Journal of the
Ocean Science Foundation

2025, Volume 43

Eviota bella, a new dwarfgoby from Milne Bay, Papua New Guinea (Teleostei: Gobiidae)

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Abstract

A new species of dwarfgoby, *Eviota bella*, is described from Milne Bay, Papua New Guinea. The new species is a member of the *E. nigriventris* complex which includes *E. brahmi, E. dorsogilva, E. dorsopurpurea*, and *E. nigriventris*. *Eviota bella* is distinguished by its iridescent live colors and a distinctive pattern of spots and colors on the eye in life. In addition to color, it is diagnosed by the combination of a sensory-canal pore system pattern IV (lacking PITO and IT pores and the AITO pore enlarged), a dorsal/anal fin-ray formula of 9/9, all pectoral-fin rays unbranched, and an elongated fifth pelvic-fin ray.

Key words: taxonomy, ichthyology, coral-reef fishes, gobies, new species, cryptobenthic fishes, species complexes

Citation: Greenfield D.W., Erdmann, M.V. & Ichida, N.K. (2025) *Eviota bella*, a new dwarfgoby from Milne Bay, Papua New Guinea (Teleostei: Gobiidae). *Journal of the Ocean Science Foundation*, 43, 67–75.

doi: https://doi.org/10.5281/zenodo.17195264
urn:lsid:zoobank.org:pub:4D583AA3-F9BB-4843-897E-475F6DCC000E

Date of publication of this version of record: 25 September 2025

Introduction

The dwarfgobies in the genus *Eviota* are tiny coral-reef fishes (usually <18 mm SL) occurring throughout the Indo-Pacific Ocean. They are relatively abundant on coral reefs, although their small size makes them difficult to observe (Greenfield 2017). There are currently 135 valid described species of dwarfgobies with a wide variety of color patterns. The dwarfgobies of the *Eviota nigriventris* complex are usually found in groups among, or often hovering above, *Acropora* table and bottlebrush corals, into which they dive for cover. The complex currently contains 4 species: *Eviota brahmi* Greenfield & Tornabene, 2014; *Eviota dorsogilva* Greenfield & Randall, 2011; *Eviota dorsopurpurea* Greenfield & Randall, 2011; and *Eviota nigriventris* Giltay, 1933 (photographs in Greenfield & Tornabene 2014; Fig. 8). The first species described in this group was *E. nigriventris* at a time when underwater observations or photographs of fresh specimens were not available and species were described solely from preserved specimens. The most obvious preserved color feature of those old specimens of *E. nigriventris* is a broad dark band running along the ventral half of the body with a darker spot on the caudal-fin base. This resulted in any specimens subsequently collected with this stripe and matching other features being labeled as *E. nigriventris*. With the advent of underwater photography, John E. Randall (1924–2020), one of the first coral-reef fish taxonomists to describe live colors based on underwater photos, noticed that fish otherwise resembling *E. nigriventris* in Fiji had a black ventral band instead of the usual red band. This observation resulted in the description of two new species, *E. dorsogilva* and *E. dorsopurpurea*, based mainly on live-color differences (Greenfield & Randall 2011). Subsequently, Greenfield & Tornabene (2014) described another member of this complex, *E. brahmi*, and demonstrated, using mitochondrial and nuclear DNA sequences, that the color differences between species in the complex were concordant with distinct DNA lineages that, moreover, corresponded to the geographic range of each putative species.

The *E. nigriventris* complex is an excellent example of the importance of eye color in identifying species of dwarfgobies, with each member of the complex having a distinctive pattern. Greenfield (2017) discussed this in detail, suggesting that dwarfgobies might have more variation in eye coloration than any other teleost genus. In the field, different eye coloration may indicate an undetected new species, and field names such as "starburst eyes" or "leopard-spot eyes" have frequently been used to distinguish specimens we have collected over the past decade. Because the species described herein has a general body color pattern closest to *E. dorsogilva*, it has been labelled as such in the past; however, when comparing its eye color to that of true *E. dorsogilva* and the other species of the complex, it became clear that it was an undescribed species.

Materials and Methods

The male holotype is deposited at the California Academy of Sciences, San Francisco, CA, USA (CAS).

