



## Three new species of the cutthroat eel genus *Dysomma*, with comments on the variation of *D. taiwanense* (Anguilliformes: Synbranchidae)

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### Abstract

Three new species of eels of the genus *Dysomma* are described from the western North Pacific Ocean off Taiwan. *Dysomma formosa* sp. nov., described from 34 specimens, differs from the congeners in having single row of 11–14 large compound teeth followed by 3–10 smaller teeth on lower jaw, 17–33 lateral-line pores, and 128–133 total vertebrae. *Dysomma brachygnathos* sp. nov., described from two specimens, differs from the congeners in the lack of a pectoral fin, having an anterior position of anus (preanal length 17.8–ca. 18.6% SL), 23–32 lateral line pores, a short lower jaw, and 131<sup>+</sup>–136 total vertebrae. *Dysomma robinsorum* sp. nov., described from four specimens, differs from the congeners in having an anterior position of anus; preanal length 15.5–16.9% SL, no intermaxillary teeth; multiple rows of teeth on upper jaw; four compound teeth on vomer; teeth on lower jaw multiserial, those on inner row slightly enlarged, and 122–124 total vertebrae. Components of the variation of *Dysomma taiwanense* originally described from Taiwan are provided based on an additional 52 recently identified specimens.

**Key words:** Pisces, taxonomy, *Dysomma*, new species, Taiwan

### Introduction

The cutthroat eel genera *Dysomma* and *Dysommima* in Taiwan were recently reviewed by Ho *et al.* (2015). The species found off Taiwan included *Dysomma anguillare* Barnard, 1923, *D. dolichosomatum* Karrer, 1983, *D. polycatodon* Karrer, 1983, *D. melanurum* Chen & Weng, 1967, *D. opisthoproctus* Chen & Mok, 1995, *D. goslinei* Robins & Robins, 1976, *D. longirostrum* Chen & Mok, 2001, a newly described species *D. taiwanense* Ho *et al.*, 2015, and *Dysommima rugosa* Ginsburg, 1951. Among those species, *Dysommima rugosa* is described as a new species, *Dysommima orientalis* by Tighe *et al.* (2018) in this volume.

After their publication, the authors continued collecting specimens and studying the taxonomy and variation of the additional specimens. Among the newly collected specimens, we found another new species similar to *D. taiwanense* and *D. anguillare*, but with more lower-jaw teeth, fewer lateral-line pores, and a vertebral count that does not fully overlap with these two species. A formal description is provided in the present work.

Two specimens were found that possessed several unique characters including lack of a pectoral fin, short lateral line, slightly bulbous snout with numerous plicae and very short lower jaw. These specimens are described as a new species here.

Without examining the only known specimen of *D. goslinei* reported in Chen & Mok (2001), Ho *et al.* (2015) suggested that further investigation was required for the population in Taiwan. Several specimens were found from Taiwan recently. We confirmed that the species has a low vertebral count and the population in Taiwan (northern South China Sea) represents a new species.

Moreover, many new specimens of *D. taiwanense* were collected from deep waters around Taiwan (both

northeastern and southwestern) recently. We found that these specimens possess a highly variable combination of lower-jaw teeth, and supplemental data on the variation of this species are provided based on these specimens.

## Methods and materials

Methods for taking counts and measurements followed Ho *et al.* (2015). Institutional abbreviations are as listed in Eschmeyer *et al.* (2018, online version). Specimens were deposited at the Pisces Collection of the National Museum of Marine Biology & Aquarium, Taiwan (NMMB-P); Department of Bioresource Science, Faculty of Agriculture, Kyoto University, Kyoto, Japan (FAKU); and National Museum of Natural History, Smithsonian Institution, D.C. (USNM).

Abbreviations. TL, total length; HL, head length; MVF, mean vertebral formula.

## Dysomma Alcock, 1889

*Dysomma* Alcock, 1889:459 (type species. *Dysomma bucephalus* Alcock, 1889).

**Remarks.** Together with three new species described herein, 16 species in *Dysomma* are recognized. The Taiwanese record of *D. goslinei* is herein described as a new species. It is notable that ten species currently occur in Taiwan, of which seven were described from Taiwan. Although some of them are only found in Taiwan, more investigation in the near waters may result in a broader distribution for each.

Moreover, the species previously recorded as *Dysommima rugosa* from the western Pacific Ocean is now described as a new species, *Dysommima orientalis* Tighe *et al.*, 2018.

## A key to species of *Dysomma* and *Dysommima* found in Taiwan

1A.	Pectoral fin absent . . . . .	2
1B.	Pectoral fin present . . . . .	3
2A.	Trunk length 14.3–17.7% TL; dorsal-fin origin well behind gill opening; MVF 18-27-153, total vertebrae 146–156 . . . . .	<i>D. dolichosomatum</i>
2B.	Trunk length 5.3–ca.7.0% TL; dorsal-fin origin slightly in front of gill opening; MV 8-16-136; total vertebrae 131 <sup>+</sup> –136 . . . . .	<i>D. brachygnathos</i> <b>sp. nov.</b>
3A.	No intermaxillary teeth; multiple rows of small teeth on lower jaws . . . . .	4
3B.	Two intermaxillary teeth; single row of large compound teeth or large compound teeth followed by smaller teeth on lower jaws . . . . .	7
4A.	Anus anterior, below pectoral fin . . . . .	5
4B.	Anus posterior, well behind pectoral fin . . . . .	6
5A.	Lower jaw projects beyond snout, not appressed to upper jaw when mouth fully closed; lateral line extends to 1/2 HL before the caudal-fin base . . . . .	<i>D. melanurum</i>
5B.	Lower jaw included, not projecting beyond snout, appressed to upper jaw when mouth fully closed; lateral line extends to about anterior fourth of body . . . . .	<i>D. robinsorum</i> <b>sp. nov.</b>
6A.	Five compound teeth on vomer; lateral-line pores present; head pores present on frontal, infraorbital posterior to eye, and preopercular . . . . .	<i>D. longirostrum</i>
6B.	Four compound teeth on vomer; pores absent on lateral line, frontal, infraorbital posterior to eye, and preopercular . . . . .	<i>Dysommima orientalis</i>
7A.	Anus anterior, trunk shorter than head length . . . . .	8
7B.	Anus posterior, trunk much longer than head length . . . . .	<i>D. opisthoproctus</i>
8A.	Two large compound teeth followed by row of 22–31 smaller ones on lower jaw . . . . .	<i>D. polycatodon</i>
8B.	Single row of 7–11 large compound teeth followed by 0–8 small regular teeth on lower jaw . . . . .	9
9A.	Lateral line long, with 57–75 pores; tip of pectoral fin extending nearly to origin of anal fin; 6–11 large compound teeth on lower jaw . . . . .	<i>D. anguillare</i>
9B.	Lateral line short, with 24–48 pores; tip of pectoral fin not reaching origin of anal fin; 5–11 compound teeth followed by 0–8 small teeth on lower jaw . . . . .	10
10A.	Body pale to light grayish; lateral-line pores 17–33; total vertebrae 128–133; total teeth on lower jaw 14–22 . . . . .	<i>D. formosa</i> <b>sp. nov.</b>
10B.	Body brownish; lateral-line pores 29–49; total vertebrae 134–140; total teeth on lower jaw 6–15 . . . . .	<i>D. taiwanense</i>

***Dysomma formosa* sp. nov.**

English name: White cutthroat eel

Figs. 1–3; Tables 1–2

**Holotype.** NMMB-P 23172 (1, 324), Dong-gang fishing port, Pingtung, SW Taiwan, northern South China Sea, ca. 300 m, 21 Nov. 2015.

