

NOTES ON SOME FISHES OF THE GENUS *AMIA*, FAMILY
OF CHEILODIPTERIDÆ, WITH DESCRIPTIONS OF FOUR
NEW SPECIES FROM THE PHILIPPINE ISLANDS.

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In identifying the large series of Cheilodipteridæ collected by the U. S. Bureau of Fisheries steamer *Albatross* on the Philippine expedition, it was found that much confusion had resulted from the remarkable similarity in color pattern, fin formulæ, scaling, and comparative measurements of some species of *Amia*. In the present paper a small group of striped forms most in need of revision is dealt with.

The measurements herein used represent the ratio between length of part described and the standard length from tip of snout to end of last caudal vertebra, with the exception of eye, snout, maxillary, interorbital, fins, and least depth of caudal peduncle, which are expressed in ratio to head measured from tip of snout to posterior edge of opercle (not including opercular flap). The length of caudal peduncle is measured between the verticals drawn at base of last anal ray and at end of last vertebra. Even when the last dorsal and anal rays are cleft to base they are still counted as single rays. The scale formula indicates the number of scales in a transverse row from insertion of dorsal downward and backward to and including lateral line, and from origin of anal upward and forward to lateral line; and the number of transverse rows above the lateral line, between upper angle of opercle and end of last caudal vertebra.

KEY TO CERTAIN STRIPED SPECIES OF *AMIA* HEREIN DESCRIBED.

- a¹. Body with three to five broad reddish brown or slaty black stripes on each side and one along the middle of the back.
- b¹. Dorsal spines 6.
- c¹. Body deep, compressed, 2.25 to 2.50; eye large, 2.2 to 2.4; dorsal vi-1,9; anal ii,9; five broad lateral stripes, the three upper extending to base of caudal; a short bar from upper part of eye, backward, thence upward, merging into first stripe and ending on tenth scale of lateral line.....*compressa*.

- b*². Dorsal spines 7 (dorsal VII-1,9; anal II,8).
- d*¹. Eye small, equal to snout, 3.50; body deep; five stripes, the second merging into the third on straight portion of lateral line; fourth and fifth indistinct, the former crossing side above base of pectoral. *fasciata*.
- d*². Eye large, less than 3.50 in head, longer than snout; body relatively slender.
- e*¹. Stripes wider than light colored interspaces, the three upper very dark colored, two of them converging to meet the median stripe at base of caudal. *aroubiensis*.
- e*². Lateral stripes equal to or narrower than interspaces, not connivent at base of caudal.
- f*¹. Scales strong, ctenoid, serrations in more than one row, 25 scales in lateral line to end of last caudal vertebra; soft dorsal and anal with black bands at base, margin sinuous. Shore fishes of moderate size with well developed stripes of reddish or olive brown.
- g*¹. Body compressed, its breadth behind opercle more than 2.1 in depth; lateral stripes narrower than light colored interspaces; no short bar behind eye.
- h*¹. Stripes dark, two of them converging to meet middle one near tip of median caudal rays; caudal blotch absent; first lateral stripe separated from its fellow near tip of snout by a median white line; pectoral base black or very dark brown; a distinct black bar near base of soft dorsal and anal; maxillary short, 1.80-1.96. *novemfasciata*.
- h*². Stripes light, not connivent near tips of caudal rays; caudal blotch distinct; first stripe united with its fellow near tip of snout; pectoral base not noticeably darker; black line near base of soft dorsal and anal, narrow, indistinct, basal portion of rays white; maxillary of moderate length, 1.75-1.79. *angustata*.
- g*². Body robust, its breadth behind opercle 1.9-2 in depth; stripes of varying width but approximately equal to interspaces, not connivent on caudal; a short stripe across upper fourth of eye, below lateral line to middle of side, usually uniting with stripe below it; first lateral stripe united with its fellow near tip of snout; third stripe crosses upper pectoral base. *robusta*.
- f*². Scales thin, weakly ctenoid, serrations on apical margin in a single row or absent, 23 scales in lateral line to end of last caudal vertebra; soft dorsal and anal without black basal bands, margins rounded. Fishes of small size, variable in form and coloration, commonly occurring in the deeper waters. *versicolor*.
- a*². Body with numerous (18 to 20 in adult) narrow olive green stripes, alternate stripes broader and darker; stripes in reduced number in young, similar to *A. robusta* except that they are narrower and the first does not unite with its fellow near tip of snout. *multilineata*.

AMIA COMPRESSA Smith and Radcliffe, new species.

Plates 20 and 21.

Dorsal VI-1,9; anal II,9; scales 3+6-25.

General form subovate, compressed; head 2.98, short, deep; body short, deep, strongly compressed, dorsal and ventral surfaces symmetrical, depth 2.45; caudal peduncle deep, strongly compressed, depth 1.64, length 1.27; eye 2.31, very large, its diameter much greater than length of snout; snout 3.93, short and blunt; mouth

moderate, oblique, lower jaw slightly projecting; maxillary 1.89, extending to vertical from posterior border of pupil; nostrils small, widely separated; interorbital 3.60, broad, nearly flat, a slight depression on either side of median ridge; margin of preopercle strongly serrate; intramarginal preopercular crest, subopercle, interopercle and orbital bones smooth or with traces of a few weak denticulations; scapula toothed; teeth villiform, in bands on jaws, vomer and palatines; tongue narrow, rounded, free, marginal portion thin; peritoneum silvery white.

Scales large, regular, of quite uniform size, deeper than long, basal margin truncate, apical margin rounded; basal radial folds rather numerous, about 15; denticulated area on apical margin rather narrow.

Origin of dorsal slightly posterior to vertical to base of pectoral, spines of moderate size; first spine short 2.55 in the second, which is longest and strongest, 1.82; origin of soft dorsal slightly anterior to origin of anal, distal margin slightly concave, first ray longest, 1.20; caudal forked, shortened outer rays pungent, spinelike; second anal spine much longer than the first, 2.12; first ray longest, 1.48; margin of fin concave; ventrals reaching to behind vent, 1.64, distal margin rounded, their base slightly in advance of vertical from pectoral base; pectoral long, narrow, reaching base of second anal spine, 1.19.

Color in alcohol: Ground color dusky silvery white with brownish shades dorsally and dusky points ventrally; five broad dark reddish brown stripes on sides and one along the middle of the back; the latter extends from nape to origin of dorsal where it divides, reuniting behind soft dorsal and ending at base of caudal, under dorsals and on caudal peduncle it is broken up into a series of blotches, one to each scale, becoming indistinct posteriorly; the first lateral stripe unites with its fellow on middle of snout and extends backward over eye, above lateral line to base of caudal; a short bar or stripe crosses upper part of eye and extends backward four scales from opercle, bends sharply upward to lateral line, its upper margin merging into the first stripe and ends or merges into the first stripe on tenth scale of lateral line; the second stripe joins its fellow on tip of snout, extends backward through middle of eye, along middle of side to base of caudal peduncle; two short bars posterior to this, above and below lateral line and a blotch just below and behind first stripe; the third unites with its fellow on tip of mandible and extends along lower margin of eye to upper pectoral base, then breaks beginning again on side above pectoral and extending to base of caudal; the fourth, narrower, extends from axil of pectoral to last anal ray; the fifth, very narrow, extends from above base of ventrals to above middle of anal; a slight duskiness, indicating

traces of a sixth, below this; head dusky brown (in adults the stripes on anterior part of head merge into the brown and are practically indiscernable; in the young they are very distinct); spinous dorsal dusky brown; soft dorsal dusky, a dark brown bar near base to tip of last ray; caudal dusky, outer rays dusky brown; anal similar to soft dorsal; ventrals dusky; pectoral hyaline.

