

A new species of gobiid fish, *Cristatogobius rubripectoralis*, from Australia

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Abstract A species of the gobiid genus *Cristatogobius* from northeastern Australia is described as new. This species is distinguishable from other species of the genus in having a higher number of scales in a longitudinal row and in a transverse row and a rounded caudal fin. In addition, there are differences in coloration such as brown reticulation on the upper anterior part of body and a red pectoral fin. A species of *Cristatogobius* reported from S. Java, Indonesia, is also identified as this species.

Key words *Cristatogobius rubripectoralis* · New species · Gobiidae

Three species have been recognized in the genus *Cristatogobius*: *C. lophius* Herre, 1927, *C. nonatoae* (Ablan, 1940), and *C. aurimaculatus* Akihito and Meguro, 2000 (see Akihito and Meguro, 2000). Specimens of a species of the genus were sent to us by Dr. D.F. Hoese of the Australian Museum and Dr. R. Winterbottom of the Royal Ontario Museum, collected in Queensland, Australia, in 1981, with photographs before fixation; by Dr. R. Winterbottom, collected in Queensland in 1994, with photographs before fixation; and by Dr. H.K. Larson of the Northern Territory Museum, collected in the Northern Territory, Australia, in 1991 and 1992. These specimens were found to have characters clearly distinguishable from these known species, and we herewith describe it as new. Two reports have been made so far on the collection of this species as an unidentified species of *Cristatogobius*. The first report was by Kottelat et al. (1993) from S. Java, Indonesia, with a photograph of a specimen and the comment that the specimen “cannot be identified as any of the known species.” The second report was by Larson and Williams (1997) from the Northern Territory, Australia, without a photograph. Specimens collected for the latter report were examined in our study.

Materials and Methods

Institutional abbreviations follow Eschmeyer (1998). All counts, the formula for the relationship between the pterygiophores of the dorsal fins and vertebrae, and the designation of the sensory canal pores follow Akihito (1984), except for the method of counting predorsal scales, which follows Akihito and Meguro (2000).

Cristatogobius rubripectoralis sp. nov.

(Figs. 1–3)

Cristatogobius sp.: Kottelat et al., 1993: 143, pl. 66 (S. Java, Indonesia).

Cristatogobius sp.: Larson and Williams, 1997: 368 (Northern Territory, Australia).

Holotype. ROM 72479, 49.8 mm SL, male, Saunders Beach, north of Townsville, Queensland, Australia, 4 Oct. 1981, collected by R. Winterbottom and D.F. Hoese.

Paratypes. 16 specimens, 19.1–60.5 mm SL. AMS I. 22717-001, 54.4 mm SL, male, AMS I. 22717-018, 60.5 mm SL, male, AMS I. 22717-019, 57.4 mm SL, male, AMS I. 22717-020, 28.2 mm SL, female, and AMS I. 22717-021, 45.8 mm SL, male, same data as holotype. BMNH 2001.3.8.3, 24.3 mm SL, male, and BMNH 2001.3.8.4, 43.3 mm SL, female, same data as holotype. NSMT-P 60898, 22.5 mm SL, male, and NSMT-P 60899, 46.9 mm SL, female, same data as holotype. NTM S. 15251-001, 19.1 mm SL, male, and NTM S. 15251-002, 32.9 mm SL, male, same data as holotype. ROM 72627, 24.5 mm SL, female, same data as holotype. USNM 364564 (two specimens), 35.2–38.0 mm SL, females, same data as holotype. WAM P. 31776-001, 20.6 mm SL, female, and 46.8 mm SL, male, same data as holotype.

