

**A New Species of Deepwater Snake Eel,
Ophichthus pullus (Anguilliformes: Ophichthidae),
from Angola and Guinea-Bissau**

John E. McCosker

*California Academy of Sciences, 875 Howard Street, San Francisco, California 94103;
Email: Jmccosker@calacademy.org*

***Ophichthus pullus*, a new species of snake eel, subfamily Ophichthinae, is described from specimens trawled in deep water (106–154 m) off Angola and Guinea-Bissau. It is most similar to *Ophichthus aphotistos* from Taiwan and *O. cruentifer* from the western Atlantic but differs from them and other elongate, deepwater species of *Ophichthus* in its vertebral number (149–153), snout condition, pectoral-fin shape and size, and dark coloration.**

KEY WORDS: Ophichthidae; *Ophichthus pullus* sp. nov.; Angola, Guinea-Bissau; *Ophichthus aphotistos*; *Ophichthus cruentifer*; snake eels.

Recent deepwater assessment cruises off the eastern tropical Atlantic by the R/V Dr. Fridtjof Nansen have uncovered a new species of snake eel, genus *Ophichthus*, of the ophichthid subfamily Ophichthinae (*sensu* McCosker 1977). The Nansen specimens were made available to a group of ichthyologists that met at an FAO workshop in Tenerife, Canary Islands, during July 2004. The specimens had been frozen and thawed, and although somewhat tawdry, they were ultimately recognized by the author as an undescribed species. Tomio Iwamoto returned to Angola aboard the Nansen in April 2005 and saved two superb specimens of the new species. In order that the name of that eel become available for the upcoming publication of the FAO *Living Marine Resources of the Eastern Central Atlantic* (Kent Carpenter, editor), I herein describe the new species and compare it to the closely related deep-water ophichthines *Ophichthus aphotistos* and *O. cruentifer*.

Most ophichthids occupy habitats shallower than 100 m, ranging from coral reefs to sand and mud substrates, entering rivers and estuaries. Recent deep-water trapping, trawling, and submersible captures of ophichthids have uncovered a number of new species living at depths as great as 1300 m (McCosker et al. 1989; McCosker 1999; McCosker and Chen 2000). Although most ophichthids are undesirable as a human protein source, they are readily consumed by other fishes and their role in marine ecosystems is poorly understood. It is likely that additional species will be discovered as a result of ongoing deepwater ichthyological surveys.

MATERIALS AND METHODS

Measurements are straight-line, made either with a 300 mm ruler with 0.5 mm gradations (for total length, trunk length, and tail length), and recorded to the nearest 0.5 mm, or a 1 m ruler with 1 mm gradations and recorded to the nearest 1 mm. All other measurements are made with dial calipers or dividers and recorded to the nearest 0.1 mm. Body length is head plus trunk length.

Head length is measured from the snout tip to the posterodorsal margin of the gill opening; trunk length is taken from the end of the head to mid-anus; maximum body depth does not include the median fins. The jaw rictus of the paratypes were surgically cut on the right side to allow the accurate examination of dentition, a necessary procedure. Head pore terminology follows that of McCosker et al. (1989:257) and McCosker and Chen (2000). Vertebral counts (which include the hypural) were taken from radiographs. The mean vertebral formula (MVF) is expressed as the average of predorsal, preanal, and total vertebrae. Type specimens are deposited at the California Academy of Sciences, San Francisco (CAS). Institutional abbreviations follow the Standard Symbolic Codes for Institutional Research Collections in Herpetology and Ichthyology (Leviton et al. 1985).

Genus *Ophichthus* Ahl, 1789

Ophichthus Ahl, 1789: 5 (type species *Muraena ophis* Linnaeus 1758, by original designation).

Ophichthus pullus McCosker, sp. nov.

