

## Two New Species of the Genus *Trimma* (Perciformes: Gobiidae) from Japan and Palau

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**Abstract.** Two new species of the gobiid fish genus *Trimma*, *T. imaii* and *T. caudipunctatum*, are described based on a specimen from Izu-oshima Island, the Izu Islands in the former and two specimens from Kumejima Island, the Ryukyu Islands and Ulong Island, the Belau Islands in the latter. *T. imaii* is distinguished from all congeneric species by the following combination of characters: seven predorsal scales; nine second dorsal-fin and 16 pectoral-fin rays; second spine of first dorsal fin elongate and filamentous; all pectoral-fin rays unbranched; fifth pelvic-fin ray unbranched; height of basal membrane between innermost pelvic-fin rays about 20% of length of fifth ray; no interorbital or postorbital trough; opercle lacking scales; ground color of head and body dull yellow; snout, interorbit, and upper and lower parts of eye dark violet when fresh and when alive. *T. caudipunctatum* is distinguished from all congeneric species by the following combination of characters: seven predorsal scales; nine second dorsal-fin rays; no elongate and filamentous spines of first dorsal fin; all pectoral-fin rays unbranched; fifth pelvic-fin ray unbranched, basal membrane absent; interorbital trough absent or shallow; opercle with two embedded cycloid scales dorsally; background color of head and body light reddish-yellow; snout, interorbit, and upper and lower parts of eye dark purplish blue; caudal fin vivid yellow with pale lavender polka dots when fresh and when alive.

**Key words:** *Trimma*, new species, Gobiidae, Japan, Palau

### Introduction

*Trimma* is an Indo-Pacific gobiid fish genus, comprising cryptic, tiny (less than 40 mm SL), colorful, tropical species found on coral and rocky reefs, usually at depths shallower than 80 m. According to Winterbottom & Southcott (2007), *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 spicules on the outer gill rakers of the first gill arch; fewer than 12 dorsal-

and anal-fin 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 90 species. Of these, 59 described species are currently recognized as valid (Hagiwara & Winterbottom, 2007; Suzuki & Senou, 2007, 2008; Winterbottom & Southcott, 2007; Winterbottom & Zur, 2007), while the others are still unnamed.

In this paper, we describe two new species of *Trimma*, each characterized by a blue- or violet-colored snout and interorbit, from Japan and Palau. One of these was first reported by Suzuki & Shibukawa (2004) as "*Trimma* sp. 15." The other one was recently collected from Izu-ohshima Island, the Izu Islands, Japan.

### Materials and methods

Institutional abbreviations follow Leviton *et al.* (1985), except for KPM (Kanagawa Prefectural Museum of Natural History, Japan).

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Methods of counting and measurements follow Suzuki & Senou (2008). Although fin spines in gobiid fishes are often called rays, "rays" of second dorsal and anal fins refer to segmented rays in this paper. Pectoral- and pelvic-fin ray branching, number and distribution of scales, cephalic sensory system and trough/trench around orbit were described from preserved material stained with a cyanine blue solution. The notation of pattern of interdigitation of the dorsal-fin proximal pterygiophores between the neural spines (P-V) follows Akihito (1984). Vertebrae were counted from radiographs. Where a paratype was available, information about tooth morphology and gill-raker counts was obtained from a paratype stained with alizarin red. Description of the color when fresh was based on color slides of the holotype of each species. Color descriptions when alive were based on the underwater photographs in the Image Database of Fishes in the Kanagawa Prefectural Museum of Natural History (KPM-NR) and/or Suzuki & Shibukawa (2004). The names of colors follow the recommendations of the Japan Color Research Institute

(1995). Color photographs are available from the PDF version of this paper: <http://nh.kanagawa-museum.jp/kenkyu/bulletin/index.html>. Proportional measurements are provided in Table 1.

***Trimma imaii* sp. nov.**

(New Japanese name: Murasakizukin-benihaze)

(Figs. 1-4)

**Holotype.** KPM-NI 4252, female, 17.6 mm SL, north of Izu-ohshima Island, the Izu Islands, Japan, N34° 47' 12", E139° 24' 32", 55 m depth, K. Imai, 24 Nov. 1997.