**Paratypes.** 33 specimens, all collected from near the type locality. FAKU 145542 (1, 323), 30 Aug. 2017. NMMB-P12065 (1, 236), 18 Feb. 2011. NMMB-P23173 (1, 245), 29 Mar. 2015. NMMB-P23481 (3, 255–313), 2013.6.11. NMMB-P23484 (4, 237–311), 22 Jul. 2016. NMMB-P24392 (2, 263–289), 24 Aug. 2016. NMMB-P26038 (2, 288–307), 15 Apr. 2017. NMMB-P26159 (1, 332), 30 Mar. 2017. NMMB-P26162 (1, 221), 30 Mar. 2017. NMMB-P26682 (1, 313), 23 Jul. 2017. NMMB-P26683 (2, 249–333), 29 Mar. 2017. NMMB-P26684 (2, 228–233), 10 Jul. 2017. NMMB-P26698 (4, 149–197), 9 Aug. 2017. NMMB-P26702 (4, 287–362), 10 Jul. 2017. NMMB-P26704 (1, 278), 19 Jul. 2017. NMMB-P26705 (1, 335), 10 Jul. 2017. USNM 441749 (2, 269–281), out of NMMB-P24392.

**Diagnosis.** Pectoral fin present; dorsal-fin origin over or slightly in front of base of pectoral fin; anus slightly behind tip of pectoral fin; trunk very short; 2 intermaxillary teeth; 4 compound teeth on vomer; single row of 14–22 teeth on lower jaw. Lateral-line pores: predorsal 2–5, prepectoral 3–6, preanal 6–11, and total 17–33. Vertebrae: predorsal 7–10, preanal 12–15, precaudal 57–61; total 128–133; MVF 9-14-130. Body uniformly pale grayish to grayish, lower part of posterior parts of body darker, anal-fin base of distal portion of anal fin and lower part of caudal fin solid black.

**Description.** Morphometric data of the holotype (in mm): TL 324; head length 38; predorsal length 36; preanal length 48.7; trunk length 10.7; tail length 275.3; depth at gill opening 15.3; depth at anus 17.5; width at anus 12.4; eye diameter 3.4; interorbital width 5.6; snout length 9.0; upper jaw 15.7; gill opening 2.8; interbranchial width 5.5.

The following values are given for the holotype, followed by that of all types in parentheses. Head relatively short, 11.7 (10.6–12.6)% TL; origin of dorsal fin slightly in front of the gill opening (in front to above the gill opening in paratypes), predorsal length 11.1 (10.8–12.5)% TL; trunk very short, 3.3 (2.5–4.8)% TL; anus slightly behind tip of pectoral fin; origin of anal fin immediately behind anus, preanal length 15.0 (13.4–17.2)% TL; tail long, tail length 85.0 (82.8–86.6)% TL.

Body moderately slender, head and trunk slightly compressed, becoming more compressed posteriorly; body width at anus 3.8 (2.0–3.8)% TL; body depth relatively uniform, depth at anus 5.4 (3.8–5.4)% TL, narrowing gradually to caudal fin; depth of gill opening 4.7 (3.5–5.2)% TL. Dorsal and anal fins low and fleshy, continuous with a small caudal fin. Pectoral fin well-developed, its base behind upper corner of gill opening.

Head slender in profile; snout blunt anteriorly and broad dorsally, covered by many short papillae, snout length 23.7 (21.3–26.1)% HL; tip of snout projecting well beyond lower jaw; eye small, covered by a thick and semitransparent membrane; eye diameter 7.9 (5.5–7.9)% HL; interorbital space broad, slightly elevated, its width 14.7 (13.3–16.9)% HL; postorbital space broad. Anterior nostrils tubular, directed anteroventrally. Posterior nostril rounded, situated at below anterior margin of eye, opening directed posteroventrally. Lower jaw shorter than upper, its tip reaching first pore of supraorbital series. End of mouth gape well behind eye, upper jaw length 44.7 (43.1–49.1)% HL.

Gill opening a narrow slit. Head and lateral-line pores large (Figs. 3A–B). Supraorbital pores 3, all restricted to anterior portion of snout; infraorbital pores 4, 2 pores between nostrils and 2 below eye; mandibular pores 6 (2 paratypes with 7 on one side), the last pore well behind the penultimate one, either below or slightly behind end of mouth gape; preopercular pores 0; adnasal 1; supratemporal commissure 0; frontal 0. Lateral line incomplete, extending to about anterior fourth to third of body, predorsal 3 (2–5), prepectoral 4 (3–6), preanal 8 (6–11) and total 24 (right)/23 (left) (17–33).

Teeth (Fig. 3C) small and pointed. Intermaxillary teeth 2, side-by-side, followed by 4 large compound vomerine teeth, uniserial, the third one largest, the fourth one smallest. Maxillary with 3 to 4 irregular rows of small teeth, those in inner row slightly larger than the rest. Lower jaw with single row of 11 or 12 (9–14) large compound teeth followed by 4 or 5 (3–10) smaller teeth; total teeth 14–22.

Mean vertebral formula 9-14-130; predorsal vertebrae 10 (7–10), preanal vertebrae 14 (12–15); abdominal vertebrae 57 (57–61), and total vertebrae 131 (128–133).

**TABLE 1.** Morphometric and meristic data of three *Dysomma* species. \* numbers of pores before gill opening.

	<i>D. formosa</i> sp. nov.			<i>D. taiwanense</i>		<i>D. brachygnathos</i> sp. nov.	
	Holotype	Types		Non-types		Holotype	Paratype
TL (mm)	324	221–362 (n=27)		210–474 (n=21)		208	242+
% TL		Mean (Range)	SD	Mean (Range)	SD		
Head	11.7	11.7 (10.6–12.6)	0.5	10.5 (8.7–12.9)	1.2	12.5	~11.6
Predorsal	11.1	11.5 (10.8–12.5)	0.5	10.9 (10.1–12.7)	0.6	11.0	~12.0
Preanal	15.0	15.2 (13.4–17.2)	0.8	14.5 (13.4–17.2)	1.0	17.8	~18.6
Trunk	3.3	3.6 (2.5–4.8)	0.6	4.1 (2.5–5.3)	0.7	5.3	~7.0
Tail	85.0	84.8 (82.8–86.6)	0.8	85.5 (82.8–86.6)	1.0	82.2	~81.4
Depth at gill opening	4.7	4.3 (3.5–5.2)	0.5	3.8 (2.2–5.4)	0.8	3.5	~4.2
Depth at anus	5.4	4.5 (3.8–5.4)	0.4	4.1 (2.9–5.8)	0.7	4.0	~4.7
Width at anus	3.8	2.6 (2.0–3.8)	0.4	2.3 (1.8–3.3)	0.4	2.2	~3.3
% HL							
Snout	23.7	23.6 (21.3–26.1)	1.3	24.5 (21.1–27.9)	1.9	21.2	27.5
Eye diameter	7.9	6.3 (5.5–7.9)	0.6	6.8 (5.7–8.7)	1.0	5.4	6.1
Interorbital	14.7	15.2 (13.3–16.9)	0.9	14.4 (11.9–18.2)	1.8	15.4	18.6
Upper jaw	44.7	45.7 (43.1–49.1)	1.6	45.8 (40.1–50.8)	3.3	36.5	45.7
Pectoral fin	25.5	19.1 (13.5–26)	3.0	17.0 (12.4–20.6)	2.4	–	–
Gill opening	7.4	7.8 (5.7–10.4)	1.5	8.9 (5.7–11.4)	1.5	4.8	9.7
Interbranchial	14.5	12.1 (9.3–15.8)	1.8	11.6 (8.0–15.6)	2.5	10..9	11.4
Head pores		n=32		n=51			
Supraorbital	3	3		3		3	3
Infraorbital	4	4		4		4	4
Adnasal	1	1		1		1	1
Mandibular	6	6 (rarely 7)		6		5	5
Lateral-line pores							
Predorsal	3	2–5		3–5		3	3
Prepectoral	4	3–6		3–6		5*	4*
Preanal	8	6–11		7–10		9	9
Total	23;24	17–33		29–49		31–32	23–24
Vertebrae							
Predorsal	10	7–10		7–10		8	8
Preanal	14	12–15		12–17		16	15
Total	131	128–133		134–140		136	131+
MVF		9-14-130		9-14-137		8-16-136	8-15-131+
Lower-law teeth	15;17	14–22		6–15		7–8	10–11

