior edge of orbit; height equal to that of dorsal; rays of dorsal and anal rough on basal halves; caudal round, the alternate rays with strong prickles; length of fin equal to length of snout; length of pectoral equal to twice the length of gill-slit; ventral spine large, length of movable part about equal to length of gill-opening, the sides with large spikes which project backward; body and head evenly covered with prickles, those of the dorsal part slightly coarser than the others; no enlarged spines on caudal peduncle.

Color silvery, dusky along top of head and back; membrane of dorsal spine blue-black; 3 small, round, dark spots in a line extending upward from base of pectoral; dark clouds somewhat larger than the eye extending downward at insertion of dorsal, from posterior half of dorsal, and on the caudal peduncle; a similar cloud extending upward from posterior half of base of anal.

One specimen 2.56 inches long, station 4021, vicinity of Kauai, depth 286 to 399 fathoms. Type, No. 50882, U. S. Nat. Mus. Only the type known.

Stephanolepis pricei Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 534, pl. 12, fig. 22, Albatross Station 4021, near Kauai.

Genus 191. OSBECKIA Jordan & Evermann.

This genus differs from *Alutera* in having the caudal fin elongate and with rounded angles; coloration not uniform, the head and body with irregular blue spots and lines, besides small round black spots; upper profile of snout concave.

Osbeckia Jordan & Evermann, Check-List Fishes, 424, 1896 (*scripta*).

346. *Osbeckia scripta* (Osbeck). "*O'ililepa*," "*Ohua*." Fig. 184.

Head 3.7 in length; depth 2.9; eye 6.5 in head; snout 1; D. 1-47; A. 49; C. 12; P. 14.

Body oblong, compressed, tapering, the greatest depth, which is over vent, greater than eye and snout by an eye's diameter; snout produced, the anterior profile concave; dorsal profile convex from in front of spine to caudal peduncle, a broad angle at beginning of soft dorsal which is midway between tip of snout and base of caudal fin; ventral outline evenly and less convex; caudal peduncle compressed, its least width 3.2 in its least depth, which is 2 in snout; chin prominent; teeth white, broad incisors, strongly emarginate in lower jaw, more pointed in the upper; gill-opening oblique, 1.6 times diameter of orbit; interorbital high, the sides forming an acute angle. Dorsal spine short, slender, shorter than eye, granular, inserted over middle of orbit; soft dorsal with the margin rounded, none of the rays produced, length of middle ones 4 in snout; anal similar to soft dorsal, the rays somewhat shorter; caudal fin rounded, longer than head, about 2.6 in body; pectoral short, 3.6 in snout; no ventral spine.

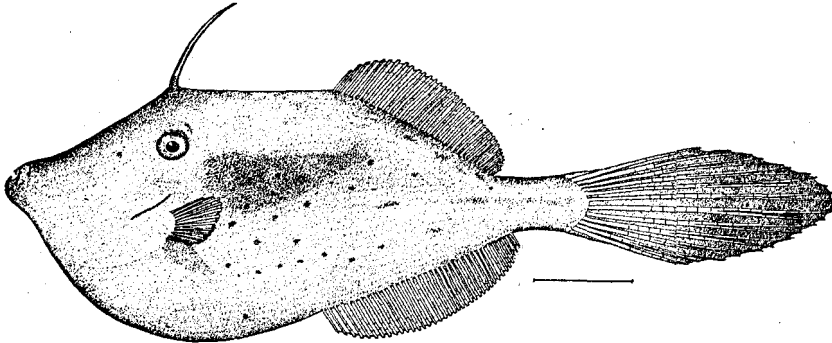


FIG. 184.—*Osbeckia scripta* (Osbeck); after Jordan and Evermann.

Color in life (No. 03006, a specimen 23 inches long, taken June 8), olivaceous; head and body with numerous irregular lines and spots of sky blue, the lines most numerous on head and near bases of dorsal and anal fins, the round spots most numerous on middle of side and on head; scattered smaller brown spots on the interspaces; lips black; dorsal and anal pale yellow; caudal dusky, paler at tip; iris yellowish silvery, dark above.

Color in alcohol, dusky olivaceous, the blue spots and lines faded to pale blue or brownish. In some examples the color is much darker, almost dark velvety brown, the spots black.

This species inhabits all tropical seas, and is common in the West Indies. It has been taken on the Atlantic coast as far north as the Carolinas, and occasionally among the islands of the Pacific coast of Mexico. It does not appear to be very common among the Hawaiian Islands, however, and was not obtained by Doctor Jenkins in 1889, though Jordan and Snyder secured one example in 1900.

We have 5 specimens, 17.5 to 25.25 inches long, all from Honolulu.

Balistes scripta Osbeck, *Iter Chinensis*, I, 144, 1751, China Seas.

Balistes monoceros scriptus Gmelin, *Syst. Nat.*, 1463, 1788; after Osbeck.

? *Lija trompa* Parra, *Dif. Piezas Hist. Nat.*, 46, pl. 22, fig. 1, Havana.

Balistes laevis Bloch, *Ichthyol.*, XII, 65, pl. 414, 1795, Morocco; Tranquebar.

Balistes liturosus Shaw, *General Zool.*, V, 405, 1804, Tahiti.

Balistes ornatus Marion de Procé, *Bull. Soc. Philom.*, 131, 1822, Isle Waigiou.

Aluteres pareva Lesson, *Voy. Coquille, Zool.*, II, Part I, 106, 1830, Tahiti.

? *Monacanthum proboscideum* Ranzani, *Nov. Comm. Ac. Sc. Inst. Bonon.*, V, 1842, 8, Brazil.

Aluteres venosus Holland, *Ann. Sc. Nat.*, Ser. 4, IV, 1855, 14, pl. 1, fig. 3, New Ireland, Bismarck Archipelago (Coll. Lesson and Garnot).

?*Alutera picturata* Pöcy, Proc. Ac. Nat. Sci. Phila. 1863, 188, Cuba.

Monacanthus scriptus, Günther, Cat., VIII, 252, 1870 (Zanzibar, Pinang, Amboyna, Siam).

Alutera scripta, Jordan & Evermann, Fishes North and Mid. Amer. II, 1719, pl. 260, fig. 637, 1898 (Clarion Island; Venados Islands); Evermann & Marsh, Fishes of Porto Rico, 261, fig. 73, 1900.

Osbeckia scripta, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 481 (Honolulu).

Genus 192. ALUTERA Cuvier.

Body elongate, strongly compressed, covered with minute scales; snout short, the anterior profile convex; mouth and teeth essentially as in *Monacanthus*, but the lower jaw more projecting, so that the lower teeth are directed obliquely upward and backward. Gill-opening an oblique slit, longer than eye, situated below and in advance of eye, its posterior end behind base of pectorals; pelvic bone long, falcate, movable under the skin, without spine at its extremity; dorsal spine small, inserted over the eye, rough, but without barbs; soft dorsal long and anal long, each of 45 to 50 rays; caudal fin short, shorter than head, almost truncate, the middle rays little produced; pectorals small. Size large.

Les Alutères Cuvier, Règne Anim., ed. 1, 153, 1817 (*monoceros*).

Alutera Agassiz in Spix, Pisc. Brasil., 137, 1829 (*monoceros*).
Alutera, *Aluterius*, etc., corrected spelling.

347. *Alutera monoceros* (Osbeck).

“*Loulu*.” Fig. 185.

Head 3.6; depth 2.4; D. 1, 49; A. 51.

Body oblong, much compressed, and skin with a fine velvety touch. Head very deep, convex both above and below; snout slightly produced upward; eye small, *not much* above the mouth, 5 in snout, 5.67 in head, 1.67 in space between its upper margin and origin of spinous dorsal, and 1 in space between its lower margin and upper margin of gill-opening; teeth broad, emarginate, the middle mandibular pair pointed; lips thin and narrow, smooth; nostrils small, in front of upper part of eye; gill-opening rather long, oblique forward until a little anterior to the nostrils, 2.67 in snout and equal to pectoral; origin of spinous dorsal over anterior edge of eye, and midway between tip of snout and origin of soft dorsal; soft dorsal and anal with the anterior rays the longer, the longest in both fins equal; caudal damaged; pectoral inserted below mouth and a little behind middle of eye; caudal peduncle compressed, equal to one-third the distance from posterior margin of eye to tip of snout.

Color in alcohol, uniform brown, mottled with darker, the fins all plain-colored and pale. Not seen by us.

A painting in the collection of Mrs. Dillingham made in Honolulu represents this widely diffused East Indian species. It bears the native name of *Loulu*.

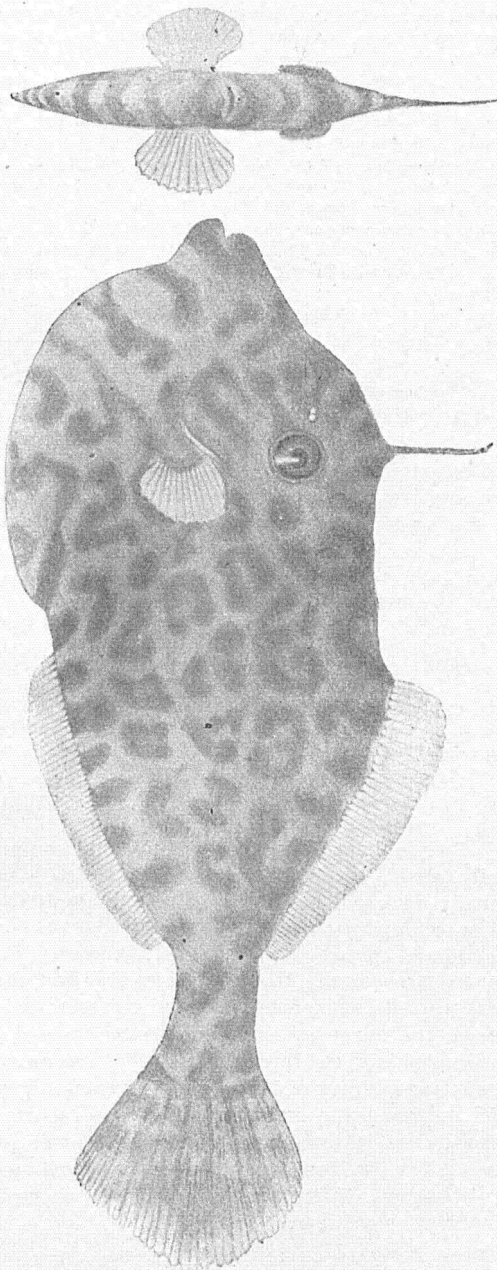


Fig. 185.—*Alutera monoceros* (Osbeck); after Hugh M. Smith.

- Capriscus murium dentibus minutis* Klein, Ichth. Missus, III, 25, 1742, pl. III, fig. 9, very bad, no locality.
Balistes monoceros Osbeck, Iter Chinensis, 144, 1751, China; Linnæus, Syst. Nat., 10th ed., I, 327, 1758 (after Osbeck).
Balistes oblongiusculus, etc., Gronow, Zoophyl., 1763, 52, Indian seas.
 ?*Liza barbuda* Parra, Dif. Piezas Hist. Nat., 48, pl. XXII, fig. 2, 1787, Habana.
Balistes kleinii Gmelin, Syst. Nat., 1472, 1788, Indian seas (after Gronow and Klein).
Balistes barbatus Walbaum, Artedi Piscium, III, 464, 1792 (after Klein).
Balistes monoceros var. *unicolor* Bloch & Schneider, Syst. Ichth., 463, 1801 (after Gmelin).
Balistes serraticornis Fréminville, Nouv. Bull. Sc. Soc. Philom., No. 67, 1813, 249, pl. IV, fig. 1.
Aluterus berardi Lesson, Voyage Coquille, Zool., 108, pl. VII, 1828; New Guinea.
Alutera cinerea Sehlegel, Fauna Japon., Poiss., p. 292, pl. CXXXI, fig. 1, 1850, Nagasaki.
Alutarius obliteratus Cantor, Malayan Fishes, 353, 1850, Pinang.
Alutarius amphacanthus Bleeker, Verh. Bat. Gen., Balist., XXIV, 1852, 23, pl. II, fig. 5, East Indies.
Alutarius macracanthus Bleeker, Verh. Bat. Gen., Balist., XXIV, 1852, 22, pl. III, fig. 7, East Indies.
Balistes linguatula Gronow, Cat., Ed. Gray, 35, 1854, Indian seas; after *Balistes oblongiusculus*, etc., of Gronow.
Aluterus anginosus Hollard, Ann. Sci. Nat., IV, 1855, 11, East Indies.
Balistes unicornus Basilewsky, Nouv. Mém. Soc. Nat. Moscou, X, 1855, 263, North China.
 ?*Alutera guntheriana* Poey, Proc. Ac. Nat. Sci. Phila., 1863, 184, Habana.
Monacanthus monoceros, Günther, Cat., VIII, 251, 1870 (Zanzibar, Pinang, Amboyna, China, Japan); Nystrom, Bihang. Svensk. Vet. Handl., Band 13, pt. IV, No. 4, 1887, 47 (Nagasaki).
Alutera monoceros, Jordan & Evermann, Fish. North and Mid. Amer., II, 1720, 1898; Smith Bull. U. S. Fish Comm. 1898, 273, pl. 64 (Woods Hole, Mass.).

Suborder GYMNODONTES.

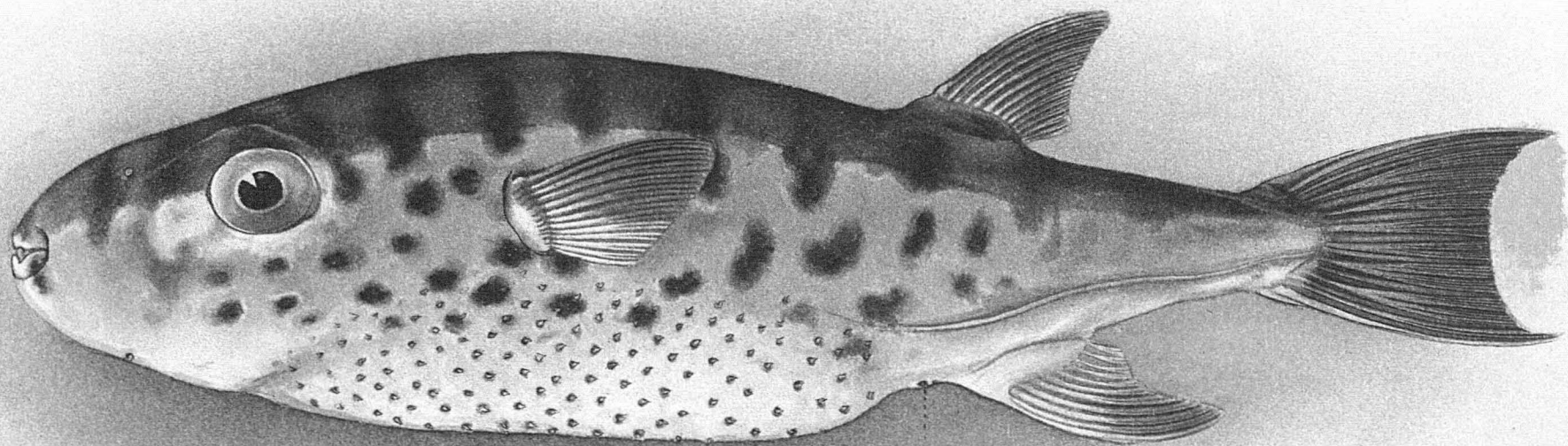
Plectognaths without a spinous dorsal, with the body short and with the belly inflatable; the scales typically spiniform, with root-like insertions, and with the jaws enveloped in an enamel-like covering, without distinct teeth. This group contains degraded Plectognaths, which have lost the scales, spinous dorsal, and distinct teeth. In the extreme forms the pelvis, ribs, and caudal vertebræ are also lost, the species depending on their dermal armature, leathery skin, or inflatable belly for protection from enemies, while little power of active movement remains.

- a. Caudal region normally developed, with a caudal peduncle.
 b. Upper and lower jaw each divided by a median suture; maxillaries and dentaries each curved outward behind the premaxillaries.
 c. Back broadly rounded; frontal bones articulated with the supraoccipital; head broad; nostrils various.
 Tetraodontidae, p. 424
 cc. Back more or less sharply ridged; frontal bones separated from the supraoccipital by the postfrontals which meet in the middle; nostrils obsolete or very small *Canthigasteridae*, p. 430
 bb. Upper and lower jaw each undivided, the premaxillary and dentary bones coossified into sutureless arches; maxillaries extended laterally behind; body covered with stout rooted spines *Diadontidae*, p. 435
 aa. Caudal region of body aborted, the body truncated behind the dorsal and anal; jaws each without median suture.
 Molidæ, p. 439

Family LXXVIII. TETRAODONTIDÆ.—The Puffers.

Body oblong or elongate, usually little compressed, sometimes very broad; head and snout broad; belly capable of great inflation; skin scaleless, usually more or less prickly, the spines or prickles usually weak and movable, not rooted; rarely the skin is armed with bony scutes forming a sort of carapace; each jaw confluent, forming a sort of beak, which in each jaw is divided by a median suture; maxillaries curved outward behind the premaxillaries; lips full; nostrils various. Spinous dorsal and ventral fins wanting, the fins composed of soft rays only; dorsal fin posterior, opposite and similar to anal; caudal fin distinct; no ventral fins, the pelvic bone undeveloped; no ribs; pectoral fins short and broad, the upper rays longest; caudal fin and caudal vertebræ normally developed; medifrontals articulated with the supraoccipital, the postfrontals confined to the sides, the ethmoid more or less projecting in front of frontals; post frontals extending outward as far as frontals; proethmoid short and narrow, little prominent to the view above; vertebræ few, 7 or 8 + 9 to 13; gill-openings small, placed close in front of pectorals; air-bladder present. Fishes of sluggish habits, inhabiting warm seas, noted for their habit of filling the belly with air. When disturbed they float on the surface, belly upward. They are not much used as food, even in Hawaii, the flesh being ill-flavored and sometimes reputed poisonous.

- a. Dorsal and anal fins each comparatively long, falcate; caudal lunate; nostrils sessile or nearly so; a ridge along lower part of side *Lagocephalus*, p. 425
 aa. Dorsal and anal fins each comparatively short, rounded; caudal rounded; nostrils at the summit of a hollow, simple papilla.
 b. Nostril on each side with 2 distinct openings, usually in a low tube or papilla *Spheroides*, p. 426
 bb. Nostril on each side with a bifid tentacle without distinct opening *Tetraodon*, p. 426



LA. OCEPHALUS OCEANICUS JORDAN & EVERMANN. TYPE.

Genus 193. LAGOCEPHALUS Swainson.

