

**A REVIEW OF THE SILUROID FISHES FOUND ON THE PACIFIC COAST OF TROPICAL AMERICA, WITH DESCRIPTIONS OF THREE NEW SPECIES.**

**By DAVID S. JORDAN and CHARLES H. GILBERT.**

Our knowledge of the marine Siluridæ of the west coast of Mexico and Central America has been due entirely to the labors of Gill, Günther, and Steindachner. Sixteen species apparently valid have been made known by these authors, to which three others are added in the present paper. Fourteen species were obtained by Mr. Gilbert at Mazatlan and Panama. All of these we have here redescribed, and the synonymy of the remaining species is given, together with a key by which they can be readily distinguished.

Genus *ÆLURICHTHYS* Baird & Girard.

*Ælurichthys* Baird & Girard, Proc. Ac. Nat. Sci. Phila. vii, 26.

ANALYSIS OF SPECIES OF *ÆLURICHTHYS*.

- a. Dorsal spine produced in a band-like filament which nearly or quite reaches the caudal fin; maxillary barbel and pectoral filament reaching past the vent; fontanelle distinct, broader than pupil; occipital process little conspicuous; anterior lobe of anal not reaching base of last rays; anal and usually ventrals above, with a conspicuous black blotch.....PINNIMACULATUS, 1.
- aa. Dorsal spine not produced in a filament; maxillary barbel reaching little if any more than half way to vent; pectoral filament rarely reaching vent; fontanelle inconspicuous, not so broad as pupil; occipital process prominent, especially in the males; anterior lobe of anal high, in the adult reaching past last rays; anal and ventrals without conspicuous black blotch.....PANAMENSIS, 2.

1. *Ælurichthys pinnimaculatus* Steindachner.

*Ælurichthys pinnimaculatus* Steindachner, Ichthyol. Beiträge, iv, 15, 1875, taf. viii. (Altata; Costa Rica; Panama.)

*Habitat*.—Pacific coast of tropical America; Mazatlan; Altata; west coast of Costa Rica; Panama.

Head  $4\frac{1}{10}$  ( $5\frac{1}{4}$  in total with caudal); width of head 5; depth  $5\frac{1}{5}$  (7). D. 1, 7; A. 5, 23. Length (28347) 20 inches.

Body elongate, compressed, the head broad and depressed, the anterior profile concave, rising rapidly to the front of the dorsal fin; head considerably broader than deep; interorbital space about  $1\frac{1}{2}$  in head; breadth of mouth about 2, length of snout 5. Eye moderate, anterior, 5 to 7 in head, placed close to the angle of the mouth, and not much above its level.

Teeth all pointed; vomerine and palatine teeth, forming a continuous, rather narrow, crescentiform band, the four different components indicated by slight constrictions, which are most distinct in the young; vomerine bands somewhat broader than palatine bands, which are not prolonged backward.

Maxillary barbels compressed and band-shaped, their attenuated tips reaching more or less past the front of the anal fin. Mental barbels short, nearly 3 in head.

Occipital process longer than broad, ascending rather steeply backward, forming an angle with the rest of head, reaching nearly to the base of the dorsal, its surface covered with smooth skin. Fontanelle rather broad, extending from the snout to the base of the occipital process, its posterior part narrow, groove-like. Shields of head mostly smooth, the temporal region and occipital process often with small granulations. Cheeks hard and prominent, the region between them and top of head somewhat concave.

Dorsal spine ending in a long, band-like, obliquely striated and articulated filament, which extends more or less past base of caudal. Adipose fin short and high. Caudal widely forked, the upper lobe somewhat longest, about one-fifth longer than head. Anal somewhat emarginate, a little shorter than head, the anterior lobe falling considerably short of the base of the fin. Pectoral spine ending in a band-like filament like that of the dorsal spine; the filament varying in length, usually reaching nearly to last rays of anal. Humeral process covered by soft skin.

Color dark brown, with bluish luster, silvery below; a round pale spot in the center of fontanelle (traces of which are seen in all our species of *Arius* and *Ælurichthys*); fins all pale; the anal with a large, roundish, black blotch in front; the upper edge of the ventrals usually, but not always, with a similar black blotch.

This species is generally abundant along the Pacific coast of tropical America, although less common than *Ælurichthys panamensis*. It reaches a length of about 2 feet. Specimens were obtained at Mazatlan and Panama.

SPECIMENS IN UNITED STATES NATIONAL MUSEUM.

28192. Mazatlan. Gilbert.  
 28347. Mazatlan. Gilbert.  
 29447. Panama. Gilbert.  
 29456. Panama. Gilbert.  
 31016. Panama. Gilbert.  
 Panama. Rev. Mr. Rowell.

2. *Ælurichthys panamensis* Gill.—*Bagre*.

*Ælurichthys panamensis* Gill, Proc. Ac. Nat. Sci. Phila. 1863, 172 (young; Panama); Günther, Fishes Centr. Amer. 1869, 476 (copied from Gill); Steindachner, Ichth. Beiträge, iv, 14, 1875, taf. ii (Magdalena Bay; Altata; Panama).

*Ælurichthys nuchalis* Günther, Cat. Fishes Brit. Mus. v, 179, 1865 (♂, Panama); Günther, Fishes Centr. Amer. 476, 1869, pl. 81, f. 2.

*Habitat*.—Pacific coast of Central America; Magdalena Bay; Mazatlan; Altata; Punta Arenas; Libertad; Panama.

Head  $3\frac{2}{3}$  ( $4\frac{2}{3}$ ); width of head  $4\frac{4}{5}$ ; depth  $4\frac{1}{3}$ . D. I, 7; A. 5, 21. Length (29174) 18 inches.

Body little elongate; the head rather broad, but not much depressed; the anterior profile scarcely concave, elevated in front of dorsal fin; head somewhat broader than deep; interorbital space about  $1\frac{3}{5}$  in head; breadth of mouth  $1\frac{3}{4}$ ; length of snout  $3\frac{1}{4}$ ; eye rather large, 5 to 7 in head, placed close to the angle of the mouth, and not much about it; vomerine and palatine teeth confluent into a band, the component parts indicated by conspicuous constrictions, more or less separated in the young; vomerine patches considerably larger than those on the palatines, the latter not prolonged backward.

Maxillary barbels compressed, of varying length, longest in the young; in the adult rarely reaching beyond the middle of the pectoral spine. Mental barbels short, about 3 in head. Occipital process varying with the sex—in the male broad-ovate, somewhat constricted toward the base, nearly as broad as long, in the females more or less narrow, the form and degree of roughness extremely variable; the plates rough-granular in old males, nearly smooth in the females, the occipital process being more or less coarsely striate; cheeks little prominent; fontanelle narrow, not very conspicuous, forming a groove which extends from the interorbital space to the base of the occipital process.

Dorsal spine slender and rather short, not produced into a filament, the greatest height of the fin  $1\frac{2}{5}$  in head, the anterior margin of the spine weakly and bluntly serrated; adipose fin short and high; caudal widely forked, the upper lobe little longest, slightly shorter than head; anal high anteriorly, emarginate, the anterior lobe much highest in the adult, in which it extends considerably beyond the last rays of the fin. Pectoral spine slender, ending in a band-like filament, which usually reaches about to the vent. Humeral process covered by soft skin.

