

MYRIPRISTIS SYMMETRICUS JORDAN & EVERMANN. TYPE.

*Myripristis chryseres* is close to *M. murdjan*, from which it differs in the smaller scales, larger eye, less black in the axil, and the absence of black edges to the dorsal and anal fins as in the life colors already noted, the yellow fins being the most conspicuous character in life. It reaches a length of 9 or 10 inches and appears to be moderately abundant at Honolulu and Hilo.

Type, No. 50629, U. S. N. M. (field No. 03463), a specimen 8 inches long, obtained at Hilo, Hawaii.

Our collections contain 17 excellent specimens from Honolulu and Hilo, ranging in length from 4 to 9.5 inches.

*Myripristis chryseres* Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (Apr. 11, 1903), 171, Hilo.

#### 107. *Myripristis symmetricus* Jordan & Evermann. Plate 26.

Head 3.2 in length; depth 2.4; eye 2.2 in head; snout 5; interorbital 3.8; D. x-1, 15; A. iv, 14; P. i, 14; V. i, 7; scales 4-36-6.

Body elongate, deep, compressed, greatest depth about midway between origin of ventrals and anal; upper and lower profiles evenly convex; head compressed, as long as deep, its width 1.7 in its length; snout short, broad, blunt, and steep; upper profile of head straight from above nostril to occiput; eye very large, high, hardly impinging upon the upper profile of head, its diameter greater than postocular region; mouth very large, oblique; mandible slightly projecting and reaching posteriorly to below posterior rim of pupil; distal expanded extremity of maxillary 2.35 in eye; several enlarged blunt teeth on outer front edges of mandible; teeth in jaws, on vomer, and palatines very fine, in bands; tongue thick, pointed, free; suborbital rim narrow, finely serrate; lower posterior margin of maxillary smooth; lips rather thick and fleshy; nostrils close together, posterior very large, close to front rim of orbit; bones of head all finely serrate; opercle with well-developed spine; gill-opening large, filaments large; gillrakers long, fine, the longest longer than longest gill-filament; pseudobranchiæ very large; dorsal spines slender, sharp, first 2.75 in head, second 2.1, third 2, fourth 1.9, tenth 6, and last 3.6; soft dorsal with anterior rays elevated, produced into a point which projects beyond tip of posterior rays when fin is depressed, first ray 1.4 in head, third 1.35, and last 3.75; anal spines graduated to last, third enlarged, 2.5 in head, fourth 2.9; soft anal similar to soft dorsal, anterior rays produced, first 1.4, third 1.3, and last 4.6; caudal elongate, deeply forked, the lobes pointed, 1.2 in head, and reaching slightly behind tips of ventrals; ventrals sharp-pointed, 1.4 in head, spine 2.2; caudal peduncle elongate, compressed, its length 1.8 and its depth 3.2; scales large, finely ctenoid, deep on middle of side; lateral line running obliquely back, slightly curved at first, and posteriorly along upper side of caudal peduncle; 4 rudimentary, slender, sharp-pointed, graduated rays along upper and lower edges of caudal; scales narrowly imbricated along middle of side.

Color in alcohol, pale straw-color; fins paler, except the anterior dorsal and anal rays, which are grayish; margin of opercle above blackish; axil of pectoral black.

This species was found both at Honolulu and Hilo, but does not appear to be common at either place. Our 4 specimens each about 5 inches long.

*Myripristis symmetricus* Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (April 11, 1903), 173, Hilo.

#### 108. *Myripristis sealei* Jenkins. Fig. 53.

Head 3 in length; depth 2.5; eye 2.5 in head; snout 5; maxillary 1.8; interorbital 4; D. x-1, 15; A. iv, 13; P. i, 15; V. i, 7; scales 4-37-8.

Body elongate, deep, compressed, greatest depth at about tip of pectoral; upper and lower profiles about evenly convex; head compressed, rather elongate, a little longer than deep, its width 1.8 in its length; snout short, broad, blunt, convex, steep; upper profile of head nearly straight from above nostril to occiput; eye large, high, hardly impinging upon the upper profile of head, about equal to postocular part; mouth large, oblique; mandible slightly projecting, reaching below posterior rim of pupil; distal expanded extremity of maxillary 1.7 in eye; teeth sharp, minute, not enlarged on edges of jaws; teeth in jaws and on vomer and palatines in bands; tongue elongate, rounded, free; suborbital rim narrow, finely serrate; lower posterior margin of maxillary smooth; lips rather thick, fleshy; nostrils close together, posterior very large, close to front rim of orbit; bones on head all finely serrate; opercle with well-developed spine; gill-opening large, filaments large; gillrakers long, fine, longest longer than longest gill-filaments; pseudobranchiæ very large, free for distal half; dorsal

spines slender, sharp, first 3.2, second 2, third 1.9, tenth 4.6, last 3.3 in head; anterior dorsal rays elongate, bluntly pointed, second ray 1.7, last 5.5; third anal spine large, 2.5 in head; soft anal similar to soft dorsal, second ray 1.7, last 6.4; caudal elongate, forked, the lobes pointed; pectoral small, pointed, 1.5; ventral 1.5, spine 2.25; scales large, finely ctenoid; lateral line slightly convex, running

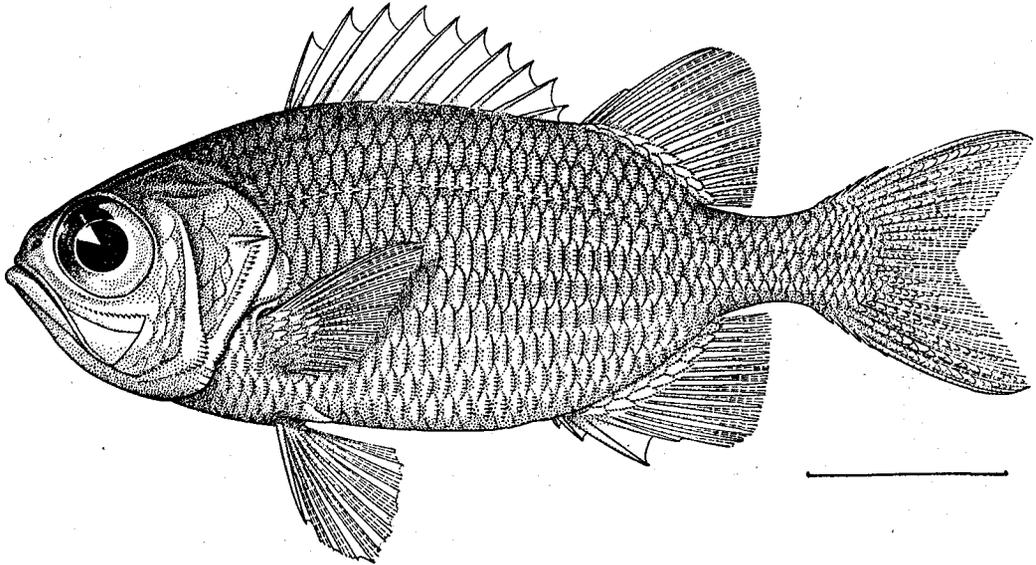


FIG. 53.—*Myripristis sealei* Jenkins; from the type.

down obliquely to base of caudal along upper side of caudal peduncle; 4 slender, sharp-pointed graduated rays above and below.

Color in alcohol, pale brown, or brownish white, fins pale or whitish; no black or brown on edges of gill-opening or in axil of pectoral.

This species is known only from the type and 11 other examples collected by Dr. Jenkins at Honolulu in 1889, ranging in length from 2.2 to 5.25 inches.

*Myripristis sealei* Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 439, fig. 13, Honolulu.

#### 109. *Myripristis murdjan* (Forskål). "U'u." Plate V.

Head 2.75 in length; depth 2.3; eye 2.4 in head; snout 4.7; maxillary 1.75; interorbital 4.9; D. x-i, 14; A. iv, 13; P. i, 14; V. i, 7; scales 4-28 to 30-7.

Body elongate, rather deep, compressed, its greatest depth about base of ventral; head rather large, its depth about equal to its length; snout blunt, obtuse, broad, its upper profile convex, beyond which the upper profile of the head is nearly straight from above the nostril to occiput; eye very large, high, hardly impinging upon the upper profile of head, and its diameter nearly equal to postocular part of head; mouth very large, oblique; mandible slightly projecting, and maxillary not reaching posteriorly to below posterior margin of eye; distal expanded extremity of maxillary 1.65 in eye; several enlarged and blunt teeth on the outer front edges of jaws; teeth fine, in broad bands in jaws, on vomer, and palatines; tongue rather thick, pointed, free; suborbital rim narrow, finely serrate; lower posterior margin of maxillary with blunt denticulations; lips rather thick and fleshy; nostrils very close together, the posterior very large, close to front rim of orbit; bones on head all finely serrate; opercle with well-developed spine; gill-opening large, filaments large; gillrakers long, fine, the longest longer than longest gill-filaments; pseudobranchiæ very large, longer than gill-filaments; dorsal spines rather slender, first spine 3.5 in head, second 2.8, third 2.25, tenth 6.8, and eleventh 4; anterior dorsal rays the highest, base of fin 2.3 in head; origin of soft anal behind soft dorsal, base of fin 2.5 in head, anterior rays highest; third anal spine enlarged, equal to fourth, which is slender; caudal rather small, forked; pectoral small; ventral reaching two-thirds distance to anus, 1.7 in head; ventral spine slender, 2.2 in head; caudal peduncle elongate, compressed, its length 2.3 in head and its depth 3.6; scales

large, ctenoid, deep on middle of side, lateral line obliquely curved at first, then running obliquely down to base of caudal, also running obliquely along upper side of caudal peduncle; 4 rudimentary caudal rays above and below, slender, sharp pointed, and graduated.

Color in life, red, the center of each scale pale; a black bar across opercular region down to axil of pectoral; first dorsal with pink spines, membranes of basal half translucent pearly, of upper half orange-yellow; soft dorsal, anal, and caudal crimson, the first rays white in each case; pectoral red, its axil blackish blood-red. Another example (No. 03487) was deep brick-red in life; the opercular blotch very plain, including axil; first dorsal orange, whitish at base; lobes of second dorsal, anal, and caudal largely black; soft anal, caudal, and ventral with first ray white; iris red.

In alcohol, pale straw-color, fins plain and paler; upper margin of opercle and axil of pectoral blackish.

Described from an example (03464) taken at Honolulu.

This species is the common *U'u* of Hawaii, a food-fish always in the markets, taken in rocky places with the hook. The natives have a curious method of fishing for it. A live individual of the same or a closely related species is attached to a line and dropped in the water in front of the rocks inhabited by the *U'u*, where, with fins spread, it arouses the enmity of its rivals, who at once attack it. They are then drawn upward in a net, and one of them takes the place of the first decoy.

Our collections contain 25 specimens from Honolulu, Hilo, and Kailua, ranging from 4 to 11.25 inches in length. Specimens were also secured by the *Albatross* at Laysan. The species is abundant at Samoa.

*Sciæna mardjan* Forskål, Descript. Animal., 48, 1775, Djidda, Red Sea.

*Perca mardjan*, Schneider, Syst. Ichth., 86, 1801 (Arabian Seas).

*Myripristis mardjan*, Rüppell, Fische Roth. Meer., 86, pl. 23, fig. 2, 1828; Günther, Fische der Südsee, III, 92, Pls. LXI and LXII, 1874 (Hawaiian Islands), (not *intermedia* and *adjusta*); Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 492 (Hawaiian Islands); Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 501 (Honolulu); Seale, Occas. Pap. Bishop Mus., I, 67, 1901 (Guam); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 440 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 523 (Laysan Island).

*Myripristis melanophrys* Swainson, Class. Fish., II, 207, 1839; founded on Rüppell's figure.

#### 110. *Myripristis berndti* Jordan & Evermann. Fig. 54.

Head 2.8 in length; depth 2.4; eye 2.7 in head; snout 4.7; maxillary 1.7; interorbital 4.9; D. x-1, 16; A. iv, 14; P. i, 14; V. i, 7; scales 4-32-7.

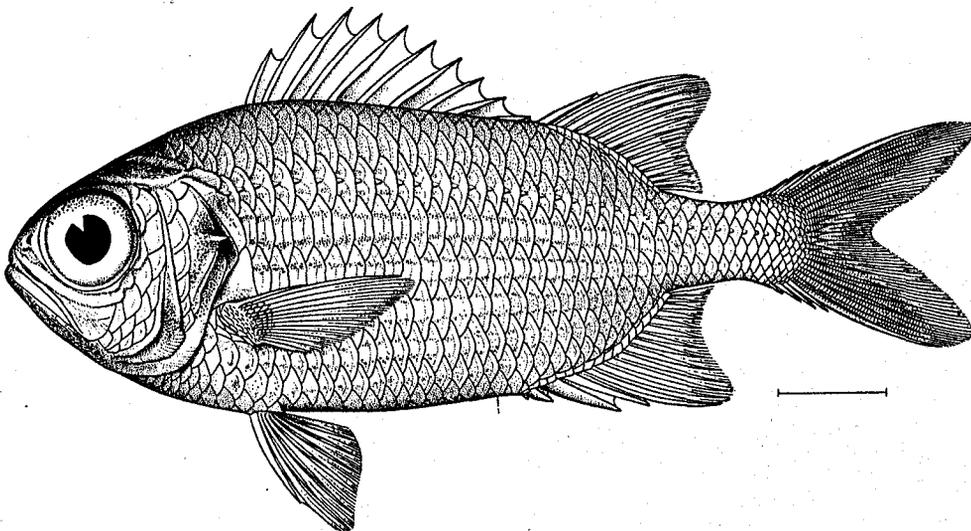


FIG. 54.—*Myripristis berndti* Jordan & Evermann; from the type.

Body elongate, deep, compressed, its greatest depth at base of ventral; head large, compressed, its depth less than its length; snout short, blunt, convex, its width about twice its length; upper profile of head straight from above nostril to occiput; eye large, high, its diameter a little less than posterior

part of head and its upper rim hardly impinging upon upper profile of head; mouth very large, oblique; mandible slightly projecting, the maxillary not reaching posterior margin of eye; distal expanded extremity of maxillary 1.7 in eye; several enlarged, blunt teeth on outer front edges of jaw and sides of mandible; teeth in jaws fine, in broad bands, also on vomer and palatines; tongue thick, pointed, and free in front; suborbital rim narrow, finely serrate; lower posterior margin of maxillary with blunt denticulations; lips rather thick and fleshy; nostrils close together, posterior very large, close to front rim of orbit; bones of head all finely serrate; opercle with well-developed spine; gill-opening large, filaments rather large; gillrakers long, fine, the longest longer than longest gill-filaments; pseudobranchiæ very large, outer portions free for half their length; dorsal spines slender, first 3.4 in head, second 2.6, third 2.2, fourth 2.2, tenth 6.4, and last 3.5; anterior dorsal rays elevated, produced into a point, first 1.8, second 1.7, and last 8; first and second anal spines short, third 2.6, and fourth 2.8; soft anal similar to soft dorsal, anterior ray 1.75, third 1.8, and last 6; caudal forked, lobes pointed, 1.2; pectoral rather small, pointed, 1.4; ventral 1.6, reaching 0.65 distance to anus; caudal peduncle elongate, compressed, 2.2 in head, its depth 3.25; scales large, ctenoid, deep; lateral line slightly arched, running obliquely down on side along upper part of caudal peduncle; 4 rudimentary caudal rays above and below, slender, sharp pointed, and graduated.

Color in life (03370), deep red, with silvery luster; no stripes on side, a blood-red band across gill-opening and base of pectoral; fins deep red, without white edgings, distal half of spinous dorsal shading into orange.

Color in alcohol, pale straw-color, fins plain and paler; upper margin of opercle blackish, and axil of pectoral black; anterior margins of soft dorsal and anal whitish.

Described from one of 16 excellent specimens 7 to 9 inches long, obtained at Honolulu. It was not seen at Hilo.

*Myripristis berndti* Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (Apr. 11, 1903), 170, Honolulu (Type, No. 50627 U. S. N. M.); Snyder, op. cit. (Jan. 19, 1904), 523 (Honolulu).

111. *Myripristis argyromus* Jordan & Evermann. Plate 27 and Fig. 55.

Head 3.5 in length; depth 2.75; eye 2.4 in head; snout 5; maxillary 1.8; mandible 1.6; interorbital 3.75; D. x-I, 15; A. iv, 13; scales 4-33-5.

Body rather long and compressed, dorsal and ventral outlines about equally and evenly convex

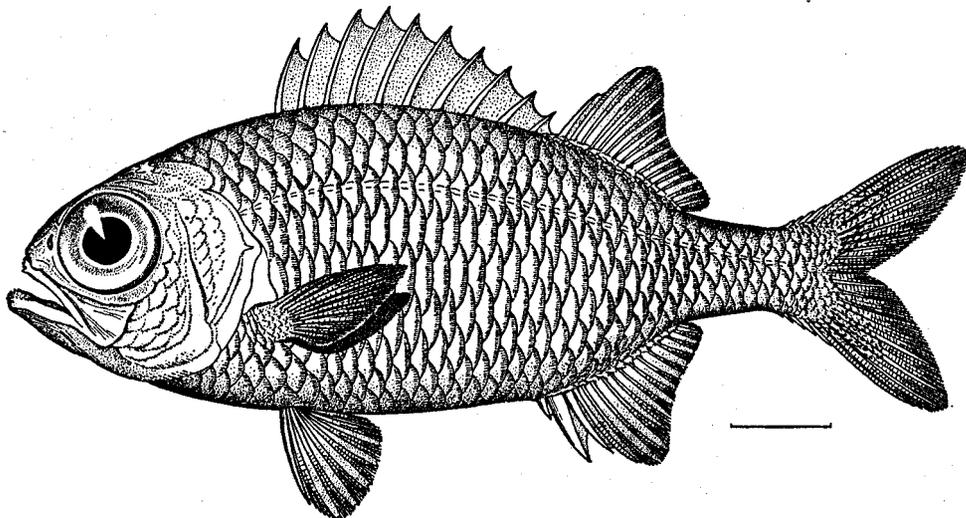
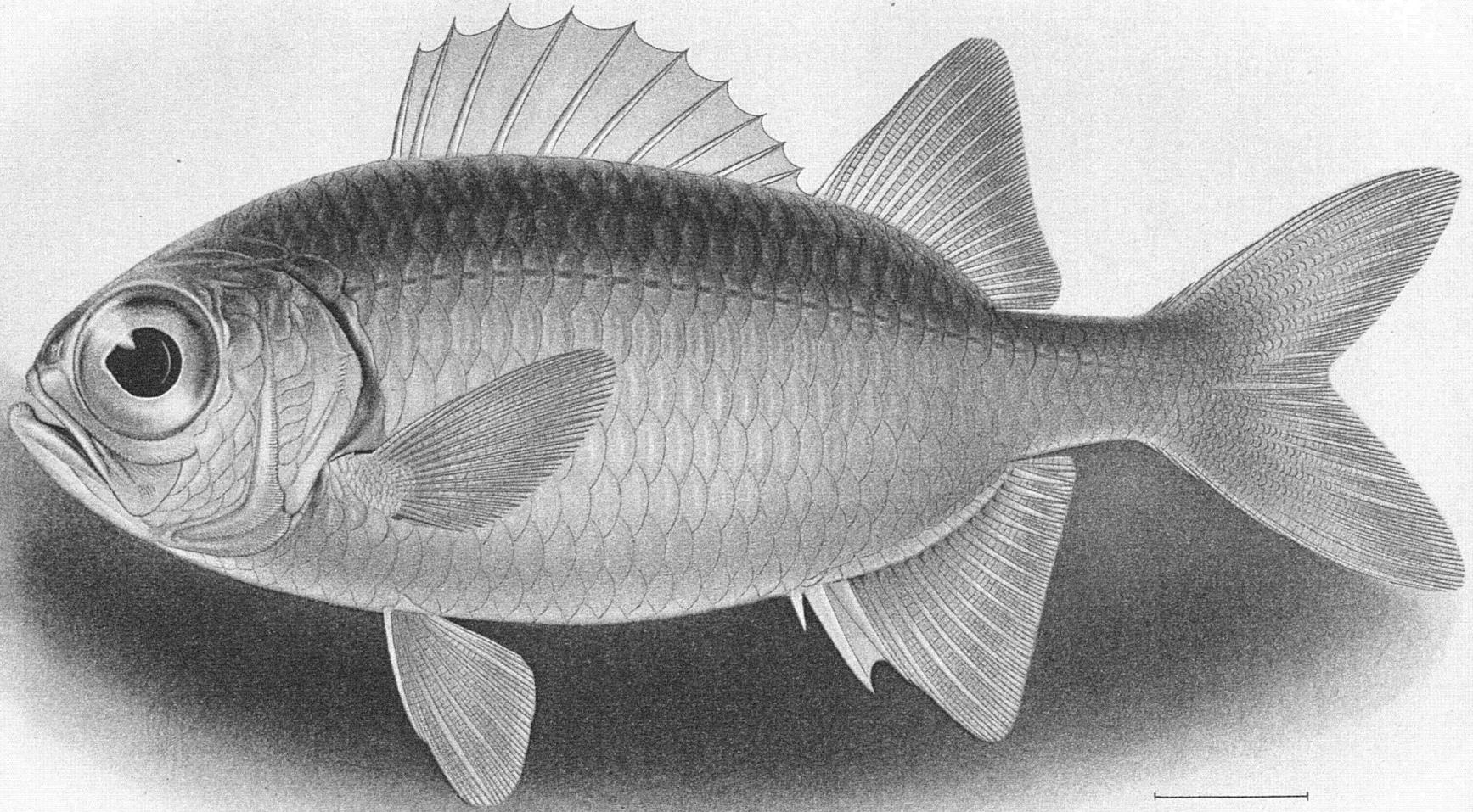


FIG. 55.—*Myripristis argyromus* Jordan & Evermann; from the type.

from snout to origin of anal and soft dorsal fins; head rather large but short; mouth moderate, maxillary reaching vertical at posterior edge of pupil, the exposed portion broad, triangular, the upper edge concave, the end rounded, and the anterior edge with short blunt teeth, strongest at angle; tip of



MYRIPRISTIS ARGYROMUS JORDAN & EVERMANN. TYPE.

upper jaw with a shallow notch roughened at its outer edges; jaws equal, lower fitting into the notch of upper and with 2 patches of strong blunt tooth-like tubercles at its tip; eye large, its middle above level of tip of upper jaw; interorbital space wide and slightly convex; 2 low, nearly parallel median ridges from tip of snout to nape, diverging slightly at their middle, another low ridge from above orbit backward to nape, and another backward around orbit; ridges on nape divergent; suborbital narrow, dentate on both edges; opercular bones all striate and dentate at the edges; opercle with a short, flat, triangular spine; scales large, rough, striate near the edges, which are finely toothed; a series of 4 or 5 large modified scales across nape, and a series of triangular scales along bases of dorsal and anal; about 10 scales in front of dorsal; origin of dorsal about over lower base of pectoral; dorsal spines slender, the first 3.2 in head, third and fourth longest, about equal to orbit; interval between dorsals very short; anterior dorsal rays somewhat produced, their length equal to snout and eye; edge of fin concave, last rays nearly 3, or equal to pupil; anal spines graduated, the first very small, second short but stout, third much longer and stoutest, its length 1.3 in eye, fourth still longer and more slender; anterior anal rays produced, their length about equal to that of longest dorsal rays, free edge of fin concave; caudal evenly forked, the lobes equal to length of head; pectoral long and pointed, reaching beyond tips of ventrals, about 1.3 in head; ventrals shorter, 1.6 in head, their tips equally distant between their bases and that of first anal ray.

Color in alcohol, pale yellowish-white, brightest above, more silvery on side and belly; opercular bones with fine round brownish specks; edge of opercle not black, scarcely dusky; axil dusky inside but not showing above fin; fins pale yellowish-white without any dark on edges.

Type, No. 50631, U. S. N. M. (field No. 04829), a fine specimen 9.5 inches long, obtained by us at Hilo, Hawaii.

*M. argyromus* is related to *M. berndti*, but is distinguished by the more slender body, the absence of black on the opercle, and the paler axil. It does not appear to be abundant and is represented in our collections by only 8 specimens, ranging in length from 6.5 to 9 inches. All but the type are from Honolulu.

*Myripristis argyromus* Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (Apr. 11, 1903), 172, Hilo.

#### Genus 92. FLAMMEO Jordan & Evermann.

This genus is distinguished by the very large mouth and projecting chin. The lower jaw is considerably more than half length of head, and the chin projects beyond upper jaw. In the species properly referable to *Holocentrus*, the lower jaw is slightly projecting or included and its length is less than one-half the head. Renewed comparison of the varied forms seems to show that *Flammeo* should be regarded as a subgenus of *Holocentrus*.

*Flammeo* Jordan & Evermann, Fishes North and Mid. Amer., III, 2871, 1898 (*narianus*).

- a. Color in life, dull crimson brown or maroon, side with 10 more or less distinct dark stripes; in alcohol, silvery with distinct dark stripes..... *sammara*, p. 155  
 aa. Color in life, red, paler on sides, side with 10 to 12 narrow yellow stripes; in alcohol, pale, without stripes..... *scythrops*, p. 157

#### 112. *Flammeo sammara* (Forskål). Fig. 56.

Head 2.75 in length; depth 3.25; eye 3.75 in head (3 to 3.75); snout 4.5; interorbital 4.2; maxillary 2.6; D. xi, 12, longest dorsal spine 2.2 in head, ray 2.2; A. iv, 8, longest spine 1.6 in head; pectoral ray 2; ventral ray 1.9; scales 4-38 to 44-6; opercular spines 2, about equal, rather short; preopercular spine short.

Body oblong, compressed, very spindle-shaped in large examples; dorsal outline arched from tip of snout to caudal peduncle; ventral outline less arched than dorsal, not so marked in small examples; head subconic, compressed; mouth large, nearly horizontal; lower jaw prominent, produced, its produced tip forming a straight line with anterior part of head; each jaw, vomer, and palatines with blunt, or slightly conic, close-set, rather pavement-like teeth, 1 on tongue; tongue long, narrow, rounded, the long, narrow anterior part and sides, free; maxillary extending to anterior edge of pupil in large examples, nearly to posterior edge in small ones; eye high, anterior; interorbital flat; first dorsal spine two-thirds second, the third the longest, tapering evenly from it to the last, which is one-half the first; third soft dorsal longest; caudal evenly forked; fourth anal spine three-fourths of third, the latter sheathed, its upper part almost hidden in the latter when fin is depressed.

Color in alcohol, dull silvery, with bluish reflections, darker above; each scale, with many dark punctulations, these more numerous and distinct in the posterior center of each scale, and forming longitudinal stripes along each row of scales; upper portion of membrane before third dorsal spine black, making a black blotch on fin; other fins pale.

Color in life, dull crimson brown or maroon; sides silvery, faint dark stripes and dots along rows of scales; lateral band in a distinct maroon stripe; sides of head much dotted; eye silvery with a streak of red anteriorly; spinous dorsal translucent, the base and tip opaque white, the outlines irregular, a large blood-red blotch on anterior 3 spines and membranes; soft dorsal maroon in front and at base, the rest pale golden; caudal maroon on each lobe, the middle dull orange; anal pale yellowish, membranes of first spines maroon; pectoral light red; ventrals pure white.

The above description from specimen 03374, 10.75 inches long, from Honolulu, where the species is rather common in the market.

Another example (No. 03407) had general color silvery in life, lake red on back, and with deeper streak along lateral line; eye silvery, with streak of red anteriorly; belly pale yellowish white; 2 parallel lines of dark spots on anterior 15 scales of the first 2 rows above lateral line; anterior edge of spinous dorsal white, tapering to a point posteriorly and below a transparent bar in which spines are tinged with lake-red; a series of milk-white spots at base of spinous dorsal just behind each spine,

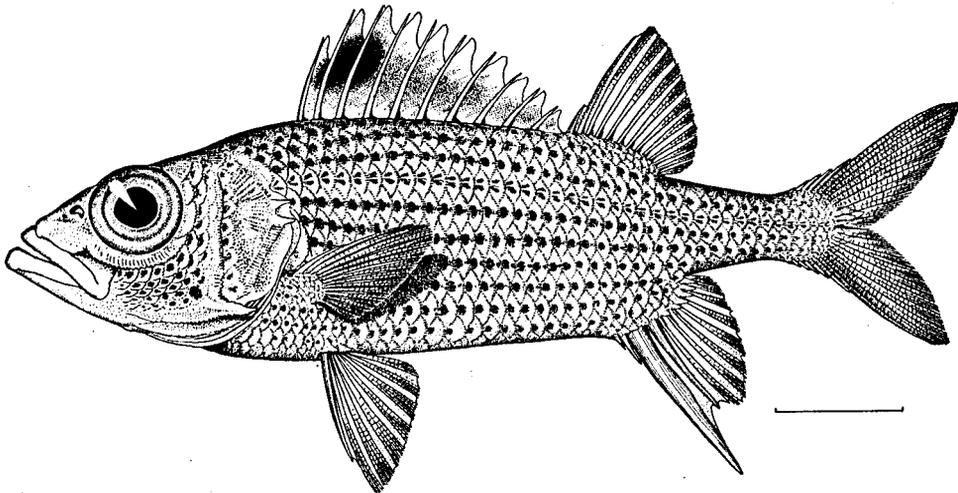


FIG. 56.—*Flammeo sammara* (Forskål).

the first the highest and extending in front of jet black ocellus edged with lake-red which extends over first 3 spines; first 3 rays of soft dorsal lake-red, then tinged with yellow over fourth and fifth, and the rest of the fin more or less transparent; a pale yellow line on soft dorsal along upper edge and base of fin, the former growing narrower posteriorly, fourth anal spine and first ray lake-red, rest of fin like soft dorsal; caudal with outer rays lake-red, last outside ray above and below white, center colorless, edge pale yellow; pectoral with pale-red tinge on rays; ventral colorless.

Our collections contain 8 specimens taken by us at Honolulu in 1901, 4 secured by Dr. Jenkins at the same place in 1889, 1 by Dr. Wood in 1898, 4 by the *Albatross* at the island of Makemo in 1899, and many others obtained by Dr. Jordan at Samoa in 1902. The *Albatross* obtained specimens at Honolulu and Laysan in 1902. The species has been recorded from Guam by Mr. Seale, and it is common at Samoa.

*Sciæna sammara* Forskål, Descr. Animal., 48, 1775, Djidda; Schneider, Syst. Ichth., 89, 1801 (after Forskål).

*Labrus angulosus* Lacépède, Hist. Nat. Poiss., III, 430, pl. 22, fig. 1, 1801, no locality.

*Holocentrus sammara*, Rüppell, Atlas. zu der Reise im Nordl. Afrika, 85, pl. 22, fig. 3, 1828.

*Holocentrum sammara*, Cuvier & Valenciennes, Hist. Nat. Poiss., III, 216, 1829 (Sea of the Indies); Günther, Fische der Südsee, 100, 1875 (Society and Paumotu islands).

*Holocentrum christianum* Ehrenberg in Cuvier & Valenciennes, Hist. Nat. Poiss., III, 219, 1829, *Cosseir*.

*Holocentrus fuscostrigatus* Seale, Occasional Papers Bishop Museum, I, No. 3, 69, 1901, Guam.

*Holocentrum tahiticum* Kner, Novara Fische, III, 9, pl. 16, fig. 2, 1869, Tahiti.

*Flammeo sammara*, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 440 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 523 (Honolulu; Laysan Island).

*Holocenthrus thorntonensis* Fowler, Proc. Ac. Nat. Sci. Phila. 1904, 231, Thornton Island; young.

