Journal of the
Ocean Science Foundation

2019, Volume 33

Sueviota minersorum, a new species of sponge-dwelling goby (Teleostei: Gobiidae) from Misool, Raja Ampat Islands, Indonesia

DAVID W. GREENFIELD
Research Associate, Department of Ichthyology, California Academy of Sciences,
55 Music Concourse Dr., Golden Gate Park, San Francisco, California 94118-4503, USA
Professor Emeritus, University of Hawai'i
Mailing address: 944 Egan Ave., Pacific Grove, CA 93950, USA
E-mail: greenfie@hawaii.edu

MARK V. ERDMANN
Conservation International Indonesia Marine Program,
Jl. Dr. Muwardi No. 17, Renon, Denpasar 80235, Indonesia
California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118, USA
E-mail: mverdmann@gmail.com

ILHAM VEMANDRA UTAMA
Ichthyology Laboratory, Museum Zoologicum Bogoriense (MZB),
Research Center for Biology, Indonesian Institute of Sciences (LIPI),
Jl. Raya Jakarta-Bogor Km. 46, Cibinong 16911, Indonesia
E-mail: ilham.vemandrautama@gmail.com

Abstract

A new gobiid species, *Sueviota minersorum*, is described from 4 specimens, 17.9–23.2 mm SL, collected from inside *Theonella* tube sponges at 20–22 m depth. The new species has a dorsal/anal-fin ray count of 9/8 and 17 or 18 pectoral-fin rays, all unbranched, and 27 or 28 lateral scales. It furthermore has a basal membrane fully joining the two branched fifth pelvic-fin rays, a character shared with 4 congeners: *Sueviota bryozophila*, *S. lachneri*, *S. larsonae*, and *S. tubicola*. *Sueviota minersorum* is most similar to *S. lachneri*, but differs in having a stocky body with a deep caudal peduncle, not tapering from the mid-body, and in color patterns. It differs from *S. bryozophila* in having all pelvic-fin rays branched (vs. unbranched), having a single AITO pore (vs. paired AITO pores), PITO and NA pores (vs. absent), and in color patterns. It differs from *S. larsonae* and *S. tubicola* by the absence of a frenum (vs. present) and in color patterns.

Key words: taxonomy, systematics, ichthyology, coral-reef fishes, sponge, Indo-Pacific Ocean, dwarfgoby, *Eviota*

Citation: Greenfield, D.W., Erdmann, M.V. & Utama, I.V. (2019) *Sueviota minersorum*, a new species of sponge-dwelling goby (Teleostei: Gobiidae) from Misool, Raja Ampat Islands, Indonesia. *Journal of the Ocean Science Foundation*, 33, 79–88.
doi: http://dx.doi.org/10.5281/zenodo.3516352
urn:lsid:zoobank.org:pub:A8A3101D-6CE0-45AE-8954-38B23BF01151

Date of publication of this version of record: 23 October 2019

Introduction

The gobiid genus *Sueviota* was described by Winterbottom & Hoese (1988) for 4 species: *S. atrinasa* from Western Australia, *S. aprica* and *S. lachneri* from the Indo-west Pacific, and *S. larsonae* from northwestern Australia and the South China Sea. Since then, three additional species have been described: *S. bryozophila* Allen, Erdmann & Cahyani, 2016 from two locations in Indonesia (Ambon, Maluku and Lembeh Strait, North Sulawesi); *S. tubicola* Allen & Erdmann, 2017 from Milne Bay, Papua New Guinea; and *S. pyrios* Greenfield & Randall, 2017 from the Gulf of Aqaba in the Red Sea. The genus is similar to the dwarfgobies of the genus *Eviota*, Jenkins, 1903 (Greenfield & Winterbottom 2016, Greenfield 2017), but differs primarily by having the fifth pelvic-fin ray branched vs. absent or present but unbranched. In addition, *Sueviota* has most species with a basal membrane fully joining the fifth pelvic-fin rays vs. separate pelvic fins without fifth rays or with unbranched fifth rays joined at most by a short and weakly developed membrane (Greenfield & Winterbottom 2016). As discussed by Allen & Erdmann (2017), the validity of the genus *Sueviota* in relation to the much larger *Eviota* genus is under question, and the issue is currently being explored by Luke Tornabene (University of Washington, WA, USA).

