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A new species of *Trimma* (Teleostei: Gobiidae) from the northwestern tropical Pacific Ocean

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Abstract

A new species of *Trimma* is described from Tabuaeran and Kirimati Atolls, Kiribati (formerly known as Fanning Island and Christmas Island in the Line Islands, respectively). *Trimma longispinum* is characterized by a scaled predorsal midline, the fifth pelvic-fin ray with one dichotomous branch point, 6–9 branched pectoral-fin rays, the bony interorbital 30–42% pupil width with the posterolateral trench not reaching papilla *p* 6, no opercular scales, and 8 or 9 anal-fin rays. It has 6 papillae in cheek row *c*, an elongate second spine of the first dorsal fin (to the middle of the second dorsal fin or farther posteriorly when abducted), and a color pattern with red to yellow saddles adjacent to the dorsum and on the anal fin and across the caudal peduncle. The species is also present off Sand Island, Palmyra Atoll about 370 km to the north-west of Kiribati, as well as possibly at the Marshall Islands (Eniwetok Atoll), and Guam (Mariana Islands).

Key words: taxonomy, ichthyology, pygmygobies, coral-reef fishes, gobies, Kiribati, northwestern Pacific plate

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Introduction

Trimma Jordan & Seale, 1906 (type species: *T. caesiura* Jordan & Seale, 1906 by original designation and also monotypic) currently contains 110 valid described species of small (usually <30 mm SL), often colorful gobiids, primarily associated with Indo-Pacific coral reefs (Winterbottom 2019, Winterbottom & Pyle 2022). Members of the genus may be recognized by the lack of cephalic sensory-canal pores, a much reduced cephalic sensory papillae (free neuromasts) pattern, a wide gill opening extending anteriorly to below the vertical limb of the preopercle or, more usually, anterior to this, a lack of spicules (odontoids) 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 (Winterbottom 2019).

Winterbottom (2011, citing unpublished data) estimated that there were, at that time, about 35 known but currently undescribed species in the genus, for a total count in the vicinity of 110 species. However, recent research involving the CO1 gene suggested that there may be a plethora of cryptic species in the genus that could double this number (Winterbottom et al. 2014, 2020), depending at least in part on whether one accepts a >2% difference in the CO1 gene as representative of specific differentiation in these fishes, and on whether any correlated morphological and/or colour characters can be found. The latter study (2020), based on 849 samples of 87 of the then 107 described valid species, predicted some 192 haplogroups in the genus. Unfortunately, our morphological studies of the haplogroups listed in that paper under a single species name are too limited to be able to distinguish genovariants from species (see Victor 2015:84). We note that species that appear to be identical in the field often prove to be distinct species when detailed forms of evidence are applied, and/or they may have two or more COI haplogroups that often occur relatively close to each other geographically.

The first species currently recognized as being attributable to *Trimma* was *Gobius townsendi* Boulenger, 1897, described from the Mekran Coast of Pakistan. However, the name he used is a junior subjective homonym of *Gobius townsendi* Eigenmann & Eigenmann, 1889, from San Diego, California (which itself proved a junior synonym of *Gillichthys mirabilis*). The name was not replaced until 1994 (as *Trimma winterbottomi* Randall & Downing). The first available name, *Trimma caesiura*, was described in 1906 by Jordan & Evermann, and this species is the type of the genus. Only 17 species in the genus had been described by 1983. In 1984, Winterbottom described 7 new species resulting from his expedition to the Chagos Archipelago. Seven new species were described during the next 15 years. Things then picked up dramatically, with 33 new species described between 2000–2009, and 42 new species described between 2010–2020. A further 5 species have been added as of the end of 2022.

Materials and Methods

Methods of gathering data and the format of the descriptions follow Winterbottom (2016, and references cited therein). The sequence of characters presented in the Abstract and Diagnosis follows the sequence of cascading characters from couplet 1 onwards in the key to the species of *Trimma* (Winterbottom 2019). Naming of the rows of cephalic sensory papillae follows Winterbottom (2011), as modified by Winterbottom et al. (2015). Lengths given are Standard Length (SL) in millimeters; values for the holotype are in bold and the mean and number of specimens from which data were recorded (if less than 20) are given in parentheses where appropriate. Locality data are given in decimal degrees. Most specimens have damaged/broken fin rays, and thus the counts, length of rays, and fin-ray branching patterns are based on a variable number of specimens. Description of the teeth is based on BPBM 40322 from Kirimati, which is a single non-type specimen that is partly desiccated (making observation of the teeth much easier than in un-dessicated specimens). Counts and measurements were input directly into an Excel file with Mitutoyo digital calipers using WinWedge 3.01™ software. Photographs of the head papillae were produced from multiple digital images taken with a Canon EOS Rebel XS camera attached to a Zeiss SV-12 dissecting microscope using Zeiss AxioVision 4.8™ software and automatic increments. The image stack was then collated into a single image using Helicon Focus 5.1™ (HeliconSoft) and edited in Adobe LightRoom 4™ and Adobe PhotoShop CS6™.

