



## The congrid eel genus *Bathycongrus* of Taiwan, with descriptions of three new species (Anguilliformes: Congridae)

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### Abstract

Ten species of the congrid eel genus *Bathycongrus* are recognized from Taiwanese waters. Diagnoses and full descriptions of eight species are provided in present work. Three species are described as new. *Bathycongrus bimaculatus* **sp. nov.** is a small species with a pale body color, two black patches on dorsal fin, and 109–111 total vertebrae. *Bathycongrus graciliceps* **sp. nov.** is a moderately elongate species with a small, slender head and long trunk, and 163 total vertebrae. *Bathycongrus castlei* **sp. nov.** is a slender species with a relatively short trunk, dorsal half of body deep brownish, and 160–162 total vertebrae. Two rare species, *B. bleekeri* Fowler, 1934 and *B. macroporis* (Kotthaus, 1968), are newly reported from Taiwan. A key to all species in Taiwan is provided.

**Key words:** Taxonomy, Pisces, Anguilliformes, Congridae, new species

### Introduction

The congrid eel genus *Bathycongrus* is a diverse and imperfectly defined group of small to moderately large and moderately elongate eels that inhabit the continental shelf and upper continental slope in tropical and subtropical waters of all oceans. Castle & Smith (1999) reassessed the genus and recognized seven valid species in the Indo-west Pacific region: *B. aequoreus* (Gilbert & Cramer, 1897), *B. guttulatus* (Günther, 1887), *B. macrocerus* (Alcock, 1894), *B. odontostomus* (Fowler, 1934), *B. retrotinctus* (Jordan & Snyder, 1901), and *B. wallacei* (Castle, 1968). They provisionally excluded *Bathycongrus bleekeri* (Fowler, 1934) pending further studies; Karmovskaya & Smith (2008) redescribed that species based on additional specimens and returned it to *Bathycongrus*. Castle & Smith (1999) also discussed the characters used to define the genus and distinguish the species. Subsequently, five new species have been described: *Bathycongrus longicavis* Karmovskaya, 2009, *B. parapolyporus* Karmovskaya, 2009, *B. parviporus* Karmovskaya, 2011, *B. trimaculatus* Karmovskaya & Smith, 2008, and *B. unimaculatus* Karmovskaya, 2009.

In this paper, we describe three new species of *Bathycongrus*, and Huang *et al.* (2018) describe two additional new species from Taiwan. We include some of their data herein for this revisionary work, and their species are included in the key as well. In addition to the three newly described species, we include two new records from Taiwan, *B. bleekeri* and *Pseudophichthys macroporis* Kotthaus, 1968; the latter is provisionally included in the genus in this work.

### Methods and materials

Methods for taking counts and measurements generally follow Böhlke (1989). Vertebral numbers were counted from digital X-rays. Predorsal vertebrae are counted to a vertical through the first dorsal-fin ray, preanal vertebrae

to a vertical through the first anal-fin ray, precaudal vertebrae to the one before the first centrum with a complete haemal spine. Counts of sensory pores were made under light microscope. The very first pore, at the junction of the lateral-line and supratemporal canals and usually enlarged, is counted as the first pore of lateral-line series. Predorsal, prepectoral and preanal pores are counted to verticals of just before first dorsal-fin ray, upper pectoral-fin base and end of anus (or just before first anal-fin ray), respectively. Data in description of new species are provided for holotype, followed by range of paratypes in parentheses, unless otherwise indicated. Asterisk (\*) means data not available, such as damaged.

Abbreviations: TL=total length, HL=head length, PAL=preanal length, HT=Holotype, PT=Paratype(s), NT=Non-type(s).

## Morphology

**Head pores.** The general arrangement of head pores is shown in Fig 1. Head pores vary in size, many of them enlarged. There are typically 3 suparorbital pores; 5 infraorbital pores, 4 along upper jaw and 1 behind rictus; 1 supratemporal pore (some species with 3); 7 mandibular pores (some with 6) and 3 preopercular pores. Some species have more pores and irregular in arrangement. The mandibular and preopercular pores are arranged in a continuous series of 10 or 11 pores, the 7th pore is slightly but distinctly behind the mandible (specifically the articular bone) and it is somewhat larger and above the level of the other mandibular pores; thus this pore is included in the preopercular series.

**Jaw teeth.** Teeth on maxilla and mandible in multiserial bands, usually 4 or 5 rows anteriorly, narrowing to 1 or 2 rows posteriorly. Intermaxillary teeth moderately enlarged, in 2 to several rows separated from maxillary and vomerine teeth, mostly exposed when mouth closed. Vomerine teeth are highly variable in size, number and arrangement, although some are quite similar. The congeners can be roughly divided into two groups, first one with 2 enlarged teeth at middle surrounding by several much smaller teeth and the second one with a triangular patch of small teeth, some teeth may be slightly enlarged, but never especially larger, and some have more or less granular teeth.

**Lateral-line pores.** The number of lateral-line pores were counted when available. Long-term preservation may result in damage to these pores, as the membranes covering the lateral-line canal are relatively loose and fragile. The numbers of preanal lateral-line pores, counted to the insertion of anal fin, are quite consistent and show distinct differences among species (Table 1).

**Vertebral counts.** The preanal and total vertebrae have long been used to distinguish eel species. The numbers of precaudal vertebrae appear to be a good character to distinguish the species, however, not all congrid species have this feature available. Moreover, some individuals may not show clear boundary on the radiographs and thus are not countable. Because the tip of the tail is often damaged and regenerated, the accurate value for most specimens is not always available. The preanal (Table 2), precaudal (Table 3) and total vertebrae (Tables 5, 8) show clear differences among the species, although some species may have overlapping values.

**Body proportions.** The body proportions are usually similar among the congeners of congrid genera. However, these proportions are relatively distinct among the species of *Bathycongrus* (Tables 4, 7). The genus can be roughly divided into two groups, one with a short body, attenuate tail and fewer than 151 total vertebrae, and a long body with filiform tail and more than 156 total vertebrae. The proportions of head length, predorsal length, preanal length, and trunk length also correspond to the separation of these two groups; while other proportions are more variable depending on the species. Because the tip of the tail is usually damaged and regenerated, the total length is not always accurate. However, we found that specimens with complete tails usually have their tail about 59–66% TL which may help to evaluate whether the tail is complete or not.

## Family Congridae

### Genus *Bathycongrus* Ogilby, 1898

*Bathycongrus* Ogilby, 1898:292 (type species *Congromuraena nasica* Alcock, 1894, by original designation).

*Rhechias* Jordan, 1921:644 (type species *Rhechias armiger* Jordan, 1921, by original designation).

*Congrina* Jordan & Hubbs, 1925:192, 196 (type species *Congermuraena aequorea* Gilbert & Cramer, 1897, by original designation).

*Pseudoxenomystax* Breder, 1927:6 (type species *Pseudoxenomystax dubius* Breder, 1927, by monotypy).

*Microcephalocongrus* Fowler, 1934:270 (type species *Bathycongrus megalops* Fowler, 1934, by original designation; described as a subgenus of *Bathycongrus*).

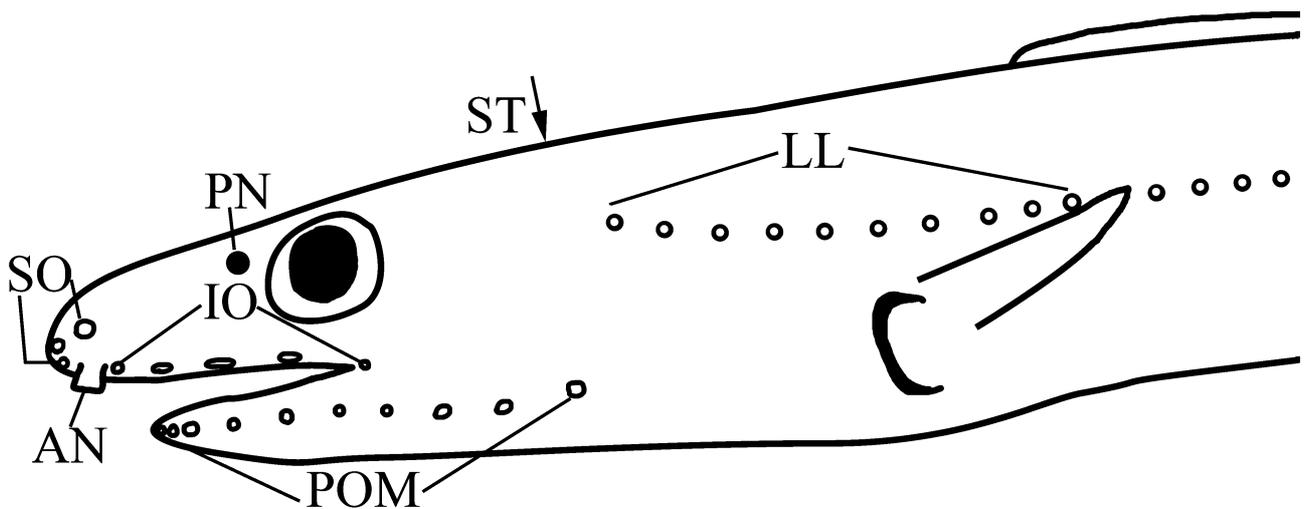
*Uranocongrus* Fowler, 1934:274 (type species *Uranocongrus odontostomus* Fowler, 1934, by original designation).

**Distinguishing characters (after Smith, 1989).** Body moderately elongate, anus at about 30–40 %TL; tail slender, moderately to markedly attenuate at tip. Dorsal fin begins over or slightly behind pectoral fin; anal fin begins directly behind anus; dorsal and anal fins continuous with caudal fin; pectoral fin well developed.

Snout projects beyond lower jaw, intermaxillary teeth at least partially visible when mouth closed; fleshy part of snout projects beyond intermaxillary teeth. Flange present on lower lip, rudimentary or absent on upper lip. Anterior nostril tubular, near tip of snout, directed ventrolaterally. Posterior nostril elliptical, in front of middle or upper part of eye.

Head pores moderate to large (see Fig. 1 for typical arrangement of pores). Supraorbital pores 3–6 (modally 3), 1 at tip of snout near edge of lip, 1 above that in front of anterior nostril, 1 above anterior nostril, 0–3 on snout and interorbital area. Infraorbital pores 5–8 (5), 4 along upper jaw, 1 in line with these behind rictus, 0–3 (0) behind eye; adnasal pore absent. Preoperculummandibular pores 10–11 (10). Supratemporal pores 1 or 3 (1).

Teeth moderately small to moderately large. Intermaxillary teeth in 2 to several rows, separated from maxillary and vomerine teeth, mostly exposed when mouth closed. Vomerine teeth variable, some species with a slightly elongate multiserial patch of small teeth, some with a few large teeth (usually 2) surrounded by a variable number of smaller teeth. Maxillary and mandibular teeth in bands.



**FIGURE 1.** Illustration of head pore systematic of a typical *Bathycongrus*. AN, anterior nostril; IO, infraorbital pores; LL, Lateral-line pores; PN, posterior nostril; POM, preopercular-mandibular pores; SO, supraorbital pores; ST, supratemporal pore (arrowed).

### Key to species of *Bathycongrus* in Taiwan

- 1A. Posterior nostril above level of upper margin of eye . . . . . *B. macroporis*
- 1B. Posterior nostril near or slightly above level of mid-eye . . . . . 2
- 2A. Teeth on vomer uniformly small, subequal in size, none enlarged . . . . . 3
- 2B. Usually 2 (some with 1 or 3) enlarged teeth on vomer, surrounded by small teeth . . . . . 6
- 3A. Trunk rounded in cross section; preanal lateral-line pores >39; total vertebrae >163; total length more than 30 cm in adults . . 4
- 3B. Trunk relatively compressed in cross section; preanal lateral-line pores 25–29; total vertebrae 107–113; total length not exceeding 20 cm . . . . . 5
- 4A. Head large and broad; trunk length 1.5 times HL; total vertebrae 174+ . . . . . *B. brunneus*
- 4B. Head small and narrowly pointed; trunk length 2.0–2.1 times HL; total vertebrae 163 . . . . . *B. graciliceps* sp. nov.

- 5A. Two black patches on anterior portion of dorsal fin; preanal lateral-line pores 27–29. . . . . *B. bimaculatus* sp. nov.  
 5B. No black patch on vertical fin; preanal lateral-line pores 25–26 . . . . . *B. bleekeri*  
 6A. Pores present behind eye; POM 11, ST 3; total vertebrae 195–201 . . . . . *B. albimarginatus*  
 6B. No pores behind eye; POM 9 or 10, ST 1; total vertebrae fewer than 181. . . . . 7  
 7A. Enlarged median vomerine teeth followed by 2 or 3 (rarely 1) small teeth, none on side . . . . . *B. wallacei*  
 7B. Enlarged vomerine teeth surrounded by several small teeth on side . . . . . 8  
 8A. Vomerine teeth forming an elongate patch, 6–9 moderately large teeth behind the enlarged vomerine teeth . *B. castlei* sp. nov.  
 8B. Vomerine teeth forming a small triangular patch, several small teeth surrounding 2 (some with 1 or 3) enlarged teeth. . . . . 9  
 9A. Trunk short, 1.3–1.6 times HL; tail less slender; preanal lateral-line pores 30–35; total vertebrae 143–151. . . . . *B. retrotinctus*  
 9B. Trunk long, 1.6–1.9 times HL; tail more slender; preanal lateral-line pores 35–39; total vertebrae 155–162. . . . . *B. guttulatus*

***Bathycongrus bimaculatus* sp. nov.**

New common name: Two-spot short-tail conger

Figs. 2A–D, 3A; Tables 1–6

**Holotype.** NMMB-P24393 (163), off Dong-gang, Pingtung, southwestern Taiwan, South China Sea, bottom trawl, ca. 300 m, 6 Nov. 2015.

**Paratypes.** NMMB-P7012 (1, 157), 5 Dec. 2003; NMMB-P23175 (1, 169), 24 Apr. 2015; NMMB-P23176 (1, 162), 16 Oct. 2013; USNM 437339 (1, 190), 6 Nov. 2015; all collected from near the type locality.

