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BULLETIN

OF

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Peabody Museum of Natural History
Yale University


Scientific Results of the Third Oceanographic Expedition
of the "Pawnee"
1927.

TELEOSTEAN SHORE AND SHALLOW-WATER
FISHES FROM THE BAHAMAS AND
TURKS ISLAND.

By Albert Eide Parr.

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BINGHAM OCEANOGRAPHIC FOUNDATION

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A. E. PARR
Curator and Editor

TELEOSTEAN SHORE AND SHALLOW-WATER FISHES FROM THE BAHAMAS AND TURKS ISLAND.

By Albert Eide Parr.
Curator of the Bingham Oceanographic Collection.

INTRODUCTION.

It has, for administrative purposes, been found desirable to undertake the identification and description of the shallow-water teleosts obtained during the third oceanographic expedition of the “Pawnee,” under the direction of Harry Payne Bingham, before continuing the investigation of the deep-sea material in which several groups of fishes still remain to be reported upon.

Since collecting in shallow water was carried on only incidentally to the deep-sea explorations, which were the main purpose of the expedition, the former part of the expedition’s activities could not be expected to yield as important and inclusive results as the latter. Nor was it possible for the author, who usually remained on board to attend to the deep-sea hauls, to keep even an approximately complete record of what was actually collected, but not preserved, by the fishing parties working in shallow water from the ship’s launches. The present report is, therefore, mainly built upon the preserved material alone, supplemented by a series of very excellent color sketches prepared in the field by Mr. Wilfrid Swancourt Bronson, the artist of the expedition.

In spite of the circumstances just described, it has nevertheless been found possible, in the following pages, to deal with no fewer than 150 species of teleostean shallow-water fishes from the Bahaman region and Turks Island. Preserved samples of 144 of these species are now at hand in the collections from the third oceanographic ex-
pedition, and the material has been found to include one new genus, eleven new species, and one new subspecies, as well as a considerable number of rare or inadequately known forms, which may thus become better known to science through these new records and through the supplementary descriptions and figures given in the following report.

A complete record of the available collections is given, but the locality lists are fully significant only in the case of the rarer forms, which were always carefully preserved, while the absence of a common species from the records does not necessarily mean that the form in question was not caught or observed during the expedition, but merely that no specimens have been preserved and no special notes were made upon the occurrence of this particular species.

A small collection of shallow-water fishes was also made at the Bermuda Islands, but the material is not large enough or rare enough to justify its publication. A few records from the coast of Florida, on the other hand, are included, along with the lists of the Bahaman localities, as pertaining to the same zoogeographic region.

Several of the specimens have been mounted for exhibition in a most excellent manner by Mr. Francis West. The illustrations for the present article have all been prepared by Miss Lisbeth B. Krause, with the exception of the two field sketches, Figs. 9 and 11, by W. S. Bronson, and the diagrammatic drawings, Figs. 5, 10, 17, 21–29, and 35, from the author's own hand.

For the convenience of the readers and bibliographers, a synopsis of the contents and conclusions embodied in the present article is given on page 141.

Order **ISOSPONDYLI**.

Family **ALBULIDAE**.

Genus **Albula** Gronow.

*Albula vulpes* (Linnaeus).

1 specimen No. 2199 B. O. C. Rum Cay, Bahamas. March 24, 1927. (Mounted.)

Family **CLUPAEIDAE**.

Genus **Sardinella** Cuvier & Valenciennes.

*Sardinella sardina* (Peyrey).


1 specimen No. 2551 B. O. C. Crooked Island, Bahamas. March 26, 1927.
1 specimen No. 2553 B. O. C. West Caicos Island. April 3, 1927.
2 specimens No. 2564 B. O. C. Turks Island. April 8, 1927.

**Sardinella macophthalmus** (Ranzani).

While provisionally accepting the synonymy of this species suggested by Meek and Hildebrand (1923–1928, p. 184), the author is inclined to believe that some of the forms now synonymized with *S. macophthalmus* might quite probably become re-established as separate species by an adequate biometric investigation. Such specific differentiations are, however, not possible on the basis of the inadequate information now available about these forms. The specimens now at hand belong to the deeper bodied type.

2 specimens No. 2550 B. O. C. Off Miami Beach, Fla. February 21, 1927.

**Genus Brevoortia** Gill.

**Brevoortia tyrannus** (Latrobe).

1 specimen No. 2431 B. O. C. Off Palm Beach, Fla. February 22, 1927. Caught by surface light at night.

**Genus Jenkinstia** Jordan & Evermann.

**Jenkinstia lamprotaenia** (Gosse).

**Lussumnieria stolifera** Jordan and Gilbert 1884, p. 25.

**Jenkinstia stolifera** Jordan and Evermann 1896–1900, p. 419.

Beebe and Tee-Van's inclusion of *J. stolifera* in the synonymy of *J. lamprotaenia* (Beebe and Tee-Van 1928, p. 44) is fully accepted by the present writer. The numbers of dorsal and anal fin rays which formed the basis for the original introduction of *J. stolifera* as a new species\(^1\) show perfect intergradations between the figures originally recorded for the two nominal species, as already made out by Beebe and Tee-Van; and the distinction of two separate forms according to the position of the dorsal fin (Jordan and Evermann 1896–1900, p. 418) has no justification when merely based upon Günther's description (Catalogue of Fishes, Vol. VII, p. 465) of two specimens (the types of Gosse's description) which were admittedly "in too bad a condition to decide upon their natural affinitites" (Günther, loc. cit.).

The dorsal fin is in all specimens of the present collection inserted somewhat nearer to the snout than to the base of caudal fin, but in many cases the difference in position is so slight as to make it seem quite reasonable to expect an approximate description of damaged specimens to give the insertion of the dorsal fin as midway between the said two points.

\(^1\) "We should identify our specimens with Clupea lamprotaenia (Gosse), from Jamaica, were it not for the difference in the number of fin rays" (Jordan and Gilbert 1884, p. 25, in the description of *J. stolifera*).
Material preserved:
1 specimen No. 2584 B. O. C. Eleuthera Island, Bahamas. March 18, 1927.
1 specimen No. 2590 B. O. C. Crooked Island, Bahamas. March 26, 1927. By surface light at night, off shore.
8 specimens No. 2589 B. O. C. Hawks Nest, Turks Island, April 9–10, 1927.

Order INIOMI.

Only the representatives of the two genera Trachinocephalus and Saurida (both of the family Synodontidae) are left to be considered in the present report, the other members of the same order having already been dealt with in the previously rendered discussion of deep-sea fishes, although there may be some doubt as to whether the representatives of the Paralepidinae and Myctophinae can all be regarded as true denizens of the deep. The following three species of Myctophinae were taken quite regularly around the surface light at night, via. Myctophum affine Lütken (see Parr 1928, p. 69), Diaphus dumerili Bleeker (Parr 1928, p. 126), and Diaphus garmani Gilbert (Parr 1928, p. 145), while only D. dumerili was also obtained from the deep-sea hauls. Among the Paralepidinae the only representative of Lestidium elegans Parr 1928 (p. 44) was also caught at the surface light.

Family SYNODONTIDAE.

Genus Saurida.

At least two distinct forms have on two separate occasions been recorded from the tropical eastern parts of the Atlantic Ocean; by Metzelaar 1919 (pp. 23–24) under the names of Saurida gracilis Quoy and Gaimard, and S. tumbil Bloch, and by Breder 1927 (pp. 14–17) as the new species S. caribaeus Breder and S. suspicio Breder. Since it would seem highly probable that the material recorded respectively by Breder and by Metzelaar from the identical faunistic region should also contain the identical two species, the author has deemed it advisable to make a comparison of the current descriptions of the various representatives of Saurida found in the different regions of the world, in an effort to establish whether the distribution of the two species, S. gracilis and S. tumbil, should really be as cosmopolitan as Weber and Beaufort’s interpreta-
<table>
<thead>
<tr>
<th>Localities (Regions)</th>
<th>East Indies</th>
<th>South Africa</th>
<th>Japan</th>
<th>West Indies</th>
<th>West Indies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Authors</td>
<td>Authors</td>
<td>Authors</td>
<td>Authors</td>
<td>Authors</td>
</tr>
<tr>
<td></td>
<td>Weber and Beaufort 1913</td>
<td>Barnard 1925</td>
<td>Jordan and Herre 1907</td>
<td>Breder 1927</td>
<td>Metzelaar 1910</td>
</tr>
<tr>
<td><strong>Species</strong></td>
<td><em>S. gracilis</em></td>
<td><em>S. tumbil</em></td>
<td><em>S. gracilis</em></td>
<td><em>S. tumbil</em></td>
<td><em>S. gracilis</em></td>
</tr>
<tr>
<td><strong>Head Depth</strong></td>
<td>In length without caudal fin</td>
<td>4.5-5</td>
<td>4.5-5</td>
<td>4.25-4.75</td>
<td>4.5-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.5-7</td>
<td>7-9</td>
<td>7-9</td>
<td>7-9</td>
</tr>
<tr>
<td><strong>Eye</strong></td>
<td>In eye</td>
<td>4-5.5</td>
<td>4.5-5</td>
<td>4-5.5</td>
<td>4-5.5</td>
</tr>
<tr>
<td><strong>Snout</strong></td>
<td>In eye</td>
<td>4.5-6</td>
<td>4-5.5</td>
<td>4-5.5</td>
<td>4-5.5</td>
</tr>
<tr>
<td><strong>Interorbital width</strong></td>
<td>In eye</td>
<td>&gt; eye</td>
<td>&gt; eye</td>
<td>&gt; eye</td>
<td>&gt; eye</td>
</tr>
<tr>
<td><strong>Gape</strong></td>
<td></td>
<td>4</td>
<td>5.5</td>
<td>4</td>
<td>3.5</td>
</tr>
<tr>
<td><strong>Maxillaries</strong></td>
<td></td>
<td>6</td>
<td>5.5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td><strong>Base of A</strong></td>
<td></td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>1.6</td>
</tr>
<tr>
<td><strong>Ventrals</strong></td>
<td></td>
<td>1.5</td>
<td>1.5</td>
<td>1.4</td>
<td>2.3</td>
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<tr>
<td><strong>Pectorals</strong></td>
<td></td>
<td>1.5</td>
<td>1.7</td>
<td>1.4</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Reach of Pectoral</strong></td>
<td>To 9th scale of lateral series</td>
<td>To base V (10th scale)</td>
<td>To 9th scale of lateral series</td>
<td>To V or beyond</td>
<td>Considerably short of V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To 10th scale of lateral series</td>
<td>To 10th scale of lateral series</td>
<td>To V or beyond</td>
<td>Considerably short of V</td>
</tr>
<tr>
<td><strong>Origin of A</strong></td>
<td></td>
<td>One length of head from C</td>
<td>Midway between bases of V and C</td>
<td>Midway tip of V to base of C</td>
<td>Midway to base of C</td>
</tr>
<tr>
<td><strong>Origin of D</strong></td>
<td>Midway snout to C</td>
<td>Midway snout to C</td>
<td>Midway snout to tip of adipose fin</td>
<td>Midway adipose fin to end of base of adipose fin</td>
<td>Midway adipose fin to end of base of adipose fin</td>
</tr>
<tr>
<td><strong>Scales in lateral series</strong></td>
<td>50-52</td>
<td>54-63</td>
<td>50-52</td>
<td>54-63</td>
<td>54</td>
</tr>
<tr>
<td><strong>Rays in D</strong></td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td><strong>Rays in A</strong></td>
<td>9-10</td>
<td>10-11</td>
<td>9-10</td>
<td>10-11</td>
<td>10</td>
</tr>
</tbody>
</table>
tion of their Pacific range (synonymization with the Japanese forms), coupled with the South African records and with Metzelaar's identification of the eastern Atlantic specimens, would seem to make it; or whether several truly distinct species should have become confused in the literature as indicated by Breder's findings. The accompanying tabulation shows how the forms here considered have been described in the standard current faunistic works on the various geographical regions.

It will be noticed that the South African and the East Indian records are in perfect agreement with each other and there seems to be little reason to doubt that these regions are both within the range of the true *S. gracilis* and *S. tumbil*.

Turning now to the two Japanese forms, *S. argyrophanes* and *S. eso*, as described by Jordan and Herre, we find it rather difficult to understand how these could have come to be considered identical with each other and with *S. tumbil* as suggested by Weber and Beaufort. According to the latter authors, on one hand, and Jordan and Herre, on the other, the two Japanese forms should both differ from *S. tumbil* as well as from *S. gracilis* by having their ventral fins inserted very considerably nearer to the tip of the snout than to the base of caudal fin, if their descriptions are correct, instead of about midway between these two points; they should further differ from *S. tumbil*, with which species they have been identified, by having the snout fully 50 per cent longer than the diameter of the eyes instead of the latter measurement being "nearly equal" to the length of the snout. Weber and Beaufort's identification is thus quite untenable if not substantiated by observations not recorded in their publication, and *S. argyrophanes* and *S. eso* must again be, at least provisionally, regarded as separate species, distinct from *S. gracilis* and *S. tumbil* in the above described manner, and from each other in the great difference between their scale counts, by differences in the size and in the proportions of their heads and in the reach of their pectoral fins.

In regard to the insertion of the dorsal fin, the two species described by Breder occupy an intermediate position between the Japanese and the East Indian-South African species, distinct from both groups. They are furthermore both characterized by their comparatively large heads, which are larger than have been recorded for any of the other species here considered, being most closely approached by *S. tumbil* (according to Barnard) and by *S. argyrophanes*. In *S. suspicio* Breder the length of the snout is approximately equal to the diameter of the eyes, as in *S. tumbil*, but the eyes are larger than in the latter species. In *S. carribbaeus* Breder the snout is conspicuously longer than the diameter of the eyes, the difference between the two measurements not being as great as in *S. argyrophanes*, however; and *S. carribbaeus* furthermore differs from the latter species by having the interorbital width much shorter than the length of the snout, even shorter, instead of much longer, than the diameter of the eyes. The distinctness of the two species described by Breder thus seems
quite unquestionable, although it may be mentioned that the number of rays in the anal fin of *S. suspicio*, which has been particularly emphasized as a diagnostic character of the species, has proved to be subject to such individual variations (see below) as to render it quite without value for the taxonomic identification of this form.¹

Turning finally to the eastern Atlantic material recorded by Metzelaar, we find no particular difficulty in identifying the *S. gracilis* of this author with Breder’s *S. carribbaeus*, assuming that individual variation in the anal fin count, similar to the variations observed in *S. suspicio*, may occur also in this species. The size of the head recorded by Metzelaar is even still somewhat larger than in the type of *S. carribbaeus*. In regard to the *S. tumbil* of Metzelaar, it would then be natural to expect this form to be identical with Breder’s *S. suspicio*, with the description of which it also seems to be in perfect concordance but for one feature, namely, the enormous size of the eyes recorded by Metzelaar. It is to be expected, however, that Metzelaar’s figure is simply due to a misprint, since no other allusion is made to the very unusual proportions it would indicate. It may therefore be considered probable that *S. tumbil* Metzelaar (*nec* Bloch) is merely a synonym of *S. suspicio* Breder.

From these considerations we have arrived at the conclusions, that there is no justification for regarding *S. gracilis* and *S. tumbil* as species of a cosmopolitan distribution, but that, while these two species occupy the region from the East Indian waters to South Africa, a perfectly distinct pair of species is apparently found in the northern Pacific (Japan) and another, equally distinct, pair occurs in the tropical eastern Atlantic.

*S. grandisquamis* Günther, from the Indo Pacific, is easily distinguished from the forms here considered by a number of characters (see Weber and Beaufort 1913, p. 141), and it is also quite possible that other forms also ought to be recognized as separate species, this discussion having no pretension to being exhaustive on the subject of the entire genus *Saurida*.

**Saurida suspicio** Breder 1927.

Two specimens of this species were obtained during the expedition, agreeing with the type in all features except the number of anal fin rays, one specimen having only 10½ of these and the other 11½, as compared with the 12½ of the type. The general proportions are shown in the following table of measurements:

¹*S. carribbaeus* Breder may possibly prove synonymous with *S. nebulosa* Cuvier and Valenciennes, but the original illustration of the latter species shows several discrepancies with Breder’s description, particularly in regard to the insertions of the fins, which make an identification unwarranted at present.
Measurements and Counts of *Saurida suspicio* Breder.

<table>
<thead>
<tr>
<th></th>
<th>74</th>
<th>66</th>
<th>74</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of head</td>
<td>25</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>Depth of body</td>
<td>15.5</td>
<td>16</td>
<td>15.5</td>
</tr>
<tr>
<td>Snout to D</td>
<td>43</td>
<td>42</td>
<td>43</td>
</tr>
<tr>
<td>Snout to adipose dorsal fin</td>
<td>81</td>
<td>79</td>
<td>80</td>
</tr>
<tr>
<td>Snout to V</td>
<td>37</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Snout to A</td>
<td>76</td>
<td>76</td>
<td>75</td>
</tr>
<tr>
<td>Diameter of eyes</td>
<td>6.7</td>
<td>6.4</td>
<td>6.8</td>
</tr>
<tr>
<td>Length of snout¹</td>
<td>6.7</td>
<td>6.1</td>
<td>5.8</td>
</tr>
<tr>
<td>Interorbital width²</td>
<td>5.0</td>
<td>4.8</td>
<td>4.7</td>
</tr>
<tr>
<td>Length of gape</td>
<td>15.5</td>
<td>14.8</td>
<td>15.0</td>
</tr>
<tr>
<td>Length of V</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Length of P</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Longest dorsal ray</td>
<td>22</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>Number of dorsal rays</td>
<td>11</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Number of anal rays</td>
<td>11½</td>
<td>10½</td>
<td>12¼</td>
</tr>
<tr>
<td>Number of scales in a lateral series</td>
<td>ca. 55</td>
<td>56</td>
<td>56</td>
</tr>
</tbody>
</table>

¹ Type specimen.
² Measured to the free edge of the adipose eyelid or circumorbital rim.

1 specimen No. 2607 B. O. C. Cat Island, Bahamas. March 22, 1927.

Order **APODA**.

Family **MYRIDEIDAE**.

Genus **Myrophis** Lütken.

*Akhia* Jordan and Davis 1892, Jordan and Evermann 1896–1900, p. 370.

Since the material obtained during the third oceanographic expedition of the “Pawnee” shows two distinct species with the dorsal fin beginning behind the vent but nevertheless in possession of teeth on the vomer, the distinction between the genera *Myrophis* and *Akhia* becomes reduced to a matter of presence or absence of vomerine dentition only. It is, moreover, not impossible that even this feature may prove quite insignificant, being perhaps related to the age of the specimen, in view of the fact that the type¹ of *Akhia egmontis* was very considerably larger than any other specimen observed with the dorsal fin in a similar position. *Akhia* has therefore been included among the synonyms.

¹ The true identity of subsequently recorded samples seems questionable.
of the genus *Myrophis*, while the absence of vomerine dentition is tentatively maintained as a diagnostic character of *M. egmontis*. If this character should fail in younger specimens, one of the three new species described on the following pages may prove identical with *M. egmontis*.

**Key to the Atlantic species of *Myrophis*.**

A. Dorsal fin beginning behind the vent, above or behind the origin of anal fin.
   I. No teeth on vomer. Diameter of eye more than half the length of snout. *M. egmontis* Jordan.
   II. Teeth present on vomer.
      a. Diameter of eye two-thirds to four-fifths the length of snout. *M. macrophthalmus*, n. sp.
      b. Diameter of eye less than half the length of snout... *M. microps*, n. sp.

B. Dorsal fin beginning well in advance of the vent.
   I. Origin of dorsal fin much nearer to the vent than to the end of the snout, the difference being equal to about one head-length or more.
      a. Origin of dorsal fin only about two-thirds of the length of the head in advance of the vent, or more than twice as far from the gill openings as from the vent............. *M. longei* Silvester 1918, p. 20.
      b. Origin of dorsal fin more than a full length of the head in advance of the vent, approximately midway between the latter point and the gill openings.†
         2. Snout long, only about 4½ or less in head. Pectorals well developed, about 4½ in head. Gape about 2½ in head. Snout slightly longer than broad............. *M. dotichorchynclus*, n. sp.

II. Origin of dorsal fin approximately midway between point of snout and vent.
   a. Diameter of eyes less than twice in the length of snout. Gape long, considerably less than 3 in head........... *M. platyrhynclus* Breder. See p. 13.

† In this group apparently also belongs the Pacific *M. vafer* Jordan and Gilbert.
### Table of Measurements of Myrophis spp.

<table>
<thead>
<tr>
<th>Species</th>
<th>Total length in mm.</th>
<th>Length of head</th>
<th>Length of snout</th>
<th>Diameter of eye</th>
<th>Cleft of snout</th>
<th>Snout to A</th>
<th>Snout to D</th>
<th>Vent to D</th>
<th>Length of P</th>
<th>Depth of body</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>M. macrophthalmus</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td>275</td>
<td>8.7 1.64 1.27 2.91</td>
<td>41.0</td>
<td>3.6 2.0 2.4</td>
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<tr>
<td>230</td>
<td>8.7 1.74 1.30 3.02</td>
<td>42.0</td>
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<td>9.0 1.58 1.16 2.90</td>
<td>45.5</td>
<td>1.3 2.2 2.9</td>
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<tr>
<td>146</td>
<td>9.3 1.71 1.37 2.88</td>
<td>42.5</td>
<td>0.9 2.1 2.8</td>
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<td>167</td>
<td>8.1 1.50 0.60 2.10</td>
<td>41.3</td>
<td>2.7 1.3 2.3</td>
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<td>165</td>
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<td>41.5</td>
<td>3.0 1.3 2.1</td>
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<td>43.0</td>
<td>1.7 1.3 2.5</td>
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<td>5.0 0.7 2.4</td>
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<td><strong>M. punctatus</strong></td>
<td>103</td>
<td>9.7 1.75 0.75 2.72</td>
<td>38.4 23.8 1.2</td>
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<tr>
<td><strong>M. dolichorhynchus</strong></td>
<td>142</td>
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<td>38.7 25.4 2.3</td>
<td>2.8</td>
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<td><strong>M. platyrhynchus</strong></td>
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<td>11.2 2.36 1.36 4.10</td>
<td>36.4 17.3 2.3</td>
<td>3.0</td>
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</table>

**Myrophis macrophthalmus**, n. sp.

_Ahliia egmontis_ (partim) Breder 1927, p. 7.

The measurements of the species are given in the preceding table, the largest specimen representing the type.

The length of the head is contained about 11 times in the total length without caudal fin. Snout moderate, 5 to 5.8 in head. Eyes large, about 1.2-1.4 in snout, 6.8-7.8 in head. Snout slightly wider than long (width measured between the anterior margins of the orbits). External cleft of mouth to the posterior end of the labial fold 2.7-3.2 in head, reaching slightly beyond the eye (true, inner cleft of mouth only extending to below posterior margin of pupil). Pectorals well developed, rounded, their length about 4-4.5 in head. Distance from snout to anal fin more than 40 per cent of the total length. Dorsal fin beginning a short distance behind the vent. In the smallest specimen its origin is approximately opposite the origin of anal fin, in the larger specimens it seems to be inserted progressively farther backwards.

The upper surface of the head is fairly broad and strongly flattened, with the interorbital width about equal to the diameter of the eyes (in the type), which project in the dorsal profile. Trunk rounded, tail gradually more compressed. Nostrils labial, anterior nostril tubular.

Vomer with about four well developed teeth along its outer margins and with a close-set pair behind. Palatine with a single main series of teeth along its outer border, but with an inner, partial series of smaller denticles on its anterior
portion (not distinctly developed in some of the specimens). An outer, single series of larger teeth in each limb of the lower jaw, with smaller, irregularly arranged denticles inside. 70 praecaudal + 80 caudal vertebrae, 150 altogether, counter in paratype No. 2596 B. O. C.

The preserved specimens are uniformly grayish, slightly lighter under the belly than on the back.

The material previously recorded by Breder as *Ahlia egmontis* belongs partly to the present species, partly to the next.

Type specimen No. 2593 B. O. C. Green Cay, Bahamas. March 8, 1927. Other samples:

1 specimen No. 2594 B. O. C. Washerman, Bahamas. February 28, 1927.
1 specimen No. 2595 B. O. C. Crooked Island, Bahamas. March 26, 1927.
1 specimen No. 2596 B. O. C. West Caicos Island. April 2–7, 1927.

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**Fig. 1.** Heads of *Myropis microps* (above), *M. dolichorhynchus* (center), and *M. macrophthalmus* (below).

**Myrophis microps**, n. sp.

*Ahlia egmontis* (partim) Breder 1927, p. 7.

For measurements, see page 10, the largest specimen being the type.
The length of the head is contained about 12 times in the total length. Snout moderate, 5.2 to 5.4 in head. Eyes very small, about 2.5 in snout, or about 12–13 in head. Width of snout equal to or greater than its length. Cleft of mouth from snout to end of labial fold 3.8–4.0 in head, extending well beyond the eyes. Pectorals very small, 6–12 in head. Distance from snout to anal fin more than 40 per cent of the total length. Origin of dorsal fin one-fifth to slightly more than one-half head length behind the vent.

Upper surface of the head flattened, but not as strongly as in *M. macrophthalmus*. Interorbital space about twice as wide as the diameter of the eyes, which are situated well below the dorsal profile of the head. Nostrils labial, anterior nostril tubular.

Vomer with 2 teeth on each side on its anterior (expanded) portion.

69 precaudal + 92 caudal vertebrae, 161 altogether (counted on one of the paratypes, No. 2598 B. O. C.).

Uniformly light grey, difference between back and belly scarcely perceptible.


Other samples:
1 specimen No. 2600 B. O. C. Cat Island, Bahamas, March 22, 1927.

**Myrophis punctatus** Lütken 1852, p. 15.

The definition of this species rendered in the key on page 9, is based upon Lütken’s original description (origin of dorsal fin) and upon his excellent figures of the species (loc. cit., pl. I, figs. 2–2d) (proportions of snout, gape, and pectoral fins), and has been verified on a specimen obtained by the third oceanographic expedition of the “Pawnee,” which is in every respect perfectly concordant with Lütken’s description and figures.

The eyes of *M. punctatus* are also conspicuously smaller than those of *M. dolichorhynchus*, as will appear from the table of measurements on page 10. This feature is also clearly shown in Lütken’s drawing from which the diameter of the eye may be found to be equal to about 0.8 per cent of the total length of the fish (0.75 per cent in the present specimen) and to be contained about 14 times in the length of the head (about 13 times in the present specimen); while in *M. dolichorhynchus* these proportions are about 1.05 and 10. The other proportions of *M. punctatus* will appear from the table.

The synonymy of *M. punctatus* is far from clear. It is probable that *M. microstigmus* Poey must represent the same species, but the inclusion of *M. tambricus* Jordan and Gilbert in *M. punctatus* (see Jordan and Evermann
1927] 

Teleostean Shore and Shallow-water Fishes

1896–1900, p. 371) is entirely discordant with the description of the former, wherefore the author has found it advisable to re-establish, at least tentatively, Jordan and Gilbert's species (see below).

Myrophis dolichorhynchus, n. sp.

The length of the head is contained about $9\frac{1}{2}$ times in the total length. Snout long, about 4.4 in head. Eyes moderate, about 2.3 in snout, 10 in head. Snout slightly longer than wide. Cleft of mouth to the posterior end of the labial fold (measured from the point of the snout) long, about $2\frac{1}{2}$ in head. Pectoral fins well developed, their length about $4\frac{1}{2}$ in head. Distance from snout to anal fin less than 40 per cent of the total length. Origin of dorsal fin approximately midway between point of snout and vent. Interorbital space about twice as wide as the diameter of the eyes.

Dorsal surface of the head slightly flattened, but still perceptibly convex in transverse section. Eyes not reaching the dorsal profile. Nostrils labial, anterior nostril tubular. Tail perhaps somewhat less compressed than in the other species here recorded.

Vomer with a few teeth along the borders of its anterior part and a long median series of teeth posteriorly extending nearly as far backwards as the palatine dentition. Palatines with a single, long series of teeth each. Lower jaw with teeth in two series.

Heart between the bases of the pectoral fins.

Almost uniformly light grey, only slightly duskier on back than on belly.

Type specimen No. 2602 B. O. C. Washerwoman, Bahamas. February 28, 1927.

Myrophis platyrhynchus Breder 1927, p. 8.

For proportional measurements of the new sample, see the table, page 10. 1 specimen No. 2603 B. O. C. Cat Island, Bahamas. March 22, 1927.


According to the proportions recorded in the original description ("Head 10\frac{2}{3} in total length." "Length of head and trunk 2\frac{3}{4} in total.") the length of the head should be contained exactly 4 times in the length of head and trunk combined. When the dorsal fin is said to have its beginning "at a distance behind gill opening about equal to length of head," it must consequently have its origin about midway between snout and vent (two lengths of the head removed from each point). In the preceding key (p. 9) Jordan and Gilbert's species therefore had to be grouped with M. platyrhynchus Breder, and its synonymization with M. punctatus Lütken (vide Jordan and Evermann 1896–1900, p. 371) seems entirely unjustified by the description, which is further amplified by the statement that the dorsal fin begins "nearer gill opening than vent" (Jordan and Gilbert 1882, p. 262).
M. lumbricus does not, however, appear to be identical with M. platyrhynchus, but should be easily differentiable from the latter as made out in the key. The species is not represented in the Bingham Oceanographic Collection.

Family **STILBISCIDAE** new name.

*Anguillicthysidae* Mowbray.

Closely related to the Moringuidae from which the present family mainly differs only in having the parasphenoids well separated from the frontals, and in the peculiar differentiation of the vertical fins.

The systematic position and anatomical characteristics of the Stilbiscidae will be further discussed in a separate paper. The differentiation of the vertical fins has been found to be of secondary origin and not indicative of a primitive state.

Genus **Stilbiscus** Jordan and Bollmann.

*Anguillicthys* Mowbray (in Breder 1927, p. 10).

Two forms referable to this genus have been described in the literature, viz. *S. edwardsii* Jordan and Bollman and *S. bahamensis* Mowbray, but an investigation of the available specimens has failed to convince the author that the differences between these two nominal species may not be entirely of a secondary sexual nature, although they also include variations in the position of the heart, which have previously been considered diagnostically significant even for the differentiation of families among apodal fishes.

All the investigated specimens of *S. bahamensis* were found to be males, while *S. edwardsii* is represented only by a female (the type specimen has not been dissected).

The following table gives the measurements of the two forms of *Stilbiscus*:

**Measurements of Stilbiscus spp.**

<table>
<thead>
<tr>
<th>Nominal species</th>
<th><em>S. edwardsii</em></th>
<th><em>S. bahamensis</em></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type 2562</td>
<td>No. 2560 B.O.C.</td>
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<tr>
<td>Total length in mm.</td>
<td>340 260</td>
<td>137 121</td>
</tr>
<tr>
<td>Length of head</td>
<td>In 7.7</td>
<td>12.5</td>
</tr>
<tr>
<td>Length of lower jaw</td>
<td>percent 2.5</td>
<td>4.4</td>
</tr>
<tr>
<td>Diameter of eye</td>
<td>of 0.4</td>
<td>1.1</td>
</tr>
<tr>
<td>Interorbital width</td>
<td>total 0.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Length of snout</td>
<td>length 1.1</td>
<td>1.8</td>
</tr>
<tr>
<td>Length of tail</td>
<td>total 25</td>
<td>27</td>
</tr>
</tbody>
</table>

1 No. 41735 U. S. N. M. Examined by the author.

2 Measured from the origin of anal fin.
It will be seen from this table that the morphological differences between the two forms are very great, yet none of the differences are of such nature as to exclude the possibility of their being due to secondary sexual differentiations only, such features as the size of eyes and heads being known to be affected by sex among other species of eels, in a similar manner, although perhaps not as strongly as in the present case. Much more significant than these differences is therefore the perfect concordance between the two forms in such important characters as the peculiar formation of the vertical fins, these being only slightly more sharply lunate in *S. bahamensis* than in *S. edwardsii*, but otherwise perfectly alike in both; the highly characteristic proportion between trunk and tail; the general structure of the head and jaw apparatus; and even in such a detail of pigmentation as the blackness of the caudal fin.

It must further be remembered that both forms are known exclusively from the same geographical region, being even caught together in the same swim around the surface light during the third oceanographic expedition of the "Pawnee" (at Crooked Island).

There seems to be a considerable difference in size. The sperm was found to be running in several specimens of *S. bahamensis* from 120 to 140 mm. long, and no specimens larger than the latter figure were obtained; whereas the investigated two representatives of *S. edwardsii* measured, respectively, 340 and 260 mm. each. A smaller size of the male is, however, also known to occur among other eels.

Since, in the author’s opinion, there can under no circumstances be any question of generic distinction between the two forms here considered, the differences in the relative position of the heart have already lost their taxonomic significance by that argument. In *S. bahamensis* the heart is situated immediately behind the pectoral fins, in *S. edwardsii* almost one length of the head removed.

**Stilbus bahamensis** (Mowbray).

*Anguillichthys bahamensis* Mowbray in Breder 1927, p. 10.
4 specimens No. 2560 B. O. C. Cat Island, Bahamas. March 22, 1927.
1 specimen No. 2478 B. O. C. Rum Cay, Bahamas. March 26, 1927.
1 specimen No. 2561 B. O. C. Crooked Island, Bahamas. March 26, 1927.

**Stilbus edwardsii** Jordan and Bollmann.
1 specimen No. 2562 B. O. C. Crooked Island, Bahamas. March 26, 1927.

**Family MURAENIDAE.**

**Genus Gymnothorax** Bloch.

*Gymnothorax moringua* (Cuvier).

1 As observed without dissection in *S. edwardsii*. 
Genus *Uropterygius* Rüppel.

The various species referred to this genus seem to constitute a very heterogeneous group of muraenid eels characterized by a reduction of the dorsal and anal fins, which appear only as a set of low median dermal folds or keels almost entirely devoid of skeletal support (fin rays). A feature of this nature is, however, very unreliable as an indication of natural relationships, since the reduction involved is not complicated by any concomitant specialization in structure, but simply represents a general degeneration of the vertical fins, which may have occurred independently among quite separate forms. Without adequate material for anatomical investigations available, it is, however, impossible to suggest any natural subdivision of the genus and it may therefore be maintained as a provisional unit for the classification of various forms of uncertain position.

A separate subgenus, *Scutica*, was introduced by Jordan and Evermann (1896–1900, p. 403) on the assumption that the genotype of *Uropterygius* (*U. concolor* Rüppel) should differ from their species (*U. necturus* Jordan and Gilbert) by having both pairs of nostrils tubular. The author has been absolutely unable to find any confirmation of this assumption in the literature, Rüppel's original figure of his species (Rüppel 1835, pl. 20, fig. 4), on the contrary, showing only the anterior nostrils tubular as in the definition of Jordan and Evermann's subgenus, which must therefore be considered invalid.

*Uropterygius acutus*, n. sp.

Total length, 143 mm. Proportions in per cent of total length: Snout to vent, 44. Snout to anal fin fold, 45. Snout to origin of dorsal fin fold, 63. Length of head, 11.9. Diameter of eye, 1.05. Length of snout, 1.8. Length of gape, 5.2. Width of snout between anterior margins of orbits, 1.4. Depth of head, exclusive of lower jaw, at the centre of the eyes, 1.5. Total depth at the highest point of the skull, 3.9. Greatest depth of fish, 5.2.

Dorsal and anal fins reduced to dermal keels with degenerate rays. Origin of the dorsal keel considerably behind the origin of the anal keel, which begins immediately behind the vent.

![Fig. 2. Head of *Uropterygius acutus*.](image)
Although the differences between this form and the only other species of *Uropterygius* known from the Atlantic, viz. *U. grassi* Roule 1916, are not very clearly defined in the recorded measurements, they are nevertheless very conspicuous in the general appearance of the two species. According to the figures (Roule 1919, pl. VI, figs. 2–2c), *U. grassi* has a very high and blunt head, the eyes occupying less than one-third of the height through their centres (measured without lower jaw). In *U. acutus*, on the other hand, the head is low, slender, and sharply pointed, with the eyes occupying about two-thirds of the height through their centres (exclusive of the lower jaw). For comparison the accompanying outline drawing of the head of *M. grassi* has been prepared from Roule's illustration of the species. The present form also differs in having several vomerine teeth, whereas only a single tooth was found by Roule.

![Fig. 3. Head of *Uropterygius grassi*. Outline drawing after Roule 1919, pl. VI, fig. 2b.](image)

The dorsal profile of the head gradually ascends to the nape in a nearly straight line. The length of the gape equals a little less than half the length of the head, or nearly three times the length of the snout. The diameter of the eyes is contained less than twice in the length of the snout (more than twice in *M. grassi*). Both trunk and tail somewhat compressed. Only anterior nostrils tubular.

