Zootaxa 5738 (1): 110–114
https://www.mapress.com/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.5738.1.14
http://zoobank.org/urn:lsid:zoobank.org:pub:B535CF37-860F-42B6-9D27-47C8D8069CC3

A new pygmy goby of genus *Trimmatom* (Teleostei: Gobiidae) from Lanyu Island, Taiwan

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Abstract

The new pygmy goby of genus *Trimmatom* was found and collected from Lanyu Island off Taiwan via SCUBA diving. The new species, *T. lanyuensis*, can be well distinguished from other congeneric species by the unique combination of the following features: (1) fin rays: second dorsal fin rays 10, anal fin rays 10, pectoral fin rays 21; (2) squamation: longitudinal scale rows 27–28 (modally 27), predorsal naked; and (3) specific coloration: head and body with greyish brown background bearing bloody red marks. Lateral body with pale gray 5 vertical bars, anterior 4 longer extension to ventral side, the last one shorter passing less than only half way of lateral side against the red body. Head generally with entirely gray in cheek. Opercle with two red vertical lines. The two red lines interrupted to dorsal two cross red bars. Caudal fin pinkish red, with basal region bloody red. Pectoral fin bloody red with basal central red mark. A brief comparison of related congeneric species will also be addressed.

Key words: *Trimmatom*, Gobiidae, marine fish, pygmy goby, fish taxonomy

Introduction

The members of family Gobiidae are rather abundant and highly diverse, especially in marine coral reef regions. Among them, both *Trimma* and *Trimmatom* are important members inhabiting caves, holes, and clefts of coral reefs in the Indo-Pacific region (Winterbottom & Emery 1981; Winterbottom 1984, 1989, 1990, 2001).

The pygmy goby genus, *Trimmatom* Winterbottom & Emery, 1981, established from the type species *Trimmatom nanus* Winterbottom & Emery, 1981, is the miniature species with the minimum standard length of benthic coral reef vertebrates. The genus comprises 7 nominal, valid species in the Indo-West Pacific, including: the type species *Trimmatom nanus* Winterbottom & Emery, 1981, as well as 6 other species: *Trimmatom macropodus* Winterbottom, 1989; *Trimmatom eviotops* (Schultz, 1943); *Trimmatom offucius* Winterbottom & Emery, 1981; *Trimmatom pharus* Winterbottom, 2001; *Trimmatom sagma* Winterbottom, 1989; and *Trimmatom zapotes* Winterbottom, 1989. The species of genus mostly exist at water depths of 3 m to 50 m in coral reef habitats.

The first record of the species of *Trimmatom* in Taiwan was reported by Winterbottom (1989), who designated a specimen from southern Taiwan as a paratype of *T. macropodus*. Our research team in 2013, Hsu *et al*. (2013), firstly recorded *T. nanus* from Dongsha Island (Pratas Island) in the South China Sea, becoming the first extension of this current Indian Ocean species' westernmost range to the South China Sea.

Most icthyologists are usually concerned about the smallest size record for the pygmy goby, *Trimmatom.* However, the very unusual, giant species was found from Lanyu (Orchid Island) off Taiwan. The species can grow near 20 mm SL, which has never been considered as tiny *Trimmatom* ever happened. The aim of this paper is to

 Accepted by M.-F. Yeh: 29 Nov. 2025; published: 30 Dec. 2025

formally describe the new *Trimmatom* species with a giant body size, like the average size of the *Trimma* species from Taiwan. A morphological comparison will also be addressed in this paper.

Materials and methods

The coral reef goby was collected by hand-net while SCUBA diving. Fish samples were preserved in 10% seawater-based formalin and later transferred to 70% ethanol for long-term storage. Measurements were taken using digital calipers, following Miller (1988) and are expressed as percentage of standard length (SL) or head length (HL). Meristic counts generally follow Chen & Shao (1996).

The terminology of the cephalic sensory canals and free neuromast organs (sensory papillae) follows Wongrat & Miller (1991), based on Sanzo (1911). Voucher specimens are deposited in the Pisces collections of National Taiwan Ocean University, Keelung (NTOUP). The following abbreviations are used herein: A = anal fin; C= caudal fin; D1 = first dorsal fin; D2 = second dorsal fin; P = pectoral fin; V = pelvic fin; LR= number of longitudinal scale rows; TR = number of transverse scale rows.