Color brownish above, with bluish and golden reflections, paler below, the white of the lower parts almost everywhere soiled with dark punctulations, which are especially numerous on the lower side of the head. Dorsal dusky; other fins pale, more or less soiled by dark points; the pectorals and ventrals more or less dusky above, but without distinct dark blotches; barbel dark; a pale spot in the center of the fontanelle.

This species is extremely common for the whole length of the Pacific coast of tropical America. It reaches a length of about 20 inches, and is known to the fishermen as "*Bagre*." It is rarely eaten. It was observed by Mr. Gilbert at Mazatlan, Punta Arenas, Libertad, and Panama.

We are unable to find the type of this species in the Museum.

#### SPECIMENS IN THE NATIONAL MUSEUM.

- 28181. Mazatlan. Gilbert.
- 28294. Mazatlan. Gilbert.
- 29174 (5 specimens). Mazatlan. Gilbert.
- 29310. Punta Arenas. Gilbert.
- 29606. Mazatlan. Gilbert.

## Genus GALEICHTHYS Cuv. &amp; Val.

*Galeichthys* C. & V. Hist. Nat. Poiss, xv, 29.

3. *Galeichthys peruvianus* Lütken.

*Galeichthys peruvianus* Lütken, Vid. Medd. 1874, 205 (Callaō); Steindachner, Ichth. Beitr. iv, 34 (Altata; Panama; Callaō).

*Habitat*.—Pacific coast of tropical America, from Mexico to Peru; Altata; Panama; Callaō.

No specimens of this species are in the National Museum.

## Genus ARIUS\* Cuvier &amp; Valenciennes.

*Arius* Cuvier & Valenciennes, Hist. Nat. Poiss, xv, 53.

*Ariodes*, *Hexanematichthys*, *Guiritinga*, *Hemiaris Cephalocassis*, *Netuma*, *Pseudarius*, *Notarius*, *Ariopsis*, and *Leptarius* of authors.

## ANALYSIS OF SPECIES OF ARIUS.†

- a. Bands of palatine teeth, each more or less produced backwards‡ on the pterygoid region, from the inner posterior margin or angle; teeth villiform; vomerine bands of teeth contiguous or confluent. (Species with coppery luster in life.) (*Netuma* Bleeker.)
- b. Ante-dorsal shield large, not crescent-shaped, its length on the median line more than one-tenth that of head; vomerine bands of teeth united.
- c. Ante-dorsal shield much broader than long, its anterior margin truncate; occipital process very short, truncate behind; fontanelle short, ending obtusely at a point much nearer tip of snout than front of dorsal; head  $3\frac{1}{2}$  in length.
- ALATUS, 4.
- cc. Ante-dorsal shield longer than broad, its anterior margin acute; occipital process short, emarginate behind; fontanelle large, ending acutely at a point nearer base of dorsal than tip of snout; head  $3\frac{1}{2}$  ..... BRANDTI, 5.
- aa. Ante-dorsal shield small, crescent-shaped, its length on the median line much less than one-tenth head.
- d. Vomerine bands of teeth fully confluent with each other, and usually with the palatine bands also.
- e. Interorbital area more or less uneven, ridged, or granulated.
- f. Fontanelle obtuse posteriorly, not prolonged in a groove behind; shields coarsely granular; barbels short; caudal less than two-thirds head; head very large,  $3\frac{1}{2}$  in length. KESSLERI, 6.

\* Some of the generic names included in the above synonymy may, perhaps, be worthy of retention. All the American species examined by us are, however, in our opinion, fully congeneric, although four subgenera may be recognized among them.

† *Arius felis* (L.) J. & G., the common species of the coasts of the United States, is here inserted for purposes of comparison. *Arius troscheli* is omitted, the description of the shields of the head being insufficient for comparison.

‡ This character has not been verified in *A. alatus*; which, however, doubtless agrees with *A. brandti* in this respect.



- ff.* Fontanelle acute posteriorly, prolonged in a groove; shields finely granular; barbels rather long; caudal more than two-thirds head; head 4 in length ..... INSCULPTUS, 7.
- ee.* Interorbital space flat and smooth, a triangular smooth area extending backward from it.
- g.* Groove of fontanelle almost obsolete, not reaching occipital process; occipital process about as broad at base as long, its margins concave; caudal a little shorter than head; head  $3\frac{1}{2}$  in length; shields of head rather coarsely granular ..... PLANICEPS, 8.
- gg.* Groove of fontanelle well defined, reaching occipital process; occipital process longer than broad, its margins straight; barbels short, compressed at base; caudal as long as head; head long,  $3\frac{3}{4}$  in length, its shields finely granular; pectorals and ventrals sometimes black at base. PLATYPOGON, 9.
- dd.* Vomerine bands of teeth separated on the median line\*; fontanelle prolonged backward in a groove; interorbital area with smooth ridges.
- h.* Mouth large, its breadth half or more length of head; spines low, less than two-thirds head; head large,  $3\frac{3}{4}$  in length.  
ELATTURUS, 11.
- hh.* Mouth small, its breadth much less than half head; spines high, not much shorter than head; caudal nearly as long as head; head small, 4 in length ..... OSCULUS, 12.
- aa.* Bands† of palatine teeth, without backward prolongation on the inner margin; vomerine bands of teeth not confluent; ante-dorsal shield small, crescent-shaped; species mostly with blue luster in life.
- i.* Eyes placed well above level of angle of mouth.
- j.* Teeth on vomer and palatines villiform or bluntly conical, not granular. (*Hexanematichthys*‡ Bleeker.)
- k.* Interorbital area flattish and smooth, without ridges or granulations; fins not low, the spines more than half head; gill-membranes not meeting in an angle.
- l.* Fontanelle prolonged backward as a narrow groove.
- m.* Inner edge of bases of paired fins jet-black; occipital process short, less than one-third head.
- n.* Occipital process emarginate at tip; bands of palatine teeth moderate (varying with age); barbels rather short; head  $3\frac{1}{4}$  in length ..... ASSIMILIS, 13.
- mm.* Occipital process truncate at tip; bands of palatine teeth small, not twice as large as vomerine bands; barbels rather long; head  $3\frac{3}{8}$  in length.  
CÆRULESCENS, 14.
- mm.* Inner edges of paired fins pale; occipital process long, its length about one-third head, its tip convex; head  $3\frac{3}{4}$  in length ..... FELIS. §

\* This character varies somewhat with age, and may prove unreliable.

† This character has not been verified in *cærulescens*, *melanopus*, and *fürthi*.

‡ = *Notarius*, *Leptarius*, and *Ariopsis* Gill.

§ *Silurus felis* L. Syst. Nat.: *Arius milberti* Cuv. & Val. xv, 74: *Arius equestris* B. & G. Proc. Ac. Nat. Sci. Phila. 1855, 26. Cape Cod to Texas; everywhere very abundant along the Atlantic coast of the United States.