**Coloration.** When fresh, body uniformly pale to grayish, lower half of posterior parts of body darker, base of posterior part of anal fin and lower part of caudal fin solid black. When preserved, coloration similar to fresh, with body more brownish. Peritoneum white with numerous pigment spots. Mouth cavity white.

**Distribution.** Known from the type specimens collected from off Dong-gang, southwestern Taiwan (northern South China Sea) by bottom trawl at depths around 200–300 meters.

**Etymology.** The specific name is derived from the historical name of Taiwan, Formosa, derived from the Latin *formosus* meaning beautiful. To be used as a noun in apposition.

**Remarks.** *Dysomma formosa* sp. nov. is most similar to *D. anguillare* and *D. taiwanense* in having similar fin

formula, coloration and dentition. These species are sympatric in Taiwan, although *D. anguillare* is far more abundant than the other two species. Based on our observation, *D. anguillare* has a broader bathymetric range from shallow to more than 500 meters, whereas the other two species are always collected by bottom trawl from deeper than 200 meters.

The numbers of lower-jaw teeth is quite different in these three species (Table 2). *Dysomma formosa* has 11–14 small compound teeth with 3–10 small teeth on lower jaw (total 14–22), whereas *D. taiwanense* has 5–11 compound teeth and 0–8 small teeth on lower jaw (total 6–15) and *D. anguillare* has 6–11 compound teeth. It is notable that a few specimens of *D. anguillare* have 1 or 2 additional small teeth behind these compound teeth on lower jaw. However, it is rare to see.

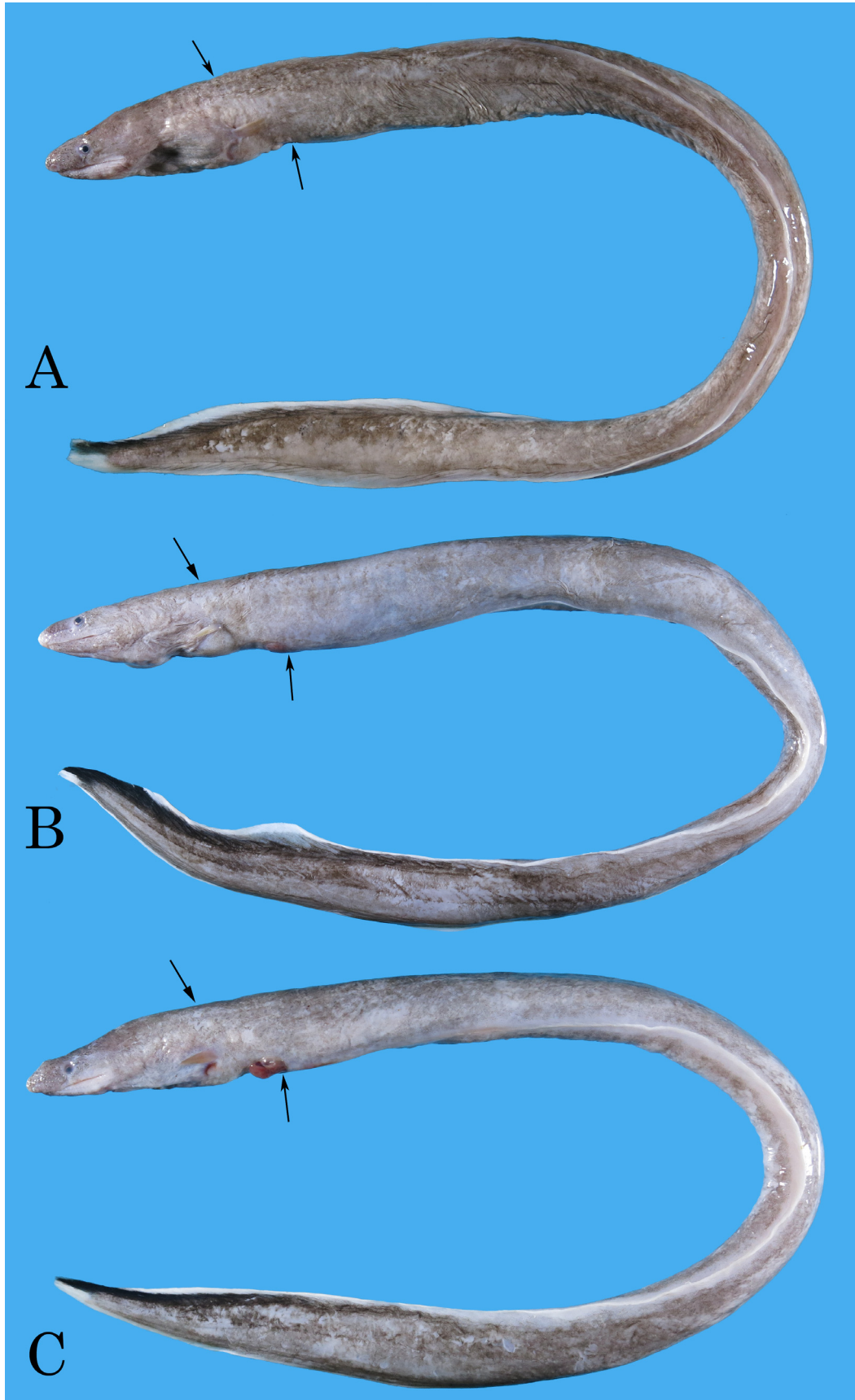


**FIGURE 1.** *Dysomma formosa* sp. nov., holotype, NMMB-P 23172, 324 mm TL. A. Lateral view of whole fish. B. Lateral view of head. Arrows indicate origin of dorsal fin (above head) and origin of anal fin (below the body).

