

"Without really *knowing* about it, I have a strong impression that the little fishes' chances would be improved if they were as widely scattered as possible when deposited. Certainly, if they are disposed to keep together at all after being released, any large school of them would have found poor hunting off Racine.

"I have made as careful a count and estimate as I could of the abundance of small entomostraca there, and have concluded that there were not more than one or two to the cubic foot of water, and that there were probably less than this.

"These calculations will have more value, however, after it is absolutely certain that entomostraca make the principal food of the fishes.

"I have taken the first steps towards the Geneva Lake experiment, and hope that we shall make that clinch the matter."

Mr. Forbes wrote again the same day (February 20) as follows:

"Since my letter of this morning the little whitefish have realized the situation, and the entomostraca are rapidly diminishing in number. Several of the little fellows have been bottled with *Corpusus delicti* in their bowels, always of the smallest species, cylops or canthocamptus. They pay no attention whatever to the algæ in their jar, and seem afraid of the daphnias, and larger entomostraca generally."

I have no further communications from Mr. Forbes relative to this matter.

NORTHVILLE, MICH., February 22, 1882.

#### DESCRIPTIONS OF NINETEEN NEW SPECIES OF FISHES FROM THE BAY OF PANAMA.

By DAVID S. JORDAN and CHARLES H. GILBERT.

The greater part of the months of February and March, 1881, were spent by Mr. Gilbert at Panama, in making collections of fishes for the United States National Museum. About 145 species were obtained at Panama, 80 of which are identical with species previously obtained at Mazatlan. The following species appear to be new to science, and are described in the present paper:

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|---|--|
| 1. <i>Urolophus aspidurus</i> .               | 12. <i>Diabasis steindachneri</i> .                |
| 2. <i>Tylosurus scapularis</i> .              | 13. <i>Xenichthys xenops</i> .                     |
| 3. <i>Caranx (Carangops) atrimanus</i> .      | 14. <i>Pimelepterus ocyurus</i> .                  |
| 4. <i>Sciæna imiceps</i> .                    | 15. <i>Gerres aureolus</i> .                       |
| 5. <i>Sciæna (Stelliferus) ericymba</i> .     | 16. <i>Gobius (Lepidogobius) emblematicus</i> .    |
| 6. <i>Sciæna (Stelliferus) oscitans</i> .     | 17. <i>Microdesmus retropinnis</i> .               |
| 7. <i>Sciæna (Bairdiella) ensifera</i> .      | 18. <i>Cerdale ionthas</i> .                       |
| 8. <i>Odontoscion archidium</i> .             | 19. <i>Citharichthys (Hemirhombus) latifrons</i> . |
| 9. <i>Cynoscion phorocephalum</i> .           |  |
| 10. <i>Isopisthus remifer</i> .               |  |
| 11. <i>Serranus (Plectropoma) lamprurus</i> . |  |

1. *Urolophus aspidurus*, sp. nov. (29410, 29307, 29454.)

Color plain brown; upper side of tail blackish; under side of body and tail white.

Disk very slightly longer than broad, its length very little less than length of tail; anterior margins of disk nearly straight, the anterior tip abruptly projecting as an exerted, narrow, triangular, prominence rounded at its end; length of exerted part about as long as the width of its base, and from half to two-thirds the interorbital width, it being longer and sharper in a male specimen, in which also the anterior margins of the disk form a less obtuse angle; distance from eye to tip of snout about one-third length of the disk. Interorbital space broad, somewhat concave,  $2\frac{1}{2}$  in distance to tip of snout. Eyes very small, much smaller than the large spiracles, their diameter less than half interorbital width. Width of mouth  $2\frac{1}{2}$  in its distance from the tip of the snout. Nostrils directly in front of angles of mouth; nasal folds forming a broad continuous flap, the edges of which are slightly fringed. Ventrals projecting a little beyond outline of disk. Caudal spine very large, its length a little more than twice interorbital width (in a large female specimen duplicated, and as long as from eye to tip of snout), its insertion well in front of middle of tail. Caudal fin long and low, the lower portion longer, beginning nearly opposite tip of caudal spine. Depth of tail with the caudal fin, about half interorbital width.

Skin entirely smooth, with the exception of a series of strong broad-rooted spines or bucklers on the upper part of the tail in front of caudal spine, and sometimes a series of minute sand-like prickles on snout, and on median line of body. These latter are present only in a large female specimen, which also has 8 spines on the tail instead of 2 as in the others. These spines are straight, sharp, directed backwards, their height about equal to width of base, which is somewhat longer than diameter of pupil.

This species is not uncommon in the Bay of Panama, and is brought into the market in company with *Urolophus mundus*. Three specimens were obtained, the largest about 18 inches in length.

2. *Tylosurus scapularis*, sp. nov. (29427, 29435, 29438.)

Allied to *Tylosurus longirostris* (Mitch.), but the tail not depressed and without cutaneous ridge.

Body slender, not compressed, as broad as deep; caudal peduncle compressed, deeper than broad, without trace of cutaneous keel, the lateral line not more conspicuous there than elsewhere, and not black.

Head long, the jaws very long and slender, narrow throughout; length of upper jaw from eye twice the length of the rest of the head. Diameter of eye about equal to interorbital width, contained 8 to 9 times in the length of the upper jaw,  $3\frac{1}{2}$  times in the length of the rest of the head. Teeth much as in *T. longirostris*, the small teeth forming the external band, not very small; the large teeth of the inner series slender

and pointed, scarcely compressed, about 40 on each side of each jaw. No teeth on vomer. Teeth not green.

Maxillary not entirely concealed beneath preorbital. Interorbital area with a deep scaly groove, which is broadest anteriorly; a strong ridge along temporal region separated by a furrow from a rectangular elevated area on the top of the cranium. Cheeks closely scaled; opercles naked below; scaled above. No gill-rakers. Scales not green, not very small.

Dorsal fin low, its anterior rays highest, as long as from eye to edge of opercle. Anal a little higher than dorsal, beginning farther forward. Caudal fin almost truncate, the lower rays little longer than the upper, the middle rays five-sevenths the length of the postorbital part of the head, their insertion somewhat nearer base of caudal than eye. Pectorals moderate, five-sixths length of postorbital part of head, the upper ray not enlarged. Ventrals small, half length of postorbital part of head, their insertion somewhat nearer base of caudal than eye.

Head  $2\frac{1}{2}$  in length; depth 19. D. 14; A. 16; P. 10; V. 6; Lat. 1. 215.

Color, in spirits, olivaceous above, whitish but not silvery below; a faint band of silvery along the sides, which becomes blackish posteriorly; this band as well as the sides of the head and the lower parts of the body rendered dusky by thick-set dark-brown points. A large distinct rounded black spot above base of pectorals. A faint dusky band along the back. Fins plain; tips of ventrals a little dusky; pectorals entirely pale. Caudal darker at tip.

Several specimens, the longest about 15 inches in length, were taken in the Bay of Panama.

### 3. *Caranx atrimanus*, sp. nov. (29341.)

Subgenus *Carangus* Gill; allied to *Caranx amblyrhynchus* C. & V. = *Caranx falcatus* Holbr.

Body regularly elliptical, compressed and much elevated, the dorsal and ventral curves about equal, and the greatest depth of the body nearly in the middle of the length, exclusive of the caudal peduncle. Head small, short and low, its depth rather less than its length, the upper profile descending gently to the sharp snout; jaws about equal; premaxillaries anteriorly about in the axis of the body; maxillaries narrow, reaching slightly beyond anterior margin of orbit,  $3\frac{2}{3}$  in head. Each jaw with a single regular series of very small, close-set teeth, without larger teeth; no teeth on vomer, palatines, or tongue. Eye moderate, slightly longer than snout,  $1\frac{1}{4}$  in interorbital width; occiput with an evident carina. Gill-rakers moderate, about 15 on the anterior limb, the longest half the diameter of the orbit. Head naked, with the exception of a patch of scales on the temporal region.

Distance from snout to origin of spinous dorsal less than length of pectorals. Dorsal spines slender and fragile, the highest equal to the distance from snout to front of pupil. A well-developed antrorse spine before the dorsal. Soft dorsal and anal similar, not falcate, the rays

regularly decreasing from the first. Highest soft ray of dorsal about half the distance from snout to base of pectoral, and somewhat longer than the highest ray of the anal. Free anal spines little developed. Dorsal and anal each depressible into a very high sheath of scales, which leaves only the last two or three rays uncovered. Caudal fin wide, well forked, the upper lobe evidently longer and more falcate than the lower, but less produced than in *C. amblyrhynchus*, the longest ray being about one-third the length of the rest of the fish. Pectoral fin very long and falcate, reaching opposite to base of seventh ray of anal, about half longer than head. Ventrals rather long, reaching beyond vent and slightly more than half way to front of anal.

Breast entirely covered with very fine thin scales; upper part of sides anteriorly with irregular series of scales which are not well imbricated. Lateral line with a strong curve anteriorly (but less arched than in *C. amblyrhynchus*), the height of the curve two-sevenths of its length, which is a little more than half the length of the straight portion; the line becomes abruptly straight opposite the front of the anal. Plates of lateral line developed along the entire length of the straight portion, the plates not large, the height of the largest one not more than half the diameter of the eye.

Head 4 in length; depth  $2\frac{2}{3}$ . D. VI-I, 29; A. II, I, 25; Lat. 1. 60 (all plates).

Color, blackish olive above, dusky yellowish below, with silvery luster. Top of head, snout, and a large diffuse blotch on upper part of opercle black; cheeks and lower parts of head thickly dusted with large brown points. Vertical fins dusky, the caudal and anterior rays of anal with much greenish-yellow; ventrals largely white. Pectorals dusky olive, the axil and a large black blotch on both sides of the fin at base *jet black*. This blotch covers the base of all the rays of the pectoral except the lower, and extends on the fin for a distance greater than one-fifth the length of the fin. Inside of mouth and lining of opercles not black.

A single large specimen, 12 inches in length, was taken in the Bay of Panama.

4. *Sciæna imiceps*, sp. nov. (29432, 29481, 29489.)

Allied to *Sciæna ophioscion* (Gthr.).

Body deep and compressed, the back considerably elevated, the caudal peduncle short and deep. Head very small, narrow, and low; the snout bluntly pointed, the profile from the nostrils to the interorbital region not steep, thence rising steeply with a considerable curve to the base of the dorsal. Depth of the head at the middle of the eye equal to the length of the snout and eye, and about equal to the greatest thickness of the head. Interorbital space narrow, little convex, little wider than eye, 4 in head, about equal to length of snout. Preorbital wide, gib-

bous; preopercle somewhat cavernous. Eye rather large, a little shorter than snout,  $4\frac{1}{2}$  in head.

Mouth small, inferior, horizontal, the lower jaw much overlapped by the snout, its tip extending little forward of the nostrils. Maxillary extending to opposite middle of eye; premaxillaries in front, far below level of lower edge of eye; length of gape,  $3\frac{2}{3}$  in head. Teeth very small, nearly as in *S. fürthi*, in narrow villiform bands in both jaws, the outer row in the upper jaw enlarged.

