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***Eviota algida*, a new dwarfgoby species from the upwelling waters off Nusa Penida, Indonesia (Teleostei: Gobiidae)**

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Abstract

A new species of dwarfgoby, *Eviota algida*, with a complete cephalic sensory-canal pore pattern (pattern I), a dorsal/anal-fin formula usually 8/8, pectoral-fin rays branched, 5th pelvic-fin ray absent, anterior dorsal-fin spines filamentous in males, a subcutaneous dark spot at center of caudal peduncle over preural centrum, male urogenital papilla black, and a red eye with gold specks, is described from a deep, cold-water upwelling area off Nusa Penida Island, Bali, Indonesia.

Key words: taxonomy, gobies, new species, Indo-Pacific, Pacific Ocean, *Eviota winterbottomi*, coral-reef fishes

Introduction

Eviota currently has 95 described species (Eschmeyer 2014), and we are aware of a number of other species waiting to be described. Many of these species have been described in recent years (Greenfield *et al.* 2014), mostly from the area in or near the “Coral Triangle”, home to the greatest diversity of coral reef fishes (Allen & Erdmann 2012a).

In their survey of the reef fishes of Bali, Indonesia, Allen & Erdmann (2012b) recorded a total of eight species of *Eviota*, including *E. guttata*, *E. prasites*, *E. punctulata*, *E. queenslandica*, *E. rubriceps*, *E. rubrisparsa*, *E. sebreei*, and *E. sigillata*. Those authors also noted that during their surveys at the Nusa Penida Island group off southeast Bali, they frequently experienced cold-water upwellings (with temperatures ranging from 18–29°C) and recorded a unique component of the ichthyofauna that was clearly related to this upwelling phenomenon, including such cool-water species as *Prionurus chrysurus*, *Springeratus xanthosoma*, and *Mola mola*. They also noted a unique disjunct distribution of a number of species known from both the cooler subtropical waters of Japan and the upwelling areas of southern Bali but nowhere in between (including *Orectolobus japonicus*, *Apogon schlegeli*, *Scorpaenodes evides*, *Chromis albicauda*, and *Trimma imaii*), and predicted these species might also be found in similar reef habitats exposed to upwelling further to the east along the Lesser Sunda Island arc. During a subsequent dive survey to Nusa Penida to observe the behavior of the sawtail surgeonfish *Prionurus chrysurus*, the second author photographed and collected a species of *Eviota* living in a deeper reef habitat exposed to cold-water upwellings that he did not recognize, and that species is described here.

The new species fits the description typical of all species of *Eviota*: the pelvic fins are separate, lack a frenum, and the 5th pelvic-fin ray, if present, is unbranched; the membrane joining the 5th pelvic-fin rays is weakly developed; there are ctenoid scales on the body but no scales on the head, nape or pectoral-fin base; the breast either lacks scales or may have a few embedded cycloid scales; the teeth in the upper jaw are in two or more rows and there are 1–3 enlarged curved canine-like teeth in the innermost row of the lower jaw just behind the jaw symphysis.

Materials and Methods

Counts and measurements, descriptions of fin morphology and the cephalic sensory-canal pore patterns follow Lachner & Karnella (1980) and Jewett & Lachner (1983). Postanal midline spots, along the posterior ventral midline of the body, begin at the anal-fin origin and extend to a vertical drawn 2 to 3 scale rows anterior to the ends of the hypurals where they articulate with the caudal-fin ray bases, the additional smaller spot posterior to this, if present, is not counted. “The membranes joining the first four [pelvic] fin rays are considered to be well developed when the membranes extend beyond the bases of the first branches; they are considered to be reduced when they are slightly developed, not extending to the bases of the first branches” (Lachner & Karnella 1980, p. 4). Dorsal/anal fin-ray counts only include segmented rays.

Measurements were made to the nearest 0.1 mm using an ocular micrometer and dial calipers, and are presented as percentage of Standard Length (SL). All specimen lengths are SL in mm. Cyanine Blue 5R (acid blue 113) stain was used to make pores more obvious (Akihito *et al.* 1993, 2002, Saruwatari *et al.* 1997) and an airjet used to observe them. For measurements, values for the holotype are given first, followed by the range for all types and the mean in parentheses.