**Diagnosis.** A small, moderately elongate species of *Bathycongrus* with head and body compressed; pale color with two black patches on anterior portion of dorsal fin; tail slender, attenuate, though not filiform; trunk length 1.3–1.5 times HL; teeth small, conical, in about four rows on jaws, in a short oval patch on vomer; preanal vertebrae 27–30, precaudal vertebrae 35–37, total vertebrae 109–111; and preanal lateral-line pores 27–29.

**Description.** Proportional measurements and meristic data are provided in Tables 1–6.

Head length 2.3 (2.3–2.5) in PAL, 6.5 (6.5–7.0) in TL; preanal length 2.8 (2.7–2.8) in TL; predorsal length 2.0 (2.0–2.2) in PAL, 5.7 (5.6–5.8) in TL; trunk length 1.8 (1.7–1.8) in PAL, 5.0 (4.5–5.0) in TL; tail length 1.5 (1.5–1.6) in TL; depth at head 5.8 (5.5–6.7) in PAL, width at head 9.9 (8.4–9.9) in PAL. Snout length 4.2 (3.9–4.3) in HL; eye diameter 5.8 (4.6–5.7); interorbital width 6.6 (6.3–7.5); upper jaw 2.8 (2.7–2.8); gill opening width 8.4 (7.8–9.8); interbranchial width 4.5 (3.9–5.1); pectoral-fin length 3.6 (2.7–3.6).

Body moderately elongate, laterally compressed through the entire length, oval in cross section, becoming more compressed posteriorly; head relatively large, its length 1.3 (1.3–1.5) times in trunk length; tip of tail moderately attenuate; anus slightly behind anterior third of total length.

Dorsal fin begins over middle of appressed pectoral fin, continuous around tip of tail with caudal and anal fins. Anal fin begins immediately behind anus. Pectoral fin well developed, pointed distally with a narrow base. Gill opening relatively small, slightly smaller than eye diameter, its upper end nearly opposite middle of pectoral-fin base; interbranchial width greater than gill opening and eye.

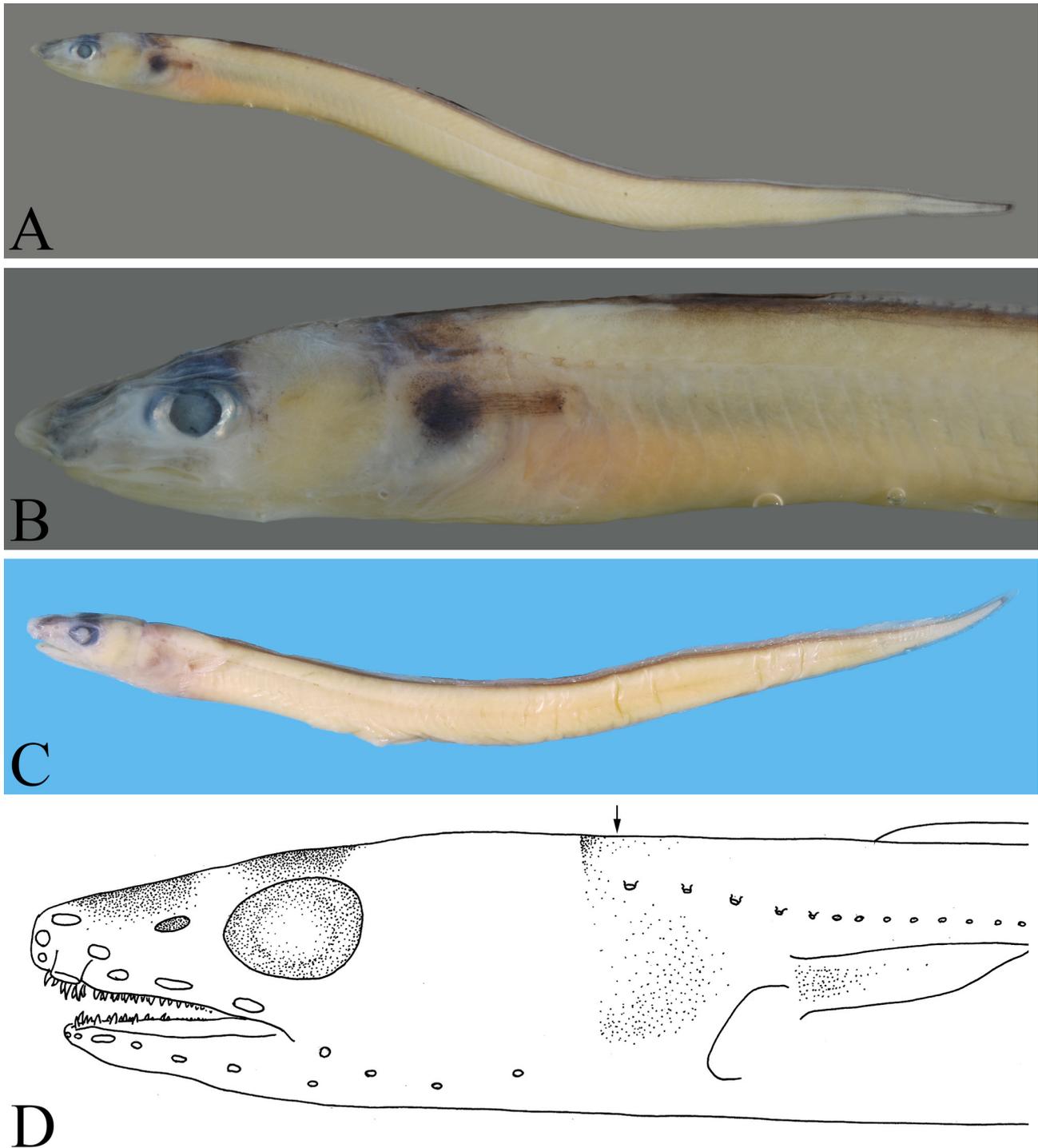
Head relatively large, 15.0% (14.3–15.7%) TL, deepest about midway between gill opening and tip of snout, tapering anteriorly from this point; snout short, blunt anteriorly in dorsal view, its length 1.4 (1.2–1.4) times eye diameter, projecting beyond lower jaw; lower jaw longer than snout; fleshy part of snout with a slight median keel on underside, projecting anteriorly beyond anterior end of intermaxillary tooth patch; rictus below posterior half of eye.

Anterior nostril tubular, near tip of snout, directed ventrolaterally. Posterior nostril elliptical, with a slightly raised rim, in front of mid-eye level. Upper jaw with flange greatly reduced; lower jaw with downturned flange. Tongue free, long, and broad.

Lateral line complete, first pore on each side slightly enlarged, the canal extended to caudal-fin base; 5 (4–7) before pectoral-fin base, 7 (6–9) pores before dorsal-fin origin, 28 (27–29) before anal-fin origin, and 114 (110–116) in total.

Head pores vary in size, mostly enlarged (Fig. 2D). Supraorbital canal with 3 pores; the first (ethmoidal pore) small, on ventral side of snout tip, just ahead lip; the second enlarged and immediately in front of anterior nostril; the third greatly enlarged and immediately above anterior nostril, about same size as anterior nostril. Infraorbital canal with 5 pores, first four enlarged; the first at posterodorsal corner of anterior nostril; the second between anterior and posterior nostrils; the third below posterior margin of posterior nostril; the fourth slightly before vertical through middle of eye; the fifth small and behind rictus; no pores behind eye. Preoperculo- mandibular canal

with 10 (rarely 9) pores; 7 mandibular pores (except 1 paratype with 6), 5 or 6 along lower jaw and 1 behind rictus, the first very small, at anterior tip of lower jaw, the third greatly enlarged; 3 preopercular pores. Supratemporal commissure with no pore.

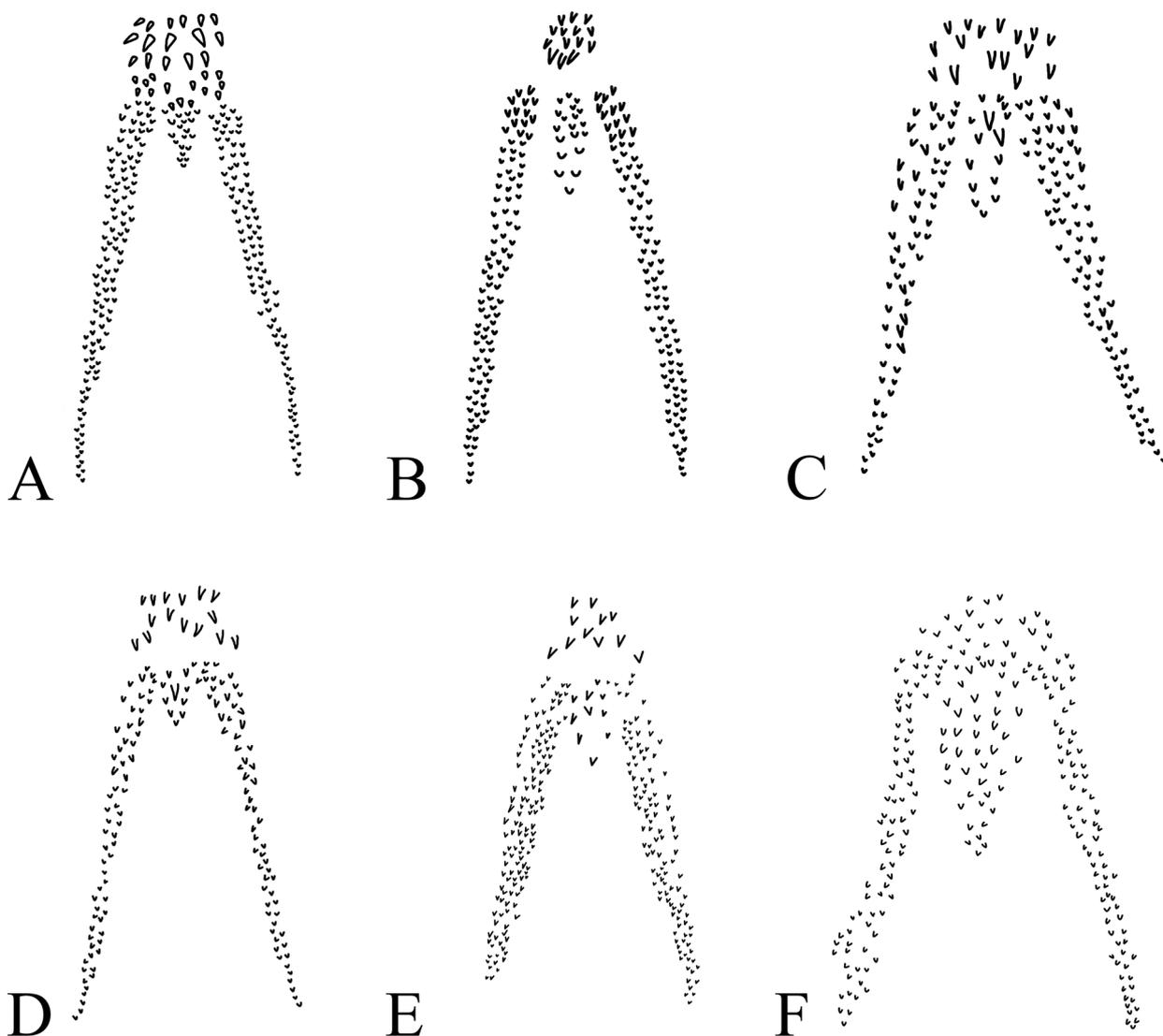


**FIGURE 2.** *Bathycongrus bimaculatus* sp. nov., A, B. Holotype, NMMB-P24393, 163 mm TL. C. Paratype, NMMB-P7012, 157 mm TL. D. head pores, NMMB-P7012, arrow indicates the ST pore.

Predorsal vertebrae 8 (8); preanal vertebrae 28 (27–30); precaudal vertebrae 37 (35–37); total vertebrae 109 (109–111).

Teeth moderately large, conical (Fig. 3A). Intermaxillary teeth largest, curved, in 3 transverse rows, separated from maxillary and vomerine teeth, mostly excluded from closed mouth. Maxillary and mandibular teeth in bands, wider anteriorly, roughly in 4 or 5 rows, narrower posteriorly, in 1 to 2 rows; outermost teeth slightly larger than

innermost. Vomerine teeth forming a small triangular patch, 4 transverse rows of small teeth anteriorly followed by several blunt teeth, roughly in 2 rows.



**FIGURE 3.** Tooth pattern on upper jaw. A. *Bathycongrus bimaculatus* **sp. nov.**, NMMB-P7012, paratype. B. *B. bleekeri*, NMMB-P26214. C. *B. castlei* **sp. nov.**, NMMB-P21740, paratype. D. *B. guttulatus*, NMMB-P7607. E. *B. graciliceps* **sp. nov.**, holotype. F. *B. macroporis*, NMMB-P29128. Not to scale.

**Coloration.** In preservative, pale to yellowish brown; lateral and ventral surface of body and abdomen without chromatophores; scattered pigment on each side of anal-fin base; dorsal surface with a darker wash composed of numerous tiny brown chromatophores on either side of dorsal fin. Snout mostly covered by black pigmentation under the skin, extending to level of posterior margin of eye, except for a clearly white band in front of eye; a black patch under skin at about brain chamber; dark pigment outlining supratemporal canal; a large patch of pigment on opercle in front of pectoral-fin base. Pectoral fin with scattered pigment, denser at base. Dorsal fin with two black patches, one at anterior end of fin and one at anterior fourth of fin; each fin ray with slight internal pigment and a black spot at its base; anal fin pale, each ray with slight internal pigment and a black spot at its base. Caudal fin with black base and scattered pigment.

Anterior half of stomach blackish, posterior half unpigmented, internally and externally. Anterior portion of intestine densely covered by black and brown pigment, posterior portion pale with numerous black dots or small patches of pigment. Dorsal third of peritoneum densely covered by black or brown dots, ventral 2/3 unpigmented. Mouth cavity and gill chamber pale.

