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ABSTRACT Two common, unmarked species of *Ophidion* have been reported from the shallow coastal waters of the western Atlantic Ocean since the latter part of the 19th century. They are *Ophidion holbrookii* (Putnam, 1874) and *Ophidion beani* Jordan and Gilbert, 1883. Both names are based on the same species, and the species to which *Ophidion beani* was applied in the 1960's and later is undescribed. We also describe three additional species in this complex. This paper provides descriptions to distinguish each of them from each other and from *O. holbrookii*, a species discussed in this paper only in a comparative sense.

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INTRODUCTION

The family Ophidiidae is poorly known. Many species are undescribed, including some that are common in coastal waters (Nielsen et al., 1999). Herein we describe four new species of the genus *Ophidion* from the western Atlantic Ocean, one of which has been widely and incorrectly reported in the literature under the name *O. beani*. This name is discussed and shown to be a junior synonym of *O. holbrookii*.

ACKNOWLEDGMENTS

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METHODS AND MATERIALS

Measurements are those defined by Robins (1962:487-488). Median fin and vertebral counts were made from radiographs. Pectoral-fin rays were stained with Alizarin red to enhance enumeration. Specimens examined are listed in the Appendix, in which the number of specimens and their range in standard length are in parentheses following the museum numbers. Institutional abbreviations follow recommendations by Leviton et al. (1985). Vessel names are in capital letters.

TAXONOMIC TREATMENT

Ophidion antipholus new species
Longnose Cusk-eel
Figs. 1, 2 & 3, Tables 1 & 2

Ophidion beani non Jordan and Gilbert, 1883. Virtually all literature on *O. beani* is compiled from the brief original description and applies to *O. holbrooki*, as do all remarks concerning the holotype of *beani*. These references are not cited here as they do not apply to *antipholus*. It is unclear when the name *beani* came to be associated with the species here described as *O. antipholus* but the following references certainly apply to that taxon. Moe et al., 1966:94 (data on specimens in the collections of the Florida Board of Conservation). Bailey et al., 1970:28, 72 (longnose cusk-eel applied); Walls, 1975:128-129, (characters, distribution in northern Gulf of Mexico); Robins et al., 1980:31 (in list); Gordon et al., 1982 (meristic data;. Robins et al., 1986:99, pl. 16, (characters, distribution "scientific name is being changed"); Robins et al., 1991:31, 81 (comments on nomenclature); Boschung, 1992:76 (Alabama records); McEachran and Fechhelm, 1998:728 (description, distribution).

Otophidium sp. A (in part), *Otophidium* sp. B, *Otophidium* sp. McCattrey, 1981: 102 (records from the Gulf of Mexico).

Holotype.—UF 232138, a male 210 mm SL, from Florida (Atlantic coast) 30°03'N, 81°12' W in 13 m, DOLPHIN 0573369, 29 October 1973.

Paratypes and other material.—See Appendix.

Diagnosis.—Dorsal-fin rays 111-133 (usually 116-123), anal-fin rays 94-103, pectoral-fin rays 18 or 19 (rarely 20 or 21), precaudal vertebrae 15-17 (usually 16), caudal vertebrae 49-53 (usually 50-52), total vertebrae 65-69 (usually 66-68); lower arm of first gill arch with five or six developed rakers; head profile rounded, mouth distinctly inferior; dorsal and ventral profiles of body nearly parallel for much of length; body unmarked; pelvic-fin rays short, unequal, longer reaching to point directly under anterior edge of opercle.

Description.—Frequency distributions of fin-ray and vertebral counts in Table 1; measurements of body parts expressed in hundredths of standard or head length in Table 2. Consistently seven branchiostegal rays and nine caudal-fin rays (four above, five below), both plesiomorphic states; two rudimentary gill rakers on upper arm of first gill arch; five or six (rarely seven) developed (but short) rakers (rarely four) on lower arm for total of seven or eight (rarely six or nine); pyloric caeca absent, head scaleless; scales on the body small, arranged in a basket-weave or anguiliform pattern.

Body shape distinctive: dorsal and ventral profiles parallel for most of their length; snout prominent, protruding beyond distinctly inferior mouth; pelvic rays short, longer one reaching under anterior edge of opercle to mid-opercle; swim bladder of males with a large jug-like posterior opening, encased anteriorly in bony casque; females, short, simple; rocker bone absent;

Table 1. Frequency distribution of fin-ray, gill-raker, and vertebral counts of four species of *Ophidion*. (Holotypes in boldface.)

	Vertebrae																	
	Precaudal				Caudal							Total						
Taxon	15	16	17	18	47	48	49	50	51	52	53	63	64	65	66	67	68	69	70
O. antipholus	3	**58**	12	—	—	—	2	24	31	14	**1**	—	—	3	19	31	16	**3**	—
O. guianense	**12**	11	—	—	1	6	**11**	5	—	—	—	1	**14**	6	2	—	—		
O. dromio	—	10	**25**	—	—	—	—	3	**21**	10	—	—	—	—	—	8	**22**	3	—
O. puck	—	—	1	**1**	—	—	—	—	—	**1**	1	—		—	—	—	—	—	**2**

	Dorsal rays																							
Taxon	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133
O. antipholus	—	—	1	—	—	1	—	2	**6**	2	8	15	7	9	8	1	2	3	—	1	1	1	—		1
O. guianense	1	—	—	3	4	2		**5**	4	1	—	1	—	1	—	—	—	—	—	—	—	—		—	—
O. dromio	—	—	—	—	—	—	—	2	1	**2**	4	5	7	3	3	2	3	1	1	—	—		—	—	—
O. puck	—	—	—	—	—	—		—	—	—	—	—	—	—	—	—	—	—	—	—	1	**1**	—	—	—

	Anal rays													Pectoral rays						Gill rakers (lower limb)		
Taxon	91	92	93	94	95	96	97	98	99	100	101	102	103	17	18	19	20	21	22	4	5	6
O. antipholus	—	—	—	**2**	6	9	12	16	13	5	3	3	1	**2**	**32**	36	7	1	—	2	**86**	8
O. guianense	—	2	3	2	7	5	3	—	—	—	—	—	—	—	1	13	7	1	—	—	**19**	5
O. dromio	—	1	—	—	1	—	3	**13**	7	3	2	1	1	—		17	**28**	**7**	—	**35**	—	—
O. puck	—	—	—	—	—	—	—	—	—	**1**	1	—	—	—	—	—	—	2	**2**	**2**	—	—

ethmoid spine prominent, stout, projecting forward, but short without sharp hooklike forward process.

