

**A new record fish genus and species, *Grammonus robustus* Smith & Radcliffe 1913, from southern Taiwan (Bythitidae: Bythitinae)**

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**Abstract**

A specimen of *Grammonus robustus* Smith & Radcliffe, 1913 is reported for the first time in Taiwan. Although being widespread in the Indo-west Pacific Ocean, the genus and species had never been found from Taiwan. Detailed description and fresh color photo are provided.

**Key words:** Pisces, Taxonomy, *Grammonus robustus*, new record, Taiwan

**Introduction**

Members of Bythitidae inhabit a huge variety of marine habitats, from shallow waters to the deep sea. Although they exhibit their greatest diversity in the deep-sea, some species even occur in warm tropical reefs. They feed on small fishes or invertebrates. A conspicuous character of the family is their viviparous reproduction mode, which is basis for their vernacular name: viviparous brotulas. Nelson et al. (2016) reported 211 species

across 53 genera, but recent investigations restricted Bythitidae as supported as monophyletic group based on molecular data. This study accounts 116 species in 32 genera for the family (Møller et al., 2016). In Taiwan, 9 species in 8 genera of the family have been recorded so far (Lee & Ho, 2016; Shao, 2017), of which *Cataetyx lepidogenys* (Smith & Radcliffe) was recorded just recently by Lee & Ho (2016). Seven of these species have been found in the southern Taiwan, thus the

northern extension of the South Chinese Sea.

A male specimen of the viviparous brotulas family Bythitidae was collected from off Dong-gang fishing port, southwestern Taiwan recently. The fish has a single short ray per pelvic fin, short pectoral-fin radials, no teeth on palatine and its posterior portion of maxilla well expanded. These characters show that the specimen belongs to the genus *Grammonus*.

The genus *Grammonus* comprises 11 valid species (Møller et al., 2016) distributed worldwide. Of these species, *G. robustus* Smith & Radcliffe, *G. minutus* Nielsen & Prokofiev, *G. thielei* Nielsen & Cohen, and *G. yunokawai* Nielsen, were distributed in adjacent countries of Taiwan. Kannan et al. (2014) included Taiwan within the distribution range of *G. robustus*, but they did not state on which data they draw their occurrence map. Also in FishBase (Froese & Pauli, 2017) “Taiwan” is given as country in which *G. robustus* is found. The cited vouchers, however, are only deposited in a collection in Taiwan, but originated from the Philippines. Thus, there is currently no evidence that the genus *Grammonus* has been recorded in Taiwan.

Morphological characters show that the herein recorded specimen belongs to the *G. robustus*. From *G. minutus* and *G. thielei* in the area it can be distinguished by the much higher amount of dorsal fin

rays (82–89 [89 in the present specimen] vs. less than 76), and from *G. yunokawai* it differs in a higher number of total vertebrae (44–47 [46] vs. 41) (Nielsen, 2007; Nielsen & Prokofiev, 2010).

Herein, we formally document the species *G. robustus* based on the single specimen collected from Taiwan. A detailed description is provided below.

## Materials and Methods

Methods for taking measurements and counts followed Nielsen & Cohen (2004).

Specimen is deposited at Pisces Collection, National Museum of Marine Biology & Aquarium, Pingtung, Taiwan (NMMB-P).

## Results

### Family Bythitidae

#### Genus *Grammonus* Gill, 1896

#### *Grammonus robustus* Smith and Radcliffe, 1913

Figures 1-2; Table 1

*Grammonus robustus* Smith and Radcliffe, 1913:168, pl. 13, fig. 4 (Type locality: between Cebu and Leyte, Philippines). Nielsen et al., 1999:104. Nielsen & Cohen, 2004:85. Nielsen, 2007:375. Randall & Hughes, 2008:143. Nielsen & Prokofiev, 2010:192. Møller et al., 2016:Appendix A.

**Specimen examined.** NMMB-P26419, 148.6 mm standard length, off Dong-gang

fishing port, Pingtung, Southern Taiwan, South China Sea, ca. 300 m depth, 20 June 2017, coll. T. Moritz, P. Warth, M. Mertzen, P. Richter and C. Marin.

**Description of NMMB-P26419.**

Dorsal-fin rays 89; anal-fin rays 64; pectoral fin rays 26 or 27; caudal fin rays 8; precaudal vertebrae 12; caudal vertebrae 34; total vertebrae 46; pelvic fin with 1 an individual ray; 3 well-developed toothed rakers and 15 small toothed patches on first gill arch, 6 on upper limb, and 9 on lower limb. Scale rows in longitudinal series from upper gill slit to caudal fin base about 82.

