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***Trimma yoshinoi*, a new gobiid fish from Japan (Perciformes: Gobiidae)**

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Abstract

The new species *Trimma yoshinoi* is described from five specimens, 18.4–21.4 mm SL, collected in 36 m depth at Iriomote-jima Island, Ryukyu Islands, Japan. This new species differs from the other described species of the genus in the following combination of characters: 10 predorsal scales; second spine of first dorsal fin elongated, filamentous, usually extending beyond base of last segmented ray of second dorsal fin when adpressed; 13–15 pectoral-fin rays; fifth pelvic-fin ray unbranched; cheek fully scaled; transverse lines of cephalic sensory papillae below eye; interorbital shallowly concave with median fleshy ridge, and bony width 90.4–99.0% of pupil diameter; ground color of head and body pale pink, a broad deep pink longitudinal stripe on side of body, and a large dark reddish brown blotch on end of midlateral caudal peduncle when fresh or alive.

Key words: taxonomy, new species, gobies, coral reefs, Ryukyu Islands.

Introduction

Trimma is an Indo-Pacific gobiid fish genus, comprising cryptic, tiny (seldom exceeding 30 mm SL), colorful, tropical species found on coral and rocky reefs, usually at depths shallower than 50 m (Winterbottom & Hoesle 2015). According to Winterbottom (2011), *Trimma* can be recognized by having the following combination of characters: lack of cephalic sensory canal pores; much reduced cephalic sensory papillae pattern; wide gill opening extending to below the vertical limb of the preopercle or anterior to this; lack of bony spicules on the outer gill rakers of the first gill arch; fewer than 12 dorsal and anal-fin segmented rays; and a fifth pelvic fin ray that is equal to or more than 40% the length of the fourth pelvic-fin ray.

Trimma, established by Jordan & Seale (1906), may contain about 110 to nearly 200 species (Winterbottom *et al.* 2014). Of these, 88 described species are currently recognized as valid (R. Winterbottom pers. comm.), while the others are still unnamed.

The following 27 valid species of *Trimma* have been reported so far from Japan, as well as 3 undescribed species of Suzuki *et al.* (2004): *Trimma anaima* Winterbottom 2000, *T. annosum* Winterbottom 2003, *T. benjamini* Winterbottom 1996, *T. caesiura* Jordan & Seale 1906, *T. caudipunctatum* Suzuki & Senou 2009, *T. caudomaculatum* Yoshino & Araga 1975, *T. emeryi* Winterbottom 1985, *T. fasciatum* Suzuki, Sakaue & Senou 2012, *T. flavatrum* Hagiwara & Winterbottom 2007, *T. grammistes* (Tomiyama 1936), *T. halonevum* Winterbottom 2000, *T. hayashii* Hagiwara & Winterbottom 2007, *T. imaii* Suzuki & Senou 2009, *T. kudoui* Suzuki & Senou 2008, *T. macrophthalmus* (Tomiyama 1936), *T. maiandros* Hoesle, Winterbottom & Reader 2011, *T. marinae* Winterbottom 2005, *T. matsunoi* Suzuki, Sakaue & Senou 2012, *T. milta* Winterbottom 2002, *T. naudei* Smith 1956, *T. nomurai* Suzuki & Senou 2007, *T. okinawae* (Aoyagi 1949), *T. sheppardi* Winterbottom 1984, *T. taylori* Lobel 1979, *T. winchi* Winterbottom 1984, *T. yanagitai* Suzuki & Senou 2007 and *T. yanoi* Suzuki & Senou 2008 (Suzuki *et al.* 2012).

In this paper, we describe a new species of *Trimma* collected from Iriomote-jima Island, Ryukyu Islands, Japan. It was first reported by Suzuki *et al.* (2004) as “*Trimma* sp. 9”.

Materials and Methods

Type specimens of the new species are deposited in Kanagawa Prefectural Museum of Natural History (KPM) and the Osaka Natural History Museum, Osaka (OMNH).