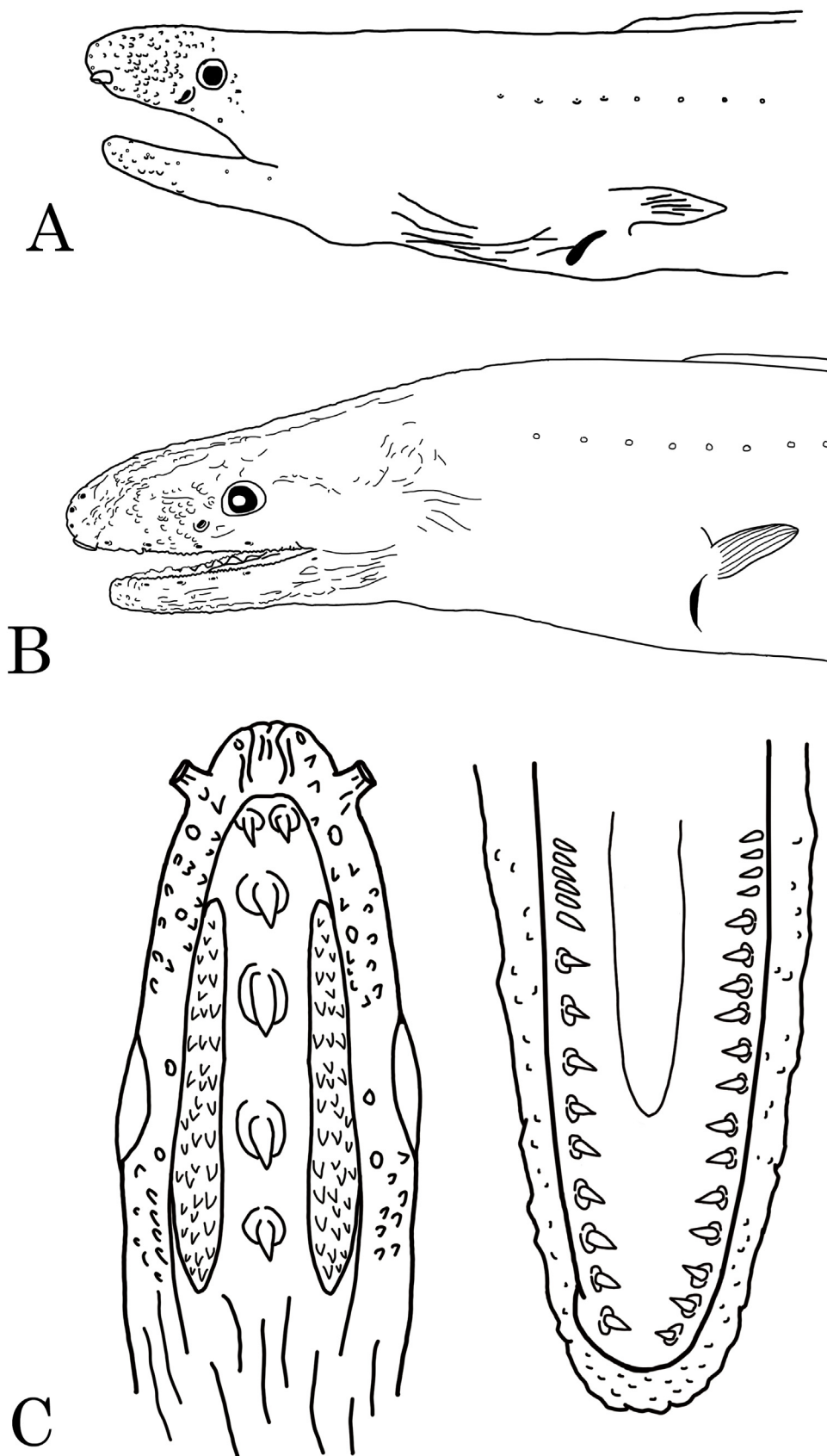
*Dysomma formosa* has a much shorter lateral line, with 17–33 pores, that extends to the anterior fourth to third of the body. *Dysomma anguillare* has a longer lateral line, with 57–75 pores, that extends to over half of body, whereas *D. taiwanense* has 29–49 lateral-line pores and it extends to the anterior third to half of the body.

The vertebral counts can also separate the three species (Table 2). *D. taiwanense* has 134–140, whereas *D. formosa* has 128–133 and *D. anguillare* has 119–128.

The body coloration is somewhat paler (light grayish) in *D. formosa*, uniformly brownish in *D. taiwanense* and more variable in *D. anguillare*, from pale brown to very dark.



**FIGURE 2.** *Dysomma formosa* sp. nov. A. NMMB-P26159, paratype, 332 mm TL. B. NMMB-P24392, paratype, 1 of 3, 272 mm TL. C. NMMB-P24392, paratype, 1 of 3, 289 mm TL. Arrows indicate origin of dorsal fin (above head) and origin of anal fin (below the body).



**FIGURE 3.** *Dysomma formosa* sp. nov. A. Lateral view of head, holotype, NMNB-P 23172. B–C. NMNB-P26705, paratype. B. Lateral view of head showing head pores. C. Upper jaw (left) and lower jaw (right), not to scale.

The anus is situated right below the pectoral fin, and the tip of the pectoral fin extends to nearly the origin of the anal fin in most specimens of *D. anguillare*; whereas the pectoral fin extends to, or almost to, the anterior margin of the anus in *D. formosa* and about one pectoral-fin length before the anus in *D. taiwanense*.

*Dysomma formosa* is also similar to *D. polycatodon* in having single row of compound and small teeth on the lower jaw. However, *D. polycatodon* has only two compound teeth at the front followed by many small teeth.

**TABLE 2.** Frequency of numbers of lower-jaw teeth (A) and total vertebrae (B) for comparison of three *Dysomma* species in Taiwan. Note that lower-jaw teeth are counted on both sides when available.

A.

Lower-jaw teeth	n	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
<i>D. anguillare</i>	41	2	22	12	2	2	1											
<i>D. formosa</i>	58									1	13	11	16	9	5	1	1	1
<i>D. taiwanense</i>	48	1	0	1	7	9	12	15	1	1	1							

B.

Total vertebrae	n	119	120	121	122	123	124	125	126	127	128	129
<i>D. anguillare</i>	21	1	2	1	6	1	2	1	2	3	2	
<i>D. formosa</i>	29										2	7
<i>D. taiwanense</i>	51											

B continued.

Total vertebrae	n	130	131	132	133	134	135	136	137	138	139	140
<i>D. anguillare</i>	21											
<i>D. formosa</i>	29	8	11	0	1							
<i>D. taiwanense</i>	51					4	4	10	12	10	8	3

***Dysomma brachygnathos* sp. nov.**

English name: Short-jaw cutthroat eel

Figs. 4–5; Table 1

**Holotype.** USNM 444742 (female, 208 mm TL), Dong-gang fishing port, Pingtung, SW Taiwan, northern South China Sea, 28 Mar 2014.

**Paratype.** NMMB-P20199 (male, 242+ mm TL), Dong-gang fishing port, Pingtung, SW Taiwan, northern South China Sea, 11 Jun 2013.

**Diagnosis.** Pectoral fin absent; dorsal-fin origin slightly in front of gill opening; trunk very short; lower jaw short, not covering intermaxillary teeth or first vomerine tooth when closed. Lateral-line pores: predorsal 3, preanal 9, and total 23–32. Vertebrae: predorsal 8, preanal 15–16, total 131+–136. Dentition: 2 compound intermaxillary teeth; 3–5 compound teeth on vomer; single row of compound teeth on lower jaw; maxillary teeth in 2–3 irregular rows. Body uniformly tannish to brownish, lower part of posterior parts of anal-fin and lower part of caudal fin darker.