(Figs. 1–3; Table 1)

MATERIAL EXAMINED.— HOLOTYPE: CAS 222666, 451 mm TL, a ripe male, from Angola (12°24'S, 13°22'E), 106–107 m, otter trawl, *R/V Dr. Fridtjof Nansen*, Sta. 3608, between 1604–1634 on 1 Aug. 2005. PARATYPE: CAS 222667, 529 mm TL, a ripening female, from Angola (07°04'S, 12°00'E), 150–154 m, otter trawl, *R/V Dr. Fridtjof Nansen*, Sta. 3767, between 1615–1645, on 20 Aug. 2005. NONPARATYPE: unnumbered specimen, Centro Oceanográfico de Canarias, Tenerife, 534 mm TL, a ripe male, from Bissau, precise locality and depth unknown.

DIAGNOSIS.— A moderately elongate species of *Ophichthus* with: tail 57–61%, head 8.5–8.9%, and body depth at gill opening 2.8–3.3% of total length; dorsal-fin origin well behind pectoral-fin tips; pectoral fin rounded, not elongate and well-developed; posterior nostril a hole above the upper lip, covered by a flap that extends to or below the edge of the mouth; upper lip lacks barbels between anterior and posterior nostrils; pores small but conspicuous, SO 1 + 4, IO 4 + 2, POM 6 + 2; teeth small and conical, biserial on anterior vomer and jaws; coloration uniform gray-brown to nearly black; total vertebrae 149–153, mean vertebral formula 20.3-56.3-151.3.

COUNTS AND MEASUREMENTS OF THE HOLOTYPE (in mm).— Total length 451; head 38.5; trunk 138.5; tail 274; predorsal distance 65; pectoral-fin length 9.6; pectoral-fin base 4.05; body depth *ca.* 12.5 at gill openings; body width *ca.* 12.0 at gill openings; body depth at anus *ca.* 15; body width at anus *ca.* 14.5; snout 6.7; tip of snout to rictus 11.0; eye diameter 3.25; interorbital width 5.4; gill opening height 5.25; isthmus width 6.6. Vertebral formula 18-55-149.

DESCRIPTION.— Body moderately elongate, subcircular to level of anus, then becoming more compressed, its depth at gill openings 30–36 in TL. Branchial basket moderately expanded. Head 3.6–3.8 in trunk. Head and trunk 2.3–2.6 and head 11–12 in TL. Snout rounded, moderately acute when viewed from above; a short groove bisecting underside of snout nearly to tip of upper jaw; snout, lips and chin densely covered with minute sensory papillae. Lower jaw included, its tip reaching beyond anterior base of anterior nostril tube. Upper jaw not elongated, rictus behind a vertical from posterior margin of eye. Eye not enlarged, 3.2–3.6 in upper jaw and 10.1–11.9 in head. Anterior nostrils tubular, extending ventrolaterally from snout at *ca.* 20°, reaching below upper lip but not reaching tip of chin when directed forward. Posterior nostril a hole above upper lip, covered by a flap that extends below the edge of mouth. There are no barbels along upper lip between the anterior and posterior nostrils. Dorsal-fin origin begins well behind pectoral fin about a head length into trunk length. Median fins low but obvious, ending in a shallow groove a little more than

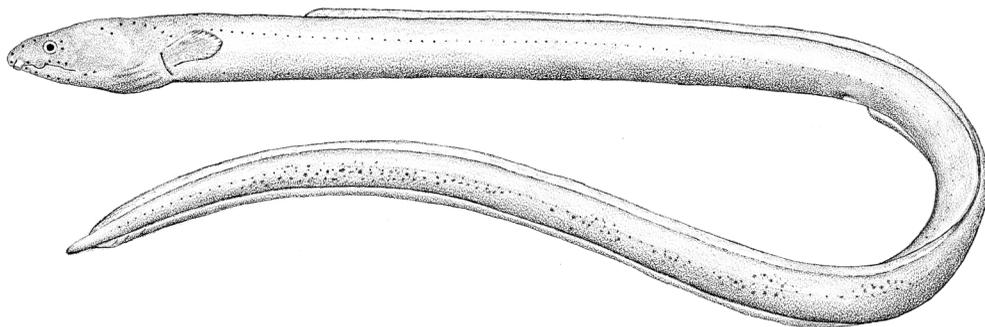


FIGURE 1. Holotype of *Ophichthus pullus* sp. nov., CAS 222666, male, 451mm.

