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DESCRIPTIONS OF ABYSSAL BENTHIC FISHES FROM THE GULF OF MEXICO

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The fishes reported here were all caught in a single bottom haul made by the personnel of the United States Fish and Wildlife Service research vessel *Oregon* in the Gulf of Mexico at Station 1303, 28° 47' N., 87° 50' W., May 26, 1955, in 1150–1200 fathoms (2104–2194 meters). Some of the specimens have been reported but not described (Grey, 1956). The collection consists of 72 specimens belonging to 7 families, 14 genera, and 17 species. Eleven of the species, including two new forms, have not been known previously from the Gulf of Mexico and of these, seven were also unknown from the western Atlantic. Two of the genera are recorded from the western Atlantic for the first time, *Grimatrocetes* Parr and *Narcetes* Alcock.

Holotypes are deposited in the United States National Museum, other specimens in Chicago Natural History Museum.

Family ALEPOCEPHALIDAE

Alepocephalus productus Gill

Alepocephalus productus Gill, 1883, Proc. U. S. Nat. Mus., 6: 256; Grey, 1956, Fieldiana, Zool., 36: 104 (complete synonymy).

One specimen, standard length 360 mm.

Description.—Dorsal rays 16; anal 17; pectoral 11; ventral 7. Lateral scale count ca. 70. The following measurements are in millimeters, the figures in parentheses representing the per cent of the standard length: Greatest depth 75? (20.8?); length of head 122 (33.9); snout 33 (9.16); orbit 27.5 (7.65); interorbital width 19.5 (5.42); tip of snout to ventral base ca. 187 (ca. 52.0), to dorsal origin ca. 255 (ca. 71.0), to anal origin ca. 257.5 (ca. 71.5); end of anal to

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base of middle caudal rays 62 (17.2); least depth of caudal peduncle 28 (7.8); dorsal base 49 (13.6); anal base 51 (14.2).

Specimen badly damaged around middle of body. Vent probably just in front of anal fin, apparently a large prominent opening. Toothless maxillary reaching a vertical from anterior edge of eye. Lower jaw included, with a small symphyseal knob. Teeth small, uniserial, present on lower jaw, premaxillaries, and palatines. Pseudobranchiae present. Pyloric caecae 13.

Color.—Body brown, head black. Peritoneum and linings of mouth and gill covers black.

Remarks.—The M/V *Oregon* specimen differs from the eastern Atlantic example reported by Koefoed (1927, p. 38) only in having a slightly greater depth, but the damaged state of our specimen leaves its actual depth measurement uncertain. In the type the depth was said to be nearly one-fourth of the total length. In the figure (Goode and Bean, 1895, fig. 46) it is between 4.7 and 4.8 times in the standard length, in the *Oregon* specimen 4.8 times, and in the example reported by Koefoed, 5.75 times. The length of the anal base of the type was only about three-quarters as long as the dorsal base, while in Koefoed's specimen and in the example from the Gulf of Mexico the anal is a millimeter or two longer than the dorsal. The type description stated that the head length is 35.5 per cent of the total length. In the figure it is contained in the standard length almost exactly three times (*Oregon* specimen 2.95, Koefoed's 2.9).

Distribution.—*A. productus* has not been reported before from the Gulf of Mexico. The type was taken off the northern United States coast (ca. 39° N., 70° W.) in 2491 meters and one specimen has been recorded from the eastern Atlantic (ca. 35° N., 8° W.) in 2055 meters.

Grimatrocetes bullisi, new species. Figure 22.

Holotype.—United States National Museum no. 159331, standard length 229 mm.

Paratypes.—Three, standard lengths 183–203 mm.

Description.—Counts are shown in Table 1. The following measurements are in millimeters, those of the holotype given first: Standard length 229, 203, 203, 183; greatest depth 47, 45, 45, 39; head 58.5, 57.5, 57.5, 50; snout 14.4, 12.5, 12.5, 11.5; orbit 20, 17, 20.5, 16; interorbital width 10, 10, 11, 6.5; upper jaw 28.8, 26, 29.5, 23.5; lower jaw 31, 29, 30, 27.5; tip of snout to pectoral base 64, 60, 62, 52, to ventral base 110.5, 99, 99, 89.5, to dorsal origin 134, 120, 114, 108,

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TABLE 1.—Counts and Proportions of *Grimatrocetes bullisi*

	Holotype	Paratypes		
		203	203	183
Standard length.....	229	203	203	183
Dorsal rays.....	17	16	15	15
Anal rays.....	15-16	16	15	16
Pectoral rays.....	12	11	11	12
Ventral rays.....	8	8	8	8
Caudal rays.....	—	—	—	10+9
Lat. line from upper edge gill opening.....	ca. 64	ca. 64	ca. 60	ca. 64
<i>Per cent of standard length</i>				
Depth.....	20.5	22.2	22.2	21.3
Head.....	25.5	28.4	28.4	27.3
Snout.....	6.3	6.16	6.16	6.3
Orbit.....	8.75	8.9	10.1	8.75
Interorbital width.....	4.36	4.9	5.4	3.55
Upper jaw.....	12.6	12.8	14.5	12.8
Lower jaw.....	13.5	14.3	14.8	15.0
Tip of snout				
to pectoral base.....	27.9	29.5	30.5	28.4
to ventral base.....	48.3	48.7	48.7	48.9
to dorsal origin.....	58.6	59.0	56.3	59.0
to anal origin.....	68.6	67.0	69.5	69.0
End of anal to base of middle caudal rays	18.5	17.5	17.8	17.5
Ventral base to anal origin.....	17.0	17.8	16.7	17.4
Least depth of caudal peduncle.....	8.5	8.6	8.6	9.3
Ventral length.....	10.05	—	—	11.5
Pectoral length.....	17.4	19.2	24.1	18.8

to anal origin 157, 136, 141, 126; ventral base to anal origin 39, 36, 34, 32; end of anal to base of middle caudal rays 42.5, 35.5, 36.5, 32; least depth of caudal peduncle 19.5, 21.5, 21.5, 17; length of pectoral fin 40, 39+, 49, 34.5; length of ventral fin 23, —, —, 21.

Body compressed. Greatest depth between pectoral and ventral bases. Origin of dorsal fin nearer base of caudal than tip of snout; last dorsal ray split to base. Anal origin beneath latter half of dorsal fin; last ray split to base. Pectoral fin not quite reaching ventral base in holotype, reaching just to or slightly past it in paratypes. Caudal rays 10+9, with 13 supplementary rays both above and below. Vent close to anal fin; a small anal papilla present on all specimens. Scales all fallen, pockets sometimes clear, about seven scales between lateral line and dorsal fin, about eight between lateral line and ventral bases. Bases of vertical fins fleshy, scaled. Head naked.

Snout short, eye large. Nostrils close together, just in front of eye. Upper jaw reaching a vertical from end of pupil or slightly beyond. Lower jaw relatively shallow, without symphyseal knob. Teeth very small, conical, uniserial in both jaws (including maxillaries), and on

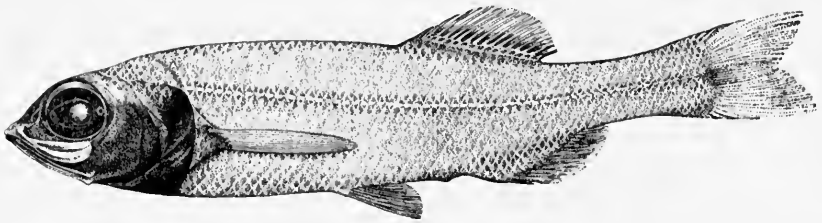


FIG. 22. *Grimatroctes bullisi*, new sp., holotype. Fins partly reconstructed from paratypes.

palatines. Vomer with two teeth on each side. Pseudobranchiae present.

One specimen examined internally, a female 203 mm. in standard length. Pyloric caecae 10. Ovaries filled with eggs of varying size, largest 2.6 mm. in diameter, yellow; smallest 1.5 mm. in diameter, pale.

Color.—Body dark brown. Head darker, almost black. Linings of mouth and gill covers black.

Remarks.—It is with reluctance that a new species is added to the genus *Grimatroctes*. However, although the four species assigned to the genus by Parr (1952, p. 266) are much alike in most respects, distinguishing characters cannot be explained as other than specific at the present time (Table 2). The specimens at hand are very similar to both *G. microlepis* (Günther) and *G. grimaldii* (Zugmayer) from the eastern Atlantic. From *microlepis*, *bullisi* differs only in having somewhat larger scales, a few less pyloric caecae, a slightly deeper body and a slightly shorter snout. The Gulf specimens differ from *grimaldii* in the presence of teeth on the vomer, the number of rays in the dorsal and anal fins, and the longer and relatively more slender caudal peduncle. These two species also differ in the scale count of the lateral line but the scales must be about equal in size as the transverse count is almost identical. *G. bullisi* is perhaps most closely related to *G. danae* (Parr), from the eastern Pacific, but *danae* has a longer head, a larger eye, and a deeper caudal peduncle. *G. zugmayeri* (Fowler), from Celebes, differs from other species in its greater body depth and longer snout.

The new species has been named for Mr. Harvey R. Bullis, Jr., to whom I owe the opportunity of studying this collection of fishes.

The genus *Grimatroctes* has not previously been recorded from the western Atlantic.