While conducting a marine biodiversity survey of the reefs within the Misool EcoResort concession area (a strict "no-take" marine reserve within the southeast Misool marine protected area in Raja Ampat Islands, West Papua, Indonesia), the second author observed a well-camouflaged dwarfgoby peering out from the exhalent pore of a ca. 12 cm-high tube sponge of the genus *Theonella* Gray, 1868. An attempt to collect that dwarfgoby with clove oil was unsuccessful. A subsequent survey of approximately 150 additional sponges of the same appearance over the course of 5 additional dives revealed 7 more of these dwarfgobies (all occupying the 15–24 m depth range), one of which was collected and photographed and is described herein as the holotype of the new species. Subsequently, the second author returned for a marine biodiversity survey of the North Misool marine protected area (ca. 100 km northwest of original collection site), and collected three additional specimens of the new species from the same depth range.

Materials and Methods

The holotype is deposited in the fish collection at the Museum Zoologicum Bogoriense, Cibinong, Java, Indonesia (MZB) and the paratypes at the California Academy of Sciences, San Francisco, CA, USA (CAS) and the University of Washington, Seattle, WA, USA (UW).

Counts, descriptions of fin morphology and the cephalic sensory-canal pore patterns follow Lachner & Karnella (1980) and Jewett & Lachner (1983). 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). Cyanine Blue 5R (acid blue 113) stain and an airjet were used to make the pores, branching fin rays, and scales more obvious (Akihito et al. 1993, 2002, Saruwatari et al. 1997).

The format of the description and methods of measurements follow Allen et al. (2016). Standard length (SL) was measured from the median anterior point of the upper lip to the base of the caudal fin (posterior end of the hypural plate); body depth from the origin of the pelvic fin (an additional body-depth measurement was taken at the anal-fin origin); head length was taken from the upper lip to the posterior end of the opercular membrane; eye diameter is the greatest fleshy diameter; snout length was measured from the median anterior point of the upper lip to the nearest fleshy edge of the eye; 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; lengths of spines and rays are measured to their extreme bases; caudal- and pectoral-fin lengths are the length of the longest ray; pelvic-fin length is measured from the base of the pelvic-fin spine to the tip of the longest segmented ray.

In the description, the data for the holotype are presented first, followed by the range for all the types and the mean for all types.

Sueviota minersorum, n. sp.

Miners' Dwarfgoby

urn:lsid:zoobank.org:act:EA185910-83EA-49EC-84E1-50C8DD9201C8

Figures 1–7.

Holotype. MZB 25111, 18.7 mm SL, male, Indonesia, West Papua, Raja Ampat Islands, southeast Misool, east tip of Boo Island, -2.2225°, 130.6098°, 20 m, clove oil and hand net, field number MVE-19-034, M.V. Erdmann & R. Mambrasar, 23 May 2019.

Paratypes. CAS 247149, 23.2 mm SL, male & 17.9 mm SL female, Indonesia, West Papua, Raja Ampat Islands, North Misool, Pulau Senyu, -1.6649°, 129.8704°, 22 m, clove oil and hand net, field number MVE-19-050, M.V. Erdmann & R. Mambrasar, 25 August 2019. UW 159841, 20.0 mm SL, female, same collection data as CAS 247149.

Diagnosis. A species of *Sueviota* distinguished from all congeners by a combination of a basal membrane fully joining fifth pelvic-fin rays; no frenum; a cephalic sensory-canal system with POP, NA, AITO (single), PITO, AOT, SOT pores present; pelvic-fin rays all branched; second-dorsal-fin elements I,9; anal-fin elements I,8; pectoral-fin rays 16 or 17, all unbranched; body stocky with a deep caudal peduncle (15–18% SL) not tapering from mid-body; color pattern in life including a bluish-grey background with red-orange markings over head, pectoral-fin base, and as a bar on each body scale and fins with iridescent sky-blue margins and round reddish spots along spines of second dorsal fin.

