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The Species of *Bathystoma* (Pisces, Haemulonidae).

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The genus *Bathystoma*, first established by Scudder (*Bull. Mus. Comp. Zool.*, 1:12, 1863), differs from *Haemulon* only in normally having 13 dorsal spines, instead of 12. In other characters the two genera essentially agree. As shown in Table III, of 166 specimens of *Bathystoma* examined only 2 variants have 12 spines. In contrast, 62 specimens examined representing 5 species of *Haemulon*, namely, *plumieri*, *sciurus*, *parra*, *macrostomum* and *flavolineatum*, have 12 spines. Therefore, this difference seems sufficiently constant to be used as a generic or subgeneric character.

Jordan and Swain (*Proc. U. S. Nat. Mus.*, 7:308-313, 1884) revised the species of *Bathystoma* which they included in *Haemulon*, used in a broad sense. They recognized three species, as follows, with the geographic distribution as determined by them: *rimator*, North Carolina to Trinidad; *aurolineatum*, Florida Keys to Cuba; *quadrilineatum*, Bermudas to Brazil. Later, Jordan and Fesler (*Rep. U. S. Comm. Fish.*, 17:477-79, 1893) designated the third species *striatum*, instead of *quadrilineatum*; this substitution being a necessary nomenclatorial emendation in their opinion. They also give the distribution of *aurolineatum* as "Florida Keys to Brazil," the latter and San Domingo being the two localities given in the original description. Still later, Jordan and Evermann (*Rep. U. S. Comm. Fish.*, 21:385, 1896) treated *Bathystoma* as an independent genus.

According to the revisers mentioned, therefore, *Bathystoma* comprises three synpatric species. Later authors have followed this conclusion (using the amended nomenclature as noted above), and as occasion required, some of them recorded three species from the same locality, distinguishing *striatum* by the higher scale count and *rimator* from *aurolineatum* by its deeper body, as was done by Jordan and Swain. The data determined in the investigation here recorded prove that this treatment is in error. *Bathystoma* comprises only two known synpatric species, *aurolineatum* and *striatum*, and not more than two occur at any given place. One of these species, *aurolineatum*, differs markedly in body depth with the local populations; but there is no evidence of a bimodal frequency distribution in that character in

any given locality. The local populations are roughly divisible by body depth into three major groups which, for taxonomic purposes, may be treated as three allopatric subspecies. One subspecies, *aurolineatum*, occurs in the West Indies and South and Central America. All specimens examined by me from the coast of the United States belong to only one species, *aurolineatum*, sensu lato. The other species, *striatum*, might possibly occur in the Florida Keys, but this remains to be proved. The composite U. S. population may be designated as a distinct subspecies, *rimator*, which is confined to the coast of the United States. The Bermuda population constitutes a third subspecies, *angustum*, which is formally established below.

I am not satisfied that the nomenclature currently applied to the species (or subspecies) of *Bathystoma* is correct. For instance, the body depth given by Jordan and Swain (above citation), as determined by Sauvage, for the type of *aurolineatum* applies more nearly, judged by my data, to that species which is designated currently by authors, and in this paper, as *striatum*. Also, the locality of *striatum* is given in the original description as North America. If by "America Septentrionali" Linnaeus meant the coast of the United States, the name *striatum* should replace *rimator*. However, the proper use of these names, and the synonymy of the species, could be determined only by a comparative study of the original material. Pending such a study, I continue to use the nomenclature in the sense it is currently applied.

Bathystoma aurolineatum (Cuvier and Valenciennes), sensu lato.

The frequency distribution of body depth is given in Table I, expressed as a percentage of the standard length, segregated into 6 size groups and by population. The depth differs considerably with size and it also differs with the local populations. The size and population differences indicated apparently are only rough approximations, as I was limited by the available material which to a certain extent determined the grouping of the data as given in the table. The minor population differences especially are indicated in a very limited way. Because of the paucity of speci-

TABLE I.—FREQUENCY DISTRIBUTION OF BODY DEPTH IN *Bathystoma*, EXPRESSED AS A PERCENTAGE OF THE STANDARD LENGTH, SEGREGATED BY SIZE, MINOR POPULATIONS, SUBSPECIES AND SPECIES.

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mens from most restricted localities, the data to a large extent are grouped by major geographic regions. The local samples comprised in the composite groupings exhibited in the table are shown in the next paragraph. A figure following a locality gives the number of specimens examined, and the next figures in parentheses give the range of their standard length.