In life, head and body pale brown without pattern; outer border of dorsal and anal fins black, best developed in larger specimens and in anal fin and, to a lesser extent, anteriorly in dorsal fin; orobranchial cavity and gastrointestinal tract pallid.

Distribution.—*Ophidion antipholus* occurs in shelf waters from South Carolina to Palm Beach County, Florida, in the Atlantic Ocean and from the Florida Keys to northwestern Florida in the Gulf of Mexico and also off northern coast of Yucatán, Mexico. It occurs on open sand and mud bottoms between 10 and 69 m with most records between 15 and 40 m. It occurs throughout these depths in all segments of its geographic range. One record (TU 14785) purportedly from 382 m is surely in error as discussed in the appendix.

Etymology.—The specific name, a noun in apposition, is from William Shakespeare's "The Comedy of Errors," an allusion to the brothers Antipholus whose identities were confused throughout the play.

Comments.—Absence of pyloric caeca and of scales on the head are shared with all genera of the tribe Ophidiini (*sensu* Cohen and Nielsen, 1978; Nielsen et al., 1999) and are derived features for the group. The arrangement of scales on the body is a tribal synapomorphy for Ophidiini). *Parophidion* has scales on top of head behind the eyes, a probable autapomorphic condition. *Raneya* has scales on the cheeks and opercle in addition to the top of the head and this may be primitive.

The status of the holotype of *Ophidion beani*, USNM 30868, a female with well developed ova, 102 mm standard length, "taken from the stomach of a red snapper at

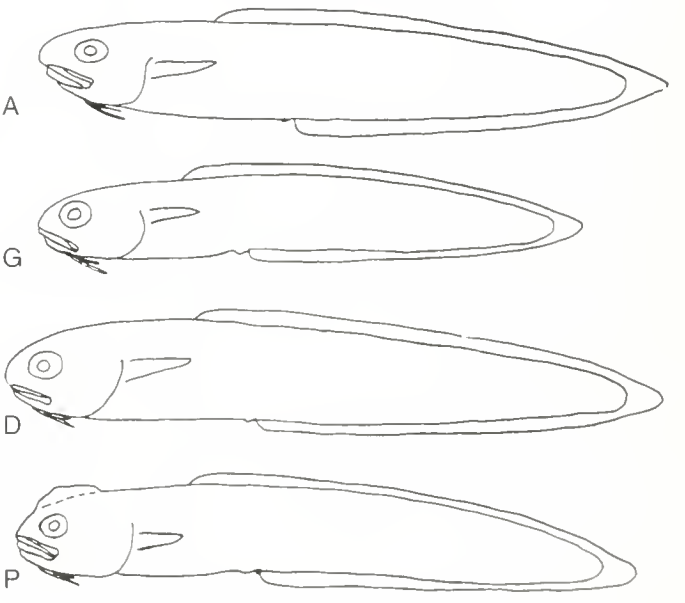

Fig. 1. Outline drawings of the holotypes of new species of *Ophidion*. A. *O. antipholus*, male, 210 mm SL; G. *O. guianense*, near ripe female, 117 mm SL; D. *O. dromio*, male, 146 mm SL; P. *O. puck*, 138 mm SL.

Table 2. Frequency distributions of body measurements of four species of *Ophidion* expressed as percentages of Standard Length. (Holotype in boldface).

	Predorsal distance						Preanal distance							Occipital distance					Head length			
Taxon	26	27	28	29	30	31	37	38	39	40	41	42	43	13	14	15	16	17	19	20	21	22
O. antipholus	–	–	4	**6**	3	2	2	1	2	**5**	3	2	–	–	–	2	9	**4**	1	**6**	7	1
O. guianense	–	**1**	4	–	3	–	2	**1**	2	1	2	–	–	–	–	–	**7**	1	–	**5**	3	–
O. dromio	1	–	–	7	17	4	–	1	1	7	8	4	3	1	2	15	**5**	1	6	**18**	–	–
O. puck	–	–	–	1	**1**	–	–	–	–	–	1	**1**	–	–	–	1	**1**	–	**2**	–	–	–

	Postorbital Length				Maxillary length			Snout length				Orbit diameter			Body depth: D1				
Taxon	9	10	11	12	8	9	10	4	5	6	7	4	5	6	13	14	15	16	17
O. antipholus	1	4	**9**	1	1	9	**5**	–	**1**	9	1	8	**6**	1	2	**8**	3	1	
O. guianense	–	5	3	–	–	7	1	3	5	–	–	2	3	3	2	5	1	–	–
O. dromio	1	**14**	9	–	1	**16**	7	**9**	15	–	–	–	**8**	16	3	7	7	4	1
O. puck	–	**2**	–	–	–	**1**	1	–	**2**	–	–	–	–	**2**	–	1	**1**	–	–

	Body Depth: A1					Body depth: occiput				Bony interorbit			Length of lateral line							
Taxon	12	13	14	15	16	12	13	14	15	2	3	4	70–72	73–75	76–80	79–81	82–84	85–87	88–90	91–93
O. antipholus	1	**8**	5	–	–	2	9	**2**	1	**3**	8	3	–	–	–	1	3	2	7	**2**
O. guianense	1	4	**3**	–	–	–	**5**	2	–	3	**5**	–	–	–	1	–	2	2	3	–
O. dromio	2	**8**	7	5	2	1	**9**	10	4	**6**	14	4	3	7	8	**6**	5	1	–	–
O. puck	–	**1**	1	–	–	–	1	1	–	**2**	–	–	–	–	–	**2**	–	–	–	–

	Outer Pelvic ray					Inner pelvic ray						Pectoral fin length		
Taxon	6	7	8	9	10	3	4	5	6	7	8	8	9	10
O. antipholus	**1**	2	8	1	1	**1**	–	9	3	–	–	1	**4**	9
O. guianense	–	3	**4**	1	–	–	1	**6**	1	–	–	–	3	**5**
O. dromio	2	4	15	**3**	–	–	4	15	3	1	–	4	**15**	5
O. puck	–	1	**1**	–	–	–	–	–	**2**	–	–	–	–	**2**