Teeth in the upper jaw in two series. Outer series of comparatively small and close-set teeth. Inner series of larger, less close-set fangs. Lower jaw with an outer series of small, close-set teeth extending over the entire length of the gape, and with an inner anterior series of about four larger fangs, limited to the pre-orbital region. Vomer with 3–4 larger teeth in a median series.

Snout and anterior part of head to somewhat behind the eyes, as well as the lower jaw, quite colorless (white). Rest of head and body perfectly uniformly grayish brown, without appreciable difference between dorsal and ventral parts.

Type specimen No. 2604 B. O. C. West Caicos Island. April 2, 1927. From the stomach of an *Epinephelus ascensionis* caught in 30 fathoms depth. (Perfect condition.)
Order SYNENTOGNATHI.

Family BELONIDAE.

Genus Tylosurus Cocco.

**Tylosurus ardeola** (Cuvier and Valenciennes).

The existing descriptions of this species seem rather inadequate on several points and a few supplementary notes and measurements based on the material now at hand may therefore be in place. The accompanying table gives the proportions of the species in sufficient detail to make further discussion unnecessary.

The caudal fin is moderately forked with the lower lobe much longer than the upper. The dorsal fin originates somewhat behind the anterior and of the anal fin, approximately above the bases of the fourth or fifth anal rays. The caudal peduncle has a very strong horizontal keel on each side, inserted along its medio-lateral line. The bluish lateral band is very distinct. There are about 105–115 scales in a medio-dorsal series anterior to the dorsal fin.


The jaws cannot be entirely closed at their base, as already observed by Breder (1927, p. 18).

1 specimen No. 2414 B. O. C. Washermans, Bahamas. February 28, 1927.
1 specimen No. 2424 B. O. C. New Providence, Bahamas. March 7, 1927.

**Measurements of Tylosurus spp.**

<table>
<thead>
<tr>
<th>Species</th>
<th>T. ardeola (Cuv. &amp; Val.)</th>
<th>T. notatus (Poey)</th>
</tr>
</thead>
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<tr>
<td>Length without caudal fin in mm.</td>
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<td>350</td>
</tr>
<tr>
<td>Length of head</td>
<td>In</td>
<td>36</td>
</tr>
<tr>
<td>Diameter of eye</td>
<td>per cent</td>
<td>4.0</td>
</tr>
<tr>
<td>Postorbital length of head</td>
<td>of</td>
<td>6.7</td>
</tr>
<tr>
<td>Length of snout</td>
<td>length</td>
<td>25</td>
</tr>
<tr>
<td>Interorbital width</td>
<td>without</td>
<td>3.5</td>
</tr>
<tr>
<td>Greatest depth</td>
<td>caudal</td>
<td>5.1</td>
</tr>
<tr>
<td>Greatest width</td>
<td>fin</td>
<td>5.4</td>
</tr>
<tr>
<td>Snout to A</td>
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<td>80</td>
</tr>
<tr>
<td>Snout to D.</td>
<td></td>
<td>82</td>
</tr>
<tr>
<td>Snout to V.</td>
<td></td>
<td>65</td>
</tr>
<tr>
<td>Length of P.</td>
<td></td>
<td>6.7</td>
</tr>
<tr>
<td>Length of V.</td>
<td></td>
<td>4.7</td>
</tr>
</tbody>
</table>

1 specimen No. 2415 B. O. C. Eleuthera Island, Bahamas. March 17, 1927.
1 specimen No. 2461 B. O. C. Cat Island, Bahamas. March 20, 1927.
3 specimens No. 2413 B. O. C. Rum Cay, Bahamas. March 25, 1927.
1 specimen No. 2411 B. O. C. West Caicos Island. April 2, 1927.

**Tylosurus raphidoma** (Ranzani).
1 specimen No. 2410 B. O. C. Green Cay, Bahamas. March 11, 1927.
1 specimen No. 2201 B. O. C. (Mounted.) Bahamas. 1927.

**Tylosurus notatus** (Poey).
A good figure of this form has been rendered by Fowler (1906, fig. 6, p. 90) but the definition of the species is still rather vague. The table on page 18 gives the measurements of some of the specimens now at hand.

The eyes are contained about 10 times in the entire length of the head (to the end of the snout), and about twice in the postorbital portion of the same. The interorbital width is equal to the diameter of the eyes. The dorsal fin originates opposite the origin of the anal fin. Pectoral fins about twice as long as the ventrals, which are inserted considerably closer to the base of the caudal fin than to the eyes, about midway between the former point and the gill slit. Caudal fin only very slightly lunate, with the lower lobe considerably larger than the upper. Greatest depth (in the region of the shoulder girdle) about equal to the greatest width (about midway between pectoral and ventral fins), the latter being, however, very considerably (about 25–50 per cent) greater than the depth of the body measured at the same point (midway P. to V.). This latter feature gives to the trunk a characteristically depressed appearance with strongly flattened back and belly. The flattening of the dorsal surface is especially pronounced on the postorbital part of the head, where very sharply marked angles are formed between the lateral margins of the dorsal surface and the upper portions of the cheeks and opercles. The caudal peduncle is compressed and perfectly smooth, without the slightest indication of lateral keels.

About 80–85 scales in a medio dorsal series anterior to the dorsal fin. D. 13–14, A. 13–14. The lateral band is sharply marked, but narrow and tapering in both directions from the region above the anal fin where it is widest. A dusky scapular blotch is found in all specimens, contrary to a statement by Jordan and Evermann (1896–1900, key to the species, p. 709). There is also a dusky vertical bar along the upper part of the posterior praeorbital margin, and an oblique subdermal blotch shines through in the region of overlapping between the operculum and the suboperculum.

11 specimens Nos. 2409 and 2618 B. O. C. Crooked Island, Bahamas. Beach seine in 0–2 feet of water. March 26, 1927.
Family HEMIRHAMPHIDAE.

Genus Hemirhamphus Linnaeus.

Hemirhamphus brasiliensis Linnaeus.

It is interesting to notice that this was the only species of half-beak obtained throughout the entire region of the Bahamas and Turks Island, while Beebe and Tee-Van (1928, p. 68) report Hemirhamphus brasiliensis to be "rather rare (in Port-au-Prince Bay, Haiti) compared with Hyporhamphus unifasciatus," which was not caught at all in the region here reported upon during the third oceanographic expedition of the "Pawnee." Hemirhamphus brasiliensis was, however, very abundant everywhere around the surface light at night.

1 specimen No. 2441 B. O. C. Washerwoman, Bahamas. February 28, 1927.
1 specimen No. 2442 B. O. C. Green Cay, Bahamas. March 1, 1927.
Juvenile.

1 specimen No. 2421 B. O. C. Rum Cay, Bahamas. March 25, 1927.
Juvenile.


Family Exocoetidae.

Genus Cypselurus Swainson.

The very considerable discrepancies existing in many cases between the published descriptions of the same nominal species of Cypselurus, as well as the often quite obviously discordant identifications of the single specimens of a sample arrived at by adherence to any particular key to the said genus, previously rendered in the literature, have prompted the author to make a number of detailed counts and measurements on some representatives of each of the four western Atlantic species, available in the Bingham Oceanographic Collection, in order to test the validity of the various numbers and proportions currently used as diagnostic characters for the differentiation of the species. Some of these measurements are recorded in the following table.

In explanation of the measurements, it may be mentioned that the total length without caudal fin has been reckoned as nearly as possible to the true base of the middle caudal rays, not to the point where these rays project from the musculature covering their proximal parts. By interorbital width is meant the width of the osseous parts alone approximately at the perpendicular from the centers of the eyes to the dorsal outline of the head in this region. The distances from the ventrals to the true base of the middle caudal rays or to the origin of the procurent part of the lower lobe of caudal fin are measured from the anterior end of the bases of the ventral fins. The rest of the measurements should not need special explanations.
<table>
<thead>
<tr>
<th>Reference Number</th>
<th>Species</th>
<th>Total length without caudal fin (mm)</th>
<th>Interscalular distance (mm)</th>
<th>Distance of eye to head (mm)</th>
<th>Greatest height (mm)</th>
<th>Length of P (mm)</th>
<th>Length of V (mm)</th>
<th>Length of base of A (mm)</th>
<th>Length of base of D (mm)</th>
<th>Snout to D (mm)</th>
<th>Snout to A (mm)</th>
<th>Snout to V (mm)</th>
<th>Ventral to snout (mm)</th>
<th>Ventral to posterior margin of opercle (mm)</th>
<th>Ventral to current part of base of caudal fin (mm)</th>
<th>Ventral to base of middle caudal fin (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>185</td>
<td>7.8</td>
<td>8.3</td>
<td>24.3</td>
<td>18.5</td>
<td>65</td>
<td>33</td>
<td>10.3</td>
<td>18.7</td>
<td>70</td>
<td>80</td>
<td>56.8</td>
<td>43.0</td>
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<td>8.5</td>
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<td>18.5</td>
<td>64</td>
<td>32</td>
<td>10.6</td>
<td>20.0</td>
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<td>32.0</td>
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1. A concave curvature of the back probably explains the increased distances from the ventrals to the various points on the head in this specimen.
2. Type specimen.
While it would appear from the table that *C. heterurus* may be quite sharply and clearly differentiable from the three other species, here considered, with regard to the situation of the ventrals relative to the caudal fin and to equidistant points on the head, it is on the other hand equally obvious that the finer distinctions such as “ventral fins inserted equidistant from pupil and base of caudal,” “equidistant from middle of opercle and base of caudal,” or “equidistant from posterior margin of opercle and base of caudal,” generally used as key characters for the differentiation of the various species, do not allow for a sufficient amount of individual variations, and are therefore useless for diagnostic purposes unless samples large enough to give reliable average values are available for identification. It furthermore appears from the literature that really adequate samples, in a statistical sense, never seem to have been obtained by any of the authors describing the various species of flying fishes here considered, and we therefore do not even know whether such distinctions as those above mentioned actually will be found to correspond to the true average values for the respective species to which they are referred, when adequate samples do become available; or whether they will prove to be merely based upon isolated and haphazard observations showing considerable deviations from the actual mean of the species. Judging from the scarcity of individual observations or at least of individually recorded observations and measurements, in the existing literature, and from the considerable discrepancies in the present material, the latter possibility may seem quite as probable as the former. On the basis of our present knowledge, the position of the ventrals relative to other parts can therefore only be used with a considerable allowance for individual variations and only in strict conjunction with other independent features of taxonomic significance. With regard to the length of the pectoral fins this measurement shows too great individual variations and proportionately too small specific differences to be of any value for the differentiations of the species, as shown particularly by the measurements recorded for *C. heterurus* (63 to 77 per cent of the total length without caudal fin) and for *C. bahiensis* (56 to 73 per cent) in the table on page 21. In the case of the ventral fins there are indications of considerably smaller ranges of individual variations and possibly also of greater specific differences, when *C. furcatus* is compared with the rest. It is therefore possible that the latter measurements may prove to be of taxonomic significance, but the adoption of this character is not to be recommended.

1 Here quoted from Meek and Hildebrand (1923–28, pp. 245–246). These finer distinctions in regard to the position of the ventrals were first introduced by Jordan and Meek (1885, pp. 52–53) and later accepted also by Jordan and Evermann (1896–1900).

2 See under the separate discussions of each of the four species treated on p. 25.

3 Only specimens in which the full (undamaged) length of the pectoral fins can be determined with reasonable clarity have, of course, been used to obtain these measurements.
nominal significance, but the present material is entirely too inadequate to justify the adoption of this feature as a diagnostic character at the present stage. The same also applies to the relative interorbital widths and to the relative lengths of the bases of dorsal and anal fins, in each of which characters the only available specimen of *C. furcatus* also shows conspicuous differences from the rest of the material. These features are therefore only with the greatest reservations included in the tentative review of the four species given on page 25. The rest of the measurements do not even show indications of appreciable specific differences in the limited samples now at hand.

With regard to the fin counts, there is some evidence of lower average values for D and A in *C. vitropinna* (D. 12 A. 8–9) than in the rest of the species here considered (D. 13–14 A. 9–11), but again we find the finer diagnostic distinctions, such as between D. 14 and D. 13, entirely valueless for the identification of our samples.

The apparently most unquestionably significant differences have been found in various scale-counts, particularly in the numbers of praedorsal scales, i.e., the numbers of scales in the median series from the top of the head to the origin of dorsal fin, and in the total numbers of scales in the lateral line. With regard to the latter count it must be mentioned, however, that accurate figures are very difficult to obtain, as the lateral line region of the captured specimens has only very rarely escaped without damage and some loss of scales from the violent death struggles of these fishes, and the scale pockets here are not as easily made out on the stripped body as in the medio-dorsal series where a fairly accurate count can always be arrived at. But even the approximate counts of the lateral lines show differences great enough compared to the individual ranges of variation to be of unquestionable significance in differentiating the species, as indicated by the figures given in the tentative review on page 25. In the case of the praedorsal scales the obtainable accuracy is greater, the ranges of individual variations seem smaller, but the specific differences quite as great as in the case of the lateral line scales. It therefore seems probable that the counts of the former will prove more valuable than those of the latter as means of identification.

In regard to the pigmentation of the pectoral fins the material tends to show that neither the density of the melanophores nor their sizes, nor their "shade" or "depth" of pigment is of any reliable value for the identification of the species; that, in other words, darkness or faintness, or even the apparent total lack of pigmentation on the pectoral fin-membranes are distinctions of no taxonomic significance. Thus the largest specimen of *C. heterurus* seems to have perfectly clear and entirely unpigmented pectorals, and only the very closest observation reveals the presence of minute, pale and comparatively scattered melanophors on the membranes of these fins. In the type of *C. vitropinna* the pigmentation is less inconspicuous, but still inconspicuous enough to cause the species to be
described as having the “membranes of all fins absolutely clear” and to be named accordingly. In other specimens of the same species obtained during the third oceanographic expedition of the “Pawnee” the pigmentation of the pectoral fin membranes is quite conspicuous. While the density of pigmentation on the pectoral fins has thus proved quite insignificant, the pattern of the same pigmentation does, on the other hand, seem to give fairly reliable indications of specific identities. Even in the case of the above mentioned, to all appearances absolutely clear, pectoral fin membranes of the largest C. heterurus, it is possible to make out that the very minute melanophores actually present also in this specimen are only found in similarly limited regions on the fins as are the larger, denser and darker melanophores, conspicuously pigmented specimens. In the case of C. vitripinna the identity of the pattern in the type and in the rest of the specimens is quite unmistakable.

With regard to the simple presence or absence of black pigmentation on dorsal and anal fins, the present material merely seems to verify the significance of these features, showing no discrepancies with existing descriptions, while, on the other hand, the details of the pattern on these fins and on the ventrals seem to be considerably less reliable than in the case of the pectoral fins.

One of the specimens of C. bahiensis shows irregular black spots in an unsymmetric arrangement on the two ventrals, but the presence (in C. furcatus) or absence (in the rest of the material except the above specimen) of black spots or regions on the membranes of these fins otherwise seems to have a certain value for the taxonomic differentiation of the species here considered.

In regard to the nomenclature and synonyms, the author has considered it outside of the scope of the present report to endeavour to make any critical review of the highly complicated situation. The identifications have therefore simply been made in concordance with those already previously rendered by Breder (1927) on the material obtained in the Bahamas and in the West Indian region during the first oceanographic expedition of the “Pawnee.” While uniform designations for the different forms contained in the Bingham Oceanographic Collection and reported upon in the various volumes of the present bulletin have thus been ensured by direct comparison of the samples, it is by no means quite clear that these designations are always used with strictly the same taxonomic meaning throughout the current literature. It also seems particularly probable that Cypselurus vitripinna Breder, which proved to be, next to C. heterurus, the most abundant of the flying fishes throughout the entire

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1 In lot No. 120 B. O. C., previously recorded (Breder 1927, p. 20) as containing 3 specimens of Cypselurus heterurus, one specimen of the genus Hirundichthys (Breder 1928), fairly concordant with the description of Exocoetus solitans rendered by Jordan and Meek (1885, p. 57) = Hirundichthys rubescens Rafinesque, according to Breder (1928, p. 20), has, by oversight, become included with two true representatives of Cypselurus heterurus.
region visited during the expedition in 1927, must formerly have been known and described under a different name as already suggested by Breder by the introduction of the new designation. As, however, the earlier descriptions are too obscure to allow of definite identification, the designation given by Breder has also been used in the present report.

On account of the difficulties discussed on the preceding pages it seems impossible to emphasize any single character or set of characters sufficiently to arrange thereby a dichotomous key to the species, but the following brief review of the various forms under discussion may serve as an explanation of the nomenclature here employed and as a possible basis for future identifications of adult specimens.

1. *Cypselurus heterurus* (Rafinesque).

Ventrals equidistant from origin of procurent part of lower lobe of caudal fin and points well in advance of the preopercular margin. A. 9. D. 13–14. About 28–33 median praedorsal scales and about 56–60 scales in the lateral line. Dorsal and anal fins and the membranes of the ventrals uniformly pale, ventral rays somewhat dusky. Membranes of the pectoral fins dusky or practically entirely clear, the pigmentation, when developed, arranged around a perfectly clear, somewhat triangular region extending from a wide base along the posterior ("inner") pectoral rays across the other fin rays through the middle of the fins towards their anterior margin, rapidly tapering away, however, without reaching the latter (see fig. 4, on p. 26).

2. *Cypselurus furcatus* (Mitchill).

Ventrals equidistant from origin of procurent part of lower lobe of caudal fin and points well in advance of the middle of the opercle. A. 9–10. D. 13–14. About 28 median praedorsal scales and about 46 scales in the lateral line. Dorsal, anal and ventral fins with distinct dark spots or regions of varying size and outline on their fin membranes. Pectoral fin membrane dusky, with a narrow, clear region extending from the posterior (inner) margin of the fin in a gentle curve through its middle part (across the rays) towards the tips of the longest rays (see fig. 4, on p. 26).


Ventrals equidistant from origin of procurent part of lower lobe of caudal fin and points well behind the preopercular margin. A. 8–9. D. 12. About 27–30 median praedorsal scales and about 46 scales altogether in the lateral line. Dorsal and anal fins and the membranes of the ventrals uniformly pale. Anterior two-thirds of the pectoral fin membranes more or less conspicuously dusky, posterior (inner) third perfectly clear, the boundary between the clear and the dusky parts running parallel with the rays, which are all dusky.
4. *Cypselurus bahiensis* (Ranzani).

Ventrals equidistant from the origin of the procurent part of the lower lobe of caudal fin and points well behind the praepercular margin. A. 9–11. D. 13. About 36–37 median praedorsal scales and about 52–58 scales altogether in the lateral line. Dorsal fin with a large, rounded, black, distal spot on its membranes. Anal pale. Ventrals with or without black spots on their membranes. Dark pigmentation on the pectoral fin membranes, when developed, covering almost the entire fin, leaving only a short and very narrow posterior (inner) margin clear.

Only the two species *C. heterurus* and *C. vitripina* are found in the collections from the third expedition.

In regard to *C. furcatus* it may be mentioned that in the specimen now at hand (No. 122 B. O. C.) the dusky area on the ventrals occupies only the distal half or less of these fins and that there are no distinct transverse bands across the caudal fin. Attention must further be called to the fact that the ventrals are distinctly posterior to the point of insertion described for this species by Meek and Hildebrand (1923–28, in the key, p. 245) as “equidistant from pupil and base of caudal” being in the present specimen found midway between a point somewhat behind the praepercular margin and the base of caudal fin.
While Meek and Hildebrand (loc. cit., key, p. 246) further, on the basis of their samples, describe *C. bahiensis* as having “pectoral fins pale” the three specimens here referred to the same nominal species do, on the other hand, have the pectoral fins much darker than any other sample of flying fishes from the western Atlantic Ocean now preserved in the Bingham Oceanographic Collection. The numbers of anal fin rays are in this species also seen to vary from 9 (specimen No. 12 in the table on page 21) to 11 (specimens No. 13 and 14), and the insertion of the ventrals from a point midway between the posterior margin of the opercle (Specimens 12 and 14) and the base of caudal fin to a point midway between the latter and the middle of the opercle (Specimen No. 13) without these variations showing any correlation justifying the differentiation of two separate forms.

**Cypselurus heterurus** (Rafinesque).

4 specimens No. 2458 B. O. C. Green Cay, Bahamas. February 27, 1927.

**Cypselurus vitripinna** Breder.

1 specimen No. 2440 B. O. C. Green Cay, Bahamas. February 27, 1927.
1 specimen No. 2439 B. O. C. Cat Island, Bahamas. March 22, 1927.
3 specimens No. 2459 B. O. C. West Caicos Island. April 2, 1927.

**Order** **HEMIBRANCHI.**

**Family** **AULOSTOMIDAE.**

**Genus** **Aulostomus** Lacépède.

**Aulostomus maculatus** Valenciennes.

1 specimen No. 2203 B. O. C. Turks Island. April 9, 1927. (Mounted.)

**Order** **LOPHOBRANCHI.**

**Family** **SYNGNATHIDAE.**

**Corythroichthys** Kaup, **Bhanotia** Hora, and **Bhanotichthys**, n. gen.

To Dr. Hora belongs the credit for first having demonstrated the existence of at least two distinct genera in the group of species generally combined in the genus *Corythroichthys* as interpreted by Duncker (1909, p. 237; 1912, p. 232, and 1915, p. 72). Accepting Duncker’s definition of the latter genus and his selection of genotype by subsequent designation¹ Hora (1925, p. 463) introduces a new genus, *Bhanotia*, for those forms which are distinct from the typical representatives of Duncker’s *Corythroichthys* by the following features:

¹ In Duncker’s first redefinitions, *Corythroichthys* is described as a monotypic genus (Duncker 1909, p. 237, and 1912, p. 232), containing only the species *C. conspicillatus.*
1. The ventrally converging skin folds of the brood pouch meet in the mid-ventral line.

2. The eggs are large and arranged in only two rows in the brood pouch.

3. The snout is short and provided with spines on its dorsal surface.

4. "The dorsal profile of the head rises abruptly in the orbital region and forms an angle with the dorsal profile of the snout."

5. "All the prominences on the head and body are serrated."

That is here a question of two truly distinct genera can scarcely be doubted. It is very unfortunate, however, that Duncker should have chosen to base his monotypic redescription of the genus Corythoichthys on a species (C. conspiculatus Jenyns) which was not included under this generic name at the time of its original publication (Kaup 1856, pp. 25-29). Duncker's designation of a genotype for Corythoichthys is therefore invalid according to the International Rules of Zoological Nomenclature (Art. 30, Point II, e, a), and his selection must consequently be superseded by the genotype by subsequent designation, C. albirostris Heckel, chosen by Jordan 1919 (Jordan 1917-1920, p. 253).

Under the circumstances, Duncker's definition must therefore also be rejected in favor of a definition based upon the characters of C. albirostris, and this species, as well as its close relatives in western Atlantic waters, unfortunately seems to be quite concordant with the definition of the genus Bhanotia in regard to all the features mentioned under points 3 to 5 above, with the only possible exception that instead of a number of spines along the mid-dorsal line of the snout, which "are continued as a low crest in the interorbital region," as described by Hora for his B. sewelli, the western Atlantic species has a continuous, but serrate, crest in the mid-dorsal line of these parts, which, however, must be considered a generically quite insignificant distinction.

In regard to the features mentioned under points 1 and 2, it appears that neither the brood pouch of C. albirostris nor that of any of its truly close relatives has ever been specifically described, and the same holds good of the eggs of these forms. Duncker (1915, p. 74) in his latest treatise on these fishes includes C. albirostris in the genus Corythoichthys as defined by him, listing a male of the species among his material. On the basis of this classification, one should therefore be entitled to conclude that Duncker had been able to verify that the eggs of C. albirostris were small and numerous, and that the protective dermal folds of its brood pouch do not meet in the median (vide his definition of the genus, loc. cit., p. 72). In the absence of a specific description in point of these characters, which Duncker also fails to give, one can, however, scarcely consider their presence in C. albirostris satisfactorily established as yet. There are thus two possibilities of classification to be further investigated. Firstly, that C. albirostris may prove perfectly concordant with the definition of the genus

*Hora's description of this feature in the generic diagnosis (genotype Corythoichthys corrugatus Weber) is not detailed enough for the present comparison.*
Bhanotia, in which case the latter designation becomes reduced to a synonym of Corythoichthys. Secondly, that C. albirostris may prove truly differentiable from Bhanotia on the basis of the size of its eggs and the dermal cover of its brood pouch, in which case Bhanotia and Corythoichthys may be maintained as truly distinct genera. It will, however, in either case be necessary to give a new generic definition for that group of species the distinction of which was first pointed out by Hora, i.e., for the forms with a relatively long slender and smooth snout, with smooth crests (at least on the head), with small, numerous eggs, and with the dermal folds of the brood pouch not meeting in the median. For the species thus defined (Corythoichthys sensu stricto Duncker, nec (Kaup) Jordan), the author herewith introduces the new generic name of Bhanotichthys,

in recognition of the true merits of Dr. Hora’s differentiation of two taxonomically separate groups among the forms here considered, and in an endeavour to perpetuate in only a slightly altered form the nomenclatural dedication intended by him for one of these groups, since the author considers it most probable that Bhanotia will prove entirely synonymous with Corythoichthys sensu stricto (Kaup) Jordan, nec Duncker. As the genotype of Bhanotichthys may be designated Syngnathus fasciatus Gray (Corythoichthys fasciatus Duncker; (?) Hora).

For the designation of the various crests on trunk and tail, the author has found it desirable to adopt in the following key and description the Latin terminology proposed and explained by Duncker (1912, p. 221; 1915, p. 15), since it seems greatly to the advantage of scientific literature that international terms of fixed definition should be used wherever possible. The terms will be sufficiently explained by the accompanying diagrammatic figure and its legend. As the last body-ring, is counted the one through which the anus opens.
Key to the western Atlantic species of the genus Corythoichthys sensu stricto. 1

A. Dorsal fin occupying only five segments.
   II. Crista media trunci not running into crista inferior caudae, but ending abruptly on the ring in advance of the anterior origin of the crista superior caudae, or under the foremost part of the latter. 3
      a. 18 + 29–32 rings. D. 20–25, on 1 trunk + 4 caudal rings. Body with about 12 dark cross bars. . . . . . . . . . . . . . . . C. albistris Heckel.
      b. 17–18 + 26–27 rings. D. 20–21, on 1½ trunk + 3½ caudal rings. 4
      Body not distinctly crossbarred (?).

C. cayorum Evermann and Kendall. 5

B. Dorsal fin on 1 trunk + 5 caudal rings. Crista media trunci ending widely separated from crista inferior caudae by a slight, tapering, somewhat downwards directed, faint crest below the anterior end of the crista superior caudae.

C. brederi, n. sp.

Total length, 123 mm. Total length without caudal fin, 117 mm. Other measurements in per cent of the total length without caudal fin. Length of head, 12. Diameter of eye, 1.9. Length of snout, 5.1. Base of dorsal fin, 9.4. Greatest depth of body, 5.1. Greatest width of body, 4.5. Distance from snout to anal fin, 47.5.


Head with a mid-dorsal crest from the snout to the interorbital region, where it is interrupted, to be continued again from the postorbital part of the cranium over the praenuchal and nuchal plates, disappearing again on the posterior part of the latter. A supra-ocular crest on each side, continued on the posterior part of the head, but not extending on the praenuchal plate. Operculum with only one single, horizontal, granulated ridge.

All crests on head and body, except crista inferior of trunk and tail, with serrated edges.

Crista media trunci ending as described in the key and shown in the diagrammatic drawing, fig. 6.

1 Syngnathus cayennensis Sauvage, which was listed by Jordan and Evermann (1896–1900, p. 772) in the “subgenus Corythoichthys” has been subsequently referred to by Duncker (1915, p. 44) to the genus Microphis, as a synonym of M. lineatus (Kaup).
2 1918, p. 21 and pl. 2, fig. 3.
3 Cr. med. tr. subcontinuous with cr. sup. c., in Duncker’s terminology.
4 “1 + 1 + 3” Metzelaar 1919, p. 27. Formula not explained.
5 1888, p. 128 and pl. 7, fig. 7.
The proportions will appear from the measurements. Both trunk and tail sharply angulate in transverse section, with prominent crests.

The largest dermal appendage is in the form of an unpaired filament arising from the medio-dorsal crest on the posterior part of the skull. Dermal appendages of the head otherwise small and very few. The development and arrangement of the appendages on trunk and tail shows a very well marked correlation to the coloration pattern, those of the white (or rather colorless) cross bands being much more concentrated, relatively very much larger, and more differentiated than those of the dark regions between. The appendages are all quite small, however, in absolute size.

Fig. 6. Head of Corythoichthys brederi.

The snout is colorless. Three darker bands start beneath the eye on each side. The anterior two short and vertical. The posterior one extending obliquely backwards across the lower anterior part of the operculum to the throat. Operculum dark, the pigmentation partly broken up in bands, which become more distinctly separated from each other in their ventral continuations below the throat.

Pigmentation of the head confluent with that of the first dark cross bar on the trunk. Body with a series of 11 wide dark cross bars occupying about 3 to 5 rings each, 4 bars on the trunk and 7 on the tail, the last one at the base of the caudal fin, interrupted by 10 narrow, colorless bands occupying only 1–2 rings each. The pigment in each of the dark cross bars is arranged with a gradually increasing density from their anterior towards their posterior portion, so that they become much more sharply set off against the colorless bands at their posterior than at their anterior margins.


Ampheliakturus, n. gen.

Brood pouch subcaudal, protected by a row of strong processes from each crista inferior caudae. These processes project separately from each body ring without being broadened and connected to form a more or less continuous lateral wall on each side of the pouch. Dermal folds of the pouch wide and
thick, meeting in the median, without diverging appreciably from each other at either end. Tail prehensile, but caudal fin present. Cristae weakly developed. Crista superior trunci and crista superior caudae discontinuous. Crista media trunci continuous with the crista inferior caudae. Crista inferior trunci apparently not continuous with crista inferior caudae, but converging with crista media trunci towards the point where the latter joins the crista inferior caudae. Base of dorsal fin elevated. Apparently one scutum nuchale and one prae- nuchale. Body with numerous branched tentacles.

Genotype A. brachyrhynchus, n. sp.

Amphelikurus is evidently most closely related to the Australian genus Haliichthys Gray (vide Duncker 1915, p. 112), differing significantly, however, by the presence of a caudal fin and of protecting processes for the brood pouch. These two genera both together occupy a very interesting intermediate position between the more typical Sicyoninae and the Hippocampinae, as already pointed out by Duncker (1915) for the genus Haliichthys.

There are two species referable to the genus Amphelikurus.

Key to the species.

I. Snout very short, its length contained more than 3 times in the length of the head. .................................................. A. brachyrhynchus, n. sp.

II. Snout moderate, its length only contained about twice in the length of the head. A. dendriticus Barbour.

Stiphostoma dendriticum Barbour 1905, p. 115 and pl. 1. ♀ (?)

Amphelikurus brachyrhynchus, n. sp.

Total length without caudal fin, about 46 mm. Proportion, in per cent of the total length without caudal fin: Length of head, 17.8. Diameter of eye, 3.5. Length of snout, 5.5. Snout to dorsal fin, 44.5. Base of dorsal fin, 8.7. Depth of body, about 7.6.

Snout tubular, not compressed, without bony crests of any kind. Dorsal profile of the head ascending abruptly from the horizontal upper profile of the snout. Supraorbital rim very prominent in the profile. Operculum with two straight ridges radiating from the region of its attachment to the hyomandibular. The upper opercular ridge directed upwards and backwards towards the gill opening, the lower, which is the stronger, obliquely backwards and downwards. Faint traces of minor, radiating ridges between those just described seem indicated on one side. Nape forming a prominent ridge or elevation, but not crested. There is a slight flexure of the head downward from the axis of the trunk, which increases the resemblance of this species to the Hippocampinae. Base of dorsal fin very conspicuously elevated. Crests of trunk and tail not very prominent; their arrangement has already been described in the diagnosis of the genus, and is the same as that shown in Barbour’s figure of A. dendriticus.
15 + 38 rings. D. 16, on 1 body + 4 caudal rings. C with either 8 simple or 4 completely bifurcated rays. P about 16. A vestigial.
In addition to the description of the brood pouch already rendered in the diagnosis of the genus, it may be mentioned that this organ in _A. brachyrhynchus_ occupies the eleven first segments of the tail, and that it is comparatively deep and narrow. It is very unfortunate that neither eggs nor their impressions are to be found in the pouch of the only available specimen, so that nothing can be said about their numbers, size, and arrangement.

Richly branched dermal filaments are profusely scattered over the entire head and body, except on the most anterior thoracic part of the abdomen (below the flexure of the "neck") and on the lower surface of the prehensile part of the tail. These appendages are also found in undiminished numbers on the outer surface of the skin folds covering the brood pouch, and even the ocular bulbs themselves carry a considerable number of small dermal flaps each.

Type specimen No. 2532 B. O. C. Crooked Island, Bahamas. March 26, 1927.

**Order BERYCIFORMES.**

**Family HOLOCENTRIDAE.**

**Genus Holocentrus** Scopoli.

Key to the Atlantic species of North and Middle America.

(For previously established synonymies, see Jordan and Evermann 1896-1900, pp. 247-253).

A. Eyes about 3½–4 in head. Third anal spine moderate, about 3 or more in the height of the body.


_H. sanctipauli_ Günther.

II. Caudal lobes equal. Eye 3½ in head. About 54–55 scales in the lateral line. Depth 4 in length without caudal. . . _H. meeki_ Bean 1906 (p. 31).

B. Eyes larger, only about 3 or less in head.


Upper caudal lobe longer than lower. 13–16 gill rakers on lower limb of the first arch.

a. Maxillary reaching to or a little beyond the centre of the eye. Eye 2½–2.8 in head. About 47–54 scales in the lateral line.

_H. ascensionis_ (Osbeck).

b. Maxillary reaching only to below the anterior margin of the pupil. Eye 3 in head. About 53–57 scales in the lateral line.

_H. oculus_ Poey.

_(fide Regan 1904, p. 259)_

II. Only about 45 or fewer scales in the lateral line. D XI + 12–14 (usually 13). A IV + 8–9. Caudal lobes equal (_H. sicilifer_?).

a. Depth of body conspicuously less than length of head (at least in adults). Operculum with one or two, usually two, enlarged spines of which the upper one is always conspicuously longer than the lower.
Cheeks with a horizontal pale cross bar extending backward from the lower third of the orbital margin, and separated below from the pale under surface of the head by a usually quite conspicuous dark cross bar. Spinous dorsal pale except for a jet black, sharply marked horizontal band which extends continuously from the first spine to the membrane between the third and fourth spine. A generally rather light form. Eye about 2½–3 in head, maxillary about 2.2–2.4.

_H. tortugae_ Jordan and Thompson

Syn. _H. puncticulatus_ Barbour 1905, p. 117.
_H. coruscus_ Beebe and Tee-Van, 1928, p. 80.

See below.

b. Depth of body about equal to or greater than (at least in adult specimens) the length of the head. Opercleum with two enlarged spines of about equal size or with the upper smaller than the lower. Cheeks without pale cross bars behind the orbit. Spinous dorsal dusky, usually with a darker band along the front of each of the anterior 3–6 spines; the bands never continuous with each other. Eye about 2.4–2.7 in head, maxillary 2.6–2.9. Third anal spine long, about 1½–1¾ in head. About 39–40 scales in the lateral line.

_H. vexillarius_ Poey.


See page 38.

c. Depth of body greater than length of head. Eye moderate, about 2.6 in head. Opercleum with 2 equal spines. About 45 scales in the lateral line. ..............._H. sexcifer_ Cope.

In the author's opinion almost certainly identical with _H. vexillarius_ Poey. Provisionally maintained as a separate species until a direct comparison with the type specimen can be made.

d. Depth of body greater than length of head. Eyes large, only 2½ in head. Maxillary short, 3 in head, not reaching to the center of the eye. Third anal spine moderate, about 1½ in head. A large black spot between first and third dorsal spines.

_H. coruscus_ Poey, fide Jordan and Bollman (1889, p. 550).

_H. coruscus_ Metzelaar 1919, p. 43 and fig. 15.
_nec H. coruscus_ Beebe and Tee-Van 1928, p. 80.

¹ The sole distinction between Cope's description and the known characters of _H. vexillarius_ is found in the recorded numbers of scales in the lateral line. In these figures are generally not included the small posterior scales at the base of caudal fin, but in _Holocentrus_ the transition from the normal scales of the tail to these reduced posterior scales is not as abrupt as in many other forms, but fairly gradual, both in regard to size and in regard to arrangement. The number of scales to be included in the count is therefore to a considerable extent a matter of personal choice, and it is quite possible to count as many as 45 in _H. vexillarius_ without any too obvious violation of the rules of taxonomical practice in such cases.
Holocentrus tortugae Jordan and Thompson 1905 (May).