Body comparatively elongate; skin smooth or variously prickly, the prickles most developed on the abdomen; abdomen capable of very great inflation; dorsal and anal rather long, falcate, of 12 to 15 rays each; caudal lunate; nostril without distinct papilla, each one with 2 distinct openings; mucous tubes on upper part of head and on sides of body very conspicuous; lower side of tail with a fold; vertebrae in increased number (about $8+13=21$). Species reaching a rather large size, chiefly tropical, the genus intergrading fully with *Spheroides*.

Lagocephalus Swainson, Class. Fishes, II, 194, 328, 1839 (*pennanti*).

Physogaster Müller, Abhandl. Akad. Wiss. Berlin, 252, 1839 (1841) (*lunaris*); name preoccupied.

Gastrophysus Müller, Weigmann's Archiv, IX, 1843, 330 (*lunaris*).

Tetrodon Gill, Cat. Fish East Coast North Amer., in Rept. U. S. Fish Comm., Part I, 1871-72 (1873), 793 (*levigatus*); not of Linnaeus, as properly restricted.

348. *Lagocephalus oceanicus* Jordan & Evermann. Plate 49.

Head 2.8 in length; depth 3.6; eye 4.5 in head; snout 2.4; interorbital 3.2; depth of caudal peduncle 6; D. 12; A. 12; C. 10; P. 14.

Body rather elongate, moderately compressed, greatest depth at vertical of pectoral; head long; snout long, blunt at tip; the sides flattened; anterior profile from tip of snout to vertical of pectoral in a long, low, even curve; ventral outline little convex when not inflated; mouth small; teeth pointed at median line, the cutting edge sharp; nostrils separate; not in tubes, the anterior somewhat the larger, their distance from eye about half their distance from snout or about half the interorbital space; gill-opening vertical, 1.2 in eye, extending a little above base of pectoral, inner flap entirely hidden by outer; eye rather large, wholly above axis of body; interorbital space very little convex; cheek long; caudal peduncle nearly round, tapering, its length from anal fin equaling snout; back, upper parts of sides and head entirely smooth, no spines or prickles evident; belly covered with small 4-rooted spines, most prominent when belly is inflated, spiniferous area not extending on throat anterior to eye, nor on side above base of pectoral, but in front of anal extending upward to level of lateral fold; a line of very small mucous pores curving above eye on interorbital space; a strong cutaneous fold on lower part of side of caudal peduncle from above anterior base of anal to lower base of caudal fin; no dermal fold on head or anterior part of body; mucous pores inconspicuous; dorsal fin somewhat anterior to anal, pointed, anterior rays produced, their length equal to that of snout; anal similar to dorsal, its rays somewhat longer; caudal lunate, outer rays about 2 in head; pectoral broad, its length a little greater than snout, 2.3 in head.

Color in life, back blackish, fading into deep steel-blue on side; side and below from level of upper edge of eye abruptly silvery-blue; sides of belly white, with round black spots about as large as pupil, these most distinct about pectoral, before, below, and behind the fin; upper fins dusky; caudal mottled black, tipped with white; pectoral black above and behind, pale below; anal pale, broadly tipped with blackish.

Color in alcohol, bluish black above; side from upper level of eye abruptly bluish silvery; back crossed by 7 or 8 narrow darker cross-streaks; belly white, with a series of about 9 to 12 small roundish black spots, chiefly below the pectoral; cheek dusky; pectoral, dorsal, and caudal dusky, tips of the latter paler; anal whitish, a little dusky at tip. A somewhat smaller example (4.5 inches long) has larger dark spots along middle of side above level of pectoral.

This species is known to us from 2 small examples obtained in the market of Honolulu. It is related to *Lagocephalus stellatus* (Donovan) of Europe (*Tetrodon lagocephalus* of Günther, not of Linnaeus), but differs in the much shorter pectoral, more conspicuous spots, and rather greater extension of the prickly region of the breast. The types of *Tetrodon lagocephalus* Linnaeus are reputed to have come from India. According to Linnaeus this species had 10 dorsal and 8 anal rays. It may have been based on *Lagocephalus sceleratus* or some other East Indian species, but there seems to be no evidence that it was identical with the European *Lagocephalus stellatus*. In any event the Hawaiian form seems different from any other yet known.

Type, No. 50820, U. S. N. M. (field No. 03379), 5 inches long, obtained at Honolulu; cotype, No. 7784, L. S. Jr. Univ. Mus. (field No. 534, paper tag), 4.5 inches long, also from Honolulu.

Lagocephalus oceanicus Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (April 11, 1903), 199, Honolulu.

Genus 194. SPHEROIDES Lacépède.—The Swell-fishes.

Body oblong or elongate; skin variously prickly or smooth, sometimes with cirri; a single, short, simple, nasal tube on each side, with 2 rather large openings near its tip, the tube sometimes reduced to a mere rim; dorsal and anal fins of 6 to 15 rays each; caudal truncate, rounded or concave; vertebrae 18 to 21; frontal bones expanded sidewise and forming the lateral roof of the orbit, the postfrontals limited to the posterior portions. Species very numerous in warm seas. The group contains 2 or 3 strongly marked subgenera which would be regarded as distinct genera if only extremes were considered; but the transition is very gradual from *Lagocephalus*, with elongate body, silvery skin, prominent lateral fold, long falcate dorsal and anal, with forked caudal, to typical *Spheroides*, with short fins and the form of *Tetraodon*.

Crayracion Klein, Missus II, 18, 1742 (*spengleri*); nonbinomial.

Les Sphéroides Lacépède, Hist. Nat. Poiss. II, 22, 1800 (French name only; *tuberculé*).

Spheroides Duméril, Zool. Analytique, 108, 1806 (*tuberculatus*=*spengleri*, from a drawing showing a front view).

Orbidus Rafinesque, Anal. Nat., 1815, ♀ (substitute for *les sphéroides* Lacépède).

Spheroides Lacépède, Pilot Ed., Hist. Nat. Poiss., VI, 1831, 279 (*tuberculatus*=*spengleri*).

Cirrhisonus Swainson, Class. Fishes, II, 194 and 328, 1839 (*spengleri*).

Cheilichthys Müller, Abhandl. Akad. Wiss. Berlin, 1839 (1841), 252 (*testudineus*).

Holacanthus Gronow, Syst. Nat., Ed. Gray, 23, 1854 (includes all *Tetraodontidae* and *Diodontidae*; name preoccupied).

Anchisonus Kaup MS., Richardson, Voy. Herald, 156, 162, 1854 (*spengleri*, etc.).

Genion Bibron, Revue de Zool., 1855, 279 (*maculatum*).

Catophrymchus Bibron, l. c. (*lampris*).

Les Promecocephales (*Promecocephalus*) Bibron, l. c. (*argentatus*).

Apsicephalus Hollaré, Études sur les Gymnodontes, in Ann. Sci. Nat. (4th Ser.), VIII, 1857, 324 (*testudineus*, etc.).

Liosaccus Günther, Cat., VIII, 287, 1870 (*cutaneus*).

349. *Spheroides florealis* (Cope).

D. 8; A. 7; eye 4.25 times in head, 2.75 in muzzle; head 3.66 in total length; anal fin behind dorsal, both subfalcate, narrow; caudal long, truncate or slightly concave; interorbital region concave, profile regularly descending; belly to vent and anterior part of sides with strong distant bristles, back to end of pectoral fin and head above to nares, with distant weaker bristles; no dermal appendages; a groove from the orbit to the tail on each side of the back, which is nearly connected by a medially interrupted cross groove at the occipital crest; a groove concentric with and within the superciliary margin extending to the preocular region and returning, but sending also a curved branch round the front of each nostril.

Color, below immaculate white, a yellowish band on the side; above reddish brown, ground reduced to narrow lines by the innumerable small light (? white) spots with a ring of smaller spots around each, over the upper regions of the head and body. Caudal fin delicately cross-barred; other fins unicolored. Length 5 inches.

Two specimens from the Sandwich Islands, obtained by Dr. J. K. Townsend 20 years ago. This species is allied to *S. alboplumbeus* Richn., but differs in the fewer fin rays as well as the color (Cope).

In our collection from Hilo are 8 young puffers, from three-quarters to an inch in length, which we identify with this species of Cope's. In so far as can be determined from such small examples they agree perfectly with Cope's description and with the figure of his type, given by Fowler, having the few fin rays, slender body, and coloration of *S. florealis*, and we have no doubt they are the young of that species.

Tetraodon florealis Cope, Trans. Am. Philos. Soc., XIV, 1871, 479, Hawaiian Islands (Types, Nos. 1109 and 1110, Ac. Nat. Sci. Phila.).

Spheroides florealis, Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 514, pl. xx, fig. 4 (Hawaiian Islands; Cope's types).

Genus 195. TETRAODON Linnæus.

Body rather robust, skin usually more or less prickly; nostril on each side with a tentacle, bifid to the base, its tips without opening, the branches of the large olfactory nerve ending in cup-like depressions along the inner edges of the 2 flattish lobes; dorsal and anal fins rounded, each of 7 to 14

rays; dorsal more or less in front of anal; caudal rounded; vertebrae usually $8+10=18$; a ring muscle about the eye forming eyelids; distinguished from *Spheroides* by the solid nasal tentacle.

Tetraodon Linnaeus, Syst. Nat., ed. 10, 1758, 332 (*lineatus*).

Les Ovoides Lacépède, Hist. Nat. Poiss., I, 1797, 256 (*fascé*; French names only); based on front view of *Tetraodon stellatus*.

Ovum Bloch & Schneider, Syst. Ichth., 1801, 530 (*commersoni*); after Lacépède; name preoccupied in mollusks.

Ovoides Duméril, Zool. Analytique, 1806, after Lacépède.

Oonidus Rafinesque, Analyse de la Nature, 1815, 90 (substitute for *Ovum*).

Arothron Müller, Abh. Berl. Akad. 1839, 252 (*testudinarius=reticularis*).

Les Epipedorhynques (*Epipedorhynchus*) Bibron, Rev. Zool., 1855, 279.

Les Dilobomycteres (*Dilobomycter*) Bibron, l. c. (*reticularis*, etc.).

Les Dichotomycteres (*Dichotomycter*) Bibron, l. c. (*fluviatilis*; no diagnosis).

Brachycephalus Hollard, Gymnodontes, 1867, 324.

Crayracion Bleeker, Atlas Gymnod., 65, after Klein 1742; type *spengleri*, erroneously supposed to belong to this group.

a. Interorbital space concave; dorsal ray 9; belly often with longitudinal dark or colored lines.....*hispidus*, p. 427

aa. Interorbital flat or convex; dorsal rays 10; body with small white spots above and below.....*lacrymatus*, p. 429

350. *Tetraodon hispidus* Linnaeus. "Ópukahú;" "Maki-maki;" "Keke." Plate LXVI.

Head 2.9; depth 3; eye 5.75; snout 2; preorbital 2.9; interorbital 2.4; D. 9; A. 10; P. 17; C. 8.

Body rather short and stout, heavy forward, tapering evenly when not inflated, to the caudal fin; head broad, its width at gill-openings about 1.3 in its length; snout moderate, broad, the anterior profile somewhat concave; interorbital space concave, the orbital rims prominent; nostril a short, bifid tentacle in front of eye; lips tubercular, in about 3 rows, scarcely covering teeth; teeth white, strong, strongly convex anteriorly, the lower jaw slightly included; gill-opening short, about as long as eye; body covered more or less uniformly with small, slender, bristle-like prickles, generally but not always present in the young, usually disappearing more or less with age. The variations in this character are entirely too great to leave it any morphological value. Some young examples not exceeding 3 inches in total length have the entire body profusely covered with slender, weak spines, usually longest and strongest on the belly, and weakest on the caudal peduncle, middle of back and top of snout. Examples similarly spiny are found among individuals of all sizes up to 7.5 or 8 inches in length. Other examples of similar range in size are almost wholly without prickles; if any at all are present they will be found in a scattered patch on each side of the vent and a few on lower jaw. In an example 13 inches long prickles are present on most of the body, the naked areas being the sides of caudal peduncle, the cheeks, snout, interorbital, and prepectoral region. In another example of the same size nearly smooth, only a few scattered prickles are evident. Dorsal fin rounded, 2.5 in head, distance of its posterior base from caudal fin 1.6 in head; anal with its anterior rays longest, the free edge oblique, the longest rays 2.6 in head; caudal rounded, 1.75 in head; pectoral broad, 2.9 in head.

Color in life of one specimen, light olive-green, with spots of pearly or bluish white which are smallest on tail; gill-openings black, with bright yellow curved streaks; belly with parallel stripes of light olive, growing fainter below; belly sometimes plain white, sometimes with yellow stripes covering it completely; prickles all white; yellow and black lines under pectoral; fins bright olive-yellow without spots except on caudal which has a few on basal portion; axil black, with a yellowish white border; posterior part of side sometimes 6 or 8 vertical white bars; no spines on snout, tail, lower jaw, or on region about vent and anal fin.

Another example in life was light olive-green with pearly white spots, smallest on tail; region about gill-opening black with bright yellow curved streaks; belly with parallel stripes of faint olive growing fainter below; belly sometimes plain white; prickles all white; fins bright olive-yellow without spots except on caudal, which has a few on basal portion; snout with a small dark edged bluish spot; no spines on snout, tail, lower jaw, or on region about vent and anal fin.

Another example in life was light olive-green with pearly white spots, smallest on tail; region about gill-opening black with bright yellow curved streaks; belly with parallel stripes of light olive, growing fainter below; spines all white; belly white, often without stripes in the young; fins bright olive-yellow without spots except base of caudal; nose with a small dark edged bluish spot; no spines on snout or tail or region about vent, anal fin or lower jaw.

Still another example was described in life by Doctor Jenkins as golden olive above, white below; bluish-white spots about as large as pupil over top of head and back, becoming smaller on caudal peduncle and caudal fin; 2 white concentric rings around eye; one distinct and one or two other less

distinct rings of white around base of pectoral including opercular opening; about 5 white longitudinal bands on side of belly below head and pectoral fin, alternating with a like number of olive bands; base of pectoral and region below black, and some black blotches anterior to the lower of these; dorsal dusky yellow; pectoral bright yellow; anal orange yellow; caudal dusky, the membranes yellowish with bluish-white spots.

Color in spirits, head, top of body, caudal peduncle on top and sides, and most of the side, dull olivaceous, covered quite uniformly with small round bluish-white spots, these sometimes oblong, the largest much smaller than pupil, those on side somewhat larger; base of pectoral black, surrounded by a narrow bluish-white line forming a nearly complete circle, interrupted only below the fin; a white bar across base of pectoral between which and the white ring are 2 shorter ones; a broad curved black band behind the white circle, continuing forward under the fin, some of the spines on its anterior surface white; 2 or 3 broad but short, horizontal black bars on breast under cheek and the same number on belly just back of pectoral, these sometimes continuous; belly chiefly white; posterior part of side mottled black, brown and paler; base of caudal fin with a few blue-white spots; spines usually pale or whitish. The colors in alcohol are as variable as they are in life. The yellowish or blackish lines on the belly become blackish or dark brown. In some examples the dark lines continue over entire belly, in others they are limited to the sides, the middle portion being plain white.

These differences are noticeable even in the very young, many of which we have ranging in total length from six-tenths of an inch to 2.75 inches. Some very small examples (5) from Coccanut Island at Hilo are uniform rich brownish black above, and all but the smallest have each about 18 distinct horizontal lines of same color on belly from chin to anal fin, the lateral ones ceasing sooner. The spaces between these lines are dull or dusky white and equally narrow. The smallest example (six-tenths of an inch in total length) is uniform dark brownish black on belly as well as on back and sides; fins all pale, caudal somewhat dusky. Other equally small examples from Hilo have the belly striped with brownish black and the pale interspaces broken up into spots anteriorly. Somewhat larger examples (1 inch to 1.75 inches long) from a pond at the Moana Hotel at Waikiki are usually striped underneath, the interspaces white, and the back and sides olivaceous. Some, however, are rich brown, agreeing perfectly with those from Hilo. In some cases the body is strongly papillose below and on sides, presenting the appearance of plush. In one example 1.6 inches long, from Hilo, the stripes on the belly are much broader and consequently fewer in number, there being only 12 of the dark stripes.

Although there is much variation among our numerous specimens both in color and in the development of the prickles, they all evidently belong to the same species. This is an abundant fish in all suitable places about Honolulu, it frequenting the mullet ponds and more or less inclosed brackish water areas, and even the fresh-water ponds near the coast. Nearly all our numerous specimens were obtained from one of the smaller ponds at Moanalua, Mr. S. M. Damon's country place. At a single haul with a 25-foot seine more than 2 bushels of these fishes were taken. As they were being hauled out upon the bank many of them became greatly inflated, in which condition they usually remained indefinitely or until returned to the water, where they would float about for some moments helplessly on their backs, their distended bellies above the water. Finally they would collapse, right themselves and swim away. Those placed in formalin or alcohol often remained inflated for some time, some permanently.

This puffer reaches a large size, our biggest examples having a total length of more than a foot. The 100 specimens in the collection from Honolulu are 1.8 to 14 inches long. In addition we have 9 small examples (1 to 1.75 inches long) from a pond at the Moana Hotel at Waikiki, and 11 examples (0.6 to 2.75 inches long), from Coccanut Island at Hilo. The fish is thought to be poisonous, a belief expressed in one of its native names, Maki Maki, meaning deadly death. The species is of wide distribution, having been recorded from various places in the Red Sea, the East Indies, Japan, and Australia, as well as from Panama and the islands off the Pacific coast of Mexico. It has been recorded from the Hawaiian Islands only by Streets, Jenkins, and Quoy and Gaimard previous to our explorations.

Tetraodon hispidus Linnæus, Syst. Nat., 10th ed., I, 333, 1758, India; Jenkins, Bull. U. S. Fish-Comm., XXII, 1902 (Sept. 237 1903), 484 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 534 (Honolulu; Necker Island).

Tetraodon perspicillaris Rüppell, Atlas, Reise Nord Africa, 63, 1828, Red Sea.

Tetraodon implitus Jenyns, Voy. Beagle, Fish., 152, 1842, Keeling Island; Streets, Bull. U. S. Nat. Mus., No. 7, 56, 1877 (Honolulu).

Tetraodon laterna Richardson, Voy. Sulphur, Zool., 124, pl. 61, fig. 2, 1848.

Arothron laterna, Bleeker, Act. Soc. Sci. Ind. Neerl., VI, 1859, 200 (Sumatra; Solor; Timor; Batjan; Amboyna; Banda).

Crayracion laterna, Bleeker, Atlas Ichth., V, 71, pl. 205, fig. 3, 1865.

Crayracion imphutus, Bleeker, Atlas Ichth., V, 71, 1865 (Padang, Siboga, Sumatra; Coecos; Lawajong, Solor; Kupang, Timor; Labuha, Batjan; Amboyna; Lonthoir, Banda).