Pensacola [Florida]," was first reported on by Jordan and Gilbert (1882a:301) as *Ophidium graëllsi* Poey. Jordan and Gilbert (1883) designated this specimen the holotype of *Ophidium beani*. In the brief description they noted that *O. beani* agreed with *O. holbrookii* in the long and tapering air bladder but that the two differ in head length (that of *O. beani* being longer). We note the measurements of the holotype in Table 2. There are 128 dorsal, 101 anal and 21 pectoral rays (each fin). There are two rudimentary gill rakers and four developed rakers on the first arch; there are 15 precaudal, 52 caudal, and 67 total vertebrae. These counts correct earlier data reported by Robins and Böhlke (1959:9). The specimen is hardened and brittle and in poor condition. The ethmoid spine is undeveloped. The specimen here is identified with *O. holbrookii* of which *O. beani* becomes a junior subjective synonym. Particularly important to this allocation are the nature of the gill rakers, the morphology of the swim bladder, and the ethmoid spine. All references to *O. beani* based on the holotype or referring to the occurrence on the snapper grounds off Pensacola, Florida (e.g., Breder, 1948:278) apply to *O. holbrookii*. The name *O. graëllsi* does not apply to any species of *Ophidion*; Robins (1986) synonymized it with *Lepophidium brevibarbe* (Cuvier).

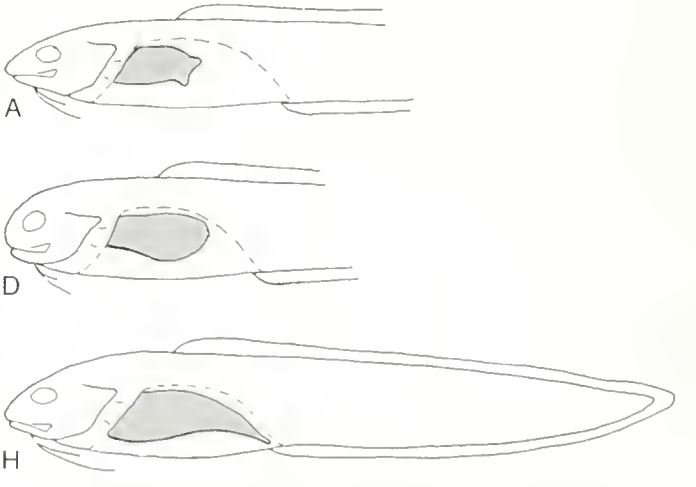

Fig. 2. Diagrams of swim bladder development in males of *Ophidion*. A. *O. antipholus*; D. *O. dromio*; H. *O. holbrooki*.

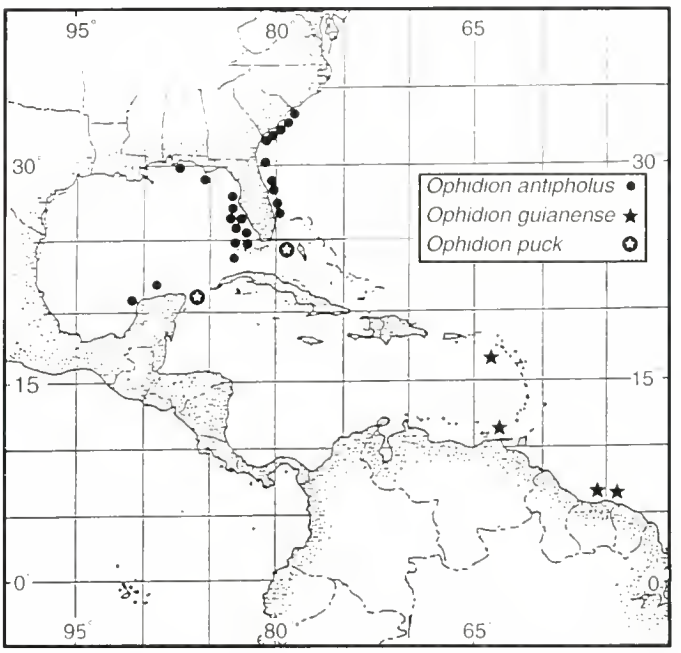

Fig. 3. Distribution of *Ophidion antipholus*, *O. guianense*, and *O. puck*. Because of the close proximity of many stations, not all stations for *O. antipholus* are shown.

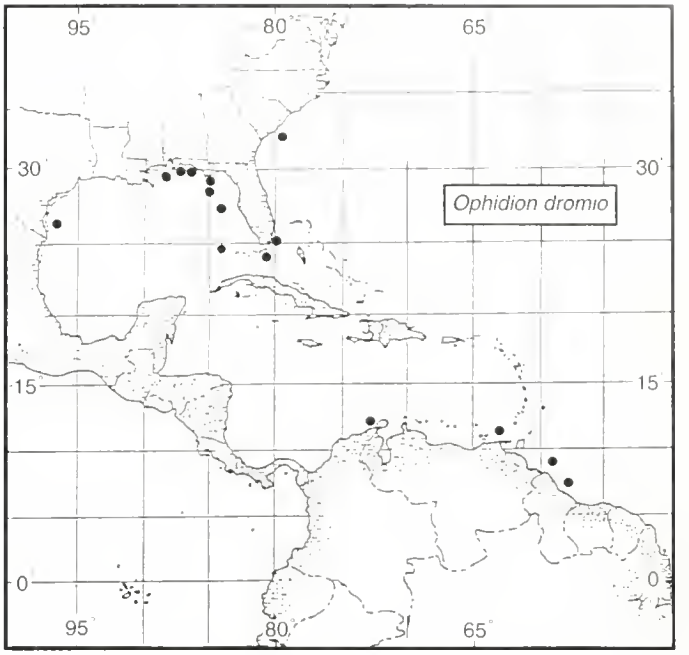

Fig. 4. Distribution of *Ophidion dromio*. Because of the close proximity of stations in the Gulf of Mexico, not all stations are shown.

Ophidion guianense new species
Guianan Cusk-eel
Figs. 1, 2 & 3, Tables 1 & 2

No literature applies to this species.

Holotype.—UF 204008, a near ripe female, 117 mm in standard length, Suriname, 06°53' N, 55°59' W in 43 m, OREGON 2268, 2 September 1958.