Specimens have been deposited in the following museums: CAS – California Academy of Sciences, San Francisco; MZB - Museum Zoologicum Bogoriense, Cibinong, Indonesia; ROM – Royal Ontario Museum, Toronto; and USNM – United States National Museum (Smithsonian Institution), Washington D.C.



Figure 1. *Eviota algida*, preserved holotype, CAS 237611, 16.4 mm male. Photograph by J.D. Fong.

***Eviota algida* Greenfield & Erdmann, n. sp.**

Upwelling Dwarfgoby

Figures 1–4.

Holotype. CAS 237611, 16.4 mm male, Gamat Bay, Nusa Penida, Indonesia, 08°42.042' S, 115°28.107' E, 32m, upwelling area, 25 September 2013, M.V. Erdmann.

Paratypes. CAS 237612, 16.5 mm, male, taken with holotype; CAS 237338 14.5 mm female, same location as holotype, 30 m, 18 April 2014, M.V. Erdmann; ROM 96648, 15.2 male, taken with CAS 237338; USNM 432571, 15.0 mm male, taken with CAS 237338; MZB 22257, 14.2 mm male, taken with CAS 237338.

Diagnosis. A species of *Eviota* with a complete cephalic sensory-canal pore pattern (pattern I), the dorsal/anal-fin formula usually 8/8, lower pectoral-fin rays branched, 5th pelvic-fin ray absent, anterior dorsal spines filamentous in males, a subcutaneous dark spot at center of caudal peduncle over preural centrum, male urogenital papilla black, and in life a red eye with gold specks in life.

Description. Dorsal-fin rays VI+I,8 (7[1], 8[5]); anal-fin rays I,8 (7[1], 8[5]); pectoral-fin rays 16 (16 [5], 17 [1]), rays 8–16 may be branched; fifth pelvic-fin ray absent; 6 (4–7) branches on 4th ray; 4 (2–4) segments between consecutive branches of 4th pelvic-fin ray; pelvic-fin membrane reduced; 12 (12–13) branched and 17 segmented caudal-fin rays; 25 (23 [1], 24 [3], 25 [2]) lateral scale rows; transverse scale rows 7; scales absent on middle of ventral surface of abdomen, no scales on breast; first dorsal fin triangular in shape, 1st spine filamentous in male holotype, extending back to sixth ray of second dorsal fin; second spine filamentous extending back to the 2nd ray; dorsal-fin spines not elongated in female; all soft rays of second dorsal and anal fin branched, the last split through its base; urogenital papilla in male smooth, not fimbriate, black, flat, wide and pear-shaped, widest anteriorly with about 8 short finger-like projections on the posterior end, extending to anal-fin base (Fig. 4); urogenital papilla of female smooth, bulbous, with several short finger-like projections on end, a row of black spots running along length on each side; front of head rounded with an angle of about 65° 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 almost to center of pupil; anterior tubular nares extending just past anterior margin of upper lip; gill opening extending forward just anterior to edge of operculum; cephalic sensory-

