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First records of the two gobies, *Cryptocentrus shigensis* and *Priolepis profunda* (Actinopterygii: Gobiiformes: Gobiidae), from the Andaman Sea

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Abstract

Single specimens of *Cryptocentrus shigensis* Kuroda, 1956 (41.1 mm standard length: SL) and *Priolepis profunda* (Weber, 1909) (24.4 mm SL) represent the first specimen-supported records of those species from the Andaman Sea. Notably, the specimen of *C. shigensis* represents the first Indian Ocean record, the species having been previously recorded only from southern Japan and Palau. Full descriptions of the specimens are provided.

Keywords

new records, description, distribution, R/V *Dr. Fridtjof Nansen*, trawl surveys

Introduction

Surveys at sea, carried out by the Norwegian R/V *Dr. Fridtjof Nansen*, are an important and integral part of the EAF-Nansen Programme (FAO) activities and Science Plan supporting the Programme's overall objective of promoting sustainable fisheries to improve food and nutrition security for partner countries. In 2013, 2015, and 2018, the Programme (in cooperation with the Myanmar Government) carried out three ecosystem surveys and one habitat survey off the coast of Myanmar to obtain biological and environmental information and identify species diversity as a basis for an FAO marine species identification guide intended for fishery purposes (see Psomadakis et al. 2019). Many unidentified gobiid specimens were collected during the 2018 survey from the Andaman Sea (northeastern Indian Ocean) that could not be examined in time to be included in the guide. Two of them, identified here as *Cryptocentrus shigensis* Kuroda, 1956 and *Priolepis profunda* (Weber, 1909) (all known primarily from the western Pacific Ocean), had not been previously recorded from the Andaman Sea. Detailed descriptions of the specimens are provided herein.

Methods

Counts and measurements generally followed Shibukawa et al. (2005), with the following descriptive modifications: longitudinal scale rows ("longitudinal scales" of

Shibukawa et al. 2005); anterior transverse scale rows (transverse scales from anal-fin origin upwards and forward to base of first dorsal fin); posterior transverse scale rows (transverse scales from anal-fin origin upwards and backwards to base of second dorsal fin); transverse scale rows from D2 (transverse scales from origin of second dorsal fin downwards and backwards to anal-fin base); and predorsal scale rows (predorsal scales). Measurements were made to the nearest 0.01 mm, except for standard length (abbreviated as SL), which was measured to the nearest 0.1 mm. Cephalic sensory canal pores and papillae were observed using versatile staining with cyanine blue (Saruwatari et al. 1997), their terminologies following Akihito (1984). Photographs of preserved specimens were taken with a Nikon D850 camera using an internal focus bracketing function; sets of multifocal images were then collated into an overall well-focused composite image, using Combine ZP (free software). Institutional codes follow Sabaj (2020).

Comparative material examined in this study was as follows: NSMT-P 45884, holotype of *Cryptocentrus shigensis*, 78.9 mm SL, Shige, Numazu, Shizuoka Prefecture, Japan, 25 Aug 1956.

Table 1. Counts and measurements of specimens of two gobies, *Cryptocentrus shigensis* and *Priolepis profunda.*

	C. shigensis		*P. profunda*
	SAIAB 208619	**NSMT-P 45884 (holotype)**	**SAIAB 208454**
Standard length (SL) [mm]	41.1	78.9	24.4
Counts			
Dorsal-fin rays	VI-I, 10	VI-I, 10	VI-I, 10
Anal-fin rays	I, 9	I, 9	I, 8
Pectoral-fin rays	17	18	20
Pelvic-fin rays	I, 5	I, 5	I, 5
Longitudinal scale rows	ca. 55	ca. 60 (left) ca. 58 (right)	26
Anterior transverse scale rows	ca. 18	ca. 20	11
Posterior transverse scale rows	ca. 15	ca. 17	11
Transverse scale rows	ca. 15	ca. 18	11
Predorsal scale rows	ca. 25	ca. 26	18
Circumpeduncular scales	ca. 14	ca. 14	12
Gill rakers	3 + 14	broken	3 + 11
Measurements [% of SL]			
Head length	29.3	26.7	35.7
Snout length	5.9	5.7	9.6
Eye diameter	9.1	6.3	10.9
Interorbital width	1.2	0.8	3.3
Nape width	10.9	11.7	19.8
Head width	12.1	15.2	21.0
Head depth	18.9	16.9	26.4
Jaw length	13.5	14.8	15.9
Body depth	19.3	17.2	27.4
Body width	10.9	12.4	18.5
Predorsal length	37.5	32.2	40.5
Prepelvic length	33.9	31.1	36.0
Pre-anal length	65.1	60.1	67.0
Caudal-peduncle length	22.1	20.8	23.1
Caudal-peduncle depth	10.3	9.6	15.1
First dorsal-fin base length	15.1	15.8	16.0
Second dorsal-fin base length	26.7	27.6	21.4
Anal-fin base length	19.2	21.5	17.1
Pectoral-fin length	24.8	19.4	30.7
Pelvic-fin length	22.8	19.4	23.0
Caudal-fin length	38.2	44.0	23.0