Color in life of a specimen 8 cm. in length from Tataan, Simaluc Island: Alternate dark red brown and silvery stripes on body; fins reddish brown; first dorsal dusky anteriorly; second with an indistinct blackish bar at base; anal with a similar bar but distinct; snout and lower portion of head blackish.

Color in life of a specimen 8.5 cm. in length from Port Uson, west of Pinas Island: Body crossed by longitudinal brown stripes, approaching vermilion below; first stripe extending along base of dorsal composed of a row of spots, interspaces olive; lower interspaces between stripes pearly; throat blackish; breast pink; front of dorsal spines with golden shades; soft dorsal rays pink, a dusky bar at base, turning upward on vertical edge; caudal pink, edges dusky; pectoral pink; iris with sapphire reflections.

Color in alcohol of a specimen 3.4 cm. in length from Balalo Bay, Palawan Island: Median dorsal stripe ending at base of last dorsal ray; three lateral stripes fading out on middle of caudal peduncle; first stripe united with its fellow on middle of snout; short bar behind eye indistinct, not continued upward to first stripe; second stripe united with its fellow on tip of snout, passing backward through middle of eye; the third encircles tip of lower jaw, touches lower margin of eye and passes backward through base of pectoral; other stripes not apparent; a large black area on caudal peduncle at base of caudal; a narrow brown bar near base of soft dorsal and anal; outer caudal rays brown.

This species is easily recognized by its short head, large eye, deep, strongly compressed body, the number of dorsal spines and anal rays, and distinctive coloration.

The collection contains over 200 specimens from about 45 different localities ranging from Port Matalvi on west coast of Luzon and Quinalasag Island on the east coast, southward throughout the Philippine Archipelago to Borneo and the Moluccas. The largest example is 10.7 cm. in length.

Type.—Cat. No. 68398, U.S.N.M., 10.2 cm. in length, from Bisucay Island, Cuyos Group, taken with dynamite April 9, 1909. The figure is of an example 7.2 cm. in length from Tataan Pass, Tawi Tawi Group.

AMIA FASCIATA (White).

Plates 21 and 22.

Mullus fasciatus WHITE, Journal of a Voyage to New South Wales, 1790, p. 268, fig. 1; Port Jackson.

Apogon fasciatus GÜNTHER, Catalogue of Fishes, vol. 1, p. 241, 1859 (part)—MACLEAY, Descriptive Catalogue of Australian Fishes, vol. 1, 1881, pp. 43-44.—TENISON-WOODS, Fish and Fisheries of New South Wales, p. 14, 1882.—STEAD, Fishes of Australia, 1906, p. 96, 107.

Following is White's original description of this species:¹

Mullus fasciatus. *Mullus subflavescens fasciis longitudinalis fuscis*. Pale yellow Mullet with longitudinal brown bands. Length about five inches; scales large.

William Macleay² wrongly places *Amia fasciata* of Bleeker in the synonymy of this species and gives the following description of specimens from type locality:

D. 7. 1/8. A. 2/8. L. lat. 28.

Height nearly half of the length without tail; space between the eyes much smaller than the diameter of the orbit and much channelled; tail slightly emarginate. Colour brownish-red with five longitudinal black bands on each side, the first close to the back, the second from above the eye to the upper margin of the tail, the third along the middle of the side and extending nearly to the extremity of the tail, the fourth from below the eye to the inferior margin of the tail, the fifth along the belly and more or less indistinct; there is also a black bar at the base of the soft dorsal and anal fins.

Port Jackson and Northern Coast. Length five inches.

This is the most common Port Jackson species and is without doubt the true *A. fasciatus*, White, but I doubt its identity with *A. aroubiensis*, Hombr. and Jacquin., *A. endekataenia*, Bleek., and even with the *A. fasciatus*, Günth., Journ. Mus. Godeff., Fish. Sudsee, Heft I., tab. 20 A. B.

Stead³ says of the soldier fish:

It is a pretty little species with large eyes and rough scales and is very prettily striped along the body—whence its name of "soldier." It is common on the New South Wales Coast—particularly at Port Jackson—and probably occurs on portions of the Victorian and Queensland coasts; though it has not so far been recorded from these places. The original specimens were taken from Port Jackson, and are described in White's "Voyage to New South Wales" before referred to.

Description of a gravid female in the United States National Museum, 10.2 cm. in length, from Port Jackson, New South Wales, from Mr. D. G. Stead:

Dorsal VII-1,9; anal II,8; scales 3 + 6—25.

General form subovate, compressed; head long, 2.58; body deep, dorsal and ventral surfaces symmetrical, depth 2.53; caudal peduncle relatively short, depth, 2.52, length 1.50; eye small, 3.50; snout, 3.50, long, pointed, as long as eye; mouth of moderate size, oblique, lower jaw slightly projecting; maxillary 1.97, not reaching vertical from posterior border of pupil; interorbital 4.20, broad, flattened,

¹ Journal of a Voyage to New South Wales, 1790, p. 268, fig. 1.

² Descriptive Catalogue of Australian Fishes, vol. 1, 1881, pp. 43-44.

³ Fishes of Australia, 1906, p. 107.

slightly channeled; preopercular margin serrate; intramarginal preopercular crest and orbital bones smooth; bands of villiform teeth on jaws, vomer, and palatines, those on vomer somewhat blunter than the others; peritoneum dusky silvery; scales normal, subrectangular.

Dorsal spines weak, the third longest, 2.52; soft dorsal, 1.91, distal margin obliquely truncate; caudal emarginate; anal 2.34, low; ventrals, 1.68, short, tips reaching vent; pectoral 1.57, short.

Color in alcohol: Ground color dusky brownish yellow (much discolored), with five dark brown lateral stripes and one along the middle of the back from nuchal region to base of last dorsal ray; the first lateral stripe appears to join its fellow near tip of snout, extends backward over eye to upper margin of caudal; the second crosses upper fourth of eye, backward along lower half of scales of curved portion of lateral line, merging into the third on straight portion; the third, widest, passes around tip of snout, through middle of eye to tips of median caudal rays; the fourth from middle of maxillary, under eye, above base of pectoral to inferior margin of caudal, very indistinct behind pectoral; faint traces of a fifth along side of belly to posterior base of anal; spinuous dorsal dusky; soft dorsal with a narrow dusky bar near base to tip of last ray; a similar bar on anal, crossing middle of sixth and seventh rays to tip of eighth; basal portion of rays of soft dorsal and anal whitish; first ventral ray light, others dusky black; pectorals dusky, base iridescent; tip of mandible blackish.

This species is apparently the only one of the group occurring on the coast of New South Wales and is distinct from the other striped forms herein described. It is characterized by the small eye, long snout, deep body, and marked coloration. White's figure was evidently made from a much faded specimen. That portion of the stripes not shown in his sketch is least distinct in the example at hand.

AMIA AROUBIENSIS (Hombron and Jacquinot).

Plate 22.

Apogon aroubiensis HOMBRON and JACQUINOT, D'Urville's Voyage au Pole Sud, Poissons, 1853, p. 31, pl. 1, fig. 1; Aroub in Malaysia.

Apogon fasciatus, GÜNTHER, Fische der Südsee, 1873, p. 19, pl. 20, fig. A (part).

Amia aroubiensis, JORDAN and SEALE, Fishes of Samoa, Bulletin Bureau of Fisheries, vol. 25, 1905, pp. 241-2, fig. 35, 1906.

Dorsal VII-1,9; anal II,8; scales 3+6—25.

