



Review of the arrowtooth eel genera *Dysomma* and *Dysommima* in Taiwan, with the description of a new species (Anguilliformes: Synphobranchidae: Ilyophinae)

HSUAN-CHING HO^{1,2,*}, DAVID G. SMITH³ & KENNETH A. TIGHE⁴

¹National Museum of Marine Biology & Aquarium, Pingtung, Taiwan

²Institute of Marine Biology, National Dong Hwa University, Pingtung, Taiwan

³Smithsonian Institution, Museum Support Center, Suitland, MD, U.S.A

⁴Department of Vertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A.

*Corresponding author. E-mail: ogcoho@gmail.com

Abstract

Species of the synphobranchid eel genera *Dysomma* and *Dysommima* from Taiwan are reviewed. A total of eight species in *Dysomma* and one species in *Dysommima* are recognized. A new *Dysomma* species is described based on four specimens collected from off Taiwan. It differs from its Taiwanese congeners in having 137–139 total vertebrae, pectoral fin well-developed, 2 intermaxillary teeth, 4 compound teeth on vomer, 40–48 total lateral-line pores, the last at about middle of body, and a uniform brownish color. A key to all species in these two genera in Taiwan is provided.

Key words: Pisces, Teleostei, taxonomy, *Dysomma taiwanensis* sp. nov., Taiwan

Introduction

The eel genera *Dysomma* and *Dysommima* belong to the subfamily Ilyophinae, a small group of benthic eels that live mainly in the continental shelf and slope. Several species are widespread in tropical latitudes, whereas others are more or less restricted in distribution. There are currently 12 known species in *Dysomma* and one species in *Dysommima*.

In Taiwan, Chen & Weng (1967) first recorded *Dysomma anguillare* Barnard, 1923 and described a new species *Dysomma melanurum*. Mok in Shen *et al.* (1993) added two species, *Dysomma dolichosomatum* Karrer, 1983 and *Dysomma goslinei* Robins & Robins, 1976 to the Taiwanese fauna. Chen & Mok (1995) described a new species *Dysomma opisthoproctus*, and Chen & Mok (2001) described a new species *Dysomma longirostrum* and mentioned specimens of *Dysomma polycatodon* Karrer, 1983 and *Dysommima rugosa* Ginsburg, 1951 collected from Taiwan.

In a project to review the eel fauna of Taiwan, the first author collected large numbers of specimens from around Taiwan. Among these specimens, *D. anguillare* is the most common and abundant species, and *D. polycatodon* and *D. dolichosomatum* are also commonly seen. Four specimens similar in appearance to *D. anguillare* were found in the NMMB and USNM collections and are recognized as a new species.

This work gathers all information provided in previous publications and new data taken from the recently collected specimens. A total of eight species of *Dysomma* and one species of *Dysommima* are recognized from Taiwan, including one new species. A key to the Taiwanese species in these two genera is provided.

Methods and materials

Total length (TL) and head length (HL) are used throughout. Methods for making measurements and counts, and terminology follow Böhlke (1989). Institutional codes follow Fricke & Eschmeyer (2015). Lateral-line pores are

counted in four numbers: predorsal, from the first pore to a level before dorsal-fin origin; prepectoral, from the first pore to a level before pectoral fin base; preanal, from the first pore to a level before posterior margin of anus; and total, from the first pore to the very end.

Cephalic lateral line is pores counted include the following series: adnasal (AD), frontal (F), infraorbital (IO), supraorbital (SO) (including ethmoidal), mandibular (M) and preopercular (POP). frontal, infraorbital, supraorbital (including ethmoidal), mandibular and preopercular.

Results

Dysomma Alcock, 1889

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

Sinomyrus Lin, 1933:93, fig. 1 (type species, *S. angustus* Lin, by monotypy; *S. angustus* is a synonym of *Dysomma anguillare* Barnard, fide Böhlke, 1949:34–35).

Definition. A genus of Synaphobranchidae with a row of large compound teeth on the vomer and the following combination of characters: body stout to moderately elongate, slightly compressed in head and trunk; scales absent; pectoral fin present or not; dorsal-fin origin in front of anus; intermaxillary teeth present or not; snout projects slightly beyond lower jaw (except for *D. melanurum*); anus below pectoral fin to more than one head length behind pectoral-fin tip; and gill openings well-separated.

Dysomma taiwanensis sp. nov.

New English name: Taiwanese arrowtooth eel

Figs. 1A–B, 2A–B; Table 1

Holotype. NMMB-P11115 (496 mm TL), Daxi, Yilan, NE Taiwan, northwestern Pacific, bottom trawl, ca. 200–400 m, 12 May 2006.

Paratypes. NMMB-P 22194 (443), collected with the holotype. USNM 427172 (2, 192–248), Dong-gang, southwestern Taiwan, market, 16 Nov. 2007.

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 7–10 large compound teeth on lower jaw; head pores: IO 4, SO 3, M 6, POP 0, AD 1, F 0, ST 0; lateral-line pores: predorsal 4–5, prepectoral 5–7, preanal 9–12, total 40–48, the last to about half of total length. Vertebrae: predorsal 9–10, preanal 13–17, total 137–139; MVF 9-15-138. 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.

Description. Morphometric data of the holotype (in mm): total length 496; head length 63.5; predorsal length 60.1; preanal length 83; trunk length 16.5; tail length 413; depth at gill opening 23.5; width at gill opening 16.7; depth at anus 26.5; width at anus 17.4; eye diameter 3.9; interorbital width 9.4; snout length 14.1; rictus 27.4; postorbital length 47.2; gill opening 6.6; interbranchial width 9.7.

The following values are given for the holotype, followed by that of paratypes in parentheses. Head relatively short, 12.8 (10.5–12.7)% TL; origin of dorsal fin slightly in front of a vertical through gill opening, predorsal length 12.1 (11.3–11.9)% TL; trunk very short, 3.3 (2.8–3.8)% TL, 26.0 (26.2–34.5)% HL; anus at one pectoral-fin length behind tip of fin; origin of anal fin immediately behind anus, preanal length 16.7 (13.3–16.5)% TL; tail long, tail length 83.3 (83.5–85.4)% TL.

Body moderately slender, head and trunk somewhat cylindrical, becoming gradually compressed to rear end; body width at anus 3.5 (2.2–2.8)% TL; body depth relatively uniform, depth at anus 5.3 (2.5–4.2)% TL, narrowing gradually to caudal fin; depth of gill opening 4.7 (3.4–3.7)% TL. Dorsal and anal fins low and fleshy, continuous with a small caudal fin. Pectoral fin well-developed, at upper corner of gill opening.

Head slender in profile; snout blunt anteriorly and broad dorsally, covered by many short papillae, snout length 22.2 (24.4–26.7)% HL; tip of snout projecting slightly beyond lower jaw; eye small, covered by a thick and semitransparent membrane; eye diameter 6.1 (4.7–7.5)% HL; interorbital space broad, slightly elevated, its width

14.8 (13.9–15.1)% HL; postorbital space very wide. 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. Mouth gape far behind eye, upper jaw length 43.1 (41.1–42.2)% HL. Tongue well-attached to mouth floor. Gill opening a narrow slit.



FIGURE 1. *Dysomma taiwanensis* sp. nov. A. Holotype, NMMB-P 11115, 496 mm TL, the black line denotes the joining of the anterior and posterior halves, which were imaged separately and merged for this figure. B. Paratype, NMMB-P 22194, 443 mm TL.

Head and lateral-line pores large (Fig. 2A). Supraorbital pores 3, all restricted to anterior portion of snout; infraorbital pores 4, 2 pores between nostrils and 2 below eye; mandibular pores 6, all under mouth gape; preopercular pores 0; adnasal 1; supratemporal commissure 0; frontal 0. Lateral line incomplete, extending to midbody, predorsal 5 (4 or 5), prepectoral 7 (4 or 5), preanal 12 (9–12) and total 45 (right)/48 (left) (40–45).

Teeth (Fig. 2B) small and pointed. Intermaxillary teeth 2, side-by-side, followed by 4 large compound vomerine teeth, uniserial, the third one largest. 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 7 (7–10) large compound teeth; two smaller paratypes with 1–3 much smaller embedded compound teeth behind these exposed teeth, which can only be seen on the x-ray.

