

Description of a new *Ophichthus* eel from Dongsha Atoll, South China Sea, and a range extension of *Ophichthus kusanagi* Hibino, McCosker & Tashiro, 2019

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Abstract. A snake eel is described on the basis of a single specimen collected near Dongsha Atoll in the South China Sea. Its large eyes and the dorsal-fin origin behind the pectoral fins place it in the *Ophichthus megalops* group, despite its lack of a blackened anal-fin base in advance of the tail tip. The following combination of characters separates this new species from all of its Indo-West Pacific congeners: body bicoloured, grey-brown dorsally and uniformly pale ventrally; dorsal-fin origin situated 2.2 times pectoral-fin length behind tip of pectoral fin; eye large and snout short and blunt; a knob present between nostrils; rictus situated slightly anterior of vertical through posterior margin of eye; and teeth biserial on upper jaw and uniserial on vomer and lower jaw. A specimen of *Ophichthus kusanagi* Hibino, McCosker & Tashiro, 2019 was also collected nearby, representing the first record of this species from the South China Sea.

Key words. Pisces, Elopomorpha, Anguilliformes, snake eel, biodiversity

INTRODUCTION

With more than 80 species, the snake eel genus *Ophichthus* Ahl, 1789 is the most diverse genus in the family Ophichthidae (Hibino et al., 2019a, b; Vo & Ho, 2021), in which species from deep waters (>200 m) are rare and poorly represented in museum collections. Asano (1987) described *Ophichthus megalops*, which is characterised by distinctly large eyes, a dorsal-fin origin far behind the tip of the pectoral fin, and a blackened anal-fin base in advance of the tail tip. Hibino et al. (2019a) redescribed *O. megalops* and described two new species similar to it, *O. semilunatus* from Taiwan and *O. brevidorsalis* from New Caledonia. All three species, herein recognised as the *O. megalops* species group, share the large eyes and blackened anal-fin base of the above diagnosis, but can be separated from each other by their vertebral counts, dentition, colouration, and position of the dorsal-fin origin (DFO). A fourth species, *Ophichthus mccoskeri* Sumod, Hibino, Manjabrayakath & Sanjeevan, 2019, described from India, also belongs to the species group.

Recently, a specimen of large-eyed *Ophichthus* was collected by bottom trawl off Dongsha Atoll (or Pratas Island) in the South China Sea. The specimen is similar to *O. megalops* but lacks a blackened anal-fin base in advance of the tail tip. There are several other Indo-Pacific *Ophichthus* species with a DFO situated two pectoral-fin lengths or more behind the head and no such blackening of the anal-fin base (Vo & Ho, 2021), but our specimen differs from these species in having more vertebrae, a different vertebral formula, a distinct colouration, and differences in other morphological features. All these lead us to describe it herein as a representative of a hitherto unknown species.

We take this opportunity to report on another unusual specimen of *Ophichthus* snake eel collected earlier from the vicinity of Dongsha Atoll, identified herein as *Ophichthus kusanagi* Hibino, McCosker & Tashiro, 2019. This species was previously recorded only from Japan, so the present find represents its first known occurrence in the South China Sea as well as in tropical waters in general.

MATERIAL AND METHODS

Morphological terminology and standards for measurements and counts follow Böhlke (1989), with further explanation below. Lengths, reported in mm, were measured either to the nearest millimetre with a ruler or to the nearest 0.1 millimetre with a digital calliper.

Total length (TL) was measured from the snout tip to the posterior tip of the tail. Head length (HL) was measured from the snout tip to the upper end of the pectoral-fin base.

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Predorsal and preanal lengths were measured from the snout tip to the origin of the respective fin. Body depth and width were both measured at two sites along the body, at the gill opening and anus. Snout length was measured from the snout tip to the eye's anterior margin. Eye diameter and interorbital width were measured as the eyes' horizontal width and the narrowest gap between their upper margins, respectively. Upper-jaw length was measured from the snout tip to the rictus. Pectoral-fin length was measured from the upper end of the fin base to the tip. Gill-opening height was measured as the length of the gill opening slit. The upper jaw's overhang of the lower jaw (S-L) was measured from the tip of the snout to the tip of the chin with the mouth closed. Interbranchial distance was measured between the lower ends of the two gill openings.