**113. *Flammeo scythrops* Jordan & Evermann. Plate VII and Fig. 57.**

Head (measured to end of flap) 2.75 in length; depth 3; eye 3 in head; snout 4; maxillary 2.1; mandible 1.8; interorbital 5; D. xi, 13; A. iv, 9; scales 5-48-7, 5 rows on cheek; Br. 7.

Body oblong, rather slender; dorsal outline gently and rather evenly curved from tip of snout to origin of soft dorsal, more nearly straight from tip of snout to nape; ventral outline less convex; head long; snout long and pointed; maxillary broad, with a strong supplemental bone whose lower edge forms a broad angle; end of maxillary slightly concave; lower jaw long, much projecting, tip prominent; mouth large, not greatly oblique; maxillary nearly reaching vertical at posterior line of pupil; lips broad, rounded, and soft; eye large, lower edge of pupil on axis of body; interorbital space with a broad, shallow groove between low ridges, 1 on each side; space between ridge and eye with short, curved ridges; nape on each side with a group of 8 or 10 short, sharp ridges, diverging backward and

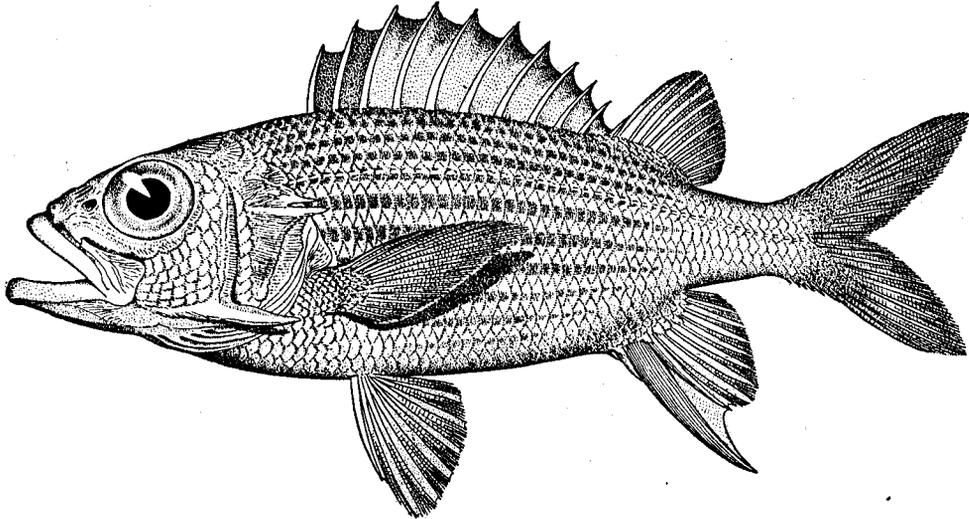


FIG. 57.—*Flammeo scythrops* Jordan & Evermann; from the type.

ending in short, sharp spines; posterior part of supraocular with a patch of short spines; suborbital dentate on its lower edge; preorbital with 2 blunt prominences in front, a strong, recurved spine below, ridges and spines on its upper surface; opercular bones all strongly striate, the striae ending in short spines; entire surface of interopercle striate; opercle with 2 strong spines, the lower the stronger, its length 1.6 in orbit; preopercle with a very strong spine at angle, its length nearly equaling diameter of orbit, its surface striate, and its base with a series of small spines; under surface of dentary somewhat roughened; surface of articular bone much rougher; jaws each with a broad band of villiform teeth, the outer series on upper jaw stronger; a narrow series on each palatine and a patch on vomer; scales moderate, the surfaces usually nearly smooth, the edges finely toothed; a series of strongly striate scales across nape, and a strong, striated plate at shoulder; lateral line well developed, little arched, with about 45 pores; bases of soft dorsal and anal each with series of modified triangular scales; caudal with small scales on base and fine scales on membranes, extending well toward tips of outer rays; origin of spinous dorsal in advance of base of pectoral or over middle of upper opercular spine; dorsal spines in a broad, deep groove, moderately strong, middle one longest, 2.3 in head, first a little shorter than snout, tenth more than half eye; dorsal rays longer than spines, longest 2.2 in head; first anal spine very short, second about 3 times as long; third anal spine very long and strong, but little curved,

reaching past base of anal, its length 1.5 in head; fourth anal spine shorter and more slender, its length 2.25 in head and equaling longest anal rays; last anal ray much shorter, 1.6 in eye; pectoral long and slender, 1.2 in head, the tip nearly reaching vent; ventrals shorter, equal to snout and eye; caudal forked, the lobes equal, not strongly divergent, their length about equaling that of third anal spine; rudimentary caudal spines 5 above, 4 below, strong and sharp.

Color in life, head red above, paler on sides, nearly white below; tips of jaws rich red; side of body with about 10 or 12 narrow yellow stripes separated by red or rosy stripes of about same width, those below paler and somewhat purplish; under parts purplish or pinkish white; the stripes beginning at edge of opercle and ceasing at base of caudal peduncle, which is rich red above, becoming paler on side and below; membranes between the first and third dorsal spines rich blood-red, those between other spines white at base, each with distal portion lemon-yellow in front and red behind, last 2 or 3 membranes with little or no yellow; dorsal spines pale rosy, nearly white; soft dorsal, anal, pectoral, and ventral with rays rosy, membranes pale; ventral with a little yellow at base; anal spines somewhat dusky; caudal rich blood-red, paler distally; eye red, a narrow yellow ring around pupil. Another example (No. 03041), much faded, was bright red; stripes on side equally bright golden; fins red; edges of dorsal membranes pale; no markings evident on fins.

Color in life of another example (No. 03451), side with 10 or 11 longitudinal golden or yellow bands; spinous dorsal more or less white; membranes between first and third dorsal spines more or less deep vermillion, except the upper marginal portion behind second spine, which is white; a red blotch along margin of membranes just before each of the other dorsal spines.

Color of another specimen (No. 03490) when fresh, violet-rose with 10 stripes of bright golden on side; dorsal red, mottled with golden, the first 2 spines deep red; soft dorsal and other fins rather light red without edgings, and scarcely darker behind third anal spine; pectoral and ventrals pink; a red dash across cheek, space above and below whitish; temporal region deep red; iris red. All these colors fade in alcohol and the fish becomes a pale yellowish white, the longitudinal lines on side showing faintly as duller and brighter stripes of yellowish white; fins all whitish or yellowish white, membranes of spinous dorsal whiter.

The above description from the type, No. 50633, U.S.N.M. (field No. 03488), a specimen 9 inches long, obtained by us at Honolulu. An examination of our large series of cotypes shows but slight variations, the characters appearing quite stable. In some examples the upper opercular spine is the larger, in others the two are equal; in 2 examples we find 3 opercular spines each.

This species has several times been called *Holocentrum argenteum*. The species described under that name by Quoy and Gaimard from New Guinea resembles this in the slender body and general coloration, but differs in having the lower jaw included, eye much smaller, mouth smaller, and the preopercular spine weaker. It was intended for *Holocentrus lacteoguttatus* of the East Indies, a species wrongly called *punctatissimus* by Bleeker.

This is one of the most abundant species in the markets at Honolulu and Hilo. It reaches a length of 8 to 10 inches. Our 30 specimens range in length from 5 to 10 inches.

*Holocentrum argenteum*, Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 492 (Honolulu and Laysan); not of Cuvier & Valenciennes.

*Plamneo scythrops* Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (Apr. 11, 1903), 174, Honolulu.

#### Genus 93. HOLOCENTRUS Scopoli. "Alahi."

Body oblong, moderately compressed, the ventral outline nearly straight, the back a little elevated, the tail very slender; head compressed, narrowed forward; opercle with a strong spine above, below which the edge is sharply serrated; a strong spine at angle of preopercle; orbital ring, preorbital, preopercle, interopercle, subopercle, occiput, and shoulder-girdle with their edges sharply serrate; mouth small, terminal, the lower jaw projecting in the adult; in the young (which constitute the supposed genera *Rhynchichthys* and *Rhinoberyx*) the snout is much produced; maxillary broad, striate, with a supplemental bone; eye excessively large; scales moderate, closely imbricated, the posterior margin strongly spinous; lateral line continuous; dorsal deeply emarginate, the spines usually 11, depressible in a groove; soft dorsal short and high; anal with 4 spines, the first and second quite small, the third very long and strong, the fourth smaller; caudal widely forked; both lobes with the rudimentary rays spinelike; ventrals large, 1, 7, the spine very strong. Species numerous, remarkable for the development of sharp spines almost everywhere on the surface of the body.

*Holocentrus* Bloch, Ichthyol., VII, 46, 1767 (*sogo*).

*Holocentrus* Scopoli, Int. Hist. Nat., 449, 1778 (*rostratus*); misprint for *Holocentrus*.

*Rhynchichthys* Cuvier & Valenciennes, Hist. Nat. Poiss., VII, 503, 1831 (*pectamidis*; young).

*Rhinoberyx* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 237 (*brachyrhynchus*; young).

*Sargocentron* Fowler, Proc. Ac. Nat. Sci. Phila. 1904, 230 (*leo*).

*Holocentrum* of authors generally.

a. Two opercular spines.

b. Head 3 or more in length (3 to 3.25).

c. Eye rather large, 2.75 to 2.9 in head.

d. Axil of pectoral grayish; spinous dorsal mainly black; head 3.25; depth 2.75; dorsal rays 13; anal rays 9; scales 4-48-8 ..... *diadema*, p. 159

dd. Axil of pectoral brown; spinous dorsal mainly pale; head 3; depth 3; dorsal rays 14; anal rays 10; scales 4-47-7 ..... *microstomus*, p. 160

cc. Eye rather small, 3.4 to 4.7 in head.

e. Mouth rather large, maxillary reaching beyond posterior margin of pupil ..... *spinifer*, p. 161

ee. Mouth rather small, maxillary reaching about to front margin of pupil.

f. Eye comparatively small, 4.5 in head; dorsal bright red; side with longitudinal violet bands ..... *erythreus*, p. 161

ff. Eye comparatively large, 3.4 in head; side with alternating longitudinal red and white bands; dorsal pale, with large red spots near edge ..... *punctatissimus*, p. 162

bb. Head less than 3 in length (2.8) ..... *xantherythrus*, p. 164

aa. One opercular spine ..... *ensifer*, p. 165

#### 114. *Holocentrus diadema* Lacépède. "Alaihi kalaloo." Plate X.

Head 3.25 in length; depth 2.75; eye 2.9 in head; snout 3.8; maxillary 3.1; interorbital 4.5; D. XI, 13; A. IV, 9; P. I, 13; V. I, 7; scales 4-47-7.

Body elongate, deep, compressed, greatest depth about midway between origin of ventral and anal; upper and lower profiles evenly convex; head compressed, longer than deep, its width half its length; snout short, broad, blunt, steep; upper profile of head slightly convex, eye very large, impinging upon upper profile, anterior, the posterior margin of pupil a little before middle of head, and its diameter a little less than postocular region; mouth small, slightly oblique; maxillary reaching a little beyond front rim of orbit, but not to pupil, small and its distal expanded extremity 1.6 in pupil; teeth in jaws, on vomer and palatines, pointed, crowded, small; tongue pointed, free; suborbital rim narrow, finely serrate; lips thick, fleshy; nostrils close together, anterior very large, close to eye; bones on head all finely serrate, the opercle with 2 well-developed spines, the upper the larger; preopercle with a strong spine reaching beyond gill-opening; gill-opening large, filaments rather long, gillrakers compressed, short, in moderate number; pseudobranchiae large; dorsal spines sharp, pointed, first 3.5 in head, second 2.2, third 1.8, fourth 1.6, eleventh 4.2; anterior dorsal rays produced, pointed, third 1.6 in head, last 5; third anal spine enlarged 1.3, fourth 2; anal similar to soft dorsal, first ray longest, 1.5, last 4.5; caudal rather small, deeply forked; pectoral 1.7; ventral 1.1; caudle peduncle elongate, compressed, its length 1.8, depth 3.8.

Color when fresh, side and upper parts rosy, deep or dark red in life; about 11 very distinct horizontal white lines, the upper narrower and somewhat rosy, these separating a corresponding number of rosy lines; head with 3 oblique white stripes on cheek, interspaces rosy; spinous dorsal deep blood-red, fading to blackish; a narrow white stripe near the base, ending at the fifth spine; a similar less regular stripe from ninth spine to end of fin above middle of spine, each spine tipped with white; soft dorsal light rosy, first ray deep red; caudal light rosy, upper and lower margins deep red with a very narrow white edge; anal light rosy, membrane from third spine to first soft ray deep blood red; pectoral pale rosy, without dark spot at base; ventral spine and first ray white, the second ray and membrane deep red, rest of fin light rosy; iris red.

Color in alcohol, pale silvery brown or whitish, each scale on back sprinkled with many fine dark brown dots; side with 8 narrow white longitudinal lines; inside of pectoral grayish; spinous dorsal black, except upper extremities of membranes between each 2 spines; a narrow line on lower part of fin running as far as sixth spine, and another running from seventh spine on upper part to end of fin; membrane between third anal spine and first soft ray at first whitish and then blackish; ventrals whitish.

Described from an example (No. 03162) taken at Honolulu. This is a small species, very abundant along the shores of the Hawaiian Islands; also abundant at Samoa. Our collection contains one example from Hilo and 22 from Honolulu. Dr. Jenkins records 11 specimens obtained by him at Honolulu in

1889. The *Albatross* secured specimens at Honolulu, Laysan Island, and at station 3834, on the southern coast of Molokai, in 8 fathoms. Our specimens range from 4 to 6.5 inches in length.

*Holocentrus diadema* Lacépède, Hist. Nat. Poiss., IV, 335, 372, 374, pl. 32, fig. 3, 1802, South Seas; Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 501 (Hawaiian Islands); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 440 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 523 (Honolulu; Laysan Island; Albatross Station 3834).

*Perca pulchella* Bennett, Zool. Journ., III, 377, pl. 9, fig. 3, 1827, Sumatra.

*Holocentrum diadema*, Cuvier & Valenciennes, Hist. Nat. Poiss., III, 213, 1829 (Ile de France; Timor; Borabora; Society Islands); Günther, Fische der Südsee, 97, 1873 (Samoa; Tahiti; Tonga; Hawaiian Islands); Steindachner, Denks. Ak. Wiss. Wien, LXX, 492, 1900 (Honolulu; Laysan).

### 115. *Holocentrus microstomus* Günther. Fig. 58.

Head 3 in length; depth 3; eye 2.75 in head; snout 4; maxillary 2.7; interorbital 5; D. x1, 14; A. iv, 10; P. i, 14; V. i, 7; scales 4-48-8.

Body elongate, compressed, greatest depth about ventral fin, upper and lower profiles evenly convex; head compressed, longer than deep, and pointed, its width a little less than half its length; upper profile of head slightly convex; eye very large, impinging upon upper profile, the posterior margin of pupil nearly midway in length of head, and a little less than postocular region; mouth

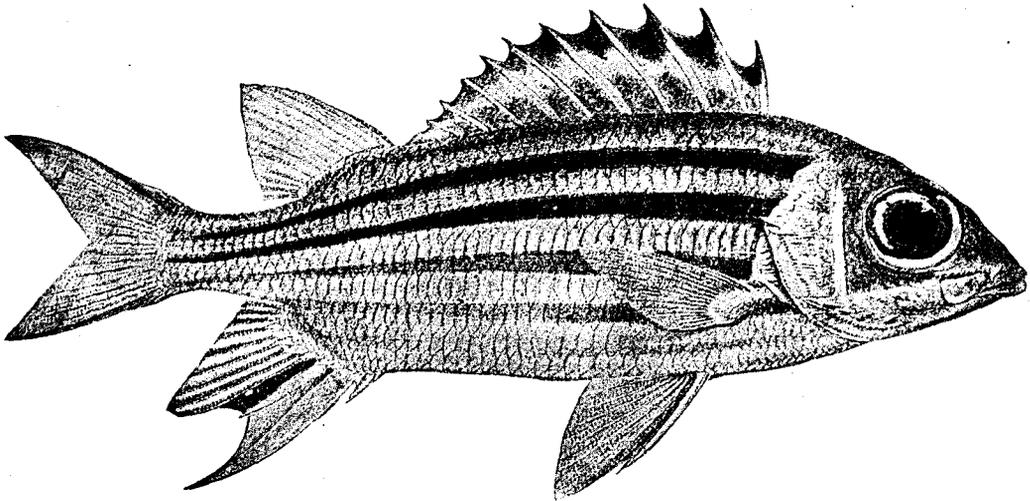


FIG. 58.—*Holocentrus microstomus* Günther; after Günther.

small, slightly oblique; maxillary reaching a little beyond anterior margin of pupil, small, its distal expanded extremity 1.25 in pupil; teeth minute, crowded; tongue pointed, free; suborbital rim very narrow, finely serrate; lips thick, fleshy; nostrils close together, anterior very large, close to eye; bones on head all finely serrate, the opercle with two well-developed spines, the upper the longer; preopercle with a strong spine reaching beyond gill-opening; gill-opening large, filaments rather long, gillrakers compressed, short, in moderate number; pseudobranchiae large; dorsal spines sharp, pointed, first 3 in head, second 2.3, third 2, eleventh 6; anterior dorsal rays elongate, fourth 2 in head, last 5; soft anal similar to soft dorsal, last ray 5; caudal small, forked, lobes pointed; pectoral small, 1.6 in head; ventral reaching three-fourths distance to anus, fin 1.4 in head, spine 2; caudal peduncle elongate, its length 1.19, its depth 3.9.

Color in alcohol (No. 03486) pale silvery brown or whitish, side with 9 or 10 narrow white longitudinal lines; axil of pectoral brown; spinous dorsal pale, with a broad blackish band from middle of membrane between first 2 spines, edged above and below with whitish in front; fins pale or whitish.

Described from an example (No. 04263) taken at Honolulu.

We have examined 2 other specimens obtained at Honolulu by Dr. Wood and recorded by Dr. Jenkins. They range from 5.5 to 6.2 inches in length. The species is common at Samoa.

*Holocentrum microstoma* Günther, Cat., I, 34, 1859, Amboyna; Günther, Fische der Südsee, IV, 98, 1875 (Amboyna; Samoa; Tonga; Society; Hawaiian; Kingsmill; Hervey, and Paumotu islands).

*Holocentrus microstoma*, Seale, Occas. Pap. Bishop Mus., I, No. 3, 70, 1901 (Guam).

*Holocentrus microstomus*, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 440 (Honolulu).

### 116. *Holocentrus spinifer* (Forskål). Plate VIII.

Head 3 in length; depth 2.4; eye 4.7 in head; snout 3.4; maxillary 2.6; mandible 2; interorbital 6.4; D. xi, 16; A. iv, 11; P. i, 14; V. i, 7; scales 5-46-8.

Body rather elongate, deep, compressed, back elevated; head moderate, compressed, pointed, upper profile straight from tip of snout to occiput; snout long, pointed, its upper profile straight; lower profile of head nearly straight; eye small, high, its posterior margin about midway in length of head; mouth large, oblique, the mandible slightly projecting; maxillary broad distally, its width at that point 1.5 in eye; lips large, thick, papillose; teeth fine, in broad bands in jaws; tongue elongate, pointed, free in front; postorbital very narrow, preorbital broad with 2 strong spines, 3 small serrations in between; nasal bone with strong spine in front; bones on head all more or less serrate; margin of preopercle coarsely serrate, ending in a long strong spine below, reaching well beyond gill-opening and furnished with a thin flap; opercle with 2 strong spines, upper longer; nasal aperture very large and deep, with a small aperture in front; interorbital space flattened, rather narrow; gill-opening large, gill-rakers rather small, short, few in number; gill-filaments and pseudobranchiæ moderately long; anterior dorsal spines longest, first 2.9 in head, second 2.1, third 2, last 8.5; anterior rays longest, first ray 2.7, second 1.9, third 1.8, last 5; third anal spine very large, strong, 2 in head, third 2.35; soft anal similar to soft dorsal, first ray 1.8, third 2, last 6.5; caudal rather small, lobes broad, rounded, pointed; caudal peduncle compressed, elongate, its length 1.8, depth 3; pectoral rather small, 1.5 in head, pointed; ventral long, pointed 1.5, spine 2.3; rudimentary caudal spines 4, graduated, sharp pointed.

Color in life, bright red, each scale with central area of pearly gray with red; spinous dorsal rich vermilion, tinged with yellow; other fins yellowish red; caudal bordered posteriorly with yellow; 3 large scales behind eye and narrow area behind these dark red; axil of pectoral, and spot on under face of base of pectoral dark red.

Color in alcohol, yellowish white; spinous dorsal yellowish; other fins pale.

We have 2 specimens of this species (No. 02554, 9.75 inches long, and No. 03437, 15 inches long), both from Honolulu. It is common at Samoa.

*Sciæna spinifera* Forskål, Deser. Anim., 49, 1775, Red Sea.

*Holocentrum leo* Cuvier & Valenciennes, Hist. Nat. Poiss., III, 204, 1829, Society Islands; Waigiou; Moluccas; Seychelles; Lesson, Voyage Coquille, XII, 222, 1830 (South Sea; Borabora; Waigiou); Cuvier, Règne Animal, Ed. II, 150, pl. 14 fig. 1, 1829; Bleeker, Nat. Tyds. Ned. Ind., VII, 1854, 355 (Cocos Islands); Quoy & Gaimard, Voyage Astrolabe, Poiss., 678, pl. 14, fig. 3, 1834 (Vanikoro); Bleeker, Act. Soc. Sci. Ind. Neerl., VI, 1859, 2 Enumeratio.

*Holocentrum spiniferum*, Günther, Cat., I, 39, 1859 (Louislade Archipelago, part); Günther, Fische der Südsee, III, 94, 1874 (Vavau; New Hebrides; Solomon Islands; in part).

*Holocentrus leo*, Smith & Swain, Proc. U. S. Nat. Mus., V, 1882, 125 (Johnston Island); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 441 (Hawaiian Islands).

*Holocentrus spinifer*, Fowler, Proc. Ac. Nat. Sci. Phila. 1899, 483 (Thornton Island); not *Holocentrum spiniferum* of Cuvier & Valenciennes and of Sauvage, which is *H. caudimaculatus*.

### 117. *Holocentrus erythræus* Günther. Fig. 59.

Head 3 in length; depth 2.7; eye 4.5 in head; snout 4; maxillary 2.2; mandible 1.8; interorbital 5; D. xi-16; A. iv, 10; P. i, 13; V. i, 7; scales 4-48-7.

Body elongate, compressed, deep, greatest depth about middle of belly; head compressed, pointed, upper and lower profiles straight; snout short, pointed; eye small, high, its posterior margin well before middle of length of head, not impinging upon upper profile; mouth rather large, oblique, mandible slightly projecting; maxillary broadly expanded distally, 1.4 in eye, reaching beyond posterior margin of pupil; supplemental maxillary large, teeth minute, crowded, in bands in jaws; lips thick, fleshy, papillose; suborbital ridge rather narrow, with 2 very strong short spines; 2 short nasal spines; posterior nasal cavity very large; interorbital space broad, flattened; margin of preopercle finely serrate, with a long pointed spine below; opercle with 2 spines, upper larger but not much longer; gill-opening large, filaments coarse, and pseudobranchiæ rather long; gillrakers rather short, thick, compressed, not as long as filaments, and in moderate number; dorsal spines rather low, first

4.2 in head, third 2.9, and last 4.6; anterior dorsal rays elevated, third longest, 1.5 in head, last 6; third anal spine enlarged, 1.8, fourth 2.2; soft anal similar to soft dorsal, first ray 1.7, last 5.25; caudal rather small, forked; pectoral pointed, 1.4; ventral sharp pointed, 1.4; spine slender, 2.5; caudal peduncle compressed, its length 1.8, its depth 3.2.

Color in life, very deep red, golden shades along rows of scales below, alternating with brighter shades of vivid violet; some faint dark spots on anterior part of body, in axil, and one on base of pectoral, these small, round spots larger than nostril; fins deep red without edge; a row of whitish spots on membrane of first dorsal; third anal spine white; ventral spine clear violet.

Another example (No. 03471) was brilliant red in life, with violet shades along the rows of scales; fins scarlet or crimson, nearly plain; no dark marks anywhere.

Color in alcohol, pale brown or brownish white, side with about 10 broad longitudinal bands.

This very handsome species resembles *H. tiere* Lesson=*H. paecilopterus* Bleeker, from the South Seas, differing principally in the fewer scales and single series of pale spots on the spinous dorsal.

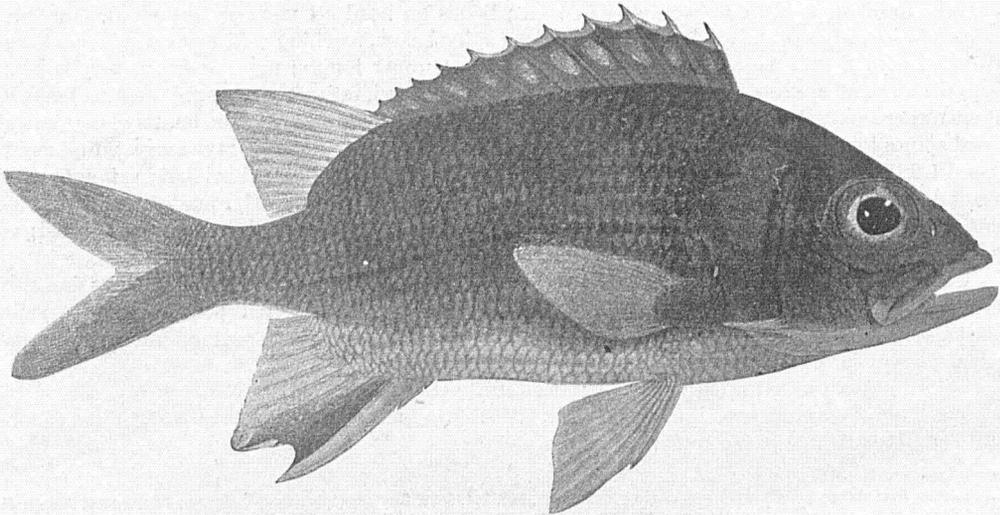


FIG. 59.—*Holocentrus erythreus* Günther; after Günther.

Described from an example (No. 04962) taken at Honolulu. We have 6 specimens 7.6 to 13.5 inches long, from Honolulu and Kailua. The species was obtained at Honolulu, also by the *Albatross*, and we have one specimen from Samoa.

*Holocentrum erythreum* Günther, Cat., I, 32, 1859, Sea of San Cristoval, Solomon Islands; Günther, Fische der Südsee, IV, 99, pl. 63, fig. B, 1875 (Solomon, New Hebrides, Kingsmill, Society, Paumotu, and Hawaiian islands); Smith & Swain, Proc. U. S. Nat. Mus., V, 1882, 127 (Johnston Island).

*Holocentrus erythreus*, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 441 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 523 (Honolulu).

**118. *Holocentrus punctatissimus* Cuvier & Valenciennes. Fig. 60.**

Head 3.25 in length; depth 3; eye 3.4 in head; snout 4; maxillary 2.7; interorbital 3.6; D. xi, 14; A. iv, 9; P. i, 14; V. i., 7; scales 4-47-7.

Body elongate, compressed, greatest depth about tip of ventral spine, upper and lower profiles nearly evenly convex; head elongate, compressed, depth 1.25 in its length, width 2; eye rather small, well anterior, and impinging a little on upper profile; snout blunt, oblique; mouth rather small, oblique; maxillary reaching posteriorly behind front margin of pupil, its distal expanded extremity 2.6 in eye; supplemental maxillary large; lips thick, fleshy; teeth in jaws, and on vomer and palatines minute, in broad bands; tongue elongate, pointed, free in front; nostrils close together, posterior one a small cavity; lower margin of preorbital serrate; suborbital rim narrow, also finely serrate; bones of head all more or less finely serrate; margin of preopercle below with a large dagger-shaped spine reaching well beyond gill-opening; margin of opercle above with two nearly equal, rather short spines;

interorbital space broad, flattened; a small, fleshy axillary flap; gill-opening large, filaments moderately long; gillrakers much shorter than filaments, compressed, few in number; pseudobranchiae large; spinous dorsal long, spines very sharp, first 3 in head, second 2.1, third 1.8, last 7.5; anterior dorsal rays longest, second ray 1.7, last 5.5; anal with third spine longest, reaching beyond tip of anterior rays, 1.5 in head, fourth spine 2.25; soft anal similar to soft dorsal; caudal small, forked, lobes pointed; caudal peduncle elongate, compressed, its length 1.6, depth 3.7; pectoral 1.25; ventral pointed, 1.4, spine 2.

Color in life, upper part of side bright rosy red with a silvery gleam, deeper and lighter lines alternating; lower two-thirds of side with alternating lines of silvery white and very pale rosy; belly plain white; top of head and nape rich rosy, snout paler; humeral region rich rosy; body at base of soft dorsal rich rosy; side of head silvery white, an obscure rosy line across cheek from lower level of

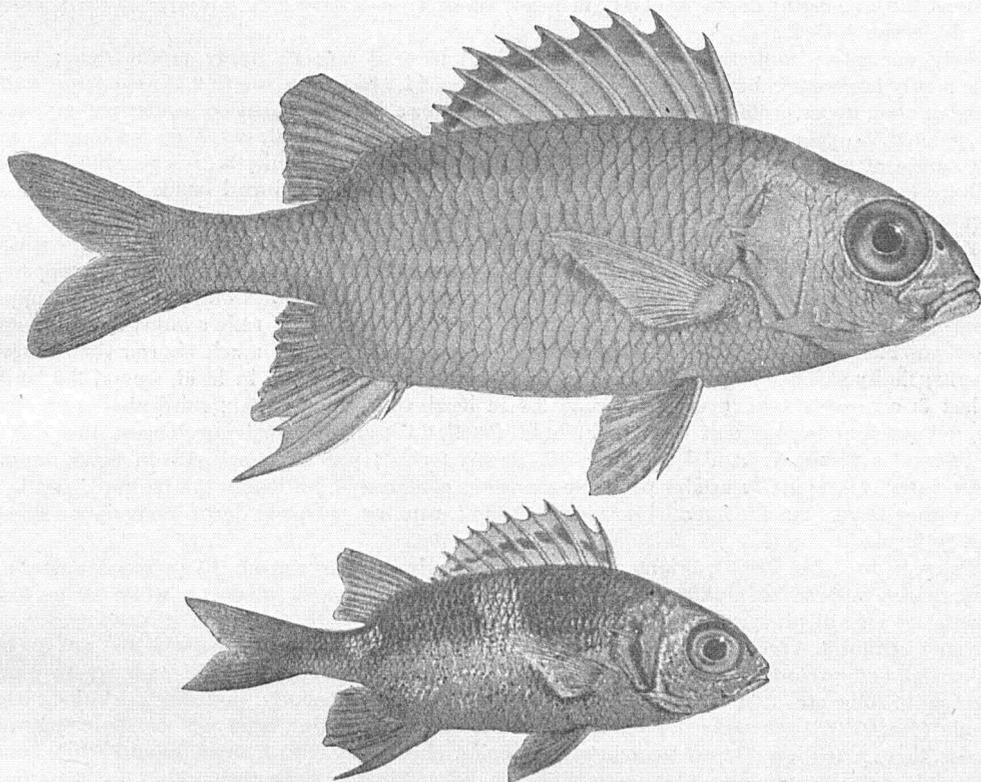


FIG. 60.—*Holocentrus punctatissimus* Cuvier & Valenciennes; after Günther.

eye; spinous dorsal silvery white with a large blood-red blotch on distal part of each membrane becoming smaller posteriorly; similar but smaller and paler spots on bases of fourth to ninth membranes; spines all white, soft dorsal and pectoral very pale rosy; caudal pale rosy; anal white except first and second rays, which are pale rosy; ventral white; iris yellowish silvery. Another example (No. 03202) was rosy when fresh, with silvery below; about 9 faint white streaks along side; a deep blood-red blotch on opercle behind eye, spinous dorsal with a row of faint white spots on the membranes, these near the base of the first 2 spines, toward the tips of the others; no white shade on back of tail; no shade on anal; fins all pale, probably light red in life.