TABLE 1. Morphometric and meristic data of *Dysomma taiwanensis* sp. nov., *Dysomma anguillare* and *Dysomma dolichosomatum*.

	<i>D. taiwanensis</i> sp. nov.		<i>D. anguillare</i>	<i>D. dolichosomatum</i>
	Holotype	Paratypes		
Total length (mm)	496	192–248 (n=3)	334–477 (n=25)	166–357 (n=25)
% TL		Mean (range)	Mean (range)	Mean (range)
Head length	12.8	11.4 (10.5–12.7)	13.3 (11.0–15.1)	9.9 (8.3–10.9)
Predorsal length*	12.1	11.6 (11.3–11.9)	11.8 (10.7–13.1)	17.8 (16.5–19.1) [23.4]
Preanal length	16.7	14.9 (13.3–16.5)	17.0 (15.2–18.9)	25.8 (23.3–28.6)
Trunk length	3.3	3.5 (2.8–3.8)	3.7 (2.8–5.5)	16.0 (14.3–17.7)
Tail length	83.3	84.1 (83.5–85.4)	82.8 (81.1–84.1)	74.2 (71.4–76.7)
Depth at gill opening	4.7	3.6 (3.4–3.7)	4.5 (3.1–5.8)	4.2 (2.9–6.5)
Depth at anus	5.3	3.4(2.5–4.2)	4.5 (2.4–6.0)	3.8 (1.1–6.1)
Width at anus	3.5	2.5 (2.2–2.8)	3.1 (1.7–4.6)	2.8 (2.0–5.8)
% HL				
Snout length	22.2	25.3 (24.4–26.7)	20.2 (17.8–23.5)	20.1 (17.1–23.9)
Eye diameter	6.1	6.5 (4.7–7.5)	6.5 (5.3–9.4)	8.6 (5.9–14.3)
Interorbital width	14.8	14.5 (13.9–15.1)	15.6 (11.5–20.4)	14.8 (11.0–22.2)
Upper jaw length	43.1	41.7 (41.1–42.2)	35.8 (31.9–39.5)	37.8 (31.0–43.9)
Interbranchial width	15.3	9.0 (7.1–10.9)	8.3 (4.4–12.1)	13.2 (8.8–19.4)
Vertebrae		n=3	n=20	n=23
Predorsal*	9	9–10	7–9	15–20 [25]
Preanal	14	13–17	12–16	23–31
Total	137	137–139	119–128	146–156
Lateral-line pores		n=3	n=16	n=26
Preanal	12	9–12	8–12	Not reaching anus
Total	45;48	40–45	57–75	9–11
Head pores		n=3	n=16	n=26
Supraorbital	3	3	3	3
Infraorbital	4	4	4 or 5	4
Adnasal	1	1	1	1
Mandibular	6	6	6	6 (1 with 7)
Preopercular	0	0	0	1
Supratemporal	0	0	0	0
Frontal	0	0	0	0
Vomerine teeth	4	4	4	3
Intermaxillary teeth	2	2	2	2

* Values in brackets from a single 312 mm specimen (part of NMMB-P 11121).

Mean vertebral formula 9-13-139; predorsal vertebrae 9–10, preanal vertebrae 13–17 and total vertebrae 137–139.

Coloration. Fresh color unknown. When preserved (Figs. 1A–B), uniformly brownish including all fins; 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. Peritoneum dark grayish. Mouth cavity light brownish.

Distribution. Known from the type specimens collected from off Taiwan at depths around 200–400 meters.

Etymology. The specific name is derived from its type locality, Taiwan.

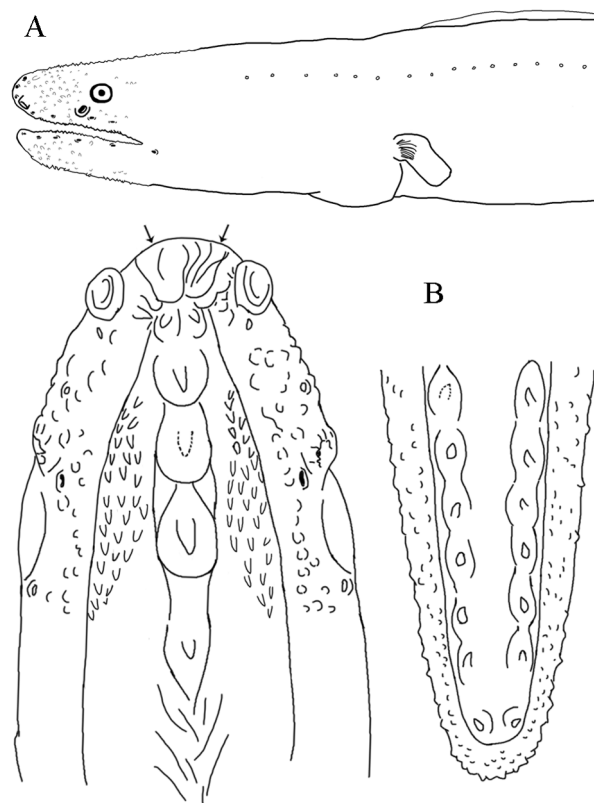


FIGURE 2. *Dysomma taiwanensis* sp. nov., from the holotype. A. Semi-diagrammatic illustration of lateral view of head. B. Semi-diagrammatic illustration of dentition of upper jaw (left) and lower jaw (right). Arrows indicate anteriormost pores of supraorbital series.

Comparison. *Dysomma taiwanensis* sp. nov. is closely similar to *D. anguillare* in its body proportions and dentition. It differs from *D. anguillare* in having more total vertebrae (137–139 vs. 119–128, 119–130 in Robins & Robins, 1989) and fewer total lateral-line pores (40–48 vs. 57–75).

The coloration of *D. taiwanensis* is somewhat different from *D. anguillare*; the type specimens of *D. taiwanensis* have uniformly brown coloration whereas *D. anguillare* usually has a darker dorsal surface and a paler ventral surface to uniformly black. However, many specimens of *D. anguillare* collected by midwater trawl (e.g. epipelagic zone less than 100 meters) may have paler body coloration.

Although *D. taiwanensis* co-occurs with *D. anguillare* in Taiwan, only four specimens were found among hundreds specimens in the collection, which may suggest either that *D. taiwanensis* is a rare species and its population is far smaller than that of *D. anguillare*, or that *D. taiwanensis* is more abundant at other depths and localities.

It is also similar to *D. polycatodon* but can be distinguished by the dentition on the lower jaw (single row of large compound teeth in *D. taiwanensis* vs. single row of two large anterior teeth followed by 22–31 small teeth) and by the total lateral-line pores (40–48 vs. 65–78). Moreover, *D. taiwanensis* has a uniformly brown body, whereas that of *D. polycatodon* is pale to light brown, and the posterior margin of the anal fin and lower half of the caudal fin are black in *D. taiwanensis*, whereas they are white in *D. polycatodon*.

Dysomma taiwanensis can also be distinguished from *D. bucephalus* Alcock, 1889 by having single row of 7–10 large compound teeth on the lower jaw (vs. single row of many small teeth) and 137–139 total vertebrae (vs. 107), and from *Dysomma fuscoventralis* Karrer & Klausewitz, 1982 by having 137–139 total vertebrae (vs. 119–124), 40–48 total lateral-line pores (vs. 57–63), and 7–13 teeth on the lower jaw (vs. 16–21).

The new species differs from *D. brevirostre* (Facciola, 1887), *D. muciparus* (Alcock, 1891), *D. dolichosomatum* and *D. tridens* Robins, Böhlke & Robins, 1989 by the presence of well-developed pectoral fins

(vs. without pectoral fin) and total vertebrae 137–139 (vs. 146–204); from *D. longirostrum*, *D. goslinei*, and *D. melanurum* by the presence of two intermaxillary teeth (vs. without intermaxillary teeth) and a single row of large compound teeth on the lower jaw (vs. multiple series of small teeth); and from *D. opisthoproctus* by having the anus below the pectoral fin (vs. far behind the tip of pectoral fin) and 137–139 total vertebrae (vs. 120).

Remarks. It is notable that two large specimens (443–496 mm TL) have only 7 compound mandibular teeth, whereas two small paratypes (192–248 mm TL) have 8–10 larger teeth anteriorly and 1–3 much smaller posterior teeth which can only be seen on the x-ray, not with direct observation of the specimens, at least without damaging the rear of the jaws. This variation may be attributed to change with growth.