Paratypes.—See Appendix.

Diagnosis.—Dorsal-fin rays 109-122 (usually 112-117), anal-fin rays 91-96 (usually 94 or 95), pectoral-fin rays 19 or 20 (modally 19) precaudal vertebrae 15 or 16, caudal vertebrae 47-50 (usually 48-50), total vertebrae 63-66 (usually 64 or 65); lower arm of first gill arch with five or six developed rakers; head short, mouth inferior but not distinctly overhung by snout; dorsal and ventral profiles of body nearly parallel for much of length; body unmarked; pelvic rays intermediate in length, reaching under middle of opercle.

Description.—Frequency distribution of fin-ray and vertebral counts in Table 1; measurements of body parts expressed in hundredths of standard or head length in Table 2. Tribal features mentioned under *O. antipholus* are the same in *O. guianense*. Two rudimentary rakers (occasionally three) on upper arm of first gill arch; and five or six developed rakers below; total rakers seven to nine.

Ophidion guianense is similar to *O. antipholus* but the snout is less projecting and the longer pelvic-fin ray is shorter, reaching to a point below opercle; head and body unmarked; dorsal and anal fins with dark edging only in larger specimens; dorsal fin may lack this feature; orobranchial cavity and gastrointestinal tract pallid; swim bladder in males jug-like with large posterior opening and anterior end encased in bone; ethmoid spine stout and prominent.

Distribution.—*Ophidion guianense* is known from Saba Bank in the eastern Caribbean Sea to Venezuela and Suriname in 18-61 m. Presumably it is more widely distributed along the Guianan coast and perhaps westward in the southern Caribbean Sea.

Etymology.—From Guiana, a region of northeastern South America, in reference to the presumed center of its distribution.

Comments.—*Ophidion guianense* seems to be the southern disjunct sister species of *O. antipholus* with which it shares the swim bladder structure and high number of developed gill rakers. It differs from *O. antipholus* in its lower caudal vertebral count, shorter snout, and longer pelvic-fin rays.

Ophidion dromio new species
Shorthead Cusk-eel
Figs. 1, 2 & 4, Tables 1 & 2

Ophidion sp. A (in part), McCattrey, 1981:102 (records from Gulf of Mexico). *Ophidion* species Robins et al., 1986: 99 (shorthead cusk-eel, diagnosis, distribution).

Ophidion sp. Cervigon, 1991:171, fig. 131 (characters, distribution).
Ophidion sp. cf. *beani*, Boschung, 1992:77 (Alabama distribution).

Holotype.—UF 232221, a male, 146 mm SL, South Carolina, 32°04' N, 79°14' W, 77-82 m, DOLPHIN 0573405, station 59, 8 November 1973.

Paratypes.—See Appendix.

Diagnosis.—Dorsal-fin rays 116-129 (usually 119-125), anal-fin rays 92-102 (usually 98-100), pectoral-fin rays 19-21 (usually 20), precaudal vertebrae 16 or 17 (usually 17), caudal vertebrae 50-52 (usually 51), total vertebrae 67-69 (usually 68); gill rakers on first arch: two rudiments above, four developed but short gill rakers below; head short, blunt, and bulbous; dorsal tissue of head often flaccid, inflated; mouth subterminal; dorsal and ventral profiles of body nearly parallel for most of length; body unmarked; pelvic-fin rays short and unequal, longer reaching under anterior third of opercle.

Description.—Frequency distribution of fin-ray and vertebral counts in Table 1; measurements of body parts expressed in hundredths of standard or head length in Table 2. Two rudimentary gill rakers on upper arm of first gill arch and four developed (but short) rakers on lower arm, a total of six rakers; body with dorsal and ventral profiles nearly parallel for most of their length, snout blunt, ethmoid spine blunt, mouth only slightly inferior; pelvic rays short, longer reaching not quite to opercle; swim bladder of male a simple sac with a median rocker bone anteriorly. Upper wall of swim bladder supported by bony plates composed of elements from fourth to seventh centra; head and body pale brown in life with no distinctive pattern; margin of the dorsal and anal fins edged in black especially anteriorly; orobranchial cavity and gastrointestinal tract pallid.

Distribution.—*Ophidion dromio* is known from the continental shelf waters of the western Atlantic from South Carolina, southern Florida, the Gulf of Mexico off Florida and Texas, and off Colombia, Venezuela, and Guyana. It is known to occur on sand and mud bottom between 51 and 183 m; most records are from less than 100 m.

Etymology.—As with *Ophidion antipholus*, from William Shakespeare's "The Comedy of Errors," an allusion to the brothers Dromio whose identities also were confused throughout the drama; to be treated as a noun in apposition. *Ophidion dromio* and the other species described in this paper are part of a larger story.

Ophidion puck new species
Pallid Cusk-eel
Figs. 1 & 3, Tables 1 & 2

No references apply to this species.

Holotype.—UF 232199, a male, 138.3 mm SL, MEXICO: off Yucatán, 21°05' N, 86°23' W, 348-357 m, PILLSBURY 580, 22 May 1967.

Paratype.—See Appendix.

Diagnosis.—Dorsal-fin rays 129-130, anal-fin rays 100-101, pectoral-fin rays 21 or 22, precaudal vertebrae 17 or 18, caudal vertebrae 52 or 53, total vertebrae 70; gill rakers on first arch six, two rudiments on upper arm, four developed (but short) essentially equal rakers on lower arm.

Description.—Frequency distribution of the fin-ray and vertebral counts in Table 1; measurements of body parts expressed in hundredths of standard or head length in Table 2; six rakers on the first gill arch; two rudimentary rakers on upper arm, and four moderately developed rakers, of approximately equal length, on lower arm; snout slightly protruding, mouth subterminal; ethmoid spine short and blunt; dorsal and anal fins unmarked (without dark borders); body peppered with melanophores and gill chamber heavily peppered; gut pale throughout; body with dorsal and ventral profiles parallel for most of their length; pelvic rays short and unequal, longer approximately one-half head length, and extending only under preopercle; swim bladder a simple sac, occupying about three-fourths of coelomic cavity; silvery white; median rocker bone present in males.