Color in alcohol, very pale brown or brownish white, more or less brassy; fins all pale. Young individuals are rather dark brown, with dark brown longitudinal bands; spots on spinous dorsal black brown; many show a pale area on middle of back like that in Günther's figure.

Described from an example (No. 02982) taken at Honolulu. A small species, and one of the most common fishes among the Hawaiian Islands. Common also at Samoa. Our collections contain no

fewer than 60 specimens from Honolulu, Hilo, and Kailua, ranging in length from 2.25 to 11 inches. Specimens were obtained by the *Albatross* at Honolulu; Puako Bay, Hawaii; and Laysan Island.

*Holocentrum punctatissimum* Cuvier & Valenciennes, Hist. Nat. Poiss., III, 215, 1829, Strong Island, Carolines.

*Holocentrum diploxiplus* Günther, Proc. Zool. Soc. Lond. 1871, 660, pl. 60 (2 figs.), Samoa; Günther, Fische der Südsee, iv, 97, 1875 (Marshall, Samoa, Tahiti, and Paumotu islands; Aneityum).

*Holocentrus gladiispinis* Fowler, Proc. Ac. Nat. Sci. Phila. 1904, 225, fig. 1, Tahiti.

*Holocentrus gracillispinis* Fowler, Proc. Ac. Nat. Sci. Phila. 1904, 228, fig. 2, Honolulu.

*Holocentrus diploxiplus*, Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 501 (Sandwich Islands); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 441 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 523 (Honolulu; Puako Bay, Hawaii; Laysan Island).

#### 119. *Holocentrus xantherythrus* Jordan & Evermann. "*Alaiki*." Plate IX.

Head 2.8 in length; depth 3; eye 3 in head; snout 4; maxillary 2.7; interorbital 5; D. xi-14; A. iv, 10; scales 4-47-8.

Body elongate, compressed, greatest depth about base of ventral; upper profile steep; lower profile nearly horizontal; head compressed, its depth about 1.2 in length, width 2.25; eye large, high, impinging upon upper profile in front, anterior, its diameter a little less than postocular region; snout short, pointed, its upper profile obliquely straight; jaws rather large, subequal; maxillary reaching beyond front margin of pupil or to first third of eye, its distal expanded extremity 2.7 in eye; supplemental maxillary large; lips rather thick, fleshy; teeth small, short, in rather broad bands in jaws and on vomer and palatines; tongue elongate, pointed, free in front; nostrils close together, posterior, a deep cavity in front of middle of eye; interorbital space broad, very slightly concave; preorbital with a large spine in front, its margins serrate; suborbital narrow, with finely serrate margin; preopercle with a large dagger-like spine at lower angle; opercle with 2 similar spines on upper margin, upper one much the larger; bones of head with serrate margins; gill-opening rather large, filaments and pseudobranchiae well developed; gillrakers short, compressed, few, and much shorter than longest filaments; fleshy axillary flap small; dorsal spines sharp-pointed, first 3.2 in head, second 2.8, third 1.9, last 7; anterior dorsal rays high, second 2.4 in head, third 2.2, last 6.5; third anal spine very large, not reaching beyond soft rays, 1.7 in head, fourth 2.25; anterior anal rays longest, first 1.75 in head, second 1.9, last 6; caudal rather small, deeply forked; pectoral small, 1.6 in head; ventral sharp-pointed, 1.4, spine 2; caudal peduncle elongate, compressed, its length 2.1 in head, depth 4; scales rather large, ctenoid; lateral line nearly straight, running obliquely down along upper side of caudal peduncle.

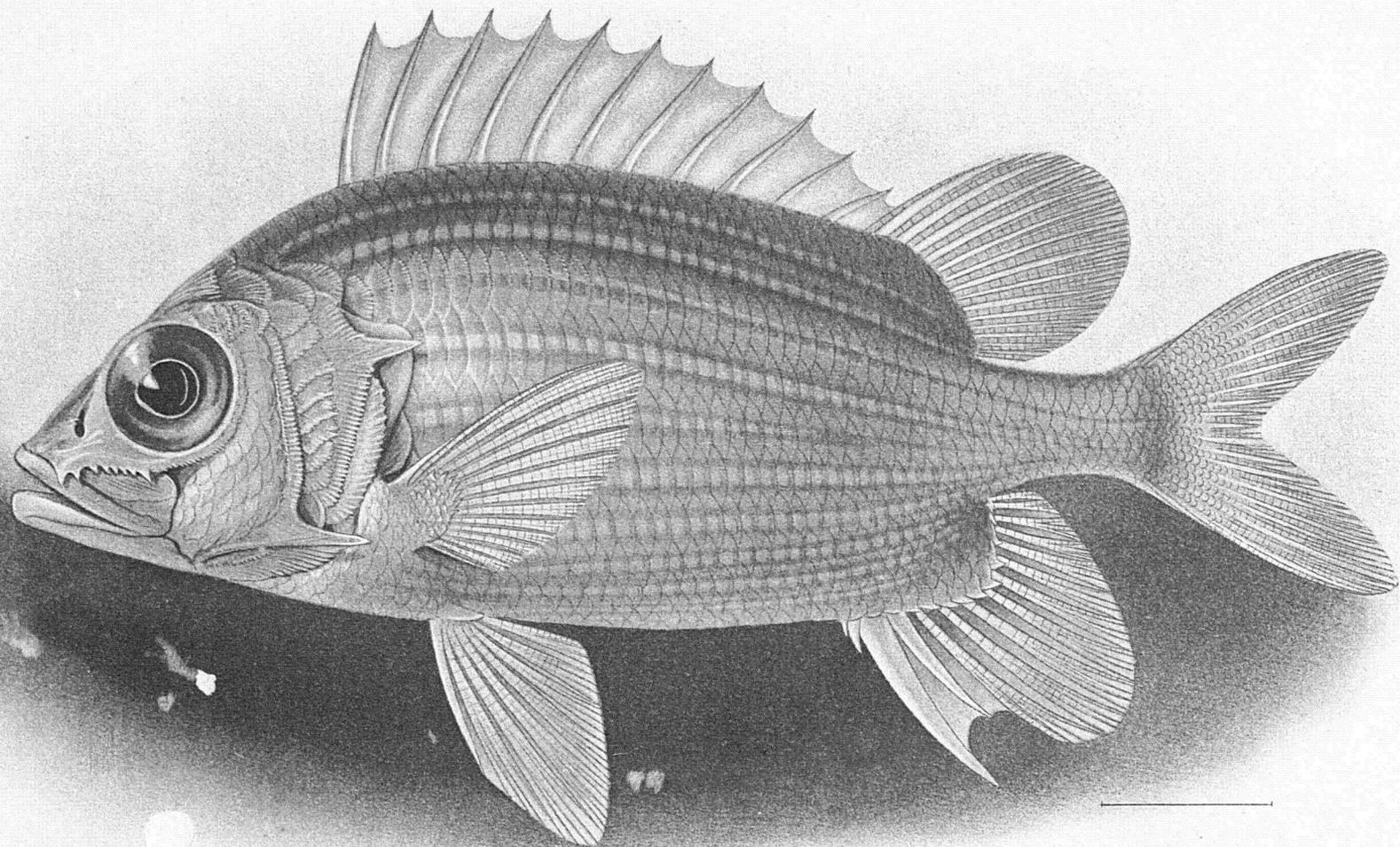
Color in life (No. 02989), bright red, belly more or less silvery; about 10 narrow longitudinal silvery stripes, uppermost pinkish; side of head silvery with pinkish shades; a white stripe from preorbital to base of preopercular spine; spinous dorsal deep red without streaks or black marking, a white spot behind first and second spines at base, tips of third to seventh spines whitish; soft dorsal, anal, caudal, and pectoral plain pink; anal with membrane of third spine and first soft ray deep red; ventral pink, spine and first soft ray white, second ray deep red anteriorly, posteriorly whitish. One example (No. 03161) was rose-red when fresh, with about 10 very faint light rosy streaks along rows of scales, these much less distinct than in other species; cheek rosy with 1 broad oblique white band; dorsal plain red, the membranes fading to white, no light stripes on dark areas; other fins plain light red; membrane of fourth anal spine not darker; iris pink. Another example (field No. 03467) was deep crimson when fresh, with 10 narrow, sharply defined, white stripes along rows of scales; an oblique white stripe below eye from snout to base of preopercular spine; dorsal clear deep red, clouded with darker; soft dorsal, caudal, and anal light bright red; membrane between third and fourth anal spines blood red; pectoral deep red; ventrals red, spines white, their membranes blood red.

Color in alcohol, pale brown or brownish white, washed more or less with silvery or brassy white; side with 9 or 10 longitudinal white stripes; fins pale.

This species is related to *Holocentrus ensifer*, differing mainly in the presence of 2 well-developed spines on the upper margin of the opercle. It is one of the most abundant of the family in Hawaiian waters.

We have 40 specimens from Honolulu and Kailua, ranging in length from 3.75 to 6.5 inches. Examples were also obtained by the *Albatross* at Honolulu.

*Holocentrus xantherythrus* Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (Apr. 11, 1903), 175, Honolulu; Snyder, op. cit. (Jan. 19, 1904), 523 (Honolulu).



HOLOCENTRUS ENSIFER JORDAN & EVERMANN. TYPE.

120. *Holocentrus ensifer* Jordan & Evermann. Plates XI and 28.

Head 3 in length; depth 2.7; eye 3 in head; snout 3.5; maxillary 2.25; interorbital 5; D. xi, 15; A. iv, 11; P. i, 14; V. i, 8; scales 4-47-8.

Body elongate, compressed, greatest depth at ventral fins; upper profile decidedly more convex than lower; head compressed, much longer than deep, pointed, its width a little more than half its length; eye moderate, about 1.2 in postocular part of head, and slightly impinging upon upper profile; snout pointed; mouth moderate, oblique; maxillary broad, with large supplemental bone, distally equal to half diameter of eye; lips thick, fleshy; teeth minute, in broad bands in jaws, and on vomer and palatines; tongue pointed, free in front; nostrils close together, posterior one a large cavity with several small spines projecting over; preorbital with 2 large strong spines and about 6 strong serrations on its margin; suborbital rim narrow; bones of head all more or less finely serrate, the opercle above and preopercle below each with a long, strong, dagger-like spine; interorbital space broad, very slightly concave; a fleshy axillary flap; gill-opening large, filaments moderately long, much longer than gillrakers, which are compressed and not very numerous; pseudobranchiæ large; spinous dorsal long, membrane between spines not much incised, first 2.2, second 2.1, third 2, last 4.2; anterior dorsal rays longest, fourth 1.8, last 7.5; third anal spine largest, 1.75, fourth 2.3; soft anal similar to soft dorsal, third spine not reaching beyond rays; caudal rather small, forked; pectoral 1.3; ventral 1.4, spine 2; caudal peduncle compressed, its length 2.2, depth 4; scales rather large, ctenoid; lateral line arched a little at first and running down obliquely on upper side of caudal peduncle.

Color in life, bright red; side with about 8 yellow longitudinal bands; spinous dorsal vermilion tinged with yellow; soft dorsal rosy with front margin white and behind this above, red; anal whitish with red between third spine and first ray; caudal red, margined above and along the emargination with whitish; pectoral whitish with red lines; ventral rosy with front margin white. One example (field No. 03454) in life had yellow and red longitudinal bands above and yellow and white below; spinous dorsal vermilion, other fins red with white borders. One (field No. 03472) was brilliant scarlet red with 11 golden streaks along rows of scales, upper 4 broadest, and third and fourth most distinct and oblique; a white or golden streak across cheek; fins plain scarlet without dark patches. Another, when fresh (field No. 03494), was bright red verging to scarlet; side red, with 4 golden stripes along back and 6 silver stripes below these, golden and silver, very bright; head crimson; a white band on cheek; spinous dorsal deep scarlet with crimson edge; soft dorsal light crimson with a white, then a dark crimson edge; caudal blood red, edged above and below with white, posterior part of fin abruptly pale; anal with pale spines, then blood red, then pinkish; ventral with white spine, then dark red, then pink; pectoral light red, axil deep red.

Color in alcohol, pale brown or brownish white, the longitudinal bands on sides, together with scales on cheeks and opercle, silvery; fins pale.

This species was obtained by us at Honolulu and Kailua, and appears to be common at the former place.

The 9 specimens we have examined are 6 to 9.75 inches long.

*Holocentrus ensifer* Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (Apr. 11, 1903), 176, Honolulu.

## Family L. POLYMIXIIDÆ.—The Barbudos.

Body rather elongated and compressed; scales not serrated; lateral line continuous with back; head compressed and with a decurved profile; preopercle serrated; mouth with a lateral and nearly horizontal cleft; teeth villiform, on both jaws and on palate; branchiostegal apertures large, the gill-membranes separate, free from the isthmus; branchiostegals 4; dorsal moderately elongated, with 1 spine, increasing backward; anal opposite the posterior portion of dorsal, armed with 3 or 4 spines; pectoral with branched rays; ventral fins thoracic, each with a spine and 6 or 7 rays. Vertebrae in increased number (29). The family is distinguished by the combination of chin barbels, increased number of rays, and small number of branchiostegals. The increased number of ventral rays and the structure of the fins seem to point to berycoid rather than percoid affinities. Mr. Starks has shown that the structure of the barbels is quite unlike that seen in the *Mullidæ*, notwithstanding the strong external resemblance.

A single genus, with 1 to 3 species, inhabiting rather deep waters in the tropical Atlantic and Pacific.

## Genus 94. POLYMIXIA Lowe. Barbudo.

Characters of the genus included above. The species are fully described in Section II.

*Polymixia* Lowe, Trans. Camb. Phil. Soc. 1838, 198 (*nobilis*).

*Nemobrama* Valenciennes, Berher-Webb & Berthelot, Ich. Ples Canar., 40, 1844 (*webbii*).

*Dinemus* Poey, Memorias, II, 160, 1860 (*venustus*).

## Suborder SELENICHTHYES.

This group is especially characterized by the presence of 14 to 17 rays in the ventral fins. The long dorsal is made of soft rays only, and the hypocoracoid bone is greatly dilated. It is probably allied to the group of *Scombroidei*.

One family, the *Lampridae*.

## Family LI. LAMPRIDÆ.—The Mariposas.

Body ovate, compressed and elevated, covered with minute, cycloid scales; head small, rather pointed; mouth small, terminal, without teeth in the adult, its angle with slits in the skin to permit motion of jaws, as in the tunnies; premaxillaries protractile; opercular bones entire; dorsal fin single, very long, elevated, and falcate in front, without distinct spines; anal long and low, not at all falcate; both fins depressible in a groove; ventral fins thoracic, but behind the pectorals, attached to a very long pubic bone, composed of 14 to 17 soft rays; pectoral fins large, falcate, their bases horizontal; caudal fin moderately forked, its peduncle short and slender, without keel; a pit at base of caudal, above and below, as in certain sharks; lateral line present, much arched in front; branchiostegals 6; gill-membranes free from isthmus; esophagus not armed with spinous teeth; air-bladder large, bifurcate behind; pyloric appendages very numerous; vertebræ 45; hypocoracoid very much dilated, as in *Brama*, the entire shoulder-girdle very heavy; the pubic bone much longer than in *Brama*. Fishes of large size and gorgeous coloration, inhabiting the open seas, the flesh firm and rich. A single genus with probably but one species. It resembles the tunnies in the character of the flesh, but the form is very different, and the character of the anal fin separates it widely from all mackerel-like fishes.

## Genus 95. LAMPRIS Retzius. Mariposas.

Characters of the genus included above. The single species is cosmopolitan, most beautifully colored, and unsurpassed as food, the flesh rich, firm, and delicate.

*Lampris* Retzius, K. Vet. Ac. Nya Handlingar, XX, 1799, 97 (*guttatus*).

*Chrysotosus* Lacépède, Hist. Nat. Poiss., IV, 586, 1802 (*luna=guttatus*).

121. *Lampris regius* (Bonnaterre).

Head 3.25 in length; depth 1.75; D. 53 to 55; A. 38 to 41; V. 14 to 17; vertebræ 23 + 22 = 45.

Body short and very deep, sides much compressed; mouth toothless; longest dorsal ray shorter than pectorals, which are nearly as long as head; anal very low in front, a little higher behind.

Color a rich brocade of silver and lilac, rosy on belly; everywhere with round silvery spots; head, opercles, and back with ultramarine tints; jaws and fins vermilion; flesh red, of varying shades.

Skeleton strong and firm. Length 3 to 6 feet. Open waters of the Atlantic and Pacific; frequently taken off the coasts of Europe; not rare off Madeira; occasionally taken off Newfoundland, Maine, and Cuba; also at Monterey and other places in California, and in Japan. Mr. Berndt sends a photograph of a specimen of this species, weighing 176 pounds, taken off Honolulu. One of the choicest of fishes, the flesh rich, firm, and of delicate flavor.

*Zeus regius* Bonnaterre, Encycl. Ichth., 72, pl. 39, 1788, Torbay, England; after Opah of Pennent.

*Zeus guttatus* Brünnich, Danske Selskr., III, 398, 1788, Elsinore, Denmark.

*Zeus luna* Gmelin, Syst. Nat., III, 1225, 1789, Normandy; after Poisson du Lune, Du Hamel, Des Pêches, III, 74.

*Lampris luna*, Günther, Cat., II, 416, 1860; Day, Fish. Great Britain, 118.

*Lampris regius*, Goode & Bean, Oceanic Ichth., 223, 1896.

## Group SCOMBROIDEI.—The Mackerel-like Fishes:

Body variously formed, usually adapted for rapid swimming; the scales usually small and cycloid or wanting, sometimes transformed into rough or bony plates, but rarely ctenoid; lateral line various, usually undulate or with an anterior arch and a posterior straight part, at least not regularly arched; sometimes wanting; flesh in typical forms, firm, oily, and reddish in color, but in some cases pale and soft; caudal peduncle almost always slender and strong, the caudal fin, if present, more or less deeply forked, except in certain deep-sea forms and in aberrant families, the structure typically adapted for swift propulsion; dorsal fin usually long, the spinous portion generally shorter than the soft part, sometimes absent; the spines seldom very strong, sometimes not differentiated from the soft rays; anal fin always more or less similar to soft dorsal; ventrals thoracic, subjugular, or subabdominal, usually with one slender spine and 5 rays, sometimes many-rayed, sometimes rudimentary or wholly wanting; branchiostegals few, usually 7; gills 4, a slit behind the fourth; gillrakers various; gill-membranes usually separate, sometimes joined together, rarely attached to the isthmus; mouth and dentition various; skeleton firm or variously soft, the structure as in spinous-rayed fishes generally; the shoulder-girdle attached to the cranium by a distinctly forked post-temporal, which is not adnate to the cranium; no orbitosphenoid; vertebrae varying from 24 to more than 100, the high numbers found in pelagic species; intestinal canal short. This group of mackerel-like fishes is not capable of exact definition, its deviations from the ordinary type of spiny-rayed fishes being various and in various directions, so that no set of diagnostic characters will cover them. The group is not a suborder, as the term is generally understood; it is incapable of simple definition, and in its divergence some members approach to other groups more nearly than to typical or even extreme members of their own. The group is, however, a somewhat natural one, as by the common consent of ichthyologists its different types have always been kept near each other in the system of classification.

- a. Ventral fins with fewer than 8 soft rays, usually I, 5, sometimes wanting.
- b. Bones of snout and upper jaw prolonged into a distinct sword; vertebrae about 24; ventrals and teeth wanting in the adult; scales obsolete..... *Xiphiidae*, p. 167
- bb. Bones of snout not prolonged in a sword.
- c. Body fusiform or band-shaped, with many vertebrae (30 to 120), small or minute scales and distinctly forked caudal on a slender peduncle (the fin sometimes wanting); dorsal and anal long, the spinous part of dorsal well developed.
- d. Caudal fin present.
- e. Soft dorsal and anal distinct from spinous part, the anterior rays forming a more or less distinct lobe; body moderately elongate, fusiform; caudal peduncle with a distinct keel; finlets always present; ventrals I, 5..... *Scombriidae*, p. 168
- ec. Soft dorsal and anal more or less continuous with spinous dorsal, their anterior rays not forming a distinct lobe; ventrals rudimentary..... *Lepidopidae*, p. 176
- cc. Body and fins various, not showing the combination noted under c.
- f. Vertebrae 10 + 12 to 15 = 22 to 25; dorsal spines not long and filamentous; anal with 2 free spines in young..... *Ovarangidae*, p. 179
- ff. Vertebrae 30 or more (in excess of 10 + 14); dorsal fin with a distinct spinous part; spinous dorsal little developed, of 3 or 4 weak and slender spines continuous with the soft rays; dorsal fin beginning behind the head; body ovate; scales firm, not very small..... *Bramidae*, p. 202
- fff. Vertebrae 30 or more (in excess of 10 + 14); dorsal fin without spinous part, all the rays branched and articulate; dorsal beginning as a crest on the head; body oblong; scales very small..... *Coryphænidæ*, p. 203

## Family LII. XIPHIIDÆ.—The Swordfishes.

Fishes of great size, with the body elongate, naked, the young covered with rough granulations; upper jaw very much prolonged, forming a "sword," which is flattened horizontally and composed of the consolidated vomer, ethmoid, and premaxillaries; teeth wanting in the adult, present in the young; dorsal fin long, usually divided in the adult, continuous in the young, without differentiated spinous part, each part composed of soft rays, the posterior portion much smaller than the anterior and placed on the tail, resembling the second dorsal of a shark; fin rays enveloped in the skin; anal fin divided in the adult; caudal peduncle slender, with a strong median keel; caudal fin widely forked in the adult; ventral fins entirely wanting; no pelvic arch; gills of peculiar structure, the laminae of each

arch joined into one plate by reticulations; gills 4, a slit behind the fourth; gill-membranes separate, free from the isthmus; pseudobranchiæ present; branchiostegels 7; air-bladder present, simple, large; pyloric cœca very numerous; intestinal canal long, with many folds; vertebræ short,  $14 + 12 = 26$  in number, the neural and hæmal spines normal; ribs very few. One species, an enormous fish of the open sea, rivaling the largest sharks in size and of immense strength of muscle. Very young or larval individuals differ much from the adults; the fins are high, both jaws are prolonged into a beak, and the head is armed with long spines.

Genus 96. **XIPHIAS** Linnæus. Swordfishes.

Teeth and ventral fins lacking; body somewhat compressed; dorsal fins 2, the anterior beginning opposite the gill-openings, falcate and elevated, its height rather less than that of the body; second dorsal very small, on the tail, opposite the small second anal. In the young, teeth are present and the 2 dorsal fins are connected, the fin being elevated as in *Istiophorus*. First anal similar to first dorsal, but smaller, less falcate, and far behind it; pectoral fins moderate, falcate; skin naked, more or less rough, especially in the young, which have rudimentary scales; sword flattened and trenchant; caudal keel single; intestines long, sinuous; air-bladder simple; pelvic arch obsolete. Fishes of great size, reaching a weight of 300 to 400 pounds, the flesh red and rich in flavor, highly valued as food.

*Xiphias* Linnæus, Syst. Nat., Ed. X, 248, 1758 (*gladius*).

122. **Xiphias gladius** Linnæus. Fig. 61. "A'u."

Head about 2.25 in length; depth about 5.5; snout 3 in length; D. 40-4; A. 18-14; vertebræ  $14+12$ ; cleft of mouth extending beyond eye. Color dark metallic purplish above, dusky below; "sword" almost black above, below lighter; fins dark, with silvery sheen.

Atlantic Ocean, on both coasts; most abundant between Cuba and Cape Breton; not rare off Cape

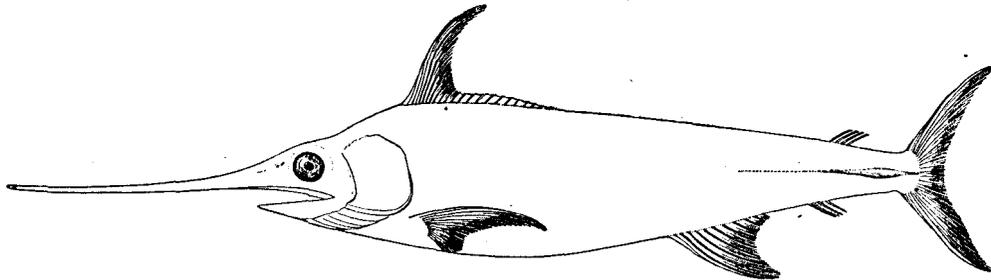


FIG. 61.—*Xiphias gladius* Linnæus; after Cuvier.

Cod and the Newfoundland Banks; rather common in southern Europe; also found in the Pacific, occasionally taken about the Santa Barbara Islands, but not elsewhere recorded from the eastern Pacific. The object of extensive fisheries in the Atlantic. A single specimen was seen by us at Hilo. Others were seen by Mr. Snyder at Honolulu.

*Xiphias gladius* Linnæus, Syst. Nat., Ed. X, 248, 1758, Europe (after *Xiphias*, of Artedi); Bloch, Ichthyologia, III, 23, pl. 76, 1786; Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 255, 1831; Günther, Cat., II, 511, 1860; Storer, Fishes Mass., 72, 1853; Jordan & Gilbert, Synopsis, 420, 1883; Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 523 (Honolulu).

*Xiphias rondeleti* Leach, in Wern. Mem., II, 58, pl. 2, fig. 1, 1818, Frith of Forth.

Family LIII. **SCOMBRIDÆ**.—The Mackerels.

Body elongate, fusiform, not much compressed, covered with minute cycloid scales, the scales anteriorly sometimes forming a corselet; lateral line present, its course undulate; head pointed anteriorly, subconic; mouth rather large, with lateral cleft; premaxillary not protractile; maxillary without supplemental bone; jaws with sharp teeth, large or small; vomer and palatines toothed or not; preopercle entire; opercle unarmed; in the very young the preopercle is armed with radiating

spines, which are later absorbed and lost; gill-openings very wide, the membranes not united, free from the isthmus; gillrakers usually long; pseudobranchiæ present, large; gills 4, a slit behind the fourth; branchiostegals 7; dorsal fins 2, the first of rather weak spines, depressible in a groove, the second similar to the anal; the elevated anterior lobe always distinct; anal spines weak; last rays of dorsal and anal detached and separate, forming in each case a series of finlets; caudal peduncle extremely slender, keeled, the caudal lobes abruptly diverging, falcate, the fin adapted for rapid motion; ventral fins well developed, thoracic, 1, 5; vertebræ in greater number than in *Carangidae*, the number ranging from 31 to 66; first upper pharyngeal present without teeth, third and fourth coossified, with teeth; lower pharyngeals separate; stomach sac-shaped; pyloric cæca numerous; air-bladder small, sometimes absent. Coloration metallic, often brilliant, the prevailing shade steel-blue. Genera about 12; species about 60. Fishes of the high seas, many of them cosmopolitan, and all having a wide range; most of them are valued as food-fishes, the flesh being firm and oily, but sometimes coarse.

- a. Caudal peduncle without median keel on each side.....*Scomber*, p. 169  
 aa. Caudal peduncle with a median keel on each side; a small keel above and one below this.  
 b. Dorsal spines 10 to 16; gills normal, the laminae not forming a network.  
 c. Body scaleless, excepting about the lateral line and corselet.  
 d. Dorsals well separated, the interspace more than half head.....*Axaxis*, p. 170  
 dd. Dorsals contiguous, the interspace more than 5 in head.....*Gymnosarda*, p. 171  
 ce. Body wholly covered with small scales, those on the corselet and lateral line sometimes larger.  
 e. Vomer and palatines with villiform or sand-like teeth; body robust, not compressed; vertebræ 39 to 41.....*Germa*, p. 174  
 ee. Vomer toothless; palatines with a single row of rather strong, conical teeth; body elongate, slightly compressed; vertebræ 50 to 54.....*Sarda*, p. 175  
 bb. Dorsal spines about 25; gills with the laminae forming a network.....*Acanthocybium*, p. 176

#### Genus 97. SCOMBER Linnæus. The Mackerels. "*Opelu*."

Body fusiform, rather elongate, somewhat compressed; caudal peduncle slender, without median keel, but with 2 small keels on each side; mouth wide, with a single row of rather small, slender teeth in each jaw and on the vomer and palatines; maxillary slipping under the broad preorbital, a fleshy lobe on each side of lower jaw near its junction with maxillary; scales very small, not forming a corselet; first dorsal of 9 to 12 feeble spines, separated from the second by an interspace greater than the base of the fin; second dorsal small, followed by 5 to 9 detached finlets; anal similar to second dorsal, with similar finlets; pectorals and ventrals small, the former placed high, on the level of the eyes; caudal fin small, widely forked; pyloric appendages exceedingly numerous; air-bladder small or wanting; vertebræ normally formed, 14+17=31; gillrakers long and slender. Species few, widely distributed, usually swimming in large schools; carnivorous and migratory; everywhere highly valued for food.

*Scomber* Linnæus, Syst. Nat., Ed. X, 297, 1758 (*scombrus*).

*Cordylus* Gronow, Cat., 163, 1854 (*scombrus*).

*Pneumatophorus* Jordan & Gilbert, Proc. U. S. Nat. Mus., V, 1882 (Apr. 25, 1883), 593 (*pneumatophorus*).

#### 123. *Scomber japonicus* Houttuyn. "*Opelu palahu*;" Chub Mackerel. Fig. 62.

Head 3.9 in length; depth 5; eye 3.75 in head; snout 3.1; maxillary 2.9; mandibl 2; interorbital 4.5; D. 1x-1, 12-v; A. 1-1, 11-v; scales 16-210-34; gillrakers 13-20, with long, slender, sparse teeth on anterior edge, the longest gillraker 1.4 in eye.

Body slender, not compressed, the dorsal outline gently elevated; caudal peduncle not compressed and not keeled; head long; snout very long and pointed, the outline from tip to nape straight; mouth large, slightly oblique, the jaws subequal; maxillary reaching near anterior edge of pupil; a single row of small teeth of uniform size in each jaw; similar teeth on vomer and palatines; no teeth on tongue; eye large, strongly adipose; preopercle broad; no blunt teeth or spines on shoulder-girdle; scales very small, covering entire body, deciduous, not forming a corselet; top of head with a large, translucent area; no groove connecting dorsals; first dorsal higher than long; origin of anal slightly behind that of soft dorsal; pectoral short, not reaching tips of ventrals, 2.3 in head; ventrals 2.6 in head.

Color in alcohol, bluish above, with about 30 wavy, darker blue streaks which reach just below

lateral line, these somewhat reticulated and inclosing paler areas; middle and lower part of side paler, with small dark spots; belly pale, with small round dark spots; axil dark.