**Description.** Morphometric data of the holotype (in mm): total length 208; head length 26; predorsal length 23; preanal length 37; trunk length 11; tail length 171; depth at gill opening 8.5; depth at anus 8.0; width at anus 5.9; eye diameter 1.4; interorbital width 4.0; snout length 5.5; upper jaw length 9.5; lower jaw length 7.0; gill opening 1.2; interbranchial width 3.3.

The following values are given for the holotype, followed by those of the paratype in parentheses. Head relatively short, 12.5 (~11.6)% TL; origin of dorsal fin slightly in front of gill opening (slightly behind gill opening), predorsal length 11.0 (~12.0)% TL; trunk relatively short, 5.3 (~7.0)% TL and 42.3 (~60.7)% HL; preanal length 17.8 (~18.6)% TL; tail long, tail length 82.2 (~81.4)% TL.





**FIGURE 4.** *Dysomma brachygnathos* sp. nov. A. USNM 444742, holotype, 208 mm TL. B. NMMB-P20199, paratype, 242+ mm TL. C. Semidiagrammatic lateral view of head showing the head pores, USNM 444742, holotype. Arrow indicates original of dorsal fin (DO) and origin of anal fin (AO)

Body moderately slender, head and trunk slightly compressed, becoming more compressed posteriorly. Dorsal and anal fins low and fleshy, continuous with a small caudal fin. Pectoral fin absent; gill opening very small and crescentic, set low on body

Head relatively stout in profile; snout blunt anteriorly and broad dorsally, tip of snout bulbous and covered by with numerous plicae, snout length 21.2 (27.5)% HL; tip of snout projecting well beyond lower jaw; eye small, covered by a thick and semitransparent membrane; eye diameter 5.4 (6.1)% HL; interorbital space broad, its width 15.4 (18.6)% HL; postorbital space broad. Anterior nostrils tubular, located just behind the bulbous snout, directed anteroventrally. Posterior nostril relatively large and rounded, below anterior margin of eye, opening directed posteroventrally. Lower jaw much shorter than upper, its tip not covering the intermaxillary teeth and first vomerine tooth when closed. End of mouth gape behind eye, upper jaw length 36.5 (45.7)% HL.

Head and lateral-line pores small (Fig. 4C). Supraorbital pores 3, all restricted to anterior portion of snout; infraorbital pores 4, 2 pores between nostrils and 2 below eye; mandibular pores 5; preopercular pores 0; adnasal 1; supratemporal commissure 0; frontal 0. Lateral line incomplete, extending to about anterior fourth to third of body, predorsal 3 (3), preanal 9 (9) and total 31 (right)/32 (left) (23/24); 5 (4) before gill opening.

Teeth (Figs. 5A–B) relatively small and pointed. Intermaxillary teeth 2, side-by-side, followed by 5 (3) large compound vomerine teeth, uniserial. One of the vomerine teeth in the holotype appears to be a replacement tooth as it does not appear to be fused to the vomer. Maxilla with 2 to 3 irregular rows of small teeth, those in inner row slightly larger than the rest; 21 or 22 (24 or 32) in outer row and 16 or 19 (20 or 27) in inner row. Lower jaw with single row of large compound teeth; the holotype has 4 large compound teeth anteriorly followed by a gap of about 5 or 6 missing teeth and then 3 or 4 smaller teeth posteriorly; the paratype has 10–11 compound teeth in a continuous row, decreasing gradually in size from anterior to posterior.

Vertebral formula 8-16-136 (8-15-131+).

**Coloration.** When preserved, body uniformly pale tannish to brownish, lower half of posterior parts of anal-fin

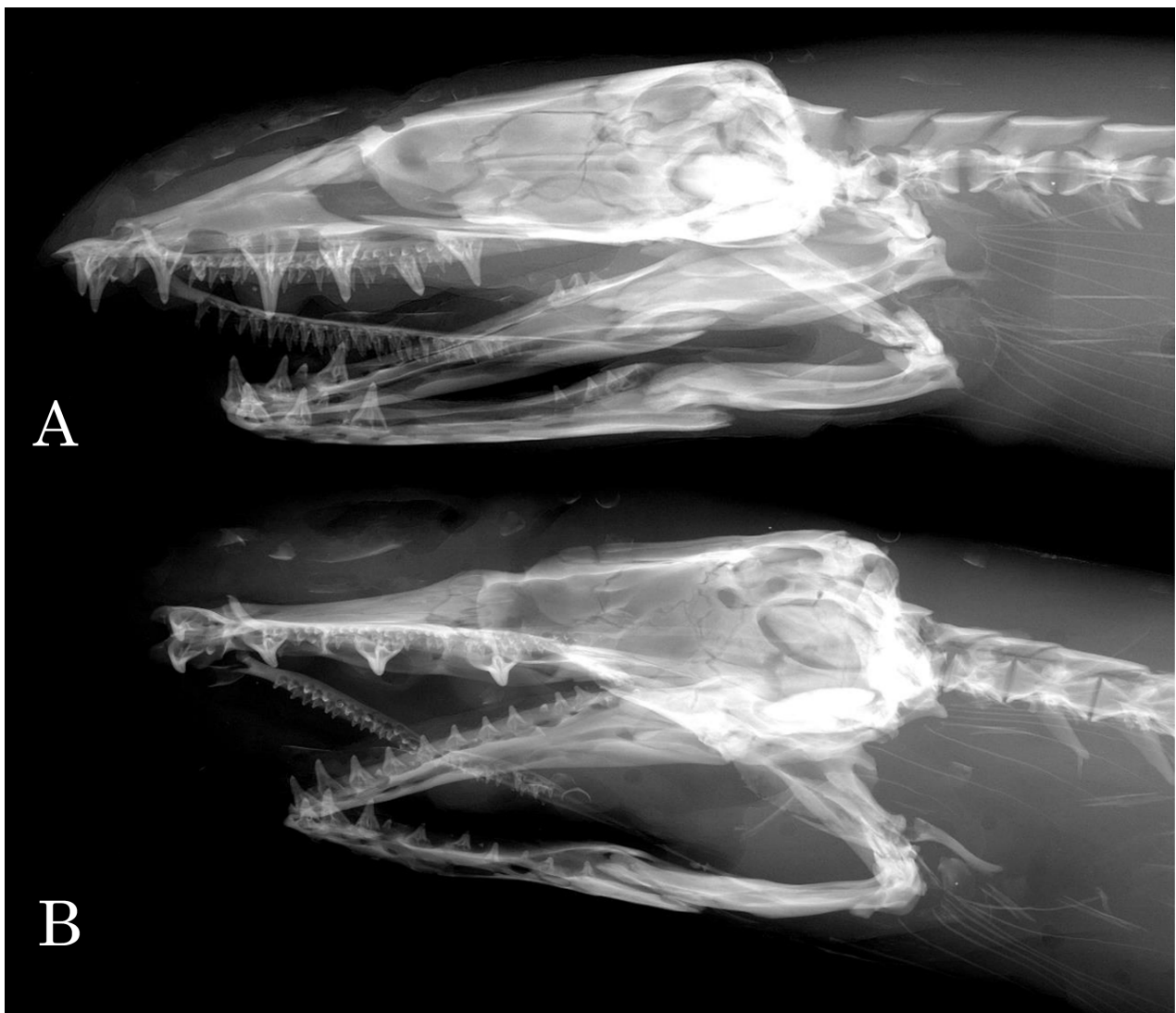
base and lower part of caudal fin darker. Peritoneum light with numerous melanophores. Mouth cavity cream colored. Fresh coloration unknown, but presumable similar to preserved condition.