Methods of counting and measurements follow Winterbottom (1996) as modified by Suzuki & Senou (2007). Pectoral- and pelvic-fin ray branching, squamation, and trench and trough around orbit were described from preserved materials stained with a cyanine blue solution. The methods of Akihito (1984) were used in describing the pattern of the interdigitation of the dorsal-fin pterygiophores between the neural spines (“P–V”). The P–V and vertebrae counts were obtained from radiographs. Cephalic sensory papillae were observed on the holotype stained with cyanine blue, and terminology follows Suzuki *et al.* (2012) and Winterbottom (2011). Information about tooth morphology and gill-raker counts, and confirmation of squamation were obtained from a paratype stained with alizarin red.

Description of the color when fresh was based on digital images taken with a Nikon camera. Color descriptions when alive were based on underwater photographs in Suzuki *et al.* (2004), and the Image Database of Fishes in the Kanagawa Prefectural Museum of Natural History (KPM-NR). The names of colors follow the recommendations of the Japan Color Research Institute (1995). Measurements are given in Table 1. In the description, data for the holotype are given first, followed by data for the paratypes in parentheses where different.

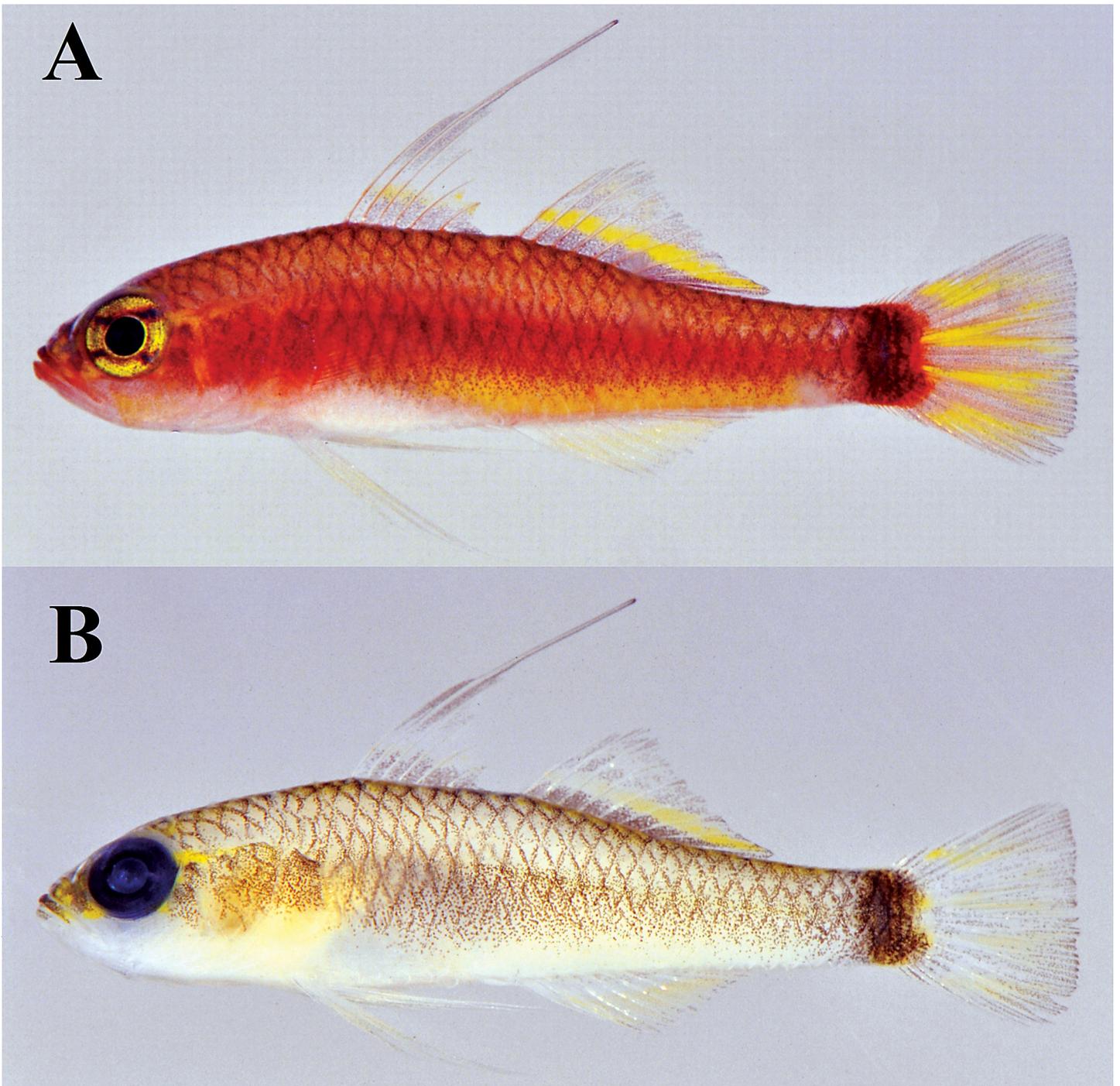


Figure 1. *Trimma yoshinoi*, holotype, OMNH-P 40816, Iriomote-jima Island, Ryukyu Islands, Japan. A: fresh specimen; B: alcohol preserved specimen (T. Suzuki).

***Trimma yoshinoi*, n. sp.**

New Japanese name: Ukibenhaze

Figures 1–4, Table 1.