**TABLE 1.** Distribution of preanal lateral-line pores of all *Bathycongrus* species in Taiwan.

Taxa	n	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	//	48	49	50	51	52	53	54					
<i>B. albimarginatus</i>	16																						1	1	1	1	8	1	3					
<i>B. bimaculatus</i> sp. nov.	5			2	2	1																												
<i>B. bleekeri</i>	3	2	1																															
<i>B. brunneus</i>	1																																	
<i>B. castlei</i> sp. nov.	6									1	1	3	1																					
<i>B. graciliceps</i> sp. nov.	2																																	
<i>B. guttulatus</i>	6													2	1	1	2																	
<i>B. macroporis</i>	2																																	
<i>B. retroinctus</i>	39																																	
<i>B. wallacei</i>	75																																	

**TABLE 2.** Distribution of preanal vertebrae of all *Bathycongrus* species recorded from Taiwan.

Taxa	n	27	28	29	30	//	34	35	36	37	38	39	40	41	42	43	44	45	46	//	50	51	52	
<i>B. albimarginatus</i>	16																							
<i>B. bimaculatus</i> sp. nov.	5	2	1	1	1																			
<i>B. bleekeri</i>	3	1	2																					
<i>B. brunneus</i>	1																							
<i>B. castlei</i> sp. nov.	6																							
<i>B. graciliceps</i> sp. nov.	2																							
<i>B. guttulatus</i>	6																							
<i>B. macroporis</i>	2																							
<i>B. retroinctus</i>	18																							
<i>B. wallacei</i>	44																							



**Distribution.** Known only from the type series collected from off Dong-gang, southwestern Taiwan, northern South China Sea, at depth around 200–300 m.

**Eymology.** Named for the two black patches on anterior portion of dorsal-fin margin.

**Size.** A small species; the largest specimen examined is 190 mm TL. Two of the smallest specimens (157 and 163 mm TL) have ovaries containing many maturing eggs.

**Remarks.** *Bathycongrus bimaculatus* belongs to the species group with low vertebral counts (109–137), a cluster of small teeth on vomer, and relatively small body size, comprising *B. bleekeri*, *B. unimaculatus*, *B. trimaculatus* and *B. parviporus*. It differs from above-mentioned species in having relatively few total vertebrae (109–111, vs. 113–120 or 137 in the other species). Among these species, *B. bimaculatus* is most similar to *B. trimaculatus* but can be easily separated by the lack of a black blotch on anal fin (vs. a large black blotch on the fin) and 109–111 total vertebrae (vs. 117–119). Table 6 shows the selected characters for comparison of these species.

### ***Bathycongrus bleekeri* Fowler, 1934 (New record)**

English name: Bleeker's short-tail conger

Figs. 3B, 4A–D; Tables 1–6

*Bathycongrus bleekeri* Fowler, 1934:272 (type locality: Utara Pt., Bongo Island, southern Mindanao, Philippines). Karmovskaya & Smith, 2008:30. Karmovskaya, 2009:150. Karmovskaya, 2011:417.

**Specimens examined.** NMMB-P21654 (1, 168), 27 Aug. 2008; NMMB-P25988, (1, 185), 15 Apr. 2017; NMMB-P26214, (1, 177), 16 Jun. 2017; NMMB-P27744 (1, 140.7), 10 Nov. 2017; all collected from off Dong-gang, Pingtung, SW Taiwan.

**Diagnosis.** A small, moderately elongate species of *Bathycongrus* with head and body compressed; vertical fins without black mark; tail slender, attenuate, though not filiform; trunk 1.4 times head length; teeth small, conical, in about four rows on jaws, in an elongate triangular patch on vomer; preanal vertebrae 27–28, precaudal vertebrae 34–37, total vertebrae 107–113; preanal lateral-line pores 25–26.

**Description.** Proportional measurements and meristics are provided in Tables 4–5. Head length 2.3–2.4 in PAL, 6.2–6.4 in TL; preanal length 2.7 in TL; predorsal length 2.0–2.1 in PAL, 5.4–5.7 in TL; trunk length 1.7–1.8 in PAL, 4.7–4.8 in TL; tail length ~1.6 in TL; depth at head 6.1–6.8 in PAL, width at head 7.6–8.9 in PAL. Snout length 4.0–4.2 in HL; eye diameter 4.7–5.5; interorbital width 6.7–7.3; upper jaw 2.7–2.9; gill opening width 3.5–7.1; interbranchial width 4.7–5.7; pectoral-fin length 2.9–3.4.

Body moderately elongate, laterally compressed through entire length, oval in cross section, becoming more compressed posteriorly; tip of tail moderately attenuate; anus slightly behind anterior third of total length. Dorsal fin begins over middle of appressed pectoral fin, continuous around tip of tail with caudal and anal fins. Anal fin begins immediately behind anus. Pectoral fin well developed, pointed distally with narrow base. Gill opening relatively large, about same size as eye, its upper end nearly opposite the upper pectoral-fin base; interbranchial broader than gill opening and eye.

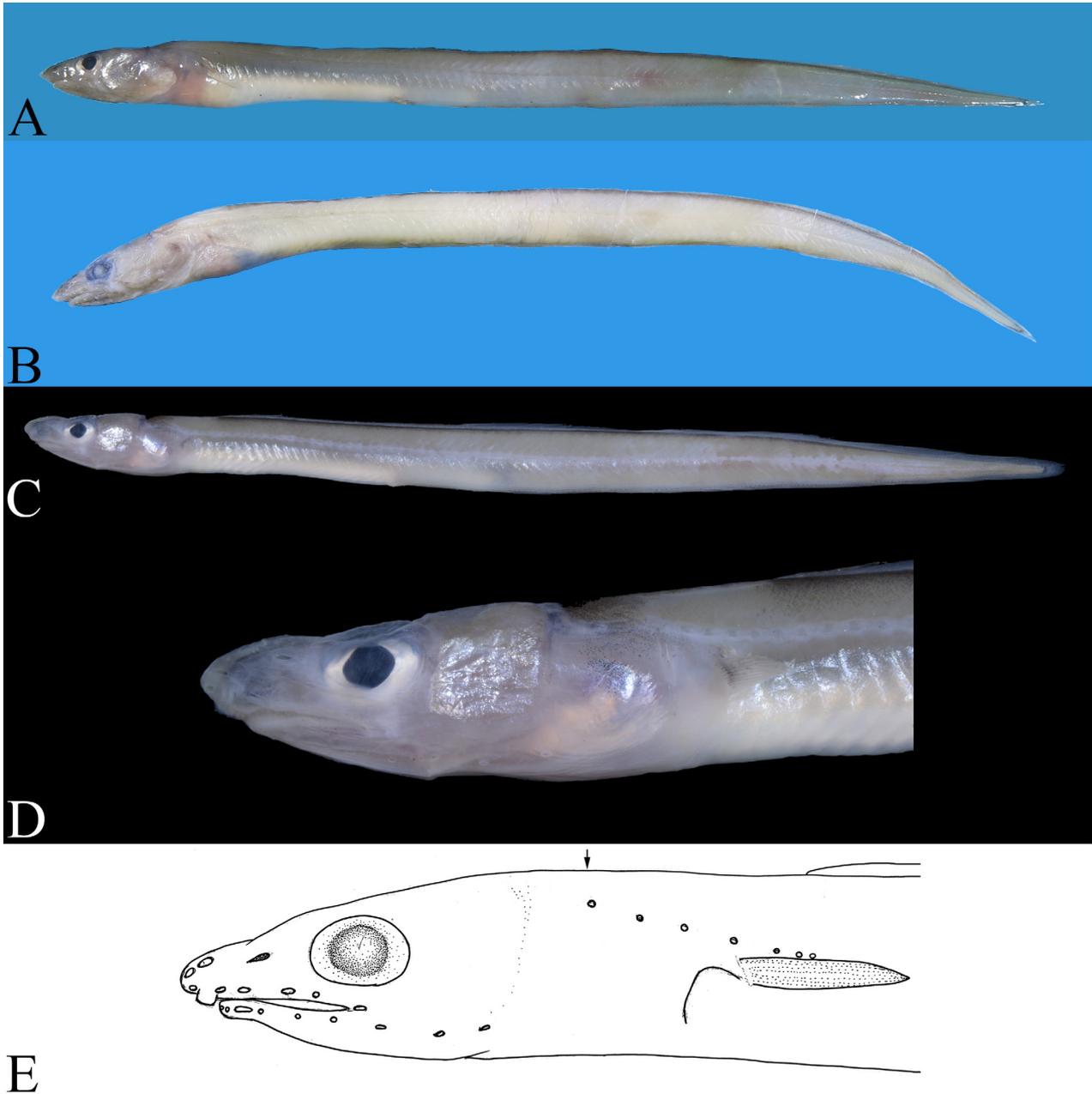
Head relatively large, its length 15.5–16.1% TL, deepest about midway between gill opening and tip of snout, tapering anteriorly from this point; snout short, broadly pointed on dorsal view, its length 1.1–1.3 times of eye diameter, projecting beyond lower jaw; lower jaw longer than snout; fleshy part of snout projecting anteriorly beyond anterior end of intermaxillary tooth patch; rictus nearly below posterior half of eye. Upper jaw with flange greatly reduced; lower jaw with downturned flange. Tongue free, long, and broad.

Anterior nostril tubular, near tip of snout, directed ventrolaterally. Posterior nostril elliptical, with a slightly raised rim, in front of mid-eye level. Upper lip with a shallow, free, upturned flange, beginning at second infraorbital pore and ending below middle of eye. Lower lip with a well-developed downturned flange. Tongue free, long, and broad.

Lateral-line complete, first pore on each side slightly enlarged, the canal extended to caudal-fin base; 3–4 pores before pectoral-fin base, 5–6 pores before dorsal-fin origin, 25–26 pores before anal-fin origin, 90+–93+ total pores, assumable a bit more than 100.

Head pores vary in size, mostly enlarged (Fig. 4E); supraorbital canal with 3 pores, the first (ethmoidal pore) on ventral side of tip of snout, just ahead of lip, the second enlarged, about twice the size of first, and immediately in front of anterior nostril, the third greatly enlarged and immediately above anterior nostril, about

same size as anterior nostril. Infraorbital canal with 5 pores, first 3 enlarged; the first at posterodorsal corner of anterior nostril; the second to fourth above the flange; the third below between posterior nostril and eye, the fourth below anterior margin of eye, and the fifth moderately large and behind rictus, at mid-eye level; no pores behind eye. Preoperculomandibular canal with 10 pores, 7 in mandibular section and 3 in preopercular; first pore very small, near anterior tip of lower jaw, the third greatly enlarged, the seventh behind rictus. Supratemporal commissure with no pore.



**FIGURE 4.** *Bathycongrus bleekeri* Fowler, 1934. A–B, NMMB-P26214, 177 mm TL. C–D, NMMB-P27744, 140.7 mm TL. E. Head pores, NMMB-P25988, 185 mm TL, arrow indicates the ST pore.

**TABLE 4.** Morphometric data of three *Bathycongrus* species in present study. \*means data not available.

	<i>B. bimaculatus</i> sp. nov.		<i>B. bleekeri</i>	<i>B. castlei</i> sp. nov.		
	HT	Types		HT	Types	NT
TL (mm)	163	157–190 (n=5)	168–185 (n=3)	328	240–350+ (n=6)	199 (n=1)
Trunk/HL	1.3	1.3–1.5	1.3–1.4	1.6	1.4–1.6	1.6
%TL						
HL	15.4	15.0 (14.3–15.7)	15.8 (15.5–16.1)	13.5	13.6 (13.5–13.7)	13.5
PAL	35.3	36.0 (35.3–37.2)	36.9 (36.8–36.9)	15.6	35.6 (35.1–36.0)	35.7
Predorsal	17.7	17.6 (17.3–17.9)	18.2 (17.7–18.5)	35.1	16.3 (15.6–16.7)	15.0
Trunk	19.9	21.0 (19.9–22.5)	21.0 (20.7–21.4)	21.6	22.0 (21.6–22.4)	22.2
Tail	64.7	64.0 (62.8–64.7)	63.1 (63.1–63.2)	64.9	64.4 (64.0–64.9)	64.3
%PAL						
Head length	43.7	41.8 (39.6–43.7)	43.0 (42.1–43.8)	38.5	39.1 (37.8–41.3)	37.7
Predorsal	50.1	49.0 (46.4–50.1)	49.4 (47.9–50.2)	45.2	45.8 (44.5–46.5)	42.1
Head depth	17.4	17.0 (15.0–18.1)	15.8 (14.6–16.5)	12.4	12.7 (11.4–14.0)	12.8
Head width	10.1	11.3 (10.1–12.1)	12.1 (11.7–13.2)	11.0	11.0 (9.4–12.5)	9.7
%HL						
Snout	23.9	24.5 (23.2–26.7)	24.5 (23.9–25.2)	26.6	26.8 (26.2–27.2)	24.3
Eye	17.1	19.4 (17.1–21.8)	20.1 (18.2–21.5)	14.2	15.6 (14.2–16.6)	17.5
Interorbital	15.1	14.9 (13.4–16.2)	14.2 (13.7–14.9)	16.5	16.3 (14.8–17.8)	14.9
Upper jaw	35.9	37.2 (35.9–39.7)	35.9 (35.1–37.2)	36.8	35.7 (33.3–38.5)	37.3
Gill opening	12.0	12.8 (19.7–16.2)	20.1 (14.0–28.2)	13.1	11.9 (10.6–13.1)	13.8
Isthmus	22.3	22.7 (19.7–25.9)	19.6 (17.7–21.5)	20.5	18.8 (14.6–20.7)	17.5
Pectoral fin	27.9	32.8 (27.9–37.5)	31.7 (29.1–35.0)	30.9	29.7 (23.5–32.1)	31.3

**TABLE 5.** Meristic data of three *Bathycongrus* species in present study. \*means data not available.

	<i>B. bimaculatus</i> sp. nov.		<i>B. bleekeri</i>	<i>B. castlei</i> sp. nov.		
	HT	Types		HT	Types	NT
Vertebrae		n=5	n=4		n=6	n=1
Predorsal	8	8	8–9	9	9–10	10
Preanal	28	27–30	27–28	35	35–38	36
Precaudal	37	35–37	34–37	50	48–50	45
Total	109	109–111	107–113	162	130+–162	144+
LL pores						
Predorsal	7	6–9	5–6	7	7–9	6
Prepectoral	5	4–7	3–4	4	3–4	4
Preanal	28	27–29	25–26	33	33–36	32
Head pores						
SO	3	3	3	3	3	3
IO	4+1	4+1	4+1	4+1	4+1	4+1
ST	0	0	0	1	1	1
M	6+1	6+1	6+1	6+1	6+1 (5+1)	6+1
POP	3	3	3	3	3	3

**TABLE 6.** Selected characters for comparison of four similar species in *Bathycongrus*. Data sources: A. this study; B. Karmovskaya & Smith, 2008; C. Karmovskaya, 2009; D. Karmovskaya, 2011.

