




Eviota taeiae, a new dwarfgoby (Teleostei: Gobiidae) of the *Eviota guttata* complex from Samoa

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Abstract

A new species of dwarfgoby, *Eviota taeiae* n. sp. is described from Nuusafee Island, Samoa. The new species is a member of the *Eviota guttata* complex that includes *E. guttata*, *E. teresae*, and *E. albolineata*, and is characterized by a complete cephalic sensory-canal pore pattern (pattern 1); a dorsal/anal-fin formula of 9/8; the first 7–10 pectoral-fin rays unbranched, the remainder branched; the fifth pelvic-fin ray 10–12% of length of the fourth ray; pelvic-fin-ray branches short, broad, and connected by membranes; distinct dark spots present on ventral side of head; the eye with four to six white spokes radiating outwards from pupil and separating red-orange on iris; rectangular blocks on the ventral half of the body taller than wide and separated from each other by narrow yellow bars less than a pupil diameter; and a red-orange blotch behind the eye connected to a red-orange spot at the back of the interorbital area.

Key words: taxonomy, ichthyology, coral-reef fishes, gobies, western Pacific Ocean, pelvic fins, *E. teresae*, *E. albolineata*

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Introduction

The dwarfgobies in the genus *Eviota* occur throughout the Indo-Pacific region and are represented by 129 valid species. Recent genetic analyses, such as that by Tornabene, Greenfield & Erdmann (2021) for the *Eviota zebrina* complex, have shown that many species once thought to be widespread across the Indo-Pacific are in fact comprised of a number of closely related but geographically non-overlapping species. Ongoing analyses reveal that the *Eviota guttata* complex is another clear example of this pattern of apparent allopatric speciation; in this paper we describe the fourth species in this complex and speculate on the existence of several additional species yet to be described.

Lachner & Karnella (1978) first described *E. guttata* from the Red Sea. Jewett & Lachner (1983) then described *E. albolineata* from Tahiti, giving its range from the east coast of Africa eastward through the Indo-Pacific region to the Tuamotu Archipelago, and discussed the difficulty they had in separating it from *E. guttata*, which only occurred in the Red Sea. In 2010, Greenfield and Randall demonstrated that the name *E. albolineata* should be restricted to the Society Islands, Tuamotus, and Line Islands, but used the name *E. guttata* for the remainder of the non-Red Sea specimens. Recognizing that the species in Fiji then called *E. guttata* differed morphologically from the Red Sea specimens, Greenfield & Randall (2016) described it as *E. teresae*, but did not treat specimens from other areas, suggesting that non-*guttata* species in the Pacific consist of a complex of geographically isolated species.

They did, however, include a photograph called *E. cf. teresae* from Nuusafee, Samoa and noted differences between it and *E. teresae*. Since that time the first author obtained tissue and additional specimens from Samoa and Fiji, and the third author compared DNA sequences between specimens from those localities that demonstrate species-level differences. The Samoan species is described herein.

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). We follow Lachner & Karnella (1980:4) in describing the membranes joining the first four 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". 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; 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 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 the horizontal distance between 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 and an airjet were used to make the cephalic sensory-canal pores more obvious (Akihito et al. 1993, 2002, Saruwatari et al. 1997). The value of the holotype is presented first, followed by the range and mean for all type specimens (n=5), meristic data were taken from these specimens and two in 95% ethanol (CAS 248039, CAS 248040). Morphometric data were taken exclusively from the holotype and formalin-fixed paratypes (CAS 247726). Two additional ethanol-fixed specimens (CAS 248041) are included in the type series and in the genetic analysis, but were not examined for morphology.

A segment of the mitochondrial gene cytochrome c oxidase subunit I (COI) was sequenced using the primers GobyL6468 and GobyH7696 (Thacker 2003) or FishF1 and FishR1 (Ward et al. 2005), as well as the nuclear