- ll. Fontanelle not prolonged backward in a groove; bases of paired fins pale; body slender; caudal about as long as head ..... GUATEMALENSIS, 15.
- kk. Interorbital area with smooth ridges; fins very small, the spines less than half head; fontanelle very short, not prolonged in a groove behind; gill-membranes meeting in an angle; shields smoothish; vomerine bands separate; barbels extremely long; head 4 in length; body very slender.....DOWI, 16.
- kkk. Interorbital area with four very rough granulated ridges; shields of head coarsely granular; vomerine and palatine teeth on each side confluent in a small roundish patch; gill-membranes not forming an angle; fontanelle prolonged backward in a groove; spines high; head  $4\frac{1}{2}$  in length .....DASYCEPHALUS, 17.
- jj. Teeth on vomer and palatines granular (*Arius* C. & V.); shields not very rough; fontanelle groove-like posteriorly.
  - o. Vomerine teeth coarse, the patches near together; ventrals pale; head  $3\frac{3}{8}$  in length.....FÜRTHI, 18.
  - oo. Vomerine teeth small, the patches widely separated; ventrals jet-black on the inner margin; head  $3\frac{1}{2}$  in length .....MELANOPUS, 19.
- hh. Eyes placed very low, not above the level of the angle of the mouth (*Cathorops* J. & G.).

p. Body slender, compressed; shields of head rugose rather than granular; fontanelle groove-like posteriorly, interorbital area with smooth ridges; fins high; jaws thin, with thin lips; teeth on palate bluntish-conical, forming two large patches, separated on the median line by a very wide space; barbels long.

HYPOPHTHALMUS, 20.

4. *Arius alatus* Steindachner.

*Arius alatus* Steindachner, Ichth. Beitr. iv, 19, taf. vi, 1875 (Panama); Steindachner, Zur Fisch-Fauna des Canca und der Flüsse bei Guayaquil, 1880, 45, taf. v f. 2 (Guayaquil).

*Habitat*.—Pacific coast of Tropical America; Panama; Guayaquil.

This species is known to us only from the accounts given by Dr. Steindachner.

5. *Arius brandtii* Steindachner.—*Bagre Colorado*.

*Arius brandtii* Steindachner, Ichthyol. Beiträge, iv, 21, taf. iii, 1875 (Altata; Panama).

*Habitat*.—Pacific coast of tropical America; Mazatlan; Altata; Punta Arenas; Panama.

Head  $3\frac{1}{4}$  ( $3\frac{5}{8}$ ); width of head  $4\frac{1}{5}$  ( $4\frac{5}{8}$ ); depth 5 ( $6\frac{1}{5}$ ); length (28230) 24 inches. D. I, 7; P. I, 12; A. 3, 16.

Body comparatively robust, broad anteriorly; head not much depressed, broader than high; eye moderate, 7 to 8 times in length of head; width of interorbital space  $1\frac{2}{3}$ ; breadth of mouth  $1\frac{2}{3}$ ; length of snout  $3\frac{1}{4}$ .

Teeth all villiform; band of vomerine teeth simple, trapezoidal, quadrangular, longer than broad, without division on median line; band of palatine teeth very large, each separated in young specimens from the

vomerine band by a narrow toothless line; in old specimens the vomerine and palatine bands are wholly confluent; each palatine band with a narrow backward prolongation on the median line. Band of premaxillary teeth broad, about six times as long as wide. Lower jaw included.

Maxillary barbel nearly or quite reaching gill-opening. Outer mental barbels about two-fifths head; the inner nearly four-fifths.

Ante-dorsal plate much larger than usual in this genus, shaped like an armorial-shield, its posterior margin concave, its anterior end acute, wedged into a deep emargination of the occipital process, the two becoming co-ossified with age. Length of ante-dorsal plate on the median line 5 to 6 in head, a little more than its width; occipital process short and broad, much broader than long; its median line with a broad keel, its edges nearly straight. Shields all coarsely granular, the granulations anteriorly forming radiating striæ.

Fontanelle large, claviform, broadest posteriorly, its posterior end about midway between tip of snout and front of dorsal; its greatest breadth about equal to the diameter of the eye and one-sixth its length; a short groove extending backward from its obtuse tip; sides of fontanelle bony and granulated for its whole length, the granules extending forward to opposite nostrils.

Dorsal spine strong,  $1\frac{2}{3}$  in head, moderately compressed; pectoral spine  $1\frac{1}{2}$  in head. Axillary pore obsolete. Humeral process coarse, granular, broad, nearly half length of pectoral spine. Base of adipose fin scarcely two-thirds length of anal, its posterior margin little free. Caudal deeply lunate, small, its upper lobe slightly the longest and narrowest,  $1\frac{2}{3}$  in head. Ventrals not quite reaching anal; vent much nearer base of ventrals than anal.

Dark brown, with strong bronze luster above, white below; dorsal dusky, especially above; pectorals blackish; anal dark; caudal rather pale; ventrals usually dark towards the tip, their inner side pale; maxillary barbel dusky; mental barbels pale.

This species is not rare along the Pacific coast of tropical America, specimens having been observed at Mazatlan, Punta Arenas, and Panama. At Mazatlan, it is known as "Bagre Colorado", and is said to reach a larger size than any other of the Cat-fishes. It is used for food.

SPECIMENS IN UNITED STATES NATIONAL MUSEUM.

28230. Mazatlan. Gilbert.  
29254. Mazatlan. Gilbert.  
29262. Panama. Gilbert.

6. *Arius kessleri* Steindachner.

*Arius kessleri* Steindachner, Ichth. Beiträge, iv, 24, 1875, taf. v (Altata; Panama).

*Habitat*.—Pacific coast of tropical America; Altata; Panama.

Head  $3\frac{1}{3}$  (4); depth 6 (7); width of head 4; length (29252) 14 inches. D. 1, 7; A. 4, 13.

Body rather long and low; the head long, broad, and much depressed, much broader than deep. Eye very small, about 10 in head, placed well above the mouth. Interorbital space 2 in head; snout  $3\frac{1}{3}$ ; breadth of mouth 2.

Mouth large, with thickish lips, the upper jaw considerably projecting. Teeth all villiform, rather pointed. Vomerine patches rather large, roundish, usually fully confluent into a trapezoidal band, without division on the median line, and separated by a very narrow groove from the palatine bands. Palatine bands very large, broadly triangular, with a backward prolongation from the inner margin, as in *A. brandti*. (Teeth on vomer and palatines all forming one continuous band in old specimens, according to Steindachner). Bands of teeth in jaws broad, the jaws strong. Barbels rather short and very slender, the maxillary barbels reaching little past base of pectoral; outer mental barbels about reaching gill-opening; inner about as long as snout.

Ante-dorsal shield short, crescent-shaped, rough, but without median keel. Occipital process long, narrowly triangular, its edges straight, its length one-fourth to one-half more than its width at base, its median line sharply keeled.

Fontanelle broad and shallow, its posterior end obtuse or almost truncate, its tip not prolonged in a groove, its edge bounded by a bony ridge, which is not granulated in front of middle of eye; end of fontanelle about midway between tip of snout and front of dorsal; its greatest width about equal to length of eye. Shields of head all very coarsely granular, the roughnesses extending forward about to the eye. Gill-membranes forming a very broad free fold across isthmus.

Dorsal spine moderate, a little more than half head, about equal to pectoral spine. Humeral process triangular, granular, not quite two-fifths length of pectoral spine. Axillary pore obsolete. Adipose fin long and low, its posterior margin little free. Caudal short and broad, the upper lobe longest,  $1\frac{2}{3}$  in head. Anal and ventrals rather small, the vent close behind the latter.