Distribution.—*Ophidion puck* is known from only two localities, one off the eastern coast of Yucatán, and the other near Cay Sal Bank, Bahamas (see Holotype and Appendix). This is the deepest dwelling of the Atlantic species of *Ophidion*, the known depth range being 348-384 m.

Etymology.—The name is from William Shakespeare's "A Midsummers Night's Dream." Puck: a tricksy fairy in the service of King Oberon; to be treated as a noun in apposition.

DISCUSSION

The genus *Ophidion* never has been defined properly and, as presently comprised, is paraphyletic. One group of species has a strongly developed, forward projecting, rostral (ethmoid) spine like that of *Lepophidium*. These species are *O. barbatum* (type species of *Ophidion*), *O. rochei*, and *O. lozanoi*. Two additional species, *O. selenops* and *O. nocomis*, do have a prominent rostral spine but it is less forward projecting. The first three also have a swim bladder with a median rocker bone. The absence of this structure in *O. selenops* and *O. nocomis* may represent a secondary loss associated with dwartism (Robins and Böhlke, 1959). In *Ophidion*, this rocker bone also is developed in *O. holbrookii*, *O. dromio*, *O. puck*, *O. grayi*, and *O. scrippsae*, all of which lack the forward projecting rostral spine. The rocker bone also is present in the putatively primitive carapid genus *Onuxodon* (see Courtenay and McKittrick,

1970). Other species of *Ophidion* have a swim bladder with a variously developed bony casque but lack a median rocker bone and this widely distributed group includes *O. antipholus* and *O. guianense*.

Ophidion holbrookii (Putnam) is a common shallow water species which ranges from North Carolina through the Gulf of Mexico and Caribbean Sea to southeastern Brazil. *Ophidion holbrookii* resembles the four species described here in being tan, unpatterned except for a dark edge to the dorsal and anal fins. For an excellent color photograph see Arai (1983:227). It is a larger species attaining at least 255 mm SL. It differs from all in the form of the swim bladder (see Fig. 3 and Rose, 1961), in having a mouth that is only slightly subterminal, and in having longer pelvic rays, the longer of the two extending well back onto the chest to a point under or nearly under the pectoral-fin base. *Ophidion* sp. Arai (1983:227) is *O. holbrookii* as noted above although the counts listed may apply to more than one species. From *O. antipholus* and *O. guianense*, *O. holbrookii* differs in having a rocker bone and in having only 4 developed rakers on the lower gill arch. Also *O. holbrookii* has the dorsal profile straight from the snout tip to the tip to the nape instead of convex.

Although the four species described here are superficially similar, they belong to different species groups; in the western Atlantic, *O. dromio* and *O. puck* are to be associated with *O. holbrookii*. These three species also consistently have only four developed rakers on the lower limb of the first gill arch. *Ophidion antipholus* and *O. guianense* are latitudinal sister species but their relationships within the genus are obscure. Both have five or six developed rakers on the lower limb of the first gill arch. *Ophidion guianense* has a shorter snout (Table 2). In addition to the features of the swim bladder and gill rakers already discussed, *O. antipholus* differs from *O. dromio* in having a longer occipital length, longer pectoral fin, shorter second pelvic ray, longer snout, smaller orbit, and longer lateral line (Table 2).

In 1959 C. R. Robins examined the two syntypes of *Ophidion josephi* Girard, 1859 (USNM 868), from St. Joseph's Island, Texas. They were x-rayed for him at the Federal Bureau of Investigation during which process the rear part of one specimen was lost. Both syntypes are small and in terrible condition. The high dorsal (151) and anal (110) ray counts preclude their being any of the four species discussed here. The name has never been used except in compiled works (e.g., Jordan and Gilbert, 1882b:793) until Nielsen and Robins (in press) identified it as a senior synonym of *O. welshi*. A review of the *Ophidion marginatum-josephi* complex is needed. Until presently undescribed species from the eastern Atlantic, Indian, and Pacific oceans are studied it is premature to attempt a more detailed analysis of the genus *Ophidion*.

LITERATURE CITED

Arai, T. 1983. Brotulas, cusk-eels. Pp. 223–235 *in* T. Uyeno, K. Matsuura, and E. Fujii (eds.), *Fishes Trawled off Suruga Bay and French Guiana*. Tokyo: Japanese Marine Fishery Resource Reserch Center.

Bailey, R. M. , J. E. Fitch, E. S. Herald, E. A. Lachner, C. C. Lindsey, C. R. Robins, and W. B. Scott. 1970. A List of Common and Scientific Names of Fishes from the United States and Canada. American Fisheries Society Special Publication 6:1–149.

Boschung, H. T. , 1992. Catalog of freshwater and marine fishes of Alabama. Bulletin of the Alabama Museum of Natural History, 14:xvi+266 pp.

Breder, C. M. , Jr. 1948. *Field Book of Marine Fishes of the Atlantic Coast*. New York: G. P. Putnam's Sons.

Cervigón, F. 1991. *Los Peces Marinos de Venezuela. Vol. 1*. Caracas, Venezuela: Fundación Científica Los Roques.

Cohen, D. M. , and J. G. Nielsen. 1978. Guide to the identification of genera of the fish order Ophidiiformes with a tentative classification of the order. NOAA Technical Report NMFS Circular 417: v + 72 pp.

Courtenay, W. R. , Jr. and F. A. McKittrick. 1970. Sound-producing mechanisms in carapid fishes, with notes on phylogenetic implications. Marine Biology 7(2):132–137.

Gordon, D. J. , D. F. Markle, and J. E. Olney. 1982. Ophidiiformes: development and relationships. Pp. 308–319 *in* H. G. Moser (ed.), *Ontogeny and Systematics of Fishes*. American Society of Ichthyologists and Herpetologists Special Publication 1.

Harry, R. H. 1951. A new cusk-eel of the genus Ophidion from California with notes on the genus. Stanford Ichthyological Bulletin 4(1):30–35.

International Commission on Zoological Nomenclature. 1999. *International Code of Zoological Nomenclature, 4th Ed.* London: International Trust for Zoological Nomenclature.

Jordan, D. S., and B. W. Evermann. 1898. The Fishes of North and Middle America. Bulletin of the United States National Museum 47, Part 3:xxiv + 2183–2860.