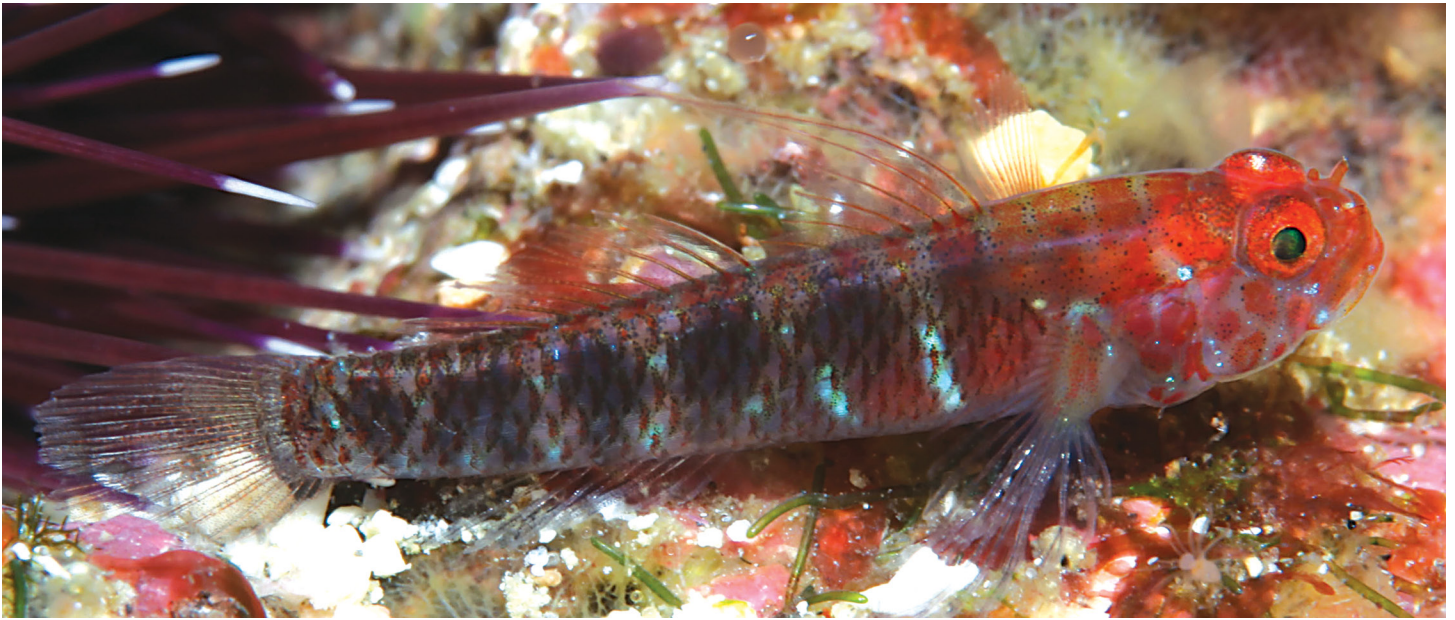


Figure 2. *Eviota algida*, underwater photograph from type locality, lateral view. Photograph by M.V. Erdmann.

canal pore system complete (pattern I), and papilla pattern A. General body shape is shown in Fig. 1.

Measurements (based on holotype and 5 paratypes, 8.5–10.9 mm). Head length 31.0 (28.5–31.0, 30.1); origin of first dorsal fin 36.7 (36.2–37.9, 37.3), lying behind posterior margin of pectoral-fin base; origin of second dorsal fin 58.7 (55.6–59.2, 57.8), slightly in advance of anal-fin origin; origin of anal fin 59.3 (58.0–62.0, 60.0); caudal-peduncle length 23.7 (20.4–24.1, 22.6); caudal peduncle moderate depth 14.7 (12.5–14.7, 13.7); body slender, its depth 21.7 (19.7–22.1, 21.3); eye diameter 9.7 (8.9–10.5, 9.7); snout length 6.0 (3.4–6.0, 4.9); pectoral-fin length 35.7 (29.4–37.1, 33.4); pelvic-fin length 30.7 (28.2–32.2, 30.2).

Color in preservative of holotype (Fig. 1). Background color of head and body light cream. Head and body from insertion of first dorsal fin forward with a sprinkling of dark chromatophores. Posterior to this the scale pockets strongly pigmented with dark chromatophores so that individual scales on entire body obvious. Four terminal midline scales on caudal peduncle darker than others on body, reflecting internal dark area. Entire eye black, area directly ventral and anterior to eye lacking dark pigment as is the anterior half of both jaws and snout. Cheek and posterior half of jaws with heavy peppering of chromatophores. Preoperculum light and several clusters of dark chromatophores on operculum with its membrane clear. Pectoral-fin base sprinkled with larger chromatophores, as is the top of the head and nape. Pelvic fins clear, membranes of pectoral fin clear with dark pigment along the rays. Basal half of anterior half of first dorsal fin dark brown to black, distal half light, its margin black. Elongated first spine edged in black. Posterior half of first dorsal fin with light area above basal membrane, distal margin of area black. Basal third of second dorsal fin dark brown; middle third lighter with scattered dark chromatophores; distal third light brown with black margin. Membranes of basal three quarters of anal fin black, distal quarter clear, rays light against black. Caudal-fin base light with black chromatophores and a few melanophores on rays, remainder of fin with black membrane with light distal margin, the rays light against the black membrane.