TABLE 2.—Counts and Proportions of Species of the Genus *Grimatroctes*
(Taken from the literature where indicated)

	<i>microlepis</i> Günther, 1887	<i>grimaldii</i> Zugmayer, 1911	<i>bullisi</i> new sp.	<i>danae</i> Parr, 1951	<i>zugmayeri</i> Fowler, 1934
Dorsal rays.....	16	13	15-17	16	16 (17?)
Anal rays.....	17	11	15-16	15	13 (14?)
Pectoral rays.....	—	11	11-12	12	12
Ventral rays.....	8	7	8	8	—
Lateral line.....	ca. 70	ca. 75	60-64	60-62	58?
Transverse scale rows...	9/12	8/8	7/8	16	7/7
Gill-rakers.....	24+11	—	23+9, 24+11	23+10	—
Pyloric caecae.....	13	9	10	11	—
Standard length.....	—	145	183-229	161	—
Total length.....	254	—	—	—	235?
	<i>Times in standard length</i>				
Depth.....	5.25	5.0	4.5-4.9	—	4.3
Head.....	3.6	3.5	3.5-3.9	ca. 3.3	3.75
	<i>Times in head</i>				
Snout.....	3.9 ¹	4.1	4.06-4.6	—	ca. 3+
Orbit.....	3.0	2.9	2.8-3.4	—	3.0
Pectoral fin.....	ca. 1.6 ¹	ca. 1.7 ¹	1.2-1.46	—	1.5 ¹

¹ From figure.***Narcetes stomias* (Gilbert). Figure 23.***Bathytroctes stomias* Gilbert, 1890, Proc. U. S. Nat. Mus., 13: 53.*Bathytroctes stomias* Goode and Bean, 1895, Ocean. Ichth., p. 40; Jordan and Evermann, 1896, Bull. U. S. Nat. Mus., 47: 454.*Narcetes stomias* Townsend and Nichols, 1925, Bull. Amer. Mus. Nat. Hist., 52: 10; Grey, 1956, Fieldiana, Zool., 36: 109.*Narcetes pluriserialis* Koefoed, 1927, Rep. Sci. Res. M. Sars No. Atl. Deep-sea Exp. 1910, 4, (1), p. 54.

Two specimens, an adult female, standard length 426 mm., and an adult male, standard length 421 mm.

Description.—Counts and proportions are shown in Table 3. The following measurements are in millimeters, those of the larger specimens given first: Greatest depth 79, 78; length of head 132, 125; snout 35, 34; orbit 21, 21; interorbital width at center of eye 31, 30.5; upper jaw 72.5, 70; tip of snout to ventral base 249, 244, to dorsal origin 277, 284, to vent 300, 300, to anal origin 315, 312; end of anal to base of middle caudal rays 70, 79; least depth of caudal peduncle 34, 32; dorsal base 64.5, 60.5; anal base 45, 39.5.

Greatest depth close behind pectoral base. Anal origin just behind a vertical from middle of dorsal. Vent rather large, close to anal

TABLE 3.—Counts and Proportions of *Narceles stomias*
(Taken from the literature where indicated)

	Koefoed, 1927	Koefoed, 1927	Oregon female	Oregon male	Koefoed, 1927
Dorsal rays.....	18	18	18	17	17
Anal rays.....	15	16	15	15	15
Pectoral rays.....	10	11	11-12?	11	11
Ventral rays.....	9	9	9	9	9
Lateral line.....	60-70	60-70	ca. 55	ca. 55	60-70
Scales above lateral line.....	ca. 100	ca. 100	—	—	ca. 100
Standard length.....	490	430	426	421	408
<i>Per cent of standard length</i>					
Depth.....	19.4	19.7	18.5	18.5	19.0
Head.....	27.6	29.5	31.0	29.7	30.0
Snout.....	7.9	8.8	8.2	8.1	8.9
Orbit.....	4.5	4.4	4.9	5.0	4.4
Interorb. width at center of eye..	6.7	7.2	7.3	7.2	6.6
Upper jaw.....	—	—	17.0	16.6	—
Tip of snout					
to ventral origin.....	55.0	56.0	58.5	58.0	56.0
to dorsal origin.....	63.0	66.0	65.0	67.5	61.6
to vent.....	68.0	69.5	70.5	71.3	67.5
to anal origin.....	70.5	70.2	74.0	74.2	70.0
Dorsal base.....	13.6	13.9	15.1	14.4	17.4
Anal base.....	9.8	10.7	10.5	9.4	12.5
End anal to base middle C rays..	19.8	18.8	16.4	18.8	18.3
Least depth of caudal peduncle..	6.9	7.4	7.9	7.6	8.7

fin, with a minute papilla posteriorly in the male but not in the female. Scales all fallen except a few anteriorly on lateral line and one, firmly attached, above pectoral base. Figure 23 indicates pattern of scale pockets, exact count impossible.

Snout prominent. Posterior nostril a vertical slit in front of eye, anterior one close to it, round. Upper jaw reaching well past eye. Teeth all fixed, pluriserial, present on maxillaries; inner row slightly enlarged in female; all teeth small, but not equal in size, in male. Palatines prominent, teeth similar to those of jaws. Vomer with two teeth on each side. Pseudobranchiae present. Three gill-rakers and one rudiment on upper limb of first gill-arch, one raker at angle, twelve on lower limb. Seven pyloric caecae. Ovaries filled with large yellow eggs, of which the largest measure 3.4 mm. in diameter.

Color.—Body dark brown. Head bluish-black. Peritoneum and linings of mouth and opercles black.

Remarks.—In the absence of comparative material it has been difficult to determine the status of these specimens and those from the eastern Atlantic described by Koefoed (1927, p. 54) under the

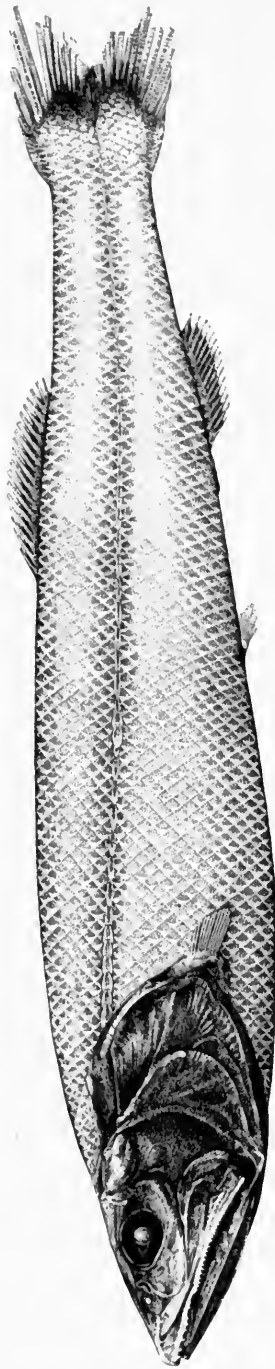


FIG. 23. *Narceetes stomias* (Gilbert). Female; standard length 426 mm.

TABLE 4.—Counts and Proportions of *Narctes stomias*, *N. pluriserialis*, and *N. affinis*

(Taken from the literature where indicated)

	<i>stomias</i>			<i>pluriserialis</i>	<i>affinis</i>
	Koefoed, 1927	Oregon specimens	Gilbert, 1890	Garman, 1899	Lloyd, 1906
Dorsal rays.....	17-18	17, 18	20	19	17
Anal rays.....	15-16	15	16	14	14
Pectoral rays.....	10-11	11	9	11	13
Ventral rays.....	9	9	8	8	10
Lateral line.....	60-70	ca. 55	57	57	73
Scale rows above lat. line.....	ca. 100	—	—	105	100 ¹
Gill-rakers.....	—	3+13	5+13	3+13	—
Branchiostegal rays.....	—	8	—	8	7
Vomerine teeth.....	1-3	2	"single series"	1	—
Total length.....	460-540	—	330-381	432	356
Standard length.....	408-490	421-426	—	—	—
<i>Times in standard length</i>					
Depth.....	5.1-5.3	5.4	5.4	6.3 ¹	6.7 ¹
Head.....	3.3-3.6	3.2-3.3	3.4-3.5	3.3 ¹	3.7 ¹
End anal to base middle caudal rays.....	5.0-5.3	5.3-6.1	—	5.2 ¹	5.0 ¹
Least depth caudal peduncle.....	11.5-14.4	12.5-13.2	—	12.6 ¹	15.0 ¹
<i>Times in head</i>					
Snout.....	3.3-3.4	3.7-3.8	3.4	4.0 ¹	4.0 ¹
Eye.....	6.1-6.8	5.9-6.3	6.2	6.0 ¹	5.7 ¹

¹ From figure.

name *N. pluriserialis*. Table 4 shows the close relationship between *stomias*, *pluriserialis*, and *affinis*. These species also have in common enlarged lateral line scales and the peculiar formation of the snout, described by Gilbert (1890, p. 53) as follows: "Premaxillaries expanded anteriorly to form a triangular projection resembling that of *Labidesthes*, and overlapping the lower jaw." Although there is some difference in counts of lateral line pores, the number of scale rows counted above the lateral line appears to be about the same, as noted by Koefoed (op. cit., p. 55). This count is not available for the type of *N. stomias*, and the exact count in the two Gulf of Mexico specimens is uncertain; it may be less than in other specimens.

These three species can be differentiated from other forms of *Narctes*. They differ from *erimelas* Alcock principally in the position of the anal fin; from *garmani* Fowler in the position of the vent and the length of the maxillary; from *pappenheimi* Fowler in the size of the eye and the length of the maxillary; from *wonderi* Herre in the position of the dorsal fin and the size of the eye; and from *lloydi* Fowler

in the size of the scales, the shape of the jaws, and in various proportions. They are perhaps closest to *lloydi* and *wonderi*.