Preopercle armed with strong radiating teeth, about three near the angle larger than the others, none of them directed downward. Chin with two large pores, preceded by two smaller ones, and without symphyseal knob. Pseudobranchiæ small. Gill-rakers (as in *S. ophioscion*) minute, slender, not longer than nostril.

Scales roughish; lateral line strongly curved, becoming straight opposite middle of anal fin.

Spinous dorsal rather high, the spines not very slender, the second spine a little stronger than the others,  $2\frac{1}{3}$  in head; the highest spine  $1\frac{3}{4}$  in head, considerably higher than the soft rays. Soft dorsal and anal fins scaled a little more than half way up. Caudal double truncate, the middle rayed moderately produced, the upper angle acute, the lower rounded; middle rays of caudal  $1\frac{2}{5}$  in head. Anal inserted nearly under the middle of the soft dorsal, the distance from its first ray to base of caudal  $3\frac{1}{6}$  in length of body. Second anal spine shortish, but rather strong, somewhat shorter than the first soft ray, its length considerably greater than its distance from the vent and equal to half the length of the head. Ventrals small, reaching about half way to anal, not to tip of pectorals, which are long, scarcely shorter than head.

Head  $3\frac{2}{3}$  in length; depth 3. D. XII, 25; A. II, 8; scales 5-51-9.

Color in spirits: Dull brown above; belly white, but not silvery; upper fins brown, the spinous dorsal dusky at tip; anal dusky, thickly studded with dark points; ventrals and pectorals dusky; a faint band of dark points from base of pectoral straight to caudal, bounding the dark color of the upper parts. Peritoneum white; lining of opercles partly black.

Three specimens of this species, each  $6\frac{3}{4}$  inches in length, were taken in the Bay of Panama.

This species is evidently allied to *S. ophioscion*, although differing considerably in details of form. It has also some points in common with the members of the group called *Stelliferus*.

*Sciæna ophioscion* does not appear to us to differ generically from *S. vermicularis* (Gthr.), or from *S. ocellata* (L.), the type of the group called *Sciænoops* by Professor Gill. We are moreover unable to see that the latter group differs from the typical species of *Sciæna* (*aquila*) in any important respect, the small size of the anal spine in "*Sciæna*," as distinguished from "*Corvina*," being a character of no systematic importance whatever.

5. *Sciæna ericymba*, sp. nov. (29338, 29433, 29466, 29477, 29479, 29494.)

Subgenus *Stelliferus* Stark = *Homoprion* Holbrook.

Allied to *S. fürthi* (Steind.).

Body short and stout, little compressed, the back somewhat elevated, the caudal peduncle slender. Profile nearly straight and not steep, from the scarcely truncate snout to the occiput, where an angle is formed, the rise thence to the base of the dorsal being more steep.

Head formed much as in *S. oscitans* and *S. stellifera*, very broad, with very cavernous preopercle, preorbital and cranium. Interorbital space broad, flat, its least width equal to snout and half of eye, about twice diameter of the small eye,  $2\frac{4}{5}$  in length of head. Supraocular ridges prominent; a cross-ridge on forehead connecting nostrils.

Mouth terminal, oblique, smaller and more oblique than in *S. fürthi*, its gape  $2\frac{4}{5}$  in length of head; premaxillaries in front on the level of lower part of eye; maxillary reaching to opposite posterior border of pupil; front of premaxillaries extending further forward than tip of snout (in *S. oscitans* the snout protrudes a little; in *S. fürthi* considerably).

Teeth much as in *S. fürthi*; upper jaw with an external series of small, slender teeth, behind which are two or three rows of smaller teeth; lower jaw with a narrow villiform band. Pores of chin obscure; symphyseal knob small.

Edge of preopercle with several (about 7), rather strong, slender, radiating teeth; the three near the angle largest, none of them directed downwards or forwards. Gill-rakers long and slender, much more than half the diameter of the eye; pseudobranchiæ small. Suprascapula prominent, with slender teeth.

Scales large, rather strongly ctenoid; lateral line very strongly arched, becoming straight just in front of insertion of anal. Vertical fins covered with small scales, as in other species of *Stelliferus* and "*Pachyurus*."

Spinous dorsal low, the second spine much stouter than those succeeding, stiff; other spines very slender and flexible; second spine as long as snout and half of eye; third spine two-fifths length of head. Soft dorsal low, rather lower than the spines. Caudal fin rhombic, the middle rays longest, three-fourths length of head; least depth of caudal peduncle two-fifths length of head.

Anal fin small, not very far back, its last rays well in front of last of dorsal; distance from its first ray to front of caudal  $3\frac{1}{2}$  in total length of fish (to base of caudal); its distance behind the vent about equal to the length of its second spine. Second anal spine 4 in head, stout, but shortish, lower than the soft rays. Ventrals moderate, not reaching vent, coterminous with the pectorals, which are rather long, four-fifths length of head.

Length of head equal to greatest depth of body,  $3\frac{1}{3}$  in length.

D. XII, 24; A. II, 7; scales 5-48-8 (rows).

Coloration dark brownish above, white below; everywhere with dark

points; upper parts with bright bluish reflections; lower parts with silvery luster; a dark temporal blotch; lower jaw black within, behind the front teeth. Fins all dark brownish, the pectoral, anal, and ventrals quite black, with minute dark points; tip of spinous dorsal black. Lining of opercle dusky; peritoneum silvery.

Six specimens obtained in the Bay of Panama. All of them are from 6 to 7 inches in length, and as they are evidently mature, this species is probably one of the smallest of the Sciaenoid fishes.

Its resemblance to *S. fürthi* is quite strong, but the armature of the preopercle, the form of the snout and mouth, and the color of the lower fins, at once distinguish it from both *S. fürthi* and *S. oscitans*. The cavernous structure of the bones of the head reaches in this species an extreme.

6. *Sciaena oscitans*, sp. nov. (29258, 29299, 29319, 29326.)

(Subgenus *Stelliferus* Stark; allied to *Sciaena fürthi* (Steind.) and *S. oscitans* J. & G.)

Body oblong, the back somewhat elevated; head very wide and heavy, almost quadrate, flat above; cheeks nearly vertical; cranium above, as well as preorbital and preopercle, cavernous, yielding to the touch; snout heavy, projecting a little beyond premaxillaries, much broader than long, its length 4 in head. Interorbital space very broad and flat, its breadth  $2\frac{2}{3}$  times in length of head. Greatest width of head two-thirds its greatest height. Eye moderate, its diameter equal to half the interorbital space. Supraorbital rim slightly elevated.

Mouth very wide and oblique, the lower jaw included; length of gape twice in length of head ( $2\frac{3}{4}$  in *S. fürthi*); premaxillaries anteriorly on the level of the lower part of pupil; maxillary reaching well beyond the posterior margin of the orbit. Chin with a small but distinct knob, the pores around it not well marked.

Teeth small, not forming villiform bands, in two rather irregular series in each jaw, the outer teeth in upper jaw somewhat enlarged, the large teeth fewer in number and larger than in *S. fürthi*.

Gill-rakers numerous, very fine and slender, the longest about two-thirds diameter of orbit, about 28 on anterior branch of outer gill arch. Pseudobranchiae quite small.

Preopercle with its margin evenly rounded, the upper and lower limbs nearly equal, the membranaceous margin minutely serrulate; above the angle is a short, very strong spine directed backwards, and at the angle is a similar one directed obliquely downward and backward; no other stiff spines on the preopercle.

First and second spines of the dorsal strong and inflexible, second spine about one-third length of head; third spine longest, about half as long as head, and like the succeeding spines very slender and flexible; eleventh and twelfth spines longer and stronger than the tenth. Soft dorsal anteriorly about as high as the third spine. Anal short, its second spine long and very strong, much stronger than second dorsal spine and longer than the third, its length rather more than half the

length of the head. Distance from vent to second anal spine considerably less than length of second anal spine. Caudal rounded, the middle rays produced, its length a little less than that of head.

Pectorals broad, reaching about to vent, about equal to length of head. Ventrals not reaching nearly to vent.

Soft dorsal, anal, and caudal fins thickly scaled to their tips; the spinous dorsal with a thick scaly sheath at base, each spine with a series of scales; other fins more or less scaly.

Scales large; lateral line with a wide low curve anteriorly, becoming straight in front of origin of anal; tubes of lateral line branched anteriorly.

Head  $3\frac{2}{3}$  in length; depth 3. Dorsal rays XI, I, 22; Anal II, 8; scales 6-53-9 (rows); 47 pores.

Coloration dusky above, pale below, with some silvery luster; middle of sides conspicuously punctulate; upper fins all brownish, punctulate with darker; ventrals, anal, and pectoral pale; the anal and pectoral dusted with dark points. Opercle blackish within; peritoneum dusky-silvery. The coloration of *S. fürthi* is very similar, but paler, the lower fins quite pale; peritoneum pale.

Four specimens, the largest 8 inches in length, were obtained at Panama. The characteristic physiognomy of the group called *Stelliferus* reaches in this species an extreme.

One specimen of *S. fürthi* (Steind.) was obtained at Panama. This species differs in the much smaller and more nearly horizontal mouth, which is overpassed by the snout; the lower preopercular spine is directed downward and forward, and there is no knob at the symphysis. The teeth of the lower jaw in *S. fürthi* form a narrow villiform band, nearly as in *S. ophioscion* and *S. chrysoleuca*, while in *S. oscitans* the dentition is essentially as in *Bairdiella*.

7. *Sciæna ensifera*, sp. nov. (29316, 29442, 29464, 29506, 29526.)

(Subgenus *Bairdiella* Gill; allied to *Sciæna icistia* J. & G.)

Body compressed, moderately elongate, the back little elevated; snout short, bluntish, not protruding, the profile nearly straight and not very steep to base of first dorsal, along the base of which it is nearly horizontal, thence again declining along base of soft dorsal; ventral outline nearly straight to front of anal, then very sharply angulated, the base of the anal very oblique; caudal peduncle long and slender. Profile depressed above head. Head moderate, compressed with vertical cheeks; preorbital very narrow, narrower than pupil; snout not projecting so far as premaxillaries; premaxillaries in front on the level of lower part of pupil; maxillary extending to opposite middle of pupil. Mouth very oblique, the jaws nearly even in front, the lower very slightly included, the gape  $2\frac{1}{3}$  in head. Teeth slender, small, in about 2 series in each jaw, the outer series in the upper jaw enlarged; symphysis of lower jaw with a slight inwardly projecting knob, bearing

teeth a little larger than the others. Chin with 4 distinct pores, the outer pair round. Interorbital space moderate, slightly convex, a little broader than length of snout, 4 in head. Eye very large, considerably longer than snout,  $3\frac{3}{4}$  in head. Preopercle with strong teeth, which grow stronger towards the angle, the lowest tooth very strong and directed downwards and forwards. Opercular spines blunt and flattish. Gill-rakers numerous, long and slender, half length of eye.

