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A New Species of *Tryssogobius* (Teleostei, Gobiidae) from Hainan Island, China and Taiwan

Helen K. Larson[1] and I-Shiung Chen[2,*]

[1]*Museum and Art Gallery of the Northern Territory, PO Box 4646, Darwin, NT 0801, Australia. E-mail:helen.larson@nt.gov.au*

[2]*Institute of Marine Biology, National Taiwan Ocean University, 2 Pei-Ning Road, Keelung 202, Taiwan. E-mail:isc@mail.ntou.edu.tw; iscfish@yahoo.com.tw*

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Helen K. Larson and I-Shiung Chen (2006) A new species of *Tryssogobius* (Teleostei, Gobiidae) from Hainan Island, China and Taiwan. *Zoological Studies* **45**(2): 155-161. A new species of *Tryssogobius* is described from 9 specimens trawled from off Hainan I., China and southern Taiwan at depths of 18-100 m. The species is distinguished from all other known species (5 described and several undescribed) by possessing preopercular pores and two pores over the opercle, as well as having differences in fin ray counts, body shape, and coloration. The live color pattern differs from all other species known in that most of the spotting is on the body, as opposed to the fins. Almost no information is available on its habitat.
http://zoolstud.sinica.edu.tw/Journals/46.2/155.pdf

Key words: Gobiidae, New species, Taiwan, China, *Tryssogobius.*

In 2003, specimens of an unusual small goby were trawled from deep water off the southwestern coast of Pingtung County, southern Taiwan. They were eventually identified as a new species of *Tryssogobius* by the senior author during a visit to Taiwan. Upon learning of our Taiwanese specimens, Koichi Shibukawa (NSMT), made available 2 additional specimens trawled off the southern coast of Hainan I., China, and gave us the morphometric and osteological data for them.

Tryssogobius was diagnosed by Larson and Hoese (2001) as having scales on the head and body, branchiostegal membranes with scales (in 1 species), the predorsal scaled forward to the eyes; the operculum and cheek covered with large cycloid scales (with embedded scales under the eye); the gill opening extending forward to below the opercle or to the posterior preoperculum margin; a broad isthmus covered with medium-sized scales; fused pelvic fins, forming a cup-shaped disc, reaching at least to below the anus; closely spaced median interorbital pores, placed just before the anteriormost predorsal scale; short and very oblique jaws; a lateral canal system on the head with closely spaced anterior and posterior interorbital pores but lacking preopercular pores; and reduced sensory papillae, mostly in a longitudinal pattern but including a short transverse row under the eye. Two species of *Tryssogobius* were described by Larson and Hoese (*T. colini* and *T. longipes*) and 3 by Randall (2006). The genus is presently being reviewed (Shibukawa, Suzuki, and Larson in prep.).

The present specimens differ from the 5 described species (and the undescribed ones) in that it possesses 3 preopercular pores and 2 pores over the opercle (vs. none), but otherwise agree in other characters with *Tryssogobius* as presently diagnosed. The specimens also have a different color pattern than most other species, being transparent with yellow markings on the body and fins (vs. having a blue or greenish-blue body with iridescent darker blue spots and stripes on the fins) (see Larson and Hoese 2001, Hayashi

*To whom correspondence and reprint requests should be addressed. Tel: 886-2-24622192 ext. 5320. Fax: 886-2-24633152. E-mail:isc@mail.ntou.edu.tw

and Shiratori 2003, Senou et al. 2004, Randall 2006).

MATERIALS AND METHODS

The type specimens of the new species were collected by trawling off southern Taiwan and off southern Hainan I., China. Meristic and morphometric methods follow those of Larson and Hoese (2001). The labeling of the lateral canal pores and sensory papilla pattern basically follows Miller (1986) and is based on Sanzo (1911). Abbreviations used are: ASZIP, Academia Sinica Zoological Institute, Taipei, Taiwan; NSMT, National Science Museum, Tokyo; NTM, Museum and Art Gallery of the Northern Territory, Darwin, Australia; NTOU, National Taiwan Ocean University, Keelung, Taiwan; ZRC, Raffles Museum of Biodiversity Research, Singapore; SL, standard length in mm; HL, head length in mm; TRB, transverse scales counting backward from the anal fin origin.