Garman's *pluriserialis* and Lloyd's *affinis* differ from *stomias* in having a more slender body, but no further characters separate them. The lateral line scales of *affinis* differ from those of the specimens at hand in being smaller and more overlapping anteriorly. *N. stomias* was described as having no enlarged teeth in the jaws but the discovery of a female with the inner row of teeth slightly enlarged and a male without enlarged teeth seems to invalidate this character as a specific distinction. In the original description of *stomias* the dorsal and anal counts were said to be, respectively, III,17 and II,14. Later, Jordan and Evermann (1896, p. 454) gave these counts as 17 and 14.

Except for slight differences in fin ray counts, there is nothing to distinguish Atlantic specimens from the type of *N. stomias*, of which there is unfortunately no figure. Atlantic specimens (Table 3) show some slight variation among themselves in head length, depth, and in the distance from snout to ventral bases, dorsal origin and anal origin. Wider ranges are found in lengths of snout, eye, dorsal and anal bases, and in the length and depth of the caudal peduncle. There is a suggestion that the latter may become more slender with age and that the dorsal base may be relatively shorter in older specimens. There is no distinction between eastern and western Atlantic specimens except in lateral line counts and, perhaps, in the length of the eye and the distance between the snout and the anal fin.

Distribution.—Neither the genus *Narceles* nor the species *N. stomias* has been taken previously in the western Atlantic. In the eastern Atlantic the species has been caught off Morocco in 2055 meters and south of Ireland in 1797 meters. Two specimens are known from the eastern Pacific, the type off the coast of Oregon in 1604 meters and a specimen off southern California in 1968 meters.

Conocara murrayi (Koefoed). Figure 24.

Alepocephalus murrayi Koefoed, 1927, Rep. Sci. Res. M. Sars No. Atl. Deep-sea Exp. 1910, 4, (1), p. 41, pl. 3, fig. 6, text figs. 9, 10.

Conocara murrayi Grey, 1956, Fieldiana, Zool., 36: 115.

One specimen, standard length 157 mm.

Description.—Counts and proportions are shown in Table 5. The following measurements are in millimeters: Greatest depth 28; length of head 58; snout 23; eye 11; interorbital width 12; upper jaw 22.5; lower jaw 28; tip of snout to base of ventrals 85, to dorsal origin 109, to anal origin 99, to vent 94.5; dorsal base 27; anal base 35; end of

TABLE 5.—Counts and Proportions of *Conocara murrayi*
(Taken from the literature where indicated)

	Oregon specimen	Koefoed, 1927		
Dorsal rays	21	19	22	—
Anal rays	27	26	27	—
Pectoral rays	8	8	9	—
Ventral rays	6	5	6	—
Lateral series of scales	90?	85	85	85
Standard length	157	206	242	255
<i>Per cent of standard length</i>				
Depth	21.1	18.5	17.3	18.8
Head	36.9	35.5	34.6	35.7
Snout	14.6	11.6	12.4	10.6
Eye	7.0	9.6	9.1	9.4
Interorbital width	7.65	—	—	—
Upper jaw	14.3	—	—	—
Lower jaw	17.8	—	—	—
Tip of snout				
to ventral base	54.0	54.0	56.6	55.3
to dorsal origin	69.5	73.0	73.5	77.4
to anal origin	63.0	68.5	68.3	72.2
to vent	60.2	61.7	64.5	64.7
Dorsal base	17.7	14.1	14.1	11.4
Anal base	22.3	19.4	17.8	16.9
End anal to base middle caudal rays	13.1	15.3	13.6	13.3
Least depth caudal peduncle (membrane included)	6.4	—	—	—
Least depth caudal peduncle (muscular portion only)	4.75	—	—	—

anal to base of middle caudal rays 20.5; least depth of caudal peduncle (membrane included) 10, same, muscular portion only, 7.5.

Body and tail compressed. Tail semi-transparent below dorsal fin, above anal fin, and above and below on caudal peduncle. Caudal peduncle as described by Koefoed (1927, p. 41) in his smaller specimen: ". . . membranous dorsally and ventrally, and supported there, throughout its major portion, by rays." Vent large, rather prominent, situated just in front of anal. Pectoral and ventral rays broken. Scales all fallen, pockets not clear. Head apparently naked. A narrow scaleless area along edge of opercle, above pectoral fin.

Top of head flat with two low ridges meeting in an angle above snout, as described by Koefoed. Upper jaw scarcely reaching anterior margin of eye. Teeth moderate, curved inward, uniserial, not numerous; present on lower jaw, premaxillaries and palatines; none on maxillaries or vomer.

Color.—Head black, body pale gray. Linings of mouth and gill covers black.

Remarks.—The specimen differs from the types in having a longer snout, smaller eye, longer dorsal and anal bases, more anteriorly placed dorsal and anal fins and a more posteriorly placed vent. The anal fin is also relatively farther in front of the dorsal than in Koefoed's examples. However, except for the size of the eye, in all of



FIG. 24. *Conocara murrayi* (Koefoed).

these characters the *Oregon* specimen is closer proportionately to Koefoed's smallest specimen and it is possible that the dorsal and anal fin bases shorten with age (Table 5). Such a reduction in size would change the relative positions of the origins of these fins as well as the distance between the vent and the anal fin. The *Oregon* fish is obviously a juvenile and since the form and appearance of the dorsal and anal fins suggest the possibility of the growth changes noted above, it seems more likely to be a young example of *murrayi* than a representative of a new species.

The proportionate depth of the caudal peduncle is not a useful character. Koefoed stated (op. cit., p. 42) that in his largest specimen the membranous portions of the peduncle were covered with musculature.

Distribution.—Eastern Atlantic, one specimen off Morocco in 2055 meters and two specimens off the Canary Islands in 2603 meters. Western Atlantic in the Gulf of Mexico (first western Atlantic capture).

Family BATHYPTEROIDAE

Benthosaurus grallator Goode and Bean

Benthosaurus grallator Goode and Bean, 1886, Bull. Mus. Comp. Zool., 12: 168; Grey, 1956, Fieldiana, Zool., 36: 131 (complete synonymy and distribution).

Three specimens, standard lengths 291, 248, 154 mm.

Description.—Counts and proportions are shown in Table 6. The following measurements are in millimeters, the first figure representing the largest specimen: Greatest depth 42.5, 38.5, 20.5; length of head 85.5, 69.5, 44; snout 23, 19, 13; interorbital width 23.5, 18, 11.5;

TABLE 6.—Counts and Proportions of *Benthosaurus grallator*
(Taken from the literature where indicated)

	Koefoed, 1927	Oregon specimen	Goode and Bean, 1895	Koefoed, 1927	Oregon specimen	Nybelin, 1946	Oregon specimen
Dorsal rays.....	13	13	11?	13	13	13	13
Anal rays.....	13	13	12?	13	13	13	13
Pectoral rays.....	9 ¹	10	9 ¹	9 ¹	10	—	10
Ventral rays.....	7 ¹	8	7 ¹	7 ¹	8	—	8
Caudal rays.....	—	12+9	—	—	12+9	—	12+9
Lateral line.....	ca. 60	ca. 52	55	ca. 60	56-57	—	54
Length to tip of upper caudal lobe.....	ca. 407	356	—	320	305	—	194
Standard length.....	346	291	275	267	248	194	154
<i>Per cent of standard length</i>							
Depth.....	14.7	14.6	13.4	13.1	13.3	14.9	13.3
Head.....	28.6	29.4	26.6	26.2	30.3	28.3	28.5
Snout.....	8.7	7.9	6.9	6.75	9.15	8.0	8.45
Interorbital width.....	7.95	8.36	7.3	6.75	8.4	8.0	7.45
Upper jaw.....	20.1	20.0	17.5	18.3	19.0	19.6	19.8
Tip of snout to dorsal origin.....	48.0	45.5	50.0	46.0	49.5	48.0	45.5
to anal origin.....	—	57.5	55.2	55.5	—	57.7	55.2
Tip of mandible to dorsal origin.....	—	47.3	—	—	—	—	47.0
to anal origin.....	—	58.5	—	—	—	—	56.5
End anal to base middle caudal rays.....	30.6	30.2	38.2 ²	35.6 ³	29.8	30.4	29.2
Least depth caudal peduncle.....	7.2	7.2	5.82	6.0	6.66	7.5	6.5
<i>Per cent of peduncle length</i>							
Least depth caudal peduncle.....	23.6	23.9	15.2?	16.8?	22.4	24.6	21.8

¹ Two upper pectoral rays and two outer ventral rays probably counted as one.

² Kanazawa, in litt.

³ Perhaps measured from end of dorsal fin.

upper jaw 58.5, 46, 30.5; tip of mandible to origin of dorsal 137.5, 116.5, 72.5, to origin of anal 170, 135.5, 87; tip of snout to origin of dorsal 132.5, 114, 70, to origin of anal 167, 134, 85; end of anal fin to base of middle caudal rays 88, 75.5, 46; least depth of caudal peduncle 21, 17, 10; length of upper pectoral ray 91, 87 (broken), 60; length of outer ventral rays ca. 466, 330, 220; length of lower caudal rays ca. 423, 306.5, 202.

Last rays of dorsal and anal fins split to base. Two upper pectoral rays closely bound together for the greater part of their length, separate at tips. Two outer ventral rays and two lower caudal rays closely bound together for their full length. Caudal deeply forked, two uppermost rays short, upper lobe larger than lower, exclusive of the prolonged rays. End of lateral line turning up toward upper caudal lobe. A small, broad-based, flat papilla present just behind vent in all three specimens.