2 eye diameters before the bluntly pointed tail tip. Pectoral fins rounded, not elongate and lanceolate.

Head pores identical in position and number for all specimens, small but apparent (Fig. 2). Single median interorbital and temporal pores. Supraorbital pores 1 + 4, infraorbital pores 4 +

2, lower jaw pores 6, preopercular pores 2, supratemporal pores 3. Faint rows of sensory papillae are visible along the nape and beneath and behind the mandible. Lateral-line pores apparent; 8 before gill opening in a high arching sequence, 54–55 before anus, 143–145 total, the last ca. the distance of the snout from the tail tip.

Teeth (Fig. 3) small, conical, slightly retrorse. One central and 2 on each side at tip of snout, followed by an intermaxillary rosette of about 5 irregular pairs of teeth, followed by a single row of 8–9 small vomerine teeth, decreasing in size posteriorly. Maxillary with about 6–9 pairs of subequal irregularly biserial teeth, followed by 3–5 uniserial teeth. Lower jaw with about 4–6 pairs of irregularly subequal biserial teeth, followed by 13–18 uniserial teeth.

Color in ethanol uniform gray-brown to black. An irregular pattern of fine black specks equal in size to lateral-line pores along dorsal and ventral surface of trunk and tail. Inner margins of lips pale, with a fine black line extending from beyond eye to rictus. Median fins basally pale. Anterior nostrils, tail tip, anal opening, lateral line and cephalic pores, and margin of median fins pale. Posterior pectoral fin margin pale. Peritoneum pale. Inside of mouth pale, densely speckled with dark brown flecks.

SIZE.— The largest known specimen was 585 mm TL. It was trawled from off Angola, frozen and thawed and in very poor condition and ultimately discarded.

ETYMOLOGY.— From the Latin *pullus*, dark-colored, in reference to its appearance.

DISTRIBUTION.— Known from the type series, from 106–154 m depth, collected from off Angola and Guinea-Bissau.

REMARKS.— The new species appears to be very closely related to the deepwater snake eels

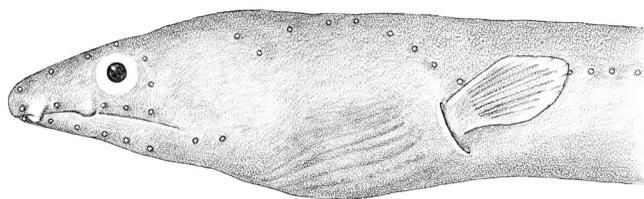


FIGURE 2. Head of holotype of *Ophichthus pullus* sp. nov., CAS 222666, male, 451mm.

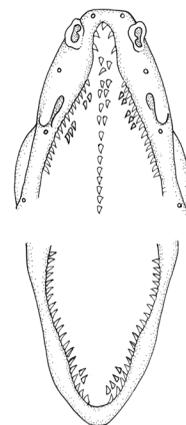


FIGURE 3. Dentition of holotype of *Ophichthus pullus* sp. nov., CAS 222666, male, 451 mm.

Ophichthus aphotistos McCosker and Chen (2000) from Taiwan and *O. cruentifer* (Goode and Bean 1896) of the eastern Atlantic. They are nearly identical in body shape and proportions, physiognomy, pore conditions, and dentition, and are very similar in their dorsal-fin origin, pectoral-fin condition, and coloration. *Ophichthus pullus* differs from *O. aphotistos* and *O. cruentifer* in the length of its lower jaw; when closed, the lower jaw of the new species extends beyond the bases of the anterior

TABLE 1. Counts and proportions (in thousandths) of the holotype, paratype, and nonparatype of *Ophichthus pullus* as compared to three specimens of *O. aphotistos* (from McCosker and Chen 2000) and 10 specimens of *O. cruentifer* (from McCosker et al. 1989). (TL = total length, HL = head length.)