gene Protease III (Ptr) using the primers PtrF2 and PtrR2 (Yamada et al. 2009). The PCR conditions are that of Tornabene et al. (2016). We sequenced 4 specimens of the new species and 6 specimens of *E. teresae* from the type locality at Fiji. These were combined with sequences of *E. albolineata* from Moorea, Society Islands (type locality is Tahiti), and *E. guttata* from the Red Sea (type locality) and the Gulf of Oman, as well as several more distantly related species of *Eviota* and a specimen of *Gobiodon* to serve as outgroups. The latter sequences came from previous studies (Tornabene et al. 2013, 2015, 2016, 2021). We specifically included members of the *E. melasma* species complex, as this was shown to be closely related to *E. guttata* in previous studies (e.g. Tornabene et al. 2016). New sequences were deposited in GenBank (Appendix I). Sequences were aligned in Geneious Prime 2021 (www.geneious.com). The final alignment consisted of 1211 bp of COI and 631 bp of Ptr. We inferred phylogenetic relationships using Bayes Inference in the software MrBayes v.3.2 (Ronquist et al. 2012), partitioning the concatenated alignment by gene. Substitution models were chosen with PartitionFinder2 (Lanfear et al. 2016). The MCMC was run for 107 generations, discarding the first 10% of samples as burn-in. Pairwise genetic distances (p-distances) were calculated using MEGA X (Kumar et al. 2018, Stecher et al. 2020) for the COI data.



Figure 1. *Eviota taeiae*, underwater photograph, Nuusafee, Samoa (MVE-15-031) (M.V. Erdmann).

Eviota taeiae, n. sp.

Taei's Dwarfgoby

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Figures 1–5

Holotype. CAS 238212, 17.2 mm SL male, Samoa, Nuusafee Island, -14.0451, -171.69162, 3–5 m, field number MVE-15-031, M.V. Erdmann, 16 August 2015.

Paratypes. CAS 247726, 14.8 & 17.0 mm SL males, taken with holotype; CAS 238213, 2 males 14.0 & 16.3, Samoa, Nu'utele, Lalomanu, -14.06007, -171.44138, 18 m, bommie, field number MVE-15-032, M.V. Erdmann, 17 August 2015. CAS 248039 (tissue voucher ET3), 13.7 mm SL female, Samoa, Faleolo (Airport Finger Reef), -13.79895, -171.97772, 15 m, field number MVE-15-025, M.V. Erdmann, 13 August 2015. CAS 248040 (tissue voucher ET4), 13.5 mm SL male, Samoa, Nuulua, -14.07013, -171.40602, 15 m, field number MVE-15-033, M.V. Erdmann, 18 August 2015. CAS 248041 (tissue vouchers ET5 and ET6), 14.2 mm SL male & 13.1 mm SL, sex indeterminate, taken with holotype.

Diagnosis. A species of *Eviota* distinguished from all congeners by a combination of a complete cephalic sensory-canal pore system (pattern 1), a dorsal/anal fin-ray formula usually 9/8; pectoral-fin rays usually 19 (18–20); first 7–10 pectoral-fin rays unbranched, remainder branched; pelvic-fin-ray branches short and connected by membranes about half-way up branch (similar to Fig. 6), fifth pelvic-fin ray 10.6–12.2% of length of fourth ray; no spot lateral to pelvic-fin base; no dark occipital spot; pectoral-fin base with no obvious dark pigmentation, just light scattering of melanophores; no dark spot on mid-caudal peduncle; head and nape without transverse bars; anal fin darker than other fins; orange scale margins in life; distinct dark spots present on ventral side of head; eye with 4 to 6 white spokes radiating outwards from pupil and separating red-orange on iris, several vertical white lines crossing red-orange area of iris on upper half of eye; rectangular blocks on ventral half of body taller than wide and separated from each other by narrow yellow bars less than a pupil diameter, red-orange blotch behind the eye connected to a red-orange spot at back of interorbital area.

Description. Dorsal-fin elements VI+I,9; anal-fin elements I,8; pectoral-fin rays 20 (18–20), branching beginning with ray 10 in holotype; fifth pelvic-fin ray 10.6–12.2% of length of fourth ray; 7 (6, 8) branches on fourth ray; two segments between consecutive branches of fourth pelvic-fin ray; pelvic-fin membrane about half-way up branch; 11 branched and 17 segmented caudal-fin rays; lateral scale rows 24 (24 or 25, usually 24); transverse scale rows 7; scales present on middle of ventral surface of abdomen, no scales on breast; first dorsal fin triangular, first spine filamentous in male holotype, extending back to second ray of second dorsal fin; second spine filamentous extending back to spine of second dorsal fin; all soft rays of second dorsal and anal fin branched, last split through its base; urogenital papilla in male smooth, not fimbriate or cup-shaped, sides straight, with three short projections at end, center one longest, extending to anal-fin base; front of head rounded with an angle of about 70° from horizontal axis; mouth slanted obliquely downwards, forming an angle of about 65° to horizontal axis of body, lower jaw not projecting; maxilla extending posteriorly to back of pupil; anterior naris tube extending just to posterior margin of upper lip; gill opening extending forward just anterior to edge of operculum; cephalic sensory-canal pore system complete (pattern 1) and papilla pattern A of Lachner and Karnella (1980). General body shape is shown in Fig. 2.