Descriptions of pelvic-fin morphology and cephalic sensory-canal pores follow Greenfield & Winterbottom (2016), as originally formulated by 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 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". The dorsal/anal fin-ray formula count (eg. 8/8) only includes segmented rays.

Measurements were made to the nearest 0.1 mm using an ocular micrometer or dial calipers (the latter only for standard length, body depth, and caudal-peduncle depth). Lengths are given as standard length (SL), measured from the median anterior point of the upper lip to the base of the caudal fin (i.e. the posterior end of the hypural plate); the 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; the origin of the second dorsal fin is measured from the median anterior point of the upper lip to the anterior base of its spine; the 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; head length is taken from the upper lip to the posterior end 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 straight-line distance from the anterior tip of the premaxilla to the end of the upper margin of the dentary where the maxilla joins behind it; caudal-peduncle depth is the least depth,

and caudal-peduncle length is the horizontal distance between the verticals at the rear base of the anal fin and the caudal-fin base; pelvic-fin length is measured from the base of the pelvic-fin spine to the tip of the longest pelvic-fin soft ray. Cyanine Blue 5R (acid blue 113) stain was used to make pores and scale outlines more obvious (Akihito et al. 1993, 2002, Saruwatari et al. 1997).

Figure 1. *Eviota bella*, freshly anesthetized specimen underwater, CAS 249377, paratype, 19.0 mm SL, male (M.V. Erdmann).

Eviota bella, n. sp.

Beautiful Dwarfgoby

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Figures 1–6

Holotype. CAS 249373, 18.1 mm SL male, Papua New Guinea, Milne Bay Province, Watota Island, -9.3172°, 150.710°, 6 m, field number MVE-25-017, M.V. Erdmann & N.K. Ichida, 15 March 2025.

Paratypes. CAS 249374 , 7 males 13.5–19.1 mm SL, 2 females 13.2 & 13.6 mm SL, taken with holotype; CAS 249375, 4 males 11.0–15.8 mm SL, 4 females 10.4–14.4 mm SL, 9.0 mm SL immature, Papua New Guinea, Milne Bay Province, Wahoo Point, -10.2530˚, 150.7841˚, 12 m, field number MVE-24-023, M.V. Erdmann & N.K. Ichida, 3 September 2024; CAS 249376, 19.0 mm SL male, Papua New Guinea, Milne Bay Province, Belasana Slipway, -10.5726°, 150.6762°, 10 m, field number MVE-16-005, M.V. Erdmann, 26 March 2016; CAS 249377, 2 males 14.7 & 16.9 mm SL, 3 females 12.3–13.0 mm SL, Papua New Guinea, Milne Bay, Nuakata, -10.2741°, 151.0143°, 5 m, field number MVE-19-065, M.V. Erdmann, 10 September 2019.

Non-type specimens. (fixed in ethanol) CAS 249378, 4 females 12.4–13.7 mm SL, taken with holotype; CAS

Figure 2. *Eviota bella*, underwater photograph CAS 249377, paratype, 19.0 mm SL, male (M.V. Erdmann).

249379, 14.6 mm SL male, 2 females 11.7 & 20.0 mm SL, 9.0 mm SL immature, Papua New Guinea, Milne Bay, Wahoo Point, -10.2530˚, 150.7841˚, 12 m, field number MVE-24-023, M.V. Erdmann & N.K. Ichida, 3 September 2024.

Diagnosis. A species of *Eviota* distinguished from all congeners by a combination of a cephalic sensory-canal pore system pattern IV (lacking PITO and IT pores and AITO pore enlarged), a dorsal/anal fin-ray formula 9/9, pectoral-fin rays unbranched, fifth pelvic-fin ray elongate, ventral half of body with a red to dusky red stripe in life (grey in preservative), extending from behind head to caudal-fin base ending in a symmetrical black spot; in life, ventral stripe bordered dorsally by a yellow-to-orange stripe; melanophores broadly scattered on upper half of pectoral-fin base; eye with a few small, white spots surrounding pupil and small white spots covering an orange dorsal sclera: male urogenital papilla narrow, elongate with two short lateral points at end and spotted with black dots.