Jordan, D. S., and C. H. Gilbert. 1882a. Fishes observed about Pensacola, Florida, and Galveston, Texas, with descriptions of new species. Proc. United States National Museum 5(282):241–307.

Jordan, D. S., and C. H. Gilbert. 1882b. A synopsis of the fishes of North America. Bulletin of the United States National Museum16, lvi + 1018 pp.

Jordan, D. S., and C. H. Gilbert. 1883. Description of two new species of fishes (*Aprion aroninus* and *Ophidium beani*) from Pensacola, Florida. Proceedings United States National Museum 6(357):147–150.

Leviton, A. E. , R. H. Gibbs, Jr. , E. Heal, and C. E. Dawson. 1985. Standards in herpetology and ichthyology: Part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. Copeia 1985(3): 802–832.

McCaffrey, P. M. 1981. Studies on the composition and organization of the demersal ichthyofauna of the Continental Shelf zones of the northeastern Gulf of Mexico. Florida Department of Environmental Regulation Technical Series 6(1):xii + 576 pp.

McEachran, J. D. and J. D. Fechhelm. 1998. *Fishes of the Gulf of Mexico. Vol. 1 Myxiniformes to Gasteosteiformes*. Austin, Texas: University of Texas Press.

Moe, M. A., Jr., P. C. Heemstra, J. E. Tyler, and H. Wahlquist. 1966. An annotated listing of the fish reference collection at the Florida Board of Conservation Marine Laboratory. Florida Board of Conservation Special Scientific Report 10: 1–121.

Nielsen, J. G., D. M. Cohen, D. J. Markle, and C. R. Robins. 1999. Ophidiiform Fishes of the World (Order Ophidiiformes). An Annotated and Illustrated Catalogue of Pearlfishes, Cusk-eels, Brotulas and other Ophidiiform Fishes Known to Date. Rome: Food and Agricultural Organization Species Catalogue, Vol. 18:xi + 178 pp.

Nielsen, J. G., and C. R. Robins [in press] Ophidiidae. In FAO Species Identification Sheets for Fisheries Purposes. Western Central Atlantic, Fishing Area 31. Rome: Food and Agricultural Organization.

Putnam, J. W. 1874. Notes on Ophidiidae and Fierasteridae with descriptions of new species from America and the Mediterranean. Proceedings of the Boston Society of Natural History 16:339–348.

Robins, C. R. 1962. Studies on fishes of the family Ophidiidae—VII. The Pacific species of *Lepophidium*. Copeia 1962(3):487-498.

Robins, C. R. 1986. The status of the ophidiid fishes *Ophidium brevibarbe* Cuvier, *Ophidium graellsi* Poey, and *Leptophidium profundorum* Gill. Proceedings of the Biological Society of Washington 99(3):384–387.

Robins, C. R., R. M. Bailey, C. E. Bond, J. R. Brooker, E. A. Lachner, R. N. Lea, and W. B. Scott. 1980. A List of Common and Scientific Names of Fishes from the United States and Canada. American Fisheries Society Special Publication 12:1–174.

Robins, C. R., R. M. Bailey, C. E. Bond, J. R. Brooker, E. A. Lachner, R. N. Lea, and W. B. Scott. 1991. Common and Scientific Names of Fishes from the United States and Canada. American Fisheries Society Special Publication 20:1–183.

Robins, C. R. and J. E. Bohlke 1959. Studies on fishes of the family Ophidiidae—IV. Two new dwart cusk-eels (genus *Ophidion*) from the tropical western Atlantic. Notulae Naturae, Academy of Natural Sciences of Philadelphia 325:1–9.

Robins, C. R., G. C. Ray, and J. Douglass 1986. *A Field Guide to Atlantic Coast Fishes of North America*. Boston: Houghton Mifflin Company.

Rose, J. A. 1961. Anatomy and sexual dimorphism of the swim bladder and vertebral column in *Ophidion holbrooki* (Pisces: Ophidiidae). Bulletin of Marine Science Gulf and Caribbean 11:280–308.

Walls, J. G. 1975. *Fishes of the Northern Gulf of Mexico*. Neptune City, New Jersey: T. F. H. Publications, Inc.

APPENDIX

Material Examined

Ophidion antipholus (Paratypes)

South Carolina: ANSP 149624 (2, 137–184) 32°50.7'-49' N, 78°57.5'-59' W in 25 m, DOLPHIN Cr. 5-73, 24Oct. 1973. KU 29987 (ex UF 232218) (1, 193) 32°52.5' N 78°48' W in 27 m, SILVER Bay 5428, 14 Jan. 1964. MCZ 148662 (1, 200) off of Charleston in 63 m, 1950's? UF 38409 (16, 95-216) 33°09' N, 78°49' W, in 20 m. UF 216270 (1, 220) 32°00' N, 79°28' W in 61 m, SILVER BAY 5395, 7 Dec. 1963. UF 232133 (12, 95-226) 32°02' N, 80°01' W in 23 m, DOLPHIN 0573353, 24 Oct. 1973. UF 232134 (13, 100-200) and UF 232135 (2, 173-192, cleared and stained) 32°00' N, 80°24' W in 20 m, DOLPHIN 0573356, 27 Oct. 1973. UF 232135 (10, 91-122) 32°07' N, 80°31' W, in 16 m, DOLPHIN 0573357, 28 Oct. 1973. UF 232145 (1,219) 32°03' N, 79°37' W in 36 m, DOLPHIN 0573401, 4 Nov. 1973. UF 232146 (11, 107-204) 32°12' N, 79°37' W in 29 m, DOLPHIN 0573402, 4 Nov. 1973. UF 232147 (1, 181) 33°05' N, 78°28' in 25 m, DOLPHIN 0573414, 12 Nov. 1973. UF 232148 (12, 128-208) 33°18' N, 78°20' W in 27 m, DOLPHIN 0573415, 12 Nov. 1973. UF 232149 (1, 178) 33°05' N, 78°44' W in 20 m, DOLPHIN 0573416, 13 Nov. 1973. UF 232150 (1, 205) 33°02' N, 77°59' W in 40 m, DOLPHIN 0573433, 15 Nov. 1973. UF 232206 (2, 228-231)33°09' N, 78°20' W in 29 m, SILVER BAY 1732, 6 Mar. 1960. UF 232220(1, 209) 31°56' N, 79 29' W in 61 m, DOLPHIN 0573400, 4 Nov. 1973. UF 234572 (1, 187; cleared and stained) 32°00' N, 80°24' W in 20 m, DOLPHIN 0573356, 27 Oct. 1973. UF 234576 (1, 225; cleared and stained) 33°33.5' N, 78°50.5' W in 10 m, SILVER BAY 1329, 16 Oct. 1959. USNM 329633 (1, 196) 32°34.0' N, 79°05.0' W in 34 m, PELICAN 194-10, 9 Mar. 1940.