Radiographs were made using a digital x-ray machine at the National Museum of Marine Biology & Aquarium, Taiwan, with pins inserted into the fish at the origins of the dorsal and anal fins. Vertebral formula is shown as numbers of vertebrae of predorsal-preanal-total. Sensory pores on head, lateral line, and jaw teeth were examined by using light microscopy.

Both specimens have been deposited in the Pisces collection of the same museum (NMMB-P). Data used for comparison were taken either from specimens examined by the authors or from various publications as indicated. Names of other museums are abbreviated as follows: MNHN (Muséum National d'Histoire Naturelle, Paris, France) and ASIZP (Biodiversity Research Center, Academia Sinica, Taipei, Taiwan).

TAXONOMY

Family Ophichthidae

Ophichthus pratasensis, new species

(Figs. 1–3; Table 1)

Holotype. NMMB-P35993, 585 mm TL, male, off Pratas Island, Dongsha Atoll, South China Sea (ca. 19°22'N, 116°42'E), bottom trawl, ca. 500 m, 17 September 2021.

Diagnosis. A species of *Ophichthus* with large eyes typical of the *O. megalops* species group, but lacking a blackened anal-fin base in advance of the tail tip. It is separable from all its Indo-West Pacific congeners in having the following features in combination: eyes large (15.9% HL); snout short and blunt (22.0% HL); rictus slightly anterior of vertical through posterior margin of eye; dorsal-fin origin 2.2 times pectoral-fin length behind tip of pectoral fin; knob present between nostrils; body bicoloured, grey-brown dorsally and uniformly pale ventrally; teeth biserial on upper jaw and uniserial on vomer and lower jaw; 1+4 supraorbital pores and 6+2 preoperculo-mandibular pores; and vertebral formula 20-59-177.

Description. Measurements of holotype in mm: total length 585, head length 51, trunk length 178, tail length 356, predorsal length 93, preanal length 229, pectoral-fin length 13.5, pectoral-fin base 5.8, body depth at gill opening 18.5, body width at gill opening 15.2, body depth at anus 17.3, body width at anus 14.6, snout length 11.2, upper jaw length 20, snout overhang beyond tip of lower jaw 1.8, eye diameter 8.1, interorbital width 9.9, gill opening height 6.5, interbranchial width 13.0.

Body rather slender (Fig. 1A), subcircular in cross-section to anterior part of tail, then becoming slightly compressed laterally, its depth at gill openings 32 times in TL. Branchial basket slightly expanded, not deeper than trunk. Skin entirely smooth except for slight wrinkling on branchial basket. Head length 11.5 in TL. Anus situated well before middle of total length, head and trunk combined length 2.6 in TL. Snout short and blunt, narrowly rounded when viewed from above and side, its length 4.6 in HL; underside of snout bisected by short groove. Eye large, over posterior half of upper jaw with posterior margin slightly behind rictus, its diameter 2.5 in upper jaw length and 6.3 in HL. Interorbital space broad, its width 1.2 times eye diameter and 5.2 in HL.

Anterior nostril tubular, extending ventrolaterally from snout, reaching chin when directed downward. Posterior nostril a hole above upper lip, covered by large flap extending slightly below edge of mouth gape. No barbel on upper lip, but broad knob present between nostrils. Tip of lower jaw extending very slightly beyond anterior margin of anterior nostril tube. Upper jaw moderately small, its length 2.6 in HL. Rictus situated slightly anterior to vertical through posterior margin of eye, followed by short fold at posterior end of mouth gape; rear end of this fold reaching to slightly behind same vertical.

