



## *Eviota pseudaprica*, a new dwarfgoby from the Western Pacific Ocean (Teleostei: Gobiidae)

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### Abstract

A new species of dwarfgoby, *Eviota pseudaprica* n. sp., is described from the main islands of Palau along with specimens from Raja Ampat Islands, West Papua, Indonesia. The new species has a unique cephalic sensory-canal pore pattern for the genus, with only the paired PITO and SOT pores present. One or more of the pectoral-fin rays are branched, the fifth pelvic-fin ray is long (65 to 83% of the length of the fourth pelvic ray), and the long tubular anterior nares are about half to fully black. In life, and in freshly collected specimens, the fish is lemon yellow with three red-orange bars crossing the nape.

**Key words:** taxonomy, systematics, ichthyology, coral-reef fishes, gobies, Republic of Palau, West Papua

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## Introduction

The dwarfgobies assigned to *Eviota* currently comprise 119 valid species from throughout most of the Indo-Pacific Ocean, and they represent one of the most diverse genera of coral-reef fishes. As the common name implies, they are tiny fishes (usually <18 mm SL) that are abundant on reefs, and they serve as a trophic link between small invertebrates and larger piscivorous fishes. Cryptobenthic fishes, such as the small planktivorous gobies, have been shown to be the main contributor to nutrient and energy import to reefs in tropical seas (Brandl et al. 2019). Greenfield (2017) and Greenfield & Winterbottom (2016) pointed out that the rate of description of new species of dwarfgobies has increased rapidly since the major works on the genus by Lachner & Karnella (Jewett), whose last paper (Jewett & Lachner 1983) listed a total of 40 species. These new discoveries have been in large part the result of advances in underwater photography and the availability of color photographs of individuals from different localities, revealing that species which were once thought to be widespread consisted of several different species.

The species described here was first collected in Koror, Palau in 2004 by the first author. Later, in 2010, M.V. Erdmann collected and photographed *Eviota* specimens from the Raja Ampat Islands, Indonesia that appear to be the same species, both exhibiting a unique cephalic sensory-canal pore for the genus with only the paired PITO and SOT pores present. A greyscale photograph of a preserved specimen from Raja Ampat, under the name *Eviota* Palau sp. 8, was published in Dimara et al. (2010: Fig. 1H).

## Materials and Methods

Type specimens are deposited at the Royal Ontario Museum, Toronto, Ontario, Canada (ROM) and the California Academy of Sciences, San Francisco, CA, USA (CAS).

Although we believe the specimens from Palau and Raja Ampat to be the same species, we have restricted the type material to specimens from Palau. The living or fresh coloration was not recorded for specimens from Palau, thus our color description is based on two anesthetized specimens from Raja Ampat.

Counts and measurements, descriptions of fin morphology and of the cephalic sensory-canal pore patterns follow Lachner & Karnella (1980) and Jewett & Lachner (1983). We follow Lachner & Karnella (1980:4) in describing the membranes joining the first 4 pelvic-fin rays, which “...are considered to be reduced when they are slightly developed, not extending to the bases of the first branches”. The segments between the first and second (if present) branches of the first 4 pelvic fin rays were counted according to the method given in Lachner & Karnella (1980) i.e. ignoring the segment at the bases of the branch points. Dorsal/anal fin-ray formula counts (e.g. 9/8) only include segmented rays. Measurements were made to the nearest 0.1 mm using an ocular micrometer or dial calipers, and are presented as percentage of Standard Length (SL). Lengths are given as standard length (SL), measured from the median anterior point of the upper lip to the base of the caudal fin (posterior end of the hypural plate); origin of the first dorsal fin is measured from the median anterior point of the upper lip to the anterior base of the first dorsal-fin spine; origin of the second dorsal-fin is measured from the median anterior point of the upper lip to the anterior base of its spine; origin of the anal fin is measured from the median anterior point of the upper lip to the anterior base of its spine; body depth is measured at the center of the first dorsal fin between the bases of the third and fourth spines; head length is taken from the median anterior margin of the upper lip to the posterior end of the dorsal margin of the opercular membrane; orbit diameter is the greatest fleshy diameter; snout length is measured from the median anterior point of the upper lip to the nearest fleshy edge of the orbit; upper jaw length is the distance from the anterior tip of the upper lip to the tissue covering the distal tip of the maxilla; caudal-peduncle depth is the least depth, and caudal-peduncle length the horizontal distance between verticals at the rear base of the anal fin and the caudal-fin base; pelvic-fin ray lengths are measured from the base of the pelvic-fin spine to the tip of the fourth or fifth pelvic-fin soft ray.