Trimma longispinum, n. sp.

Long-spined Pygmygoby

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Figures 1 & 2

No published names refer to this species, although it has informally been referred to as *Trimma* RW sp 54.

Holotype. BPBM 41799, 24.8 mm SL male, Kiribati, Tabuaeran Atoll (old names are Line Island & Fanning Island), 3.875°, -159.319°, coral reef near middle of lagoon, 6–7.5 m, J. & H. Randall, J. McVey, B. Jennions & D. Banner, 29 October 1968

Paratypes: BPBM 14094, 17 (16.3–24.7 mm SL), collected with holotype; ROM 110165, 4 (20.8–25.2 mm SL), collected with holotype.

Non-type material. Kiribati: BPBM 7792, 2 (17.1–18.6 mm SL), Tabuaeran Atoll, 3.875°, -159.319°, coral reef near center of lagoon, 6–7.5 m, rotenone, J.E. Randall, J. McVey, W. Hashimoto & B. Jennions, 17 October 1960; BPBM 28074, 21.5 mm SL, Tabuaeran Atoll, 3.84°, -159.36°, about 1.6 km SSE of entrance to English Harbour, ocean reef slope, sand and rubble, 36.5 m, rotenone, J.E. Randall & J.L. Earle, 4 April 1981; BPBM 31920, 4 (12.1–17.2 mm SL), Kirimati Atoll, 1.98°, -157.50°, NW side of atoll off North London Resettlement Area, isolated reef, cave, 31 m, rotenone, J.E. Randall & J.B. Culp, 2 August 1987; BPBM 40322, 18.0 mm SL, Kirimati Atoll, 2.02°, - 157.51°, off New Village, rubble patch reef at crest of deep drop-off, 70 m, rotenone, J.E. Randall & J.L. Earle, 28 July 2005. **United States Minor Outlying Islands:** CAS 59880, 27.2 mm SL, Palmyra Atoll, outer reef 0.4 km SE of center of Sand Island, 5.8729°, -162.1035°, 0.6–6.1 m, E.S. Herald et al., 17 August 1951. **Possible record: Mariana Islands:** BPBM 32788, 15.9 mm SL, Guam, south of Uruno Point (about 16 kilometers NE of Agana), 13.62°, 144.83°, reef edge and sand, many Halimeda fragments, 18–27 m, rotenone, J.E. Randall and H. Kami, 27 June 1968. **Possible record: Marshall Islands:** BPBM 12905, 15.3 mm SL, Enewetok Atoll, outside reef off Leroy (Biker, or Rigili) islet, 11.45°, 162.09°, entrance to cave, 43 m, rotenone, J.E. Randall, 7 April 1972.

Diagnosis. A species of *Trimma* with a scaled predorsal midline, an elongated second spine of first dorsal fin (to middle of second dorsal fin or farther when abducted), fifth pelvic-fin ray with one dichotomous branch point, 6–9 branched pectoral-fin rays, 8 or 9 anal-fin rays, bony interorbital 30–42% pupil width with posterolateral trench not reaching papilla *p* 6, no opercular scales (1 with 1), and cheek row *c* with 6 papillae. Body pale pink to off-white when freshly collected, scale pockets outlined with chromatophores, about 7 red to yellow saddles over dorsum with ventral counterparts along anal-fin base and onto caudal peduncle; head and body pale straw-colored in preservative.