Dysomma anguillare Barnard, 1923

Figure 3; Table 1

Dysomma anguillaris Barnard, 1923:443 (type locality: off Tugela River mouth, KwaZulu-Natal, South Africa, southwestern Indian Ocean, depth 63 fathoms [115 meters]).

Dysomma anguillare: Böhlke, 1949:36. Nelson, 1966:392. Robins & Robins, 1976:263. Robins & Robins, 1989:245. Chen & Mok, 1995:930. Chen & Mok, 2001:79.

Sinomyrus angustus Lin, 1933:93 (type locality: Hoitow, Hainan). Böhlke, 1949:34–36.

Dysomma japonicus Matsubara, 1936:900, fig. (description, relationships; type locality: Japan, southeast of Kii Peninsula). Böhlke, 1949:34, 36.

Dysomma zanzibarensis Norman, 1939:44, fig. 17 (description; type locality: 5°38'54"S, 39°15'42"–39°17'36"E). Böhlke, 1949:34.

Dysomma anguillaris: Smith, 1949:394. Smith, 1961:394.

Dysomma aphododera Ginsburg, 1951:452, fig. 7 (type locality: off Padre Island, Texas, in 50 fms., 26° 30'N, 96° 26' W).

Dysomma angustum: Kamohara, 1950:49. Kamohara, 1952:20. Kamohara, 1958:15. Kamohara, 1964:18.

Specimens examined. Collected from Tainan, southwestern Taiwan: NMMB-P5709 (1 spec., 392 mm TL), 20 Feb. 1966. Collected from Kaohsiung, southwestern Taiwan: NMMB-P5716 (2, 260–286), 23 Jan. 1960. Collected from Fong-gang, southwestern Taiwan: NMMB-P14566 (1, 239), 200 m, 28 Feb. 2001. Collected from Dong-gang fishing port, southwestern Taiwan: NMMB-P7144 (1, 332), 26 Dec. 2003. NMMB-P7994 (1, 279), 17 Jun. 2004. NMMB-P11124 (6, 305–360), 13 Sep. 2010. NMMB-P11125 (9, 334–455), 13 Sep. 2010. NMMB-P12065 (1, 235), 18 Feb. 2011. NMMB-P13799 (1, 450), 2 Jul. 2011. NMMB-P13840 (2, 185–265), 5 Oct. 2010. NMMB-P13842 (1, 260), 5 Oct. 2010. NMMB-P13844 (2, 330–420), 5 Oct. 2010. NMMB-P15568 (2 of 4, 153–191), 25 Oct. 2011. NMMB-P16176 (1, 262), 10 Nov. 2009. NMMB-P16453 (1, 135), 2 Feb. 2012. NMMB-P16536 (1, 385), 23 Feb. 2012. NMMB-P18108 (3, 386–466), 8 Aug. 2012. USNM 395054 (1, 363), 16 Nov 2007. USNM 398733 (1, 300), 14 Nov. 2009. USNM 398734 (1, 282), 14 Nov. 2009. USNM 398735 (1, 315), 14 Nov. 2009. Collected from Daxi fishing port, NE Taiwan, bottom trawl: NMMB-P4517 (1, 385), 23 Jan. 1994. NMMB-P16175 (1, 310), 20 May 2010. NMMB-P11113 (1, 515), no date. NMMB-P11114 (4, 345–434), no date. NMMB-P11118 (3, 308–370), 5 Jan. 2010. NMMB-P11119 (1, 460), 8 Dec. 2010. NMMB-P12067 (4, 345–434), 2 Oct. 2011. NMMB-P12068 (2, 401–413), 20 Jan. 2011. NMMB-P12069 (3, 401–477), 21 Jan. 2011. NMMB-P22059 (9, 300–417), 1 Dec. 2014. USNM 371927 (1, 521), 4 Mar 1999. USNM 398516 (1, 378), 6 Nov. 2009. USNM 398517 (1, 333), USNM 401058 (1, 370), 6 Nov. 2009. Collected from Nan-fang-ao fishing port, NE Taiwan, bottom trawl: NMMB-P16288 (1, 202), 16 Mar. 2012. Collected from Tong-shih, Chia-yi, Taiwan: USNM 396128 (3, 362–421), 14 Nov 2008). Collected from Taiwan, no precise locality: USNM 396129 (1, 388), 2009. Plus many others in NMMB-P collection.

Other localities. Da Nang, Vietnam: NMMB-P12592 (1, 148), 13 Apr. 2011. Nha Trang, Vietnam: USNM 396163 (6, 332–450), 16 Apr 2009. China: CAS-SU 32403 (20, 280–426). MNHN 1978-0078 (formerly CAS-SU 32403, 2, 273–365), Oct. 1936. Luzon, Philippines: MNHN 1998-0655 (1, 210), 13°23'N, 122°21'E, 760–820 m, 26 Nov. 1980. Madagascar: MNHN 1987-1226 (3, 337–458), 23°36'3.6"S, 43°32'2.4"E, 250 m, 28 Feb. 1973. MNHN 1987-1227 (2, partly dry), 25°2'6"S, 47°5'6"E, 65–60 m, 4 Mar. 1973. Solomon Islands: MNHN 2002-3921 (1, 364), 9°31'58.8"S, 160°37'1.2"E, 2 Oct. 2001.

Diagnosis. Pectoral fin present; dorsal-fin origin slightly anterior to pectoral-fin base, predorsal length 10.7–13.1% TL; anus anterior, below tip of pectoral fin, preanal length 15.9–18.9% TL; trunk very short, 2.8–5.5% TL; two intermaxillary teeth; 4 compound teeth on vomer; single row of 9–11 large compound teeth on lower jaw; head pores: IO 4, SO 3; M 6; POP 0; AD 1, F 0, ST 0; lateral-line pores: predorsal 3–6, prepectoral 6–9, preanal 8–12,

total 57–75, the last at posterior two-thirds of total length; MVF 8-14-124, total vertebrae 119–128 (119–130 in Robins & Robins, 1989).



FIGURE 3. *Dysomma anguillare* Barnard, 1923. A. NMMB-P 11125, 1 of 9, 372 mm TL. B. Unregistered specimen, ca. 300 mm TL. Both collected from Dong-gang fishing port.

Body light brown to blackish dorsally, paler ventrally. Dorsal fin and most part of anal fin white; posterior margin of anal fin with black and white color. Caudal fin black with upper margin white.

Distribution. Widespread in the Indo-west Pacific and Atlantic oceans, although the taxonomic status of the various geographic populations is still to be determined. In Taiwan, it is the most abundant species of *Dysomma* and can be collected by bottom and midwater trawls from near the surface (<50 m) to as deep as 600 m.

Dysomma dolichosomatum Karrer, 1983

Figs. 4A–B; Table 1

Dysomma dolichosomatum Karrer, 1983:93 (type locality: Madagascar, 22°25'S, 43°04.5'E, 550–555 m). Robins & Robins, 1989:249. Chen & Mok, 2001:79.