Gill rakers of SAIAB 208619 and SAIAB 208454 were counted on the right side only.

Results

Family Gobiidae Cuvier, 1816
Cryptocentrus Valenciennes, 1837

Cryptocentrus shigensis Kuroda, 1956

[English name: Shige shrimp goby]

Fig. 1; Table 1

Material examined. SAIAB 208619, 41.1 mm SL, station 47 (14°41′27″N, 94°05′49″E), northeast of Coco Islands, Myanmar, Andaman Sea, Indian Ocean, 84 m depth, R/V. *Dr. Fridtjof Nansen* (P. N. Psomadakis), bottom trawl, 2 Sep 2018.

Description. Counts and measurements are given in Table 1 and general appearance in Fig. 1. Head and body slender, strongly compressed, width much less than depth. Anus located posteriorly, slightly separated from anal-fin origin. Snout short (much shorter than eye diameter), rounded; lateral profile steep, forming angle of ca. 60° with body axis. Eyes large, located dorsolaterally. Interorbital region very narrow (width much narrower than pupil diameter), flattened. Anterior and posterior nostrils close to each other; former located just before snout tip, with membranous tube; latter located posterodorsally of anterior nostril, small, circular. Mouth terminal, inclined anterodorsally, forming angle of ca. 50° with body axis. Lower jaw subequal to upper jaw, its posterior tip reaching vertical through posterior margin of pupil. Upper-jaw tip behind vertical through lower-jaw tip. Both jaws with irregular rows of small, pointed conical teeth, with tip of each slightly incurved posteriorly; teeth on outermost row on jaws spaced, distinctly larger than teeth on inner rows; 2 or 3 somewhat large canine-like teeth present on both sides of jaws; vomerine and palatine teeth absent. Gill membranes attached anteriorly to isthmus. Gill opening relatively narrow, anteroventral point extending slightly forward to vertical level of preopercle margin.

Cephalic sensory system. A detailed pattern of cephalic sensory system given in Fig. 1B. Head sensory canals pores well developed; anterior oculoscapular canal with pores B’, C (single), D (single), E, F, G, and H’; posterior oculoscapular canal with pores K’ and L’; preopercular canal with pores M’ and O’. Head sensory papillae damaged, but following conditions confirmed: 4 transverse papillae rows extending from lower eye margin to upper jaw (anterior 2 rows) and cheek (posterior 2 rows); 2 longitudinal papillae rows present on cheek; single transverse papillae row present between longitudinal papillae rows.

Scales. Body covered with deciduous (almost all scales lost due to abrasion) cycloid scales, small anteriorly, becoming larger posteriorly. Pre-dorsal- and pelvic-fin regions covered with small cycloid scales, anterior scaled margins reaching vertical through between eye and preopercle and just behind anteroventral point of gill opening, respectively; lower margin of pre-dorsal scaled area