General form subovate, compressed; head 2.65; depth 2.73; caudal peduncle slender, depth 2.18, length 1.34; eye 2.57, large; snout 3.94, short, pointed; mouth of moderate size, oblique; maxillary 1.76, long, reaching a little beyond vertical from posterior border of pupil; interorbital 5.14, narrow, flattened, rugose; margin of preopercle

serrate; intramarginal preopercular crest and orbital bones smooth or with very weak serrations; teeth small, villiform; peritoneum silvery white; scales large, subcircular, regular in arrangement.

Dorsal spines slender, third longest, 1.76; soft dorsal somewhat higher 1.54, distal margin rounded; caudal forked; anal similar to soft dorsal, depth 1.75; ventrals 1.61; pectoral 1.37, long.

Color in alcohol: Ground color silvery white, four broad, dark reddish-brown stripes on sides and one along the middle of the back, stripes much wider than light-colored interspaces; the median dorsal stripe extends from between eyes to posterior base of soft dorsal, margined anteriorly by a silvery white line on each side which unite and extend to near tip of snout, separating the first lateral stripe from its fellow at this point, the latter extends over eye to upper base of caudal peduncle, then bends sharply downward uniting with the second on base of caudal; the second separated from first and third on head by white lines joins its fellow on tip of snout and extends through middle of eye to base of caudal ending in a very dark brown area; the third extends from lower margin of eye to inferior base of caudal peduncle, then bends sharply upward to second; the fourth, lighter in color, extends along side of belly to base of anal; fins yellowish white; a black bar along base of soft dorsal to tip of last ray; a similar bar on anal; middle rays of caudal in this specimen with a slight trace of duskiess. This description is of an individual 6.1 cm. in length from Tutu Bay, Jolo.

This species is found throughout the Philippine Archipelago, the collections containing about 125 examples from 50 localities in the Philippines and Celebes. These do not differ from individuals from Apia, Samoa. It closely resembles *A. novemfasciata*, differing in having the stripes broader and not extended beyond base of caudal; the curvature of dorsal surface is greater, giving the fish a slightly deeper appearance; the eye is relatively larger, and the snout is shorter.

AMIA NOVEMFASCIATA (Cuvier and Valenciennes).

Plate 23.

Apogon fasciatus QUOY and GAIMARD, Voyage de l'Uranie, 1824, p. 344; Guam.

Apogon fasciatus,¹ PETERS, Monatsberichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin, 1868, p. 256; Luzon, Samar—GÜNTHER, Fische der Südsee, 1873, p. 19, pl. 20, fig. B—BLEEKER, Atlas, 1873-76, vol. 7, p. 87, (part), pl. 326, Percoidei pl. 48, fig. 4, 1876-77—DAY, Fishes of India, p. 69, 1878-88 (part).

Apogon novemfasciatus CUVIER and VALENCIENNES, Histoire Naturelle des Poissons, vol. 2, 1828, p. 154; Timor and Guam.

Amia novemfasciata JORDAN and SEALE, Fishes of Samoa, Bulletin Bureau of Fisheries, vol. 25 (1905), pp. 242-3, fig. 36, 1906 (not fig. 37)—JORDAN and SEALE, Fishes from Negros, Proc. U. S. National Museum, vol. 28, 1905, p. 777—JORDAN and RICHARDSON, Fishes from Islands of Philippine Archipelago, Bulletin Bureau of Fisheries, vol. 27 (1907), p. 254, 1908; Calayan, Cuyo, Ticao.

¹Confused with *Mullus fasciatus* White.

Dorsal VII-1,9; anal II,8; scales 3 + 6—25.

General form oblong, compressed; head 2.68, regular in outline; body slender, curvature of dorsal and ventral surfaces similar, depth, 2.86; caudal peduncle strongly compressed, depth 2.03, length, 1.37; eye 2.93, small; snout 3.73, pointed; mouth large, oblique; maxillary 1.82, long, not reaching vertical from posterior border of orbit; interorbital 5.12, flattened; margin of preopercle armed with weak serrations; intramarginal preopercular crest and orbital bones smooth or with traces of weak serrations; well-developed villiform teeth on jaws, vomer and palatines; peritoneum silvery white; scales regular.

Dorsal spines slender, third longest, 1.80; height of soft dorsal 1.64, its distal margin nearly truncate, becoming concave posteriorly; caudal forked; anal similar to soft dorsal, 1.78; ventrals 1.58; pectoral 1.46.

Color in alcohol: Ground color silvery white with three dark reddish brown stripes on sides and one along middle of back, width about two-thirds that of interspaces; median dorsal stripe extends from interorbital, dividing at nape, along base of dorsals, uniting again behind dorsals and extending as a narrow line to base of caudal; the first lateral stripe separated from its fellow by a median white line, near tip of snout, extends over eye to upper base of caudal, bends downward to meet the second near tip of median caudal rays; the second margined above and below on side of snout by white lines, encircles snout, passes through middle of eye to tips of median caudal rays; the third from middle of maxillary along lower margin of eye, through lower pectoral base, following curvature of belly to base of caudal, then bends upward to meeting place of first and second; a fourth, quite distinct on head, from tip of mandible to near base of ventrals, very indistinct on breast; two white lines on ventral surface of head; spinous dorsal hyaline, tips of membranes posteriorly black; a black bar margined above and below with white near base of soft dorsal to tips of last rays, remainder of fin hyaline; caudal rays whitish, membranes hyaline except portions crossed by connivent stripes; anal similar to soft dorsal; paired fins hyaline; base and lower axil of pectoral black, very characteristic of the species. This description is of an example 7 cm. in length from tide pools at Gubat Bay, Luzon.

There are 25 examples in the collection from the coasts of Luzon to the Celebes. These have been compared with specimens from Apia, Samoa, in the reserve series of the United States Bureau of Fisheries and with examples from the Fiji Islands in the United States National Museum. The slender, compressed form, trim appearance, narrow stripes connivent near tip of caudal, and black pectoral base are characteristic of this species.

In the original description of the species, Cuvier and Valenciennes mention as types two specimens, one from Timor and the other from

Guam, the latter apparently Quoy and Gaimard's type of *A. fasciatus*; both seem to be this species, and as the name *fasciatus* is preoccupied the present name holds. Bleeker¹ wrongly credits this species to Doctor Gill, and Day² evidently has copied from Bleeker.

AMIA ANGUSTATA Smith and Radcliffe, new species.

Dorsal VII-1,9; anal II,8; scales 3+6—25.

General form oblong, compressed; head 2.68, conic; body compressed, slender, dorsal and ventral outline arched from tip of snout to caudal peduncle, depth 2.95; breadth of body behind opercle 2.18 in depth; caudal peduncle strongly compressed, rather deep, depth 2.12, length 1.40; eye 2.75, large, prominent; snout 3.85, short, depressed, pointed; mouth large, oblique, jaws subequal; maxillary

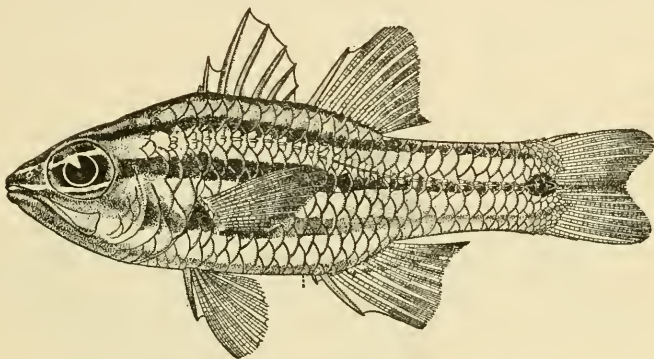


FIG. 1.—*AMIA ANGUSTATA*. (From the type. Natural size.)