Tetraodon hispidus, Günther, Cat., VIII, 297, 1870 (Red Sea; Zanzibar; Mozambique; Port Natal; Ceylon, East Indian Archipelago; Amboyna; Australia, and Aneityum).

Ovoides erethizon Jordan & Gilbert, Proc. U. S. Nat. Mus. 1882, 631, Panama.

? *Tetraodon stellatus*, Eydoux & Souleyet, Voy. Bonite, I, 212, pl. 10, fig. 2, 1841 (Sandwich Islands).

351. *Tetraodon lacrymatus* (Cuvier). Fig. 186.

Head 2.7; depth 2.6; eye 6.5; snout 2; preorbital 2.8; interorbital 2.3 in head, 6.5 in body; D. 10; A. 12; P. 19.

Body short and stout; head short and broad; snout short; teeth in each jaw in 2 strong convex plates, produced and beak-like at line of union; lips thin, not covering teeth completely; interorbital space broad and flat, the profile from tip of snout to occiput slightly concave; orbital rim prominent; gill-opening nearly vertical, its length half the distance from tip of snout to middle of pupil; nostril a short closed bifid tube. Fins broad; dorsal posterior, distance of base of anterior ray from base of caudal 1.5 in head, or 4 in body, length of base of fin 1.6 in length of fin, whose free edge is evenly rounded; caudal rounded, its length 2 in head; anal similar to dorsal, posterior to it, its base longer,

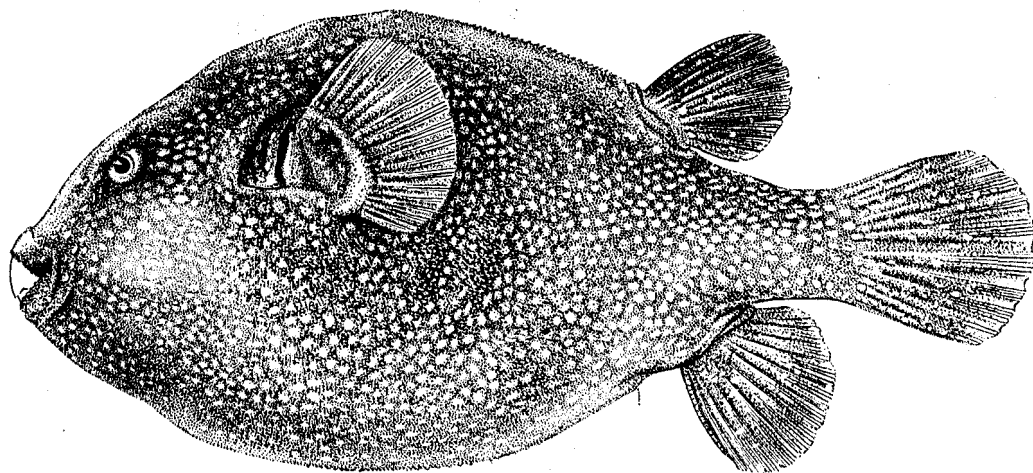


FIG. 186.—*Tetraodon lacrymatus* (Cuvier). Type of *Ovoides latifrons*.

its height about the same; pectoral broad, evenly rounded, its length 2.6 in head, its depth 1.2 in its length. Body more or less covered with small, simple, setae-like spines, mostly embedded in the skin, only the tips projecting, most of them inclined backward; snout, cheeks, caudal peduncle, base of dorsal, caudal and anal fins, chin, and a broad stripe along middle of side, and region about pectoral naked.

Color in life (No. 03409, 13 inches long, obtained at Honolulu, July 7), raw umber, streaked with mottling in black, covered everywhere with small white spots; belly covered also with small white prominences, the general tone grayish white; edge of dorsal, anal, and pectoral grayish white, yellowish behind pectoral.

Color of same specimen in alcohol, rich brownish black, profusely and quite uniformly covered with small roundish blue-white spots, varying in size from very small, mere specks, to nearly as large as pupil, those in axil, caudal peduncle, and caudal largest, the large ones on caudal being in the second and fourth fifths of the depth; setae white, especially on belly; all the fins with numerous roundish white spots, all except the caudal narrowly edged with white.

This species is close to *T. setosus* Smith, from the Pacific coast of Mexico, from which it differs chiefly in the smaller size of the spots. It is known to us from the type of the nominal species *Ovoides*

latifrons, a specimen about 8 inches long, and 2 examples (No. 03409, 12 inches long, and No. 05574, 9.5 inches long) obtained by us at Honolulu.

Tetrodon lacrymatus Cuvier in Quoy & Gaimard, Voy. Uranie, 204, 1824, Sandwich Islands.
 ? *Arothron ophryas* Cope, Fishes Lesser Antilles, in Trans. Amer. Philos. Soc., XIV, 1871, 479, Navigator Islands.
 ? *Tetrodon meleagris*, Smith & Swain, Proc. U. S. Nat. Mus., V, 1882, 141 (Johnston Island); probably not of Lacépède.
 ? *Ovooides ophryas*, Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 528, pl. xx, fig. 2; after Cope's type.
Ovooides latifrons Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (June 8, 1901), 398, fig. 10, Honolulu. (Type, No. 49696, U. S. N. M. Coll. Dr. Jenkins.)

Family LXXIX. CANTHIGASTERIDÆ.—The Sharp-nosed Puffers.

This family includes small puffers, similar in external appearance to the Tetraodontidæ, but with the snout sharp and the back more or less compressed or ridge-like. The skeletal characters by which the group is defined are thus given by Doctor Gill: Medifrontals separated from the supraoccipital by the intervention of the sphenotics, which are connected and laterally expanded, but short; the prosthmoid prominent above, enlarged and narrowed forward. Vertebrae about 8 + 10. Head compressed, with a projecting, attenuated snout; dorsal and anal short, few-rayed. Nostrils wanting or little developed. Tropical seas; small species; none of them reaching a length of more than 6 inches.

Genus 196. CANTHIGASTER Swainson.

Body short, deep and compressed, the back more or less sharply ridged; nostrils very small and inconspicuous, apparently sometimes imperforate.

Canthigaster Swainson, Class. Fishes, etc., II, 194, 1839 (diagnosis only; no type mentioned).

Psilonotus Swainson, l. c., II, 328, 1839 (*rostratus*): substitute for *Canthigaster*; not *Psilonotus*, a genus of Hymenoptera of prior date.

Prilonotus (Kaup MS.) Richardson, Voy. Herald, 162, 1854 (*rostratus*); a misprint.

Tropidichthys Bleeker, Nat. Tyds. Nederl. Ind., VI, 1854, 500 (*valentini*).

Anosmius Peters, Wiegmann's Archiv 1855, 274 (*taeniatus*).

Rhynchotus (Bibron MS.) Hollard, Etudes Gymnodontes in Ann. Sci. Nat. 4th ser. Zool., VIII, 1857, 320 (*personi*).

Eumycterias Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (June 8, 1901), 399 (*biteuiatus*).

a. Body almost everywhere covered with small prickles; body not barred.

b. Snout with small prickles.

c. Body with white spots; caudal peduncle without spinules; interorbital equal to eye, slightly concave; dorsal rays 9. *jactator*, p. 430

cc. Body with white and black spots; caudal peduncle with spinules; interorbital flat, wider than eye; dorsal rays 11. *oahuensis*, p. 432

bb. Snout without prickles; body and head, except snout, with prickles; dorsal rays 10; body with broad dark bars. *cinctus*, p. 433

aa. Body mostly smooth.

d. Dorsal rays more than 10; body with dark spots.

e. Snout long, 1.5 in head; dorsal rays 11 *psigma*, p. 433

cc. Snout about 2.5 in head; dorsal rays 13 *janthinus*, p. 434

dd. Dorsal rays 10.

f. Body with dark spots; small prickles on sides, caudal peduncle, belly, dorsal fin, and a patch on lower part of cheek *epilamprus*, p. 434

ff. Body with two dark lines; a few minute spines on lower surface of body, otherwise smooth. *biteuiatus*, p. 435

352. *Canthigaster jactator* (Jenkins). Fig. 187.

Head 2.66 in length of body; depth of body from back to lower edge of base of pectoral 3.33 in length. Eye equal to interorbital space, 2 in snout; D. 9; A. 10; P. 16; C. 7. Profile rising from tip of snout to middle of back where the median dorsal crest forms a prominent point; dorsal profile of head concave from tip of snout to eyes, straight from eyes to dorsal prominence. Interorbital space very slightly concave; profile descending to a straight line from apex of back to dorsal fin, from dorsal fin to caudal fin descending with gentle concavity; caudal peduncle deep anteriorly, depth just back of dorsal and anal fins equal to snout; much less deep posteriorly, depth just before bases of caudal rays 2.33 in head; ventral parts of body much dilated, depth below pectoral 1.25 in depth above pectoral; dorsal and anal fins very short, dorsal above anal; rays equal, about 3 in head; caudal slightly

rounded, median rays equal to snout; pectoral wide, distal edge slightly concave; upper rays longest, 2.66 in head. Body and head everywhere except on caudal peduncle covered with small asperities consisting of small, erectile, two-rooted spines directed backward; spines largest on belly.

Color in alcohol, dark brown above and on sides, belly pale yellowish; dark parts with numerous, regularly distributed, pale (apparently bluish in life), round or polygonal spots; spots largest on sides where the brown ground-color appears as a network between them, obsolete on fore part of head in one specimen, extending distinct to tip of snout in a smaller one, none smaller than pupil, those on sides three-fourths of eye in diameter; dusky ring about eye, most conspicuous above; fins colorless.

As was stated by Doctor Jenkins, this species is very similar to *C. punctatissimus* (Günther). Its distinction rests on a difference in the color pattern, the spots being fewer and generally more widely separated than those of *C. punctatissimus*. The distended belly, an alleged distinctive character seen in the type specimen of *C. jactator*, is merely the result of the specimen having been preserved while distended with air. In 3 specimens from Laysan Island, measuring 2.56, 3.07, and 3.66 inches, respectively, the spots on the sides of the head are nearly as large as those on the body; those on the upper part of the snout are about half as large; there are 7 or 8 on a line between upper part of eye and tip of snout. Those on the snout and upper part of head and nape are narrowly bordered with dark brown. On the body there are about 13 spots in a line between the dorsal and anal fins, and 6 in a vertical line near the middle of caudal peduncle. The largest example has an indefinite dark

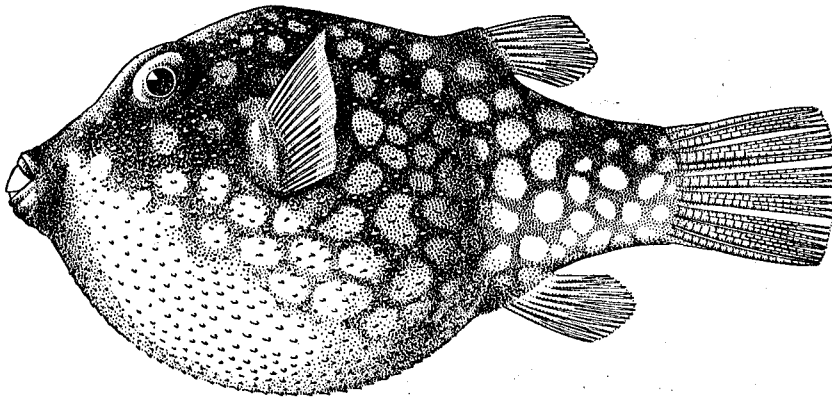


FIG. 187.—*Canthigaster jactator* (Jenkins); from the type.

spot below the base of dorsal fin. In life the spots are light blue. Most of them are as large as the pupil, and so close together that the brown ground color appears as a network.

Three examples from the reef at Honolulu measure 1.46 inches each. The spots on the upper part of the snout and head are very small, 5 in a line between upper part of eye and tip of snout. They are ocellated, as are also the spots along the back to the base of dorsal. There are 7 or 8 spots in a line between anal and dorsal fins, and 4 in a vertical line near middle of caudal peduncle. The cotype collected by Doctor Jenkins in Honolulu also has large spots on the snout.

C. punctatissimus, represented by 8 specimens from Panama, has from 7 to 10 small ocellated spots in a line on upper part of snout. The spots on the back from nape to base of caudal are small and have dark margins. There are from 11 to 23 spots between anal and dorsal, and from 8 to 15 on the caudal peduncle. One example has 4 short lines extending backward from the eye. A specimen from the Galapagos Islands referable to *C. punctatissimus* has the spots on the sides of the snout fused, forming vertical bands. There are 3 short bands or elongate spots radiating backward from the eye.

The species was not obtained by us, the only specimens known being the 2 examples, 1.5 and 2.5 inches long, respectively, obtained by Dr. Jenkins at Honolulu, and 6 examples collected by the *Albatross*, 3 at Honolulu and 3 at Laysan Island.

Tropidichthys jactator Jenkins, Bull. U. S. Fish Comm. for 1899 (June 8, 1901), 399, fig. 11, Honolulu (Type, No. 49703, U. S. Nat. Mus. Coll. O. P. Jenkins); *ibid.*, XXII, 1902 (Sept. 23, 1903), 485 (Honolulu); Snyder, *op. cit.* (Jan. 19, 1904), 535 (Honolulu; Laysan Island).

Tetrodon margaritatus solandri, Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 518 (Laysan); not of Richardson.

353. *Canthigaster oahuensis* (Jenkins). Fig. 188.

Head 3 in length; depth 2; eye 4 in head; snout 1.5; interorbital 3; D. 11; A. 10; C. 9; P. 16.

Body short, deep, and compressed, the back narrow and strongly elevated; anterior profile rising pretty evenly to a point slightly posterior to vertical of gill-opening; interorbital nearly flat; snout long, flattened laterally; teeth strong, convex, the edge sharp; eye small, high up, the supraorbital prominent; gill-opening short, slightly oblique, less than diameter of eye; nostril small and inconspicuous, but evident and perforate; caudal peduncle compressed, its least depth about 2 in head.

Body covered more or less uniformly with small, short prickles, most prominent on snout, back, chin, cheek, belly, and under pectoral fin; caudal peduncle and posterior part of side naked; base of pectoral and other fins naked.

Color of a nearly fresh example (No. 03528), 2.8 inches long, bluish gray, upper parts of head and body dusky; region from axil of pectoral fin to dorsal fin and backward to base of caudal and below for some distance below level of chin covered with small, bright blue spots; dark brown spots below and behind pectoral, mingled with the blue ones; 5 or 6 narrow brown lines running obliquely downward and forward on side of head, underneath which are brown spots and lines; radiating blue lines

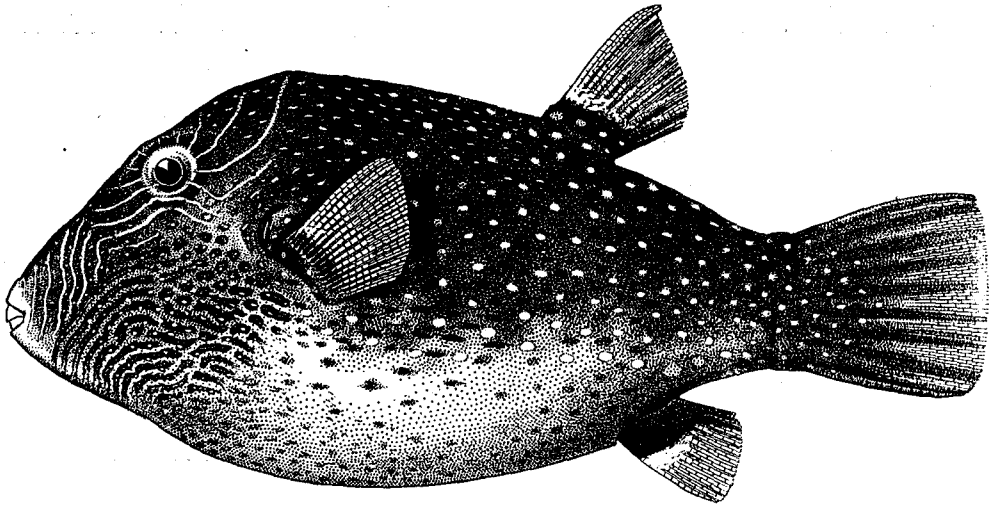


FIG. 188.—*Canthigaster oahuensis* (Jenkins); from the type.

from eye; 2 blue lines extending from upper posterior border of eye, diverging and then coming together at an eminence back of occiput in such a way as to include an irregular oval area about as large as eye; caudal dusky, with some small blue spots like those on body; dorsal and anal transparent, with dusky bases; blue spots on base of dorsal, and some on base of anal. Color in alcohol of same specimen, dark olivaceous; body from gill-opening to caudal fin with numerous small, round, pale bluish spots, among the lower of which are interspersed brownish spots; cheek with 4 or 5 narrow bluish lines separated by dark brown ones running upward and backward from chin to region in front of gill-opening; beneath and back of these are numerous brown spots and short wavy lines; short blue lines radiating forward and downward from eye; 2 similar blue lines running backward and upward from eye, coming together on nape and inclosing an oblong area about as large as eye; fins all dusky; dorsal black at base and with a few blue spots on base; basal third of anal blackish; base of pectoral black.

This species is known only from the type (original No. 326), a specimen 4.5 inches long, obtained by Doctor Jenkins at Honolulu in 1889, and one example (No. 03528) 2.5 inches long, obtained by us at Honolulu, August 4, 1901.

Tropidichthys oahuensis Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 485, fig. 32, Honolulu (Type, No. 50690, U. S. Nat. Mus.).

354. *Canthigaster cinctus* (Solander). Fig. 189.

Head and body, except front of snout, covered with spinules; profile of snout very steep, slightly concave; interocular space concave, equaling eye; D. 10, no ocellus at its base, but a large black blotch extending under it upon the flank; a broad black band, between these blotches on the flanks, connecting the pectorals; a band of the same color between the eyes, bordered in front with bluish spots; snout, side and caudal peduncle covered with smaller spots of same color, these spots equaling diameter of pupil, the spots of lower part of snout having a tendency to unite in the form of slightly curved horizontal lines; caudal bordered with black. Polynesia.

