Fishes of the Indo-Pacific Genus *Eviota* with Descriptions of Eight New Species (Teleostei: Gobiidae)

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and
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SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 315

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ABSTRACT

Lachner, Ernest A., and Susan J. Karnella. Fishes of the Indo-Pacific Genus *Eviota* with Descriptions of Eight New Species (Teleostei: Gobiidae). *Smithsonian Contributions to Zoology*, number 315, 127 pages, 66 figures, 12 tables, 1980.—Thirty-one species of the widely distributed and speciose genus *Eviota* Jenkins of the tropical Indo-West Pacific are treated, including 23 nominal and 8 new species. Important specific characters are: presence of certain cephalic sensory pores; presence and number of branched pectoral fin rays; presence and length of fifth pelvic fin ray; number of primary branches on fourth pelvic fin ray and number of segments between branches; shape of male genital papilla; number of dorsal and anal fin rays; and body coloration.

Diagnostic characters of the genus are reviewed. An artificial key to the 31 species is provided. Relationships of 6 major natural or artificial species groups are discussed. Data for important meristic characters are tabulated. The species, and details of certain characters, are illustrated by photographs and drawings. A diagnosis, list of material examined, and description are provided for each species, and geographic distributions are plotted on maps for 30 species.

Nominal species of *Eviota* placed in the synonymy of other *Eviota* are: *E. viridis* (Waite) and *E. verna* J.L.B. Smith in *E. prasina* (Klunzinger); *E. stigmapteron* J.L.B. Smith in *E. distigma* Jordan and Seale; and *E. gymnocephalus* Weber in *E. zonura* Jordan and Seale. The nominal species *E. pruinosa* Jordan and Seale, *E. grammistes* Tomiyama, *E. macrophthalmus* Tomiyama, *E. caesiura okinawae* Aoyagi, *E. wollacottae* Whitley, and *E. personata* Jordan and Thompson are not *Eviota*.

The eight new species and their distributions are: *E. melasma*, Indo-Pacific Archipelago; *E. nigripinna*, insular Indian Ocean localities; *E. pseudostigma*, from two disjunct areas, the Indian Ocean and Oceania; *E. spilota*, Vietnam to the Bismarck Archipelago; *E. indica*, the Seychelles and St. Brandon Shoals; *E. variola*, southern Great Barrier Reef; *E. bimaculata*, Western and South Australia; and *E. bifasciata*, Philippine Islands, Indonesia, New Guinea, and the Palau Islands.

Fourteen of the 31 species are endemic or have restricted distributions. Five species are widespread, *E. distigma*, *E. sebreei*, and *E. prasina* from the Red Sea to Oceania, and *E. nebulosa* and *E. infulata* from Africa or insular Indian Ocean sites to eastern Oceania. Of these, *E. distigma* and *E. infulata* have discontinuous distributions, not occurring in the Indonesian–Philippine–New Guinea area. Other geographic distribution patterns are noted.

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Contents

Fishes of the Indo-Pacific Genus *Eviota* with Descriptions of Eight New Species (Teleostei: Gobiidae)

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and Susan J. Karnella

Introduction

The genus *Eviota* was described by Jenkins (1903:501) with *E. epiphanes* Jenkins representing the type-species that was taken at Honolulu. At that time there were species described as *Eleotris prasina* Klunzinger (1871) from the Red Sea and *Asterropteryx abax* Jordan and Snyder (1901) from Misaki, Japan, that are now relegated to the genus *Eviota.* Jordan and Seale (1906) described the largest number of new species in their Samoa report, of which seven of the eight are recognized by us. The first writer began a study of what was thought to be a new species of *Eviota* from the Marshall Islands about 20 years ago, with only a few specimens for study. It was this introduction to *Eviota* that led him to believe that the genus was a relatively discrete group of gobies and not particularly speciose. It was soon learned that there was no adequate set of characters to distinguish the nominal forms. The National Museum of Natural History types of Jordan's and Seale's species were of no special value because they were greatly faded, the fins were frayed or broken off and otherwise in a poor state of preservation. Also the descriptive accounts of the nominal species were incomplete and inaccurate, due in part to the small size of these fishes. Counts of the number of pelvic fin rays were inaccurately recorded, the small fifth ray often overlooked. The cephalic sensory pore system, an important species-group characteristic, was omitted from the reported data, as well as many other characters that we have found to be critical for the interpretation of the species. Analysis of the type material became a major task, often involving careful comparison of minute patches of faded chromatophores on the body of the types with that pattern of fresh collections from or near the type-locality, whenever such collections were available. As an example of the problem in the analysis of type material, we carefully evaluated every specimen of the 31 syntypes of *Eviota gymnocephalus* (Weber 1913:452, fig. 87). We found at least five species of *Eviota* and another species of Gobiidae other than the genus *Eviota* (see "Remarks" under *E. zonura*) in this series, and Weber's specific name had to be relegated to the synonymy of *E. zonura.* In recent years we have acquired great numbers of these tiny fishes, ranging from the Red Sea to the Hawaiian Islands, which facilitated our inter-

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pretation of the nominal species. Extensive collections were received on loan from many museums, particularly from the Australian Museum, the California Academy of Sciences, the Academy of Natural Sciences, Philadelphia, and the American Museum of Natural History. What was initially thought to be a modest genus of fishes comprising 23 nominal species is much larger with about 45 species undescribed and many having extensive distributions. Lachner and Karnella (1978) reported on *Eviota* from the Red Sea, treating six species, three of them new. In our Red Sea study we recognized 22 species as valid among 23 nominal species and 2 nominal subspecies. In this study we submerge 2 more species in synonymy and thus report on 20 valid nominal species described by other writers, treat the 3 species described by Lachner and Karnella (1978), and describe 8 additional new species from extensive collections totaling more than 7100 specimens. We leave a group of about 35 undescribed new species, among collections equally as extensive, to be treated by us subsequently.

The objectives of this study are (1) to develop and analyze a set of characters useful in the determination of the species, (2) to redescribe and compare 20 valid nominal forms using this set of characters as a basis for the interpretation of the species, (3) to describe as new 8 species that are either closely related to the nominal forms, or appear to be so, based on general body form and color pattern, and (4) to compare the geographic distributions of the 31 species in this study.