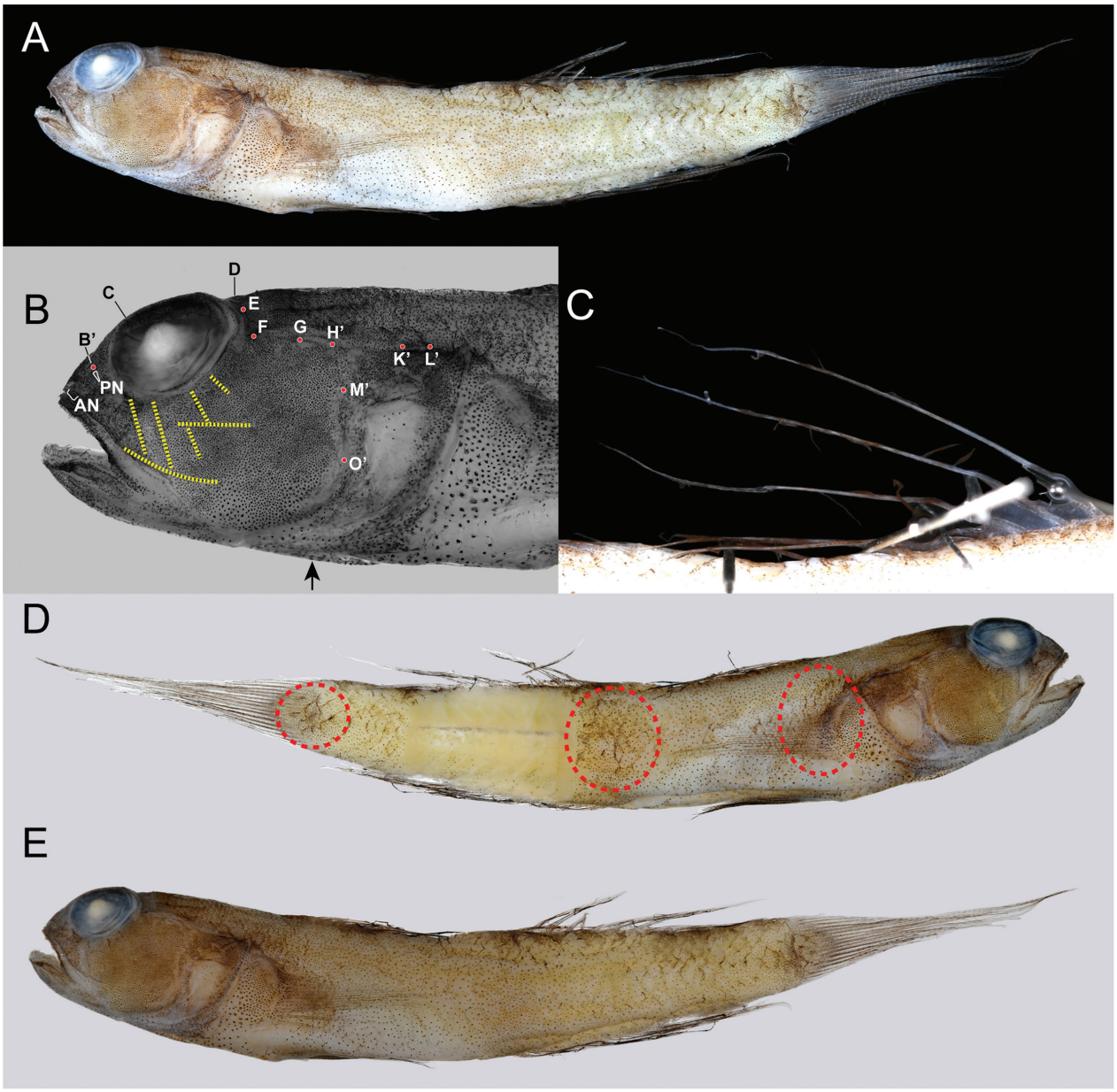

Figure 1. Preserved specimen of *Cryptocentrus shigensis* (SAIAB 208619, 41.1 mm SL). (**A**, **E**) and (**D**), left and right sides of body, respectively; (**B**), close-up of head, showing cephalic sensory system; (**C**): close-up of 1st dorsal fin (right side). Yellow dots and red circles indicate sensory papillae rows and brown blotches, respectively. AN and PN indicate anterior and posterior nostrils, respectively. Arrow head indicates anteroventral end of gill opening.

not reaching horizontal level of upper end of opercle. Entire head region (except for lateral surface of nape) naked.