H. puncticulatus Barbour 1905 (September), p. 117, pl. 2.
H. coruscus Beebe and Tee-Van, 1928, p. 80.
H. tortugae Breder 1927, p. 25.

There can scarcely be any doubt at all that the two descriptions published almost simultaneously by Jordan and Thompson and by Barbour both refer to the same species. The possibility that the slight differences recorded in the proportions of the two type specimens should be indicative of geographical variation is refuted by the fact that the specimens now at hand show intermediate individual variations in these respects.

The original description of H. coruscus Poey being inadequate for proper identification, the species must either be dropped from further consideration or must be accepted on the basis of the earliest concordant redescription, which is that rendered by Jordan and Bollmann 1889 (p. 559). The material referred by Beebe and Tee-Van 1928 (p. 80) to H. coruscus does, however, at least in as far as the only adult specimen (No. 7291) is concerned, not agree with Jordan and Bollmann's diagnosis of this species, but is on the other hand quite concordant with the definition of H. tortugae (and with the specimens assigned to this species by Breder 1927 (p. 25) and by the present writer) in all features whereby the latter species differ from the former as made out in the preceding key (see also footnote).

The accompanying table shows the measurements of H. tortugae and H. vexillarius in greater detail. The most conspicuous difference between the proportions of the two species are contributed by the lesser height of the body and the shorter pectoral and caudal fins in H. tortugae, in which the caudal is also less deeply bifurcate and its lobes more rounded than in H. vexillarius. Minor differences also seem to exist in the slightly shorter head and the slightly greater length and posterior width of maxillaries in H. tortugae.

2 specimens No. 2530 B. O. C. West Caicos Island. April 3, 1927.

1 The other two specimens recorded by these authors are still quite juvenile in their characters and therefore difficult to identify. Through the kindness of Dr. Beebe the writer has had opportunity to investigate the entire sample, thus being able to ascertain the identity of the adult with the specimens now at hand. To avoid any confusion in the future definitions of the species, it is necessary to mention that the author has been unable to measure the length of the head in Beebe and Tee-Van's largest specimen as only 30 mm., as recorded by them, but finds it to be about 33 mm. to the end of the opercular spine, or about 32 mm. to the margin of the opercular flap, thus making the length of the head greater than the depth of the body also in this case.
### Measurements of Holocentrus spp.

<table>
<thead>
<tr>
<th>Species</th>
<th>Holocentrus tortuguero</th>
<th>Holocentrus g. caudal</th>
<th>Holocentrus g. robustus</th>
<th>Holocentrus g. elongatus</th>
</tr>
</thead>
<tbody>
<tr>
<td>In mm</td>
<td>107.0</td>
<td>78.0</td>
<td>74.0</td>
<td>70.0</td>
</tr>
<tr>
<td>Head length</td>
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<td>75.0</td>
<td>71.0</td>
<td>67.0</td>
</tr>
<tr>
<td>Body length</td>
<td>98.0</td>
<td>72.0</td>
<td>68.0</td>
<td>64.0</td>
</tr>
<tr>
<td>Tail length</td>
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<td>36.0</td>
</tr>
<tr>
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<td>34.0</td>
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<td>26.0</td>
</tr>
<tr>
<td>Pectoral fin</td>
<td>10.0</td>
<td>4.0</td>
<td>3.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

### Percent of Length Without Caudal Fin

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<th>C</th>
<th>D</th>
<th>E</th>
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<tr>
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</tr>
<tr>
<td>Body length</td>
<td>20</td>
<td>17</td>
<td>14</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Tail length</td>
<td>15</td>
<td>12</td>
<td>9</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Dorsal fin</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Anal fin</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Pectoral fin</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Holocentrus vexillarius Poey.

(Fide Meek and Hildebrand 1923–1928, p. 299).

? Holocentrus brachypterus Poey 1865.

Since there are no significant features in the rather inadequate description of *H. brachypterus* by which this species can be considered satisfactorily established as distinct from *H. vexillarius*, it can only serve to create confusion in the nomenclature and in the taxonomic identifications to continue to treat these two only nominally differentiated forms as truly separate species. *H. brachypterus* has therefore, at least provisionally, been included among the synonyms of *H. vexillarius*.

The proportions of *H. vexillarius* are shown in detail in the preceding table, and its differences from *H. tortugae* are discussed under the heading of the latter species.

Preserved material:

6 specimens No. 2309 B. O. C. Rum Cay, Bahamas. March 26, 1927.
4 specimens No. 2314 B. O. C. West Caicos Island. April 3, 1927.
11 specimens No. 2321 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.
3 specimens No. 2335 B. O. C. Crooked Island, Bahamas. March 26, 1927.

Holocentrus ascensionis (Osbeck).

1 specimen No. 2310 B. O. C. Rum Cay, Bahamas. March 26, 1927.
8 specimens No. 2320 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.
5 specimens No. 2339 B. O. C. Cat Island, Bahamas. March 20, 1927.
1 specimen No. 2425 B. O. C. Green Cay, Bahamas. February 28, 1927.

Genus Plectryptops Gill.

On account of the ontogenetic changes to be described below, the spinous armature of the head skeleton can not be relied upon for the generic identification of juvenile specimens. The only known species is, however, also in these cases fairly easily recognized by its short and deep body, by the rounded outlines of the vertical fins and comparatively slight bifurcation of the caudal, and, above all, by the low number of scales in its lateral line.

Plectryptops retrospinus Guichenot.

Holocentrus exasperatus Breder 1927.

A very interesting series is found in the sample from Turks Island (No. 2322 B. O. C.) representing total lengths without caudal fin of 44, 56 and 70 mm. It is evident from this material that the forward curvature of the suborbital spines is a product of growth, which must be unequal anteriorly and posteriorly in relation to the point of each spine. At 44 mm. without caudal the basal core of each spine still distinctly shows the backward direction of its early stages,
while the points are now turning downwards, but only the most anterior spine has yet become slightly antrorse. At 56 mm. without caudal this differential growth has progressed further, 2 spines being sharply antrorse and the third approximately vertical. In the largest specimen 3 spines have become sharply antrorse and the fourth approximately vertical. It may further be noticed that the spine at the lower corner of the praeoperculum, which is quite conspicuously enlarged in the smallest specimen, becomes progressively relatively less enlarged in the others, although it is still distinctly stronger than the other spines of the praeoperculum even in the largest specimen. Comparing this material with the type of Breder's *Holocentrus exasperatus*, measuring only 34 mm. without caudal fin, we find the latter specimen, in accordance with its size, forming a perfect continuation of the above described series, with which it also seems to be entirely concordant in all other respects than those here considered. In this small specimen the suborbital spines still all have their points directed obliquely straight backwards, and the spine at the lower corner of the praeoperculum is very strongly enlarged.

While the differentiation of the genus *Plectryops* solely on the basis of the spinous armature of the head has thus proved unfortunate when applied to small specimens, the only known species, *P. retrospinis*, in the author's opinion nevertheless fully merits to rank as the type of a separate genus on the basis of its great general differences from the typical representatives of *Holocentrus*, at least as long as intermediate forms have not been discovered (the most adequate description and figure of *P. retrospinis* have been rendered by Meek and Hildebrand 1923–1928, p. 301 and pl. XXIII).

1 specimen No. 2311 B. O. C. Rum Cay, Bahamas. March 26, 1927.
1 specimen No. 2313 B. O. C. West Caicos Island. April 3, 1927.
3 specimens No. 2322 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

Genus *Flammeo* Jordan and Evermann.

*Flammeo marianus* (Cuvier and Valenciennes).

7 specimens No. 2324 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

Genus *Myripristis* Cuvier.

*Myripristis jacobus* Cuvier and Valenciennes.

1 specimen No. 2366 B. O. C. Cat Island, Bahamas. March 20, 1927.
1 specimen No. 2323 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

The specimens also form a progressive series in regard to the relative lengths of the maxillaries, which in the type of *H. exasperatus* (34 mm.) reach to below the posterior margin of the pupil, at 44 mm. to slightly in advance of the posterior margin of the orbit, at 56 mm. to slightly beyond the posterior margin of the orbit and at 70 mm. a conspicuous distance beyond the eye.
Order **ACANTHOPTERYGII**.
Suborder PERCSCOCES.
Family **ATHERINIDAE**.
Genus **Atherina** Linnaeus.

*Atherina* Jordan and Hubbs 1919, p. 35.
*Hepsetia* (Bonaparte) Jordan and Hubbs 1919, p. 31.
*Atherinomorus* Fowler 1903, p. 730.

In the author’s opinion the various attempts at a generic or subgeneric differentiation of the species here included in the genus *Atherina*, mainly according to the upper profile of the mandibular rami, have utterly failed to establish the justification of this procedure. In the case of the two species here considered, each presumably belonging to a different genus, the differences in the shapes of the lower jaws are so slight as to be almost imperceptible in some specimens, and so unimportant morphologically that the author would scarcely even be able to consider them of specific significance in the absence of other distinguishing features. These conditions are also admitted by Jordan and Hubbs 1919, p. 31, who state that “none of the differential characters when considered alone, however, is very sharply defined.” In regard to the argument advanced by these two authors in favor of a distinction between two separate genera, that “in the various regions where they both occur, the two groups are usually distinguishable by means of a combination of other characters, a fact strongly indicating that the distinction of the groups is natural,” it seems to the present writer that the very fact that it is in each specific case necessary to resort to “a combination of other characters” is strong evidence that the subdivision on the basis of the characters of the lower jaw is entirely arbitrary and impracticable, and results in a very heterogeneous grouping of the species.

In regard to the “other characters” it will be seen from the following table and from the discussions of the separate species that, in regard to the sizes of the heads and eyes, the interorbital widths and other features, the racial differences within the species *A. stipes* exceed, in magnitude, the specific differences between this form and *A. harringtonensis*.

Certain biological observations might perhaps also be of interest in this connection. While *A. harringtonensis araena* was exclusively obtained along the open shores, *A. stipes* had its main occurrence in mangrove channels, lagoons and saline ponds, and a comparison shows that the form of *A. stipes* obtained in localities which were in open connection with, or off, the open shores, is, in many respects, morphologically intermediate between the extreme variety found in the ponds of the old saltwork on West Caicos Island, and *A. harringtonensis araena*. Full knowledge of the possible, directly induced, modifications of both species might therefore perhaps show them to be descriptively even less distinct than they are at present assumed to be, although the author does not doubt their real taxonomic validity.
**Atherina harringtonensis araea** Jordan and Gilbert.

This form was generally very abundant around the surface light at night, off the open coasts of the Bahama Islands. The measurements of the subspecies are recorded in the table on the next page, and further discussed under *A. stipes* (below).

Material preserved:

1 specimen No. 2569 B. O. C. Green Cay, Bahamas. February 27, 1927.
2 specimens No. 2570 B. O. C. Rum Cay, Bahamas. March 26, 1927.
Numerous specimens No. 2574 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.
10 specimens No. 2571 B. O. C. Off Miami Beach, Florida. February 21, 1927.

**Atherina stipes** Müller and Troschel.

While this species had its main distribution in the lagoons, mangrove channels, and salt water ponds of the various islands, being seined in great numbers in such localities, it also occurred much less abundantly off the open coasts and was occasionally caught together with *A. harringtonensis araea* around the surface light at night. While the specimens of *A. stipes* thus obtained in open water were easily differentiated from *A. harringtonensis* by their larger heads and eyes and their greater interorbital widths, as shown in the table below, it will also be seen that the relative dimensions of these measurements in the offshore samples were quite moderate in comparison with those of the specimens from the very restricted and rather strongly saline ponds of the abandoned salt works on West Caicos Island. The specimens from the much larger Watlings Lake on San Salvador, with apparently almost normal sea water, did not differ to any similarly significant degree from those taken in open water. In the following table a comparison of the most important features of *A. harringtonensis araea* and of the open-water—and West Caicos Island—forms of *A. stipes* is made.

The previous statement that the open-water form of *A. stipes* in many respects occupies a descriptively intermediate stage between the salt-pond variety of the same species and *A. harringtonensis araea* will be sufficiently explained by the above comparative table. The deviations of the West Caicos Island specimens are conspicuous enough to be immediately noticeable even by a mere superficial inspection of the sample without any measurements being made.
### SUMMARY OF THE TABLE ON THE NEXT PAGE.

<table>
<thead>
<tr>
<th>Species and race</th>
<th>In per cent of length without caudal fin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length of head</td>
</tr>
<tr>
<td>A. harringtonensis area</td>
<td>23–24</td>
</tr>
<tr>
<td>A. stipes From open water</td>
<td>27–28</td>
</tr>
<tr>
<td>A. stipes Ponds on west Caicos I.</td>
<td>32–34</td>
</tr>
</tbody>
</table>

It will be seen from the table of individual measurements and counts that the differences between *A. harringtonensis araca* and *A. stipes* in regard to the depth of body are frequently quite negligible and not reliable for the differentiation of the two species. It will also be noticed that there may be some overlapping in the scale counts, those for most of the specimens of *A. stipes* being higher than previously recorded.

Material preserved:

Numerous specimens No. 2581 B. O. C. Watlings Lake, San Salvador, March 24, 1927.
1 specimen No. 2509 B. O. C. Off Rum Cay, Bahamas. March 26, 1927.
31 specimens No. 2353 B. O. C. Mangrove Channel, Crooked Island, Bahamas. March 26, 1927.
Numerous specimens No. 2579 B. O. C. Ponds of abandoned salt works, West Caicos Island, Bahamas. April 2, 1927.
1 specimen No. 2573 B. O. C. Turks Island. April 8, 1927.
1 specimen No. 2572 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

**Family MUGILIDAE.**

**Genus Mugil Linnaeus.**

? Mugil cephalus Linnaeus.

A number of small specimens, obtained in a salt-water pond above normal high water at Crooked Island, are only with considerable hesitation referred to *Mugil cephalus* Linn. The sample differs most conspicuously from the current descriptions of the latter species by the number of scales, of which there are only about 35 in a lateral series. The specimens are also rather atypical in several of their proportions, although not entirely outside of the range of variations recorded for *M. cephalus*. In the absence of adult specimens or comparable
<table>
<thead>
<tr>
<th>Species</th>
<th>Locality</th>
<th>Length without caudal fin in mm.</th>
<th>Length of head</th>
<th>Diameter of eyes</th>
<th>Inter-orbital width</th>
<th>Depth of body</th>
<th>Snout to D1</th>
<th>Snout to D2</th>
<th>Snout to V</th>
<th>Snout to A</th>
<th>Scales</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. harringtonensis area</td>
<td>Off open shore</td>
<td>72</td>
<td>24</td>
<td>8.3</td>
<td>8.7</td>
<td>19</td>
<td>54</td>
<td>71</td>
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<td>Off open shore</td>
<td>65</td>
<td>27</td>
<td>10.5</td>
<td>10.5</td>
<td>20</td>
<td>55</td>
<td>71</td>
<td>42</td>
<td>68</td>
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<td>63</td>
<td>28</td>
<td>11.0</td>
<td>11.0</td>
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<td>56</td>
<td>73</td>
<td>41</td>
<td>68</td>
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<td>62</td>
<td>27</td>
<td>11.0</td>
<td>10.5</td>
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<td>57</td>
<td>71</td>
<td>41</td>
<td>68</td>
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<td>59</td>
<td>28</td>
<td>12.0</td>
<td>11.0</td>
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<td>56</td>
<td>73</td>
<td>42</td>
<td>70</td>
<td>43</td>
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<td></td>
<td>47</td>
<td>28</td>
<td>11.5</td>
<td>11.0</td>
<td>19</td>
<td>56</td>
<td>70</td>
<td>42</td>
<td>68</td>
<td>44</td>
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<tr>
<td>Watlings Lake, San Salvador</td>
<td></td>
<td>54</td>
<td>30</td>
<td>13.0</td>
<td>11.5</td>
<td>19</td>
<td>57</td>
<td>71</td>
<td>43</td>
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<td>48</td>
<td>28</td>
<td>12.5</td>
<td>10.5</td>
<td>18</td>
<td>57</td>
<td>70</td>
<td>42</td>
<td>67</td>
<td>40</td>
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<td></td>
<td>47</td>
<td>29</td>
<td>11.5</td>
<td>11.0</td>
<td>20</td>
<td>57</td>
<td>73</td>
<td>43</td>
<td>69</td>
<td>40</td>
</tr>
<tr>
<td>Salt ponds, West Calcos Island</td>
<td></td>
<td>50</td>
<td>33</td>
<td>13.0</td>
<td>12.0</td>
<td>21</td>
<td>60</td>
<td>75</td>
<td>48</td>
<td>72</td>
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<td></td>
<td></td>
<td>48</td>
<td>33</td>
<td>12.0</td>
<td>10.5</td>
<td>20</td>
<td>59</td>
<td>71</td>
<td>46</td>
<td>68</td>
<td>38</td>
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<tr>
<td></td>
<td></td>
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<td>73</td>
<td>45</td>
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<td></td>
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<td>32</td>
<td>13.0</td>
<td>13.0</td>
<td>21</td>
<td>60</td>
<td>73</td>
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<td>11.0</td>
<td>21</td>
<td>59</td>
<td>74</td>
<td>48</td>
<td>70</td>
<td>41</td>
</tr>
</tbody>
</table>
samples of typical *M. cephalus* from the same region, the material has been provisionally referred to the latter species, while a more detailed description is rendered for future identifications of the form here considered.

There are no scales, as yet, to be seen on the vertical fins. The anal fin is inserted conspicuously in advance of the second dorsal, while the first dorsal has its origin distinctly nearer to the caudal fin than to the point of the snout. The general proportions will appear from the following table of measurements taken from the two largest specimens.

**Measurements of *Mugil cephalus (?)* from Crooked Island.**

<table>
<thead>
<tr>
<th></th>
<th>62</th>
<th>62</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of head</td>
<td>29.0</td>
<td>31.4</td>
</tr>
<tr>
<td>Length of gape</td>
<td>7.3</td>
<td>8.1</td>
</tr>
<tr>
<td>Width of gape</td>
<td>8.1</td>
<td>8.9</td>
</tr>
<tr>
<td>Diameter of eyes</td>
<td>In</td>
<td></td>
</tr>
<tr>
<td>Interorbital width</td>
<td>percent</td>
<td>8.9</td>
</tr>
<tr>
<td>Greatest width of head</td>
<td>of the</td>
<td>11.0</td>
</tr>
<tr>
<td>Depth of head</td>
<td>length</td>
<td>19.5</td>
</tr>
<tr>
<td>Greatest depth of body</td>
<td>without</td>
<td>22.6</td>
</tr>
<tr>
<td>Snout to D&lt;sub&gt;1&lt;/sub&gt;</td>
<td>caudal</td>
<td>29.0</td>
</tr>
<tr>
<td>Snout to D&lt;sub&gt;2&lt;/sub&gt;</td>
<td>fin</td>
<td>53.0</td>
</tr>
<tr>
<td>Snout to A</td>
<td>75.0</td>
<td>77.0</td>
</tr>
</tbody>
</table>

1 Not including the adipose rim.

The two specimens treated in the above table both have an anal count of III + 8½, while the smaller specimens (30–35 mm. without caudal fin) show II + 9½ in 9 cases and II + 10½ in 2 cases, apparently without any correlated variations in other characters, which might indicate the presence of two separate forms among these specimens. The presence of 8½ or 9½ soft anal rays (in the adult) would thus, in the present case, seem to be within the range of individual variations, although this feature is commonly used for specific distinctions within the genus *Mugil*. The improbability of there being two separate forms present in the sample is further increased by the very restricted locality from which it was obtained, the entire pond not covering more than about 500 square feet.

The teeth in the jaws are in a single series, the lips are thin, there are only about 35 scales in a lateral series, and the adipose eyelids are already strongly developed in the two largest specimens, but absent in the smaller ones.

13 specimens No. 2605 B. O. C. Salt pond above normal high water, Crooked Island, Bahamas. March 26, 1927.

*Mugil curema* Cuvier and Valenciennes.

Family **Sphyraenidae**.

Genus **Sphyraena** Klein.

*Sphyraena barracuda* (Walbaum).

1 specimen No. 2405 B. O. C.  Rum Cay, Bahamas.  March 25, 1927.
1 specimen No. 2378 B. O. C.  Crooked Island, Bahamas.  March 26, 1927.

Suborder Scombriformes.

Family **Scombridae**.

Genus **Gymnosarda** Gill.

*Gymnosarda alletterata* Rafinesque.


Genus **Scombroromorus** Lacépède.

*Scombroromorus regalis* (Bloch).

1 specimen No. 2207 B. O. C.  Green Cay, Bahamas.  March 1, 1927.  (Mounted.)
2 specimens No. 2404 and 2419 B. O. C.  West Caicos Island.  April 7, 1927.

Family **Carangidae**.

Genus **Caranx** Lacépède.

*Caranx crysos* (Mitchill).

Common.

1 specimen No. 2432 B. O. C.  Nassau, Bahamas.  March 5, 1927.
2 specimens No. 2400 B. O. C.  Rum Cay, Bahamas.  March 25, 1927.

*Caranx latus* Agassiz.

Fairly common.

2 specimens No. 2399 B. O. C.  West Caicos Island.  April 7, 1927.

*Caranx lugubris* Poey.

One specimen was caught at West Caicos Island.  Not preserved.

*Caranx bartholomaei* Cuvier and Valenciennes.

1 specimen No. 2377 B. O. C.  Crooked Island, Bahamas.  March 26, 1927.

*Caranx ruber* (Bloch).

Very common.

1 specimen No. 2401 B. O. C.  Rum Cay, Bahamas.  March 25, 1927.
7 specimens Nos. 2402 and 2380 B. O. C.  West Caicos Island.  April 7, 1927.
Genus **Decapterus** Bleeker.

**Decapterus macarellus** (Cuvier and Valenciennes 1828–1849).

† **Caranx sanctae-helenae** Cuvier and Valenciennes 1828–1849.

**Decapterus sanctae-helenae** Poey 1868.

In the smaller specimens (ca. 50–100 mm. total length) of the form here referred to *D. macarellus*, minute teeth are found to be present on jaws, vomer, palatines, and tongue. In the single larger specimen (ca. 160 mm. total length) obtained during the expedition the entire dentition must be termed obsolete, in accordance with Jordan and Evermann’s definition of *D. macarellus* (Jordan and Evermann 1896–1900, p. 909), although the minute rudiments of teeth can still be perceived, under a lens, on all the above mentioned parts. Twenty-five to thirty keeled scutes are counted in the posterior part of the lateral line in the preserved specimens, the series starting approximately under the beginning of the last third or fourth of the base of the soft dorsal fin. Jordan and Evermann’s statement (loc. cit., p. 909) that the scutes begin “at end of dorsal” must probably be due to a misprint as it scarcely seems possible that 25, or more, keeled scutes could be crowded together on the short caudal peduncle of any fish with the general proportions characteristic of the genus *Decapterus*.

Comparing these observations on the key-characters of the material now at hand with the existing descriptions of American species, we find the form here referred to equally well identifiable with *D. macarellus* and with *D. sanctae-helenae*, at least in as far as the western Atlantic records of the latter species are concerned. There is, in fact, in this region at least, apparently no way of telling the two nominal species apart. The author therefore feels quite confident that the *D. sanctae-helenae* of Poey, and of subsequent authors, in so far as they refer to western Atlantic waters, should be synonymized with *D. macarellus*. Whether a similar synonymization should also prove to be warranted for the material referred to *D. sanctae-helenae* from other geographical regions can only be determined by a direct comparison with specimens from the regions in question; but the fact that *D. macarellus* seems to be more typically a member of the oceanic nekton, than of the inshore pelagic communities (see below), rather strengthens the possibility of the identical form occurring on the other side of the Atlantic, or even in more remote regions.

*D. macarellus* proved to be very common in the pelagic layers throughout the Bahaman waters visited during the third oceanographic expedition of the “Pawnee,” being obtained quite regularly in the 14-foot circular net used for the deep-sea hauls, in numbers ranging from one to several hundred, or, in one case, even to several thousand, while it was only on one single occasion caught near the shore, and then only through its being attracted to a light lowered into the surface at night, an arrangement which was also found to attract other typically oceanic stragglers. It may be in some way significant that this latter
specimen was the only one of any larger size (about 160 mm. total length), all the other catches consisting of specimens from about 50 to about 100 mm. length, but, at least up to the latter size, the author feels justified in concluding that the species is typically oceanic in its habitat.

14 specimens No. 2519 B. O. C. N. 24° 00' 15". W. 77° 16' 40". February 28, 1927. Tow net.

Suborder PERCIFORMES.

Family CHILODIPTERIDAE.

Genus Amia Gronow.

Amia maculatus (Poey).

2 specimens No. 2501 B. O. C. Rum Cay, Bahamas. March 26, 1927.
1 specimen No. 2502 B. O. C. Turks Island. April 9-10, 1927.

Amia binotatus Poey.

1 specimen No. 2505 B. O. C. Turks Island. April 9-10, 1927.

Amia gloverensis Mowbray (in Breder 1927).

This species is distinguished from the following by the presence of a conspicuous dusky band along the basal parts of the second dorsal and anal fin

Measurements of Amia gloverensis Mowbray and A. pigmentarius (?) Poey.

<table>
<thead>
<tr>
<th>Species</th>
<th>pigmentarius</th>
<th>gloverensis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total length in mm.</td>
<td>47</td>
<td>48^1 48 57 58</td>
</tr>
<tr>
<td>Length without caudal fin in mm.</td>
<td>35</td>
<td>36 35 43 43</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>In per cent of the total</th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Length of head</td>
<td>42.0</td>
<td>42.0 43.0 44.0 44.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diameter of eye</td>
<td>11.5</td>
<td>14.5 15.0 15.5 15.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of snout</td>
<td>length</td>
<td>9.5 10.0 9.5 9.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snout to end of dorsal fin base</td>
<td>without</td>
<td>71.0 72.0 74.0 73.0 73.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greatest depth</td>
<td>caudal</td>
<td>33.0 34.0 34.0 36.0 37.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth of caudal peduncle</td>
<td>fin</td>
<td>18.0 23.0 17.0 18.0 16.0</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

^1 Type specimen.
membranes (not along the fin bases themselves), by the larger eyes (see the accompanying table), and by the transversely elongate and pointed shape of the dusky dot on each scale.

1 specimen No. 2503 B. O. C. Rum Cay, Bahamas. March 26, 1927.
2 specimens No. 2504 B. O. C. Turks Island. April 9–10, 1927.

**Amia pigmentarius** (Poey).

A single small specimen from Cat Island, Bahamas, is with considerable hesitation tentatively referred to this species. It differs from *Amia gloverensis* Mowbray in the entire absence of a dusky longitudinal band along the proximal (basal) portion of the anal and second dorsal fin membranes, in the comparatively rounded, instead of transversely drawn out and diamond-shaped form of the dusky dot on each scale which gives the fish a checkered rather than a reticulate appearance,\(^1\) and in having considerably smaller eyes than *A. gloverensis* of the same size. The latter feature is clearly shown in the accompanying table of measurements. That the specimen represents a taxonomically distinct form seems quite certain, but whether Poey's designation can properly be applied to the species is questionable. About 24 scales in the lateral line.

1 specimen No. 2545 B. O. C. Bennets Harbour, Cat Island, Bahamas. March 19–20, 1927.

Genus *Apogonichthys* Bleeker.

**Apogonichthys stellatus** Cope.

7 specimens No. 2334 B. O. C. Crooked Island, Bahamas. March 26, 1927.

\(^1\) See also Breder 1927, p. 38.
Family **SERRANIDAE.**

Genus *Cephalopholis* Bloch and Schneider.

*Cephalopholis fulvis* Linnaeus.

The fact that the so-called subspecies *rubra* and *punctatus* merely represent spontaneous color phases of one single form (one single individual) has already been pointed out by Townsend (1929, p. 335, and color plate 9, p. 360). A specimen in the lemon-yellow phase, described by Jordan and Evermann 1896-1900, p. 1145, as comparatively scarce and characteristic of the deeper water, was obtained in quite shallow water (ca. 5 fathoms) at Boobie Rocks, Tongue of the Ocean. This phase differs from that shown in the upper figure on Dr. Townsend's plate of the color changes in *C. fulvescens*, in being suffused with an extremely bright clear lemon-yellow instead of the pinkish cream color of Dr. Townsend's figure, agreeing, however, in the sharp subdivision of the body into a darker dorsal and lighter ventral portion with a straight horizontal boundary stretching from the snout to the end of the base of dorsal fin. The specimen was kept alive for several hours but could not be brought to change into any of the typical *rubra* or *punctatus* phases, neither by quiet, nor by offering of food or by irritation. The changes observed would only involve a rather slight dulling and darkening toward a quite light brownish color. It is possible that some of the color phases, such as this lemon-yellow, may be determined by physiological conditions not under direct and spontaneous control by the nervous system.

1 specimen No. 2426 B. O. C. Green Cay, Bahamas. March 1, 1927.
1 specimen No. 2407 B. O. C. New Providence, Bahamas. March 7, 1927.
1 specimen No. 2227 B. O. C. Boobie Rock, Bahamas. March 12, 1927. (Mounted.)
1 specimen No. 2435 B. O. C. Cat Island, Bahamas. March 22, 1927.
1 specimen No. 2356 B. O. C. Hawks Nest, Turks Island. April 9-10, 1927.

Genus *Petrometopon* Gill.

The author is greatly in doubt about the desirability of maintaining this as a separate genus from *Cephalopholis.*

*Petrometopon cruentatus* (Lacépède).

1 specimen No. 2319 B. O. C. West Caicos Island. April 3, 1927.
1 specimen No. 2357 B. O. C. Hawks Nest, Turks Island. April 9-10 1,927.

Genus *Epinephelus* Bloch.

*Epinephelus guttatus* (Linnaeus).

1 specimen No. 2491 B. O. C. Boobie Rock, Tongue of the Ocean, Bahamas. March 10, 1927. (Mounted.)
2 specimens No. 2315 B. O. C. West Caicos Island, April 3, 1927.
**Epinephelus striatus** (Bloch).
1 specimen No. 2622 B. O. C. Nassau, Bahamas. February 26, 1927. (Mounted.)

**Epinephelus adscensionis** (Osbeck).
1 specimen No. 2408 B. O. C. Boobie Rock, Tongue of the Ocean, Bahamas. March 10, 1927.
1 specimen No. 2306 B. O. C. Rum Cay, Bahamas. March 26, 1927.

**Genus Mycteroperca** Gill.

**Mycteroperca venenosa apua** (Bloch).
Usually common in deep water, particularly at the stations around Exuma Sound.
1 specimen No. 2623 B. O. C. Eleuthera, Bahamas. March 15, 1927. (Mounted.)

**Mycteroperca tigris** (Cuvier and Valenciennes).
1 specimen No. 2624 B. O. C. Washerman, Bahamas. March 1, 1927. (Mounted.)

**Mycteroperca falcata** (Poey).
A specimen of this species was obtained in Florida in January 1927 by Mr. Francis West, taxidermist of the oceangraphic expeditions of the “Pawnee,” and has been included in the collections from the third expedition.
1 specimen No. 2625 B. O. C. Florida. January 1927. (Mounted.)

**Genus Promicrops** Poey.

**Promicrops italira** (Lichtenstein).
1 specimen No. 2626 B. O. C. West Caicos Island. April 2, 1927. (Mounted.)
Fresh weight 320 pounds.

**Genus Gramma** Poey.
The osteology of *Gramma hemichryso* Mowbray does not give any valid reason for separating the genus from the family Serranidae.

**Gramma hemichryso** Mowbray (in Breder 1927).
1 specimen No. 2500 B. O. C. Rum Cay, Bahamas. March 26, 1927.
1 specimen No. 2344 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

**Genus Prionodes** Jenyns.

**Prionodes tigrinus** (Bloch).
1 specimen No. 2365 B. O. C. Cat Island, Bahamas. March 21, 1927.
Family LUTIANIDAE.
Genus Lutianus Bloch.

Lutianus synagris (Linnaeus).
2 specimens No. 2360 B. O. C. Cat Island, Bahamas. March 20, 1927.

Lutianus mahogoni (Cuvier and Valenciennes).
6 specimens No. 2375 B. O. C. West Caicos Island. April 3, 1927.

Lutianus griseus (Linnaeus).
1 specimen No. 2438 B. O. C. Miami Beach, Florida. February 21, 1927.

Lutianus apodus (Walbaum).
2 specimens No. 2457 B. O. C. Crooked Island, Bahamas. March 26, 1927.
3 specimens No. 2456 B. O. C. West Caicos Island, April 3, 1927.

Lutianus aya Bloch.

It is unfortunate that only one single specimen has been preserved of the many red snappers caught during the third oceanographic expedition of the "Pawnee" and identified in the field as L. aya Bloch according to the definition of this species rendered by Jordan and Evermann (1896-1898, p. 1264). In their later discussion of the taxonomy of these fishes Hildebrand and Ginsburg (1927a) have shown the existence of two apparently specifically separate forms in the group of nominal species included by Jordan and Evermann in their description of L. aya. These two forms are by the former authors identified as L. blackfordi Goode and Bean and L. campechanus Poy, while the name of L. aya is held in abeyance for future determination of its taxonomic status. It now appears that the present specimen of red snapper can neither be identified with either one of these two species as interpreted by Hildebrand and Ginsburg, nor is it in all respects an intermediate between the two; but does on the contrary exhibit extreme characters in several comparatively significant features, these characters being of such nature that they can not all be explained as merely due to differences in size. To avoid the addition of a new specific designation to the already more than ample nomenclature of the red snappers, the author has therefore deemed it advisable to reoccupy tentatively the name of L. aya for the form represented by the specimen now at hand, without thereby intending to express any final opinion upon the actual taxonomic status or validity of any of the three nominal species of red snappers thus provisionally recognized in the present report.

The following measurements have been made: Total length without caudal fin, 270 mm. Proportions in per cent of the total length without caudal fin: Length of head, 40. Length of snout, 15.5. Maxillary, 16.3. Diameter of eye, 9. Greatest height, 38. Length of second anal spine, 12. Length of third anal spine, 11.

It will be seen from these figures that both head and eyes are relatively very considerably larger than in either of the two species described by Hildebrand
and Ginsburg (compare with their tabulation of characters, op. cit., p. 84). The
differences in these respects might, however, quite conceivably be partly or
entirely due to differences in size, although it is worth noticing that the largest
heads according to Hildebrand and Ginsburg otherwise are to be found in L.
blackfordi, while the larger eyes should be found in L. campechanus, these features
thus tending to point in opposite directions with regard to the possible relations-
ship of the present specimen. The maxillary extends fully to the vertical
from the anterior margin of the eye (as in L. campechanus) or even very slightly
beyond this line. The relative depth of the body and the proportion between
the length of the snout and the length of the maxillary are intermediate between
the corresponding figures recorded for L. blackfordi and L. campechanus. The
exposed portions of the scales on the middle of the sides, in front, are about
1\(\frac{1}{2}\) as high as the exposed parts of the scales situated on the middle of the
sides and above the anal fin (intermediate character). There are about 67–68
nearly vertical rows of scales above the lateral line, and about 50 rows running
downward and backward (approximately as in L. campechanus). The lateral
line itself contains about 48-50 scales. There are only 6 scales in a vertical
row between the origin of dorsal fin and the lateral line on one side, 7 scales on
the other, the latter figure, however, apparently being due to an irregularity
in the row of scales thus defined, while the first mentioned row with only 6
scales seems perfectly normal. The present specimen further shows 13 scales
on one side and 14 on the other between the origin of anal fin and the lateral
line, counting upward and slightly backward. L. blackfordi and L. campechanus
are described by Hildebrand and Ginsburg as having respectively 7 and 8 scales
between dorsal fin and lateral line, and 14 and 15 scales between lateral line
and anal fin. The taxonomic significance of these differences is of course greatly
reduced by the observed asymmetry in the present specimen. A more important
difference may, however, possibly be seen in the fact that this specimen also
shows 7 rows of scales on each cheek, instead of only 6 rows, as described for
the other two species of red snappers, the seventh row having 6 scales on one side
but only 3 on the other.