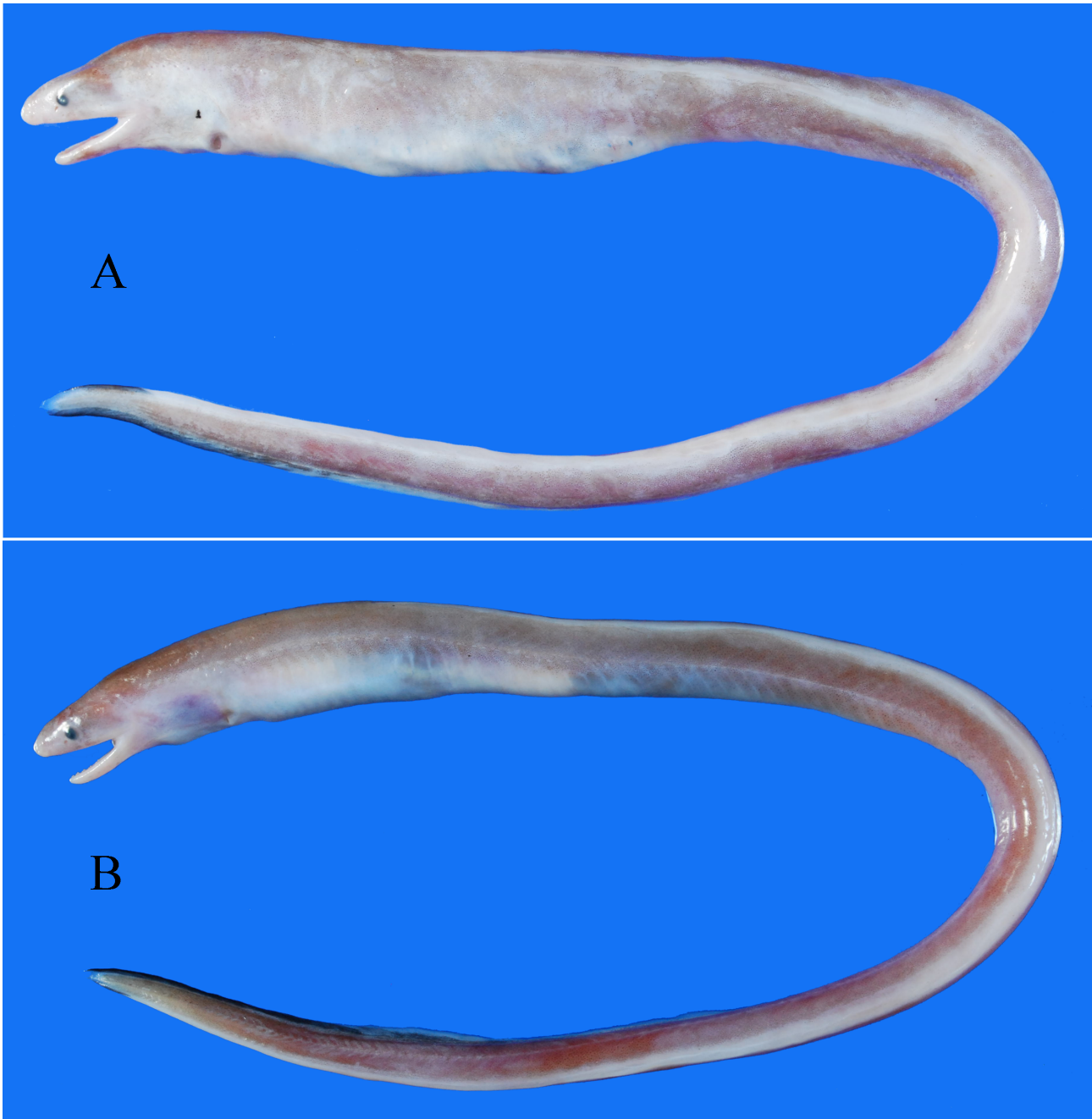


FIGURE 4. *Dysomma dolichosomatum* Karrer, 1983. NMMB-P11130. A. 269 mm TL. B. 231 mm TL. Collected from Dong-gang fishing port.

Specimens examined. Collected from Fong-gang, SW Taiwan: NMMB-P2861 (1 spec., 242 mm TL), 8 Nov. 2001. Collected from Dong-gang fishing port, SW Taiwan: NMMB-P9098 (1, dry), 13 Jun. 2008. NMMB-P9241 (1, 349), 18 Sep. 2008. NMMB-P11121 (6, 209–312), 16 Jul. 2009. NMMB-P11130 (2, 231–269), 13 Sep. 2010. NMMB-P12066 (1, 336), 28, Jan. 2011. NMMB-P13794 (1, 197), 21 Jul. 2011. NMMB-P14189 (4, 166–301), 20 Oct. 2011. NMMB-P15568 (2 of 4, 218–294), 25 Oct. 2011. NMMB-P16134 (1, 189), 9 Feb. 2012. NMMB-

P16404 (4, 264–320), 28 Jan. 2012. NMMB-P16422 (1, 357), 21 Feb. 2012. NMMB-P17820 (1, 357), 2 Nov. 2012. NMMB-P17881 (1, 263), 25 Jan. 2012. NMMB-P18083 (1, 336), 7 Sep. 2012. NMMB-P21733 (2, 215–221), 18 Feb. 2011. NMMB-P21799 (1, 227), 7 Nov. 2013. NMMB-P21928 (1, 343), 1 Nov. 2014. NMMB-P22126 (1, 242), 12 Dec. 2013. USNM 270682 (2, 172–187), 23 Nov. 1969. USNM 398567 (1, 317), 10 Nov. 2009. USNM 401019 (1, 197), 26 Feb. 2011. USNM 401036 (1, 345), 8 Nov. 2009.

Other localities. Madagascar: MNHN 1979-0004, holotype, 22°25'1.2"S, 43°4'4.8"E, 550–555 m, 27 Nov. 1973. Philippines: MNHN 1978-0717, paratype, 14°1'1.2"N, 120°22'1.2"E, 223 m, 21 Mar. 1976. Solomon Islands: MNHN 2006-0734 (1, 203), 8°24'28.8"S, 159°28'22.8"E, 105–897 m, 24 Oct. 2004.

Diagnosis. No pectoral fin; dorsal-fin origin about 0.8–1 HL behind gill opening, predorsal length 16.5–19.1% TL; anus posterior, about 1.5 time of HL behind gill opening, preanal length 23.3–28.6% TL; trunk long, trunk length 14.3–17.7% TL; two intermaxillary teeth; 2 irregular rows of small blunt teeth on upper jaw; 2 or 3 (mainly 3) compound teeth on vomer; single row of 4 or 5 small compound teeth followed by 1 or 2 irregular rows of small blunt teeth on lower jaw; short cirri on surfaces of chin and jaws; head pores: IO 4, SO 3, M 6 (1 with 7), POP 1, AD1, F 0, ST 0; lateral-line pores large, prepectoral 5 or 6, total 9–11, the last at slightly beyond the gill opening posteriorly; MVF 18-27-153, total vertebrae 146–156.

Body light pinkish to light grayish dorsally when fresh with a black margin at posterior portion of anal fin; light brownish to grayish when preserved.

Distribution. Indo-west Pacific off Madagascar, Taiwan, Philippines, and Solomon Islands at depth 105–897 m.

Remarks. This species is common in the by-catch in Taiwan. It is usually collected by midwater trawlers together with many mesopelagic fishes, which would indicate pelagic living. However, many specimens are also found to feed on polychelids, a demersal shrimp family. *Dysomma dolichosomatum* is the only species found to possess one preopercular pore and a very short lateral line, with only 9–11 pores, among all Taiwanese species. It is similar to *D. brevirostre*, *D. muciparus* and *D. tridens* in lacking a pectoral fin. It differs from *D. brevirostre* by having tiny papillae on the head and snout (vs. large papillae and ridges) and total vertebrae 146–156 (vs. 195–205 in Robins & Robins, 1989); from *D. muciparus* by having trunk 1.4–1.9 times in head length (vs. less than 1 time in head length) and 146–156 total vertebrae (vs. 153–157); and from *D. tridens* by having 2 intermaxillary teeth (vs. three large compressed teeth) and by having 146–156 total vertebrae (vs. 175).

Our specimens have a broader range of total vertebrae (146–156) compared to 151–152 reported for the types by Karrer (1983). One 312 mm specimen out of NMMB-P 11121 had a relatively long predorsal measurement (23.4 % of TL) and high predorsal vertebral count (25 vertebrae). While it is possible that this specimen may represent a different species, the close correspondence of all other counts and measurements with the other specimens of *D. dolichosomatum* from Taiwan indicates that it is probably a specimen with an aberrant dorsal origin.

***Dysomma goslinei* Robins & Robins, 1976**

Table 2

Dysomma goslinei Robins & Robins, 1976:261 (type locality: Indian Ocean, 14°52'N, 96°39'W). Robins & Robins, 1989:249. Smith, 1999:1661. Chen & Mok, 2001:79.

Diagnosis. Pectoral fin present; dorsal-fin origin before pectoral-fin base, predorsal length 10.7% TL; anus anterior, just below pectoral fin, preanal length 16.2% TL; trunk very short, trunk length 4.0% TL; no intermaxillary teeth; multiple rows of teeth on upper jaw; 4 compound teeth on vomer; teeth on lower jaw multiseriate, those on inner row slightly enlarged; lateral line short; and MVF 10-15-123. [Data adapted from Chen & Mok, 2001].