Color of live individuals of *E. algida* (Figs 2 & 3). Basic color of head and body reddish-orange, head lighter than body. Top of head, interorbital, snout and jaws red-orange, a single narrow white line crossing center of upper jaw, and two small white spots under eye, one on upper jaw and one below it on lower jaw. Nape crossed by four narrow gray-white lines. Pupil of eye black, iris same color as head with a few gold specks. Cheek white with irregular red-orange bars under the eye; first directly under pupil and splitting into two ventrally; second posteroventral to eye, extending down to branchiostegals; third directly posterior to second, also extending down to branchiostegals. A few scattered small white spots in light areas between bars. Operculum red-orange above with two short bars extending ventrally under head, a single small white spot above operculum. Entire side of head, nape and top of head sprinkled with a mixture of melanophores and larger black chromatophores. Body



Figure 3. *Eviota algida*, underwater photograph from type locality, dorsal view. Photograph by M.V. Erdmann.

translucent gray showing internal dark blotches, surface dark reddish-orange with distinct dark-red scale pockets. Six dark internal blotches spaced along midline with white bars between blotches one and two and between two and three crossing the abdomen. Scattered small white spots between remaining blotches. In some photographs the terminal blotch appears to be the darkest. A narrow gray-white line running length of body above dark internal blotches from above operculum to caudal peduncle. Dorsal surface of body with reddish-orange areas above the internal dark blotches. Fin rays reddish, membranes appear clear, coloration on membranes not visible from photographs.

Distribution. Collected only from Gamat Bay, Nusa Penida Island, Bali, Indonesia, but also photographed approximately 950 km to the east at Beangabang Bay, Pantar, Indonesia. Likely distributed along the entire Lesser Sunda Island chain in reef habitats exposed to cold-water upwelling along the eastern Indian Ocean coastlines.