The lower limb of the branchial arch has 3-4 small anterior tubercles followed

\(^1\) This number corresponds to the figures obtained by Hildebrand and Ginsburg
by "counting the rows running upward and backward," these rows being in the
present specimen so steeply inclined as to be quite vertical or even directed slightly
forward. This minor difference in the arrangement of the scales might possibly
prove to be a valuable taxonomic character, when and if the specific distinctness of
the three nominal species of red snappers here compared can be verified on a larger
material.
by 12 well developed gill rakers (on both sides), the upper limb of the arch having 2 well developed rakers and 5 coarse tubercles. Hildebrand and Ginsburg describe *L. campechanus* as having 11 gill rakers in the lower limb and *L. blackfordi* as having only 9, the present specimen thus differing from both of these species in an extreme direction.

The anal spines are comparatively long, the second spine being even slightly longer than the third, while according to the measurements and illustrations rendered by Hildebrand and Ginsburg the second anal spine of the two other species of red snappers is considerably, and very conspicuously, shorter than the third.

There are 8 soft rays in the anal fin, as in *L. campechanus*. No black lateral spot but a very sharply marked black spot on the upper part of the base of pectoral fin. In its fresh condition the specimen was otherwise uniformly, very deeply and brilliantly red. Eye red.

Teeth on vomer moderate, in a comparatively large, somewhat anchor-shaped patch. Interopercular knob moderate.

As will appear from the above description, the form represented by the specimen now at hand, and here designated as *L. aya* Bloch, seems differentiable from the related red snappers by the numbers of gill rakers, by the proportions of the anal spines, and by the numbers of scales on the cheeks and in a vertical row between the origin of dorsal fin and the lateral line, as well as by several quite considerable but possibly not significant differences in the proportions of various other parts, and perhaps also to some extent by the geometric arrangement of the scales above the lateral line. The author does not feel perfectly satisfied, however, that the differences, which can not be explained as due to differences in size, will not ultimately prove to be features of local or individual variations only.

*L. aya*, as here understood, is quite distinct from *L. vivanus* Cuvier and Valenciennes, which was also caught and identified according to the descriptions given by Jordan and Evermann on several occasions during the same expedition. Samples of the latter species were unfortunately not preserved, however, but its distinctness was quite unmistakable on the fresh material. Comparing with the figures rendered by Jordan and Evermann (1896–1898, p. 1262) for a specimen of about the same size as the present representative of *L. aya* (10 inches) we find *L. vivanus* distinguished by the following features: Smaller head (23/4), smaller scales (8–72–17), shorter snout (3), and larger eyes (4). The number of gill rakers is given as 11, but 5 rudiments are said to be found in front, so it is questionable whether any actual difference exists in this respect. The relative proportions of the anal spines are the same as in the present form. The colors in life are both according to Jordan and Evermann’s description and according to the author’s own observations on newly caught specimens quite conspicuously different from those of *L. aya* by being in general a considerably lighter
rose red, with a slightly golden tinge or "light golden streaks," and by the brightly yellow iris.

1 specimen No. 2429 B. O. C. Station 8, February 28, 1927. Washerwoman, Bahamas.

Genus **Oxyurus** Gill.

**Oxyurus chrysaurus** (Bloch).

4 specimens No. 2376 B. O. C. West Caicos Island. April 3, 1927.
2 specimens No. 2349 B. O. C. West Caicos Island. April 7, 1927.
1 specimen No. 2351 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

Family **PRIACANTHIDAE**.

Genus **Priacanthus** Oken.

**Priacanthus cruentatus** (Lacépède).

According to the specimens in the Bingham Oceanographic Collection the insertion of the ventral fins can scarcely be used as a means for differentiating *P. cruentatus* from *P. arenatus*, as suggested by Meek and Hildebrand 1923–1928, in their key, p. 487, since the ventrals of most of the available specimens of *P. cruentatus* are situated approximately at or even slightly in advance of the vertical from the anterior end of the base of pectoral fin, as in *P. arenatus*, only one *P. cruentatus* having them inserted under the middle of the pectorals. The rest of the characters mentioned in Meek and Hildebrand's key are, however, ample enough for the differentiation of the two species, and are quite concordant with the material now at hand.

2 specimens No. 2537 B. O. C. Off Hawks Nest, Cat Island, Bahamas. March 21, 1927.
1 specimen No. 2395 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

Family **HAEMULIDAE**.

Genus **Haemulon** Cuvier.

**Haemulon flavolineatum** (Desmarest).

5 specimens No. 2368 B. O. C. Cat Island, Bahamas. March 20, 1927.
2 specimens No. 2308 B. O. C. Rum Cay, Bahamas. March 26, 1927.
3 specimens No. 2325 B. O. C. Crooked Island, Bahamas. March 26, 1927.
8 specimens No. 2316 B. O. C. West Caicos Island. April 3, 1927.
7 specimens Nos. 2340 and 2393 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

1 Not mentioned in the field notes of the present author.
Haemulon plumieri (Lacépède).
1 specimen No. 2417 B. O. C. Miami, Florida. February 21, 1927.
2 specimens No. 2418 B. O. C. Off New Providence, Bahamas. March 5, 1927.

Haemulon sciurus (Shaw).
1 specimen No. 2367 B. O. C. Cat Island, Bahamas. March 20, 1927.

Haemulon melanurum (Linnaeus).
A field sketch by Mr. Wilfrid Swancourt Bronson is reproduced in the accompanying illustration. The original, being in colors, shows a bluish white background with a number of longitudinal yellowish bronze stripes, suffused with black pigmentation in the case of the stripe from the snout through the eye and backwards on the body, and the stripe from immediately above the eye backwards, so that these two stripes, particularly the lower one, are fairly persistent as dusky bands also in the preserved specimens. There is a broad dusky area along the base of the dorsal fin, continuing over the upper part of the caudal peduncle to the base of the caudal fin, where it bifurcates, sending one dusky bar into each caudal fin lobe. Each lobe, however, has a narrow upper, respectively lower, colorless margin, the upper margin of the upper lobe, being merely invaded by black pigmentation at the base of the fin, while the lower margin of the lower lobe is entirely clear.

5 specimens Nos. 2355 and 2392 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

Haemulon carbonarium Poey.
5 specimens of 176, 200, 205, 217, and 250 mm. length without caudal have the eyes consistently smaller than recorded for the species by Meek and Hildebrand (1923–28, p. 537), their diameter being contained exactly four times in the length of the head, instead of 3 to 3.5 times. Six to eight rows of scales were found between the lateral line and the base of dorsal fin.
Since the descriptions of the coloration of this species are rather lacking in detail, a full account and diagrammatic drawing (fig. 10) of the pattern observed in the material now at hand are rendered. The species is characterized by a number of longitudinal bronze-colored stripes on a more or less dusky grey or often greyish brown background. The stripes usually fall quite sharply into two groups: The main stripes which are broader, more clearly defined and, with the exception of the anterior median one, also longer than the neighboring secondary stripes which are fainter, narrower, and shorter. The two kinds of stripes alternate quite regularly on the dorsal half of the fish, beginning with one main, median stripe from snout to dorsal fin, followed on each side by 1) a secondary stripe from nape to somewhere below the dorsal fin; 2) a main stripe from the interorbital space to the end of the soft dorsal fin, converging and often fusing with the next main stripe below (4) before its termination; 3) another secondary stripe from nape to below dorsal fin; 4) another main stripe from the interorbital space to a joint or closely approached termination with the next main stripe above; 5) a secondary stripe running from the shoulder region backwards in the interspace between the just mentioned main stripe (4) and the anterior portion of the lateral line. Below the lateral line we find 6) a main stripe following the course of the anterior portion of the line very closely, but crossing it above the base of the anal fin to terminate on the dorsal surface of the anterior part of the caudal peduncle; 7) a short secondary stripe; 8) the only stripe which it has been found difficult to classify, it being sometimes developed with the full distinctness of a main stripe, sometimes faint as a secondary stripe, being always longer than the secondary stripes above and below (when these are perceptible), but always ending freely on the side, without continuing to a
'natural' termination at a fin base or at the outline of the fish, as do all the other main stripes; 9) another short secondary stripe; and 10) a long, almost perfectly straight main stripe running horizontally backwards from immediately above the upper end of the base of pectoral fin to the upper half of the base of caudal fin, crossing the lateral line approximately at the anterior end of the caudal peduncle. While all the stripes above the last mentioned main stripe have more or less followed the curvature of the back, gradually straightening out downwards, the stripes below, on the other hand, follow the ventral scale series and their curvatures as indicated in the diagram. These ventral stripes are all very faint, never even nearly approaching the distinctness of a main stripe, but often entirely absent, particularly the lowest ones. A definite number can therefore not be given for the ventral stripes, but about 10 of them may be discernible in a strongly colored specimen. All the stripes on trunk and tail, both main and secondary, are much narrower than their interspaces, and are so variable in distinctness that even the main stripes may become almost imperceptible, while the secondary stripes can only be made out as a faint bronze luster in a badly defined band between the main stripes. In one very dusky specimen all the stripes are imperceptible except those on the somewhat lighter belly.

There are about 6 straight, horizontal bronze stripes running from the snout and the edge of the upper lip towards the eyes and cheeks on each side, usually fading away at or below the orbits but sometimes showing vague and irregular continuations on the cheeks and opercles.

The species is also characterized by the dense black pigmentation of its caudal fin, leaving only a narrow sickle-shaped colorless margin on its middle distal portion, and by the black tips of its ventral fins, in addition to being generally a rather dusky species.

2 specimens No. 2507 B. O. C. Rum Cay, Bahamas. March 26, 1927.
6 specimens No. 2391 B. O. C. Hawks Nest, Turks Island. April 9-10, 1927.

**Haemulon parra** (Desmarest).

In the preserved specimen (length without caudal fin 240 mm.) the maxillaries scarcely reach to the vertical from the anterior margin of the orbit.

1 specimen No. 2394 B. O. C. Hawks Nest, Turks Island. April 9-10, 1927.

**Haemulon album** Cuvier and Valenciennes.

The accompanying reproduction of a field color-sketch by Mr. Wilfrid Swancourt Bronson represents the banded phase of this species, drawn from a fairly large, live specimen. The markings will all disappear spontaneously in a few seconds, leaving a perfectly plain, light greyish fish. The dark spot form-
Fig. 11. *Haemulon album.* From field sketch by W. S. Bronson.

The termination of the mediolateral band at the base of the caudal peduncle is the most persistent feature of the pigmentation both in life and in preservative.

1 specimen No. 2433 B. O. C. Green Cay, Bahamas. February 27, 1927.
1 specimen No. 2422 B. O. C. Green Cay, Bahamas. February 28, 1927.
1 specimen No. 2416 B. O. C. Nassau, Bahamas. March 5, 1927.
1 specimen No. 2208 B. O. C. (Mounted.) Bahamas, 1927.

Genus *Anisotremus* Gill.

*Anisotremus virginicus* (Linnaeus).

Common throughout the visited region. Only one specimen preserved (mounted).

1 specimen No. 2210 B. O. C. (Mounted.) Bahamas. 1927.

Family **Mullidae**.

Genus *Upeneus* Cuvier.

*Upeneus maculatus* (Bloch).

From the material obtained during the third expedition of the “Pawnee” it would seem that the change from the pelagic existence of the young of this species to the benthonic life of its adults does not occur until the fish has reached a length without caudal fin of about 70 mm., the transition being accompanied by some very interesting changes in color. In the apparently most typical pelagic phase there is a very intense, uniform, bright metallic blue color on the back, fading into a very clear bluish silver on the lower sides and belly. This blue can become spontaneously suffused by a slightly purplish hue, especially on the ventral parts, but the bright metallic blue phase seems to be the normal for this stage. The fins are clear and colorless, the iris silvery, and the barbels are white. The latter features are not subject to spontaneous changes. In the beginning transition stage the fish has a light greenish or yellowish brown
ground color on the back with a number of short, duskier, dorsal cross bars, followed below by a somewhat discontinuous longitudinal band of purplish pink hue in the region of the lateral line. The cheeks and lower portions of the flanks are silvery, while a purplish pink tint again predominates on the most ventral parts of head, trunk, and tail. The dorsal crossbars may vary considerably in extent and intensity. When the bars are more strongly developed the longitudinal purplish pink band is generally broken entirely up into corresponding portions forming ventral extensions of the cross bars. The change from one to the other of these two crossbarred phases can occur spontaneously but an ontogenetic element is apparently also involved since different specimens may choose either phase as their normal, but usually always the same for the same specimen, when undisturbed in an aquarium. These transitory stages show altogether the greatest amount of spontaneous changes in the whole series, and may, at least in the earlier phases (first crossbarred stage described above), fade into an almost uniform purplish, bluish silver; but even in this phase the specimens of the crossbarred stage remain distinct from those of the true blue pelagic stage by the rather intensely, slightly orange-yellow color of its barbels, which is not subject to spontaneous changes.

Specimens of the above-mentioned phases occurred very abundantly in the aggregations around a surface light at night throughout the Bahamas and Turks Island but were never caught at the bottom.

At Hogsty Reef specimens of the earliest benthonic stage were finally obtained in a small bottom trawl, fishing among the sea grass in shallow water (about 3–5 fathoms) inside of the reef. In this stage the fish is altogether much more strongly colored than in the pelagic blue or transition crossbarred phases. Bright yellow and crimson or scarlet red predominates. All the fins are colored, particularly strongly in the case of the first dorsal, the caudal and the ventrals. The iris is golden and the barbel very intensely, slightly orange-yellow. There is no indication of blue. The cross bars have disappeared or become quite indistinct on the back itself but their lower parts remain as a series of more or less conspicuous greenish dusky areas in a longitudinal row immediately above the middle of each side. The back itself often shows indications of a fine longitudinal striation in red and yellow. The cheeks and flanks are yellow or greenish yellow, while the purplish pink tint of the transition stage still predominates on the most ventral parts of head, trunk, and tail. The fins are yellow, more or less marked by red dots or bands which are particularly numerous, intense and conspicuous on the first dorsal, caudal and ventrals. In this bottom stage the ability to effect immediate color changes again seemed more limited and the specimens appeared to be incapable of changing spontaneously into either of the two phases observed among the fish collected at the surface.

At a length of 70–80 mm. without caudal fin, specimens could be found in

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1 There is a slight amount of color on the vertical fins and the iris has a purplish hue.
each of the three color phases above described, wherefore it is concluded that this
represents the length at which the species takes to the bottom. Specimens in
the benthonic phase were never observed at the surface, neither at this length, nor
larger.

Material preserved:

1 specimen No. 2540 B. O. C. Off Miami Beach, Florida. February 21, 1927.
1 specimen No. 2539 B. O. C. Nassau, Bahamas. February 25, 1927.
2 specimens No. 2541 B. O. C. Green Cay, Bahamas. February 27, 1927.
2 specimens No. 2538 B. O. C. Edge of Great Bahama Bank. N. 23° 47' 30.5"
W. 76° 34' 50.7'. March 9, 1927.
1 specimen No. 2542 B. O. C. Green Cay, Bahamas. March 11-13, 1927.
7 specimens Nos. 2336 and 2543 B. O. C. Crooked Island, Bahamas. March
26-27, 1927.
4 specimens No. 2374 B. O. C. Hogsty Reef, Bahamas. April 1, 1927.
5 specimens No. 2348, 2381 and 2546 B. O. C. West Caicos Island. April 2-7,
1927.

**Upeneus martiniacus** Cuvier and Valenciennes.

It is peculiar that not a single young of this species was caught around the
surface light at night, in view of the great abundance of *U. maculatus* in the
catches thus obtained. The preserved specimens are all adults.

4 specimens No. 2361 B. O. C. Cat Island, Bahamas. March 20, 1927.
3 specimens No. 2379 B. O. C. Crooked Island, Bahamas. March 20, 1927.
1 specimen No. 2318 B. O. C. West Caicos Island. April 3, 1927.

**Family MAENIDAE.**

Genus **Emmelichthys** Richardson.

**Emmelichthys vitattatus** (Poey).

No illustrations having previously been rendered of this species the accom-
panying drawing has been prepared from the specimens obtained during the
third expedition of the “Pawnee.”

![Fig. 12. Emmelichthys vitattatus (Poey).](image-url)

Family GERRIDAE.

In the current keys to the genera of the family Gerridae, main emphasis is generally placed upon the structure of the most anterior interhaemal bone,\(^1\) according to the system first introduced by Jordan and Evermann (1896–1900, p. 1366) in concordance with the definition of their new genus *Ulaema*.\(^2\)

According to the definitions the genus *Eucinostomus* should be distinct from the other genera in having the upper part of the anterior interhaemal bone developed as a hollow, inverted cone (see fig. 13), receiving the posterior pointed end of the swim bladder, while the bone in question is claimed to be entire in the genera *Ulaema*, *Gerres* and *Diapterus*. In the course of the present investigation it immediately developed, however, that the distinction in the just mentioned respect is not at all as sharp as it would appear from the earlier descriptions; that a fairly complete series of intergradations can be found among the recent forms; and that at least the genus *Ulaema* has been erroneously defined in this regard, on the basis of an inadequate examination of the anterior interhaemal bones. A tentative revision of the genera investigated may therefore be in place.

In the accompanying figure are shown, from left to right, the anterior interhaemal bones and the two first anal spines of *Gerres havana* Nichols, *Ulaema lefroyi* Goode and *Eucinostomus californiensis* Gill, the names being here given according to the current generic classification of these species (taken from Meek and Hildebrand, 1923–1928, pp. 551–590).

In *Gerres havana* the anterior surface of the anterior interhaemal bone is

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\(^1\) When the structures in question are commonly referred to the second interhaemal bone, this has its foundation in the fact that the pterygiophores of the first and second anal spines have become completely fused so as to jointly form the most anterior of the originally separate interhaemal bones, the various authors, however, regarding the parts of this bone, with which we are concerned, as entirely homologous with an original second pterygiophore. This does not, however, justify the use of the term second interhaemal bone with reference to an ossification which is actually only the posterior portion of the most anterior bone in the interhaemal series. The expression "interhaemal bone of the second anal spine," used by Jordan and Evermann (1896–1900, p. 1367, in the diagnosis of the genus *Eucinostomus*, but not in the key to the genera), while still perhaps somewhat confusing, would at least not be direct contradiction of the actual facts and would still express the assumed homology. It seems highly improbable to the author, however, that the parts in question can be entirely homologized with the original (?) second pterygiophore alone, and do not also embrace the first of these. Both of the above mentioned expressions have therefore been intentionally avoided in the present text, the purely descriptive term "anterior interhaemal bone" being used in their place.

\(^2\) First mentioned, as quotation from manuscript, by Jordan 1895, p. 471.
expanded into a pair of lateral ridges between which a shallow groove runs down along the entire length of the bone to end in a slightly less shallow, spoon-like, expansion1 immediately above, and in front of, the insertion of the first anal spine. In addition to the material in the Bingham Oceanographic Collection the author has also had opportunity to examine the type specimen in the  

1 This latter feature is not very clearly seen in the side view presented in the drawing.
American Museum of Natural History, finding all specimens quite concordant with the above description and figure, which are also in perfect accord with the descriptions already rendered by Nichols (1912, p. 189).

In *Ulaema lefroyi* there is a narrow, compressed funnel opening about midway on the anterior interhaemal bone and penetrating downwards through the bone in a slight curve ending opposite the posterior part of the articulating surface for the first anal spine. Mr. Barton A. Bean, of the United States National Museum, has kindly compared an anterior interhaemal bone, dissected by the author from a specimen in the Bingham Oceanographic Collection, with the anterior interhaemal of the type specimen of *Ulaema lefroyi*, and has found the funnel of these bones to be "exactly alike" in both. When the genus *Ulaema*, with the type species *U. lefroyi*, has been defined as having the "second interhaemal" . . . "short, bluntish and not hollowed out" (Jordan and Evermann 1896-1900, p. 1371; followed in all later definitions by other authors), this must therefore either be due to inaccurate observation of the type or to confusion with some other form. The systematic position of the genus *Ulaema* and the species *Ulaema lefroyi* will be further discussed below.

In *Eucinostomus californiensis* we find the wide and deep, smoothly rounded conical funnel, considered characteristic of the genus it represents, opening almost at the upper end of the anterior interhaemal bone, and penetrating downwards through the latter in a direction towards the anterior part of the articulating surface for the second anal spine. This structure of the anterior interhaemal bone in *Eucinostomus californiensis* is also well known from the earlier descriptions of this and related species referred to the same genus.

Three points are evident from the above comparisons between the species *Gerres hawaii*, *Ulaema lefroyi* and *Eucinostomus californiensis*: 1. That they form a complete series of intergradations in the structure of the anterior interhaemal bone, which makes a generic differentiation on the basis of this feature alone seem arbitrary and therefore unwarranted. 2. That, except in the case of *Eucinostomus californiensis*, the facts of their morphology, as interpreted in the light of these intergradations, are discordant with the definitions of the genera to which they are currently referred. 3. That the peculiar modifications here considered do not in all forms only affect that part of the anterior interhaemal bone which may be considered homologous with the pterygiophore of the second anal spine, there being, on the contrary, a serial shifting backward of the structures in question from the anterior surface of the bone to that part thereof on which the articulating surface for the second anal spine is found.

Even with the wide range of variation shown by this series, however, the above mentioned species have still one feature of the anterior interhaemal bone in common by which it is possible to differentiate them from the typical representatives of the genera *Gerres* and *Diapterus*, investigated by the author. They all have the said bone more or less modified as a receptacle and surface of attachment for the posterior part of the swim bladder.
Neither in *Gerres cinereus* nor in *Diapterus rhombeus*\(^1\) or *D. plumieri*\(^2\) is there any corresponding modification, whatever, in the structure of the anterior interhaemal bone, which is quite in accordance with the published descriptions of these genera.

By the dissection of *Gerres cinereus*, however, another significant, but apparently heretofore overlooked, feature was discovered. In this species\(^3\) the swim bladder bifurcates in front of the anterior interhaemal bone, sending one tapering diverticulum of considerable proportions backwards on each side, along the anal pterygiophores approximately to the fifth of these bones. There is no median posterior extensions of the swimbladder in *Gerres cinereus*.

In *Gerres havana*, *Ulaema lefroyi*, and *Eucinostomus californiensis* the swim bladder has no lateral diverticula but a tapering, median posterior extension which enters into the groove or funnel in the anterior interhaemal bone, attaches itself firmly\(^3\) to the walls of the latter, and ends only a short distance above the lower end of the interhaemal.

In the investigated species of *Diapterus* the swim bladder ends bluntly and rather abruptly at the upper end of the anterior interhaemal bone, is only comparatively loosely attached to the latter, and has no diverticula.

By considering the features of the swim bladder and of the first interhaemal spine together it thus seems possible to differentiate the above discussed species, in the following manner, into three separate groups or genera.

I. Swim bladder ending in a pair of diverticula, extending backwards beyond the body cavity, on each side of the interhaemal bones. Anterior interhaemal bone simple.\(\ldots\) *Xystema* Jordan and Evermann.

II. Swim bladder ending bluntly, with neither posterior diverticula nor median extension, at the upper end of the anterior interhaemal bone, which is simple.\(\ldots\) *Diapterus* Ranzani. 

III. Swim bladder without lateral, posterior diverticula, but with a median extension\(^4\) which reaches backwards and downwards into an osseous groove or funnel in the anterior interhaemal bone, to which it is firmly attached.\(\ldots\) *Eucinostomus* Baird and Girard.

The generic name of *Xystema* has been applied to the first group for the reason that the species here investigated is the type species of Jordan and Evermann's genus, the author not having had access to the type of Cuvier's genus

\(^1\) Specimens in the Bingham Oceanographic Collection (Breder 1927, p. 48) and in the American Museum of Natural History. *Gerres cinereus* was studied on material in the latter institution and from the expedition here reported upon.

\(^2\) Type not seen.

\(^3\) In *Eucinostomus californiensis* it seems possible from a macroscopic inspection, only, that ossifications in the walls of the swim bladder itself might participate in the formation of the upper part of the funnel.

\(^4\) This extension may sometimes be so narrow as to appear like a solid string of tissue, particularly at its lower end, but is always easy to make out.
Gerres. The nomenclature here adopted must therefore be considered of a provisional nature only. Only one species, *Xystaema cinereus*, is known with certainty to belong to the first genus.

In the second group one will scarcely make any mistake by including most, or all, of the species currently referred to the genus *Diapterus*. The type species of the latter, *D. rhombicus*, is, moreover, included in the material investigated by the author, who has thus already been able to establish the justification of applying the generic name of *Diapterus* to the group in question. An examination of the other species is still desirable, however.

In the genus *Eucinostomus* the author proposes to include *Ulaema lefortyi* and *Gerres havana* in addition to the species already formerly included in the said genus, in so far as their characters are in accordance with the above rendered definition of group III. This may be regarded as already established for the type species, *E. argenteus* Baird and Girard = *E. gula* Cuvier and Valenciennes, through the previously rendered definitions of the genus (Jordan and Evermann 1896–1900, p. 1367).

In regard to *Ulaema lefortyi* the true morphology of its anterior interhaemal bone makes its inclusion in the genus *Eucinostomus* unavoidable also according to the earlier generic definitions of the latter; and, in scanning the literature, we find that the species in question has undoubtedly already been referred to the said genus by Eigenmann (1904, p. 229) under the name of *E. meeki*. The fact that *E. lefortyi* is yet distinct from the other species of *Eucinostomus* by having only two, instead of three, anal spines can not be considered sufficiently significant to justify its segregation from the rest of the genus, a view which has already been implicitly expressed by Eigenmann (1904) and by Meek and Hildebrand (1923–1928) in their classification of "E. meeki." If one should still want to segregate *E. lefortyi*, one would further, to be logical, also have to introduce a similar subdivision of the related genus *Diapterus*, in which parallel conditions are found in regard to the numbers of anal spines. Such a step has not been heretofore proposed, however, and the author can see no practical or theoretical advantage in taking it.

In regard to *Eucinostomus havana* the relation of its anterior interhaemal structures to those found in the other species of *Eucinostomus* has already been

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1 When Eigenmann, through a more accurate investigation of his specimens, discovered the presence of a funnel in the anterior interhaemal bone, he could only conclude that he had had before him a form which was specifically and generically distinct from *Ulaema lefortyi*, assuming the definition of the genus *Ulaema* to be valid at least for its type specimen and species. When now, however, a similar funnel has also been found in the anterior interhaemal bone of the latter, there can no longer be any reason for regarding *E. meeki*, which is otherwise described as having the "general appearance of *Ulaema lefortyi*" (Eigenmann, loc. cit.), as a distinct species, and it has consequently in the present report been included among the synonyms of *Eucinostomus lefortyi*. 
shown on page 61, and the shape of the swim bladder is quite in accordance with
the definition of this genus, showing no indication of the posterior, lateral
diverticules seen in *Gerres cinereus*.

Genus **Eucinostomus** Baird and Girard.

**Eucinostomus californiensis** (Gill).

2 specimens No. 2494 B. O. C. Rum Cay, Bahamas. March 25, 1927.  
3 specimens No. 2495 B. O. C. West Caicos Island. April 7, 1927.

**Eucinostomus havana** (Nichols).

27 specimens Nos. 2498 and 2510 B. O. C. Crooked Island, Bahamas. March 26, 1927.

**Eucinostomus lefroyi** (Goode).

2 specimens No. 2496 B. O. C. Rum Cay, Bahamas. March 26, 1927.  
3 specimens No. 2497 B. O. C. West Caicos Island, Bahamas. April 3, 1927.

Genus **Xystaema** Jordan and Evermann.

**Xystaema cinereus** (Walbaum).

2 specimens No. 2499 B. O. C. Turks Island. April 10, 1927.

Family **KYPHOSIDAE**.

Genus **Kyphosus** Lacépède.

**Kyphosus incisor** (Cuvier and Valenciennes).

The specimen here referred to *K. incisor* differs from the current definitions
of that species in having only 12 soft rays in the dorsal fin (instead of 14) and
11 rays in the anal (instead of 13), but is otherwise so perfectly concordant
with our very inadequate information about *K. incisor* that it may reasonably
serve as the basis for a more complete description of the species.

Total length, about 278 mm. Length without caudal fin, 220 mm. Proportions
in per cent of the length without caudal: Length of head, 28. Diameter of
eye, 6.5. Length of snout, 9.5. Interorbital width, 10.5. Length of maxillary,
9. Snout to dorsal fin, 40. Snout to ventrals, 40. Snout to anal fin, 62. Length
of base of soft anal fin, 20. Longest anal ray, 12. Length of caudal lobes,
about 30. Length of middle caudal rays, 13. Length of pectorals, 17. Length
of ventrals, 17. Greatest depth of body, 41. Depth of caudal peduncle, 10.5.


There are about 67–70 oblique series of scales below the lateral line, or about
61 scales counted in a straight horizontal series from base of caudal fin to gill
opening. The small scales at the caudal fin base are not included in these
figures. The transition from the normal to the reduced caudal scales is fairly
abrupt and well marked. There are 11 scales between the origin of dorsal fin.
and lateral line, and 20 scales between the latter and the origin of anal fin. About 14 rows of scales on each cheek.

About 16 gillrakers in the lower limb of the first arch. 26 teeth in each jaw (13 in each half).

Color (in formalin) plumbeus with a white horizontal band along each row of scales below the lateral line.

1 specimen No. 2617 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

Family **MALACANTHIDAE**.

Genus **Malacanthus** Cuvier.

**Malacanthus plumieri** (Bloch).

1 specimen No. 2406 B. O. C. Cat Island, Bahamas. March 22, 1927.

Family **POMACENTRIDAE**.

Genus **Pomacentrus** Lacépède.

**Pomacentrus fuscus** Cuvier and Valenciennes, *sensu lato*.

The great difficulties arising from our lack of knowledge about the extent of individual or geographic variations as well as the range of ontogenetic or spontaneous changes occurring in the western Atlantic representatives of the genus *Pomacentrus* have caused all attempts at a taxonomic differentiation of the various nominal species of the earlier descriptions from this region to become entirely abandoned by recent investigators. Meek and Hildebrand (1923–28, p. 699) and Breder (1927, p. 54) thus more or less hesitatingly refer the entire Atlantic material investigated by them to one single species, which is designated as *P. fuscus* Cuvier and Valenciennes. While the adoption of this procedure is qualified by Meek and Hildebrand by the sentiment “we, however, do not understand the relationship of the Atlantic species” (loc. cit., p. 700), and the reservation is made by Breder (loc. cit.) that “it is almost impossible to believe that certain of the forms belong all to the same species”; a more definite and positive standpoint has, on the other hand been taken by Beebe and Tee-Van (1928, p. 195) with the statement: “we believe that many, if not all of the West Indian species to which names have been given will be found to be ontogenetic color phases.” Beebe and Tee-Van, however, in the same report also express their dissatisfaction with a unspecific conception of the West Indian *Pomacentrus* fauna by defining as a new species, *P. fremani*, a form, which, in the author’s opinion, is in no manner differentiable from the already previously described *P. partitus* Poey (see page 80).

A very detailed examination of the Atlantic material of *Pomacentrus* now accumulated in the Bingham Oceanographic Collection as a result of the second and third expeditions of the “Pawnee” has entirely failed to convince the author of the conspecific nature of the various forms contained therein, not
only in regard to *P. parritus* but also in regard to one or possibly two other varieties. While the samples are at least large enough and concordant enough to make it seem rather improbable that the observed correlations of differences might be of a purely accidental nature, it must, however, on the other hand also be admitted that the material is quite inadequate for giving any conclusive evidence of taxonomic distinctness, and the author has therefore followed Meek and Hildebrandt, and Breder in refraining from making any specific distinctions in the identification of the single specimens. In the following discussion the observed varieties will, for practical purposes, simply be designated as *formae* A–E, to be regarded as of entirely undetermined taxonomic rank and status. While it is undoubtedly true that the systematic problems of the genus *Pomacentrus* can be finally settled only by a study of living or fresh specimens in the field, as already stated by Beebe and Tee-Van, it is, according to the author's experience, equally true that such study is apt to prove very haphazard and futile unless it is carried out along very definite lines laid down by careful examination and measurements of dead and preserved specimens in the laboratory. In the accompanying tables and in the following discussion the author will therefore endeavour to outline more definitely in terms of correlated characters, the systematic problems involved in the determination of the taxonomic status of the various forms represented in the investigated collections.

Taking as a starting point the sample collected around Turks Island during the expedition of 1927 we find that the 14 specimens contained therein can be very sharply divided by their coloration into four separate groups which we will designate as *formae* A–D.

**Forma A** is predominantly light yellow, with a somewhat darker mid-dorsal region, with a dorsal ocellus and numerous small, dark dots in a definite arrangement on the dorsal parts of head, trunk and tail, with only one dot to a scale. There is no enlarged supracaudal "saddle"-like spot or ocellus. The largest specimen is faintly dusky (light-grayish) on the entire head and trunk, being quite light only on the tail, but the small dots are present with their usual distinctness and in the normal arrangement, and there is a small dorsal ocellus, but no supracaudal spot. Fig. 14, p. 74.

In **forma B** the ground color is a moderately light yellowish brown, quite distinct from the typical bright yellow of *forma A*, and somewhat darker. There is a black dorsal ocellus and a large black saddle-like supracaudal spot. The brown pigmentation on the sides of the body is more or less concentrated along the posterior margins of the scale-pockets, thereby forming a quite conspicuous pattern of narrow vertical stripes corresponding to the vertical rows of scales. There are no traces whatever of small dorsal dots similar to those of *forma A*. Fig. 15, p. 74.

In **forma C** no indications of dorsal ocellus, supracaudal spots or small dorsal dots are seen. The head and the anterior part of the body with the
ventral fins are covered by a very dark, somewhat purplish brown, which also extends over the anterior parts and the entire distal margins of the dorsal and anal fins; while the posterior part of the body, the posterior proximal parts of dorsal and anal fin, the tail and the caudal fin are rather abruptly light-colored.

In forma D the entire fish is uniformly, or almost uniformly, dusky brownish gray to a very dark purplish brown. In the smallest and least darkly colored specimen there is a small but distinct dorsal ocellus and some very faint indications of dorsal dots in a similar arrangement to that in forma A; while the largest specimens are absolutely uniform.

Turning our attention from these differences in coloration to the peculiarities of the body proportions we find that certain differences in the general outlines are quite unmistakable even to the unaided eye when representatives of the different formae are directly compared.

The body-depth seems distinctly greater, the profile of the head and nape much straighter and the eyes somewhat more remote from the corners of the mouth in forma B than in any of the other forms.

In forma C we notice that the snout seems somewhat shorter, the eyes larger and the profile of the head and nape even more curved than in the formae A and D.

The formae A and D do not to the naked eye seem differentiable by their proportions.

Detailed measurements of the sample further proved the possibility of expressing numerically the apparent differences in general habitus observable, as above described, by a direct comparison between the formae B and C and the group comprising A and D. It therefore seemed as though the coloration might, after all, give a truly significant clue to the relationship of the single specimens, and this feature was consequently made the general basis for the grouping of the entire materla.

A specimen observed in the sample from Station 38, 1927, has finally necessitated the introduction of a fifth forma, E, for the practical purposes of the present discussion. This form is characterized by a quite uniformly light grayish color, without any regular markings at all, but usually with somewhat duskier vertical fins, and by the relatively small depth of body.

The above described coloration types of the 5 formae all pertain to specimens preserved in formalin. These colors are only slightly changed from the colors in life, however, except in forma A, where the small dark dots on the dorsal parts of head, trunk and tail in the preserved material are brightly blue in the living specimens. It may otherwise, as a general observation, be mentioned that the paler regions of the formalin specimens of all forms were usually found to be suffused by a bright golden yellow in life, least noticeable in forma C, where it is somewhat obscured by a faint admixture of purplish brown also in the light posterior parts of trunk and tail; and most prominent in forma A where it
constitutes the ground color of the entire fish, taking, in some specimens, a slightly greenish tinge from an admixture of light gray as described on page 68. In forma B the predominance of the golden yellow in life is usually limited to the regions of the throat and the caudal fin, but varies somewhat according to variations in the extent and intensity of the darker brownish pigmentation. In typical representatives of forma D the golden yellow is entirely suppressed, also in life, by the dark purplish brown of this form.

Turning now to our entire material, including also that obtained by the first expedition in 1925, we will first consider the specimens of unquestionable identity. Of these there are 14 specimens referable to forma A, 11 to forma B, 15 to forma C, 16 to forma D, and 6 to forma E. The individual measurements of these specimens are recorded in the accompanying tables and, for greater convenience in the comparison, the means of each of the five formae have been gathered in a separate table below.