**Photograph Records from Image Database of Fishes.** North of Izu-ohshima Island, the Izu Islands, Japan: KPM-NR 89368, 53 m depth, H. Onuma, Oct. 2003; KPM-NR 89685, 53 m depth, H. Onuma, Sept. 2003; KPM-NR 89686, 50 m depth, H. Onuma, Sept. 2003.

**Diagnosis.** *Trimma imaii* differs from the other described species of the genus in the following combination of characters: seven predorsal scales; nine second dorsal-fin and 16 pectoral-fin rays; second spine of first dorsal fin elongate and filamentous; all pectoral-fin rays unbranched; fifth pelvic-fin ray unbranched; height of basal membrane between innermost pelvic-fin rays about 20% of length of fifth ray; no interorbital or postorbital trough; opercle lacking scales; ground color of head and body dull yellow; snout, interorbit, and upper and lower parts of eye dark violet when fresh and when alive.

**Description.** Dorsal fin VI-I, 9; anal-fin I, 8; pectoral fin 16; pelvic fin I, 5; segmented caudal-fin rays 9+8, branched caudal-fin rays 6+5; longitudinal scales 23; anterior transverse scales 8.5; posterior transverse scales 7.5; predorsal scales 7; P-V 3 / II II I I 0 / 9; vertebrae 10+16=26.

Second spine of first dorsal fin longest, slightly elongate and filamentous, reaching posteriorly to base of second ray of second dorsal fin when adpressed. All pectoral-fin rays unbranched; pectoral fin reaching posteriorly to above base of first anal-fin ray. First four pelvic-fin rays each with a sequential branch point; fifth ray unbranched, 56% of fourth ray in length; fourth ray

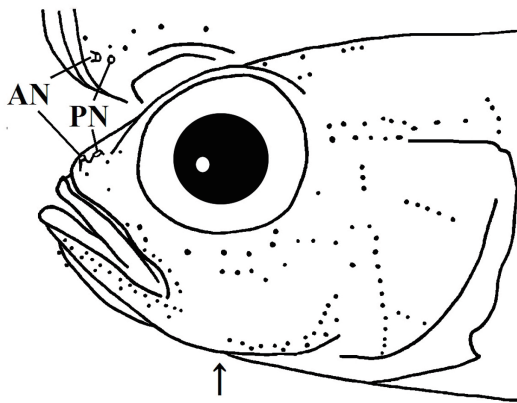


Fig. 1. The cephalic sensory system of *Trimma imaii*, KPM-NI 4252, holotype. Anterior region of dorsal (top left) and lateral views of head. The dots represent sensory papillae. AN and PN indicate anterior and posterior nares, respectively. The arrow shows position where the gill membrane attaches to isthmus.



Fig. 2. *Trimma imaii*, fresh specimen, KPM-NI 4252, female, holotype, 17.6 mm SL, north of Izu-ohshima Island, the Izu Islands, Japan, 55 m depth, photo by H. Senou.

longest, reaching posteriorly to base of first ray of anal fin when adpressed. No pelvic-fin fraenum. Basal membrane between innermost pelvic-fin rays about 20% of length of fifth ray.

Cheek and opercle without scales. Pectoral-fin base with large cycloid scales. Breast with both large and small cycloid scales. Anterior part of belly with small cycloid scales. Nape with large cycloid scales, extending anteriorly to orbit. Other parts of body with large ctenoid scales. Gill opening extending anteriorly to below middle of pupil. Anterior naris with a short tube, posterior naris with a well-developed raised rim. No interorbital or postorbital trough. Bony interorbital width 40% of pupil diameter. The cephalic sensory system is depicted in Figure 1.

**Color when fresh** (Fig. 2). Background color of head and trunk dull yellow. Tail bright yellow. Ventral sides of head and belly greyish white. Scale pockets with medium-gray margins except for those on belly and ventral surface of tail. Middle of body medium gray. Snout, interorbit, margin of eye, and upper and lower parts of eye dark violet. Lip and iris pale yellow. Dorsal fins with a light-gray basal stripe and a bright yellow, broad, longitudinal stripe midially. Distal one-quarter of dorsal fins hyaline. Basal one-half of anal fin light gray; remainder hyaline. Pectoral fin hyaline, pelvic-fin grayish white. Caudal fin bright yellow with a pale lavender stripe on upper and lower margin respectively.