Trimma sp. 9: Suzuki *et al.* 2004: 113 (underwater photographs, Iriomote-jima Island, Ryukyu Islands, Japan, 36 m depth, photo by K. Yano).

Holotype. OMNH-P 40816, male, 20.8 mm SL, Funauki Bay, Iriomote-jima Island, Ryukyu Islands, Japan, 36 m depth, K. Yano, 17 Aug. 1999.

Paratypes. OMNH-P 15598, male, 21.4 mm SL, stained; KPM-NI 38111 (ex. OMNH-P 40817), female, 21.1 mm SL; OMNH-P 40818, female, 19.5 mm SL; OMNH-P 40819, female, 18.4 mm SL; all with same collection data as holotype.

Photographic Records from Image Database of Fishes. KPM-NR 11432, Kume-jima Island, Ryukyu Islands, Japan, 60 m depth, Yusho Sakamoto, 24 June 1994; KPM-NR 33589 & 33809, Iriomote-jima Island, Ryukyu Islands, Japan, 35 m depth, K. Yano, 1999; KPM-NR 61726, Okinawa-jima, Ryukyu Islands, Japan, 40 m depth, Mitsuaki Takata, 9 June 2001; KPM-NR 64518, Kume-jima Island, Ryukyu Islands, Japan, 68 m depth, Hiroshi Kobayashi, 3 May 2002; KPM-NR 93353 & 93436, Iriomote-jima Island, Ryukyu Islands, Japan, Rika Ikoma, May 2004 & May 2006.

Diagnosis. *Trimma yoshinoi* differs from other described species of the genus in the following combination of characters: 10 predorsal scales; second spine of first dorsal fin elongated, filamentous, usually extending beyond base of last segmented ray of second dorsal fin when adpressed; 13–15 pectoral-fin rays; fifth pelvic-fin ray unbranched; cheek fully scaled; transverse lines of cephalic sensory papillae below eye; interorbital shallowly concave with median fleshy ridge, and bony width 90.4–99.0% of pupil diameter; ground color of head and body pale pink, a broad deep pink longitudinal stripe on side of body, and a large dark reddish brown blotch on end of midlateral caudal peduncle when fresh or alive.