### Average Proportions of the Five Formae of Pomacentrus fuscus, sensu lato.

<table>
<thead>
<tr>
<th>Forma</th>
<th>Total lengths without caudal fin in mm.</th>
<th>Length of head</th>
<th>Diameter of eyes</th>
<th>Width of sub-orbital</th>
<th>Length of snout</th>
<th>Snout to dorsal fin</th>
<th>Height from P to D</th>
<th>Total height</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>33-62</td>
<td>31.4</td>
<td>10.2</td>
<td>3.48</td>
<td>9.5</td>
<td>39.3</td>
<td>29.6</td>
<td>46.1</td>
</tr>
<tr>
<td>B</td>
<td>14-76</td>
<td>33.6</td>
<td>10.9</td>
<td>4.75</td>
<td>10.8</td>
<td>44.8</td>
<td>35.3</td>
<td>55.1</td>
</tr>
<tr>
<td>C</td>
<td>20-55</td>
<td>32.0</td>
<td>10.9</td>
<td>3.35</td>
<td>8.5</td>
<td>39.1</td>
<td>30.2</td>
<td>48.0</td>
</tr>
<tr>
<td>D</td>
<td>37.5-64</td>
<td>31.8</td>
<td>10.0</td>
<td>3.75</td>
<td>9.5</td>
<td>42.3</td>
<td>31.9</td>
<td>49.1</td>
</tr>
<tr>
<td>E</td>
<td>36-68</td>
<td>30.8</td>
<td>9.4</td>
<td>3.63</td>
<td>9.3</td>
<td>36.3</td>
<td>26.3</td>
<td>41.0</td>
</tr>
</tbody>
</table>

In per cent of the total length without caudal fin
### Teleostean Shore and Shallow-water Fishes

#### Measurements of *Pomacentrus Fuscus*, Sensu Lato I.

<table>
<thead>
<tr>
<th>Reference No.</th>
<th>Total length without caudal fin mm.</th>
<th>Length of head</th>
<th>Diameter of eye</th>
<th>Width of suborbital bone</th>
<th>Length of snout</th>
<th>Distance from snout to D</th>
<th>Distance (height) from base of P to origin of D</th>
<th>Greatest depth of body</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>31</td>
<td>9.0</td>
<td>3.7</td>
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<td>58</td>
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<td>52</td>
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<td>39</td>
<td>29</td>
<td>45</td>
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<tr>
<td>6</td>
<td>51</td>
<td>32</td>
<td>11.0</td>
<td>3.2</td>
<td>9.5</td>
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<td>28</td>
<td>47</td>
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<td>10.5</td>
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<td>46.5</td>
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<td>3.2</td>
<td>9.5</td>
<td>41</td>
<td>31</td>
<td>47</td>
</tr>
<tr>
<td>9</td>
<td>46</td>
<td>33</td>
<td>11.0</td>
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<td>11.0</td>
<td>3.3</td>
<td>10.0</td>
<td>40</td>
<td>30</td>
<td>49</td>
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<td>11</td>
<td>42</td>
<td>31</td>
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<td>3.6</td>
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<td>44</td>
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<td>12</td>
<td>41</td>
<td>32</td>
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<td>47</td>
<td>32</td>
<td>48</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In per cent of total length without caudal fin</th>
</tr>
</thead>
</table>

**Forma A (leucostictus)**

Light yellow (or greenish) with dorsal ocellus and dots

<table>
<thead>
<tr>
<th>Reference No.</th>
<th>Total length without caudal fin mm.</th>
<th>Length of head</th>
<th>Diameter of eye</th>
<th>Width of suborbital bone</th>
<th>Length of snout</th>
<th>Distance from snout to D</th>
<th>Distance (height) from base of P to origin of D</th>
<th>Greatest depth of body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>33</td>
<td>12</td>
<td>4</td>
<td>10.5</td>
<td>41(47)</td>
<td>33</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>29</td>
<td>9</td>
<td>3</td>
<td>9</td>
<td>37</td>
<td>26</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>31.4</td>
<td>10.2</td>
<td>3.48</td>
<td>9.5</td>
<td>39.3*</td>
<td>29.6</td>
<td>46.1</td>
<td></td>
</tr>
</tbody>
</table>

**Forma B (planifrons)**

Yellowish brown, with vertical stripes, supracaudal spot and dorsal ocellus (in young) but without dots

<table>
<thead>
<tr>
<th>Reference No.</th>
<th>Total length without caudal fin mm.</th>
<th>Length of head</th>
<th>Diameter of eye</th>
<th>Width of suborbital bone</th>
<th>Length of snout</th>
<th>Distance from snout to D</th>
<th>Distance (height) from base of P to origin of D</th>
<th>Greatest depth of body</th>
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<tr>
<td>Maximum</td>
<td>35</td>
<td>12</td>
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<td>12.0</td>
<td>47</td>
<td>38</td>
<td>63</td>
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<tr>
<td>Minimum</td>
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<td>4.5</td>
<td>9.5</td>
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<tr>
<td>Mean</td>
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<td>35.25</td>
<td>55.1</td>
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</tbody>
</table>

1 Measured from the upper posterior corner of the maxillary groove to the edge of the orbit.

* The measurement of specimen No. 14 (47 per cent) has not been included in the calculation of the mean (see page 70).
### Table: Measurements of *Pomacentrus Fuscus*, Sensu Lato II.

<table>
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<th>Reference No.</th>
<th>Total length without caudal fin mm.</th>
<th>Length of head</th>
<th>Diameter of eye</th>
<th>Width of suborbital bone</th>
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<th>Distance (height) from base of P to origin of D</th>
<th>Greatest depth of body</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Uniformly dark anteriorly, light posteriorly. Without dots, spots or ocelli</td>
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<td>37.5 32 12.0 3.0 9.0 40 30 48</td>
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<td>14</td>
<td>31 34 12.0 3.0 8.0 39 30 45</td>
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</tr>
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<td><strong>Minimum</strong></td>
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<td></td>
<td></td>
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</tr>
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<td></td>
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</table>

### Table: Forma D (fuscus, sensu stricto, et al.)

- Dark brown

<table>
<thead>
<tr>
<th>Reference No.</th>
<th>Total length without caudal fin mm.</th>
<th>Length of head</th>
<th>Diameter of eye</th>
<th>Width of suborbital bone</th>
<th>Length of snout</th>
<th>Distance from snout to D</th>
<th>Distance (height) from base of P to origin of D</th>
<th>Greatest depth of body</th>
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### Measurements of Pomacentrus Fuscus, Sensu Latio III.

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<th>Width of suborbital bone</th>
<th>Length of snout</th>
<th>Distance from snout to D</th>
<th>Distance (height) from base of P to origin of D</th>
<th>Greatest depth of body</th>
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Specimens of questionable status

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<th>Width of suborbital bone</th>
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<td>31</td>
<td>49</td>
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</table>

In *forma A* not a single deviation from the typical coloration and the slightly dusker variety described on page 68 was found. The average diameter of the eyes is somewhat smaller than in either *forma B* or *forma C*, but the material is inadequate to show whether there is really a significant difference in this respect. The length of the snout (measured diagonally to the point of the upper lip) varies between 9 and 10.5 per cent of the total length without caudal fin, with an average of 9.55 per cent thus showing differences of apparently significant magnitudes both from *forma B* and from *forma C*, being shorter than that of the former, but longer than that of the latter. The head is relatively short, the width of the suborbital bones small, the depth of the body moderate and the distance from snout to dorsal fin also normally moderate. In regard to the latter feature, however, we notice one very striking deviation from the mean in an otherwise typical specimen (No. 14) in which the distance from snout to dorsal fin attains a length of 47 per cent of the total without caudal. As it seems impossible to appreciate the true significance of this apparent abnormality, this figure has been omitted by the calculation of the average for *forma A*. 
In the unquestionable representatives of *forma B* the average values for the length of the head, the diameter of the eyes, the width of the suborbital ring at the upper posterior corner of the maxillary groove, the length of the snout, the distance from snout to dorsal fin, and the depth of the body are all larger than in any other of the investigated forms. Of these proportions the length of the snout, the width of the suborbital ring, the depth of the body and possibly...
(see p. 78) the distance from snout to dorsal fin seem particularly significant in conjunction with the previously described (p. 69) straightness of the profile characteristic of this form. The dorsal ocellus, which in the smaller specimens

Fig. 16. *Pomacentrus fuscus*, forma C (*partitus*).

is generally even larger than in *forma A*, shows a distinct decrease with increasing total length, and in the three specimens measuring 50 mm. or more, exclusive of the caudal fin, it has totally disappeared, leaving only the supra-caudal
saddle-like spot. The other features of coloration are essentially the same as described on page 69 in all specimens reckoned as unquestionable representatives of forma B, although the extent and intensity of the brown pigmentation may vary somewhat.

The coloration of the forma C varies quite extensively in regard to the location and shape of the boundary between the dark anterior and the light posterior parts. Some of the variations in this respect have been indicated on the accompanying diagram. In many specimens the lighter color extends forward across the lower parts of the body even to the throat, but even in these specimens the edge of the anal fin remains conspicuously dark, and in absolutely no case are any indications of dorsal ocellus, supracaudal spot or dorsal dots found in specimens otherwise showing relationship to forma C. The average proportions of forma C agree with those of forma A in regard to the length of the head, the width of the suborbital bones and the distance from snout to dorsal fin and also fairly well in regard to the moderate depth of the body. The most distinctly appreciable and therefore probably most significant differences between the measurements of formae A and C is contributed by the smaller values for the relative length of the snout in the latter form. It is questionable whether the difference in regard to the average dimensions of the eyes will prove to be of sufficient magnitude to become of importance for the differentiation of the two forms. Correlated with the measureable shortness of the snout in forma C is

Fig. 18. Pomacentrus fuscus, large, questionable specimen (forma D ?).
an usually stronger curvature of the anterior profile of the head, as already mentioned in page 69.

The measurements of forma D show somewhat higher average values for the distance from snout to dorsal fin and for the depth of the body, but are otherwise perfectly concordant with those of forma A. Forma D, however, shows very considerable and confusing variations in coloration. It has been mentioned already that the smallest specimen from Station 51 (1927) shows faint indications of the typical dorsal dots of forma A on the upper part of the caudal peduncle, which is slightly less dusky than the rest of the body. This specimen (No. 11) also shows a small but quite distinct dorsal ocellus. Similar ocelli are also seen indicated in specimens 9 and 10, being in these cases, however, almost entirely obscured by the uniform and very dark, purplish brown ground color.

Fig. 19. Pomacentrus fuscus, forma E (zanthus).

In the two smallest specimens, on the other hand, (Nos. 15 and 16), there are both a well developed dorsal ocellus and a quite distinct saddle-like supra-caudal spot, while a vertical striation of the dark ground color is also observable. In spite of this approach towards the color pattern of forma B the color itself remains very much darker than in any of the available specimens of comparable size, belonging to the latter form, and all proportions as well as the strongly curved profiles of the heads and napes are typically those of forma D (or A). As far as the present material goes any real confusion could therefore never arise in regard to the distinctness of these two specimens from our forma B at the same stage of growth. Specimen No. 7 shows a similar, abnormally great distance from snout to dorsal fin to that in specimen No. 14 of forma A.

The coloration of forma E shows scarcely any variation at all, although it may be mentioned that specimen No. 3 shows some very faint, minute dots, which, according to their arrangement might possibly be interpreted as identical with the dorsal dots of forma A. Forma E is otherwise distinguished by the
small depth of body and the short distance from the snout to dorsal fin, but agrees fairly well with formae A and D in all other measurements as well as in the curved profile of the head.

It thus appears that there is, at least in the above considered specimens of formae A (and D), B, C, and E, a very distinct correlation between differences in coloration-pattern and differences in the general shape and in several of the proportions of the body. It may further be mentioned that the part of the entire material which is thus clearly and unquestionably referable to any one of these forms comprises absolutely all specimens of less than 58 mm. total length without caudal fin, most (5/7) of the specimens between 58 and 70 mm. and one specimen (Forma B, No. 1) of 76 mm. length without caudal; while 9 of the 11 specimens of truly questionable relationship measure more than 70 mm. exclusive of the caudal fin, and none of them less than 58 mm. As far as the present material goes, we may therefore say that at least four apparently separate forms (A, B, C, and E) seem clearly differentiable up to a length of about 60 mm., exclusive of the caudal fin, while conditions tend to become more confused in the larger specimens. Before proceeding with the discussion of the latter it may be in place, however, to say a few words about the possible geometric dependence of the distance from the snout to dorsal fin upon the total height of the body.

Since the fraction of the vertical distance from the origin of the dorsal fin to the ventral outline of the belly (corresponding to the recorded depths of body) situated above the horizontal axis of the fish, together with the part of the horizontal axis anterior to the location of this vertical measurement, and the line from snout to dorsal fin form a right-angled triangle with the latter line as hypotenuse, the difference between the squares of the distances from snout to dorsal fin and the squares of the fractions of the vertical height above the horizontal axis must remain constant if the variations in these two measurements are entirely interdependent in a purely geometric sense. It has unfortunately proved impossible, without too much waste of time, to make sufficiently accurate triangulations of these small fishes, to allow of a numerical determination of the actual fraction of the vertical height situated above the horizontal axis in each individual case, but by choosing certain proportional values, according to a general judgment of the outlines of the fishes in question, certain ideas as to the possibilities of interdependency may be obtained. To get more comparable figures X has in the accompanying table been calculated as the square root of the above mentioned differences between the squares in the following manner:

$$X = \sqrt{(\text{Snout to dorsal fin})^2 - \left(\frac{m}{n} \times \text{Depth of body}\right)^2}$$

X therefore directly represents the estimated part of the horizontal axis anterior to the vertical from the origin of dorsal fin, and variations in X will indicate independency in the variations of the distance from snout to dorsal fin.
and of the depth of body, and vice versa. In the upper series of figures the part of the vertical height above the horizontal axis has been considered equal to one-half of the entire height \((m/n = \frac{1}{2})\); in the lower series the proportion has been assumed to be \(\frac{3}{6}\) of the same \((m/n = \frac{3}{6})\).

<table>
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<th>(\frac{m}{n})</th>
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<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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</tr>
<tr>
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<td>30.3</td>
<td>26.7</td>
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</table>

It will be seen from this table that the extreme differences in the average values of \(X\) are only about half of the extreme differences in the average distances from snout to dorsal fin, and the taxonomic value of the numerical correlation between the latter measurement and the depth of body is therefore considerably reduced on account of the purely geometric interdependence. Full taxonomic value, as an independent variable, can therefore only be ascribed to one of the two proportions in question in the discussion of the distinctness or identity of the forms here considered, although both features may be used for the practical identification of the single specimens. It is also unquestionable that a certain amount of independent variability is present, as particularly shown by the two aberrant specimens, \(forma\) A, No. 14 and \(forma\) D, No. 7.

In regard to specimens of truly questionable relationship, these are only found among the larger individuals in the material, as already above mentioned, and are characterized by certain features common to all of them. The profile of the head and nape is distinctly straighter than in any other group except in \(forma\) B, but not quite as straight as in the typical representatives of the latter. The depth of body varies between the average for \(forma\) D and that of \(forma\) B, being thus comparatively great, the values for the relative distances from snout to dorsal fin being also rather high. In regard to coloration, specimens 1, 2, 3, 6, and 9 are quite uniformly brownish black, as in the darker specimens of \(forma\) D, with slight indications, however, of a vertical striation. Specimens 7, 10, and 11 are now, after 4 years in formalin, of a somewhat lighter, tobacco-brown color, with very conspicuous vertical striations, but without other markings. Specimens 4, 5 and 8 have a similar tobacco-brown ground color with vertical striations and also show a sharply marked, saddle-like supraneural spot, thus being quite concordant with the larger specimens of \(forma\) B in regard to coloration. The observations on these larger, questionable, specimens would thus seem to upset the evidence rendered by the smaller specimens in the same material, by showing a fairly complete series of intergradations between the \(formae\) B and D. If, however, we compare the measurements of the questionable intermediates with those of the two largest specimens of \(forma\) B, which are the
only ones of a comparable size, we find the intermediates just as distinct from these representatives of forma B in regard to the width of the suborbital ring and the height of the body, as were the smaller specimens of forma D from those of forma B. It seems possible that there is a general tendency towards an increase in the depth of the body, and in correlation to this a straightening of the dorsal profile of head and nape, and an increase in the width of the suborbital bones which may partly explain the features observed in the questionable specimens.

That the questionable specimens must have been recruited either from forma B or from forma D, or from both seems obvious, if a third (sixth) unrecognized form does not here enter into our problem. There are absolutely no indications of a straightening of the strongly curved profile of forma C or an elongation of its snout in the larger specimens, and the questionable material shows no resemblance whatever to this form. If the characteristics of forma E, small depth of body, short distance from snout to dorsal fin, and coloration, should not prove quite accidental in the composition of the investigated material, the definition of this form is certainly quite incompatible with any assumption of relationship to the questionable group. Further than this, however, the identity of the questionable specimens remains obscure and can only be determined by future observations in the field and on other preserved collections.

In regard to nomenclature, forma A, of course, represents P. leucostictus Muller and Troschel.

P. fuscus Cuvier and Valenciennes, sensu stricto, is obviously included in forma D.

P. planifrons Cuvier and Valenciennes is represented by forma B, which may also be identical with P. chrysus Bean (1906a, p. 32, and 1906b, p. 61, fig. 4).

P. partitus Poey is identical with forma C. A comparison with the 6 cotypes of P. freemani Beebe and Tee-Van has failed to reveal any features by which this form can be differentiated from the forma C of the present report.

Forma E apparently represents the P. analis forma Xanthus of Metzelaar (1919, p. 98 and fig. 29). P. nepenthae Nichols (1921, p. 1) may perhaps also pertain to the same form.

It has already been mentioned on page 77 that no really significant differences have been found between the proportions of forma A and those of forma D, and certain indications of similarity to forma A, in coloration (dots) in the paler specimens of forma D seem to strengthen the evidence of the identity of these two forms. To this must be added that the light A (leucostictus) has repeatedly

Concerning the probable geometric interdependence of these features see above.

The proportional measurements of the six cotypes of Beebe and Tee-Van's species are in perfect accordance with those of forma C, as shown in the accompanying table, thus verifying our definition of this form and thereby giving further evidence of the possibility of introducing taxonomic subdivisions of the genus Pomacentrus on the basis of such measurements. (Footnote continued at bottom of next page).
been reported as being able to change into a quite dark form identified as *P. fuscus*, sensu stricto (see Breder 1927, p. 55, Beebe and Tee-Van 1928, p. 195). It may therefore be taken for granted that *forma A* and *forma D* are at least partly identical; the author does, however, not feel absolutely certain that two separate forms may not be combined under the latter heading, and therefore does not feel definitely justified in entirely synonymizing the two groups. It seems possible, and, from the general appearance of the material, altogether not quite improbable that the *forma A*, with its darker phase included in the *forma D*, may represent a somewhat smaller type, reaching maturity at about 50-60 mm. length exclusive of caudal fin, while *forma D* may also comprise a somewhat larger type from which the questionable large specimens of the present material may possibly have been recruited. As far as the author has been able to make out, no really large specimens with the blue and yellow *leucostictus* (*A*) coloration have ever been recorded, and none are seen in the present material. The largest specimens are all *fuscus* (*D*) or *planifrons* (*B*) colored. It therefore seems possible that the *leucostictus* contingent of the *formae A* and *D* may only reach a smaller size and therefore constitutes a separate form from the larger type. The material is, however, quite inadequate either to prove or disprove this possibility.

As far as the present material goes, the possibility that *formae B* (*planifrons*) and *C* (*partitus*) should merely represent different ontogenetic color phases seems excluded by the fact that each form, including also *forma A*, is represented over approximately the same range of total lengths. And the possibility that

**Footnote 2 for page 80 continued:**

**Measurements of six cotypes of *Pomacentrus freemani* Beebe and Tee-Van.**

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<tr>
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<td>3.1</td>
<td>3.4</td>
<td>2.9</td>
<td>3.1</td>
<td>2.7</td>
<td>3.2</td>
</tr>
<tr>
<td>Length of snout</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>without</td>
<td>8.7</td>
<td>8.5</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.5</td>
</tr>
<tr>
<td>Snout to D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>caudal</td>
<td>37</td>
<td>39</td>
<td>37</td>
<td>38</td>
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<td>38</td>
</tr>
<tr>
<td>Height P to D</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>fin</td>
<td>32</td>
<td>29</td>
<td>27</td>
<td>31</td>
<td>32</td>
<td>31</td>
</tr>
<tr>
<td>Total height</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>49</td>
<td>48</td>
<td>44</td>
<td>51</td>
<td>49</td>
<td>48</td>
</tr>
</tbody>
</table>

The specimens all have the typically curved profile, large eyes and short snout of *forma C*. Indications of a slight duskiness of the caudal fin can also be seen in one or two specimens in the Bingham Oceanographic Collection, so there can be no reason for regarding the darkness of this fin in Beebe and Tee-Van's material as a taxonomically significant difference in the complete absence of other distinguishing features.

The author is indebted to Dr. Beebe for the loan of the above discussed cotypes.

1 Apparently ripe gonads (ovaries) observed in specimen measuring 52 mm. without caudal fin.
they might represent spontaneous color phases seems equally excluded by the correlated differences in their proportions. It therefore seems fairly probable that the formae B and C must be truly distinct from each other and from the rest of the material.

A ripe specimen (female) of forma C is observed at a total length without caudal fin of 55 mm., and it seems possible that this form may not attain to such size as formae B and D (7).

Forma E would seem perfectly distinct by its proportions, but the possibility of its representing a certain type of physiologically or pathologically emaciated specimens needs investigation.

Although the author does not feel justified in drawing any final conclusions from these detailed considerations it is hoped that they will prove useful for future investigations by giving a more definite aspect to the problems involved in the classification of the western Atlantic forms of the genus Pomacentrus, and by pointing out the apparent possibilities, which will have to be disproved as due to the purely accidental composition of the investigated collections if all the various forms above considered should be genetically identical in nature, or which may, on the other hand, serve as a provisional basis for the differentiation of these forms if they should prove to be truly differentiable.

The possibility of occasional hybridizations taking place between forms of such close systematic relationship and intimate biological contact in nature should also be considered in future discussions of their classification.

Secondary sexual characters may also be of some importance, although the above described differences between the various forms can obviously not be explained on this basis, mature ovaries having been found in each of the formae A, B and C as well as in the questionable group.

It must finally be kept strictly in mind that the absolute proportional figures given in the tables on pp. 71–73 can not be directly compared with the values obtained by other investigators without considerable allowances for deviations due to differences in the individual methods of manipulating the specimens and in the practical interpretation of even the most sharply defined measurement. Until the classification of the genus Pomacentrus in western Atlantic waters is quite clearly understood it will therefore be necessary for each investigator to make his own measurements of each of the forms considered as possible systematic units, and not to base the discussion upon figures of a heterogeneous origin.

In addition to the samples listed below the following numbers from the collection of 1925 were included in the investigated material: 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 449, 451, 452, 453, and 530.

Preserved material from the third oceanographic expedition of the "Pawnee":
**Forma A.**
1 specimen No. 2467 B. O. C. Station 37, March 26. Rum Cay, Bahamas.
1 specimen No. 2462 B. O. C. Station 38, March 26. Mangrove Channel, Crooked Island, Bahamas.
2 specimens No. 2464 B. O. C. Station 45, April 3. West Caicos Island, Bahamas.
4 specimens No. 2471 B. O. C. Station 51, April 9–10. Turks Island.

**Forma B.**
2 specimens No. 2472 B. O. C. Station 51, April 9–10. Turks Island.

**Forma C.**
3 specimens No. 2473 B. O. C. Station 51, April 9–10. Turks Island.

**Forma D.**
6 specimens No. 2466 B. O. C. Station 37, March 26. Rum Cay, Bahamas.
2 specimens No. 2465 B. O. C. Station 45, April 3. West Caicos Island, Bahamas.
3 specimens No. 2474 B. O. C. Station 51, April 9–10. Turks Island.

**Forma E.**
1 specimen No. 2470 B. O. C. Station 30, March 20. Cat Island, Bahamas.
2 specimens No. 2463 B. O. C. Station 51, April 9–10. Turks Island.

Genus **Abudefduf** Forskal.

**Abudefduf saxatilis** (Linnaeus).
1 specimen No. 2312 B. O. C. Rum Key, Bahamas. March 26, 1927.
2 specimens No. 2396 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

Genus **Chromis** Cuvier.

**Chromis cyaneus** (Poey).

**Chromis cyaneus** Beebe and Tee-Van 1928, p. 193.
A sample of 7 specimens of **Chromis** from Turks Island falls very sharply into two different groups in accordance with the definitions rendered by Beebe and Tee-Van 1928, p. 193, 5 specimens representing the **Chr. cyaneus** (Poey) of these authors, while the two larger specimens belong to their **Chr. marginatus** (Castelnau).
5 specimens No. 2608 B. O. C. Hawks Nest, Turks Island, April 9–10, 1927.

**Chromis marginatus** (Castelnau).

**Chromis marginatus** Beebe and Tee-Van 1928, p. 194.
2 specimens No. 2609 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.
Genus *Microspathodon* Günther.

*Microspathodon chrysurus* (Cuvier and Valenciennes).

4 specimens No. 2506 B. O. C. Hawks Nest, Turks Island, April 9–10, 1927.

Suborder PHARYNGOGNATHI.

Family LABRIDAE.

Genus *Halichoeres* Rüppel.

*Halichoeres irideus* Starks 1913.

Subspecies *torquatus*, n. subsp.

The specimen here reported upon differs from the typical *Halichoeres irideus* Starks in the presence of a well marked, pale, oblique band, which extends from the pectoral base on each side obliquely downwards and backwards to the middle of the belly, flanked by a pair of narrow dusky ribbons in front and behind (see fig. 20). But for this feature the specimen is in all other points of coloration, counts and proportions so perfectly concordant with the description and figure of *Halichoeres irideus* rendered by Starks (1913, p. 60 and pl. 8) that it is only with the greatest hesitation that a new subspecies is herewith introduced. A deciding point has been the fact that Starks' description has not been based only upon a single type, but upon 5 specimens, one of which has also been examined by the writer (No. 3762 American Museum of Natural History), whereby the possibility of intergrading individual variations seems rather reduced. It must, on the other hand, also be remembered that the specimen now at hand is about 50 per cent longer than the largest of those investigated by Starks (5 inches) so that the possibility that the "collar" of *torquatus* may represent a late ontogenetic differentiation in color pattern still remains.

Total length, 180 mm. Length without caudal fin (to end of penultimate pore-bearing lateral line scale), 151 mm. Proportions in per cent of the length without caudal fin: Length of head, 30. Length of snout, 10. Diameter of eye, 5. Length of pectoral fin, 20.5. Length of ventral fins, 16.5. Distance from snout to dorsal fin, 32. Snout to anal fin, 53.5. Greatest depth of body, 30. Depth of caudal peduncle, 14.5. Greatest width, 14. Width of osseous inter-orbital space, 6.

The lateral line occupies the fourth row of scales from above (not counting the mediodorsal series behind the end of the dorsal fin) throughout the entire length of the fish, opening through 3 pores on each of the 27 scales it penetrates. Anteriorly, backwards to and including the 19th scale, it runs approximately along the middle of the dorsal half of the body, from the 19th to the 22d scale it bends abruptly downwards, still continuing to occupy the fourth scale from above (the mediodorsal scales not being counted), and from the 22d to the 27th scale, inclusive, it runs horizontally backwards along the middle of the caudal
peduncle. Twenty-four scales are counted in a mediolateral series from the gill opening to the base of caudal fin, including the 6 last scales of the lateral line. The scales in advance of the dorsal fin (4 oblique rows) are conspicuously reduced in size and do not cross the median strip, which is naked. Nine scales between lateral line and origin of anal fin, counting downwards and backwards.


Two anterior canines above, 4 below.

There are two large dusky spots below the dorsal fin, one approximately at its middle, and one at its posterior part, neither of them extending on to the fin itself, whereby subspecies *torquatus* apparently differs from *H. irideus irideus*.

Fig. 20. *Halichoeres irideus torquatus*. The collar is much less distinct in the reproduction than in the specimen.

A similar dusky spot is also found at the base of the caudal fin immediately above the end of the lateral line. The ground color of the head and body is otherwise, in the present state of the specimen, a greyish olivaceous brown, the margins of the scales being slightly paler than their centres, giving the whole a somewhat marmorated appearance. The lateral line scales are specially marked off by a small, dusky, central dot each. The ground color is interrupted by two well marked, horizontal, perfectly pale bands running for the full length of the trunk and tail, one from the upper part of the gill opening and one from underneath the lower part of the pectoral fin. A similar pale band runs obliquely upwards and forwards on each side from the belly underneath the ventral fins on to the base of the pectoral, which is also perfectly pale except at its upper edge where it carries a small sharply marked dark dot. This oblique pale band is bordered by two dusky brownish stripes, the posterior one of which continues upwards into the axil of the pectoral fin, while the anterior one bends abruptly forward in front of the pectoral base and is continued as a horizontal band across the suboperculum and the lower part of the cheek to the corner of the mouth. The latter band sends two less sharply defined vertical bands downwards across the throat, which is dusky. There is an indistinct, separate,
Genus *Microspathodon* Günther.

*Microspathodon chrysurus* (Cuvier and Valenciennes).

4 specimens No. 2506 B. O. C. Hawks Nest, Turks Island, April 9-10, 1927.

Suborder PHARYNGOGNATHI.

Family LABRIDAE.

Genus *Halichoeres* Rüppel.

*Halichoeres irideus* Starks 1913.

Subspecies *torquatus*, n. subsp.

The specimen here reported upon differs from the typical *Halichoeres irideus* Starks in the presence of a well marked, pale, oblique band, which extends from the pectoral base on each side obliquely downwards and backwards to the middle of the belly, flanked by a pair of narrow dusky ribbons in front and behind (see fig. 20). But for this feature the specimen is in all other points of coloration, counts and proportions so perfectly concordant with the description and figure of *Halichoeres irideus* rendered by Starks (1913, p. 60 and pl. 8) that it is only with the greatest hesitation that a new subspecies is herewith introduced. A deciding point has been the fact that Starks' description has not been based only upon a single type, but upon 5 specimens, one of which has also been examined by the writer (No. 3762 American Museum of Natural History), whereby the possibility of intergrading individual variations seems rather reduced. It must, on the other hand, also be remembered that the specimen now at hand is about 50 per cent longer than the largest of those investigated by Starks (5 inches) so that the possibility that the "collar" of *torquatus* may represent a late ontogenetic differentiation in color pattern still remains.

Total length, 180 mm. Length without caudal fin (to end of penultimate pore-bearing lateral line scale), 151 mm. Proportions in per cent of the length without caudal fin: Length of head, 30. Length of snout, 10. Diameter of eye, 5. Length of pectoral fin, 20.5. Length of ventral fins, 16.5. Distance from snout to dorsal fin, 32. Snout to anal fin, 53.5. Greatest depth of body, 30. Depth of caudal peduncle, 14.5. Greatest width, 14. Width of osseous interorbital space, 6.

The lateral line occupies the fourth row of scales from above (not counting the mediadorsal series behind the end of the dorsal fin) throughout the entire length of the fish, opening through 3 pores on each of the 27 scales it penetrates. Anteriorly, backwards to and including the 19th scale, it runs approximately along the middle of the dorsal half of the body, from the 19th to the 22d scale it bends abruptly downwards, still continuing to occupy the fourth scale from above (the mediadorsal scales not being counted), and from the 22d to the 27th scale, inclusive, it runs horizontally backwards along the middle of the caudal
peduncle. Twenty-four scales are counted in a mediolateral series from the gill opening to the base of caudal fin, including the 6 last scales of the lateral line. The scales in advance of the dorsal fin (4 oblique rows) are conspicuously reduced in size and do not cross the median strip, which is naked. Nine scales between lateral line and origin of anal fin, counting downwards and backwards.


Two anterior canines above, 4 below.

There are two large dusky spots below the dorsal fin, one approximately at its middle, and one at its posterior part; neither of them extending on to the fin itself, whereby subspecies torquatus apparently differs from H. irideus irideus.

Fig. 20. Holichores irideus torquatus. The collar is much less distinct in the reproduction than in the specimen.

A similar dusky spot is also found at the base of the caudal fin immediately above the end of the lateral line. The ground color of the head and body is otherwise, in the present state of the specimen, a greyish olivaceous brown, the margins of the scales being slightly paler than their centres, giving the whole a somewhat marmorated appearance. The lateral line scales are specially marked off by a small, dusky, central dot each. The ground color is interrupted by two well marked, horizontal, perfectly pale bands running for the full length of the trunk and tail, one from the upper part of the gill opening and one from underneath the lower part of the pectoral fin. A similar pale band runs obliquely upwards and forwards on each side from the belly underneath the ventral fins on to the base of the pectoral, which is also perfectly pale except at its upper edge where it carries a small sharply marked dark dot. This oblique pale band is bordered by two dusky brownish stripes, the posterior one of which continues upwards into the axil of the pectoral fin, while the anterior one bends abruptly forward in front of the pectoral base and is continued as a horizontal band across the suboperculum and the lower part of the cheek to the corner of the mouth. The latter band sends two less sharply defined vertical bands downwards across the throat, which is dusky. There is an indistinct, separate,
horizontal band on the interoperculum. Another, sharply marked band runs from above the corner of the mouth obliquely upwards below the eye, bending downwards again toward the pectoral fin and ending in a half-whirl on the lower part of the operculum. There is a dusky spot on the opercular flap and a small streak at its upper margin. A very distinct band runs from the snout to the eye and continues from the upper part of the orbit to the beginning of the nuchal squamation. Another postorbital band from the middle of the eye is faintly indicated, and a short, but very sharply marked oblique bar runs from the upper posterior corner of the cheek to the beginning of the squamation at the top of the shoulder girdle.

In the freshly preserved specimen the entire coloration was suffused with a clear yellow, making the pale oblique and longitudinal bands on trunk and tail, the front of the pectoral base and the pale areas on the cheeks between the dusky bands stand out very brightly in an unusually clear and intense golden color.

Pectorals pale, with a narrow, dusky upper edge. A dusky band occupies the lateral third of each ventral fin, the mesial two-thirds being pale. Dorsal and anal fins with a proximal pale horizontal band along their bases, followed by a narrow dusky band, which is continuous in the anal, but more or less interrupted in the dorsal, then by a wider distal pale band, which is again bordered by a narrow distal dusky band with faint indications of a paler edge along the margin of each fin. In the anal the pattern is further complicated by a row of small dusky dots along the base, one at the base of each soft ray, and by a series of small dots scattered along the middle of the distal pale band. The caudal fin has a group of irregularly arranged dots on its middle rays, and a dusky upper and anterior portion of the lower edge.

Type specimen No. 2613 B. O. C. Rum Cay, Bahamas. March 26, 1927.

**Halichoeres radiatus** (Linnaeus).

The lower horizontal dusky band is already fully developed in a specimen of only 100 mm. length without caudal fin.

5 specimens No. 2370 B. O. C. Green Cay, Bahamas. March 11, 1927.
1 specimen No. 2303 B. O. C. Rum Cay, Bahamas. March 26, 1927.
4 specimens No. 2330 B. O. C. Crooked Island, Bahamas. March 26, 1927.
6 specimens No. 2345 B. O. C. West Caicos Island. April 7, 1927.
8 specimens No. 2339 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

**Halichoeres garnoti** (Cuvier and Valenciennes).

The vertical dusky bar beneath the anterior soft dorsal rays is not found in a specimen of 105 mm. length without caudal fin, but is well developed at 125 mm.

1 specimen No. 2369 B. O. C. Green Cay, Bahamas. March 11, 1927.
1 specimen No. 2354 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.
Genus Thalassoma Swainson.

Thalassoma bifasciatum (Bloch).

Thalassoma nitida (Günther).

After the investigations of Breder (1927, pp. 60-63), supplemented by the observations of Beebe and Tee-Van (1928, pp. 205-206), and further confirmed on the present material, there can scarcely be any question about the taxonomic identity of Th. bifasciatum and Th. nitida.

1 specimen No. 2371 B. O. C. Green Cay, Bahamas. March 11, 1927.
5 specimens No. 2302 B. O. C. Rum Cay, Bahamas. March 26, 1927.
5 specimens No. 2329 B. O. C. Crooked Island, Bahamas. March 26, 1927.
3 specimens No. 2338 B. O. C. Hawks Nest, Turks Island. April 9-10, 1927.

Genus Xyrichthys Cuvier.

Novaculichthys Bleeker.