Color dark brown, with bronze reflections; belly white. Fins all dusky in one specimen, in the other mostly pale. Maxillary barbels dusky; others pale.

Two large specimens were obtained at Panama.

SPECIMENS IN UNITED STATES NATIONAL MUSEUM.

29252. Panama. Gilbert.

29413. Panama. Gilbert.

7. *Arius insculptus*, sp. nov.

Head 4 ( $4\frac{2}{3}$ ); depth  $5\frac{2}{3}$  ( $6\frac{2}{3}$ ); width of head  $4\frac{2}{3}$ . Length (29415)  $13\frac{1}{2}$  inches. D. 1, 6; A. 4, 14.

Body moderately elongate, little compressed, the caudal peduncle



slender and short. Head shortish, low and broad, anteriorly depressed. Eye rather large,  $6\frac{1}{2}$  in head, placed rather high; interorbital space flat and nearly smooth, 2 in head; snout 3; breadth of mouth  $\frac{1}{8}$ . Snout very bluntly rounded, almost truncate in front.

Mouth large; teeth all villiform; vomerine bands of teeth large (fully confluent with each other in the type, partly separated in smaller examples), and with the large, club-shaped band on the palatines, from which they are separated by a slight furrow and constriction; palatine band of teeth with a backward prolongation. Premaxillary band of teeth large. Maxillary barbellong, somewhat compressed, extending to middle of pectoral spine. Outer mental barbel reaching base of pectoral spine; inner 2 in head.

Ante-dorsal shield short, crescent-shaped, without median keel, its tips produced, its length on the median line about two-fifths the length of one of its halves. Occipital process about as broad at base as long, with a moderate median keel, its lateral margins somewhat concave. Fontanelle becoming gradually contracted at a point a little nearer base of dorsal than top of snout, thence forming a narrow groove, which extends to within the diameter of the pupil of the base of the occipital process, this groove sometimes nearly obsolete. Greatest width of fontanelle about three-fifths diameter of eye. Granulated striæ extending along the sides of the fontanelle to a point opposite or in front of middle of eye.

Shields of head finely and evenly granulated, the roughnesses more uniform than usual and many of them arranged in lines, especially anteriorly. Opercle not striate, the skin marked with fine vermiculations. Gill-membranes forming a broad fold across the isthmus.

Dorsal and pectoral spines long, about equal,  $1\frac{1}{3}$  in head. No axillary pores. Humeral process very large, triangular, finely granular, about half as long as pectoral spine. Adipose fin large, without free tip. Upper lobe of caudal longest,  $1\frac{1}{2}$  in head. Anal and ventrals moderate, the vent close behind the latter.

Color rather pale; belly pale. Fins and barbels all pale, or but slightly tinged with dusky.

A single adult male specimen was obtained at Panama. Two smaller ones are in the Museum collection, also from Panama.

SPECIMENS IN UNITED STATES NATIONAL MUSEUM.

29415. Panama. Gilbert.

30977 (2). Panama. Rev. Mr. Rowell.

8. *Arius planiceps* Steindachner.

*Arius planiceps* Steindachner, Ichth. Beitr. iv, 26, taf. iv, 1875 (Panama; Altata).

? *Sciades troscheli* Gill, Proc. Ac. Nat. Sci. Phila. 1863, 171 (Panama).

*Habitat*.—Pacific coast of tropical America; Altata; Panama.

Head 4 ( $4\frac{1}{8}$ ); depth  $5\frac{1}{3}$  ( $5\frac{2}{3}$ ); width of head 5; length (29417) 11 inches. D. I, 7; A. 4, 13.

Body comparatively elongate; the head small, rather narrow, depressed anteriorly; the snout rather narrow and moderately rounded. Eye moderate, placed well above mouth, its length  $5\frac{1}{2}$  in head. Interorbital space flat and smooth,  $2\frac{1}{4}$  in head; snout  $3\frac{1}{5}$ ; breadth of mouth 2.

Mouth rather large, with thickish lips. Teeth villiform. Vomerine bands moderate, confluent with each other and with the much larger ovate palatine bands; a slight constriction or furrow marking the divisions. Palatine bands each with a backward prolongation. Pre-maxillary band moderate. Barbels very short; maxillary barbel scarcely or not reaching to base of pectoral; outer mental barbel scarcely past gill-opening below; inner shorter than snout.

Ante-dorsal shield short, anteriorly truncate, not keeled, the length on the median line about half of one of its halves. Occipital process subtriangular, rather narrow, truncate behind, its margins straight, becoming concave forward, its width at base about equal to its length; fontanelle an almost obsolete groove, its posterior end not reaching base of occipital process by about the diameter of the eye; the groove extending forward to a point about midway between tip of snout and base of dorsal spine. Anterior to this point is an equilateral triangle, flat, covered with smooth skin, the base of the triangle formed by the smooth, flattish, interorbital area. Shields of head rather coarsely granular-striate, the granulations beginning anteriorly about opposite posterior margin of eye. Opercle scarcely striate. Gill membranes forming a moderate fold across the isthmus.

Dorsal spine high, about equal to pectoral spine, and but little shorter than head. No axillary pore. Humeral process triangular, granulated a little more than one-third length of pectoral spine. Adipose fin rather long. Upper lobe of caudal longest, a little shorter than head. Ventrals and anal moderate.

Color brownish, not very dark; belly pale, thickly speckled with brown; fins more or less dusky; maxillary barbels black; mental barbels pale.

Two specimens were obtained at Panama. They disagree in several details from Steindachner's description, and it is possible that they belong to a different species. The head in Steindachner's types is  $3\frac{3}{4}$  to  $3\frac{1}{2}$  in length, and the occipital process is narrower and less widened anteriorly.

SPECIMENS IN UNITED STATES NATIONAL MUSEUM.

29417. Panama. Gilbert.

29500. Panama. Gilbert.

9. *Arius troscheli* (Gill) Günther.

*Sciades troscheli* Gill, Proc. Ac. Nat. Sci. Phila. 1863, 171 (Panama).

*Arius troscheli* Günther, Cat. Fish. Brit. Mus. v, 1864, 150 (copied from Gill).

*Habitat*.—Pacific coast of Central America; Panamá.

This species is apparently related to, *A. planiceps*, &c., but on account

of the insufficiency of the description we are unable positively to assign its place in the genus. It may possibly be identical with *A. planiceps*.

The type of the species cannot now be found in the Museum.

#### 10. *Arius platypogon* Günther.

*Arius platypogon* Günther, Cat. Fishes Brit. Mus. v, 147, 1864 (San José de Guatemala); Steindachner, Ichthyol. Beiträge, iv, 17 (Magdalena Bay; west coast Central America; Callao).

*Habitat*.—Pacific coast of tropical America, from Lower California to Peru; Magdalena Bay; Mazatlan; Libertad; Punta Arenas; San José de Guatemala; Panama; Callao.

Head  $3\frac{2}{3}$  ( $4\frac{2}{5}$ ); width of head  $4\frac{2}{5}$ ; depth  $5\frac{1}{5}$  ( $6\frac{2}{5}$ ); length (28286)  $15\frac{1}{2}$  inches. D. I, 7; A. 4, 14.