	<i>O. pullus</i>		<i>O. aphotistos</i>	<i>O. cruentifer</i>
	Mean	Range	Range	Range
TL (mm)	—	451–529	480–628	249–428
HL/TL	88	85–89	77–81	69–87
Head and trunk/TL	415	392–427	396–406	380–430
Tail/TL	585	573–608	594–604	570–620
Depth/TL	30	28–33	25–29	23–30
DFO/TL	175	144–191	123–148	95–160
PF length/HL	237	226–249	208–326	238–306 ¹
Upper jaw/HL	317	286–343	311–324	290–370
Snout/HL	183	174–188	204–216	200–230
Eye/HL	92	84–99	94–106	56–92
Predorsal vertebrae	20	18–23	16–19	14–19 ²
Preanal vertebrae	56	55–58	58–60	56–61 ³
Total vertebrae	151	149–153	158–162	144–155 ⁴

¹ These data reflect the removal of an irregular specimen that was previously included in McCosker and Chen (2000: table 1); ² n=33; ³ n=31; ⁴ n=48

nostril tubes, whereas that of the other species either falls short or does not exceed the bases of those tubes. The dentition of the new species is similar in appearance, location, and number to that of *O. cruentifer* (see McCosker et al. 1989: fig. 395), but differs from that of *O. aphotistos* (see McCosker and Chen 2000: fig. 3). Whereas the jaw teeth of *O. pullus* are biserial anteriorly and uniserial posteriorly, those of most *O. aphotistos* are biserial throughout. This however may be related to the size of the specimen in that the smallest paratype (480 mm TL) of *O. aphotistos* also has uniserial maxillary dentition posteriorly (McCosker and Chen 2000: 354–355). *Ophichthus pullus* further differs from *O. aphotistos* (Table 1) in having a shorter head, slightly more posterior dorsal-fin origin, a shorter and blunter snout, a shorter pectoral fin (paddle-shaped rather than lanceolate), and fewer vertebrae. *Ophichthus pullus* further differs from *O. cruentifer* (Table 1) in having a longer head, a slightly more posterior dorsal-fin origin, a generally smaller eye, a shorter and blunter snout, a shorter and broader pectoral fin, and a darker coloration (uniform tan to grayish brown, rather than dark gray to black). *Ophichthus pullus* attains a larger size than does *O. cruentifer*; the known specimens of *O. pullus* range from 451–585 mm TL, whereas the largest of 84 specimens of *O. cruentifer* examined by Wenner (1976) was 423 mm TL and the largest of 80 specimens examined by McCosker et al. (1989) was 467 mm TL. *Ophichthus cruentifer* occupies depths similar to that occupied by the new species, and *O. aphotistos* has been captured by trawl over sand and muddy substrates between 36–1350 m (McCosker et al. 1989), and was observed from submersibles by Wenner (1976) to be most abundant between 250–350 m, with only their heads exposed over sandy substrates or resting on the sediment with their bodies in S-shaped curves.

The new species was also compared to specimens and descriptions of other elongate Indo-Pacific species of *Ophichthus*. The deepwater (235–490 m) western Indian Ocean *O. serpentinus*

Seale (1917) is similar in elongation and appearance, but has more vertebrae (163–167) and uniserial mandibular teeth. *Ophichthus pullus* is also similar in appearance to *Ophichthus exourus* McCosker (1999), a deepwater (450–520 m) species from New Caledonia and Fiji, which differs in having uniserial mandibular teeth and more vertebrae (176–177). *Ophichthus brachynotopterus* Karrer (1982), known from three deepwater (355–428 m) specimens from NE Madagascar, has similar but more irregular biserial dentition, a much larger eye, a more posterior dorsal-fin origin (above the 27th–31st vertebrae), and more vertebrae (178).

Various subgeneric lineages can be identified within *Ophichthus* (sensu lato), and a comprehensive examination of the more than 55 valid species may result in the elevation of several subgenera to generic status (McCosker 1977; McCosker et al. 1989). Based on current knowledge, the new species and its relatives *O. aphotistos* and *O. cruentifer* would reside in *Omochelys* (Fowler 1918, originally described as a subgenus of *Pisodonophis*), type species *Pisodonophis cruentifer* Goode and Bean (1896).