Remarks. No specimen from Taiwan is available for this study. Mok in Shen *et al.* (1993) first recorded the present species from Taiwan, but no voucher was mentioned. One specimen (NSYSU 2607, 207 mm TL) examined by Chen & Mok (2001) has only 123 total vertebrae, less than 130–131 provided by Robins & Robins (1989). However, we could not locate this specimen. More investigations are needed of the population in Taiwan.

TABLE 2. Morphometric and meristic data of *Dysomma goslinei*, *Dysomma longirostrum* and *Dysomma melanorum*. Data of *D. goslinei* and morphometric data of *D. longirostrum* are adapted from Chen & Mok (2001).

	<i>D. goslinei</i>	<i>D. longirostrum</i>		<i>D. melanorum</i>
		Holotype	Non-type	
Total length (mm)	197	196	283	206–297 (n=13)
% TL				Mean (range)
Head length	12.2	14.3	14.1	12.2 (11.0–13.4)
Predorsal length	10.7	17.9	18.6	13.8 (11.5–15.0)
Preanal length	16.2	24.0	24.3	16.2 (15.4–17.3)
Trunk length	4	9.7	10.3	4.0 (3.0–5.3)
Tail length	83.8	76	75.7	83.8 (82.7–84.6)
Depth at gill opening	–	–	6	2.8 (2.2–3.2)
Depth at anus	4.6	5.1	6.5	3.0 (2.4–4.0)
Width at anus	–	–	3.5	1.8 (1.0–2.6)
%HL				
Snout length	20.8	32.1	25.7	16.6 (13.8–19.2)
Eye diameter	4.2	7.1	8.8	6.7 (5.4–9.1)
Interorbital width	–	–	15.8	5.9 (3.9–7.5)
Upper jaw length	41.7	57.7	42.0	41.1 (36.2–45.3)
Interbranchial width	–	–	16.6	4.6 (2.4–6.1)
Vertebrae				n=12
Predorsal	10	14	–	12–13
Preanal	15	24	–	13–15
Total	123	130	–	131–138
Lateral-line pores	–			n=13
Preanal	–	20	20	11–17
Total	–	ca.96	ca.77	107–117
Head pores	–			n=13
Supraorbital	3	5	5	3
Infraorbital	5	8	8	4
Adnasal	?	1	1	1
Mandibular	6	7	7	7 (1 with 8)
Preopercular	–	2	2	0
Supratemporal	–	0	0	0
Frontal	–	1	1	0
Vomerine teeth	4	5	5	5 or 6
Intermaxillary teeth	0	0	0	0

***Dysomma longirostrum* Chen & Mok, 2001**

Fig. 5; Table 2

Dysomma longirostrum Chen & Mok, 2001:79 (type locality: Nan-fang-ao, NE Taiwan). Ho & Shao, 2011:22.

Specimens examined. Holotype: NSYU 2732 (196), Nan-fang-ao fish market, NE Taiwan, bottom trawl, 100–150 m, 12 Sep. 1992, coll. Y.-Y. Chen.

Other locality. MNHN 2003-1515 (1, 285), R/V Alis, stn. CP8, 24°54'S, 168°21'E, Norfolk Ridge, New Caledonia, Coral Sea, 540 m, 11 Aug. 1999.



FIGURE 5. *Dysomma longirostrum* Chen & Mok, 2001. NSYU 2732, holotype, NSYU 2732, 196 mm TL.

Diagnosis. Pectoral fin present; origin of dorsal fin above tip of pectoral fin, predorsal length 17.9–18.6% TL; no intermaxillary teeth; snout very long, its length 25.7–32.1% HL; jaw long and slender, upper jaw length 42.0–52.1% HL; anus posterior, far behind pectoral fin, preanal length 24.0–24.3% TL; trunk moderately long, trunk length 9.7–10.3% TL; multiple rows of teeth on upper jaw; 5 compound teeth on vomer; multiple rows of small teeth on lower jaw, those on inner row larger than the rest; head pores: SO 5, IO 8 (2 between nostrils, 2 below eye, 4 behind eye), M 7, POP 2, AD 1, ST 0, F 1; lateral-line pores: predorsal 11, prepectoral 3–6, preanal 20, total ca. 77 or ca. 96, the last at 2/3 HL before caudal fin; MVF 14-24-130 (holotype only). Body uniformly brown when preserved. [Data adapted from Chen & Mok, 2001 and based on present study].

Remarks. One additional specimen was found in the MNHN collection that represents the second record of the species, in New Caledonia.

Dysomma longirostrum is the only member with four head pores behind the eye and two POP pores among all congeners. There is one frontal pore in the holotype whereas the MNHN specimen has none. The count of total lateral-line pores is not accurate because the posterior portion of the lateral line (behind anus) is broken into small canals, each canal connects two pores. These canals are not evenly spaced and sometimes have additional pores in the space between two canals. However, this may be used as a diagnostic character because the other congeners examined in the present work all have a continuous lateral line.

***Dysomma melanurum* Chen & Weng, 1967**

Figs. 6A–B; Table 2

Dysomma melanurum Chen & Weng, 1967:84, fig. 63 (Type locality: Tungkang [Dong-gang], Taiwan). Chen & Mok, 2001:79. Ho *et al.* 2010:26. Ho & Shao, 2011:22.

Specimens examined. Lectotype: NMMB-P5284 (formerly THUP 1687), Tungkang [Dong-gang], SW Taiwan.

Paralectypes: NMMB-P3885 and NMMB-P5470, same as lectotype. **Non-types:** collected from Dong-gang, SW Taiwan by midwater trawl: NSYU 2732 (1, 237 mm TL). NMMB-P3885 (1, 191, partly dry), 13 Feb. 1962. NMMB-P10949 (3, 271–285), 4 Sep. 2010. NMMB-P11122 (2, 258–261), 13 Sep. 2010. NMMB-P13741 (1, 265), 29 Jul. 2011. NMMB-P13841 (1, 260), 5 Oct. 2010. NMMB-P14044 (7, 206–285), 3 Nov. 2011. NMMB-P14213 (1, 255), 20 Oct. 2011. NMMB-P15471 (3, 281–297), 2 Jul. 2011. USNM 398473 (1, 165), 13 Nov. 2009. USNM 398474 (1, 178), 13 Nov. 2009.



FIGURE 6. *Dysomma melanurum* Chen & Weng, 1967. NMMB-P10949, 2 of 3. A. 285 mm TL. B. 271 mm TL.

Diagnosis. Pectoral fin present; dorsal-fin origin above middle of pectoral fin, predorsal length 11.5–15.0% TL; lower jaw longer than upper jaw, slightly curved and not appressed to upper jaw when mouth closed; anus anterior, below pectoral fin, preanal length 15.4–17.3% TL; trunk very short, trunk length 3.0–5.3% TL; no intermaxillary teeth; multiple rows of teeth on upper jaw, those on innermost row about twice the size of the rest; 5 or 6 (mainly 5) compound teeth on vomer; multiple rows of teeth on lower jaw, those on innermost row about twice the size of the rest; head pores: IO 4, SO 3, M 7 (1 with 8), POP 0, AD 1, F 0, ST 0. Lateral-line pores very large, predorsal 10–13, prepectoral 8–11, preanal 11–17, total pores 107–117, the last to 1/2 HL before the caudal-fin base. MVF 13–14–135, total vertebrae 131–138. Body uniformly light pinkish to grayish with numerous melanophores, posterior margin of anal fin and caudal fin black.

Remarks. This species has a very different morphology of its lower jaw, strongly curved and not appressed to the upper jaw when the mouth is closed. This may reflect its pelagic living. Many specimens are found to feed on pelagic shrimps. This is a small species; the largest specimen examined was only 297 mm TL.

Robins & Robins (1976:263) suggested that the projecting lower jaw of this species was an artifact, based on the damaged condition of the specimen they examined (THUP 1687, now the lectotype). We have examined 25 specimens, however, and they all have a clearly projecting lower jaw.

***Dysomma opisthoproctus* Chen & Mok, 1995**

Table 3

Dysomma opisthoproctus Chen & Mok, 1995:930 (type locality: Nan-fang-ao, NE Taiwan, 200 m). Chen & Mok, 2001:79.

TABLE 3. Morphometric and meristic data of *Dysomma opisthoproctus*, *Dysomma polycatodon* and *Dysommima rugosa*. Data of *D. opisthoproctus* are adapted from Chen & Mok (1995).