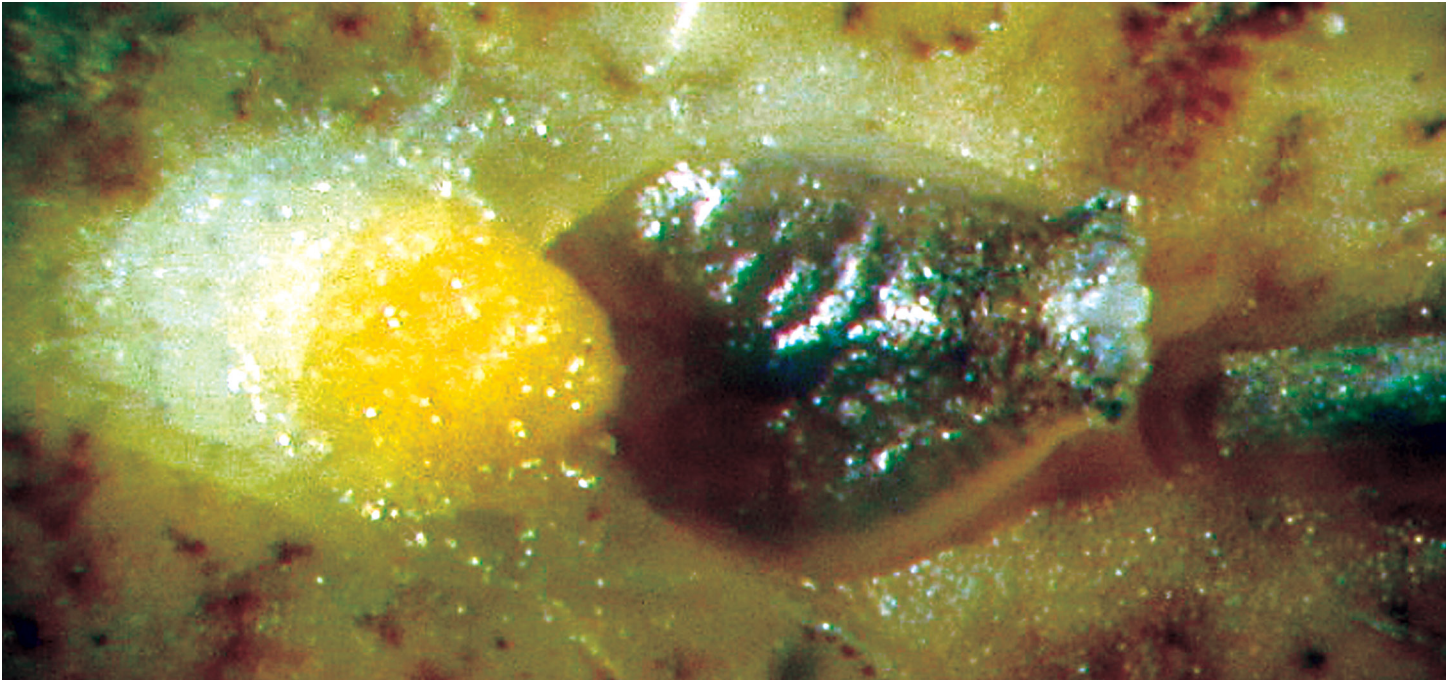


Figure 4. *Eviota algida*, male urogenital papilla of holotype. Photograph by D.W. Greenfield.

Etymology. The specific epithet is from the Latin *algidus*, meaning cold, referring to the species being found in the cooler, deep upwelling waters, and is a first/second declension feminine adjective.

Comparisons. *Eviota algida* is most similar to *E. winterbottomi* Greenfield & Randall 2010, sharing a complete cephalic sensory-pore pattern, a dorsal/anal-fin formula of 8/8, branched pectoral-fin rays, no 5th pelvic-fin ray, lacking a distinct external dark spot on the caudal peduncle, and no distinct dark spots on the pectoral-fin base. It differs from *E. winterbottomi* in having filamentous dorsal-fin spines (vs. absent), the internal caudal-peduncle spot centered on midline (vs. a complete dark internal bar over preural centrum region), in life iris of eye red with a few gold specks (vs. yellow with red spokes radiating out from pupil, Fig. 5), four red bars crossing nape with scattered dark chromatophores beneath (vs. several scattered dark spots and bars across nape). Both *E. algida* and *E. winterbottomi* have an unusual male urogenital papilla, being flat, wide and pear-shaped, widest anteriorly with about 8 short finger-like projections on the posterior end (Fig. 4). Four of the five male specimens of *E. algida* have a solid black papilla, whereas the fifth had only the central portion black. The CAS paratype of *E. winterbottomi* only had a few black chromatophores on the papilla. Whether the shared shape of the papillae indicates a relationship is not known. The structure of the urogenital papilla in *Eviota* as a possible phylogenetic character has not yet been studied.

Remarks. When Greenfield & Randall (2010) described *E. winterbottomi*, they restricted the type material to Vietnam, but mentioned and illustrated specimens from Komodo (Figs. 6 & 7) and Palau that agreed with *E.*



Figure 5. *Eviota winterbottomi*, fresh holotype, ROM 73100, 14.7 mm SL, Vietnam. Photograph by R. Winterbottom.



Figure 6. *Eviota* cf. *winterbottomi*, BPBM 38789, preserved specimen, Komodo, Indonesia. Photograph by D.W. Greenfield.

winterbottomi in many characters, but differed in having a filamentous first dorsal fin and in some fresh coloration. *Eviota algida* is similar to these specimens in having a filamentous first dorsal fin, but has some differences in live coloration, especially eye color. We have learned that eye color is very important in differentiating various *Eviota* species when alive or fresh. Thus, we are restricting the type material of *E. algida* to specimens from Nusa Penida, awaiting genetic comparisons with similar specimens with live color differences from other areas such as those mentioned from Komodo.

Other material examined: *Eviota winterbottomi*: CAS 227274, 2 paratypes. *Eviota* cf. *winterbottomi*: BPBM 38789 (2), Komodo, Indonesia; ROM 80693 (1), Palau.



Figure 7. *Eviota* cf. *winterbottomi*, BPBM 38789, underwater photograph from Komodo, Indonesia. Photograph by J.E. Randall.

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