Fins. All dorsal- and anal-fin spines slender, flexible. First dorsal fin triangular, all spines with very long filamentous tips, 2nd and 3rd spines longest (much longer than 1st dorsal-fin base) (Fig. 1C); dorsal-fin origin posterior to vertical through pectoral-fin base. Second dorsal and anal fins relatively long, origin of latter slightly posterior to vertical through 2nd dorsal-fin origin, posteriormost rays of both fins well separated from caudal-fin base. Pectoral fin moderately long, pointed, middle rays longest, tips extending posteriorly to a vertical line drawn between dorsal fins. Pelvic fins fused medially with connecting membrane (between innermost rays) and well developed frenum (between spines); posterior tips located vertically level with pectoral-fin tip; pelvic-fin origin just below ventral end of pectoral-fin base; posterior margin of pelvic frenum smooth, slightly emarginated; all segmented pelvic-fin rays branched. Caudal fin very long (subequal to predorsal length), lanceolate.

Coloration. Based on preserved specimen (Figs. 1A, D, and E). Head and body pale brown. Most pigmentation patterns lost, but three poorly defined brown blotches retained on right side of body, anteriormost blotch just behind opercle, middle blotch below 2nd dorsal-fin origin, posteriormost blotch on caudal-fin base (Fig. 1D). Dorsal, anal and pelvic fins blackish-brown; pectoral and caudal fins light gray.

Identification. Morphometric and meristic characters of the Andaman specimen (SAIAB 208619) agreed closely with the holotype of *C. shigensis* (Table 1) and the detailed description of the species provided by Akihito et al. (2013). In addition, the presently reported specimen conformed to other diagnostic characters for *C. shigensis* (e.g., pre-dorsal squamation and first dorsal- and caudal-fin shape; Figs. 1A, C, and E; see Remarks). Although head sensory papillae and body pigmentation patterns could not be completely determined due to damage, some characters [e.g., 4 transverse papillae rows extending from lower eye margin to upper jaw (anterior 2 rows) and cheek (posterior 2 rows) and position of three brown blotches on body; Figs. 1B and D] also matched those given by Akihito et al. (2013: 1591) and Kuroda (1956: fig. 1).

Distribution. *Cryptocentrus shigensis* was originally described on the basis of a single specimen collected from Shizuoka Prefecture, Japan (Kuroda 1956). Subsequently, Myers (1999) recorded the species from Palau [based on an unpublished photograph(s)], which remains the only record outside of southern Japan to date (Akihito et al. 2013). Accordingly, the presently reported specimen, collected from the Andaman Sea, represents the first Indian Ocean record of the species.

Remarks. Count of the longitudinal scale rows of the presently reported specimen (ca. 55) was much fewer than those given by the original description of *C. shigensis* (ca. 101; Kuroda 1956). However, re-examination of the holotype of the species revealed that its count was actually ca. 60 on the left side of the body (poor condition) and 58 on the right side (Table 1).

Currently, the generic position of *C. shigensis* is equivocal, the species being closer to *Myersina* Herre, 1934 rather than *Cryptocentrus* (the long filamentous tips on the 1st dorsal fin matching the former), according to Hoese and Lubbock (1982) and Winterbottom (2002). However, the pre-dorsal region covered with cycloid scales differs from the diagnosis of *Myersina* provided by Winterbottom (2002) (completely naked). In addition to the above-mentioned characters, *C. shigensis* can be easily recognized by the lanceolate caudal fin and four brown blotches on the body [3rd blotch (located under middle of 2nd dorsal fin; Kuroda 1956) of the presently reported specimen could not be determined] (Kuroda 1956; Allen and Erdmann 2012; Akihito et al. 2013; this study).

Priolepis Valenciennes, 1837

Priolepis profunda (Weber, 1909)

[English name: narrowbar reef goby]

Figs. 2 and 3; Table 1

Material examined. SAIAB 208454, male, 24.4 mm SL, station 143 (11°01′34″N, 97°56′32″E), north of Clara Island, Myanmar, Andaman Sea, Indian Ocean, 59 m depth, R/V. *Dr. Fridtjof Nansen* (P. N. Psomadakis), bottom trawl, 25 Sep 2018.