TABLE 1
Proportional measurements of type specimens of *Trimma yoshinoi*
as percentages of the standard length

	holotype	paratypes			
	OMNH-P 40816 male	OMNH-P 15598 male	KPM-NI 38111 female	OMNH-P 40818 female	OMNH-P 40819 female
Standard length (mm)	20.8	21.4	21.1	19.5	18.4
Head length	30.4	28.5	28.9	30.3	30.5
Snout to first dorsal-fin origin	38.6	37.4	37.9	38.2	38.6
Snout to second dorsal-fin origin	55.4	56.1	56.8	56.4	57.1
Snout to anal-fin origin	55.4	56.1	56.8	55.8	57.8
Caudal peduncle length	27.5	28.5	27.4	28.2	28.3
Caudal peduncle depth	12.0	10.8	11.1	11.0	11.7
Snout length	5.8	5.4	5.9	5.9	6.0
Upper jaw length	10.8	10.8	10.2	10.3	11.0
Eye diameter	10.4	9.8	10.4	10.5	11.2
Pupil diameter	5.1	5.1	5.4	5.3	5.3
Longest spine of first dorsal-fin length (II)	39.8	42.6	36.4	31.3	broken
4th pelvic-fin ray length	29.9	29.0	29.8	29.7	29.4
5th pelvic-fin ray length	14.7	18.0	14.2	14.5	13.3
Bony interorbital width % of pupil diameter	99.0	94.5	90.4	92.2	96.9
Pelvic basal membrane length % of 5th pelvic-fin ray length	6.6	3.9	1.7	4.6	6.1

Description. Dorsal-fin rays VI-I, 8; anal-fin rays I, 8; pectoral-fin rays 14 (13 in single paratype, 15 in single paratype); pelvic-fin rays I, 5; segmented caudal-fin rays 9 + 8, branched caudal-fin rays 6 + 5; longitudinal scales 23; anterior transverse scales 8 (8.5 in two); posterior transverse scales 7 (7.5 in two, 8 in one); predorsal scales 10 (11 in one); P-V 3 /II II I I 0 / 9; vertebrae 10 + 16=26; gill rakers (4 + 14 in an alizarin red stained paratype only).

Second spine of first dorsal fin elongated and filamentous, longest, extending beyond base of last segmented ray of second dorsal fin when adpressed (reaching posteriorly to base of sixth segmented ray in one, broken in one); first dorsal fin separate from second dorsal fin. Middle six rays of pectoral fin branched (1–6 rays in four), reaching posteriorly to above line between base of first to second segmented ray of anal fin (spine in two, first segmented ray in two). First four rays of pelvic fin each with two terminal tips; fifth ray unbranched, 49.2% (45.4–48.8% in four paratypes, mean 47.2%) of fourth ray in length; fourth ray longest, reaching posteriorly to base of third segmented ray of anal fin when adpressed (second to third in four). No pelvic-fin frenum. Height of basal membrane between innermost pelvic-fin rays 6.6% (1.7–6.1% in four, mean 4.4%) of length of fifth ray.

Cheek and opercle with small cycloid scales (three and four horizontal rows of scales on cheek and opercle, respectively, confirmed on an alizarin red stained paratype). Pectoral fin base with small cycloid scales (three vertical rows of small cycloid scales confirmed on an alizarin red stained paratype). Breast with small cycloid scales; anterior part of belly with small cycloid scales; nape with large ctenoid scales, extending anteriorly to middle of interorbital; the other parts of body with large ctenoid scales (same condition, confirmed on an alizarin red stained paratype).

Gill opening extending anteriorly to below middle of pupil. Anterior nares with short tube, posterior nares opening pore-like with low raised rim, nasal sac slightly raised. Interorbital shallowly concave with median fleshy ridge and no postorbital trough or trench. Bony interorbital width 99.0% (90.4–96.9% in four, mean 93.5%) of pupil diameter. No dermal crest anterior to first dorsal fin.

Pattern of cephalic sensory papillae as shown in Fig. 2: papillae immediately below eye on cheek in six transverse rows, each row with two to three papillae except fifth row with 5, vertical rows incorporating elements of rows *a* (in part), *c*, and *cp*, the numbers (in parentheses) in each of remaining rows as follows: *a* (2), *b* (6), *d* (8), *d'* (9), *ea* (18), *ep* (15), *ia* (7), *ip* (11), *r* (5), *f* (6), *cs''* (4), *x* (4), *z* (6), *ot* (12), *oi* (4), *os* (3), *p* (7), *s* (1) and *u* (4).