	<i>bimaculatus</i>	<i>trimaculatus</i>	<i>unimaculatus</i>	<i>bleekeri</i>	<i>parviporus</i>
Blotch on dorsal fin	Two	Two	None	None	None
Blotch on anal fin	None	One	One	None	None
Preanal pores	27–29	26–29	30	25–26	25–27
Preanal vertebrae	27–29	28–30	32	28–30	35–38
Precaudal vertebrae	35–37	37–39	40	34–37	29–30
Total vertebrae	109–111	117–119	137	113	120–122
Data source	A	B	C	A, B	D

Predorsal vertebrae 8–9; preanal vertebrae 27–28; precaudal vertebrae 34–37; total vertebrae 107–113.

Teeth moderately large, conical (Fig. 3B). Intermaxillary in about four transverse rows, separated from maxillary and vomerine teeth, mostly excluded from closed mouth. Maxillary and mandibular teeth in bands, wider anteriorly, roughly in four or five rows, narrower posteriorly; in 1 to 2 rows; outermost teeth slightly larger than innermost. Vomerine teeth forming a small oval patch, 3 irregular rows of small teeth followed by several large blunt teeth, roughly in 2 rows.

**Coloration.** In preservative, brown on dorsum and pale elsewhere. Lateral and ventral surface of body and abdomen without chromatophores; dorsal surface with a darker wash composed of numerous tiny brown chromatophores on either side of dorsal fin. Snout mostly covered by black pigmentation under the skin, extending to level of posterior margin of eye, except for a clearly white band in front of eye; a black patch under skin at about brain chamber; dark pigment outlining supratemporal canal; a large patch of pigment on opercle in front of pectoral-fin base. Row of few black dots on ventral surface of abdomen. Pectoral fin with scattered pigment, denser at base. Dorsal fin uniformly light brownish, without any black marks, each fin ray with clear internal pigment and a black spot at base; anal fin pale, each ray with slight internal pigment and a black spot at base. Caudal fin with a black base and scattered pigment.

Anterior third of stomach blackish, posterior 2/3 pale with some small black patches of pigments internally, pale externally. Intestine mostly damaged but presumably pale with numerous black dots based on the membrane left. Dorsal third of peritoneum densely covered by black or brown pigments; ventral 2/3 of peritoneum unpigmented. Mouth cavity and gill chamber pale.

**Distribution.** Known from the Philippines at depth 51–333 m (Karmovskaya & Smith, 2008); newly collected from southwestern Taiwan at depth ca. 200–300 m.

**Remarks.** Karmovskaya & Smith (2008) redescribed this species based on 2 additional specimens collected from the Philippines, and no additional information has been provided since then. Our specimens represent the first record in Taiwan.

Several differences were observed in our specimens. Karmovskaya & Smith (2008) reported one single pore on the supratemporal commissure, whereas our specimens have none. In the same work they described *B. trimaculatus* which also has 10 out of 13 specimens lacking the pore. Our specimens have roughly 3 or 4 transverse rows of teeth on intermaxillary and those on vomer forming a narrow triangular patch, in about 3 irregular rows, whereas Karmovskaya & Smith (2008) reported 2 transverse rows of teeth on intermaxillary and a relatively broad patch of vomerine teeth. These may be attributed to individual variations.

### *Bathycongrus castlei* sp. nov.

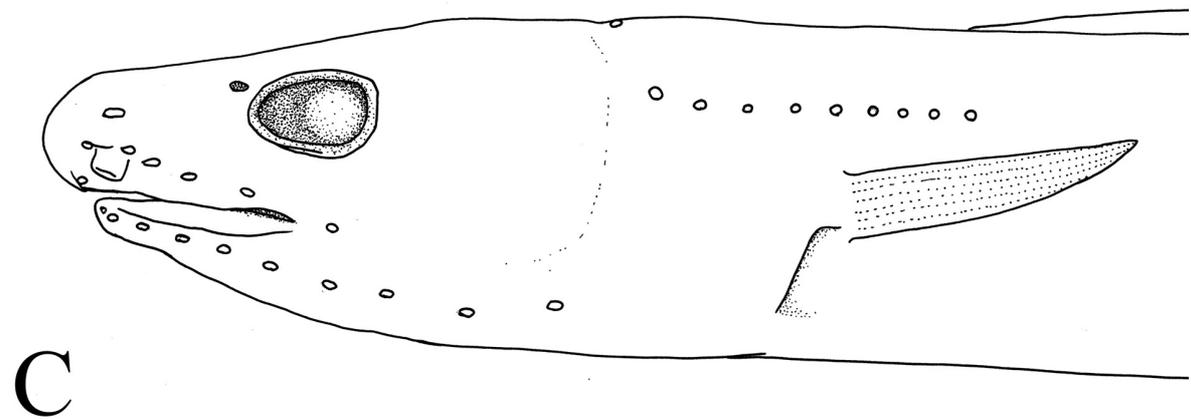
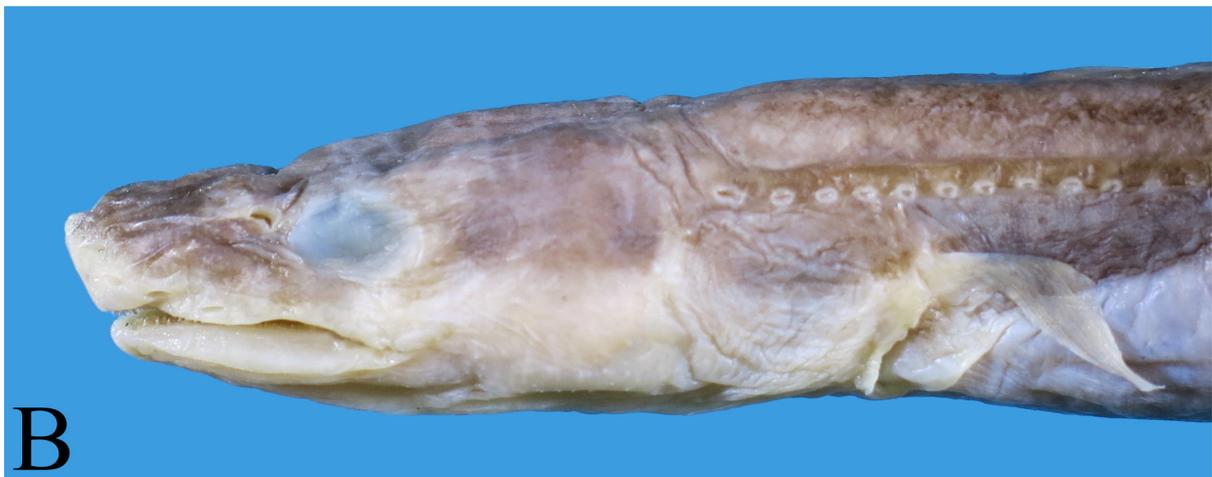
Castle's slender conger

Figs. 3C, 5A–C, 6A; Tables 1–5

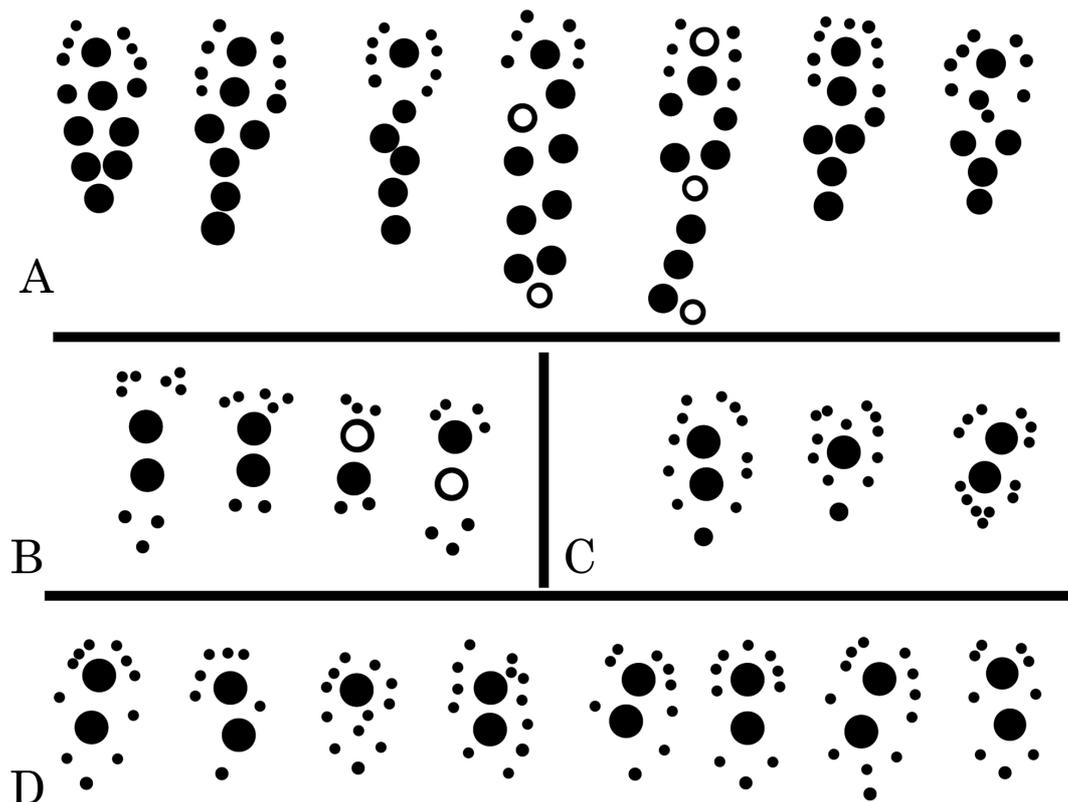
**Holotype.** NMMB-P16586 (immature female, 328), Nan-fang-ao, Yilan, NE Taiwan, western Pacific Ocean, bottom trawl, 16 Jul. 2010.

**Paratypes.** NMMB-P21740 (ripe female, 328+), NMMB-P26855 (1 mature male, 295+), USNM 441752 (1 ripe female, 350+), Nan-fang-ao, 11 Mar. 2011. NMMB-P29129 (1 immature female, 240), collected with holotype. NMMB-P21736 (1 immature female, 278), Taiwan, no data.

**Non-type.** NMMB-P21741, (1, 199+), Dong-gang, 6 Feb. 1966.



**FIGURE 5.** *Bathycongrus castlei* sp. nov.. A. NMMB-P16586, holotype, 328 mm TL. B–C, NMMB-P21740, paratype, 328+ mm TL.



**FIGURE 6.** Vomerine tooth pattern and variation of four *Bathycongrus* species. Ventral view, anterior to upward. Open dots mean teeth lost or damaged. Not to scale. A. *B. castlei*. From left to right: NMMB-P29129 (240 mmTL), P16586 (328, holotype), P26855 (295+), P21740 (328+), USNM 441752(350+), P21736(278), 21741 (199). B. *B. wallacei*, P21026 (420+), P11902 (380), P21020 (344), P21739 (353+). C. *B. guttulatus*, P4041 (368), P7076 (231), P21737 (310). D. *B. retrotinctus*, P11912 (318+, 235, 235, 318, 351, 230), P11910 (288).

**Diagnosis.** A small, slender species of *Bathycongrus* with tail tapering, filiform; vomerine teeth forming a long triangular patch, one or two slightly enlarged teeth accompanied by several small teeth at front and sides and 4–9 moderately large, blunt teeth behind; dorsal half of head and body deep brown; preanal vertebrae 35–38, precaudal vertebrae 48–50, total vertebrae 160–162; and preanal lateral-line pores 33–36.

**Description.** Proportional measurements and meristics are provided in Tables 4–5. Head length 2.6 (2.4–2.6) in PAL, 7.4 (7.3–7.4, based on 3 complete types) in TL; preanal length 2.9 (2.8–2.9) in TL; predorsal length 2.2 (2.1–2.2) in PAL, 6.0 (6.0–6.4) in TL; trunk length 1.6 (1.6–1.7) in PAL, 4.6 (4.5–5.0) in TL; tail length 1.5 (1.5–1.6) in TL; depth at head 8.0 (7.1–8.8) in PAL, width at head 9.1 (8.0–10.6) in PAL. Snout length 3.8 (3.7–3.8) in HL; eye diameter 7.0 (6.0–7.0); interorbital width 6.1 (5.6–6.7); upper jaw 2.7 (2.6–3.0); gill opening width 7.6 (7.6–9.5); interbranchial width 4.9 (4.8–6.9); pectoral-fin length 3.2 (3.1–4.2).

Body elongate, rounded in cross section anteriorly, becoming more compressed behind anus and posterior portion; head moderately slender, its depth and width slightly less than those of trunk; trunk moderately long, its length 1.6 (1.4–1.6) times head length; tip of tail tapering and filiform; anus near anterior third of total length when tail is complete.

Dorsal fin begins over middle of pectoral fin, continuous around tip of tail with caudal and anal fins. Anal fin begins immediately behind anus. Pectoral fin well developed, pointed distally with a narrow base. Gill opening relatively small, smaller than eye diameter, its upper end nearly opposite middle of pectoral-fin base. Interbranchial broader than gill opening and eye.

Head relatively small, its length 13.5 (13.5–13.7)% TL (based on 3 complete types), deepest at about occiput, tapering anteriorly from this point; dorsal profile nearly flat from occiput to internasal space; snout long and broadly pointed, its length 1.9 (1.6–1.9) times of eye diameter, projecting beyond lower jaw; lower jaw longer than snout; fleshy part of snout with a slight median keel on underside (observed from some of paratypes), projecting anteriorly beyond anterior end of intermaxillary tooth patch; rictus nearly below middle of eye.

Anterior nostril tubular, near tip of snout, directed ventrolaterally. Posterior nostril elliptical, with a clear raised rim, in front of eye above mid-eye level. Upper lip with flange strongly reduced; lower lip with a well-developed downturned flange. Tongue free, long, and broad.