Measurements (% SL, based on holotype and 4 paratypes, 14.0–17.2 mm). Head length 26.2 (26.2–29.4, 27.9); origin of first dorsal fin 33.7 (33.7–36.5, 35.0), lying behind posterior margin of pectoral-fin base; origin of second dorsal fin 33.7 (33.7–36.5, 35.0), slightly in advance of anal-fin origin; origin of anal fin 58.7 (54.1–59.3, 56.3); caudal-peduncle length 24.7 (24.7–29.5, 26.2); caudal peduncle slender 10.7 (10.7–12.9, 11.7); body slender, its depth 18.9 (17.0–20.2, 18.4); eye diameter 9.6 (9.4–10.3, 9.8); snout length 3.8 (2.7–4.4, 3.4); pectoral-fin length 36.9 (30.4–37.0, 34.5); pelvic-fin length 29.1 (28.1–33.8, 31.2).

Color in preservative (Fig. 2) Head and body light cream; a scattering of melanophores on nape and on body along dorsal-fin bases; clusters of melanophores behind eye, one at one o'clock position and another at two; a dark spot half size of pupil on ventral side of head on isthmus, about in line with posterior portion of maxilla; a few scattered dark melanophores on underside of lower jaw near tip. First three spines and membranes of first dorsal fin with heavy peppering of melanophores and scattered melanophores on remainder of fin. Second dorsal and caudal fins peppered with melanophores; anal fin black; pectoral and pelvic fins with some melanophores on rays.



Figure 2. *Eviota taeiae*, preserved holotype, CAS 238212 (D.W. Greenfield).

Color in life (Figs. 1, 3–5). Background color of head and body translucent gray; series of orange-red dashes extending along top of vertebral column, each separated by a white spot; ventral half of body with a series of red rectangular blocks separated by yellow or white bars, anteriormost block largest and preceded by a yellow blotch behind pectoral fin; posterior to first block is a narrow yellow bar, less than pupil diameter, followed by second red block subequal to first, and another narrow yellow bar posterior to it; 7 more progressively smaller red blocks follow, each separated by a very narrow white bar; area above first three red blocks under vertebral column white. Scale edges on body orange, distinct against translucent background underneath, most obvious on upper body above vertebral column. A series of small, iridescent, white spots scattered along side from beneath the second dorsal fin posteriorly to caudal peduncle; a series of vertical white lines along dorsum down from dorsal fins, extending to caudal-fin base. Head with a large orange-red blotch behind eye, anterior to first orange-red dash above vertebral column, anterodorsal area of blotch extends anteriorly connecting to spot on post-interorbital area (Fig. 3); a distinct orange-red horizontal bar extends from under eye to end of operculum; three additional short red-orange horizontal lines under eye along upper jaw; two short red-orange lines on anterior portion of lower jaw. Eye with 4 to 6 white spokes out from pupil, separating red-orange on iris, several white lines crossing red-orange area of iris on upper half of eye (Fig. 3). Pectoral and pelvic fins clear, spines and rays of dorsal fins with reddish tinge, caudal fin with scattered orange specks.

Etymology. The specific epithet is named for Sue Miller Tabei, a passionate and highly respected marine conservationist who dedicated her career to the reefs and peoples of the Pacific “Oceanscape”, and especially to her native Samoa. Sue tragically passed away shortly after this beautiful new species was discovered, and it is an honor to name the species in her memory.

Distribution and habitat. The new species is currently known only from the reefs and small islands fringing the main island of Upolu in Samoa: it is likely more widespread (at least to Savai’i in Samoa). Observed and collected from 3–20 m depth on outer reef slopes exposed to significant wave energy, usually perched individually on encrusting coralline algal outcrops or occasionally on live encrusting coral.