United States, Miscellaneous: off Albemarle Sound, North Carolina, 3 (88-97); Cape Lookout, N. C., 1 (161); Browns Inlet, N. C., 1 (166); off Cape Fear, N. C., 4 (160-189); Charleston, South Carolina, 12 (124-242); off Savannah, Georgia, 5 (76-183); Fernandina, Florida, 1 (196); New Smyrna, Florida, 1 (134); off Pine Island, Florida, 7 (83-118); Charlotte Harbor, Florida, 2 (136-149); Gasparilla Light, Florida, 5 (41-89); off Choctawhatchee Bay, Florida, 2 (53-55); Pensacola, Florida, 3 (103-108); Galveston, Texas, 1 (165). *Florida Keys*: Biscayne Bay, 1 (71); Big Pine Key, 1 (74); Bahia Honda, 3 (131-135); Boca Grande, 6 (73-117). *Southern Florida*: the Florida Keys as given above, and Key West, 23 (54-171). *Tortugas*, 5 (78-144). The preceding specimens are here referred to the subspecies *rimator*; the following to the subspecies *aurolineatum*. *Hispaniola*: Haiti, 8 (67-143); Samana Bay, Dominican Republic, 5 (141-158). *American Tropical Atlantic*: Includes Hispaniola as stated and the following, Bahamas, 6 (124-172); Cuba, 12 (65-132); Jamaica, 2 (110-123); Puerto Rico, 2 (94-149); St. Thomas, Virgin Islands, 1 (124); St. Lucia, Windward Islands, 3 (86-94); Colon and Porto Bello, Panama, 2 (78-88); Bahia, Recife and Rio de Janeiro, Brazil, 6 (105-155).

To display some minor population differ-

ences indicated by the data, groupings are not the same in all three tables. In Table I "Key West" and "Cuba" are stated separately from "Southern Florida" and "American Tropical Atlantic," respectively, in order to show some apparent minor differences in those two populations. In Table II "Hispaniola" and in Table III "Hispaniola" and "Cuba" are stated separately from the rest of "American Tropical Atlantic" for the same purpose.

Table I shows that the combined sample from the coast of the United States, excepting perhaps the smallest size group and also the Tortugas population, diverges from that of tropical America to a subspecific degree, and it seems appropriate to treat the two major groups of population as two coordinate subspecies, *rimator* with a relatively deep body and *aurolineatum* with a more slender body. The Bermuda population is at the other extreme and should be treated as an independent subspecies.

Within the major groups of populations there also appear to be some population differences of a minor degree. Although the samples examined are not sufficiently extensive to elaborate the minor differences satisfactorily, the following seems tentatively indicated. The southern Florida populations, as compared with the more northern United States populations, average the body somewhat deeper in the smaller specimens; but more slender in the large-size group, overlapping the subspecies *aurolineatum* to a greater extent, especially the Key West population. The Cuba population seems to average a slightly more slender body as compared with the other American tropical populations. (The latter comparison is made for the com-

TABLE II.—FREQUENCY DISTRIBUTION OF THE NUMBER OF SCALES SEGREGATED BY MINOR POPULATION, SUBSPECIES AND SPECIES.

Population	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
<i>aurolineatum</i> sensu lato U. S., Miscellaneous				2	3	3	6	1	7	4	4	2	4	1	1							
Southern Florida		2	3	1	5	1	3	6	4	5	1	1		1								
Tortugas			1		1	1				2												
American Tropical Atl.		2	2	5	2	6	4	4	3		1	2		1								
Hispaniola	1	1	1	2	1	4	2		1													
<i>rimator</i>		2	4	3	9	5	9	7	11	11	5	3	4	2	1							
<i>aurolineatum</i>	1	3	3	7	3	10	6	4	4		1	2		1								
<i>angustum</i>					1	2	4	3	2	1												
<i>striatum</i>																	1	1	1			1

bined size group data as the specimens for each separate size group are too few to draw even tentative conclusions.)

The five specimens examined from Tortugas approach the subspecies *aurolineatum* even more closely than the other southern Florida populations. The two larger specimens fall at the mode of the distribution of that subspecies. It is possible that the study of an adequate sample from Tortugas will show that that population is more appropriately grouped with *aurolineatum* rather than *rimator*. If this contingency proves so, such a rather unexpected population difference will find a parallel in *Bathygobius curacao* (see *Jour. Washington Acad. Sci.*, 37: 278, 1947). However, in the absence of satisfactory proof, the 5 Tortugas specimens are tentatively grouped with *rimator*.

Omitting the two extreme size groups, one at each end, the combined data for the other 4 size groups are given under geographical groupings and the subspecies heading in Table I. In the absence of adequate data for each size group separately, this combination gives a roughly approximate measure of the degree of subspecies divergence.

The combined data for the 4 size groups show to some extent a gradual transition in decreasing body depth from the more northern U. S. localities to the Florida Keys to Key West to Tortugas to Cuba. Hence, the pertinence of separating the populations into two distinct subspecies might be questioned. However, this is rather the general rule in subspecies distinctions. That is, subspecies, as a rule, are not homogeneous entities; but the constituent local populations differ in a minor way and in variable degrees. Omitting the Tortugas sample which is discussed above, there is a slightly but perceptibly abrupt transition between the U. S. populations and those from tropical America and this seems to be the proper geographical boundary to draw between the subspecies.