Color in life (No. 03536), upper half of head and body blue, with brilliant silvery and blue reflections; lower half white, with metallic reflections; back and upper part of side with more than 30 transverse zigzag dark bands; lower half covered with numerous inconspicuous roundish and oval

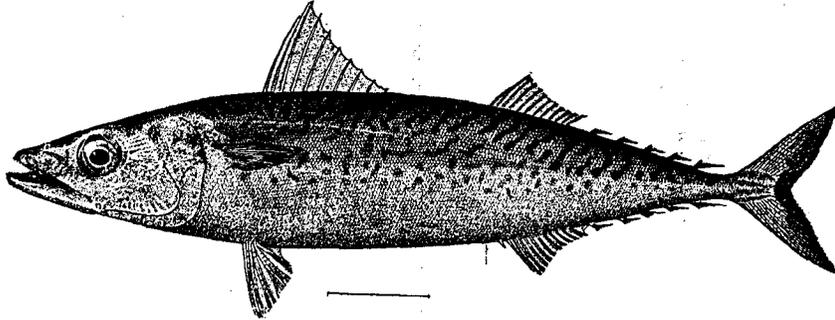


FIG. 62.—*Scomber japonicus* Houttuyn; after Jordan and Evermann.

dusky spots; spinous dorsal transparent; soft dorsal slightly dusky; anal whitish; ventrals white, with reddish base; pectoral dusky; caudal dusky, with the edge yellowish.

The above description based chiefly upon a specimen (No. 04022) 15.75 inches long, taken at Hilo. One other was obtained at Hilo. The collection contains 2 examples obtained at Honolulu August 8 and 13, and another was seen in the Honolulu market August 13.

This mackerel is not often seen among the Hawaiian Islands. The only specimens known from there are those here noted. It is apparently identical with the chub mackerel of the Atlantic and with the common Japanese *saba*.

*Scomber japonicus* Houttuyn, Verhand. Holl. Maatsch. Haarl., XX, 1782, 331, Japan; Jordan & Evermann, Amer. Food and Game Fishes, 276, 1902, with figure; Jordan & Snyder Proc. U. S. Nat. Mus., XXIII, 1901, 745, 747.

*Scomber auratus* Houttuyn, l. c., 333, Japan.

*Scomber colias* Gmelin, Syst. Nat., 1329, 1788, Sardinia; Dresslar & Fesler, Bull. U. S. Fish Comm., VII, 1887, 432, Pl. II; Jordan & Evermann, Fish. North & Mid. Amer., I, 866, Pl. CXXXIII, fig. 364, 1896.

*Scomber lacertus* Walbaum, Art. Pisc., 209, 1792, Sardinia.

*Scomber pneumatophorus* De la Roche, Ann. Mus. Nat. Hist. Paris, XIII, 1809, 315 and 334, Balearic Islands.

*Scomber macrophthalmus* Rafinesque, Indice, 15, 1810, Palermo.

*Scomber græc* Mitchell, Trans. Lit. and Philos. Soc. N. Y. 1815, 422, New York.

*Scomber maculatus* Couch, Ann. Mag. Nat. Hist., V, 1832, 22, England.

*Scomber undulatus* Swainson, Nat. Hist. Fishes, II, 409, 1839, Sicily.

*Scomber gracilis* Swainson, op. cit., II, 410, 1839, Sicily.

*Scomber diego* Ayres, Proc. Cal. Ac. Sci. 1856, 101, Santa Barbara.

*Scomber dekayi* Storer, Hist. Fishes Mass., 130, pl. 11, fig. 1, 1853, Massachusetts coast.

#### Genus 98. AUXIS Cuvier. The Frigate Mackerels.

Body oblong, plump, mostly naked posteriorly, anteriorly covered with small scales, those of the pectoral region enlarged, forming a corselet; snout very short, conical, scarcely compressed; mouth rather small, the jaws equal; teeth very small, mostly in a single series, on the jaws only; tail very slender, depressed, with a rather large keel on each side; first dorsal short, separated from the second by a considerable interspace; second dorsal and anal small, each with 7 or 8 finlets; pectorals and ventrals small; no air-bladder; branchiostegals 7; pyloric cæca dendritical; gillrakers very long and slender, numerous; vertebrae 39 in number, peculiarly modified, essentially as in *Gymnosarda*. One species, pelagic, widely distributed.

*Auxis* Cuvier, Règne Animal, Ed. 2, Vol. II, 199, 1829 (*rochei*=*thazard*).

124. *Auxis thazard* (Lacépède). Frigate Mackerel. Fig. 63.

Head 3.6 in length; depth 4.75; eye 5 in head; snout 4.1; interorbital 4.2; maxillary 3; D. x-12-viii; A. 13-vii; gillrakers 30+10, serrate, longest nearly equal to eye.

Body robust, scarcely compressed, abruptly contracted at caudal peduncle; least depth of latter 1.3 in least width, strongly keeled; head long, subconic; snout pointed; jaws equal; small teeth in a single series in each jaw; tongue long, rounded, free, a thin flap on each upper side, narrowing posteriorly and giving a trough-like appearance; maxillary reaching below anterior edge of pupil, slipping under preorbital for nearly its entire length; eye, moderate, high, anterior; interorbital flat; opercle very broad; fins small; dorsal spines rather stiff, longest equal to snout and eye; soft dorsal very low, its longest ray about equal to eye; caudal crescent-shaped, lobes equal; longest anal ray equaling base of fin, its origin under posterior base of soft dorsal; pectoral short, reaching slightly beyond

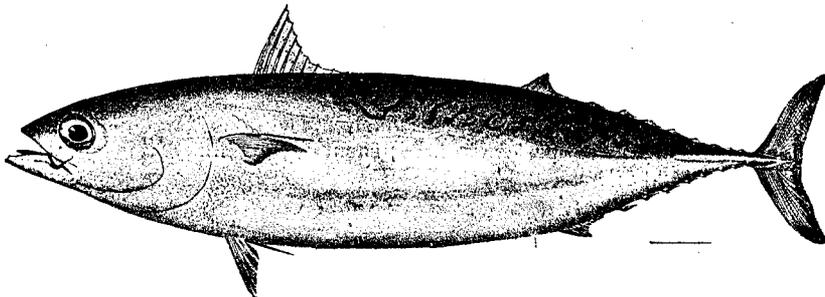


FIG. 63.—*Auxis thazard* (Lacépède); after Jordan and Evermann.

ventrals, past middle of first dorsal, longest ray 2.5 in head, its upper base on a line with upper edge of pupil; ventrals 2.6 in head, base under upper base of pectoral; scales of corselet and along anterior dorsal region comparatively large.

Color in alcohol, blackish blue above, lighter below, becoming silvery on belly; color of fins same as adjacent body color.

The above description based chiefly upon a specimen (No. 04021) 10.5 inches long, from Hilo. We have a specimen (No. 04027) 14.5 inches long, from Honolulu, and have examined one obtained by Dr. Jenkins at Honolulu. The species was found abundant at Hilo. It is taken with the trolling hook in the open sea, and is one of the best game fishes of the islands.

*Scomber thazard* Lacépède, Hist. Nat. Poiss., III, 9, 1801, between 6 and 7 S. lat., on coast of New Guinea.

*Scomber rochei* Risso, Ichth. Nice, 165, 1810, Nice.

*Scomber bisus* Rafinesque, Caratteri, 45, 1810, Palermo.

*Thynnus rocheanus* Risso, Eur. Mérid., III, 417, 1827, Nice.

*Auxis vulgaris* Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 139, 1831, Mediterranean.

*Auxis tapinosoma* Bleeker, Fauna Japan, in Nat. Tyds. Ned. Ind., VI, 1854, 408, Nagasaki.

*Auxis thynnoides* Bleeker, Nat. Tyds. Ned. Ind., VIII, 301, 1855, Ternate, V, Ternate.

*Auxis thazard*, Jordan & Evermann, Fish. North & Mid. Amer., 867, fig. 365, Pl. CXXXIII, 1896; Jordan & Evermann, Amer. Food and Game Fishes, 277, 1902, with figure; Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 441 (Honolulu).

#### Genus 99. GYMNOSARDA Gill. The Little Tunnies.

This genus differs from *Thynnus* (1) in the absence of teeth on the vomer; (2) in the complete absence of scales outside of the corselet, while in *Thynnus* of the same size the skin is covered with small scales; the limits of the corselet in the tunny and albicore are obscure, so that it can not properly be said to be a distinct character in those species; and (3) in an important osteological character, namely, the peculiar development, in the form of a network or trellis, of a portion of the abdominal part of the backbone, between the vertebræ proper and the hæmapophyses; vertebræ 38. Species of smaller size than the tunnies, also pelagic and of little value as food.

*Gymnosarda* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 125 (*unicolor*).

*Thynnus* Lütken, Spolia Atlantica, 460, 1880 (*pelamys*); not of Cuvier & Valenciennes.

*Thynnichthys* Giglioli, Catal. Pesci Italiana, 25, 1880 (*thunnina*); not *Thynnichthys* Bleeker, a genus of *Cyprinidae*.  
*Euthymus* Lütken MS. (in lit. Feb., 1881), Jordan & Gilbert, Synopsis, 429, 1883 (*thunnina*).

- a. Lateral line with a decided curve below second dorsal; 4 lengthwise stripes on sides of body below lateral line ..... *pelamis*, p. 172  
 aa. Lateral line without distinct curve; no stripes below lateral line ..... *alletterata*, p. 173

125. *Gymnosarda pelamis* (Linnaeus). "Aku,"<sup>a</sup> Ocean Bonito. Fig. 64.

Head 3.5 in length; depth 4; D. xv-12-viii; A. ii, 12-vii.

Body oblong, robust; lateral line making a decided curve immediately beneath the second dorsal; corselet strongly developed, covering the entire space between the diagonals connecting the posterior extremity of the spinous dorsal and the base of the pectorals; posterior margin of preopercle about 1.5 in inferior margin; pectorals reach vertical from tenth dorsal spine.

Back bluish; belly silvery; 4 brownish stripes on each side of belly, parallel with the lower curve of body; no spots below pectorals.

Warm seas; pelagic; not very common, north to Cape Cod and Bermudas on the Atlantic coast of America; once recorded from California.

A specimen (No. 04439) 32 inches long, from Honolulu, is described as follows:

Head 3.3 in length; depth 4.4; eye 7.75 in head; snout 3.2; maxillary 2.7; mandible 2.3; gape 2.7; interorbital 3.6; D. xvi-12+8; A. ii, 12+7.

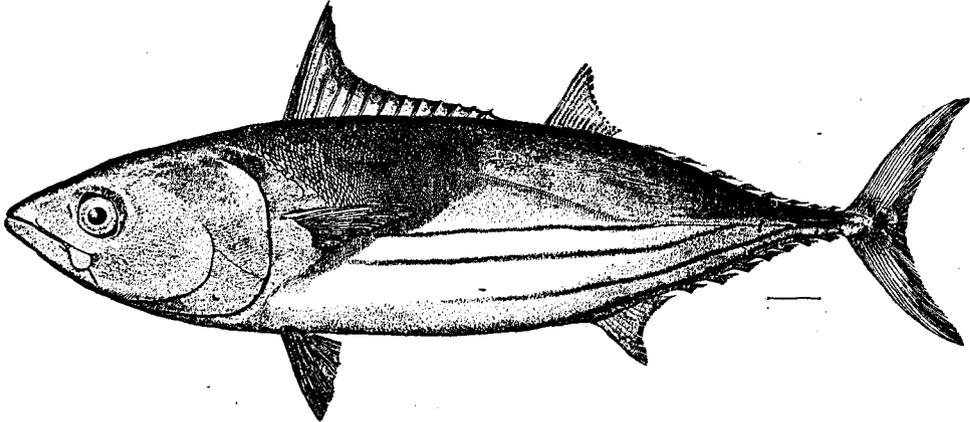


FIG. 64.—*Gymnosarda pelamis* (Linnaeus).

Body rather short, stout, not compressed; head and caudal peduncle uniformly pointed; head rather large, long, conic; snout small, sharply conic; mouth moderate, the jaws subequal; maxillary reaching middle of pupil, slipping under preorbital, width at tip 1.7 in eye, lower edge convex, fitting into a concavity in mandible; teeth small in both jaws, none on vomer or palatine; short, sharp teeth on base of tongue; interorbital space broadly convex; eye rather small in anterior half of head; opercle and preopercle with fine but soft serrations; caudal peduncle short, depressed, and strongly keeled; origin of spinous dorsal slightly behind base of pectoral, the anterior spines produced, 2 in head, the fin folding in a groove; distance between dorsal fins very short, not exceeding diameter of eye; anterior dorsal ray produced, 3.1 in head; anal similar to soft dorsal, its origin under last dorsal ray, its anterior rays produced, equaling those of dorsal; caudal extremely broadly forked, the lobes small, scarcely exceeding snout and eye in length; pectoral moderately long, pointed, 1.9 in head; ventrals shorter, 2.75 in head; corselet well developed; a large naked area on side anterior to line connecting origin of soft dorsal to tip of pectoral; lateral line with an irregular arch above the pectoral, thence descending in an irregular wavy line to keel of caudal peduncle.

<sup>a</sup>In ancient tradition the "Aku" and the "Opelu" (mackerel) accompanied Pili on his voyage to Hawaii. "Aku" helped to paddle the canoe, and "Opelu" calmed the winds when too strong.

Color in alcohol, bluish black above, pale on sides, whitish below, lower part of side with 4 broad bluish-black lines, broadest posteriorly and separated by broad silvery bands, which are broadest anteriorly.

The above description based upon a specimen (No. 04439) 32 inches long, obtained in the market at Honolulu. We have another specimen (No. 04440), 27 inches long, from the same place, and also the head (No. 04018) of a large example seen at Hilo. In the collection made by Dr. Jenkins is a specimen (No. 798), 14 inches long, which does not agree fully with current descriptions of this species. It has 6 narrow brown lines along lower part of side instead of 4, and there is a narrow row of blunt tubercular teeth on each palatine bone.

This species is pelagic and occurs in all warm seas, being abundant about Hawaii in summer. It has been found on the Atlantic coast of America as far north as Cape Cod, and it is frequent about the Bermudas. It has been recorded from the coast of southern California.

*Scomber pelamis* Linnæus, Syst. Nat., Ed. X, 297, 1758, "in pelago inter Tropicos."

*Scomber pelamides* Lacépède, Hist. Nat. Poiss., III, 14, 1802; after Linnæus.

*Thynnus pelamys*, Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 113, 1831; after Linnæus.

*Gymnosarda pelamis*, Jordan & Evermann, Fishes North and Mid. Amer., 868, 1896 (Oct. 3); Jordan & Evermann, American Food and Game Fishes, 278, 1902; Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 441 (Honolulu).

126. *Gymnosarda alletterata* (Rafinesque). "Kāwakāwa;" Little Tunny; Bonito. Fig. 65.

Head 3.6 in length; depth 3.9; eye 5.4 in head; snout 3.3; interorbital 3.75; maxillary 2.3; D. xv-12-viii; A. 13-7; gillrakers 22+9, serrate, longest nearly equal to eye.

Body robust, scarcely compressed, abruptly contracted at caudal peduncle, least depth of latter 1.3 in least width, strongly keeled; head long, subconic; snout pointed; jaws subequal, lower slightly the shorter; teeth on both jaws and palatine arch, the latter very minute; those on jaws small, sharp,

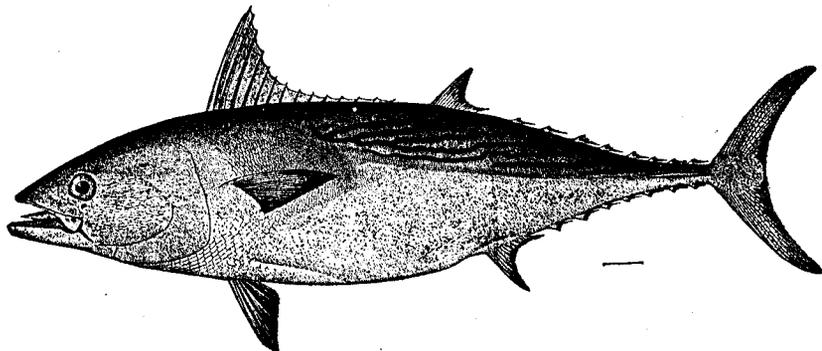


FIG. 65.—*Gymnosarda alletterata* (Rafinesque); after Jordan and Evermann.

conic, wide set; tongue long, rounded, free, a thin flap on each upper side narrowing posteriorly, giving a trough-like appearance; maxillary reaching center of pupil, slipping under the preorbital for nearly its entire length; eye moderate, high, anterior; interorbital rounded, wide; opercle broad; fins small; dorsal spines stiff, longest equal to snout and eye; soft dorsal very low, its longest ray not quite equal to its base; caudal crescent-shaped, lobes equal; base of anal fin equal to longest ray, its origin under posterior base of soft dorsal; pectoral short, reaching slightly beyond ventrals past middle of first dorsal, longest ray 2.4 in head, its upper base on a line with middle of pupil; ventrals 3 in head, base behind upper edge of pectoral; scales of corselet and anterior dorsal region comparatively large.

Color in alcohol, blackish blue above, lighter below, becoming silvery on belly; back with about 12 oblique, wavy, dark streaks, separated by bluish silvery interspaces; side with 10 to 13 darker bands; several black blotches size of pupil or slightly larger on side between ventrals and pectoral; fins color of body.

The above description based chiefly on a specimen (No. 04019), 10.5 inches long, from Hilo. We have one other specimen (No. 04020), 10 inches long, from Hilo, and one (No. 04025), 17.75 inches long, from Honolulu. In the larger examples the spots on the side between the ventral and pectoral are fewer—only 2 or 3 in number.

This species is common in the markets at Honolulu and Hilo in the summer, being taken with the hook in the open sea.

*Scomber quadripunctatus* Geoffrey St. Hilaire, Deser. Egypt. Poiss., pl. 24, fig. 5, 331, about 1814, Red Sea.

*Scomber alletteratus* Rafinesque, Caratteri, 46, 1810, Palermo.

*Thynnus leachianus* Risso, Eur. Mérid., II, 414, 1826, Nice.

*Thynnus thunnina* Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 104, 1831, Mediterranean.

*Thynnus brasiliensis* Cuvier & Valenciennes, op. cit., VIII, 110, 1831, Brazil.

*Thynnus brevipinnis* Cuvier & Valenciennes, op. cit., VIII, 112, 1831, Mediterranean.

*Gymnosarda alleterata* Jordan & Evermann, Fish. North & Mid. Amer., 869, fig. 366, Pl. CXXXIV, 1896; Jordan & Evermann, Amer. Food and Game Fishes, 278, 1902; Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 441 (Honolulu).

Genus 100. GERMO Jordan. The Albacores.

Pectoral fins very long, saber-shaped, their length in the adult about two-fifths the length of the body. Otherwise essentially as in *Thynnus*, to which this genus is very closely related. Size large, but much less than that of the species of *Thynnus*.

*Oreymus* Cuvier, Règne Animal, Ed. 1, II, 314, 1817 (*alalunga*); not *Oreymus* Rafinesque, Analyse de la Nature, 1815, which is equivalent to *Scombrooides*.

*Germo* Jordan, Proc. Ac. Nat. Sci. Phila. 1888, 180 (*alalunga*).

127. *Germo germo* (Lacépède). "Ahi," Albacore. Fig. 66.

Head 3.6 in length; depth 3.9; eye 5.7 in head; snout 3; interorbital 3; maxillary 2.5; mandible 2.2; gape 2.7; D. XIV-II, 12+8; A. II, 12+7.

Body short, stout, fusiform, scarcely compressed, dorsal and ventral profiles curving gradually, body deepest at the middle; head moderate, sharply conic; snout short, pointed, the jaws subequal; maxillary reaching below middle of pupil, slipping under the thin preorbital; teeth on jaws in a single

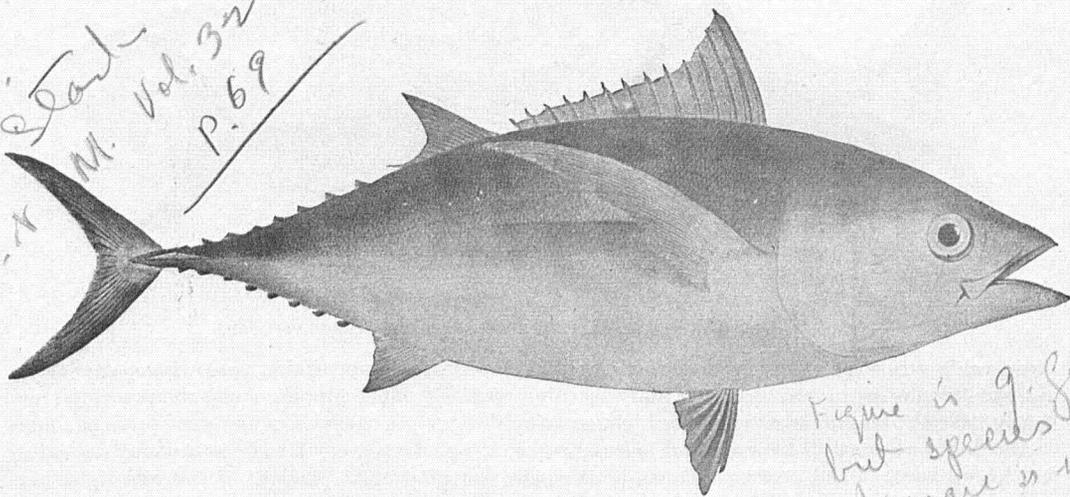


FIG. 66.—*Germo germo* (Lacépède); after Schlegel.

row, small and bluntly conic, villiform patch on vomer, none on palatines; eye large, in anterior half of head; opercles smooth, skin of preopercular edge finely denticulate, as is also the upper edge of opercle; caudal peduncle slender, short, depressed, least depth not exceeding half diameter of eye, the least width 1.5 in eye; origin of spinous dorsal slightly posterior to base of pectoral, the first spine 2.5 in head, the fin folding completely in a groove; soft dorsal and anal similar, rays elevated, each about 3 in head; caudal very broadly forked, each lobe about 1.3 in head; pectoral long, slender, reaching origin of anal, inserted below line of eye, the length equaling that of head; ventrals short, fitting into a depression, their length 2.7 in head; scales small, cycloid, covering entire body, somewhat larger along back; corselet distinct, scales on it large, coarsely ctenoid.

Color in life of a specimen (No. 03455), 17 inches long, from Honolulu, dark above, with steel-blue reflections; silvery below; very faint light bands, every other one a solid band separated by rows of spots curving downward and backward from pectoral region to ventral line; some very faint indications of similar narrow bands behind pectoral, vertical above, curved backward below; soft dorsal and anal and dorsal and anal finlets bright lemon-yellow; caudal dusky white with yellow border; ventrals white on under surface, black above, a small black spot on base of each; pectoral very dark-blue above, black on surface next body, silvery grayish blue on opposite surface; no dark bands or spots on body.

Color in alcohol, brownish black above, paler on the sides, bluish-white below; fins all dusky; pectoral almost black.

The albacore is known from all related species by the bright yellow color of the finlets. It reaches a large size and is occasionally taken on the hook in the open sea and brought into the markets of Honolulu and Hilo. It is less common about the Hawaiian Islands, however, than in southern Japan. The Japanese *shibi* (*germo sibi*) is apparently the same fish.

*Scomber germo* Lacépède, Hist. Nat. Poiss., II, 598, and III, 1, 1802, 17° S. latitude and 103° W. longitude.

*Thynnus sibi* Schlegel, Fauna Japon., Poiss., 97, pl. 50, 1844, Nagasaki, Japan.

*Germo sibi*, Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 523 (Honolulu).

#### Genus 101. SARDA Cuvier.

Body rather elongate, covered with small scales, those of the pectoral region forming a corselet; caudal peduncle slender, strongly keeled; head large, pointed, compressed; mouth large; teeth in jaws rather strong, conical, slightly compressed; similar teeth on the palatines, but none on the vomer; maxillary not concealed by preorbital; gillrakers long and strong; first dorsal long and rather low, of 18 to 22 rather stout spines, which are gradually shortened behind; interval between the last spine and the second dorsal short; second dorsal small, followed by 8 or 9 finlets; anal fin similar, usually with one fewer finlets; paired fins small; pectorals placed below the level of the pupil; no air-bladder; pyloric caeca very numerous, dendritical; vertebrae normally formed, 50 to 54 in number. Fishes of rather large size, of metallic coloration. Two species known, one from the Hawaiian Islands.

*Sarda* Cuvier, Règne Anim., Ed. 2, II, 199, 1829 (*pelamys*=*sarda*).

*Pelamys* Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 149, 1831 (*sarda*); not *Pelamys* of Daudin, a genus of snakes.

#### 128. *Sarda chilensis* (Cuvier & Valenciennes). California Bonito.

Head 3.75; depth 4.75; D. XVIII-I, 12-VIII; A. II, 11-VI. Head pointed, conical, naked; maxillary not reaching eye; teeth strong, curved, about 40 in each jaw; pectoral placed just below the level of pupil, scarcely half as long as head; gillrakers long, strong, 16 or 17 below angle; corselet moderately developed; lateral line undulating, making a sharp curve below soft dorsal. Dark metallic blue; sides dusky; several blackish stripes running obliquely upward and backward from the pectoral region to the upper edge of the tail, these variable in number and direction. Length 2 to 3 feet; weight 16 pounds. San Francisco to Patagonia and Japan; abundant northward in summer; very similar to the Atlantic bonito, *Sarda sarda*, but with the spinous dorsal always shorter, its flesh similarly coarse, dark red, and oily.

A specimen about 2 feet long recently received from Honolulu belongs without doubt to this species. Head 3.5 in length; maxillary extending to a vertical through posterior edge of orbit; 6 dark oblique stripes on body, the uppermost and lower ones being indistinct; dorsal with 18 spines. This is the first record from Hawaii. It tends to add further probability to the supposition that *Sarda lineolata* Girard, from California, and *Sarda orientalis* (Schlegel), from Japan, are fully identical with *Sarda chilensis*, as was indicated by us in our Fishes of North and Middle America.

*Pelamys chilensis* Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 163, 1831, Valparaiso, Chile; Günther, Cat., II, 368, 1860.

*Pelamys orientalis* Temminck & Schlegel, Fauna Japonica, Poiss., 99, pl. 52, 1850, Japan.

*Pelamys lineolata* Girard, Pac. R. R. Surv., X, 106, 1858, San Diego, Cal.

*Sarda chilensis*, Jordan & Evermann, Fishes North & Mid. Amer., I, 872, 1896.

## Genus 102. ACANTHOCYBIUM Gill. The Petos.

Body elongate, fusiform; head very long, slender, and pointed, the mandible being longer than upper jaw; jaws forming a sort of beak; cleft of mouth extending to below eye; posterior part of maxillary covered by the preorbital; both jaws armed with a close series of trenchant teeth, ovate or truncate, their edges finely serrate; villiform teeth on vomer and palatines; gills as in *Xiphias*, their laminae forming a network; scales small, scarcely forming a corselet, those along the base of dorsal enlarged and lanceolate; keel strong; caudal spinous; dorsal very long, its spines about 25 in number. One species, a very large mackerel-like fish, widely distributed; especially abundant about the Florida Straits. This remarkable genus marks a long step from *Scomberomorus* toward the type of swordfishes.

*Acanthocybium* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 125 (*sara=solandri*).

129. *Acanthocybium solandri* (Cuvier & Valenciennes). "Ono."

Head 4; depth 6.5; eye 5 in snout; gape more than half length of head; premaxillaries in front prolonged in a sort of beak, which is nearly half length of snout; teeth somewhat irregular, the posterior much the largest, all strong, serrated, about 50 in each jaw. Dorsal spines mostly subequal; lateral line descending abruptly under sixteenth dorsal spine, the highest, behind middle of fin, 5.66 in head; dorsal and anal lobes low; caudal lobes short, very abruptly spreading, their length about two-thirds head; pectoral 2.25 in head; corselet small.

Color steel-blue; dark above, paler below; no distinct markings; young faintly barred; fins colored like the body.

This fish is not abundant, but a single specimen, 48 inches long, was seen by Doctor Jenkins in 1889, in Honolulu, and Mr. Snyder obtained it there in 1902.

The *Ono* was said by the ancient Hawaiians to be the parent of the *Opelu* (mackerel).

*Cybiium solandri* Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 192, 1831, open sea of the Pacific, exact locality unknown.

*Cybiium sara* Lay & Bennett, Beechey's Voyage, Zool., 63, pl. 20, fig. 2, 1849, Loo Choo.

*Cybiium petus* Poey, Memorias, II, 234, pl. 16, fig. 1, 1860, Habana.

? *Acanthocybium petus* Poey, Synopsis, 363, 1868 (Cuba).

*Cybiium verany* Doderlein, Giorn. de Sc. Nat., Ed. Econ., VIII, 1872, Palermo.

*Acanthocybium solandri*, Jordan, Proc. U. S. Nat. Mus. 1884, 119; Jordan & Evermann, Fish. North & Mid. Amer., 876, 1896; Jordan & Evermann, Amer. Food and Game Fishes, 288, 1902; Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 441 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 523 (Honolulu).

## Family LIV. LEPIDOPIDÆ.—The Escolars.

Mackerel-like fishes with the body rather elongate, more or less compressed, covered with minute scales; lateral line various, sometimes obsolete, sometimes with a dorsal branch; head large, compressed, with very strong teeth, usually compressed, some of the anterior canine-like; lower jaw projecting; gill-openings wide, the membranes not united, free from isthmus; gills 4, a slit behind fourth; opercles in adult unarmed; in young, the preopercle with radiating spines as usual in scombroid fishes; dorsal fin long, a notch separating the weak spines from the soft part, which always forms a distinct lobe anteriorly, similar in form to the anal fin; finlets often present; caudal peduncle slender, usually not keeled, the fin moderate in size, always forked; ventrals small, often reduced to a single spine; vertebrae numerous, 32 to 53 in number; pyloric cœca rather few; air-bladder usually present. Coloration metallic, usually brilliant. Genera about 6; species about 12. Fishes of the high seas, widely distributed and descending to considerable depths; usually breeding about rocky islands; most of them used as food. The *Lepidopidæ* are closely allied to the *Scombridæ*, from which they diverge in the direction of the *Trichuridæ*. The successive steps are indicated by the progressive elongation of the body, the progressive reduction of the ventrals and vertical fins, and on the other hand by the progressive elongation of the lower jaw and the specialization of the dentition. Dr. Lütken calls attention to the fact that the *Lepidopidæ* possess a system of dermal or subcutaneous ribs, composed of slender bony filaments, close-set, directed backward and upward, and backward and downward from the median line. This character has been verified in *Thyrsites*, *Nealotus*, and *Gempylus*.

a. Body moderately elongate, the dorsal spines fewer than 30, the finlets usually few.

b. Ventrals well developed, their rays 1, 5.....*Ruvettus*, p. 177

bb. Ventrals each reduced to a single spine.....*Promethichthys*, p. 178

aa. Body greatly elongate, the dorsal fin with about 30 spines, the spinous part continuous with the soft part; dorsal and anal finlets 6; dentition strong; ventrals 1, 5, very small.....*Lennisoma*, p. 179

Genus 103. *RUVETTUS* Cocco.

Body fusiform, moderately elongate, the skin covered with bony tubercles remote from each other and obliquely placed; mouth large, with strong teeth, some of the anterior in each jaw canine-like; lateral line obscure, little developed; abdomen keeled; tail not keeled; dorsals near together, well differentiated; dorsal and anal each with 2 finlets; ventral rays 1, 5. Color black. One species. A large, deep-water fish, generally valued as food in the Tropics.

*Ruvettus* Cocco, Giorn. Sci. Sicilia, XLII, 2, 1829 (*pretiosus*).

*Acanthoderma* Cantraine, Mem. Ac. Sci. Belles-Lettres, Bruxelles, X, 1835 (*temmincki*).

*Aplurus* Lowe, Trans. Zool. Soc. Lond., II, 1841, 180 (*simplex*).

130. *Ruvettus pretiosus* Cocco. "Walu." Fig. 67.

Head 4.15 in length; depth 5.4; eye 6.5 in head; snout 2.6; maxillary 1.9; gape 2.16; interorbital 2.25; D. XIII-11, 15-11; A. 16-11; V. 1, 5; P. 13; C. IX, 9+9, VIII; prickles in about 85,—38 series.