COMPARATIVE MATERIAL EXAMINED.— *Ophichthus aphotistos*, CAS 209192, 580 mm TL (holotype), and USNM 356862, 628 mm TL, and NSYSU 3657, 480 mm (paratypes). *Ophichthus brachynotopterus*, MNHN 1979-22, 442 mm TL, and 413 mm TL (MNHN 1979-23, 413 mm TL (paratypes). *Ophichthus cruentifer*, USNM 28938, 415 mm TL (lectotype), and 80 additional specimens 67–467 mm, as listed in McCosker et al. (1989: 386). *Ophichthus exourus*, MNHN 1995-425, 520 mm (holotype), and CAS 89552, 429 mm (paratype). *Ophichthus serpentinus*, MCZ 9200, 495 mm, holotype.

ACKNOWLEDGMENTS

I wish to thank Tomio Iwamoto for collecting the type specimens; Kent Carpenter, Michel Lamboeuf, and Pere Oliver for inviting my participation in the FAO workshop; Eduardo Balguerías Guerra for assistance during the FAO workshop; Beth Herd Guy for preparing the illustrations; the late Eugenie Böhlke (Academy of Natural Sciences, Philadelphia [ANSP]), and the staffs of the California Academy of Sciences (CAS), Museum of Comparative Zoology, Harvard University (MCZ), Muséum National d'Histoire Naturelle, Paris (MNHN), and the National Museum of Natural History (NMNH), Washington D.C., for advice and assistance with specimens; Alan Leviton for his patience and assistance; Tomio Iwamoto for reading a draft of this manuscript; and the volume editors, who caught a few unpardonable goofs in the typescript.

LITERATURE CITED

- AHL, J.N. 1789. Dissertatio de Muraena et Ophichtho. *Dissertationes Academicæ Upsalæ habitæ sub præsidio C.P. Thunberg* 3(1):1–12.
- FOWLER, H.W. 1918. New and little known fishes from the Philippine Islands. *Proceedings of the Academy of Natural Sciences of Philadelphia* 70:2–71.
- GOODE, G.B., AND T. H. BEAN. 1896. *Oceanic Ichthyology, a Treatise on the Deep-Sea and Pelagic Fishes of the World . . . with an Atlas containing 417 figures*. Special Bulletin of the U.S. National History Museum Vol. 1. 553 pp.
- KARRER, C. 1982. Anguilliformes du Canal de Mozambique (Pisces, Teleostei). *Faune Tropicale* 23:1–116.
- 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 resources collections in Herpetology and Ichthyology. *Copeia* 1985:802–832.
- MCCOSKER, J.E. 1977. The osteology, classification, and relationships of the eel family Ophichthidae. *Proceedings of the California Academy of Sciences* ser. 4, 41(1):1–123.
- MCCOSKER, J.E. 1999. Pisces Anguilliformes: Deepwater snake eels (Ophichthidae) from the New Caledonia region, Southwest Pacific Ocean. Pages 571–588 in A. Crosnier, ed., *Résultats des Campagnes MUSORSTOM* Vol. 20. *Mémoires du Muséum national d'Histoire naturelle* 180.

- MCCOSKER, J.E., E.B. BÖHLKE, AND J.E. BÖHLKE. 1989. Family Ophichthidae. Pages 254–412 in *Fishes of the Western North Atlantic*, Part 9, Vol. 1: *Orders Anguilliformes and Saccopharyngiformes*. Sears Foundation for Marine Research, Yale University, New Haven, Connecticut, USA.
- MCCOSKER, J.E., AND Y. CHEN. 2000. A new species of deepwater snake-eel, *Ophichthus aphotistos*, with comments on *Neenchelys retropinna* (Anguilliformes: Ophichthidae) from Taiwan. *Ichthyological Research* 47(4):353–357.
- SEALE, A. 1917. New species of apodal fishes. *Bulletin of the Museum of Comparative Zoology, Harvard College* 61(4):79–94.
- WENNER, C.A. 1976. Aspects of the biology and morphology of the snake eel, *Pisodonophis cruentifer* (Pisces, Ophichthidae). *Journal of the Fisheries Research Board of Canada* 33(4):656–665.