Dorsal-fin origin far behind head, 2.2 times pectoral-fin length behind fin tip and 0.9 times HL behind head. Median fins low but obvious, ending slightly less than one eye diameter before tapering tail tip. Pectoral fin with narrow base, fin length 2.3 times basal height, broad at midlength, somewhat wedge-shaped and slightly pointed, with its longest rays at mid-fin.

Head and body pores small but well apparent (Fig. 3A). Supraorbital pores (SO) 1 (ethmoid) + 4 on dorsal surface of snout and interorbital space; infraorbital pores (IO) 3 + 3, comprising 1 between nostrils, 2 below eye, and 3 behind eye; mandibular pores (M) 6 (right) / 7 (left), the last pore being situated anterior to rictus; preopercular pores (POP) 2; frontal pore (F) 1; supratemporal pores 3 (ST; single median pore). No sensory papillae present on head. Lateral-line pores small: cephalic pores 7 (right) / 7 (left), forming arch, predorsal lateral-line pores 21/21; preanal lateral-line pores 60/59; total pores 161/157, the last at about 1/2 head length in advance of tail tip.



Fig. 1. *Ophichthus pratasensis*, new species, holotype, fresh, NMMB-P35993, 585 mm TL. A, lateral view; B, lateral view of right side of head; C, posterior portion of tail, left side, anterior to left, preserved. Not to scale.

Teeth (Fig. 3B) moderately large, conical and closely spaced. Intermaxillary with 14 irregularly sized teeth arranged in oval patch, followed by single row of 16 smaller teeth on vomer, these decreasing slightly in size posteriorly. Biserial tooth rows on maxilla comprising 25/25 teeth in outer row, these becoming gradually smaller posteriorly, and 12/13 teeth in inner row, these being flanked by about posterior 2/3 of outer row with inner teeth slightly larger than adjacent outer teeth. Mandible with 34/ca. 32 moderately small teeth arranged in single row and becoming slightly smaller posteriorly.

Colouration. In both fresh and preserved condition, body distinctly bicoloured, with dorsal half of head and body

greyish-brown and ventral surface uniformly pale; dorsal, pectoral, and anal fins pale. Mouth cavity pale with several scattered irregular back dots. Peritoneum densely covered with black pepper dots, thereby appearing nearly uniformly black; stomach and intestine pale.

Etymology. The specific name, an adjective, is derived from Pratas Island, the only island of Dongsha Atoll, whose large coral reefs surrounded by deep sea are situated near the holotype's collection site. With this name we also hope to call attention to the possible damage that frequent fishery activity in the area might be causing to the environment and natural resources of Dongsha Atoll.