Body short, anterior half rather stout and gradually compressed posteriorly, gradually tapering from the anal fin into a pointed caudal fin. Dorsal fin originating behind pectoral fin base and anal fin originating behind mid-body; both with long, continuous base and connected to

caudal fin posteriorly. Origin of dorsal fin slightly behind origin of pectoral fin. Pectoral fin moderately long (29.7% SL), with a broad base, vertical height of the base about half of the fin length. Pelvic fin long (26.0% SL), with a single long simple ray, closed to each other. Origin of anal fin at about middle of lower margin of entire length. Lateral line interrupted at mid-body, anterior lateral line at upper third of anterior half of body and posterior one at axis of posterior half of body respectively.

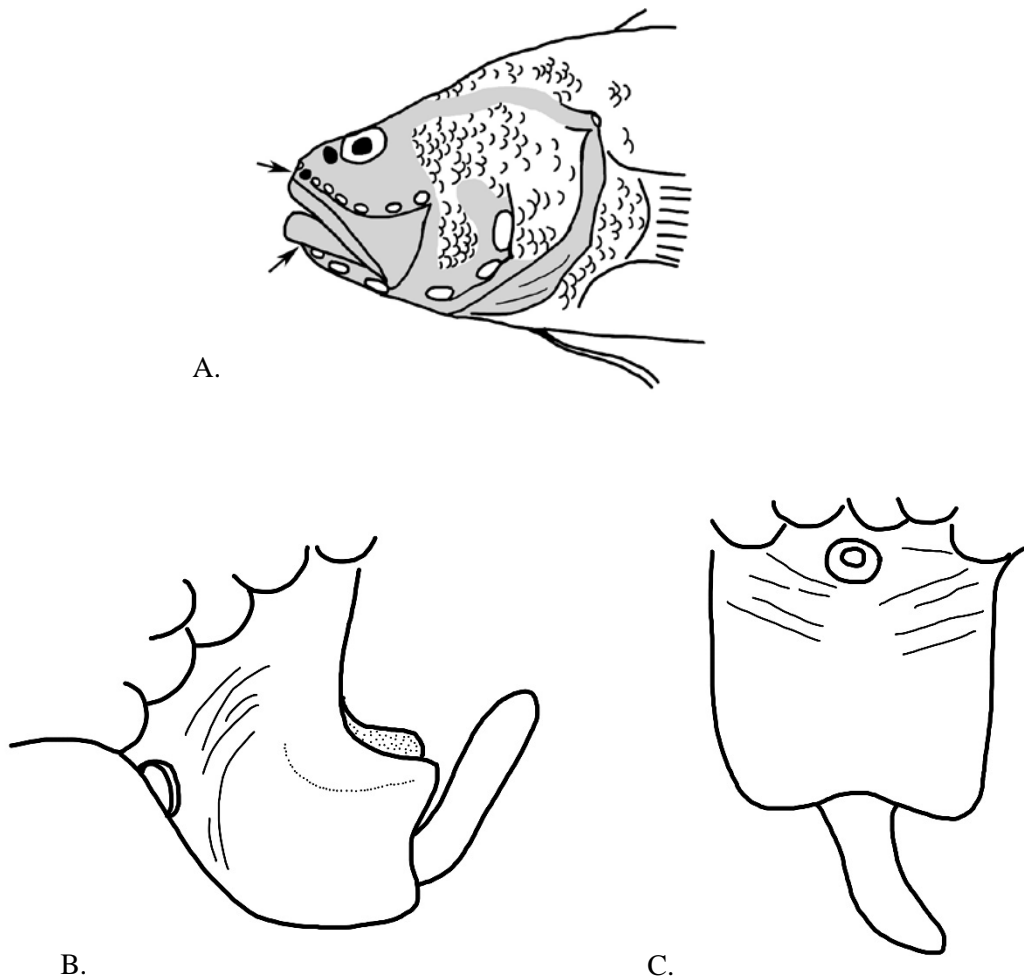
Head moderately large (28.6% SL), rather plump, with occiput swollen. Eye small, covered by a circular membrane connected to nearby skin, its diameter 14.4% of head length (HL). Snout short (29.4% HL), very broad and blunt. Interorbital space broad (29.4% HL). Mouth large and oblique; lower jaw entirely included under the upper jaw.



**Fig. 1.** Freshly caught specimen of *Grammonus robustus* Smith and Radcliffe, 1913, NMMB-P26419, 148.6 mm SL

Posterior portion of maxilla well expended, its rear margin extending for about one eye diameter beyond vertical from posterior margin of eye. Two large nostrils, anterior nostril with low irregular

rim, close to upper lip, posterior nostril just in front of the eye, a simple oval pore. Dorsal surface of snout and interorbital space with many small cirri or papillae. Postorbital space about  $\frac{2}{3}$  of HL.