Remarks.—Mr. Robert Kanazawa, of the United States National Museum, has kindly examined one of the cotypes of *B. grallator*, USNM no. 35651, and reports (in litt.) that on this specimen also the lateral line at its posterior end turns upward toward the upper caudal lobe, which is larger than the lower lobe (exclusive of the elongated rays). He has counted 12 dorsal rays and 13 anal rays, the last ray of each being split to the base so that they might be counted as 13 and 14. The pectoral count of this specimen is 12, the first two rays minute, the third and fourth bound together but divided at the base. The *Oregon* specimens do not have the two minute upper rays. Ventral rays are 8, the first two bound together and difficult to distinguish. Mr. Kanazawa has also compared the cotype with the photograph of *Skagerakia nilssoni* (Nybelin, 1946, figs. 3, 4) and has found the general appearance to be similar. It is probable that the type specimen is like USNM no. 35651 and that the figure (Goode and Bean, 1895, fig. 73) is somewhat misleading. Goode and Bean (op. cit., p. 63) wrote of no. 35651: "It is well preserved and throws additional light on the external characters of the species."

It thus becomes clear that *Skagerakia* Nybelin is not a valid genus, nor can the species *nilssoni* be maintained when all reported specimens of the genus *Benthosaurus* are critically compared (Table 6). The original diagnosis of the genus needs only to be changed as follows: Ventrals eight-rayed, the two outer rays closely bound together and greatly produced.

A close check of the differences noted by Nybelin (1946, p. 4; 1948, p. 32) between eastern and western Atlantic specimens results in the elimination of most of them, as follows:

(1) Depth of caudal peduncle in relation to its length, measured from end of anal to base of caudal. As shown in Table 6 the *Oregon* specimens in this respect are like those from the eastern Atlantic, while the types seem to have a more slender peduncle. However, Goode and Bean did not state whether they measured the length of the caudal peduncle from the end of the anal fin or from the end of the dorsal. If the latter measurement is used the peduncle length of the eastern Atlantic and *Oregon* examples is 37–40 per cent of the standard length, as in the types.

(2) Length of head. The difference is not great, but in this character all of the *Oregon* specimens are closer to eastern Atlantic examples than to the types.

(3) Scale pockets are visible on the opercles of *Oregon* specimens.

(4) Profile of body, upturned lateral line and larger upper caudal lobe are discussed above.

(5) Dorsal rays. The *Oregon* fishes and one of the types have the same number of rays as those from the eastern Atlantic. These rays may also have been miscounted by Goode and Bean on the figured specimen.

Table 6 shows some discrepancy in depth proportions, but the lesser and greater depths are found in both eastern and western examples. This character, as well as the relative length and depth of the caudal peduncle, may be subject to variation.

Distribution.—Western Atlantic off the northern United States coast and in the Gulf of Mexico (type locality), five specimens caught in 2104–3384 meters. Eastern Atlantic off Morocco and southwest of the Azores, three specimens in 2150–2865 meters.

Bathypterois phenax Parr. Figure 25.

Bathypterois atricolor phenax Parr, 1928, Bull. Bingham Oceanogr. Coll., 3, (3), p. 31.

Bathypterois phenax Grey, 1956, Fieldiana, Zool., 36: 133 (complete synonymy).

Two specimens, standard lengths ca. 133 and 86 mm.

Description.—Counts and proportions are shown in Table 7. The following measurements are in millimeters, the first figure representing the larger specimen: Depth 16, 9.5; head 30, 21; snout 9.5, 6; eye 2.5, 1.5–2; tip of snout to ventral base 50, 32.5, to dorsal origin 52, 34, to anal origin 75, 51.5; end of anal to base of middle caudal rays 41, 27; least depth of caudal peduncle 9, 5.5; longest ventral ray 40.5, 24.5.

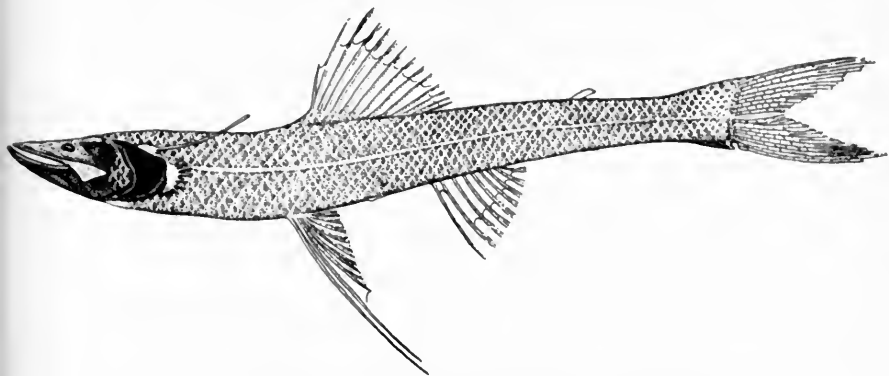


FIG. 25. *Bathypterois phenax* Parr. Standard length ca. 133 mm.

Both specimens with a small, narrow, elongate papilla behind vent. Anal origin just behind a vertical from end of dorsal. Two upper pectoral rays broken off short in larger fish; in smaller specimen extending beyond base of caudal but not as far as its tip, separated at ends. Lower pectoral rays not reaching origin of ventrals in smaller specimen, all pectoral rays broken in larger one. Outer two ventral rays with flattened and rounded, but not enlarged, tips; reaching past anal origin in smaller specimen, to end of anal in larger one. Both caudal lobes rather long and about equal, all rays broken

TABLE 7.—Counts and Proportions of *Bathypterois phenax*
(Taken from the literature where indicated)

	Parr, 1928	Oregon specimen	Parr, 1928	Oregon specimen
Dorsal rays	14	14	13	15
Anal rays	9	9	9	10
Pectoral rays	3+8	3+7	3+8	3+8
Ventral rays	9	9	9	8
Lateral line	50	56-57	51	ca. 54
Standard length	162	ca. 133	123	86

Per cent of standard length

Depth	15.5	12.0	12.5	11.0
Head	24.0	22.5	20.2	24.5
Snout	7.4	7.15	7.3	7.0
Eye	2.2	1.9	2.3	2.1-2.5
Tip of snout				
to ventral base	40.0	37.5	37.5	37.8
to dorsal origin	43.5	39.1	44.0	39.5
to anal origin	61.0	56.4	60.0	60.0
End anal to base middle C. rays	—	30.8	—	31.4
Least depth caudal peduncle	—	6.75	—	6.4
Longest ventral ray	—	30.2	—	28.4

at tips, the lower two longer than others but not enlarged. Caudal notch present.

Teeth minute, in a very narrow band in lower jaw and a slightly wider band in upper jaw. A few minute teeth present on each side of vomer. Smaller specimen with 14 small, soft, transparent flaps projecting outward on each side of outer edge of lower jaw (at first glance these appear to be teeth). A few similar but smaller structures on posterior lower edges of maxillaries. Larger specimen with one or two of these little flaps on posterior edge of lower jaw but none elsewhere. Head of larger specimen somewhat damaged.

Color.—Smaller specimen with body entirely blackish except the pale elongated pectoral rays and prolonged ends of outer ventral rays. Larger specimen partially black or dark brown, probably uniformly dark in fresh state; fins dusky; head and ventrals darker. Peritoneum, inside mouth, and gill covers black.

Distribution.—The species has been known previously only from two specimens taken off the Bahama Islands in 1645–1729 meters.

Family IPNOPIIDAE

Ipnops murrayi Günther

Ipnops murrayi Günther, 1878, Ann. Mag. Nat. Hist., (5), 2: 187; Grey, 1956, Fieldiana, Zool., 36: 136 (complete synonymy and distribution).

One specimen, standard length 112.5 mm.

Description.—Dorsal rays 10; anal 14; pectoral 13; ventral 8; caudal 12+11. Lateral series of scales 52. The following measurements are in millimeters, the figures in parentheses representing per cent of standard length: Total length ca. 135; standard length 112.5; depth 10.5 (9.35); head 24 (21.3); tip of snout to origin of dorsal 36.5 (32.4), to origin of anal 73 (65.0), to base of ventral 29.5 (26.2); end of anal to base of caudal 18 (16.0); least depth of caudal peduncle 4 (3.56).

Color.—In alcohol, black. Mr. Harvey R. Bullis, Jr., who collected the specimen, has written (1955, in litt.) that when fresh the fish was black with some deep blue on the under side of the head and on the belly, while the plates on the head were bright, almost brilliant, yellow.

Family NETTASTOMIDAE

Venefica procera (Goode and Bean)

Nettastoma procerum Goode and Bean, 1883, Bull. Mus. Comp. Zool., 10: 224.
Venefica procera Grey, 1956, Fieldiana, Zool., 36: 141 (complete synonymy).

Three specimens, total lengths about 713, 726 and 748+ mm.

Remarks.—The largest specimen lacks part of the tail and measures 301 mm. to the vent. The smaller specimens are 265.5 and 283 mm. to the vent, this anterior part of the body being 37.2 and 39 per cent of the total length. If the same length (301 mm.) of the largest specimen were 37–39 per cent of the total length, the fish would then have measured between 770 and 810 mm. in length.

Distribution.—The species has not previously been taken in the Gulf of Mexico. In the Atlantic it has been caught in the Caribbean Sea (ca. 16° N., 62° W.) and off the United States coast (33°–34° N.), 326–1183 meters. One specimen is known from the Pacific, in the Celebes Sea, 301 meters.

Family HALOSAURIDAE

Aldrovandia gracilis Goode and Bean

Aldrovandia gracilis Goode and Bean, 1895, Ocean. Ichth., p. 134, fig. 157;
Grey, 1956, Fieldiana, Zool., 36: 154, 320.

Twenty-one specimens, total lengths 267–536 mm.