Differences in the scale, gill raker and fin ray counts, shown in Tables II-III, are of minor degrees, less than subspecies magnitude. The subspecies *angustum* averages low soft dorsal and pectoral counts; while *aurolineatum* averages a somewhat high gill raker count on the lower limb. Other differences are indicated for the minor constituent populations within the subspecies as follows: The southern Florida populations, as compared with the more northern United States populations, average lower scale and gill raker (on upper limb) counts, and a slightly higher pectoral count. The Hispaniola population averages somewhat lower scale and soft dorsal ray counts, and the Cuba population averages a high gill raker count on upper limb and a slightly lower pectoral count, within their subspecies.

The color pattern of the subspecies *aurolineatum* and *rimator* is essentially as that described below for *angustum*. The dark

lines disappear with growth, and most of the smaller specimens have two more dark lines than the partly faded specimens of *angustum* examined, one close to the dorsal contour and another on the head, behind the eye.

***Bathystoma aurolineatum angustum*, new subspecies.**

Depth modally 29 (in specimens 74-113 mm.), varying 28-31. Dorsal rays predominantly 14, very often 15. Pectoral rays with the mode decidedly at 17, varying 16-18.

Specimens examined more or less faded and color pattern rather faint or hardly perceptible; a dark blotch at caudal base moderately marked; with rows of small pearly spots along rows of scales, horizontal below lateral line, about 12, oblique above; each spot at anterior part of exposed portion of scales, their periphery darker colored; often shades reversed, the spot darker, the periphery lighter, resulting in rows of darker spots against a lighter background, forming nearly continuous streaks in gross effect; the latter phase more often present on lower part of body and in the larger specimens; a median dark streak from snout to within a variable distance of caudal blotch, interrupted by eye; a second streak above lateral line on dorsal aspect of snout and interorbital space, continued to end of dorsal fin; traces of streaks present in largest specimens examined.

The color pattern, as judged by these faded specimens, is essentially as in the other two subspecies of *aurolineatum*, except that the dark streaks appear to persist to a larger size. The other two subspecies usually have two more streaks, as noted above; but this seeming difference is possibly due to the faded condition of the specimens.

Holotype:—U. S. N. M. 20178 Bermuda; 127 mm. in standard length, about 160 mm. in total length (caudal broken at end).

Other 29 specimens 74-138 mm. in standard length examined from Bermuda.

This is a highly divergent subspecies. It diverges from the other two subspecies of *aurolineatum*, sensu lato, to a higher degree than the latter diverge from each other. The divergence in body depth, shown by the determined data, is about of species magnitude. However, *angustum* nearly agrees with the other two subspecies in the scale count, color pattern and other characters, and its treatment as a coordinate subspecies seems the best course to take, judged by available evidence. In two characters, body depth and soft dorsal count, *angustum* bridges the depression in the distribution between *striatum* and the other two subspecies of *aurolineatum*.

***Bathystoma striatum* (Linnaeus).**

This species evidently is not as common as *aurolineatum*. Only 4 specimens were found in the National Museum, 3 from Cuba and 1

from Haiti, and these were the only specimens examined during this study.

Typically with 6 longitudinal dark streaks; the uppermost at a little distance below upper contour, beginning on nape and ending before end of spinous part of dorsal; the second on dorsal aspect of snout and interorbital space and continued to end of dorsal; the third short, not continued behind head, converging forward with second on snout; the fourth from upper margin of eye continued backward along lateral line to an area under end of dorsal; fifth median in position, from eye backward, merging with fourth under anterior part of soft dorsal; sixth wider and fainter than others, from pectoral base to within a moderate distance of caudal base; an unpaired streak on midback in front of dorsal; no definite caudal blotch in specimens examined. The streaks are present in the largest specimens examined and possibly do not disappear with growth.

This species, then, has a different color pattern than *aurolineatum*, sensu lato. The streaks occupy somewhat different positions, typically they number 2 more, and they possibly do not disappear with growth. The specimens examined also lack the caudal spot. The structural differences are indicated in the tables. The most divergent character is found in the scale count. The determined data show a slight gap between the two species; but some degree of intergradation may reasonably be expected when more specimens of *striatum* are examined. This species also differs in averaging more gill rakers on the lower limb, fewer anal rays, more pectoral rays, a more slender body and fewer dorsal rays, the degrees of divergence of these overlapping characters perhaps being in the order named. On the whole, it is not difficult to distinguish single specimens of *striatum* from *aurolineatum* sensu lato.



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