Systematics

***Trimmatom lanyuensis* sp. nov.**
(蘭嶼小磨鰕虎)
(Figs. 1–2)

Material examined

Holotype

NTOUP-2003-07-205, 18.2 mm SL, Yeyu, Lanyu (Orchid Island), Taitung County, Taiwan, ROC, coll. I-S. Chen, July 18, 2003.

Paratypes

NTOUP-2003-07-206, 18.8 mm SL, collection data and date same as holotype.
NTOUP-2003-07-207, 16.7 mm SL, collection data and date same as holotype.
NTOUP-2003-07-208, 17.6 mm SL, collection data and date same as holotype.

Diagnosis

The new species. *T. lanyuensis* can be well distinguished from other congeneric species by the unique combination of following features: (1) fin rays: second dorsal fin rays 10, anal fin rays 10, pectoral fin rays 21; (2) squamation: longitudinal scale rows 27–28 (modally 27), predorsal naked; and (3) specific coloration: head and body with greyish brown background bearing bloody red marks. Lateral body with pale gray 5 vertical bars, anterior 4 longer extension to ventral side, the last one shorter passing less than only half way of lateral side against the red body. Head generally with entirely gray in cheek. Opercle with two red vertical lines. The two red lines interrupted to dorsal two cross red bars. Caudal fin pinkish red, with basal region bloody red. Pectoral fin bloody red with basal central red mark.

Description

Body proportions from morphometric measurements for 4 type specimens are listed in Table 1. Head length 27.3–30.0 (average 28.2), predorsal length 35.0–36.4 (35.6), snout to 2nd dorsal fin 54.0–56.1 (55.0), snout to anal fin origin 60.0–63.2 (61.5), prepelvic length 29.3–31.7 (30.8), caudal peduncle length 20.3–22.1 (21.4), caudal peduncle depth 13.6–15.2 (14.3), first dorsal fin 13.4–14.5 (13.8); second dorsal fin 22.3–26.1 (25.2), pectoral fin length 20.4–25.5 (22.8), and body depth of anal fin origin 18.1–19.6 (19.0) all in percentage of standard length. Snout length 15.6–17.1 (16.1), eye diameter 30.3–34.8 (33.3), postorbital length 46.3–48.4 (47.3), cheek depth 28.0–31.9 (30.0) and lower jaw length 36.8–39.6 (38.8) all in percentage of head length. Body elongated, head moderately compressed. Mouth oblique, maxilla extending posteriorly to vertical drawn through mid-pupil. Lower jaw protruding slightly beyond tip upper jaw. Anterior nasal opening with short, tapered tube reaching anteriorly to

point above posterior margin of upper lip, posterior opening pore-like with low raised rim. Eyes large, positioned dorsolaterally. Narrow interorbital width with no trenches. Gill-opening large, extending anteroventrally to vertical line through posterior edge of orbit.

TABLE 1. Morphometry of *Trimmatom lanyuensis* from Taiwan.

Type status	Holotype	Paratype	Paratype	Paratype
Size (mm SL)	18.2	18.8	16.7	17.6
% in SL				
Head length	28.3	27.3	30.0	27.3
Predorsal length	36.4	35.4	35.0	35.6
Snout to 2nd dorsal origin	55.3	54.0	54.6	56.1
Snout to anal fin origin	62.1	60.7	63.2	60.0
Prepelvic length	31.7	30.8	31.5	29.3
Caudal peduncle length	21.0	22.0	22.1	20.3
Caudal peduncle depth	14.2	14.2	15.2	13.6
First dorsal fin base	13.4	13.8	13.4	14.5
Second dorsal fin base	23.5	22.2	25.6	24.5
Anal fin base	22.5	21.5	21.7	22.9
Caudal fin length	25.7	23.2	25.7	26.1
Pectoral fin length	21.5	25.5	23.8	20.4
Body depth of anal fin origin	19.6	18.1	19.1	19.2
% in HL				
Snout length	15.8	15.9	15.6	17.1
Eye diameter	34.8	34.5	33.7	30.3
Postorbital length	47.9	46.3	48.4	46.5
Cheek depth	28.6	31.9	28.0	31.6
Lower jaw length	36.8	39.6	39.3	39.4
% in caudal peduncle length				
Caudal peduncle depth	67.4	64.6	68.8	67.0

Fins.—D1 VI; D2 10; A 10; P 21; V I/5+I/5. Second spine of D1 longest and elongate, reaching to fourth ray of D2, even to posterior base of D2 when depressed in male. D1 membrane not connected to origin of D2. D2 usually unbranched. A origin located below second to third rays of D2. P rays unbranched, not reaching to vertical drawn through anus. V well separated with no frenum; fourth ray unbranched and elongate (when undamaged reaching beyond the base last ray of anal-fin), fifth ray only about 6–10% length of fourth ray.