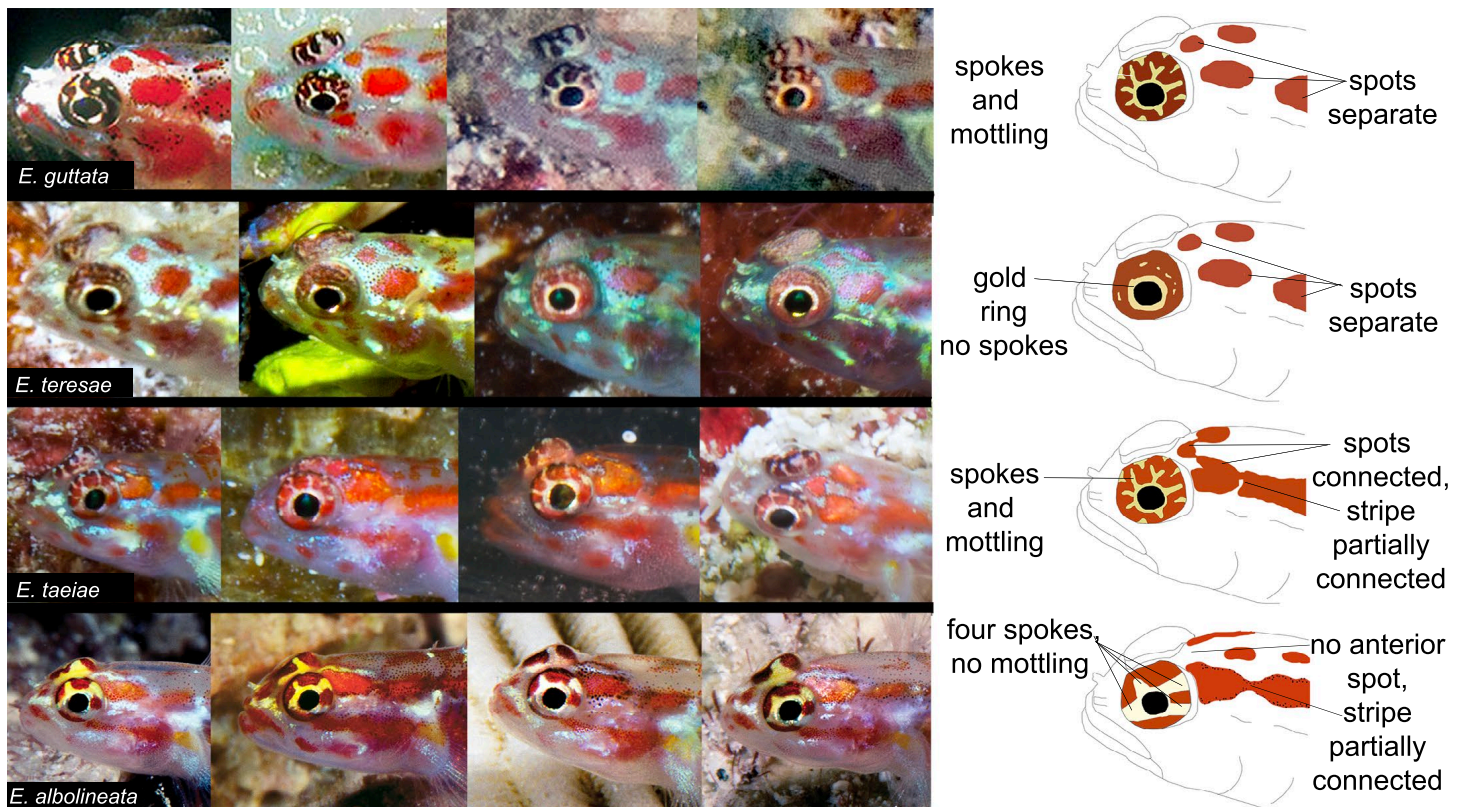


Figure 3. Comparison of eye and head coloration across the *E. guttata* species complex: *E. taeiae* from Samoa (M.V. Erdmann); *E. guttata* from the Red Sea (J.E. Randall, C. Cox, J. Herler); *E. teregae* from Fiji (M.V. Erdmann); and *E. albolineata* from French Polynesia (P. Bacchet).



E. guttata



E. teresae



E. taeiae



E. albolineata

Figure 4. Live photographs of the four members of the *E. guttata* species complex, all taken at or near the type localities (from top, J. Casey, M.V. Erdmann, M.V. Erdmann, and P. Bacchet).