**Color in alcohol.** Yellow, violet and lavender colors faded. Head and body pale yellow. Snout and interorbit medium gray. Scale pockets outlined with light yellowish-brown. Middle of body light yellowish-brown.

**Color when alive** (Figs. 3 & 4). Similar to fresh coloration,



Fig. 3. *Trimma imaii*, live, KPM-NR 89368, north of Izu-ohshima Island, the Izu Islands, Japan, 53m depth, photo by H. Onuma.



Fig. 4. *Trimma imaii*, live, KPM-NR 89686, north of Izu-ohshima Island, the Izu Islands, Japan, 50m depth, photo by H. Onuma.

except as follows: background color of head and body bright greenish yellow; middle of body light gray to grayish-brown; scales pockets on body (except belly) with greenish-gray margins; snout, interorbit, margin of eye, and upper and lower parts of eye strong blue; iris bright yellow; middle of caudal fin bright yellow without round blotches.

**Distribution.** Izu-ohshima Island of the Izu Islands, Japan.

**Etymology.** The specific name, *imaii*, honors Mr. Keisuke Imai, who provided the holotype of the new species.

**Remarks.** Two species of *Trimma*, *T. imaii* and *Trimma* sp. 15 *sensu* Suzuki & Shibukawa, 2004 (described below), uniquely share a blue- or violet-colored snout and interorbit, when fresh and when alive. *Trimma* sp. 15 differs from *T. imaii* in having: no elongated spine of the first dorsal fin (vs. second spine slightly or very elongated in the holotype and a live fish of *T. imaii*, see Figs. 2 & 4); basal membrane between innermost pelvic-fin rays absent (vs. present); 7 anterior and 7 posterior transverse scales (vs. 8.5 and 7.5 respectively); scales present on the opercle (vs. absent); caudal fin light yellow with pale lavender polka dots when fresh and when alive (vs. no polka dots on caudal fin).

*Trimma imaii* is similar to *T. milta* Winterbottom, 2002, which has 5-8 predorsal scales; 9-10, 7-8, and 16-18 rays of second dorsal-fin, anal-fin and pectoral-fin rays respectively; 22-24 longitudinal scales; 7-9.5 anterior and 6.5-7.5 posterior transverse scales; an unbranched fifth ray of the pelvic fin; length of fifth pelvic-fin ray 42-53% length of fourth ray; no scales on the cheek; scales on the nape and pectoral-fin base; and no postorbital trough. But *T. imaii* differs from *T. milta*, in having: an elongated second spine of the first dorsal fin (vs. not elongated in *T. milta*); unbranched pectoral-fin rays (vs. middle rays branched); no scales on the opercle (vs. present); and a violet-colored snout and interorbital region (vs. brown).

#### *Trimma caudipunctatum* sp. nov.

(New Japanese name: Daitoku-benihaze)

(Figs. 5-8)

*Trimma* sp. 15: Suzuki & Shibukawa, 2004: 117 (underwater photograph, Okinawa-jima Island, Okinawa Islands, the Ryukyu Islands, Japan, 53 m depth, photo by M. Takata).

**Holotype.** KPM-NI 13301, male, 20.9 mm SL, Tonbarazashi, Kume-jima Island, Okinawa Islands, the Ryukyu Islands, Japan, N26° 21' 9", E126° 50' 32", 70 m depth, S. Ogawa, 12 Apr. 2004.

**Paratype.** OMNH-P 32317, female, 17.3 mm SL, Ulong Island, the Belau Islands, N07° 18' 21.00", E134° 13' 43.56", 67 m depth, J. Sakaue, 31 May 2007.