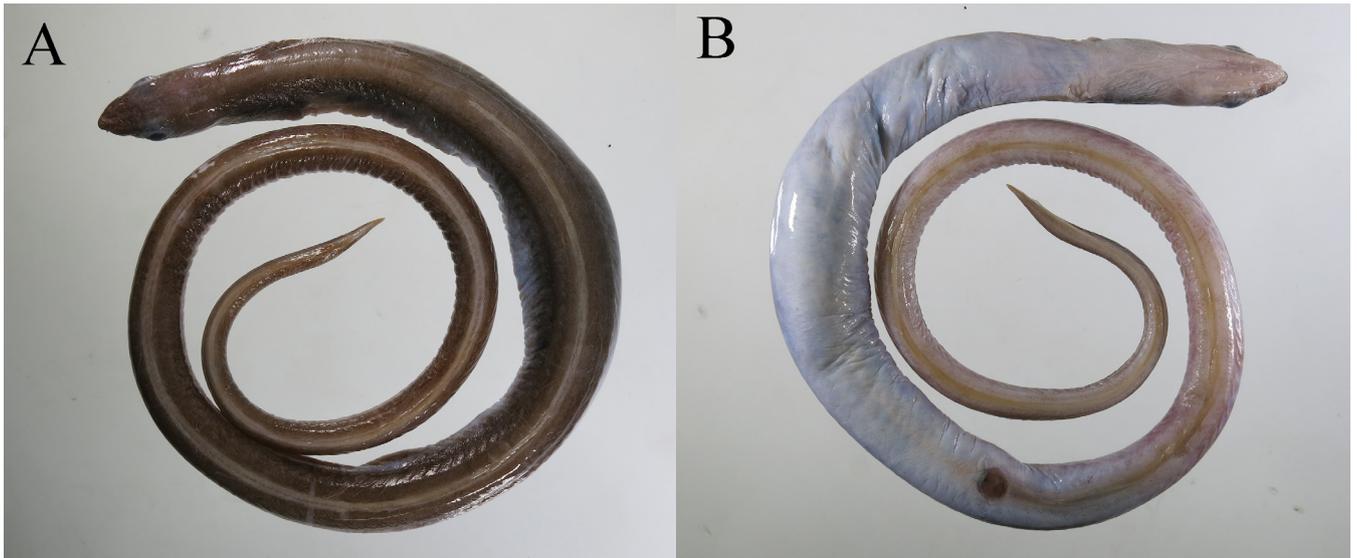
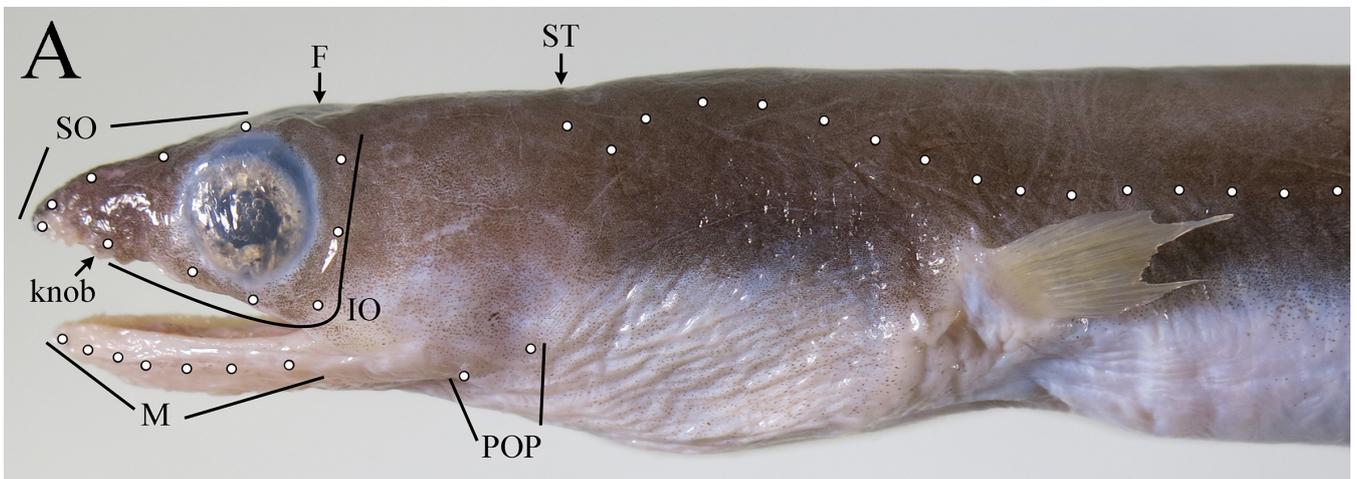


Fig. 2. *Ophichthus pratasensis*, new species, holotype, fresh, NMMB-P35993. A, dorsal view; B, ventral view.