Description.—The specimens agree well with the original description and figure. Tail long and slender, tapering to a filiform tip, often broken; some specimens with pseudocaudal developed. Ventral bases distinctly in advance of dorsal origin. Scales mostly fallen. Head naked except on cheeks and behind eye. Bones of head thin and transparent; a long bony channel extending below eye from mouth to slightly beyond edge of opercle. Nostrils small, close together, situated just in front of eye, the posterior one larger, the anterior one with a small tube. Teeth small, pointed, in bands on jaws, vomer, and palatines (including a very narrow band on maxillaries). Vomerine bands of teeth separate from one another and from the narrow palatine bands. Pectoral rays 10–11. Upper limb of first gill-arch with two short gill-rakers and a rudiment, lower limb with 6–8 rakers and 2–4 rudiments, the total usually 12+3.

Color.—Trunk and tail fairly uniformly pale with yellowish tinge; head and belly blackish. Isthmus dusky or black, inside of mouth and gill covers black. Pre-oral portion of snout whitish or translucent.

Remarks.—*A. gracilis* is very similar to *A. pallida* but differs in having a more slender body, a shorter pre-oral snout length and more forwardly placed ventral and anal fins. The pectoral fin of *gracilis* is smaller, more delicate, and with fewer rays than that of *pallida*,

and there are also differences in color. Proportionately the two species show some overlap but can be distinguished with certainty by the difference in the relative positions of dorsal and ventral fins. The origins of these fins are much closer together in *A. pallida*. If the per cent of the distance between tip of snout and ventral bases is subtracted from the per cent of the distance between tip of snout and dorsal origin, the difference in *pallida* is found to range only up to 5.6 while in *gracilis* the difference is 6.4 to 11.4.

Distribution.—*A. gracilis* has been taken only in the Gulf of Mexico, in the Caribbean Sea off Guadeloupe Island, and off the United States coast in ca. 42° N., 63° W. Depth range 1380–2615 meters.

***Aldrovandia pallida* Goode and Bean. Figure 26.**

Aldrovandia pallida Goode and Bean, 1895, Ocean. Ichth., p. 135, fig. 158; Grey, 1956, Fieldiana, Zool., 36: 154.

Twenty specimens, total lengths 307.5–512 mm. (twelve females 415+–512 mm.; four males 400+–444+ mm.; and four specimens of undetermined sex, 307.5–459 mm.).

Description.—The specimens agree well with the description and figure of the type. Tail long and slender, broken in some specimens, some with pseudocaudal. Dorsal origin above or close behind a vertical from ventral bases. Scales mostly fallen. Scales on head, and suborbital mucus cavity, as in *A. gracilis*. Nostrils small, close together, situated just in front of eye; anterior nostril of female colorless and with a small, scarcely noticeable tube or flap; anterior nostril of male with a relatively long, prominent, black tube. Teeth as in *A. gracilis*, those on maxillaries minute, even smaller than those of *gracilis*. Gill-rakers as in *gracilis*, with the total usually 11+3. Pectoral rays usually 13, one specimen with 12, three specimens with 14. Ovaries of six largest female specimens with numerous very small yellow eggs.

Color.—Trunk and head pale with a whitish or silvery tinge. Snout somewhat translucent. Under side of head bluish or bluish black, isthmus and top of head blackish. Inside of mouth and opercular linings black, the latter showing through the thin opercular bones. Tail and anal fin brown, darker than trunk, varying somewhat in different specimens. Varying amounts of black or dark brown pigment present on belly between ventral fins and anal fin. Snout in some examples colorless, in others brownish.

Remarks.—Closely related to *A. gracilis* (see above).

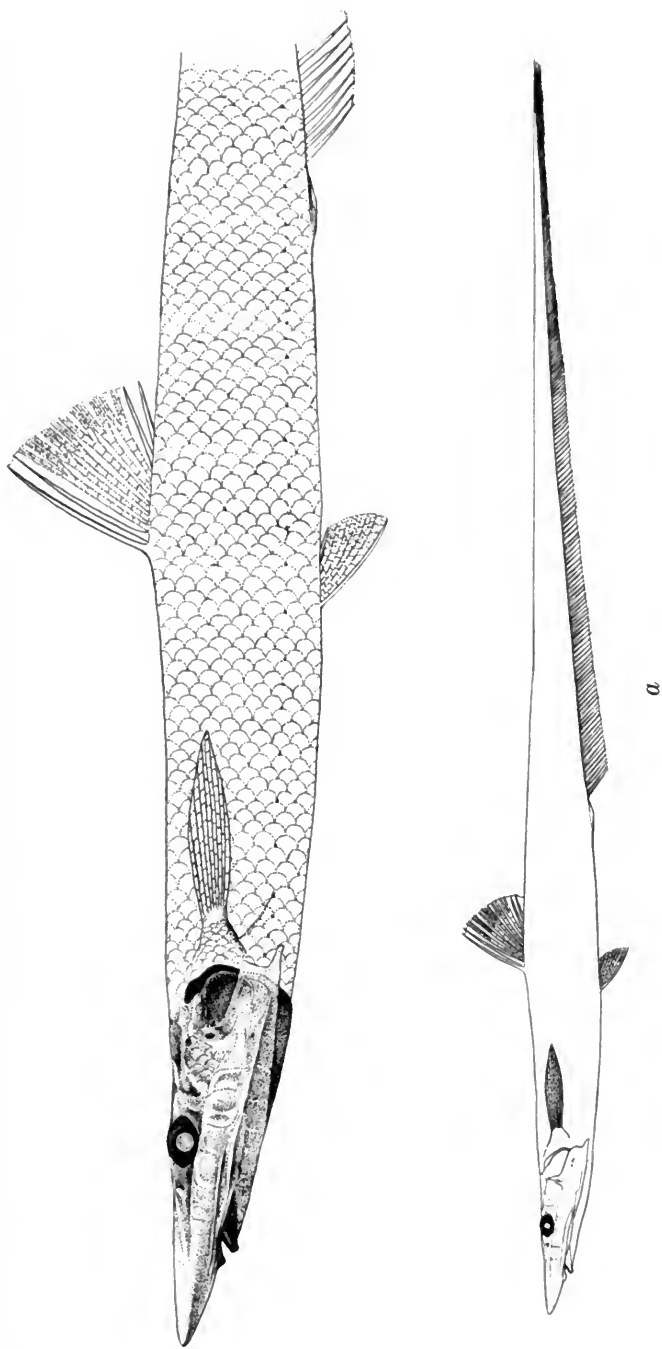


FIG. 26. *Aldrorandia pallida* Goode and Bean. Female; length 485 + mm., tip of tail broken. a. Full view.

Distribution.—The species is not known outside the western Atlantic, where it has been taken in the Gulf of Mexico and off the United States coast to ca. 41° N. in 1241–2615 meters.

Family MACROURIDAE

Chalinura murrayi (Günther)

Coryphaenoides murrayi Günther, 1878, Ann. Mag. Nat. Hist., (5), 2: 26.

Chalinura murrayi Grey, 1956, Fieldiana, Zool., 36: 170, 320 (complete synonymy).

One specimen, total length 730 mm.

Description.—Dorsal rays 10; anal 117; pectoral 19; ventral 13; branchiostegal 6. The following measurements are in millimeters, the figures in parentheses representing per cent of total length: Tip of snout to anal origin 249 (34.2); length of head 138 (18.9); greatest depth 134 (18.4); outer ventral ray 128 (17.5).

In the following measurements the figures in parentheses represent percentage of head length: Diameter of orbit 25 (18.1); length of snout 33 (23.9); length of barbel 36 (26.1); interorbital width 32 (23.2); length of upper jaw 58 (42.0); length of lower jaw 54 (39.1); base of outer ventral ray to anal origin 77 (55.7); outer ventral ray 128 (93.0); greatest depth 134 (97.2).

Dorsal profile rising steeply from snout, body in front of dorsal fin with a decidedly “humpbacked” appearance. Greatest depth at region of ventral bases. Vent close to anal origin, no scaleless areas around it. Abdominal cavity not (or only very slightly) extending beyond anal origin. Second dorsal spine finely serrate. Origin of second dorsal fin above eleventh or twelfth anal ray, the first rays rudimentary. Ventral bases beneath pectoral bases, outer ventral ray elongate, reaching ninth or tenth anal ray when depressed. Scales large, almost all lost, scale-pockets clear, 7–8 above lateral line, 19 below. Scales dissimilar on different parts of body and head: one remaining on head at upper end of gill opening smooth; one on head above preopercle with 10 low, more or less parallel ridges; one on anterior portion of lateral line with 5 small spiny ridges above the central groove and 4 below it; on belly just behind isthmus several scales with about 12 ridges, slightly more radiating than parallel.

Upper part of head entirely scaled except the short vertical portion of the snout, which is naked; scales on top of head between eyes irregular, about 13 in transverse count. Mouth large, upper jaw reaching end of orbit. Upper jaw with an inner band of minute teeth

and a single outer series of small, conical, well-separated teeth. Lower jaw with a single row of small, separated teeth. Vomer and palatines toothless. Second gill-arch with two rudimentary rakers on the short upper limb and nine short, widely spaced rakers on the lower limb, followed by two rudiments.

Color.—Brown, with scale-pockets outlined in black. Dorsal, anal and pectoral fins brown; ventrals dusky. Branchiostegal membrane, linings of mouth and opercles, and peritoneum black.

Remarks.—*C. murrayi* is closely related both to *C. simula* and *C. brevisbarbis*, from which it differs principally in having more ventral rays and a deeper body. Farran (1924, p. 102) has shown that the exaggerated dorsal development of *C. murrayi* is characteristic of older specimens. It may also be a sexual character. The Oregon example, a male, is considerably larger than any hitherto recorded and has a markedly "humpbacked" appearance.