Scales.—LR 27–28 (modally 27); TR 8–9 (modally 8). Predorsal region entirely naked on mid-predorsal area. Nape, cheek or opercle all naked. Body with large ctenoid scales.

Head lateral-line system (Fig. 1)

Head canals and pores. No canal pore on head.

Sensory papillae. Sensory papillae or free neuromasts distributed as follows, with counts and ranges shown in parentheses: Row *a* long, extending from posterior to anterior of orbit; rows *b* and *d* present; row *c* longitudinally; single *cp* papillae; row *f* paired.

Coloration while fresh. (Fig. 2)

Head and body with greyish brown background bearing bloody red marks. Lateral body with pale gray 5 vertical bars, anterior 4 longer extension to ventral side, the last one shorter passing less than only half way of lateral lateral side against the bright red body.

Head generally with entirely gray in cheek. Opercle with two red vertical lines.

The two lines interrupted to dorsal two cross red bars. Rear of interorbital region of a red band. First dorsal fin translucent with red rays and a basal longitudinal line. Second dorsal fin follow the pattern. Caudal fin pinkish red, with basal region bloody red. Pectoral fin bloody red with basal central red mark. Pelvic fin translucent and red rays. Anal fin pinkish red.

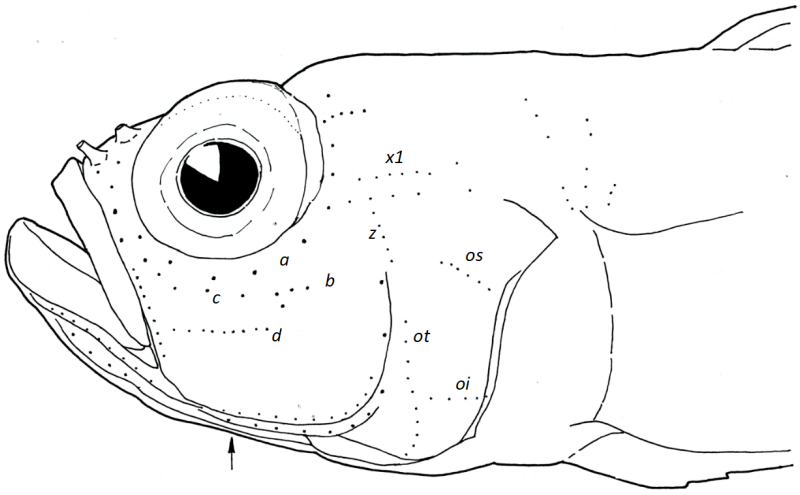

FIGURE 1. Head lateral-line system of *Trimmtom lanyuensis,* holotype, 18.2 mm SL, Lanyu, Taiwan. The arrow indicates the vertical end of gill-opening.

FIGURE 2. *Trimmtom lanyuensis,* holotype, 18.2 mm SL, Lanyu, Taiwan.

Coloration after preservative

The preserved specimens all faded into very light creamy yellow, all fins translucent and unmarked.

Etymology

The specific name, *lanyuensis*, is referred to the type locality "Lanyu - Orchid Island", Taiwan.

Distribution

The fish species merely found from the coastal waters off Lanyu Island, it is highly possible to be exist around other nearby countries of West Pacific region.

Remarks

The new species is rather similar to *T. eviotops* than any other congeneric species. However, *T. lanyuensis* can be well distinguished from *T. eviotops* by the following features: (1) D1 with the rather elongation spinous ray filament of first dorsal fin rays vs. none of them seen; (2) specific coloration: head with interrupted vertical red bars vs. continuous dark vertical bars, lateral body after first dorsal fin origin with 5 major vertical gray marks vs. 4 dark marks. The new species, *T. lanyuensis* can grow larger body size into about 20 mm SL, the *E. eviotops* with body size usually less than 14 mm SL.

Acknowledgments

The authors wish to thank all the lab members of R509, Institute of Marine Biology, NTOU (Taiwan), for their help during the marine fish surveys. We also thank the partial grant support from National Academy Marine Research, Kaohsiung, Taiwan.

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