**Distribution.** Known from the type specimens collected from off Dong-gang, southwestern Taiwan (northern South China Sea) by bottom trawl at depths around 200–300 meters.

**Etymology.** The specific name is derived from the Greek, *brachys*, short and *gnathos*, jaw, in reference to the relatively short lower jaw found in this species, to be treated as a noun in apposition.

**Remarks.** The difference in dentition between the holotype and the paratype of *Dysomma brachygnathos* is remarkable, and would normally indicate that these specimens represent two different species. However, the consistency in all other characters especially the very short lower jaw indicate that these two specimens are in fact the same species and that some other explanation for the dentition differences must be found. It is possible that the differences are due to sexual dimorphism since the holotype is a female and the paratype is a male. Whether this is the case will depend on the collection of additional specimens of this rare eel.

Below we also provide the case of *D. taiwanense* which is highly variable in the composition of lower-jaw teeth. Although the teeth on the lower jaw are an important character for identifying *Dysomma* species, such variation should be considered while working on this group.



**FIGURE 5.** X-rays of teeth of *Dysomma brachygnathos* sp. nov. A. USNM 444742, holotype. B. NMMB-P20199, paratype.

***Dysomma robinsorum* sp. nov.**

English name: Robinses' cutthroat eel

Figs. 6–7; Table 3

*Dysomma goslinei* (not of Robins & Robins, 1976): Chen & Mok, 2001:79. Ho *et al.*, 2015:94.

**Holotype.** NMMB-P26327 (1, 190.5 mm TL), off Dong-gang, Pingtung, southwestern Taiwan, northern South China Sea, 10 Jul. 2017.

**Paratypes.** NMMB-P23174 (1, 139 mm), Dong-gang fishing port, 28 Oct. 2011. NMMB-P29724 (1, 119), Dong-gang fishing port, 20 Jan. 2017. USNM 441751 (1, 152.5), Dong-gang fishing port, 10 Jan. 2017.

**Diagnosis.** Pectoral fin present; dorsal-fin origin before pectoral-fin base, predorsal length 11.3–13.8% TL; anus anterior, just below pectoral fin, preanal length 15.5–16.9% TL; trunk very short, trunk length 2.7–4.2% TL; no intermaxillary teeth; 4 compound teeth on vomer; multiple rows of teeth on upper jaw and lower jaw; lateral line short, lateral-line pores 28–33; and MVF 10-14-123.

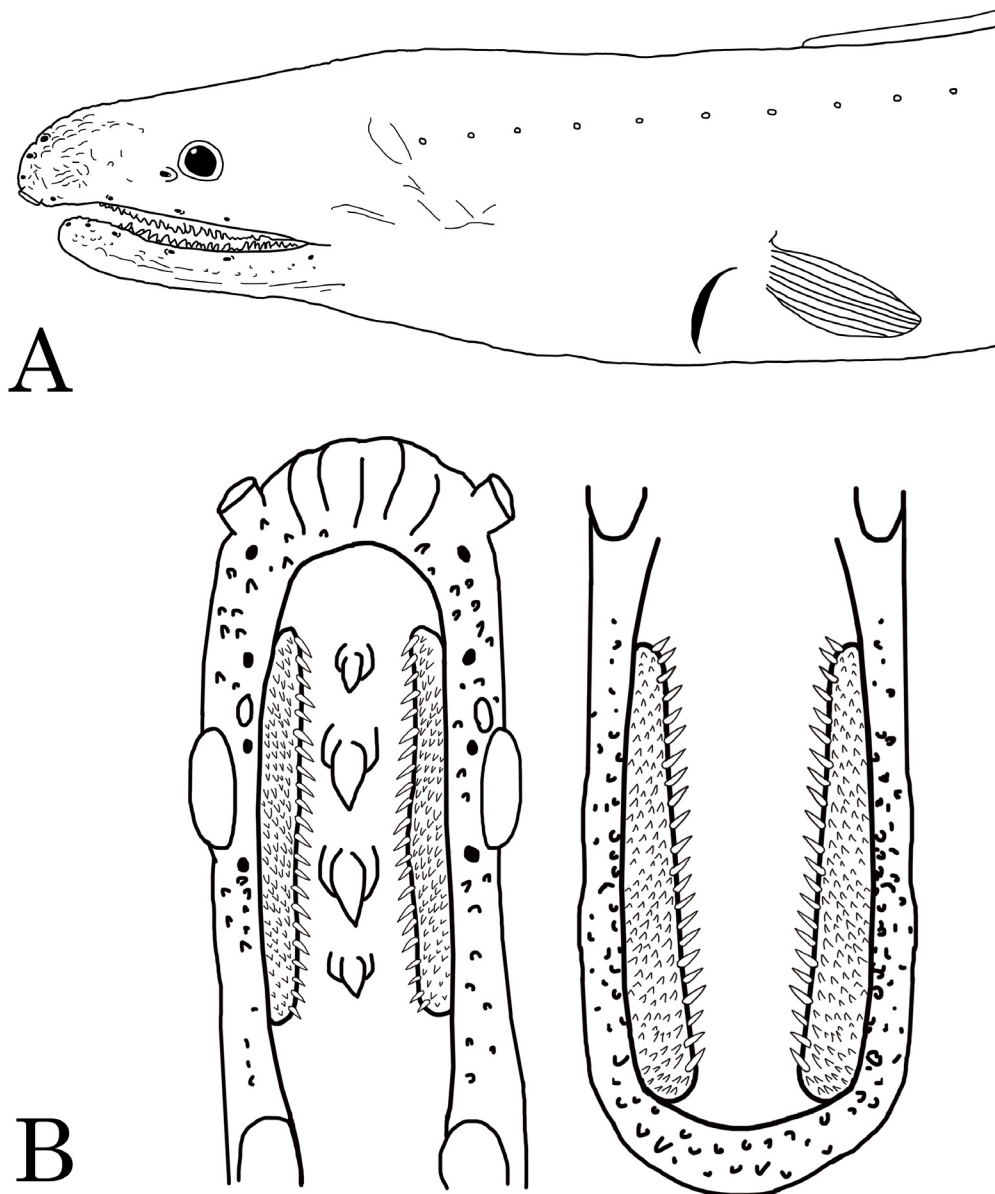


**FIGURE 6.** *Dysomma robinsorum* sp. nov. A. NMMB-P-26327, holotype, 190.5 mm TL. B. USNM 441751, paratype, 152.5 mm TL. Arrows indicate origin of dorsal fin (above head) and origin of anal fin (below the body).

**Description.** Morphometric data of the holotype (in mm): total length 190.5; head length 21.6; predorsal length 21.5; preanal length 30.8; trunk length 9.2; tail length 159.7; depth at gill opening 8.0; depth at anus 8.4; width at anus 2.7; eye diameter 1.5; interorbital width 3.0; snout length 4.3; upper-jaw length 9.2; gill opening 2.0; interbranchial width 2.0.

The following values are given for the holotype, followed by that of all types in parentheses. Head short, 11.3 (12.8–13.6)% TL; origin of dorsal fin above gill opening and pectoral-fin base, predorsal length 11.3 (11.3–13.8)% TL; trunk very short, 4.2 (2.7–3.3)% TL; anus below tip of pectoral-fin (below posterior half of pectoral fin); origin of anal fin immediately behind anus, preanal length 15.5 (15.5–16.9)% TL; tail long, tail length 84.5 (83.1–84.5)% TL.