**Fig. 2.** *Grammonus robustus* Smith and Radcliffe, 1913, NMMB-P26419. A. Lateral view of head showing the head pore system and naked bare area (gray shading). Arrows point to the anterior-most pores in the supraorbital (above) and mandibular (below) regions. B. Lateral view of copulatory organ. C. Ventral view of copulatory organ.

Posterior margin of opercle smooth, with a stout but strong spine at upper portion. A prominent skin flap bearing large pore above opercle. Margins of preopercle and subopercle smooth, except for a low, triangular spine at approximately middle portion of preopercle. Isthmus membrane partly free from gular region. Head pores large in size, with 6 pores on suborbital region along upper jaw, 2 pores on each side of internasal space close to the anterior nostril, 4 pores on mandibular, and 3 large pores on preopercle (Fig. 2A).

Cycloid scales cover on head and body. Scales on head extend to a line slightly behind posterior margin of eye, the rest of head is devoid of scales. About 10 scale rows in series from the origin of dorsal fin to lateral line and 14 scale rows from the origin of anal fin to the lateral line.

Teeth villiform, forming narrow bands on jaws and vomer, absent from palatines.

Male with copulatory organ not covered by a protective hood and lacking ossified parts. Penis merged into a fleshy hood in front of anal fin. A pair of cartilaginous bumps at the anterior base of penis connected by a membrane and forming an anterior wall (Fig. 2B). Anal opening small and located at front base of the copulatory organ (Fig. 2C).

Coloration. When freshly caught,

uniformly blackish with head and all fins darker, except for the scaled regions which are slightly paler. When preserved, color slightly lighter (Fig. 1).

**Distribution.** Western Pacific from Australia (Bray, 2017) to Philippines (Radcliffe, 1913; Shao, 2017), Taiwan (present study), and Japan (e.g., Araga & Tanase, 1966). Also recorded in the Indian Ocean between India and Sri Lanka (Kanan et al., 2014), as well as in the Red Sea and Gulf of Aden (Klausewitz & Uiblein, 1994). Possible records from South Africa, though these need confirmation (Nielsen, 1999).

**Remarks.** The meristic and morphometric characteristics of the Taiwanese *G. robustus* specimen fall mostly within the ranges provided by Nielsen (2007) (Table 1), except for some differences. There are 26 or 27 pectoral-fin rays in our specimen, versus only 24 or 25 rays in Nielsen (2007). The majority of the species in the genus *Grammonus* possess 23–25 pectoral-fin rays, except for *G. ater* (18–19), *G. thielei* (21), and *G. waikiki* (25 or 26; Nielson & Prokofiev, 2010). The slightly higher pectoral-fin ray count in our specimen could simply represent individual variation. The pectoral-fin length, eye diameter and interorbital width are all slightly above the highest values noted by Nielsen (2007); this may also be attributed variation between individuals.

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**Table 1.** Meristic and morphometric data of *Grammonus robustus* Smith and Radcliffe, 1913.

	Taiwan	Japan and the Philippines
	NMMB-P26419	Nielsen (2007)
Standard length (mm)	148.6	105-207 (n=13)
<b>Meristics</b>		
Dorsal fin rays	89	82–89
Anal-fin rays	64	59–65
Abdominal vertebrae	12	12–13
Caudal vertebrae	34	–
Total vertebrae	46	45–47
Pectoral-fin rays	26;27	24–25
Caudal-fin rays	8	8
Long rakers on anterior gill arch	3	3
Total rakers	18	15–20
Anterior dorsal fin rays above vertebral number	7	6–7
Anterior anal fin rays below dorsal fin ray number	31	29–34
Anterior anal fin rays below vertebral number	18	17–19
<b>Morphometrics</b>	% SL	
Head length	28.6	27.0–29.0
Body depth at head	28.4	24.5–29.0
Predorsal length	32.2	32.0–34.5
Preanal length	54.6	55.0–59.0
Pectoral-fin length	19.9	17.0–19.0
Pelvic-fin length	12.1	11.0–16.5
Dorsal-fin base	71.1	–
Anal-fin base	43.5	–
Eye diameter	4.1	3.2–3.8
Interorbital width	8.4	6.9–7.3
Snout length	6.4	–
Upper- jaw length	16.4	14.5–16.5
Height of posterior margin of maxilla	6.5	5.3–6.8