The cephalic cutaneous sensory papillae (free neuromasts) in *Eviota* are relatively much reduced in number, but the pattern of rows remain interpretable using the terminology developed by Sanzo (1911) as applied by Winterbottom et al. (2015, Fig. 2) to the pygmygobies (*Trimma*). Cyanine Blue 5R (acid blue 113) stain and an airjet were used to make the cephalic sensory-canal pores, papillae, fin rays, and scales more obvious (Akihito et al. 1993, 2002, Saruwatari et al.1997).

*Eviota pseudaprica*, n. sp.

False Sunny Dwarfgoby

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Figures 1–5

*Eviota* Palau sp. 8: Dimara et al. 2010: 621 & 622, Fig. 1H (Raja Ampat Islands, Indonesia).

**Holotype.** ROM 77495, 13.3 mm SL male, Palau, SE of Koror Island at SW corner of Uchelbeluu Reef, 7.27464°, 134.52558°, 13.7–25.9 m, RW04-05, wall with ledges, shallow caves, some silty sand, corals (*Acropora*, *Montipora*), hydroids, rotenone, Winterbottom et al., 21 May 2004.

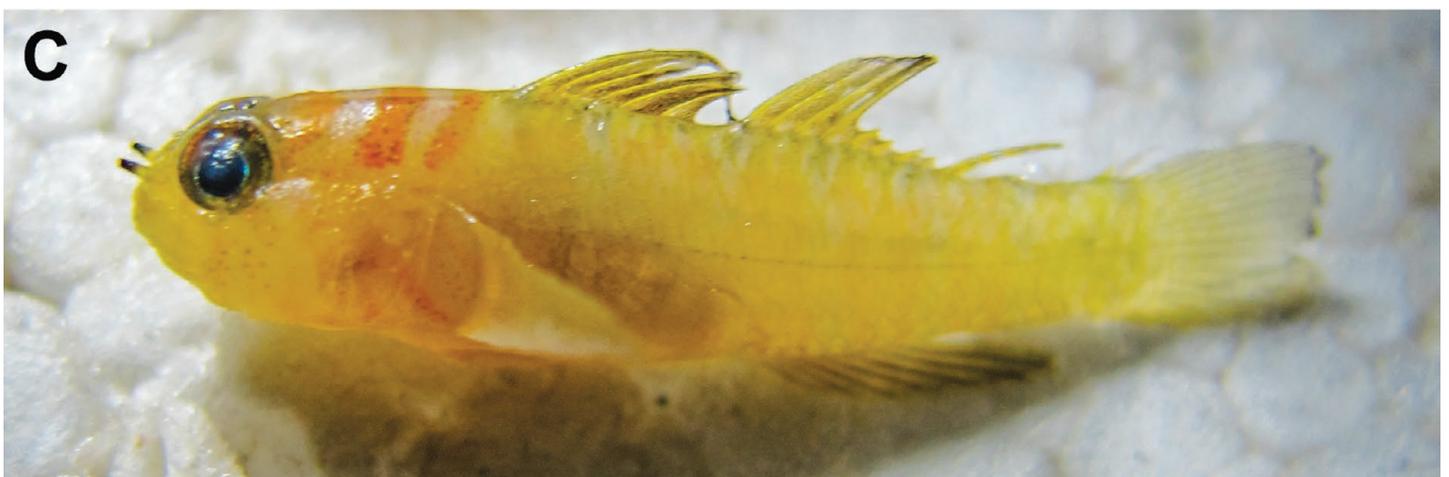
**Paratypes.** CAS 247231 (ex-ROM 76353), males 10.9 & 12.5 mm SL, females 11.6 & 12.6 mm SL, 5 juveniles 8.6–9.9 mm SL, Palau, outer reef off Ulong pass to N of Ngerumekaul Pass, 7.30311°, 134.23506°, 15.2–30.5 m, RW04-15, vertical drop-off with small caves and ledges, hydroids, sea fans, various hard corals, some *Halimeda*, rotenone, Winterbottom et al., 26 May 2004; ROM 105385 (ex-ROM 77495), males 12.6 & 13.7 mm SL, females 10.9 & 11.1 mm SL, juveniles 6.8 & 8.0 mm SL, collected with holotype; ROM 76554, female 11.5 mm SL, 4 juveniles 7.5–10.0 mm SL, Palau, just N of pass to W of Ulong Is., 7.29561°, 134.23858°, 18.3–30.5 m, RW04–38, outer reef, vertical wall of drop-off, some small caves, broad sandy ledge at 30 m, some gorgonians, sponges, *Acropora*, *Pocillopora*, *Halimeda*, rotenone, Winterbottom et al., 7 June 2004; ROM 82403, male 13.7 mm SL, female 12.6 mm SL, Palau, SE of Koror Island at Uchelbeluu Reef, 7.25000, 134.52500, 50 m, quinaldine, P. Colin, 10 May 2007.