Body moderately slender, head and trunk compressed; body width at anus 1.4 (1.4–3.2)% TL; body depth relatively uniform, depth at anus 4.4 (4.1–4.9)% TL, narrowing gradually to caudal fin; depth at gill opening 4.2 (3.9–5.3)% TL. Dorsal and anal fins low and fleshy, continuous with a small caudal fin. Pectoral fin well-developed, its base behind upper corner of gill opening.



**FIGURE 7.** *Dysomma robinsorum* sp. nov., NMMB-P26327, holotype. A. Lateral view of head showing the head pores. B. upper jaw (left) and lower jaw (right).

Head slender in profile, with many small papillae on snout, interorbital space and lower jaw; snout blunt anteriorly and broad dorsally, snout length 19.9 (19.9–25.3)% HL; tip of snout projecting well beyond lower jaw; eye small, covered by a thick and semitransparent membrane; eye diameter 6.9 (6.2–6.9)% HL; interorbital space broad, slightly elevated, its width 13.9 (12.3–15.1)% HL; postorbital space very long. Anterior nostrils tubular, directed anteroventrally. Posterior nostril rounded, below anterior margin of eye, opening directed posteroventrally. Lower jaw shorter than upper, its tip reaching first pore of supraorbital series. End of mouth gape far behind eye, upper jaw length 42.6 (42.6–44.8)% HL.

Gill opening a narrow slit. Head and lateral-line pores large (Fig. 7A). Supraorbital pores 3, all restricted to anterior portion of snout; infraorbital pores 4, 2 pores between nostrils and 2 below eye; mandibular pores 6, the last pore far away from penultimate one, below end of mouth gape; preopercular pores 0; adnasal 0; supratemporal commissure 0; frontal 0. Lateral line incomplete, extending to about anterior fourth to third of body, predorsal 6 (5–7), prepectoral 6 (6–8), preanal 10 (10–12) and total 33 (both sides) (28–33).

Teeth (Fig. 7B) small and pointed. No intermaxillary teeth. Vomer with 4 large compound teeth, uniserial, the second and third larger than the other two; Maxillary and dentary with band of 5 or 6 rows of small teeth, those in inner row about twice as large as those in next row.

Mean vertebral formula 10-14-123; predorsal vertebrae 10 (10), preanal vertebrae 14 (13–14), and total vertebrae 122–124.

**Coloration.** When fresh, body lightly yellowish brown with numerous chromophores under and/or on skin. Dorsal fin, pectoral fins devoid of chromatophores. Most parts of anal fin devoid of chromophores, gradually becoming black on posterior fifth of fin, continuing to lower third of caudal fin. Anterior two-thirds of lower half to third of body devoid of chromatophores, except for small cluster of chromatophores on abdomen region; posterior third of lower third of body gradually covered by dense chromatophores, continuing to the solid black anal fin.

**Distribution.** Known from the type series collected from off Dong-gang, southwestern Taiwan.

**Etymology.** The species is named after C.H. Robins and C.R. Robins, in recognizing their enormous contribution to eel systematics.

**Remarks.** This species has multiple rows of teeth on lower jaw and lacks intermaxillary teeth. Ho *et al.* (2015) suggested that *Dysomma goslinei*, *D. melanurum* and *D. longirostrum* share with *Dysommima* these characters and might belong to this genus as would *Dysomma robinsorum*. However, without detailed study on the phylogeny of *Dysomma* and *Dysommima*, we will leave the generic level of these four species for further investigation.

*Dysomma robinsorum* can be separated from *D. melanurum* by having a normal lower jaw (vs. lower jaw curved and projecting beyond upper jaw) and from *D. longirostrum* in having a short snout (20–25% vs. 26–32% HL) and fewer head pores (SO 3, IO 4 vs. SO 5, IO 8).

Chen & Mok (2001) provided data on *D. goslinei* from a 197 mm specimen (NSYU 2607, now lost) collected from Taiwan. However, their specimen had only 123 total vertebrae whereas three type specimens of *D. goslinei* all have 131. Although the proportions of our specimens almost entirely overlap those of the type series of *D. goslinei* (Table 3), *Dysomma robinsorum* has fewer predorsal vertebrae (13–14) and total vertebrae (122–124) compared to *D. goslinei* (15–18 and 130–131, respectively).