Description. Dorsal-fin elements VI+I,9, first dorsal fin triangular; first two spines filamentous in larger males, extending back to center of second dorsal fin when adpressed; last ray branched to base; anal-fin elements I,9, last ray branched to base; pectoral-fin rays 17, all unbranched, fin pointed, reaching to first few anal-fin rays; pelvic-fin elements I,4, fifth ray elongate, about 50–70% of fourth, fourth with 4 branches; pelvic-fin membranes well developed, often extending near to end of rays, basal membrane reduced; 11 branched and 17 segmented caudal-fin rays; 24 lateral scales, 7 transverse scales; urogenital papilla of male narrow, elongate with two short lateral points at end and spotted with black dots (see Fig. 6); front of head sloping with an angle of about 55˚ from horizontal axis; mouth slanted obliquely upwards, forming an angle of about 55˚ to horizontal axis of body, lower jaw projecting, maxilla extending posteriorly to front of pupil; anterior tubular nares moderate, extending just past posterior edge of upper lip; gill opening extending forward to below posteroventral edge of preoperculum. Cephalic sensory-canal pore system pattern IV (lacking PITO and IT pores and AITO pore enlarged).

Color in life. (Figs. 1–5) Lower portion of body with a broad dark band running from pectoral-fin base to caudal-fin base, ranging from dark brown to black, darker at pectoral-fin base and ending as a large, black, symmetrical spot, edged in iridescent blue and red, centered over insertion of lower caudal-fin rays. Dark band flanked above by a dusky orange stripe extending from eye back to caudal-fin base and below by a bright white area from chin to anus. Upper body translucent greenish grey extending up to dorsal-fin bases and onto nape. Upper cheek reddish with dusky overtones, beoming bright red below eye and over jaws. Snout reddish orange with a thin midline white line bisecting interorbital area and extending from upper lip to nape, flanked by short thin white lines from orbital rim to upper jaw. A scattering of small white spots extends over orange area of

Figure 3. *Eviota bella*, freshly anesthetized specimen underwater, CAS 249373, holotype, 18.1 mm SL male (M.V. Erdmann).

adjacent dorsal sclera, continuing over upper iris, and in an irregular line along upper margin of pupil across iris onto head behind eye. Pectoral-fin rays pink, membranes clear; pelvic-fin rays pink, membranes iridescent blue; anal fin with purple patch on first two membranes, followed by a red-orange area with an iridescent blue distal margin, remainder of fin with pink rays, purple membranes with scattered iridescent-blue spots, and iridescent-blue distal margin. Spines and rays of both dorsal fins pink, membranes purple, first dorsal fin with patch of iridescent blue over distal three quarters of membranes of first three elongated spines, second dorsal fin with iridescent-blue margin. Caudal-fin rays pink, membranes purple, and dorsal, ventral, and distal margins iridescent blue. Broad lateral stripe is dusky red in direct light (Fig. 3), flanked dorsally by a yellowish stripe. Holotype is a large male, deeper bodied and more robust than other specimens and appearing overall paler in color, in part due to more direct lighting, with fins more yellowish (Fig. 3).

Color of holotype in preservative. (Fig. 6) Background color of head and body light yellow, mid and lower portion of body with a dark-brown band running rearward from pectoral-fin base ending in a symmetrical black spot over base of caudal-fin, upper body pale, dark band extends forward onto head across upper operculum to eye,

Figure 4. *Eviota bella*, freshly anesthetized specimen underwater, CAS 249375, paratype, 15.8 mm SL male (M.V. Erdmann).

Figure 5. *Eviota bella*, underwater photograph in an *Acropora* bottlebrush coral at Milne Bay, Papua New Guinea (M.V. Erdmann).