Lateral line complete, first pore on each side slightly enlarged, the canal extended to caudal-fin base; 7 (7–9) pores before dorsal-fin origin; 4 (3–4) before pectoral-fin base, 3–5 fewer than predorsal pores; 33 (33–36) before anal-fin origin; total pores not clear due to state of preservation.

Head pores vary in size, mostly enlarged (Fig. 5C). Supraorbital canal with 3 pores; the first (ethmoidal pore) on ventral side of snout tip, just above lip; the second enlarged, about twice the size of first, and immediately in front of anterior nostril; the third greatly enlarged and immediately above anterior nostril, about same size as anterior nostril. Infraorbital canal with 5 pores, the first 3 pores enlarged; the first at posterodorsal corner of anterior nostril; the second to fourth above the flange; the second and third between anterior and posterior nostrils; the fourth below anterior margin of eye; and the fifth small and behind rictus; no pores behind eye. Preoperculomandibular canal with 10 pores (9 in one side of one paratype), 7 (6) in mandibular section and 3 in preopercular; first mandibular pore very small, near anterior tip of lower jaw, third greatly enlarged, and seventh behind rictus. Supratemporal commissure with a single small median pore.

Predorsal vertebrae 9 (9–10); preanal vertebrae 35 (35–38); precaudal vertebrae 50 (48–50); total vertebrae 162 (130+, 136+, 149+, 160 in paratypes).

Teeth moderately large, conical to granular (Figs. 3C, 6A). Intermaxillary teeth largest, curved, in three transverse rows, separated from maxillary and vomerine teeth, mostly excluded from closed mouth. Maxillary and mandibular teeth in bands, wider anteriorly, roughly in 4 or 5 rows, narrower posteriorly, in 1 or 2 rows; outermost teeth slightly larger than innermost. Vomerine teeth forming a long oval patch, 2 (1 or 2) slightly enlarged teeth with several small teeth at front and sides and followed by 9 (4–8) moderately large, blunt teeth behind.

**Coloration.** Distinctly bicolored dorsoventrally, the boundary slightly below lateral line; deep brown on dorsal surface of head, trunk and anterior half of tail, and on entire posterior half of tail; whitish and semi-transparent on ventral surfaces of head, trunk and anterior half of tail, with scattered black pigment under skin with a clear myomere pattern seen from outside. Pectoral fin and its base slightly pigmented. A patch of black pigment in front of pectoral-fin base and inner wall of gill opening. Mouth cavity and gill chamber pale, except for some small scattered patches of black pigment on roof of mouth in holotype. Vertical fins grayish with broad black margins, gradually becoming entirely black posteriorly, caudal fin black. Stomach black internally and mostly externally, except for some irregular pale patches; intestine uniformly black; peritoneum densely covered by black pepper dots making the membrane brownish, some paratypes also have large black dots loosely but evenly arranged.

**Remarks.** The vomerine tooth pattern is quite distinctive among the congeners; two slightly enlarged teeth with a few small teeth at front and sides and 6–9 stout or nearly granular teeth behind. It is most similar to *B. guttulatus* in having similar vertebral formula. However, it has a relatively short trunk, its length 1.4–1.6 times head length (vs. 1.6–1.9 in *B. guttulatus*); 33–36 preanal lateral-line pores (vs. 36–40); the third and fourth infraorbital pores before posterior nostril and below anterior margin of eye, respectively (vs. the third below posterior nostril and the fourth below mid-eye); and a different pattern of vomerine teeth (Figs. 6A vs. 6C).

It is notable that the non-type, NMMB-P21741 (199+ mm TL), has a total 144+ vertebrae. However, the tip of tail is quite tapering and does not look damaged, or at most only few rear vertebrae lost. The tail length is 64.3% TL, not much different from these congeners with complete filiform tails. The coloration on body surface is mostly faded and the most parts of vertical fins are pale, except for the posterior portion. The peritoneum is similar to that of *B. castlei*, except that the lower part has somewhat scattered pigment. The anterior 2/3 of the stomach is brownish, and the posterior 1/3 is pale. The intestine is pale. There is one row of scattered dots on the lateral body and some internal dots on the ventral side of the abdomen. It also has a slightly different vomerine tooth pattern (Fig. 6A, last from the left), slightly shorter predorsal distance (42.1% TL), 45 precaudal vertebrae and 32 preanal lateral-line pores. This specimen may represent a different species, but more specimens are needed for further study.

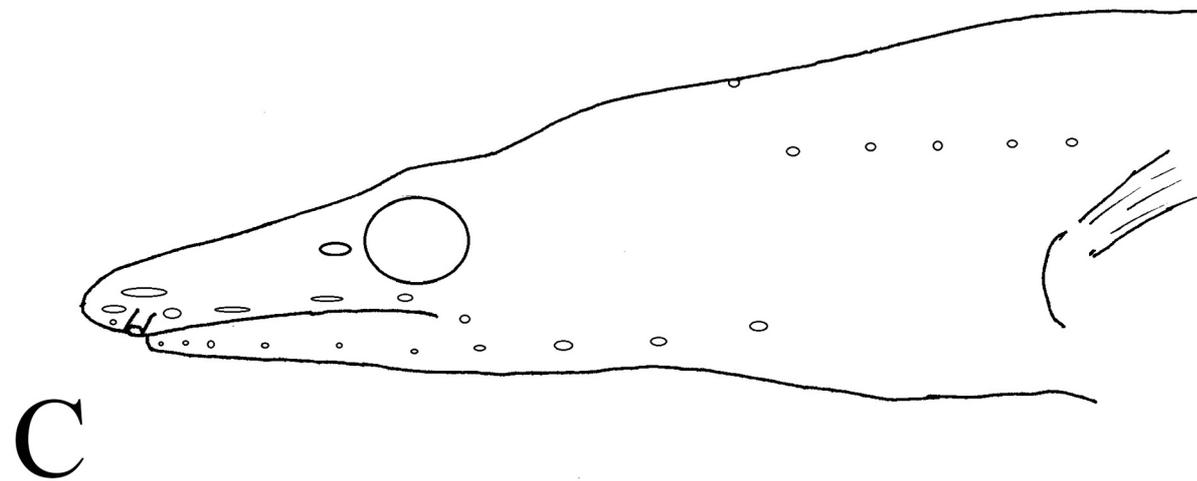


FIGURE 7. *Bathycongrus graciliceps* sp. nov., holotype, NMMB-P9141, 473 mm TL.

***Bathycongrus graciliceps* sp. nov.**  
Common name: Slender-head conger  
Figs. 3E, 7A–C, Tables 1–3, 7–8

**Holotype.** NMMB-P9141 (473, female), Daxi, Yilan, NE Taiwan, northwestern Pacific Ocean, 8 Aug. 2008.

**Paratype.** USNM 399886 (1, 445+, tip of tail damaged), Dong-gang, SW Taiwan, South China Sea, 13 Sep. 2010.

**Diagnosis.** A moderately large and elongate species of *Bathycongrus*, deepest near mid-trunk and tapering at both ends to a slender tail and head; head small, about 12.7–13.1% TL, snout acute; trunk long, 2.0–2.1 times head length. Preanal vertebrae 43–46, total vertebrae 163; preanal lateral-line pores 39–41.

**Description.** Proportional measurements and meristics are provided in Tables 7–8. Morphometric and meristic characters given for holotype with paratype in parentheses. Head length 3.0 (3.1) in PAL, 7.8 (\*) in TL; preanal length 2.6 (\*) in TL; predorsal length 2.7 (2.6) in PAL, 7.0 (\*) in TL; trunk length 1.5 (1.5) in PAL, 4.0 (\*) in TL; tail length 1.6 (\*) in TL; depth at head 8.9 (\*) in PAL, width at head 11.4 (\*) in PAL. Snout length 4.0 (3.7) in HL; eye diameter 7.0 (7.5); interorbital width 9.5 (\*); upper jaw 2.7 (2.8); gill opening width 9.8 (8.2); interbranchial width 7.0 (6.5); pectoral-fin length 4.3 (3.5).

Body elongate, deepest near mid-trunk and tapering at both ends to slender tail and head, anus at slightly more than 1/3 TL. Trunk long, about twice the length of head. Dorsal fin begins over posterior part of pectoral fin; anal fin begins immediately behind anus; caudal fin confluent with dorsal and anal fins. Pectoral fin relatively small but well developed, narrow and pointed at tip. Gill opening moderate in size, width less than interbranchial space, its upper corner touching lower end of pectoral-fin base.

Head small, distinctly narrower than trunk, 12.7% (13.1%) TL, tapering anteriorly toward a relatively acute snout, rictus below posterior part of eye, upper jaw extending well beyond tip of lower jaw. Eye well developed, about half snout length. Anterior nostril tubular, near tip of snout, directed antero-laterally. Posterior nostril elliptical, about one nostril diameter in front of mid-eye. Snout long and narrowly pointed, its length 1.6 (2.0) times eye diameter, projecting beyond lower jaw; lower jaw longer than snout; fleshy part of snout with a slight median keel on underside, projecting anteriorly beyond anterior end of intermaxillary tooth patch; rictus nearly below middle of eye.

Lateral line complete, first pore on each side slightly enlarged, the canal extended to caudal-fin base; 9 (8) pores before dorsal-fin origin, 6 (6) before pectoral-fin base, 41 (39) before anal-fin origin; total pores not available due to the preservation.

**TABLE 7.** Morphometric data of five *Bathycongrus* species in present study. \* means data not available.

	<i>B. graciliceps</i> sp. nov.		<i>B. guttulatus</i>	<i>B. macroporis</i>	<i>B. retroinctus</i>	<i>B. wallacei</i>
	HT	PT				
TL (mm)	473	445+	231–470 (n=7)	395 (415+)	225–403 (n=16)	231+–523+ (n=36)
Trunk/HL	2.0	2.1	1.6–1.9	1.3 (1.4)	1.3–1.6	1.5–1.7
%TL						
Head length	12.7	13.1	13.8 (13.2–14.6)	15.5 (*)	16.6 (15.7–18.6)	13.5 (12.6–14.4)
Preanal	37.4	40.4	38.0 (37.0–39.0)	36.2 (*)	39.8 (37.9–41.0)	35.3 (34.0–36.6)
Predorsal	14.8	15.6	15.2 (14.0–16.2)	16.6 (*)	17.2 (16.1–18.1)	14.2 (13.2–15.8)
Trunk	24.7	27.4	24.2 (23.6–25.3)	20.7 (*)	23.2 (21.7–24.6)	21.8 (20.7–23.0)
Tail	61.9	*	62.0 (61.0–63.0)	63.8 (*)	60.2 (59.0–62.1)	64.7 (63.4–66.0)
%PAL						
Head length	34.1	32.3	36.4 (34.4–38.0)	42.9 (42.0)	41.6 (39.1–44.1)	38.2 (36.4–40.3)
Predorsal	39.5	38.5	39.9 (37.7–41.6)	45.8 (43.3)	43.0 (40.8–46.1)	40.1 (37.7–44.0)
Head depth	10.7	11.1	12.1 (10.7–14.3)	16.0 (15.0)	15.7 (13.5–16.9)	14.1 (12.3–16.2)
Head width	8.8	8.2	10.2 (8.9–11.1)	12.8 (14.1)	13.2 (12.0–14.4)	12.0 (9.7–13.5)
%HL						
Snout	23.5	27.3	28.0 (25.1–30.9)	25.1 (22.7)	27.7 (25.3–29.4)	29.7 (27.5–31.9)
Eye	14.8	13.4	15.1 (12.1–18.7)	17.9 (14.3)	14.4 (12.6–17.1)	16.1 (14.6–18.8)
Interorbital	11.3	8.6	12.7 (10.1–14.4)	14.0 (13.7)	16.9 (14.3–20.4)	16.8 (14.7–19.4)
Upper jaw	35.0	35.4	39.1 (36.4–44.2)	34.3 (32.6)	41.2 (38.0–44.3)	44.1 (41.2–47.0)
Gill opening	10.8	12.2	12.1 (8.9–14.5)	13.9 (15.0)	13.7 (10.9–15.9)	14.2 (10.8–16.6)
Interbranchial	15.1	15.3	16.8 (12.9–19.9)	19.7 (20.2)	19.1 (14.6–24.5)	18.1 (14.1–22.8)
Pectoral fin	23.5	27.1	26.2 (22.8–28.7)	34.1 (32.8)	29.8 (25.9–35.5)	28.2 (25.2–31.9)

Head pores well developed (Fig. 7C). Supraorbital canal with 3 pores; the first (ethmoidal) pore very small, at tip of snout just above edge of upper lip; second larger and somewhat elongate, directly above first pore and before base of anterior nostril; third the largest of all pores, elongate, above anterior nostril. Infraorbital canal with 5 pores; first pore relatively large, directly behind anterior nostril; second large and slit-like, between anterior and posterior nostrils, slightly closer to anterior nostril; third somewhat smaller, below posterior nostril; fourth slightly smaller than third, below mid-eye; fifth small and round, directly behind rictus. Preoperculo-mandibular canal with 10 pores, 7 in mandibular section and 3 in preopercular; first pore small, near tip of lower jaw; second and third progressively larger, the third the largest in mandibular series; fourth, fifth, and sixth smaller, located between third pore and rictus; seventh behind rictus; 3 preopercular pores in a longitudinal series directly behind mandibular pores, the last one below level of ST canal, no pores in ascending branch. Supratemporal commissure with 1 median pore (paratype has a small lateral pore on right side).

**TABLE 8.** Meristic data of five *Bathycongrus* species in present study. Values in brackets are those of comparative specimens.