### ***Dysomma taiwanense* Ho, Smith & Tighe, 2015**

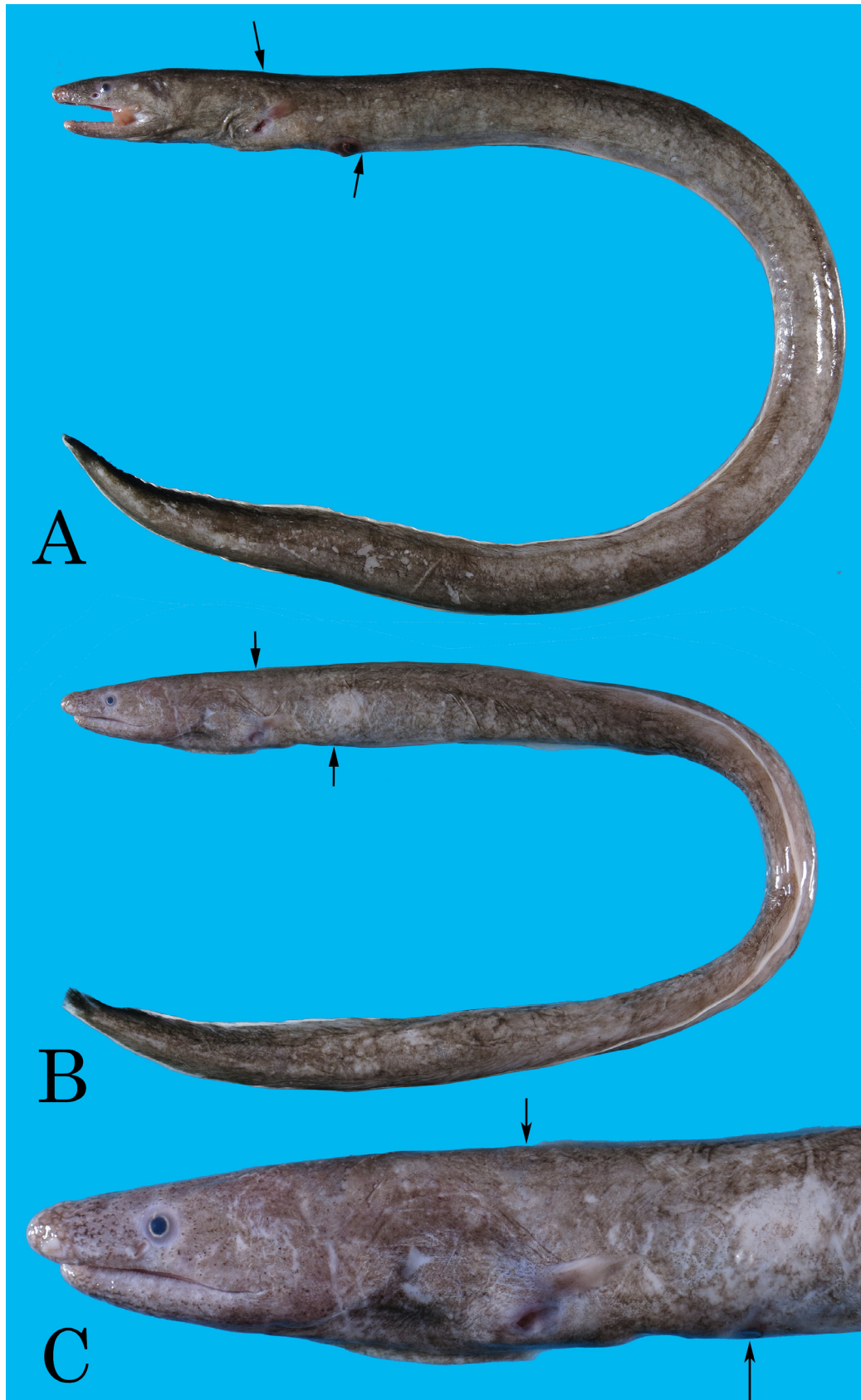
Fig. 8; Tables 1–2

*Dysomma taiwanensis* Ho, Smith & Tighe, 2015:87, figs. 1–2 (type locality: Daxi, Yilan, northeast Taiwan, depth ca. 200–400 meters).

**Specimen examined.** Type series. Listed in Ho *et al.* (2015).

**Additional specimens.** 52 specimens, 136–474 mm TL. **Dong-gang, Pingtung, SW Taiwan.** NMMB-P3845 (2, 203–279), 21 Mar. 1979. NMMB-P16453 (1, 136), 2 Feb. 2012. NMMB-P21720 (1, 194), 25 Oct. 2011. NMMB-P23482 (1, 210), 11 Jun. 2013. NMMB-P24383 (12, 149–354), 22 Jul. 2016. NMMB-P24392 (2, 315–322), 24 Aug. 2014. NMMB-P24733 (1, 209), 11 Oct. 2016. NMMB-P25965 (1, 419), 29 Mar. 2017. NMMB-P26037 (3, 288–324), 15 Apr. 2017. NMMB-P26160 (1, 280), 30 Mar. 2017. NMMB-P26161 (1, 362), 30 Mar. 2017. NMMB-P26220 (1, 385), 23 Jun. 2017. NMMB-P26399 (1, 304), 12 Jul. 2017. NMMB-P26448 (2, 333–358), 23 Jun. 2017. NMMB-P26472 (1, 378), 19 Jul. 2017. NMMB-P26475 (1, 320), 19 Jul. 2017. NMMB-P26689 (8, 244–355), 10 Jul. 2017. NMMB-P26693 (2, 228–335), 29 Mar. 2017. NMMB-P26696 (1, 395), 16 Jun. 2017. NMMB-P26697 (1, 256), 16 Jun. 2017. NMMB-P26699 (3, 215–262), 9 Aug. 2017. NMMB-P26701 (1, 334), 10 Jun. 2017. **Daxi, Yilan, NE Taiwan.** NMMB-P1754 (1, 474), 9 Sep. 2003. NMMB-P26400 (1, 361), 1 Jul. 2017. **Nan-fang-ao, Yilan, NE Taiwan.** NMMB-P16288 (1, 205), 16 Mar. 2012. NMMB-P16383 (1, 158), 14 Mar. 2012.

**Diagnosis.** Pectoral fin present. Dorsal-fin origin slightly in front of level of pectoral-fin base; anus well behind tip of pectoral fin; trunk very short; two intermaxillary teeth; 4 compound teeth on vomer; single row of 5–11 small compound teeth followed by 0–8 small teeth on lower jaw; head pores: IO 4, SO 3, M 6, POP 0, AD 1, F 0, ST 0; lateral-line pores: predorsal 3–5, prepectoral 3–7, preanal 7–12, total 29–49, the last at about half of total length. Vertebrae: predorsal 7–10, preanal 12–17, total 134–140; MVF 9-14-137. Body uniformly brownish, lower part of posterior one-eighth of body darker, with black base and margin on rear part of anal fin and lower part of caudal fin.



**FIGURE 8.** *Dysomma taiwanense* Ho, Tighe & Smith, 2015. A. NMMB-P25965, 419 mm TL. B. NMMB-P26161, 362 mm TL. C. Same as B, lateral view of head. Arrows indicate origin of dorsal fin (above) and anus (below).

**TABLE 3.** Morphometric and meristic data of *Dysomma robsorum* sp. nov., comparing with the original data of *Dysomma goslinei*. Meristics of the latter are counted by us.

	<i>D. robsorum</i> sp. nov.		<i>D. goslinei</i>
	Holotype	All types	Types
TL (mm)	190.5	119.0–190.5	n=3
		Mean (Range)	SD
Head	11.3	12.7 (11.3–13.6)	1.0
Predorsal	11.3	12.6 (11.3–13.8)	1.1
Preanal	15.5	16.0 (15.5–16.9)	0.7
Trunk	4.2	3.4 (2.7–4.2)	0.6
Tail	84.5	84.0 (83.1–84.5)	0.7
Depth at gill opening	4.2	4.4 (3.9–5.3)	0.6
Depth at anus	4.4	4.4 (4.1–4.9)	0.4
Width at anus	1.4	2.2 (1.4–3.2)	0.7
% HL			
Snout	19.9	22.4 (19.9–25.3)	2.4
Eye diameter	6.9	6.5 (6.2–6.9)	0.3
Interorbital width	13.9	13.6 (12.3–15.1)	1.2
Upper jaw	42.6	43.9 (42.6–44.8)	0.9
Pectoral fin	25.0	25.7 (24.1–28.6)	2
Gill opening	9.3	7.2 (5.3–9.3)	1.6
Interbranchial	9.3	8.2 (6.5–9.7)	1.6
Head pores			
Supraorbital	3	3	–
Infraorbital	4	4	–
Adnasal	0	0	–
Mandibular	6;6	6	–
Lateral-line pores			
Predorsal	6	5–7	–
Prepectoral	6	6–8	–
Preanal	10	10–12	–
Total	33	28–33	ca.27
Vertebrae			
Predorsal	10	10	9–10
Preanal	14	13–14	15–18
Total	124	122–124	130–131
MVF		10-14-123	10-16-131

**Remarks.** Ho *et al.* (2015) described *D. taiwanense* (as *Dysomma taiwanensis*) based on four specimens, two collected from northwestern Taiwan and two collected from southwestern Taiwan. They stated that two smaller specimens (e.g. two paratypes from southwestern Taiwan) have 1–3 smaller embedded teeth on the lower jaw whereas the two larger specimens (holotype and one paratype collected from northeastern Taiwan) have only 7 large compound teeth.

The specimens examined in the present study show that all specimens have 5–10 large widely spaced compound teeth followed by 0–8 small teeth which are dense in arrangement. The total lower-jaw teeth are 6–15.

After examining many specimens, the range of meristics is expanded slightly, thus the above diagnosis is modified accordingly.

*Dysomma taiwanense* is most similar to *D. formosa* described above in having the tip of the pectoral fin usually in front of the anus and a single row of compound and small teeth on the lower jaw, although the latter character is variable in these two species. The number of compound teeth and total teeth are clearly fewer in *D. taiwanense* than in *D. formosa*, and the total vertebrae are clearly more in *D. taiwanense* than in *D. formosa* without overlap (Table 2).

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<http://dx.doi.org/10.11646/zootaxa.4454.1.6>