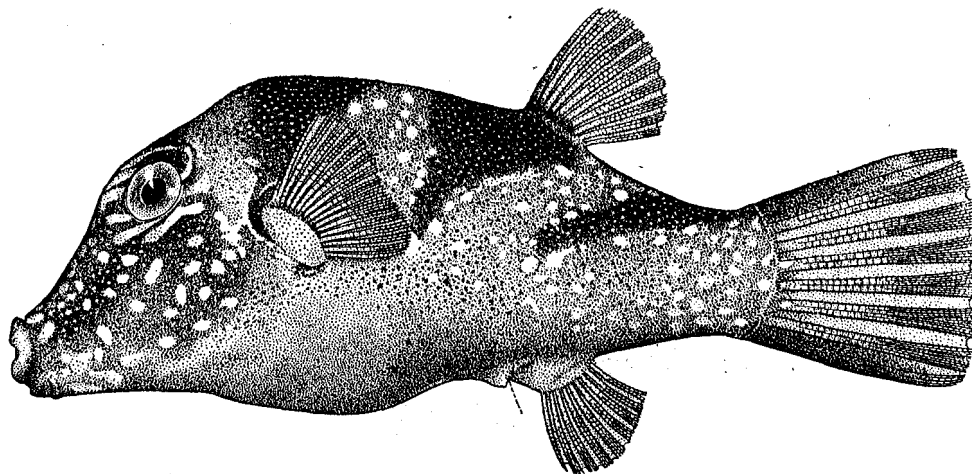


FIG. 189.—*Canthigaster cinctus* (Solander); from an Hawaiian example taken by the *Albatross* in 1902.

Tetrodon cinctus (Solander) Richardson, Zool. Voy. Samarang, 19, 20, 1850, Tahiti.

Tetraodon valentini Bleeker, Nat. Tijds. Ned. Ind., IV, 1853, 130, Amboyna.

Tropidichthys valentini, Bleeker, Nat. Tijds. Ned. Ind., VI, 1854, 500, Amboyna.

Anosmius valentini, Bleeker, Enum. Spec. Ind. Archipel., 203, 1859, Amboyna.

Tetraodon (Anosmius) coronatus Vaillant & Sauvage, Rev. Mag. Zool. (3d series), III, 1875, 286, Sandwich Islands.

355. *Canthigaster psegma* (Jordan & Evermann). Plate 50.^a

Head 3 in length; depth 2; eye 4.5 in head; snout 1.5; interorbital 2.3; D. 11 or 12; A. 11; C. 8; P. 16.

Body short, stout, moderately compressed; snout long, conic; anterior dorsal profile rising evenly to region above gill-opening, at which point the body is deepest; interorbital flat; gill-opening nearly vertical, short, its length less than diameter of eye; mouth low, below axis of body; teeth strong, convex, cutting edge sharp; eye small, supraorbital rim not prominent; caudal peduncle deep, its least depth about 2 in head, its least width 4 in its least depth; length of caudal peduncle from dorsal fin to base of caudal fin 1.3 in head; from base of anal fin 2 in head; dorsal prominence equally distant between tip of snout and posterior base of caudal; base of dorsal 1.5 in height of fin, which latter is 2 in head; anal similar to dorsal, its edge rounded; caudal truncate, or very slightly convex, 1.2 in head; pectoral broad, its base 2.6 in head, free edge oblique, posterior rays 1.5 in anterior ones; body mostly smooth; interorbital space and snout above and on side with small prickles; belly with a few prickles; a scattered patch also on side above pectoral.

Color in alcohol, dark brown above, paler below; 3 or 4 short black lines running forward from orbit, and same number backward; lower part of side, especially posteriorly, and lower part of caudal peduncle, with small roundish black spots; snout and interorbital space crossed by about 12 narrow black lines, these extending down on side of snout; side of snout with 3 or 4 narrow black lines from chin toward eye, separated by paler lines; posterior to these, small irregular black spots covering entire cheek, dotted over with fine white specks; ends of spines, pectoral, dorsal, and anal pale whitish, their bases largely brownish black; caudal dark brownish or black.

^a *Tropidichthys psegma* on plate.

This species is known from the type, No. 50885, U. S. N. M. (field No. 2561), 3.75 inches long, obtained by us at Honolulu in 1901, a second specimen recently received from Mr. Berndt at Honolulu, and from numerous specimens obtained by Doctor Jordan at Samoa.

Tropidichthys psegma Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (July 9, 1903), 209, Honolulu.

356. *Canthigaster janthinus* (Vaillant & Sauvage).

Dorsal with 13 rays; head without nasal tentacles; snout 2.5 in head; back rounded; profile not steep, convex, gradually merging into the dorsal outline; body without spines, except the ventral pouch, which is furnished with short, strong spines; caudal fin as long as caudal peduncle.

Body slate color, some black blotches between pectoral and eye; a few large rounded black blotches at intervals along the upper part of ventral pouch; upper part of pectoral black; caudal and dorsal stronger in color; anal transparent.

Hawaiian Islands; not seen by us. Known only from the record by Vaillant and Sauvage.

Tetraodon (Anosmius) janthinus Vaillant & Sauvage, Rev. Mag. Zool. (3d series), III, 1875, 286, Hawaiian Islands.

357. *Canthigaster epilamprus* (Jenkins). "*Puu olai*." Fig. 190.

Head 2.8 in length; depth 2.7; eye 3.6 in head; snout 1.6; interorbital 3.5; D. 10; C. 10; P. 17.

Body oblong, compressed; head long, snout pointed, its sides flattened; mouth small, the teeth strong, convex, meeting in a produced point at the center; eye high up, the supraorbital rim prominent; interorbital space concave; anterior profile from tip of snout to occiput nearly straight; caudal

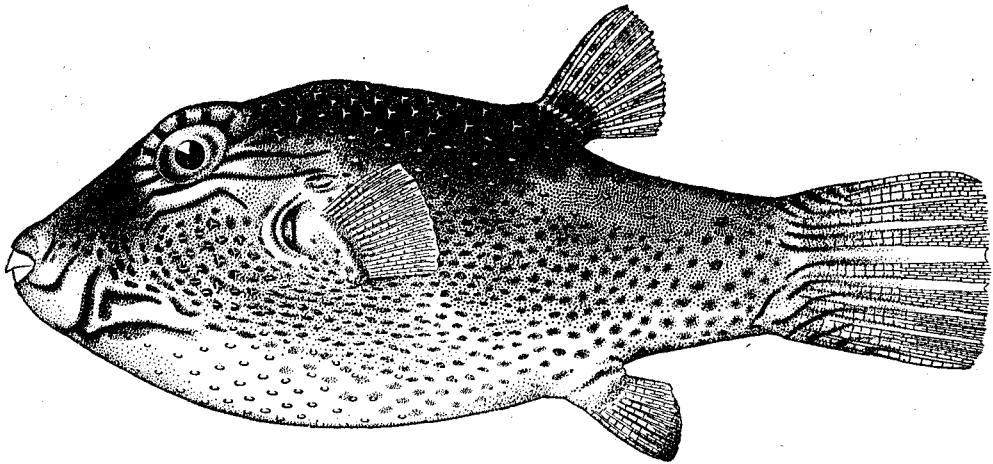
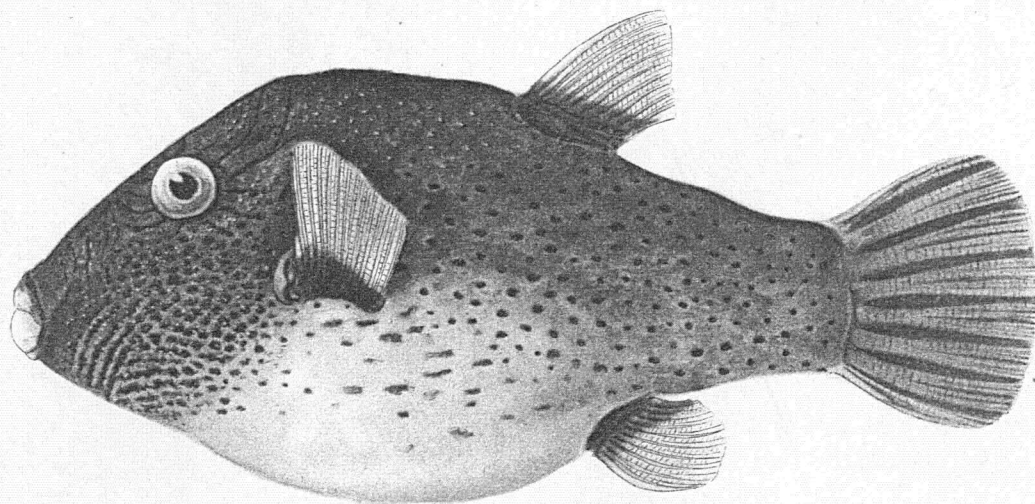


FIG. 190.—*Canthigaster epilamprus* (Jenkins); from the type.

peduncle compressed and deep, its depth 2.25 in head; gill-opening vertical, its length less than diameter of eye; nostril small, perforate, not in a projecting tube.

Body chiefly smooth on sides and caudal peduncle; dorsal region between eyes and dorsal fin with small, sharp prickles; a similar patch on lower part of cheek and belly; snout and interorbital region naked; lower jaw naked; posterior part of body and caudal peduncle naked; fins moderate; dorsal with the anterior rays longest, the free edge oblique, nearly straight, height of fin 2 in head; anal pointed, its length about 2.8 in head; caudal truncate, its length 1.3 in head; pectoral broad, little oblique, its length 2.6 in head.

Color in alcohol, pale brownish above, paler on sides and belly; a large blackish area on side below base of dorsal; cheek and entire body covered with small roundish brown spots; 2 dark-brown lines on cheek under eye; 2 or 3 similar lines radiating backward from eye and 2 others running



TROPIDICHTHYS PSEGMA JORDAN & EVERMANN. TYPE.

forward from eye; 5 narrow, dark lines across head between eyes; a dark median line from tip of lower jaw to vent; side of snout with 2 vertical and 2 horizontal brown lines; fins all pale, the caudal with converging light-brown lines on base.

This species is known only from the type, a specimen 3.5 inches long, collected near Kihei, Maui, by Mr. Richard C. McGregor.

Tropidichthys epilamprus Jenkins, Bull. U. S. Fish Com., XXII, 1902 (Sept. 23, 1903), 485, fig. 33, Kihei, Maui. (Type, No. 50853, U. S. Nat. Mus., Coll. R. C. McGregor.)

358. *Canthigaster bitæniatus* (Jenkins). Fig. 191.

Head 2.66 in length of body; depth a little greater than head. Back compressed, culminating in a very obtuse point above middle of pectoral fin. Profile from tip of snout to before eyes somewhat concave, straight from interorbital to top of dorsal prominence, descending in a straight line from here to base of caudal fin, being interrupted, however, at middle by elevation bearing dorsal fin. Ventral outline evenly curved, no more convex than the dorsal; eye 3.33 in head; snout 1.75 in head; interorbital concave, slightly greater than eye, 3 in head; one nostril in each side, each a simple opening with slightly raised margin, but scarcely tubular; distance from eye to nostril 2 in distance from nostril to tip of snout; front of dorsal fin midway between dorsal prominence and base of caudal fin, outline rounded; rays 10, longest 1.5 in snout; caudal slightly rounded, median rays equal distance from tip of snout to center of pupil; anal similar to dorsal, front of its base below posterior end of base

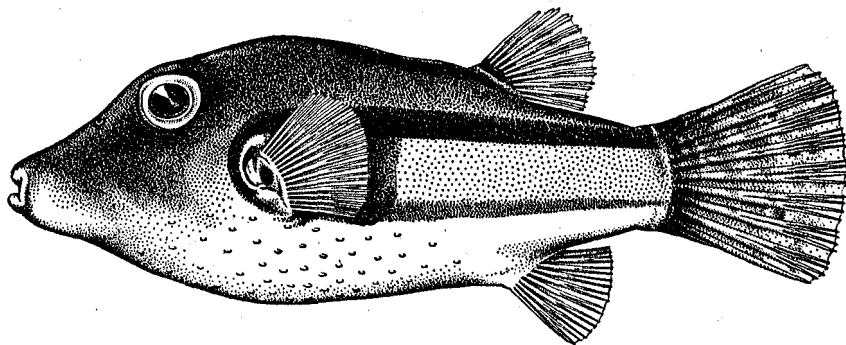


FIG. 191.—*Canthigaster bitæniatus* (Jenkins); from the type.

of dorsal; pectoral broad (in specimen median and lower rays on both sides broken), upper rays 2.5 in head; a few minute spines on lower surface of body; surface otherwise smooth.

Color in alcohol, general color brown or dusky above, paler brownish below; a wide dusky band from base of upper rays of the caudal running forward along side of body, above base of pectoral, to upper end of gill-slit, here becoming narrow and curving downward around anterior edge of gill-slit, then backward again below it as a narrow band below base of pectoral and along side of body, parallel with the upper band, to a little below middle of caudal fin, a black spot on outer side of base of pectoral; bases of upper and lower caudal rays black. One specimen, 2.04 inches long, secured by Dr. Wood at Honolulu. It is apparently not distinct from the Japanese species, *C. rivulatus* (Schlegel).

Eumycterias bitæniatus Jenkins, Bull. U. S. Fish Com., XIX, 1899 (June 8, 1901), 400, fig. 12, Honolulu (Type, No. 49702, U. S. Nat. Mus.); Jenkins, Bull. U. S. Fish Com., XXII, 1902 (Sept. 23, 1903), 486 (Honolulu; type specimen).

Tetrodon caudofasciatus, Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 518, pl. III, fig. 3 (Laysan); not of Günther.

Family LXXX. DIODONTIDÆ.—The Porcupine Fishes.

Body short, broad, depressed above; belly moderately inflatable, covered everywhere except on the lips and caudal peduncle with spines, which are usually 2-rooted or 3-rooted at their bony base; caudal peduncle short and slender; mouth moderate, terminal, each jaw covered with a bony plate like the beak of a bird, these not divided by a median suture; nostrils on each side forming a small tentacle, usually with 2 openings; eye rather large, gill-opening moderate, immediately in front of the pectoral,

which is short, broad, and rounded; dorsal and anal fins short, similar to each other, rounded in form and placed posteriorly. Genera about 6; species 15. Sluggish fishes, living on the bottom among weeds and corals in tropical seas. When disturbed they swallow air and float belly upward on the water. Their capacity of inflation is very much less than that of the *Tetraodontidae*, from which family they differ chiefly, however, in the stronger armature and in having no division in the bony plate of either jaw. They are rarely used as food, being generally regarded as poisonous. The species are mostly well known in collections, the singular form having attracted the attention of travelers in the earliest times.

- a. Dermal ossifications mostly 2-rooted; the spines rather slender, but stiff and erectile; both jaws entire. . . . *Diodon*, p. 436
 aa. Dermal ossifications all or nearly all 3-rooted, each with a short, stiff, immovable spine; jaws each with a median suture *Chilomycterus*, p. 438

Genus 197. DIODON Linnaeus.

Body robust, the belly moderately inflatable; dermal spines strong, stiff, most of them 2-rooted and erectile, a few 3-rooted and therefore immovable; both jaws entire; nasal tube simple, with 2 lateral openings; pectoral broad, the margin undulate, the upper lobe longest; vertical fins rounded, the dorsal and anal short, posteriorly inserted, similar to each other. Tropical seas; the few species very widely distributed.

Diodon Linnaeus, Syst. Nat., Ed. X, 335, 1758 (*hystrix*).

Paradiodon Bleeker, Atlas Ichth., V, 56, 1865 (*hystrix*); name a substitute for *Diodon*, transferred to another genus; the first species mentioned by Linnaeus being *Diodon atinga*, which was therefore taken by Bleeker as the type.

- a. Frontal spines long, usually longer than post-pectoral spines, about twice as long as eye in adult. . . . *holacanthus*, p. 436
 aa. Frontal spines not longer than the post-pectoral spines.
 b. Dorsal rays 12, spines on forehead *hystrix*, p. 437
 bb. Dorsal rays 15; no spines on forehead. *nudifrons*, p. 438

359. *Diodon holacanthus* Linnaeus.

D. 12; A. 12. Very similar to *Diodon hystrix*, but with the frontal spines usually longer than the spines behind the pectorals, about twice as long as eye; predorsal spines not shortened, 2-rooted; erectile; about 14 to 17 spines in a series between snout and dorsal; post-pectoral spines not especially elongate, but movable; pectoral broader than long, upper lobe pointed, lower lobe rounded. Coloration much as in *Diodon hystrix*, but more variable, the spots fewer and larger; usually a broad black bar from eye to eye, continued below eye as a narrow bar; a broad bar across occiput; a black blotch above each pectoral; a short bar in front of dorsal, another in which the dorsal is inserted; a blotch behind the pectoral, and many small spots and blotches on the upper parts; fins with few spots, mostly immaculate in the young. Found in all warm seas, north to the Florida Keys, Lower California, and the Hawaiian Islands; its range coinciding with that of *Diodon hystrix*, from which it may prove to be not distinct. The differences are generally evident in the adult, but young individuals apparently intermediate are often found. Possibly they are the 2 sexes of the same species. Jordan and Snyder had this species from Japan and Doctor Steindachner records it from Laysan, whence he had one specimen. It was not seen by us among the Hawaiian Islands, but the *Albatross* obtained at Laysan Island, a single specimen, 9.25 inches long, upon which Professor Snyder has the following note:

"The fins are immaculate; 10 or 12 small dusky spots scattered over the body; a broad, dark bar, interrupted in the middle, extending between the eyes; a similar bar on nape, a spot as large as eye above and behind pectoral, a median brown bar on back anterior to dorsal, and a blotch surrounding base of dorsal."

Diodon holacanthus Linnaeus, Syst. Nat., Ed. X, 335, 1758, India (based on Artedi; misprint for *holacanthus*); Snyder, Bull. U. S. Fish Com., XXII, 1902 (Jan. 19, 1904), 535 (Laysan Island).

Diodon liturosus Shaw, Gen. Zool., v. 436, 2, 1804; after *Le Diodon tachete* Lacépède.

Diodon spinosissimus Cuvier, Mém. Mus. Hist. Nat., IV, 134, 1818, no locality.

Diodon novemmaculatus Cuvier, op. cit., IV, 136, pl. 6, 1818, no locality.

Diodon sexmaculatus Cuvier, op. cit., IV, 136, pl. 7, 1818, no locality.

Diodon multimaculatus Cuvier, op. cit., IV, 137, 1818, no locality.

Diodon quadrimaculatus Cuvier, op. cit., IV, 137, pl. 6, 1818, Tahiti.

Diodon melanopsis Kaup, Weigmann's Archiv, 1855, 228.

Paradiodon novemmaculatus, Bleeker, Atlas Ichth., V, 57, pl. 206, fig. 3, 1865 (Priaman, Sumatra; Batu; Nias; Singapore; Badjoa, Manado, Celebes; Kajeh, Buro; Amboyna; New Guinea).

Paradiodon quadrimaculatus, Bleeker, op. cit., 58 pl. 212, fig. 2, 1865 (Lawajong, Solor; Amboyna).

Diodon maculatus Günther, Cat., VIII, 307, 1870, St. Croix, Jamaica, Panama, South America, Sandwich Islands, China, Sooloo Sea, Indian Ocean, East Indies, Amboyna, Cape of Good Hope, Bourbon, Formosa; Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 518 (Laysan).