ABBREVIATIONS.—The following abbreviations are used to designate institutions and collections cited:

AMNH	American Museum of Natural History, New York
AMS	Australian Museum, Sydney
ANSP	Academy of Natural Sciences, Philadelphia
BPBM	Bernice P. Bishop Museum, Honolulu
CAS	California Academy of Sciences, San Francisco; also houses collections formerly at Stanford University (SU), including the George Vanderbilt Foundation collections (GVF register numbers)
FMNH	Field Museum of Natural History, Chicago
HUJ	Hebrew University, Jerusalem
ISNB	Institut Royal des Sciences Naturelles de Belgique, Brussels
LACM	Los Angeles County Museum
MNHN	Museum National d'Histoire Naturelle, Paris
NFIS	Natur-Museum and Forschungs-Institut Senckenberg, Frankfurt
RUSI	Rhodes University, J.L.B. Smith Institute of Ichthyology, Grahamstown, South Africa
SU	See CAS
UCLA	University of California, Los Angeles
UG	University of Guam
UH	University of Hawaii, Honolulu, now housed at BPBM
UMMZ	University of Michigan, Museum of Zoology, Ann Arbor
USNM	Former United States National Museum, collections in the National Museum of Natural History (NMNH), Smithsonian Institution, Washington, D.C.
WAM	Western Australian Museum, Perth
ZMA	Zoologisch Museum, Amsterdam

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Figures 3, 4, 6, 16, 18, 21, 29, 36, 43, 51, 59, and 65 were drawn by J. R. Schroeder; Figures 47, 48, and 53 were drawn by Paul Mazer; Figures 40 and 62 were drawn by Trudy Nicholson; Figure 5 was drawn by Chloe Leslie Starks. The following photographs were taken by Kjell B.

Sandved, NMNH: Figures 17*b*, 19, 22, 23*c* and *d*, 27*a*, 37, and 55. The manuscript was critically reviewed and valuable suggestions contributing to its improvement were received from James E. Böhlke (ANSP) and C. E. Dawson (Gulf Coast Research Laboratory Museum, Ocean Springs, Mississippi).

Methods

We follow the methods of Lachner and McKinney (1974, 1978) and Lachner and Karnella (1978) in taking and recording meristic counts and other data. Where these methods are modified in this study, or require additional explanation for clarity in using the key and text, they are discussed below.

PECTORAL FIN RAYS.—The uppermost ray is considered the first ray of the pectoral fin, and those below are numbered consecutively, up to 19 rays. The simple or unbranched rays are recorded separately from the branched rays for each species in Table 2. The first horizontal row in Table 2 of each species gives the frequency of occurrence of unbranched rays and the second horizontal row gives the frequency for the branched rays. The first horizontal row has continuous data for all of the rays in *E. monostigma* and *E. pseudostigma*, the only species we have found in which specimens may have either only simple pectoral rays or some branched rays. The frequencies for the total number of pectoral fin rays, whether simple or branched, is summarized for 31 species in Table 3. In our reference in the text, for example, to pectoral rays 10 through 16 "usually" branched, we denote that from 50 to 94 percent have branched rays (Table 2); "almost always" denotes from 95 to 100 percent.

PELVIC FIN RAYS.—The number of primary branches (Figure 1) on the fourth pelvic fin ray was counted, the distal portion considered as one (Table 4). The number of segments between the branches of the fourth pelvic fin ray was counted, excluding the segment at the base of each branch, those before the first branch, and those on the terminal portion of the ray. These data are summarized for the 31 species in Table 5. The length

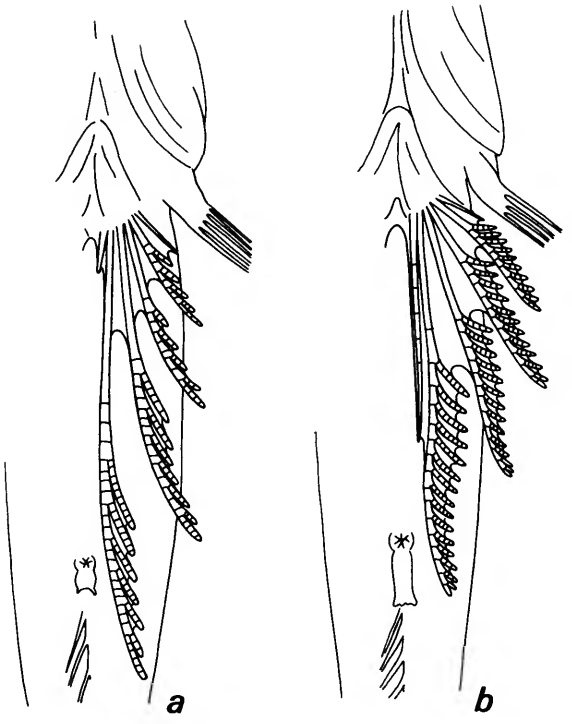

FIGURE 1.—Ventral view of left pelvic fins of two species of *Eviota: a*, *E. pardalota*, female, small fifth fin ray about one-tenth length of fourth ray, membrane between fin rays reduced, total of 7 branches on fourth fin ray and segments between consecutive branches from first branch to base of last branch number 3, 2, 2, 3, 2 (see "Methods" for counting procedure); *b*, *E. sebreei*, male, long fifth fin ray about six-tenths length of fourth fin ray, membrane between fin rays well developed, total of 16 branches on fourth fin ray, and no segments between consecutive branches of fourth fin ray.

of the unbranched fifth pelvic fin ray was measured and expressed in tenths of the length of the fourth fin ray, and the data summarized as frequencies of particular lengths in Table 6. When the fifth fin ray is barely visible, perceptibly less than one-tenth the length of the fourth fin ray, it is termed a rudiment and designated by an "R." Some species lack the fifth pelvic fin ray, designated as "A" in Table 6, or it is not discernible using the higher power, above 30 ×, of a binocular microscope.

The membrane joining the fifth pelvic fin rays is always short and weakly developed and the fins

lack a frenum. The membranes joining the first four 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.

First Dorsal Fin Elongation.—The development of the elongate or filamentous spiny dorsal fin elements is related to species, sex and size (SL). The elongation occurs most frequently in males, but elongation or filamentation of these spiny elements was found in some females. The filamentous development is variable, not being present in all adult or large specimens of a given species. The first three spines of the spinous dorsal fin are most frequently elongate, the first spine almost always the longest. The larger specimens of a particular species generally have the longer filaments. The length of the longest filament of a specimen was measured along the dorsal midline in a depressed position. The longer filaments often extend posteriorly to the caudal fin. Some species apparently have no dorsal fin elongation.

Dorsal and Anal Fin Rays.—These rays were counted in the conventional manner, the last ray branching to the base, and these data are summarized in Table 7 for 31 species. We refer to the dorsal-anal fin ray formula, especially in the key to the species, as a combination of the counts of the soft rays for the second dorsal fin and the anal fin. In poorly preserved specimens, especially type specimens, these counts were facilitated by radiographs.