Body rather elongate, the head not very broad nor much depressed, a little broader than deep. Eye rather large, 5 to 6 in head. Interorbital space slightly more than half head, a trifle less than width of mouth; length of snout  $3\frac{1}{5}$  in head.

Teeth all pointed; bands of vomerine teeth small, roundish, their boundaries traceable by a slight depression in the young, in the adult fully confluent with each other and with the palatine bands; palatine bands broad, ovate, several times as large as the patches on vomer, continued backwards over the pterygoid region; premaxillary band rather broad, 5 to 6 times as broad as long; maxillary barbel reaching past base of pectoral in the young, not to gill-opening in the adult; its base a little broader and more compressed than usual in *Arius*; outer mental barbels 2 in head; inner  $2\frac{1}{2}$ .

Ante-dorsal shield very short, lunate, subtruncate in front, its breadth more than three times its length on the median line. Occipital process long, triangular, with straight margins, its length about  $1\frac{2}{3}$  times its width in front, its broad median line rather sharply keeled. In the young it is proportionally shorter, little longer than broad. At the beginning of this keel is the end of the long, narrow, groove-like fontanelle, which extends forward to a point just behind the eye, where it merges into the flattish and smooth anterior part of the head. Shields of head all finely granular, the granules rarely forming distinct lines.

Dorsal spine long,  $1\frac{1}{3}$  to  $1\frac{1}{2}$  in head, the soft rays projecting beyond the spine. Pectoral spine about as long as dorsal, sharply serrate behind, the anterior serræ not very sharp; axillary pore small or absent. Humeral process nearly smooth, rather narrow and short, half length of pectoral spine. Adipose fin short and rather high, its base barely two-fifths length of base of anal. Caudal deeply forked, its upper lobe longest, and slightly falcate, about as long as head. Ventrals reaching anal in the females, shorter in the males. Vent nearer base of ventrals than anal.

Color in life very pale olive brown, with bronze and blue reflections;



white below. Fins all pale, the tip of anal and edges of caudal somewhat dusky; female with fins rather darker, the upper edge of the pectorals and ventrals largely black; in the male these fins are pale, or somewhat brown above. Maxillary barbels blackish; lower pale.

Generally abundant along the Pacific coast of tropical America. Specimens were observed by Mr. Gilbert at Mazatlan, Libertad, Punta Arenas, and Panama. It reaches a length of about 18 inches, and is seldom eaten.

The males of this species, according to Dr. Steindachner, carry the eggs in their mouths until after hatching.

## SPECIMENS IN UNITED STATES NATIONAL MUSEUM.

28215.	Mazatlan.	Gilbert.
28259.	Mazatlan.	Gilbert.
28262.	Mazatlan.	Gilbert.
28286.	Mazatlan.	Gilbert.
29257.	Punta Arenas.	Gilbert.

11. *Arius elatturus*, sp. nov. (29408.)

Head  $3\frac{2}{3}$  ( $4\frac{1}{3}$ ); depth  $5\frac{3}{4}$  ( $6\frac{3}{4}$ ); width of head  $4\frac{2}{5}$ ; length (29408)  $12\frac{1}{2}$  inches. D. I, 6; A. 4, 14.

Body low, not very elongate, the head rather short and very broad, much broader than deep, the snout depressed and very broadly rounded, almost truncate. Eye moderate, placed rather high, its diameter 7 in head. Interorbital space  $2\frac{1}{6}$  in head; snout  $3\frac{1}{3}$ ; breadth of mouth  $1\frac{7}{8}$ . Mouth large, with thick lips, the upper jaw considerably projecting. Teeth on vomer and palatines villiform, but bluntly conical, less acute than in most of the species. Vomerine patches oblong, small, separated by a narrow interspace from each other and from the palatine bands, which are roundish and comparatively small, with a backward prolongation. Teeth in the jaws in broad bands. Barbels rather short, the maxillary barbels reaching a little past base of pectorals, the outer mental barbels a little past gill-opening, the inner a little more than one-third head.

Ante-dorsal shield not very short, crescent-shaped, with a distinct median keel, its length on the median line about one-third its breadth. Occipital process short, broadly triangular, with concave sides which spread out abruptly near the base, forming a sort of shoulder; its length scarcely equal to its width at base. Median keel well developed.

Fontanelle broad and shallow, abruptly narrowed posteriorly at a point a little nearer base of dorsal than tip of snout, but extending as a groove to a point distant less than a diameter of the eye from the base of the occipital process, this groove indistinct in the smaller specimen. Greatest width of fontanelle scarcely more than half eye. Shields of head granular-striate, the roughness less coarse than in *A. kessleri*. Interorbital space with two prominent ridges and numerous striae, none



of them granular, the granulations chiefly confined to the region behind widest part of fontanelle. Opercle striate. Gill-membranes forming a moderate fold across isthmus.

Dorsal spine low, shorter than pectoral spine, which is  $1\frac{3}{5}$  in head, the anterior edges of both bluntly serrate. Humeral process broadly triangular, granulated, not two-fifths length of pectoral spine, much smaller than in *A. insculptus*. No axillary pore. Adipose fin long and low, without free posterior margin. Lower fins of moderate length; vent much nearer ventrals than anal. Caudal short, the upper lobe longest,  $1\frac{3}{5}$  in head (a little more than half head in the smaller specimens).

Color dusky above, the lower parts soiled with dark points. Fins all more or less dusky with dark points. Maxillary barbels dusky, others pale.

One male specimen was obtained at Panama.

SPECIMENS IN UNITED STATES NATIONAL MUSEUM.

29408. Panama. Gilbert.

30995. Panama. Rowell.

12. *Arius osculus* sp. nov. (29476.)

Head  $3\frac{3}{5}$  ( $4\frac{3}{4}$ ); depth  $6\frac{1}{4}$  ( $7\frac{3}{8}$ ); width of head  $4\frac{3}{4}$ ; length (29476) 11 inches. D. I, 7; A. 4, 14.

Body moderately elongate, the head short, rather narrow, tapering forwards, considerably broader than deep. Eye small,  $7\frac{1}{2}$  in head, placed well above the mouth. Interorbital space  $1\frac{9}{10}$  in head; snout 3; breadth of mouth  $2\frac{3}{5}$ .

Mouth very small for the genus, with thick lips. Teeth on vomer and palatines villiform, but rather coarse and bluntish. Vomerine patches small, rather longer than broad, separated on the median line, and each also separated by a narrow groove from the large and roundish palatine bands, which have a distinct backward prolongation. Premaxillary band of teeth very broad, barely 3 times as long as wide. Barbels short, the maxillary barbels reaching slightly beyond base of pectorals, the outer mental barbels scarcely past gill-opening below; inner mental barbels about as long as snout.

Ante-dorsal shield short, crescent-shaped, granulated, but without median keel, its length about one-fourth its breadth. Occipital process narrow, its edges almost parallel until abruptly widened at base; the narrow part considerably longer than broad, with curved edges. A well-developed median keel. Fontanelle broad and shallow, abruptly contracted at a point midway between tip of snout and end of occipital process, thence continued backward as a narrow groove to a point less than an eye's diameter in front of the base of the occipital process. Greatest width of fontanelle about three-fifths eye. Shields of top of head all coarsely and rather sparsely granular, and anteriorly striate. Interorbital space nearly plane, with a few low, smooth ridges. Opercle

scarcely rugose. Gill-membranes forming a narrow fold across isthmus posteriorly.