**Non-type material.** ROM 84899, females 13.4 & 14.8 mm SL, Indonesia, Raja Ampat, Kerou Island off Penemu Island, Fam Islands, -0.58767°, 130.29475°, 56 m, steep wall with caves, clove oil, M.V. Erdmann, 5 January 2010; ROM 85399, 3 females 12.1–14.7 mm SL, S. side of Balbulol Island off SE Misool, -2.024861°, 130.693028°, 45 m, cave in reef slope, clove oil, M.V. Erdmann, 2 February 2010; ROM 87550, females 13.2 & 15.6 mm SL, Keruo Island, -0.58819°, 130.30967°, 66 m, cave in steep slope with sand and gorgonians, clove oil, M.V. Erdmann, 26 August 2010.

**DNA samples.** ROM T03731, T03732 from ROM 82403.

**Diagnosis.** A species of *Eviota* with cephalic sensory-canal pore system consisting only of paired PITO and SOT pores, dorsal/anal fin-ray formula 9/8, one or more branched pectoral-fin rays, fifth pelvic-fin ray present and 65–85% of fourth, anterior narial tubes about half to fully black, body and fins yellow, nape crossed by three broad red-orange bars.

**Description.** (based on Palau type specimens only) Dorsal-fin elements VI+I<sub>9</sub>; first dorsal fin essentially triangular, second and third spines elongate (Fig. 1), second spine reaching to bases of first to ninth fin rays of second dorsal fin and third spine to bases of seventh to eighth rays of second dorsal fin when adpressed, all second-dorsal-fin soft rays except first and penultimate branched, last ray branched to base; anal-fin elements I<sub>8</sub>, all soft rays branched, last ray branched to base; pectoral-fin rays 17 (15–17, usually 16), with 1–5 rays branched, reaching to below second dorsal fin when unbroken; fifth pelvic-fin ray 71% (65–83%, 73.2%) of length of fourth pelvic-fin ray, which has 3 (2–4) branches and 8 (5–8) segments between consecutive branches (see Fig. 2 and Table 1 for further details), pelvic-fin membranes between branches reduced, basal membrane reduced; caudal fin with 13 (12 or 13) branched and 17 segmented rays; lateral-line scales 25 (23–25, usually 25); transverse scale rows 7; urogenital papilla of male smooth, long, tapered, and rounded at tip, extending past anal-fin spine (Fig. 3A); female papilla smooth, bulbous, with short finger-like projections on distal end (Fig. 3B); front of head rounded with an angle of about 60° from horizontal axis; mouth slanted obliquely upwards, forming an angle of about 55° to horizontal axis of body, lower jaw not projecting; maxilla extending posteriorly to front of pupil (longer in males); anterior tubular nares long, usually black, extending to center of upper lip; gill opening extending forward to below posteroventral edge of preoperculum.