Description. Dorsal-fin elements VI+I,9, first dorsal fin triangular; first spine filamentous, extending to base of fourth segmented ray of second dorsal fin when adpressed; all rays of second dorsal fin branched except first, last ray branched to base; anal-fin elements I,8, all soft rays branched, last ray branched to base; pectoral-fin rays 17 (16–17), all unbranched; pelvic-fin elements I,5, all rays branched, fifth ray with two branches, subequal to fourth, a well-developed basal membrane joining the two fifth rays, extending out to the ends of the rays (Fig. 3), no frenum; caudal fin with 17 segmented rays and 13 (12–13) branched rays. Lateral scale rows 27 (27–28); transverse scale rows 7; scales finely ctenoid on body, no evidence of scales present on head or breast region, but present on belly; anterior extent of scales to top of pectoral-fin base, but absent along bases of first three dorsal-fin spines.

Front of head rounded, snout forming angle of about 70° to horizontal of body axis; mouth terminal, inclined

Figure 1. *Sueviota minersorum*, fresh anesthetized holotype, MZB 25111, male, 18.7 mm SL, Boo Island, Raja Ampat, West Papua, Indonesia (M.V. Erdmann).

Figure 2. *Sueviota minersorum*, preserved holotype, MZB 25111, 18.7 mm SL, Boo Island, Raja Ampat, West Papua, Indonesia (D.W. Greenfield).

slightly obliquely upwards, forming an angle of about 65° to horizontal axis of body, lower jaw not projecting; maxilla extending posteriorly to a vertical through anterior edge of pupil; anterior tubular nares about half diameter of pupil in length, posterior nares with elevated rim; gill opening extending forward to below posterior edge of operculum; cephalic sensory-canal pores with POP, NA, AITO, PITO, AOT, SOT present. The pore and papilla pattern is the same as that illustrated for *S. tubicola* by Allen & Erdmann (2017: Fig. 3). Urogenital papilla of male smooth, elongate, tapering and rounded at end, reaching anal-fin base.

Figure 3. *Sueviota minersorum*, preserved holotype, MZB 25111, fused pelvic fins with no frenum (D.W. Greenfield).

Measurements (holotype and 3 paratypes, % SL): body stocky, body depth 20.3 (18.4–24.2; 21.4); body depth at anal–fin origin 19.1 (19.1–22.2; 20.5); head length 27.8 (26.7–28.5; 27.6); origin of first dorsal fin 31.8 (31.7–32.7; 32.1), behind posterior margin of pectoral–fin base; origin of second dorsal fin 51.9 (51.9–53.9; 53.0), well in advance of anal–fin origin; origin of anal fin 57.5 (55.6–57.5; 56.3); caudal–peduncle length 27.3 (25.1–27.8; 26.3); caudal–peduncle deep, depth 15.8 (15.1–17.7; 16.4), not tapering from the mid–body; eye diameter 8.5 (8.1–9.2; 8.5); snout length 5.6 (3.7–5.6; 4.9); pectoral–fin length 26.7 (26.7–33.2; 29.5); pelvic–fin length 20.6 (20.6–26.7; 24.1).