SYSTEMATICS

Family Gobiidae
Subfamily Gobiinae

Tryssogobius Larson and Hoese, 2001, type species *Tryssogobius colini* Larson and Hoese, 2001, by original designation.

Tryssogobius porosus sp. nov.
(Figs. 1-4)

Type material: Holotype - ASIZP 65022, 22.5 mm SL ♂, off Tungkang, Pingtung Co., Taiwan, 100 m, H.J. Chen, 5 Dec. 2003. Paratypes - NTM S.16087-001, 22.5 mm SL ♂ and 26 mm SL ♀, same data as for holotype; ZRC 50384, 22 mm SL ♀, same data as for holotype; NTOU P-2005-07-001, 26 mm SL ♀, same data as for holotype; NTOU P-2005-05-087, 21.5 mm SL ♀, off Fong-Kang, Taiwan, 50 m, H.J. Chen, 22 May 2002; NTOU P-2005-05-088, 27.5 mm SL ♂, same data as for previous entry; NSMT P.54837, 21 mm SL ♀, Sanya Bay, southern coast of Hainan I., China, 18 m, K. Matsuura, 3 Mar. 1997; NSMT P.54836, 21.3 mm SL ♂, cleared and stained, same data as for previous entry.

Diagnosis: *Tryssogobius porosus* sp. nov. is distinguished from other known species of the genus by the following combination of characters: preopercular canal with 3 pores and 2 pores over opercle; color in life translucent with yellow markings on body and fins and a distinctive dense black oval blotch posteriorly on 1st dorsal fin; 5th to 8th caudal fin rays usually elongate and filamentous, extending beyond other rays; branchiostegal membranes with 1 cycloid scale on each side; I, 9 second dorsal fin rays; I, 10 anal fin rays; and 20 or 21 pectoral fin rays.

Description: Based on 9 specimens, 21-27.5 mm SL. Counts for holotype indicated by an asterisk, and number of specimens with given count in parentheses.

First dorsal spines VI* (in 9); 2nd dorsal rays I,9* (9); anal rays I,10* (9); pectoral rays 20* (7), 21 (2); segmented caudal rays 17* (9), in 9/8 pattern; branched caudal rays 6/6* (4), 6/7 (1), 7/6 (3); longitudinal scale count 23 (1), 24* (3), 25 (1), 26 (2), 28 (1); transverse scales (TRB) 7* (5), 8 (1) 8.5 (1), 9 (2); predorsal scale count 5* (5), 6 (4); circumpeduncular scale count 12 (2); gill rakers on outer face of 1st arch 1+8 (1), 2+6 (1), 2+7 (1), 4+7 (1); vertebrae 10+16 (in 2); dorsal pterygiophore pattern 3-22110 (2); 2 epurals (2); 2 anal

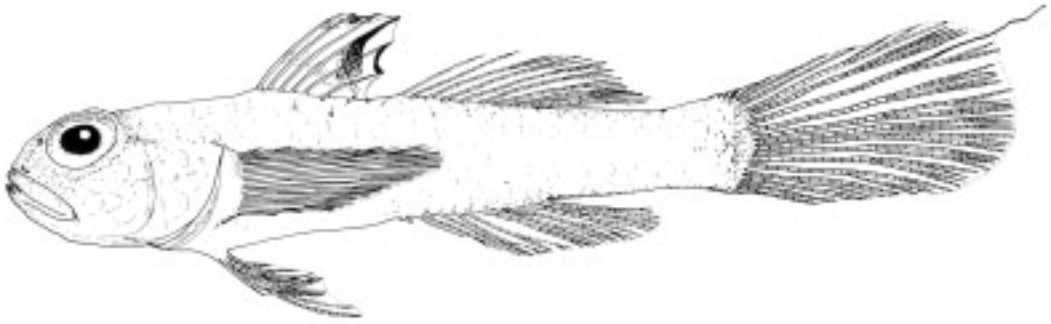

Fig. 1. Holotype of *Tryssogobius porosus* sp. nov., ASZIP 65022, 22.5 mm SL male. Fins partly reconstructed (all specimens with damaged fins). Drawing by Helen K. Larson.

pterygiophores anterior to 1st hemal spine (2). Summary of meristics and measurements shown in table 1.