1.79, extending slightly beyond vertical from posterior border of pupil; interorbital 5.31, narrow, with a slight median ridge; margin of preopercle denticulated; intramarginal preopercular crest and orbital bones with weak denticulations; well-developed villiform teeth on jaws, vomer, and palatines; peritoneum silvery white; scales large, firm, somewhat longer than broad; 28 pores in lateral line.

Dorsal spines slender, the first 5.55 in the second, second 2.20 in third, the third longest, 2; soft dorsal high, 1.66; caudal forked; anal 1.85, distal margin sinuous; ventrals 1.85, short; pectoral 1.39, long.

Color in alcohol: General color yellowish white with three light brown stripes on the side and one along the middle of the back, these are narrower than light-colored interspaces; median dorsal stripe extends from between eyes to occiput, where it divides, reuniting and ending behind last dorsal ray; first lateral stripe joins its fellow near tip of snout and passes over eye to base of caudal, slightly decurved at

¹ Atlas, vol. 7, p. 87.

² Fishes of India, p. 69.

end; the second unites with its fellow at tip of snout and extends through center of eye to base of caudal, ending in a round black blotch about the size of pupil; a third from middle of maxillary, beneath eye, through lower pectoral base to inferior base of caudal, very indistinct posteriorly; obscure brown dots along lower part of maxillary to base of anal; fins hyaline, spines and rays whitish, base of soft dorsal and anal white with dusky above, indicating presence of dark bar as in related species; dorsal stripe on head margined with a white line which becomes median at anterior end of stripe, extending forward to first lateral stripe; a white line crosses upper third of eye, extends forward on snout as a margin to first lateral stripe, a similar line through lower part of eye, margining second stripe around tip of snout.

A specimen 7 cm. in length from Sipadan Island, Borneo, has the following measurements: Head 2.72; depth 3.11; depth of caudal peduncle 2.10, length 1.43; eye 2.50; snout 4.17; maxillary 1.75; interorbital 5.71; third dorsal spine 1.81; height soft dorsal 1.45; depth of anal 1.60; ventral 1.74; pectoral 1.40; a narrow black line composed of a series of spots on membranes between rays near base of soft dorsal and anal.

From *A. novemfasciata* this species differs in having the maxillary slightly longer, the eye more prominent, body relatively longer, the ratio of depth to length being less, first stripe not separated from its fellow near tip of snout, the lateral stripes not connivent on caudal, base of dorsal not markedly darker, and bars on soft dorsal and anal less distinct. From *A. robusta* it differs in the slenderer, more compressed body, larger eye, narrower interorbital, shorter dorsal spines, shorter ventrals, narrower stripes, and absence of short stripe behind eye.

Type.—Cat. No. 68399, U.S.N.M., 8.5 cm. in length, from Malapina Island, east of Zamboanga.

AMIA ROBUSTA Smith and Radcliffe, new species.

Plate 24.

Amia fasciata, EVERMANN and SEALE, Fishes of the Philippine Islands, Bulletin Bureau of Fisheries, vol. 26 (1906), p. 72, 1907; Bacon.

Dorsal VII-I,9; anal II,8; scales 3 + 6—25.

General form fusiform; head 2.68, conic, robust; body robust, dorsal and ventral surface arched from tip of snout to caudal peduncle, depth 2.63, breadth behind opercle 1.90 in depth; caudal peduncle tapering, compressed, depth 2.15, length 1.47; eye 2.84, moderate; snout 3.85, rounded, not depressed; mouth large, oblique, upper jaw projecting slightly; maxillary 1.85, extending a little beyond vertical from posterior border of pupil; nostrils small, dis-

tingent, well separated, the anterior provided with a raised flap; interorbital 4.55, rather broad, nearly flat; preopercular margin serrate; intramarginal preopercular crest weakly serrate, the serrations least distinct at angle and on lower border; orbital bones smooth or with slight traces of serrations; small, regular, villiform teeth on jaws, vomer and palatines; peritoneum silvery white; scales regular, firm, ctenoid, somewhat deeper than long; 27 pores in lateral line.

Dorsal spines strong, first 2.38 in second, 5.55 in third, second 1.94 in third, third longest and strongest, 1.72; soft dorsal somewhat higher, 1.61, its distal margin obliquely truncate; caudal forked, lobes rounded; anal 1.92, its distal margin sinuous; ventrals 1.51, not reaching base of anal, their base a little in front of base of pectoral; pectoral 1.39.

Color in alcohol: Ground color yellowish bronze with iridescent reflections; four stripes on side and one along middle of back, light

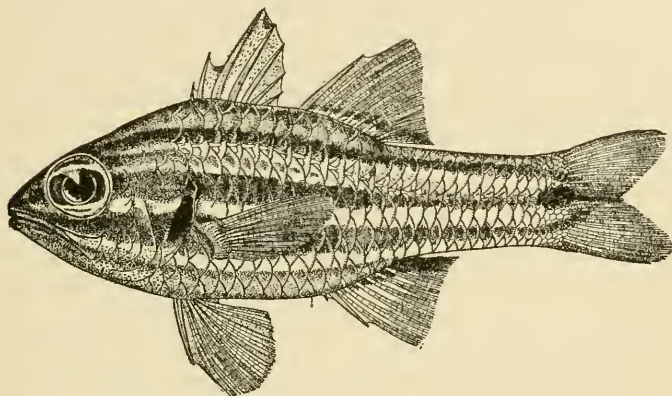


FIG. 2.—*AMIA ROBUSTA*. (From the type. Natural size.)

reddish brown in color, varying in width, but approximately equal to interspaces; the median dorsal stripe begins above anterior margin of eye, divides on nape, following row of scales along base of dorsals, uniting behind soft dorsal, continues to base of caudal; from front of dorsal posteriorly it is broken up into a series of blotches, one on each scale; the first lateral stripe, narrower than the others, joins its fellow near tip of snout, in this respect differing from *aroubiensis* and *novemfasciata*, extends backward over eye, touching upper half of anterior scales of lateral line, decurved near base of caudal, the coloration rapidly fading out on rays; a short stripe of lighter color crosses upper fourth of eye, below pores of lateral line to eleventh scale, where it is decurved and merges into second stripe; the latter encircling snout, passes through middle of eye to base of caudal, enlarging into a darker colored blotch at this point, a dusky shade along caudal to tips of median rays; the third from middle of maxillary, along lower border

of eye, through and above base of pectoral, always parallel with second to base of caudal, curved upward toward second, similar to the first; a fourth from tip of mandible to posterior base of anal; head dusky brown, with an iridescent sheen in places; lateral stripes not nearly so distinct anteriorly as in smaller examples; two silvery lines cross eye forming a margin to second stripe to tip of opercle; opercle brown and iridescent, an irregular dark brown or blackish area above pectoral base; anterior dorsal spines with a silvery sheen, membranes and posterior spines dusky; soft dorsal dusky, a brownish bar along base to tips of posterior rays; caudal dusky, outer and median rays with a brownish tinge; anal similar to soft dorsal; ventrals dusky with traces of a silvery sheen, especially on the spine; pectorals hyaline, axil brownish black, base brownish.

Color in life: Body pearl gray with three broad olive-green stripes along side, another less distinct, along middle of back and base of dorsal and a fifth below base of pectoral; head with yellowish shades; lower portion of opercle with a dusky blotch (while specimen was being described, this was invaded by a silvery white spot about size of pupil); ground colors on cheeks and under pectoral becoming somewhat silvery; first dorsal with greenish yellow shades on anterior membranes; spines silvery white in front; posterior portion of fin purplish; second dorsal washed with orange distally; a dark olive-green bar from base of spine to tips of last rays; caudal somewhat pink; anal pale vermilion, a reddish brown bar from base of spines to tips of posterior rays; edge of fin somewhat dusky; ventral similar to anal but paler, tip dusky; pectoral pale pink; iris dark green.