Color of holotype when fresh. (Fig. 1) Background color of head and body bluish grey, more bluish on upper half of body; scale pockets on body with elongated, strong, burnt-orange marks, scales sprinkled with fine melanophores; head sprinkled with small melanophores and overlaid with burnt-orange markings consisting of three irregular bars across nape; 4 bars radiating from eye, at the 2, 4, 6, and 7 o'clock positions; two bars on cheek, one from between eye bars 4 and 6 obliquely to under head and a vertical bar just behind posterior edge of preoperculum; opercular membrane burnt-orange and heavily peppered with melanophores; pectoral-fin base heavily peppered with melanophores and with two burnt-orange spots, one on upper portion and one on lower portion; iris of eye golden with 8 red bars radiating from pupil; snout with red-orange reticulations; anterior tubular naris black; jaws brownish with red-orange reticulations; first spine of first dorsal fin red with sky-blue dots along its length, remaining spines red with a few scattered blue spots, membrane with small scattered blue and yellow spots, distal margin iridescent sky blue; second dorsal fin similar to first except round red spots

running along length of each spine and distal third of fin yellow, margin iridescent sky blue. Caudal-fin rays orange-red with blue squares spaced along length, membranes peppered with blue and yellow spots, dorsal and ventral edges more yellow, distal margin iridescent sky blue. Anal-fin rays lemon yellow, membranes peppered with sky blue spots. Pelvic-fin rays 1 to 4 white, fifth ray yellow, membrane between fifth rays peppered with sky blue spots. Pectoral fins clear.

Color in preservative. (Fig. 2) Background color of head and body pale yellow; scale pockets on body with elongated brown marks, scales sprinkled with melanophores; head sprinkled with melanophores; brown markings on head as described for burnt-orange marks on fresh holotype; opercular membrane heavily peppered with melanophores; jaws and snout grey; membranes of first and second dorsal fins black, rays of second dorsal fin with round white spots along length of rays; anal-fin rays clear, membranes black; caudal-fin rays white with a series of black spots along length of rays, distal margin of membranes black; pectoral fins white; first 4 pelvic-fin rays white, fifth ray pale yellow.

Etymology. The specific epithet is a latinized plural eponym, a noun in the genitive case, in honor of Andrew and Marit Miners, who founded the Misool EcoResort in Raja Ampat Islands and whose superlative efforts in conservation and sustainable economic development in the region have dramatically improved the health and biomass of the thriving reefs where this new species was discovered. It is a pleasure to name this unique and apparently rare goby in their honor.

Distribution and habitat. The new species is currently known only from the reefs surrounding Misool Island in Raja Ampat Islands, West Papua, Indonesia, although focused surveys for this extremely cryptic species are likely to reveal a wider distribution in eastern Indonesia and the Coral Triangle region. The species was only observed in close association with a particular species of tube sponge that is provisionally assigned to the genus *Theonella*. With the aid of an underwater lightsource, the goby could be seen peering out from the darkened recesses of the exhalent pore of the sponge, but would quickly retreat deep into the canal structure of the sponge. This behavior made it difficult to photograph in situ or to capture by hand, even with the use of anesthetic clove oil. The sponge species was commonly observed on current-exposed walls and steep slopes in the 15–25 m depth range; a visual survey of approximately200 individual sponges revealed only 10 *S. minersorum*.

Comparisons. Only 4 other species of *Sueviota* have a basal membrane fully joining the two branched fifth pelvic-fin rays, i.e. *S. bryozophila*, *S. lachneri*, *S. larsonae*, and *S. tubicola*. *Sueviota minersorum* differs from *S. bryozophila* in having all pelvic-fin rays branched (vs. unbranched), having a single AITO pore (vs. paired AITO pores), PITO and NA pores (vs. absent), and in live color: *S. bryozophila* is a semi-translucent pale pink to whitish with scattered red spots and is covered with fine bright white speckling (Fig. 4: typical white speckling not visible).

Figure 4. *Sueviota bryozophila*, freshly anesthetized specimen, North Sulawesi, Indonesia (M.V. Erdmann).