Comparisons. *Eviota taeiae* belongs to a complex of species related to *Eviota guttata* described from the Red Sea (Lachner & Karnella 1978), including *E. albolineata* and *E. teresae* (Fig. 4). *Eviota albolineata* differs from *E. guttata*, *E. teresae*, and *E. taeiae* in lacking dark spots on the ventral side of the head on the isthmus, about in line with the posterior portion of the maxilla and a few scattered dark melanophores on the underside of the lower jaw near the tip. However, these spots may vary depending on the state of preservation, and method of fixation (formalin vs. 95% ethanol).

In the absence of any apparent meristic or morphometric differences, or prominent differences in the pigment of preserved specimens, species within this complex can be distinguished based on live coloration. The most prominent character separating *E. albolineata* from *E. guttata* and *E. teresae* is the complete or partially complete red stripe behind the eye, which is not complete in *E. guttata* and *E. teresae* (stripe partially complete in *E. taeiae*) (Fig. 3). In *E. guttata* and *E. teresae*, the large red spot behind the eye is distinctly separate from a smaller red spot located between and behind the eyes on the dorsal midline, whereas in *E. taeiae* the small red interorbital spot is connected to the larger spot behind each eye, and in *E. albolineata* the small red interorbital spot is absent.

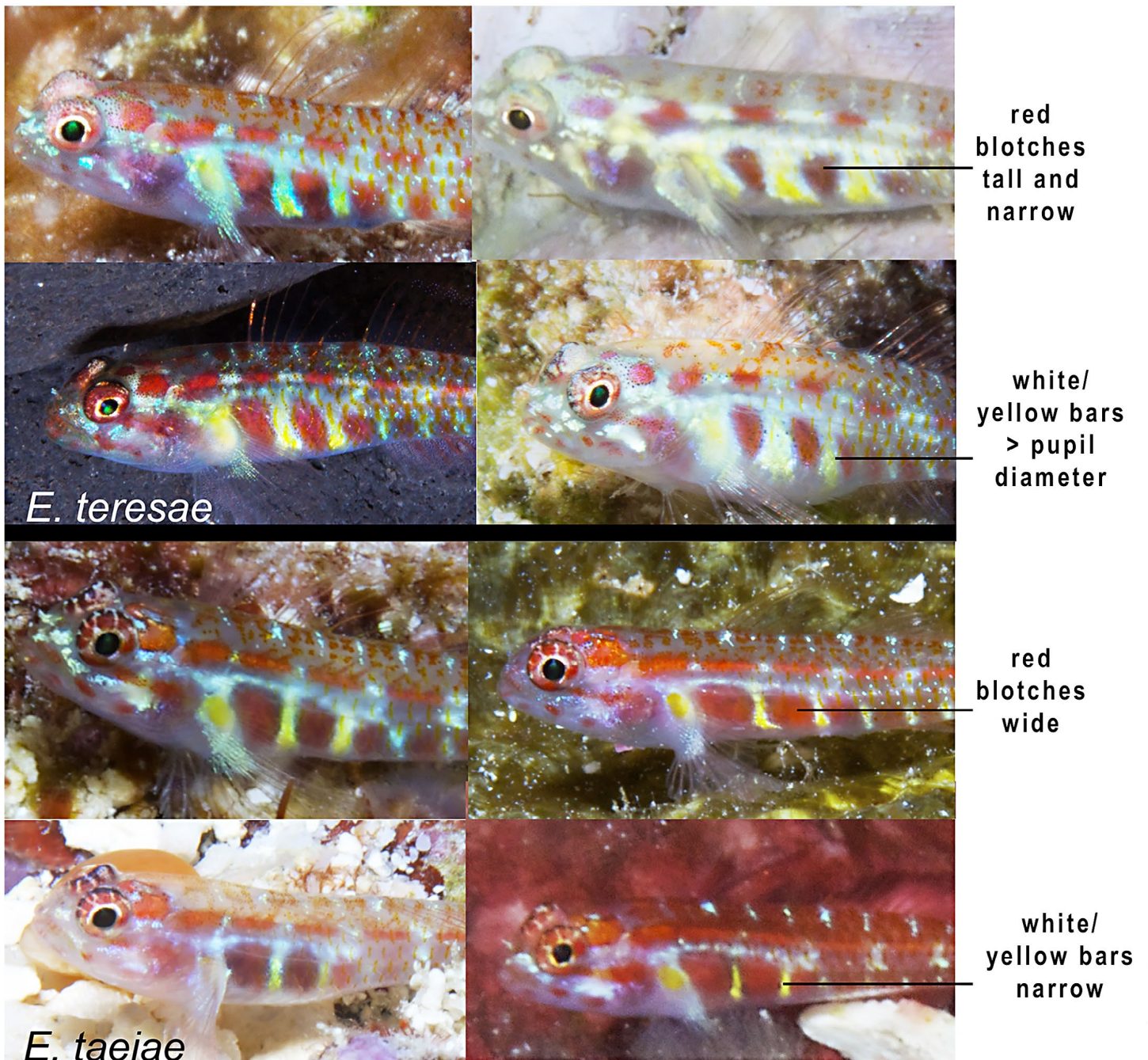


Figure 5. Comparison of abdomen coloration between *E. taeiae* and *E. teresae* (M.V. Erdmann).

The coloration of the eyes also serves to separate *E. taeiae* (and *E. guttata*) from *E. teresae* and *E. albolineata*. Both *E. taeiae* and *E. guttata* have multiple thin, white, or gold spokes radiating outwards from pupil with occasional mottling over the iris, whereas *E. teresae* has a gold ring around the pupil with no prominent spokes, and *E. albolineata* has 4 wide spokes, two anterior and two posterior, with no mottling over the iris (Fig. 3).

Finally, the reddish rectangular blocks on the ventral half of the body in *E. taeiae* are separated from each other by narrow white/yellow bars less than a pupil diameter, whereas in *E. teresae* they are wider than the pupil diameter (Fig. 5); the blocks themselves are wider and more rectangular in shape in *E. taeiae* vs. more narrow and wider at the top with the lower portion of the block less than half the width at the top in *E. teresae*. The reddish rectangular blocks on the ventral side of the body are taller than wide in *E. taeiae* whereas they are wider than tall in *E. guttata*.