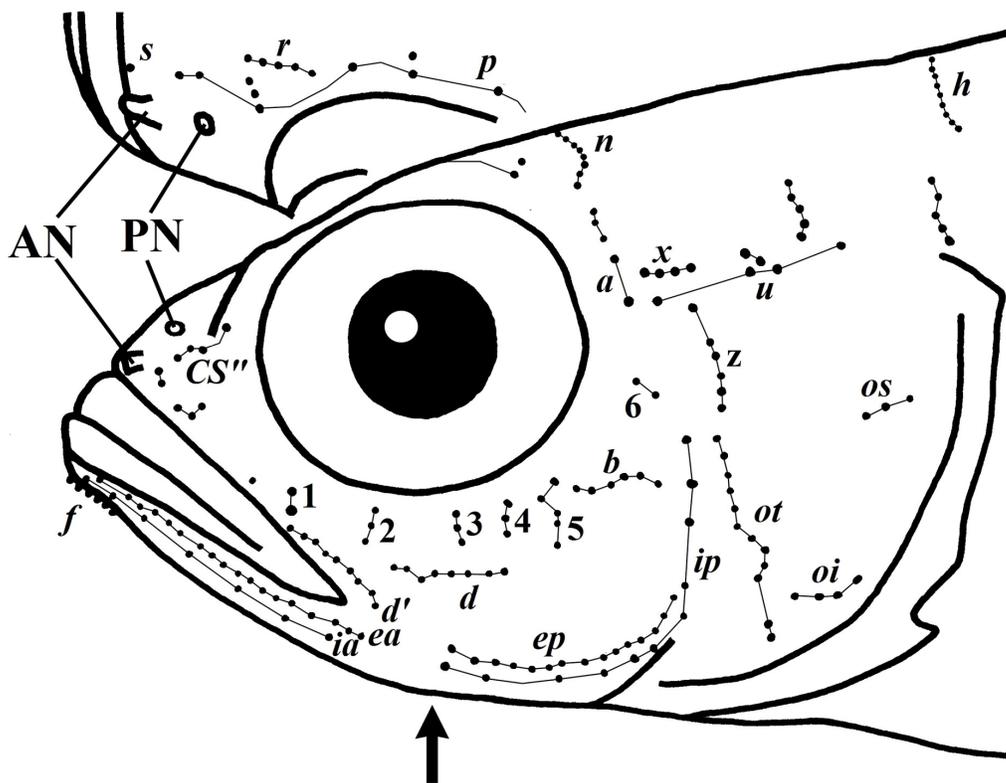


Figure 2. *Trimma yoshinoi*, holotype, OMNH-P 40816, the cephalic sensory papillae of head: dorsal view of snout (above); lateral view of head (below). Dots represent the sensory papillae. AN and PN indicate anterior and posterior nares, respectively. Arrow shows position of lower end of gill opening.

Inner curved conical teeth on both jaws. Upper jaw with outermost row of 27 large teeth, three irregular inner rows of small teeth, leading to posterior row of small teeth; anterior and outer teeth of inner rows larger than posterior and inner ones. Anterior part of lower jaw with outermost row of six large teeth, three irregular inner rows of small teeth; middle part with an inner row of eight medium-sized and spaced teeth, an outer row of small teeth. Posterior part of lower jaw with a row of small teeth.

Color of holotype when fresh. (Fig. 1A). Ground color of head and body pale pink. Dorsal side of head and body yellowish. Ventral side of head brownish white and belly white. A broad, pink longitudinal stripe from posterior margin of eye to middle of caudal peduncle, terminating at broad, dark reddish brown bar. Ventral side of tail with reddish yellow stripe. Scale pockets except ventral side of head and body with brown margins.