Scales roughish, extending up on soft portions of vertical fins, covering about one-third of the soft dorsal and more of the anal. Lateral line not strongly curved, becoming straight in front of anal. First dorsal high, its spines slenderer than in *S. armata*, stouter than in *S. icistia*; the second spine short, slender, very stout, half the length of the third, which is  $1\frac{3}{4}$  in length of head. Soft dorsal rather high, its longest rays a little less than half head. Caudal subtruncate, the middle and upper rays slightly produced, its length  $1\frac{1}{3}$  in head. Distance from front of anal to caudal  $3\frac{1}{4}$  in length of body. Abdomen extremely long, its length one-third greater than length of head. Posterior outline of anal fin concave; its second spine very long and strong, scarcely shorter than soft rays, its length  $1\frac{1}{3}$  in head, its distance from the vent two-thirds its length. Ventrals long,  $1\frac{2}{3}$  in length of head, reaching beyond tips of pectorals, but not quite to vent. Pectorals rather short,  $1\frac{2}{3}$  in head.

Head  $3\frac{1}{2}$  in length; depth  $3\frac{1}{4}$ . D. XI-22; A. II, 8; Lat. l.  $59\frac{1}{4}$ .

Color bluish-gray above and on sides, silvery below; a dark ill defined bluish-gray blotch on upper anterior angle of opercle; mouth yellow within, blackish towards tip of lower jaw. Spinous dorsal translucent, with dark punctulations and a narrow black margin, or sometimes largely blackish; soft dorsal dusky yellow; caudal, and anterior 3 rays of anal brighter yellow; caudal, and membrane between spine and first soft ray of anal with black punctulations; posterior anal rays white; ventrals immaculate; pectorals with upper half of axil and membrane of upper rays internally brownish; the upper rays with a slight yellowish tint externally.

This species is abundant at Panama and Punta Arenas, No. 29506 being from the latter locality. It is apparently the species noticed by Steindachner (Icith. Beiträge, iii, 1875, 31) under the name of "*Corvina armata*." The *Bairdiella armata* of Gill is, however, a different species, identical with *Corvina acutirostris* Steind., as we have ascertained by the examination of the typical specimen.

The species of *Sciæna* known from the Pacific coast of tropical America may be distinguished as follows:

a. Lower jaw without canines.

b. Head very broad and depressed, the interorbital space being more than two-sevenths of its length; mouth oblique; teeth small, in narrow bands; preopercle and preorbital usually more or less distinctly cavernous; middle rays of caudal longest; soft parts of vertical fins densely scaly; dorsal spines weak, usually 12 in number; gill-rakers slender, rather long. (*Stelliferus* Stark.)

- c. Teeth of lower jaw unequal, not villiform, the inner series rather strong; mouth very large, oblique, the jaws equal, the snout not projecting beyond the premaxillaries, which are on the level of the eye; maxillary extending beyond eye, its length more than half head; interorbital width nearly half head; preopercle with two spines only, the upper directed backward, the lower downward and backward; second anal spine rather strong,  $1\frac{2}{3}$  in head; lower fins pale. D. XI-I, 22; A. II, 8; Lat. l. 48.....OSCITANS.
- cc. Teeth of lower jaw equal, villiform.
- d. Mouth terminal, the jaws subequal, the snout scarcely projecting beyond the premaxillaries, which are on the level of lower part of eye; maxillary reaching middle of eye, its length  $2\frac{1}{3}$  in head; interorbital width less than one-third head; preorbital and preopercle extremely cavernous; preopercle with numerous spines all directed backward; second anal spine not large,  $2\frac{1}{2}$  in head; lower fins dusky. D. XI-I, 25; A. II, 7; Lat. l. 47...ERICYMBA.
- dd. Mouth subterminal, the lower jaw included, the snout projecting beyond the premaxillaries, which are below the eye; maxillary reaching to behind pupil,  $2\frac{1}{2}$  in head; interorbital width more than one-third head; bones of side of head scarcely cavernous; preopercle with two spines only, the upper directed backward, the lower downward and forward; second anal spine small,  $2\frac{1}{2}$  in head; lower fins pale. D. XI-I, 23; A. II, 9; Lat. l. 46.  
FÜRTH.\*
- bb. Head not very broad, the interorbital space less than two-sevenths its length; bones of head not cavernous.
- e. Gill-rakers extremely short, scarcely longer than posterior nostril; mouth small, more or less inferior, horizontal; lower teeth villiform, in rather broad bands; preopercle with strong teeth, none of them directed downward or forward; anterior profile more or less concave.
- f. Caudal fin lanceolate, nearly as long as head; body rather elongate, depth  $3\frac{1}{2}$  in length; head low, slender, the maxillary reaching middle of eye; snout projecting beyond premaxillaries; second anal spine strong,  $1\frac{3}{4}$  in head; pectorals short,  $1\frac{2}{3}$  in head; color grayish; anal and ventrals largely black. D. X-I, 22; A. II, 7; Lat. l. 44..... OPHIOSCION.†
- ff. Caudal double-truncate or double-concave, much shorter than head.
- g. Snout much projecting beyond the premaxillaries; head low, very slender; body rather deep, compressed, the depth 3 in length; second anal spine small,  $2\frac{1}{2}$  in head; pectoral  $1\frac{1}{2}$  in head; dorsal spines slender; color grayish; anal and ventrals largely black. D. XI-I, 25; A. II, 8; Lat. l. 49..... IMICEPS.
- gg. Snout scarcely projecting beyond the premaxillaries; head not very slender; body robust, its depth 3 in length; second anal spine moderate,  $2\frac{1}{2}$  in head; color dusky, with blackish stripes along the rows of scales; ventrals and anal largely black. D. X-I, 24; A. II, 7; Lat. l. 47.....VERMICULARIS.‡

\* *Corrina* (*Homoprion*) *fürthi* Steindachner, Ichthyol. Beitr. iii, 26, 1875, taf. iii. Panama (Steind. Gilb.).

† *Ophioscion typicus* Gill, Proc. Ac. Nat. Sci. Phila. 1863, 164; *Corrina ophioscion* Günther, Fish. Centr. Amer. 1869, 428. Panama (Gill, Steind. Gthr. Gilb.).

‡ *Corrina vermicularis* Günther, Fish. Centr. Amer. 1869, 427, pl. lxxvii, f. 2. Mazatlan (Gilb.); Panama (Gthr.).

ee. Gill-rakers not very short, nearly or quite as long as pupil; mouth rather large, terminal or nearly so; anterior profile scarcely concave; caudal rounded or double truncate.

h. Teeth of lower jaw subequal, forming a rather narrow villiform band; preopercle with strong teeth, the lowest one directed downward.

i. Snout bluntish; the head rather stout and broad above; interorbital space broader than eye; dorsal spines rather slender; anal spine moderate, 2 in head; pectorals moderate,  $1\frac{1}{2}$  in head; preopercle strongly curved, somewhat V-shaped. Color brassy, with faint dark stripes along the rows of scales; lower fins more or less dusky. D. X-I, 21; A. II, 9; Lat. l. 53.

CHRYSOLEUCA.\*

ii. Snout sharp; the head slender, narrow above; interorbital space not broader than eye; dorsal spines strong; anal spine very strong,  $1\frac{3}{8}$  in head; pectoral short,  $1\frac{1}{2}$  in head; preopercle not strongly curved. Color bluish above, silvery below; lower fins pale. D. X-I, 22; A. II, 8; Lat. l. 52 ..... ARMATA.†

hh. Teeth of lower jaw not villiform, unequal, pointed, in a very narrow band. Color bluish silvery; the lower fins pale. (*Bairdiella* Gill.)

j. Preopercle with strong teeth, the lower tooth largest, directed downward and forward; second anal spine very large.

k. Eye moderate, not longer than snout, 4 to 5 in head; snout not very blunt; dorsal spines very slender; soft dorsal moderate, the longest rays less than half length of head; second anal spine two-thirds length of head; body rather elongate, the depth  $3\frac{3}{8}$  in length. D. X-I, 26; A. II, 8; Lat. l. 54.

ICISTIA.

kk. Eye very large, longer than snout, 3 to 4 in head; snout very blunt; dorsal spines comparatively stiff; soft dorsal high, its longest rays about half head; second anal spine very large, four-fifths head; body not very elongate, the depth about  $3\frac{1}{2}$  in length. D. X-I, 23; A. II, 8; Lat. l. 57. .... ENSIFERA.

jj. Preopercle with fine uniform teeth, none of them directed downward; second anal spine small,  $2\frac{3}{4}$  in head; eye very large, longer than snout, 3 to 4 in head; dorsal spines rather slender; body deep, depth  $2\frac{3}{4}$  in length. D. XI-I, 26; A. II, 10; Lat. l. 50 ..... MACROPS.‡

aa. Lower jaw with two slender canines in front, the other teeth unequal, not villiform, in few series (*Odontoscion* Gill); mouth large, oblique, lower jaw slightly projecting; preopercle with a few rather strong teeth, the lower one largest and directed downwards; snout rather pointed; eye large, longer than snout; dorsal spines very slender; anal very small, its spine small, 3 in head; body rather elongate, depth  $3\frac{3}{8}$  in length. Color silvery, bluish above; lower fins pale. D. X-I, 23; A. II, 8; Lat. l. 58.

ARCHIDIUM.

\* *Corvina chrysoleuca* Günther, Fish. Centr. Amer. 1869, 427, pl. lxvii, f. 1: ? *Sciæna alata* Jor. & Gilb. Proc. U. S. Nat. Mus. iv, 1881, 332; probably the same species, but with D. X-I, 19; Lat. l. 45, etc. La Union (Nichols Coll.); Panama (*Gthr. Gilb.*).

† *Bairdiella armata* Gill, Proc. Ac. Nat. Sci. Phila. 1863, 164: *Corvina* (*Homopriion*) *acutirostris*, Steindachner, Ichthyol. Beitr. iii, 28, 1875, taf. iv. Panama (*Gill; Steind. Gilb.*).

‡ *Corvina macrops* Steindachner, Ichthyol. Beitr. iii, 1875, 24, taf. ii. Panama (*Steind.*).

8. *Odontoscion archidium*, sp. nov. (29266, 29480, 29518.)

Head and body rather elongate, considerably compressed; back not elevated, the snout somewhat gibbous, the profile depressed above the eyes.

Mouth very large, terminal, oblique, the maxillary reaching vertical from posterior margin of pupil; jaws subequal; premaxillaries in front on the level of lower edge of pupil; symphysis of lower jaw with an oblong knob, which projects inwards and upwards; on this are two series of teeth, three in each series, the inner pair being canines of moderate size, larger than any of the other teeth, but much smaller and slenderer than the canines in *Cynoscion*. Both jaws without villiform teeth; upper jaw with two series of slender pointed teeth, the outer series enlarged. Lower jaw laterally with a single series of teeth similar to those of the outer series of upper jaw, but larger; those in the middle of the jaw largest.

Diameter of eye about equal to length of snout, or to interorbital width, and  $4\frac{1}{2}$  times in length of head. Length of maxillary  $2\frac{1}{4}$  in head.

Gill-rakers long and slender,  $6 + 13$  in number. Pseudobranchiæ well developed. Posterior nostril a narrow oblong vertical slit.