Body moderately elongate, compressed, the dorsal and ventral outlines very gently elevated, body deepest under middle of pectoral fin, the outline tapering regularly to caudal; head rather large, conic; snout long and pointed; mouth large, somewhat oblique, maxillary reaching posterior line of orbit, its greatest width nearly 2 in eye, the gape reaching anterior third of pupil; lower jaw long, slightly projecting, its sides forming an acute angle; teeth strong, canine-like, a single row in each jaw and on each palatine; about 5 large, backwardly directed canines on the vomer; teeth of jaws larger on sides than at tips; eye large, entirely above axis of body, chiefly in anterior half of head; interorbital space broad and flat; anterior nostril nearly round, the opening directed forward, midway between tip of

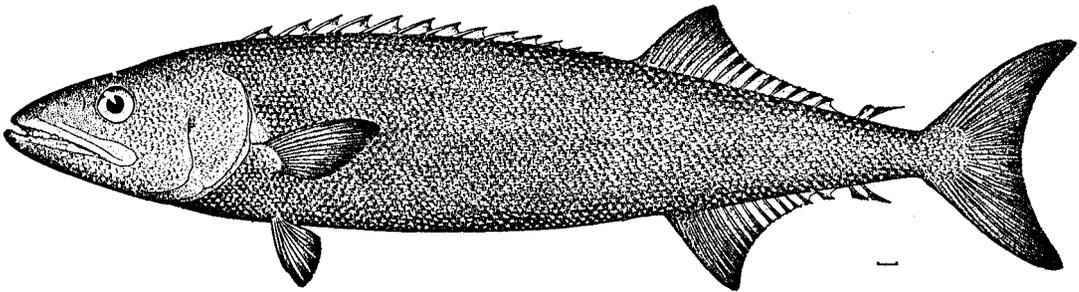


FIG. 67.—*Ruvettus pretiosus* Cocco; from our Hawaiian specimen.

snout and middle of pupil; posterior nostril a long, vertical slit, opening backward, its length 1.5 in pupil; gillrakers short, but strong, sparsely placed; opercular margin soft, the spine obscure; belly with a low, broad keel; caudal peduncle nearly round, its least depth equal to its least width or about 2 in snout; fins small, origin of spinous dorsal over edge of opercle, its distance from snout equal to half of head; spinous dorsal low, the spines slender, folding in a groove; distance between dorsals short, 1.5 in eye; origin of soft dorsal anterior to that of anal, anterior rays elevated, their length equal to snout, the last ray scarcely greater than pupil; distance between base of last dorsal ray and first ray of dorsal finlet 1.4 in eye; length of second ray of dorsal finlet 2.2 in snout; distance from base of dorsal finlet to caudal 1.6 in snout; anal similar to soft dorsal, its origin somewhat posterior, its anterior rays elevated and about equal to those of dorsal, base of fin somewhat shorter than that of soft dorsal, length of last anal ray equal to that of last dorsal ray; anal finlet with 2 rays and entirely similar to dorsal finlet; caudal large, broadly forked, a number of supporting spines along each edge, the lobes 1.6 in head; pectoral short, 2 in head; ventral shorter than pectoral, 3 in head; skin covered with small, irregular, somewhat embedded, cycloid scales, among which are rows of glossy forked prickles, arranged somewhat definitely in rows, each with 2 sharp points and 2 or 3 roots; scales of head very small, densely covering top of head, cheeks, and opercles, the head everywhere, except tip of snout, rough to the touch; body with numerous small but conspicuous pores, usually at bases of the prickles.

Color in alcohol, dark, dirty brown, the prickles showing as lighter yellowish silvery lines; fins mostly dark.

We have one large example of this species, No. 04314. It has a total length of 4 feet 6 inches, measured from tip of snout to tips of middle caudal rays, and weighs, after evisceration and having been in alcohol several months, 40 pounds. This specimen agrees with current descriptions except that the dorsal and anal spines and rays are somewhat fewer. It was sent us by Mr. E. L. Berndt, inspector of the Honolulu market, and furnishes the first record of the occurrence of this species in the Pacific.

*Ruvettus pretiosus* Coceo, Giorn. di Scienze per la Sicilia, XLII, 21, 1829, **Messina**; Goode & Bean, Oceanic Ichth., 196, 1896; Jordan & Evermann, Fishes North and Mid. Amer., I, 879, 1896; Jordan & Evermann, Amer. Food and Game Fishes, 289, 1902; Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 523 (Honolulu).

*Tetragonurus simplex* Lowe, Proc. Zool. Soc. Lond. 1833, 143, **Madeira**.

*Rovettus temminckii* Cantraine, Giorn. Sci. et Litt., Pisa, 1833; vide Poey.

*Acanthoderma temminckii* Cantraine, Nouv. Mem. Ac. Sci. Belles-Lettres, Bruxelles, X, 6, Pl. I, 1837 (Jan. 17, 1835), **Sicily**.

*Thyrssites acanthoderma* Lowe, Proc. Zool. Soc. Lond. 1839, 78, **Madeira**.

*Rovettus temminckii*, Valenciennes, Poiss., in Webb & Berthelot Nat. Hist. Canary Islands, II, 62, Pl. II, 1837-44.

*Aplurus simplex*, Lowe, Trans. Zool. Soc. Lond., II, 1841, 180.

*Thyrssites scholaris* Poey, Memorias, I, 372, pl. 32, fig. 1, 1851, **Havana**.

*Thyrssites pretiosus*, Günther, Cat., II, 351, 1860 (Mediterranean).

#### Genus 104. PROMETHICHTHYS Gill. Conejos.

Body elongate, slender, fusiform; mouth large, with 2 strong canines in front of each jaw; spinous dorsal long, contiguous to the soft, which is rather high; 2 finlets above and 2 below; pectorals comparatively low; caudal without keel; ventrals represented by a pair of minute spines; no dagger-shaped spine behind vent. Preopercle unarmed except in young. Lateral line descending in an oblique line, undulating below the front of the spinous dorsal. Scales very minute, smooth. Voracious fishes of the open seas, reaching a moderate size.

*Prometheus* Quoy & Gaimard, MS.

*Prometheus* Lowe, Trans. Zool. Soc. Lond., II, 1841, 184 (*atlanticus*); name preoccupied.

? *Dicerotus* Günther, Cat., II, 349, 1860 (*armatus*).

*Promethichthys* Gill, Mem. Nat. Ac. Sci., VI, 115, 123, 1893 (*atlanticus*; substitute for *Prometheus* of Lowe).

#### 131. *Promethichthys prometheus* (Cuvier & Valenciennes). Plate 29.

Head 3.5 in length; depth 7.8; eye 5 in head; snout 2.6; interorbital 6.1, in eye 1.3; maxillary 2.2; D. XIX-I, 19-II; A. II, 17-II.

Body subfusiform, elongate, low, uniform, compressed, slender; head long, compressed; snout long, lower jaw the longer, rounded, with 2 long, sharp, canine teeth in front, slipping outside upper jaw; teeth on both jaws; vomer, palatines and tongue, the latter small and villiform as are those on the palatines, those on vomer 6, long and fang-like; rather blunt, wide-set, conic teeth in jaws; tongue thick, rather pointed, free for a short distance; maxillary reaching anterior edge of pupil; mandible reaching vertical slightly beyond posterior edge of pupil; eye large, median; interorbital concave with a deep groove, pointed posteriorly; middle dorsal spines highest, about 3.2 in head, last spine over vent; caudal forked; anal and soft dorsal similar, highest anteriorly; dorsal and anal finlets 2 each; ventrals each composed of a single spine about as long as eye, the base slightly anterior to base of pectoral; pectoral 2 in head; scales small, thin, cycloid, deciduous; lateral line straight to under fourth dorsal spine, thence abruptly downward and backward, reaching a line on middle base of pectoral at the tip of pectoral, thence straight to fork of caudal fin, running on lower side of caudal peduncle and rising slightly on posterior portion of peduncle.

Color in alcohol, uniform blackish brown; head black; fins all dark, dorsal membranes black.

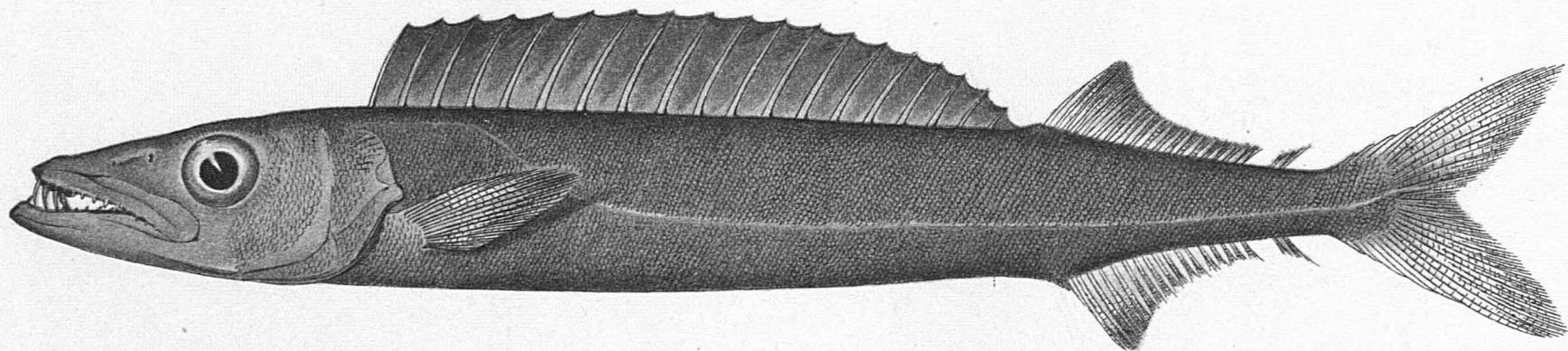
The above description based upon a specimen (No. 04215) 16 inches long, obtained at Honolulu.

Three other examples were obtained at Honolulu (Nos. 04213, 14 inches; 04214, 15 inches; and 04216, 8.5 inches). We are unable to discover any differences between these and Japanese specimens with which we have compared them.

*Gempylus prometheus* Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 213, 1831, **St. Helena**; Valenciennes, Ichth. Iles Canaries, 51, Pl. XL, 1836-1844 (Canary Islands).

*Gempylus solandri* Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 215, 1831, **New Holland**.

*Prometheus atlanticus* Lowe, Trans. Zool. Soc. Lond., II, 1841, 181, **Madeira**; Lowe, Proc. Zool. Soc. Lond. 1839, 78; Lowe, Fishes of Madeira, I, 141, pl. 20, 1843; Gill, Proc. Ac. Nat. Sci. Phila. 1862, 126; Poey, Synopsis, II, 364, 1868 (Cuba); Poey, Enumeratio Piscium Cubensium, 73, 1876.



PROMETHICHTHYS PROMETHEUS (CUVIER & VALENCIENNES).

*Thyrsites prometheus*, Günther, Cat., II, 351, 1860 (Madeira); Günther, Challenger Rep., XXII, 268, 1887, and XXXI, 7, 1889 (north of Hawaiian Islands); Goode, Amer. Journ. Sci. Arts, XIV, 291, 1877 (Bermuda).  
*Promethichthys prometheus*, Gill, Mem. Nat. Ac. Sci., VI, 1893, 115; Goode & Bean, Oceanic Ichthyology, 200, 1896; Jordan & Evermann, Fish. North & Mid. Amer., I, 882, 1896.

**Genus 105. LEMNISOMA Lesson. Snake Mackerels.**

Body very elongate, compressed and band-shaped, approaching the form of *Lepidopus*; head long, pointed anteriorly, the lower jaw projecting, the anterior teeth in upper jaw very long, canine-like; scales minute or obsolete; spinous dorsal very long, of about 30 spines; soft dorsal low, but with a distinct lobe, similar to anal, and each followed by 5 to 7 finlets; ventrals 1, 5, but extremely minute; caudal fin rather small, well forked; lateral line single, arched anteriorly; vertebrae 28 + 25 = 53; air-bladder present. The young have the "*Dicrotus*" form, with large head, spinous ventrals, and spinigerous preopercle. Deep sea.

*Lemnisoma* Lesson, Voyage Coquille, Poissons, 160, 1830 (*thyrsitoites*).  
*Gempylus* Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 207, 1831 (*serpens*).  
*Zyphothycæ* Swainson, Nat. Hist. Fishes, II, 239, 1839 (*coluber*).

**132. Lemnisoma thyrsitoides Lesson. "Haūliuli pūhi."**

Head 5.25 in length; depth 17; D. xxx-i, 13-v; A. ii-i, 11-vii; V. i, 5; vertebrae 28 + 25 = 53; eye 7 in head; maxillary nearly reaching front of pupil; each jaw with a series of compressed triangular, trenchant teeth; about 6 long canines in front of upper jaw, some of these with an emargination, as in *Sphyræna*; palatines with a row of small teeth, none on vomer; usually a single canine at tip of lower jaw; lateral line straight except anteriorly; dorsal spines slender; soft dorsal and anal small, with numerous finlets; pectoral pointed, rather long; ventrals minute.

Color dark metallic blue. Flesh firm. Deep seas; a rare fish, widely distributed, reaching a length of 3 feet or more.

A painting of this species made in Hilo by Andrew Garrett is preserved by Dr. Francis Wetmore, resident in Hilo. The specimen came from Puna to the south of Hilo. D. xxix-ii-vii; caudal forked; ventral very short; dorsal divided. There is also a painting in the collection of Mrs. J. B. Dillingham, in Honolulu, called "Haūliuli Pūhi."

*Lemnisoma thyrsitoides* Lesson, Voyage Coquille, II, 160, 1830, South Pacific, near Paumotu Islands, lat. 17° S., long. 108° E.  
*Gempylus serpens* Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 207, 1831, Martinique; Günther, Südsee, 106, pl. 68, fig. B., 1875 (Sandwich Islands).  
*Gempylus coluber* Cuvier & Valenciennes, op. cit., 211, Otaite.  
*Gempylus ophidianus* Poey, Memorias, II, 246, tab. 18, fig. 1, 1861, Cuba.

**Family LV. CARANGIDÆ.—The Pampanos.**

Body more or less compressed and often elevated, sometimes naked, or more usually covered with small, thin, cycloid scales; head compressed, the occipital keel prominent, usually trenchant; mouth of varying size, the dentition various, the teeth generally small; premaxillaries usually protractile; maxillary with or without a supplemental bone; preopercle usually entire in the adult, in the very young armed with 3 or more spines; lateral line complete, anteriorly arched, the posterior part straight, sometimes armed with bony plates; dorsal fins more or less separated, the spinous part rather weak, the spines usually depressible in a groove; anal fin long, similar to the soft dorsal, always preceded by 2 stiff spines, usually separate, but in the young often more or less connected with the fin or with each other; these sometimes disappear with old age, and sometimes the spinous dorsal also vanishes; often a procumbent spine before the dorsal fin; ventral fins thoracic, well developed, 1, 5; caudal peduncle very slender, the fin widely forked; pectoral fins narrow; gill-openings very wide, the membranes usually not united, free from the isthmus; gills 4, a slit behind the last; gillrakers usually long; branchiostegals commonly 7; air-bladder present, often bifurcate behind; pseudobranchiæ large, present in all our genera, sometimes disappearing with age; œsophagus unarmed; pyloric cœca generally numerous; vertebrae fewer than in the *Scombridae*, usually 10 + 14 = 24 in number; first superior pharyngeal without teeth; second, third, and fourth separate, with teeth; lower pharyngeals separate.

Coloration generally metallic and silvery or golden. Genera 29, species about 200, abounding

in warm seas, often moving northward in summer, like the *Scombridae*. They swim swiftly, often with the dorsal fin above the surface of the water. Most of the species are widely distributed, and nearly all are valued as food.

- a. Premaxillaries not protractile ..... *Scomberoides*, p. 180  
 aa. Premaxillaries protractile.  
 b. Anal fin much shorter than the soft dorsal, its base not longer than the abdomen.  
 c. Dorsal and anal fins without finlets.  
 d. Dorsal spines 4 or 5, the connecting membrane disappearing with age ..... *Naucrates*, p. 181  
 dd. Dorsal spines about 7, the connecting membrane persistent ..... *Seriola*, p. 182  
 cc. Dorsal and anal fins each with a two-rayed detached finlet ..... *Elagatis*, p. 185  
 bb. Anal fin about as long as soft dorsal, its base longer than abdomen.  
 c. Dorsal and anal fins each with a single detached finlet. .... *Dcaapterus*, p. 186  
 cc. Dorsal and anal fins without finlets.  
 f. Shoulder-girdle with a deep cross furrow at its junction with the isthmus, above which is a fleshy projection; body elongate. .... *Trachurus*, p. 187  
 ff. Shoulder-girdle normal, its surface even; body deeper.  
 g. Teeth of jaws not forming villiform bands, but variously in one or more series ..... *Carangus*, p. 188  
 gg. Teeth of jaws, if present, forming villiform bands.  
 h. No teeth on vomer or palatines; teeth of jaws wanting in adults, sometimes appearing in young ..... *Caranx*, p. 197  
 hh. Teeth present on vomer and palatines; teeth of jaws of adults present, persistent.  
 i. Body oblong, not much elevated; none of the dorsal rays filamentous ..... *Carangoides*, p. 198  
 ii. Body rhomboid, deep, strongly compressed; first rays of dorsal more or less filamentous. .... *Aletris*, p. 200

#### Genus 106. SCOMBEROIDES Lacépède.

Body compressed, oblong or lanceolate; caudal peduncle slender, not keeled; head short, compressed, acute; occipital keel sharp; mouth rather large, with small, sharp teeth in bands on jaws, tongue, vomer, palatines, and pterygoids; jaws about equal, the upper not protractile, except in the very young, in which it is movable as in other *Carangidae*; maxillary very narrow, with a supplemental bone; gillrakers rather long; scales rather narrow, but more or less normally developed, embedded in the skin at different angles; lateral line unarmed; dorsal spines rather strong, 7 in number, nearly free in the adult; second dorsal very long, its posterior rays pencillated and nearly or quite disconnected, forming finlets; anal rather longer than soft dorsal, much larger than the abdomen, its last rays forming similar finlets; anal spines strong; ventral fins depressible in a groove; pectoral fins very short. Species few.

*Scomberoides* Lacépède, Hist. Nat. Poiss., III, 192, 1801 (*Coryphaena scomberoides*).

*Chorinemus* Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 367, 1831 (*commersonianus*).

- a. Body deep, fusiform, depth 3.5 in length. .... *tolooparah*, p. 180  
 aa. Body more slender, depth 4.3 in length ..... *sancti-petri*, p. 181

#### 133. *Scomberoides tolooparah* (Rüppell). "*Iae*."

Head 4.25; depth 3.5; eye 4; snout 3.5; interorbital 3.75; maxillary 1.9; D. VII-I, 19; A. II-I, 18.

Body fusiform, compressed; head moderate; snout rather narrow, pointed; jaws subequal, lower the longer and prominent; mouth slightly oblique, rather large; edge of upper lip on a line with upper edge of pupil; small bands of setiform teeth on vomer, palatines, and tongue, those on lower jaw slightly larger and in 2 rows, not banded anteriorly, those in upper jaw similar but smaller, in 1 row, banded anteriorly; maxillary reaching slightly past posterior edge of pupil; eye slightly above median line, anterior, not quite as long as snout; dorsal spines broad, flat, low, longest about equal to eye, tip of last spine reaching origin of soft dorsal; longest soft dorsal ray 2 in head; caudal deeply forked, lobes equal; anal similar to soft dorsal, its first ray under origin of soft dorsal, longest ray 2.4 in head; tip of ventral reaching vent, and equal to tip of pectoral, 2.2 in head; pectoral 2 in head, its anterior base slightly in advance of base of ventral; lateral line slightly arched above pectoral fin, descending to line under base of soft dorsal, thence straight to base of caudal.

Color in alcohol, bluish silvery above, white silvery below; 8 or 10 spots about size of pupil, extending on either side of lateral line to middle of soft dorsal; a dark blotch on upper anterior soft dorsal, similar spots on each dorsal ray; caudal dusky, other fins pale; no spots on anal.

The above description based chiefly on a specimen (No. 02927) 8 inches long from Honolulu.

This fish appears to be fairly common. We obtained it at Honolulu, Hilo, and Waialua. It was obtained at Honolulu also by Jenkins, Wood, and Jordan and Snyder.

Our numerous specimens are 1 to 10.25 inches long.

*Lichia tolooparah* Rüppell, Atlas zu der Reise im Nördl. Afrika, 91, 1828, Massowah; not *Toloo parah* Russell, Fish. Vizagapatam, II, 29, plate 137, 1803, which is nonbinomial.

*Chorinemus mouadetta* Ehrenberg in Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 382, 1831, Massuah, coast of Abyssinia, Red Sea, Trincomali, Ceylon (not Rüppell, Klunzinger, Day, Peters); Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 495 (Honolulu).

*Chorinemus mauritanus* Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 382, 1831, Isle of France, Mahe, Vanicolo, Celebes. *Chorinemus tolooparah* Rüppell, Neue Wirbelthiere, Fisch., 45, 1837.

? *Chorinemus sancti-petri* Bleeker, Verh. Bat. Genoot., XXIV, 1852, 45 (not of Cuvier & Valenciennes, Rüppell, Klunzinger); Günther, Fische der Südsee, V, 138, 1876 (part).

*Chorinemus tolooo* Rüppell, Verzeich. Mus. Senckenberg, Sammlungen 12, 1852.

*Chorinemus tol* Rüppell, Verzeich. Mus. Senckenberg, 12, 1852.

*Chorinemus tolooo*, Klunzinger, Verh. Zool. bot., Ges. Wien, 1870, 447 (not *tolooparah* Russell, not *Chorinemus tolooo* Cuvier & Valenciennes, Bleeker, and Day).

*Scomberoides tata*, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 441 (Honolulu).

#### 134. *Scomberoides sancti-petri* (Cuvier & Valenciennes).

Head 4.3; depth 4.3; eye 4.3; snout 3.6; interorbital 3.4; maxillary 2; D. VII-1, 20; A. II-1, 18.

Body lanceolate, slender, and compressed; head moderate, profile slightly depressed over eyes; snout rather narrow, pointed; jaws subequal, lower being slightly the longer and prominent; mouth moderate, slightly oblique; small bands of setiform teeth on vomer, palatines, and tongue, those in lower jaw slightly larger and in 2 rows, banded anteriorly; in upper jaw similar but smaller teeth, in 1 row, banded anteriorly; maxillary reaching posterior edge of orbit; eye slightly above median line, anterior, not quite so large as snout; dorsal spines broad, flat, low, longest not quite equal to eye, tip of last spine, when depressed, reaching origin of soft dorsal; longest soft dorsal ray 2.3 in head; caudal deeply forked, lobes equal; anal similar to soft dorsal, its first ray under origin of latter, longest ray 2.65 in head; pectoral reaching tip of ventrals, 2 in head; ventrals 2.25 in head, base slightly behind upper anterior base of recting, tips reaching vent.

Color in alcohol, bluish silvery above, white silvery below; 3 or 4 spots slightly larger than pupil below the lateral line anteriorly, 7 or 8 similar spots above this line extending farther posteriorly; a large black blotch on anterior upper part of soft dorsal, a similar smaller spot on each following ray; anal pale; a spot the size of pupil on middle of second and third rays; ventrals pale; pectorals dark, pale at tips.

The above description based on a specimen (No. 04033), 16.25 inches long, from Honolulu.

This species does not appear to be common. It was obtained by Streets, also by Günther, Steindachner, Jordan and Snyder, and by the *Albatross*, but was not seen by Jenkins or Wood. Only one example was secured by us.

Jordan and Snyder obtained one specimen, 7.5 inches long, in 1900 at Honolulu.

*Chorinemus sancti-petri* Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 379, plate 236, 1831, Malabar; Günther, Fische der Südsee, V, 138, 1876 (Kingsmill, Samoa, Society, Hawaiian Islands); Streets, Bull. U. S. Nat. Mus., No. 7, 70, 1877 (Honolulu); Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 496 (Honolulu).

*Scombroides sancti-petri*, Smith & Swain, Proc. U. S. Nat. Mus., V, 1882, 124 (Johnston Island).

*Scomberoides sancti-petri*, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 442 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 523 (Honolulu).

#### Genus 107. NAUCRATES Rafinesque. The Pilot Fishes.

This genus differs from *Seriola* only in the reduction of the spinous dorsal to a few (4 or 5) low, unconnected spines. The young, called *Nauclerus* and *Xystophorus*, have the spines of the dorsals connected by membrane, and a more or less distinct strong spine at the angle of the opercle. A single pelagic species, widely distributed in the open seas.

*Centronotus* Lacépède, Hist. Nat. Poiss., III, 311, 1802 (*conductor* = *ductor*); not *Centronotus* Bloch & Schneider, 1801, which equals *Pholis*.

*Naucrates* Rafinesque, Caratteri, 44, 1810 (*conductor*).

*Pomplius* Minding, Lehrb. Nat. Fische, 108, 1832 (*ductor*).

*Nauclerus* Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 247, 1833 (*compressus* = young).

*Xystophorus* Richardson, Voyage Erebus and Terror, 52, 1844 (very young).

135. *Naucrates ductor* (Linnaeus). Pilot-fish; Romero; "Annexation-fish." Fig. 68.

Head 4 in length; depth 4; eye 5 in head; snout 3.5; D. IV-I, 26; A. II-I, 16.

Body rather elongate, little compressed; snout rather blunt; mouth terminal, oblique, small; maxillary scarcely reaching orbit; caudal keel large, fleshy; pectoral short and broad; ventrals rather large.

Bluish, with 5 to 7 broad, dark vertical bars, extending on the fins.

Length 2 feet. A pelagic fish, found in all warm seas; occasional on our Atlantic coast from Cape Cod to the West Indies.

The earliest evidence we have of the occurrence of this fish among the Hawaiian Islands is that furnished by a painting made by Mrs. J. B. Dillingham from a specimen obtained by her in the

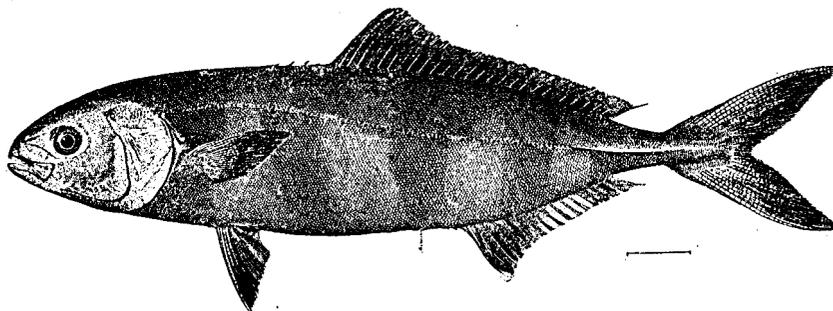


FIG. 68.—*Naucrates ductor* (Linnaeus); after Jordan and Evermann.

Honolulu market. The painting was examined by us and is undoubtedly of this species, which is locally known as "annexation fish," having appeared at the date of the annexation of Hawaii to the jurisdiction of the United States. A specimen in good condition, collected by Dr. Julius Rosenstein, is in the museum of the California Academy of Sciences at San Francisco.

*Gasterosteus ductor* Linnaeus, Syst. Nat., Ed. X, 295, 1758, "in Pelago."

*Gasterosteus antecessor* Daldorf, Skriv. Nat. Selskab. Kjob., II, 166, 1800.

*Scomber katrcuteri* Bloch & Schneider, Syst. Ichth., 570, 1801, locality not given.

*Centronotus conductor* Lacépède, Hist. Nat. Poiss., III, 311, 1801.

*Naucrates fanfarus* Rafinesque, Caratteri, 44, 1810, Sicily.

*Naucrates indicus* Lesson, Voyage Coquille, 157, pl. 14, fig. 2, 1830, India.

*Naucrates noveboracensis* Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 325, 1831, New York.

*Seriola dussumieri* Cuvier & Valenciennes, op. cit., IX, 217, 1833, Gulf of Bengal.

*Seriola succincta* Cuvier & Valenciennes, op. cit., IX, 218, 1833, between Cape of Good Hope and St. Helena.

*Nauclerus compressus* Cuvier & Valenciennes, op. cit., IX, 249, pl. 263, 1833, Molucca.

*Nauclerus abbreviatus* Cuvier & Valenciennes, op. cit., IX, 251, 1833, Indian Ocean.

*Nauclerus brachycentrus* Cuvier & Valenciennes, op. cit., IX, 253, 1833, Indian Ocean, Moluccas.

*Nauclerus annularis* Cuvier & Valenciennes, op. cit., IX, 254, 1833, between the Cape of Good Hope and St. Helena.

*Nauclerus leucurus* Cuvier & Valenciennes, op. cit., IX, 255, 1833, between the Cape of Good Hope and St. Helena.

*Naucrates cyathophrys* Swainson, Nat. Hist. Fishes, etc., II, 412, 1839, Palermo, Nice.

*Naucrates serratus* Swainson, op. cit., 413, 1839 (on *Scomber ductor* Bloch).

*Xystophorus* sp., Richardson, Voyage Erebus and Terror, 52, pl. 30, fig. 22, 1844 (young).

*Thynnus pompilus* Gronow in Gray, Cat. Fishes, 123, 1854, Mediterranean Sea, Spain, America.

*Naucrates ductor*, Günther, Cat., II, 374, 1860 (Polperro, Falmouth, Madeira, Cape Seas, south Pacific, northwest coast of America); Jordan & Evermann, Fish. North & Mid. Amer., I, 900, pl. 139, fig. 379, 1896; *ibid.*, Amer. Food and Game Fishes, 298, with figure, 1902.

#### Genus 108. SERIOLA Cuvier. The Amber-Fishes.

Body oblong, moderately compressed, not elevated; occiput and breast not trenchant; head usually more or less conical, not very blunt; mouth comparatively large, with broad bands of villiform teeth on jaws, tongue, vomer and palatines; a broad, strong supplemental maxillary bone; premaxillaries protractile; scales small, lateral line scarcely arched, a keel on the caudal peduncle, not armed with bony plates; sides of head with small scales; first dorsal with about 7 low spines, connected by membrane; second dorsal very long, elevated in front; anal similar to the soft dorsal, but not nearly so long, shorter than the abdomen, preceded by 2 very small free spines, which disappear in old

fishes; no finlets; ventral fins very long; pectorals short and broad; gillrakers moderate. Species of moderate or large size, often gracefully colored; most of them valued as food-fishes.

*Seriola* Cuvier, Règne Animal, Ed. 2, II, 205, 1829 (*dumerilii*).

*Micropteryx* Agassiz, Pisc. Brasil., 104, taf. LIX, 1829 (*cosmopolita*); substitute for *Seriola*, used in botany; not *Micropteryx* Hubner, 1816, a genus of insects.

*Zonichthys* Swainson, Nat. Hist. Fishes, etc., II, 248, 1839 (*fasciatus*).

*Haluttractus* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 442 (*dumerilii*); substitute for *Seriola*, used in botany.

*Lepidomegas* Thominot, Bull. Sci. Philom. Paris (7), IV, 173, 1880 (*muelleri*).

- a. No scales on opercle; anterior dorsal rays somewhat elevated, the longest about 2.5 in head; gillrakers on lower arch few, about 13.....*purpurascens*, p. 183  
 aa. Upper part of opercle densely scaled; anterior dorsal rays scarcely elevated, 3.7 in head; gillrakers more numerous, about 22 on lower arch.....*sparna*, p. 184

136. *Seriola purpurascens* Schlegel. "Piakahāla," "Kahāla." Fig. 69.