The genus Novaculichthys Bleeker has been defined by Jordan and Evermann (1896-1900, p. 1613) as different from Xyrichthys "chiefly in having the upper profile of the head more or less obtuse, not cultrate." To this is added, in the key to the genera of the family Labridae, rendered by the same authors (loc. cit., p. 1575), that the curve of the head shall be "parabolic" in Xyrichthys but not parabolic in Novaculichthys. Other features of minor significance, mentioned in the characterizations of the genera, such as differences in the depth of the cheeks or in the relative positions of the eyes, are obviously, such as they are, directly correlated with the shape of the profile, or vice versa, so that the definitions of the two genera can in reality be said to differ only in point of two independently variable morphological features, viz., the curvature and the sharpness of the dorsal profile of the head.\footnote{The independence of even these two features is perhaps only of a purely abstract geometrical nature, as it seems quite probable that also they are biologically only to be regarded as quasi-independent variables (Breder 1928, p. 68), ontogenetically or phylogenetically correlated to each other.}

In regard to the first of these characters, it would indeed be surprising to find that it were not subjected to considerable ontogenetic changes, and this has also been found to be the case in the material now at hand, particularly in the series here tentatively identified with the species Xyrichthys venustus Poey. The diagrammatic sketches of specimens of various lengths rendered on page 94 will show the gradually increasing steepness and curvature of the head during the development of this form. While the series does not completely bridge the gap between the extreme adult Xyrichthys-shape of the head and the lowest, juvenile Novaculichthys profile, it nevertheless points the direction with sufficient clearness to make it quite obviously possible that the maintenance of generic distinctions on the basis of this feature may easily lead to a considerable confusion by causing a taxonomic separation of different ontogenetic stages of the
same species. This in itself should be perfectly adequate reason for abandoning
the genus Novaculichthys as a separate systematic unit. To the best of the
author's knowledge, typical representatives of the genus Xyrichtys, as under-
stood by Jordan and Evermann, are only known from comparatively large
adults, while all records of Novaculichthys seem based upon smaller specimens.
It would, moreover, on the basis of parallel cases among other fishes, be quite
unwarranted to consider the high profile of the adult Xyrichtys an ontogeneti-
cally permanent feature to be expected also in the younger specimens. It
therefore seems quite possible that more complete series will also show further
intergradations between the form of the largest specimen figured on page 94
and specimens with a profile similar to that of the adult Xyrichtys psittacus
shown in figure 21. But, even if this expectation should be shown to be un-
warranted, the series already at hand covers a large enough range for conclusive
demonstration of the quite arbitrary nature of a generic distinction between the
two types of specimens here compared, and it also adequately shows the onto-
genetic unreliability of such distinctions.

In regard to the second feature, the sharpness of the profile, it may first be
said that the differences do not pertain to the vertical cross section of the inter-
orbital space, at least not in the species seen by the author, but to a horizontal
longitudinal section through the snout. The accompanying outlines (fig. 22)
are based upon thin, soft metal wires, which have been shaped to fit the contours
of the sections in question, and they clearly show that there is no appreciable

Fig. 21. Head of Xyrichtys psittacus, length without caudal fin 101 mm.
difference to be seen in the shape of the interorbital spaces in the selected representatives of the two "genera," while the difference in the horizontal sections through the snout is very easily recognizable. Also in this feature, however, there is a distinct progression from a blunter to a less blunt profile in the already above discussed series of *X. venustus*, although there is, as we have just seen, still a quite appreciable difference between the largest specimen of this series and the smallest typical representative of *X. psittacus*.

On the basis of these considerations the author has deemed it advisable to include the genus *Novaculichthys* in the genus *Xyrichthys*, at least until the ontogenetic development of the typical representatives of the latter genus has been clearly made out, and both the generic and specific distinctness of their earlier stages from the various forms previously referred to the genus *Novaculichthys* has been fully proved, the latter being a possibility which is considered highly improbable by the present author.

![Outline sections vertically through the interorbital space (1 and 3), and horizontally through the snout (2 and 4) of *Xyrichthys psittacus* (1 and 2) and *Xyrichthys venustus* (3 and 4).](image)

In further justification of this step might also be mentioned that the old distinctions have already proved confusing in the literature, Jordan and Evermann (1896–1900, p. 1619) themselves, for instance, thus referring the species described by Bean (1890, p. 200) as *X. venustus* Poey (see page 93) to Linnaeus' *X. psittacus* in spite of Dr. Bean's explicit statement (loc. cit., p. 201) that "the descent of the profile of the head is not abrupt, and the edge of the profile does not form a very sharp edge." The specimen referred by Breder (1928, p. 66) to *Xyrichthys argentimaculata* Steindachner (see *X. splendens* Castelnau, p. 95), while having a slightly steeper profile than the largest of the present specimens of *X. venustus* has the blunt-edged snout of *Novaculichthys* and may, by general comparison, perhaps be said to be closer to the smaller specimens of the latter nominal genus than to the larger specimens of *Xyrichthys*, sensu stricto. In addition to its morphological justification being highly questionable, the distinction between two separate genera has thus proved confusing in its practical application to taxonomic investigations.

As a contribution to the taxonomic analysis of the various species hereby included in the genus *Xyrichthys*, the author has prepared the accompanying table of measurements from the material now at hand in the Bingham Oceanographic Collection. Instead of being helpful in differentiating the species, however, the figures obtained rather tend to show a discouraging lack of distinctions between the forms compared in point of their proportional measurements.
### Table of Measurements of the Genus *Xyrichthys*.

<table>
<thead>
<tr>
<th>Species</th>
<th>Total length in mm.</th>
<th>Total length without caudal fin in mm.</th>
<th>In percent of the total length without caudal fin</th>
<th>Length of V</th>
<th>Depth of body</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Xyrichthys splendens</em></td>
<td>81.5</td>
<td>68.0</td>
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<td>97.0</td>
<td>79.0</td>
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<td></td>
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<tr>
<td></td>
<td>104.0</td>
<td>86.5</td>
<td>30.1 10.4 6.4 23 30 48 28.3 30.1 25.1</td>
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</tr>
<tr>
<td><em>Xyrichthys rosipes</em></td>
<td>55.5</td>
<td>46</td>
<td>32.6 7.6 8.7 4.4 26 32 48 28.7 29.7 25.1</td>
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<tr>
<td><em>Xyrichthys venustus</em></td>
<td>51.0</td>
<td>41</td>
<td>32.2 7.9 8.5 5.5 24 30 50 15.9 29.7 25.1</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>79.0</td>
<td>65</td>
<td>30.4 9.2 9.6 5.4 23 29 49 18.5 29.7 25.1</td>
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<tr>
<td></td>
<td>80.0</td>
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<td>31.5 9.5 10.0 6.2 24 30 51 18.5 29.2 25.1</td>
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<tr>
<td></td>
<td>103.5</td>
<td>86</td>
<td>30.8 10.8 7.0 6.4 24 30 52 22.7 31.4 25.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Xyrichthys pictus</em></td>
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<td>101 103</td>
<td>29.7 12.9 12.9 10.4 5.9 26 28 50 13.9 31.7 25.1</td>
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<td></td>
</tr>
<tr>
<td><em>Xyrichthys binghamii</em></td>
<td>122 176 178</td>
<td>100 146 145</td>
<td>30.0 13.5 14.5 10.5 6.0 28 30 51 17.0 31.0 25.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Measured to the lower anterior part of the free preopercular edge.
The differences observed mainly pertain to two separate groups of measurements, viz., to the lengths of the snouts and the correlated distances from the eyes to the corners of the mouths and the depths of the cheeks; and to the lengths of the ventral fins.

In point of the first group of measurements, the nominal species X. splendens, X. venustus, and X. rosipes show smaller proportions than do X. psittacus, and X. binghami, this grouping of the species corresponding to the old subdivision of the genus into the two genera Novaculichthys and Xyrichtys, sensu stricto. It

![Graph](image)

Fig. 23. Correlation of the relative depth of the cheek, in percent of the length without caudal fin, with the absolute size of the specimens, as expressed by the latter measurement, in various species of Xyrichtys. Depth of cheek vertically, absolute lengths horizontally.

will also be observed, however, that the proportions of these measurements show a very distinct increase with increasing total lengths in both groups of species and if we plot the observed relative depths of the cheeks against the total lengths without caudal fin, as done in the accompanying diagram, we find the differences between the two groups becoming indeed quite insignificant. Similar relations are shown in the other measurements. The possibility of the Xyrichtys group merely representing the adults of the Novaculichthys group can therefore only be confirmed on the basis of these observations.

In point of the relative lengths of the ventrals fins the species become divided in a different manner. The ventrals of X. splendens are much longer than those of any other of the investigated forms; X. psittacus, on the other hand, shows the shortest ventral fins, while those of X. binghami, of X. venustus and of X. rosipes are of intermediate proportions. In X. psittacus and X. venustus a gradual increase in the relative lengths of the ventral is distinctly indicated, while similar phenomena are not seen in the other samples. It seems probable to the author, however, that this gradual increase in ventral fin lengths will prove to
be a common feature in the development of all the investigated forms, when adequate material becomes available for comparison. Taking these possibilities into consideration we may say that X. splendens, as here understood, may be considered definitely established as different from X. venustus, X. psittacus, and X. binghami, but it still seems possible, as already suggested by Jordan and Evermann (1896–1900, p. 1615) that the adult of X. rosipes, which in relation to the size of the available specimens has also got very large ventral fins, will “be found to approach the Brazilian species,” X. splendens, “in form and coloration,” perhaps, the author might add, even proving identical with the latter form. As it stands, X. rosipes differs from X. binghami, X. psittacus, and X. venustus (of comparable size) by the length of its ventrals, by the greater production of the anterior dorsal spines (than in X. venustus) and by the pigmentation. The relative ventral lengths of X. venustus¹ make it seem rather improbable that this form could develop directly into X. psittacus, but it shows no appreciable differences in this regard from the larger specimens here referred to X. binghami.

In the rest of the material X. binghami the relative lengths of the ventrals were found to be even greater than in the specimens recorded in the table of measurements rendered on page 90, the values obtained for the former being: 19.7, 19.5, 18.2, 18.6, and 21.1 per cent of the total length without caudal fin. It is apparent from these figures that X. binghami can also be regarded as quite distinct from X. psittacus.

Comparing these observations with the descriptions of other related western Atlantic forms not examined by the author, we find X. ventralis Bean (1890, p. 198) differing from X. splendens only by the absence of the lateral spot characteristic of the latter species. X. infirmus Bean (1890, p. 199) seems distinct from X. psittacus mainly by a dark blotch in the axil of the pectorals and by a somewhat less trenchant, though steep profile. X. martiniensis and X. vitta Cuvier and Valenciennes are described by Jordan and Evermann (1896–1900, p. 1616) as having no scales on the cheeks, in which respect they would then differ from all the other species here considered, in which at least a small series below the lower posterior part of the orbit is always present. X. modestes Poey seems scarcely differentiable from X. psittacus.

The entire genus is strongly in need of revision on fresh material, the necessity of studying the development of the various forms and their ontogenetic and spontaneous color changes being particularly obvious.

In regard to X. binghami the author may mention that the characteristic coloration of this form described by Mowbray (in Breder 1928, p. 64) has now completely disappeared from all specimens after four years in formalin, while, on the other hand, the lateral blotch on a specimen of X. splendens, kept for the same length of time in a similar solution, shows no fading at all.

¹ The specimens described by Dr. Bean were not appreciably larger than those now at hand, the largest measuring only 105 mm. total (?) length.
Xyrichthus venustus (Poey).

Xyrichthus venustus (Poey) Bean 1890, p. 200.

The reasons why X. venustus Poey as identified by Bean (1890) can not be included among the synonyms of X. psittacus, as done by Jordan and Evermann (1896–1900, p. 1619), unless it should prove to be a juvenile Novaculichthys stage of the latter species, have already been given on page 89.

Since Dr. Bean’s description shows no significant differences from the specimens now at hand his nomenclatural identification has been tentatively accepted for the samples recorded below. It must be mentioned, however, that the material in its present condition shows no coloration or pigmentation pattern at all, except some very faint indications of vertical stripes on the cheeks and faint discontinuous cross bars on the vertical fins. There is particularly no sign of a dark blotch on the operculum and suboperculum, but it must be noticed that this very region shows a darker hue than the rest of the fish, due to the darker coloration of the underlying gills. There is thus a possibility that the original description of this feature may to some extent be due to a misinterpretation of this phenomenon. The specimens are otherwise in their general shape and in all proportions quite concordant with Dr. Bean’s description.

The sample from Hogsty Reef (No. 2511 B. O. C.) constitutes a very complete series from a total length without caudal fin of 20 mm. to one of 65 mm. (represented by two specimens), the intermediate measurements being 22, 24, 27, 29, 32, 33, 41 mm. To this may be added a specimen of 87 mm. length without caudal, obtained during the first oceanographic expedition of the “Pawnee” (No. 139 B. O. C.). The following diagrammatic drawings, showing the progressive changes in the profile of the head, have been prepared on the basis of this series. The proportional measurements of the larger specimens are given in the table on page 90. Even in the smaller specimens the relative elevation of the two anterior dorsal spines is quite moderate. At 41 mm. total length (without caudal fin) the length of these spines is only about seven fifths of the length of the third spine, at 20 mm. the difference is rather somewhat less, at 65 mm., on the other hand, it has nearly, and at 87 mm., it has totally disappeared. The species is thus in this regard considerably different from X. rosipes of comparable sizes. In the smallest specimens the ventrals only reach about two thirds of the distance from their origin to the base of anal fin, at 65 mm. length without caudal they reach to the anus, and at 87 mm. slightly beyond the origin of anal fin.

10 specimens No. 2511 B. O. C. Hogsty Reef, Bahamas. April 1, 1927.
6 specimens (all juvenile) No. 2523. Turks Island. April 9–10, 1927.

Xyrichthus sp.

The material also contains two samples of juvenile specimens similar to the juveniles of X. venustus, but differing in minor features, which make their
Fig. 34. Outlines of the head of *Xyrichthus venustus* at various sizes. Lengths without caudal fin, from top to bottom: 20, 41, 65, and 86 mm.
identity questionable. They will quite probably be found to represent a different, but closely related species, the identity of which must remain doubtful until a complete series may become available for investigation.

1 specimen No. 2524 B. O. C. Hogsty Reef, Bahamas. April 1, 1927.
3 specimens No. 2525 B. O. C. Crooked Island, Bahamas. March 26, 1927.

**Xyrichthys splendens** Castelnau.

A specimen belonging to this species has been tentatively referred by Breder (1927, p. 66) to *X. argentinaculatus* Steindachner (1861, p. 134), but the author can see no particular reason for assuming an identity between this West Indian specimen and the South African form described by Steindachner,\(^1\) while the former is, on the other hand, quite obviously identical with Castelnau’s *Xyrichthys splendens* from Bahia. Two more specimens were obtained during the third oceanographic expedition of the “Pawnee” in 1927. These specimens are all distinguished by a very sharply marked dark blotch occupying only the tenth scale (from the gill opening) of the third horizontal row below the lateral line. This blotch is surrounded by an area which is distinctly paler than the rest of the body. In Castelnau’s illustration of the species (Castelnau 1855, pl. 5, fig. 1) the dark blotch is shown in an accurately corresponding position relative to the horizontal distances, but closer to the lateral line (on the first row of scales below). This latter difference can not be considered significant, however, since the position of the spot is not specified in corresponding detail in the description and the feature may therefore be due to an error in the drawing. The figure otherwise also agrees with the present material in the other distinctive feature of this form, viz. the great length of the ventral fins, as well as in the general appearance of the fish, so there can scarcely be any question about the taxonomic identity of the samples.

The available specimens have a profile similar to that of the largest specimen of *X. venustus*, or very slightly steeper, but not trenchant. The proportional measurements are recorded in the table on page 90. Apart from the lateral blotch and a number of pale vertical bands on the sides of the head, corresponding to the greenish blue streaks shown in Castelnau’s figure,\(^2\) the coloration pattern has now entirely faded from the specimens at hand.

2 specimens No. 2512 B. O. C. Hogsty Reef, Bahamas. April 1, 1927.

\(^1\) The ventrals of *X. argentinaculatus* are explicitly described as being short, and the measurements given show them to be intermediate between those of the present specimens of *X. psilticus* and the shortest ventrals found in *X. venustus*, thus being very far from the proportions of *X. splendens*.

\(^2\) There is, in the present specimens, one extra band between those on the gill cover and those on the cheeks, shown in Castelnau’s illustration, but the concordance is otherwise perfect in detail.
**Xyrichthus rosipes** Jordan and Gilbert.

One small specimen was obtained during the third oceanographic expedition of the "Pawnee." This has been compared with a somewhat larger specimen in sample No. 272 B. O. C. In the accompanying illustration the profiles of the heads and the outline of the anterior portions of the dorsal fins in the two specimens have been diagrammatically represented. As in the case of *X. venustus* an increasing height of the head is clearly shown. The specimens do, on the other hand, differ very conspicuously from those of the latter species, of comparable size, by the much greater production of their two anterior dorsal spines, which, at a total length without caudal fin of 27 mm., are more than 25 times as long as the third dorsal spine, and at 46 mm. length without caudal...
somewhat more than twice as long.\(^1\) In addition the ventrals of both specimens reach fully to the origin of anal fin, and the general pigmentation is considerably darker than in *X. venustus*, this latter difference being particularly prominent on the ventrals and on the elevated anterior part of the dorsal fin, these parts being quite dark in *X. rosipes* but merely more or less dusky in *X. venustus*.

1 specimen No. 2513 B. O. C. Hogsty Reef, Bahamas. April 1, 1927.

Genus *Doratonotus* Günther.

*Doratonotus megalepis* Günther.

The material consists of six females and one male, taken in the latter part of March and the first half of April. Four of the females, of a total length of about 35 mm. (inclusive of caudal fin), seem ready to spawn, and the eggs of the two smaller specimens, 32 and 27 mm. long, are also found to be in an apparently very advanced stage. The male measures 48 mm. inclusive of caudal fin.

4 specimens No. 2521 B. O. C. 3 ♀ + 1 ♂. Turks Island. April 9–10, 1927.

Family SCARIDAE.

During the taxonomic investigation of the Scaridae collected on the third oceanographic expedition of the “Pawnee” the author’s attention was drawn to the very considerable differences existing between the various forms of this family in regard to the topography of the ultimate caudal squamation; and an endeavor has been made to analyze the taxonomic value and significance of these differences. It would seem at first as though the danger of scales being lost or in various atypical stages of regeneration, particularly in such an exposed situation as at the base of the caudal fin, would render any taxonomic differentiation based upon scale characters of slight value for the identification of the various species. The author’s experience with the quite considerable collection now at hand, however, tends to show either that the loss of these scales is much less frequent than one might expect\(^2\) or that the regeneration is so rapid and so complete as to obscure the frequency of the loss. Partly regenerated scales in the region here considered were only observed in one or two cases, and seem to be very easily recognizable by the fact that the pigmentation adhering to the scale surface does not fit into the general pigmentation pattern of the body until

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\(^1\) Metzelaar (1919, p. 108, fig. 32) gives a figure of a specimen of about 60 mm. total length without caudal fin (according to the scale of the drawing) in which the elevation of the anterior dorsal rays is still quite pronounced.

\(^2\) Assuming, of course, that the specimens are carefully handled after they have been caught. If a parrot fish, whether fresh or preserved, is lifted in a grip by its tail, it will, in four cases out of five, slip out of the pinch, leaving a number of its caudal scales behind in the grip.
the scale is fully regenerated, exposing unpigmented parts of the scale-pocket around its borders in the intermediate stages.

The following features were found to be of value for carefully handled collections: 1) The shape of the ultimate scales at the base of the caudal fin, and 2) the proportions of these scales and the extent to which they cover the caudal fin. It was found practical to express the latter feature in figures by taking the four measurements indicated on the accompanying diagram. The first measurement gives the distance from the posterior free edge of the fifth scale from behind to the posterior free edge of the penultimate scale. The second measurement gives the length of the free portion of the last caudal scale, measured from the posterior margin of the penultimate scale; and the third measurement indicates the length of the free portion of the caudal fin itself. For purposes of comparison these measurements are expressed in percent of their sum, i.e., the total distance from the posterior free edge of the fifth scale from behind to the end of the middle caudal rays (IV, in figure 26). This distance was also measured directly as a control. All measurements pertain to the medio-lateral series of scales and the middle caudal fin rays. The following table shows the proportions

<table>
<thead>
<tr>
<th>Species</th>
<th>Figure in this article</th>
<th>Number of specimens measured</th>
<th>Total length of specimens in mm.</th>
<th>In percent of measurement IV (see figure 26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scarus crocensis</td>
<td>27, 1</td>
<td>3</td>
<td>133</td>
<td>Measurement I: 42 35 23 30 32</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>86 39 31 30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>81 37</td>
<td></td>
</tr>
<tr>
<td>Scarus punctulatus</td>
<td>27, 2</td>
<td>3</td>
<td>141–165</td>
<td>Measurement II: 35–36 21–24</td>
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<td></td>
<td></td>
<td></td>
<td>35–43</td>
<td></td>
</tr>
<tr>
<td>Sparisoma squamidum</td>
<td>27, 3</td>
<td>3</td>
<td>75–170</td>
<td>Measurement III: 34–39</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>39–43</td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td>22–25</td>
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</tr>
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<td>. . . .</td>
<td>1</td>
<td>161</td>
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</tr>
<tr>
<td></td>
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<td></td>
<td>38–40</td>
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<td>35–37</td>
<td></td>
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<tr>
<td>Sparisoma radians</td>
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<td>. . . .</td>
<td>3</td>
<td>118</td>
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<td></td>
<td></td>
<td></td>
<td>81 39 30 34 34</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>75 35 27 34 34</td>
<td></td>
</tr>
<tr>
<td>Sparisoma obtidaardi</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>144 36 30 24 40</td>
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<td></td>
<td></td>
<td>144 36 24 40</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>144 36 40</td>
<td></td>
</tr>
<tr>
<td>Scarus etula</td>
<td>27, 6</td>
<td>1</td>
<td>315</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>39 18 43</td>
<td></td>
</tr>
<tr>
<td>Scarus acutus</td>
<td>27, 6</td>
<td>4</td>
<td>77–178</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>37–42</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>17–20 40–44</td>
<td></td>
</tr>
<tr>
<td>Pseudoscarus sp.</td>
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<td>2</td>
<td>215–270</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>ab. 40</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ab. 20</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>ab. 40</td>
<td></td>
</tr>
</tbody>
</table>

1 The two sides of this specimen were slightly unequal.
found in the investigated material, the observed types being further illustrated in the accompanying diagram.

It will be noticed from the table that the species fall into three fairly sharply differentiated groups according to the proportions of their caudal squamation, these groups being best defined by the relative length of the free portion of the ultimate caudal scale (measurement II) which has a range of 31–37 per cent of IV in the first group (Scarus croicensis and punctulatus), 20–29 per cent of the same measurement in the second group (the various species of Sparisoma), and 17–20 per cent in the third group (Scarus vetula and acutus, and Pseudoscarus). The ultimate caudal squamation always consists in only three scales on each side, one medio-lateral, one superior, and one inferior (see figs. 27 and 29), which vary in accordance with each other in regard to their longitudinal dimensions and also seem to maintain a fairly constant ratio and relationship to the height of the caudal peduncle in point of their widths. The variations in the longitudinal measurement of the ultimate medio-lateral scale is therefore not accompanied by corresponding variations in its width and the said measurement (II) thus gives a direct expression for the shape of this scale, and indirectly also for the superior and the inferior ultimate caudal scales, as will be seen from a comparison of the diagrammatic drawings shown in figure 27, each pair of drawings representing one of the above considered groups of species.

Fig. 26. Diagrammatic illustration of the caudal measurements made on the Scaridae.
Fig. 27. Diagrammatic illustrations of the caudal squamation and caudal fin form in:
In the second group there is a notable difference between the two extremes (Sparisoma squalidum and S. abildgaardi, fig. 27 Nos. 3 and 4), particularly in regard to the outlines of the medio-lateral scales immediately preceding the last caudal scale, these showing a distinctly angular posterior margin in S. squalidum, while their posterior free borders are evenly rounded in S. abildgaardi, a feature which seems consistent enough to be quite helpful in differentiating these two closely related forms. The differences in the shape of the last medio-lateral caudal scale are less distinct and reliable although usually also quite noticeable. The various other species of the second group show intermediate scale-forms and are not clearly defined in point of this feature, which can apparently only be used for differentiating the extremes. The other groups are rather homogeneous in regard to the outlines of their caudal scales.

Slight indications of a consistent change in the proportions of the caudal squamation with growth may perhaps seem indicated in the measurements of Scarus croicensis, Sparisoma radians, and S. abildgaardi. No such consistency of variation was shown in the other species.

The posterior outline of the caudal fin shows considerable differences in the various species and specimens, but it is well known that such differences are directly correlated with the size or age of the fish, and are therefore without taxonomic significance unless defined in relation to the total lengths at which they occur. All species seem to start with the posterior margin of the caudal fin evenly convex, truncated or produced corners and other peculiarities of the outline developing later, if at all. Experience on the present material has proved to the author that it is practically impossible to make any sharp distinction between rounded or truncated caudal fins, especially since such differences may be caused by a mere variation in the extent to which the fin rays are spread in the individual specimens. It is also impossible to draw any sharp line between the beginning prominences of the upper and lower corners (as in fig. 27, No. 1 and fig. 29 Nos. 1 and 2) and the produced rays of a truly concave caudal fin, but for practical purposes the following criterion for "produced" corners, and thereby also for simple or complex (see fig. 29 No. 4 page 109) concavity of the outline, has been found serviceable: The caudal fin is said to have produced corners, and to be simply or doubly concave, if the upper and lower rays extend beyond the vertical from the end of the middle caudal rays, when the fin is normally spread, that is, the fin membrane is straightened without stretching. Thus figure 27 Nos. 4 and 5 are simply concave, No. 3, and fig. 29 Nos. 3 and 4 are doubly concave, while figure 27 No. 1 and figure 29 No. 1 are neither considered doubly concave, nor as having produced corners, in spite of their beginning prominences above and below. Using this criterion we find that the
caudal fin has not yet attained concavity in the following species at the following maximum total lengths:


Produced corners were observed on the other hand observed at the following minimum lengths in the material now at hand:

- *Sparisoma abildgaardi*, 144 mm. *S. squalidum*, 170 mm. *S. flavescens*, 161 mm. *Scarus vetula*, 315 mm. (probably much too high). *Pseudoscarus guacamaia* (?), 555 mm., while the caudal fin of another *Pseudoscarus* at 270 mm. total length is just on the verge of becoming concave (see fig. 29 No. 2, p. 29).

It is hoped by the writer that further observations along the lines here indicated may serve to facilitate the taxonomic identification of the Scaridae.

Genus *Scarus* Forskal.

*Scarus acutus* Poey.


The form here identified as *Scarus acutus* Poey is perfectly identical with *Scarus croicensis* Bloch in its general appearance and proportional measurements, as well as in the coloration, or at least the most common color phases, and the author is therefore strongly inclined to suspect that it may previously have become confused with the latter species with which it seems to associate. *Scarus acutus*, as here understood, differs most significantly from *Scarus croicensis* in the topography of the caudal squamation, which is of the third instead of the first type mentioned in the discussion on page 105, with the ultimate scales very short and wide, and with a large portion of the caudal fin free (see fig. 27 No. 6), and in having 3½ instead of 2½ rows of scales on the cheeks. Since the correlation between these two features is quite consistent the author has no hesitation in considering the differences taxonomically significant. To establish positively the identity of the form here reported upon with that of Poey's description is, of course, impossible on account of the incompleteness of the latter; there are, however, no discrepancies preventing Poey's name from being made available for the species now at hand, and the author has considered this procedure preferable to introducing a new specific designation in the already ample nomenclature of the parrot fishes.

1 As found on the present material. The real maximum may be higher for *Sparisoma abildgaardi*, while the outline of the fin in the 94 mm. specimen of *S. squalidum* (see the dotted outline in fig. 27 No. 3 representing a 75 mm. specimen) would indicate that the recorded maximum will be fairly truly representative for this species. *S. radians*, *Scarus punctulatus*, *croicensis* and *acutus* probably never develop a truly concave outline of the caudal fin.
The proportions of the species will be sufficiently apparent from the accompanying table of measurements.

**TABLE OF MEASUREMENTS OF Scarus auritus Poey.**

<table>
<thead>
<tr>
<th></th>
<th>172</th>
<th>150</th>
<th>112</th>
<th>78</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length without caudal fin</td>
<td>144</td>
<td>123</td>
<td>93</td>
<td>63</td>
</tr>
<tr>
<td>Length of head</td>
<td>37</td>
<td>37</td>
<td>39</td>
<td>40</td>
</tr>
<tr>
<td>Diameter of eye</td>
<td>5.5</td>
<td>6.5</td>
<td>7.5</td>
<td>9.0</td>
</tr>
<tr>
<td>Interorbital width</td>
<td>13</td>
<td>13</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Length of snout</td>
<td>16</td>
<td>15</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Distance from snout to D</td>
<td>36</td>
<td>36</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Depth of body</td>
<td>31</td>
<td>32</td>
<td>32</td>
<td>33</td>
</tr>
</tbody>
</table>

The topography and proportions of the caudal squamation have already been dealt with in the table on page 98 and in fig. 27 No. 6, where the very great differences in this regard between the present species and _Scarus croicensis_ are also fully shown. Apart from these features of the caudal squamation the four specimens here referred to _S. auritus_ are also all characterized by a more or less complete third series of scales on each cheek, not found in _S. croicensis_, in addition to the incomplete ("half") series found immediately along the free edge of the preopercular fold. Conditions obtaining on the left side of the head in the largest specimen are shown in figure 28. The counts for each side of the four specimens are given in the following table:

**Scales on the Cheeks of Scarus auritus Poey.**

<table>
<thead>
<tr>
<th>Total length of specimen in mm.</th>
<th>Scales in upper row</th>
<th>Scales in middle row</th>
<th>Scales in lower row</th>
<th>Scales in incomplete series</th>
</tr>
</thead>
<tbody>
<tr>
<td>172</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>150</td>
<td>8</td>
<td>9</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>112</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>78</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

It will be noticed that there are considerable irregularities in the number of scales in the third row, accompanied by some irregularities also in their arrangement when their numbers are low, as in the specimen of 150 mm. total length.
Yet a third row is always to be made out, on both sides, in every specimen which shows a caudal squamation of the type considered characteristic of *S. acutus*, as compared with *S. croicensis*, while no indications of an extra row on the cheeks has been found in the latter species. The largest specimen of *S. acutus* even shows still an extra scale between the two middle rows of the left side as shown in the figure.

Fig. 28. *Head of Scarus acutus.*

*S. acutus*, like *S. croicensis*, is a comparatively slender parrot fish with the upper and lower outlines about equally curved and with the caudal fin squarely truncated in the larger specimens (the corners being slightly rounded in the smaller ones). There are no lateral canines in the upper jaw.

The smallest specimen (78 mm.) has the typical coloration of young *S. croicensis*, with three horizontal dusky bands on each side, one from the corner of the mouth across the cheek to the upper part of the base of pectoral fin, continuing behind this fin in a straight line to the base of caudal fin a little below its middle; another band runs parallel with the one just described from the posterior margin of the orbit to the base of caudal fin above the middle of the latter; and a third band runs horizontally from the nape to the end of the dorsal fin, leaving a narrow, slightly paler segment along the base of the latter. As in the young of *S. croicensis* the upper dark band is less distinct than the lower two, which are separated by a well marked, pale, medio-lateral band. The pattern of this
smallest specimen is altogether quite indistinguishable from that of *S. croicensis* at the same size.

The next specimen shows a perfectly uniform, dark purplish brown color but gives no morphological reason for suspecting that it should not be identical with the other specimens.

The two largest specimens are again identical with *S. croicensis* of comparable size in regard to their coloration, each scale having a purplish brown centre and a paler margin, the head being more uniformly purplish grey-brown. As in the largest *S. croicensis* (133 mm.) the horizontal bands on the sides have entirely disappeared at this stage.

1 specimen No. 2389 B. O. C. Rum Cay, Bahamas. March 26, 1927.
2 specimens No. 2387 B. O. C. West Caicos Island. April 3, 1927.
1 specimen No. 2386 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

**Scarus croicensis** Bloch.

The coloration of this species is entirely concordant with that above described for *S. acutus* Poey. The caudal squamation has been dealt with in the table on page 98 and in figure 27 No. 1. There are only 2½ series of scales on each cheek, with 6–7 scales in the upper, 5–7 scales in the middle, and 1–4 scales in the lower ("half") series.

4 specimens No. 2333 B. O. C. Crooked Island, Bahamas. March 26, 1927.
23 specimens No. 2352 B. O. C. Crooked Island, Bahamas. From Mangrove channel. March 26, 1927.
2 specimens No. 2388 B. O. C. West Caicos Island. April 3, 1927.
4 specimens No. 2343 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

**Scarus vetula** Bloch and Schneider.

A single specimen 315 mm. long was found to be in every respect concordant with the color plate of this species rendered by Evermann and Marsh (1902, pl. 31). For the caudal squamation see the table on page 98, and figure 27 No. 5.

1 specimen No. 2390 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

**Scarus punctulatus** Cuvier and Valenciennes.

For caudal squamation see table on page 98 and figure 27 No. 2.

4 specimens No. 2382 B. O. C. West Caicos Island. April 3, 1927.

Genus **Sparisoma** Swainson.

**Sparisoma abildgaardi** (Bloch).

Lateral canines are already well developed in a specimen of 51 mm. total length but are not found in another specimen only 32 mm. long. The young stages of this species (30 mm. or less to 60 mm. or more) are especially characterized by the very abrupt manner in which the dusky pigmentation on the tail
stops at a sharply drawn vertical line across the base of the caudal fin, leaving at least the proximal part of the latter perfectly colorless (in formalin). The largest of the young specimens (51 mm.) has two dusky vertical bands across the distal portion of the caudal fin separated from each other by a narrow white streak and bordered posteriorly by the white distal margin of the fin. The caudal squamation has been dealt with in the table on page 98 and in figure 27 No. 4.

1 specimen No. 2358 B. O. C. Cat Island, Bahamas. March 20, 1927.
1 specimen No. 2487 B. O. C. Crooked Island, Bahamas. March 26, 1927.
1 specimen No. 2384 B. O. C. West Caicos Island, Bahamas. April 4, 1927.

Sparrisoma radians (Cuvier and Valenciennes).

A female specimen of 73 mm. total length has one fully developed posterior lateral canine on each side, and a smaller canine immediately in front of it. A male of 117 mm. has 3–4 lateral canines on each side, the posterior ones decurved, the anterior ones smaller and pointing forwards.

A dusky crossbar across each ventral fin, more or less distinctly developed also in the adults, is very characteristic of the young of this species.

The coloration of some of the younger specimens approaches that described for S. niphobes Jordan and Bollmann (1889, p. 551) but lacks the opercular spot and the dark axils of the pectorals.

The caudal squamation resembles that of S. squalidum very closely (see fig. 27 No. 3, and the table on page 98). The corners of the caudal fin are still slightly rounded even in the largest specimen (117 mm., ♂), although approaching the entirely truncate form at this size.

Ripe eggs were found in a female of 73 mm. total length.

14 specimens No. 2483 B. O. C. Crooked Island, Bahamas. March 26, 1927.
4 specimens No. 2484 B. O. C. Hogsty Reef, Bahamas. April 1, 1927.
3 specimens No. 2485 B. O. C. West Caicos Island, Bahamas. April 3, 1927.
6 specimens No. 2486 B. O. C. Turks Island. April 9–10, 1927.

Sparrisoma flavescens (Bloch and Schneider).

One single specimen of 161 mm. total length. Outline of caudal fin concave as in the specimen of S. abildgaardi shown in figure 27 No. 4. Caudal squamation as in S. squalidum (see the table on page 98).

1 specimen No. 2385 B. O. C. West Caicos Island. April 3, 1927.

Sparrisoma squalidum (Poey).

Outlines of the caudal fin and caudal squamation are given in figure 27 No. 3, and the features have been further analyzed in the table on page 98.
A small specimen (No. 2482 B. O. C.) of only 27 mm. total length is tentatively referred to this species on the strength of the relative slenderness of the body (compared with S. flavesens and S. abildgaardi), the absence of a dusky bar across the ventrals (found by the author to be characteristic of the investigated material of S. radians), the general lightness of pigmentation, and the presence of four sharply marked dusky dots on each side along the base of the dorsal fin. Similar dots in exactly the same arrangement are found also in the adults of S. squallidum, and while they may also be indicated in the younger stages of S. radians they are never as sharply defined in the latter species as in the former.

1 specimen No. 2482 B. O. C. Crooked Island, Bahamas. March 26, 1927.
1 specimen No. 2480 B. O. C. Crooked Island, Bahamas. March 26, 1927.
2 specimens No. 2383 and 2481 B. O. C. West Caicos Island, April 3, 1927.

Genus Cryptotomus Cope.

Cryptotomus berylinus Jordan and Swain.

None of the specimens now at hand, ranging from 60 to 70 mm. total length, show any lateral canines. The author therefore follows Breder (1927, p. 67) in provisionally maintaining C. berylinus as a distinct species from C. ustus Cuvier and Valenciennes, for the purpose of the present report.