**Photograph Records from Image Database of Fishes.** Kume-jima Island, Okinawa Islands, the Ryukyu Islands, Japan: KPM-NR 16409, 65m depth, Y. Sakamoto, 17 Jun. 1997; KPM-NR 38591, 55m depth, T. Kawamoto, Jul. 1998; KPM-NR 39667, T. Kawamoto, 2000. North of Izu-ohshima Island, the Izu Islands, Japan: KPM-NR 35985, 40 m depth, O. Hoshino, 2000. Izu Oceanic Park, E. of Izu Pen, Sagami Bay, Japan: KPM-NR 66322, 40m depth, S. Yamamoto, 17 Nov. 2001. Tsutomezaki,



Table 1. Measurements (% SL) for *Trimma imaii* and *T. caudipunctatum*

	<i>T. imaii</i>	<i>T. caudipunctatum</i>	
	Holotype KPM-NI 4252 female (18.1mm SL)	Holotype KPM-NI 13301 male (20.9mm SL)	Paratype OMNH-P 32317 female (17.3mm SL)
Head length	30.1	31.1	28.9
Snout to first dorsal-fin origin	38.6	35.9	38.2
Snout to second dorsal-fin origin	56.3	54.1	54.3
Snout to anal-fin origin	59.1	56.9	60.1
Caudal peduncle length	27.8	27.3	28.3
Caudal peduncle depth	13.1	13.9	12.1
Longest first dorsal spine length	19.9	19.1	17.3
Eye diameter	11.4	10.5	11.6
Snout length	5.1	5.7	5.8
Upper jaw length	10.8	8.6	10.4
Interorbital width	2.3	1.9	1.7
Pupil diameter	5.7	5.3	5.8
4th pelvic fin ray length	24.4	27.8	30.6
5th pelvic fin ray length	13.6	17.7	16.2

Kashiwa-jima Island, Shikoku, Japan: KPM-NR 80318, 50 m depth, T. Fujita, 16 Oct. 2002. Seragaki, Okinawa-jima Island, Okinawa Islands, the Ryukyu Islands, Japan: KPM-NR 80589, 50 m depth, M. Takata, 7 Jul. 2002; KPM-NR 80806, 50 m depth, Y. Miyamoto, 7 Jul. 2002.

**Diagnosis.** *Trimma caudipunctatum* differs from the other described species of the genus in the following combination of characters: seven predorsal scales; nine second dorsal-fin rays; no elongate and filamentous spines of first dorsal fin; all pectoral-fin rays unbranched; fifth pelvic-fin ray unbranched, basal membrane absent; interorbital trough absent or shallow; opercle with two embedded cycloid scales dorsally; background color of head and body light reddish-yellow; snout, interorbit, and upper and lower parts of eye dark purplish blue; caudal fin vivid yellow with pale lavender polka dots when fresh and when alive.

**Description.** In the following description, data for the holotype are given first, followed by the data for the paratype in parentheses where different.

Dorsal fin VI-I, 9; anal fin I, 8 (I, 9); pectoral fin 17 (16); pelvic fin I, 5; segmented caudal-fin rays 8+7 (9+8); branched caudal-fin rays 6+5 (7+5); longitudinal scales 23; anterior transverse scales 7; posterior transverse scales 7; predorsal scales 7; gill rakers (2+12, stained paratype only); P-V 3 / II II I I 0 / 9; vertebrae 10+16=26.

Second spine of first dorsal fin longest but not elongate and filamentous, reaching posteriorly to second-dorsal fin origin when adpressed. Pectoral-fin rays unbranched; fin reaching posteriorly to above base of second anal-fin ray (to anus). First four rays of pelvic fin each with a sequential branch point; fifth ray unbranched and 64% (53%) of fourth ray in length; fourth ray longest, reaching posteriorly to base of fourth ray of anal fin when adpressed (base of second ray). No pelvic fraenum and basal membrane.