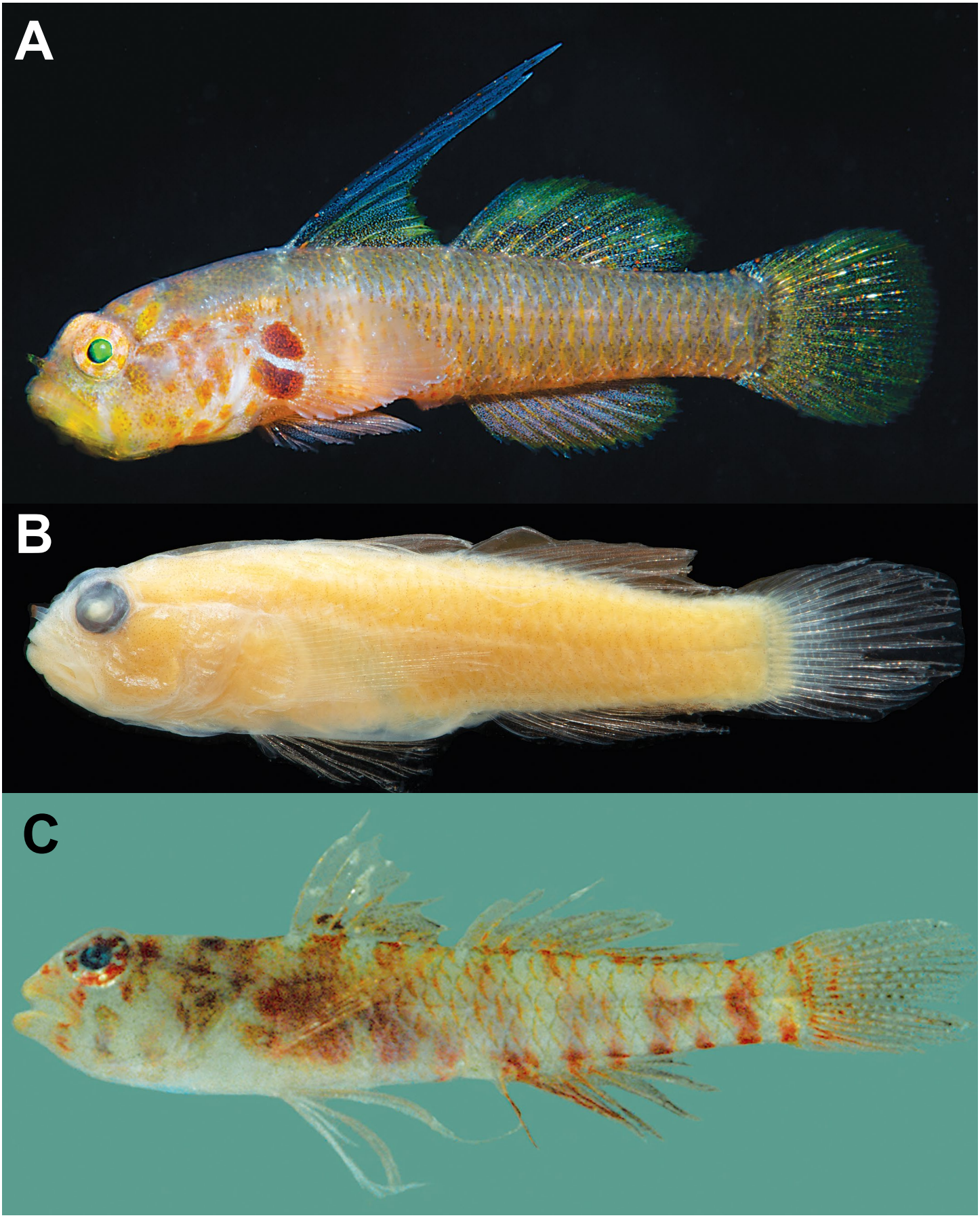

Figure 5. (A) *Sueviota tubicola*, freshly anesthetized specimen, Normanby Island, Papua New Guinea (M.V. Erdmann); (B) *Sueviota larsonae*, preserved specimen, NTM S.13259-001, Gulf of Carpentaria, Australia (M. Hammer); (C) *Sueviota lachneri*, fresh paratype, ROM 44129, 16.2 mm SL, Peros Banhos Atoll, Indian Ocean (R. Winterbottom).