Other specimens. 64 specimens, 16.3–60.5 mm SL. AMS I. 22720-002, 26.7 mm SL, Three Mile Creek, Townsville, Queensland, Australia, 8 Oct. 1981, collected by D.F. Hoese and R. Winterbottom. AMS I. 23265-002(2), 27.4–53.6 mm SL, Weipa, Embley River, Queensland, Australia, 5 Oct. 1982, collected by D.F. Hoese and D. Rennis. NTM S. 13465-003, 17.4 mm SL, Blackmore River, Darwin, Northern Territory, Australia, 17 June 1991, collected by M. Burke. NTM S. 13486-001, 51.6 mm SL, same locality and collector as NTM S. 13465-003, 17 Feb. 1992. NTM S. 13489-003, 30.3 mm SL, same locality and collector as NTM S. 13465-003, 6 Mar. 1992. NTM S. 13490-003 (2), 36.9–43.9 mm SL, same locality and collector as NTM S. 13465-003. NTM S. 13496-006, 43.7 mm SL, Channel Island Bridge, Darwin, Northern Territory, Australia, 18 Mar. 1992, collected by M. Burke. ROM 38735 (4), 20.4–48.8 mm SL, same data as AMS I. 22720-002. ROM 68459 (13), 16.3–60.5 mm SL, Blacksand Creek, Townsville, Queensland, Australia, 10

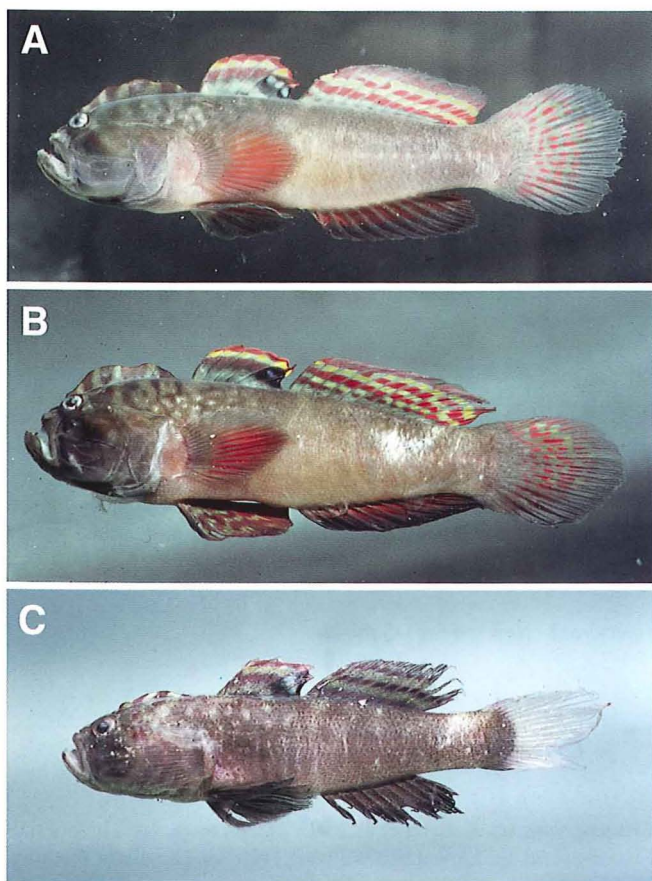


Fig. 1. *Cristatogobius rubripectoralis* sp. nov. **A** Holotype, ROM 72479, 49.8 mm SL, male, Saunders Beach, north of Townsville, Queensland, Australia. (Photograph by D.F. Hoese) **B** Paratype, AMS I. 22717-001, 54.4 mm SL, male, same data as holotype. (Photograph by D.F. Hoese) **C** Paratype, ROM 72627, 24.5 mm SL, female, same data as holotype. Pectoral fin reflected anteriorly. (Photograph by D.F. Hoese)

June 1994, collected by R. Winterbottom et al. ROM 68476 (38), 16.8–58.4 mm SL, same data as ROM 68459.

Diagnosis. A large species of *Cristatogobius* with the following characters. First dorsal fin distally rounded without filamentous spines. Posterior margin of caudal fin rounded. Scales small, 39–55 scales in a longitudinal row and 19–25 scales in a transverse row. Color of specimens before fixation: nuchal crest with transversely alternating reddish-brown and light greenish-brown areas; body light greenish brown reticulated with brown on upper anterior part and having iridescent bluish or greenish spots surrounded by reticulation; first dorsal fin with red upper margin, submarginal row of contiguous yellow spots, grayish-red band on middle part, greenish gray on lower part, and large blackish spot with blue spots between fifth spine and fin terminus; second dorsal fin red with two or three irregular longitudinal yellow stripes on middle part, and greenish gray on basal part; anal fin proximally red and distally dark gray; pectoral fin with a red area on middle to lower part. Color in