Small examples in alcohol have the spot at base of caudal more distinct, larger, often black in color; the second and third stripes are broadest, broader than interspaces, parallel, the third not following the curvature of belly as in related species; base of pectoral not darker than rest of stripe; first lateral stripe joins its fellow near tip of snout; traces of a short stripe behind upper third of eye in all save one or two of smallest examples.

The collection contains about 150 specimens from eleven localities in the Philippines and Celebes, principally from the southeastern coast of Luzon. The characteristic coloration, the greater breadth of body, and the more rounded appearance of dorsal surface of head and body are diagnostic of the species.

Jordan and Seale¹ list this species as a color variation of *A. novemfasciata* with the following note: "A third specimen from the same locality has a deeper body, the black stripes more olive, none below level of pectoral; no black bar across axil; a blackish spot on lower part of opercle; fins dull red; both dorsals and anal with an oblique black crossband; stripes on caudal less distinctly converging, the

¹ Fishes of Samoa, p. 243, fig. 37.

outer margin black; first dorsal all black. These specimens differ rather markedly from the ordinary ones and may represent a distinct species, but except in color we find no tangible characters." In the reserve series of the United States Bureau of Fisheries, among the specimens of *A. novemfasciata*, taken by these authors, are a number of examples of this species. These agree with specimens from the Philippines, and their figure, 37, is undoubtedly from a fish of this species; it lacks the short bar behind eye.

The specimen in the reserve series of the United States Bureau of Fisheries identified as *A. fasciata*, Evermann and Seale¹ from Bacon, Philippine Islands, is also this species.

Some of the *Albatross* examples from Canimo Island taken June 15, 1909, and those from Apia are females with eggs in an advanced stage of development. An examination of a number of examples of this species and of *A. novemfasciata* shows both sexes present in each case.

The relative proportions of parts of body of *A. aroubiensis*, *novemfasciata*, *angustata*, and *robusta* are so close that the ordinary comparative measurements when used alone are of little diagnostic value, yet the form of body and differences in coloration are so marked that these species can be separated with comparative ease.

Type.—Cat. No. 68400, U.S.N.M., 8.7 cm. in length, from Jolo Reefs, taken with dynamite.

AMIA VERSICOLOR Smith and Radcliffe, new species.

Dorsal VII-1,9; anal II,8; scales 3+6-23.

General form subovate, compressed; head 2.46, large; body short, deep, depth 2.50; caudal peduncle short slender, depth 3.05, length 2.10; eye 2.90, small; snout 4.06, short, rounded; mouth large, very oblique, jaws subequal; tongue large, thick, with a peculiar pointed, constricted tip; maxillary 1.63, scarcely reaching vertical from posterior border of orbit; nostrils well developed; interorbital 3.40, rather broad, convex; margin of preopercle serrate; intramarginal preopercular crest smooth or with weak serrations; orbital bones smooth; small villiform teeth on jaws, vomer and palatines; peritoneum dusky silvery; scales large, suborbicular, with a marginal row of long slender denticulations; some of the scales have only a few denticulations or none at all, cycloid-like.

Dorsal spines weak, third longest, 2.15; soft dorsal 1.80, margin rounded; caudal rather deeply forked; anal similar to soft dorsal, 2.45; ventrals 1.75, short; pectoral 1.75, broad rounded, short.

Color in alcohol: Ground color dusky silvery; three narrow, slaty black lateral stripes and one along the middle of the back from nape to base of caudal; the first lateral stripe unites with its fellow near

¹ Fishes of the Philippine Islands, 1907, p. 72.

tip of snout, extends over eye to posterior base of second dorsal; the second from near tip of snout through middle of eye to base of caudal; the third from middle of maxillary, below eye, through base of pectoral to base of caudal, parallel with contour of ventral surface, narrowest on caudal peduncle; traces of a fourth from throat to base of ventrals, uniting as a median ventral stripe to base of anal; a broad band of silver forms lower margin to third; spinous dorsal dusky slate, other fins hyaline; constricted tip of tongue white, rest of tongue silver plated.

Color in life of two specimens from Usada Island near Jolo: General color seal brown, over silvery, with reddish shades under this; vertical fins vermilion; paired fins similar but very pale. When first taken from the water these examples were black as in deep-sea fishes—paling later, the reds appearing.

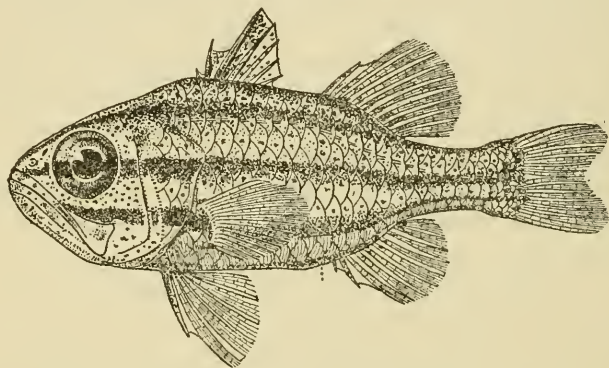


FIG. 3.—*AMIA VERSICOLOR*. (From the type. Twice natural size.)

This interesting little species is subject to a remarkable variation in color and form. Most of the specimens taken with seine at Cataingan Bay, Masbate, are like the type in coloration, the others, together with specimens taken with dynamite at Usada and Pangasinan Islands, are silvery black without or with only slight traces of stripes, others taken with the dredge in deep water are silvery white, the stripes in some very distinct, these shading into forms in which the striping is less and less marked, finally disappearing entirely, especially those taken with seine at Canmahala Bay, Luzon. The silver plating on tongue and the broad silvery band from throat to inferior caudal base are present in all. In form they range from the robust little fish with a very large head to an elongate, spindle-shaped form as in Canmahala Bay examples; these may represent a distinct species, but the gradations from one form to the other are so close that it has seemed best not to separate them.

Following is description of one of slender form from Canmahala Bay, Luzon, length 4.4 cm.:

Dorsal VII-1,9; anal II,8; scales 3+6—23.

Body slender, fusiform; head 2.76; depth 2.92; depth caudal peduncle 2.45, length 1.81; eye 3.02; snout 3.62; maxillary 1.72; interorbital 3.35; pectoral 1.70; ventral 1.70; light brown with silvery reflections; ventral silver stripe margined above with a narrow black line; first dorsal dusky, other fins hyaline; opercular bones silvery; tongue silver plated.

Specimens from Cataingan Bay, the largest being 3.9 cm. in length, had spawned and many males were carrying eggs and apparently fry in mouth. As these had practically all been washed out into preservative it is impossible to determine the conditions in individual cases. Comparison with eggs and young from mouth of *Albatross* examples of *Amia atradorsata* from Chatham Island, Galapagos Islands, shows that the fry are farther advanced in the Philippine species and were free from egg capsule at time of capture. The condition of the young of *Amia atradorsata* indicates that they may have been freed by the shock resulting from placing them in alcohol.

There are 110 specimens in the collection from numerous shore stations between Luzon and the most remote southern parts of the Philippine Archipelago—Sibutu Island and North Balabac Strait; and from various dredging stations at depths of 10 to 169 fathoms.

Type.—Cat. No. 68401, U.S.N.M., 3.9 cm. in length, from Cataingan Bay, Masbate.

AMIA MULTILINEATA Bleeker.

Plate 25.

Apogon multitanicius, BLEEKER, Contribution to ichthyology of Sumbawa, Journal Indian Archipelago and Eastern Asia, vol. 2, 1848; Verhandelingen Bataviaasch Genootschap van Kunsten en Wetenschappen, vol 22, Percoiden, 1849, p. 28.—GÜNTHER, Catalogue of Fishes, vol. 1, 1859, p. 242, (not of Ehrenberg).