Description. (based on holotype and up to 19 paratypes from same lot as holotype) Dorsal-fin elements VI+I,9, second spine of first dorsal fin reaching to base of seventh ray of second dorsal fin up to third scale beyond end of fin; third spine of first dorsal fin reaching to base of spine of second dorsal fin up to first scale beyond end of fin; first ray of second dorsal fin broken in most, two with ray unbranched, one with a first branched ray, posterior element of last ray unbranched, fin reaches posteriorly 49–64% (n=3) of distance between base of last ray and first exposed dorsal procurrent caudal-fin ray; anal-fin elements I,9, first ray (and second ray in one) as well as posterior element of last ray unbranched (n=5), fin reaching posteriorly 61–70% (n=2) of distance between base of last ray and first exposed ventral procurrent caudal-fin ray; pectoral fin 18–**19**–20 (18.6), with **4**–6 dorsal and 4–**6**–8 unbranched and 6–**9**–10 branched rays in middle of fin, fin reaching posterior to vertical above urogenital papilla and base of anal-fin spine; caudal fin with three dorsal and three ventral segmented unbranched rays and 6 dorsal and 5 ventral segmented branched rays (n=2); pelvic fin I,5, fifth ray with one dichotomous branch point for a total of two branch tips, and 50–60% (54.1%, 6) length of fourth ray, which reaches posteriorly to about

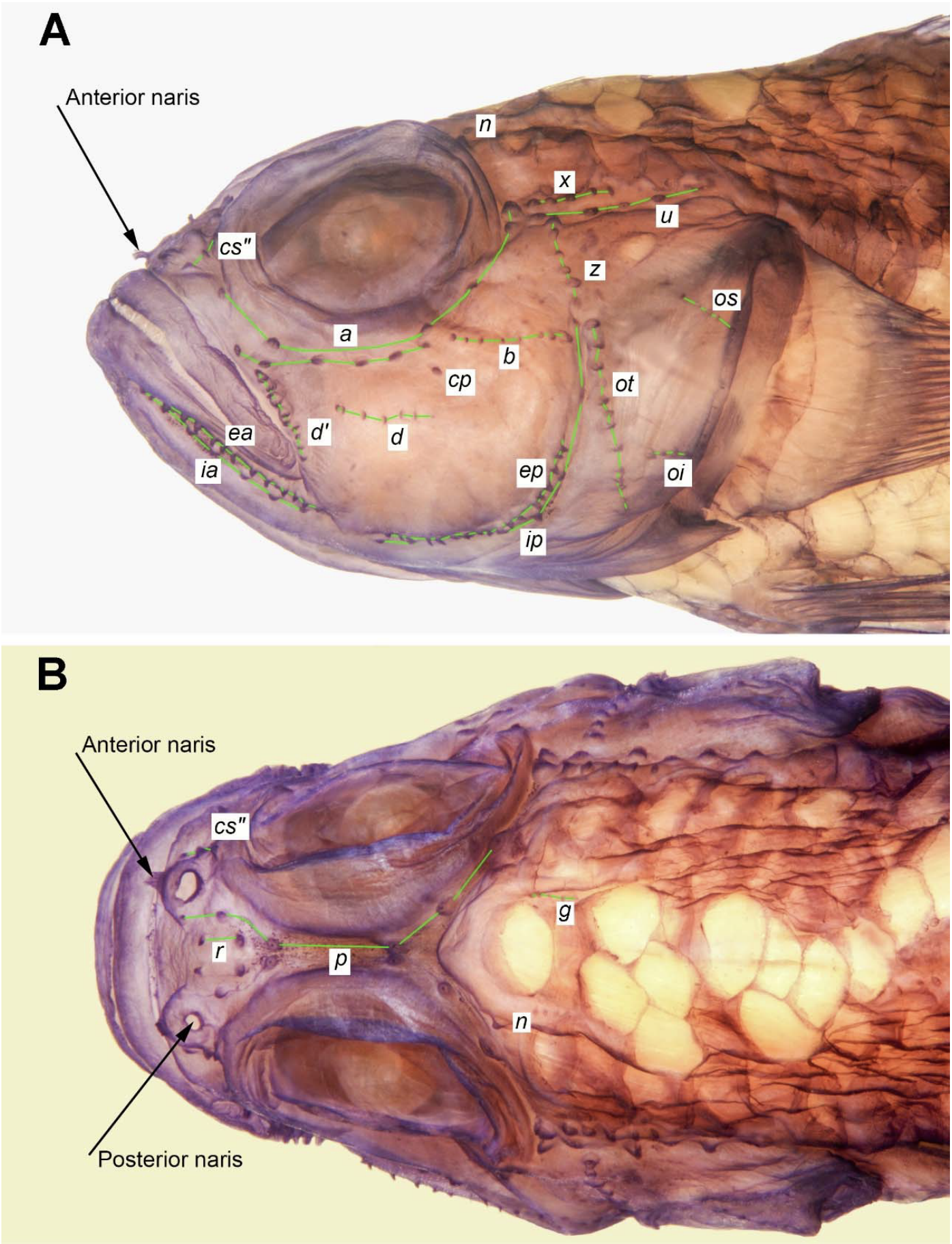

Figure 1. *Trimma longispinum*, holotype, 24.8 mm SL male, BPBM 41799. Left lateral (A) and dorsal (B) views of head to show head papillae, specimen stained with cyanine blue. Papillae in any given row connected by a thin green line (photo and image collation: R. Winterbottom).