Scales.—The lateral scale row count was made from the upper edge of the gill opening posteriorly to the scale overlying the end of the hypural base. Transverse scale rows were counted from the origin of the second dorsal fin, downward and posteriorly, to the anal fin. Data for scale morphology were recorded from samples taken from the middorsolateral trunk area of several specimens of about average size for the species. Counts from six to seven scales for each species were made for the ctenii and the primary radii. These counts were higher on larger specimens of a given species. The scales of *Eviota* have a single row of well-developed ctenii on the posterior field, a broad eccentric focal area, and the radii are restricted to the anterior field. There are only a few small secondary radii present, usually one or two, rarely more than three. Radii were considered as primary when they were one-half or longer than the longest on a particular scale.

We consider the breast as scaled when one or more embedded, cycloid scales were observed. There are never any well-developed overlapping scales on the breast as are found on the trunk. Sometimes the embedded scales are enlarged.

Genital Papilla.—There is a sexual structural difference in the genital papilla. There are three structural types in male papillae: the fimbriate condition (Figure 2*a*) found in 3 species, the simple nonfimbriate condition (Figure 2*b*) present in 27 species, and the cup-shaped form (Figure 3) present in 1 species. The females have a short, bulbous papilla (Figure 2*c*) about as wide as long, with slight variation in the development and number of the fingerlike projections. The papilla is elongate in adult males, longer than in the females. The fimbriate condition is most highly developed in large males, often undeveloped in juveniles.

Specimens were usually sexed by examination of the genital papilla. The small, unsexed specimens with incompletely developed genital papillae and gonads are termed juveniles.

Vertebrae.—The precaudal and caudal vertebrae were counted separately using radiographs, and the data are tabulated in Table 3 for all species.

Pterygiophore Formula.—This count was made on a few specimens for all of the species. It describes the relationship of the spinous dorsal fin ptergiophores to the underlying vertebrae. The formula was 3(22110) for all species.

Proportional Measurements.—Routine measurements were largely avoided because of the small size of most of the species and the error involved in taking such data. Measurements were taken where differences were observed in closely related species.

Cephalic Sensory Pore and Cutaneous Papilla Systems.—These two systems are related in that the absence of a pore, particularly the inter-

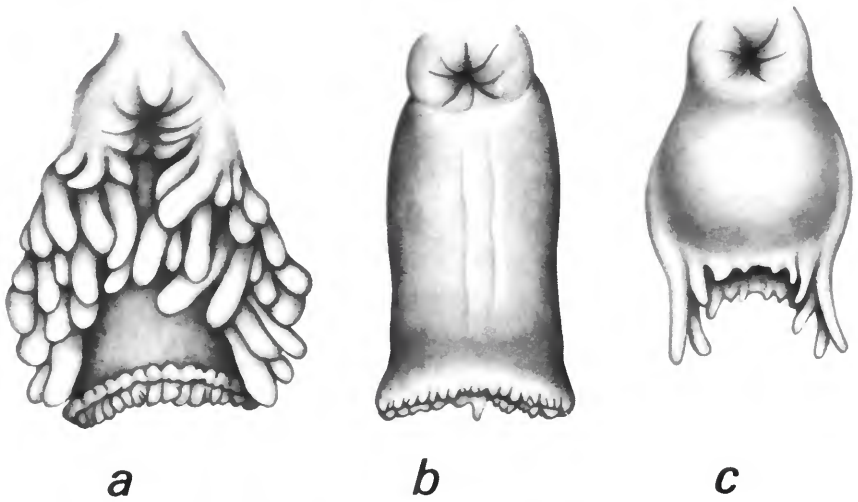

FIGURE 2.—Three types of genital papillae in mature *Eviota: a*, fimbriate condition in male *E. prasina*; *b*, nonfimbriate condition in male *E. guttata*; *c*, bulbous papilla of female *E. prasina*. (Drawn by J. R. Schroeder.)

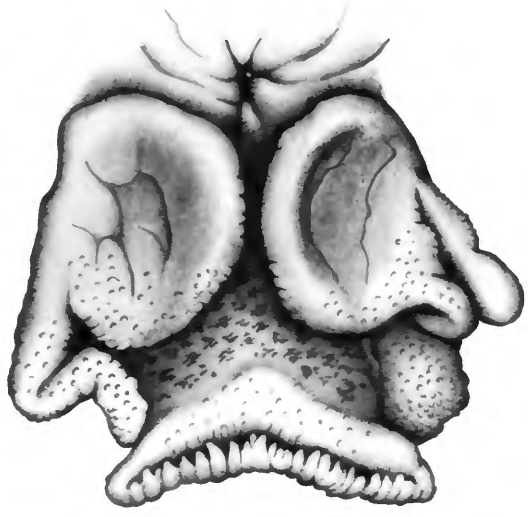

FIGURE 3.—Cup-shaped papilla of male *E. saipanensis*, 17.5 mm SL. (Drawn by J. R. Schroeder.)

temporal pore, results in a greater development of the rows of cutaneous papillae. The cephalic pores, although not enlarged as in some genera of gobies, are well developed and can be seen in most species of *Eviota* in juveniles at about 8–9 mm SL. The full complement of sensory pores found in *Eviota* is shown in Figure 4*a*. Abbreviations used for the respective pores follow: paired nasals, NA; anterior interorbital, AITO; posterior interorbital, PITO; paired supraotics, SOT; paired anterior otics, AOT; paired intertemporals, IT; paired upper and lower preoperculars, POP.

We recognize five different pore patterns (Table 8, patterns 1–4 and 6) and three cutaneous papilla patterns (Table 8, A, B, C) among the 31 species of *Eviota* treated in this paper. The IT pore is most frequently absent among particular species lacking the full complement of pores; the NA and PITO pores are less frequently absent. The AITO pore is always present and is approximately the same size in most species; but in the *E. lachdeberei* group, including *E. nigriventris* and *E. bifasciata*, it is either an enlarged single pore or a paired pore structure. The SOT and the AOT pores are also always present and not enlarged. In at least three new species of *Eviota* not treated herein the two, paired preopercular pores are absent and in another undescribed *Eviota* all pores are absent.