Posterior margin of preopercle inclined downward and backward, both margins convex and with the angle broadly rounded. Both margins with weak distinct serrations; posterior border with two or three stronger teeth next the angle directed backwards, the angle with one robust flattish spine directed more or less vertically downwards.

Spinous dorsal with very weak, flexible spines, the third the longest and about half length of head; soft dorsal moderate, the longest ray shorter than the dorsal spines but more than one-third length of head. Caudal fin subtruncate or slightly emarginate. Anal fin very small, posteriorly inserted, its base but little oblique; length of base about equal to length of snout; second anal spine moderate, shorter than the first soft ray; much stronger than the dorsal spines and inflexible, its length about equal to snout and half of eye, 3 in head. Distance from front of anal to middle of base of caudal slightly more than one-fourth the length of the body. Distance from vent to front of anal about equal to length of base of anal.

Pectoral short, not reaching tips of ventrals, its length  $1\frac{3}{4}$  in head. Ventrals reaching half way to front of anal, not nearly to vent. Membranes of soft parts of vertical fins with series of scales extending more than half way to the tips. Lateral line scarcely arched, becoming straight opposite front of soft dorsal.

Head 3 times in length; depth  $3\frac{1}{2}$ . Dorsal rays XI, 24; Anal II, 8; Lateral line 50 (series of scales); 52 pores.

Color lustrous bluish-gray above, silvery below; middle of sides with indistinct lengthwise streaks formed by clusters of dark dots in the centers of the scales. Snout and tip of lower jaw blackish; a dark blotch on opercle above; sides of head bright silvery; fins light straw

color; upper half of pectorals dusky; spinous dorsal finely speckled with black; upper half of axil brown. Peritoneum pale; lining of opercle black above. Iris bright yellow, dusky above.

This species is known to us from three specimens, each about 7 inches in length, taken in the Bay of Panama. It seems to be related to *Corvina dentex* C. & V. and thus to belong to the group called *Odontoscion* by Professor Gill. Its affinities with *Bairdiella* are evident, the development of small canines in the lower jaw being the only character distinguishing *Odontoscion* from *Bairdiella*.

9. *Cynoscion phoxocephalum*, sp. nov. (29296, 29339, 29389, 29724.)

(Subgenus *Atractoscion* Gill.)

Body not very elongate, fusiform, little compressed, the greatest thickness nearly two-thirds the greatest depth. Back scarcely elevated nor compressed, the profile from the snout to the front of the dorsal nearly straight.

Head conical, little compressed, pointed in profile, tapering with much regularity toward the tip of the projecting lower jaw; length of mandible more than half that of head. Mouth large, very oblique, the premaxillary in front on the level of the upper part of the orbit, the broad maxillary extending to below the posterior margin of the eye, 2 in head.

Teeth in narrow, cardiform bands in each jaw, the bands composed of about 2 series in front, growing narrow laterally, and finally forming a single series. Teeth subequal, with the exception of about two pairs in the front of the upper jaw, the posterior pair being developed as small canines directed inward and backward. In the smaller specimens the canines are proportionately larger than in the adult, but in all they are smaller than is usual in *Cynoscion*.

Eye rather small,  $7\frac{1}{2}$  in head, a little less than half the length of the snout, a little more than half the breadth of the evenly convex interorbital space, which is  $3\frac{2}{3}$  in head. Gill-rakers few, thickish, and very short, shorter than the pupil. Pseudobranchiæ quite small.

Scales of lower part of cheeks enlarged, imbedded, covered with silvery skin. Scales above eyes on nape and on border of preopercle much reduced in size. Preopercle, as in all species of this genus, entire, with a broad membranaceous border.

Scales on body small and smooth. Lateral line scarcely arched in front, becoming straight opposite front of anal.

Dorsal fins entirely separate, the spines of the first dorsal slender. Second spine shorter than third and fourth, which are considerably elevated,  $1\frac{3}{4}$  in length of head in the young,  $2\frac{1}{2}$  in the adult. Second dorsal of moderate height, enveloped in lax scaleless skin, which is thickened at the base of the fin; longest rays a little more than one-third length of head. Anal rather long and low, its longest rays about equal to the length of the base, and a little more than one-third length of head. Anal spines very small and weak, wholly enveloped in the skin and not visi-

ble. Anal fin nearly coterminous with the dorsal, its rays similarly enveloped in loose skin. Caudal fin moderate, thickish and scaly at base, lunate, its lobes equal, the middle rays  $1\frac{2}{3}$  in length of head. Ventrals short, about half length of head, reaching about one-third the distance to the vent. Pectorals short, not reaching tips of ventrals, 2 in head. Distance from vent to base of caudal about two-fifths its distance from snout.

Head  $3\frac{1}{3}$  in length; depth  $4\frac{1}{3}$ . D. IX-I, 21; A. II, 10; Lat. 1. 90 (series of scales, the number of pores in the lateral line somewhat less); 17 scales in an oblique series from first dorsal spine to lateral line.

Color in life, dark above with strong bright reflections of purplish-brown; silvery below, the lower part of the caudal peduncle golden yellow. Middle of sides noticeably punctulate with brown dots; inside of mouth deep orange yellow; lining of opercle black. Dorsal and caudal fins dusky whitish, with more or less of dark edging; lower rays of caudal yellowish; fins otherwise translucent, unmarked. Axil of pectoral light brownish above. The silvery color of the sides of the head and the bright reflections on its upper surface are very conspicuous, more so than in any other species of the genus.

Four specimens, the largest (No. 29296)  $16\frac{1}{2}$  inches in length, were obtained at Panama. This species is readily distinguishable from all others of the genus found in the Pacific Ocean, by the peculiar, tapering head.

The species of *Cynoscion* known from the Pacific coast of tropical America may be compared as follows:

a. Second dorsal and anal scaleless.

b. Canines of upper jaw large, 2 (or 1) in number; membranes of soft dorsal not thickened.

c. Back and sides with conspicuous dark reticulations; soft dorsal with 25 to 28 rays; maxillary not quite reaching posterior border of eye; caudal double-truncate; pectorals about reaching tips of ventrals, rather more than half head; scales 9-73-16; 60 pores in lateral line .....RETICULATUM.\*

cc. Back and sides nearly plain grayish-silvery; soft dorsal with 20 to 23 rays.

d. Caudal fin double-concave, the middle rays more or less produced; anal rays II, 7 to II, 9.

e. Pectorals reaching nearly or quite to tips of ventrals, their length more than half head.

f. Scales very small (12-86-x); about 70 pores in the lateral line; head rather long and pointed; maxillary a little less than half head, reaching just past eye; lateral line becoming straight nearly opposite vent .....XANTHULUM.

ff. Scales moderate (8-66-18); 63 pores in lateral line; head large, bluntish; maxillary nearly half head, reaching well past eye; lateral line becoming straight at a point considerably in advance of vent .....ALBUM.†

\* *Otolithus reticulatus* Günther, Proc. Zool. Soc. Lond. 1864, 149. Mazatlan (*Gilb.*); Acapulco (*Nichols coll.*); San José de Guatemala (*Gthr.*); Chiapam (*Gthr.*); Panama (*Gilb.*).

† *Otolithus albus* Günther, Proc. Zool. Soc. Lond. 1864, 149. Chiapam (*Gthr.*); Panama (*Gthr. Steind. Gilb.*).

- ec.* Pectorals reaching little past middle of ventrals, their length not more than half head; body elongate; mouth oblique, the maxillary extending to below its posterior margin; lateral line becoming straight under front of second dorsal; scales 10-73-17; about 60 pores in lateral line . . . . STOLZMANNI.\*
- dd.* Caudal fin lunate, the middle rays shortest; anal rays II, 10; pectorals short, not reaching to tips of ventrals; scales 90; lateral line with about 75 tubes; maxillary extending beyond pupil . . . . . PARVIPINNE.†
- bb.* Canines little developed, usually 4 in number when present. (*Atractoscion* Gill.)
- g.* Pectoral moderate, more than half head; head pointed, compressed,  $3\frac{3}{8}$  in length; gill-rakers moderate; scales very small (13-95- $x$ ), those on head little embedded; canines obsolete; caudal lunate, its middle rays less than half head. D. X-I, 22; A. II, 10. Color grayish; lower fins dusky; inside of opercle not black. Size very large . . . . . NOBILE.‡
- gg.* Pectorals short, not more than half head; second dorsal enveloped in lax, naked skin, thickened at base; head regularly conical, pointed, tapering, scarcely compressed,  $3\frac{1}{2}$  in length; gill-rakers very short; scales very small (14-90- $x$ ), those on the head largely imbedded; canines small; lateral line little arched; caudal lunate, its middle rays more than half head. D. IX-I, 21; A. II, 10. Color silvery, with bright reflections; lower fins pale; lining of opercle black . . . . . PHOXOCEPHALUM.
- aa.* Second dorsal and anal densely covered with small scales; coloration grayish-silvery; canines well developed; sides of lower jaw with a single series of teeth.
- h.* Caudal lunate; dorsal rays IX-I, 23; A. II, 10; Lat. 1. about 65; maxillary reaching a little beyond eye; pectorals more than half length of head, reaching beyond tips of ventrals; lateral line becoming straight in front of vent.
- OTHONOPTERUM.
- hh.* Caudal rhombic, the middle rays produced; D. VIII-I, 21; A. II, 10; Lat. 1. about 70; maxillary reaching a little beyond eye; pectoral shortish, scarcely more than half length of head; lateral line becoming straight opposite front of anal . . . . . SQUAMIPINNE.§

10. *Isopisthus remifer*, sp. nov. (29169, (3 spec.); 29312, 29324; 29336; 29429.)

Head  $3\frac{1}{4}$  ( $3\frac{3}{4}$  in total); depth  $4\frac{1}{5}$  ( $4\frac{3}{4}$ ); length (29312) 11 inches. D. VIII-I, 20; A. II, 19; scales 15-73-16; about 55 scales pierced by the lateral line.

\* *Otolithus stolzmanni* Steindachner, Neue & Seltene Fische aus den K. K. Zool. Museen Wien. &c. 1879, 35, taf. ii, f. 1. Panama (*Gilb.*); Tumbes (*Steind.*).

† *Cynoscion parvipinnis* Ayres, Proc. Cal. Ac. Nat. Sci. 1861, 156: *Otolithus magdalene* Steindachner, Ichth. Beiträge, iii, 1875. San Pedro (*Jor. & Gilb.*); San Diego (*Jor. & Gilb.*); Coast of Lower California (*Ayres*); Magdalena Bay (*Steind.*); Gulf of California (*Nichols coll.*).

‡ *Johnius nobilis* Ayres, Proc. Cal. Ac. Nat. Sci. 1860, 78: *Otolithus californiensis*, Steind. Ichth. Beitr. iii, 31, 1875. San Francisco to Magdalena Bay.

§ *Otolithus squamipinnis* Günther, Proc. Zool. Soc. Lond. 1866, 601. La Union (*Nichols coll.*); Panama (*Gthr. Steind.*).

Body moderately elongate, compressed, the back not elevated; head compressed; snout rather short, not prominent; anterior profile slowly rising from snout to front of dorsal. Premaxillaries extending beyond front of snout, anteriorly on the level of the upper part of the pupil. Mouth large, very oblique, the maxillary extending to below the middle of the eye, its length  $2\frac{1}{3}$  in head. Lower jaw strongly projecting at tip. Chin without pores.