Body moderately slender and compressed, more so posteriorly; body depth at anal origin 15.9%-19.2% of SL. Caudal peduncle depth 10.5%-11.8% of SL. Caudal peduncle slender, length 22.9%-26.2% of SL. Head rounded to

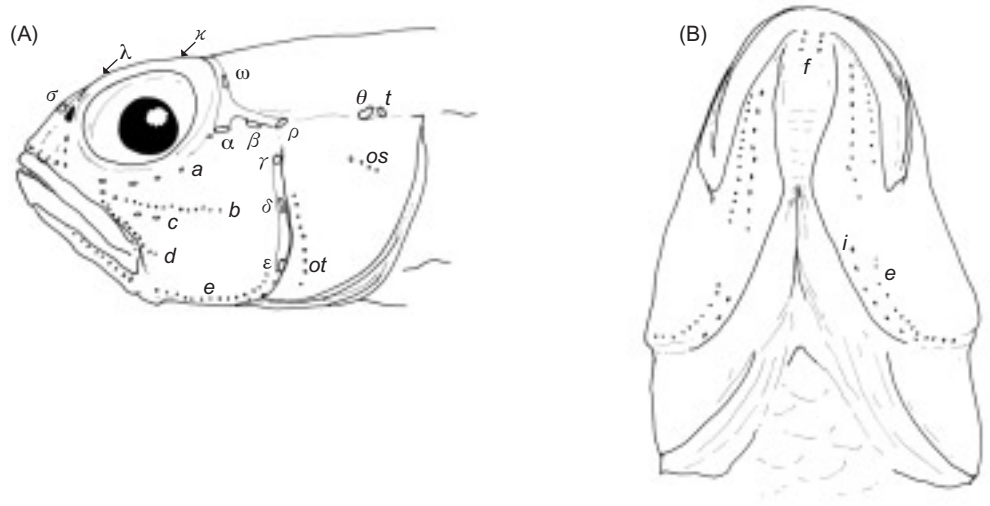

Fig. 2. Head of paratype of *Tryssogobius porosus* sp. nov., NTOUP 2005-05-087, 21.5 mm SL female. (A) Partial arrangements of the head pores and sensory papillae; skin torn and abraded; (B) underside of head indicating partial arrangement of the sensory papillae. Drawing by Helen K. Larson.

Table 1. Summary of counts and measurements (in mm) of *Tryssogobius porosus* sp. nov. (*n* = 9)

	Holotype	Mean	Maximum	Minimum	Mode
First dorsal spines	VI	VI	VI	VI	VI
Second dorsal rays	I,9	I,9	I,9	I,9	I,9
Anal rays	I,10	I,10	I,10	I,10	I,10
Pectoral rays right	20	20	21	20	20
Pectoral rays left	20	20	21	20	20
Caudal segmented rays	17	17	17	17	17
Caudal branched rays	12	12	13	12	12
Lateral scales	24	25	28	23	24
Transverse scales backward	7	8	9	7	7
Transverse scales forward	8	8	9	7	8
Predorsal scales	5	5	6	5	5
Standard length	22.5	23.3	27.5	21	22.5
Head length	6.7	6.8	7.8	5.7	-
Head depth	4.4	4.4	5.3	3.8	4.8
Head width	4.7	4.6	5.1	3.5	5.1
Body depth	3.9	4.0	4.9	3.5	3.9
Caudal peduncle length	5.9	5.8	6.7	4.8	-
Caudal peduncle depth	2.6	2.6	3.1	2.3	2.3
Snout length	1.4	1.3	1.6	1.1	1.2
Eye width	2.5	2.4	2.8	2.0	2.5
Upper jaw length	2.8	2.9	3.5	2.6	2.7
Interorbital width	0.3	0.3	0.4	0.3	0.3
Pectoral fin length	6.0	6.2	7.1	5.5	5.9
Pelvic fin length	5.7	5.8	6.8	5.1	5.8
Caudal fin length	8.9	7.9	9.3	5.7	8.7
Depressed 1st dorsal fin	5.0	5.6	7.1	4.7	5.0