Amia multitanziata, BLEEKER, Atlas, vol. 7, p. 319, Percidæ, pl. 41, fig. 1, 1873-76.

Amia multilineata BLEEKER, Atlas, vol. 7, pp. 83-84, 1873-76.

Dorsal VII-1,9; anal II,8; scales 3 + 6—25.

General form oblong, compressed; head 2.87, conic; body robust, dorsal and ventral outline symmetrical; depth 2.66; caudal peduncle elongate, compressed, depth 2.02, length 1.39; eye 2.59; snout 3.55, short, pointed; mouth moderate, oblique, jaws subequal; maxillary 2, reaching vertical from posterior border of pupil; interorbital 5, flat; preopercular margin finely serrate; intramarginal preopercular crest and orbital bones smooth or with a few very weak serrations; villiform teeth on jaws, vomer and palatines; peritoneum silvery white; scales regular.

Dorsal spines long and slender, third longest and strongest, 1.65; soft dorsal higher, 1.28, its distal margin slightly rounded, nearly truncate; caudal forked; anal similar to soft dorsal, 1.54; ventral 1.52; pectoral 1.54.

Color in alcohol: Ground color dull silvery gray with about 18 narrow longitudinal olive brown stripes, those on head indistinct, alternate stripes narrower; a distinct silvery line from tip of snout through lower third of eye, across opercle to above base of pectoral, a second from lower margin of eye to lower base of pectoral; a fine silvery line from eye above posterior nostril meeting its fellow near tip of snout; a median line from this point backward to between eyes where it divides and fades out; fins dusky hyaline; a dusky brown bar at base of soft dorsal and anal to tips of posterior rays. This description is of a specimen 8.2 cm. in length from Jolo Reefs, taken with dynamite.

Color in life of an example 6.6 cm. in length from Tataan Bay: Ground color olive gray with many narrow dark-green olive stripes, these irregularly alternately narrower and wider; the median stripe ends in a blotch at base of caudal; head yellowish green; pearl gray through lower edge of eye across snout and posterior part of head; a similar stripe under eye, through angle of preopercle; posterior and lower parts of head with bronzy and green shades; third and posterior membranes of spinous dorsal yellowish, spines lilac, tips of first four or five scarlet; soft fins orange; pectoral very pale; caudal membranes in fork of fin citron yellow; anal with a dusky bar at base posteriorly; iris dark.

Color in life of an example 7.6 cm. in length from Great Toba Island: Ground pearly gray with numerous olive stripes; side of head olivaceous with white stripe through lower eye from snout to edge of opercle; a similar stripe along upper maxillary to base of pectoral; pale stripes on top of head and snout; fins very pale scarlet or orange; brownish bar across base of second dorsal and anal, other fins unmarked.

In smaller examples, there are fewer stripes, the narrow alternate stripes being the first to disappear. In an example 2.3 cm. in length from Great Toba Island there are three distinct lateral stripes and one along the middle of the back, these are arranged very much as in the young of *A. robusta* except that the first lateral stripe does not unite with its fellow near tip of snout and there is no distinct caudal blotch; very indistinct traces of narrow lines between lateral stripes. The marked similarity in color of the young to some of foregoing species make them difficult to identify, especially where bands and markings on head are not distinct. *Lepidamia noordzieki* (Bleeker) resembles this species in coloration, but is easily identified by the smaller scales.

The collection contains about 25 examples from the Philippines and Celebes.

EXPLANATION OF PLATES.

PLATE 20.

Amia compressa Smith and Radcliffe, new species.

From photograph. Illustrating changes in color pattern at different stages of growth. Upper figure, a fish 4.8 cm. long, from Romblon, Philippine Islands; middle figure, a fish 7.4 cm. long, from same locality; lower figure, a fish 9.5 cm. long, from Biri Channel, east coast of Luzon, Philippine Islands.

PLATE 21.

Upper figure, *Amia compressa* Smith and Radcliffe, new species.

From photograph of a colored drawing of a fish 7.2 cm. long, from Tataan Pass, Tawi Tawi Group, Philippine Islands.

Lower figure, *Amia fasciata* (White).

Copied from White's Journal of a Voyage to New South Wales, p. 268, fig. 1.

PLATE 22.

Upper figure, *Amia aroubiensis* (Hombron and Jacquinot).

From photograph of a fish 6.5 cm. long, from Kayoa Island, west of Gillolo, Dutch East Indies.

Lower figure, *Amia fasciata* (White).

From photograph of a fish 10.2 cm. long, from Port Jackson, New South Wales.

PLATE 23.

Amia novemfasciata (Cuvier and Valenciennes).

From photograph. Illustrating changes in color pattern. Upper figure, a fish 2.6 cm. long from Basa Reef, Gulf of Boni, Celebes; middle figure, a fish 4.8 cm. long, from Sablayan, Mindoro, Philippine Islands; lower figure, a fish 7.8 cm. long, from Gubat Bay, Luzon, Philippine Islands.

PLATE 24.

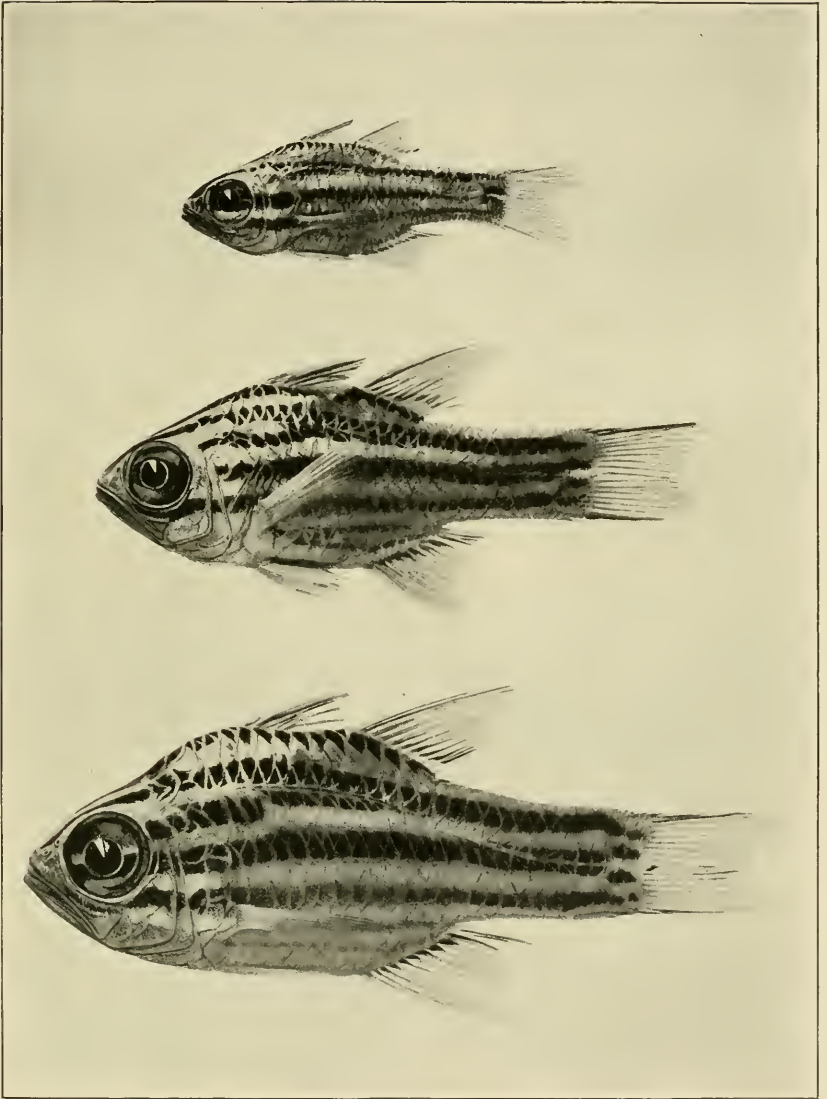
Amia robusta Smith and Radcliffe, new species.