base of anal-fin spine up to base of third anal-fin ray, pelvic-fin rays 1–4 with one sequential branch point; basal membrane present as a fold across midline; no fraenum visible. Caudal fin with 3 dorsal and 3 ventral segmented unbranched rays, and 6 dorsal and 5 ventral segmented branched rays (n=2). Abdominal/caudal vertebral transition type unknown.

Scales (many scale counts based primarily on scale pockets) in mid-lateral series 23 (18), anterior transverse scales **8** or 9 (8.3, 18), posterior transverse scales **7** or 8 (7.3, 18), cheek and opercle scaleless except for a single small cycloid scale on left side of middorsal part of opercle in holotype (Fig. 1A); predorsal midline crossed by 7–**8**–9 (8.0, 19) irregular scale rows with first scale apparently a little enlarged, anteriormost extent of scales to vertical with posterior part of eye just behind pupil, three vertical rows of cycloid scales on pectoral-fin base with 1 or **2** in first, **3**–5 in second, and **4**–6 scales in third row (from anterior to posterior, n=12); cycloid scales in midline anterior to pelvic-fin base 6 or **7** (6.6, 16); ctenoid scales on most of head and body, but cycloid in area between pelvic-fin spine and ventral margin of pectoral-fin base, anteriormost row of body scales beneath axil of pectoral-fin base, immediately lateral to bases of paired fins and anterior few rows of scales in midline of belly; circumpeduncular scales 12 (9), scale rows in midline between base of last anal-fin ray and first ventral procurrent caudal-fin ray 8–**9** (8.8, 9).

Upper jaw with outer row of about 12 curved enlarged canines separated by gaps about equal to tooth length, teeth decreasing in size and size of gap posteriorly to end at bend of premaxilla; about three inner rows of small conical teeth at symphysis with innermost row twice size of other inner teeth and decreasing in size posterolaterally until same size as other inner teeth at bend of premaxilla, number of rows decreasing posteriorly to one at end of gape. Lower jaw with row of about 6 enlarged teeth, as for upper jaw, reaching to bend of dentary; about three inner rows of small, conical, straight teeth at symphysis, innermost row three times size of other inner teeth at symphysis but decreasing in size posteriorly to half size of other inner rows, number of inner rows decreasing until only innermost row remains at coronoid process.

Tongue sharply to bluntly rounded. Gill opening extending anteroventrally to below anterior mid-pupil; gill rakers 3–**4**–5+**14**–16 =**18**–20 (4.1+15.2=19.3, 19). Anterior naris in short tube just reaching anteriorly to above upper lip, posterior opening pore-like with raised rim, separated from bony front of orbit by twice pore diameter; nasal sac raised and on anterior half of snout. Bony interorbital width 30–**37**–42% (36.3, 11) pupil diameter; moderate U-shaped interorbital trench with no median raised fleshy ridge; postorbital groove narrow with vertical sides, extending from papilla 4 becoming shallower as extends more laterally until disappears at papilla 5 of row p (Fig. 1B); epaxialis reaching anteriorly in midline to vertical above posterior margin of eye; no dermal ridge in midline of nape extending anteriorly from origin of first dorsal fin. Caudal-peduncle depth as percentage of caudal-peduncle length 41–**44**–52 (44.3, 11) Head length as percentage of SL 28–**31** (29.8, 11); as percentage of head length, horizontal eye diameter **31**–38 (35.4, 11); snout length 22–**24**–26 (24.1, 11); cheek depth **24**–28 (26.2, 11). Cephalic sensory papillae as in Fig. 1. Number of papillae in each row: *a*=6; *b*=5–**8**–9 (6.6); *c*=6; *cp*=1; *d*=5–**7**–9 (6.8); *d′*=5–**11** (6.8); *e-anterior*=10–**13**–16 (13.2); *e-posterior*=11–**18** (14.3); *i-anterior*=8–**9**–10 (8.8); *i-posterior*=7–**8**–9 (8.0); *p*=6; *r*=2; *f*=**3**–4 (3.1); *cs″*=3; *g*=4–**5**–7 (5.9, 15); *n*=1; *x*=**5**–8 (6.1); *u*=5; *z*=4–**5**–6 (5.2); *ot*=11–**13**–15 (12.7); *os*=**5**–7 (5.6); *oi*=3–**4**–5 (4.0).