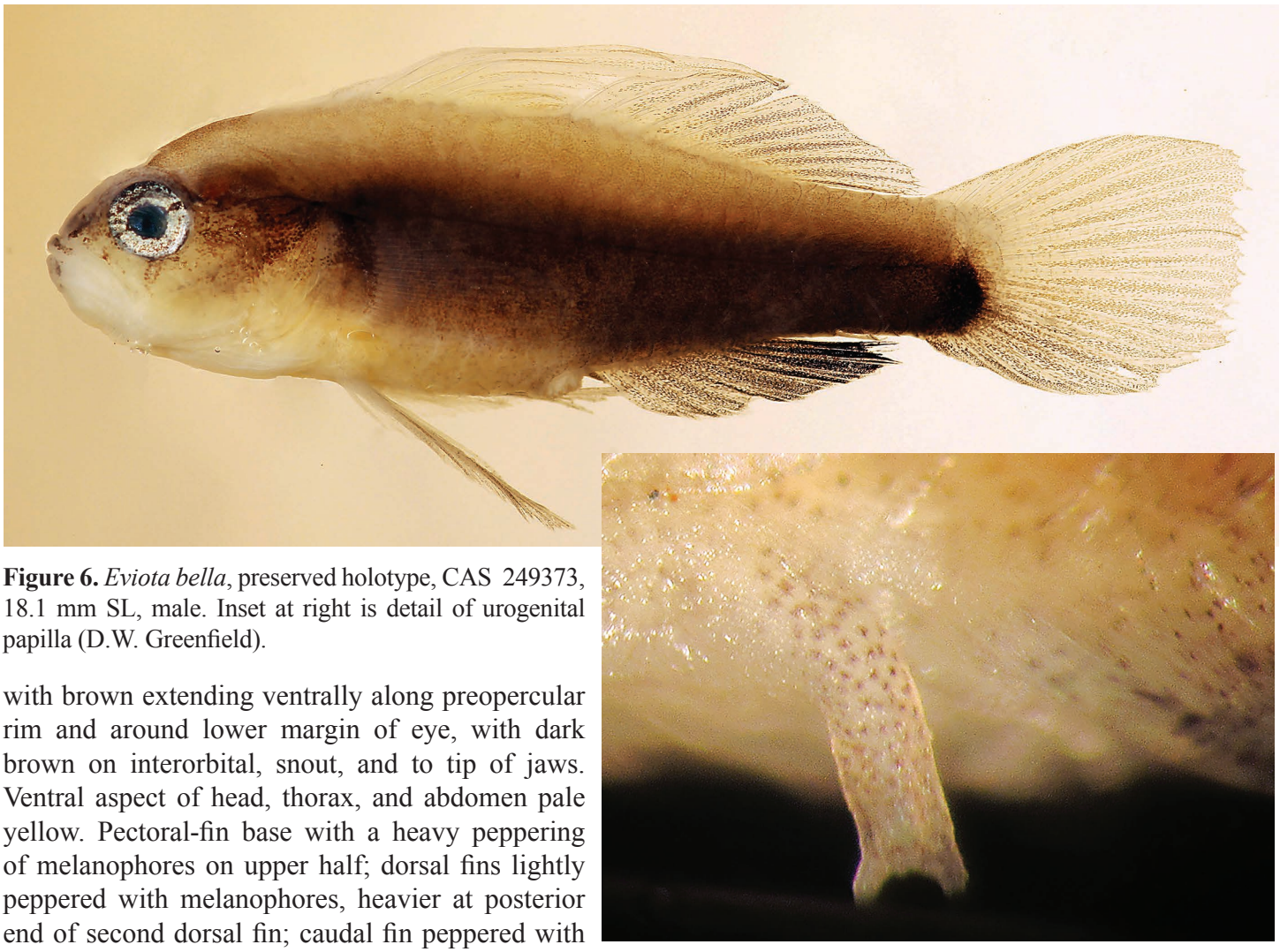

Figure 6. *Eviota bella*, preserved holotype, CAS 249373, 18.1 mm SL, male. Inset at right is detail of urogenital papilla (D.W. Greenfield).

with brown extending ventrally along preopercular rim and around lower margin of eye, with dark brown on interorbital, snout, and to tip of jaws. Ventral aspect of head, thorax, and abdomen pale yellow. Pectoral-fin base with a heavy peppering of melanophores on upper half; dorsal fins lightly peppered with melanophores, heavier at posterior end of second dorsal fin; caudal fin peppered with melanophores, heavier on ventral half behind black spot at base; anal fin heavily peppered with melanophores becoming more concentrated on posterior third.

Etymology. The specific epithet is based on the Latin *bellus*, meaning beautiful, referring to the iridescent live colors. It is treated as a noun in apposition.