Distribution.—*C. murrayi* has not been recorded previously from the western Atlantic. Originally described from three specimens taken by the *Challenger* expedition off New Zealand, it has since been reported only in the eastern Atlantic: from near Rockall (ca. 57° N., 11° W.); off southwestern Ireland; in ca. 35° N., 8° W.; and perhaps off the Azores.

Family BROTULIDAE

Genus *Dicrolene* Goode and Bean

A study of published descriptions and figures of the species of *Dicrolene* has proved the impossibility of working up a key without an examination of the specimens. Such a key would necessitate taking many proportions from the figures, an uncertain course at best and particularly so in this case as some of the ranges are small; for example, the depth appears to vary from about 5 (*nigricaudis*) to 7.4 (*gregoryi*) times in the standard length, with nearly all of the intervening figures found in other species. Similarly, the head goes into the standard length from about 4 (*nigricaudis*) to 5.5 times (*nigra*). The distance between the tip of the snout and the dorsal origin varies from 3.3 to 4.6 times in standard length, that of snout to anal 2.1 to 2.8 times. The relative lengths of the pectoral and ventral fins, as well as snout length, maxillary length, and eye diameter, are not reliable. Some of these parts of the body lengthen or diminish in relative size with growth.

D. nigra Garman and *D. gregoryi* Trotter seem to differ from other species in having higher dorsal and anal counts. They also have

smaller scales than other forms and a tendency toward a more slender body and smaller head, although these last two characters are shared with other species. Only *nigra*, *gregoryi*, and *intronigra* have been described as having a small spine above the eye posteriorly.

D. nigricaudis (Alcock) has a relatively deeper body, shorter tail, and longer head than other species, and shares with *D. hubrechtii* Weber lower dorsal and anal counts. Norman (1939, p. 86) has proposed a subgenus, *Brachydicolene*, for *nigricaudis*, and perhaps to include *hubrechtii* also.

D. kanazawai, new sp., is the only species with a long, curved opercular spine that extends beyond the margin of the opercle. This spine, measured from its base at the edge of the preopercle, is equal in length to the distance from the tip of the snout to the posterior edge of the eye. Several other species have a strong opercular spine, especially *intronigra* and *multifilis*, but in none does it approach the relative length of the spine of *kanazawai*.

Apparently the number of pectoral rays is subject to great variation, even on individual specimens. The count differs on left and right sides in four of the five specimens of *kanazawai*. In general, however, this new form has more pectoral rays than other species.

The genus *Dicolene* is known from the eastern and western north Atlantic and off South Africa (*intronigra* Goode and Bean, although eastern Atlantic specimens may differ from the type); the eastern Pacific (*pullata* Garman, *nigra* Garman, *filamentosa* Garman, *gregoryi* Trotter); the western Pacific (*longimana* Smith and Radcliffe, *tristis* Smith and Radcliffe, *multifilis* (Alcock), *quinquaria* Günther, *hubrechtii* Weber); and the north Indian Ocean (*nigricaudis* (Alcock), *longimana* Smith and Radcliffe, *multifilis* (Alcock), *intronigra* Goode and Bean). The distribution suggests a possible continuity that might allow subspecific development, perhaps even in two directions, horizontal and vertical. Specimens have been taken between about 300 and 1900 meters, with one doubtful record in 5000 meters and seven specimens of the new species *kanazawai* in 2104–2194 meters.

Dicolene kanazawai, new species. Figure 27.

Holotype.—United States National Museum no. 159332, standard length 254 mm.

Paratypes.—Six; standard lengths 203.5–233 mm.

Description.—Counts and proportions are shown in Table 8. Head rounded, body compressed, tail long and rather slender. Greatest depth at origin of dorsal, close behind pectoral base. Vent

TABLE 8.—Counts and Proportions of *Dicrolene kanazawai*, new sp.

	Holotype		Paratypes			
	Count	Proportion	Count	Proportion	Count	Proportion
Standard length.....	254	233	225	219	217	203.5
Dorsal rays.....	106	106	105	107	108	107
Anal rays.....	82	86	—	89	89	89
Pectoral rays.....	25+8	24+7	25+8	23+8	24+7	26+7
	23+8	22+5	25+7	20+8	23+7	24+7
Ventral rays.....	2	2	2	2	2	2
Caudal rays.....	6	7	6	7	6	—
Transverse scale count.....	35-40	—	—	—	—	35-40
<i>Per cent of standard length</i>						
Greatest depth.....	16.9	14.4	14.0	14.8	14.7	13.0
Length of head to end of opercular membrane....	20.9	19.5	20.2	19.2	19.3	18.9
Length of snout.....	5.9	5.15	5.1	4.56	5.0	4.92
Diameter of orbit.....	5.1	4.5	5.35	4.8	4.6	4.67
Interorbital width at center of eye.....	5.5	5.37	4.9	5.25	5.0	5.17
Length of upper jaw.....	10.2	9.9	10.0	9.6	9.95	9.85
Length of opercular spine.....	9.1	9.45	8.56	9.14	8.0	8.86
Snout						
to dorsal origin.....	24.8	23.8	22.4	22.2	22.8	22.6
to vent.....	35.4	32.8	33.4	33.3	33.9	34.4
to anal origin.....	38.8	35.0	36.2	36.5	36.7	36.3
Anal origin to end of body.....	61.8	65.4	64.0	64.0	65.0	62.7
Length of pectoral fin.....	25.2	21.0	22.2	21.2	21.4	19.4
Length of ventral fin.....	7.9	6.87	ca. 6.45	7.32	7.4	6.65

just in front of anal fin. Dorsal and anal fins largely covered with skin, which is thicker anteriorly. A lobe of black, scaleless skin above pectoral base. Upper pectoral rays black, filamentous at ends, longest reaching past anal origin. Lower pectoral rays paler, shorter than longest upper rays, not quite reaching vent. Scales small, mostly lost, covering head, body, and bases of dorsal and anal fins. No lateral line visible.

Snout short, somewhat swollen. Nostrils large, the posterior one a vertical slit close to eye, the anterior one horizontal. Upper jaw reaching posterior margin of eye or just beyond. Teeth villiform, in bands on jaws, vomer, and palatines. A row of large pores around front, lower, and hind margins of eye, and extending backward, above, to end of head. Opercular spine long, strong, narrow, curving upward and reaching well beyond end of opercular membrane. Preopercle of holotype and smallest paratype with four short, stout, broad-based spines at and above angle on left side, and three spines on right side; other specimens with four spines on both sides. No other spines on head. Lower limb of first gill-arch with eleven well-developed gill-rakers and six very small rudiments; upper limb with five rudimentary rakers, the last two much smaller than the first three.

Color.—Brown with a faint reddish tinge on back. Head and belly blackish. Ventrals dusky. Pectorals largely black. Vertical fins gray, paler posteriorly. Peritoneum, linings of mouth and gill covers black.

Remarks.—*Dicrolene kanazawai* differs from all other species of the genus in the length of the opercular spine, the additional small spine at the angle of the preopercle, the larger number of pectoral rays, and in having most of the upper rays of this fin longer than the longest rays of the lower portion. It is probably most nearly related to *D. intronigra* Goode and Bean, from which it differs, in addition to the characters mentioned above, in lacking a spine above the eye and in having a slightly larger eye, shorter maxillary, and shorter pectoral fin. There is also a slight difference in the gill-rakers. Those of the upper limb of the first gill-arch are all rudimentary in form in *kanazawai*, while the first two or three in *intronigra* are of normal shape, though smaller than those of the lower limb. In specimens of *intronigra* examined, from both the Atlantic Ocean and the Gulf of Mexico, the lobe of skin above the pectoral base is dusky in color, not black as in *kanazawai*. In proportions, the two species are very similar.

The new species is named for Mr. Robert Kanazawa, of the United States National Museum, in appreciation of his help, over a

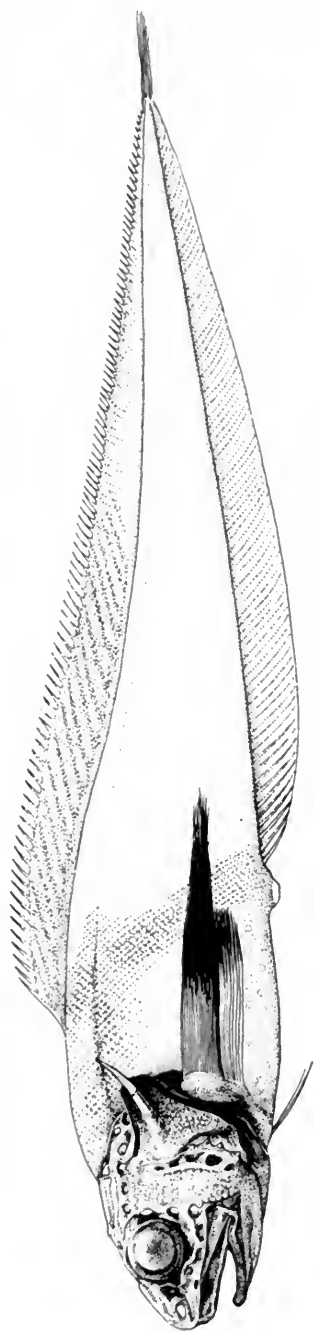


FIG. 27. *Dicrolene kanazawai*, new sp. Holotype.

long period of time, in supplying measurements and counts of various fishes.

Bassozetus normalis Gill

Bassozetus normalis Gill, 1883, Proc. U. S. Nat. Mus., 6: 259; Grey, 1956, Fieldiana, Zool., 36: 208 (complete synonymy).

Two specimens, standard lengths, 299 and 164 mm.