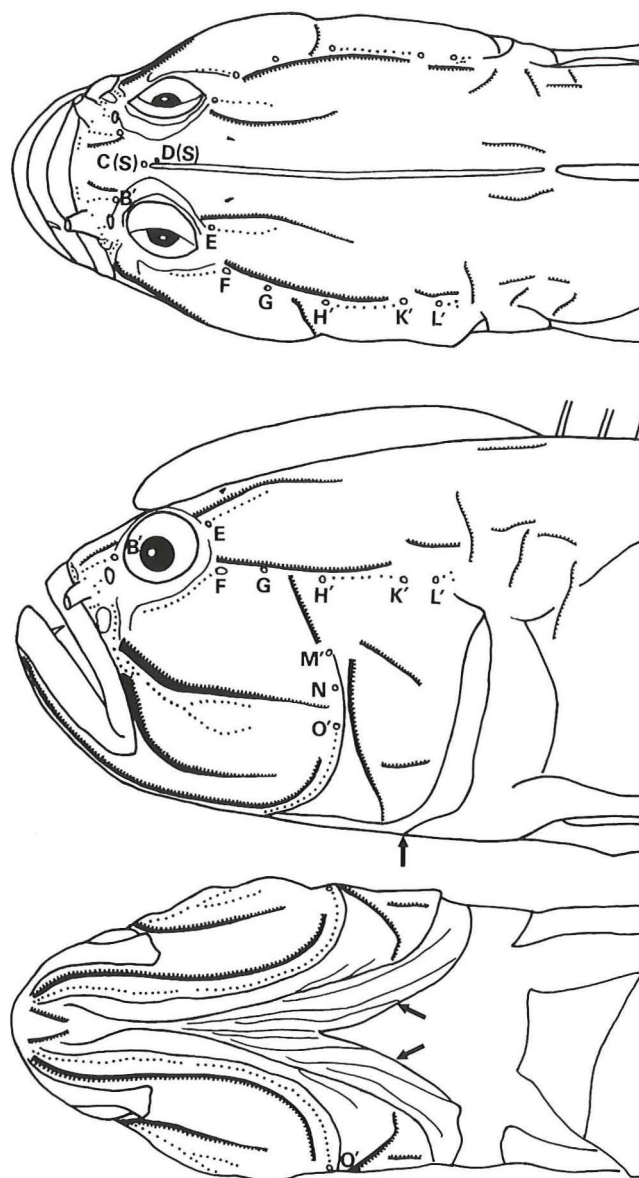


Fig. 2. Arrangement of sensory canal pores and sensory papillae of holotype (ROM 72479) of *Cristatogobius rubripectoralis* sp. nov. Arrows, position at which the gill membranes are attached to the isthmus; thick black lines, sensory papillae on ridge. B' to H', anterior oculoscapular canal pores; K' to L', posterior oculoscapular canal pores; M' to O', preopercular canal; apostrophes, terminal pores of canals; (S), single pore

preservation: upper anterior part of body reticulated with brown.

Description. Counts of meristic values in 81 specimens are as follows. Dorsal fin rays VI-I,9 (one specimen), VI-I,10 (79 specimens including holotype and 15 paratypes), VI-I,11 (one paratype); anal fin rays I,8 (one specimen), I,9 (78 specimens including holotype and 14 paratypes), I,10 (two paratypes); pectoral fin rays 16 (22 specimens including four paratypes), 17 (55 specimens including holotype and 12 paratypes), 18 (three specimens), 19 (one specimen); segmented caudal fin rays 9 + 8 = 17 (81 specimens including