3 specimens No. 2488 B. O. C. Cat Island, Bahamas. March 21, 1927.
1 specimen No. 2489 B. O. C. Turks Island. April 9–10, 1927.

Genus Pseudoscarus Bleeker.

Pseudoscarus guacamaia (Cuvier), P. plumbeus Bean and P. coelestinus (Cuvier and Valenciennes).

When typical adults of the former two of the above listed nominal species are compared alive, or with their colors in life preserved or reliably reproduced, it scarcely seems possible that any difficulties could ever be met with in identifying single specimens or that any question could ever arise with regard to the taxonomic validity of the two species. Yet it appears that the very scanty descriptions of these common forms show no significant differences in counts or proportions by which discolored or aberrantly colored specimens can be safely identified, or by which the distinctness of the two species can be regarded as definitely established. The smaller dimension of the eyes in P. plumbeus, as described by T. H. Bean (1912, p. 125), is of no taxonomic importance in view of the size of the specimens on which the description is based. Variations in relative diameter of the eyes of P. guacamaia from 5.55 to 6.8 in head are recorded by Meek and Hildebrand (1923–28, p. 745) from specimens between 95 and 370 (220?) mm. length, and a ratio of 8.5 in head in specimens of 406 to 457 mm. length, such as the type specimens of P. plumbeus, can therefore not be considered at all significant as an indication of specific distinctness. The descriptions of the two species are also otherwise quite concordant in all features.
except the coloration. It therefore seems as though we might have two
nominal species based upon color differentiation alone, and it will further appear
from the following discussion of the few specimens now at hand and of the scanty
descriptions in the literature, that the significance of the differences in coloration
may also be quite questionable in the present case, there being apparently no
reliable differences in the pattern itself. Without expressing any definite opinion
upon their true taxonomic status the author therefore hereby wants to call
attention to the fact that the existing descriptions do not give any conclusive
evidence whatever of the assumed distinctness of the two nominal species under
discussion. Whether this situation is only due to inadequacy in the descriptions
or to an actual lack of perceptible differences other than those of color can only
be shown by an investigation of ample collections identified by adequate color
notes from the fresh material. For the purpose of the present report we must
limit ourselves, however, to a discussion of the specimens now available in the
Bingham Oceanographic Collection. These consist of two large specimens
obtained by the first expedition in 1925 and identified by Breder (1927, p. 71)
as belonging one to each of the two nominal species under discussion, and in two
small or moderate-sized specimens preserved during the third expedition in
1927. As the larger two specimens have both been mounted for exhibition they
can unfortunately no longer serve as a reliable basis for proportional measure-
ments.

The following table, however, shows the complete lack of any significant
proportional differences between the two smaller specimens, which can therefore
not be differentiated on the basis of their measurements. Nor do their pro-
portions or counts, for reasons already made out, in any manner indicate their
relationship to either one of the two nominal species under discussion.

**Measurements of Pseudoscarus sp.**

<table>
<thead>
<tr>
<th></th>
<th>Total length in mm.</th>
<th>Total length exclusive of caudal fin, in mm.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>215</td>
<td>270</td>
</tr>
<tr>
<td></td>
<td>180</td>
<td>225</td>
</tr>
<tr>
<td>Length of head</td>
<td>In</td>
<td></td>
</tr>
<tr>
<td>Length of snout</td>
<td>35</td>
<td>34</td>
</tr>
<tr>
<td>Diameter of eye</td>
<td>14</td>
<td>14.5</td>
</tr>
<tr>
<td>Interorbital width</td>
<td>5.5</td>
<td>4.9</td>
</tr>
<tr>
<td>Greatest depth</td>
<td>12.5</td>
<td>12.5</td>
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<tr>
<td>Snout to D</td>
<td>38</td>
<td>39</td>
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<tr>
<td>Snout to A</td>
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<td>37</td>
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<td>Snout to V</td>
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<td>66</td>
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<td>Length of V</td>
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<td>35</td>
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<tr>
<td>Length of P</td>
<td>20</td>
<td>21</td>
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<tr>
<td></td>
<td>23</td>
<td>24</td>
</tr>
</tbody>
</table>

Turning our attention to the shape of the caudal fins and the characters of the
ultimate caudal squamation, we find it, also in regard to these features, quite
impossible to detect any significant differences at all between the four specimens available for the present investigation.

It will be seen from the figure 29 that the caudal fins form a complete series of perfect intergradations from the practically truncate shape in the smallest specimen (A) to the doubly concave posterior outline, with greatly produced upper and lower corners, in the largest one (D) [P. guacamaia Breder 1927, p. 71].

Fig. 29. Caudal squamation and caudal fin form in Pseudocarus spp (?). Lengths without caudal fin: 1. 180 mm. 2. 225 mm. 3. 470 mm. 4. 645 mm.

The ultimate caudal scales are lost in the largest specimen, but show no essential differences at all in the rest of the material, as seen by a comparison of the two figures (A and C) in which the squamation has been fully drawn. Nor are any differences perceptible in the squamation on the other parts of the bodies.

It thus only remains to consider whether any reliable discrimination between the two nominal species, P. guacamaia and P. plumbeus, can be based upon colors and coloration patterns alone in the case of the specimens here reported upon, and it will be most convenient for the further discussion to start with a descrip-
tion of the coloration reproduced upon the two mounted specimens according to color sketches very carefully prepared by the artist of the expedition, Mr. W. S. Bronson, immediately after the capture of the live specimens.

The specimen, measuring 780 mm. to the end of the middle caudal rays and about 645 mm. to their base, is very strikingly divided into an anterior, mainly reddish brown portion, including the head, and a posterior brightly and uniformly green part, including the caudal peduncle to the end of the squamation. The boundary between the two colors runs, with some irregularities, obliquely upward and forward from the origin of anal fin toward the base of the sixth dorsal spine, leaving, however, a single series of green scales extending forward along the base of dorsal fin to its second spine. There is some intermingling of green and brown scales in the boundary region, and three or four partly or entirely green scales are found in a short vertical series on the ventral part of the body somewhat behind the axis of the ventral fins. The head is mostly reddish brown, showing, however, a very distinct purplish hue on cheeks and opercle. Upper lip blue. Dorsal fin reddish brown anteriorly and on the distal parts posteriorly, where the proximal part is occupied by a broadening area of dark purplish color. Edge of dorsal fin blue. Caudal reddish brown, with green posterior margin but without greenish or bluish upper and lower edges. Anal reddish brown, with a slight blue edge (not shown in Mr. Bronson's sketch). Anterior ventral rays and upper pectoral rays greenish blue, ventrals otherwise mostly reddish brown with some green, pectorals mostly greenish with some reddish brown and a deep blue posterior margin.

This specimen has been identified by Breder (1927, p. 71, sp. No. 347 B. O. C.) as *P. guacamaya*.

The other mounted specimen (No. 348 B. O. C.) measures about 555 mm. to the end of the middle caudal rays and about 470 mm. to their base, and has been identified by Breder (loc. cit.) as *P. plumbeus*. The general color is a very deep brownish black which also covers all of the fins, leaving only narrow, blue distal margins on dorsal and anal fins, blue anterior rays of ventrals and similar upper rays of pectorals, and narrow, blue, upper and lower edges on the caudal, but no similarly colored posterior margin on the latter fin. Bright blue spots are shown on the scales in some of the horizontal series on the anterior part of the body, particularly in the series beginning under the upper part of the base of pectoral fin and in the two nearest series above. These spots form discontinuous and tapering blue bands disappearing toward the tail where only some irregularly scattered blue spots are found. The cheeks are framed in bright blue color, with a brownish black central part. Lips and throat blue; a brownish black vertical band separating the blue of the lower lip from the anterior blue border of the cheek. Two transverse blue bars above the eyes and two median blue spots on the nape.

In these two specimens we thus find two extremely different types of colora-
tion and the justification of the nominal identifications already previously rendered by Mr. Breder (see above) is quite unquestionable on the assumption of the existence of two actually distinct species. It would seem from the above observations as though the two forms were quite clearly distinguishable not only by their colors but also by their color patterns, particularly by the features shown in the following tabulation:

**P. guacamaya.**

1. Body quite sharply divided into an anterior and a posterior region of conspicuously different coloration.
2. Caudal fin without blue or green upper and lower edges, but with a green posterior margin.
3. Head with changing hues of brown, from reddish brown to purplish brown, but without bluish or greenish dots or patterns of any kind except a blue line along upper lip. No spots on nape.

**P. plumbeus.**

1'. Body not sharply divided into regions of different coloration.
2'. Caudal fin with blue upper and lower edges but without blue or green posterior margin.
3'. Head with a bright pattern of vivid blue. A pair of transverse bands between the eyes, two median spots on the nape, a blue frame around each cheek and wide blue bands along the lips being particularly conspicuous.

Comparing these observations with the descriptions rendered by other investigators and with the specimens preserved during the third oceanographic expedition of the "Pawnee," we find, however, that each of the above features is subject to such extensive variations that the differences between the two here discussed forms are almost entirely obscured thereby.

Thus according to the description of *P. guacamaya* rendered by Jordan and Swain (1884, p. 84, copied in Jordan and Evermann 1896–1900, p. 1657) the color in life of specimens of moderate size is "olive green, each scale edged with clear brown" and only the sides of the head are "brownish-gray" and the belly "white, tinged with brown." One further notices that the edges of the fins, "including sides and tip of caudal" are "all bright greenish-blue," and finally that there is "a bright green stripe from eye around snout; another from eye to eye above; another undulating stripe below eye," and "several green spots and dashes behind eye." This description is in its main features also confirmed by Beebe and Tee-Van (1928, p. 210) according to whom the species in question is "olive green with more or less ill defined green markings on head; lower parts more or less reddish (often dark brown in preserved specimens), vertical fins brownish orange, all edged with deep blue."11 Turning now to the original descrip-

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1 Italics here.
2 This feature is also shown in each of the three figures of *P. guacamaya* on the colored plate of the species published by Townsend (1929, p. 369, pl. 18).
tion of *P. plumbeus* we find that only the tips of the caudal are described as having "a narrow stripe of bluish green," while nothing is mentioned about a distinguishing coloration of the upper and lower edges of this fin. The rest of the description is, however, so perfectly concordant with the coloration pattern of the above mentioned specimen No. 348 B. O. C. that there can scarcely be any doubt about the identity of the latter. It thus appears, according to the various descriptions above discussed that none of the differences in pattern mentioned in the tabulation on page 111 are of any general validity for the differentiation of the two nominal species under consideration. *P. guacamaia* is apparently only in very large specimens sharply divided into two strikingly differently, and each fairly uniformly colored parts. The pattern of the caudal fin shows the same variations in both forms, and the head of *P. guacamaia* may have markings in green possibly showing a partial similarity in pattern to the blue markings on the head of *P. plumbeus*. Still no truly intermediated forms have been described, however, and a considerable difference would seem to exist between the olive green and reddish brown of *P. guacamaia* and the brown or purplish black and blue or bluish green of *P. plumbeus*, as well as in minor details of the distribution of these colors, particularly in the concentration of the blue of the latter form on the anterior part of the body while the corresponding green of *P. guacamaia* would seem to be essentially a color of the posterior and dorsal parts.

These minor differences are further obscured, however, by the features of the two smaller specimens in the Bingham Oceanographic Collection. But for some narrow markings, to be described below, these specimens are both quite uniformly colored over the entire head, body and fins; the color of the largest being a somewhat bluish olive-green, paling to yellowish gray on the belly, while that of the smaller specimen is a deep uniform brown. These colors, which were the reasons for the specimens being preserved, are still clearly recognizable in formalin although the green is considerably faded, while the brown is practically unaltered. Both specimens show bright blue margins on the vertical fins, including both edges and tips of the caudal, and blue anterior ventral rays. But for the bluish green lips the smaller specimen (brown) shows absolutely no other markings than these, while the larger specimen (bluish olive-green) also has the upper pectoral rays blue and two narrow transverse, more densely bluish green stripes from eye to eye above, two similar stripes across the nape, one from the corner of the mouth below eye to opercle, one from upper lip to eye, and similar colors on the lips. The margins of the scales are somewhat paler than their centers in both specimens, but not of a notably different color. That the green specimen is a representative of *P. guacamaia* can scarcely be questioned, the concordance with the description of this species rendered by Jordan and Swain (see quotations on page 111) being particularly striking, especially in the case of the markings on the head. We thus have here a specimen...
of *P. guacamaia* in which there is no subdivision whatever into differently colored parts or regions, even the head showing exactly the same ground color as the rest of the body; in which the reddish brown has totally disappeared, while a faint yellowish gray, gradually changing into the green of the sides, occupies the most ventral parts of the belly and a similar color is found on the fins;* and in which the head and nape show many markings corresponding very strikingly to those observed in a typical *P. plumbeus*.

In regard to the smallest specimen it is absolutely impossible to decide where it should be properly placed in relation to the two nominal species under discussion. Is it a *P. guacamaia* in which the green has become completely suppressed, or does its brown represent the brownish or purplish black of a *P. plumbeus*, which has lost its blue?

It thus develops that even the minor differences mentioned on page 111 have no validity in the present case. The reddish brown may be totally absent in *P. guacamaia*, and the distribution of the green in the above described specimen is certainly no more posterior than anterior, the color being rather somewhat more intense anteriorly. The differentiation is further complicated by a comparison with the three color changes shown by Townsend (1929, pl. 18, p. 369).

As the extremes of *P. guacamaia* we have thus a practically uniform somewhat bluish olive-green, or, according to Jordan and Swain, “olive green, each scale edged with clear brown”; while in the unquestionable specimens of *P. plumbeus*, so far mentioned, we have a blue coloration more or less definitely concentrated on the anterior parts, although some blue spots are also to be found on the tail. An inspection of the available specimen and color sketches, however, very clearly shows that a change from the above described distribution of the blue to a condition wherein this color could be found on the central part of every scale on the entire body must be considered so insignificant that it would, in fact, seem very surprising if such conditions should not occasionally, or quite frequently, be found as cases of individual variations or even as changing color phases in the same specimen.

A condition in which the blue covers the entire body has finally been described by Beebe and Tee-Van (1928, p. 211) in their redescription of *Pseudoscarus coelestinus* Cuvier and Valenciennes. It seems quite unquestionable that the form treated by these authors is taxonomically identical with the one identified by Breder (1927, p. 71) as *P. plumbeus* Bean, and the justification of the latter identification seems equally unquestionable, as already mentioned on page 111. A gradual change from “bright blue, the edges of the scales brownish” through a decrease in the sizes and numbers of the blue central parts and a corresponding

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1 The proximal posterior parts of dorsal and anal fins and the distal points of the pectorals are somewhat dusky.

2 *P. coelestinus* according to Beebe and Tee-Van 1928, p. 210 in the key to the species.
increase in the brownish edges, to a “purplish brown” color with “greenish blue” spots and markings as described by T. H. Bean (1912, p. 125) for *P. plumbeus* is certainly only what one would expect to find within the probable range of variations for a species such as this. The mounted specimen and color plate in the Bingham Oceanographic Collection show an intermediate condition in this respect.

Having thus, on one hand, a form which can be described as “olive green, each scale edged with clear brown” (Jordan and Swain for *P. guacamaia*) and on the other a form which may be “bright blue, the edges of the scales brownish” (Beebe and Tee-Van for *P. coelestinus*), and finding that these forms show no other reliable differences in color pattern or coloration, the blue of one being described by some as “greenish blue” (T. H. Bean for *P. plumbeus*), the green of the other occasionally showing a somewhat bluish tinge, and finding, further, that no significant differences have so far been shown to exist in their proportions or counts, one may very naturally become inclined to suspect the two forms of being taxonomically identical. Yet the author does not feel definitely convinced that this conclusion would be warranted, but merely that the existing descriptions, by failing to discuss individual variations, have entirely failed to give definite proof of the distinctness of the nominal species considered. The possibility of secondary sexual differences and of periodical differences related to breeding and to maturing gonads should also be investigated, when feasible.

The significance of the brown specimen is not clear. Meek and Hildebrand (1923–28, p. 745) describe the color of *P. guacamaia* in spirits as “olive brown to dark brown,” without mentioning the colors in life. The present specimen was uniformly brown also in life and apparently must represent the same variety or color phase as the specimens examined by Meek and Hildebrand, but may just as well be related to the blue *P. coelestinus* (or “*plumbeus*”) as to the green *P. guacamaia*, unless other characters may establish more definitely its relationship to either one of these two species, if they should appear to be taxonomically differentiable at all. Both the green and the brown specimen have provisionally been designated as *P. guacamaia* Cuvier, this being the oldest name for any species in the group of forms here considered.

Specimens of a “reddish brown color” are also recorded by Townsend (1929, p. 338) from Swan Island, being identified by that author as *P. guacamaia*, in concordance with Meek and Hildebrand’s observations.

In regard to the proper designation of the blue form the identification rendered by Beebe and Tee-Van seems perfectly justified and the name of *P. coelestinus* Cuvier and Valenciennes therefore probably ought to take the place of *P. plumbeus* Bean. No significance can be attached to the fact that a single canine was found by Jordan (1887, p. 543) on the right side of the upper jaws in the type of *P. coelestinus*, none being found on the left. There are no other records in recent descriptions of canines being found in either *P. coelestinus* (or *P. plumbeus*) or in *P. guacamaia*. 
More adequate descriptions of specimens from Bermuda seem particularly desirable.

Material preserved (several typical specimens of *P. coelestinus* were caught and observed at various stations, but were unfortunately not kept for investigation).

1 specimen No. 2444 B. O. C. (Brown.) Crooked Island, Bahamas. March 26, 1927.
1 specimen No. 2445 B. O. C. (Green.) West Caicos Island, Bahamas. April 3, 1927.

Suborder SCLEROPAREI.

Family SCORPAENIDAE.

Genus *Scorpaenodes* Bleeker.

Key to the species recorded from the Atlantic coast of North and Central America.

I. Three opercular spines. Only about 34–35 scales in the lateral line.

*S. triacanthus* n. sp.

II. Only two opercular spines. About 40 scales or more in the lateral line.

A. Suborbital stay with two spines below the eye, one approximately below its anterior margin and one below its center, in addition to the two spines at the posterior end of the stay, entirely behind the eye. Only about 40 scales in the lateral line. P with 2 simple rays above + 6–7 divided rays + 10 simple rays below..................*S. russelli* Beebe and Tee-Van 1928 See below.

B. Suborbital stay with only one projecting spine below the eye, situated approximately under its center, in addition to the two spines entirely behind the eye. Generally more than 40 scales in the lateral line.$^1$

1. Dorsal fin with 10 soft rays. P with only 1 simple ray above + 7 branched rays + 10 simple rays below..................*S. xyris* Jordan and Gilbert
2. Dorsal fin with 9 soft rays. P with only 8 simple rays below

*S. tredecemspinosa* Metzelaar 1919.

3. Dorsal fin with only 8 soft rays. P with 3 simple rays above + 6 branched rays + 9 simple rays below. *S. caribbaeus* Meek and Hildebrand, 1923–1928

*Scorpaenodes triacanthus*, new species.


$^1$The following three species are rather unsatisfactorily differentiated by their descriptions.

34–35 scales in the lateral line, which has about 25 pores.

Counts and proportions will be sufficiently clearly shown by the above recorded figures.

The dorsal profile ascends in a practically straight line from the upper lip to the origin of dorsal fin, which is situated at the highest point of the very high back. Ventral profile as a whole almost quite horizontal, giving the fish a hunch-backed appearance by bringing out most conspicuously the great elevation of the back. Maxillaries reaching approximately to below the posterior margin of the pupil. No teeth on palatines. Lower jaw prominent. Interorbital space concave. Anterior nostril with a branched dermal flap. Most of the spines on the head with simple dermal filaments.

Suborbital stay with one spine approximately below the middle of the eye and on one side two, on the other side three, small spines entirely behind the orbit. A few spines between the suborbital stay and the maxillary. Operculum with three well-developed spines, the middle one somewhat longer than the others. 2 or 3 spines on each shoulder in continuation of the lateral line. Narial spines moderate, without filaments. Supraorbital ridge carrying three spines with long filaments. Another spine immediately behind and mesially from the last supraorbital spine, also with filament. An interorbital crest on each side close to the supraorbital ridge, ending in a small spine without filament, approximately at the posterior margin of the pupil. A series of two large nuchal spines with filaments on each side.

Color of preserved specimen: Uniform dark brown, with the distal half of the pectorals, the distal two-thirds of the soft portions of dorsal and anal fins, and the distal three-fourths of the caudal white with only a few darker dots in 1–3 series on the rays. Ventrals and spinous portion of the dorsal quite dark. The dark coloration of the body shows some irregular interruptions in a vertical crossband over the greatest part of the caudal peduncle.

In life the just mentioned region on the caudal peduncle was uniformly paler violaceous grey than the rest of the body, being separated posteriorly from the pale portion of the caudal fin by a dark vertical bar across the base and most proximal part of the latter. The parts of the fins which are pale in the preserved specimen had a yellowish tinge in life and were dotted with orange red. The main color of the body was a very dark greenish black, and the ventral fins dusky greenish. (Described from color sketch no. 52, prepared by W. S. Bronson.)

Type specimen No. 2533 B. O. C. Bennet's Harbour, Cat Island, Bahamas. March 19–20, 1927.
Scorpaenodes russelli Beebe and Tee-Van.

While in every other respect perfectly concordant with the description of *S. russelli* rendered by Beebe and Tee-Van (1928, p. 189) the two specimens now at hand are both distinguished by a very well marked black ocellus on the posterior distal part of the spinous dorsal fin, between the eighth or ninth and the eleventh or twelfth spines (the ocellus being somewhat larger in the smaller specimen). It does not seem probable that the ocellus should be merely an element of a certain, spontaneous color phase, as one of the specimens has obviously been preserved in a light, coarsely mottled phase, on the entire head and body, while the trunk and most of the tail of the other specimen is of a very dark almost uniform brown, only the caudal peduncle and the soft vertical and pectoral fins being conspicuously mottled. In the latter specimen even the head is of almost uniform dark color, as are also the ventral fins, which are quite light in the other specimen. The dorsal ocellus is equally distinct and conspicuous in both, and it does not seem impossible that the feature may be found to indicate a true taxonomic distinction. More material and field observations are necessary on the point.

In regard to the number of spines on the suborbital stay, by which this species apparently can be separated from all other western Atlantic representatives of the same genus, it is necessary to specify that two spines are found on the anterior part of the stay, one below the anterior margin of the eye and one approximately below its middle, in addition to the two spines on its posterior part, entirely behind the eye, since a total of four can, at least as an abnormality (see *S. triacanthus*, above), also be found in other forms, but then only by an increase in the number of posterior spines behind the eye, while the spine below its anterior margin has only been described for *S. russelli*.
One specimen shows 2 simple + 7 branched + 10 simple and differentiated pectoral rays, as described by Beebe and Tee-Van, the pectorals of the other, however, only containing 2 + 6 + 10 rays.

The largest specimen measures 60 mm. without caudal fin, the smallest only 49.

2 specimens No. 2520 B. O. C. Hawks Nest, Turks Island, April 9-10, 1927.

Family CEPHALACANTHIDAE.
Genus Cephalacanthus Lacépède.

Cephalacanthus volitans (Linnaeus).

1 specimen No. 2225 B. O. C. Crooked Island, Bahamas. March 25, 1927. (Mounted.)

Suborder GOBIFORMES.
Family GOBIIDAE.
Genus Gobius Linnaeus.

Gobionellus Girard.

In the author's opinion there is no adequate systematic reason for separating the genus Gobionellus from Gobius Linnaeus, while, for practical taxonomic purposes, the distinction is more confusing than orientating. If the genus Gobius is of a rather heterogeneous nature, the genus Gobionellus, as currently interpreted, does not seem to be appreciably less so. It is therefore proposed that the two genera be united again, at least until a sorely needed comprehensive revision of the entire family may become rendered on a sound morphological basis.

The author has been greatly in doubt about the advisability of adding a new species to the confusion of forms of uncertain status and relationships already comprised by the genus Gobius (including Gobionellus), even though it has proved impossible to identify the specimens now at hand with any of the previously described species. Inadequate descriptions of various species make the compilation of a reliable dichotomous key to the genus a practical impossibility, without an extensive revision of the original samples and fresh material from the various type localities; an undertaking which is entirely beyond the scope of the present report. Reliable identification is thus only attainable by a detailed comparison with each specific description by itself, and the author must apologize for adding another description to the series.

Gobius ebriosus, n. sp.

Head about 3, depth about 4 in length without caudal fin. Eye 3½-3¾ in head, slightly longer than snout.

P. about 3½/5, V. 3½/5-4, C. 3½-3¾ in length without caudal fin.

Other proportions will appear from the accompanying table of measurements:
Measurements of \textit{Gobius ebriusus}, n. sp.

<table>
<thead>
<tr>
<th></th>
<th>35.5</th>
<th>32.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total length in mm.</td>
<td>27.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Length without caudal fin in mm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of head</td>
<td>31</td>
<td>32</td>
</tr>
<tr>
<td>Diameter of eye</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Snout</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Length of maxillary</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>Greatest depth of body</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>Depth of caudal peduncle</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Snout to $D_1$ length</td>
<td>37</td>
<td>36</td>
</tr>
<tr>
<td>Snout to $V$ without</td>
<td>33</td>
<td>34</td>
</tr>
<tr>
<td>Snout to $A$ caudal</td>
<td>58</td>
<td>60</td>
</tr>
<tr>
<td>Longest spine of $D_1$</td>
<td>33</td>
<td>24</td>
</tr>
<tr>
<td>Length of $P$</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>Length of $V$</td>
<td>28</td>
<td>25</td>
</tr>
<tr>
<td>Sex</td>
<td>$\sigma$</td>
<td>9</td>
</tr>
</tbody>
</table>

In general appearance the species is a very typical representative of the genus to which it is referred. The head is wide, somewhat depressed, with naked, slightly tumid cheeks, an oblique mouth, and a slightly prominent lower jaw.

The eyes are large, the snout short and the interorbital space very narrow (about 3 in eye) and concave. The ventrals just reach the origin of anal fin, while the pectorals extend slightly beyond this point. Anal and second dorsal fin equal, their posterior corners not reaching to the base of caudal fin. Caudal fin moderate, with rounded corners and a straight middle posterior margin. The

\footnote{Judged by the size of the anal papilla, the shape of the dorsal fin, etc., in accordance with the conditions among other species of \textit{Gobius}. The specimens seem to be either immatures or spents, making direct determination of sex difficult.}
second dorsal spine is considerably produced in the male (?, see footnote on page 120) but quite short in the female.

The entire body is covered by fairly large ctenoid scales which also extend forward over the nape even to the postero-dorsal rims of the orbits, the squamation only ending at the beginning of the narrow interorbital constriction. There is a median series of scales from first dorsal fin to the interorbital space. About 31 scales in the lateral line to the top of the gill slit. About 5–8 oblique series from this point to the orbits.

Jaws with an outer series of about 12–15 decurved fangs each (about 6–7 in each half), increasing in size towards the corners of the mouth, and with an inner, irregular band of smaller teeth. No teeth on vomer or palatines.


Color in life greenish olive marked by a number of reddish dusky cross bars. Of these there are about 3 across the nape, the anterior two continuing downwards across the cheeks, respectively opercles, the third ending on the shoulder. About 6–7 cross bars across the trunk and tail, the last one being at the base of caudal fin. The vertical fins have a number of small orange dots arranged in about 6–8 oblique longitudinal bands (slanting backwards) on the second dorsal fin and correspondingly in the anal, while a similar number of somewhat irregular vertical crossbands are formed on the caudal. The orange dots on the first dorsal fin are less distinctly arranged. There is a small dark spot at the upper edge of the operculum and one at the origin of the first dorsal fin. Pectorals clear, ventrals faintly dusky. In preservative the orange dots on the fins and the cross bars on the body become dusky, the cross bars losing considerably in distinctness, while the pattern of the fins can be just as clearly made out as in the live specimens.

Type specimens No. 2614 B. O. C. Rum Cay, Bahamas. March 26, 1927. ♂ (?).
3 specimens No. 2615 B. O. C. (Cotypes.) Rum Cay, Bahamas. March 26, 1927.

Gobius soporator Cuvier and Valenciennes.


Genus Lophogobius Gill.

The Bingham Oceanographic Collection contains several samples of a crested goby, which can not be referred to the species currently identified as Lopho-
gobius cyprinoides (Pallas). All authors whose descriptions of the latter form have been based upon fresh collections of their own agree in describing it as a uniformly dark species, with dark vertical fins and with only 9–10 rays and spines altogether in the anal fin (Pallas (fide Cuvier and Valenciennes); Cuvier and Valenciennes 1828–49, Vol. XII, pp. 129–131 (Gobius cyprinoides and G. crista galata); Günther 1859–70, Vol. III, p. 8; Evermann and Kendall 1898, p. 131; Jordan and Evermann 1896–1900, p. 2209; Meek and Hildebrand 1923–28, p.
866]. On the basis of this universal agreement in all previously recorded collections of *Lophogobius* the author, in this particular case, feels justified in regarding even a difference in coloration alone, as of considerable taxonomic significance, when it proves itself to be as consistent as in the specimens of the Bingham Oceanographic Collection. The existence of two distinct species is further confirmed by an equally consistent difference of one or more in the numbers of anal fin rays, and, if our comparison with *L. cyprinoides* is based upon the descriptions of this form rendered by Evermann and Kendall (1898, p. 131) and by Meek and Hildebrand (1923–28, p. 866), we will also find the distinction verified by a considerable difference in the relative lengths of the snouts. It is therefore presumably possible to differentiate two species of *Lophogobius* in the following manner:

I. Color uniformly dark. First dorsal fin black, other fins dusky. Anal with 9–10 spines and rays altogether. Snout about 4 to 4 1/2 in head... *L. cyprinoides* (Pallas)

II. General color very light, with a definite pattern of darker dots in horizontal rows on trunk and tail. Vertical fins all very pale. Anal with 11 spines and rays altogether. Snout larger, only about 3 to 3 1/2 in head....... *L. pallidus*, n. sp.

**Lophogobius pallidus**, n. sp.

*Lophogobius cyprinoides* Breder 1927, p. 83.

Mouth oblique, jaws equal, maxillary extending approximately to the vertical from the anterior margin of the lens. Dorsal profile of snout slightly convex, that of the orbital region, on the other hand, slightly concave, with the eyes somewhat prominent. Profile of nape again convex. Interorbital space narrow and concave in transverse section, its width only about equal to one-third of the horizontal diameter of the eyes. Eyes slightly protruding, particularly in the dorsal view of the fish. Fins large. Pectoral and caudal fins about equal in length and slightly longer than the head. Ventralss slightly shorter. Ventrals and pectorals reaching fully to the origin of anal fin; second dorsal and anal to the bases of the procurent caudal rays. First dorsal only slightly higher than the second (even in the male). Dorsal fins entirely separate, but contiguous at their base. Caudal fin with unequal lobes, semi-truncate, the upper corner being slightly prominent and fairly pointed, the lower deeply rounded and receding.

The general proportions will appear from the following table of measurements:
**Measurements of Lophogobius pallidus, n. sp.**

<table>
<thead>
<tr>
<th></th>
<th>38.5</th>
<th>44</th>
<th>38</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length without caudal fin</td>
<td>38.5</td>
<td>44</td>
<td>38</td>
</tr>
<tr>
<td>in mm.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of head In mm.</td>
<td>31.2</td>
<td>29.6</td>
<td>29.0</td>
</tr>
<tr>
<td>Diameter of eyes per cent</td>
<td>9.1</td>
<td>7.4</td>
<td>7.9</td>
</tr>
<tr>
<td>Length of snout of the</td>
<td>9.1</td>
<td>9.7</td>
<td>9.2</td>
</tr>
<tr>
<td>Length of body length</td>
<td>27.3</td>
<td>23.9</td>
<td>26.3</td>
</tr>
<tr>
<td>Depth of caudal peduncle</td>
<td>15.5</td>
<td>13.6</td>
<td>13.3</td>
</tr>
<tr>
<td>Snout to D caudal fin</td>
<td>37.7</td>
<td>35.2</td>
<td>36.8</td>
</tr>
<tr>
<td>Snout to A fin</td>
<td>57</td>
<td>58</td>
<td>57</td>
</tr>
</tbody>
</table>


Only the most anterior of the anal rays is simple and unarticulated (a spine), the second being both branched and articulate. The same also holds good of the second dorsal fin.

![Fig. 33. Lophogobius pallidus.](image-url)

About 25–27 scales in the lateral line, and about 9 scales in a transverse series upwards and forwards from the origin of anal fin to the base of the dorsal. Scales absent from the entire head, from the nape dorsally and anteriorly to a set of oblique lines from the origin of dorsal fin towards the middle of the upper margins of the operculae on each side, and from the throat and lower parts anterior to the equally naked bases of the paired fins.

A sharp, but very low medio-dorsal crest, its height only about one-fourth of the diameter of the eyes, or less, extends from above the posterior margins of the eyes directly to the first dorsal fin, which it joins without interruption at the front of the first spine.

Body and fins generally very pale. Two or three horizontal rows of oval, perfectly pigment-free spots can be discovered on the membranes of the two dorsal fins by the aid of a lens, but the general color of the fins is too pale to
make these spots easily recognizable to the naked eye. A lens also shows a
very faint, and apparently quite uniform pigmentation also on the other fins.
There is a medio-dorsal series of 9 very definitely arranged dusky spots, which
do not seem to vary in numbers or arrangement. There are 3 of the spots across
the nuchal crest anterior to the first dorsal fin, 2 half spots on each side along
the base of the latter, 1 at the origin of second dorsal, 2 more along its base,
1 at its posterior end, and 3 on the caudal peduncle. Each shoulder carries a
small, almost black, squarish spot with an apparently very characteristic, cir-
cular, pale indentation in its upper margin. A less regular series of fainter spots
extends horizontally backwards from the shoulder dot on each side, without
following the curvature of the back, thus approaching the mediadorsal series
on the caudal peduncle to such an extent that its spots become fused with
those of the latter. Between the shoulder dot and the caudal peduncle the upper
lateral series contains about 5–9 spots. A lower lateral series of dusky spots is
finally found between the base of pectoral fin and the lower part of the base of
caudal, containing altogether about 8–9 spots of which the posterior ones may
be rather indistinct.

Teeth in bands in the jaws. Minute denticles in the roof of the mouth, in
the region of the vomer and palatines, but not attached to the bones.

In addition to the specimens obtained by the third oceanographic expedition
of the “Pawnee,” those from the first expedition, formerly recorded as L.
cyprinoides (Breder 1927, p. 83), should be referred to this species.

Type specimen No. 2534 B. O. C. Mangrove Channel, Crooked Island, Bahamas.
March 26, 1927.
Paratypes No. 2535 B. O. C. Six specimens from same sample as the type.

Genus *Garmannia* Jordan and Evermann.

Key to the Atlantic species.

Color light oliveaceous. 1 ............ *G. hemigemma* Eigenmann and Eigenmann.
II. D. VI + 12½. A. 10½. Maxillary reaching to below the posterior margin of
the lens. Color purplish black. 1 ............ *G. binghamii* n. sp.
III. D. VII. 12–13 A. 10. "Maxillary extending to below anterior border of eye."
Brownish red .................................................. *G. rubra* Rosen. 2

*Garmannia binghamii*, n. sp.

Total length, 22 mm. Total length without caudal fin, 18.5 mm. Measure-
ments in per cent of the total length without caudal fin: Length of head, 26.
Diameter of eye, 5.5. Length of pectorals, 24. Length of ventrals, 23. Dis-
tance from snout to dorsal fin, 35. Distance from snout to anal fin, 60. Greatest
depth of body, 17.5. Depth of caudal peduncle, 16.

1 Whether the coloration is of taxonomic value or not may be questionable.
2 1911, p. 63 and fig. 1.
D. VI – 12½. A. 10½. Caudal fin with well developed articulated procurent rays particularly dorsally. P. 18. V. I – 5, with a transverse anterior membrane between the spines on each side.

Maxillary only reaching to approximately below the posterior margin of the pupil. Snout short but very high and slightly prominent, giving the anterior end of the head an almost perfectly semicircular profile, with a distinctly ventral mouth. Lower jaw entirely included by the upper. Lips and cheeks very swollen. Interorbital space about equal to diameter of eyes. Gill openings vertical, of approximately the same height as the bases of the pectoral fins, which extend over about one-half, or more, of the entire height of the body.

![Fig. 34. Garmaninia binghami.](image)

The ventrals are inserted immediately behind the pectorals and reach fully to the anal opening. Origin of anal fin slightly behind the origin of second dorsal. Caudal peduncle short and deep. Vertical fins very well developed, high.