Front of premaxillaries with a long, sharp, curved canine on each side (one of these often smaller or absent); sides of upper jaw with smaller teeth, wide-set, mostly in one row. Lower jaw with about two series of small, slender teeth in front; laterally with a single series of small teeth, besides three to six large canines, much smaller than the canines of the upper jaw.

Preorbital narrow, not wider than the pupil. Eye large,  $4\frac{1}{2}$  in head, slightly shorter than snout, which is about equal to interorbital width. Preopercle with a membranaceous flap at its angle, which is striate and slightly fringed at its edge. Gill-rakers rather long and slender, few in number. Pseudobranchiæ well developed. Nostrils small, the posterior vertically oblong.

Scales small, nearly smooth, deciduous. Dorsal and anal fins closely covered with small scales. Lateral line little arched, becoming straight behind vent. First dorsal small, its spines slender, the highest  $2\frac{1}{2}$  in length of head. First spine minute or obsolete, the second not much shorter than third. Space between dorsal fins about equal to diameter of eye,  $3\frac{1}{2}$  in head. Soft dorsal moderate, its longest ray a little less than one-third length of head. Caudal shortish, slightly double-concave, its middle rays about half length of head. Base of anal two-thirds length of head, its spines rudimentary. Ventrals half length of head, reaching half way to vent, which is close in front of anal. Pectorals reaching considerably beyond tips of ventrals, their length  $1\frac{1}{4}$  to  $1\frac{1}{3}$  in head,  $4\frac{1}{6}$  to  $4\frac{1}{3}$  in body. Flesh comparatively soft.

Color in life: Bluish gray above; grayish silvery below; top of snout and tip of lower jaw blackish; inside of mouth yellow, with black on lower lip within; lining of opercles black, bordered with pale orange. Dorsals, caudal, and pectorals with fine black punctulations; the ground color in all except the spinous dorsal faintly yellowish. Anal white, the anterior part and the tips of most of the rays yellowish, punctate with black. Ventrals white, immaculate. A dark blotch behind orbit and another on upper part of opercle. Axil brown above, the color extending on the upper rays of the pectoral within.

This species seems to be rather common at Panama, where numerous specimens were obtained. It is extremely close to *I. affinis* Steind. from Porto Alegre, Brazil, and were it not for the considerably longer pectoral, we should consider it identical with the latter species. *Isopisthus parvipinnis* (C. & V.) Gill, from Surinam, is insufficiently described, but seems to be nearer *I. affinis*, if not identical with it.

11. *Serranus lamprurus*, sp. nov. (29651.)

Subgenus *Plectropoma* Cuvier; allied to *Serranus chlqrurus* C. & V. (*Plectropoma chlorurum* C. & V.), but with considerably larger scales.

Body short and deep, compressed, the back elevated, the ventral outline from lower jaw to front of anal, little arched; profile convex from dorsal to occiput, thence concave above eye, the snout low and acute in profile. Mouth large; maxillary about half length of head, reaching to below the middle of the eye, the premaxillary in front rather below the level of the lower edge of the eye; preorbital narrow; jaws subequal, the lower slightly included; teeth strong, the anterior canines stronger than those of the sides of the jaws, about 4 in the upper jaw and 6 in the lower; teeth all fixed. Cheeks with 5 rows of scales; top of head and both jaws scaleless. Eye large, about equal to snout and broader than interorbital space, about  $3\frac{1}{2}$  in head (doubtless smaller in adults). Vertical limb of preopercle nearly straight, the teeth growing larger downwards; angle and lower limb with about 9 strong radiating teeth, those nearest the angle largest, the anterior directed more and more forwards. Opercle with two flat points. Gill-rakers moderate, slender, nearly as long as pupil. Dorsal spines strong, the fourth the highest, about equal to soft rays and  $2\frac{1}{3}$  in head; the last spine considerably shorter than soft rays. Caudal emarginate,  $1\frac{2}{3}$  in head, the middle rays little shorter than the outer. Anal spines strong, the second longer and stronger than the third,  $2\frac{2}{3}$  in head. Ventrals long,  $1\frac{2}{3}$  in head, nearly reaching anal. Pectorals about reaching anal,  $1\frac{1}{3}$  in head. Scales above lateral line in series parallel to lateral line. Head  $2\frac{3}{5}$  in length; depth  $2\frac{1}{4}$ . D. X, 13; A. III, 8; scales 6-46-13.

Color black with violet luster; faint pale streaks formed by paler spots along rows of scales on lower part of body. Entire caudal fin abruptly translucent; pectoral nearly colorless; tips of spines of dorsal and anal, and terminal portions of soft rays, abruptly whitish. Ventrals black.

A single specimen, three inches in length, was taken in a tide-pool in Panama Bay. It would be a species of "*Hypoplectrus*" in Professor Gill's arrangement of the Serranoids.

12. *Diabasis steindachneri*, sp. nov. (29305, 29387 from Panama, 28172, 29226, 29634, 29759, 29778, 29795 from Mazatlan.)

(*Hæmulon caudimacula* Steindachner, Ichthyol. Beiträge, iii, 15 (Acapulco, Rio Janeiro, Rio Grande do Sul, Marauhaõ, not of Cuv. & Val., v, 236, 1850 = *Diabasis parva* Desm.)\*

\* The *Hæmulon caudimacula* is imperfectly described by Cuvier and Valenciennes. We are indebted to Dr. H. E. Sauvage, of the Museum d'Histoire Naturelle of Paris, for the following important information concerning the species:

There are in the Museum of Paris three specimens of *Hæmulon caudimacula*, viz, from Brazil by Delalande, from Bahia by Castelnau, and from Cuba by Desmarest. The diagnosis of this latter specimen, the type of the species and the type of *Diabasis parva* Desmarest, is as follows:

D. XI, I, 15; A. III, 7; Lat. 1. 49.

Height of the body equal nearly to the length of the head, and  $3\frac{1}{2}$  in the total

Head 3 ( $3\frac{2}{3}$  with caudal); depth  $2\frac{5}{8}$  ( $3\frac{2}{5}$ ); length (29387)  $7\frac{1}{2}$  inches. D. XII, 16; A. III, 8; scales 7-50-14.

Body oblong, moderately compressed, the back somewhat elevated; the profile from the snout to the base of the dorsal rather steep and straight or slightly convex. Snout pointed, of moderate length, a little more than one-third of length of head. Ventral outline little curved. Caudal peduncle nearly twice as long as deep, three-fifths length of head.

Head rather long and pointed. Mouth large, little oblique, the premaxillary below lower border of eye; the lower jaw included; the maxillary 2 in head, reaching to opposite middle of pupil, its posterior portion extending behind the preorbital sheath. Teeth strong, in moderate bands, the outer series enlarged, especially in the upper jaw, and on the sides of the lower jaw. Chin with a large pit and two pores. Eye rather large, 4 in head, shorter than snout, which is 1 more than to the width of the flattish interorbital space; about half wider than the moderate preorbital.

Preopercle sharply serrate, its upright limb nearly straight. Gill-rakers short and weak, about 15 on lower part of arch.

Scales moderate, those above lateral line in very oblique series, becoming horizontal on the caudal peduncle; those below it in horizontal series. Vertical fins well scaled, the scaly sheaths of dorsal and anal well developed. Scales on breast small. Dorsal fin rather high, the spines strong, the fourth or longest  $2\frac{1}{4}$  in head, about one-third longer than the soft rays. Caudal short, moderately forked, the upper lobe slightly the longest, two-thirds head. Second anal spine strong,  $2\frac{2}{5}$  in head; much longer than the third spine, which is shorter than the soft rays. Soft rays of anal high, the first soft ray when depressed reaching almost to tip of last ray; much beyond the base of the last ray. Ventral fins four-sevenths length of head, not reaching tips of pectorals, which are about three-fourths length of head.

Color in life, light olive brown, silvery below, the edges of the scales of back with brilliant bluish luster. Each scale on back and sides with a median silvery spot (much larger than the spots in *D. flaviguttatus*), these forming very distinct streaks, having the direction of the

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length; snout pointed, a little longer than the diameter of the eye, which is  $3\frac{2}{3}$  in head, and equal to the distance between the angle of the operculum and the limb of the preoperculum. The upper maxillary extends to the vertical from the anterior margin of the eye. The posterior limb of the preoperculum is slightly emarginate and minutely denticulated, the denticulations of the angles not stronger than the others. Dorsal fin notched; spines moderately strong, the fourth longest,  $2\frac{1}{3}$  in length of head. Soft dorsal, caudal, and anal fins thickly enveloped in scales. Caudal fin little notched. Second anal spine a little longer than third, as long as the longest dorsal spine. Scales between pectoral fin and lateral line not larger than the others.

Color yellowish with numerous (18) oblique brownish streaks on the side of the body: anal and ventral fins blackish: some irregular brownish spots on the caudal.

Total length m. 0, 130; head 0, 039; eye 0, 010; snout 0, 013; second anal spine 0, 017; fourth dorsal spine 0, 017; depth of body 0, 037.

rows of scales. Head brownish, unspotted. A large, distinct, round blackish blotch on end of caudal peduncle and base of caudal fin, more distinct than in other species known to us. A distinct bluish black vertical bar on lower anterior part of opercle, partly concealed by angle of preopercle. Fins all bright yellowish; ventrals and anal not dark. Peritoneum dusky.

This small species was found to be rather rare at Mazatlan, and comparatively abundant at Panama.

Dr. Steindachner has identified this species with *Hæmulon caudimacula* C. and V., remarking: "Ich verglich die bei Acapulco gesammelten Exemplare auf sorgfältigste mit jenen, welche das Wiener Museum aus der Bucht von Rio Janeiro, von Rio Grande do Sul sowie von Maranhão besitzt, und bin nicht in Stande, zwischen diesen ein Artunterschied zu entdecken."

Whether the Brazilian specimens referred to really belong to the present species or not, it is evident that the original *Hæmulon caudimacula* is a very different species.

The species of *Diabasis* found on the Pacific coast of Tropical America may be compared as follows:

a. Scales above lateral line arranged in very oblique rows.

b. Spots on scales black or blackish.

c. Snout long and protruding, forming more than two-fifths length of head; preorbital very deep, wider than eye; sides with dark vertical bars; sides of head spotted; size large.....SEXFASCIATUS.\*

cc. Snout short and bluntish, about one-fourth length of head; preorbital about as wide as eye; sides not barred; head unspotted....SCUDDERI.†

bb. Spots on scales pale-bluish or grayish.

d. Mouth large, nearly horizontal, the maxillary extending to opposite middle of eye, beyond preorbital sheath; head long, 3 in length; gill-rakers short and weak; anal fin rather high, the first soft rays when depressed extending beyond the base of the fin; spots silvery, comparatively large.....STEINDACHNERI.

dd. Mouth small, oblique, the maxillary reaching pupil, not beyond preorbital sheath; head short,  $3\frac{1}{2}$  in length; gill-rakers comparatively long and slender; anal fin low, the first soft ray when depressed not reaching to base of last ray; spots bluish, small, stellate.