Georgia: UF 232136 (3, 81-150) 31°27' N, 80°52' W in 14 m, DOLPHIN 0573358, 28 Oct. 1973. USNM 329634 (1, 156) 31°46.5' N, 79°47.5' W, in 43 m, PELICAN 195-9, 13 Mar. 1940.

Florida (Atlantic coast): CAS 32047 (1, 189) 28°42' N, 82°12' W in 30 m, UNDAUNTED 6904 sta. 7, 22 Oct. 1969. UT 232140 (3, 169-185) 28°54' N, 080°42' W in 14 m, DOLPHIN 0573381, 31 Oct.1973. CAS 216609 (ex UF 232142) (5, 121-208) 29°21' N, 80°41'W in 23 m, DOLPHIN 0573384, 2 Nov. 1973. KU 29988 (ex UF 212239) (1, 205) 29°24.5' N, 80°36' W, in 28 m, SILVER BAY 4737, 26 Mar. 1963. 13 Nov. 1973. KU 29985 (ex UF 232137) (6, 124-180) 30°16' N, 81°15' W in 15 m, DOLPHIN 0573368, 29 Oct. 1973. KU 23674 (ex UF 234574 and 34575) (2, 213-220 + 1, 214; cleared and stained) 28°55' N, 80°16' W in 39 m, SILVER BAY 4400, 4 Oct. 1962. KU 29986 (ex UF 232141) (4, 156-197) 28°47' N, 80°24' W in 27 m, DOLPHIN 0573382, 1 Nov. 1973. KU 29988 (ex UF 212329) (1, 205) 29°24.5' N, 80°36' W in 28 m, SILVER BAY 4737, 26 Mar. 1963.NCSM 31844 (ex UNC-IMS 312)(1-207) 30°25'N, 80°20'W, in 15 m, GEORGE M. BOWERS B-54, 10 Mar. 1956. UF 13041 (1, 198) 28°30' N, 80°07' W in 62 m, OREGON 5287, 21 Feb. 1965. UF 13057 (5, 187-203) 28°35.5'N, 80°80.08'W in 63 m, OREGON 5286, 21 Feb. 1965. UF 13230 (1, 193) 27°50'N, 79°59'W in 69 m, OREGON 5278, 20 Feb. 1965. UF 16019 (2) Palm Beach County, ca. 1 mi. E of Delray Beach, in 20 m, 25 Aug. 1967. UF 12230 (2, 186-198) collected with holotype. UF 232139 (4, 90-210) 30°08' N, 080°44' W in 30 m, DOLPHIN 057337, 30 Oct. 1973. UF 232143 (4, 90-202) 29°28' N, 80°40' W in 25 m, DOLPHIN 05733385, 2 Nov. 1973. UF 232144 (1, 122) 29°31' N, 80°32' W in 28 m, DOLPHIN 0573386, 2 Nov. 1973. UF 232151 (38, 78-214) 30°02' N, 81°06' W in 20 m, DOLPHIN 0573370, 30 Oct. 1973. UF 232219 (1, 158) 28°20' N, 80°15' W in 30 m, SILVER BAY 4259, 30 Aug. 1962. UF 234643 (1, 231) 30°04' N, 80°40' W in 34 m, SILVER BAY 3016, 22 Apr. 1961. USNM 329635 (1, 184) 29°03.0'N, 80°12.5'W in 54 m, PELICAN 204-2, 29 Mar. 1940.

Florida (Gulf of Mexico): FMNH 69159 (1, 140) 30°00' N, 87°15' W in 27 m, OREGON 872, 8 Dec. 1953. FMNH 69281 (2, 213-242) 29°00'-10' N, 85°01' W in 36 m, OREGON 729-730, 16 Dec. 1952. FMNH 69285 (2, 214-228) 25°35' N, 82°49' W in 27 m, OREGON 998, 8 Apr. 1954. FDNR 18725 (4, 202-210) 26°24' N, 82°28' W in 18 m, HERNAN CORTEZ, sta. J, 14 Feb. 1966. KU 29989 (ex UF 205730) (2,142-190) Lee Co., off Boca Grande in 12 m, CRR F-221, 24 May 1959. UF 9157 (2, 198-212) 9 mi. WNW off Boca Grande sea buoy in 14 m, 23 July 1960. UF 19981 (1,184) 23°56' N, 83°04' W in 58 m, BELLOWS Cr. 7405 sta. 2T74-10, 28 Apr. 1974. SIO 02-100 (ex UF 205514 (2, 158-162) 24°45'-50' N, 82°10-30' W in 25 m, CRR-F-133, 10-12 Mar. 1958. UF 208783 (7, 190-208) 25°10' N, 82°13' W in 25 m, 15-17 Jan. 1960. UF 220812 (2, 128-136), Monroe Co., 5 mi NW of Smith Shoal Light, Key West, Dec. 1963-Jan. 1964. UF 232217 (3, 188-225) 25°50' N, 82°30' W in 27 m, OREGON 997, 8 Apr. 1954. USNM 343369 (formerly FDNR 18726) (2, 184-191) 26°24' N, 82°58' W in 36 m, HERNAN CORTEZ, sta. K, 14 Feb. 1966.

Mexico (Yucatán): FMNH 69282 (6,116-192) 20°05.6' N, 91°13' W in 22 m, OREGON 713-716, 8-9 Dec. 1952. FMNH 69284 (1, 158) 22°15' N, 88°55' W in 45 m, OREGON 725, 13 Dec. 1952.

Ophidion antipholus (Non-paratypes)

North Carolina: UF 40758 (1, 90) 33°53'N, 78°10'W, in 13 m, ALBATROSS IV 82-11, sta. 52, 19 Sep. 1982.