In their description of *E. teresae*, Greenfield and Randall (2016) erred in stating that the membranes are absent or weak in the pelvic fins of *E. teresae*. The type material was taken in rotenone collections and held in bags with other fishes until sorting, thus damaging the fins. Subsequent collections of *E. teresae* in Fiji by the first author (CAS 247348) were made by taking individuals using clove oil and then placing them in tubes. The fragile membranes were intact in these carefully handled specimens (Fig. 6).



Figure 6. Fourth pelvic-fin ray of *E. teresae*, 16.3 mm SL male (CAS 247348), Fiji (D.W. Greenfield).

Remarks. Based on the phylogeny inferred from mitochondrial COI and nuclear Ptr data, *Eviota taeiae* is sister to *E. albolineata* with strong support. Both species belong to a monophyletic *E. guttata* species complex, along with *E. teresae* and *E. guttata*, which are sister to one another but with low support (0.58 posterior probability) (Fig. 7). The *E. melasma* species complex was also recovered as monophyletic with strong support. The COI p-distances species in the *E. guttata* complex were high (0.07–0.11) compared to within-species p-distances (0.004–0.013) (Table 1).

Table 1

Net between species p-distances from COI sequences
(shaded numbers on diagonal are average within-species p-distances)

	<i>E. teresae</i>	<i>E. taeiae</i>	<i>E. guttata</i>	<i>E. albolineata</i>
<i>E. teresae</i>	0.008	0.0968	0.0906	0.0975
<i>E. taeiae</i>	0.0968	0.013	0.1092	0.0697
<i>E. guttata</i>	0.0906	0.1092	0.004	0.0991
<i>E. albolineata</i>	0.0975	0.0697	0.0991	n/a

Within the *E. guttata* complex, *E. guttata* (type locality Eritrea, Red Sea) is definitely known from the Red Sea and the Gulf of Oman. Records of *E. guttata* from the Indian Ocean have not been verified genetically, and photographs from the Seychelles and the Maldives suggest significant differences in coloration with *E. guttata*. *Eviota albolineata* (type locality Tahiti, Society Islands) appears to be restricted to the Society Islands and Tuamotus, French Polynesia. Photographs of '*E. albolineata*' from Kiritimati differ in coloration from those in French Polynesia and thus are unverified. *Eviota teresae* is definitely known from Fiji, although photographs from other localities in the Coral Triangle appear to very closely resemble those from Fiji, but the identity of these species has yet to be confirmed genetically. *Eviota taeiae* is known only from Samoa. Underwater photographs of fishes in the *E. guttata* complex from various other Pacific localities show variation in coloration of the body and eyes in some specimens, suggesting additional species in the complex.