Color pattern of freshly collected fish. (Fig. 2; based on three images taken by J.E. Randall). Color pattern rather variable: background color (for specimen in Fig. 2A) white to light grey, with scale pockets lightly outlined with reddish-brown chromatophores; head with overall pinkish-red wash; dorsum with 9 reddish saddles about two scales in width, first two on nape, two below first dorsal fin (at third to fourth spine bases and just posterior to sixth spine), two below base of second dorsal fin (at base of first to second and fifth to seventh fin-ray bases) and three saddles on peduncle (just posterior to last dorsal-fin ray, at middle of peduncle length, and at bases of anterior procurrent caudal-fin rays); row of 5 similar spots along ventrum below saddles (first indistinct and faint). Iris red with slightly slanted dark line across top of pupil, and a small dark spot at 4 o'clock position near outer edge. Dorsal, anal, and pectoral-fin rays reddish, pelvic fin apparently hyaline.

Background color (for specimen in Fig. 2B) of body pale and of head reddish, saddles along midlines more clearly defined, posteriormost yellow (rather than red) with a discrete, small, yellow spot over distal margin of hypurals just below midline; head with a chevron-shaped yellow line up along posterior margin of preopercle and bending posterodorsally along mid-region of opercle. Iris with slanted yellow line across dorsal margin of pupil