Head 3.75 in length; depth 4; eye 6.5 in head; snout 2.9; interorbital 3; maxillary 2.4, reaching middle of pupil; mandible 2; gape 2.6; D. VI-I, 30; A. 1, 19; scales about 175.

Body long and slender, the back scarcely elevated; head large, not much compressed; mouth large, jaws equal and covered with broad bands of strong, villiform teeth; vomer, palatines, roof of

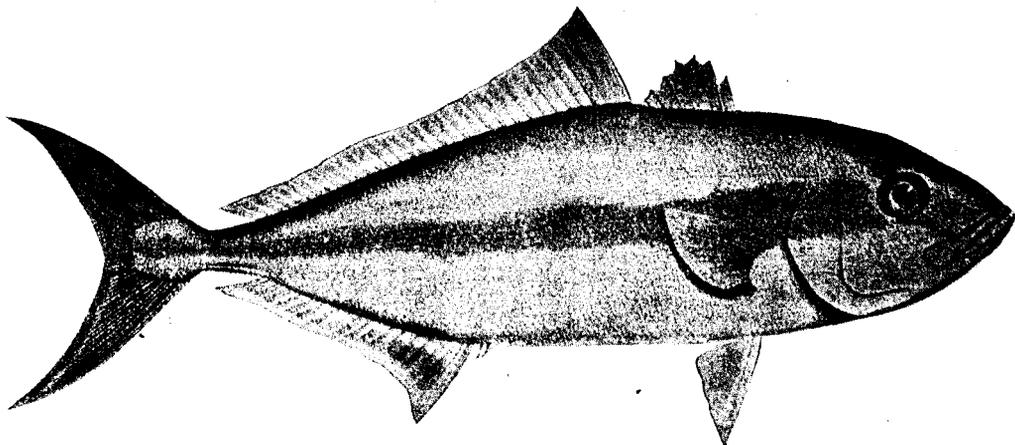


FIG. 69.—*Seriola purpurascens* Schlegel; after Günther.

mouth and tongue with similar teeth; eye moderate, high up, in middle of head; interorbital space strongly convex; maxillary very broad at tip, its width equaling eye, the supplemental bone very broad; body from origin of anal fin tapering slowly to the short caudal peduncle, whose least depth is equal to eye and whose width is somewhat greater; origin of spinous dorsal over middle of pectoral; spines small and weak, longest somewhat greater than eye, the last obscure; anterior dorsal rays somewhat produced, their length 2.4 in the head and somewhat exceeding that of longest anal rays; caudal widely forked; pectoral short, its length equaling distance from tip of snout to middle of pupil, its origin somewhat anterior to base of ventrals; ventrals somewhat longer than pectoral, their length equal to snout and eye; scales very small, cycloid; lateral line well developed, nearly straight, curved slightly upward over tip of pectoral, broadly and shallowly decurved under first third.

Color in life, upper part of body, head, and tail light brown, with scales at certain angles showing bluish; lower parts lighter to whitish; a lemon-yellow band from upper articulation of maxillary through lower two-thirds of eye and along whole length of body as wide as pupil, becoming narrower and losing itself on caudal peduncle; iris edged with yellow; edge of caudal fin edged with lemon-yellow; pectoral and anal suffused with yellow; soft dorsal light brown with show of yellow on posterior portions, more marked on outer ends of rays; spinous dorsal lemon-yellow on ground of light brown; ventrals white on lower surface, somewhat dusky on upper surface. A specimen 4 inches long from Hilo had in life a golden stripe from head to tail.

Color in spirits, dull olivaceous white above, paler on sides, under parts dirty whitish; fins all dusky white.

The above description based upon a specimen (No. 03410), 31 inches long, from Honolulu market, where several other large examples were seen July 18. A smaller specimen (No. 03304), 8 inches long, may be described as follows:

Head 3.2 in length; depth 3.3; eye 5 in head; snout 3; interorbital 3.5; maxillary 2.3; D. VIII-1, 31; A. II-1, 20; gillrakers 13 + 4, serrate, longest three-fourths diameter of eye.

Body rather fusiform, compressed; head a fourth longer than deep; mouth rather large; snout rounded; jaws subequal, the lower prominent and slightly the longer; broad bands of villiform teeth on jaws, vomer, palatines, and tongue; tongue broad, rounded, thin, and free for most of its length; maxillary broad, 0.8 diameter of eye, reaching to center of pupil; eye just above median line, anterior; interorbital broad and very convex; dorsal spines short and weak, connected by membrane and folding in a groove; soft dorsal long and low, highest anteriorly, the longest ray about 2.5 in head; caudal forked, lobes moderate, equal to distance from snout to edge of preopercle; anal similar to soft dorsal, the spines very short and blunt, the longest rays equal to snout; origin of anal under first third of soft dorsal; ventral 2.1 in head; pectoral broad, falcate, short, 2.4 in head, its lower base slightly in advance of base of ventral; lateral line arched anteriorly, no caudal keel; scales small, none on opercle, snout, and top of head.

Color in life, golden olivaceous on back, golden on side below lateral line and on belly; 2 short darkish postocular lines; dorsal and anal rich orange, the dorsal with narrow bluish edge; caudal dirty yellow; pectoral pale yellow; ventrals yellow, the rays whitish; iris whitish and brown. Color in alcohol, grayish olivaceous above, becoming silvery white below; dorsal edged with dark; other fins pale.

Another example had head 3.7; depth 3.75; maxillary broad, 2.2 to front of pupil; D. I, 29; A. I, 20; color when fresh, olive with a golden stripe from head to tail. We have examined a score of examples at Honolulu, 4 to 31 inches long. This species has hitherto been known only from Japan.

*Seriola purpurascens* Schlegel, Fauna Japonica, Poiss., 113, Pl. LXI, 1842, seas of Japan; Richardson, Ichth. Chin., 271, 1846 (after Schlegel) (Sea of Japan); Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 523 (Honolulu).

*Seriola aurovittata* Schlegel, Fauna Japonica, Poiss., 115, Pl. LXII, fig. 1, 1842, Japan; Richardson, Ichth. Chin., 271, 1859 (Canton).

*Seriola quinqueradiata* Schlegel, Fauna Japonica, Poiss., 115, Pl. LXII, fig. 2, 1842, Nagasaki, Japan; Richardson, Ichth. Chin., 272, 1846 (China).

*Seriola dumerilii*, Günther, Cat., II, 462, 1860 (China, part); Günther, Fische der Südsee, V, 136, taf. XC, Fig. A, 1876 (Hawaiian Islands, part); Klunzinger, Fische des rothen Meeres, I, 103, 1884 (Red Sea, part).

### 137. *Seriola sparna* Jenkins. "Kahala opio." Fig. 70.

Head 3.7 in length; depth 3.7; eye 5.2 in head; snout 3.2; maxillary 2.6; interorbital 3.5; D. VI-32; A. II, 20; scales about 220.

Body rather long, fusiform, not much compressed, the back greatly elevated, the ventral outline little convex; head rather long, conic; snout long, gently curved; mouth large, little oblique, the jaws equal; maxillary reaching front of pupil, its posterior margin oblique, its width nearly equaling vertical diameter of eye; teeth in villiform bands on jaws, vomer, and tongue; eye small, anterior, in axis of body; adipose eyelid moderately developed, especially behind; interorbital space broad, strongly convex, the nape slightly keeled; least depth of caudal peduncle less than its least width; preopercle entire; gillrakers longer than diameter of pupil, 22 on lower arm of first arch; spinous dorsal low, the rays short and weak, the second spine 6.3 in head, the first scarcely more than one-third the second, the others regularly decreasing in length, the fifth shorter than the first; soft dorsal low, the first rays scarcely elevated, their length 3.7 in head; anal similar to soft dorsal, but much shorter, its first rays 1.25 in snout; caudal deeply forked, the lobes slender, about equal, 1.3 in head; pectoral short, about 2 in head; ventrals short, 2 in head, reaching less than halfway to vent; body covered with very small scales; cheek, preopercle and upper part of opercle densely scaled, rest of head naked; breast scaled; lateral line nearly straight, slight arch above pectoral; scutes scarcely developed, perceptible only on the caudal peduncle, where they are very weak.

Color in alcohol, pale brownish or purplish above with silvery reflections, lower part of side and under parts yellowish silvery. Recently seen in the Waikiki aquarium.

The above description is based upon the type, 10.5 inches long, the only example known, obtained by Dr. Jenkins at Honolulu in 1889.

*Seriola sparna* Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 442, fig. 14, Honolulu; type, No. 50845, U. S. N. M. (field No. 742), coll. O. P. Jenkins.

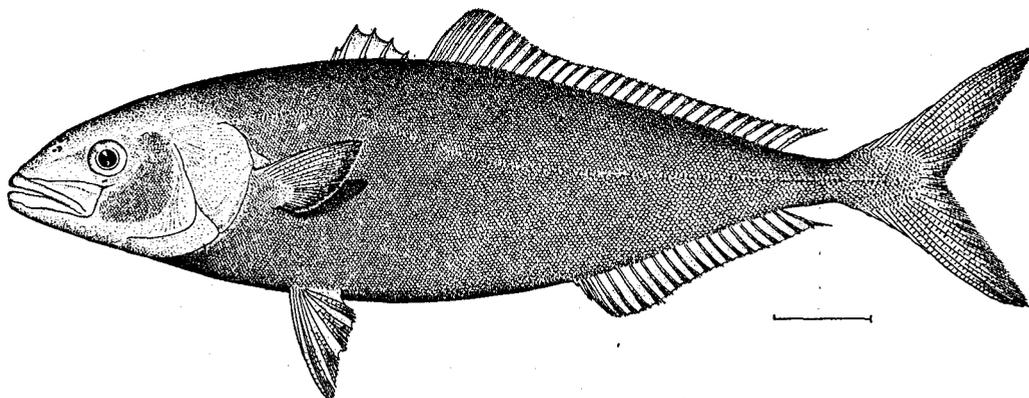


FIG. 73.—*Seriola sparna* Jenkins; from the type.

#### Genus 109. ELAGATIS Bennett. The Runners.

Body long and slender; second dorsal and anal long, each with one detached finlet, composed of 2 rays, behind the rest of the fin; otherwise essentially as in *Seriola*. One species, pelagic.

*Elagatis* Bennett, Narrative Whaling Voyage, II, 283, 1840 (*bipinnulatus*).

*Seriolichthys* Bleeker, Natuurk. Tydschr. Neederl. Ind., VI, 196, 1854 (*bipinnulatus*).

*Decaptes* Poey, Memorias, II, 391, 1861 (*pinnulatus*).

#### 138. *Elagatis bipinnulatus* (Quoy & Gaimard).

Head 4.3 in length; depth 5.5; eye 7.3 in head; snout 2.6; D. VI-1, 25 + 2; A. I, 18 + 2; interorbital 2.9; maxillary 3.1; mandible 2.5; scales about 100.

Body oblong, pointed, the back little elevated; head moderately long and pointed; snout long, conic, the jaws subequal; maxillary broad, triangular, its greatest width 2 in its length; supplemental maxillary long and narrow, slipping under the thin preorbital; teeth in broad villiform patches on jaws, vomer, and palatines, tongue naked; eye small, somewhat anterior; interorbital space broad, convex; preopercle and opercle entire; gillrakers about all below the angle, cephalic ones gradually shorter, longest about 1.5 in eye; fins moderate; origin of spinous dorsal over tips of pectorals, the rays weak and short, folded somewhat in a groove, the longest 2 in snout, the fin not connected to soft dorsal; soft dorsal long and low, anterior rays elevated, longest 2.9 in head, last ray equal to eye; last ray of dorsal finlet produced, its length 3.6 in head; distance between dorsal finlet and base of last dorsal ray 1 in eye; distance from last ray of dorsal finlet to base of caudal lobe 3.6 in head; origin of anal under about the fifteenth dorsal ray, the fin very low, anterior rays slightly elevated, the longest 4 in head; detached anal spines obsolete; caudal very deeply forked, lobes long and slender, their length equaling distance from snout to first third of pectoral; pectoral short, scarcely falcate, 2 in head; ventrals about equal to pectoral; scales small, numerous, cycloid; head naked, except cheek and postocular region; scales on cheek in about 7 series; scales on nape and antedorsal region smaller than elsewhere; lateral line well developed, continuous, forming a very low keel on last part of caudal peduncle.

Color in alcohol, dark blue or leaden above, becoming paler and yellowish below; under parts dirty white; fins dusky, yellowish, or olivaceous. In life 2 conspicuous blue bands on side of body, the upper beginning at orbit and passing to dorsal margin of caudal peduncle, its width about equal to that of eye, the other beginning at snout and passing along the lower margin of orbit across opercle and above pectoral fin to the caudal; caudal yellowish with a darker margin; ventrals and pectoral yellowish with some blue.

The above description based upon a specimen (No. 04446) 3 feet long obtained in Honolulu market, which is the only record of the species in these islands. It reaches a length of 3 feet and is found in all tropical seas, on the Atlantic coast straying as far north as Long Island. It was obtained by Poey at Havana and was originally described from the Keeling Islands.

*Seriola bipinnulata* Quoy & Gaimard, Voy. Uranie, I, 363, pl. 61, fig. 3, 1824, Isles of Papous, or the archipelago between New Guinea and Celebes.

*Elagatis bipinnulatus*, Bennett, Whaling Voy., II, 283, 1840 (Pacific Ocean; Indian Arch.); Jordan & Evermann, Fish. North & Mid. Amer., I, 906, 1896.

*Seriolichthys bipinnulatus*, Bleeker, Nat. Tyds. Ned. Ind., VI, 1854, 196 (Batavia).

*Seriola pinnulata* Poey, Memorias, II, 233, 1860, Habana.

*Seriolichthys lineolatus* Day, Proc. Zool. Soc. Lond. 1867, 559, Madras.

*Elagatis pinnulatus*, Jordan & Gilbert, Synopsis, 446, 1883.

#### Genus 110. DECAPTERUS Bleeker. The Mackerel Scads.

Body elongate, little compressed, almost perfectly fusiform; head short, pointed; mouth rather small; jaws about equal, the dentition feeble; maxillary rather broad, with a supplementary bone; premaxillaries protractile; scales moderate, enlarged for the whole length of the lateral line, but spinous and bony posteriorly only; second dorsal and anal each with a single detached finlet; free anal spines very strong; first dorsal well developed, persistent; pectorals comparatively short; abdomen rather shorter than anal fin; gillrakers long and slender. Species numerous. Only one known from the Hawaiian Islands.

*Decapterus* Bleeker, Natuurk. Tydschr., VIII, 417, 1855 (*kurra*).

*Eustomatodus* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 261 (*kurroides*).

*Gymnepignathus* Gill, op. cit., 261 (*macrosoma*).

*Evepigymnus* Gill, op. cit., 261 (*hypodus*).

#### 139. *Decapterus pinnulatus* (Eydoux & Souleyet). "*Opilu*." Plate 30.

Head 3.9 in length; depth 5.5; eye 4 in head; snout 3; interorbital 4; maxillary 3.4; mandible 2.5; D. VIII-1, 32-1; A. 1-28-1; scutes 25; scales 116.

Body oblong, little compressed, almost perfectly fusiform; head moderate, pointed; mouth rather small, slightly oblique; jaws equal; a few very small teeth on palatines and tongue, no others evident; tongue long, narrow, rounded, free for almost entire length; eye slightly above axis, anterior; adipose eyelid covering nearly entire eye; interorbital wide, slightly convex; longest dorsal spine 2.2 in head, longest ray 3, origin of soft dorsal just over vent; caudal forked, lobes moderate; anal similar to soft dorsal, its longest ray 3.5 in head; ventrals 2.8 in head; pectoral scarcely falcate, 1.65 in head, base anterior to base of ventrals; lateral line nearly straight from origin to interdorsal space, thence gently descending until over about fifth anal ray, whence it continues straight to caudal fin; scales deciduous, enlarged for whole length of lateral line, minute on nape and forward to interorbital space; small embedded scales on cheek, opercle, preopercle and preorbital, rest of head naked.

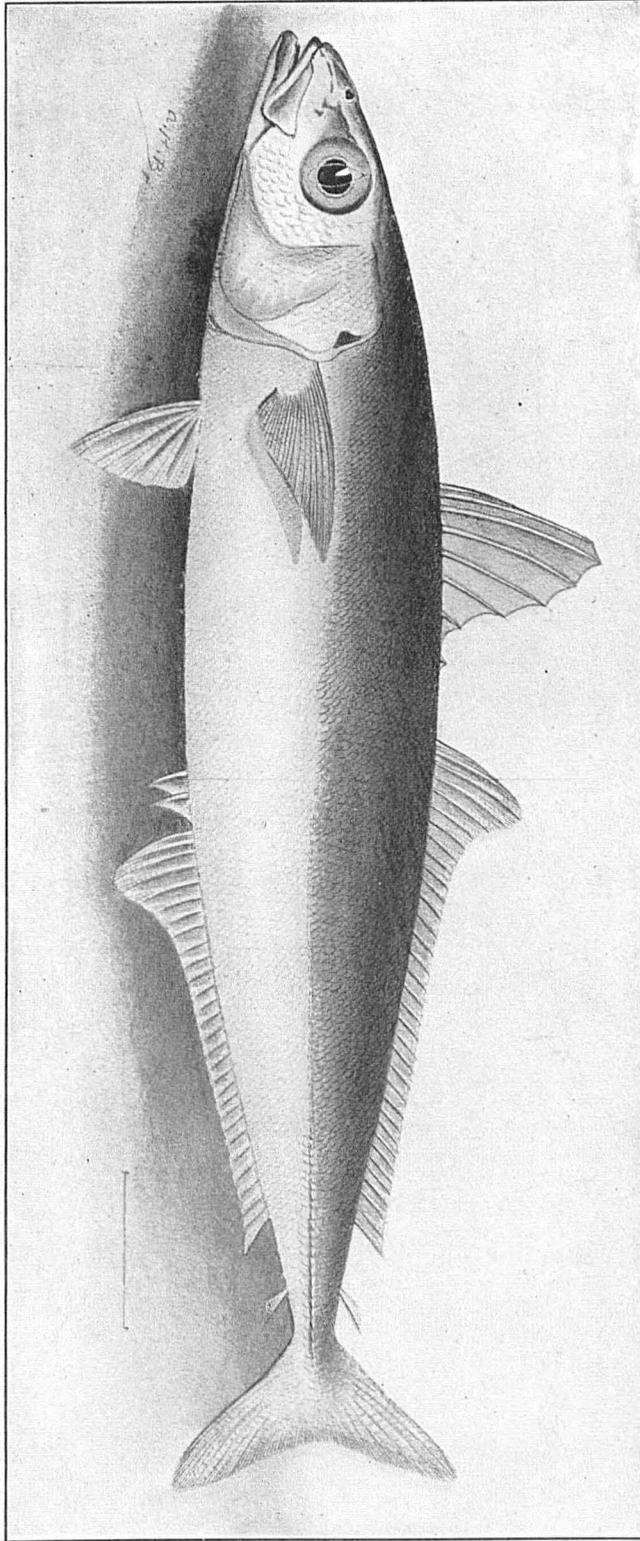
Color in alcohol, bluish silvery above, lighter below, becoming white on belly; dorsal fins and caudal with dark punctulations, other fins pale; upper edge of opercle with a black spot; base of pectoral dusky.

The above description is based on a specimen (No. 03306) 12 inches long from Honolulu. It seems to be a common fish at times at Honolulu, where it is highly prized by the natives as food. It was first noticed by Eydoux and Souleyet. Jenkins's specimens were taken by Dr. Wood and Mr. McGregor. The identification of this species with *Decapterus sancte-helenae* and *Decapterus maruadsi* as Steindachner has indicated, is apparently not correct. Our species is quite distinct in color in that it has no yellow or golden stripe or, in fact, no yellow anywhere.

*Caranx pinnulatus* Eydoux & Souleyet, Voy. Bonite, Zool., I, 165, pl. 3, fig. 1, 1841, Hawaiian Islands.

*Decapterus sancte-helenae*, Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 495 (Honolulu).

*Decapterus canonicoides* Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 442, pl. 4, Honolulu. (Type, No. 50846, U. S. N. M.; field No. 2737; coll. Dr. Wood).



DECAPTERUS SANCTAE-HELENÆ (OUVIER & VALENCIENNES). TYPE OF D. CANONOIDES JENKINS.

## Genus 111. TRACHUROPS Gill. The Big-eyed Scads:

This genus is close to *Caranx*, differing in the more elongate form, and especially in the structure of the shoulder-girdle, which has a deep cross furrow at its junction with the isthmus, with a fleshy projection above the furrow. Species few. Found in all warm seas.

One species known from the Hawaiian Islands.

*Trachurops* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 431 (*crumenophthalmus*).

140. *Trachurops crumenophthalma* (Bloch). "Akule;" "Halalaku." Fig. 71.

Head 3.4 in length; depth 3.5; eye 3.2 in head; snout 3.3; maxillary 2.3; interorbital 4.5; D. VII-1, 26; A. II-1, 22; scutes 35.

Body oblong-elongate, little compressed, the back not much elevated; head long, rather pointed, the lower jaw somewhat projecting, maxillary reaching middle of pupil, slipping under the preorbital, exposed portion triangular, posterior portion somewhat wavy; eye very large, longer than the snout and greater than the interorbital width; adipose eyelid strongly developed; mouth moderate, somewhat oblique; a single series of small teeth in each jaw, very weak teeth on vomer and palatines; a small patch of teeth on tongue; shoulder-girdle near isthmus with a fleshy projection, in front of which is a deep cross furrow; an angle at lower posterior portion of opercular region as in *Clupea*; dorsal spines moderate, their length 2 in head, the fin folding in a groove; dorsal rays low, scaled at base, folding in a groove; anal low, resembling soft dorsal, longest rays 2.6 in head; free anal spines strong, their length 2 in eye; caudal small, forked, the lobes equal, 1.6 in head; pectoral moderately

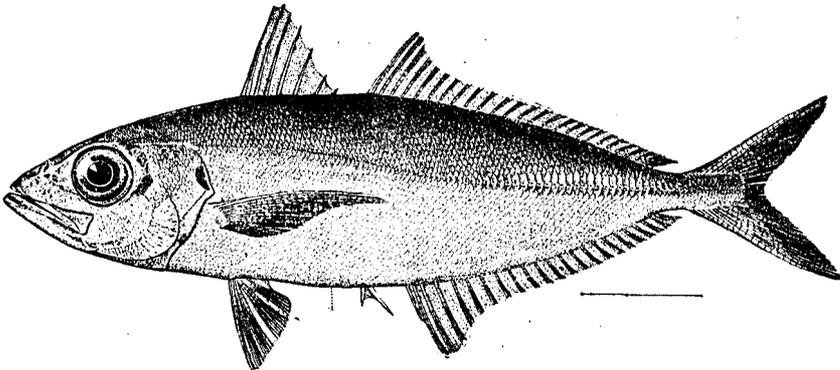


FIG. 71.—*Trachurops crumenophthalma* (Bloch); after Jordan and Evermann.

long and falcate, 1.25 in head; ventrals barely reaching vent, 2 in head; scales small; lateral line nearly straight, the scutes little developed except on caudal peduncle; cheeks and breast scaly.

Color in alcohol, bluish silvery above, paler below, with brassy reflections, under parts white; dorsal and caudal fins somewhat dusky; other fins pale.

The above description based upon a specimen (No. 02924) 12 inches long from Honolulu.

An abundant and well-known species, next to the *ulua* and the *amaama* the most important food fish of Honolulu. It was obtained in 1889 by Dr. Jenkins, and has been recorded from the Hawaiian Islands by Günther, Steindachner, Fowler, and Snyder. Numerous specimens were obtained by us at Honolulu, Kailua, Hilo, Hoopuloa, and Hanalei Bay, Kauai, varying in length from 5 to 12.25 inches.

The synonymy of this species is open to some question. Our specimens probably correspond to *Trachurops torva* Jenyns, described from Tahiti.

*Scomber crumenophthalmus* Bloch, Ichthyologia, pl. 343, 1793, **Acara, in Guinea.**

*Scomber plumieri* Bloch, Ichthyologia, X, 67, pl. 344, 1797, **Antilles.**

*Scomber bakantophthalmus* Bloch & Schneider, Syst. Ichth., 29, 1801, **Guinea.**

*Caranx daubentoni* Lacépède, Hist. Nat. Poiss., III, 58, 1801, **no locality.**

*Caranx mauritianus* Quoy & Gaimard, Voy. Uranie, Zool., 359, 1824, **Mauritius.**

*Caranx macrophthalmus*, Rüppell, Atl. Reis. Nord. Af., 97, pl. 25, fig. 4, 1828, (Red Sea); Agassiz, Spix, Pisc. Bras., 107, pl. 56a, fig. 1, 1829 (**Brazil**).

- Caranx plumieri*, Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 65, 1833.  
*Caranx torvus* Jenyns, Zool. Voy. Beagle, 69, pl. XV, 1841, Tahiti.  
*Selar torvus*, Bleeker, Verh. Batavia Genoot., XXIV, 1852, 51, (Batavia).  
*Trachurops brachycephalus* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 261, Cape San Lucas, Lower California.  
*Trachurops crumenophthalmus*, Gill, Proc. Ac. Nat. Sci. Phila. 1862, 432 (Beesley Point, New Jersey); Jordan & Evermann, Fish. North & Mid. Amer., I, 911, Pl. CXXI, fig. 385, 1896 (Cape San Lucas, Mazatlan, Acapulco, Panama); Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 501 (Hawaiian Islands); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 443 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 523 (Hanalei Bay, Kauai).  
*Trachurops plumieri*, Poey, Enum. Pisc. Cubens., 78, 1875.  
*Caranx crumenophthalmus*, Günther, Fische der Südsee, V, 131, 1876 (Cape de Verde Islands, west coast of Africa, St. Helena, West Indies, Mexico, Bay of Panama, Hawaiian Islands, South Seas, East Indies, Seychelles, Red Sea); Günther, Rept. Shore Fish., Challenger, Zool., I, Part VI, 59, 1880 (Honolulu); Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 495 (Honolulu).  
*Trachurops mauritianus*, Streets, Bull. U. S. Nat. Mus., No. 7, 68, 1877 (Honolulu).  
*Caranx (Selar) macrophthalmus*, Klunzinger, Fische des rothen Meeres, I, 97, 1884 (Red Sea).

Genus 112. **CARANGUS** Griffith. The Cavallas.

“*Papiopto*,” small size; “*Pa’upa’u*,” medium size; “*Uluu*,” large size.

Body ovate or oblong, compressed, the back sometimes considerably elevated, sometimes little arched; head moderate or rather large, more or less compressed; mouth moderate or large, oblique; maxillary broad, with a well-developed supplemental bone extending to below eye; premaxillaries protractile; teeth developed in 1 or few series, unequal, or at least not in villiform bands; villiform teeth usually present on vomer, palatines, and tongue, wanting or deciduous in some species; gillrakers long; eye large, with an adipose eyelid; dorsal spines rather low, connected; second dorsal long, usually elevated in front, both fins depressible in a groove; anal fin similar to second dorsal and nearly as long, preceded by 2 rather strong spines, its base longer than the abdomen; caudal fin strongly forked, the peduncle very slender; ventral fins moderate; pectorals falcate; no finlets; preopercle entire in the adult, serrate in the young, usually with a membranaceous border. Species very numerous in all warm seas, most of them valued for food.

About 9 species of this genus are now known from the Hawaiian Islands.

*Carangus* Griffith in Cuvier, Animal King., X, Pisces, 355, 1834 (*carangus*).

- a. Teeth on vomer and palatines, small and villiform.  
 b. Soft dorsal high; spinous dorsal rather low; scutes of straight portion of lateral line fewer than 40.  
 c. Scutes in straight portion of lateral line fewer than 30 (27 or 28).  
 d. Body short, stout, depth 3 in length to base of caudal; dorsal VIII-1, 21; anal II-1, 19 ..... *ignobilis*, p. 188  
 dd. Body more slender, depth 3.4; dorsal VII-1, 19; anal II-1, 16 ..... *clavate*, p. 190  
 ce. Scutes in straight part of lateral line more than 30 (32 to 35).  
 e. Opercular spot present; anal pale, not black, dusky or tipped with black ..... *marginatus*, p. 191  
 ce. No opercular spot; anal black, dusky or tipped with black.  
 f. Scutes in straight portion of lateral line 35; anal rays 18 or 19.  
 g. Dorsal spines comparatively long, longest 2.8 in head; body sometimes with transverse dusky bands ..... *forsteri*, p. 191  
 gg. Dorsal spines rather low, longest 4.3 in head; body without transverse dusky bands ..... *melampyggus*, p. 192  
 ff. Scutes in straight portion of lateral line 32; anal rays 16 ..... *rhabdotus*, p. 193  
 bb. Soft dorsal rather low; dorsal spines comparatively long; scutes of straight portion of lateral line 40 or more.  
 h. Body with dusky transverse bands; anal dusky; scutes 40 ..... *politus*, p. 194  
 hh. Body without transverse dusky bands; anal pale; scutes 43 ..... *affinis*, p. 195  
 aa. No teeth on vomer or palatines.  
 i. Lower jaw projecting somewhat beyond upper; dorsal V-1, 28; scutes in straight portion of lateral line 35 ..... *helvolus*, p. 196  
 ii. Lower jaw not projecting beyond the upper; dorsal VIII-1, 24; scutes about 38 ..... *cheilio*, p. 196

141. **Carangus ignobilis** (Forskål). “*Pauu’u*.” Fig. 72

Head 3.5 in length; depth 3; eye 5 in head; snout 3; interorbital 3.5; maxillary 2.1; preorbital 4.8; D. VIII-1, 21; A. II-1, 19; scutes 27.

Body short, stout, and compressed; head short and heavy; snout short and blunt, the anterior profile rising abruptly to nape, the dorsal outline strongly elevated from tip of snout to origin of spinous dorsal; ventral outline relatively straight; portion of body covered by soft dorsal and anal fins tapering rapidly to the short caudal peduncle, which is much depressed, its least depth about 2 in

its least width; mouth large, nearly horizontal, the jaws equal; moderately strong, canine-like teeth in a single row in each jaw, sparsely set, especially on upper jaw, a patch of villiform teeth on vomer; palatines and tongue with granular or villiform teeth; maxillary reaching vertical at posterior edge of orbit; supplemental maxillary well developed and slipping under the broad preorbital; eye moderate, about 1.5 in interorbital; adipose eyelid strongly developed posteriorly; interorbital and nape strongly keeled; fins moderate, origin of spinous dorsal somewhat behind base of pectoral, the spines folding in a groove, the longest 3 in head; anterior dorsal rays produced, their length 1.8 in head, equal to that of longest anal rays; caudal widely forked; pectoral ray very long and falcate, tip reaching about to base of seventh anal ray, the length 2.8 in body and equaling base of soft dorsal; ventrals short, reaching vent, 2.1 in head; scales rather large, covering entire body, entire cheek, and upper part of opercle with fine series, rest of head and nape naked; breast naked, except a small central patch of scales; lateral line with a strong regular arch above pectoral fin joining the straight part over origin of anal, chord of arch part slightly shorter than length of straight part; scutes well developed on entire straight portion.