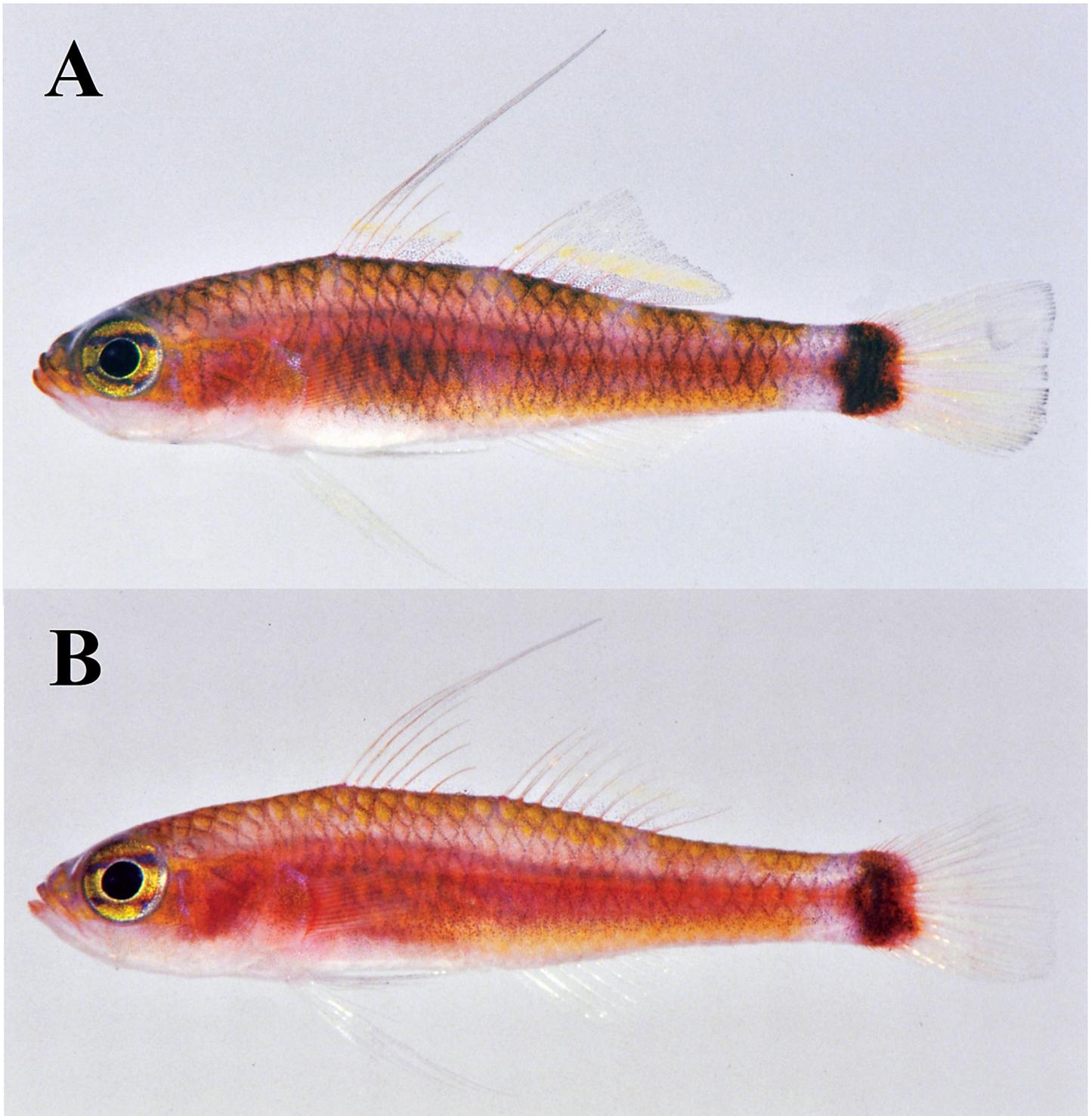


Figure 3. *Trimma yoshinoi*, paratypes, fresh specimens, Iriomote-jima Island, Ryukyu Islands, Japan. A: OMNH-P 15598, male, 21.4 mm SL; B: KPM-NI 38111, female, 21.1 mm SL (T. Suzuki).



Figure 4. *Trimma yoshinoi*, underwater photograph, approx. 30 mm TL, Funauki Bay, Iriomote-jima Island, Ryukyu Islands, Japan, 36 m depth (K. Yano).