**Figure 1.** *Eviota pseudaprica*, lateral view of freshly collected specimens, Keruo Island, Raja Ampat, Indonesia: ROM 87550 (A) 13.2 mm SL female, right lateral view; (B) 15.6 mm SL female, right lateral view; (C) same specimen as in A, image taken some 2.5 hours later, left lateral view (M.V. Erdmann).

Only two cephalic sensory-canal pores present: a pair of posterior interorbital pores (PITO) close to midline (but two Raja Ampat specimens, 13.4 and 15.6 mm SL, have only a single large pore in midline of posterior interorbital region) and a pair of supraoptic pores (SOT), opening just above last papilla of sensory papilla row *p* (Fig. 4 B). No other pores present in any specimens. Numbers of cephalic cutaneous papillae in each named row given in Table 2 (see also Fig. 4A & 4B). *Eviota pseudaprica*, and many other *Eviota* species, are somewhat unusual in that papilla row *b* on cheek below posteroventral region of eye comprises two sections, one papilla a little posterior to fifth papilla of row *c*, and (usually) a row of two additional papillae just anterior to vertical limb of preopercle. In general, papillae can be considered to represent a very reduced transverse papillae pattern.

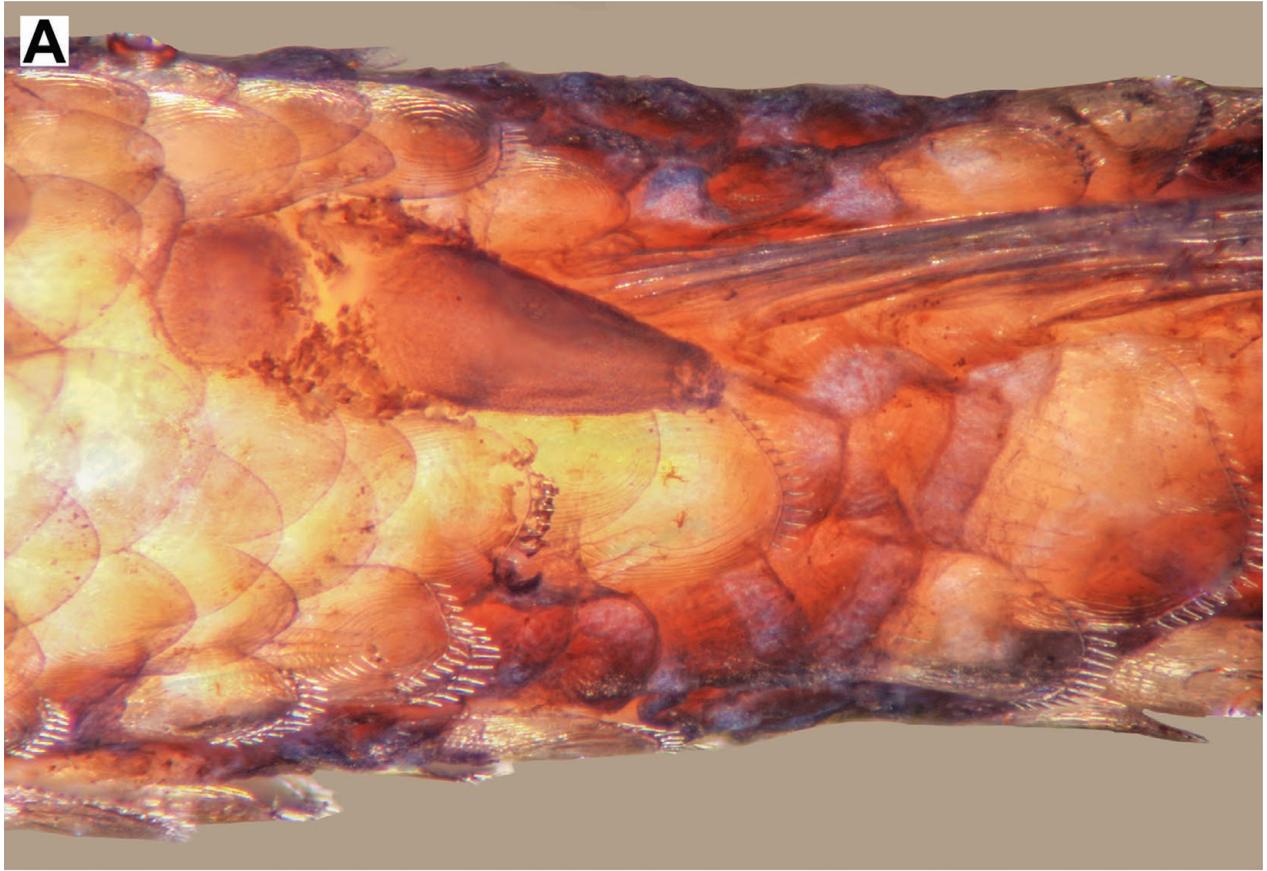
Measurements (percentage of SL; based on Palau holotype and 12 paratypes, 9.9–13.7 mm SL): head length 31.2 (27.8–34.3, 30.6); origin of first dorsal fin 33.4 (29.4–41.3, 35.3); origin of second dorsal fin 55.6 (54.3–60.1, 57.2); origin of anal fin 61.6 (57.8–65.4, 61.2); caudal-peduncle length 24.1 (22.2–28.2, 24.9); caudal-peduncle depth 15.0 (11.2–15.0, 13.3); body depth 25.6 (20.6–26.2, 22.9); eye diameter 10.1 (10.1–12.8, 11.5); snout length 5.2 (3.5–5.8, 4.5); upper-jaw length of males 10.5 (10.1–11.7, 10.5) and females 7.6–10.1, 9.0; pectoral-fin length 24.8 (22.1–33.9, 28.9); pelvic-fin length 22.1 (22.1–38.4, 30.4).

Measurements and meristic values for Raja Ampat specimens (7 females, 12.1–15.6 mm SL): head length (27.4–32.2, 30.3); origin of first dorsal fin (34.7–42.3, 32.3); origin of second dorsal fin (54.0–61.2, 58.5); origin of anal fin (60.6–66.5, 63.1); caudal-peduncle length (20.5–25.8, 22.7); caudal-peduncle depth (12.7–14.4, 13.3); body depth (21.6–24.4, 22.9); eye diameter (9.8–12.7, 11.3); snout length (3.6–7.0, 4.6); upper-jaw length (7.7–10.9, 9.2); pectoral-fin length (27.6–36.4, 32.1); pelvic-fin length (28.1–36.4, 31.6).