almost square in cross-section, about as wide as deep at posterior preopercular margin, length 27.1%-30.7% of SL, depth at posterior preopercular margin 61.5%-68.8% of HL, width at posterior preopercular margin 61.4%-70.1% of HL. Mouth oblique, forming an angle of about 45° with body axis; anterior margin of jaws horizontally in line with lower 1/2 of pupil; posterior end of jaws under anterior margin or anterior 1/2 of pupil. Upper jaw length 35.1%-45.6% of HL; lips thin; lower lip fused to chin anteriorly, side of lip free; no mental frenum or lobe on chin. Anterior naris at end of short tube just above upper lip; posterior naris very close to anterior margin of eye. Eye large, width 33.3%-37.3% of HL. Interorbital narrow, much less so than pupil diameter, width 3.9%-7.0% of HL. Snout short, broadly rounded in dorsal view, convex in side view, its length much less than eye width, 16.9%-21.2% of HL. Gill opening moderate, extending forward to under opercle. Isthmus moderate, partly covered by branchiostegal membranes; membrane on each side with an elongate cycloid scale (missing in 6 specimens; damage due to abrasion prevented accurate observation of scale pockets). Gill rakers slender near angle of arch and becoming progressively shorter and stubbier anteriorly, longest raker (below angle of arch) approximately equal in length to gill filaments; rakers on inner face of 1st and other arches short, stubby, and denticulate. Tongue tip truncate to rounded. Teeth small, sharp, conical, and slightly curved. Outer row of teeth in upper jaw slightly enlarged and widely set, may be slightly straighter and stouter in males; followed by inner row of

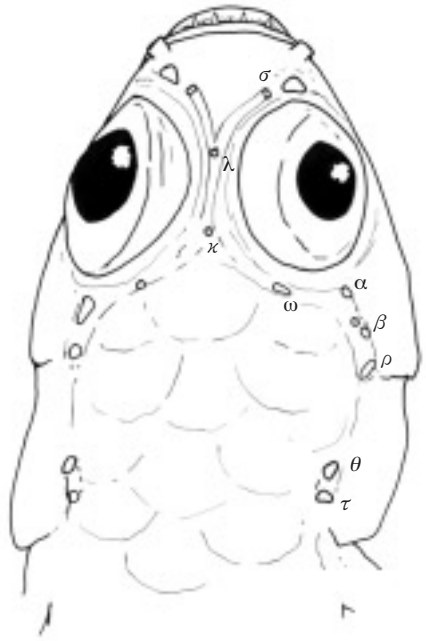

Fig. 3. Top view of the head of the holotype of *Tryssogobius porosus* sp. nov., showing head pore arrangement as far as can be determined (as there was some damage due to scales and some skin having been torn off) and approximate position of predorsal scales (based on scale pockets). Drawing by Helen K. Larson.

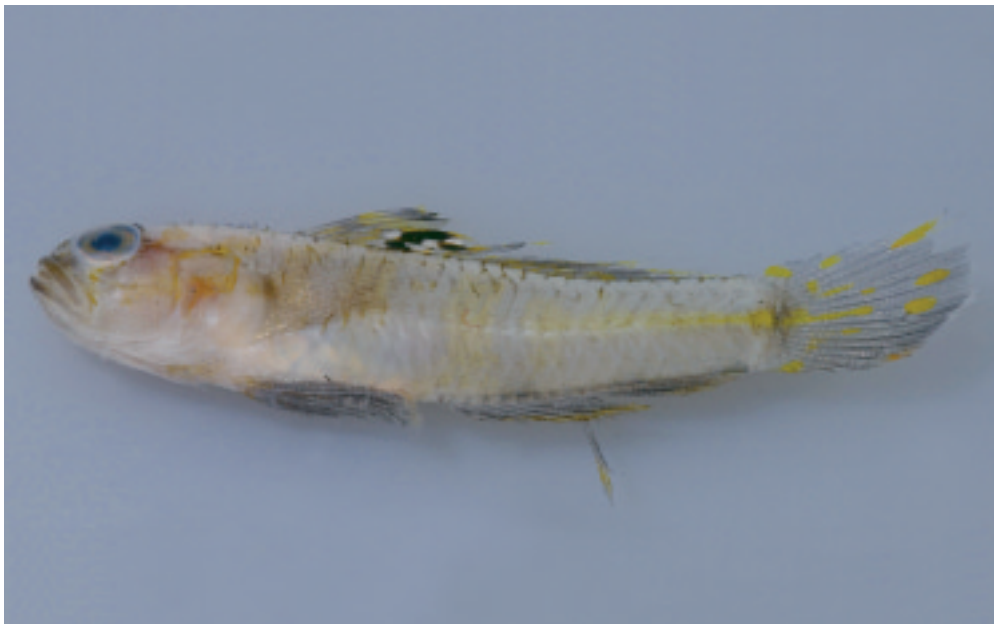

Fig. 4. Fresh specimen of *Tryssogobius porosus* sp. nov., 100+ m depth, off Tungkang, southwestern Taiwan. Photograph by I-Shiung Chen.