Description.—Dorsal rays ca. 116; anal 100; pectoral 24–25; ventral 1; caudal 8; branchiostegal 8. Measurements in millimeters, followed in parentheses by per cent of standard length, the first figure in each case referring to the larger specimen: Total length 329, 170; standard length 299, 164; depth 45, 23.5 (15.0, 14.3). Head 61.5, 33 (20.5, 20.3); snout 16, 8 (5.25, 4.86); eye 7, 4 (2.3, 2.4); interorbital width 21, 12 (7.04, 7.3); upper jaw 31.5, 16.4 (10.6, 10.0); lower jaw 35, 19.5 (11.7, 11.9); tip of snout to ventral base 51, 26 (17.0, 15.8), to origin of dorsal 58.5, 31 (19.6, 18.9), to vent 99, 51 (33.1, 32.9), to origin of anal 106.5, 56 (35.6, 34.1); ventral base to vent 52, 26.5 (17.4, 16.2); length of pectoral fin 29, 20 (9.7, 12.2); length of ventral fin 49, ca. 29 (16.4, 17.7).

Body thin and compressed, tail long and tapering. Dorsal and anal extending almost to caudal. Ventral bases close together, rays rather long, nearly reaching vent in larger specimen, beyond it in smaller one. Vent close to anal fin; a very small, flat, triangular papilla just behind it in both specimens. Scales all fallen, pockets visible all over head and body, about 40 transverse rows counted obliquely forward from anal origin. No lateral line apparent.

Head moderately compressed posteriorly but round and inflated anteriorly, covered with soft, thick skin; no spines visible. Nostrils round, the posterior one slightly larger, close to eye, the anterior one about 3 mm. in front of it in larger specimen. Teeth villiform, in bands on jaws, palatines and vomer. Free edge of preopercle and short vertical edge of opercle crenate. A deep black membrane extending slightly beyond edge of opercle. Lower limb of first gill-arch with fifteen normal and four rudimentary gill-rakers, upper limb with four rudimentary ones. No pseudobranchiae.

Color.—Body pale, head and belly black. Peritoneum and linings of mouth and gill covers black.

Remarks.—These specimens differ from the description of the type and from the figure shown by Goode and Bean (1895, p. 322, fig. 287) in having a larger head and deeper body. They agree in all other

respects except that the diameter of the eye goes only $2\frac{1}{2}$ times in the snout length, while in the type it was said to go four times. However, in the figure the eye seems to be proportionately like that of the *Oregon* specimens. As in the type description, the vent is about twice as far from the caudal base as from the snout and the figure shows the same flap of black skin extending beyond the edge of the opercle, the same profile of the head, no visible spines on the head, etc.

Bassozetus oncercephalus (Vaillant), from the eastern Atlantic, seems to be closely related to *B. normalis*.

Distribution.—The species has been found only in the western Atlantic off Dominica (West Indies), in the Gulf of Mexico, and off the United States coast, in 2068–2844 meters.

Porogadus miles Goode and Bean

Porogadus miles Goode and Bean, 1885, Proc. U. S. Nat. Mus., 8: 602; Grey, 1956, Fieldiana, Zool., 36: 211 (complete synonymy).

One specimen, standard length 281 mm.

Description.—Counts and proportions are shown in Table 9. The following measurements are in millimeters. Total length 291; standard length 281; depth 25.5; head 48; snout 15; eye 8.5; interorbital width 8; upper jaw 26.5; lower jaw 30; tip of snout to ventral base 40, to dorsal origin 54, to vent 88, to anal origin 92; ventral base to vent 51; length of pectoral fin 27.5; length of ventral fin 31.

Body compressed, tail long and attenuate. Greatest depth at region of pectoral base. A small lobe of scaleless black skin above pectoral base. Dorsal origin just behind pectoral base. Vent close to anal origin. Ventrals not reaching vent, their bases close together. Scales all fallen, scale-pockets clear, about 36 transverse rows counted obliquely forward from vent. Lateral lines: upper row with eleven small pores; median row reaching about to a vertical above vent, marked by well-spaced, lighter-colored scale-pockets, no pores visible; lower row similar to median row, very low on body, beginning below pectoral base and reaching 50–55 mm. beyond vent.

Head somewhat compressed behind eye, flat on top, snout depressed. Arrangement of spines and pores as in type. Posterior nostril large, oval, in front of eye; anterior nostril smaller, close to upper jaw. Teeth minute, in villiform bands on jaws, palatines and vomer. Tip of tongue with a small, rather pointed knob. No pseudo-branchiae. Lower limb of first gill-arch with fifteen long gill-rakers, upper limb with three rudimentary ones, the first of these the longest.

TABLE 9.—Counts and Proportions of *Porogadus miles*
(Taken from the literature where indicated)

	Goode and Bean, 1895	<i>Oregon</i> specimen
Total length	153(?)	291
Standard length	153(?)	281
Dorsal rays	—	170
Anal rays	—	ca. 135
Pectoral rays	—	16
Ventral rays	2	2
Caudal rays	—	6
Branchiostegal rays	8	7
Gill-rakers ¹	15+3	15+3
Transverse scale count	ca. 34 ¹	ca. 36
<i>Per cent of standard length</i>		
Depth	9.8	9.1
Head	15.0	17.1
Snout	—	5.35
Eye	2.6	3.2
Interorbital width	—	2.85
Upper jaw	8.5	9.45
Lower jaw	9.8	10.7
Snout		
to ventral base	—	14.2
to dorsal origin	16.3	19.2
to vent	—	31.3
to anal origin	28.8	32.8
Ventral base to vent	14.4?	18.1
Pectoral length	—	9.8
Ventral length	9.8	11.0

¹ From figure.

Color.—Body brown, paler scale-pockets giving it a speckled appearance. Belly and head darker, almost black. Pectorals and dorsal dark brown, anal gray, ventrals light gray. Peritoneum and linings of mouth and gill covers black.

Remarks.—This specimen differs a little in some proportions from the description of the type, as shown in Table 9, but is in almost exact agreement with the figure of the type specimen. The most important proportional difference is in the distance from the ventral bases to the vent. However, this distance is seen in the figure to be longer than the head, although in the text its length was given as 22 mm. (head 23 mm.) and it was said to be “nearly equal to length of head.” The same measurement is several millimeters longer than the head in the *Oregon* example and was “slightly greater than head” in a specimen recorded from South Africa (Gilchrist, 1906, p. 159). Another measurement in the type description is probably an error also. The width of the interorbital space was given as 15 mm., although this width

was said to be $4 \frac{3}{5}$ in head. The proportions of the type are also rendered somewhat dubious, as its length, 153 mm., may include the caudal fin.

Porogadus nudus Vaillant, from the eastern Atlantic, is closely related to *P. miles* and may prove to be the same species. It differs principally in the complete absence of lateral lines.

Distribution.—This is the first specimen of *P. miles* to be taken in the Gulf of Mexico. It is known otherwise only from the type, which was caught off the United States coast in ca. 38° N., 73° W., in 2136 meters, and a specimen found off Cape Point, South Africa, in 1280–1463 meters.

***Porogadus subarmatus* Vaillant**

Porogadus subarmatus Vaillant, 1888, Exp. Sci. Trav. Talis., Poiss., p. 265, pl. 24, fig. 3; Grey, 1956, Fieldiana, Zool., 36: 213 (complete synonymy); Nybelin, 1957, Rep. Swedish Deep-sea Exp., 2, Zool., 20: 291, 335, pl. 6, fig. 7.

Two specimens, standard lengths 222+ and 172 mm.

Description.—Dorsal rays 177 and ca. 179; anal ca. 153+; pectoral 16; ventral 2. The larger specimen lacks the caudal fin and an undetermined portion of the tail, and the proportions given for this fish may be slightly incorrect. The fact that the smaller example, with tail complete, has a dorsal count of ca. 179 and the larger one 177 indicates that only a few millimeters of the tail are broken off.

The following measurements are in millimeters, the figures in parentheses representing per cent of standard length. The first figure in each case refers to the larger specimen. Depth 19.5, 14.5 (8.8, 8.45); head 31.5, 24.5 (14.2, 14.2); snout 7, 5.5? (3.15, 3.2?); orbit ca. 7, ca. 5 (ca. 3.15, ca. 2.9); interorbital width ca. 5.5, 5 (ca. 2.48, 2.9); upper jaw 18, 15 (8.1, 8.73); lower jaw 21, 17.5 (9.45, 10.2); tip of snout to ventral base 26, 22.5 (11.7, 13.0), to dorsal origin 34.5, 28 (15.5, 16.2), to vent ca. 63.5, ca. 49 (ca. 28.6, ca. 28.4), to anal origin 66, 53 (29.7, 30.8); ventral base to vent ca. 37.5, ca. 27 (ca. 16.8, ca. 15.7); length of pectoral fin 23.5, — (10.6, —); length of ventral fin ca. 19, — (ca. 8.55, —).

Body and tail compressed. Tail very attenuate, tapering to a slender tip. Greatest depth at region of pectoral base. Dorsal and anal extending almost to caudal. Dorsal origin just behind pectoral base. Pectorals and ventrals of smaller specimen broken. Ventral bases close together, placed almost beneath preopercle. Area around vent slightly damaged in both specimens, vent probably a few milli-

meters in advance of anal origin. No scale-pockets visible. No lateral line apparent.

Head somewhat compressed, top rounded, snout not depressed. Heads of both specimens slightly damaged, eyes of smaller one missing. Jet-black opercular membrane, (when intact, partially covering pectoral bases. Spination and pores on head as in type. Posterior nostril in front of eye, either torn or very large; anterior nostril not far in advance, smaller, round. Teeth villiform, in bands on jaws, palatines, and vomer. Tongue ending in a small, blunt knob. No pseudobranchiae. Upper limb of first gill-arch with one long and four short rudimentary gill-rakers in larger specimen, and two long and three rudimentary rakers in smaller example. Lower limb of first gill-arch with seventeen long rakers and four or five minute rudimentary rakers in larger fish, and sixteen long and three minute rudimentary rakers in smaller specimen. Total long gill-rakers on first arch eighteen.