Description. Counts and measurements are given in Table 1 and general appearance in Fig. 2. Body somewhat stout, subcylindrical anteriorly, compressed posteriorly. Anus located just before anal-fin origin. Head relatively large, slightly depressed anteriorly. Snout moderate (slightly shorter than eye diameter), rounded. Eyes large, located dorsolaterally. Interorbital region narrow, flattened. Anterior and posterior nostrils close to each other; former located mid-way between anterior tip of snout and eye; latter located just before orbit, larger than former; both with membranous tube. Mouth terminal, inclined anterodorsally, forming an angle of ca. 60° with body axis. Lower jaw subequal to upper jaw, its posterior tip reaching to vertical through anterior margin of pupil. Upper-jaw tip behind vertical through lower-jaw tip. Both jaws with irregular rows of small, pointed conical teeth, with tip of each slightly incurved posteriorly; teeth in outermost row on jaws more widely spaced and distinctly larger than teeth in inner rows. Gill membranes attached anteriorly to isthmus. Gill opening relatively narrow, anteroventral point extending slightly forward to vertical level of preopercle margin.

Cephalic sensory system. Detailed pattern of cephalic sensory system is given in Figs. 3A–C. Head sensory canals pores absent. Head sensory papillae damaged, but following conditions confirmed: 5 transverse papillae rows present on suborbital region; 2 transverse papillae rows present on interorbital region, neither connecting in mid-line, anterior and posterior rows including 2 and 3 papillae, respectively; 2 longitudinal papillae rows present on chin and ventrolateral surface, each papillae row on chin well-spaced anteriorly, becoming gradually closer posteriorly, but not joining.

Scales. Body covered with ctenoid scales, except abdomen (covered with cycloid scales). Pre-dorsal region fully scaled (except just behind 1st dorsal-fin origin), anterior margin of scaled area rounded, reaching vertical through posterior margin of pupil. Pre-pelvic-fin region covered with ca. 6 rows of cycloid scales, anterior margin reaching just behind anteroventral point of gill opening. Entire head region (except for lateral surface of nape) naked. Pectoral-fin base with cycloid scales.

Fins. All dorsal- and anal-fin spines slender, flexible. First dorsal fin squarish, all spines without filamentous tips, 5th spine longest; dorsal-fin origin located just above dorsal origin of pectoral fin. Second dorsal and anal fins relatively short, origin of latter slightly posterior to vertical through 2nd dorsal-fin origin. Pectoral fin long, pointed, middle rays longest, tips reaching just above base of 2nd anal-fin ray. Pelvic fins weakly fused medially with connecting membrane (between ca. 1/5 innermost rays), pelvic frenum absent; posterior tip reaching anus; pelvic-fin origin just below ventral end of pectoral-fin base; all segmented pelvic-fin rays branched. Caudal fin relatively short, with rounded posterior margin.

Coloration. Based on Fig. 2. Head and body orange with many narrow white bars, all bars on each side connected mid-dorsally. Four bars on interorbital region; anterior two bars continuous with two bars under eye;