Color in alcohol, greenish olivaceous above, becoming paler on the sides and below; head green-

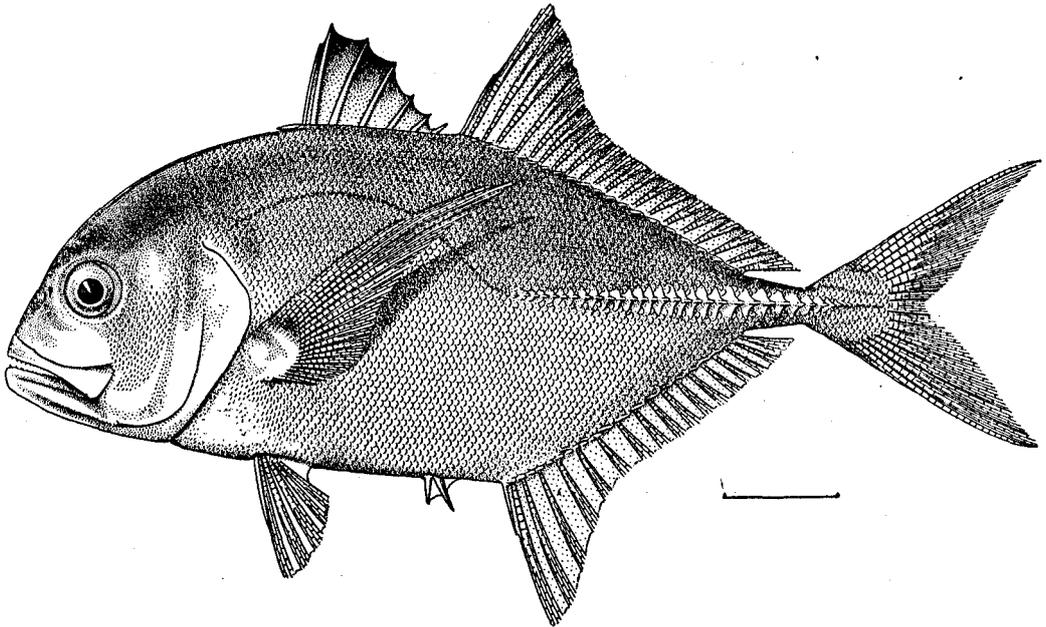


FIG. 72.—*Carangus ignobilis* (Forskål); from the type of *C. hippoides* Jenkins.

ish, silvery on cheek, lower jaw paler, the head with a yellowish or brassy tinge; axil black; no spot on opercle; dorsals, anal, and caudal dusky; more or less yellow in life; soft dorsal and anal each with a narrow, pale border; edge of free portion of caudal paler, upper part of caudal peduncle dusky; pectoral and ventrals somewhat dusky; no spot on lower pectoral rays.

The above description based upon a specimen (No. 04448) 22 inches long, from Honolulu. A much smaller example (No. 02918) 8 inches long, from Honolulu, may be described as follows:

Head 3.2 in length; depth, 2.4; eye 3.6 in head; snout 3.4; maxillary 2.25; interorbital 4; D. VIII-1, 20; A. II-1, 17; scutes about 30.

Body short and deep, greatly compressed, the back strongly elevated, the dorsal profile strongly and regularly convex from tip of snout to origin of spinous dorsal; outline from origin of anal to snout nearly straight; head as long as deep; snout short, very steep, bluntly rounded; jaws subequal, the lower heavy; bands of villiform teeth on vomer, palatines, and tongue, those on jaws in a single row, small, sharp, conic, and wide-set; tongue rather thick, rounded, and free for most of its length; maxillary reaching to posterior border of pupil; eye anterior, somewhat above axis of body; interorbital

trenchant; spinous dorsal low and weak, 2.5 in head; origin of soft dorsal midway between tip of snout and fork of caudal, longest ray 1.5 in head; caudal deeply forked; longest anal ray 1.65 in head, origin of fin under about seventh soft dorsal ray; ventrals short, reaching past vent, 2.1 in head; pectoral long and falcate, reaching beyond arch of lateral line, slightly longer than base of anal; arch of lateral line dropping rather suddenly from under last dorsal spine to the straight part under third soft dorsal ray, chord of arch 1.4 in straight part; scutes on entire straight part; breast naked except a small patch of scales near center; cheek, postocular region, and upper part of opercle scaled, rest of head naked, body completely scaled; dorsal and anal fins scarcely sheathed.

Color in life, very pale olive, side white; head greenish; no opercular spot; no spot on pectoral; base of pectoral dark; both dorsals edged with blackish; upper lobe of caudal blackish, especially the edge, lower lobe bright yellow; anal bright, light yellow, the edge whitish; ventrals whitish with yellowish streaks along the rays; pectoral pale, the axil blackish.

Color in alcohol, slaty silvery, becoming lighter below, almost white on belly; spinous dorsal dusky; soft dorsal pale, edged with dark, other fins pale, inner axil of pectoral black.

This species is related to *Carangus hippos* of the Atlantic, with which it agrees in the small patch of scales on the otherwise naked breast, the character of the lateral line, and the teeth. It is, however, a much deeper fish, the snout is shorter, the anterior profile rises more abruptly, and there is no black spot either on the opercle or on lower rays of the pectoral. The yellow color of the anal fin seems to be constant and diagnostic, especially in the young. The species is common at Honolulu, from which place we have examined 13 specimens 2.5 to 22 inches in length.

*Scomber ignobilis* Forskål, Descript. Animal., 55, 1775, Red Sea.

*Scomber sansun* Forskål, Descript. Animal., 56, 1775, Red Sea.

*Caranx sansun*, Rüppell, Atlas zu der Reis. Nordl. Af., 101, 1828 (Red Sea); Rüppell, Neue Wirbelthiere, 1838, 48, pl. 13, fig. 3 (Red Sea); Günther, Cat., II, 447, 1860 (Mauritius, India); Klunzinger, Verh. Zool. Bot. Ges. Wien, 1871, 466 (Red Sea); Day, Fishes of India, II, 216, Pl. L, fig. 5, 1876 (Madras).

*Caranx sem* Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 105, 1833, Pondicherry.

*Caranx lessonii* Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 113, 1833, New Holland.

*Caranx beleugerii* Cuvier & Valenciennes, op. cit., 116, 1833, Malabar.

*Carangus sansun*, Bleeker, Fauna de Madag., 1874, 99, (Mauritius).

*Caranx ignobilis*, Klunzinger, Sitz. Ak. Wiss. Wien, LXXX, Abt. I, 1879, 377 (Port Darwin and Cleavelands Bay, Australia); Klunzinger, Fische des rothen Meeres, 1884, 100 (Red Sea); Steindachner, Denks. Ak. Wiss. Wien, LXX, 495, 1900 (Honolulu and Laysan).

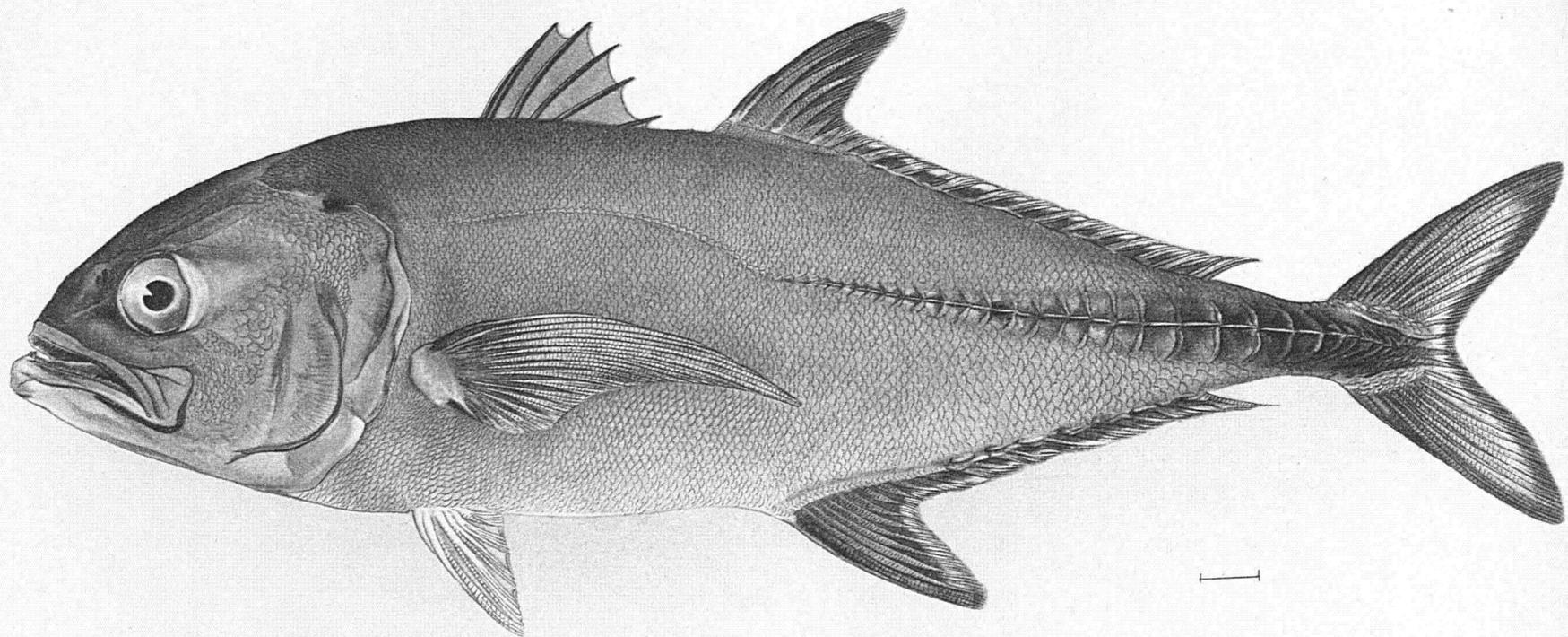
*Carangus hippoides* Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 443, fig. 15, Honolulu. Type, No. 50710 U. S. N. M. (field No. 749); coll. O. P. Jenkins.

#### 142. *Carangus elacate* Jordan & Evermann. Plate 31.

Head 3.6 in length; depth 3.4; eye 4.5 in head; snout 3.8; interorbital 3.8 in snout; maxillary 2.1; preorbital 8.5; mandible 1.9; D. VII-1, 19; A. II-1, 16; scutes 28.

Body slender, compressed, not greatly elevated; snout rather short, profile ascending to nape in a gentle curve, slightly trenchant; mouth large, slightly oblique; lower jaw somewhat projecting; maxillary reaching posterior edge of orbit, its width at tip 1.5 in orbit; supplemental maxillary well developed, its width 3.25 in entire width; gape reaching vertical of posterior edge of pupil; villiform teeth on vomer, palatines, and tongue, those on jaws in a single row, small and somewhat canine-like; eye large, anterior; adipose eyelid strongly developed behind; supraocular region with 2 ridges, extending to humeral region, the lower the stronger; posterior half of body, beginning at origin of soft dorsal, long and gently tapering to caudal peduncle; caudal peduncle much depressed, its least depth scarcely half its least width; distance from base of last dorsal ray to origin of caudal fin equal to snout and pupil; fins small; origin of spinous dorsal posterior to base of pectoral by a distance equal to eye; longest dorsal spine slightly greater than snout; anterior rays of soft dorsal somewhat produced, about 1.8 in head; anal similar to soft dorsal, its origin under eighth soft dorsal ray, anterior ray produced, but scarcely equaling longest soft dorsal rays; caudal widely forked, lobes apparently equal; pectoral long and falcate, reaching past origin of anal, exceeding head in length by 0.65 diameter of eye; ventrals short, 2.4 in head; scales rather large, a low sheath at base of soft dorsal and anal anteriorly; breast entirely scaled; lateral line strongly arched above pectoral, joining straight portion under sixth dorsal ray, chord of arched portion 1.6 in straight part.

Color in alcohol, rusty olivaceous above, paler on side below lateral line; belly white; top of head dark olive, side and lower jaw lighter, with strong brassy tinge on postocular and on lower portions



CARANGUS ELACATE JORDAN & EVERMANN. TYPE.

of opercle; lower jaw profusely covered with fine brown points; a black spot at upper end of opercular opening; axil black; vertical fins all more or less dark; produced part of soft dorsal almost black, low part of soft dorsal black at base, then lighter, narrowly tipped with dark; anal dark brown, with a subterminal stripe of yellowish white along edge of fin; pectoral and ventrals pale.

The above description based upon the type, No. 50638, U. S. N. M. (field No. 04452), a large example, 27 inches long, from Honolulu. This species somewhat resembles *Carangus marginatus*, from which it differs in the much more slender body, larger eye, and dark anal fin. The type is the only example obtained.

*Carangus elacate* Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (Apr. 11, 1903), 177, Honolulu.

#### 143. *Carangus marginatus* (Gill). "Ulua."

Head 3.4 in length; depth 2.8; eye 4 in head; snout 3.75; interorbital 4; maxillary 2; D. VIII-1, 22; A. II-1, 16; scutes about 34.

Body oblong, compressed, dorsal outline evenly arched to nape, rather steep thence to tip of snout; head slightly longer than deep; snout bluntly pointed; mouth moderate, slightly oblique, lower jaw prominent, slightly produced; villiform teeth on vomer, palatines and tongue, a single row of small, wide-set, sharp, conic teeth in each jaw; tongue rounded, rather thick, free for most of its length; maxillary reaching to posterior edge of pupil, its width 1.25 in eye, sheathed by preorbital for the greater part of its length; eye anterior, pupil above axis; interorbital slightly trenchant; dorsal spines weak, longest 2.75 in head; origin of soft dorsal midway between tip of snout and fork of caudal, longest soft dorsal 1.75 in head, 2 in base of fin; caudal deeply forked, anal similar to soft dorsal; ventrals reaching just beyond vent, 2.35 in head; pectoral long and falcate, reaching considerably beyond end of arch, slightly longer than head, equal to base of soft dorsal; arch of lateral line nearly straight to under sixth dorsal spine, then descending rather abruptly to straight part under about the fifth dorsal ray, making rather a sharp angle, arch 1.35 in straight part; scales on entire body, cheeks, and upper parts of opercle; breast scaly; scaly sheath of fins not greatly developed.

Color in alcohol, grayish silvery, with slight bluish reflection above, becoming light below and white on belly; spinous dorsal dusky, the produced part of soft dorsal black, rest of fin edged with dark; caudal edged with dark; anal pale, a row of about 10 spots at its base, these seeming to be produced by the bone showing through the membrane; other fins pale, the pectoral with a black spot at its axil; a small black spot on opercle at upper part of gill-opening.

The above description based on a specimen (No. 04052) 11.25 inches long from Honolulu. We have examined 7 others from Honolulu, 8 to 11.25 inches long. Comparison with specimens from Panama fails to show any differences.

*Carangus marginatus* Gill, Proc. Ac. Nat. Sci. Phila. 1863, 166, Panama; Jordan & Evermann, Fish. North & Mid. Amer., I, 922, 1896; Jordan & Evermann, Amer. Food and Game Fishes, 306, 1902.

*Carangus marginatus*, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 444 (Honolulu).

#### 144. *Carangus forsteri* (Cuvier & Valenciennes). "Ulua."

Head 3.3 in length; depth 2.5; eye 5.5 in head; snout 3.5; interorbital 3.8; maxillary 2.6; D. VII-1, 23; A. II-1, 19; scutes about 35.

Body oblong, greatly compressed, dorsal outline arched, steeper anteriorly, straight from nape to tip of snout; ventral outline curved from caudal peduncle to origin of anal, straight thence to tip of snout; head subconic, longer than deep, greatly compressed; snout bluntly pointed, lower jaw slightly produced; mouth moderate, slightly oblique; small villiform teeth on vomer, palatines, and tongue, a single row of larger, wide-set conic teeth on each jaw; tongue rounded, thin, free for most of its length; maxillary broad, its width 1.2 in eye, reaching anterior edge of pupil, and slipping under preorbital for most of its length; interorbital very convex, trenchant; dorsal spines slender and weak, longest 2.8 in head; origin of soft dorsal midway between tip of snout and fork of caudal, just over second anal spine; longest dorsal ray 1.6 in head, 2 in its base; caudal deeply forked; longest anal ray 1.8 in head; ventral short, reaching past vent, 2.5 in head; pectoral long, falcate, 1.1 in head, reaching considerably beyond arch of lateral line; lateral line arched to under fifth dorsal ray, chord of arched part greater than head, 1.3 in straight part; scutes on entire straight portion, obscure anteriorly; entire body scaly; breast not naked.

Color in life, of specimen (No. 02998) from Honolulu, pale bluish above, changing to silvery white on side and belly; dorsals, anal, and caudal dusky; pectoral rich lemon-yellow, iris yellowish white. Color of another specimen when fresh (No. 03450), silvery with golden reflections; 5 transverse dark bands on side, one over caudal peduncle, about as wide as length of snout, and distinct above lateral line; an indistinct dark band over head through eye; fins colorless.

Color in alcohol, light grayish silvery with bluish reflections above, paler below, becoming white on belly; dorsal spines pale, produced part of soft dorsal dark, edge of rest of fin dark; caudal edged with dark; the produced part of anal dark; ventrals and pectorals pale; no dark opercular spot; axil dusky but not showing above fin.

This species may be known in life by the dusky anal and yellow pectoral. In *C. ignobilis* the yellow is brightest on the anal fin. The above description based chiefly on a specimen (No. 04046) 11 inches long, from Honolulu. The collection contains numerous specimens from Honolulu.

The most important food-fish of the South Seas, abundant in the markets, and unsurpassed as the basis of fish-chowder. It is of wide distribution, being found throughout the tropical Pacific. A closely related species, *Carangus latus*, abundant in the West Indies, occurs as far north on the Atlantic coast as Virginia and has been doubtfully recorded from the Pacific coast of Mexico. This species needs close comparison with the present one. The earlier name probably belonging here is *Carangus forsteri*. *Caranx heberi* is figured as colored differently from any species known to us. It most resembles *Carangus marginatus*.

The large series of specimens in our collections, ranging from 2 inches to nearly a foot in length, enables us to study very satisfactorily the variation in the species. Most of the young show evidences of broad dark bluish cross-bars, though some show them scarcely at all, the color being plain silvery. While the breast is always scaled, the scales are often so embedded and obscure as to be easily overlooked. A series of 51 specimens examined, 2.4 to 11.25 inches in length, from Honolulu, Hilo, Waialua, Hanalei Bay, and Puako Bay.

? *Scomber heberi* Bennett, Fish. Ceylon, 26, pl. 26, 1830, Ceylon.

*Caranx forsteri* Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 107, 1833, Isle of France, Malabar, Celebes, New Guinea, New Ireland, Vanicoro, East Indies.

? *Caranx peroni* Cuvier & Valenciennes, op. cit., 112, 1833, Vanicoro, Amboyna, Java, Malabar, East Indies.

*Caranx parapistes* Richardson, Voy. Erebus and Terror, 136, 1844, Northern Australia, Torres Straits.

*Caranx hippos*, Günther, Cat., II, 449, 1860 (St. Vincent, Jamaica, Puerto Cabello, South America, Madagascar, Port Natal, China, Amoy, Tanna, Ceylon, Pinang, Port Essington), not *Scomber hippos* L.; Günther, Fische der Südsee, V, 131, taf. LXXXIV, 1876 (Samoa, Tanna); Günther, Rept. Shore Fishes, Challenger, Zool., I, Part VI, 59, 1880 (Hilo).

*Caranx latus*, Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 501 (Honolulu) (not of Agassiz); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 444 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 523 (Hanalei Bay, Kauai; Puako Bay, Hawaii).

#### 145. *Carangus melampygus* (Cuvier & Valenciennes). "Omilu;" "Omilimilu." Fig. 73.

Head 3.4 in length; depth 2.8; eye 6.5 in head; snout 2.4; interorbital 3.8; maxillary 2.4; mandible 2; gape 2.8; preorbital 4.5; D. VII-1, 24; A. II-1, 18; scutes 35.

Body short, deeply compressed, the back much elevated; head rather short, the snout short and blunt; mouth moderate, little oblique; teeth small, sparse, in a single row in each jaw; jaws subequal; maxillary reaching anterior edge of pupil, triangular, its width at end 9.2 in its length, its edge slipping under the preorbital; interorbital narrow and very convex; the anterior profile very trenchant; eye moderate, in middle of head, entirely above axis of body, the adipose eyelid well developed posteriorly; ventral outline nearly straight from tip of jaw to origin of anal, thence ascending obliquely to caudal fin; origin of spinous dorsal posterior to base of pectoral, the spines weak and short, folding into a groove, the longest 4.3 in head; distance between dorsals equal to eye, anterior dorsal rays elevated, their length somewhat greater than snout and eye, 1.8 in head; anal spines short and blunt; origin of anal posterior to that of soft dorsal, the anterior rays elevated, their length 2 in head; soft dorsal and anal each anteriorly slipping into a scaly sheath; caudal widely forked, the lower lobe somewhat the longer, 1.4 in head; pectoral very long and falcate, its tip reaching base of about fourth anal ray, its length 2.75 in body; ventrals short, 3.25 in pectoral or 2.6 in head; scales small, closely but irregularly imbricated; lateral line beginning at upper end of opercular opening, continuing nearly straight to under fourth dorsal spine, where it begins to curve gently downward until origin of soft dorsal, where

the downward curve is more abrupt; scutes of lateral line beginning under about the eighth or tenth dorsal ray and increasing in size to the fourth from last.

Color in life, general ground-color silvery, dusky above, lighter below; upper parts with numerous small black spots, intermingled with numerous bright dark-blue spots; interspaces with more or less golden reflections; golden band along the scutes; soft dorsal, anal and a narrow area along their bases bright ultramarine; indistinctly outlined areas of same color on side of head about the eye; pectoral and caudal dusky, with golden reflections; ventrals dusky with dark blue; no opercular spot; base of pectoral not dark.

Color in alcohol, dirty white above and on sides, profusely covered with small irregular darker spots and blotches, these also upon top of head and opercles; lower part of sides and under parts dirty yellowish white; fins all dusky, soft dorsal and anal almost black, white tipped.

The above description based upon a specimen (No. 03412) 24 inches long, obtained in the Hono-

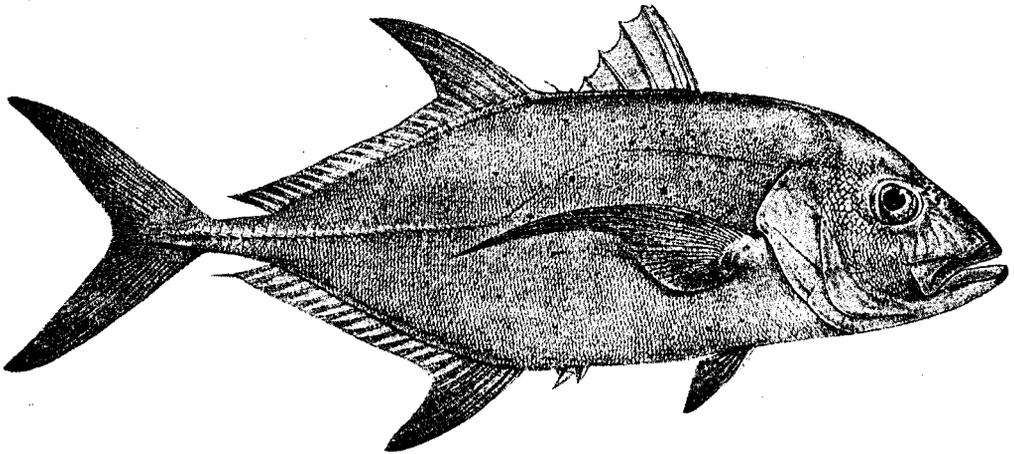


FIG. 73.—*Carangus melampygus* (Cuvier & Valenciennes); after Günther.

lulu market, July 18. Two other examples 15 and 24 inches in length were obtained by us at the same place. The species was also obtained by Streets and by the *Bonite*. It is more common in Samoa, where it is known as *malauli*, and as a food-fish it is superior even to the *ulua*.

*Carangus melampygus* Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 116, 1833, Waigiou, Rauwak, Buru, Vanicoro, Mauritius; Günther, Fische der Südsee, V, 133, taf. LXXXVI, 1876 (Celebes, Zanzibar, Mauritius, Seychelles); Jordan & Evermann, Fish. North & Mid. Amer., I, 925, 1896 (Socorro Island, Revillagigedo group); Jordan & Evermann, Amer. Food and Game Fishes, 307, 1902.

*Carangus biacanthopterus* Rüppell, Neue Wirbelthiere, Fisch., 49, pl. 14, fig. 2, 1838, Red Sea.

*Carangus stellatus* Eydoux & Souleyet, Voy. Bonite, Poiss., 167, Pl. III, fig. 2, 1841, Hawaiian Islands; Günther, Cat., II, 436, 1860 (Sandwich Islands).

*Carangus melampygus*, Streets, Bull. U. S. Nat. Mus., No. 7, 69, 1877 (Honolulu).

#### 146. *Carangus rhabdotus* Jenkins. Fig. 74.

Head 3.4 in length; depth 2.6; eye 3.75 in head; snout 3.8; maxillary 2.1; interorbital 3.3; D. VIII-1, 20; A. II-1, 16; scutes 32.

Body oblong, elliptical, compressed; dorsal outline evenly arched, ventral outline slightly straighter than dorsal outline; head compressed, its depth equal to length; snout bluntly rounded, lower jaw slightly produced; mouth moderate, slightly oblique; villiform teeth on vomer, palatines, and tongue, and a single row of small, conic teeth on each jaw; maxillary reaching to posterior edge of pupil, its greatest width about 0.75 in eye; center of eye slightly above axis of body, anterior; interorbital space convex; fins moderate; longest dorsal spine 2.5 in head; soft dorsal slightly concave, longest ray 1.75 in head; caudal forked, lobes moderate; anal similar to soft dorsal; ventrals short, 2.2 in head; pectoral long, falcate, reaching slightly beyond arch of lateral line, equal to head; body completely scaled; bases of soft dorsal and anal with low sheath of scales; cheek and upper part of

opercle scaled, rest of head naked; breast scaled; lateral line strongly arched above the pectoral, the arch joining the straight portion under fifth dorsal ray, the chord of the arch equaling length of head or 1.5 in straight portion; scutes rather strong, the largest 0.65 diameter of eye in width.

Color in alcohol, bright silvery, darker above, with 5 indistinct vertical bands nearly as wide as eye on upper three-fourths of body, a sixth band less distinct on caudal peduncle; no opercular spot; fins plain, except the elevated portions of soft dorsal and anal, which are tipped with black.

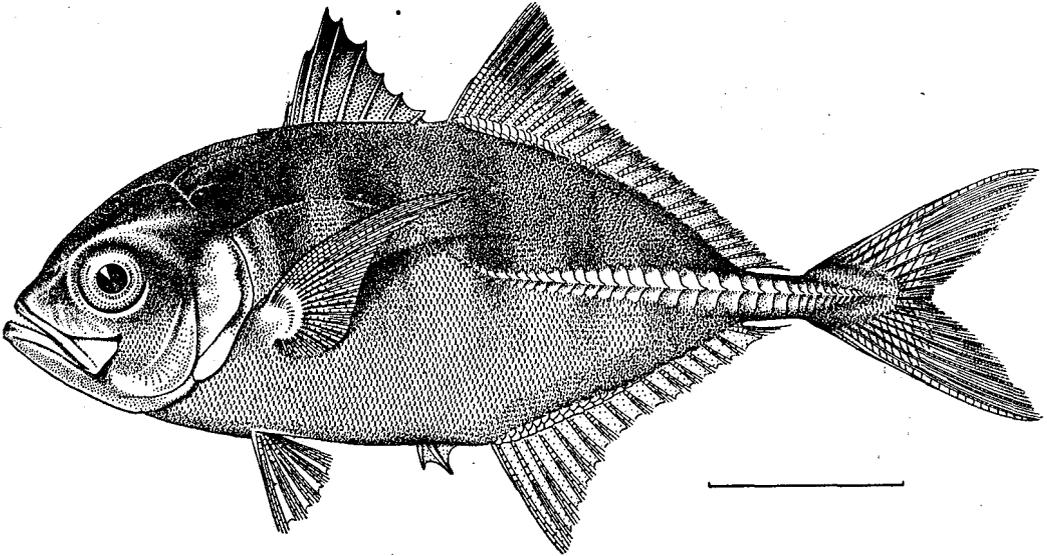


FIG. 74.—*Carangus rhabdotus* Jenkins; from the type.

This description is based upon the type (No. 50711, U. S. N. M.), a specimen 5.5 inches long, obtained at Honolulu by the *Albatross* in 1896. Another small example was obtained at the same time. This species was not seen by us at Honolulu. It resembles a species found in the estuaries of Samoa.

? *Carangus sexfasciatus* Quay & Gaimard, Zool. Voy. Uranic, 358, pl. 65, fig. 4, 1824, Papous Islands.

*Carangus rhabdotus* Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 444, fig. 16, Honolulu.

147. *Carangus politus* Jenkins. "Maka," "Makaa." Fig. 75.

Head 4 in length; depth 3; eye 4.1 in head; snout 3.5; interorbital 3.2; maxillary 3; D. VIII-1, 24; A. II-1, 19; scutes 40.

Body oblong, compressed, dorsal and ventral outline about equal; head subconic, longer than deep, compressed; snout bluntly pointed; lower jaw produced; small villiform teeth on vomer, palatines, and tongue, a single row of small canine-like teeth in each jaw, those in lower jaw almost obsolete; maxillary short, rather narrow, reaching anterior margin of eye; eye slightly above axis of body, anterior; interorbital moderately trenchant; fins moderate, longest dorsal spine 2 in head; caudal forked, lobes not greatly produced; anal similar to soft dorsal; ventrals reaching just past vent, 2.3 in head; pectoral long and falcate, tip not quite reaching to straight portion of lateral line, slightly longer than head, not quite equal to base of anal; arch of lateral line rather long, reaching to below eighth dorsal ray, and about equal to straight part; scutes on entire straight portion of lateral line.

Color in alcohol, grayish olivaceous above, lighter below, becoming white on lower sides and belly; 9 indistinct vertical dark bands on upper two-thirds of scales of body; fins all dusky; opercular spot present.

The above description, based upon the type (original No. 100), a specimen 8 inches long, obtained by Doctor Jenkins, at Honolulu, 1889. Another example, No. 327, 5 inches long, is in the same collection, and these agree very closely with specimens from the Philippines, which are determined as *Carangus hasselti*. *Carangus politus* is probably a synonym of the latter species.

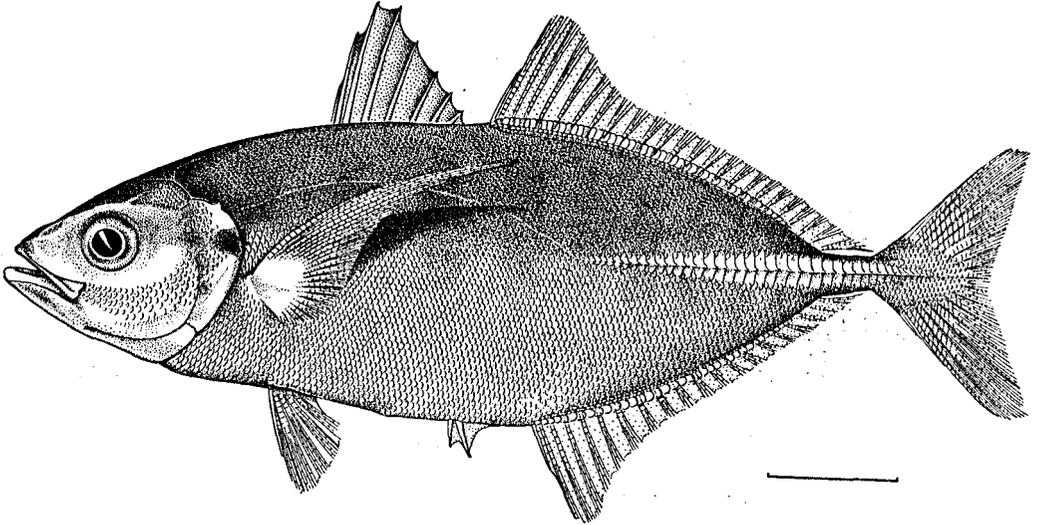


FIG. 75.—*Carangus politus* Jenkins; from the type.