The cutaneous papilla system in *Eviota* is often weakly or incompletely developed in most specimens. The papillae are usually very small and are often eroded away. The patterns we recognize are

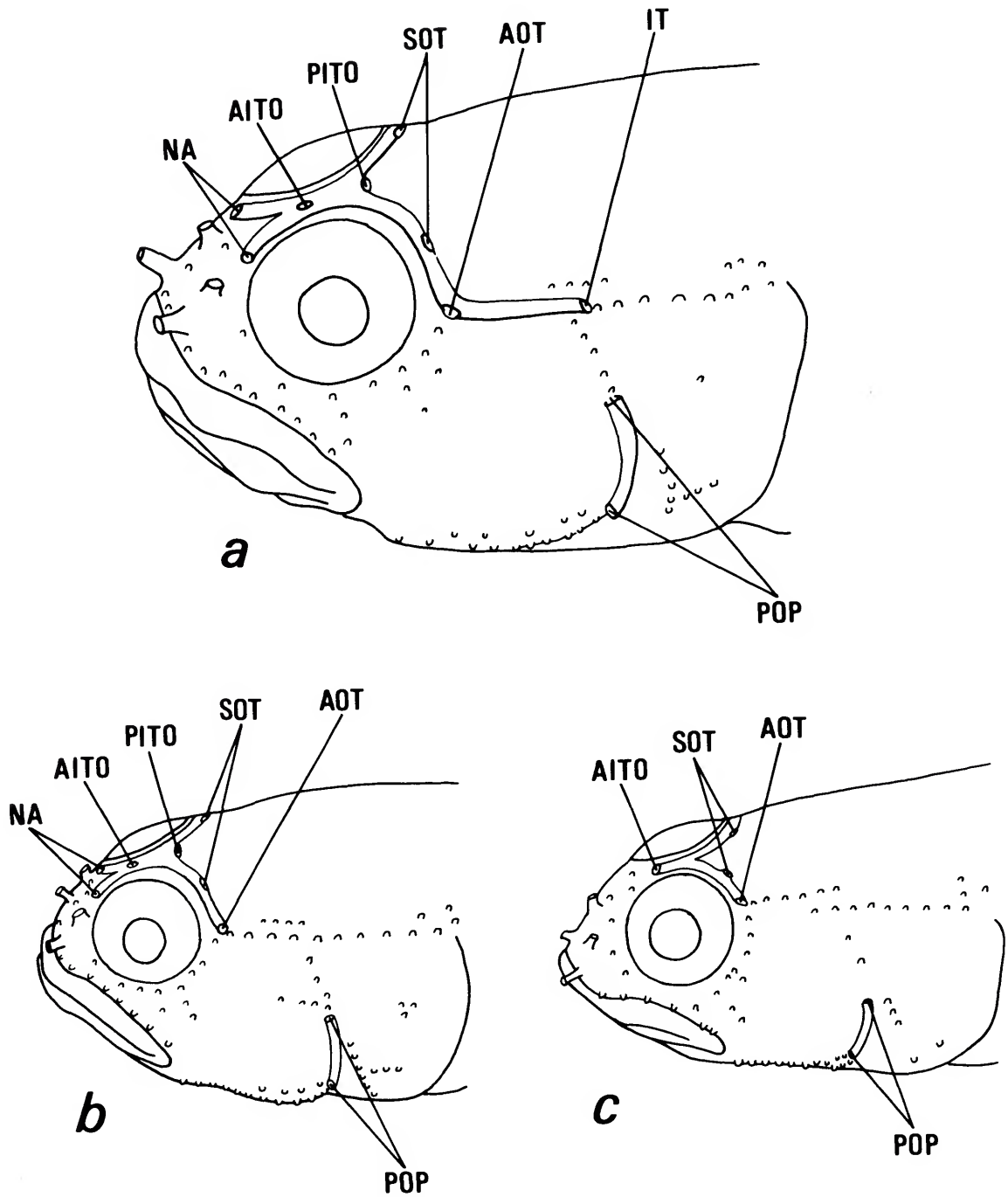

FIGURE 4.—Views of three patterns of the cephalic sensory pore system and the cutaneous papilla system in *Eviota: a*, pore pattern 1 and papilla pattern A, typical of *E. guttata* (see "Methods" for descriptions of these patterns); *b*, pore pattern 2 and papilla pattern B (sketched from *E. zebrina*); *c*, pore pattern 6 and papilla pattern C (sketched from *E. sebreei*).

described from a few, well-preserved, large specimens, where the papillae are obvious and well developed. The specimens were selected after examination of the available collections, and most of them were segregated during the sorting process or when sexing each collection. In most of the older and poorly preserved collections the papilla patterns could not be seen, even when using the high magnification of a binocular microscope and staining procedures.

The five cephalic sensory pore patterns found in the 31 species treated herein are identified as follows: pore pattern 1 shown in Figure 4*a* has the maximum complement of pores found in species of *Eviota*, including all the new species known to us and not treated in this paper; pore pattern 2 shown in Figure 4*b* lacks the intertemporal pore; pore pattern 3 lacks the intertemporal and the posterior interorbital pores, and the anterior interorbital pore is either enlarged or a paired structure; pore pattern 4 lacks the intertemporal and the nasal pores; pore pattern 6 shown in Figure 4*c* lacks the intertemporal, posterior interorbital and the nasal pores. Pore pattern 5, not represented among the species in this paper, lacks the intertemporal and the preopercular pores. Another unspecified pattern lacks the pores in pattern 5 and the nasal pores, and an additional species lacks all pores.

The cutaneous papilla patterns are related mainly to the absence of the intertemporal pore and the canal from the AOT pore to the position of the IT pore when present, and these patterns are designated as follows: Papilla pattern A, associated with pore pattern 1, has the upper and lower lateral cephalic rows of papillae interrupted or absent between the AOT and IT pores (Figure 4*a*); the upper lateral cephalic row of four to five small papillae is located above the IT pore; the lower lateral cephalic row of stout papillae extends from the level of the IT pore posteriorly to the upper end of the opercle, where two to three vertical rows of one to two papillae or a patch of small papillae is present, more or less in line with the upper lateral cephalic row. The papilla pattern in *E. abax*, A-1, has in addition to the papillae in pattern 1 an anterior extension of the lower lateral cephalic row from the IT pore, consisting of about three to four papillae. Papilla pattern B (Figure 4*b*), associated with pore pattern 2, has the lower lateral cephalic row continuous with the suborbital row and extends from the AOT pore posteriorly to the upper end of the opercle; the upper lateral cephalic row is usually longer than in papilla pattern A. A modification of pattern B is found in *E. storthynx*, pattern B-1, where the normally short upper lateral cephalic row extends anteriorly and ventrally and is more or less confluent with the lower lateral cephalic row just posterior to the AOT pore. A variation of pattern B-1 occurs in *E. infulata*, where the upper lateral cephalic row is absent and the lower lateral cephalic row is slightly curved upward in the area posterior to the AOT pore, or papillae of both rows may be involved. Papilla pattern C (Figure 4*c*) is associated with pore pattern 6 and is found in *E. sebreei*, where the AOT pore is more dorsally located in respect to the eye than in other species of *Eviota*, the upper lateral cephalic row extends from approximately above the normal position of the IT pore forward to the AOT pore and is confluent with the main suborbital row; and the lower lateral cephalic row begins just before the normal position of the IT pore and extends posteriorly to the upper edge of the opercle above which there may be several small papillae.