	<i>B. graciliceps</i> sp. nov.		<i>B. guttulatus</i>	<i>B. macroporis</i>	<i>B. retroinctus</i>	<i>B. wallacei</i>
	HT	PT				
Vertebrae			n=7	n=2	n=39	n=75
Predorsal	10	11	9 [9–11]	9–10	8–9 [8–10]	8–11 [9–11]
Preanal	43	46	38–40 [35–41]	34–36	36–38 [35–38]	38–43 [41–44]
Precaudal	53	52	45–49 [48–52]	39–40	42–49 [45–48]	53–57 [56]
Total	163	145+	156–162 [158–163]	148+	143–151 [144–149]	172–181 [169–180]
LL pores						
Prepectoral	6	6	3–6	5	4–6	5–7
Predorsal	9	8	6–8	6–7	4–7	6–9
Preanal	41	39	36–39 [32–36]	30–32	30–35 [30–35]	39–43 [38–42]
Head pores						
SO	3	3	3	3	3	3
IO	4+1	4+4	4+1	4+1	4+1	4+1
ST	1	1	1	1	1	1
M	6+1	6+1	6–7+1	6+1	6+1	6+1
POP	3	3	3	3	3	3

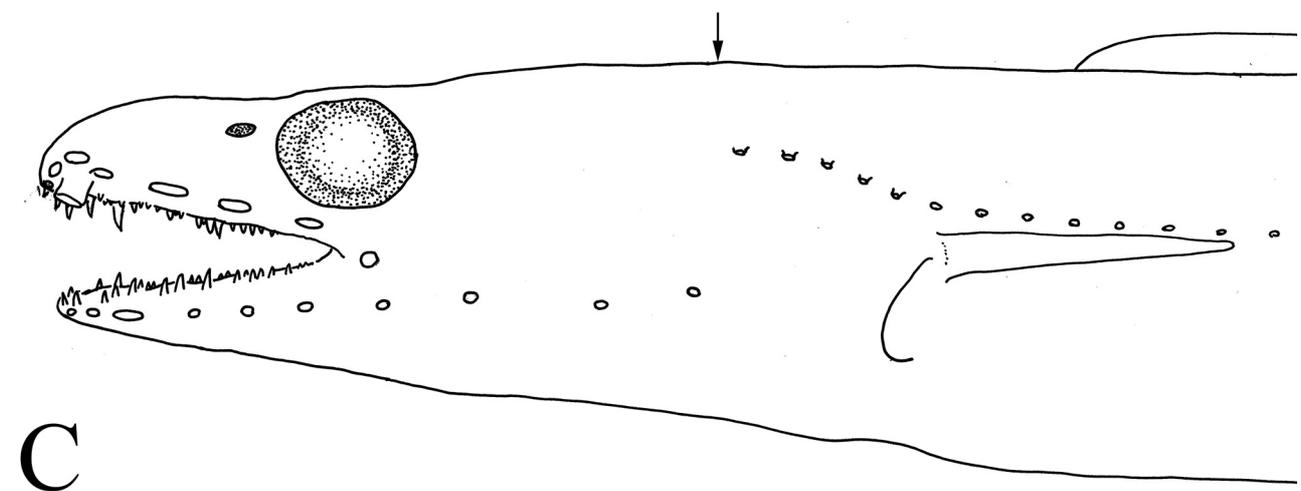
Predorsal vertebrae 10 (11); preanal vertebrae 43 (46); precaudal vertebrae 53 (52); total vertebrae 163 (145+).

Intermaxillary teeth moderately enlarged (Fig. 3E), conical, sharp, in about four transverse rows, largely exposed when mouth closed, slightly separated from vomerine and maxillary teeth. Vomerine teeth in a short, elongate patch, some teeth enlarged but not forming an even row. Maxillary and mandibular teeth in multiserial bands, wider anteriorly than posteriorly, outer teeth somewhat larger.

**Coloration.** In preservative pale brown or tan, slightly darker dorsally.

**Etymology.** From the Latin *gracilis*, slender, and *ceps*, head, referring to the slender head.

**Remarks.** This distinctive species is characterized by its relatively long trunk and its slender head with an acute snout. *Bathycongrus albimarginatus* also has a short head and a long trunk, but the head is stouter and the snout much broader. The holotype and paratype are both females with large eggs. The holotype is intact and the paratype is missing part of the tail tip. It is known so far only from Taiwan.



**FIGURE 8.** *Bathycongrus guttulatus* (Günther, 1887), NMMB-P7607, 233 mm TL. Arrow indicates the ST pore.

## ***Bathycongrus guttulatus* (Günther, 1887)**

Lined conger

Figs. 3D, 6C, 8A–C; Tables 1–3, 7–8

*Congromuraena guttulata* Günther, 1887:252 (Type locality: off Matuku, Fiji Islands Koro Sea, South Pacific, depth 315 fathoms).

*Bathycongrus guttulatus* (Günther, 1887): Smith, 1999:1686. Castle & Smith, 1999:993. Karmovskaya & Smith, 2008:35. Karmovskaya, 2009:140. Karmovskaya, 2011:417. Ho *et al.*, 2015:145

**Specimens examined.** NMMB-P4041 (1, 368), Dong-gang, 21 Mar. 1979. NMMB-P7607 (1, 231), Kaohsiung, 4 Jul. 2004. NMMB-P21737 (1, 310), Dong-gang, 21 Mar. 1979. USNM 396132 (1, 570+), Taiwan, no further data. USNM 401083 (3, 295–470), Dong-gang, 25 May 2010.

**Diagnosis.** A moderately large, elongate species of *Bathycongrus* with tail slender, filiform; 1 or 2 enlarged teeth on vomer surrounded by several smaller teeth; trunk relatively long, its length 1.6–1.9 times head length; preanal vertebrae 38–40; precaudal vertebrae 45–49; total vertebrae 156–162; and preanal lateral-line pores 36–39.

**Description.** Proportional measurements and meristics are provided in Tables 7–8. Body elongate, rounded in cross section anteriorly, becoming more compressed behind anus; head moderately slender, its depth and width slightly less than that of trunk; trunk relatively long, its length 1.6–1.9 times head length; tip of tail tapering and filiform; anus slightly behind anterior third of total length when tail is complete.

Dorsal fin begins over middle of pectoral fin, continuous around tip of tail with caudal and anal fins. Anal fin begins immediately behind anus. Pectoral fin well developed, pointed distally with a narrow base. Gill opening relatively large, about same size as eye diameter, its upper end nearly opposite middle of pectoral-fin base. Interbranchial broader than eye and gill opening.

Head relatively small, its length 13.2–14.6% TL, deepest at about occiput, tapering anteriorly from this point; dorsal profile nearly flat from occiput to internasal space; snout long and broadly pointed, its length 1.6–2.1 times eye diameter, projecting beyond lower jaw; lower jaw longer than snout; fleshy part of snout with a slight median keel on underside, projecting anteriorly beyond anterior end of intermaxillary tooth patch; rictus below posterior half of eye.

Anterior nostril tubular, near tip of snout, directed ventrolaterally. Posterior nostril elliptical, with a slightly raised rim, in front of eye slightly above mid-eye level. Upper lip with flange greatly reduced; lower lip with a well-developed downturned flange. Tongue free, long, and broad.

Lateral line complete, first pore on each side slightly enlarged, the canal extended to, or nearly so, caudal-fin base; 3–6 before pectoral-fin base, 6–8 before dorsal-fin origin, 36–39 [32–36 in comparative specimens] pores before anal-fin origin; total pores not available due to the preservation.

Head pores large in general (Fig. 8C). Supraorbital canal with 3 pores, the first (ethmoidal pore) on ventral side of tip of snout, just above lip, the second enlarged and immediately in front of anterior nostril, the third greatly enlarged and immediately above anterior nostril. Infraorbital canal with 5 pores, first 3 enlarged; the first at posterodorsal corner of anterior nostril, the second behind and below first, between anterior and posterior nostrils; the third below posterior nostril; the fourth below middle of eye; the fifth small and behind rictus; no pores behind eye. Preoperculo-mandibular canal with 10 pores (1 specimen with 11), 7 (1 specimen with 8) in mandibular section and 3 in preopercular; first mandibular pore very small, near anterior tip of lower jaw, third greatly enlarged, and seventh behind rictus; no pores behind eye. Supratemporal commissure with a single small pore.

Predorsal vertebrae 9 [9–11]; preanal vertebrae 38–40 [35–41 in comparative specimens]; precaudal vertebrae 45–49 [48–52]; total vertebrae 156–162 [158–163].

Teeth moderately large, conical. Intermaxillary teeth largest, curved, in 2 to 4 transverse rows, separated from maxillary and vomerine teeth, mostly excluded from closed mouth. Maxillary and mandibular teeth in bands, wider anteriorly, roughly in 4 or 5 rows, narrower posteriorly, in 1 to 2 rows; outermost teeth slightly larger than innermost. Vomerine teeth forming a small triangular patch, 2 (rarely 1) enlarged central teeth surrounded by many smaller teeth.

**Coloration.** In preservative uniformly creamy white; vertical fins light grayish, gradually darker posteriorly, caudal fin blackish. Stomach black internally and pale externally; intestine uniformly black; peritoneum silver white with numerous pepper dots, densely arranged on dorsal of the chamber, becoming sparser ventrally. Mouth and gill chamber pale. NMMB-P7607 has 3 rows of dots on lateral sides of body and many scattered dots on ventral side of trunk, possibly the remains of larval pigment.

**Distribution.** Widely distributed in the Indo-West Pacific from Hawaii and Fiji to the western Indian Ocean.

**Remarks.** *Bathycongrus guttulatus* is very similar to *B. wallacei*, both always have 2 enlarged central teeth on vomer, but in *B. guttulatus* there are more small teeth around them, especially on lateral sides (Figs. 6C vs. 6B). The following characters provided in Castle & Smith (1999) can separate these two species: total vertebrae 158–163 in *B. guttulatus* (vs. 169–181 in *B. wallacei*); preanal lateral-line pores 33–38 (vs. 37–43); precaudal vertebrae 45–52 (vs. 52–57); and a cluster of vomerine teeth, with the central two to three somewhat larger than those of the short curved row flanking these on each side (vs. central vomerine teeth conspicuously enlarged, with just two or three smaller teeth behind).

In the present study we counted 36–39 preanal lateral-line pores; 45–49 precaudal vertebrae and 156–162 total vertebrae for *B. guttulatus* and 39–43, 53–57, 172–181, respectively, for *B. wallacei*, which agree with those in Castle & Smith (1999). The arrangements of vomerine teeth are also similar to Castle & Smith (1999). We also found *B. guttulatus* has a preanal length of 37.0–39.0% TL and trunk length 23.6–25.3% TL, both slightly longer than that of *B. wallacei* (34.0–36.6% TL and 20.7–23.0% TL, respectively). These two proportions can be used to separate these two species.

### ***Bathycongrus macroporis* (Kotthaus, 1968) (New record)**

Figs. 3F, 9A–C; Tables 1–3, 7–8

*Pseudophichthys macroporis* Kotthaus, 1968:35, figs. 138–140, 152 (type locality: off Sokotra Island, Indian Ocean, 11°33.9'N, 52°54'E to 11°38'N, 52°52'E, depth 337–175 m).

**Specimens examined.** NMMB-P29128 (1, 395), 15 Sep. 2011; USNM 398471 (1, 415+), 23 Sep. 2008; from Chang Bin, Taitung, eastern Taiwan, by hook and line.

**Diagnosis.** A large, robust species of *Bathycongrus* with posterior nostril above level of upper margin of eye; band of granular teeth on jaws and vomer; vomerine teeth forming a long and broad patch; trunk 1.3–1.4 times head length; predorsal vertebrae 9–10, preanal vertebrae 34–36, precaudal vertebrae 39–40, total vertebrae 148+; and preanal lateral-line pores 30–32.

**Description.** Proportional measurements and meristic data are shown in Tables 7–8. Head length 2.3 (2.4 in USNM 398471) in PAL, 6.4 (\*) in TL; preanal length 2.8 (\*) in TL; predorsal length 2.2 (2.3) in PAL, 6.0 (\*) in TL; trunk length 1.8 (1.7) in PAL, 4.8 (\*) in TL; tail length 1.6 (\*) in TL; depth at head 6.2 (6.7) in PAL, width at head 7.8 (7.1) in PAL. Snout length 4.0 (4.4) in HL; eye diameter 5.6 (7.0); interorbital width 7.1 (7.3); upper jaw 2.9 (3.1); gill opening width 7.2 (6.7); interbranchial width 5.1 (5.0); pectoral-fin length 2.9 (3.1).

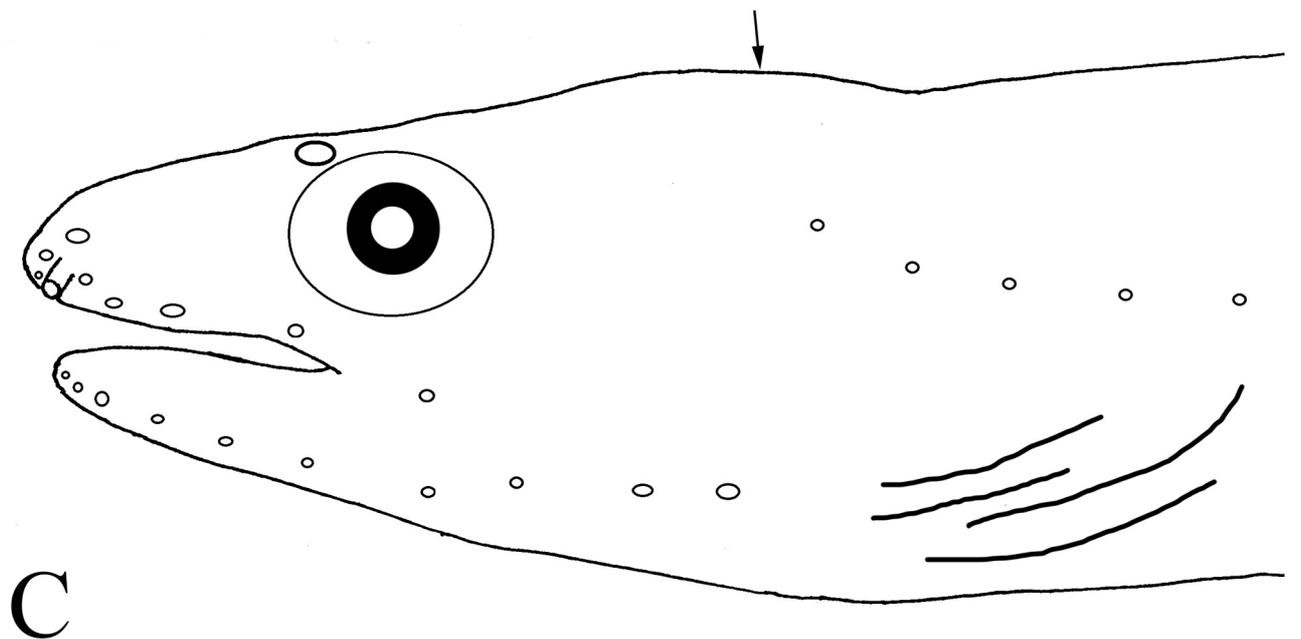
Body moderately elongate, robust, more or less uniform in depth over head and trunk, round in cross section anteriorly, becoming compressed posteriorly; trunk stout, 1.3–1.4 times of head length; tip of tail tapering, moderately filiform; anus near anterior third of total length.