	<i>D. opisthoproctus</i> Holotype	<i>D. polycatodon</i>	<i>Dysommima rugosa</i>
Total length (mm)	421	344–600 (n=10)	238–413 (n=4)
% TL		Mean (range)	Mean (range)
Head length	12.5	13.6 (12.7–14.3)	12.8 (12.3–14.0)
Predorsal length	10.6	11.5 (10.0–12.9)	15.6 (14.0–17.1)
Preanal length	35.1	16.9 (15.5–18.2)	27.6 (26.8–28.8)
Trunk length	20.2	3.3 (2.4–3.9)	14.9 (12.8–16.4)
Tail length	64.9	83.1 (81.8–84.5)	72.4 (71.2–73.2)
Depth at gill opening	–	5.7 (4.6–6.6)	5.0 (4.7–5.5)
Depth at anus	5.9	5.6 (4.9–6.6)	5.0 (4.0–6.0)
Width at anus	–	3.4 (2.6–4.7)	3.4 (2.2–4.2)
%HL			
Snout length	22.0	21.4 (18.8–23.9)	27.5 (25.1–30.9)
Eye diameter	3.2	6.6 (6.1–7.8)	10.0 (8.0–12.9)
Interorbital width	–	15.3 (13.0–18.7)	16.2 (13.4–19.8)
Upper jaw length	36.9	41.3 (37.5–47.9)	46.5 (42.3–49.5)
Interbranchial width	–	9.5 (6.5–15.6)	13.4 (9.9–18.2)
Vertebrae		n=12	n=4
Predorsal		7–11	10–12
Preanal	35	12–15	26–32
Total	120	128–133 [1 with 120]	133–141
Lateral-line pores		n=12	n=4
Preanal	24	8–11	absent
Total	–	65–78	absent
Head pores		n=12	n=4
Supraorbital	3	3	3
Infraorbital	4	4	4
Adnasal	1	1 (1 with 0)	1
Mandibular	7	6	6
Preopercular	0	0 (1 with 1)	0
Supratemporal	0?	0	0
Frontal	0?	0	0
Vomerine teeth	4	3	4
Intermaxillary teeth	2	2	0

Diagnosis. Pectoral fin present; dorsal-fin origin in front of level of pectoral-fin base, predorsal length 10.6% TL; anus posterior, far behind tip of pectoral fin, preanal length 35.1% TL; trunk very long, trunk length 20.2% TL; 2 intermaxillary teeth; 4 compound teeth on vomer; multiple rows of small teeth on upper jaw; single row of 7 or 8 large compound teeth on lower jaw; head pores: IO 4, SO 3, M 7, POP 0, AD 1; lateral-line pores: prepectoral 6, preanal 24, lateral line runs to more than 2 head length before caudal fin; preanal vertebrae 35, total vertebrae 120. Body brownish dorsally and paler ventrally with lower part of posterior margin of anal fin and caudal fin black. [Data adapted from Chen & Mok, 1995]

Remarks. The holotype and only known specimen was not available for our study because its whereabouts is unknown. *Dysomma opisthoproctus* can be separated from all Taiwanese congeners except *D. dolichosomatum* and *D. longirostrum* by the posterior position of the anus. It differs from *D. dolichosomatum* by having a pectoral fin (vs. absent) and 7 or 8 larger compound teeth on lower jaw (vs. 4 or 5 small compound teeth followed by 1 or 2 irregular rows of small blunt teeth on lower jaw) and 120 total vertebrae (vs. 147–156). It differs from *D. longirostrum* by having 2 intermaxillary teeth (vs. 0), a relatively short snout (22.0% vs. 32.1% HL), 7 or 8 large compound teeth (vs. small multiserial teeth) on lower jaw, 120 (vs. 130) total vertebrae, and lacking POP pores (vs. 2 POP pores). It is also similar to *Dysommima rugosa* in the posterior position of its anus and a similar external appearance, but differs by having lateral-line pores (vs. absent), a single row of compound teeth (vs. small multiserial teeth) on the lower jaw, 120 (vs. 127–134) total vertebrae, presence of intermaxillary teeth (vs. absent), and well-developed papillae on both jaws (vs. slightly developed).

Dysomma polycatodon Karrer, 1983

Fig. 7; Table 3

Dysomma polycatodon Karrer, 1983:89 (type locality: Northwestern Madagascar, 15°21'S, 46°11'E, depth 170–175 m). Robins & Robins, 1989:250. Smith, 1999:1661. Chen & Mok, 2001:79.

Specimens examined. Collected from Daxi fishing port, NE Taiwan, bottom trawl: ASIZP 60188 (1 spec., 453 mm TL), 15 Oct. 1997. NMMB-P384 (1, 326), 23 Jan. 1994. NMMB-P11120 (1, 544), 6 Sep. 2010. USNM 372011 (1, 362), 12 Sep 1998. USNM 398475 (1, 384), 10 Sep. 2007. Collected from Dong-gang fishing port, SW Taiwan, bottom trawl: ASIZP 55560 (1, 358), 15 Jan. 1981. NMMB-P2843 (1, 505), 100 m, 8 Nov. 2001. NMMB-P3652 (1,321), 150 m, 28 May 2012. NMMB-P9076 (1, 250), 13 Jun. 2008. NMMB-P11128 (2, 310–333), 13 Sep. 2010. NMMB-P11129 (1, 400), 13 Sep. 2011. NMMB-P11132 (1, 365), 6 Sep. 2010. NMMB-P12070 (1, 550), 18 Feb. 2011. NMMB-P12625 (2, 372–375), 25 Mar. 2011. NMMB-P15256 (1, 407), 28 Oct. 2011. NMMB-P15625 (2, 367–371), 25 Mar. 2011. NMMB-P16388 (1, 274), 21 Feb. 2012. NMMB-P17776 (1, 344), 9 Aug. 2012. NMMB-P17783 (1, 544), 9 Aug. 2012. NMMB-P18040 (3, 500–600), no date. NMMB-P19278 (1, 260), 10 Nov. 2011. USNM 398736 (1, 196), 14 Nov. 2009. USNM 398737 (1, 265), 14 Nov. 2009. USNM 402447 (5, 275–362), Nov. 2009. USNM 410020 (1, 382), 26 Feb. 2011. USNM 427171 (1, 311), 16 Nov. 2011. Collected from Shiao-liu-chiu, SW Taiwan: NMMB-P3415 (1, 355), 26 Dec. 2003.

Other localities. Philippines: USNM 344108 (1, 436), 23 Sep. 1995. Madagascar: MNHN 1979–0003 (1, 523), holotype, 15°19'58.8"S, 46°11'2.4"E, 170–175 m, 19 Jan. 1979.

Diagnosis. Pectoral fin present; dorsal-fin origin anterior to level of pectoral fin base, predorsal length 10.0–12.9% TL; anus anterior, just below pectoral fin, preanal length 15.5–18.2% TL; trunk very short, trunk length 2.4–3.9% TL; 2 intermaxillary teeth; 3 compound teeth on vomer; 3 or 4 rows of small sharp teeth on upper jaw; single row of 2 large anterior teeth followed by 22–31 small sharp teeth on lower jaw; head pores: IO 4, SO 3, M 6, POP 0 (1 with 1), AD 1 (1 with 0); lateral-line pores: predorsal 3–5, prepectoral 5–7, preanal 8–11, and total 65–78, the last at about anterior two-thirds of total length; MVF 8–13–130, total vertebrae 128–133 (1 with 120). Body light grayish to brown dorsally, paler ventrally; posterior half of anal-fin base deep brown, and dorsal and anal fins with white margins.

Remarks. The holotype of this species, collected off Madagascar, has 140 vertebrae (Karrer, 1983), significantly more than the specimens from Taiwan (128–133). One of two specimens in NMMB-P18040 has only 120 total vertebrae. However, no other difference can be observed and the vertebrae appear to be complete. This specimen may represent a different species when more specimens are available.



FIGURE 7. *Dysomma polycatodon* Karrer, 1983, NMMB-P 11128, 1 of 2, 333 mm TL, collected from Dong-gang fishing port.

***Dysommima* Ginsburg, 1951**

Dysommima Ginsburg, 1951:450 (type species: *Dysommima rugosa* Ginsburg 1951, by monotypy).