Although *S. tubicola* (Fig. 5A) shares the same cephalic sensory-pore pattern as *S. minersorum*, and also has two red-orange spots on the pectoral-fin base and similarly marked scale pockets, it differs in having a pelvic frenum (vs. absent), branched pectoral-fin rays (vs. unbranched), and a narrower caudal peduncle depth, resulting in a more slender appearance than that of the stocky *S. minersorum*. *Sueviota larsonae* (Fig. 5B) also has a pelvic frenum (vs. absent) and branched pectoral-fin rays (vs. unbranched). *Sueviota minersorum* is most similar to *S. lachneri* (Fig. 5C), sharing a fully developed basal membrane joining the two branched fifth pelvic-fin rays, usually 9 dorsal-fin rays, two pigmented spots on the pectoral-fin base, one dorsal and one ventral, and similar pigment marks arranged around the eye. *Sueviota minersorum* differs from *S. lachneri* in both the shape of the body and in coloration. *Sueviota minersorum* has a stocky body with a deep caudal peduncle that does not taper from the body under the dorsal fins, whereas *S. lachneri* is more slender (Fig. 6): the difference in caudal-peduncle depth is demonstrated by two body proportions, the caudal-peduncle depth as a proportion of its length and as a proportion of the body depth at the anal-fin origin. The body in *S. minersorum* is less translucent and with more surface melanophores than in *S. lachneri*, so that the internal body bars are not obvious as in *S. lachneri* (Fig. 5C). Although the area between the two orange spots on the pectoral-fin base is lighter in *S. minersorum*, it lacks the intense white bar crossing the pectoral-fin base in *S. lachneri*. The opercular membrane is heavily peppered with