? *Selar hasselti* Bleeker, Verh. Bat. Gen., XXIV, 53, 1852, Moluccas.

? *Caranz hasseltii*, Günther, Cat., II, 430, 1860 (Moluccas; Amboyna).

*Carangus politus* Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 445, fig. 17, Honolulu (type, No. 50709, U. S. Nat. Mus.)

148. *Carangus affinis* (Rüppell). "Amuka;" "Púakahála." Fig. 76.

Head 3.9 in length; depth 3.5; eye 4.1 in head; snout 3.6; interorbital 3.6; maxillary 3; D. VII-1, 23; A. II-1, 20; scutes 43.

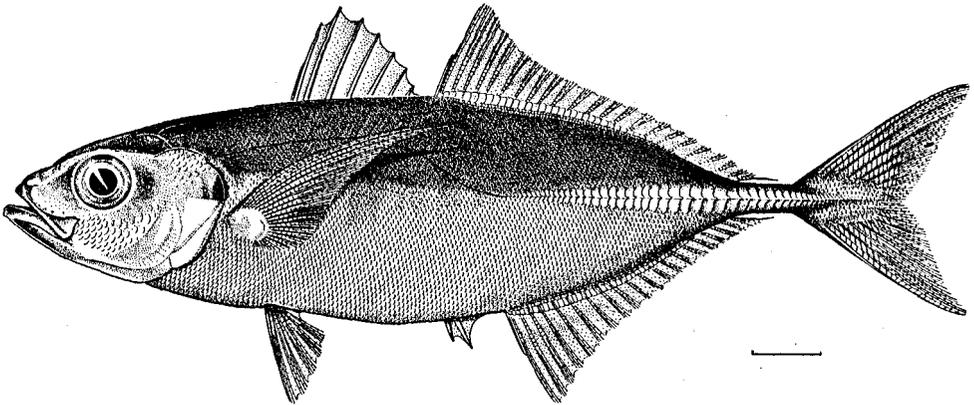


FIG. 76.—*Carangus affinis* (Rüppell).

Body fusiform, dorsal and ventral outlines about the same; head longer than deep; snout conic, its tip on a line with middle of eye; upper jaw bluntly rounded; lower jaw produced, rather pointed; series of small teeth on vomer, palatines, and tongue, a single row of minute canine-like teeth in each jaw; tongue rounded, thin, and moderately wide, free for most of its length; maxillary reaching anterior

edge of orbit; dorsal spines weak and thin, longest 2.1 in head; soft dorsal sheathed, its longest ray 2.2 in head, its origin midway between tip of snout and last scute and directly over second anal spine; caudal forked; anal similar to soft dorsal and similarly sheathed, its longest ray 2.3 in head, spines very short, less than eye; ventrals short, just reaching posterior edge of vent, 2.1 in head; pectoral long, narrow, falcate, nearly reaching straight part of lateral line, its length 1.2 times the length of the head; lateral line with a long curve, whose chord nearly equals the straight part, the lateral line becoming straight under about the tenth soft dorsal ray; scutes on the entire straight part of the lateral line; in some examples a trace of a second lateral line under soft dorsal fin, continuing to posterior edge of dorsal spine.

Color in alcohol, bluish silvery above, becoming white silvery below lateral line; dorsal and caudal dusky, other fins pale, axil of pectoral black, a black spot on upper posterior edge of opercle, covering upper end of shoulder-girdle, slightly larger than pupil.

The above description from a specimen (No. 04030), 8.75 inches long, from Honolulu, where numerous examples were taken, 7.5 to 8.75 inches long. We identify these with *Caranx affinis* of Rüppell, with which they seem to agree in all essential respects. It is a deeper fish than *C. hasselli*, with lighter fins, and doubtless represents the same species which Steindachner had from Honolulu.

*Caranx affinis* Rüppell, Neue Wirbelthiere, Fisch., 49, Pl. XIV, fig. 1, 1835 (March, 1838), Red Sea.

*Caranx (Sclar) affinis*, Klunzinger, Fische des rothen Meeres, II, 19, 1879 (Red Sea); Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 495 (Honolulu).

*Carangus affinis*, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 446 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 523 (Honolulu).

#### 149. *Carangus helvolus* (Forster). Plate 32.

Dorsal v, 28; A. i, 22; head, including opercular flap, 3.3 in length to base of caudal fin; depth 2.5; snout 2.9 in head; lower jaw projecting somewhat beyond upper; maxillary 2.5, reaching to a vertical through anterior edge of pupil; eye 4.3, a horizontal from tip of snout passing through center of pupil; width of interorbital space 2.9. No teeth on vomer, palatines, or tongue, those of jaws in a single series. Tongue dead white in color; roof of mouth similar, becoming abruptly blue-black posteriorly, the white extending backward as a V-shaped prolongation; the membranous flap white on the part touched by tongue, black on sides; lower jaw below tongue dark, the flap white beneath tongue, dark on sides. Head with scales behind the eye and on the cheeks; a narrow, naked space on the occiput, extending backward to spinous dorsal; breast naked; plates in straight portion of lateral line 35, each plate with a keel forming a sharp ridge.

The locality from which Forster obtained this species is not known; but as he visited the Society Islands with Captain Cook on his second voyage, it is possible that his specimen came from that region. An example 15 inches long, obtained by the *Albatross* in the Honolulu market in 1902, agrees perfectly with the description of this species.

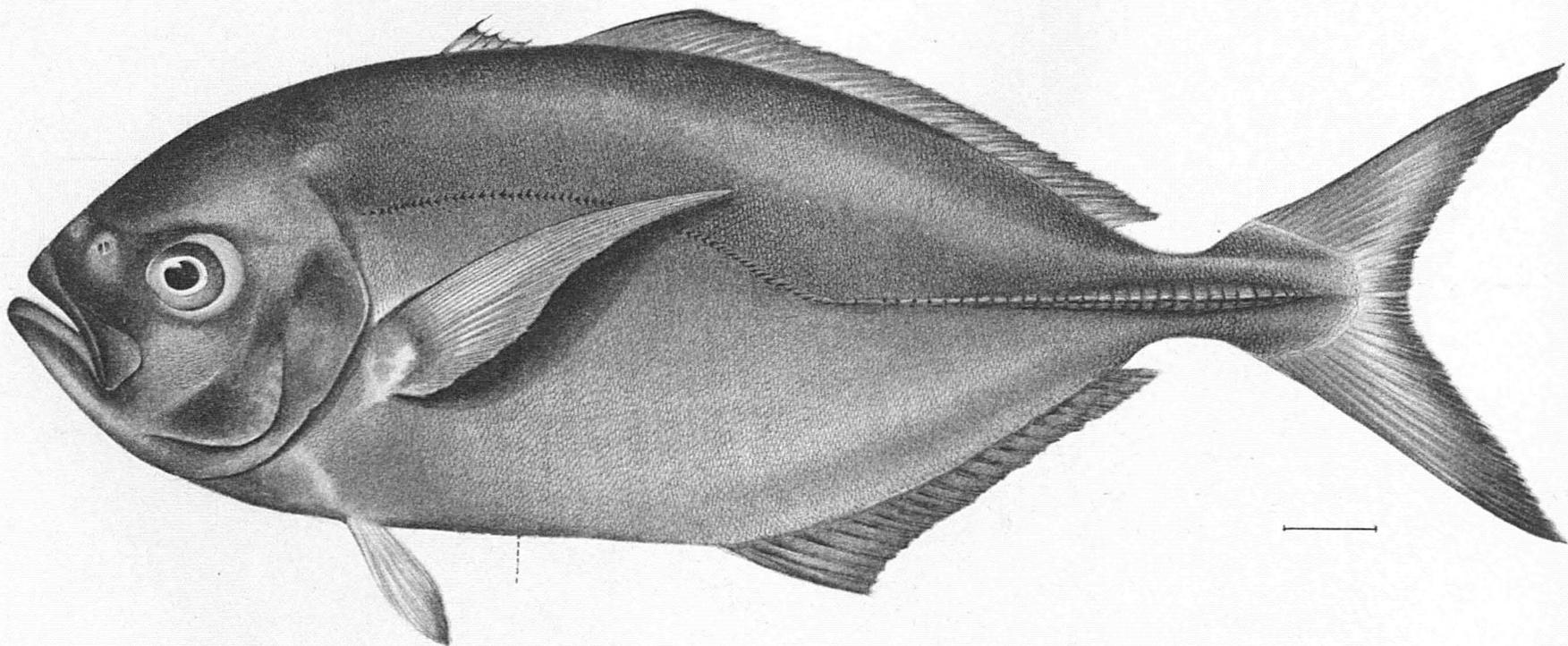
*Seomber helvolus* Forster, Deser. Anim., 414, 415, 1775 (Lichtenstein ed., 1844), probably Society Islands.

*Caranx helvolus*, Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 101, 1833.

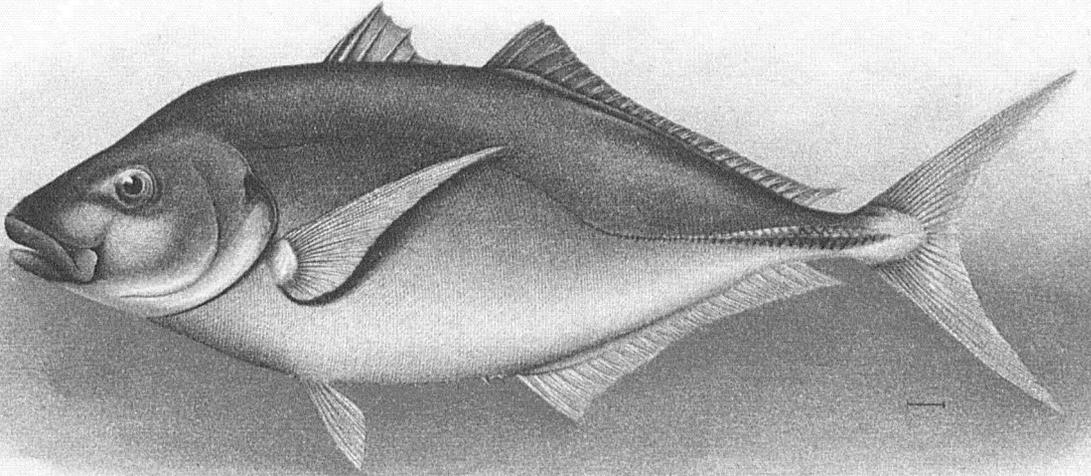
*Carangus helvolus*, Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 524 (Honolulu).

#### 150. *Carangus cheilio* Snyder. Plate 33, fig. 1.

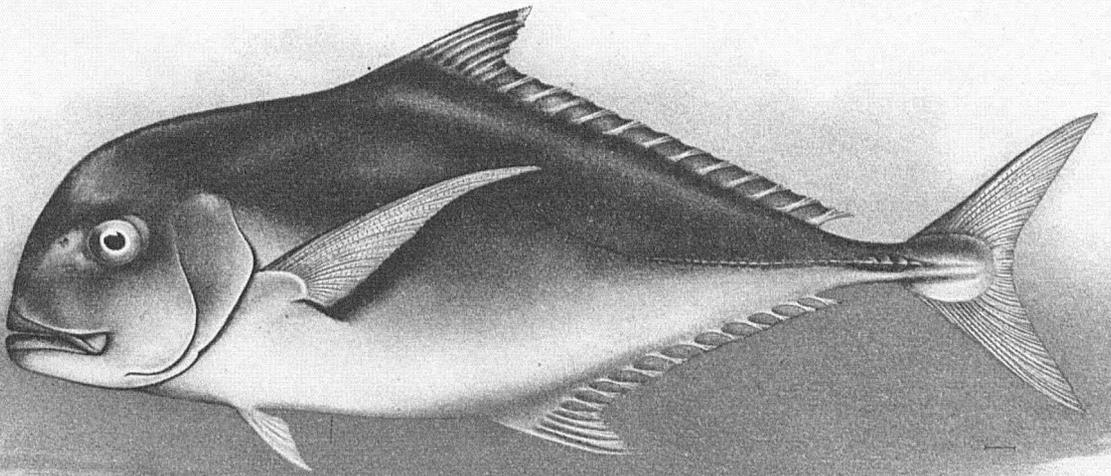
Head, measured to end of opercular flap, 3 in length to base of caudal; depth 2.9; depth of caudal peduncle 6.7 in head; diameter of eye 7.1; width of interorbital space 3.3; length of snout 2.3; maxillary 2.9; pectoral fin 1.1; ventrals 2.5; height of first dorsal ray 3.1; anal ray 3.4; length of upper lobe of caudal 1.2; D. VIII-I, 24; A. II, 21; scales in lateral series about 116; between lateral line and spinous dorsal, counting upward and forward, about 23; plates in straight portion of lateral line about 38. Snout pointed, anterior contour of head somewhat concave in the region of interorbital area. Lower jaw slightly shorter than upper; maxillary not reaching a vertical through anterior edge of orbit by a distance about equal to diameter of pupil; lips very thick, the width of upper near its middle equal to half diameter of eye; teeth short and blunt, in a single series on the jaws, none on vomer and palatines; a few very short teeth on tongue; gillrakers 7+25, the longest equal in length to diameter of iris.



CARANGUS HELVOLUS (FORSTER).



1. CARANGUS CHEILIO SNYDER.



2. CARANGOIDES AJAX SNYDER.

Scales on occiput, interorbital area, cheek, and upper parts of opercles; other parts of head naked; body, including breast and a sheath along base of dorsal and of anal, with small scales; scales of posterior part of body with minute ones along their edges; no scales on membranes of fins; lateral line a little more curved than contour of back, the straight part beginning below tenth articulated ray. Plates highest and broadest near middle of caudal peduncle, their width at that point equal to half the width of maxillary at posterior part. First dorsal spine short and closely adnate to second; second spine longest, 3 in head; rayed portion of fin with a scaled sheath along its base, the height of anterior part of which is equal to diameter of pupil; posteriorly the sheath gradually grows lower, disappearing near end of fin; anal spines thick and strong, their height a little less than diameter of pupil; base of fin with a sheath similar to that of dorsal. Caudal deeply forked, the lobes sharply pointed; pectoral falcate, sharply pointed; ventrals not reaching anal opening.

Color silvery, a little darker above than below; upper edge of opercular flap with a dark spot about half the size of pupil; axil dusky.

This species was based on a single specimen 30.3 inches long obtained by the *Albatross* in 1902 in the Honolulu market.

*Caranx cheilio* Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 524, pl. 8, fig. 14, Honolulu (type, No. 50873, U. S. N. M.).

### Genus 113. *CARANX* (Commerson) Lacépède.

This genus differs from *Caranx* mainly in the dentition, the teeth being very small, granular, and entirely lost with age; maxillary broad; body compressed; the fins without filaments.

Only one species known from Hawaii.

*Caranx* Commerson MS. (*speciosus*).

*Caranx* Lacépède, Hist. Nat. Poiss., III, 57, 1802 (*trachurus, speciosus, caranx, ruber, etc.*).

*Gnathanodon* Bleeker, Verh. Bat. Gen., XXIV, 30, 72, 1852 (*speciosus*).

*Caranx* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 433 (*speciosus*).

*Hypocarax* Klunzinger, Fische des rothen Meeres, 92, 96, 1884 (*speciosus*).

### 151. *Caranx speciosus* (Forskål). “*Páopáo*,” “*Ulua Pauú*.” Plate XII.

Head 3.25; depth 2.14; eye 5; snout 2.5; maxillary 2.75; D. vi-1, 20; A. i, 16; scutes weak, about 15.

Body broadly ovate, strongly compressed; back considerably elevated, the ventral outline less curved; caudal peduncle short; dorsal and ventral outlines approaching it at about equal angles; head rather small, short; snout short, the profile ascending rather abruptly; nape trenchant; mouth moderate, slightly oblique, the lower jaw included; maxillary reaching anterior border of pupil, its edge slipping under preorbital for its entire length; suborbital broad, about 2 in snout; mouth entirely toothless, tongue with small villiform teeth; interorbital space strongly convex; eye small, slightly above axis of body, slightly anterior; gillrakers moderate, about half diameter of eye, stout and blunt, about 20 below angle; dorsal spines weak, short, longest 3.2 in head; origin of soft dorsal midway between tip of snout and base of caudal; caudal deeply forked; anal similar to soft dorsal, its origin under seventh soft dorsal ray; ventrals short, reaching beyond vent, 2.5 in head; pectoral long and falcate, reaching beyond arch, its length equal to base of anal; arch of lateral line equal to straight part (in smaller examples the arch is less, sometimes 1.25 in straight part); cheek and upper parts of opercle scaly, breast scaly, no scales on snout and upper part of head.

Color in life, light dusky above with silvery and blue reflections, becoming white on belly; anterior part of belly and sides of face yellow; indistinct yellow blushes on other parts of body; yellow line on body at base of anal; 8 or 9 indistinct transverse bands on body; margin of caudal yellow; anterior anal yellow, bright toward tip of longest rays; ventrals white; pectoral translucent; dorsals dusky; irregular, blackish spots on back below base of soft dorsal.

Color in alcohol, dusky grayish, lighter below; soft dorsal brownish olivaceous, other fins slightly lighter, no bands evident on body, though these show in small examples.

The above description from a specimen (No. 03523) 18 inches long, from Honolulu, where the fish was also obtained by the *Albatross* in 1902. Our collections contain an excellent series of this species, the specimens ranging from 8.5 to 20 inches in length.

*Scomber speciosus* Forskål, Descript. Animal., XII, 54, 1775, Djidda.

*Scomber rim* Forskål, op. cit. (= *Scomber speciosus* Forskål), Australia; Polynesia, etc.

*Caranx speciosus*, Lacépède, Hist. Nat. Poiss., III, 72, 1802; Jordan & Evermann, Amer. Food and Game Fishes, 308, 1902; Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 417 (Honolulu); Snyder, op. cit. (Jan 19, 1904), 525 (Honolulu).

*Caranx pectaurista* Geoffroy Saint-Hilaire, Descript. Egypte, pl. 23, fig. 1, 1809.

*Caranx poloosoo* Richardson, Voy. Erebus and Terror, Ichth., pl. 58, figs. 4 and 5, 1844 (called *Caranx speciosus* in the text, 136), Australia.

*Gnathanodon speciosus*, Bleeker, Verh. Bat. Gen., XXIV, 1851, 72; Jordan & Evermann, Fish. North & Mid. Amer., I, 928, 1896.

*Caranx ruppellii* Günther, Cat., II, 445, 1860, Red Sea.

*Caranx panamensis* Gill, Proc. Ac. Nat. Sci. Phila. 1863, 166, Panama (Coll. Captain Dow).

*Caranx (Hypocarax) speciosus*, Klunzinger, Fische des rothen Meeres, I, 96, 1884 (Red Sea); Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 495 (Pearl Harbor, Oahu).

#### Genus 114. CARANGOIDES Bleeker.

Teeth persistent, all small, in villiform bands on jaws, vomer, palatines, and tongue; lateral line scarcely arched in front; body oblong, not much elevated; otherwise essentially as in *Caranx*. Tropical seas.

*Carangoides* Bleeker, Verh. Bat. Gen., XXIV, 27, 59, 1852 (*plagiolenia*; teeth equal, several series in both jaws and on palate and tongue).

a. Anal with numerous rays, 25 or 26.

b. Scutes about 30 ..... *ferdau*, p. 198

bb. Scutes about 25 ..... *gymnostchoides*, p. 199

aa. Anal with fewer rays, about 16 ..... *ajax*, p. 200

#### 152. *Carangoides ferdau* (Forskål). "*Omilu*." Fig. 77.

Head 3.6 in length; depth 2.7; eye 4.5 in head; snout 3; interorbital 3; maxillary 2.5; D. vi-i, 29; A. ii-i, 25; scutes about 30.

Body elongate, elliptical, compressed, dorsal outline evenly arched, steep from above eye to tip of snout; head as deep as long; snout short, blunt, depressed in front of eye, steep anteriorly; mouth

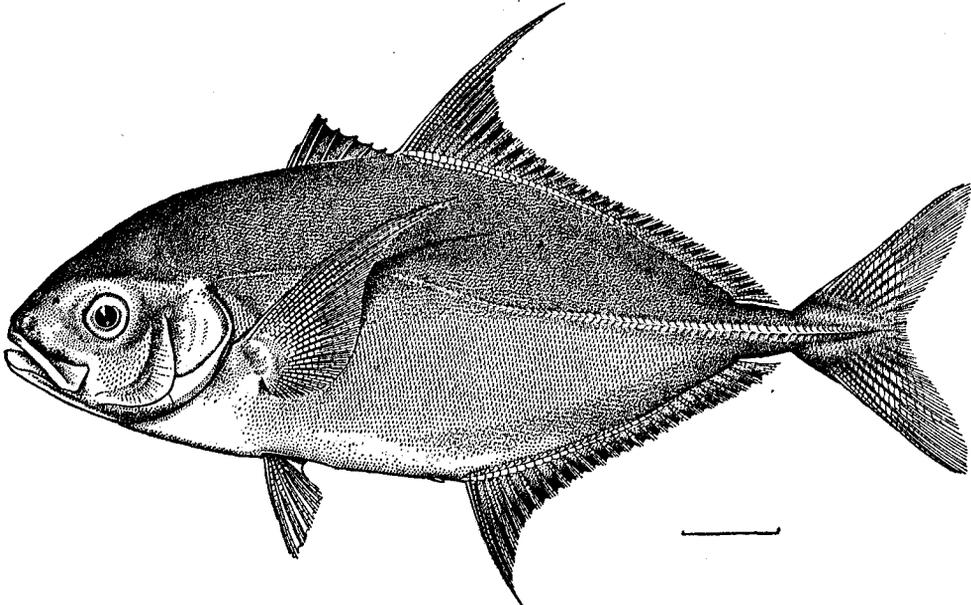


FIG. 77.—*Carangoides ferdau* (Forskål).

moderate, slightly oblique; teeth small, villiform on vomer, palatines, tongue, and jaws, those in jaws the larger and arranged in bands; tongue rounded, thin, and free for the most of its length; maxillary rather broad, its greatest width 2 in eye, extending to anterior edge of pupil; eye anterior, slightly

above axis; interorbital very convex, the nape trenchant; spinous dorsal short, weak, and low; 6 or 7 rays of soft dorsal elevated anteriorly, the longest ray about 2 in base of fin, other rays even, slightly less than eye; origin of soft dorsal midway between tip of snout and base of caudal; caudal deeply forked, lobes equal; anal similar to soft dorsal, longest ray about 2 in its base; ventrals short, reaching past vent, 2.5 in head; pectoral long, falcate, equal to base of anal, the head contained 1.3 in pectoral, its lower base just anterior to base of ventrals; lateral line with a long, low arch, extending nearly to tip of pectoral.

Color in life, silvery, with dark-blue reflections over upper portions of back and head, several small lemon-colored spots with dusky centers on side, the number and position varying in different specimens, generally a group under curve of lateral line and one near beginning of straight portion; soft dorsal and anal blue, lower portion of these fins golden with blue outer margin; ventrals white with bluish shade, pectoral transparent, with golden shade; caudal bluish and golden with dusky margin.

Color in alcohol, purplish blue, lighter on sides and below, anterior portion of anal and soft dorsal dusky; pectorals pale; side with a few indistinct dark spots, usually below lateral line and posterior to middle of pectoral.

The above description based upon a specimen (No. 03413) 14 inches long, obtained in the market at Honolulu, July 19. Several other specimens were obtained at Honolulu and one is in the collection from Kailua. The fish is rather common about Hawaii, and equally so in Samoa.

*Scomber ferdau* Forskål, Descript. Animal., 55, 1775, Red Sea.

*Caranx bajad* Rüppell, Atl. Reis. Nordl. Af., 98, pl. 25, fig. 5, 1828, Red Sea.

*Carangoides henigymnostethus* Bleeker, Verh. Bat. Gen., XXIV, 1852, 61, Batavia.

*Carangoides fulvoguttatus* Bleeker, Verh. Bat. Gen., XXIV, 1852, 89, Batavia.

*Caranx venator* Playfair, Proc. Zool. Soc. London 1867, 859, fig. 2; no locality, probably Seychelles.

*Caranx ferdau*, Klunzinger, Verh. Zool. Bot. Ges. Wien, 1871, 462 (Red Sea) (not of Rüppell); Günther, Fische der Südsee, I, taf. 77 and 78, 134, 1876 (Red Sea, Tahiti, Seychelles, Bonin Islands); Day, Fishes of India, II, 217, 1876; Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 495 (Honolulu).

*Caranx* (*Carangoides*) *ferdau*, Klunzinger, Fische des rothen Meeres, I, 99, 1884 (Red Sea).

*Carangoides ferdau*, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 446 (Honolulu).

### 153. *Carangoides gymnostethoides* Bleeker.

Head 3.3 (4) in length; depth 3 (3.6); D. VII-1, 31; A. II-1, 26.

Body elliptical, compressed; profile convex from snout to nostril, thence regularly arched to caudal; ventral outline less convex, being almost straight from head to anal; head longer than deep; snout rather blunt, 3 in head; mouth low, somewhat oblique; maxillary 2.3 in head, extending opposite front of pupil; lower jaw little produced; teeth in villiform bands on jaws, vomer, palatines, and a patch on the tongue; eye large, 1.5 in snout, 4.4 in head; adipose eyelid little developed; cheeks and temporal regions with fine scales, head otherwise naked; scales rather small, those below pectoral smaller; a naked area on breast not widening forward from base of ventrals as much as in *C. orthogrammus* Jordan & Gilbert; lateral line but little curved, arched above pectorals, and gradually becoming straight at their tips; greatest depth of arch about equal to pupil, the arched part of the line longer than the straight, plates developed only in the posterior half of the straight part; the plates small with low keels, their spines little prominent; 25 developed plates, including small ones; spinous dorsal rather weak, the highest spine 1.75 in snout (these spines probably varying according to the age); soft dorsal long and low, with slender rays; a well-developed scaly basal sheath anteriorly; the first articulate ray is 1.75 in base of fin and 1.25 in head; anal similar to soft dorsal; first free anal spine nearly obsolete, second small; caudal lobes moderate, equal, 1.2 in head, their length much less than the depth from tip to tip; pectorals falcate, their tips slender, reaching tenth ray of anal, their length 2.5 in body (from snout to base of caudal fin); ventrals 2.6 in head.

Color, in spirits, nearly plain olive, about as in *C. orthogrammus*. This species is recorded from Johnston Island by Smith & Swain. We have not seen it from elsewhere.

*Carangoides gymnostethoides* Bleeker, Verh. Bat. Gen., XXIV, 1852, 61; Bleeker, Nat. Tyds. Ned. Ind., I, 364, Batavia; Bleeker, Enum. Spec. Pisc. Archip. Indie., 69, 1859 (Java).

*Caranx gymnostethoides*, Günther, Cat., II, 431, 1860 (Sea of Batavia); Smith & Swain, Proc. U. S. Nat. Mus., V, 1882, 125 (Johnston Island).

154. *Carangoides ajax* Snyder. Plate 33, fig. 2.

Head measured to end of opercular flap, 3.6 in length to base of caudal; depth 2.7; depth of caudal peduncle 7.7 in head; diameter of eye 5; width of interorbital space 3.5; length of snout 2.3; maxillary 2.3, D. 19; A. 16; plates in straight portion of lateral line about 32.

Anterior profile elevated, the contour rising abruptly to a point above posterior margin of orbit; lower jaw slightly longer than upper; cleft of mouth almost horizontal, maxillary reaching a vertical passing through center of pupil; width of suborbital area 4 in head. Teeth villiform, in bands on jaws, vomer, palatines, and tongue; gillrakers on lower limb of first arch 14, the longest equal in length to width of posterior part of maxillary.

Head naked, except a small area behind and below eye, where there are small, deeply embedded scales; body mostly naked, there being an irregularly outlined area along lateral line with small, embedded scales; lateral line much more arched than dorsal contour, the highest point of curve just anterior to insertion of dorsal, the straight part beginning below base of twelfth dorsal ray; 3 or 4 posterior plates large, their length about half the depth of caudal peduncle; other plates growing smaller anteriorly, almost disappearing before curved portion of lateral line is reached; spinous dorsal not present; anal spines absent; anterior rays of both fins elevated, their height about 2.5 in head; caudal deeply forked, lobes of equal length, 1.2 in head; pectoral falcate, 1.1 in head; ventrals short, pointed, 2.3 in head.

Color silvery, darker above, indistinctly marbled with dusky along the back; base of pectoral colored on posterior side, upper half brownish black, lower dead white; dorsal fin with a dusky margin.

One specimen 38 inches long, from the market at Honolulu. Type, No. 50874, U. S. Nat. Mus.

*Carangoides ajax* Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 524, pl. 8, fig. 15, Honolulu.

Genus 115. *ALECTIS* Rafinesque. The Thread-Fishes.

Body rhomboid, deep, strongly compressed, more or less completely covered with minute embedded scales, sometimes apparently naked; scutes on the straight portion of the lateral line enlarged, bony, and spinous, as in *Carangus*, but much less developed; mouth moderate, with bands of villiform teeth on jaws, vomer, palatines, and tongue; first dorsal fin little developed, the spines short and rudimentary, mostly disappearing with age; soft dorsal and anal similar to each other; the first 5 or 6 rays of each fin elongate and filiform in the young, becoming shorter with age; ventral fins elongate in young, short in the adult; pectorals falcate; no finlets; caudal peduncle narrow, the caudal widely forked; gillrakers moderate, stout. This genus is not essentially different from *Carangus*, the great change in form arising from no important modification of the skeleton. The changes due to age are surprisingly great, as Dr. Lütken has shown, the characters of the nominal genera being chiefly stages in the growth of individuals. The young individuals are almost orbicular in form, with the filaments excessively long. Tropical seas.

*Gallus* Lacépède, Hist. Nat. Poiss., IV, 583, 1802 (*virescens=ciliaris*); name preoccupied in ornithology.

*Alectis* Rafinesque, Analyse de la Nature, 84, 1815 (substitute for *Gallus*, preoccupied).

*Blepharis* Cuvier, Règne Animal, Ed. 1, II, 322, 1817 (*ciliaris*); name preoccupied.

*Seyris* Cuvier, Règne Animal, Ed. 2, II, 209, 1829 (*intilica*).

*Gallichthys* Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 168, 1833 (*gallus*); substitute for *Gallus*, preoccupied.

*Blepharichthys* Gill, Proc. Ac. Nat. Sci. Phila. 1861, appendix, 36 (*ciliaris*); substitute for *Blepharis*, preoccupied.

155. *Alectis ciliaris* (Bloch). "*Ulva kihikihiki*." Fig. 78.

Head 3.2 in length; depth 1.9; eye 3.8 in head; snout 2.7; preorbital 3.6; interorbital 3.5; maxillary 2.5; gape 3.1; mandible 2; D. 1, 22; A. 11, 17; scutes 18.

Body oval, much compressed, highest between the elevated bases of dorsal and anal; snout very short, the profile ascending abruptly in a straight line to front of eye, thence in a sharp curve to nape, from which point it is nearly straight to origin of dorsal fin; interorbital narrow and very trenchant; preorbital very deep; mouth moderate, very low, little oblique in adult, very oblique in young; the jaws equal; chin prominent; maxillary rather narrow, reaching vertical of anterior edge of pupil; teeth on jaws, vomer, tongue, and palatines in villiform bands; eye large, above axis of body, the adipose eyelid well developed before and behind; spinous dorsal obscure, the spines scarcely perceptible in