Dorsal spine very high,  $1\frac{1}{5}$  in head, a little longer than pectoral spine. Humeral process granular, not quite two-fifths length of pectoral spine. No axillary pore. Adipose fin adnate posteriorly. Caudal long, its upper lobe longest, somewhat falcate,  $1\frac{1}{10}$  in head. Anal rather high.

Color brown, with bluish reflections; lower parts dusky, with dark punctulations. Fins all blackish; maxillary and outer mental barbels dusky.

A single male specimen was obtained at Panama.

SPECIMEN IN UNITED STATES NATIONAL MUSEUM.

29476. Panama. Gilbert.

13. *Arius assimilis* Günther.

*Arius assimilis* Günther, Cat. Fish. Brit. Mus. v, 146, 1864 (Lake Yzabal); Günther, Fish. Centr. Amer. 1869, 474; Steindachner, Fisch-Fauna des Cauca etc. 1880, 39 (no description; Magdalena River, in brackish water).

? *Arius scemani* Günther, Cat. Fish. Brit. Mus. v, 147, 1864 ("Central America"; specimen with the fontanelle extending to base of occipital process).

? *Arius carulescens* Günther, Cat. Fish. Brit. Mus. v, 149, 1864 (Huamachal).

*Arius guatemalensis* Steind. Ichth. Beitr. iv, 18, 1875 (Magdalena Bay; Altata Panama).

*Habitat*.—Both coasts of tropical America; Magdalena Bay; Mazatlan; Altata; Panama; Lake Yzabal (in Guatamala, tributary to Bay of Honduras); Magdalena River (tributary to Caribbean Sea).

Head  $3\frac{1}{4}$  ( $4\frac{3}{8}$  in total); width of head  $5\frac{1}{2}$ ; depth 5 ( $6\frac{5}{8}$ ); length (28299) 11 inches. D. I, 7; A. 4, 14. In the largest specimen (29213) the head is 4 in length.

Body comparatively elongate, the head depressed but not very broad, somewhat broader than high; eye rather large, 5 to 6 in length of head; width of interorbital space  $2\frac{1}{4}$  in head; breadth of mouth  $1\frac{3}{4}$ ; length of snout  $3\frac{1}{3}$ .

Teeth all villiform; bands of vomerine teeth separated by a rather wide interval, each small, roundish, confluent with the neighboring palatine band, the junction marked by a slight constriction; palatine bands ovate, broad behind, varying considerably in size and somewhat in form, the width ranging from one-third diameter of eye to two-thirds, being generally largest in adults; band of palatine teeth without backward prolongation; band of premaxillary teeth rather broad and short, its length about 5 times its breadth. Maxillary barbel reaching a little past base of pectoral in the young, scarcely to gill-opening in the adult; outer mental barbels 2 in head, inner 3.

Ante-dorsal shield very short, narrowly crescent-shaped, its length on the median line not more than half that of one of its sides. Occipital process subtriangular, not quite as long as broad at base, with a strong median keel, its edges slightly curved. A short distance in front of the beginning of the keel is the end of the very narrow groove-like

fontanelle, which is somewhat widened anteriorly, finally merging into the broad, flat, smooth interorbital area, the boundaries of which are not well defined; shields of head unusually smooth, all finely and very sparsely granular, the granules not forming distinct lines.

Gill-membranes forming a rather broad fold across isthmus.

Dorsal spine long, usually, but not always, shorter than the pectoral spine, about  $1\frac{3}{4}$  in head; axillary pore absent. Humeral process rather broadly triangular, not much produced backward, less than half length of pectoral spine, its surface not granular, covered by skin. Adipose fin half length of anal, its posterior margin little free. Upper lobe of caudal longest and somewhat falcate, about as long as head. Ventrals about reaching anal in the females, shorter in the males. Vent much nearer base of ventrals than anal.

Color olive green, with bluish luster, white below; upper fins dusky olivaceous; caudal yellowish dusky at tip; anal yellowish with a median dusky shade; ventrals yellowish, the basal half of the upper side abruptly black; pectorals similarly colored, the black area rather smaller; maxillary barbel blackish; other barbels pale.

Very common at Mazatlan, where it is the most abundant species of the genus. It reaches a length of less than 18 inches. It was not observed at Panama by Mr. Gilbert. According to Günther and Steindachner this species occurs on both sides of the isthmus. It is not improbable that *Arius seemani* and *cærulescens* Gthr. are identical with it. Our specimens answer the description of *assimilis* better than that of either of the others.

SPECIMENS IN UNITED STATES NATIONAL MUSEUM.

- 28161. Mazatlan. Gilbert.
- 28189. Mazatlan. Gilbert.
- 28210. Mazatlan. Gilbert.
- 28213 (2). Mazatlan. Gilbert.
- 28221. Mazatlan. Gilbert.
- 28232. Mazatlan. Gilbert.
- 28276. Mazatlan. Gilbert.
- 28304. Mazatlan. Gilbert.

**14. *Arius cærulescens* Günther.**

*Arius cærulescens* Günther, Cat. Fishes Brit. Mus. v, 149, 1864 (Rio Huamuchal; west coast of Guatemala).

*Habitat*.—Pacific coast of Central America; Rio Huamuchal.

This species is unknown to us. It is certainly very close to *Arius assimilis*, if not identical with it.

**15. *Arius guatemalensis* Günther.**

*Arius guatemalensis* Günther, Cat. Fish. Brit. Mus. v, 1864, 145 (Guatemala; Chiapam); Günther, Fish. Centr. Amer. 1869, 393 (name only); not *Arius guatemalensis* Steind.

*Habitat*.—Pacific coast of tropical America; Mazatlan; Chiapam.



Head  $3\frac{5}{8}$  ( $4\frac{2}{3}$ ); width of head 5 ( $6\frac{1}{2}$ ), depth  $6\frac{1}{2}$  (7). Length (28140)  $12\frac{1}{2}$  inches. D. I, 6; P. I, 10; A. 3, 15.

Body slender, its width anteriorly greater than its depth; caudal peduncle compressed, short; distance from end of anal to base of median caudal rays about one-half length of head. Head depressed, not very broad; its depth at posterior margin of branchiostegal membranes less than three-fifths its width; interorbital region flat, smooth, the smooth area forming a broad equilateral triangle, its base at the interorbital space, the apex at a point four-ninths the distance from snout to dorsal, the triangle forming the termination of the almost obsolete fontanelle; top of head, occipital process, and ante-dorsal shield finely granular, some of the anterior granulations only arranged in lines, none of them in radiating striæ. Occipital process broadly trapezoidal, its width slightly greater than the length of its side, with a slight or obsolete median carina; its posterior margin truncated; its sides slightly convex posteriorly, concave toward the front; ante-dorsal shield small, narrow, crescent-shaped, its median length about half the length of its side. Eye small, 6 in head; interorbital width  $2\frac{2}{7}$  in head; snout 4 in head; breadth of mouth 2. Maxillary barbel very slender, reaching base of pectoral spine; outer mental barbel to well beyond margin of branchiostegal membranes, its length about half head; inner mental barbel 3 in head.