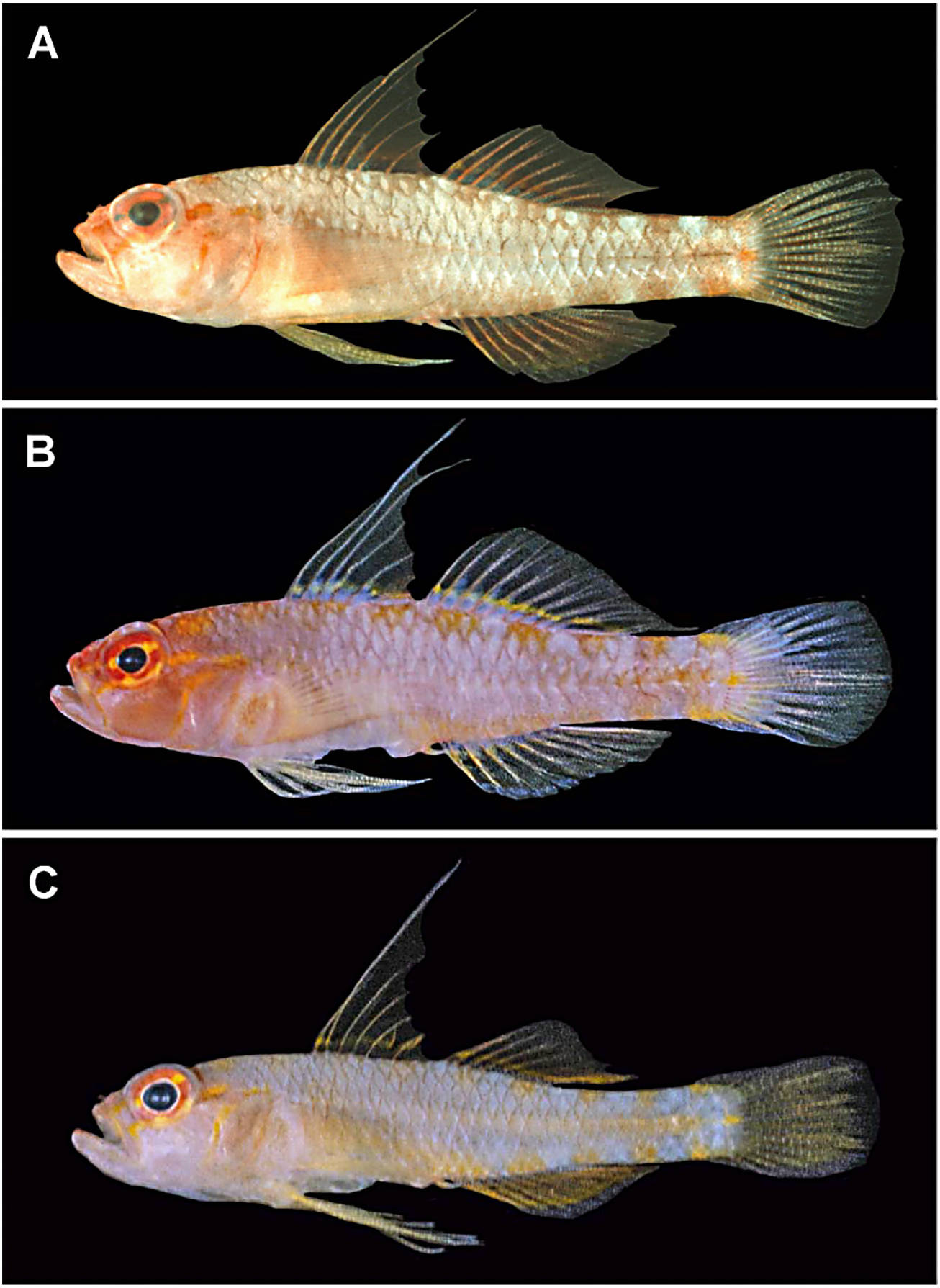

Figure 2. *Trimma longispinum*, freshly collected paratypes. A: BPBM 7792, 21.4 mm SL male, Kiribati, Tabuaeran Atoll; B: BPBM 28074, 22.2 mm SL male, Kiribati, Tabuaeran Atoll; C: BPBM 31920, 17.3 mm SL male, Kiribati, Kirimati Atoll (all J.E. Randall).

and similar line along ventral margin, both continuing both anteriorly and posteriorly. A line of yellow spots, about a third pupil width, along bases of both dorsal fins about half pupil width above bases.

Background color (for specimen in Fig. 2C) of both body and head pale, saddles yellow and faint anterodorsally, yellow caudal spot located centrally, iris as in specimen of Fig. 2B, yellow spots in dorsal fins more in form of a streak which continues as a solid line along last dorsal-fin ray, entire anal fin except distal margin light orange, pectoral-fin rays yellowish, caudal-fin rays suffused with light yellow.

Color in preservative. Body and fins pale straw-colored with no discernable markings

Etymology. The specific name "*longispinum*" is derived from the Latin *longus* (long or extended), in combination with the Latin *spinum* (spine), in reference to the elongated second spine of the first dorsal fin. It is treated as a neuter compound adjective.

Distribution. Currently known definitively from specimens from Kiribati (Kirimati and Tabuaeran Atolls in Kiribati). Probably present in the Marshall Islands (Enewetok Atoll) and possibly from Guam (Mariana Islands)– both specimens are small and in poor condition.

Comparisons. This species stalls in Winterbottom's (2019) key at couplet 17. It differs from *T. barralli* Winterbottom, 1995 (17a, a Red Sea endemic species) in having 6 (rather than 5) sensory papillae in cheek row *c* and in color pattern and distribution, but shares with that species a very elongated second spine of the first dorsal fin (to the middle of the second dorsal fin or farther when abducted). It differs from *T. erdmanni* Winterbottom, 2011 and *T. preclarum* Winterbottom, 2006 (couplet 17b) in a longer second spine in the first dorsal fin (to the middle of the second dorsal fin or farther back), and in lacking either a light longitudinal stripe on the cheek (*T. erdmanni*) or the three pale yellow lines on the body (*T. preclarum*), which latter also has 5 papillae in row *c* (vs. 6 in *T. erdmanni*).

Discussion. The following explanation of etymologies involving island names was kindly provided by Arnold Suzumoto, who, together with Jack Randall, obtained the information directly from Richard Sixberry when they visited Tabuaeran Atoll (Fanning Island) in the 1980s.

When the Gilbertese people's desire to highlight their language influenced the change from "Gilbert Islands" to "Kiribati" in 1979, a little was lost in translation. While the basic explanation replaced the "ti" syllable with "s" sound, resulting in people saying "kee-ree-buss" [buss sounding more like bah-s], what was not emphasized was that the kee ree part was a Gilbertese pronounciation of 'Gill', as in Gee-lee-bah-s, or, Gilberts. Similarly, Christmas became "Kee-ree-see-mahs", or Kiritimati. Thus, phonetically, nothing much has changed, since the local people essentially pronounce Kiribati as 'Gilberts' and Kiritimati as 'Christmas'. (See also p. 95 in Reilly Ridgell 1995 Pacific Nations and Territories: The Islands of Micronesia, Melanesia, and Polynesia, 3rd. Edition. Bess Press, Honolulu, HI, USA, who states that the name change from Gilberts to Kiribati "is a rendering of "Gilberts" in the phonology of the indigenous Gilbertese").

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