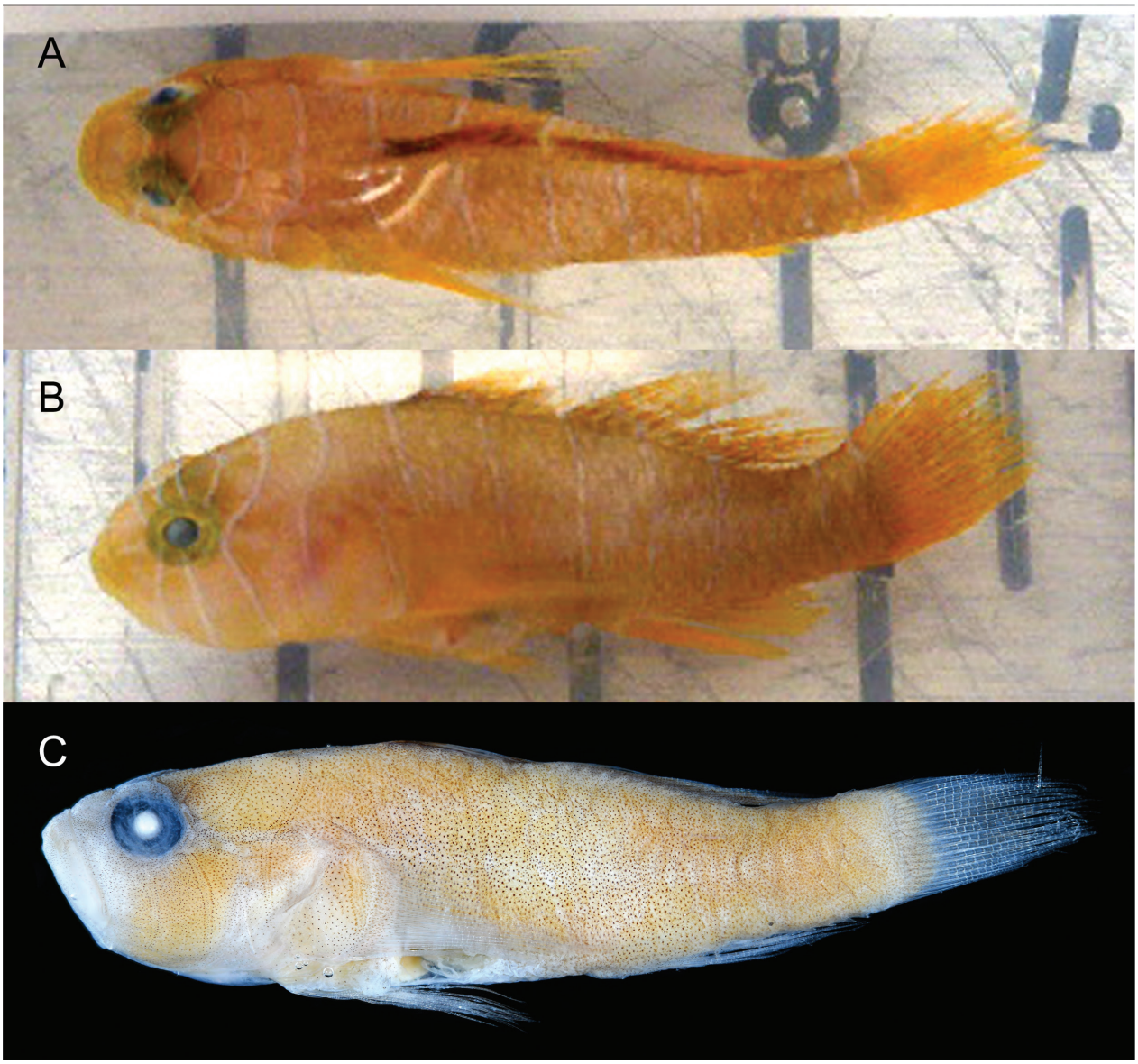

Figure 2. Fresh (**A**, **B**) and preserved (**C**) specimen of *Priolepis profunda* (SAIAB 208454, male, 24.4 mm SL).

posteriormost bar relatively curved posteriorly, more widely spaced from anterior bars. Two bars on postorbital region; former strongly curved, extending from middle of nape to lower edge of preopercle through posterior margin of eye; latter weakly curved, extending from posterior end of head to lower margin of opercle. Eight straight vertical bars along body; two anteriormost below origin and middle of 1st dorsal-fin base, respectively, middle three below origin, middle and posterior end of 2nd dorsal-fin base, respectively, three posteriormost on caudal peduncle (two) and caudal-fin base. All fins orange basally; anterior part of 1st dorsal fin with dark brown smudge; small reddish-orange spots on 2nd dorsal fin and upper part of caudal fin; a single short, pale white bar on pectoral-fin base; caudal fin lacking dark black blotches or bar.

Color in alcohol. Head and body pale brown. All bars visible in fresh specimen retained (pale white with brown edge), but those posteriorly on body somewhat indistinct. All fins translucent white basally, anterior part of 1st dorsal fin and 2nd dorsal-fin base dark brown.

Identification. The Andaman specimen (SAIAB 208454) agreed well with the detailed description of *P. profunda* provided by Hoese and Larson (2010), especially as follows: transverse papillae rows present on suborbital region (Fig. 3B); 6 papillae present on posterior part of interorbital region (Fig. 3A); anterior margin of pre-dorsal scales reaching to vertical through posterior margin of pupil (Figs. 3A and B); 8 narrow white bars on body (Fig. 2).