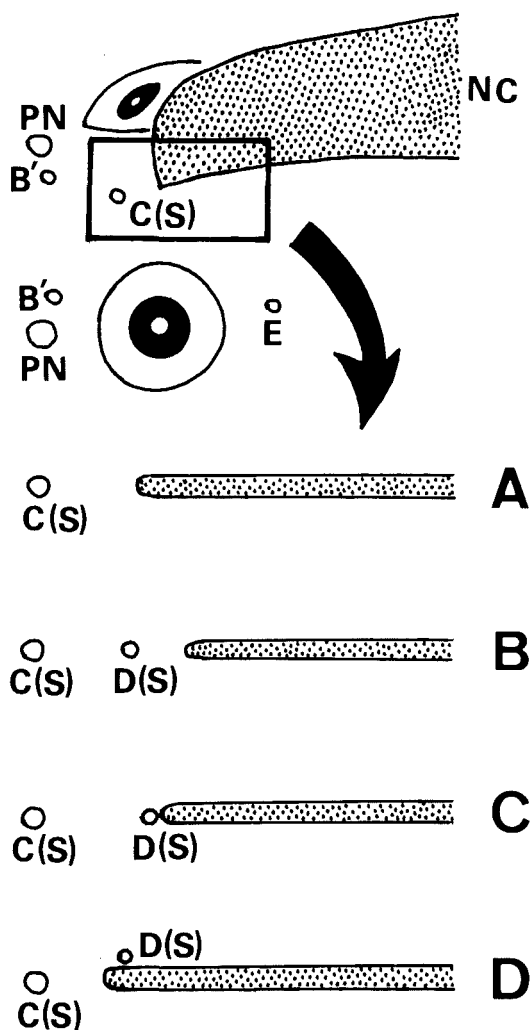


Fig. 3. Variation in pore D of *Cristatogobius rubripectoralis* sp. nov. in dorsal view. **A** Lack of pore D; **B** presence of a space between pore D and origin of nuchal crest; **C** pore D close to anterior origin of nuchal crest; **D** pore D on right side of origin of nuchal crest. *NC*, nuchal crest; *PN*, posterior nostril

holotype and 16 paratypes); scales in a longitudinal row 39–55 (81 specimens including holotype and 16 paratypes), 51 (holotype), 43–52 (16 paratypes); scales in a transverse row 19–25 (81 specimens including holotype and 16 paratypes), 22 (holotype), 20–22 (16 paratypes); predorsal scales 2–14 (80 specimens including holotype and 16 paratypes; one paratype, NTM S. 15251-001, uncountable owing to small size), 12 (holotype), 2–11 (15 paratypes); relationship between the pterygiophores of the dorsal fins and vertebrae 3/ II II I I 0/9 (81 specimens including holotype and 16 paratypes); vertebral counts 10 + 15 = 25 (two specimens including one paratype), 10 + 16 = 26 (79 specimens including holotype and 15 paratypes).

Head and body compressed. Dorsal profile sloping upward, curving on nape, and gradually sloping downward posteriorly. Body depth at origin of pelvic fins in percent of standard length of three young males (16.3–19.1 mm SL)

20.9–23.9%, that of 18 large males (40.0–60.5 mm SL) 22.3–27.9%, and that of 10 large females (43.3–49.5 mm SL) 21.6–26.5%. Thin nuchal crest with rounded margin extending from above eye to origin of first dorsal fin; its height from base to uppermost edge greater than half the eye diameter in large specimens; anterior margin of crest in some large specimens bulging anteriorly beyond point connecting it with dorsal surface of head. Mouth oblique, lower jaw projecting. Pluriserial teeth on upper jaw, enlarged teeth in outer row; pluriserial teeth on lower jaw, enlarged teeth in outer row from anterior to middle part, posteriormost tooth or rarely two teeth distinctly enlarged. Anterior nostril at end of a tube and posterior nostril without a tube.

Arrangement of sensory canal pores and sensory papillae on head of holotype illustrated in Fig. 2. Pore D variable in size, mostly half the diameter of pore C or less than that, as well as in position relative to nuchal crest (Fig. 3); eight of the 81 specimens without pore D, which is not found in small specimens, smallest 35.2 mm SL; specimens with pore D close to origin of nuchal crest as C in Fig. 3 most numerous, found from small to large specimens (16.3–60.5 mm SL). Loss of other pores or presence of an additional pore between pores rarely found. Largest specimen with sensory canals not completely developed, 28.2 mm SL (paratype, AMS I. 22717-020). Sensory papillae consisting of rows of papillae on ridges and rows of separated papillae without ridges. Height different between ridges and between parts of ridges. Anterior part of two longitudinal ridges on cheek highest among them.