From photograph. Illustrating the characteristic color pattern and the differences in color and form from *A. novemfasciata* at same stages of development. Upper figure, a fish 6.4 cm. long, from Canimo Island near Daet, Philippine Island; middle figure, a fish 4.3 cm. long, from Sablayan, Mindoro, Philippine Islands; lower figure, a fish 2.7 cm. long, from Canimo Island near Daet, Philippine Islands.

PLATE 25.

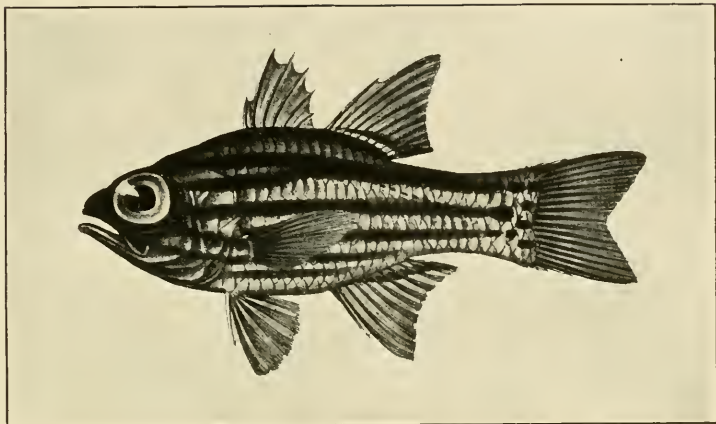
Amia multilineata Bleeker.

From photograph. Illustrating the remarkable changes in color pattern at different ages and the marked resemblance of the young to the young of *A. novemfasciata* and *A. robusta*. Fishes respectively 2.2, 3.9, 4.6, and 7.3 cm. long, from Great Toba Island, Celebes.



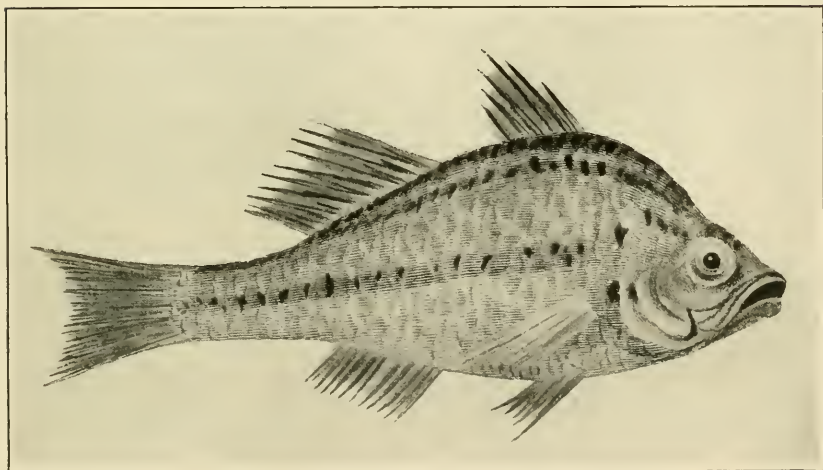
AMIA COMPRESSA.

FOR EXPLANATION OF PLATE SEE PAGE 261.



AMIA COMPRESSA.

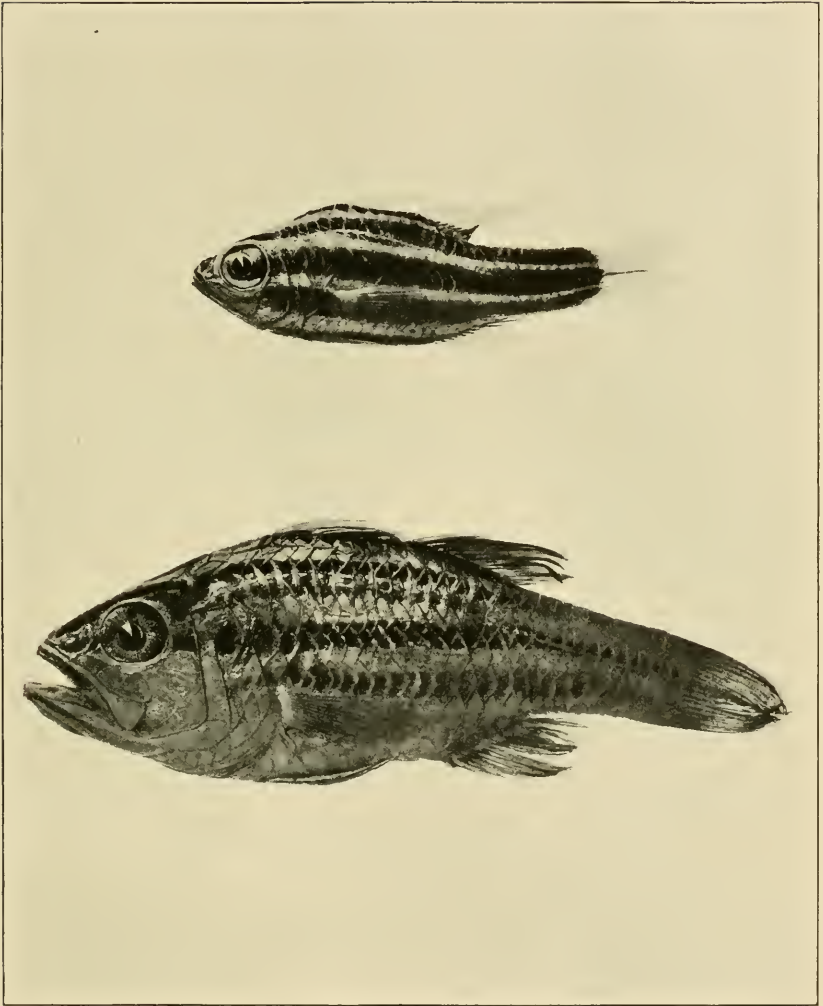
FOR EXPLANATION OF PLATE SEE PAGE 261.



AMIA FASCIATA. AFTER WHITE.

FOR EXPLANATION OF PLATE SEE PAGE 261.