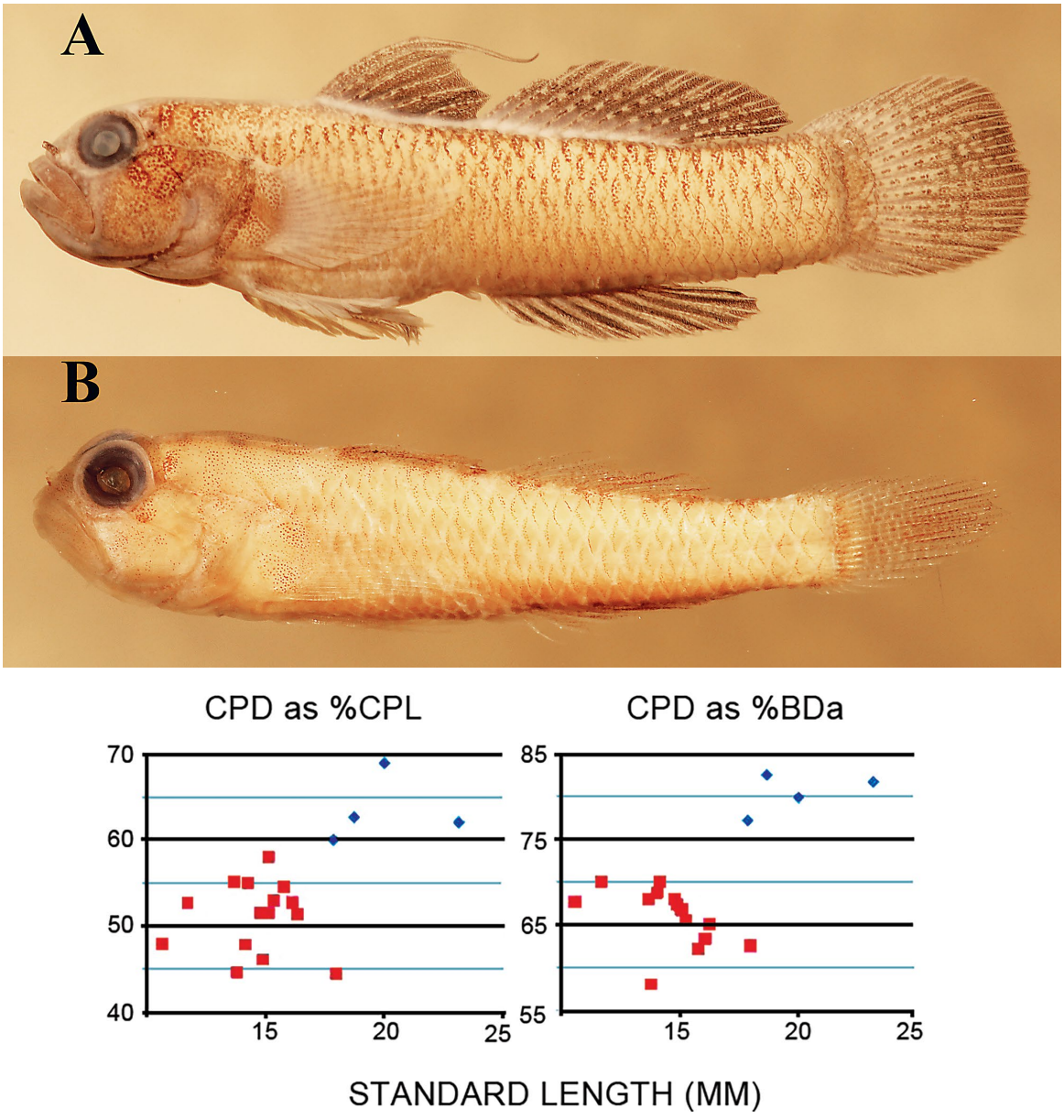

Figure 6. (A) *Sueviota minersorum*, preserved holotype, MZB 25111, 18.7 mm SL; (B) *Sueviota lachneri*, preserved paratype, ROM 44133, 18.0 mm SL (D.W. Greenfield); graphs of caudal-peduncle depth as a percentage of caudal-peduncle length (left) and body depth at anal-fin origin for *Sueviota minersorum* (blue diamonds) versus *S. lachneri* (red squares).

Figure 7. *Sueviota lachneri*, fresh specimen, CAS 247110, 15.6 mm SL, Laamu Atoll, Maldives (M.V. Erdmann).

melanophores in *S. minersorum* (vs. not heavily pigmented). The caudal-fin rays of *S. minersorum* have a series of blue squares running along their length with the rays bordered with red on each side, whereas the caudal-fin rays of *S. lachneri* have red spots along their length. A photograph of a fresh specimen of *S. lachneri* from the Maldive Islands (Fig. 7) is similar to the paratypes from the Chagos Archipelago in body shape and coloration.

The remaining species in the genus lack the fully developed basal membrane joining the two branched fifth pelvic-fin rays: *Sueviota pyrios* can be distinguished by having 8 dorsal-fin and 8 anal-fin soft rays (vs. 9/8 in *S. minersorum*), and a very distinctive orange-red in live coloration (Fig. 8A); both *S. aprica* (Fig. 8B) and *S.*

Figure 8. (A) *Sueviota pyrios*, fresh holotype, BPBM 13361, 16.5 mm SL, Eilat, Gulf of Aqaba, Red Sea (J.E. Randall); (B) *Sueviota aprica*, fresh specimen, Raja Ampat, Indonesia (R. Winterbottom).

Figure 9. *Sueviota atrinasa*, freshly anesthetized specimen, Cenderawasih Bay, Indonesia (M.V. Erdmann).

atrinasa (Fig. 9) lack POP pores (vs. present in *S. minersorum*), *S. aprica* has 10 dorsal-fin rays (vs. 9), and both *S. aprica* and *S. atrinasa* are very different in fresh coloration.