Shape of first dorsal fin distally rounded with no filamentous spines; fifth spine longest; posteriormost tip of spine when appressed reaching base of spine to second soft ray of second dorsal fin in both males (16.3–60.5 mm SL) and females (20.4–49.5 mm SL). Posterior margin of caudal fin rounded.

Color of specimens photographed before fixation. The description is based on two photographs of the holotype (49.8 mm SL, male, Fig. 1A; the color of the holotype in the other photograph is considerably faded) and a photograph of a large paratype (AMS I. 22717-001, 54.4 mm SL, male, Fig. 1B). Narrow blackish band behind upper lip; blackish area below eye slanting ventroposteriorly on cheek, and upper anterior and posterior sides of blackish area tinged with reddish brown (in the other photograph of holotype, not Fig. 1A, blackish area below eye considerably faded to greenish brown); posteriorly light greenish brown with brown mottling. Ventral surface of head blackish. Nuchal crest with transversely alternating reddish-brown and light greenish-brown areas. Light greenish brown with brown irregular transverse bands and brown spots on dorsal side below nuchal crest. Body light greenish brown dorsally, paler ventrally; upper anterior part reticulated with brown and having iridescent bluish or greenish spots surrounded by reticulation; small iridescent bluish or greenish spots on caudal peduncle. First dorsal fin with red upper margin; submarginal row of contiguous yellow spots; grayish-red band on middle part; greenish gray on lower part; large blackish spot with blue spots on it between fifth spine and

fin terminus. Second dorsal fin red with two or three irregular longitudinal yellow stripes on middle part; greenish gray on basal part. Anal fin proximally red and distally dark gray. Caudal fin spotted with red and yellow, distally gray, darker ventrally. Pectoral fin base light brown with slight reddish tinge. Two small red spots on middle part between pectoral fin base and rays. Proximal and dorsal portions of pectoral fin gray; medially and ventrally red. Pelvic fins of holotype (Fig. 1A), seen ventrally, dark gray with red on central part, spine and frenum with yellowish tinge; that of large paratype (Fig. 1B), seen dorsally, red mottled with yellow, first soft ray dark gray.

The color of two other photographed specimens (ROM 68459, 60.5 mm SL, male; ROM 68476, 46.9 mm SL, female) is similar to that of the holotype and the large paratype. They have a brown head and body, and the greenish-gray area in the first and second dorsal fins of the holotype and the large paratype is brown in these specimens. The blackish area below the eye and the ventral surface of the head of the holotype and the large paratype (Fig. 1A,B) are considerably faded in these specimens, and two small red spots are seen on the posteromedial part of the cheek in one of them (46.9 mm SL).

The color of young specimens is based on the two photographs of a smaller young paratype (ROM 72627, 24.5 mm SL, female, Fig. 1C) and a photograph of a larger young paratype (USNM 364564, 35.2 mm SL, female). The color of the smaller young paratype is as follows. Dark gray area below eye slanting ventroposteriorly on cheek, and upper anterior and posterior sides of dark gray area with red tinge and dark gray area extending over anterior red tinge; posteriorly gray with slight reddish tinge; upper part of cheek behind eye with two closely placed small spots tinged with red; gray transverse bands with slight reddish tinge on light greenish-gray dorsal side below nuchal crest; ventral surface of head gray; nuchal crest with transversely alternating reddish brown and light greenish yellow. Body gray; upper anterior part with scattered light greenish-gray spots; lower anterior part with small bluish spots anteroventrally and narrowly spaced light gray transverse bands posteroventrally; posterior part of body with a few light gray short transverse bands and small iridescent bluish or greenish spots; light brownish-yellow area on upper part of caudal peduncle. First dorsal fin with red upper margin, submarginal yellow stripe, grayish-red band on middle part, grayish yellow on lower part, and large blackish spot with bluish spot on it between fifth spine and fin terminus. Second dorsal fin with three grayish-red longitudinal bands with two yellow bands between them; uppermost grayish-red band beginning from anterior upper margin running through submarginal area posteriorly; light gray band with slight yellowish tinge between reddish-gray upper margin and grayish-red submarginal band; bluish gray or yellowish gray (in the other photograph, not Fig. 1C) on basal part. Anal fin proximally dark red and distally dark gray. Caudal fin mostly colorless. Pectoral fin without red. Pelvic fins dark gray.