Teeth all villiform; width of premaxillary band about one-sixth its length. Vomerine and palatine bands of teeth, fully confluent on each side, forming together a crescent-shaped patch, narrowly divided on the median line of the vomer; form of vomerine band similar to that of the palatine band. Palatine band of teeth without backward prolongation. Opercle with radiating ridges; humeral process granular, narrow, produced backward, not quite half-length of pectoral spines; no axillary pore. Gill-membranes forming a narrow fold across isthmus.

Dorsal short, its base about equal to that of adipose dorsal; dorsal spine robust, but little shorter than pectoral spine, about three-fifths length of head; its anterior serræ small and tubercle-like; its posterior edge, as well as that of pectoral, retrorsely serrate; soft rays of dorsal rays extending much beyond the spine, the longest about three-fourths length of head. Adipose dorsal about one-half as high as long, its posterior margin largely free. Caudal very widely forked, the upper lobe falcate, nearly one-third longer than the lower, as long as head. Anal short and low. Distance from vent to base of ventrals slightly more than one-half its distance from origin of anal. Pectoral spine very strong, much stronger than dorsal spine, its anterior margin with serræ towards the tip, becoming small tubercles towards base; inner edge with strong retrorse serræ, the soft rays longer than spines, reaching three-fourths distance to base of ventrals.

Color very dark bluish or greenish above; sides with bronze lustre; belly silvery. Mental barbels white, with black edge; maxillary bar-



bel blackish; fins all blackish, the caudal nearly uniform; the paired fins darkest on the inner side. Sides with vertical series of mucous pores, conspicuous in life.

This species is not uncommon at Mazatlan, where several specimens were obtained by Mr. Gilbert. Four specimens from Colima are also in the National Museum. It was not observed at Panama.

The original description of this species is brief and not entirely correct. That it was intended to refer to the species here described we have ascertained by the examination of Dr. Günther's original types in the British Museum.

SPECIMENS IN UNITED STATES NATIONAL MUSEUM.

28140.	Mazatlan.	Gilbert.
29284.	Mazatlan.	Gilbert.
28289.	Mazatlan.	Gilbert.
28290.	Mazatlan.	Gilbert.
29647.	Mazatlan.	Gilbert.
8144 (4).	Colima.	John Xantus.

16. *Arius dowi* (Gill) Günther.

*Leptarius dowii* Gill, Proc. Ac. Nat. Sci. Phila. 1863, 170 (Panama; "generic" diagnoses and measurements).

*Arius dowii* Günther, Fish. Centr. Amer. 1869, 476 (copied from Gill).

*Habitat*.—Pacific coast of Central America; Panama.

Head 4 ( $4\frac{2}{5}$ ); depth  $6\frac{1}{2}$  ( $7\frac{1}{2}$ ); width of head  $5\frac{1}{5}$ ; length (29529) 10 inches. D. I, 8; A. 4, 12.

Body elongate, narrow and slender, the caudal peduncle  $1\frac{2}{5}$  in head. Head low and narrow, tapering anteriorly, the snout sub-truncate. Eye small, 7 in head, placed rather high; interorbital space little arched, with ridges and depressions,  $2\frac{4}{5}$  in head; snout  $3\frac{4}{5}$  in head; breadth of mouth  $2\frac{1}{5}$  in head.

Mouth moderate, with thinnish lips; teeth villiform, bluntish; vomerine teeth forming two smallish, rounded patches, separated by a moderate interspace; each patch confluent with the neighboring palatine patch, which is rounded and rather large; the suture marked by a constriction. Palatine bands without backward prolongation. Premaxillary band of teeth broad.

Barbels very long; maxillary barbel extending well beyond tip of pectoral fin; outer mental barbel reaching well past front of pectoral; inner  $2\frac{2}{5}$  in head.

Ante-dorsal shield comparatively large, not distinctly crescent-shaped, its divisions produced backward, their length about twice the length of the shield on the median line; anterior margin with two emarginations, the point fitting into an emargination of the occipital process; ante-dorsal shield without keel. Occipital process very broad and short, its edges nearly straight, its breadth at base considerably greater than its length; its median line with a rather low keel. Fontanelle broad and

very short, ending obtusely at a point not far behind eye, the distance from this point to tip of snout  $1\frac{2}{3}$  in its distance from base of dorsal. Each side of fontanelle with a conspicuous smooth ridge, the two ridges converging anteriorly; shields of head rather finely granulated, few of the granulations forming lines, none of them extending farther forward than posterior margin of eye. Opercle striate.

Gill-membranes meeting below in a sharp angle, forming a rather broad fold across isthmus.

Dorsal spine very short, its length a trifle less than pectoral spine,  $2\frac{1}{4}$  in head. Axillary pore obsolete. Humeral process granulated, rather narrowly triangular, a little less than half length of pectoral spine, which extends barely two-fifths the distance to the ventral fins; adipose fin long and low, very nearly or quite coterminous with the anal; caudal narrow, rather short, the upper lobe longest,  $1\frac{2}{3}$  in head; anal rather low and short; ventrals short, the vent not far behind them.

Color dusky above, pale below, the fins all more or less dusky; maxillary barbels dusky, others pale.

A single young male specimen was obtained at Panama.

This is one of the more aberrant species of the genus. It is, however, not distantly related to *A. guatemalensis*, and there is certainly no sufficient ground for its separation from "*Hexanematichthys*" as a distinct genus, "*Leptarius*" Gill.

The original type of this species cannot be found.

#### SPECIMEN IN UNITED STATES NATIONAL MUSEUM.

29528. Panama. Gilbert.

#### 17. *Arius dasycephalus* Günther.

*Arius dasycephalus* Günther, Cat. Fish. Brit. Mus. v, 1864, 157 (Oahu, Sandwich Islands); Steindachner, Ichth. Beitr. iv, 1875, 26 (Panama; no description).

*Habitat*.—Tropical parts of the Eastern Pacific; \*Sandwich Islands; Panama.

Head  $4\frac{1}{2}$  ( $5\frac{2}{3}$ ); depth 6 ( $7\frac{1}{4}$ ); width of head  $5\frac{1}{3}$ ; length (29400) 11 inches. D. I, 7; A. 4, 17.

Body elongate, compressed behind, the head small, narrow and moderately depressed anteriorly, the snout not very blunt. Eye rather large, placed somewhat above level of angle of mouth, its length 5 in head; width of interorbital space  $2\frac{1}{2}$  in head; breadth of mouth  $2\frac{1}{2}$ ; length of snout  $3\frac{1}{4}$ .

Teeth villiform, those of vomer and palatines rather coarse, bluntly

\*Three species (*Arius dasycephalus*, *Chatodon humeralis*, and *Isesthes brevipinnis*), belonging to the fauna the Pacific Coast of Central America, are recorded by Dr. Günther from the Sandwich Islands. In these cases we strongly suspect that there has been a confusion of localities among the specimens in the British Museum, and that all came from America.

conic; bands of vomerine teeth separated by a rather broad area, each confluent with the neighboring palatine band, the two forming a small oblong patch much smaller than the eye, the division between the palatine and vomer scarcely appreciable. Palatine bands without backward prolongation. Bands of teeth in jaws short and broad. Maxillary barbel reaching about to middle of pectoral spine; outer mental barbel to base of pectoral; inner slightly more than half head.