Diodon holacanthus, Jordan and Evermann, Fish. North & Mid. Amer., II, 1746, 1898 (La Paz).

360. *Diodon hystrix* Linnaeus. Fig. 192.

Head 2.9; depth 4; eye 4.5; snout 2.5; preorbital 4; interorbital 1.4; width of head 1.1; width of body at base of pectorals 1.1; D. 12; A. 12; C. 10; P. 23.

Body stout and heavy forward, tapering posteriorly; anterior profile from tip of snout to interorbital region concave; interorbital very broad and nearly flat, scarcely convex; eyes large, oblique, farther apart posteriorly; mouth broad, its width 3 in head; dental plates strong, the edge blunt and rough, not much convex at middle; gill-opening vertical, short, with a broad anterior flap; nostril in a short, simple tube with 2 openings, one smaller and more lateral than the other. Body covered with strong, sharp, erectile spines, longest in the post-pectoral region, where they equal distance from eye to gill-opening; those on nape about 2 in eye; those on belly usually short but more slender than those on back; those on posterior part of back and on tail short and 3-rooted, and therefore not erectile; snout naked; sides of caudal peduncle naked; about 6 spines on dorsal side of caudal peduncle back of dorsal fin and 2 on ventral surface posterior to anal fin.

Color in alcohol, light brown, pale or yellowish-white below; entire upper part of head and body

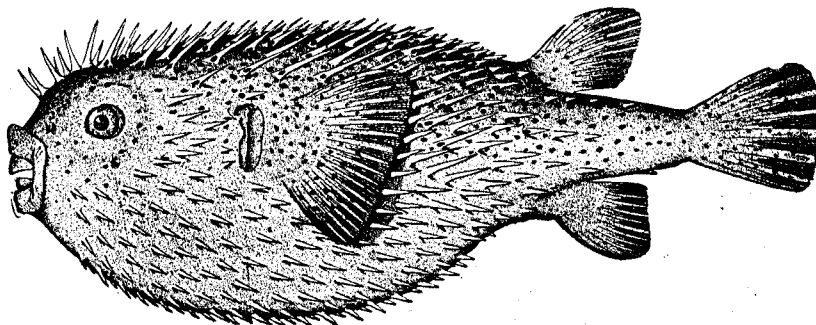


FIG. 192.—*Diodon hystrix* Linnaeus; after Jordan and Evermann.

and also sides covered thickly with small round or roundish black spots, smallest and most numerous on snout, fewest on caudal peduncle; belly with a few small dark spots on belly; a broad dark band across under side of head, convex forward; fins all profusely marked with small dark spots.

Occasionally taken among the Hawaiian Islands. We have examined a specimen 20 inches long taken by the *Albatross* at Honolulu in 1896, one 25 inches long and another of 10 inches obtained in 1889 by Doctor Jenkins; and 2 examples 20 and 21 inches long, respectively, secured by us at Honolulu, where other examples were collected by the *Albatross* in 1902. Smith and Swain record it also from Johnston Island.

Diodon hystrix Linnaeus, Syst. Nat., Ed. X, 335, 1758, India (after Artedi); Smith & Swain, Proc. U. S. Nat. Mus., v, 1882, 141 (Johnston Island); Jordan & Evermann, Fish. North & Mid. Amer., II, 1745, 1898; Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 489 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 535 (Honolulu).

Diodon atinga, Bloch, Ichthyologie, IV, 75, pl. 125, 1787; not of Linnaeus.

Diodon plumieri Lacépède, Hist. Nat. Poiss., II, 10, pl. 3, fig. 3, 1800, Martinique; on a drawing by Plumier.

Diodon brachiatus Bloch & Schneider, Syst. Ichth., 513, 1801.

Diodon punctatus Cuvier, Mém. Hist. Nat., IV, 132, 1818, no locality.

Diodon echinus Rafinesque in Bonaparte, Cat. Met. Pisc. Eur., 87, 1846, Mediterranean; no description.

Diodon atinga Rüppell, Verzeichn. Senckenb. Mus. Samml. Fische, 35, 1852.

Holocanthus hystrix Gray, Cat. Fish. Coll. Gronow, 27, 1854 (African and American oceans).

Paradiodon hystrix Bleeker, Atlas Ichth., V, 56, pl. 207, fig. 2, 1865 (Batavia, Java; Telokbetong, Sumatra; Batu; Makassar, Celebes; Larantuka, Flores; Timor; Ternate; Amboyna; Wahi, Ceram; Banda)?

? *Diodon spinosissimus*, Günther, Cat., VIII, 307, 1870 (Cape of Good Hope; Siam).

361. *Diodon nudifrons* Jenkins. "*Oopu kawa*." Fig. 193.

D. 15; A. 12; forehead sloping upward from snout at angle of about 45°; interorbital 1.3 in head; spines mostly short, not longer than eye, except those back of pectoral, the longest of which are equal to length of pectoral and about 2 in head; no spines on forehead below level of upper margins of eyes; foremost spines of head few and short; head, back, sides, all the fins and the membranous sheaths of the spines closely covered with small, roundish, black spots, much smaller than pupil; below pale; a

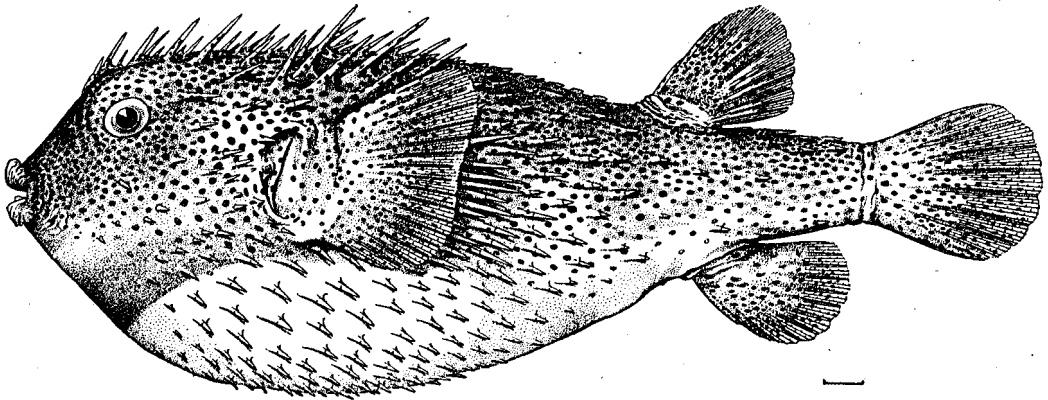


FIG. 193.—*Diodon nudifrons* Jenkins; from the type.

brown band from below gill-opening forward along lower angle of head to below eye, then across throat continuous with corresponding band of opposite side. Known only from one specimen, 21 inches long, obtained by Doctor Jenkins at Honolulu, and from several examples recently seen in the Waikiki aquarium.

Diodon nudifrons Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 488, fig. 35, Honolulu (type, No. 50854, U. S. N. M.; coll. O. P. Jenkins).

Genus 198. *CHILOMYCTERUS* Bibron.—The Burr-fishes.

Body broad, depressed, moderately inflatable; dermal spines short, stout, immovable, triangular, each with 3 roots; nasal tube simple, with 2 lateral openings; the tube sometimes rounded, sometimes flattened, and with the partition feeble and easily torn, so that the tentacle appears divided; caudal peduncle short; fins small, formed as in *Diodon*; jaws without median suture.

Species numerous, of smaller size than those of *Diodon*, the spines broader and lower, their bases forming a coat of mail. Only one species known from the Hawaiian Islands.

Chilomycterus Bibron in Barneville, Rev. Zoologique 1846, 140 (*reticulatus*=*tigrinus*).

Chilomycterus Kaup, Wiegmann's Archiv 1847, 365 (*antennatus*).

Cyclichthys Kaup, op. cit., 1855, 231 (*orbicularis*).

Cyanichthys Kaup, op. cit. (*cæruleus*).

Diodon Bleeker, Atlas Ichth., V, 1865, 54 (*atinga*, the first species named by Linnæus); not *Diodon* as properly restricted by Kaup to *Diodon hystrix*.

362. *Chilomycterus affinis* Günther. "*Obpukūe*."

Head 2.7; depth 3.5; snout 2.5; eye 4; preorbital 4.6; interorbital 1.6; depth of caudal peduncle 5.2; length of gill-opening equals eye; D. 12; A. 10; C. 14; P. 20.

Body short, stout and broad, its width at pectorals equal to length of head; anterior profile from tip of snout to interorbital concave; interorbital broad, concave, the supraocular rim not prominent; eye large, placed obliquely, the anterior margins being closer together than the posterior; mouth rather large, its width 1.6 in interorbital width; teeth strong, in a broad, flat, rough plate, the cutting edge low and concave, the upper with a strong blunt point at middle; nasal tentacle flattened, somewhat bilobed, the surface with small, roundish cup-shaped cavities; gill-opening vertical, a little wider than base of pectoral; spines all short and blunt, increasing in length posteriorly except above and below, 3-rooted, the anterior very long; a very low 4-rooted spine on posterior part of interorbital space; 3 low supraocular spines followed by a row of 3 somewhat higher spines, the first of which is 4-rooted, the

next 3-rooted, and the last with a very long anterior root and 2 very short lateral roots; no spines on cheek; middle of belly with very low spines having long and strong anterior roots; caudal peduncle crossed by 2 bony plates, the anterior formed by the inner roots of the spine on each side of dorsal fin, the posterior being the bifid bony base of a single median short spine, which disappears with age; a small, slender, supraocular cirrus near base of middle supraocular spine, this sometimes obscure; spines of back each often with broad but short dermal flap posteriorly, these sometimes obscure or wanting. Fins all rounded; dorsal high, its height about 2 in head; caudal long, its rays about 1.8 in head; anal similar to dorsal, a little lower; pectoral very broad, its edge nearly truncate, its depth 1.2 in distance between eye and gill-opening.

Color in alcohol, dark brownish or olivaceous above, yellowish white below, the color on back distributed in indistinct clouds; side with 4 broad dark brown bars extending downward from the dark upper parts, the first under eye, the second in front of pectoral, the third under posterior half of pectoral, and the fourth in front of vertical of dorsal fin; entire back and upper parts of sides with numerous small round black spots, less than half diameter of pupil, these more sparse anteriorly, especially on interorbital and snout, sometimes few or none on snout; 2 or 3 spots in front of gill-opening, and 1 or 2 sometimes on cheek; under parts immaculate; caudal peduncle sparsely spotted; fins all very closely covered with small, round brownish black spots, much smaller than those on body.

The collection contains 3 excellent specimens of this fish, which agree so perfectly with Günther's description of *C. affinis* that we have no hesitancy in identifying them with that species. Günther's specimen was a stuffed skin 15 inches long, from an unknown locality.

We have compared our examples with a specimen from Tokyo, Japan (Coll. K. Otaki), and one from the Galapagos Islands (Coll. Snodgrass and Heller), both of which were thought by Jordan and Snyder and by Snodgrass and Heller to be identical with *C. californiensis* Eigenmann, from San Pedro, California. We have not been able to examine the type of *C. californiensis*, but this identification is probably correct, although Doctor Eigenmann states that his specimen had no cirri or tentacles anywhere and the color appears to be somewhat different. In any case all our specimens are certainly referable to Günther's *C. affinis*, which is the oldest available name.

This species reaches a large size, our longest example exceeding 20 inches in length. It does not appear to be common among the Hawaiian Islands, and was not obtained by Jenkins, Streets, nor any previous collector. Snyder records it as having been obtained at Honolulu by the *Albatross*, but fails, curiously, to give any further information.

Diodon tigrinus Schlegel, Fauna Japonica, Poiss., 288, pl. CXXVIII, fig. 1, 1842, Nagasaki; not of Cuvier.

Chilomycterus affinis Günther, Cat., VIII, 314, 1870, locality unknown (type, a stuffed skin 15 inches long, in British Museum); Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 535 (Honolulu).

Chilomycterus californiensis Eigenmann, Amer. Nat., V, 1891, 1133, San Pedro, California; Jordan & Snyder, Review of Gymnodont Fishes of Japan, in Proc. U. S. Nat. Mus., XXIV, 1901, 258 (Tokyo; Galapagos Islands); Snodgrass & Heller, Proc. Wash. Ac. Sci., VI, 1904 (Jan. 31, 1905), 415 (Tagus Cove, Albemarle Island).

Family LXXXI. MOLIDÆ.—Head Fishes.

Body oblong or more or less short and deep, compressed, truncate behind, so that there is no caudal peduncle. Skin rough, naked, spinous, or tessellated. Mouth very small, terminal; teeth completely united in each jaw, forming a bony beak without median suture, as in the *Diodontidæ*. Dorsal and anal fins similar, falcate in front, the posterior parts more or less perfectly confluent with the caudal; no spinous dorsal; no ventral fins; pelvic bone undeveloped; pectorals present. Belly not inflatable; gill-openings small, in front of pectorals; an accessory opercular gill; no air-bladder.

Fishes of the open seas, apparently composed of a huge head to which small fins are attached; found in most warm seas, pelagic in habit, and reaching a very large size. The very young are variously shortened in form and armed with spines. The flesh of these fishes is coarse and tough and not used for food.

Genus 199. RANZANIA Nardo.

Body oblong, the depth about one-half height; skin smooth, tessellated, divided into small hexagonal scutella; caudal truncate. Otherwise essentially as in *Mola*. The larval forms are unknown. Pelagic.

Ranzania Nardo, Ann. Sci. Regn. Lombard., Venet., V, 1840, 10, 105 (*truncatus*).

363. *Ranzania makua* Jenkins. "Apahu;" "Makua." Fig. 194.

D. 17; A. 18; C. 19; P. 3; depth 2.12 in length; head 2.8; eye 6 in head, 2.33 in snout.

Body much compressed, the ventral margin a sharp, evenly curved keel; eye much above axis of body, a little nearer snout than base of pectoral; teeth forming a turtle-like beak completely hidden by projecting folds of skin, which form a truncated opening to the mouth; gill-opening just in front of upper base of pectoral, covered by a 2-lobed valve; body covered by an armor of small plates, more or less hexagonal and concealed; pectoral about 1.5 in head, above axis of body; height of dorsal about equal to head; anal slightly lower; dorsal and anal each separated from the caudal by a notch. Color, bright silvery on sides, upper parts dark; sides with brighter silvery bands, the first 3 with

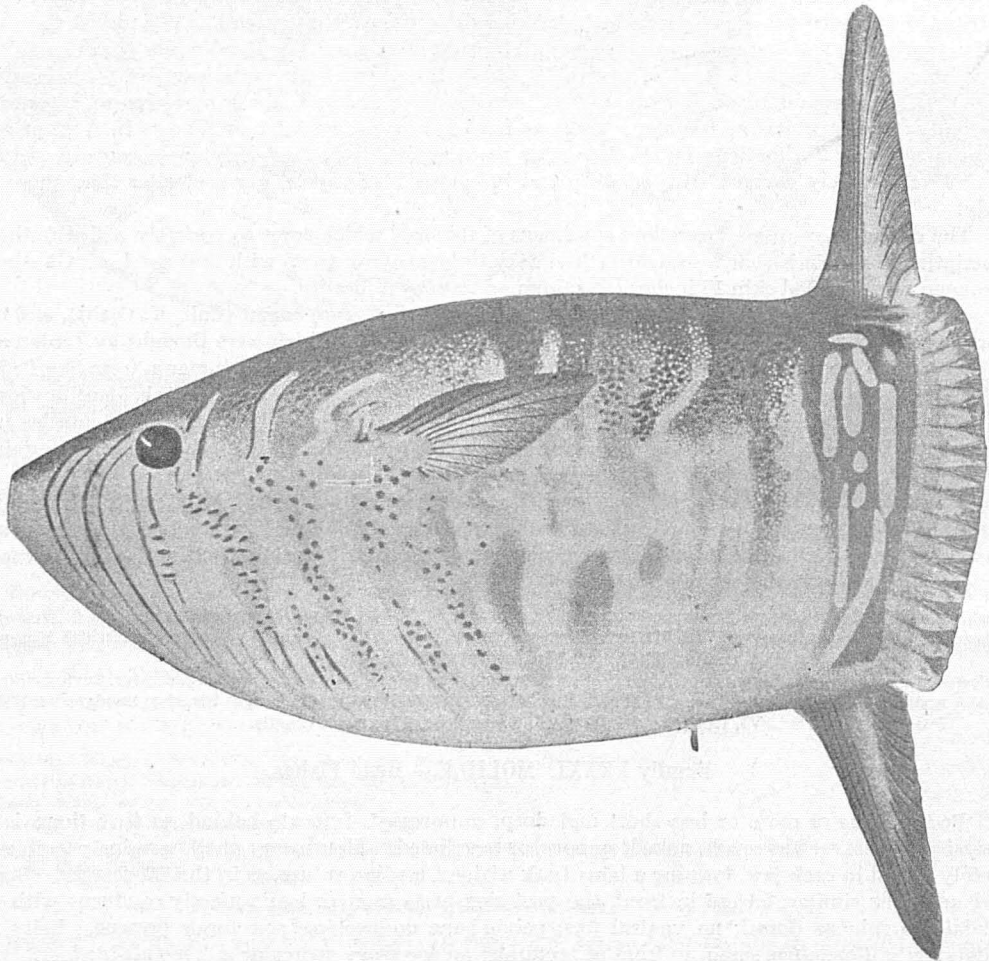


FIG. 194.—*Ranzania makua* Jenkins; from the type.

distinct black borders, the next 4 with numerous black spots, the black margins appearing only on lower parts.

Differing from *Ranzania truncata* chiefly in the smaller eye, placed well above the mouth and above the axis of the body, in the high position of the pectoral fin, in the higher dorsal and anal, and in the coloration. Originally known from one specimen, 20 inches long, taken at the mouth of Pearl Harbor, Oahu, by Mr. Hiel Kapu, and sent to Stanford University by Mr. Charles B. Wilson. A second example about 4 inches long was secured by us at Honolulu in the summer of 1901.

Ranzania makua Jenkins, Proc. Cal. Ac. Sci., 2d series, V, October 31, 1895, 780, 784, with colored plate, Pearl Harbor, near Honolulu; Jordan & Evermann, Fishes North and Mid. Amer., 1755, 1898; Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 486 (Honolulu: the type).

Suborder OSTRACODERMI.—The Trunk Fishes.

This group includes those Plectognaths which are without spinous dorsal and which have the body inclosed in a 3-angled, 4-angled, or 5-angled box or carapace, formed by polygonal, bony scutes, firmly joined at their edges, and with distinct teeth in the jaws. There is but one family, the *Ostraciidae*, a singular offshoot from the *Sclerodermi*.

Family LXXXII. OSTRACIIDÆ.—The Trunk Fishes.