Dorsal fin begins over pectoral fin, slightly behind fin base; continuous around tip of tail with caudal and anal fins. Anal fin begins immediately behind anus. Pectoral fin well developed, long and broad. Gill opening moderately large, about same size as eye diameter, its upper end opposite middle of pectoral-fin base; interbranchial broader than gill opening and eye.

Head relatively large, its length 15.5% TL, deepest about occiput, slightly tapering anteriorly from this point; dorsal profile nearly flat from occiput to internasal space; snout broadly rounded in dorsal view, its length 1.4–1.6 eye diameter, projecting beyond lower jaw; fleshy part of snout with a slight median keel on underside, projecting anteriorly beyond anterior end of intermaxillary tooth patch; rictus below middle of eye.

Anterior nostril tubular, near tip of snout, directed ventrolaterally. Posterior nostril elliptical, with a slightly raised rim, in front of eye above level of upper margin of eye and behind anterior margin of eye. Upper lip with flange greatly reduced; lower lip with well-developed downturned flange. Tongue free, long, and broad.

Lateral line complete, first pore on each side slightly enlarged, the canal extended to caudal-fin base; 5 (5) before pectoral-fin base, 6 (7) pores before dorsal-fin origin, 30 (32) before anal-fin origin, total pores not countable.



**FIGURE 9.** *Bathycongrus macroporis* (Kotthaus, 1968), USNM 398471, 415+ mm TL. Bar indicates locality of posterior nostril. Arrow indicates the ST pore.

Head pores vary in size, most enlarged to some extent (Fig. 9C). Supraorbital canal with 3 pores; the first (ethmoidal pore) small, on ventral surface of snout tip, just above lip; the second enlarged, about twice the size of first, and immediately in front of anterior nostril, the third greatly enlarged and immediately above anterior nostril, about same size as anterior nostril. Infraorbital canal with 5 pores, the first 3 pores enlarged; the first at posterodorsal corner of anterior nostril; second behind and below the first, on upper lip; third behind second, on upper lip, about midway between anterior nostril and eye; fourth slightly smaller, below anterior part of eye; fifth behind and slightly below rictus; no pores behind eye. Preoperculo-mandibular canal with 10 pores; 7 pores in

mandibular section, 6 along lower jaw and 1 behind rictus; first pore small, near tip of lower jaw, second and third pores progressively larger, the third the largest in the series; fourth through seventh smaller; 3 pores in preopercular section. Supratemporal commissure with a single median pore.

Predorsal vertebrae 9 (10); preanal vertebrae 34 (36); precaudal vertebrae 40 (39). Total vertebrae not available due to the damaged tails in both specimens, the incomplete counts are 148+ (117+). The holotype was also incomplete, with 126 vertebrae (Kotthaus, 1968).

Teeth on jaws moderately stout to blunt (Fig. 3F). Intermaxillary with 5 or 6 transverse rows of teeth, those on outer 2 rows large, gradually smaller posteriorly, not exposed when mouth closed. No clear gap between intermaxillary and vomerine teeth. Vomerine teeth conical, forming a long patch, extending about half length of maxillary tooth band. Maxillary teeth in about 5 irregular rows, gradually narrowing to 1 or 2 rows posteriorly, outer teeth longest, inner teeth gradually smaller. Mandibular teeth similar in size and arrangement to those on maxilla.

**Coloration.** Light brown dorsally, paler ventrally. Dorsal and anal fin pale with broad black margin; posterior portion entirely black. Pectoral fin pale. Stomach, intestine, and peritoneum pale. Mouth cavity pale; gill chamber unpigmented on outer side, inner side with small, closely spaced melanophores forming a slight darkening.

**Distribution.** Known from off Sokotra Is. in the western Indian Ocean and now Taiwan.

**Remarks.** This species is placed in *Bathycongrus* provisionally. The lack of any notably enlarged teeth, and the long and broad vomerine tooth patch differ from the condition found in most species of *Bathycongrus*, which have a short patch with at least a few teeth enlarged. The elevated position of the posterior nostril, above the dorsal margin and behind the anterior margin of the eye, differs markedly from the other species, which have the nostril in front of the eye near mid-eye level. Kotthaus (1968) placed it in the genus *Pseudophichthys*, but the type species of that genus, *P. splendens* (Lea, 1913), is more slender and has the posterior nostril in front of mid-eye. This species was known previously only from the holotype collected in the northwestern Indian Ocean. Its discovery in Taiwan suggests that it may be present in intermediate areas as well.

### ***Bathycongrus retrotinctus* (Jordan & Snyder, 1901)**

Blackedge conger

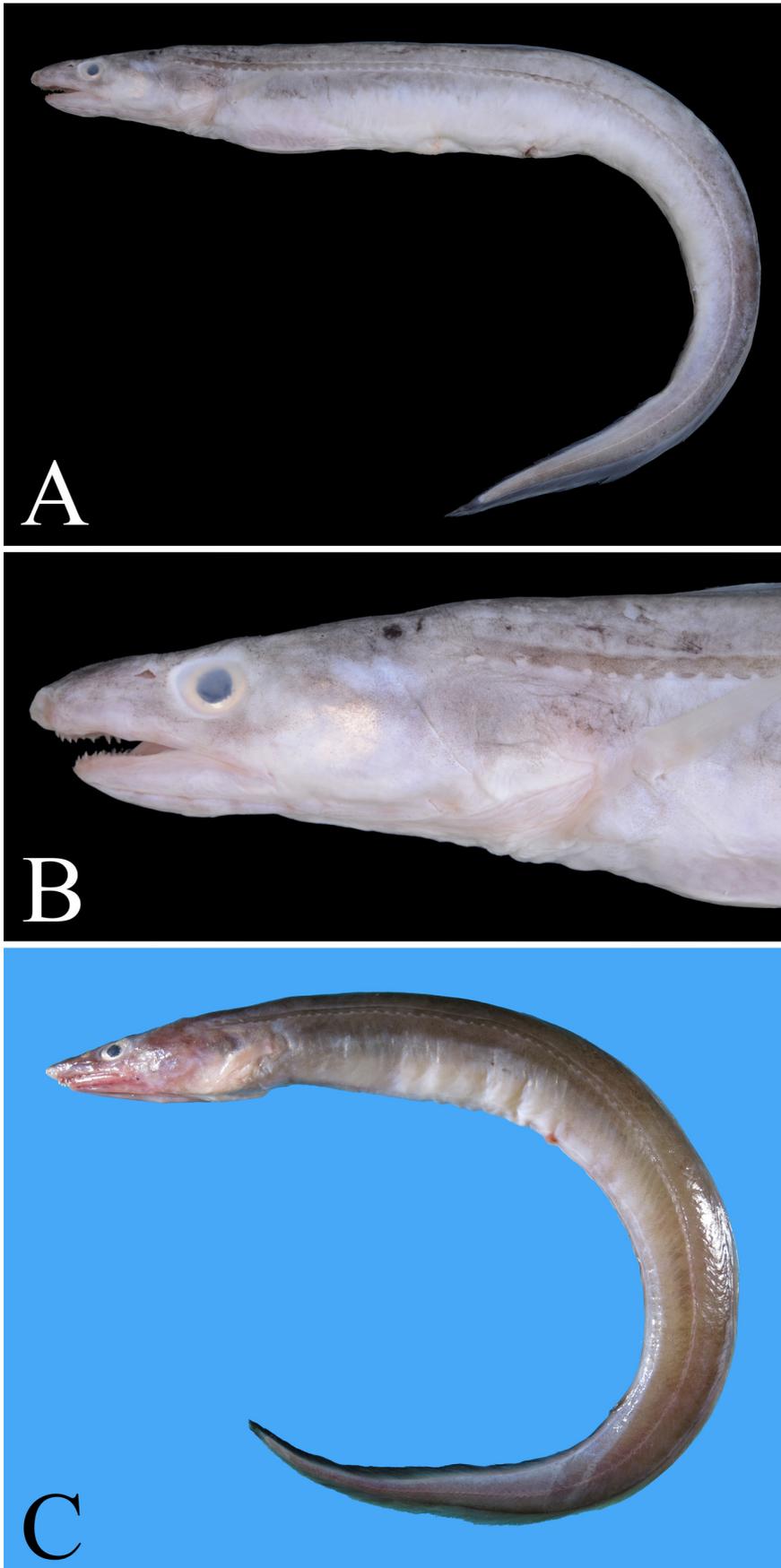
Figs. 6D, 10A–C; Tables 1–3, 7–8

*Leptocephalus retrotinctus* Jordan & Snyder, 1901:853, fig. 6 (type locality: Tokyo market, Japan).

*Bathycongrus retrotinctus* (Jordan & Snyder, 1901): Ben-Tuvia, 1993:365. Castle, 1995:716. Castle & Smith, 1999:993. Ho *et al.*, 2015:145.

**Specimens examined.** NMMB-P11910 (4, 288–403), Dong-gang, Ping-tung, Taiwan, 18 Feb. 2011. NMMB-P11912 (7, 230–351), Dong-gang, 15 Feb. 2011. NMMB-P11921 (1, 335), Nan-fan-ao, Yi-lan, Taiwan, 11 Mar. 2011. NMMB-P13154 (3, 250–313), Dong-gang. NMMB-P19177 (2), Dong-gang, 3 Nov. 2011. NMMB-P21013 (1, 351), Dong-gang, 12 Mar. 2014. NMMB-P21023 (1, 365), Dong-gang, 12 Mar. 2014. NMMB-P21775 (1, 271), Dong-gang, 12 Dec. 2013. NMMB-P23985 (4, 225–289), Dong-gang, 21 Nov. 2015. NMMB-P26030 (5, 240–278), Dong-gang, 15 Apr. 2017. NMMB-P25787 (1, 253), Dong-gang, 3 Mar. 2017. NMMB-P21183 (1, 357), Dong-gang, 2 Apr. 2014. NMMB-P21009 (1, 332), Dong-gang, 12 Mar. 2014. NMMB-P27888 (1, 320), NMMB-P27889 (1, 263), Dong-gang, 3 Mar. 2017. NMMB-P27916 (1, 167, cleared & stained), Dong-shi, Chia-yi, 1 Jul. 2017. NMMB-P28203 (1, 213), Dong-gang, 29 Mar. 2015. USNM 399865 (1, 360), USNM 399866 (1, 330), 8 Nov. 2009. USNM 400336 (1, 270), USNM 400337 (1, 304+), USNM 400338 (1, 345), USNM 400339 (1, 347+), Dong-gang, 10 Nov 2009. USNM 404430 (2, 325+–417+), Taiwan, 2009, no further data. Plus some uncatalogued specimens.

**Diagnosis.** A moderately large and stout species of *Bathycongrus* with tail short, attenuate; trunk length 1.3–1.5 times head length; vomer with usually 2 enlarged teeth surrounded by small teeth; origin of dorsal fin above or slightly behind pectoral-fin base; preanal vertebrae 36–38, precaudal vertebrae 42–49, total vertebrae 143–151; and preanal lateral-line pores 30–35.



**FIGURE 10.** *Bathycongrus retrotinctus* (Jordan & Snyder, 1901). A–B. NMMB-P29026, 323 mm TL. C. NMMB-P27888, 320 mm TL.

**Description.** Proportional measurements and meristics are provided in Tables 7–8. Body less elongate, rounded in cross section, becoming more compressed behind anus; head moderately slender, its depth and width slightly less than those of trunk; tip of tail tapering, attenuate, though not filiform; anus near anterior two-fifths of total length; body depth narrows relatively abruptly near posterior end.

Dorsal fin begins over or slightly behind pectoral-fin base, continuous around tip of tail with caudal and anal fins. Anal fin begins immediately behind anus. Pectoral fin well developed. Gill opening relatively large, about same size as eye diameter, its upper end nearly opposite middle of pectoral-fin base; interbranchial broader than gill opening and eye.

Head large, its length 15.7–18.6% TL, deepest at about occiput, tapering anteriorly from this point; dorsal profile nearly flat from occiput to internasal space; snout moderately long and pointed, its length 1.7–2.1 times eye diameter, projecting beyond lower jaw; lower jaw longer than snout; fleshy part of snout with a slight median keel on underside, projecting anteriorly beyond anterior end of intermaxillary tooth patch; rictus below posterior third to nearly posterior margin of eye. Eye well developed.

Anterior nostril tubular, near tip of snout, directed ventrolaterally. Posterior nostril elliptical, with a slightly raised rim, in front of eye above mid-eye level. Upper jaw with flange greatly reduced; lower jaw with well-developed downturned flange.

Lateral line complete, first pore on each side slightly enlarged, the canal extended to caudal-fin base; 4–6 before pectoral-fin base, 4–7 (mostly 6) before dorsal-fin origin, and 30–35 (same in comparative specimens) pore before anal-fin origin.

Head pores vary in size, mostly enlarged. Supraorbital canal with 3 pores; the first (ethmoidal pore) on ventral side of tip of snout, just above lip; the second enlarged, about twice the size of first, immediately in front of anterior nostril; the third greatly enlarged and immediately above anterior nostril. Infraorbital canal with 5 pores, the first 4 enlarged, along upper jaw; the first at posterodorsal corner of anterior nostril; the second behind and slightly below the first, between anterior and posterior nostrils; the third below the space between posterior nostril and eye; the fourth below anterior half to middle of eye; the fifth small and behind rictus; no pores behind eye. Preoperculo-mandibular canal with 10 pores, 7 in mandibular section and 3 in preopercular; first mandibular pore very small, near anterior tip of lower jaw, third pore greatly enlarged, seventh pore behind rictus. Supratemporal commissure with 1 single small median pore (cf. Fig. 1).

Predorsal vertebrae 8–9 [8–10 in comparative specimens]; preanal vertebrae 36–38 [35–38]; precaudal vertebrae 42–49 [45–48]; total vertebrae 143–151 [144–149].