South Carolina: UF 38400 (1,84) 33°15'N, 78°52'W, in 16 m, DELAWARE II Cr. 83-05, sta. 221, 10 My 1983.

Georgia: ANSP 141969 (2, 92-95) 31°15.5' N, 80°43' W, DOLPHIN, 28 Oct. 1973.

Florida (Atlantic coast): UF 127441 (ex HBOI 8001) (1, 198) 26°57.6' N, 79°59.4' W in 51 m, GOSNOLD Cr. 216, sta. 128, 12 Jan. 1974. UF 127442 (ex HBOI 8002) (5, 171-182) 27°23.3' N, 79°59.1' W in 38 m, GOSNOLD, Cr. 216, sta. 133, 18 Jan. 1974. TU 14785 (1, 242) 28°48' N, 79°53' W in 382 m, PELICAN 67, 13 June 1956 (these data can not be correct and this collection most likely is from COMBAT 67, 30°15'N, 80°52' W in 23 m, 30 Aug. 1956). UNC 312 (1, 207) 30°25' N, 80°20' W in 45 m, GEORGE M BOWERS B-54, 10 Mar. 1956.

Florida (Gulf of Mexico): FDNR 00000 (1, 128) 1.5 mi. offshore between Dunedin and Tarpon Springs, 12 Feb. 1958. UF 35549 (2,176-203) 25°17.5' N, 82°32'W, in33 m,21 May 1978. UF 37505 (1, 125) 24°40.8' N, 82°35.45' W, in 26 m, 19 Apr. 1980.

Georgia: UF 232136 (3, 81-150) 31°27' N, 80°52' W in 14 m, DOLPHIN 0573358, 28 Oct. 1973. USNM 329634 (1, 156) 31°46.5' N, 79°47.5' W, in 43 m, PELICAN 195-9, 13 Mar. 1940. UF 71469 (1, 215) 28°32.5'N, 84°39'W, TURSIOPS 7109-03 in 55 m, 2 April 1971. UT 72167(1, 251) 29°39'N, 85°18'W, TURSIOPS 7023-08 in 41 m, 2 Dec. 1970. UF 72195 (1, 144)29°01'N, 84°38.5'W, TURSIOPS 7103-02 in 40 m, 29 Jan. 1971. UT 72209 (1, 223) 29°08.5'N, 85°18'W, TURSIOPS 7110-02 in 36 m, 6 Apr. 1971. UT 72309 (5, 210-240) 30°10'N, 86°41.5'N,TURSIOPS 7120-33 in 36 m, 21 July 1971. UT 81684 (1, 242) 29°48.3'N, 86°12.0'W, 49 m, 10 Jan. 1987 UF 221803 (1) 28°12' N, 83°39' W in 22 m, HERNAN CORTEZ 17, 2 May 1965.

Ophidion guianense (Paratypes)

CAS 216610 (ex UF 229556 (1, 153) Lesser Antilles, 17°28.2' N, 63°27' W in 17 m, PILLSBURY 963, 20 July 1969. UF 232225 (1, 115) Suriname, 07°02' N, 54°45' W in 61 m, ORLGON II 10588, 7 May 1969. UF 229557 (17, 58-125) and KU 30051 (3, 102-132) Venezuela, 11°08' N, 63°18' W in 31 m, PILLSBURY 712, 19 July 1968.

Ophidion dromo (Paratypes)

South Carolina: UF 12249 (9, 156-182) collected with holotype.

Florida (Atlantic Coast): UF 210247 (1, 98) 4 mi. SE of Islamorada, 73 m, 20 Aug. 1961. UF 210807 (2, 134–147) and KU 29983 (ex UMMH 32740) (3, 131-148; 2 specimens to W. R. Courtenay, Jr. for clearing and staining) 25°15' N, 80°10' W, 73-82 m, SILVER BAY 3521, 9 Nov. 1961.

Florida (Gulf of Mexico): CAS 216612 (1, 162) 29°48' N, 86°30' W, 91 m OREGON 945, 21 Mar. 1954. FMNH 69275 (1, 165) 29°50' N, 86°30' W, 91 m, OREGON 944, 21 Mar. 1954. FMNH 69276 (1, 145) 28°50' N, 85°00' W, 51 m, OREGON 897, 7 Mar. 1954. MCZ 52738 (5, 158-204) 24°32.5' N, 83°17.5' W, 60 m, ANTON BRUUN 834, 18 Oct. 1966. UF 72158 (2, 152-177) 28°56.0' N, 85°20.0'W, 87 m, TURSIOPS 7020-40, 1 Nov. 1970. UF 72161 (1, 129) 28°33.0' N, 84°40.0' W, 61 m, TURSIOPS 7023-03, 1 Dec. 1970. UF 72258 (1, 176) 28°32.0'N, 84°39.0'W, 55 m, TURSIOPS 7115-03, 18 May 1971. UF 72272 (1,164) 28°33.0'N, 84°39.0'W, 61 m, TURSIOPS 7120-03, 17 July 1971. UF 203981 (1, 156) 27°42' N, 84°11' W, 55 m, SILVER BAY 775, 12 Sep. 1958.

Texas: KU 29984 (ex UF 232222) (1, 155) 26°16' N, 96°29' W, 66 m ORLGON II 10453, 20 Mar. 1969.

Colombia: CAS 216611 (ex UF 215404 (1, 167) 12°09' N, 72°47' W, 183 m OREGON 4913, 1 June 1964.

Venezuela: SIO 02-101 (ex UF 216301 (2, 182-183) 11°27' N, 62°17' W, 118-128 m OREGON 5040, 24 Sept. 1964.

Guyana: FMNH 69274 (1, 150) 09°03' N, 59°00' W, 137 m, OREGON 1993, 4 Nov. 1957. KU 29982 (ex UF 204970) (2, 124-136) 07°20' N, 56°49' W, 60 m, OREGON 2261, 1 Sept. 1958.

Ophidion dromo Non-paratypes

Gulf of Mexico: UAIC 1002709 (4 of 10 seen, 166-187) 24°48.88' N, 87°10.8-12.9' W, in 88 m, 10 Dec. 1990.

Ophidion puck (Paratype)

KU 29981 (1, 113.1) between Cuba and Bahama Islands, 23°52' N, 79°11' W, 366-384 m SILVER BAY, 6 Nov. 1960.

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