FLAVIGUTTATUS.‡

\* *Hæmulon sexfasciatus* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 254: *Hæmulon maculosum* Peters, Berlin Monatsber., 1869 705. Cape San Lucas (*Gill*); Mazatlan (*Gilb. Peters*); Panama (*Steind. Gilb.*).

† *Hæmulon scudderi* Gill, Proc. Ac. Nat. Sci. Phila., 1862, 253: *Hæmulon brevirostrum* Günther, Fish. Centr. Amer. 1866, 418: *Hæmulon undecimale* Steindachner, Ichthyol. Beitr. iii, 11, 1875. (Cape San Lucas (*Gill*); Mazatlan (*Steind. Gilb.*); Acapulco (*Steind.*); Panama (*Günther, Steind. Gilb.*). The dorsal spines in this species are normally 11.

‡ *Hæmulon flaviguttatus* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 254: *Hæmulon margaritifera* Günther, Proc. Zool. Soc. Lond. 1864, 147. (Cape San Lucas (*Gill*); Mazatlan (*Steind. Gilb.*); Acapulco (*Steind.*); Altata (*Steind.*); Panama (*Gthr. Steind. Gilb.*).

aa. Scales above lateral line in horizontal rows parallel with the lateral line; body elliptical; mouth small, little oblique; sides with alternate stripes of dark brown and light grayish.....MACULICAUDA.\*

13. *Xenichthys xenops*, sp. nov. (29173 (eighteen specimens), 29513.)

Allied to *X. xanti*.

Form elliptical, the body comparatively deep, compressed, the back somewhat elevated; profile nearly straight from snout to base of dorsal. Head subconic, flattish above, not strongly compressed; the temporal region prominent. Post-temporal, interorbital, and suborbital regions somewhat cavernous, yielding to the touch. Nuchal region slightly carinate.

Mouth terminal, very oblique, the lower jaw strongly projecting, its tip entering the upper profile of head. Preorbital rather narrow, its least width less than half the diameter of the pupil. Teeth small and feeble, in narrow bands in both jaws; a few on vomer, none on palatines or tongue. Nostrils similar, near together, oblong, more than twice as long as broad (nearly round in *X. californiensis*.) Preorbital region, upper jaw, and tip of lower jaw naked; rest of head scaly. Edge of preorbital entire. Eye extremely large, half longer than snout, which is somewhat longer than the width of the flat interorbital space; diameter of eye 3 in length of head. Preopercle produced and membranaceous at its angle, its vertical limb with weak, sharp teeth. Gill-rakers moderate, about half diameter of pupil.

Scales moderate, thin, somewhat ctenoid, those of the breast like the others; scales on breast and back somewhat reduced.

Dorsal spines high, flexible, the third highest, as long as snout and eye, or  $1\frac{2}{3}$  in head,  $5\frac{1}{3}$  in length of body; tenth dorsal spine very low; eleventh and twelfth a little higher; soft dorsal long and low, its highest rays less than diameter of orbit; its base three-fourths length of head; slightly longer than base of soft dorsal, equal to base of anal. Anal spines small, graduated, the third two-thirds height of the soft rays. Caudal moderately and equally forked, the middle rays two-thirds length of outer; length of the fin more than length of snout and eye. Pectoral short, not reaching nearly to vent; a little longer than snout and eye, or  $1\frac{1}{2}$  in head. Ventrals not nearly reaching vent,  $1\frac{3}{4}$  in head, their accessory scale well developed. Vertical fins with well-developed sheaths of scales; anal entirely scaly; soft dorsal, pectorals, and ventrals mostly covered with scales; caudal partly scaled.

Head 3 in length; depth 3. D. XI, 1, 18; A. III, 17; scales 10-54-14.

Coloration in life: Back bluish gray, below silvery; upper part of sides with seven or eight longitudinal, narrow, yellowish-brown streaks, some of which are continued very faintly on the head; snout blackish above, yellowish on sides; mouth light yellow within, with tip of tongue

\* *Orthostichus maculicauda* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 255: *Hamulon mazatlanum* Steind. Ichth. Notizen VIII, 12, taf. vi, 1869. Cape San Lucas (*Gill*); Mazatlan (*Steind.*); Acapulco (*Steind.*); Panama (*Gill*).

and membrane of lower jaw blackish anteriorly. Eye with a dusky yellowish streak surrounding the iris. Spinous dorsal yellowish below, dusky towards the margin; other vertical fins yellowish, with some scattered black points and with narrow black margins. Pectorals yellowish, the membrane with series of dark points between the rays. Ventrals white, with a dusky yellow blotch on the outer half of outer rays.

Numerous specimens, all about ten inches in length, were obtained in the Bay of Panama.

This species is a member of the typical section of the genus *Xenichthys*, which is characterized by the length of the soft dorsal and anal, these being much longer than the spinous part. To this section also belong *X. xanti* Gill and *X. agassizii* Steind. The two remaining species, now known (*X. californiensis* Steind. and *X. xenurus* J. & G.), have the soft dorsal and anal not longer than the spinous dorsal.

The species of *Xenichthys* may be distinguished by the following analysis:

- a. Soft dorsal much longer than spinous dorsal, of 14 to 18 rays; anal elongate, with 16 to 18 soft rays; form elliptical, the depths about equal to length of head. Caudal lunate.
- b. Scales of the lateral line larger than the others; dorsal rays XII, 14; lat. l. 50; eye moderate, 3 in head, the maxillary not reaching its front; pectoral short, little longer than ventrals, about half length of head. Pale, with two purplish longitudinal stripes; an obscure spot at base of caudal ..... XANTI.\*
- bb. Scales of lateral line like the others.
- c. Eye very large,  $2\frac{3}{8}$  in head, the maxillary reaching beyond its front; pectoral moderate,  $1\frac{3}{8}$  in head, considerably longer than ventrals; dorsal rays XI, 18; lat. l. 54. Color silvery, with several faint longitudinal dark streaks; lower fins with dusky points ..... XENOPS.
- cc. Eye rather large,  $3\frac{1}{4}$  in head; pectoral very long, scarcely shorter than head; dorsal rays XII, 18; lat. l. 58. Color silvery, bluish above, without stripes ..... AGASSIZII.†
- aa. Soft dorsal shorter than spinous dorsal of 10 or 11 rays; anal short, of 10 or 11 soft rays.
- d. Caudal fin lunate, the middle rays more than half length of outer; body rather elongate, the depth ( $3\frac{1}{2}$ ) equal to length of head; eye moderate,  $3\frac{1}{2}$  in head; dorsal spines moderate, the longest three-fifths head; pectorals rather long, three-fourths head; dorsal rays X, 12; lat. l. 52. Color silvery, bluish above, with several longitudinal dark stripes. CALIFORNIENSIS.‡
- dd. Caudal fin deeply forked, the middle rays scarcely one-third length of the outer; body not elongate, the depth ( $2\frac{3}{8}$ ) much more than length of head; eye very large,  $2\frac{3}{8}$  in head; dorsal spines very high, the longest two-thirds head; pectorals short, two-fifths head; dorsal rays X, 11; lat. l. 51. Color olivaceous above, silvery below, unstriped. XENURUS.

\* *Xenichthys xanti* Gill, Proc. Ac. Nat. Sci. Phila. 1863, 82. Cape San Lucas (Gill).

† *Xenichthys agassizii* Steindachner, Ichthyol. Beiträge, iii, 6, 1875. Galapagos Islands (Steind.).

‡ *Xenichthys californiensis* Steindachner, Ichth. Beitr. iii, 3, 1875. San Diego (Steindachner); Cerros Island (Streets; Nichols coll.).

14. *Pimelepterus ocyurus*, sp. nov. (29395, 29397, 29725.)

Body oblong-elliptical, much less compressed and elevated than in related species; both dorsal and ventral outlines regularly and nearly equally curved; frontal region little gibbous, the depression below it little marked and the snout scarcely blunt.

Mouth small, terminal, the lower jaw slightly included; maxillary not reaching front of eye. Incisor teeth very small, about 30 in the upper jaw lanceolate, each with a very small horizontal process, shorter than the tooth. Behind them a band of scarcely evident asperities; patches of similar asperities on vomer and palatines. Eye very large, nearly as long as snout, its diameter nearly one-half interorbital width and one-fourth length of head. Preopercle produced and rounded at angle, its margin weakly serrulate. Gill-membranes united straight across breast, free from the isthmus, their free border under posterior part of eye. Gill-rakers small and short; pseudobranchiæ present. Head more completely scaled than in *P. bosci*, the naked areas similar, but more restricted. Scales striated and rugose, but scarcely ctenoid; much smoother than in *P. bosci*; those on middle of sides largest; those on breast not much reduced in size. Soft dorsal and anal completely covered with scales, the pectorals and caudal nearly so. Dorsal spines low, the longest  $3\frac{1}{4}$  in head; the base of the fin nearly equal to that of the soft dorsal or the anal. Soft dorsal very low, its last rays longest, its middle rays not so long as the eye. Caudal extremely long, deeply forked, the lobes falcate, the upper rays more than four times the length of the middle rays, and equal to the greatest depth of the body. Anal long and low, its base greater than length of head, its last ray longest, its middle rays shorter than eye. Anal spines small, graduated. Ventrals short, well behind pectorals, nearly half length of head, and reaching half way to front of anal. Pectorals short, a little more than half head.

Head  $3\frac{1}{5}$  in length; depth  $2\frac{4}{5}$ . D. XI, 13; A. III, 14; scales 12-78-20 (rows).

Color in life: Back and sides above light olive brown, becoming yellowish olive below; belly and lower part of sides white. Each side of back with a very distinct dark-blue stripe, commencing a little in front of origin of dorsal and running to upper lobe of caudal fin; it gradually increases in width backwards to caudal peduncle, along which it is suddenly narrowed. A small blue spot on median line between the orbits, a broad blue stripe from snout through eye to suprascapula; a second from snout through lower margin of orbit to opercle, where it is abruptly expanded; lores golden; a broad golden stripe behind angle of mouth, not reaching preopercular margin. A broad dark-blue stripe from above base of pectorals straight to base of median caudal rays. Below this is a narrower golden stripe. Lower part of sides with indistinct longitudinal brownish streaks along the margins of the series of scales. Vertical fins golden yellow, caudal narrowly margined with black. Pec-

torals brown within, the outer side silvery with yellow tinge. Ventrals yellow on inner margins, silvery on the outer. Roof of mouth and tongue bright white.

This species occasionally appears in large numbers in the market of Panama, where several specimens were obtained.

The type of the present description (No. 29395) is 16 inches in length.