The color of the larger young paratype is darker overall than the smaller young paratype; most of the side of the

head and pelvic fins are black. The pattern shows a more developed stage than that of the smaller young paratype, such that nearly half the length of the caudal fin is spotted with red and yellow. It still retains the pattern found in the smaller young paratype such as the caudal peduncle with a light brown area and the pectoral fin without a red area. The pattern of the second dorsal fin is similar to that of the smaller young paratype, but the light gray submarginal band in the smaller young paratype extends anteriorly and is stronger in yellow.

Color of specimens in preservation. No difference in coloration between males and females. The color of the holotype is considerably faded. The color of the large paratype (AMS I. 22717-001, same paratype as in Fig. 1B photographed before fixation) is as follows. Head light brown; narrow brown band behind upper lip; brown area below eye slanting ventroposteriorly on cheek; brown irregular transverse bands and brown spots on dorsal side below nuchal crest. Nuchal crest light brown. Body light brown, paler ventrally; upper anterior part reticulated with brown. First dorsal fin proximally brown and distally paler; a dark brown blotch posteriorly. Second dorsal fin proximally light brown and distally paler. Anal fin distally brown and proximally paler. Caudal fin colorless. Pectoral fin light brown. Pelvic fins mostly light brown.

The color of smaller young paratypes (NTM S. 15251-001, 19.1 mm SL, male; WAM P. 31776-001, 20.6 mm SL, female) is as follows. Head and body considerably faded to light brown with scattered dark brown dots. First dorsal fin brown with posteriorly dark brown. Second dorsal fin brown. Anal fin brown. Caudal fin colorless. Pectoral fin proximally light brown and distally colorless. Pelvic fins brown.

Size. Two largest males 60.5 mm SL; largest female 49.5 mm SL; four other males (49.8, 53.6, 57.4, and 58.4 mm SL) larger than largest female.

Distribution. Known from Northern Territory and Queensland, Australia; S. Java, Indonesia (Kottelat et al., 1993).

Habitat. Mangrove streams with mud or sand bottom.

Etymology. From the red pectoral fin.

Remarks. The photograph of a specimen of *Cristatogobius* sp. (33 mm SL) from S. Java by Kottelat et al. (1993: pl. 66) was identified as *C. rubripectoralis*, because it showed similarity to the color of the smaller young paratype (24.5 mm SL, Fig. 1C) and the larger young paratype (35.2 mm SL), its size being between the two young paratypes. The diagnostic color similar to that of the two young paratypes is the transversely alternating colored areas of the nuchal crest and the number of the alternating colored bands of the second dorsal fin.

The specimens (NTM S. 13465-003, 13486-001, 13489-003, 13490-003, and 13496-006) reported as *Cristatogobius* sp. by Larson and Williams (1997) were identified as *C. rubripectoralis*.

In the generic description by Akihito and Meguro (2000), the illustrations of the arrangement of the sensory canal pores and sensory papillae of *C. nonatoae* in Akihito (1984) and Akihito et al. (2002: p 1286, 18-4) are cited. However,

these figures are based on small specimens of *C. nonatoae* (15.0–27.3 mm SL). In reexamination, low ridges were recognized in these small specimens in place of the ridged rows of *C. rubripectoralis* shown in Fig. 2, and developed ridges were found in large specimens of *C. nonatoae* as well as the other two species. Accordingly, the arrangement of the sensory canal pores and sensory papillae in Fig. 2 is diagnostic for the genus except for pore D. Pore D is placed before and close to the anterior origin of the nuchal crest in most specimens of the four species of the genus as shown in Fig. 3B, and not placed on the right side of the origin of the nuchal crest as shown in Fig. 2.