Acknowledgments

We are grateful to Andrew and Marit Miners for the invitation to MVE to visit Misool EcoResort and survey the reef-fish biodiversity of the region; we also thank Sabine Templeton, Sue Taylor, and Mark Atkinson for hosting that survey, as well as the fantastic dive guides and staff of Misool EcoResort. The authors also thank Unilever, the makers of Norilicious seaweed snacks, for their support of the expedition that led to the discovery of this new species. We also thank Yayasan Nazareth and the Blue Abadi Fund for sponsoring the North Misool MPA survey which led to the collection of the paratype specimens. We moreover thank the government and people of the Raja Ampat Islands for their continued support of marine conservation efforts in the region, and Dawn Arnall, Antoine Firmenich, and Wolcott Henry for financial support of ichthyological explorations in West Papua, Indonesia. We thank Michael Hammer, John E. Randall, and Richard Winterbottom for their photographs; Mysi Hoang of the California Academy of Sciences for processing the holotype; and Don Stacy of the Royal Ontario Museum for loaning the paratypes of *S. lachneri*. The manuscript was reviewed by two anonymous referees.

References

Akihito, Sakamoto, K., Ikeda, Y. & Sugiyama, K. (2002) Gobioidei. *In*: Nakabo, T. (Ed.), *Fishes of Japan with pictorial keys to the species. English edition*, *Vol. II.* Tokai University Press, Tokyo, Japan, pp. 1139–1310.

Akihito, Sakamoto, K., Iwata, A. & Ikeda, Y. (1993) Cephalic sensory organs of the gobioid fishes. *In*: Nakabo, T. (Ed.), *Fishes of Japan with pictorial keys to the species*. Tokai University Press, Tokyo, Japan, pp. 1088–1116.

Allen, G.R. & Erdmann, M.V. (2017) *Sueviota tubicola*, a new species of coral-reef goby (Teleostei: Gobiidae) from Papua New Guinea. *Journal of the Ocean Science Foundation*, 25, 1–7. http://dx.doi.org/10.5281/zenodo.262097

Allen, G.R., Erdmann, M.V. & Cahyani, N.K.D. (2016) *Sueviota bryozophila*, a new species of coral-reef goby from Indonesia (Teleostei: Gobiidae). *Journal of the Ocean Science Foundation*, 20, 76–82. https://doi.org/10.5281/zenodo.50519

Greenfield, D.W. (2017) An overview of the dwarfgobies, the second most speciose coral-reef fish genus (Teleostei: Gobiidae: *Eviota*). *Journal of the Ocean Science Foundation*, 29, 32–54. https://doi.org/10.5281/zenodo.1115683

Greenfield, D.W. & Winterbottom, R. (2016) A key to the dwarfgoby species (Teleostei: Gobiidae: *Eviota*) described between 1871 and 2016. *Journal of the Ocean Science Foundation*, 24, 35–90. https://doi.org/10.5281/zenodo.219620

Greenfield, D.W. & Randall, J.E. (2017) *Sueviota pyrios*, a new species of coral-reef dwarfgoby from the Red Sea (Teleostei: Gobiidae). *Journal of the Ocean Science Foundation*, 25, 8–13. https://doi.org/10.5281/zenodo.268651

Jewett, S.L. & Lachner, E.A. (1983) Seven new species of the Indo-Pacific genus *Eviota* (Pisces: Gobiidae). *Proceedings of the Biological Society of Washington*, 96 (4), 780–806.

Lachner, E.A. & Karnella, S.J. (1980) Fishes of the Indo-Pacific genus *Eviota* with descriptions of eight new species (Teleostei: Gobiidae). *Smithsonian Contributions to Zoology*, 315, 1–127. https://doi.org/10.5479/si.00810282.315

Saruwatari, T., Lopez, J.A. & Pietsch, T.W. (1997) Cyanine blue: a versatile and harmless stain for specimen observations. *Copeia*, 1997 (4), 840–841. https://doi.org/10.2307/1447302

Winterbottom, R. & Hoese, D.F. (1988) A new genus and four new species of fishes from the Indo-West Pacific (Pisces; Perciformes; Gobiidae), with comments on relationships. *Royal Ontario Museum, Life Sciences Occasional Paper*, 37, 1–17.