Distribution and habitat. The new species is found in groups of 3–30+ individuals, in depths of 4–15 m, inhabiting *Acropora* coral colonies displaying a table or bottlebrush growth form (Fig. 5). They are typically found

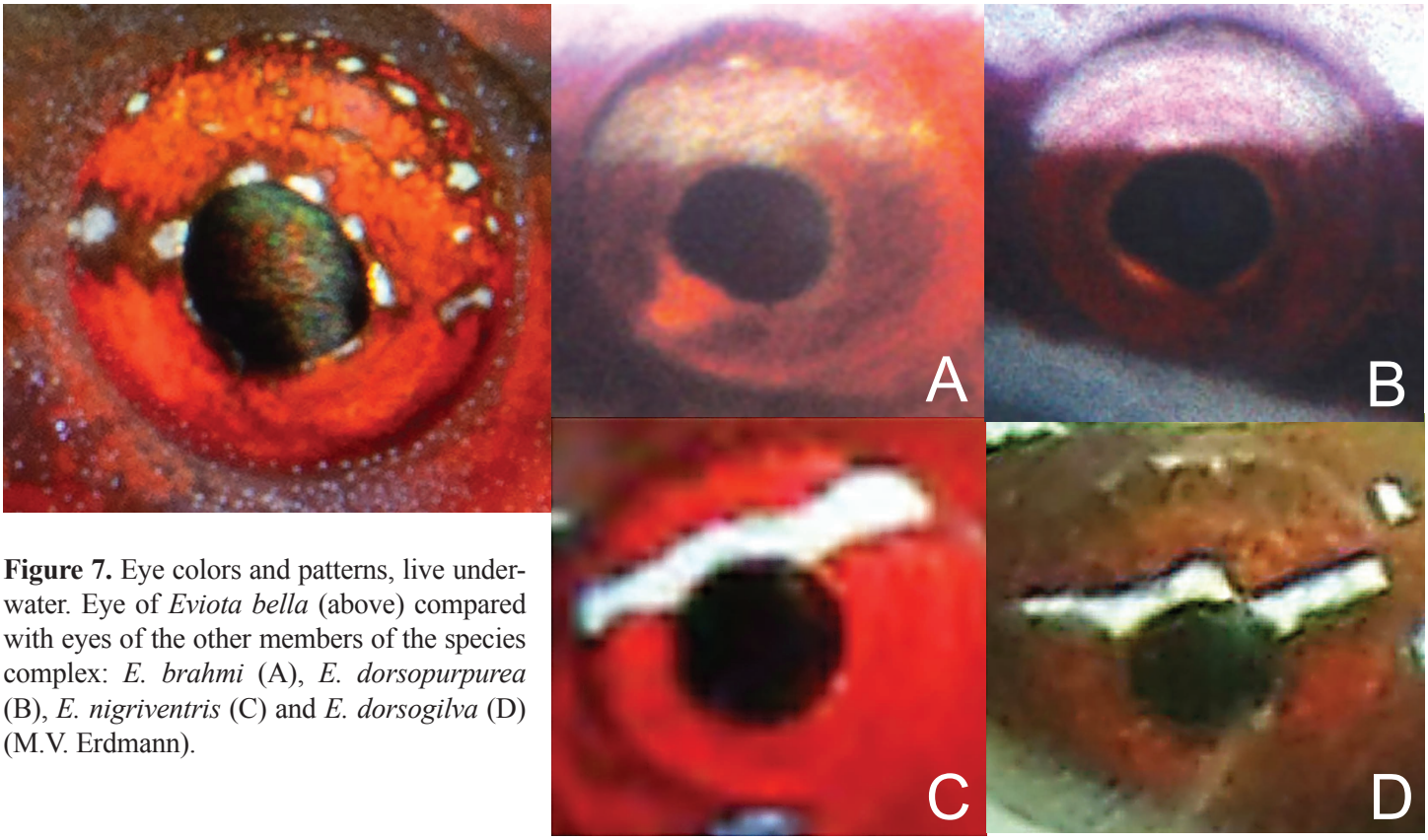

Figure 7. Eye colors and patterns, live underwater. Eye of *Eviota bella* (above) compared with eyes of the other members of the species complex: *E. brahmi* (A), *E. dorsopurpurea* (B), *E. nigriventris* (C) and *E. dorsogilva* (D) (M.V. Erdmann).

on outer reef slopes exposed to clear water, and individuals retreat into the coral colonies as they are approached.