B

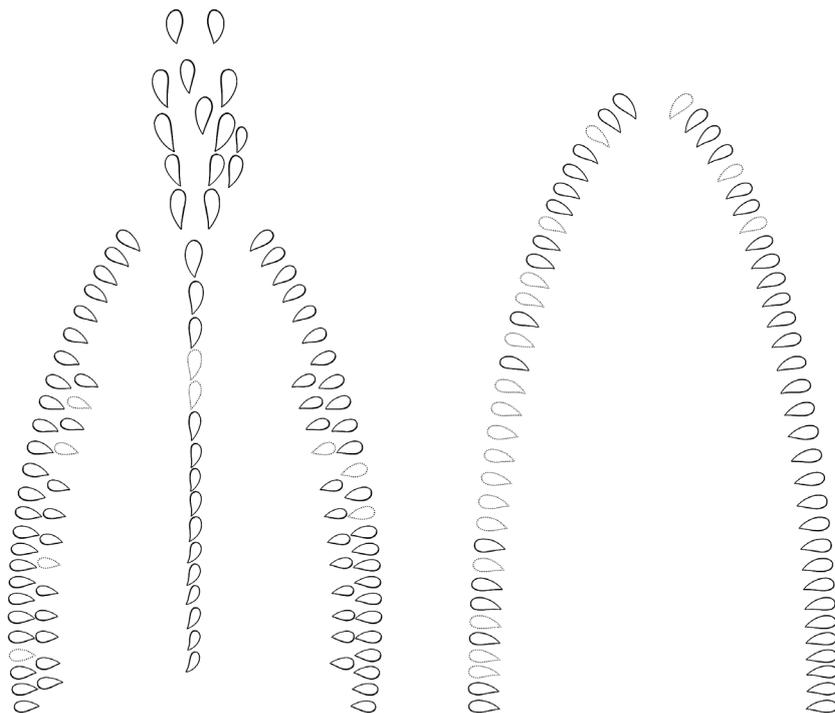


Fig. 3. Drawings of (A) head pores and (B) teeth on upper jaw (left) and lower jaw (right). Knob between nostrils is indicated by arrow. Missing teeth are represented by dotted lines.



Fig. 4. *Ophichthus kusanagi* Hibino, McCosker & Tashiro, 2019, NMMB-P34713, 492 mm TL. A, lateral view; B, lateral view of left side of head.



Fig. 5. *Ophichthus kusanagi* Hibino, McCosker & Tashiro, 2019, NMMB-P34713. A, dorsal view; B, ventral view.

Distribution. Known only from the holotype taken at a depth of ca. 500 m near Dongsha Atoll, but possibly having a broader range in the South China Sea.

Comparison. When first found, the present holotype was identified as *Ophichthus megalops*, but it lacks one of that species' most distinct features, a blackened posterior anal-fin base. The species is still recognised as a member of the *O.*

megalops species group (herein established) on account of its large eyes, the DFO's location well behind the tip of the pectoral fin, and the bicoloured body (grey-brown dorsally and pale ventrally).

It can be separated from the three members of the species group, viz., *O. brevidorsalis*, *O. megalops*, and *O. semilunatus*, by the single row of teeth on the lower jaw,

Table 1. Morphometric and meristic data of *O. pratasensis*, new species, and *O. kusanagi* Hibino, McCosker & Tashiro, 2019, collected off Dongsha Atoll.