Body short, cuboid, triquetrous or pentagonal, covered by a carapace formed of firmly united polygonal bony patches, the jaws, bases of the fins, and caudal peduncle free and covered by smooth skin. Mouth small; each jaw with a single series of long, narrow teeth; maxillaries and premaxillaries firmly united; gill-opening a nearly vertical slit, below and behind the eye; dorsal fin single, short, without spine; anal short, similar to dorsal; caudal rounded; no ventral fins; vertebrae 14, the anterior 9 elongate, the last 5 extremely short; no ribs. Genera 3; species about 20, all of the tropical seas, living near the bottom in shallow waters. The species of this group are so singular in appearance and so easily preserved that they have been common in collections ever since the collecting of tropical curiosities began. The 4 American species were well known to Artedi and Linnæus. "The locomotion of the trunk fishes is very peculiar. The propelling force is exerted by the dorsal and anal fins, which have a half rotary, sculling motion, resembling that of a screw propeller; the caudal fin acts as a rudder, save when it is needed for unusually rapid swimming, when it is used as in other fishes; the chief function of the broad pectorals seems to be that of forming a current of water through the gills, thus aiding respiration, which would otherwise be difficult on account of the narrowness and inflexibility of the branchial apertures. When taken from the water, one of these fishes will live for 2 or 3 hours, all the time solemnly fanning its gills, and when restored to its native element seems none the worse for its experience, except that, on account of the air absorbed, it can not at once sink to the bottom." (Goode.)

a. Carapace 4-angled.

b. Carapace entirely without spines..... *Ostracion*, p. 441

bb. Carapace with 2 preocular spines and 2 terminating the ventral keels. *Lactoria*, p. 444

aa. Carapace 6-angled..... *Aracana*, p. 446

Genus 200. OSTRACION Linnæus.

Trunk-fishes with the carapace closed behind the anal fin; carapace with or without frontal and abdominal spines; dorsal rays 9 or 10; caudal rays always 10; lateral ridges developed; median dorsal ridge undeveloped, or else raised in a sharp spine, the body therefore 4-angled or 5-angled. Although this character is a striking one it is not one of high structural importance. Hollard and Bleeker have discarded it as being of no real systematic value. All writers agree that the species of the group are most closely related, and that the relations are closer than they appear. We think, with Doctor Goode, and Jordan and Fowler, that the shape of the carapace affords the most reliable guide to the arrangement of the species of the genus, and we find it difficult to define more than 2 genera in the family, unless we assign generic rank to each of the leading sections. In Japan 3 of these sections are represented, *Tetrosomus*, *Lactoria*, and *Ostracion*. The remaining 4, *Rhinesomus*, *Chapinus*, *Lactophrys*, and *Acanthostracion* are all based on 3-angled species, a type confined to the West Indian region and taken as a distinct genus, *Lactophrys*, by us in our Fishes of North and Middle America.

Ostracion Linnæus, Syst. Nat., 10th ed., 330, 1758 (many species; first restricted by Swainson to 4-angled forms, *cubicus* taken as type).

Tetrosomus Swainson, Classn. Fish., ii, 323, 1839 (*turritus*).

Cibotium Kaup, Wiegmann's Archiv Natur. 1855, 215 (*cubicus*).

a. Ventral surface of carapace without spots; anterior opening of carapace broad, greater than orbit.

b. Sides of body with golden spots *sebae*, p. 442

bb. Sides of body entirely without spots *oahuensis*, p. 443

aa. Ventral surface of carapace with small bluish white spots or reticulations; anterior opening of carapace narrow, its width less than orbit *lentiginosum*, p. 443

364. *Ostracion sebæ* Bleeker. "Moa." Fig. 195.

Head 3.75 in length; depth 3; eye 2.6 in head; snout 1.2; interorbital 1.2; D. 9; A. 9; P. 10; C. 10.

Body 4-sided; back slightly rounded; interorbital flat; profile before eyes strongly convex, from there to tip of snout straight or slightly concave in small examples, forming a reentrant angle in larger individuals; side of body concave; ventral surface slightly convex, its sides uniformly curved, less so posteriorly, the width at middle one-fourth greater than head, its length 2.6 times head; width of dorsal surface 1.2 times head; depth of side 1.25 in head; preorbital 1.6 in head; carapace entirely without spines; 2 plates posterior to dorsal fin and 1 behind anal fin; anterior opening of carapace moderate, its greatest width 1.8 in interorbital; greatest width of posterior opening 1.6 in interorbital; caudal peduncle, measured along middle of side, equal to snout; pectoral short, broad, its length equaling interorbital width; dorsal shorter, the distal edge somewhat oblique, length of rays 1.2 in interorbital; anal fin shorter, the rays 1.3 in interorbital; caudal long, rounded, its length equaling greatest interorbital width or length of head.

Color in life, dark blue or black on back, belly dark blue; a lighter patch below eye; an irregular golden band, nearly as broad as eye, across top of head between the eyes; back covered with many small round white spots, uniform in size and uniformly distributed; side with golden spots; caudal peduncle black, with one or more rows of golden spots on each side and white dots on dorsal surface;

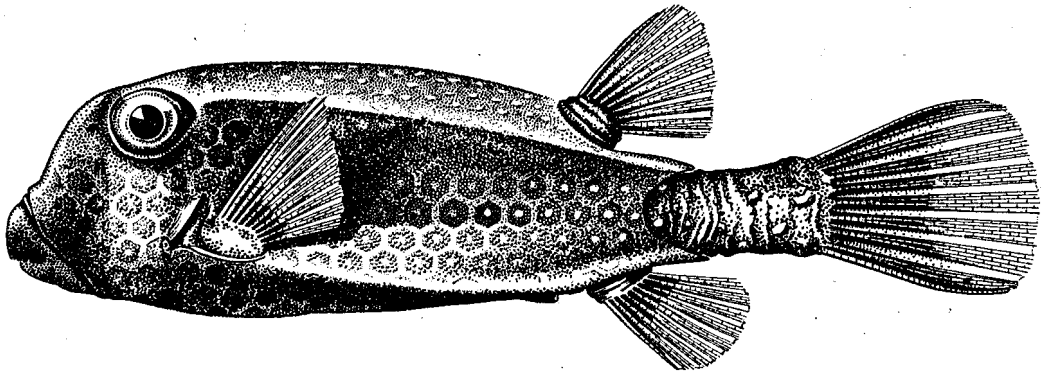


Fig. 195.—*Ostracion sebæ* Bleeker. Type of *O. camurum*.

axil blue; fins dusky, posterior half of caudal lighter; iris white, with orange spots. Different specimens show considerable variation in color, some being decidedly dark blue, others black.

In alcohol the general color becomes dirty brownish, the spots bluish white; the basal portion of caudal black, the distal part yellowish white; anal and pectoral pale yellowish white, each crossed by 1 or 2 darker bars; base of pectoral dark brown; the orange stripe across interorbital pale dusky.

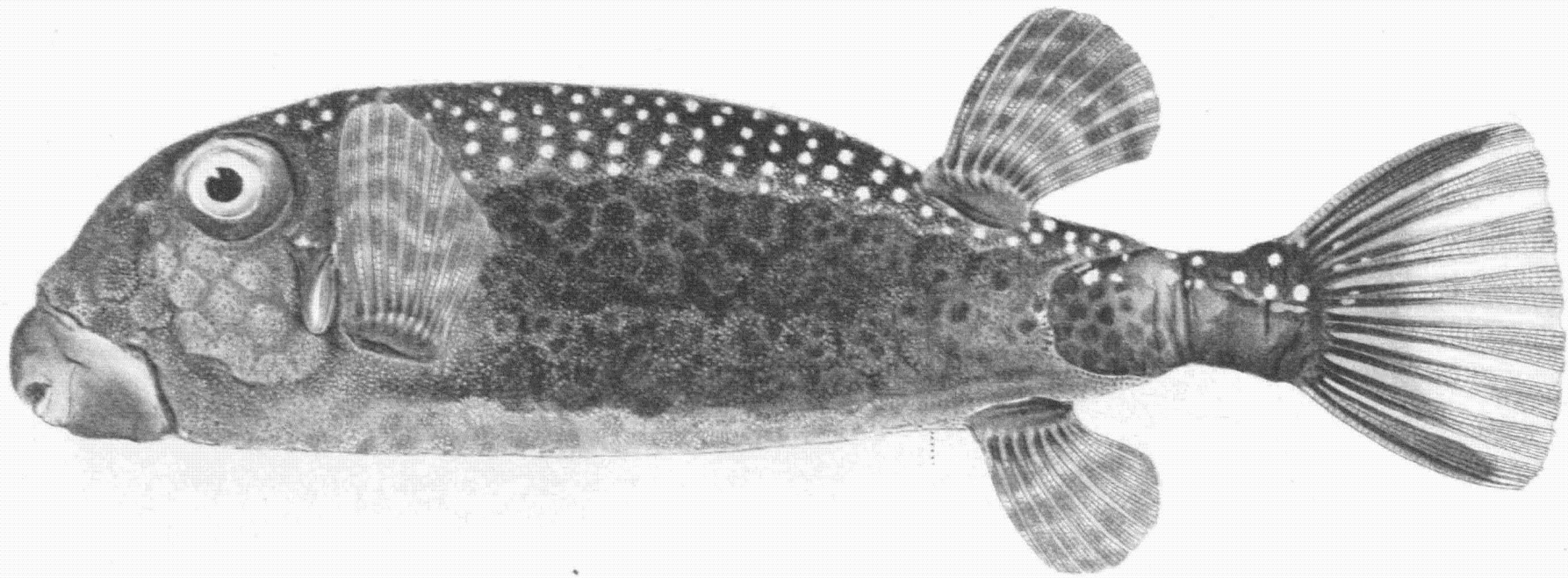
The Bureau has recently received from Mr. Berndt 5 specimens of this species, 3.3 to 4.7 inches long. These differ in no way from specimens collected by Doctor Jordan in Samoa. Two examples have the ventral surface without spots, while 2 others have the same area spotted like the back. In 1 specimen the spots extend inward along the edges of the ventral surface of the carapace. Some have the caudal peduncle with spots only, while others have elongate white bands of irregular shape, no two being alike in this respect. The largest individual has a transverse white band between the eyes.

This is the most abundant species among the Hawaiian Islands, although not represented in our collections by many specimens. Doctor Wood obtained 1 example, the *Albatross* 2 in 1896, Doctor Jenkins 1 (the type), and 1 was secured by us, all at Honolulu. The *Albatross* found it at Puako Bay, Hawaii. There are 2 specimens from Honolulu in the California Academy, and we have examined a specimen collected by Snodgrass and Heller at Clipperton Island. The species was also found by Doctor Jordan at Apia where it is known as Moamoia Samasama.

Ostracion sebæ Bleeker, Verh. Bat. Gen., XXIV, 32, tab. 6, fig. 13, East Indies.

? *Ostracion bombifrons* Hollard, Ann. Sci. Nat., 1857, VII, 168.

Ostracion camurum Jenkins, Bull. U. S. Fish Comm. for 1899 (June 8, 1901), 396, fig. 9, Honolulu (type, No. 49697, U. S. N. M. Coll. O. P. Jenkins); *ibid.*, 1902 (Sept. 23, 1903), 486 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 535 (Puako Bay, Hawaii).



365. *Ostracion oahuensis* Jordan & Evermann. "Moamoa waa." Plate 51.

Head 3.9 in length; depth 2.9; eye 2.9 in head; snout 1.2; preorbital 1.6; interorbital 1; D. 9; A. 9; P. 10; C. 10.

Body 4-sided; dorsal side of carapace evenly convex, its greatest width one-fourth greater than head; lateral dorsal angles not trenchant, slightly convex anteriorly, then evenly convex; snout blunt, the anterior profile ascending abruptly then strongly convex in front of eyes; interorbital space nearly flat; cheek flat; side of body concave, its width about equal to head; ventral keel prominent, evenly convex; ventral surface nearly flat posteriorly, but little convex anteriorly, its greatest width 1.4 times length of head, its length just twice its width; gill-opening short, not exceeding two-thirds diameter of eye; least width of anterior opening of carapace 1.75 in interorbital, or 1.5 times diameter of orbit, the depth nearly twice orbit; mouth small; teeth rich brown; least depth of posterior opening of carapace much less than width of anterior opening, equaling distance from lower edge of preorbital to pupil; length of caudal peduncle less than that of head, its depth 2.2 in its length; no spines anywhere. Dorsal fin high, its edge obliquely rounded, its length 1.3 in head; anal similar to dorsal, the edge rounded, its length 1.2 in dorsal; caudal slightly rounded, its rays nearly equal to head; pectoral with its free edge oblique, the rays successively shorter, length of fin equal to height of dorsal.

Color in life, dark brown with blue tinges; interorbital space showing more or less golden; small whitish spots profusely covering entire dorsal surface; no spots on side of body or on face; no spots on ventral surface, except a faint one of a slightly darker color than general gray color of surface; one longitudinal row of golden spots on each side of upper part of caudal peduncle from carapace to base of caudal fin; pectoral, anal, and dorsal fins with transverse rows of faint spots; caudal bluish black at base, white on posterior half; a broad light or yellowish area below eye; iris golden.

Color in alcohol, rich brown above, the sides darker, and the ventral surface paler, brownish about margins, dusky yellowish within; entire back with numerous small, roundish, bluish-white spots; upper half of caudal peduncle with similar but larger spots; forehead and snout dark brown; lips brownish black; cheek dirty yellowish; sides and ventral surface wholly unspotted; base of caudal blackish, paler distally, the dark extending farthest on outer rays; other fins dusky, with some obscure brownish spots.

This species is related to *O. sebae* Bleeker, from which it differs in the smaller, more numerous spots on back, the entire absence of spots on side, the smaller size of the spots on the caudal peduncle, and the brighter yellow of the suborbital region.

The type and 1 cotype were obtained by us at Honolulu where other specimens were later collected by the *Albatross*. One example was obtained by Doctor Wood. Our specimens are 5 to 6 inches long.

Ostracion oahuensis Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (April 11, 1903), 200, Honolulu (type, No. 50668, U. S. N. M.); Jenkins, op. cit. (Sept. 23, 1903), 487; Snyder, op. cit. (Jan. 19, 1904), 535.

366. *Ostracion lentiginosum* Bloch & Schneider. "Oopakaku."

Head 4 in length; depth 3; eye 2.8 in head; snout 1.25; preorbital 1.9; interorbital 1.2; D. 9, sometimes 7; A. 9; C. 10; P. 10.

Body 4-sided; dorsal surface moderately rounded, the lateral dorsal angles not sharp, uniformly convex, except at extreme anterior and posterior ends, where each is slightly concave; greatest width of dorsal surface one-fourth greater than length of head, there being 10 hexagonal plates in a transverse series; 3 plates posterior to dorsal fin; side concave, its greatest depth about 1.2 in head; ventral surface evenly convex, its sides uniformly curved, its greatest width 1.6 times length of head, its length 3 times head, about 10 plates in a transverse series, one plate behind anal fin; anterior opening of carapace narrow, its greatest width less than orbit; mouth small, the teeth brown; anterior dorsal profile concave to front of eyes, then strongly convex; interorbital nearly flat; least depth of posterior opening of carapace equal to width of anterior opening, its greatest width a trifle greater than depth of preorbital; length of caudal peduncle equaling head, its depth 2 in its length; dorsal fin high, its rays 1.6 in head; anal similar, equally high, its distal edge rounded; caudal broad, rounded, its length nearly equaling that of head; pectoral with its distal edge oblique, the longest rays about as long as caudal.

Color in life of an example (No. 03527), 3.25 inches long, gray, covered all over carapace on all sides, including head, with small white spots; similar spots all over caudal peduncle and on basal half

of caudal fin; posteriorly the spots have a tinge of blue; spots on head very small, those posteriorly larger, but none nearly so large as pupil; dorsal, ventral and pectoral fins transparent.

Color in alcohol dark brownish black; back and sides profusely covered with small, round, or stellate bluish white spots, uniformly disposed; ventral surface paler, the lighter spots and markings disposed to run together, forming reticulations; cheek with few or no spots; caudal peduncle brown, with somewhat larger, round, or oblong bluish white spots; base of dorsal black, the fin dusky; base of anal pale brownish, with a few small white spots, the base of the rays with a brown line, the fin dusky; caudal dark at base with a few white spots, the distal portion paler; ventrals dusky.

This is a species of wide distribution, having been recorded from the Indian Ocean and Archipelago and from various places in the tropical Pacific. Steindachner had 1 example from Honolulu, Jenkins has 2, and we have 5, all from the same place. Others were obtained by the *Albatross*. Jenkins also had 1 from Hilo and there is 1 from Hilo in the California Academy.

Ostracion lentiginosus Bloch & Schneider, Syst. Ichth., 501, 1801, Isle of France.

Ostracion punctatus Bloch & Schneider, Syst. Ichth., 501, 1801; Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 517 (Honolulu).

Ostracion meleagris Shaw, Gen. Zool., V, 428, pl. 172, 1804.

Cibotium punctatus, Kaup, Arch. Naturgesch., XXI, 1855, 216.

Ostracion (Ostracion) punctatus, Bleeker, Atlas Ichth., V, 39, pl. 202, fig. 4, 1865 (Ternate; Amboyna; Ceram; Banda (Neira); Letti; New Guinea; Mauritius; Tahiti; New Holland).

Ostracion lentiginosum, Jenkins, Bull. U. S. Fish. Comm., XXII, 1902 (Sept. 23, 1903), 487 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 535 (Honolulu).

Ostracion punctatum, Smith & Swain, Proc. U. S. Nat. Mus., V, 1882, 140 (Johnston Island).

Genus 201. LACTORIA Jordan & Fowler.

This genus agrees with *Ostracion* in having the carapace 4-angled, but differs in having strong spines in front of the eyes and a pair terminating the ventral keels; a median dorsal spine is sometimes present.