Figure 7. Molecular phylogeny of *Eviota* spp. based on COI and Ptr sequences. Branch lengths are substitutions/site, node labels are Bayesian posterior probabilities.

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References

- Akihito, Sakamoto, K., Ikeda, Y. & Sugiyama, K. (2002) Gobioidae. 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.
- Greenfield, D.W. & Randall, J.E. (2010) Four new gobiid fishes of the genus *Eviota* from the western Pacific, with clarification of *Eviota guttata* and *Eviota albolineata* (Teleostei: Gobiidae). *Proceedings of the California Academy of Sciences*, 61, 269–289.
- Greenfield, D.W. & Randall, J.E. (2016) A review of the dwarfgobies of Fiji, including descriptions of five new species (Teleostei: Gobiidae: *Eviota*). *Journal of the Ocean Science Foundation*, 20, 25–75. <https://doi.org/10.5281/zenodo.48268>
- 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.
- Kumar, S., Stecher, G., Li, M., Knyaz, C. & Tamura, K. (2018) MEGA X Molecular Evolutionary Genetics Analysis across computing platforms. *Molecular Biology and Evolution*, 35, 1547–1549.
- Lachner, E.A. & Karnella, J.S. (1978) Fishes of the genus *Eviota* of the Red Sea with descriptions of three new species (Teleostei: Gobiidae). *Smithsonian Contributions to Zoology*, 286, 1–23. <https://doi.org/10.5479/si.00810282.286>
- 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>
- Lanfear, R., Frandsen, P.B., Wright, A.M., Senfeld, T. & Calcott, B. (2016) PartitionFinder 2: new methods for selecting partitioned models of evolution for molecular and morphological phylogenetic analyses. *Molecular Biology and Evolution*, 34 (3), 772–773.
- Ronquist, F., Teslenko, M., van der Mark, P., Ayres, D.L., Darling, A., Höhna, S., Larget, B., Liu, L., Suchard, M.A. & Huelsenbeck, J.P. (2012) MrBayes 3.2: Efficient Bayesian Phylogenetic Inference and Model Choice Across a Large Model Space. *Systematic Biology*, 61 (3), 539–542.
- 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>
- Stecher, G., Tamura, K. & Kumar, S. (2020) Molecular Evolutionary Genetics Analysis (MEGA) for macOS. *Molecular Biology and Evolution*, 37, 1237–1239.
- Thacker, C.E. (2003) Molecular phylogeny of the gobioid fishes (Teleostei: Perciformes: Gobioidae). *Molecular Phylogenetics and Evolution*, 26, 354–368. [https://doi.org/10.1016/S1055-7903\(02\)00361-5](https://doi.org/10.1016/S1055-7903(02)00361-5)
- Tornabene, L., Ahmadi, G.N., Berumen, M.L., Smith, D.J., Jompa, J. & Pezold, F. (2013) Evolution of microhabitat association and morphology in a diverse group of cryptobenthic coral reef fishes (Teleostei: Gobiidae: *Eviota*). *Molecular Phylogenetics and Evolution*, 66, 391–400. <https://doi.org/10.1016/j.ympev.2012.10.014>
- Tornabene, L., Valdez, S., Erdmann, M.V. & Pezold, F. (2015) Support for a 'Center of Origin' in the Coral triangle: cryptic diversity, recent speciation, and local endemism in a diverse lineage of reef fishes (Gobiidae: *Eviota*). *Molecular Phylogenetics and Evolution*, 82, 200–210. <https://doi.org/10.1016/j.ympev.2014.09.012>