The various pore and papilla patterns of the species and the association between respective pore and papilla patterns is shown in Table 8. There may be other differences in the presence or length of certain other rows of papillae than we report on, but such differences are difficult to detect for lack of adequately preserved material. The following papillae or rows of papillae appear to be commonly developed in all of the species of *Eviota*: two rows along the lower preopercular margin, the lower row having somewhat larger and more widely spaced papillae than the upper row and extending from the lower POP pore anteriorly to the middle of the lower jaw (both rows may be interrupted at about the angle of the jaw); a main suborbital row begins at the AOT pore and extends below and adjacent to the

eye and anteriorly to the snout; beneath the eye and the suborbital row there usually are one to three short vertical rows consisting of about one to three papillae that are mostly integrated with the main suborbital row; a row along the upper margin of the jaw on fleshy fold extending posteriorly to rictus; snout commonly with three pairs of papillae, usually very small, one pair in anterior interorbital area, one pair between and close to the posterior nares, and a pair just anterior to and between the anterior nasal tubes, a greater development when the NA pores are absent as in *E. lachdeberei*; a short upper preopercular row of three to five papillae extending vertically from the upper POP pore to area just anterior to the IT pore; a few scattered papillae or short vertical rows at upper edge of gill opening just above the end of the lower lateral cephalic row.

Color in Preservation.—Our descriptions of color in preservation and use of color marks or specific color patterns in the key and diagnoses are based on relatively recent collections and well-preserved specimens. Most *Eviota* fade rapidly when preserved in ethyl or isopropyl alcohols of concentrations up to 75 percent. The poorly preserved or older specimens often reveal little of the original characteristic color pattern.

Because of the small size of all species of *Eviota*, maturing commonly at lengths under 20 mm SL, and their delicate bodies, the fins are often torn, the tissue on the head may be frayed, and many specimens may have trunk scales missing. These conditions make it difficult to obtain specimens for adequate color descriptions and to compare differences between the sexes and among various populations.

We have attempted to base our color descriptions of preserved specimens on individuals from localities extending over the range of the species. Our analysis includes possible differences associated with sex, size, and geographic areas. When geographic differences are observed, the coloration of the typical population is described first. Large numbers of specimens were examined in order to ascertain the common, characteristic color pattern and to differentiate between color artifacts associated with different kinds and lengths of preservation. Recent, well-preserved specimens of various species of *Eviota* have subcutaneous pigment marks usually involving bars, spots, or particular areas. These marks are often of value in differentiating among certain species, but such color patterns are obscure in old, preserved material. The pigment is blackish and often intense on recently collected specimens and it becomes more brownish with age in preservation, often making it difficult to compare different intensities in the development of certain marks, spots, or bars among related species.

The pigment forming the subcutaneous bars on the posterior trunk is internal, except where it becomes integrated with the ventral or sometimes dorsal midline spots. When referring to such bars in the diagnoses, key, and descriptive data, we number the first bar as the one passing through the origin of the anal fin or nearly so, and those posterior to this bar are numbered consecutively.

It became evident in studying some species that the color pattern showed much local variation or geographic differentiation. In such cases, the presence, size, and intensity for each important color mark, spot, or bar was analyzed and recorded for each specimen (or by each collection) over the range of the material. In this manner we were able to evaluate the importance of certain color marks among populations of a species and between various species. Enlarged photographs of males and females representing typical examples of these populations facilitated comparison and analysis.

Our data on coloration in life are limited to color slides of a few species. Certain dark marks or spots in preserved specimens, as the postocular and caudal peduncle spots, are also black in life, but other dark or black marks seen on preserved material may be brilliant red in life, as are the scale margins or spots on some of the fins. Analysis of living colors could provide additional comparative diagnostic data for species identification.

Photography.—We have made good use of enlarged photographs, about 6 inches TL, to facilitate comparative examination of color patterns among closely related species or of intraspecific populations. The specimens photo-

graphed are the best available and the enlarged photograph conveys a clear view of particular aspects of the color pattern, such as the development and intensity of spots, bars, and other pigment marks. The typical color pattern photographed and enlarged on prints of the various species, by sex and suspected populations, assisted materially in segregating and defining the systematic importance of the many different color marks.

PRESENTATION OF DATA.—All of the specimens examined for this study are listed in the "Material Examined" section for each species, grouped by major geographic areas. The total number of specimens and collections, size range, largest male, largest female, and smallest gravid female are given for each species. Most of these data are summarized in Table 1. Data referring to type specimens, including those pertaining to synonymies, are treated separately. The data for each collection include the catalog number, total number of specimens in the collection (size range in mm standard length, SL), number of juveniles, number of males (maximum size of males), number of females (maximum size of females), pertinent locality data, date of collection, and principal collector and field station number.

Synonymies are based on examination of original specimens, a published illustration, or diagnostic descriptive data. In most cases, only the primary synonymy is given.

The underscored item of certain character data in the section on "Description" refers to the count obtained for the holotype.

The localities for the collections supporting the section on "Geographic Distribution" for all of the species except *E. abax* are plotted on a map. In order to conserve space, more than one species may be plotted on a map. Some of the spots plotted on various maps may represent more than one collection. The size of the spot indicates the number of specimens involved, which is given in the legend to each map.

Many collections that were received on loan were unsorted. After sorting and studying the material available, we arranged the distribution and exchange of portions of the abundant collections to several institutions over the world, thus establishing representative collections of as many species as possible.

TYPE SPECIMEN DESIGNATION.—Our greatest problem with type designations by early authors was involved in the *Eviota* of the Samoa report by Jordan and Seale (1906). There was no uniform pattern of type designation especially in respect to the specimens that exist in jars at the National Museum of Natural History, Smithsonian Institution, and those at the California Academy of Sciences.

There is often a difference in the type-locality between that given in the original publication and the data recorded in the catalog records; the locality is either Apia or Pago Pago. Type specimens labeled "Drawn" in jar data may or may not represent the specimen selected by Jordan and Seale as the "type." The "Drawn" specimens are often those located at the California Academy of Sciences, whereas the published catalog number given by Jordan and Seale for the "type" is always a USNM designation where the "type" is on file. Also, the number of specimens involving types reported in the original description is often different compared to existing USNM and CAS records; sometimes there are more type specimens extant than originally listed, and sometimes there are fewer.

Our Accession File, No. 43712, contains a letter from David S. Jordan to Richard Rathbun dated 23 December 1904 that reads, in its entirety: "Enclosed find list in duplicate of types of new species from Samoa forwarded by Wells Fargo and Co.'s Express yesterday, Dec. 22." This list gives the USNM number and the name of the species, for example, "51,763. *Eviota afelei*." The number of specimens with each USNM number was not indicated in the letter.