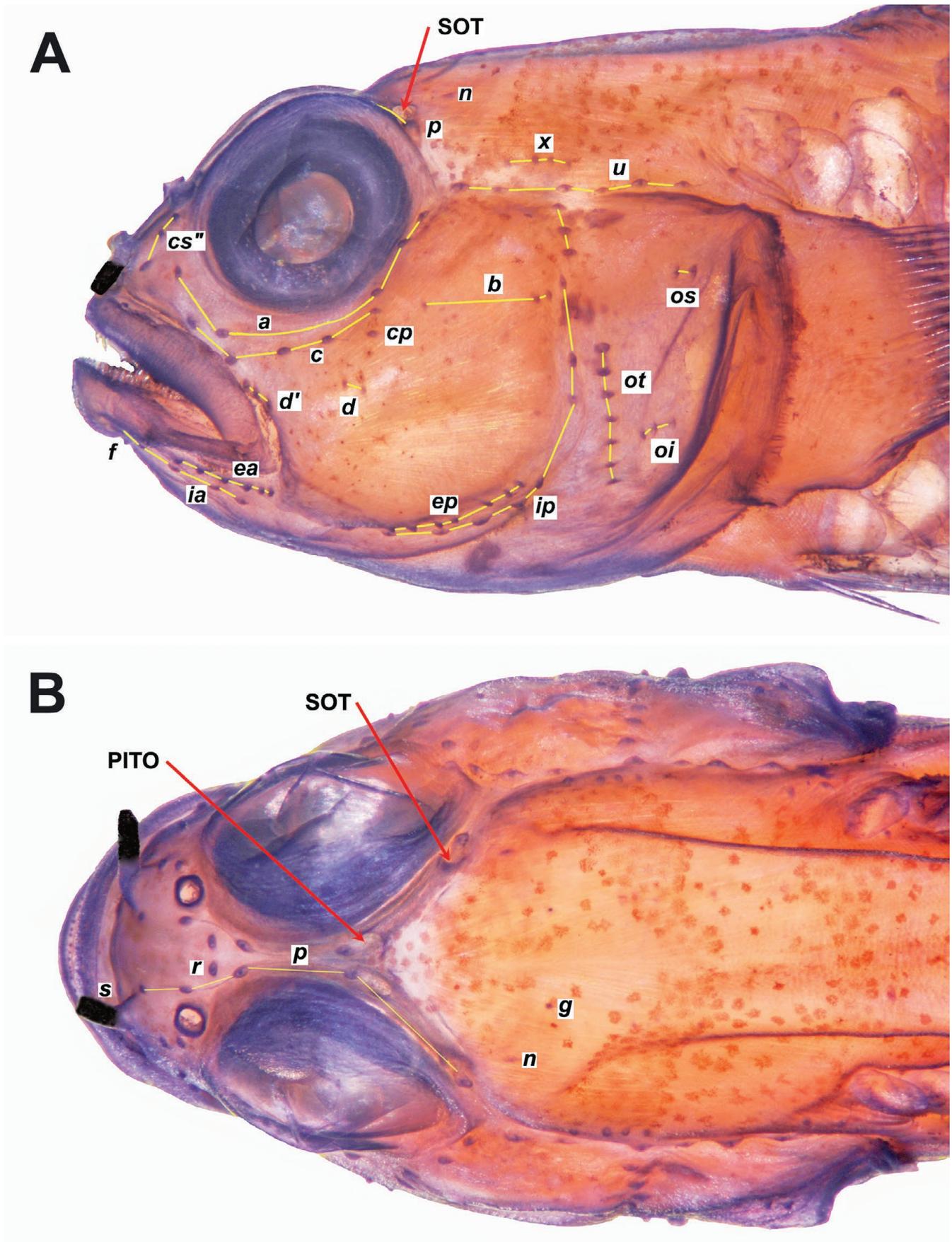
Dorsal/anal fin formula 9/8 (6), 8/8 (1), pectoral-fin rays 16, lateral scales 24–25, transverse scales 7, fifth pelvic-fin ray 73–85% of length of fourth pelvic-fin ray. Five specimens have paired PITO and SOT pores and two have paired SOT pores and a single PITO pore.