Ante-dorsal shield short, crescent-shaped, a little more than three times as broad as long on the median line. Occipital process sub-triangular, its sides straight, slightly longer than broad, its median line rather sharply keeled. Close in front of its base begins the deep fontanelle, which is narrow and groove-like posteriorly, becoming rather abruptly broader above the opercle, then gradually narrowed anteriorly.

Ridges bounding fontanelle prominent anteriorly to a point just behind vertical from nostrils, coarsely granular for their whole length, the granules mostly arranged in one series. Between these ridges and the eye on each side is another ridge extending obliquely backwards and inwards from above front of eye, likewise very coarsely granular, the granules mostly in two series. Shields of head all rough granular, the granules forming irregular lines. Gill-membranes forming a narrow fold across isthmus.

Dorsal spine moderate, about equal to pectoral spine,  $1\frac{1}{4}$  in head. Axillary pore present, small. Humeral process broad, scarcely granular, about two-fifths pectoral spine. Adipose fin rather long and low. Caudal long, the upper lobe longest, somewhat longer than head. Anal long and high, its outline emarginate, its longest rays a little more than half head. Ventrals long, the vent nearer their base than that of anal.

Color dusky, the entire ventral surface soiled with dark points; fins all largely blackish; barbels black.

Two specimens were obtained at Panama. This species may be known at once by the four granulated ridges, which extend the length of the interorbital space.

SPECIMENS IN UNITED STATES NATIONAL MUSEUM.

29400. Panama. Gilbert.

29478. Panama. Gilbert.

18. *Arius fürthii* Steindachner.

*Arius fürthii* Steindachner, Ichth. Beiträge, iv, 29, 1875 (Panama).

*Habitat*.—Pacific coast of Central America; Panama.

This species is known to us only through the description of Steindachner.

19. *Arius melanopus* Günther.

*Arius melanopus* Günther, Cat. Fish. Brit. Mus. 1854, v, 172 (Rio Motagua; east coast of Guatemala); Steindachner, Ichth. Beitr. iv, 1875, 29 (Panama).

*Habitat*.—Both (?) coasts of Central America; Rio Motagua; Panama.

This species is known to us only from the descriptions of Günther and Steindachner.

20. *Arius hypophthalmus* Steindachner.

*Arius hypophthalmus* Steindachner Ichth. Beitr. iv, 31, 1875, taf. x, (Panama).

*Habitat*.—Pacific coast of Central America; Panama.

Head  $3\frac{2}{5}$  (4); depth  $4\frac{2}{5}$  ( $5\frac{1}{4}$ ); width of head  $5\frac{1}{2}$ ; length (29508) 14 inches. D. I, 7; A. 2, 20.

Body elongate, compressed, the back rather abruptly elevated at front of base of dorsal. Head rather long, narrow, much depressed anteriorly, as high at occiput as broad. Snout rather narrow and thin, rounded anteriorly; the mouth small, the upper jaw much projecting. Eye small, placed low, with no vertical range, its middle below the level of angle of mouth, 7 in head; interorbital space  $2\frac{1}{6}$  in head; breadth of mouth  $2\frac{1}{2}$ ; length of snout 3.

Palatine teeth small, bluntly conic, almost granular; vomerine bands of teeth separated by a very wide interval about equal to eye; on each side, fully confluent with and scarcely distinguishable from the palatine band, which forms a large oblong patch rather broadest anteriorly. Palatine band without backward prolongations. Both jaws very thin, depressed, their bands of teeth narrow. Barbels very long and slender, the maxillary barbel extending nearly to middle of pectoral spine; outer mental barbels nearly as long as maxillary barbel, considerably longer than head, extending well past base of pectoral; inner mental barbels almost reaching base of pectoral.

Ante-dorsal shield very short, narrowly crescent-shaped, its length on the median line scarcely more than one-fifth its width. Occipital process subtriangular, somewhat emarginate behind, in the adult specimen longer than broad, its sides concave. Its sides slope steeply from the median line, which forms an angle rather than a keel. A short distance in front of the base of the occipital process is the pointed termination of the long and rather narrow fontanelle, which is widest above the cheeks, tapering slowly forward and more rapidly backward. On each side of the fontanelle anteriorly is a ridge composed of a rather feeble bone, striate, but not granular, and like the rest of the interorbital space, covered with thick skin. An oblique ridge extends upwards and backwards between the above-mentioned ridge and the eye, the interorbital region being more uneven and covered by thinner skin than usual in this genus. Shields of head all rugose, moderately rough, but scarcely granular, the depressions being rather of the nature of reticulating furrows; young specimen with the plates more granular. Opercle with distinct radiating striæ. Gill-membranes forming a very narrow fold across the isthmus.

Dorsal spine long,  $1\frac{1}{2}$  in head, considerably longer than the pectoral spine. Axillary pore well developed. Humeral process very short, nearly smooth, less than one-fourth length of pectoral spine. Adipose fin rather high, its posterior margin largely free. Upper lobe of caudal short,



scarcely longest,  $1\frac{1}{2}$  in head. Anal comparatively long and high, its longest rays  $2\frac{1}{4}$  in head, its margin somewhat concave.

Ventrals moderate. Vent much nearer base of ventrals than anal.

Color rather dull grayish brown, with bluish and purple reflections above, paler below; fins all pale, or the lower more or less dusky. Maxillary and outer mental barbels blackish.

This species is not very abundant at Panama, where two specimens were obtained.

Among the species here noticed, this is decidedly the most aberrant. It may be considered as the type of a distinct subgenus, characterized chiefly by the position of the eyes. This group may be known as *Cathorops*. (*Kathopaw*—to look down;  $\omega\psi$ —eye.)

SPECIMENS IN UNITED STATES NATIONAL MUSEUM.

29436. Panama. Gilbert.

29508. Panama. Gilbert.

INDIANA UNIVERSITY, *May 27, 1882.*

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**A POOR SEASON FOR SHAD HATCHING IN NORTH CAROLINA.**

**By S. G. WORTH.**

(Letter to Col. M. McDonald.)

I have been in Raleigh a week getting the affairs of my shad work fixed up. We had poor luck at Avoca; hatched only 2,260,000 fish. We attended every haul at Dr. Capehart's fisheries, and for more than a week attended three fisheries on the Roanoke. I also attended three other fisheries near Plymouth (on the Roanoke) for three days, and many of the dip-nets at Weldon. It would appear that the cause was due (1) to the cold and variable weather, and (2) to the poor character of fishing done at Sutton Beach, our chief source of supply.

The catch in Albemarle Sound, according to Dr. Capehart, is smaller than usual; but I am disinclined to think so. He had an inferior season, running about 7,000 shad below last year. The catch on the Roanoke was better than for years; and I learn that the same increase was apparent on the Neuse and Tar. The Cape Fear was below last year very considerably. Your jars worked beautifully, and the additions to the glass tubes were found unnecessary.

DEPARTMENT OF AGRICULTURE,

*Raleigh, N. C., May 20, 1882.*