The new species is known with certainty from Milne Bay and Oro (Tufi) Provinces in SE Papua New Guinea, although a photo by Mark Rosenstein from Guadalcanal, Solomon Islands, labelled as *Eviota dorsogilva*, appears to also be this species, based particularly on eye coloration (Bray 2020). *Eviota bella* co-occurs with one other member of the *E. nigriventris* complex, *E. dorsopurpurea*, which is also known only from the Milne Bay area of Papua New Guinea. Other members of the complex include *E. nigriventris*, known only from eastern Indonesia (Banda Sea to West Papua), and *E. brahmi*, known only from northeastern Papua New Guinea, from the Ninigo and Hermit Islands to Manus Island, New Hanover, New Ireland and New Britain. The last member of this species complex, *E. dorsogilva*, has been reported from localities as widespread as the Ryuku Islands, Palau, Papua New Guinea, the Solomon Islands, the northern Great Barrier Reef, New Caledonia, Fiji, Tonga, and Wallis Island (Allen & Erdmann 2024). However, given the relatively restricted ranges of each of the other species of the complex, it seems likely that nominal *E. dorsogilva* may in fact be restricted to Fiji and the SW Pacific, with additional cryptic species yet to be described from this complex. Further research is needed to confirm the true range of *E. dorsogilva* and determine if there are other species awaiting description from this complex.

Comparisons. Live eye color has proven to be invaluable in distinguishing the species in this complex (Fig. 7). Two of the species, *E. brahmi* and *E. dorsopurpurea*, have a broad pale patch on the upper iris above the pupil that is lacking in *E. bella*. In addition, *E. brahmi* has an asymmetrical dark mark at the caudal-fin base with the dorsal margin sharply angled downward, whereas it is symmetrical and ending in a semicircle in *E. bella* (Fig. 8), and *E. brahmi* as a dorsal/anal formula of 10/9 vs. 9/9 in *E. bella*. *Eviota dorsopurpurea* has a purple area above the broad dark band along the length of the body, whereas it is translucent greenish grey in *E. bella*. The other two species, *E. dorsogilva* and *E. nigriventris*, differ in having a narrow white line running above the pupil (Fig. 7). The lateral dark band along the length of the body is black in *E. dorsogilva*, whereas it is red in *E. bella* and *E. nigriventris*. The melanophores on the pectoral-fin base are clustered on the extreme top in *E. nigriventris* vs. scattered over the upper half in *E. bella*. The live eye color and spot pattern in *E. bella* is its most distinctive feature, with scattered small white spots over the orange area of the dorsal sclera, continuing over the upper iris, and in an irregular line along the upper margin of the pupil across the iris and onto the head behind the eye.