Akihito and Meguro (2000) describe the shape of the caudal fin of this genus as somewhat lanceolate. However, as this species has a rounded posterior margin, the shape of the caudal fin as a defining character should be deleted from the generic description.

Comparison with the other three species of the genus. *Cristatogobius lophius*, *C. nonatoae*, and *C. aurimaculatus* are morphologically similar to each other, and the differences are mostly found in coloration (Akihito and Meguro, 2000). *Cristatogobius rubripectoralis* is clearly distinguishable from the other species in the number of scales and in the shape of the caudal fin. *Cristatogobius rubripectoralis* has 39–55 scales in a longitudinal row and 19–25 scales in a transverse row, whereas the other three species have 24–33 scales in a longitudinal row and 9–13 scales in a transverse row. *Cristatogobius rubripectoralis* differs from the other species in having a rounded caudal fin whereas that of the other species is somewhat lanceolate. The first dorsal fin of *C. rubripectoralis* is distally rounded in shape without filamentous spines, and differs from that of *C. nonatoae* and *C. aurimaculatus*, which is somewhat triangular in shape with a filamentous spine at its apex. However, it is not distinguishable from *C. lophius* in dorsal fin shape, because *C. lophius* also has a distally rounded first dorsal fin and the dorsal fin without filamentous spines is also found in some large specimens.

The coloration of *C. rubripectoralis* differs from the other species in the brown reticulation on the upper anterior part of the body and in the red area of the pectoral fin. Each species of the genus has distinguishing characters in the second dorsal fin. The second dorsal fin of *C. rubripectoralis* differs from the other species in the red upper margin, two or three irregular longitudinal yellow stripes on the red middle part, and the greenish-gray basal part, whereas that of *C. lophius* has a yellow spotted or lined upper margin with or without black spots, yellow mottling on red from the upper to middle part, and yellow and red mottling on gray with black spots on the lower part; that of *C. nonatoae* has a red upper margin, irregular longitudinal rows of red blotches from the upper to basal part that are interspaced with a yellowish tinge; that of *C. aurimaculatus* has a purple tinge over the fin with scattered yellow spots, and its upper margin is spotted with yellow.

With respect to the body depth at the origin of the pelvic fins, *C. rubripectoralis* shows a wide range of values: the deepest and lowest values are found in *C. rubripectoralis* in comparison with the other species (values for *C. lophius*, *C.*

nonatoae, and *C. aurimaculatus* are given by Akihito and Meguro, 2000).

Cristatogobius rubripectoralis appears to reach a larger size than the other three species. Among the others, the largest is a specimen of *C. lophius* from Indonesia (51.0 mm SL; Akihito and Meguro, 2000), whereas six specimens of *C. rubripectoralis* are 53.6–60.5 mm SL (including two specimens of 60.5 mm SL).

Key to the Species of the Genus *Cristatogobius* (based on the adult life color*)

- 1a. Scales in a longitudinal row 39–55 and scales in a transverse row 19–25; rounded caudal fin; brown reticulation on upper anterior part of body; pectoral fin with a red area *C. rubripectoralis* sp. nov.
- 1b. Scales in a longitudinal row 24–33 and scales in a transverse row 9–13; somewhat lanceolate caudal fin; no brown reticulation on upper anterior part of body; pectoral fin without a red area 2
- 2a. Black spots on head, body, and pectoral fin base; several brown transverse bands from dorsal to ventral sides of body; anal fin separated into proximal red and distal black areas with a yellow line on red area close to black area *C. lophius*
- 2b. No black spots on head, body, or pectoral fin base; no brown transverse bands from dorsal to ventral sides of body; anal fin without three-colored pattern 3
- 3a. Second dorsal fin purple scattered with yellow spots from upper margin to basal part; two brown bands below nuchal crest** *C. aurimaculatus*
- 3b. Second dorsal fin with red upper margin and with irregular longitudinal rows of red blotches on submarginal to basal part, interspaced with yellow tinge; no brown bands below nuchal crest *C. nonatoae*

* Brown to black marks remain in the specimens in preservation.

** Two brown bands are conspicuous in the specimens in preservation.

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