Snout yellow. Upper part of preopercle with yellow-shaped mark. Iris bright yellow with two purple to bluish longitudinal stripes. Dorsal and caudal fins gray. A narrow, nearly longitudinal yellow stripe across middle of dorsal fins, ending posteriorly at distal tip of last dorsal-fin ray. First dorsal fin with broad, hyaline longitudinal stripe above yellow stripe. Caudal fin with four bright yellow longitudinal stripes. Anal fin with white basal stripe, proximal broad pale yellow stripe, and gray margin. Pectoral and pelvic fins hyaline. Pelvic fin with large pale yellow blotch.

Color of holotype in alcohol. (Fig. 1B). All pink, yellow, and blue colors almost faded. Head and body white. A broad, grayish brown longitudinal stripe from posterior margin of eye to middle of caudal peduncle. A broad, dark grayish brown bar at base of caudal fin. Scales except ventral side of head and body with grayish brown margin.

Color of paratypes when fresh. (Fig. 3). Similar color as holotype, except as follows: four to five whitish saddle-like vertical bands on dorsal side of body, the last one on caudal peduncle broad and reaching to ventral side of caudal peduncle.

Color when alive. (Fig. 4). Similar color when fresh, except as follows: dorsal side from snout to caudal peduncle greenish. A broad, deep red longitudinal stripe on body. A diffuse baby blue transverse band on caudal peduncle. A broad, grayish brown bar with orange margin at base of caudal fin.

Distribution. Iriomote-jima Island, Ryukyu Islands, Japan; also Okinawa-jima Island and Kume-jima Island, Ryukyu Islands, Japan based on the Image Database of Fishes from the Kanagawa Prefectural Museum of Natural History.

Etymology. The specific name, *yoshinoi*, refers to Tetsuo Yoshino, who is the former assistant professor of the University of the Ryukyus, Japan, and supervisor of the third author (HS) when HS studied at Yoshino's laboratory, in recognition of his extensive taxonomic research on the fishes of Japan.

Comparisons. Four species of *Trimma*, i.e. *Trimma yoshinoi*, n. sp., *T. nauagium* Allen 2015, *T. tevegae* Cohen & Davis 1969 and *T. xanthochrum* Winterbottom 2011, uniquely share transverse lines of cephalic sensory papillae below eye, interorbital shallowly concave with median fleshy ridge, and bony width 70–100% of pupil diameter (see Allen 2015, Winterbottom 2011, Winterbottom & Hoese 2015). However, *T. yoshinoi* differs from the other three in having: papillae immediately below eye on cheek in six transverse rows, each row with two to

three papillae except fifth row with five (vs. three to four papillae in a vertical row in *T. nauagium*; single or two papillae in a vertical row in *T. tevegae*); 10 predorsal scales (vs. 11–12 in *T. tevegae* and *T. nauagium*; 12–14 in *T. xanthochrum*); longitudinal scales 23 (vs. 25 in *T. nauagium*); elongated second spine of first dorsal fin usually extending beyond base of last segmented ray of second dorsal fin when adpressed (vs. second dorsal-fin spine and third ray in *T. tevegae*; second dorsal-fin spine and fifth ray in *T. nauagium* and *T. xanthochrum*); 13–15 pectoral-fin rays (vs. 16 in *T. nauagium*); middle pectoral-fin rays branched (vs. usually unbranched in *T. tevegae*); fifth pelvic-fin ray unbranched (vs. branched in *T. xanthochrum*); fifth ray 45.4–49.2% of fourth ray in length (vs. 55–64% in *T. nauagium*); height of basal membrane between innermost pelvic-fin rays 1.7–6.6% of length of fifth ray (vs. absent in *T. nauagium*; 8–17% in *T. xanthochrum*); eye with two stripes when fresh or alive (vs. no stripe in *T. nauagium*; a stripe on upper part of eye in *T. tevegae* and *T. xanthochrum*); no stripe just below the eye when fresh or alive (vs. a thin diffuse red stripe in *T. xanthochrum*); a large dark bar on end of midlateral caudal peduncle (vs. no bar in *T. nauagium*).

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