	<i>O. pratasensis</i> , new species		<i>O. kusanagi</i>	
	NMMB-P35933 (Holotype)/ TOU-AE8564 (Paratype)		NMMB-P34713	
TL (mm)	585/566		492	
Morphometrics	%TL	%HL	%TL	%HL
HL	8.7/8.8	–	7.8	–
Trunk length	30.4/31.1	–	33.3	–
Preanal length	39.1/39.9	–	41.1	–
Tail length	60.9/60.1	–	58.9	–
Predorsal length	15.9/16.1	–	14.9	–
Pectoral-fin length	2.3/1.8	26.5/20.6	2.1	26.3
Pectoral-fin base height	1.0/0.6	11.4/7.0	0.6	7.6
Body depth at gill opening	3.2/3.4	36.3/39.0	2.3	28.9
Body width at gill opening	2.6/2.3	29.8/26.0	1.8	22.7
Body depth at anus	3.0/3.2	33.9/35.8	2.4	22.7
Body width at anus	2.5/2.7	28.6/31.0	2.1	31.0
Snout length	1.9/2.0	22.0/23.0	1.2	15.1
Upper-jaw length	3.4/3.2	39.2/36.0	2.7	34.1
S-L	0.3/0.3	3.5/3.0	0.5	6.0
Eye diameter	1.4/1.4	15.9/15.8	0.6	7.6
Interorbital width	1.7/1.6	19.4/17.8	1.3	16.1
Gill-opening height	1.1/1.2	12.7/13.8	0.8	10.2
Interbranchial width	2.2/2.4	25.5/27.6	1.6	20.8
Meristics	Holotype	Paratype		
Supraorbital pores	1+4	1+4	1+4	
Infraorbital pores	3+3	3+3	3+3	
Preoperculo-mandibular pores	6+2/7+2	7+2/6+2	6+2	
Frontal pore	1	1	1	
Supratemporal pores	3	3	3	
Cephalic LL pores	7	8	8	
Predorsal LL pores	21	22	22	
Preanal LL pores	60/59	59	63	
Total LL pores	161/157	159	155	
Predorsal vertebrae	20	20	20	
Preanal vertebrae	59	58	61	
Total vertebrae	177	171	160	

the position of the rictus slightly before a vertical through the posterior margin of the eye, the relatively few predorsal vertebrae (20 vs. >28) and predorsal lateral-line pores (21 vs. >28), the smaller head (8.7% TL vs. >9.4% TL), the shorter predorsal length (15.9% TL vs. >20.7% TL) and upper jaw (39.2% HL vs. >41.2% HL), and the smaller pectoral fins (26.5% HL vs. >30.0% HL). It can be further distinguished from them by the vertebral formula 20-59-177, vs. 31-61-164 (mean) in *O. megalops*, 29-64-176 in *O. semilunatus*, and 43-61-164 in *O. brevidorsalis* (data from Hibino et al., 2019a).

Moreover, it differs from *O. mccoskeri* in having a single row of teeth on lower jaw (vs. irregularly biserial and ending in triserial), rictus slightly behind posterior margin of eye (vs. well behind the margin), a smaller head (8.7% TL vs.

13.0–14.0% TL), a smaller eye (15.9% HL vs. 17.1–19.4% HL), a shorter preanal length (39.1% TL vs. 44.2–45.4% TL), a shorter predorsal length (15.9% TL vs. 18.4–20.5% TL), a short and broad pectoral fin (26.5% HL in length vs. the fin slender and 29.1–33.0% HL), 2 POP pores (vs. 3), and relatively more vertebrae (20-59-177 vs. 20-55-153) (data from Sumod et al., 2019).

Among the species of *Ophichthus* that have the DFO situated behind the head by two pectoral-fin lengths or more and no blackened anal-fin base in advance of the tail tip (see Vo & Ho, 2021: table 2), *O. pratasensis* is readily distinguished by having a different vertebral formula. The low knob on the upper lip in *O. pratasensis* is reminiscent of *O. kusanagi*, from which the new species differs in having a bicoloured body (vs. uniformly dark brown), more total vertebrae (177

vs. 158–163), the DFO situated 2.2 times the pectoral-fin length behind the tip of the fin (vs. 3–3.5 times) and HL 3.5 times in trunk length (vs. 4.1 times) (data from Hibino et al., 2019b, and this study).