The species of *Pimelepterus* known from the Pacific Coast of tropical America may be thus distinguished:

- a. Incisor teeth well developed, each with a conspicuous horizontal process or root; caudal fin moderate, about as long as head, the outer rays not 3 times length of middle rays; junction of gill-membranes forming an angle.
- b. Body broad-ovate, the depth 2 to  $2\frac{1}{2}$  in length; profile of snout concave; interocular space gibbous; fins low, the longest dorsal spines less than half head; scales not small, about 10-57-17. Color dusky, with light and dark stripes along the rows of scales; fins mostly dark.....ANALOGUS.\*
- bb. Body oblong-elliptical, the depth  $2\frac{1}{2}$  in length; profile of snout not concave, the interocular space little gibbous; fins rather high, the longest dorsal spine half head; scales rather small, 12-67-22. Color chiefly yellow, not distinctly striped; fins pale.....LUTESCENS.†
- aa. Incisor teeth small, with inconspicuous roots; caudal much longer than head, the lobes falcate, the outer 5 times length of middle rays; gill-membranes not forming an angle at junction; form rather slender, the depth  $2\frac{1}{2}$  in length; profile of snout scarcely concave; interocular space little gibbous; fins low, the highest dorsal spine less than one-third head; scales small, 10-78-18. Color olivaceous, with blue and golden spots and stripes; fins mostly yellow. OCYURUS.

15. *Gerres aureolus*, sp. nov. (29487.)

Body ovate, much compressed, the back elevated, the outlines nearly regular; outline along base of anal very oblique; caudal peduncle very short and deep, tapering regularly to base of tail; snout rather pointed, projecting, the interorbital area strongly depressed. Maxillary long, reaching to a point midway between front and middle of pupil, the exposed portion narrowly oblong, its width about two-fifths its length; teeth slender, in narrow bands; groove on top of head for premaxillaries, scaleless, triangular, reaching a point opposite middle of eye, its width in front two-thirds its length. Eye very large, its diameter greater than snout or than interorbital width,  $3\frac{1}{2}$  in head. Preopercle with the angle produced, the margin sharply and finely serrated. Gill-rakers very short, not one-third diameter of pupil. Scales moderate, in about 4 rows on the cheek; lateral line running high, but little arched, much above axis of body even on caudal peduncle.

Dorsal spines slender, but little flexible, the second scarcely stronger than the others, about as long as the third, half as long as the head. Dorsal fins separate, notched to the base, the upper outline of spinous

\**Pimelepterus analogus* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 245; *Pimelepterus clegaus* Peters, Berliner Monatsber. 1869, 707. Cape San Lucas (*Gill.*); Mazatlan (*Peters, Gilb.*); Porto Escondido (*Nichols coll.*); Chiapam (*Gthr.*); Panama (*Gthr. Gilb.*).

†*Pimelepterus lutescens* Jordan & Gilbert, Proc. U. S. Nat. Mus. iv, 1881, 239. Socorro Island (*Nichols coll.*).

portion very oblique. Caudal deeply forked. Anal low; the second spine a little longer and noticeably stronger than the third,  $2\frac{2}{5}$  in head; soft rays posteriorly, not rising above their basal sheath of scales. Ventrals reaching well past vent, their length more than half head. Pectorals long, as long as head, reaching slightly beyond origin of anal.

Head 3 in length; depth  $2\frac{1}{4}$ . D. IX, 10; A. III, 8; Lat. 1. 35.

Color in life: Light olivaceous above, silvery below, sides with distinct tinge of pale yellow. Fins all yellowish; vertical fins margined with black, the spinous dorsal with a jet-black blotch on tip of membrane of anterior spines. Membrane of each spine and ray of the dorsal with a distinct jet-black spot at its base. Ventrals yellow on terminal portion of outer rays only, the very tip of these white. Tip of snout dark. Opercular membrane yellowish above. Lips with some yellow.

A single specimen,  $5\frac{1}{4}$  inches in length, was taken in the Bay of Panama.

The species of *Gerres* found on the Pacific Coast of tropical America may be thus compared:

- a. Preopercle entire; anal rays III, 7; body rather elongate; dorsal and anal spines comparatively low.
- b. Furrow on top of head for premaxillary processes long and narrow, naked; tip of spinous dorsal more or less abruptly black (this black spot ocellated in the males); teeth not very small.
- c. Body elliptical, strongly compressed, the profile not steep; depth little more than one-third of length; cheeks and sides without dark punctulations; lower fins pale; head small,  $3\frac{1}{2}$  in length; eye barely one-third length of head ..... GRACILIS.\*
- cc. Body subelliptical, deeper, and less compressed, the profile rather steep; depth nearly two-fifths of length; cheeks and sides with dark punctulations; head rather large,  $3\frac{3}{4}$  in length; eye more than one-third length of head. DOWI.†
- bb. Furrow on top of head for premaxillary processes, short and broad, posteriorly semicircular or subtriangular, naked; tip of spinous dorsal becoming gradually dusky; teeth small.
- d. Body moderately elevated, the depth barely two-fifths of length; caudal fin moderate, shorter than head; second anal spine not very strong, shorter than third, about one-fourth length of head; ventrals short, little more than half length of head, not reaching vent; sides without dark bars. CALIFORNIENSIS.‡
- dd. Body more elevated, the depth about two-fifths the length; caudal fin long, usually longer than head; second anal spine very strong, longer than third, one-third or more length of head; ventrals long, two-thirds head, reaching vent; sides with 8 or 9 dark vertical bars ..... ZEBRA.§

\* *Diapterus gracilis* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 246. Cape San Lucas (*Gill*); Guaymas (*Nichols coll.*); Mazatlan (*Gill.*); Panama (*Gill.*).

† *Diapterus dowi* Gill, Proc. Ac. Nat. Sci. Phila. 1863, 162. Panama (*Gill, Steind. Gilb.*); Galapagos Islands (*Steind.*).

‡ *Diapterus californiensis* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 245. Cape San Lucas (*Gill*); Guaymas (*Nichols coll.*); Mazatlan (*Gill.*).

§ *Gerres zebra* Müller & Troschel, Schomburgk Hist. Barbadoes, 1848, 668: *Gerres squamipinnis* Günther, i, 349, 1849. West Indies; Mazatlan (*Gill.*); Chiapam (*Gthr.*); Panama (*Gthr.*).

- aa. Preopercle serrate; anal rays III, 8; furrow for premaxillary processes naked, broad; teeth very small.
- e. Preorbital entire; body without dark lengthwise stripes.
- f. Body ovate, the outlines somewhat regularly elliptical, the depth a little less than half length; spines rather slender and short; second dorsal spine half length of head, one-fourth longer than second anal spine, which is less than half length of head .....AUREOLUS.
- ff. Body rhomboid, short and deep, with angular outlines, the depth usually rather more than half length; spines long and strong; second dorsal spine about as long as head, about half longer than the strong second anal spine, which is more than half length of head.....PERUVIANUS.\*
- ee. Preorbital serrate; body with distinct dark stripes along the rows of scales; body rhomboidal, with angular outline, the depth a little less than half length; spines very strong, the second dorsal spine two-thirds to three-fourths length of head, about half longer than second anal spine.
- f. Pectoral long, reaching about to front of anal; caudal longer than head; lateral stripes numerous.....LINEATUS.†
- ff. Pectoral short, barely reaching vent; caudal shorter than head; lateral stripes few.....BREVIMANUS.‡

16. *Gobius emblematicus*, sp. nov.

Body rather elongate, compressed, heaviest forwards, tapering regularly from the occiput to the caudal fin. Snout short, rather broad, acute in profile; mouth terminal, very oblique; gape wide, its length nearly half length of head; maxillary reaching to opposite middle of pupil; premaxillaries in front on the level of the pupil. Tip of lower jaw protruding beyond the upper.

Teeth in the upper jaw forming a single row, in the lower jaw partly in two series in front, forming a single row laterally; the anterior teeth in both jaws strong, incurved, and almost canine-like, the lateral teeth smaller and more closely set. Vomer and palatines toothless. Tongue emarginate in front.

Eyes very large, placed high, close together, the interorbital space extremely narrow, scarcely one-fourth the diameter of the orbit, which is greater than the length of the snout and scarcely less than one-third the length of head. Gill-opening moderate, extending from upper angle of opercle to below level of lower edge of pectoral fin.

Scales extremely small, cycloid, scarcely increasing in size toward caudal peduncle; head and anterior part of body to front of dorsal fin naked; a narrow naked strip along base of anterior half of spinous dorsal.

Dorsal spines very slender and weak, some of the middle ones usually prolonged, sometimes reaching nearly to the base of caudal, sometimes

\* *Gerres peruvianus* Cuv. & V. vi, 467, 1830: *Gerres rhombus* Gthr. Fish. Centr. Amer. 1866, 391 (not of C. & V.). Mazatlan (*Gilb.*); Chiapam (*Gthr.*); Panama (*Gilb.*); Peru (*C. & V.*).

† *Smaius lineatus* Humboldt, Observ. Zoolog. ii, 185, pl. 46: *Gerres axillaris* Günther, Proc. Zool. Soc. Lond. 1864, 102. Mazatlan (*Gilb.*); San Blas (*Nichols coll.*); Acapulco (*Humboldt*); Chiapam (*Gthr.*).

‡ *Gerres brevimanus* Günther, Proc. Zool. Soc. Lond. 1864, 152. Chiapam (*Gthr.*).

little elevated. Second dorsal and anal similar to each other, their bases elongate, their rays high, the last, when depressed, nearly reaching to the base of the caudal. Caudal fin of moderate length, sharply pointed, the middle rays produced, as long as from snout to base of pectoral. Pectoral fins short and broad, the rays all slender and fine, the upper not silk-like, the fin about three-fifths length of head. Ventrals fully united, the basal membrane very delicate, but well developed, the fin pointed in outline. Insertion of ventrals under axil of pectorals.

Head,  $3\frac{3}{4}$  in length; depth, 5. D. VII-16; A. 17; Lat. l. about 65.

Coloration in life: Light olivaceous, the belly silvery; above thickly punctate with pale dots; sides very thickly covered with golden-green specks, visible under the lens; back with six pairs of golden-green spots on each side of the dorsal fin, each nearly as large as the pupil; those of the first pair approximate, in front of the spinous dorsal; the second pair is under middle of spinous dorsal; the third pair under end of spinous dorsal; the fourth pair under first third of second dorsal; the fifth pair under the second third; the sixth pair (faint and often wanting) under last rays of soft dorsal. Sides of head and anterior half of body with wide streaks and bars alternately of purplish blue and golden bronze; those on cheeks longitudinal; those on opercle extending obliquely upwards and backwards; those on body vertical. All these markings disappear in spirits, leaving the fish plain light olive, usually with a broad silvery cross-bar behind pectorals. First dorsal transparent dusky, second dorsal with about three series of light blue spots. Anal with a tinge of light pink and a narrow margin of greenish white. Caudal yellowish green below, dusky above; a very conspicuous narrow bright red streak from the lower end of the base to the tip of the 5th or 6th ray from the bottom, thus crossing the rays obliquely. Ventrals glaucous bluish.

This species is very common in the rock-pools in the Bay of Panama, where it hides very closely among the rocks. Numerous specimens were obtained from  $2\frac{1}{2}$  to  $3\frac{1}{2}$  inches in length.

This species has the dentition of the group called *Euctenogobius*, with the squamation similar to that of the species which have been called *Eucyclogobius*. It may for the present be referred to *Gobius*, although it is not a member of that genus as restricted by Bleeker, Gill, and Günther. In Bleeker's system it would form the type of a new "genus."