Cheek without scales. Opercle with two embedded cycloid scales

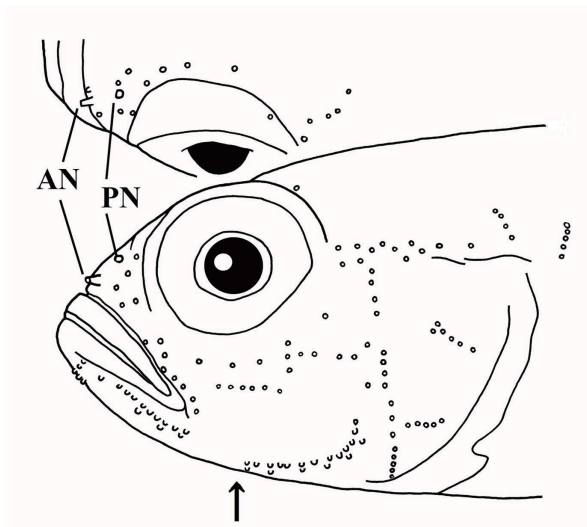


Fig. 5. The cephalic sensory system of *Trimma caudipunctatum*, KPM-NI 13301, holotype. Anterior region of dorsal (top left) and lateral views of head. The dots represent sensory papillae. AN and PN indicate anterior and posterior nares, respectively. The arrow shows where the gill membrane attaches to the isthmus.

dorsally. Pectoral-fin base, breast and anterior belly with small cycloid scales. Nape with ctenoid scales, extending anteriorly to orbit. Remainder of body with large ctenoid scales. Gill opening extending anteroventrally to below middle of pupil. Anterior naris with a short tube, posterior nasal opening a simple pore (with low rim). Interorbital trough shallow (absent), postorbital trough absent. Bony interorbital width 36% of pupil diameter (30%). The cephalic sensory system is depicted in Figure 5.

Inwardly curved conical teeth in both jaws. Upper jaw with outermost row of eight medium-sized, slightly spaced teeth; two irregular inner rows of small teeth, grading to single posterior row of small teeth; an enlarged tooth on anteriormost and innermost



Fig. 6. *Trimma caudipunctatum*, fresh specimen, KPM-NI 13301, male, holotype, 20.9 mm SL, Kume-jima Island, Okinawa Islands, the Ryukyu Islands, Japan, 70 m depth, photo by H. Senou.



Fig. 7. *Trimma caudipunctatum*, live, KPM-NR 80806, Seragaki, Okinawa-jima Island, Okinawa Islands, the Ryukyu Islands, Japan, 50m depth, photo by Y. Miyamoto.



Fig. 8. *Trimma caudipunctatum*, live, KPM-NR 66322, Tsutomezaki, Kashiwa-jima Island, Shikoku, Japan, 40 m depth, photo by S. Yamamoto.

part of upper jaw. Lower jaw with outermost row of four enlarged, spaced teeth; two irregular inner rows of small teeth, grading to single posterior row of small teeth; a single innermost row of medium-sized, slightly spaced teeth.

**Color when fresh** (Fig. 6). Background color of head and body light reddish-yellow. Ventral sides of head and body pale yellow. Scale pockets with grayish brown margins except for those on belly and ventral surface of tail. Iris vivid yellow. Snout, interorbit, and upper and lower parts of eye dark purplish blue. Dorsal fins light gray with a vivid yellow basal stripe. Second dorsal fin with a vivid yellow, broad, longitudinal medial stripe. Caudal fin vivid yellow with pale lavender polka dots and a broad, light gray margin. Anal and pelvic fins bluish white. Pectoral fin hyaline.

**Color in alcohol.** Yellow, blue and lavender colors faded. Head and body pale yellow. Dorsal sides of head and body brownish. Snout and interorbit medium gray. Scale pockets outlined with light yellowish brown except for those on belly and ventral surface of tail.

**Color when alive** (Figs. 7 & 8). Similar to fresh coloration

except as follows: snout, interorbit, and lower parts of eye dark soft violet; upper part of eye strong blue; anal and pelvic fins hyaline; caudal fin with a broad, pale lavender margin.

**Distribution.** Izu-ohshima Island, the Izu Islands; Sagami Bay; Kashiwa-jima Island, Shikoku; Okinawa-jima Island, Okinawa Islands, the Ryukyu Islands; Kume-jima Island, Okinawa Islands, the Ryukyu Islands, Japan; west reef, Ulong Island, the Belau Islands, Palau.

**Etymology.** The specific name is a combination of the Latin *cauda* meaning “tail,” and *punctatum* meaning “spot,” in allusion to the distinctive polka dots on caudal fin that characterizes the new species.