The posterior squamation is not limited to the lower parts, but covers almost the entire tail, occupying a region on each side, which begins with the anterior scale of a mediolateral series approximately under the origin of second dorsal fin, expanding dorsally and ventrally towards the tail along almost straight lines, reaching the base of the anal fin at the 7th anal ray. The squamation on the other hand never quite reaches the base of dorsal fin and does not form a medi-dorsal series on the caudal peduncle, leaving, however, only a very narrow strip free on each side of the posterior part of this fin base and in the median of the peduncle. The scales are strongly ctenoid and gradually increase in size towards the ventral parts, where a medioventral series of 4–5 large scales are formed under the caudal peduncle. There are altogether about 6–8 horizontal series on each side, depending upon where they are counted, and about 18 scales in the mediolateral series, which is the longest. Color uniform purplish black.

Type specimen No. 2529 B. O. C. Crooked Island, Bahamas. March 26, 1927. Collected by Mr. Bingham from a sponge.
Suborder DISCOCEPHALI.

Family ECHENEIDIDAE.

Genus Echeneis Linnaeus.

Echeneis naucrates Linnaeus.

Many specimens were collected from sharks caught in inshore waters.

1 specimen No. 2548 B. O. C. Washerwoman, Bahamas. February 28, 1927.
2 specimens No. 2547 and 2455 B. O. C. Green Cay, Bahamas. March 1, 1927.
1 specimen No. 2454 B. O. C. Green Cay, Bahamas. March 12, 1927.

Genus Remora Gill.

Remora remora Linnaeus.

This form was exclusively obtained from sharks caught at the surface well off shore, never in the inshore waters, but is, for convenience, also included in the present report.

1 specimen No. 2451 B. O. C. Station 23, March 14, 1927; N. 24° 29'. W. 77° 29' at surface.
1 specimen No. 2459 B. O. C. Station 27, March 18, 1927. N. 24° 45'. W. 76° 21' at surface.
1 specimen No. 2452 B. O. C. Station 31, March 21, 1927. N. 24° 29'. W. 75° 53' at surface.
1 specimen No. 2450 B. O. C. Station 33, March 22, 1927. N. 24° 11'. W. 75° 37' at surface.

Family BLENNIDAE.

Genus Ophioblennius Gill.

Ophioblennius ferox Beebe and Tee-Van.

The specimen here recorded differs from the type in having only 19, instead of 20, soft rays in the dorsal fin, but is otherwise perfectly concordant with the original description. Length without caudal fin, 43 mm.

1 specimen No. 2558 B. O. C. Edge of Great Bahama Bank. N. 23° 47' 30''. W. 76° 34' 50''. March 9, 1927. By surface light at night.

Family CLINIDAE.

Genus Labrisomus Swainson.

Labrisomus heilneri Nichols 1921, p. 2.
Labrisomus haitiensis Beebe and Tee-Van 1928, p. 232.
? Labrisomus lentiginosus Bean 1906a, p. 30, 1906b, p. 84, fig. 13.
The material now at hand combined with the earlier records seems to indicate quite clearly that the described differences between *L. haitiensis* Beebe and Tee-Van and *L. heilneri* Nichols may be entirely due to the different ontogenetic stages of the investigated specimens, the relative dimension of the eyes showing a very pronounced decline with increasing size as clearly demonstrated in the following table:

<table>
<thead>
<tr>
<th>Species:</th>
<th><em>L. lentiginosus</em></th>
<th><em>L. heilneri</em></th>
<th><em>L. haitiensis</em></th>
<th><em>L. heilneri</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Source:</td>
<td>Bean 1906 a and b</td>
<td>Bingham Oceanographic Collection</td>
<td>Nichols 1921</td>
<td>Beebe and Tee-Van, 1928</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nichols 1921</td>
<td></td>
</tr>
<tr>
<td>Length without caudal fin</td>
<td>112 mm.</td>
<td>63.5 mm.</td>
<td>52 mm.</td>
<td>61 mm.</td>
</tr>
<tr>
<td>Eye in head</td>
<td>4½</td>
<td>4</td>
<td>3½</td>
<td>4</td>
</tr>
<tr>
<td>Scales</td>
<td>. . .</td>
<td>50</td>
<td>50</td>
<td>49</td>
</tr>
</tbody>
</table>

Beebe and Tee-Van in their discussion of *L. haitiensis* seem to have entirely overlooked the measurements recorded by Nichols for the smaller cotype of his species. The decrease in the relative proportions of the eyes is very clearly shown both in the records of Nichols and of Beebe and Tee-Van, on one hand, and in the measurements obtained by the present writer, on the other.

It furthermore seems quite possible that the *L. lentiginosus* described by Bean 1906 from the Bermudas might be fitted into the series here considered. No scale counts are recorded for this species, however, and further investigation of the type specimen will therefore be necessary to determine its proper relationship to the Bahaman forms.

The *L. herminier* of Le Sueur is too inadequately described to be clearly recognizable, but the statement that the scales are “pretty large” might perhaps indicate identity with the species here reported upon rather than with the small-scaled *L. nuchipinnis* of Quoy and Gaimard. The type-specimen, if available, should be reinvestigated to settle this question.

The accompanying table of measurements shows the proportions of the specimens now at hand.
Measurements of Labrisomus heitneri Nichols

<table>
<thead>
<tr>
<th>Total length in mm.</th>
<th>75</th>
<th>62</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length without caudal fin in mm.</td>
<td>63.5</td>
<td>52</td>
</tr>
</tbody>
</table>

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of head</td>
<td>35</td>
<td>33</td>
</tr>
<tr>
<td>Diameter of eyes</td>
<td>8.7</td>
<td>9.5</td>
</tr>
<tr>
<td>Interorbital width</td>
<td>3.1</td>
<td>3.8</td>
</tr>
<tr>
<td>Length of snout</td>
<td>9.5</td>
<td>9.5</td>
</tr>
<tr>
<td>Length of maxillary</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Greatest depth</td>
<td>26</td>
<td>25</td>
</tr>
<tr>
<td>Depth of caudal peduncle</td>
<td>6.5</td>
<td>6.7</td>
</tr>
<tr>
<td>Length of ventrals</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>Length of pectorals</td>
<td>24</td>
<td>27</td>
</tr>
</tbody>
</table>

Dorsal spines and rays: XIX + 10½ XIX + 9½

The specimens have the characteristic coloration of all previous descriptions, with five irregular dusky brownish cross bars on trunk and tail, and with a conspicuous dark spot on each opercle.

1 specimen No. 2620 B. O. C. West Caicos Island. April 3, 1927.
1 specimen No. 2619 B. O. C. Turks Island. April 9–10, 1927.

Genus Acteis Jordan.

Acteis moorei (Evermann and Marsh).

7 specimens No. 2507. From mangrove swamp on Crooked Island, Bahamas, March 26, 1927.

Family Callionymidae.

Genus Callionymus Linnaeus.

While the existence of very pronounced and conspicuous secondary sexual differences among the species of Callionymus occurring in other geographic regions is well known to science, the author has found the descriptions of the western Atlantic forms of this genus deplorably lacking in information on this point. There is, in several cases, not even a record of the sex of the type specimens upon which new species have been based. When we further consider that the recorded collections of these fishes generally seem to have been too scanty to permit any study of the range of individual variations in the various diagnostic characters, we can clearly see that it is at the present time almost impossible to form any definite opinion as to what should or what should not be regarded as constituting a separate species. The points on which a more detailed information seem most obviously needed for our understanding of the taxonomy of the genus are listed below.

1. To what extent and in which species is the production of the rays of the
caudal and first dorsal fins a matter of secondary sexual differentiation, only, and to what extent and in which species can it be regarded as a specific character common to both sexes?

2. To what extent are the coloration and the general shape and proportions of these fishes influenced by secondary sexual differentiation and what limitations should consequently apply to the use of these features for diagnostic purposes?

3. More definite and detailed descriptions of the apparently very characteristic and taxonomically significant spines on the praepercular processes are needed for most forms. As a first contribution on this point the praepercular processes of the three species now at hand are represented in the accompanying diagram.

4. Great care should be taken to establish on a taxonomically sound basis the amount of individual variations in regard to the numbers of dorsal and anal spines and rays occurring among specimens of unquestionable specific identity. With the great development of the vertical fins in these fishes and their low total numbers of rays and spines, it would seem reasonable to assume that comparatively small differences in these numbers must be taxonomically significant. This particularly holds good of the numbers of spines in the first dorsal fin. The amount of actual observations which might be referred to in favor of this assumption is, however, as yet quite negligible.

In an endeavour to clarify the situation represented by the existing descriptions, and by the hesitant introduction of a new species below, the following provisional key to the western Atlantic species has been compiled.


A. Praepercular process ("spine") armed with about 9 spines, 8 on its posterior edge, and one antrorse spine at the base of its exterior ridge. Caudal fin not filamentous................................. C. bairdi Jordan.
B. Pteraopercular process with a bifid, dorsal, upwards directed spine at its end (see fig. 35, right). Caudal with produced rays.

*C. himantophorus* Goode and Bean.

C. Pteraopercular process with three decurved spines above and one straight, antorise spine below (see fig. 35, left). Caudal without produced rays.

*C. boecki* Metzelaar

(See page 132).


(nee *C. pauciradiatus* Metzelaar 1919, p. 149, see below).

B. Pteraopercular process terminating in an acute point, but with only two spines above (see fig. 35, centre).


2. Spines on pteraopercular process (see fig. 35, centre) directed upwards and backwards (in relation to the axis of the body). D. IV + 7. A. 5. Ventral fins longer than pectorals (in \(\sigma\)). Rays of first dorsal fin in the male reaching to the base of caudal fin, which has (also in \(\sigma\)) a pointed posterior outline. .................. *C. dubiosus*, n. sp.

See below.


**Callionymus dubiosus**, n. sp.

Total length, 40 mm. Length without caudal fin, 28 mm. Proportions in per cent of the total length without caudal fin: Greatest depth of body, 18. Greatest width of body, 22. Snout to base of pectoral fin (head), 39. Snout to end of pteraopercular process, 32. Snout to origin of first dorsal fin, 29. Snout to base of ventrals, 29. Snout to origin of anal fin, 55. Length of caudal

\(^1\) Sex not recorded by Dr. Barbour, but specimens with a short first dorsal fin are also mentioned in his description.

\(^2\) Our knowledge about individual variations among these fishes is not sufficient to justify the identification of the specimens recorded by Metzelaar as having only 3 spines altogether on the pteraopercular process, two pointing upwards and the last one backwards, with the species described by Gill as having 3 spines above and one in the termination of the said process. Nor do we on the other hand know enough to decide whether Metzelaar's material can be considered specifically distinct or whether it should be identified with *C. dubiosus* or *C. bermudarum*, or whether indeed any of these forms are truly distinct in nature. The problem in this case particularly hinges upon the taxonomic value of the vertical fin counts, although some other features are also to be considered.


Pectorals shorter than the ventrals, but inserted farther back so their tips reach beyond the ventral tips. Both pectorals and ventrals reaching well beyond the origin of anal fin, which is approximately opposite the anterior end of second dorsal. Rays of first dorsal greatly produced, filiform, decreasing somewhat in length from the first ray backwards, but all reaching fully to the base of caudal fin or beyond (first to third ray beyond). Second dorsal high, the posterior corner produced and extending somewhat beyond the base of caudal fin, when laid down. Posterior anal rays barely reaching to the base of the anterior procurent caudal ray. Caudal fin very long, pointed, but without filamentous rays.

Eyes large, interorbital space very narrow, only about 0.5 mm. wide. The maxillaries do not reach to the eyes. Praemaxillaries very protractile. Snout slightly longer than the horizontal diameter of the eyes.

The general proportions of the head and body will be sufficiently apparent from the above recorded measurements.

Coloration gray, punctuated by many small, rounded, darker dots in a regularly symmetrical arrangement on the two sides, and by two or three short dusky bands across the back, one through the posterior part of the base of first dorsal, one approximately through the middle of second dorsal and a much fainter one at the end of the latter fin. Sides of the body with about four, less regular, dusky, transverse spots. Two dusky vertical bars under each eye, each bar including 2 small black spots (large single chromatophores ?), in addition to a condensation of finer pigmentation. Ventrals and anal dusky. The other fins lighter. All fins with a number of black dots arranged in rather irregular
series, transversely on the caudal and paired fins, horizontally on dorsal and anal. The produced rays of first dorsal fin with dark tips.

Praeopercular process with two spines above and posteriorly ending in a sharp point, as shown in figure 35, centre.

The type specimen is a male.

Type No. 2531 B. O. C. Cat Island, Bahamas. March 21, 1927.

**Callionymus boekei** Metzelaar.

*Callionymus boekei* Metzelaar 1919, p. 149.

*Callionymus sancti eustatii* Metzelaar 1919, p. 150.

A small specimen, measuring 40 mm. with caudal fin, 38 mm. without, is referred to Metzelaar’s species particularly on the strength of its perfect concordance with the descriptions of the latter in regard to the development of the hooks on the praepercular spine. These structures are shown as figure A in the accompanying diagram. The praepercular spine itself ends bluntly, but carries on its upper surface 3 strongly developed, slightly decurved hooks, and on its lower surface a straight, pointed projection (spine) directed forwards at a sharp angle with the axis of the praepercular spine itself.

The specimen at hand is a mature female, with apparently ripe eggs. The fin formulae differ slightly from those given by Metzelaar inasmuch as there are only 8, instead of 9, anal rays and 9, instead of 10, rays in the second dorsal fin, but these differences must be considered quite insignificant in view of the otherwise perfect agreement with the descriptions, particularly in point of the peculiarly modified armature of the praepercular spine, a feature which the author is inclined to regard as of great taxonomic value for the definition of the species.

The differences between the dorsal views of the heads in *C. boekei* and in *C. sancti eustatii* are probably entirely due to different states of contraction in the opercular musculature of the two specimens compared, connected with the expansion or compression of the gill cavity. The other differences apparent from the figures of the two species are, on the basis of parallel cases among other species of the same genus, probably entirely explainable by the recorded difference in size and by a possible difference in sex. On the basis of Metzelaar’s explicit statement that the (praec-) “opercular spines” of *C. sancti eustatii* are

1. The actual existence of such differences between the two specimens seem indicated in the figures of the two nominal species (Metzelaar 1919, figs. 46 and 47), the drawing of *C. sancti eustatii* apparently showing an expanded branchiostegal membrane, which can not be seen in the figure of *C. boekei*, in perfect concordance with the described differences in the dorsal views of the heads.

2. Metzelaar unfortunately fails to record the sex of his specimens, but it seems probable from his drawings that the type of *C. sancti eustatii* will prove to represent the female of the species, the type of *C. boekei* representing the male.
“exactly as in C. boekee” the author therefore feels justified in uniting the two nominal species.

As a female the specimen now at hand shows a perfect agreement with the type of C. sancti eustatii.

1 specimen No. 2526 B. O. C. Cat Island, Bahamas. March 21, 1927.

Family BROTULIDAE.

Genus Ogilbia Jordan and Evermann.

Ogilbia cayorum Evermann and Kendall.

In the present specimens the ventral fins reach from two-thirds to four-fifths of the distance from their origin to the vent. Otherwise concordant with the description of the species.

2 specimens No. 2508 B. O. C. Rum Cay, Bahamas. March 26, 1927.

Family CARAPIDAE.

Fierasferiidae of the older literature.

Considerable confusion in the classification of the Carapidae has arisen from the peculiarities of the so-called vexillifer stage in the development of these fishes, which undergo a very striking metamorphosis from larvae to adults. The comparatively great length attained before the metamorphosis is completed (up to 220 mm. or more) has apparently served to prevent a proper recognition of the larval stages as such, and separate genera have time and again been introduced to accommodate intermediate stages in the ontogeny of the fishes here considered.

The vexillifer stage of the Carapidae is characterized by two features. 1. A greatly produced anterior dorsal ray (the vexillum) inserted above the trunk region and equipped with a number of minute lobate organs or appendages. 2. A thin, exenuated filiform caudal appendage, which is simply a continuation of the larval tail containing the posterior parts of the notochord and the spinal chord as well as bloodvessels and rudimentary musculature. During metamorphosis this caudal “appendage” becomes lost, thus causing very considerable changes in the proportions of the fish. According to the available records and specimens it seems that the length of the head in the vexillifer stage is normally contained from 20 to 40 times in the total length inclusive of the caudal appendage, while after metamorphosis the head is only contained from 6 to 11 times in the total length of the fish.

The metamorphosis of Carapus (Fierasfer) has been studied in great detail by Emery (1880) and by Bykowski and Nusbaum (1904 and 1905). According to Emery the loss of the caudal filament of the vexillifer stage follows through a “truncatura,” a throwing off or an accidental severing of the part in question from the persisting tail, and this “truncatura” is assumed to be a normal phe-
nomenon in the process of metamorphosis. Bykowski and Nusbaum, however, were able to show that a process of intensive resorption also takes place in the caudal filament at the later \textit{vezillifer} stages. The latter authors are therefore undoubtedly justified in concluding that total resorption would represent the morphologically normal process of metamorphosis; but, with the even at its fullest development, extremely fragile caudal filament further weakened by a beginning breakdown of its tissues in the later larval stages, as described by Bykowski and Nusbaum, it seems highly probable that the metamorphosis of these parts will, under normal environmental conditions, sooner or later come to an abrupt completion by accidental loss of the yet remaining rudiment of the caudal appendage. The “tronature” described by Emery, might thus perhaps be found to be the ecologically normal finishing step in the ontogeny of the Carapidae, although it has apparently no relationship to definite morphological differentiations other than that of the general weakening of the filament.

Through these discoveries on the development of the European Carapidae the true identity of the young fish \textit{“genera”} P. \textit{Kaup} and \textit{Vezillifer} Gasco with the genus \textit{Carapus} (\textit{Fierasfer}) has already long been recognized, but the literature still retains two nominal genera which are differentiated from the genus \textit{Carapus} solely by the features characteristic of the \textit{vezillifer} stage.

The genus \textit{Helminthodes} was introduced by Gill (1864, footnote on page 208) for \textit{C. (Oxybeles) helminthodes} Bleeker, “distinguished by its very slender form” (Gill), this definition being apparently simply based upon the proportions recorded by Bleeker, according to whom (Naturkund. Tijdschr. Ned. Indie. Vol. 7, p. 163. Batavia 1854) the head is contained about 21 times in the total length of the specimen although the tail is said to be incomplete. These proportions are, as we have seen, quite characteristic of the \textit{vezillifer} stage of \textit{Carapus} and there is thus absolutely no reason for maintaining \textit{Helminthodes} as a separate genus.

A new genus, \textit{Leptoferasfer}, was finally introduced by Meek and Hildebrand (1928-28, p. 964) for a species distinguished by an extremely slender body, a long, filamentous tail, and by a spinous filament inserted at nape. In this definition we thus again recognize all the features characteristic of the \textit{vezillifer} stage, and since no other features are described by which \textit{Leptoferasfer} can be differentiated from larval \textit{Carapus}, the former nominal genus must also be included among the synonyms of the latter.

With the synonymies previously established by other authors for lack of morphological differentiation in the descriptions of the adults, and with the nominal genera for the larval forms included, the synonymy of the genus \textit{Carap-

\footnote{A new name for this genus, \textit{Pirellinus}, has been proposed by Whitley (1928, p. 226), \textit{Helminthodes} being preoccupied by Marsh for a genus of fossil Annelida.}

\footnote{This, according to the illustration, is evidently only partly preserved in the described samples.}
pus, sensu stricto, or, as the author will suggest, the subgenus Carapus, should now read:

Genus Carapus Rafinesque.

Subgenus Carapus.

(Carapus, sensu stricto).


In regard to the genus Jordanicus Gilbert (1905, p. 656) for which distinction is claimed on the basis of an adnate maxillary, the lack of a distinct lower lip and the depression of the head, which is said to be as broad as deep in the type species (Fierasfer umbratilis Jordan and Evermann) it seems advisable to avoid complete separation from the genus Carapus until the status of all previously described species of the latter relative to the definition of the new genus and the actual existence of a sharp division in point of the above mentioned features has been properly established. It is therefore suggested that the genus Jordanicus be provisionally regarded merely as a subgenus of the genus Carapus, sensu lato.

The genus Enchelophilis Müller (Sitzungsber. Ak. Wiss. Berlin, 1843, p. 153) is evidently very closely related to Carapus, differing only in the complete lack of pectoral fins which can not be regarded as a phylogenetically very significant feature in view of the greatly reduced state in which these fins are usually also found in the genus Carapus. It does, in fact, seem rather questionable to the author whether a distinction based upon this feature alone, unsupported by more significant morphological differences, really guarantees a natural subdivision of the species. Further anatomical comparisons between the genera Carapus and Enchelophilis seem highly desirable.

The genus Rhizoiketicus Vaillant (Compt. Rend. Acad. Paris, vol. 117, p. 745, 1893) is distinguished from the other genera of the Carapidae by the presence of small imbedded scales.

Carapus sp. juv.

While still retaining their caudal filament the three specimens obtained during the third oceanographic expedition of the “Pawnee” have all lost their vexillum.
On account of their juvenile proportions the author has found it impossible to make any definite identification. Total lengths, 170–180 mm.

3 specimens No. 2612 B. O. C. Green Cay, Bahamas. By the surface light at night. February 27, 1927.

Suborder XENOPTERYGII.

Family GOBIESOCIDAE.

Genus Arbacioides Jordan and Evermann.

Arbacioides rupestris (Poey).

Two small specimens collected in a rock pool on Green Cay show perfect concordance with the current descriptions of A. rupestris in coloration and proportions. The six oval, or rather diamond-shaped, dark spots on the sides of the back are particularly clearly shown in one of the specimens which also has the vertical white, respectively dusky cross bars on the sides (11 in number) most distinctly developed. Both specimens, however, give the fin counts of only 6 dorsal and 6 anal rays, but since a specimen with 6 anal rays has already been recorded by Beebe and Tee-Van (1928, p. 252) the feature can only be regarded as evidence of individual variations. The species as a whole must therefore be defined as having 6 or 7 dorsal and the same numbers of anal rays.

2 specimens No. 2611 B. O. C. From rock pools on Green Cay. March 13, 1927.

Suborder SQUAMIPENNES.

Family CHAETODONTIDAE.

Genus Chaetodon Linnaeus,

Chaetodon capistratus Linnaeus.

1 specimen No. 2337 B. O. C. Crooked Island, Bahamas. March 26, 1927.

Genus Pomacanthus Lacépède.

Pomacanthus arcuatus (Linnaeus).

Commonly caught during the expedition. None preserved.

Genus Angelfish Jordan and Evermann.

Angelichthys ciliaris (Linnaeus).

Commonly caught. None preserved.

Genus Holacanthus Lacépède.

Holacanthus tricolor (Bloch).

Observed only once during the entire expedition. At Turks Island. None preserved.
Family **ACANTHURIDAE.**

Genus **Acanthurus** Forskal.

**Acanthurus pawnee** (Breder).

*Hepatus pawnee* Breder 1927, p. 73.

If the characters (squamation, etc.) of this species (and *A. elegans* Garman) should not be of a juvenile nature and do not change into adult features more similar to those of the other forms of *Acanthurus*, *A. pawnee* undoubtedly merits to rank as the type of a separate genus. The species is so far only known from very small specimens, however, and is therefore provisionally retained in the genus *Acanthurus*, pending osteological and histological investigations of the material at hand.

Perfectly transparent in life, but for a slightly silvery sheen of the peritoneum. Many small specimens No. 2559 B. O. C. Nassau, Bahamas. February 25, 1927.

**Acanthurus coeruleus** Bloch and Schneider.

Very common.

1 specimen No. 2342 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

**Acanthurus bahianus** Castelnau.

Very common.

3 specimens No. 2305 B. O. C. Rum Cay, Bahamas. March 26, 1927.

1 specimen No. 2347 B. O. C. West Caicos Island. April 7, 1927.

**Acanthurus helioides** Barbour?

*Teuthis helioides* Barbour 1905, p. 127 and pl. 3.

While exploring a narrow mangrove channel on Crooked Island in a small glass-bottom skiff, the author discovered a very brilliantly yellow, deep-bodied and compressed fish hiding along the brinks. By baiting and keeping absolutely quiet we succeeded in luring the fish into open water even within a couple of feet, only, from the skiff, and were thus able to observe the specimen in considerable detail and definitely to establish its identity as a form of *Acanthurus*, quite typical in its general morphological appearance and conclusively identified by the clearly visible caudal spines, one on each side. All attempts at catching the specimen failed, however, and the incident would scarcely have been worthy of mention but for the fact that a brilliantly yellow surgeon fish has already been described from the Bermudas by Dr. Barbour in 1905, under the name of *A. helioides*, and it therefore seems very probable that this may have been the form observed by the author at Crooked Island, Bahamas.¹

¹The writer has been informed that a yellow surgeon fish has also been observed in the Bahaman waters by J.T. Nichols, of the American Museum of Natural History, also in this case, however, without being captured.
Order **PLECTOGNATHII.**

Family **MONACANTHIDAE.**

Genus **Monacanthus** Cuvier.

**Monacanthus tuckeri** Bean (1906, p. 33).

It is notable that most of the specimens preserved in the Bingham Oceanographic Collection show rudiments of a second dorsal spine behind the first. The specimens obtained during the third expedition of the "Pawnee" are all quite small.

4 specimens No. 2326 B. O. C. Crooked Island, Bahamas. March 26, 1927.
6 specimens No. 2372 B. O. C. Hogsty Reef, Bahamas. April 1, 1927.

**Monacanthus ciliatus** (Mitchill).

3 specimens No. 2327 B. O. C. Crooked Island, Bahamas. March 26, 1927.

Genus **Stephanolepis** Gill.

**Stephanolepis hispidus** (Linnaeus).

12 specimens No. 2328 B. O. C. Crooked Island, Bahamas. March 26, 1927.
1 specimen No. 2341 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

Genus **Cantherines** Swainson.

**Cantherines pullus** (Ranzani).

1 specimen No. 2453 B. O. C. Crooked Island, Bahamas. March 26, 1927.

Genus **Pseudomonacanthus** Bleeker.

**Pseudomonacanthus amphioxys** (Cope).

Between the anterior and the posterior main series of spines on each side of the first dorsal spine there are three to four additional series of minute spinules not mentioned in previous descriptions of the species. The spinules of the anterior median series are of the same magnitude as those of the just mentioned lateral series. The development of both spines and spinules is very variable, but their arrangement and relative sizes are the same in both of the specimens now at hand. The specimen obtained in 1927 shows five longitudinal series of widely interspaced small dusky dots in a very regular arrangement on a brownish-olive background. Similar dots are faintly indicated in the larger specimen collected in 1925 (see Breder 1927, p. 78). The following table may contribute to the definition of this little known form:
Fig. 37. *Pseudomonacanthus amphioxys.*

Fig. 38. *Pseudomonacanthus amphioxys.* Lateral view of dorsal spine, above. Semilateral view (left) and ventral view (right) of ventral spine, below.
MEASUREMENTS OF Pseudomonacanthus amphioxys Cope

<table>
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<tr>
<th>Total length in mm.</th>
<th>58</th>
<th>73</th>
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<td>Length without caudal fin in mm.</td>
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<td>59</td>
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<th>Length of head (to end of skull)</th>
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<th>44.0</th>
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<tr>
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<td>per cent</td>
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<td>32.0</td>
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<tr>
<td>Diameter of eyes</td>
<td>of the</td>
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<td>27.0</td>
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<td>Greatest depth</td>
<td>total</td>
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<td>10.0</td>
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<tr>
<td>Depth of caudal peduncle</td>
<td>length</td>
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<td>54.0</td>
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<tr>
<td>Snout to soft dorsal fin</td>
<td>without</td>
<td>11.5</td>
<td>11.0</td>
</tr>
<tr>
<td>Snout to anal fin</td>
<td>caudal</td>
<td>63.0</td>
<td>64.0</td>
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<tr>
<td>Dorsal spine</td>
<td>fin</td>
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<tr>
<td>Base of soft dorsal fin</td>
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<td>30.0</td>
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</tr>
<tr>
<td>Base of anal fin</td>
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<td>13.5</td>
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<tr>
<td>Rays in anal fin</td>
<td></td>
<td>35</td>
<td>34</td>
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</table>

1 specimen No. 2621 B. O. C. West Caicos Island. April 2–7, 1927.

Family OSTRACIIDAE.

Genus Lactophrys Swainson.

Lactophrys triguerter (Linnaeus).

This species was found to be very common at Turks Island but was not obtained in the other localities visited during the third oceanographic expedition of the "Pawnee."

3 specimens Nos. 2398 and 2448 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

Lactophrys bicaudalis (Linnaeus).

1 specimen No. 2397 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.

Lactophrys trigonus (Linnaeus).

Fairly common throughout the Bahamas.

2 specimens No. 2446 B. O. C. Hawks Nest, Turks Island.

Lactophrys tricornis (Linnaeus).

Common on sandy bottom, particularly among the eel-grass, throughout the region visited during the third expedition of the "Pawnee."

1 specimen No. 2362 B. O. C. Cat Island, Bahamas. March 21, 1927.
1 specimen No. 2449 B. O. C. Hogsty Reef, Bahamas. April 1, 1927.
3 specimens No. 2447 B. O. C. Hawks Nest, Turks Island. April 9–10, 1927.
Family **TETRAODONTIDAE**.

Genus **Tetraodon** Linnaeus.

The collection contains a considerable number of juvenile specimens as well as one adult which can not be reliably determined without more extensive investigation of individual variations than the available material will permit. The larger specimen was preserved on account of its perfect smoothness to the touch. Inspection, however, reveals the bony dermal spines to be present but in a greatly reduced or abraded stage. The author does not feel confident that the armature of these forms may not be subject to seasonal or ontogenetic changes correlated with sex or other biological phenomena. In the absence of any definite information on this point and also in regard to the range of individual variations for the various species, it has been deemed advisable not to introduce any new species or to render definite identifications until circumstances may permit a more exhaustive investigation of the entire group.

Genus **Canthigaster** Swainson.

**Canthigaster rostratus** (Bloch).

Common among eel-grass on sandy bottom.

5 specimens No. 2332 B. O. C. Crooked Island, Bahamas. March 26, 1927.
1 specimen No. 2373 B. O. C. Hogsty Reef, Bahamas. April 1, 1927.
3 specimens No. 2346 B. O. C. West Caicos Island. April 7, 1927.

Order **HETEROSOMATA**.

Family **BOTHIDAE**.

Genus **Platophrys** Swainson.

**Platophrys ocellatus** (Agassiz).

10 specimens No. 2363 B. O. C. Cat Island, Bahamas. March 21, 1927.

**Platophrys lunatus** (Linnaeus).

3 specimens No. 2364 B. O. C. Cat Island, Bahamas. March 21, 1927.

**Platophrys maculifer** (Poey).

3 specimens No. 2350 B. O. C. West Caicos Island. April 7, 1927.

SYNOPSIS OF CONTENTS AND CONCLUSIONS.

1. The classification of the species referred to the genus *Saurida* is discussed and suggestions are made for a revision, pp. 4–8.
2. A key to the western Atlantic eels of the genus *Myrophis* is given and three new species described, pp. 8–14.
3. The family Stilbiscidae is introduced to replace Anguillichthyidae Mowbray,
Anguillichthys bahamensis Mowbray being found to belong to the genus Stilbiscus Jordan and Bollman, pp. 14–15.

4. Suggestions for revision of the western Atlantic flying fishes of the genus Cypselurus are rendered, pp. 20–27.

5. The classification of the Syngnathid genera Corythoichthys Kaup, BHanotia Hora and Bhanotichthys n. gen. is discussed and a key to the western Atlantic species of Corythoichthys is given, pp. 27–31.

6. A tentative revision of the Atlantic North and Middle American species of the genus Holocentrus is given, pp. 34–38.

7. Late ontogenetic changes in the cephalic armature of Plectrypops are described. Holocentrus exasperatus Breder is found to represent a juvenile stage of Plectrypops retrospinus Guichenot, pp. 38–39.

8. Inclusion of the genera Hepteria Jordan and Hubbs and Atherinomorus Fowler in Atherina Linnaeus is proposed and discussed, pp. 40–41.


10. A generic revision of the family Gerridae in western Atlantic waters is rendered, with new definitions of the genera Xyotaema, Diaopterus and Eucinostomus based upon the features of the swimbladder as well as those of the anterior interhaemal bone. The current definitions based upon the morphology of the latter part alone are found to have been misleading and partly in direct disagreement with the true anatomical structures of the investigated species. Gerres havana Nichols and Uluaena lefroyi Goode are both included in the revised genus Eucinostomus. Eucinostomus meeki Eigenmann is synonymised with E. (“Uleaena”) lefroyi Goode, pp. 61–66.

11. An extensive discussion and comparison of the available western Atlantic forms of the genus Pomacentrus is rendered under the provisional heading of P. fuscus, sensu lato, and suggestions are made for taxonomic subdivisions to be attempted by future investigations, pp. 67–83.

12. Late ontogenetic changes in various species of razor fish are discussed in detail and a tendency to change from a Novaculichthys-like form in early life towards the general appearance of Xyrichthys in the later stages is shown. The taxonomic separation of the two genera is found confusing and impracticable and Novaculichthys is therefore included among the synonyms of Xyrichthys, pp. 87–97.

13. The caudal squamation and caudal fin form of the Scaridae are discussed as aids in the classification of these fishes, with illustrations and tables, pp. 97–107.

14. The western Atlantic forms of the genus Pseudoscarus are discussed in detail and the difficulties met with in an attempt to differentiate more than one species are pointed out, pp. 107–115.

15. The relationships and possible identities of Labriscus heilneri Nichols, L. hatiensis Beebe and Tee-Van, L. lentiginosus Bean, and L. hermitier Le Sueur are discussed, pp. 126–128.

16. Keys to the Atlantic North and Middle American species of the following genera are rendered (in addition to the keys already specified under points 2, 5 and 6, above):

   - Genus Scorpaenodes, p. 115.
   - Genus Garmaniida, p. 124.
   - Genus Callionymus, pp. 128–130.
17. The classification of the family Carapidae (PierASFeridae) is discussed and synonymsies for the various genera suggested, pp. 133–136.

18. The following species not specially mentioned above are partly redescribed, or discussed at greater length, or illustrated:

- *Saurida suspicio* Breder, p. 7.
- *Myrophis platyrhyncus* Breder, p. 10 (table).
- *Holocentrus tortugae* Bean, p. 36.
- *Atherina harringtonensis* areae Jordan and Gilbert, p. 41–42.
- *Atherina stipes* Müller and Troschel, p. 41–42.
- *† Mugil cephalus* Linnaeus, p. 42.
- *Decapterus macarellus* (Cuvier and Valenciennes), p. 46.
- *Amia glomerensis* Mowbray, p. 47.
- *Amia pigmentarius* Poey, p. 48.
- *Cephalopholis fulvus* Linnaeus, p. 49.
- *Haemulon carbonarium* Poey, p. 55.
- *Scarus croicensis* Bloch, p. 105.
- *Scarus vetula* Bloch and Schneider, p. 105.
- *Scarus punctulatus* Cuvier and Valenciennes, p. 105.
- *Sparisoma radians* (Cuvier and Valenciennes), p. 106.
- *Sparisoma flavescens* (Bloch and Schneider), p. 106.
- *Scorpaenodes russelli* Beebe and Tee-Van, p. 118.
- *Callionymus boeki* Metzelaar, p. 132.
- *Pseudomonacanthus amphioxys* Cope, p. 138.

19. Complete redescriptions are rendered for the following five species:

- *Tylosurus ardeo* Cuvier and Valenciennes, p. 18.
- *Tylosurus notatus* Poey, p. 19.
- *† Kyphosus incisor* Cuvier and Valenciennes, p. 66.
- *Yrlichthys venustus* Poey, p. 93.
- *Scarus acutus* Poey, p. 102.

20. The following new family, genera, species and subspecies are introduced:

- Family Stilbiididae (for Anguillichthyidae Mowbray)
- Genus *Bhanastichthys* (Syngnathidae), p. 27.
- Genus *Amphiekturus* (Syngnathidae), p. 31.

New Species:

- *Myrophis microps*, p. 11.
Myrophis dolichorhynchus, p. 13.
Uropterygius acutus, p. 16.
Corythoichthys brederi, p. 30.
Amphelikurus brachyrhynchus, p. 32.
Scorpaenodes triacanthus, p. 115.
Gobius ebrinus, p. 119.
Lophogobius pallidus, p. 121.
Garmannia binghami, p. 124.
Callionymus dubius, p. 130.
New Subspecies:
Holichoeres iridescens torquatus, p. 84.

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