**Figure 2.** *Eviota pseudaprica*, ventral view of body to show pelvic-fin rays; ROM 77495, male holotype, 13.3 mm SL; red arrow indicates right fifth pelvic-fin ray; small blue circles on right fourth pelvic-fin ray depict individual segments between the first two branches (see also Table 1); specimen stained with Alcian Blue (R. Winterbottom).



**Figure 3.** *Eviota pseudaprica*, ventral view of urogenital papillae: A) ROM 105385, male paratype, 12.6 mm SL; B) ROM 105385 female paratype, 10.9 mm SL; specimens stained with Alcian Blue (R. Winterbottom).



**Figure 4.** *Eviota pseudaprica*, pattern of cephalic sensory-canals pores and papillae, ROM 77495, male holotype, 13.3 mm SL: A) left lateral view of head; B) dorsal view of head; PITO=posterior interorbital pore; SOT=supraoptic pore; papillae in a given row joined by yellow lines; specimen stained with Alcian Blue (R. Winterbottom).

**Color in life.** (based on two Raja Ampat specimens) Fresh anesthetized specimens (Figs. 1A & B) have a brownish body with about 7 narrow, incomplete, cream-to-light-yellow bars, and three, pupil-width, dark red bars across nape. Head mostly yellowish with red suffusion over opercle (from gill filaments?); a few scattered melanophores on nape, cheek, and pectoral-fin base; iris yellow with four uneven-sized black spokes radiating out from pupil. Membranes of dorsal, anal and caudal fins yellow with numerous melanophores, distal margins white.

Photographs of one of the same specimens as above taken about 2.5 hours later (Fig. 1C) shows background color of head and body lemon yellow; body crossed by about 7 very faint internal bars; nape crossed by three red-orange bars, narrower red-orange bar passes anterodorsally from ventral edge of pectoral fin and fades out beneath opercular membrane; abdomen with dark peritoneum visible through body wall. Head lemon yellow with some red-orange on center of upper lip, distal half of tubular anterior naris black; few scattered melanophores on cheek, nape and pectoral-fin base; iris brownish dorsally, darker ventrally. First-dorsal-fin rays yellow, membranes heavily invested with melanophores, some red-orange along base of fin; second dorsal fin similar but lacking red-orange; anal-fin membranes black, rays yellow; pectoral fin yellow, caudal fin yellow with black distal margin. Second specimen shows a narrow red-orange bar across middle of cheek, with suggestions of two additional such bars, one below anterior and one below posterior margin of eye.

**Color in preservative.** (Fig. 5) Background color of head and body cream, with no distinctive dark marks. Top of head crossed by three bars of scattered melanophores and a few scattered melanophores on dorsal surface of body below dorsal-fin bases. Anterior naris variably black, ranging from about half to fully black (usually > 80%). Dorsal and anal fins with scattered melanophores.

**Etymology.** The specific epithet is from Latin *pseudo*, meaning false and Latin *apricus*, meaning sunny, and is an allusion to the similarity in coloration of the new species to *Sueviota aprica* Winterbottom & Hoese, 1988, especially on the nape. The name is treated as a feminine nominative singular adjective.

**Distribution and habitat.** The new species is apparently a relatively deep-reef inhabitant in the main islands of Palau (14–50 m) and in the Raja Ampat Islands of Indonesia (45–66 m). It appears to be primarily associated with small caves in the vertical slopes of the drop-offs.

**Comparisons.** *Eviota pseudaprica* differs from all described *Eviota* species in having a unique cephalic sensory-canal pore pattern, with only paired PITO and SOT pores present. It also has a long fifth pelvic-fin ray that is 65–78% the length of the fourth pelvic-fin ray. Only 13 other described species have a fifth ray that is greater than 50% of the fourth ray, and all of these except *E. laterita* and *E. sparsa* have unbranched pectoral-fin rays (at least one, and up to 5, branched in *E. pseudaprica*). Neither *E. laterita* (confined to New Caledonia) nor *E. sparsa* (widespread in the western Pacific, including Palau) have black areas on the anterior narial tubes, whereas *E. pseudaprica* has about half to all of the tube black. *Eviota laterita* has distinctive red spots on the second dorsal and caudal fins that are lacking in *E. pseudaprica*, and both *E. laterita* and *E. sparsa* have dark edges to the scales