An example of mixed-up type specimens and confusing data related to the Samoa report by Jordan and Seale follows for *E. smaragdus*: USNM 51764 was labeled "Type" by Jordan and Seale (1906:389), but the present jar bearing USNM 51764 has two vials of *Eviota* in it. One vial contains one specimen and bears a metal tag 51764, and the other vial has six specimens. Jor-

dan and Seale (1906:389) stated that there were 12 specimens from Pago Pago, but our specimens are from Apia. The drawing by C. L. Starks, #950, states "drawn from type," collected at "Apia, Samoa." The CAS (SU 8712) jar has seven specimens of this species, one in a separate vial labeled "drawn," but the label is a comparatively recent one. Metal tags tied to each specimen bear the number 7812, not 8712.

Some species of *Eviota* described by Jordan and Seale (1906) are represented in the USNM collections by a single specimen (*E. prasites*, *E. sebreei*) or by a series of syntypes (*E. distigma*, *E. zonura*). Our procedure in recognizing or designating a primary type specimen depends on the following circumstances in each case:

1. Where there is a single specimen with a USNM number given by Jordan and Seale (1906), and the species is listed in the initial accession data (No. 43712), that specimen is regarded as the holotype.

2. Where there is more than one specimen in a type lot under one USNM number (for example *E. smaragdus*), and a single specimen was originally isolated and placed in a separate vial with a metal tag tied to the specimen, that specimen is regarded as the holotype and the other specimens have been removed, placed in another jar, and given a separate catalog number, and these are regarded as paratypes.

3. Where a jar contains more than one specimen, is labeled "type," and bears a single catalog number, then one specimen was selected as the lectotype and received the original catalog number; the remaining specimens received a new catalog number and these are considered as paralectotypes. If a specimen, USNM or CAS (SU), was drawn and is extant, it was considered for lectotype designation if the specimen was in recognizable condition.

Particular type designations are discussed, where necessary, in the "Remarks" section under the respective species. The lectotype designation for *E. distigma* was discussed by Lachner and Karnella (1978:9). Other type designations, such as those made for *Eleotris prasinus* Klunzinger and *Eviota gymnocephalus* Weber (see *E. zonura*), are also discussed in the "Remarks" section of the respective species.

KEY TO SPECIES.—These fishes are small, some maturing under 10 mm SL, and they are difficult to identify without using some low magnification of a binocular microscope. There is also some variation in certain color marks within a species that may be related to body size, sex, or geographic distribution. We include photographs and drawings of all species and illustrate particular color marks and their variation to facilitate identification. For example, we refer to a midcaudal peduncle spot that is about three scale rows anterior to the base of the hypural (see *E. distigma*, Figure 23*a–d*), and we also refer to a spot at the midbase of the caudal fin, overlying or touching the hypural (see *E. sebreei*, Figure 57, and *E. lachdeberei*, Figure 59). We refer to occipital spots that are comparatively high on the posterior part of the head (see *E. smaragdus*, Figures 8 *a,b* and 9*a*, and *E. melasma*, Figures 8*c,d* and 9*b*) and the postocular spots that are located just behind the eye (see *E. storthynx*, Figure 32*a–c*). The illustrations clarify the size, location, and intensity of the important color marks and patterns.

The sequence of the species in the text follows the order of appearance in the key. The key is an artificial arrangement of the species, although the major species groups and closely related species are located under particular categories.

Analysis of Characters

The salient characters important in the determination of species groups, whether artifical or natural, and in the differentiation of the species of *Eviota*, are discussed below.

CEPHALIC SENSORY PORE SYSTEM.—The full complement of cephalic sensory pores for any given species is developed during the early juvenile stage. We found no variation in the absence of a particular pore with a species. In species where a particular pore is lost it never reappeared in any specimen; thus, pore reduction is an important group character. The full complement of sensory pores was present in 13 species (Table 8). The IT pore was absent in 13 species. The NA

and the IT pores were absent in *E. infulata*; the PITO and IT pores were absent in the *E. lachdeberei* group (including *E. nigriventris* and *E. bifasciata*); and the NA, PITO, and the IT pores were absent in *E. sebreei*.

The different cutaneous papilla systems (Table 8) among the species are correlated with the development of the cephalic sensory pore system. The papilla system is only of limited use as a systematic character because of the weak and incomplete development of the papillae in most specimens.

PECTORAL FIN.—The most important character involving the pectoral fin is the presence or absence of branched rays in certain species. Of the 31 species, 10 had all of the pectoral rays simple in all specimens. Two species, *E. monostigma* and *E. pseudostigma*, had some specimens with all of the pectoral rays simple, and other specimens had certain rays branched. Nineteen species (Table 2) always had some of the pectoral rays branched. Usually the lower rays are branched in most of the species that have branched pectoral rays, but there are notable differences among the species. In *E. abax*, *E. inutilis*, and *E. smaragdus* a large number of the rays are branched, whereas in other species (e.g., *E. variola* and *E. zonura*) only a few particular rays are branched. The extent of branching of the rays is a useful species character.

The total number of pectoral rays ranged from 13 to 19 in the 31 species (Table 3) and usually varied between 3 and 4 rays within a given species. This count was of limited use as a species character, for most of the species had 15–17 rays. Low pectoral ray counts were found in *E. infulata* (13–15) and high counts in *E. guttata*, *E. prasina*, and *E. variola* (14–19).

PELVIC FINS.—The number of primary branches on the fourth pelvic fin ray (Table 4), the number of segments between branches of the fourth pelvic fin ray (Table 5), and the length of the fifth pelvic fin ray (Table 6) are useful species characters, each varying considerably among the species. For example, almost all specimens of *E. sebreei* had no segmentation between bases of consecutive branches of the fourth pelvic fin rays, while other species averaged more than 5 segments and ranged up to 10. The number of branches on the fourth pelvic fin rays was modally 3 in *E. bifasciata* and 14 in *E. sebreei*. The simple, fifth pelvic fin ray was rudimentary or absent in nine species, while in four other species this ray was five-tenths to eight-tenths the length of the fourth pelvic ray.

The membranes joining the first four rays of the pelvic fins are always well developed in 14 species, reduced in 14 species, and variable or intermediate in size in 3 species. This membrane is easily frayed and its full development may not be readily observed.

GENITAL PAPILLA.—The male genital papilla is nonfimbriate in 27 species (Table 1), fimbriate in 3 (the *E. prasina* species group, including *E. variola* and *E. zonura*), and cup-shaped only in *E. saipanensis*.

VERTEBRAE.—The vertebral counts for 31 species are given in Table 3. Twenty-one species have either 25 or 26 vertebrae, and 10 others have only minor variation of these counts.

DORSAL AND ANAL FIN RAYS.—The number of dorsal and anal fin rays (Table 7) is an important character that is useful in grouping together several species into a major category. They are most useful when used in combination with the group characters listed above, such as the number of cephalic pores, presence of pectoral fin branching, number of vertebrae, and type of genital papilla in the male (see section on "Relationships"). In most cases, closely related species cannot be identified by the number of dorsal and anal fin rays.