**Remarks.** *Trimma caudipunctatum* differs from all other congeners in having the pale lavender polka dots on caudal fin when fresh and when alive.

*Trimma caudipunctatum* is similar to *T. milta*, which has 5-8 predorsal scales; 9-10, 7-8 and 16-18 second dorsal-fin, anal-fin and pectoral-fin rays respectively; 22-24 longitudinal scales; 7-9.5 anterior and 6.5-7.5 posterior transverse scales; no elongate spines of first dorsal fin; an unbranched fifth ray of the pelvic

fin; length of fifth pelvic-fin ray 42-53% of fourth ray; no scales on the cheek; scales on the opercle, nape and pectoral-fin base; and no postorbital trough. But *T. caudipunctatum* differs from *T. milta*, in having: all pectoral-fin rays unbranched (vs. middle rays branched in *T. milta*); basal membrane between innermost pelvic-fin rays absent (vs. present); blue-colored snout and interorbital region when fresh and when alive (vs. brown); caudal fin light yellow with pale lavender polka dots when fresh and when alive (vs. no polka dots on caudal fin, see Winterbottom, 2002).

**Comparative materials:** *Trimma milta*: ROM 59816, 34 specimens (7.4-19.5 mm SL), paratypes of *T. milta*, Moorea, Society Island, 12-18 m depth, R. Winterbottom & R. Mooi, 5 Dec. 1989; BPBM 38623, 18.7 mm SL, Oahu, Hawaiian Islands, 23 m depth, R. R. Holcom, 14 Aug. 1999; BPBM 38706, 17.0 mm SL, Oahu, Hawaiian Islands, 22m depth, R. R. Holcom, 26 July 1997.

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#### 摘 要

Suzuki, T. & H. Senou, 2009. Two New Species of the Genus *Trimma* (Perciformes: Gobiidae) from Japan and Palau. *Bull. Kanagawa prefect. Mus. (Nat. Hist.)*, (38): 107-112. (鈴木寿之・瀬能 宏, 2009. 日本およびパラオで採集されたハゼ科ベニハゼ属の2新種. 神奈川県立博物館研究報告 (自然科学), (38): 107-112.)

吻と両眼間が青系色を呈したハゼ科ベニハゼ属の2新種: *Trimma imaii* ムラサキズキンベニハゼ (新称) と *Trimma caudipunctatum* ダイトクベニハゼ (新称) を記載した。*Trimma imaii* は伊豆大島から採集された体長 17.6 mm の個体に基づいて記載され、次のような特徴を持つことで同属他種と区別できる: 背鰭前方鱗数 7; 第2背鰭 1 棘 9 軟条; 胸鰭 16 軟条; 第1背鰭第2棘は糸状に伸長する; 全ての胸鰭軟条は不分枝; 腹鰭第5軟条は不分枝, 腹鰭間の癒合膜の高さは第5軟条の約 20%; 両眼間と眼の後方に溝はない; 鰓蓋部は無鱗; 生時および生鮮時、頭と体の地色はにぶい黄で、吻、両眼間、眼の上下縁は暗い青紫を呈する。*Trimma caudipunctatum* は琉球列島久米島とパラオ諸島ウーロン島から採集された体長 17.3 mm と 20.9 mm の2個体に基づいて記載され、次のような特徴を持つことで同属他種と区別できる: 背鰭前方鱗数 7; 第2背鰭 1 棘 9 軟条; 第1背鰭第2棘は伸長しない; 全ての胸鰭軟条は不分枝; 腹鰭第5軟条は不分枝、腹鰭間の癒合膜はない; 両眼間の溝は浅い; 主鰓蓋部上部の皮下に2小円鱗をもつ; 生時および生鮮時、頭と体の地色はあさい赤みの黄で、吻、両眼間、眼の上下縁は暗い紫みの青を呈し、尾鰭はあさい黄で淡藤色の水玉模様を持つ。

なお、上記2種のカラー写真は本報告の PDF 版 (<http://nh.kanagawa-museum.jp/kenkyu/bulletin/index.html>) を参照。

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