**Figure 5.** *Eviota pseudaprica*, ROM 77495, male holotype, 13.3 mm SL, Koror Island, Palau (D.W. Greenfield).

TABLE 1

Number of segments between the first and second (if present) branches of the first 4 pelvic-fin rays of *Eviota pseudaprica* minimum to maximum (mean, number of specimens)

Pelvic-fin ray number	Palau	Raja Ampat
First	2–4 (3.0, 4)	1–3 (2.3, 3)
Second	2–5 (3.3, 8)	3–9 (5.3, 3)
Third	2–5 (3.7, 7)	2–5 (3.6, 5)
Fourth	5–8 (6.5, 6)	3–9 (5.0, 6)

TABLE 2

Number of cephalic sensory papillae per row of *Eviota pseudaprica* minimum to maximum (mean, number of specimens)

Terminology of papillae rows follows Winterbottom et al. (2015)

Papillae row	Palau	Raja Ampat
<i>a</i>	4–5 (4.9, 13)	5 (6)
<i>b</i>	1 + 2 (13)	1 + 2 (6)
<i>c</i>	5 (13)	5 (6)
<i>cp</i>	1 (13)	1 (6)
<i>d</i>	2–4 (2.2, 13)	2–3 (2.1, 7)
<i>d'</i>	3–4 (3.1, 13)	3–4 (3.1, 7)
<i>e-ant.</i>	5–6 (5.7, 13)	5–6 (5.7, 6)
<i>e-post.</i>	6–8 (7.0, 13)	6–8 (6.8, 6)
<i>i-ant.</i>	5–6 (5.2, 13)	5 (7)
<i>i-post.</i>	6–8 (7.5, 13)	6–8 (7.5, 6)
<i>p</i>	5 (13)	5 (7)
<i>r</i>	1 (13)	1 (7)
<i>f</i>	1 (13)	1 (7)
<i>cs''</i>	3 (13)	3 (7)
<i>g</i>	1–3 (1.5, 13)	1–4 (2.1, 7)
<i>n</i>	1 (13)	1 (7)
<i>x</i>	3–4 (3.8, 13)	3–4 (3.9, 7)
<i>u</i>	5–6 (5.7, 13)	5–6 (5.3, 7)
<i>z</i>	3–4 (3.1, 13)	3–4 (3.2, 6)
<i>ot</i>	6–8 (7.2, 13)	6–8 (6.8, 6)
<i>os</i>	2–3 (2.1, 13)	2–3 (2.2, 6)
<i>oi</i>	3 (13)	2–3 (2.8, 6)
<i>s</i>	1 (9)	1 (7)



**Figure 6.** *Sueviota aprica*, A) ROM 44126, paratype, 13.9 mm SL, Chagos Archipelago; B) ROM 85262, 14.4 mm SL, Walo Island, Raja Ampat Islands, West Papua, Indonesia (R. Winterbottom).

forming a distinctive diamond pattern that is not as obvious in *E. pseudaprica*. Although the color pattern of *E. pseudaprica* is essentially similar to that of *Sueviota aprica* (cf. Fig. 1 & Fig. 6), the two species can easily be told apart by the branched fifth pelvic-fin ray common to all species of *Sueviota* (vs. unbranched in all *Eviota*).

**Remarks.** We have introduced a detailed description and figures of the pattern of sensory papillae here. Although this information is lacking for many species, Lachner & Karnella (1980) attempted to characterize several of the patterns they observed in the species they examined. We suspect that more detailed studies of pattern of sensory papillae across the spectrum of *Eviota* species will yield new and useful characters for distinguishing species.

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