COLOR IN PRESERVATION.—Color marks such as the presence and intensity of spots, bars, bands, streaks, aggregations of chromatophores, and other dark or light areas are the principal characters useful in distinguishing closely related species. Sometimes the size or intensity of a color mark is described in detail from widely distributed specimens in order to isolate a species, and in other situations the number of spots or bars are counted to show specific differences (Table 8). Specific color characters critical in species identification are treated in detail in the sections on "Color in Preservation" under each species.

There is no evidence that color variations

within a species are related to depth of capture, although most specimens were taken in water less than 50 feet. There is some evidence that color variations may be related to different substrates (Hoese, pers. comm.), but our collection data was too limited to permit this kind of analysis.

Genus *Eviota* Jenkins

Eviota Jenkins, 1903:501 [type-species: *Eviota epiphanes* Jenkins, 1903, by monotypy and original designation].

Allogobius Waite, 1904:176 [type-species: *Allogobius viridis* Waite, 1904, by monotypy].

Eviotops J.L.B. Smith, 1956:825 [type-species: *Eviotops infulatus* Smith, 1956, by monotypy and original designation].

DIAGNOSIS.—Small, tropical, marine Indo-Pacific gobies, ranging from the Red Sea eastward to the Hawaiian Islands and the eastern Tuamotu Archipelago; females of most species mature at less than 15 mm SL (Table 1); pelvic fins separated, a fine, fragile membrane joining bases, frenum absent; pelvic fin elements I,4 or I,5, the fifth element a small rudiment or a simple, unbranched ray; fourth ray of pelvic fin multibranched, the lateral branching often fringelike; pectoral rays branched or unbranched; trunk usually with dark, subcutaneous, vertical bars; first dorsal fin with six spines, some spines elongate or filamentous in many species; scales ctenoid, less than 30 scale rows in the lateral series, absent from head, nape, and base of pectoral fin; cephalic sensory pore system variously developed or absent; cutaneous papilla system weakly developed; gill opening narrow; fine, pointed teeth in villiform patches in both jaws, with several enlarged teeth anteriorly in both jaws; genital papilla elongate, frimbriate, simple, or cup-shaped in males and bulbous in females; vertebrae typically total 25 or 26.

The following nominal species are not regarded by us as *Eviota* although they were originally described in the genus from the Indo-Pacific: *E. pruinosa* Jordan and Seale (1906:391, fig. 82, pelvics I,5, the fifth ray branched), *E. grammistes* Tomiyama (1936:47, fig. 7, pelvics I,5, the fifth ray branched); *E. macrophthalmus* Tomiyama (1936:47, fig. 6, pelvics I,5, the fifth ray branched); *E. caesiura okinawae* Aoyagi (1949:172, has predorsal scales); *E. woolacottae* Whitley (1958: 86, fig. 1, pelvics I,5, the fifth ray branched), placed in *Fusigobius neophytus* by D. Hoese (pers. comm.).

Jordan and Thompson (1905) described *Eviota personata* from the western Atlantic Ocean, which Böhlke and Robins (1962) subsequently relegated to the genus *Coryphopterus* Gill.

The following species were incorrectly placed in the genus *Eviota* subsequent to their original allocation: (1) *Eleotris miniatus* Seale (1901:125) was placed in *Eviota* by Jordan and Seale (1906: 386); two syntypes, ANSP 84153, belong to the genus *Asterropteryx*; (2) *Trimma caesiura* Jordan and Seale (1906:391) was placed in *Eviota* by Fowler (1927:27, 1928:394, 1938:242) and Aoyagi (1949: 172) but this species has predorsal scales. Aoyagi also described a new subspecies of *T. caesiura.*

The following nominal species of *Eviota* are relegated to the synonymy of other species of the genus *Eviota*: *E. viridis* (Waite) and *E. verna* J.L.B. Smith to *E. prasina* (Klunzinger), *E. stigmapteron* J.L.B. Smith to *E. distigma* Jordan and Seale, and *E. gymnocephalus* Weber to *E. zonura* Jordan and Seale.

We are not certain of the proper allocation of *Eviota sealei* Herre (1927:73). This name may be placed in the synonymy of *E. prasina* (Klunzinger), *E. distigma* Jordan and Seale, or *E. queenslandica* Whitley. *Eviota sealei* was described from the holotype (13 mm SL), Philippine Bureau of Science No. 7372, from Puerto Galera, Mindoro. The holotype was evidently destroyed in World War II. Herre did not give the critical characters necessary for the identification of his specimen, such as the sensory pore data, extent of pectoral fin branching, sex, structure of the genital papilla, and the number of the "eight faint bands" that were located posterior to the origin of the anal fin.

Eviota sealei has been treated variously by past investigators. Schultz (1943:255) placed it in the synonymy of *E. prasites*, Aoyagi (1949:172) synonymized it with *E. abax*, Herre (1954:368) recognized *E. sealei* from the Philippines in addition to *E. distigma* and *E. gymnocephala*, and Fowler

(1962:63) recognized the species along with *E. abax* and *E. viridis*. Fowler (1962) reported a specimen of *E. sealei* at the Philadelphia Academy from Aguni Shima collected by E. R. Tinkham. In our material listed under *E. prasina* are several specimens loaned from the Academy of Natural Sciences, Philadelphia, that were collected at Aguni Shima by Tinkham, one of which may represent Fowler's specimen.

The dorsal and anal fin ray counts and the color description given by Herre in the original description for *E. sealei* agree with *E. distigma* if the holotype was a male. We question this allocation, in part, because Herre (1954) distinguished *E. distigma* from *E. sealei*, and because his counts could have been atypical (taken from the holotype only), in which case the color description could apply to *E. prasina* or *E. queenslandica*.

We recognize that some of the species that we place in *Eviota* may eventually be allocated to other genera. The *E. lachdeberei* species group, including *E. nigriventris* and *E. bifasciata*, are probably most divergent from other species in the genus and share several important characters, one of which is the paired or enlarged AITO sensory pore. This species group also has a well-developed fifth pelvic fin ray that is unbranched, the most important generic character distinguishing *Eviota*. We feel we should await the description and analysis of all the new *Eviota*-like forms and reanalyze the salient generic and species-group characters before making new generic alignments.