Definition. A genus of Synphobranchidae with a row of large compound teeth on the vomer and the following combination of characters: body moderately elongate, slightly compressed in head and trunk; scales absent; pectoral fin present; dorsal-fin origin over or slightly behind tip of pectoral fin; pores in lateral line absent; intermaxillary teeth absent; snout projects slightly beyond lower jaw; anus more than 1 head length behind pectoral-fin tip; multiple serial teeth on lower jaw; and gill openings well-separated.

***Dysommima rugosa* Ginsburg, 1951**

Fig. 8; Table 3

Dysommima rugosa Ginsburg, 1951:450 (type locality: off Cumberland Island, Georgia, U.S.A., western North Atlantic, 30°53'00"N, 79°42'30"W, depth 273 fathoms [499 m]). Karrer, 1983:96. Robins & Robins, 1989:242. Smith, 1999:1661.

Specimens examined. Collected from Dong-sha Island, South China Sea: ASIZP 57954 (1 spec., 238 mm TL), 17 Aug. 1991. Collected from Dong-gang fishing port, SW Taiwan, bottom trawl: NMMB-P8361 (1, 258), 16 Mar. 2005. NMMB-P11131 (1, 413), 13 Sep. 2010. NMMB-P14012 (1, 316), 20 Oct. 2011. NSYU uncat. (2, twisted).

Other localities. Solomon Islands: MNHN 2006-0017 (1, 350), 8°16'26.4"S, 160°4'33.6"E, 23 Oct. 2004. MNHN 2006-0461 (1), 7°45'S, 156°28'22.8"E, 582–609 m, 1 Nov. 2004. MNHN 2006-0509 (1), 8°16'33.6"S, 160°4'33.6"E, 430 m, 23 Oct. 2004. Madagascar: MNHN 1979-0005 (1), 18°54'S, 43°55'1.2"E, 24 Nov. 1973. Philippines: MNHN 1998-0641 (1), 13°49'1.2"N, 120°49'58.8"E, 23 Nov. 1980. USNM 343985 (1, 362+), 12°54'29"N, 12°57'30"E, 376–382 m, 23 Sep. 1995. New Caledonia: MNHN 1995-0329 (1, 140), 22°6'S, 167°10'1.2"E, 550 m, 3 Oct. 1985. MNHN 2003-1529 (1, 198), 23°42'S, 168°15'E, 12 Aug. 1999.



FIGURE 8. *Dysommima rugosa* Ginsburg, 1951. NMMB-P11131, 413 mm TL, collected from Dong-gang fishing port.

Diagnosis. Pectoral fin present; dorsal-fin origin over tip of pectoral fin, predorsal length 14.0–17.1% TL; anus posterior, more than 1 head length behind pectoral fin, preanal length 26.8–28.8% TL; trunk long, trunk length 12.8–16.4% TL; no intermaxillary teeth; 4 compound teeth on vomer; multiple rows of teeth on upper jaw and lower jaw; head pores: IO 4, SO 3, M 6, POP 0, AD 1, ST 0, F 0; lateral-line pores absent; MVF 11-28-136, total vertebrae 133–141.

Body light brownish dorsally, paler ventrally; dorsal and anal fins with white margin, posterior one third of anal-fin base and posterior one-seventh of anal fin black.

Distribution. Widespread in tropical Atlantic and Indo-West Pacific Oceans. Specimens examined in present study were collected at depths of 376–609 m.

Discussion

Dysomma is a highly variable genus. In the present work, new characters are used to differentiate the species, such as the number of lateral-line pores and the position of the dorsal-fin origin. Although the coloration can be an important character, most specimens fade after long-term preservation. Although *Dysommima rugosa* is currently placed in a different genus, it shares many external characters with species of *Dysomma*. Further studies are needed on *Dysomma*, which may contain more than one genus among the species assigned to it.

The pectoral fin is absent in *Dysomma dolichosomatum* and present in all other species that occur in Taiwan.

The position of the anus can roughly divide the Taiwanese species into two groups. *Dysomma anguillare*, *D. goslinei*, *D. melanurum*, *D. polycatodon* and *D. taiwanensis* have the anus situated anteriorly, right below the pectoral fin, whereas *D. dolichosomatum*, *D. longirostrum*, *D. opisthoproctus* and *Dysommima rugosa* have the anus in a more posterior position, well behind the pectoral fin.

The origin of the dorsal fin in *D. taiwanensis*, *D. anguillare*, *D. polycatodon*, *D. opisthoproctus* and *D. goslinei* is anterior to the base of the pectoral fin. In *D. melanurum* it is above the pectoral fin, and in *D. longirostrum* and

Dysommima rugosa it is over the tip of the pectoral fin. In *D. dolichosomatum* it is well behind the gill opening at about the middle of the trunk.

The intermaxillary teeth are absent in *Dysommima rugosa*, *Dysomma goslinei*, *D. longirostrum* and *D. melanurum*, whereas the rest have two teeth on the intermaxilla.

There are two rows of teeth on the upper jaw of *D. dolichosomatum*, whereas the rest have at least three to four rows on upper jaw.

There is a single row of teeth but with different composition of sizes on the lower jaw in *D. dolichosomatum*, *D. anguillare*, *D. polycatodon*, *D. opisthoproctus*, and *D. taiwanensis*, whereas the rest have multiple rows of smaller teeth. There are 9–11 compound teeth on the lower jaw in *D. anguillare*, 7–10 in *D. taiwanensis*, 7–8 compound teeth in *D. opisthoproctus*, 4–5 large anterior teeth followed by one (sometimes two) irregular row(s) of smaller ones in *D. dolichosomatum* and two large anterior teeth followed by 22–31 smaller ones in *D. polycatodon*. Interestingly, the four species with small, multiserial teeth on the lower jaw are also the ones that lack intermaxillary teeth.

There are five or six large compound teeth on vomer in *D. melanurum*, five in *D. longirostrum*; four in *D. anguillare*, *D. taiwanensis*, *D. opisthoproctus* and *D. goslinei*; and three in *D. dolichosomatum*, *D. polycatodon* and *Dysommima rugosa*.

The trunk length is considerably longer than the head length in *D. opisthoproctus* (20.2% TL), *D. dolichosomatum* (14.3–17.7%) and *Dysommima rugosa* (12.8–16.4%), followed by *D. longirostrum* (9.7%) with trunk length slightly shorter than head length, and the rest with a very short trunk (<5.5% TL), ranging from equal to or smaller than the pectoral-fin length.

The head is relatively short in *D. dolichosomatum* (8.3–10.9% TL, mean 9.9%), and relatively long in *D. anguillare* (11.0–15.1%, mean 13.3 %), *D. polycatodon* (12.7–14.3%, mean 13.6 %) and *D. longirostrum* (14.1–14.3%, mean 14.2%), whereas the rest have intermediate values of head length (means of 11.9% TL to 12.8 % TL).

The lateral-line pores vary among the species, relatively large in *D. melanurum* and *D. dolichosomatum*, small in others members, and absent in *Dysommima rugosa*. The lateral line is very short in *D. dolichosomatum*, ending far before the anus. Its length is about 23% total length in *D. goslinei* (based on Chen & Mok, 2001); reaches about half of the total length in *D. taiwanensis*; it reaches about 2/3 of total length in *D. anguillare*, *D. opisthoproctus* and *D. polycatodon*; and it reaches about half to one head length anterior to the caudal fin in *D. melanurum* and *D. longirostrum*. Chen & Mok's (1995) statement that the lateral line of *D. anguillare* is nearly complete may be a mistake.

Based on our examination, *D. goslinei*, *D. longirostrum* and *D. melanurum* share with *Dysommima rugosa* two very important characters, the absence of intermaxillary teeth and the presence of multiserial teeth on the lower jaw, which may suggest they belong to *Dysommima* rather than *Dysomma*.

Key to species of *Dysomma* and *Dysommima* in Taiwan

As mentioned above, *Dysommima* shares many external characters with *Dysomma* and is thus included in this key.