Among the species of *Ophichthus* that have the DFO situated well behind the head and a blackened anal-fin base in advance of the tail tip (e.g., *O. exourus* McCosker, 1999, *O. brachynotopterus* Karrer, 1983, and *O. mystacinus* McCosker, 1999), *O. pratasensis* is most similar to *O. exourus* in having almost identical body proportions and vertebral formula (mean 19.7-60-177.3, total 176–179; see McCosker, 1999, 2010). *Ophichthus pratasensis* differs from *O. exourus* in having uniserial teeth on lower jaw (vs. some additional teeth on inner row anteriorly and posteriorly), a somewhat pointed pectoral fin (vs. pectoral fin rounded and paddle-like), a shorter and stouter snout (22.0% HL vs. 25.2–28.4% HL), a larger eye (15.9% HL vs. 11.2–12.8% HL), a broader interorbital space (19.4% HL vs. 13.5–14.1% HL), a broader interbranchial width (25.5% HL vs. 14.1% HL), and a smaller ratio of snout length/eye diameter (1.4 vs. 2.2) (data from McCosker, 1999, 2010).

Ophichthus pratasensis differs from *O. brachynotopterus* in having uniserial teeth on the lower jaw and vomer (vs. biserial), the rear margin of the eye slightly behind the rictus (vs. slightly in advance of the rictus) and the posterior nostril well covered by a large flap on the upper lip (vs. barely covered with a narrow flap), and from *O. mystacinus* in having the DFO situated at about one-third trunk length (vs. about mid-trunk), short pectoral fin (vs. elongate fins with threadlike central rays), the posterior margin of eye behind the rictus (vs. in front of the rictus), and uniserial teeth on the lower jaw and vomer (vs. biserial on the lower jaw and anterior part of the vomer) (data from McCosker, 2010).

Remarks. The holotype is a ripe male with moderately developed testes.

New distribution record of *Ophichthus kusanagi*

A single specimen of the recently described species *O. kusanagi* (NMMB-P34713, 492 mm TL; Figs. 4, 5) was collected from off Dongsha Atoll. This find represents the first record of this species in the South China Sea, as well as in tropical waters.

The meristic and morphometric data for this specimen (Table 1) agree with the diagnosis, and mostly also correspond well to other aspects of the original description of *O. kusanagi* provided by Hibino et al. (2019b), which is not repeated here. However, some proportional measurements are slightly different: our specimen has a slightly more slender body, with its body depth at the gill opening 44 times in TL (vs. 33–38.5 times) and a slightly broader interorbital space (16.2% HL vs. 9.4–13% HL), slightly shorter snout (15.1% HL vs. 18–20% HL), slightly shorter rictus (34.1% HL vs. 35–39% HL), and slightly narrower pectoral-fin base (7.6% HL vs. 9.6–12% HL). We attribute these differences to individual variation.

Comparative material. *Ophichthus brachynotopterus*: MNHN 1979-21, holotype, 438 mm, Madagascar. *Ophichthus brevadorsalis*: ASIZP 61684, holotype, 398 mm TL, New Caledonia; *O. exourus*: MNHN 1995-0425, holotype, 590 mm TL, New Caledonia; *O. kusanagi*: NMMB-P34713, 492 mm TL, off Pratas Island, Dongsha Atolls, 13 February 2019; *O. megalops*: NMMB-P12006, 7 spec., 288–500 mm TL, Nan-fang-ao, Taiwan; NMMB-P12193, 408 mm TL, Nan-fang-ao, Taiwan; *O. mystacinus*: MNHN 1998-0046, holotype, 426 mm TL, New Caledonia; *O. semilunatus*: NMMB-P17751, holotype, 500 mm TL, Da-xi, Yilan, Taiwan.

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Postscript. After this paper went to press, a second specimen of *Ophichthus pratasensis*, new species, was discovered. The specimen is in good condition and is a large female with mature eggs. It agrees well with the diagnosis and description provided above, except for the relatively small pectoral fin (e.g., dorsal-fin origin is three times pectoral-fin length behind the fin tip) and relatively few total vertebrae. The tip of tail does not appear to be damaged. Herein, we recognise the new specimen as a paratype of *O. pratasensis* and provide the meristic and morphometric data in Table 1. The specimen was registered as: TOU-AE8564, 566 mm SL, collected by bottom trawl from off Dong-sha Island, South China Sea, 25 March 2022. We thank Jien-Fu Huang for informing us about the presence of this specimen and making it available to us.

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