- Tornabene, L., Valdez, S., Erdmann, M.V. & Pezold, F. (2016) Multi-locus sequence data reveal a new species of coral reef goby (Teleostei: Gobiidae: *Eviota*), and evidence of Pliocene vicariance across the Coral Triangle. *Journal of Fish Biology*, 88, 1811–1834. <https://doi.org/10.1111/jfb.12947>
- Tornabene, L., Greenfield, D.W. & Erdmann, M.V. (2021) A review of the *Eviota zebrina* complex, with the description of four new species (Teleostei: Gobiidae). *Zookeys*, 1057, 149–184. <https://doi.org/10.3897/zookeys.1057.66675>
- Ward, R.D., Zemlack, T.S., Innes, B.H., Last, P.H. & Hebert, P.D.N. (2005) DNA barcoding Australia's fish species. *Philosophical Transactions of the Royal Society B*, 360, 1847–1857.
- Yamada, T., Sugiyama, T., Tamaki, N., Kawakita, A. & Kato, M. (2009) Adaptive radiation of gobies in the interstitial habitats of gravel beaches accompanied by body elongation and excessive vertebral segmentation. *BMC Evolutionary Biology*, 9, 145. <https://doi.org/10.1186/1471-2148-9-145>

Appendix 1. Specimen data and GenBank accession numbers for the DNA sequences used in the phylogeny in Figure 7.

Genus	species	Collection site	DNA number	catalog number	GenBank # COI	GenBank # Ptr
<i>Eviota</i>	<i>taeiae</i>	Samoa	ET3	CAS 248039	OR088870	OR060902
<i>Eviota</i>	<i>taeiae</i>	Samoa	ET4	CAS 248040	OR088871	OR060903
<i>Eviota</i>	<i>taeiae</i>	Samoa	ET5	CAS 248041	OR088872	OR060904
<i>Eviota</i>	<i>taeiae</i>	Samoa	ET6	CAS 248041	OR088873	OR060905
<i>Eviota</i>	<i>albolineata</i>	Moorea	N/A	AMNH 256486	JX483989	JX483966
<i>Eviota</i>	<i>guttata</i>	Gulf of Oman	UAE18509	UW 158532	OR088886	OR060894
<i>Eviota</i>	<i>guttata</i>	Gulf of Oman	UAE18283	UW 158534	OR088885	OR060895
<i>Eviota</i>	<i>guttata</i>	Saudi Arabia	N/A	CAS 234528	JX483993	JX483963
<i>Eviota</i>	<i>oculineata</i>	Papua New Guinea	COM1	CAS 246244	MK712445	MK712464
<i>Eviota</i>	<i>nigriventris</i>	Cendrawasih	NI1	CAS 237495	KP013282	KP013364
<i>Eviota</i>	<i>punctulata</i>	Fiji	PU6	CAS 244638	MH940307	MH940322
<i>Eviota</i>	<i>hinanoae</i>	Moorea	N/A	CAS 234535	JX483953	JX483988
<i>Eviota</i>	<i>teresae</i>	Fiji	ET9	CAS 248058	OR088874	OR060906
<i>Eviota</i>	<i>teresae</i>	Fiji	ET10	CAS 248059	OR088875	OR060897
<i>Eviota</i>	<i>teresae</i>	Fiji	ET11	CAS 248060	OR088876	OR060898
<i>Eviota</i>	<i>teresae</i>	Fiji	ET12	CAS 248061	OR088877	OR060899
<i>Eviota</i>	<i>teresae</i>	Fiji	ET13	CAS 248062	OR088878	OR060900
<i>Eviota</i>	<i>teresae</i>	Fiji	ET14	CAS 248063	OR088879	OR060901
<i>Eviota</i>	<i>fallax</i>	Sulawesi	EFA1	CAS 237502	KP013252	KP013336
<i>Eviota</i>	<i>pictifacies</i>	Cendrawasih	EG1	CAS 237507	KP013253	KP013337
<i>Eviota</i>	cf. <i>melasma</i>	Pohnpei	N/A	CAS 234532	JX483990	JX483960
<i>Eviota</i>	<i>karaspila</i>	Fiji	KA2	CAS 248064	OR088880	OR060896
<i>Eviota</i>	<i>rubrisprsa</i>	Raja Ampat	RY1	CAS 237514	KP013287	KP013367
<i>Eviota</i>	<i>melasma</i>	Australia	M2545	uncataloged	OR088884	OR060893
<i>Eviota</i>	<i>melasma</i>	Australia	M2180	uncataloged	OR088881	OR060890
<i>Eviota</i>	<i>melasma</i>	Australia	M2218	uncataloged	OR088882	OR060891
<i>Eviota</i>	<i>melasma</i>	Australia	M2271	uncataloged	OR088883	OR060892