smaller closely set teeth. Outer row of teeth in lower jaw composed of widely set curved teeth mostly confined to anterior end of jaw, inner row of smaller closely set teeth extending full length of dentary. No vomerine teeth. Scales missing (and skin variably abraded) from most of head and body of all specimens, so described arrangement tentative and based mainly on scale pockets: predorsal scales reaching close behind eyes; operculum with few large scales which may have covered entire operculum; cheek scales in 2 rows (1 above and 1 below papilla row *b*); pectoral base covered with cycloid scales; prepelvic area covered with cycloid scales; belly scales cycloid.

First dorsal fin elevated, tips of 1st to 3rd dorsal spines elongate, fin membranes not incised, fin reaching back to 1st few 2nd dorsal fin elements when adpressed (membrane joining 6th spine to dorsum absent from 1 specimen); adpressed 1st dorsal length 22.2%-30.0% of SL, not differing much between males and females; 1st dorsal fin base short, dorsal fins separated by 2 rows of scales. Posteriormost 2nd dorsal and anal rays longest but not greatly elongate, reaching (at most) or falling just short of procurrent rays at base of caudal fin; anteriormost 2nd dorsal and anal rays unbranched. Pectoral fin somewhat pointed, central rays longest, 25.5%-29.0% of SL. Pelvic origin below pectoral insertion; fin length 22.7%-27.7% of SL; pelvic fins pointed, 5th rays longest, with 3 branch points; fin just reaching anus; frenum well developed, thin. Caudal fin pointed, with single elongate filament (may be broken) extending from any one of 5th to 8th (6th in holotype) segmented rays from top of fin, caudal fin length 27.1%-39.6% of SL. Overall detailed morphometry seen in table 2.

Male genital papilla small, slender, tapering to pointed tip; female genital papilla stout, short, and rounded, with no lobes at tip.

Head canals: Lateral canal pores on head with large posterior nasal pore σ immediately above posterior nostril, separated from nostril by thin membrane; unpaired median anterior pore λ at level with anterior edge of pupil, unpaired median posterior interorbital pore $\varkappa$ at level with posterior edge of pupil; postorbital pore ω behind each eye; infraorbital pore α below postorbital pore, oculoscapular canal pore β and terminal oculoscapular canal pore ρ above posterior end of preoperculum; 2 pores (θ and τ) over opercle, in very short canal; 3 preopercular pores (γ, δ, and ε).

Sensory papillae: Head papillae in reduced transverse pattern, few in number but most abraded and missing, as are most scales on head. Row *a* extending beyond anterior margin of pupil. Row *b* rather long. Row *f* paired and longitudinal. Remnant papillae showing an arrangement similar to that of *T. colini* (Figs. 2, 3).

Color in alcohol: Head and body whitish, with fine dusting of melanophores which may form 2 broad faint stripes on either side of narrow unpigmented stripe along central midside of body; 1 or 2 indistinct short dusky bars may cross unpigmented midline stripe below anterior 1/2 of 2nd dorsal fin; rear edges of scale pockets on dorsal surface of body and nape outlined with dusky to blackish pigment (Figs. 1, 4). Head faintly dusky, becoming darker just behind eyes, on snout, lips, and chin; in some specimens, blackish pigment forming a dif-

Table 2. Morphometrics of *Tryssogobius porosus* sp. nov., expressed as a percentage of standard length (SL) or head length (HL) as indicated (n = 9)