- 1A. Pectoral fin absent; about 2 rows of teeth on upper jaw *D. dolichosomatum*
- 1B. Pectoral fin present; 4 or more rows of teeth on upper jaw 2
- 2A. Intermaxillary teeth present; uniserial teeth on dentary 3
- 2B. Intermaxillary teeth absent; multiserial teeth on dentary 6
- 3A. Anus anterior, trunk shorter than head length 4
- 3B. Anus posterior, trunk much longer than head length *D. opisthoproctus*
- 4A. Two large compound teeth followed by row of 22–31 smaller ones on lower jaw *D. polycatodon*
- 4B. Single row of 7 to 11 large compound teeth on lower jaw 5
- 5A. Total vertebrae 137–139; total lateral-line pore 40–48 *D. taiwanensis* sp. nov.
- 5B. Total vertebrae 119–130; total lateral-line pores 57–75 *D. anguillare*
- 6A. Anus anterior, just below pectoral fin 7
- 6B. Anus posterior, well behind pectoral fin 8
- 7A. 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 *D. melanurum*
- 7B. Lower jaw included, not projecting beyond snout, appressed to upper jaw when mouth fully closed; lateral line extends to about anterior 23% of body *D. goslinei*

- 8A. Five compound teeth on vomer; lateral-line pores present; head pores present on frontal, infraorbital posterior to eye and preopercular *D. longirostrum*
- 8B. Four compound teeth on vomer; pores absent on lateral line, frontal, infraorbital posterior to eye and preopercular *Dysommia rugosa*

Acknowledgements

We thank R.-R. Chen (NMMB-P), M. Hoang, J. Fong (CAS), S. Raredon, J. Williams, J. Clayton, D. Pitassy, S. Smith, K. Murphy (USNM), Z. Gabsi, C. Ferrara, R. Causse, P. Pruvost (MNHN) for curatorial assistance. This study is supported by the National Museum of Marine Biology & Aquarium to HCH.

References

- Alcock, A. (1889) Natural history notes from H. M. Indian marine survey steamer 'Investigator,' Commander Alfred Carpenter, R.N., D.S.O., commanding. No. 13. On the bathybial fishes of the Bay of Bengal and neighbouring waters, obtained during the seasons 1885-1889. *Annals and Magazine of Natural History*, Series 6, 4 (24), 450-461.
- Alcock, A.W. (1891) Class Pisces. In: II.--Natural history notes from H.M. Indian marine survey steamer 'Investigator,' Commander R. F. Hoskyn, R. N., commanding.--Series II., No. 1. On the results of deep-sea dredging during the season 1890-91. *Annals and Magazine of Natural History*, Series 6, 8 (43/44), 16-34, 119-138, pls. 7-8.
- Barnard, K.H. (1923) Diagnoses of new species of marine fishes from South African waters. *Annals of the South African Museum*, 13 (pt 8, no. 14), 439-445.
- Böhlke, E.B. (1989) Methods and terminology In: Böhlke, E.B. (Ed.), Fishes of the Western North Atlantic. *Memoirs of the Sears Foundation for Marine Research*, 1 (part 9), 1-7.
- Böhlke, J.E. (1949) Eels of the genus *Dysomma*, with additions to the synonymy and variation in *Dysomma anguillare* Barnard. *Proceedings of the California Zoological Club*, 1 (7), 33-39.
- Chen, Y.-Y. & Mok, H.-K. (1995) *Dysomma opisthoproctus*, a new synphobranchid eel (Pisces: Synphobranchidae) from the northeastern coast of Taiwan. *Copeia*, 1995 (4), 927-931.
<http://dx.doi.org/10.2307/1447041>
- Chen, Y.-Y. & Mok, H.-K. (2001) A new synphobranchid eel, *Dysomma longirostrum* (Anguilliformes: Synphobranchidae), from the northeastern coast of Taiwan. *Zoological Studies*, 40 (2), 79-83.
- Chen, J.T.-F. & Weng, H.T.-C. (1967) A review of the apodal fishes of Taiwan. *Biological Bulletin Tunghai University Ichthyology Series*, No. 6 (art. 32), 135-220.
- Facciola, L. (1887) Intorno a due Lepadogastrini ed un nuovo Nettastoma del mare di Sicilia. Lettera al Ch. Dott. Cristoforo Bellotti. *Naturalista Siciliano*, 6, 163-167, pl. 3.
- Fricke, R. & Eschmeyer, W.N. (2015) Guide to Fish Collections. Electronic version. Available from: <http://researcharchive.calacademy.org/research/ichthyology/catalog/collections.asp> (accessed 31 August 2015)
- Ginsburg, I. (1951) The eels of the northern Gulf Coast of the United States and some related species. *Texas Journal of Science*, 3 (3), 431-485.
- Ho, H.-C., Smith, D.G., Wang, S.-I., Shao, K.-T., Ju, Y.-M. & Chang, C.-W. (2010) Specimen catalog of pieces (sic) collection of National Museum of Marine Biology and Aquarium transferred from Tunghai University. (II) Order Anguilliformes. *Platax*, 6, 13-34.
- Ho, H.-C. & Shao, K.-T. (2011) Annotated checklist and type catalog of fish genera and species described from Taiwan. *Zootaxa*, 2957, 1-74.
- Kamohara, T. (1950) *Description of the fishes from the provinces of Tosa and Kishu, Japan*. Kochiken Bunkyo Kyokai, Kochi, 288 pp, 220 figs.
- Kamohara, T. (1952) Revised descriptions of the offshore bottom-fishes of Prov. Tosa, Shikoku, Japan. *Research Reports of the Kôchi University, (Ser.) Natural Science*, 3, 1-122.
- Kamohara, T. (1958) A catalog of fishes of Kochi Prefecture (Province Tosa), Japan. 5 (1), 1-76.
- Kamohara, T. (1964) Revised catalog of fishes of Kochi Prefecture, Japan. *Report of the USA Marine Biological Station*, 11 (1), 1-99, figs. 1-63.
- Karrer, C. (1983) Anguilliformes du Canal de Mozambique (Pisces, Teleostei). *Faune Tropicale*, 23, 1-116.
- Karrer, C. & Klausewitz, W. (1982) Tiefenwasser- und Tiefseefische aus dem Roten Meer. II. *Dysomma fuscoventralis* n. sp., ein Tiefsee-Aal aus dem zentralen Roten Meer (Teleostei: Anguilliformes: Synphobranchidae: Dysommidae). *Senckenbergiana Biologica*, 62 (4/6), 199-203.
- Lin, S.-Y. (1933) A new genus and three new species of marine fish from Hainan Island. *Lingnan Science Journal, Canton*, 12 (1), 93-96.
- Matsubara, K. (1936) Studies on the deep-sea fishes of Japan. I. On a new apodal fish, *Dysomma japonicus*, with an emendation of the genus *Dysomma*. *Zoological Magazine Tokyo*, 48 (11), 960-962.

- Mok, H.-K. (1993) Order Anguilliformes: Synphobranchidae. *In*: Shen, S.-C., Lee, S.-C., Shao, K.-T., Mok, H.-K., Chen, C.-T. & Chen, C.-H. (Eds.), *Fishes of Taiwan*. Department of Zoology, National Taiwan University, Taipei, pp. 108–110.
- Nelson, G.J. (1966) Gill arches of teleostean fishes of the order Anguilliformes. *Pacific Science*, 20 (4), 391–408.
- Norman, J.R. (1939) Fishes. *Scientific Reports, John Murray Expedition*, 7 (1), 1–116.
- Robins, C.H. & Robins, C.R. (1976) New genera and species of dysommene and synphobranchine eels (Synphobranchidae) with an analysis of the Dysommeneae. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 127, 249–280.
- Robins, C.H. & Robins, C.R. (1989) Family Synphobranchidae. *In*: Böhlke, E.B. (Ed.), *Fishes of the Western North Atlantic. Memoirs of the Sears Foundation for Marine Research*, 1 (Part 9), 207–253.
- Smith, D.G. (1999) Synphobranchidae. *In*: Carpenter, K.E. & Niem, V.H. (Eds.), *FAO Species Identification Guide for Fishery Purposes. The Living Marine Resources of the Western Central Pacific. Volume 3. Batoid fishes, chimeras and bony fishes part 1 (Elopidae to Linophrynidae)*. FAO, Rome, pp. 1658–1661.
- Smith, J.L.B. (1949) *The Sea Fishes of Southern Africa*. Central News Agency, South Africa, 550 pp.
- Smith, J.L.B. (1961) *The Sea Fishes of Southern Africa*. Central News Agency, South Africa, 580 pp.