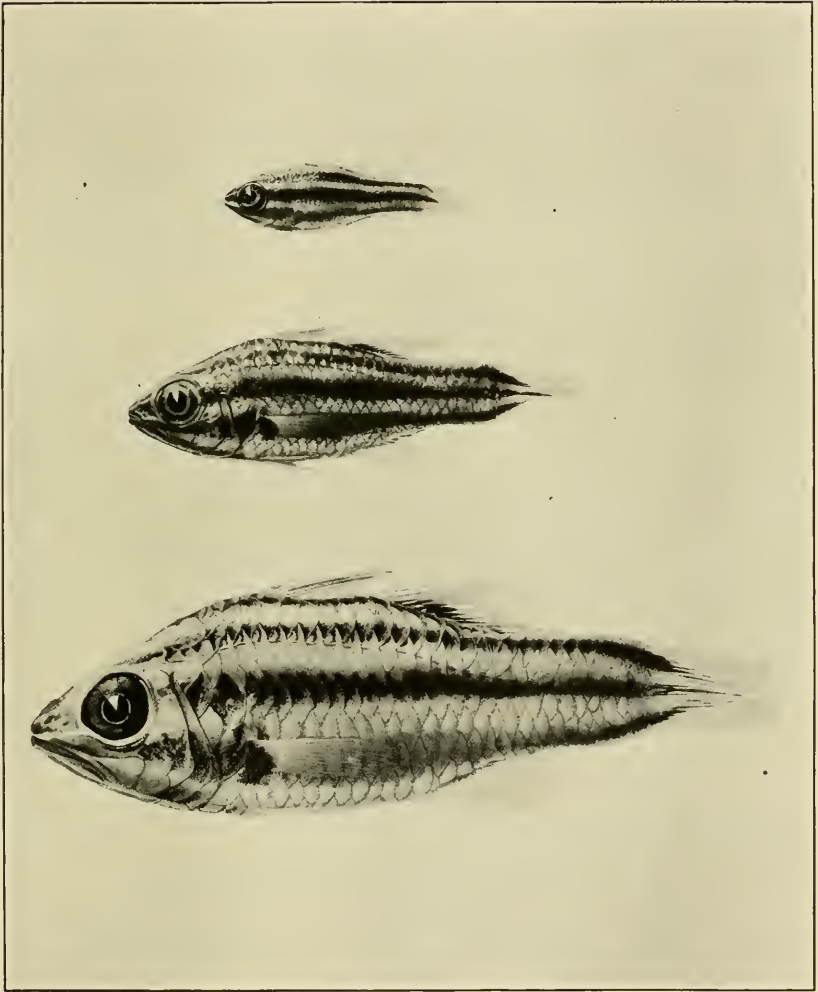


AMIA AROUBIENSIS. UPPER FIGURE.

AMIA FASCIATA. LOWER FIGURE.

FOR EXPLANATION OF PLATE SEE PAGE 261.

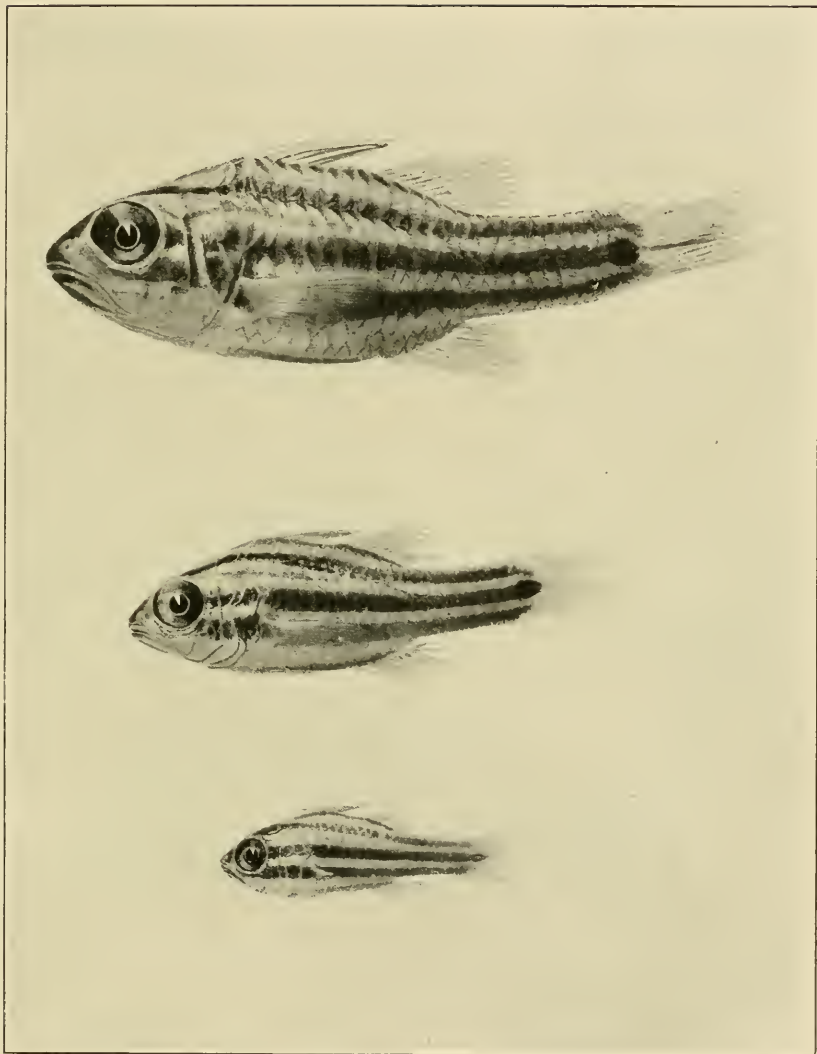




AMIA NOVEMFASCIATA.

FOR EXPLANATION OF PLATE SEE PAGE 261.

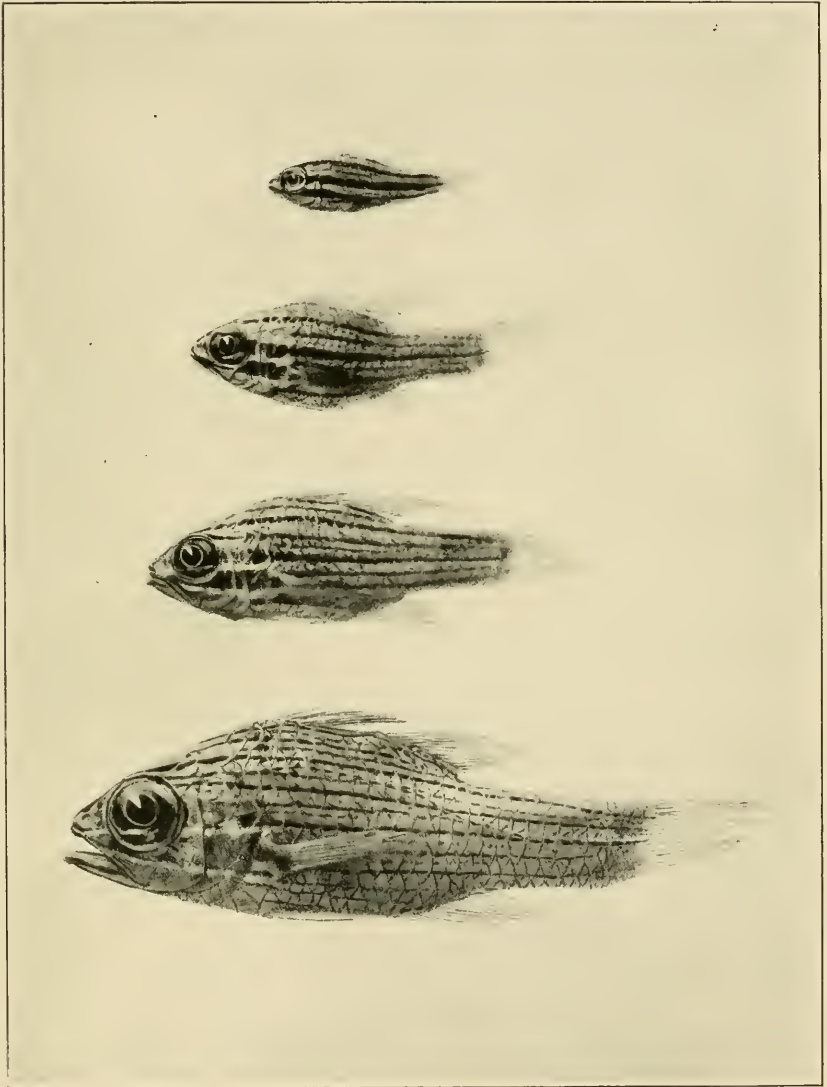




AMIA ROBUSTA.

FOR EXPLANATION OF PLATE SEE PAGE 261.





AMIA MULTILINEATA.

FOR EXPLANATION OF PLATE SEE PAGE 261.