	Holotype	Mean	Maximum	Minimum
Head length in SL	29.8	29.0	30.7	27.1
Head depth in HL	65.7	64.3	68.8	61.5
Head width in HL	70.1	65.9	70.1	61.4
Body depth in SL	17.3	17.4	19.2	15.9
Caudal peduncle length in SL	26.2	24.8	26.2	22.9
Caudal peduncle depth in SL	11.6	11.3	11.8	10.5
Snout length in HL	20.9	19.3	21.2	16.9
Eye width in HL	37.3	35.5	37.3	33.3
Upper jaw length in HL	41.8	42.5	45.6	35.1
Interorbital width in HL	4.5	5.0	7.0	3.9
Pectoral fin length in SL	26.7	26.8	29.0	25.5
Pelvic fin length in SL	25.3	24.8	27.6	22.7
Caudal fin length in SL	39.6	33.8	39.6	37.1
Depressed dorsal fin in SL	22.2	24.2	30.0	22.2

fuse darker band from lower edge of eye through nares to anteriormost part of lips and chin. Side of head light dusky with a few indistinct darker short lines or groups of melanophores on opercle and rear part of preopercle. Underside of head, breast, and belly whitish. Ventral midline of caudal peduncle with a narrow blackish line from base of last anal fin ray to base of 1st ventral procurrent ray of caudal fin.

First dorsal fin transparent, with diffuse dusky to blackish blotch across tips of first 3 spines; most distinct marking a broad black band from tip of 4th spine to halfway down 6th spine, a broad black band present along margin of membrane joining 5th and 6th spines; black stripes may be broken up into several black, closely spaced blotches, or fused to form a single broad black blotch on rear part of fin; broad, diffuse, dusky band running length of fin just above base. Second dorsal fin transparent with fine dusky speckles forming 2 indistinct irregular streaks or series of elongated spots (most specimens damaged); 1 along base of fin and 1 along middle. Anal fin translucent dusky to light brown (in holotype); fin may be darkest along middle (all specimens damaged); bases of rays dusky. Caudal fin translucent dusky, with scattered transparent spots or oval areas; base of fin most heavily pigmented, with melanophores forming a narrow vertical brownish bar across bases of fin rays. Pectoral fin transparent; margins of rays outlined with speckling of fine brownish melanophores; bases of uppermost few rays crossed by small diffuse brownish bar or blotch. Pelvic fins brownish, usually with transparent margin; frenum speckled with brownish melanophores in several specimens.

Fresh color: Live color unknown; a specimen photographed shortly after capture in shown in fig. 4. Color pattern similar to that described for preserved coloring, but transparent midline stripe faint yellow, becoming brighter posteriorly and most intense just before vertical dark grey bar at base of caudal fin; 3 indistinct faint yellow bars crossing body, 1st bar below 1st dorsal fin, 2nd and 3rd bars below 2nd dorsal fin. Underside of head, breast, and belly pearly white with scattered dusky melanophores on front of breast. Dorsal surface of body and most of head with yellow tinge overlying dusky background, and indistinct yellow stripe along middle of preopercle and opercle, as well as yellow stripe along top of opercle; side of nape with several indistinct yellowish blotches. Iris dull dark yellow. Pectoral fin base with small yellowish blotch just anterior to dusky bar on bases of upper rays of fin.

Transparent areas in preserved specimens in 1st dorsal fin yellow with bright white spots above and below black blotches on fin. Second dorsal fin grey with scattered yellow spots, fin margin probably yellow. Anal fin plain dark grey with dusky-yellow margin. Caudal fin dusky-grey with whitish posterior margin (part of fin missing) and scattered oval to elongate yellow spots and streaks. Pectoral fin membranes mostly transparent, rays outlined by dusky-grey pigment; fin darker on lower posterior 1/2. Pelvic fin grey with faint yellow posterior margin; frenum dusky-yellowish.

Distribution: Known only from off southern Hainan I., China and Taiwan, trawled from mud substrate at depths of 18-100 m.

Comparisons: *Tryssogobius porosus* can be distinguished from the 5 other described species in the genus by possessing 3 preopercular pores and 2 pores in a very short canal over the operculum, as well as differences in the color pattern (translucent with yellow markings on body and fins vs. blue or green body with blue and yellow markings on fins) and lower dorsal and anal fin rays counts (2nd dorsal I,9 and anal I,10 vs. 2nd dorsal I,10 or 11 and anal I,11-14).

Etymology: Named *porosus* for its preopercular pores and pores over the opercle, the chief distinguishing feature of this species.

Remarks: Shibukawa et al. (in prep.) are reviewing the species of *Tryssogobius*; another probable new deepwater species (from 153 m) is represented by a single damaged specimen from the Ryukyu Is., Japan. With continuing survey work in deep tropical waters, it is highly probable that more species will come to light.

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