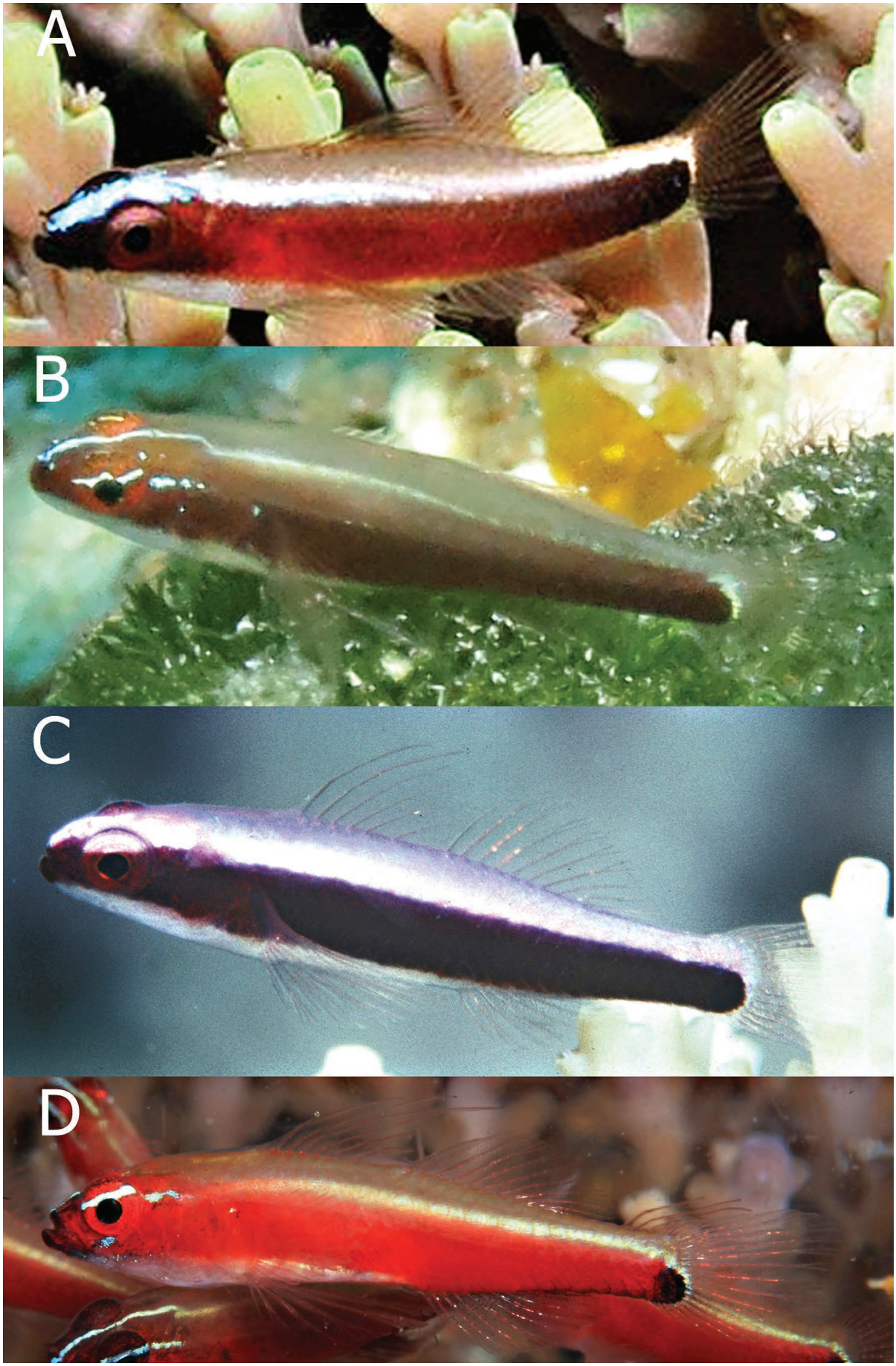

Figure 8. Underwater photographs, (A) *E. brahmi*, Kimbe Bay, New Britain (J.E. Randall); (B) *E. dorsogilva*, Vanua Levu, Fiji (J. Eyre); (C) *E. dorsopurpurea*, Milne Bay, Papua New Guinea (J.E. Randall); (D) *E. nigriventris*, Gunung Api, Banda, Indonesia (M.V. Erdmann).

Acknowledgments

We thank Dr. Osborne Sanida, Nou Korema, and Georgia Kaipu of the Papua New Guinea National Research Institute for facilitating our research visas and for liaising with other national institutions and technical review committees to effect project approval. Sincere thanks are also due to Mr. Igo Gari of the Milne Bay Provincial Administration, Mr. Hayson Kassap of the Oro Provincial Administration, and Mr. Vagi Rei, Marzena Anne Marinjembi, Juda Nundima, and Mary Palik of the PNG Conservation and Environmental Protection Agency (CEPA) for supporting this research and issuing Permit #023058 (W3 Permit to Export Wildlife). We also extend our appreciation to Rob Vanderloos and the amazing crew of the MV *Chertan* as well as Jordan Honey, Luth Morales, Loni and the highly capable dive crew of Tufi Resort for all their efforts to support our diving and expedition logistics, and we thank Matt Brooks for sponsoring the expedition and for his able assistance in the collection of fish specimens. We also thank Julie Munro for supporting the participation of Nesha Ichida in this expedition as part of her training in reef fish taxonomy. We thank Jess Blakeway and Christine Dudgeon from the University of the Sunshine Coast, Julie-Anne Waranaka of the University of PNG, Max Teliwa of the National Fisheries Authority, and Gerry Allen of the Western Australian Museum for their assistance in arranging the expedition and permits and for executing a successful expedition. We thank Jon Fong and Mysi Hoang of the California Academy of Sciences for providing valuable curatorial and logistic support. Finally, we thank the warm and friendly people and government of both Milne Bay Province and Tufi (Oro Province) for welcoming us to their beautiful reefs and allowing this research. The manuscript was reviewed by two reviewers.

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