Teeth moderately large, conical (Fig. 6D). Intermaxillary teeth largest, curved, in three or four transverse rows, separated from maxillary and vomerine teeth, mostly excluded from closed mouth. Maxillary and mandibular teeth in bands, wider anteriorly, roughly in 4 or 5 rows, narrower posteriorly, in 1 to 2 rows; outermost teeth slightly larger than innermost. Vomer with 2 (sometimes 1) enlarged teeth surrounded by several smaller teeth.

**Coloration.** When fresh, dorsal and posterior portions mostly deep gray, central surfaces of head, abdomen and anterior portion of tail pale with some pigment under skin. Vertical fins gray anteriorly, gradually becoming dark gray or black posteriorly, with unclear white margin; caudal fin deep gray. Preserved specimens slightly paler. Stomach pale on surface but black internally; intestine slightly pigmented anteriorly and most parts pale; ventral half of peritoneum unpigmented, gradually covered by denser pepper dots on dorsal half, some large black dots may be present. Gill chamber and mouth cavity pale.

**Distribution.** Known from Japan, Taiwan, and the Philippines.

**Remarks.** This species is distinguished by the relatively abrupt decrease in body depth posteriorly (Figs. 10A, C). In other species, the body depth decreases more gradually.

### ***Bathycongrus wallacei* (Castle, 1968)**

Longnose conger

Figs. 6B, 11; Tables 1–3, 7–8

*Congrina wallacei* Castle, 1968:709, pl. 107B, figs. 1a–b (Type locality: off the mouth of Limpopo River, Mozambique, depth 480–500 meters).

*Bathycongrus wallacei* (Castle, 1968): Castle & Smith, 1999:993. Karmovskaya & Smith, 2008:35. Karmovskaya, 2009:145, Karmovskaya, 2011:417. Ho *et al.*, 2015:145.

**Specimens examined.** ASIZP 53853 (1, 289), Dong-gang, Ping-tung, 23 May. 1966. ASIZP 57963 (1, 422), Da-xi, Yi-lan, 8 Feb. 1990. ASIZP 71583 (1), Da-xi, 15 Oct. 1997. ASIZP 71584 (1), Da-xi, 24 Apr. 2004. ASIZP 66772 (1, 165), Daxi, 8 Aug. 2005. NMMB-P1469 (1), Dong-gang, 13 Feb. 1962. NMMB-P1362 (1), NMMB-P1470 (1), Dong-gang, 6 Feb. 1966. NMMB-P1471 (1), Dong-gang, 1 Aug. 1965. NMMB-P3680 (2, 453+, 469), Dong-gang, 28 May. 2002. NMMB-P3820 (1, 326), Fong-gang, 23 Aug. 2001. NMMB-P6214 (1), Da-xi, 8 May. 2003. NMMB-P7962 (1), Dong-gang, 11 Jun. 2004. NMMB-P8047 (1), Fang-shan, Pingtung, 17 Jun. 2004. NMMB-P9186 (1, 324). Da-xi, 8 Sep. 2008. NMMB-P9236 (2), NMMB-P9243 (2, 364–450), Dong-gang, 18 Sep. 2008. NMMB-P9336 (3), NMMB-P9438 (3), Dong-gang, 27 Aug. 2008. NMMB-P11899 (1, 325), Dong-gang, 15 Feb. 2011. NMMB-P11902 (1, 377), no data. NMMB-P12664 (3), Dong-gang, 16 Apr. 2004. NMMB-P13871 (3, 323+–437), Dong-gang, 10 Aug. 2011. NMMB-P14018 (1), Dong-gang, 6 Sep. 2011. NMMB-P16290 (5), NMMB-P16314 (4), Nan-fan-ao, 20 Jul. 2010. NMMB-P16369 (1, 196), Dong-gang, 21 Feb. 2012. NMMB-P17762 (1, 443), Dong-gang, 8 Aug. 2012. NMMB-P17888 (1, 414), Dong-gang, 25 Jan. 2013. NMMB-P20661 (1, 455), NMMB-P20676 (1, 397), Chang-bin, Taitung, 10 May. 2012. NMMB-P20678 (1, 369), Chang-bin, 23 Jul. 2012. NMMB-P20996 (1, 457+), Dong-gang, 12 Mar. 2014. NMMB-P20679 (2), Chang-bin, 28 Apr. 2012. NMMB-P21010 (1, 342), NMMB-P21026 (1, 420+), NMMB-P21033 (1, 370), NMMB-P21034 (1, 335), Dong-gang, 12 Mar. 2014. NMMB-P21739 (1, 355+), Dong-gang, 15 Feb. 2011. NMMB-P21707 (1), Dong-gang. NMMB-P21735 (2), Dong-gang, 10 Aug. 2011. NMMB-P21798 (1, 243), Dong-gang, 7 Nov. 2013. NMMB-P22454 (1, 295), Dong-gang, 11 Feb. 2015. NMMB-P24509 (1, 320), NMMB-P24516 (1, 322), Dong-gang, 24 Aug. 2016. NMMB-P24920 (1), Dong-gang. NMMB-P26029 (1, 325, cleared & stained), Dong-gang, 15 Apr. 2017. NMMB-P26385 (1, 180), Da-xi, 1 Jul. 2017. NMMB-P26394 (9, 267–385), Nan-fan-ao, 1 Jul. 2017. NMMB-P26553 (24, 255–511), Dong-gang, 3 Mar. 2017. NMMB-P26755 (1, 374), Da-xi, 24 Dec. 2015. NMMB-P27606 (5, 171–291), Dong-gang, 3 Mar. 2017. NMMB-P28487 (1, 271), Dong-gang, 30 Jan. 2018. NMMB-P27885 (1, 340), NMMB-P27886 (1, 373), NMMB-P27887 (1, 374), Dong-gang, 3 Mar. 2017. NMMB-P28212 (1, 195), Dong-gang, 10 Nov. 2017. NMMB-P28258 (1, 263), NMMB-P28276 (1, 372), NMMB-P28435 (1, 354), NMMB-P28439 (1, 273), NMMB-P28440 (1, 263), Dong-gang, 15 Nov. 2017. NMMB-P29130 (3, 322–428), Dong-gang, 27 Mar. 2018. USNM 395266 (1, 345+), Dong-gang, 16 May 2008. USNM 398443 (1, 366+), Taiwan, 2009. USNM 398513 (1, 354+), USNM 398514 (1, 370), USNM 398515 (1, 248), Da-xi, 6 Nov 2009. USNM 398558 (1, 315), USNM 398559 (1, 328), USNM 398560 (1, 362), USNM 398729 (1, 234), USNM 398730 (1, 292), USNM 398731 (1, 332), Dong-gang, 10 Nov. 2009. USNM 398793 (1, 280+), USNM 398794 (1, 290), USNM 398795 (1, 280), Nan-fang Ao, 18 Nov. 2009. USNM 399861 (1, 352), USNM 400321 (1, 402), Dong-gang, 8 Nov. 2009. USNM 401054 (1, 184), USNM 401055 (1, 362+), Da-xi, 6 Nov. 2009. USNM 401084 (1, 403), Dong-gang, 25 May 2010. USNM 404432 (1, 386), Taiwan, 2009. USNM 437335 (1, 345+), Dong-gang, 28 Sep. 2013. USNM 437336 (1, 417), Dong-gang, 13 Mar. 2015. USNM 437337 (470+), Da-xi, 11 Oct. 2015. USNM 437338 (1, 435+), Da-xi, 15 Oct. 2015. USNM 439062 (1, 570), USNM 439063 (1, 386), USNM 439064 (1, 395), Dong-gang, 4 Feb. 2016. Twenty-five uncatalogued specimens (231+–523+).

**Diagnosis.** A moderately large, slender species of *Bathycongrus* with tail tapering and filiform; two enlarged teeth on vomer followed posteriorly by 2 smaller teeth side by side; trunk length 1.5–1.7 times head length; preanal vertebrae 38–43 (mainly 40–42); precaudal vertebrae 53–57, total vertebrae 172–181; and preanal lateral-line pores 39–43.

**Description.** Proportional measurements and meristics are provided in Tables 7–8. Body elongate, round in cross section anteriorly, becoming more compressed behind anus and posterior portion; head moderately slender, its depth and width slightly less than these of trunk; trunk moderately long, its length 1.5–1.7 times of head length; tip of tail tapering and filiform; anus slightly behind anterior third of total length when tail is complete.

Dorsal fin begins over origin to middle of pectoral fin, continuous around tip of tail with caudal and anal fins. Anal fin begins immediately behind anus. Pectoral fin well developed, pointed with a narrow base. Gill opening large, about same size as eye, its upper end opposite middle to lower part of pectoral-fin base; interbranchial broader than gill opening and eye.

Head small, deepest about occiput, tapering anteriorly from this point; dorsal profile nearly flat from occiput to internasal space; snout long, blunt anteriorly in dorsal view, its length 1.7–2.0 times eye diameter, projecting beyond lower jaw; lower jaw longer than snout; fleshy part of snout with a median keel on underside, projecting anteriorly beyond anterior end of intermaxillary tooth patch; rictus below posterior margin of eye.



**FIGURE 11.** *Bathycongrus wallacei* (Castle, 1968), NMMB-P29130, 428 mm TL.

Anterior nostril tubular, near tip of snout, directed ventrolaterally. Posterior nostril elliptical, with a slightly raised rim, in front of eye above mid-eye level. Upper lip with a shallow, free flange; lower lip with a well-developed downturned flange. Tongue free, long, and broad.

Lateral line complete, first pore on each side slightly enlarged, the canal extends to, or nearly to, caudal-fin base; 5–7 before pectoral-fin base, 6–9 pores before dorsal-fin origin (usually 1 or 2 more than prepectoral); 39–43 before anal-fin origin [38–40 in comparative specimens]; total pores not countable.

Head pores vary in size, mostly enlarged. Supraorbital pores 3; the first (ethmoidal pore) on ventral side of snout tip, just above lip; the second enlarged, about twice the size of first, and immediately in front of anterior nostril; the third greatly enlarged and immediately above anterior nostril, about same size as anterior nostril. Infraorbital canal with 5 pores, first 3 pores enlarged, second to fourth above the flange; first pore at posterodorsal corner of anterior nostril; second pore behind and slightly below the first, between anterior and posterior nostrils; the third between posterior nostril and anterior margin of eye; the fourth below middle of eye; the fifth small and behind rictus; no pores behind eye. Preoperculomandibular canal with 10 pores, 7 in mandibular section and 3 in preopercular; the first mandibular pore very small, near anterior tip of lower jaw, the third greatly enlarged, the seventh behind rictus. Supratemporal commissure with 1 pore (cf. Fig. 1).

Predorsal vertebrae 8–11 (mainly 8 or 9; 9–12 in comparative specimens); preanal vertebrae 38–43 (mainly 40–42; 41–44 in comparative specimens); precaudal vertebrae 53–57 (mainly 54–56); and total vertebrae 172–181 (169–180 in comparative specimens).

Teeth moderately large, conical (Fig. 6 B). Intermaxillary teeth curved, in about three or four transverse rows, separated from maxillary and vomerine teeth, mostly excluded from closed mouth. Maxillary and mandibular teeth in bands, wider anteriorly, roughly in 4 or 5 rows, narrower posteriorly, in 1 to 2 rows; outermost teeth slightly larger than innermost. Vomerine teeth with 2 (rarely 1 or 3) enlarged teeth on midline, with 2 smaller teeth directly behind, side by side; a few additional small teeth in front and behind, no teeth laterally.

**Coloration.** When fresh, body mostly light grayish or pinkish gray with ventral surface paler. Vertical fins pale anteriorly, gradually becoming blackish posteriorly and entirely black at posterior fourth of body; caudal fin black. Slightly paler in preservation. Stomach black internally and pale externally, covered with many black dots on outer surface; intestine black or brown internally and externally. Mouth cavity and gill chamber pale; lower 2/3 of peritoneum silver white, gradually covered by denser pepper dots on dorsal 1/3 dorsally with some large black dots may present.

**Distribution.** This species is known from two widely separated locations: Japan to the Philippines in the northwestern Pacific, and the southwestern Indian Ocean.

**Remarks.** Castle & Smith (1999) re-assessed the genus and diagnosed *B. wallacei* as: 168–180 total vertebrae and two enlarged teeth followed by 2 or 3 smaller teeth on vomer. We counted our specimens with 172–181 total vertebrae.

The pattern of vomerine teeth in this species is quite distinctive. There are one or two enlarged teeth on the midline followed directly behind by two smaller teeth arranged side by side. There are usually a few smaller teeth in front or behind those mentioned, but there is no consistent pattern of numerous smaller teeth on both sides of the median teeth. Although there are a few small teeth that extend from each side of the maxillary teeth in the specimens we examined, there is always a space on the lateral side of the vomerine tooth patch that clearly separates it from the maxillary teeth.

Based on HCH's long-term observations, *B. wallacei* is one of the most common and abundant eel species in the bycatch of bottom trawls in Taiwan. Other common eel species are *Rhynchoconger ectenurus*, *Uroconger* spp., *Conger macrocephalus*, *Ariosoma meeki* (Congridae); *Dysomma* spp. (Synbranchidae); and *Ophichthus urolophus*, *Pisodonophis* spp. (Ophichthidae).

**Comparative materials.** *Bathycongrus guttulatus*: USNM 92344 (1, 566). USNM 93356 (3, 343–350). USNM 93357 (1, 530). USNM 93358 (1, 462). USNM 93362 (1, 530). *Bathycongrus wallacei*: Japan: FAKU 25140 (1, 374). FAKU 27870 (1, 354). USNM 177762 (1, 485). The Philippines: USNM 135253 (1, 260). CAS 34533 (1, 191). *Bathycongrus retrotinctus*: Japan: USNM 49974 (1, 247). USNM 59787 (1, 222). USNM 117983 (2, 268–288). USNM 117995 (1, 341). USNM 163371 (1, 304+). USNM 163372 (1, 389). The Philippines: USNM 92345 (1, 331). USNM 93295 (1, 95). USNM 135236 (3, 220–335). USNM 135240 (2, 160–270). USNM 135242 (1, 336). USNM 135246 (1, 290). USNM 135249 (1, 192). USNM 135251 (1, 314). CAS 40910 (1, 350). CAS 34435 (1, 262).

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