Lactoria Jordan & Fowler, Proc. U. S. Nat. Mus., XXV, 1903, 278 (*cornutus*).

a. Ventral portion of carapace not translucent; no spines on dorso-lateral crest posterior to the orbit.....*schlemmeri*, p. 444

aa. Ventral portion of carapace translucent; spines on dorso-lateral crest posterior to the orbit*gateodon*, p. 445

367. *Lactoria schlemmeri* Jordan & Snyder. Plates 52 and 53.^a

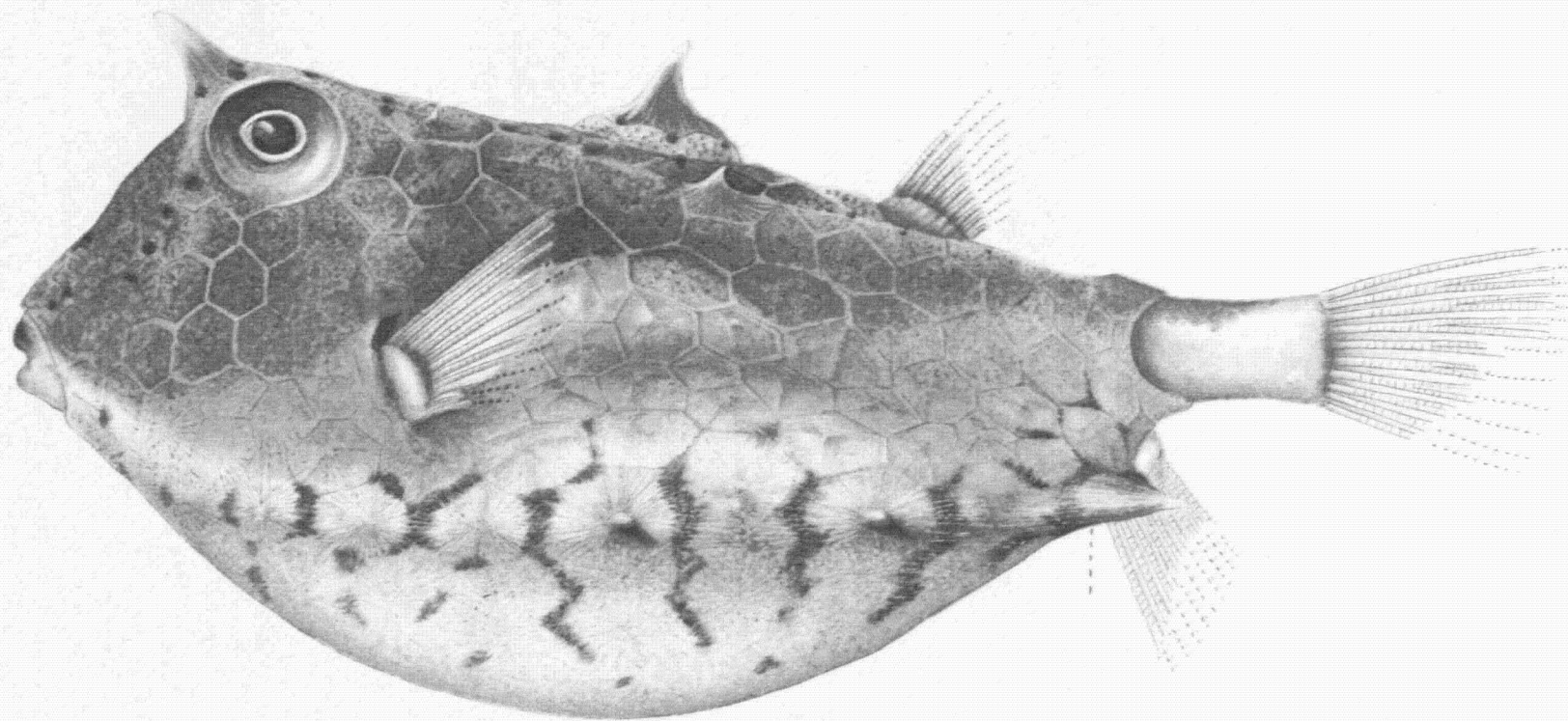
Head measured to gill-opening, 3.7 in length to base of caudal; depth 2.3; eye 2.7 in head; snout 4.6; D. 9; A. 9.

Anterior profile of head very steep, interrupted by a constriction one-third of distance between tip of snout and middle of interorbital space; interorbital space V-shaped, when viewed from before, the depression extending almost to a level with upper edge of pupil; carapace with 5 ridges, the dorsal ridge scarcely evident, with a large spine located midway between tip of snout and base of caudal fin; dorso-lateral crest with 3 spines, the anterior projecting upward and forward from the orbit; the posterior located slightly behind middle of dorsal spine, midway between anterior edge of orbit and posterior end of carapace; the median, which is small and weak, located somewhat nearer to the orbital than the posterior spine; ventro-lateral ridge with 4 spines, the first very small, the second larger, located below dorsal spine, the posterior one projecting backward, the distance between it and the one of the opposite side equal to distance between center of pupil and dorsal spine; ventral surface of carapace convex, a slight median depression extending from breast to anal fin; plates granular, except 10 or 12 in the region posterior to pectoral fin, each with a central granule usually larger than the others.

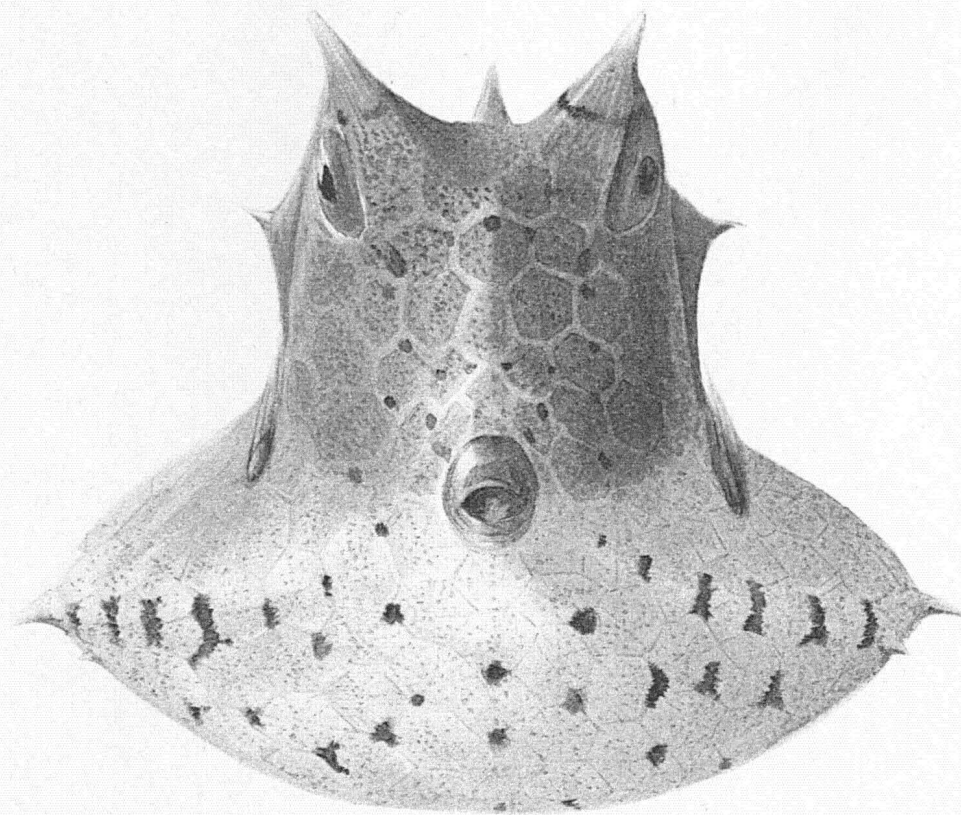
Dorsal fin located midway between dorsal spine and end of carapace; base of anal fin occupying most of the space between vent and end of carapace; pectoral just behind vertical through posterior edge of orbit.

Dorsal portion of body dusky with small dark spots scattered over snout and back; ventral half of carapace translucent with zigzag dusky bars along the region of crest, the color following the vertical sutures between the plates; throat and breast with scattered dusky spots somewhat smaller than pupil.

^a*Ostracion schlemmeri* on plate.



OSTRACION SCHLEMMERI JORDAN & SNYDER. TYPE.



OSTRACION SCHLEMMERI JORDAN & SNYDER. TYPE.

This species is closely related to *L. diaphanum* (Bloch & Schneider), of Japan and the East Indies. Compared with Japanese examples it differs in having the spines better developed, and in greater number, there being 2 on the dorso-lateral ridge, 1 of which is opposite the large median spine, the other between the former and the orbital spine; also in having the carapace deeper in the region of the ventro-lateral ridge and broader near the anal fin, and the plates posterior to the pectoral less granular. The only Hawaiian form with which it might be confused is *L. galeodon* Jenkins. In this species the ventral portion of the carapace is not translucent, the orbital spines are longer and project in a more horizontal direction, and there are no spines on the dorso-lateral crest posterior to the orbit.

One specimen, 4.13 inches long, from Laysan Island, collected by Mr. Max Schlemmer, for whom the species is named. Type No. 8440, Stanford Univ. Mus.

Lactoria schlemmeri Jordan & Snyder, Proc. U. S. Nat. Mus., XXVII, 1904, 945, Laysan Island.

368. *Lactoria galeodon* Jenkins. "Makukana." Fig. 196.

D. 9; P. 11; A. 8; head 2.8; depth 2; eye 2; snout 4.5; interorbital 1.2.

Carapace 4-sided; a pair of long, slender, slightly divergent spines in front of eyes, their direction slightly upward; a similar pair terminating the lateral ventral angles, horizontal and not divergent; middle of back with a strong, compressed, triangular spine, notched on posterior border, slightly

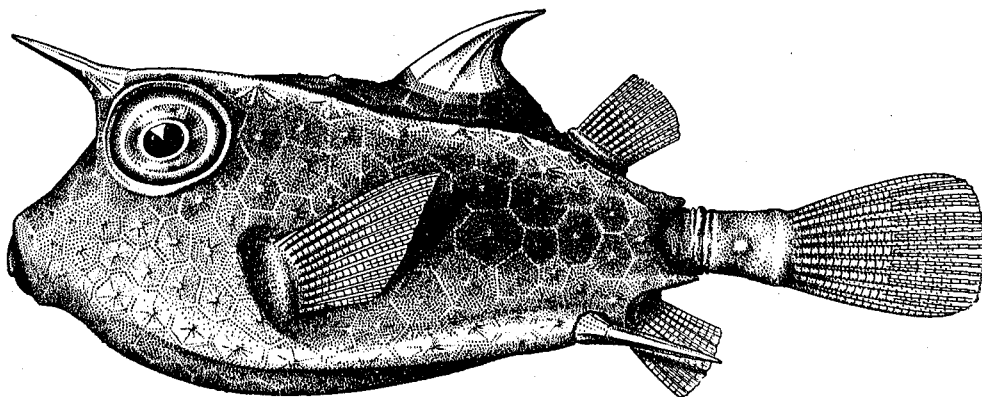


FIG. 196.—*Lactoria galeodon* Jenkins; from the type.

projecting backward, and resembling a sharp tooth; snout short, the anterior profile concave; dorsal lateral angles little convex, the ventral angles more convex, 12 plates along its edge from snout to spine; 8 plates in lateral dorsal angle, no spine at its middle; ventral surface with 11 or 12 plates in longitudinal median series, 7 in transverse series.

Color in alcohol, dirty yellowish or olivaceous above; middle of side with a large oblong dark or blackish area; ventral surface yellowish.

This species is closely related to the East Indian species, *L. diaphanum* (Bloch & Schneider), from which it is readily distinguished by the entire absence of median spines on the lateral ventral keel, by the longer and straighter frontal and ventral spines, the character of the dorsal spine, and the opaque carapace.

A single example was obtained at Honolulu in 1889 by Doctor Jenkins, and our collection contains three small specimens 1 to 1.3 inches long, all from Hilo. We have also examined a painting made by Andrew Garrett, preserved in Hilo, the specimen having been taken at Kailua; also a colored drawing made at Kailua by Miss Louise Kimball, of Los Angeles.

The Albatross obtained several specimens at Honolulu from the stomach of a *Coryphæna*.

Lactoria galeodon Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 487, fig. 34, Honolulu (type, No. 50717, U. S. N. M.); Snyder, op. cit. (Jan. 19, 1904), 535.

Ostracion diaphanus, Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 517 (Laysan and Hawaii); probably not of Bloch & Schneider.

Genus 202. *ARACANA* Gray.

This genus differs from *Ostracion* in having the carapace 6-angled and open behind the anal fin. The species vary in form almost as much as do those of *Ostracion*. In *Aracana* proper there are spines over the eye, and the abdomen is crested, while in *Apoplocapros* the back and belly are crested, but no spines are present anywhere.

The single Hawaiian species of this genus is fully described in Section II.

Aracana Gray, Ann. Nat. Hist., I, 1838, 110 (*auritus*).

Acerana Kaup, Wiegmann's Archiv, 1855, 219 (*auritus*).

Capropygia Kaup, op. cit., 220 (*unistriata*).

Kentocapros Kaup, l. c.

Anoplocapros Kaup, op. cit., 221 (*grayi*).

Group CIRRHITOIDEI.—The Cirrhitoid Fishes.

This group agrees with the *Percoidæ* in most respects, the chief external difference being in the form of the pectorals, which have broad, procurrent bases, as in the *Scorpenidæ*, the lower rays being unbranched and more or less thickened. Its relations doubtless lie with both *Percidæ* and *Scorpenidæ*. One family is represented in Hawaiian waters.

Family LXXXIII. CIRRHITIDÆ.

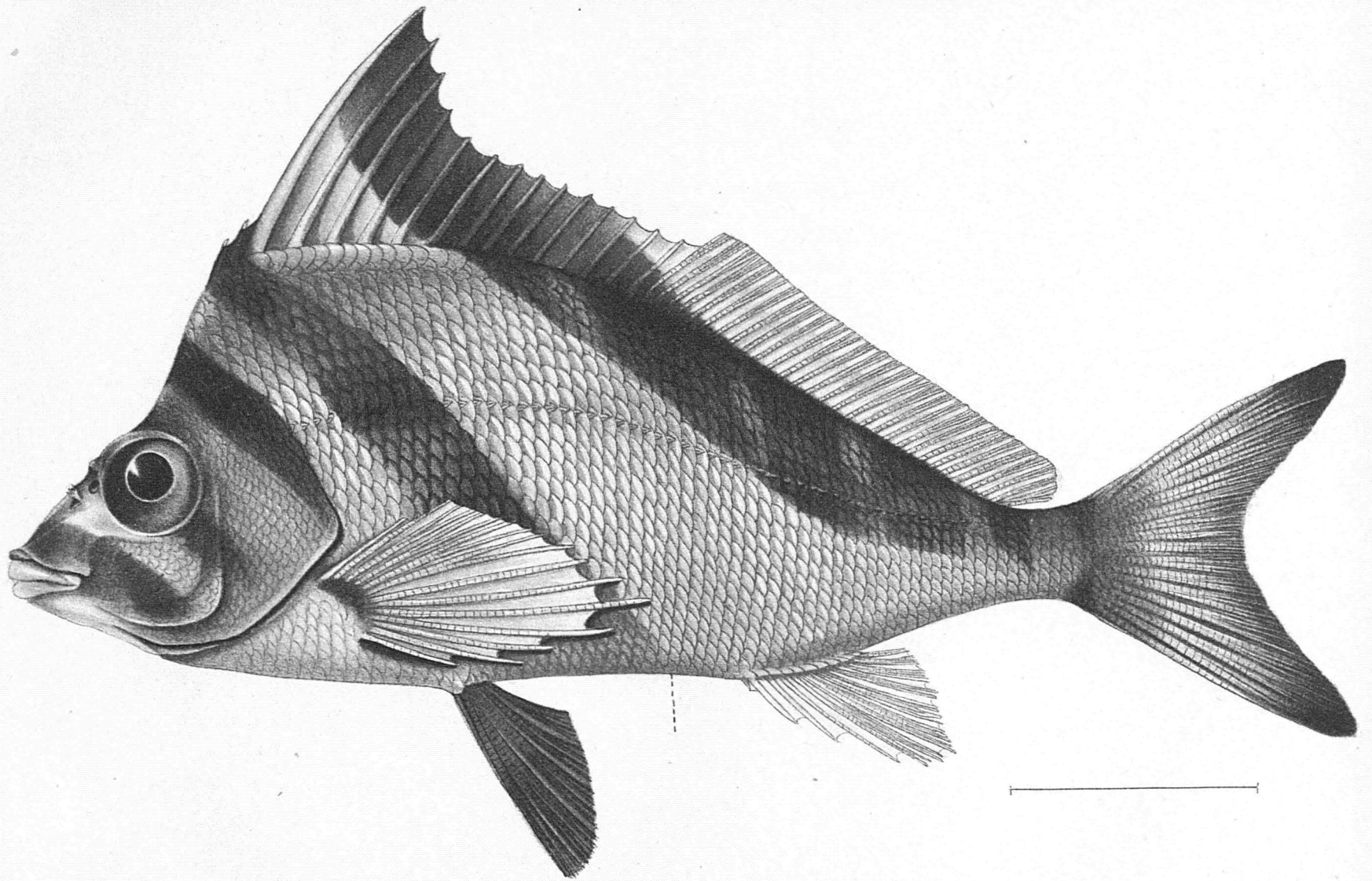
Body compressed, oblong, covered with moderate scales, which are cycloid or ctenoid; lateral line continuous, concurrent with the back, not extending on caudal; mouth low, terminal, with lateral cleft; eye lateral, of moderate size; premaxillaries protractile; maxillary narrow, not sheathed by preorbital; teeth small, pointed, occasionally with canines, sometimes present on vomer or palatines; cheek without bony suborbital stay; branchiostegals 3 to 6, usually 6; gill-membranes separate, free from the isthmus; preopercle serrate or entire; opercle unarmed; no spines or serrations on bones of cranium; dorsal fin continuous, long, the spinous and soft parts subequal, the spines not depressible in a groove; soft dorsal low; spines rather low and strong; pectoral fin short and broad as in the *Cottidæ*; lower half of fin with its rays simple and generally stout; the membranes deeply incised; ventral fins thoracic, but considerably behind root of pectorals, the rays I, 5; air-bladder large and complicated or wanting; pyloric cæca few; vertebrae 10 + 16 = 26; skull very compact and solid. Carnivorous fishes of the warm seas; genera 10; species 40; apparently really allied on the one hand to the *Serranidæ*, with which group Dr. Boulenger finds that the skeleton has much in common; on the other hand they show affinities with the *Scorpenidæ*. Through such forms as these the great group of *Loricati* or mail-cheek fishes may be connected with their perch-like ancestors. This family is represented in American waters by one genus (*Cirrhitus*) with 2 species, and in the Hawaiian Islands by 4 genera and about 7 species.

- a. Dorsal with 18. spines; body greatly elevated anteriorly, the nape trenchant; body greatly compressed
Cheilodactylus, p. 446
- aa. Dorsal with 10 to 12 spines; body not elevated nor greatly compressed.
- b. Snout long and pointed, 3 in head *Cirrhitoidea*, p. 447
- bb. Snout not especially long, more than 3 in head.
- c. Teeth on palatines wanting; scales on cheeks as well as on body large *Paracirrhites*, p. 448
- cc. Teeth on palatines; scales on body large, those on cheeks small *Cirrhitus*, p. 451

Genus 203. *CHEILODACTYLUS* Lacépède.