Color.—Top of head, back and tail pale. Belly, remainder of head, peritoneum and linings of mouth and gill covers black.

Remarks.—*P. subarmatus* is probably most nearly related to *P. nudus* Vaillant and *P. miles* Goode and Bean, from both of which it differs principally in the size, shape, and reduced spination of the head.

Distribution.—The species was known previously from twelve specimens taken in a single haul off Cape Verde, North Africa, in 3200 meters.

Penopus microphthalmus (Vaillant). Figure 28.

Sirembo microphthalmus Vaillant, 1888, Exp. Sci. Trav. Talis., Poiss., p. 275, pl. 24, fig. 4.

Penopus(?) *microphthalmus* Grey, 1956, Fieldiana, Zool., 36: 215.

Penopus microphthalmus Nybelin, 1957, Rep. Swedish Deep-sea Exp., 2, Zool., 20: 292, 335.

One specimen, total length 112.5 mm.

Description.—Pectoral rays 18; ventral 1; caudal 8. Measurements in millimeters, followed in parentheses by per cent of standard length: Total length 112.5; standard length 107; depth 10 (9.35); width of body at dorsal origin 5 (4.66); length of head 24 (22.4); width of head at edge of preopercle 7.5 (6.6); snout 8.5 (7.93); preoral length of snout 3.5 (3.27); width of snout above anterior end of mouth 4.5 (4.2); eye 1.5 (1.4); interorbital width 5 (4.67); upper jaw 10.8 (10.1); lower jaw 13 (12.1); length of mouth cleft 8.5 (7.95);

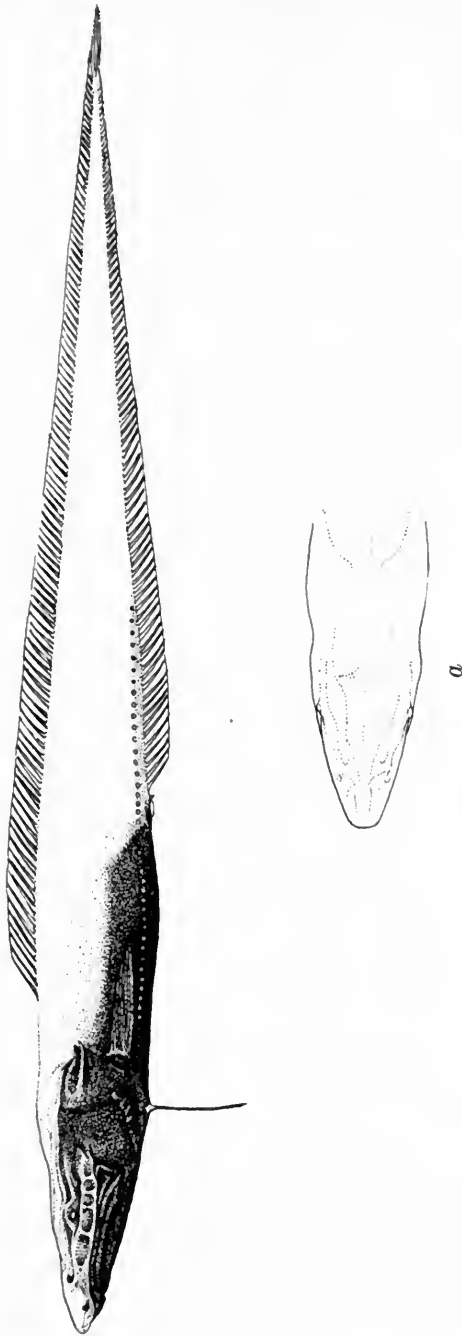


FIG. 28. *Penopus microphthalmus* (Vaillant). a. Top of head.

length of mucus channel above upper jaw 9 (8.4); tip of snout to ventral base 18.5 (17.3), to dorsal origin 28 (26.1), to vent 43.5 (40.6), to anal origin 46 (43.0); ventral base to vent 24 (22.4); length of vent 2 (1.87); length of pectoral 10 (9.35); length of ventral 7.7 (7.2).

Body and tail slender, compressed, tail long and tapering. Greatest depth about halfway between dorsal origin and anal origin. Dorsal and anal confluent with caudal but caudal extending beyond them; accurate counts impossible without some damage to specimen. Origin of dorsal over about middle of pectoral. Anal origin below a vertical about 16 mm. behind dorsal origin. Vent just in front of anal, prominent, its length 2 mm., a small narrow papilla on posterior edge. Pectorals normal. Ventrals each with a single ray, their bases 1 mm. apart, situated below angle of preopercle. Scales minute, embedded, round, scarcely or not imbricated, covering body but not extending on vertical fins. Head naked except on cheeks and just behind eye. Lateral lines very indistinct, one low on body composed of forty-three slightly enlarged scales, beginning beneath pectoral base and extending well past anal origin; apparently two more rows of enlarged scales anteriorly, one on middle of body and one close to dorsal profile, these scarcely discernible.

Head somewhat compressed but with snout depressed, broadened, somewhat rounded at tip, and projecting beyond mouth. Mouth inferior, moderately large, lower jaw included. Rami of upper jaw separated anteriorly by a space about 0.5 mm. wide. End of maxillary expanded, reaching well beyond eye. Teeth villiform, in narrow bands in jaws and on vomer and palatines. Posterior nostril on same level as, and 3.5 mm. in front of, eye; a minute spine above it. Anterior nostril on edge of depressed portion of snout, above anterior end of upper jaw, 2 mm. in front of posterior nostril. Eye small but distinct, entirely covered by transparent skin, outlines of orbit not apparent. A long mucus channel extending above full length of upper jaw, giving the head a halosaurid-like appearance. Opercle with a single long, slender, sharp spine above, its tip curved upward, and four weak small spines on lower portion of posterior edge. Angle of preopercle with four or five similar small, weak spines. Nine well-developed gill-rakers on lower limb of first arch (including one at angle) and two rudiments. Upper limb with only two or three rudiments.

Color.—Tail and upper half of trunk pale yellowish in formalin. Abdomen black. Head black except pale (translucent) snout. Pectorals dusky, fins otherwise colorless. Peritoneum and inside of mouth and gill covers black.

TABLE 10.—Counts and Proportions of *Penopus microphthalmus*
(Taken from the literature where indicated)

	Nybelin, 1957			Oregon specimen
	142 (type)	135	111	
Standard length.....	142 (type)	135	111	107
Pectoral rays.....	13 ¹	—	—	18
<i>Per cent of standard length</i>				
Head length.....	20.07	20.74	20.27	22.4
Snout to anal origin.....	39.8	41.48	ca. 42.7	43.0
<i>Per cent of distance between tip of snout and anal origin</i>				
Head length.....	50.44	50.0	47.87	52.1
Snout length.....	15.93	16.96	17.0	18.4
Length of lower jaw.....	29.2	27.68	27.66	28.2
<i>Per cent of head length</i>				
Length of snout.....	31.58	33.92	35.55	35.5
Length of lower jaw.....	57.89	55.36	57.77	54.2

¹ From Vaillant, 1888, p. 275.

Remarks.—The similarity of this fish to *Penopus macdonaldi* is so great that it must be placed provisionally in the same genus in spite of differences in scalation and body width. This last character, as well as differences in the position of the ventral fins and the proportionate lengths of the eye and the upper jaw, necessitates a specific distinction. The non-imbricated scales of *P. microphthalmus* are reminiscent of those found in some zoarcid fishes, while in *P. macdonaldi* the scales are apparently overlapping, although equally small. It is possible that the scalation of *P. microphthalmus* is a juvenile character. The specimen is otherwise very like *P. macdonaldi*, with which it shares the following characters: long, curved opercular spine, minute spination of preopercle and subopercle, a pair of minute nasal spines, and similar or identical bands of teeth, mucus canals, nostrils, and many body proportions. The head of *Penopus* was described as thick and scaly, but the figure of the type of *P. macdonaldi* (Goode and Bean, 1895, fig. 293) shows no scales on the head except, perhaps, on cheeks and opercles, indicating that the scalation of the head probably is reduced as in *P. microphthalmus*. It should also be noted that the figure of *P. macdonaldi* shows a long mucus cavity above the upper jaw, similar to the structure so noticeable in the specimen at hand.

The specimen described above was thought to be a new species until Nybelin (1957, pp. 287, 335) published the results of his re-examination of the type specimens of *P. microphthalmus*. The fig-

ures (Table 10) show that at least some of the proportional differences between the types and the specimen at hand may be due to growth changes. A comparison of percentages calculated from measurements given in the type description (Vaillant, 1888, p. 275) shows the body to be considerably wider in the type (7.05 per cent of the standard length) and the distance between ventral bases and anus considerably longer (26.0 per cent). These discrepancies are of considerable importance if they are not due to a difference in size, or to distortion after preservation, but the two forms are so similar otherwise that it seems imprudent to describe a new species based on a single small, soft-bodied specimen. A further discrepancy is seen in comparing the snout of our specimen with that of the type as figured by Vaillant (op. cit., pl. 24, fig. 4), in which it is shorter and much less "overhanging" than in the western Atlantic fish. However, the snout of the latter is soft and wrinkled, and its original outlines may well have differed from the present ones as shown in figure 28.

Distribution.—Previously known from only three specimens taken by the personnel of the *Talisman* off Cape Verde, North Africa, in 3200 meters.

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