17. *Microdesmus retropinnis*, sp. nov. (29665.)

Body very elongate, compressed, tapering somewhat from front of dorsal to caudal peduncle. Head very small, rapidly tapering forward from occiput; upper profile with a noticeable depression behind the orbits, the outline thence to snout strongly convex.

Mouth very small, somewhat oblique, the fleshy tip at symphysis of lower jaw projecting much beyond the premaxillaries; gape scarcely reaching vertical from orbit. Teeth small, apparently in a single series

in each jaw only. Nostrils double, distant, the anterior near the end of snout, the posterior above anterior margin of orbit. Gill-opening a very narrow, somewhat oblique slit, from front of lower third of pectoral fin downward and forward. Branchiostegals evident, 4 or 5 in number. Eye very small, lateral, situated near the upper profile of the head, its diameter nearly half the length of the short snout.

Vertical fins well developed; dorsal and anal connected with the caudal by a very delicate membrane. Distance from origin of dorsal fin to occiput three times the length of the head, its rays distant, connected by thin transparent membrane, as are the rays of the anal; most of the rays simple and undivided (but articulate); a few of the posterior only forked at tip. Origin of anal fin nearly equidistant between gill-opening and tip of caudal, its rays mostly forked at tip. Caudal rays much divided and more closely set than those of dorsal and anal, the fin somewhat pointed in outline, as long as the head. Tail not isocercal, truncate at base of caudal fin. Ventral fins very small, close together, inserted slightly behind base of pectorals; each fin reduced to a single undivided filament. Pectoral fins small, pointed; the middle rays longest, much shorter than the ventrals and half the length of the head.

Vent considerably behind middle of total length of the fish (with caudal).

Head and body covered with scattered rudimentary scales.

Head  $14\frac{1}{2}$  in length; greatest depth  $15\frac{3}{8}$ . D. 48; A. 29; C. 3-17-3; P. 13; V. 1.

Color in life translucent light olive, with a series of irregular quadrate dark blotches along the back and a series along each side, these blotches formed of clusters of dark points.

One specimen, nearly 4 inches in length, was taken in a rock-pool at Panama.

This species differs from the description of the previously known *Microdesmus dipus* Gthr. in the posterior insertion of the dorsal and of the posterior position of the vent, the smaller number of fin rays, the shorter head, longer ventrals, and mottled coloration.

18. *Cerdale ionthas*, gen. et sp. nov. (29664.)

CHAR. GEN.—Allied to *Microdesmus* Günther, from which genus it is distinguished by the presence of two rays in the ventral fin. Its body is much less elongate than in *Microdesmus*. The gill-openings are reduced to small, nearly horizontal slits below and in front of the pectoral fins. The pseudobranchiæ are well developed and the tail is not isocercal.

DESCR. SPEC.—Body considerably elongate, compressed, of nearly equal depth throughout, the head tapering rapidly from occiput to snout; snout short, not obtuse, but the lower jaw heavy and blunt, much projecting beyond the premaxillaries; gape very short and

oblique, the tip of the premaxillary not reaching vertical from orbit. Margin of upper jaw formed entirely by the premaxillaries, which are free laterally, but scarcely movable mesially. Maxillary not distinguishable, probably enveloped in the integument of the snout. Teeth rather strong, short and blunt, in a double series in each jaw, apparently wanting on the vomer or palatines. Lips developed laterally, where they form a fold around the angle of the mouth; lower lip adnate mesially, the upper reduced to an obsolete fold. Length of gape one-fifth length of head. Nostrils two, distant, the anterior at the end of the snout, almost labial, the posterior above front of orbit; both circular. Eye very small, somewhat less than interorbital width or than length of snout. Distance from snout to past margin of orbit contained  $2\frac{2}{3}$  times in length of head. Pseudobranchiæ well developed. Gill-opening very narrow, reduced to a short, nearly horizontal slit, extending forward from a point just below the lower base of the pectoral fin. Branchiostegals evident, apparently four in number.

Vertical fins well developed; dorsal and anal both long, the membrane of the last ray of each joining the base of the rudimentary rays of the caudal. Distance from occiput to origin of dorsal fin equal to the length of the head; rays of dorsal fin very slender, distant, the membrane thin and transparent, the rays all articulate, the anterior simple, the posterior bifid at tip. Vent slightly in advance of middle of length of body, the anal fin beginning immediately behind it. Anal rays bifid at tip, excepting the first two, which appear simple. Tail not isocercal, truncate at base of caudal, most of the rays of the caudal springing from the expanded last vertebra. Caudal fin rounded, four-fifths length of head, its rays much branched, more closely set than the rays of the dorsal and anal; rudimentary rays very numerous.

Ventral fins small, close together, inserted slightly in advance of lower end of base of pectoral, each fin composed of two rays, the inner prolonged beyond the outer and bifid at tip, about as long as pectoral fin and three-fifths length of head. Pectorals well developed, broad, the rays branched at tip.

Head and body entirely covered with small scales, which are close-set but hardly imbricate, not arranged in series; mandible, snout, and gill-membrane scaly; scales on belly and breast smaller than the others and more thickly set; bases of caudal and pectoral fins scaled.

Head  $7\frac{3}{4}$  in length; depth  $10\frac{3}{4}$ . D. 41; A. 36 to 38; C. 4-17-4; P. 12; V. 2.

Coloration in life: Body translucent light olive, immaculate below; back and sides very finely marked with clusters of fine dots, the ground color appearing as reticulations between the clusters, which are of irregular size and form; on the sides of the head these dots form bars which radiate from the eye to the snout and lower side of the head.

This species is known from three specimens, from  $2\frac{1}{2}$  to 3 inches in length, taken in a rock-pool at Panama.

19. *Citharichthys latifrons*, sp. nov. (29255, 29416, 29425, 29496.)

Subgenus *Hemirhombus* Bleeker.

Body elliptical, the dorsal and ventral outlines equally arched; mouth placed low, below axis of body; snout with an abrupt constriction in front of upper orbit, the outline then again convex; eyes on the left side, distant, the lower in advance of the upper; a vertical line from anterior margin of upper orbit passing through the middle of the lower; distance of upper eye from dorsal outline equaling two-thirds its vertical diameter; interorbital space concave, very wide, its width  $1\frac{1}{2}$  times diameter of orbit in a specimen 8 inches long, much narrower in young specimens; a ridge from upper angle of lower eye runs upwards and backwards to join a ridge from upper orbit. Nostrils on a level with upper margin of lower eye, the anterior with a flap, distant from the posterior, which is circular; length of snout to front of lower eye  $4\frac{1}{3}$  to 5 in head. Mouth very oblique, the gape convex upwards and backwards; maxillary two-fifths length of head, reaching to middle of lower pupil; it is very narrow and covered with small scales. Teeth small; the upper jaw with two series, the front teeth of the outer series somewhat enlarged; lower jaw with a single series; vomer and palatines toothless.

Gill-rakers short and broad, the longest about one-half vertical diameter of pupil; about 7 on anterior limb of arch; pseudobranchiae present. Preopercle with posterior margin nearly vertical, the lower third only free, the upper two-thirds grown fast to opercle and scaled over; the lower margin running very obliquely downwards and forwards, the angle thus an obtuse one. Dorsal fin commencing on the snout in front of upper eye, the first four or five rays exerted and turned over to the blind side; the highest rays are behind the middle of the fin and are about two-fifths length of head; anal fin similar to dorsal, its origin under base of pectorals. Caudal short, about two-thirds length of head, the middle rays the longest, the outer rays slightly prolonged. Ventrals unsymmetrical, that of colored side on the ridge of the abdomen, the other inserted in front of it. Pectoral of colored side long, the rays very slender, the two upper prolonged and filamentous, the upper (in adults) more than one-third total length; pectoral of blind side more than two-fifths length of head.

Scales ciliated, somewhat irregular, of moderate size, with small scales intermixed; snout naked, head and body otherwise scaly; scales on interorbital region very small; a series of small scales on basal half of each dorsal and anal ray; base of caudal thickly scaled, a series of small scales running nearly to tip of each ray. Lateral line slightly rising anteriorly but without distinct curve.

D. 92; A. 72. Head 4 in length; depth  $2\frac{1}{3}$ ; Lat. 1. 60.

Head and body light brown, with grayish and light bluish dots, with some darker areas and a few round brown spots ocellated with lighter. Interorbital space with a vertical brown bar bordered by lighter. Fins

similarly marked, the dorsal and anal with a dark blotch on each eighth or tenth ray, the pectoral sometimes with one or more brownish bars.

Not abundant in the Bay of Panama; several specimens were taken, the largest about 10 inches in length.

INDIANA UNIVERSITY, *December 2, 1881.*

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**ON THE NUCLEAR CLEAVAGE-FIGURES DEVELOPED DURING THE SEGMENTATION OF THE GERMINAL DISK OF THE EGG OF THE SALMON.**

**By JOHN A. RYDER.**

The fact that very complex changes are undergone by nuclei during the segmentation of cells has been known for only a comparatively short time, and, we may add, our knowledge has been greatly increased by the recent advances made in the perfection of histological methods. The titles of the principal memoirs on the subject are given below.\*

From the list of papers, it will be gathered that all are German, and by only a few authors. The first of them, Professor Flemming, has described and figured such remarkable cleavage-figures, which he has claimed to have observed in segmenting cells, that it is not to be wondered at that some cotemporaries have been inclined to be incredulous. Since I have been enabled, however, to observe some of these phenomena for myself, I am quite well convinced that he has given us results, the value of which cannot perhaps just yet be properly estimated.

I recently received a series of ova of the common salmon, some of them in the second day of development, from Mr. H. H. Buck, of Orland, Me., in which very complex and interesting nuclear changes were in progress. The germinal disk had not yet begun to spread to form the blastoderm, but the cleavage had advanced so far that it had been segmented into several thousand cells, each measuring about  $\frac{1}{300}$ th of an inch in diameter. These salmon ova had been preserved in weak alcohol, so that they were not quite as good, perhaps, for our studies as they would have been had they been hardened in very weak chromic acid. The cells were, however, very clear, so that any nuclear figures could be well seen even without other reagents, though upon immers-

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\* W. Flemming. Beiträge zur Kenntniss der Zelle und ihrer Lebenserscheinungen. I Part, Arch. f. mikr. Anatomie, XVI; II Part and supplement, Ibidem, XVIII; III Part, Ibidem, XX.

W. Flemming. Ueber das Verhalten des Kerns bei der Zelltheilung und über die Bedeutung mehrkerniger Zellen. Virchow's Archiv, LXXVII.

Peremeschko. Ueber die Theilung thierischer Zellen. Arch. f. mikr. Anatomie, XVII.

W. Pfitzner. Die Epidermis der Amphibien Morphol. Jahrb., VI.

W. Pfitzner. Ueber den feineren Bau der bei der Zelltheilung auftretenden fadenförmigen Differencirungen des Zellkerns. Morph. Jahrb., VII, Hft. 2.

W. Pfitzner. Beobachtungen über weiteres Vorkommen der Karyokinese. Arch. f. mikr. Anatomie, XX, Hft. 1.