Distribution. *Priolepis profunda* has previously been recorded widely from the western Pacific Ocean (Japan, Philippines, Thailand, Indonesia, Papua New Guinea, and northwestern Australia; Hoese and Larson 2010; Allen and Erdmann 2012; Akihito et al. 2013). Recently, Ramachandran et al. (2020) recorded the species from India, being the first Indian Ocean record. However, because the inclusion of the Andaman Islands within the distributional range of *P. profunda* by Allen and Erdmann (2012) was not supported by underwater photographs or voucher specimens, the presently reported specimen represents the first reliable record of *P. profunda* from the Andaman Sea (Myanmar).

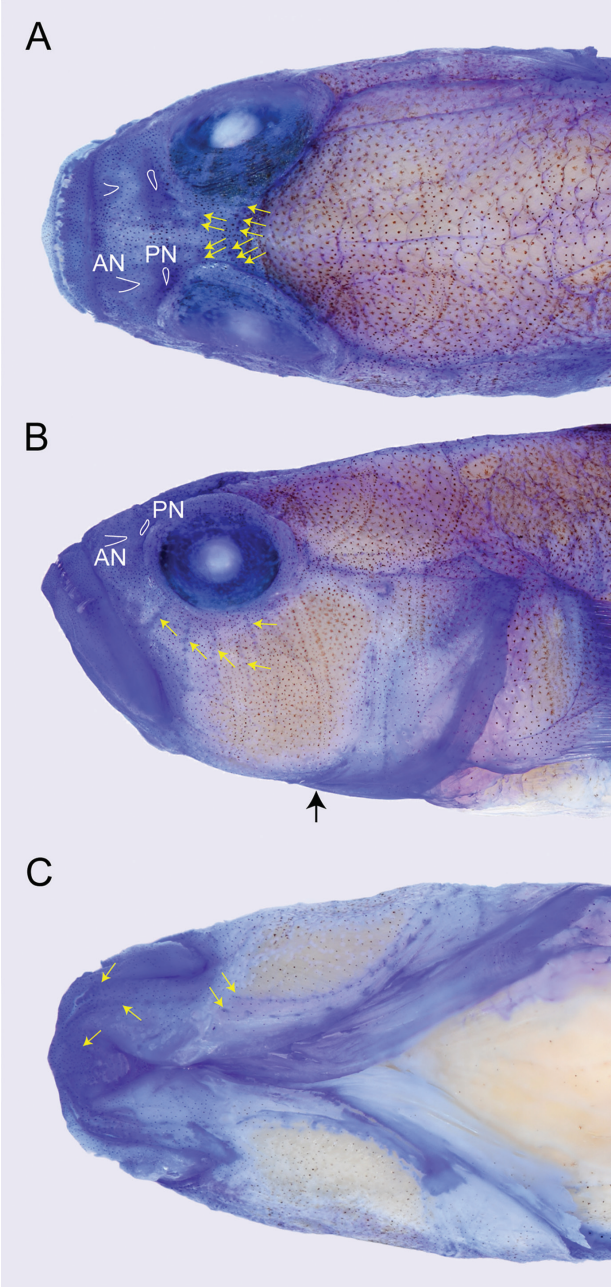

Figure 3. Head of *Priolepis profunda* (SAIAB 208454, 24.4 mm SL), showing cephalic sensory system. Yellow arrows indicate sensory papilla (**A**) and papillae rows (**B**–**C**). AN and PN indicate anterior and posterior nostrils, respectively. Black arrows indicate anteroventral end of gill opening.

Remarks. In addition to *P. profunda*, 11 species of *Priolepis* are known to have transverse papillae rows on the suborbital region [*P. profunda* grade *sensu* Winterbottom and Burridge (1993)] (Winterbottom and Burridge 1992; Nogawa and Endo 2007; Hoese and Larson 2010; Bogorodsky et al. 2016; Allen et al. 2018; Fujiwara et al. 2020; Koeda et al. 2021). *Priolepis profunda* and seven of the 11 species also share white bars on the body, although the number and width of the bars in *P. profunda* are relatively high (8 bars) and distinctly narrow, respectively. Moreover, the combination of squamation on the pre-dorsal region and number of papillae on the interorbital region of *P. profunda* (see Identification) is unique within the species complex.

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