Body greatly elevated anteriorly, the anterior profile rising abruptly from occiput to origin of dorsal fin; nape trenchant, back very greatly compressed, the body tapering rapidly posteriorly; anterior dorsal spines long and strong. Several species, only one known from the Hawaiian Islands.

Cheilodactylus Lacépède, Hist. Nat. Poiss., V, xix, 5, 1803 (*fasciatus*).



CHEILODACTYLUS VITTATUS GARRETT.

369. *Cheilodactylus vittatus* Garrett. "Kikakapu." Plate 54.

Head 3 in length; depth 2.6; eye 3.2 in head; D. xviii, 29; A. iii, 7; scales 11-63-12.

Body greatly compressed, anteriorly greatly elevated, the profile rising nearly vertically from posterior line of orbit to origin of dorsal fin, from which point it descends in a long low curve but slightly convex; nape trenchant; head moderate; snout not produced; mouth small, little oblique; maxillary scarcely reaching orbit; lower jaw short, included; preopercle entire; eye moderate or large, entering anterior profile; nostrils round, close to eye, the anterior with a small, branched filament; fins well developed; origin of dorsal over posterior edge of orbit, its base covering nearly entire length of body; first dorsal spine very short, second somewhat longer, third very long, nearly equaling head; fourth and fifth dorsal spines both a little shorter than third, about 1.4 in head, the other spines progressively shorter; edge of soft dorsal nearly straight, the rays about equal in length, a little greater than snout or about equal to last dorsal spine; caudal deeply forked, the lobes pointed; anal spines short, the anterior spines produced somewhat, equal to snout and eye; ventrals reaching past vent, their length 1.6 in head; pectoral long, the lower rays produced, nearly equaling head; scales rather small, firm and smooth; head densely covered with much smaller scales; scales of breast very small.

Color in life, according to Garrett, grayish silvery, ornamented with 5 oblique blackish brown bands disclosed as follows: one from snout to margin of preopercle; the second from eye across cheek to base of pectoral fin, which it involves; the third, which passes over the occipital region, extending downward and backward to axil of pectoral; the fourth and broadest from origin of dorsal downward and backward, widening in its descent and passing beneath the abdomen under the ventral fins; a fifth beginning at the tip of fourth dorsal spine, passing downward and backward, reaching back at base of seventh spine, and continuing chiefly on side to caudal peduncle, partly crossing lateral line under about twelfth dorsal ray; within this dorsal band are 3 irregular pale or whitish spots; caudal peduncle with a large blackish spot near the middle and 2 smaller ones at base of caudal fin; opercular flap and snout tinged with orange red; interorbital with 2 transverse brownish red bands; dorsal fin anterior to fifth black band, white; soft portion of dorsal, caudal and anal light yellowish, the caudal lobes tipped with blackish brown; pectoral orange-red; ventrals deep blackish brown; iris yellowish silvery. In alcohol the general pattern of coloration holds.

The above description is based upon a specimen about 6 inches long, taken at Honolulu some years ago by Doctor Rosenstern, of San Francisco, and now in the California Academy of Sciences.

The species is an extremely rare one. It was described originally from Honolulu, by Garrett, his type being a specimen 7 inches long, the present location of which is unknown. It is probably not in existence. The description and colored plate in Günther's *Fische der Südsee* were based upon Garrett's description and sketch. A second example, 8 inches long, was obtained by Professor Schausinsland at Honolulu in 1896, and described by Doctor Steindachner. Recently we have received from Mr. Berndt, at Honolulu, 2 other examples much larger than either of those previously known. They measure 6.9 and 9.7 inches, and with the specimen in the California Academy of Sciences and the one in the Museum at Vienna seem, therefore, to be the only known examples, and are probably the only representatives of the species extant.

Cheilodactylus vittatus Garrett, Proc. Cal. Ac. Nat. Sci., III, 1864 (January 4), 103, Hawaiian Islands; Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 489 (Honolulu; coll. Dr. Rosenstern).

Cheilodactylus vittatus, Günther, *Fische der Südsee*, III, 73, pl. 51, fig. B, 1874 (Sandwich Islands); Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 490 (Honolulu).

Genus 204. CIRRHITOIDEA Jenkins.

No palatine teeth; teeth on vomer; jaws with narrow band of small canine-like teeth; intermaxillary denticulate; preopercle finely toothed; dorsal single, of 10 spines and 12 rays; 5 rays of pectoral simple, lower rays of pectoral elongate, 1.8 in head; snout sharp, pointed, 3 in head. This genus is allied to *Oxycirrhites* Bleeker, from which it differs chiefly in the shorter snout.

Cirrhitoidea Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 489 (*bimacula*).

370. *Cirrhitoides bimacula* Jenkins. Fig. 197.

Head 2.6 in length; depth 3; eye 4.6 in head; snout 3.8; maxillary 2.7; D. x, 12; A. III, 6; scales 3-37-7.

Body short, deep, and compressed, the dorsal profile strongly arched from tip of snout to base of first dorsal spines; back very narrow, trenchant; ventral outline nearly straight, head rather long, pointed; snout long and pointed; mouth moderate, slightly oblique, the jaws equal; maxillary reaching pupil; jaws with small, close-set canine-like teeth, small teeth on vomer, none on palatines; preopercle serrate; opercle ending in a long flap; fins rather large; dorsal spines slender, weak, their length equal to distance from tip of snout to middle of pupil; dorsal rays somewhat shorter; second anal spine longest, about equal to longest dorsal spine; anal spines similar to those of soft dorsal; caudal slightly rounded; ventrals rather long, reaching past vent; pectoral moderate, the middle rays longest, about 1.2 in head; scales rather large, lateral line complete, beginning at upper end of gill-opening and running a little nearer dorsal outline posteriorly; scales on nape, breast, cheek, and opercle.

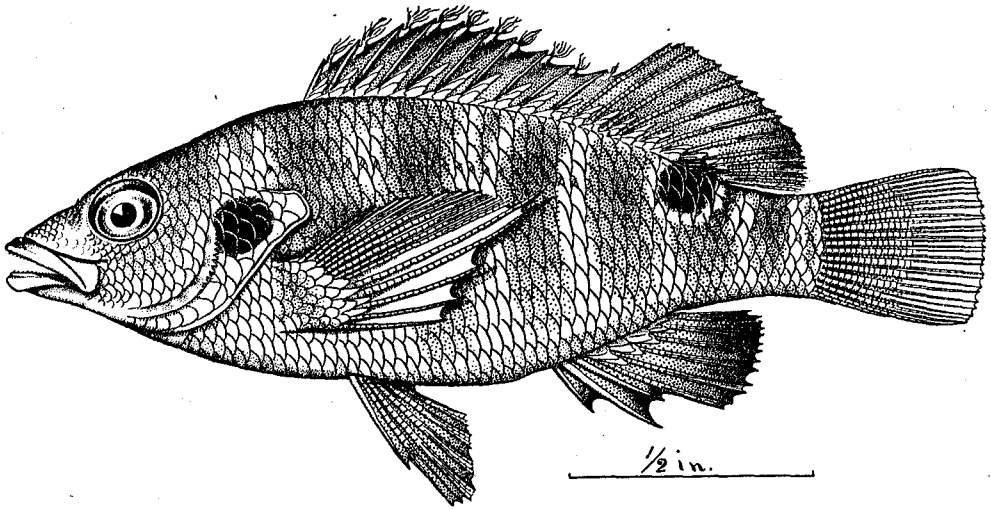


FIG. 197.—*Cirrhitoides bimacula* Jenkins; from the type.

Color in alcohol, dusky; body crossed by about 7 rather broad darker vertical bars, the first at origin of dorsal, second under middle or spinous dorsal, third under beginning of soft dorsal, last 2 on caudal peduncle; head dusky yellowish; a large brownish black spot on opercle, and another large round brownish black spot on side above lateral line and under posterior third of soft dorsal; fins somewhat dusky, the anal darkest.

The above description is based chiefly upon the type, No. 50702, U. S. N. M. (original No. 275), a specimen 2 inches long, obtained by Jenkins at Honolulu. One other specimen, which was taken as a cotype, is of the same length and was obtained at the same time.

Cirrhitoides bimacula Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 489, fig. 36, Honolulu.

Genus 205. **PARACIRRHITES** Bleeker.

Premaxillaries not produced; some of the teeth on jaws canine-like; teeth on vomer but none on palatines; head obtuse, convex; body and head covered with large scales.

This genus is close to *Cirrhitus*, from which it differs chiefly in the absence of palatine teeth and in having large scales on cheek. Most of the species of *Cirrhitidae* of Polynesia belong to this genus.

Paracirrhites Bleeker, Verh. K. K. Wet., XV, 1875, 5 (*forsteri*).

a. Dorsal rays 14; body crossed by alternating broad bars of red and white.....*cinctus*, p. 449

aa. Dorsal rays 11; body without red and white crossbars.

b. Head with numerous small or fine round spots; no large, brownish postocular ocellus.....*forsteri*, p. 450

bb. Head without small round spots; a large brownish, postocular ocellus.....*arcatus*, p. 450

371. *Paracirrhites cinctus* (Günther). "Pilikoa;" "Oopuka-hai-hai;" "Póopá 'a."
Plate LXVIII.

Head 3 in length; depth 2.8; eye 4.5 in head; snout 3.4; maxillary 2.4; interorbital 5.3; D. x, 14; A. III, 6; scales 5-48-10; Br. 5; gillrakers 12 + 5, finely ciliated.

Body oblong, compressed, deepest through base of pectoral; dorsal outline from tip of snout to origin of dorsal rather steep, straight, thence to end of fin evenly slanted; ventral outline slightly curved; head longer than deep, compressed, subconic; snout bluntly pointed; mouth rather large, nearly horizontal, lips thick, lower jaw slightly included; maxillary reaching about to anterior edge of pupil; a single row of small conic teeth in each jaw, behind these anteriorly a patch of small villiform teeth; bands of villiform teeth on vomer and palatines; posterior edge of preopercle roughly serrate; eye high up, the supraorbital above line of anterior profile; interorbital narrow, concave; anterior nostril with a short branched filament about as long as pupil; fins rather large, origin of dorsal slightly in advance of base of pectoral, the latter much in front of ventral, distance from origin of dorsal to tip of snout equal to head; dorsal spines not as high as rays, the fifth or sixth longest, 2.1 in head; base of spinous dorsal slightly longer than that of soft dorsal, the anterior dorsal rays slightly the longer, longest 1.75 in head; caudal truncate; anal short, its base equal to snout and eye, second spine stout and longest, equal to base of fin, front rays slightly the longer, equal to second spine; ventrals rather short, scarcely reaching anal, 1.75 in head; pectoral long, the 6 lowermost rays thick and not united beyond the tips of the shorter rays, longest ray, reaching base of third anal spine, 1.3 in head; scales firm, moderate, cycloid, none on top of head and snout; lateral line concurrent with dorsal outline.

Color in life, head olive brown, finely vermiculated and spotted with bluish and greenish white, the vermiculations on lower part of cheek and lower jaw red and white; opercle blackish, with bluish white spots; nape with a narrow lighter area, behind which are delicate bluish white and red points on a dark ground; side with broad, white crossbars, alternating with broader red bars; first white crossbar extending from base of third or fourth dorsal spines to just posterior to base of pectoral, this bar narrowest and somewhat brownish at upper end; then less red just above lateral line, followed by blood red, ending under middle of pectoral; second, third, and fourth white bars each with purplish shade and each with an obscure orange blotch near lower end; second and third red bars brightest, the second extending from bases of last 3 dorsal spines to base of third anal spine, broadest at top, narrowing gradually downward; third red bar beginning under fourth to ninth dorsal rays and ending at base of last anal rays; fourth red bar crossing base of caudal peduncle, its center splotched with blackish; rest of caudal peduncle pale rosy or purplish; under parts bluish white, with reddish or orange spots and lines, the latter confined chiefly to the breast; membranes of dorsal fin red, blotched and dotted with irregular bluish or greenish white markings; edge of membranes narrowly white, tip of dorsal spines red, a small black speck on base of first spine; soft dorsal greenish with bluish and purplish wash, indistinct orange or brassy spots through the center; caudal rays purplish or rosy, the membranes greenish, anal bluish, the rays brassy green, 3 or 4 small brassy spots near the base; ventrals similar to anal; pectoral pale rosy; iris golden.

Color in alcohol, head brownish above, paler below, with numerous fine bluish-white spots, larger and more irregular and most distinct on lower jaw and gill-membranes; opercle dark; side with 4 broad brownish black crossbars, separated by narrower yellowish white bars, the crossbar on caudal peduncle blackest and most distinct, under parts rosy white; dorsal, pectoral, and ventrals uniform yellowish white, little dusky; caudal and anal somewhat dusky.

This beautiful species is very abundant among the Hawaiian Islands and is one of the most interesting and attractive fishes seen in the Honolulu market. It reaches a length of 4 to 5 inches. The collections contain 71 specimens, 8 from Hilo, the others from Honolulu, ranging in length 2.8 to 4.4 inches. Specimens were obtained by Jenkins, Jordan, and Snyder, the *Albatross*, and by us.

Cirrhites fasciatus, Bennett, Zool. Journ., IV, No. XIII, Art. III, 39, 1828 (Oahu); not Cuvier.

Cirrhites cinctus Günther, Cat., II, 73, 1860, Hawaiian Islands, Madagascar, Ile de France; *ibid.*, Fische der Südsee, II, 72, pl. 52, figs. A and B, 1874 (Hawaiian Islands and Mauritius); Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 490 (Honolulu).

Cirrhites fasciatus, Gill, Proc. Ac. Nat. Sci. Phila. 1862, 107 (Hawaiian Islands).

Paracirrhites cinctus, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 491 (Honolulu); Snyder, *op. cit.* (Jan. 19, 1904), 527 (Honolulu).

372. *Paracirrhites forsteri* (Bloch & Schneider). "*Hilupilikoa*," "*Piliko'a*." Plate LXVII.

Head 3 in length; depth 2.75; eye 6.2 in head; snout 3.2; maxillary 2.25; interorbital 5.4; D. x, 11; A. III, 6; scales 6-48-10.

Body oblong, deepest at base of pectoral; head longer than deep, the upper profile a little concave over eyes; snout long, blunt; jaws large, powerful, the lower slightly projecting; lips fleshy; maxillary large, reaching middle of eye; teeth strong, 2 large canines in front of upper jaw; teeth on sides of mandible enlarged, conic; eye small, high, in anterior part of head; preopercular margin finely serrate; interorbital space nearly flat, the supraocular ridges little elevated; anterior nostrils with large ciliated flap; spinous dorsal beginning a little behind base of pectoral, fifth spine longest, 2.5 in head; first dorsal ray longest, 1.65 in head; second anal spine enlarged, longest; first anal ray longest, 1.8 in head; lower pectoral rays longest, 1.5 in head, and free for only small portion distally; ventrals 1.75 in head, inserted well behind pectorals and not reaching anus; scales large, cycloid, in even series, those on top of head, snout, and mandible very minute; small scales on basal portions of soft dorsal, caudal, anal, pectoral, and ventrals; lateral line straight.

Color in life, upper parts of head and back pale yellowish olivaceous; a broad paler or whitish line along base of dorsal fin, below this yellowish brown posteriorly with a long broad black blotch extending from about middle of side under last 3 dorsal spines, along upper edges of caudal peduncle and upon bases of middle and 1 or 2 upper caudal rays; beneath this, along axis of body, a broad whitish band, bordered above and below by yellowish brown, the anterior end with few reddish or brown spots, the posterior half somewhat bluish; lower half of side with about 7 narrow longitudinal orange yellow stripes separated by nearly equally wide bluish silvery lines; lips and face with very bright red spots; red and black spots on opercle, preopercle and body above the pectoral; chin and throat with red spots; under parts of head and breast with red and black spots; iris red; dorsal fin red, the spinous portion dusky on outer margin, the soft rays with the membranes somewhat dusky; caudal chiefly red or rosy; rays of anal yellow, the membranes dusky; rays of pectoral red, red spots on base and in axil.

Color in alcohol, dull brown, deepest anteriorly; head and anterior part of trunk with small round black spots, very much smaller on snout and mandible; iris dull yellow with a few deep brown spots; back along base of dorsal fin dusky orange; upper half of body posteriorly with a broad black band from middle of back to middle of caudal; broad, whitish band out on caudal; spinous dorsal dusky brown, soft dorsal with outer half whitish, the basal portion blackish; anal, pectoral, and ventrals dusky, the last slightly tinted with olivaceous; caudal more or less dusky, outer or marginal portion broadly whitish.

Described from No. 04574, 6.8 inches long, from Honolulu. The collections contain 25 examples, all from Honolulu but one, which is from Hilo. Length 4.4 to 8.25 inches.

Grammistes forsteri Bloch & Schneider, Syst. Ichth., 191, 1801, Island of Santa Christina or Waitaho, Marquesas Islands.

Sparus pantherinus Lacépède, Hist. Nat. Poiss., IV, 160, 1802, South Seas.

Cirrhites pantherinus, Cuvier & Valenciennes, Hist. Nat. Poiss., III, 70, 1829 (Ile de France).

Serranus tankervillei Bennett, Fishes of Ceylon, 27, pl. 27, 1841, Ceylon.

Perca teniata Forster, Descript. Animal., Lichtenstein, 224, 1844, Santa Christina, Marquesas Islands.

Cirrhites forsteri, Günther, Cat., II, 71, 1860 (Mauritius, Cape Seas, India); Günther, Fische der Südsee, I, 69, taf. XLIX, fig. A., 1874 (Indian Archipelago, east coast of Africa, Red Sea, Polynesia, Tahiti, Hawaiian Islands); Streets, Bull. U. S. Nat. Mus., No. 7, 73, 1877 (Honolulu); Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 490 (Honolulu); Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 502 (Honolulu).

Amblycirrhites forsteri, Bleeker, Ned. Tijds. Dierk., III, 175, 1866.

Paracirrhites forsteri, Bleeker, Verb. Ak. Wet. Amst., XV, 1875, 6 (Manado, Celebes, Sangir, Amboyna, Banda, Neira, Ternate, Waigiu); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 490 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 527 (Honolulu).

373. *Paracirrhites arcatus* (Cuvier & Valenciennes). "*Pilik'o'a*." Plate LXIX.

Head 2.9 in length; depth 2.33; eye 5.5 in head; snout 3.2; maxillary 2.2; interorbital 5; D. x, 11; A. III, 6; scales 6-50-11.

Body oblong, deepest about pectoral region; head deep; snout long, obtuse; jaws large, equal, powerful; lips fleshy, broad; mouth large, oblique; maxillary broad, reaching posterior margin of pupil; 2 large canines in front of upper jaw, and enlarged teeth on sides of mandible; eye small, anterior, and superior; margin of preopercle convex, finely serrate; interorbital space concave; anterior