Key to the Species of *Eviota*

1. Cephalic sensory pore system complete 2
   Cephalic sensory pore system incomplete 14
2. Dorsal-anal fin ray formula almost always 10/8; pelvic membrane well developed; a single, dark posterior occipital spot and 2 dark spots on base of pectoral fin (Japan and Okinawa) ..... ***E. abax*** (Jordan and Snyder)
   Dorsal-anal fin ray formula usually 9/8, 8/8, or 8/7; pelvic membrane reduced or well developed; head and pectoral base variously pigmented 3
3. Dorsal-anal fin ray formula usually 9/8 4
   Dorsal-anal fin ray formula usually 8/8 or 8/7 8
4. A small dark spot lateral to base of pelvic fin; a large, dark diffuse occipital spot above opercle (Western Australia) ... ***E. inutilis*** Whitley
   No spot lateral to base of pelvic fin; dark occipital spot above opercle prominent or absent 5
5. A dark, prominent occipital spot 6
   No dark occipital spot 7
6. Dorsal midline of trunk with a series of small dark spots; segments between branches of fourth pelvic fin ray modally 4; a broad, diffuse dark band at base of spinous dorsal fin (Okinawa southeast to Norfolk-Samoa Is.) ..... ***E. smaragdus*** Jordan and Seale
   Dorsal midline of trunk without dark spots; segments between branches of fourth pelvic fin ray modally 2; no dark band at base of spinous dorsal fin (eastern Indian Ocean to western Pacific Ocean) ..... ***E. melasma,*** new species
7. Head dorsally and nape with well-defined dark transverse bars; a dark spot on midcaudal peduncle, about 3 scale rows anterior to caudal fin base; 5 dark spots on ventral midline from origin of anal fin to vertical

passing through midcaudal peduncle spot; spinous dorsal fin not elongate; pelvic fin membrane reduced (Hawaiian chain, Johnston and Christmas Islands) ..... ***E. epiphanes*** Jenkins

Head and nape without transverse bars; no dark spot on midcaudal peduncle, 6 dark spots on ventral midline from origin of anal fin to vertical passing through normal position of midcaudal peduncle spot; spinous dorsal fin may be elongate in male; pelvic fin membrane well developed (Red Sea and the Gulf of Oman) ..... ***E. guttata*** Lachner and Karnella

8. Dorsal-anal fin ray formula almost always 8/7; head with many large dark spots; base of pectoral fins with 2 dark prominent spots (Red Sea) ..... ***E. pardalota*** Lachner and Karnella

Dorsal-anal fin ray formula usually 8/8; head variously marked or plain, but lacking numerous, large, dark prominent spots; base of pectoral fins pale, or with 1 or 2 dark spots 9

9. Pelvic fin membrane reduced; fifth pelvic fin ray rudimentary or absent; either a large, dark, caudal peduncle spot centrally located or above midline, or a single, enlarged dark spot on base of pectoral fin 10

Pelvic fin membrane moderate to well developed; fifth pelvic fin ray 1/10–2/10 length of fourth pelvic ray; caudal peduncle spot variously developed; base of pectoral fin with 2 dark spots or spots absent 13

10. Base of pectoral fin pale; a large dark spot on caudal peduncle; no spinous dorsal fin elongation; segments between branches of fourth pelvic fin ray modally 1 11

Base of pectoral fin with a deep, dark, enlarged spot extending onto rays of fin; no dark spot on caudal peduncle; spinous dorsal fin may be elongate; segments between branches of fourth pelvic fin ray modally 3 or 4 12

11. Dark caudal peduncle spot rectangular, above midline; spinous dorsal fin with broad dark and light bars (Africa to Oceania) . ***E. nebulosa*** Smith

Dark caudal peduncle spot located on midportion, often diffuse and subcutaneous; spinous dorsal fin uniform black (southwestern Indian Ocean) ..... ***E. nigripinna,*** new species

12. Dark spot on base of pectoral fin and rays well developed over entire height of base, semicircular or crescent shaped; dark spots on ventral midline from origin of anal fin posteriorly to end of caudal peduncle number 7; subcutaneous bars obscure (Great Barrier Reef and New Caledonia) ..... ***E. monostigma*** Fourmanoir

Dark spot on base of pectoral fin and rays predominantly developed on lower portion; dark spots on ventral midline from origin of anal fin posteriorly to end of caudal peduncle number 4; subcutaneous bars evident, number 3 or 4 (Seychelles-Amirantes Is. and Samoa-Society Is.) ..... ***E. pseudostigma,*** new species

13. Prominent dark spots on head and 2 dark spots on base of pectoral fin in males; body more slender, depth at origin of spinous dorsal fin 21.0–25.0 percent of standard length, average 22.9 in 8 males (Red Sea

eastward to the Tuamotu Is., but absent in most of Indonesia and the Philippine Is.) ..... ***E. distigma*** Jordan and Seale

Prominent dark spots lacking on head and pectoral fin base in both sexes; body stout, deeper, depth at origin of spinous dorsal fin 24.8–28.5 percent of standard length, average 26.9 in 8 specimens (Indonesia eastward to Tubuai Is.) ..... ***E. herrei*** Jordan and Seale

14. Cephalic sensory pore system lacking only the IT pore; pectoral fin rays simple or branched; male genital papilla variously shaped; vertebrae total 25 or 26 15

Cephalic sensory pore system lacking the IT pore and either the NA or the PITO pores, or all 3 pores are absent; pectoral fin rays always simple; male genital papilla nonfimbriate; vertebrae total 25 27

15. Pectoral fin rays always simple; pelvic fin membrane almost always well developed; segments between branches of the fourth pelvic fin ray more numerous, modally 2 to 4; branches on the fourth pelvic fin ray fewer, modally 5 to 7; male genital papilla nonfimbriate; vertebrae total 25 16

Some pectoral fin rays branched; pelvic fin membrane reduced; segments between branches of the fourth pelvic fin ray fewer, modally 1 or 2; branches on the fourth pelvic fin ray more numerous, modally 7 to 12; male genital papilla fimbriate, nonfimbriate or cup-shaped; vertebrae total 26 20

16. Dorsal-anal fin ray formula usually 9/8 or 9/7 17

Dorsal-anal fin ray formula almost always 8/7 18

17. Dark spot present at midbase of caudal fin; 3–4 prominent, dark, wavy vertical bands on caudal fin; pectoral base pale; anal fin usually I,8; fifth pelvic fin ray shorter, modally 1/10 length of fourth ray (Red Sea, Indian Ocean, Western Australia, Great Barrier Reef) ..... ***E. zebrina*** Lachner and Karnella

No dark spot at midbase of caudal fin; caudal fin with small dark spots but not arranged as prominent, wavy vertical bands; base of pectoral fin with a dark to dusky spot on uppermost portion; anal fin usually I,7; fifth pelvic fin ray longer, modally 4/10 length of fourth ray (Vietnam, Philippines, New Guinea, and Indonesia) ..... ***E. spilota,*** new species

18. A dark postocular spot present; fifth pelvic fin ray shorter, modally 1/10 length of fourth ray (Western Australia, Indonesia, Palau and Yap Is.) ..... ***E. storthynx*** Rofen

Dark postocular spot absent; fifth pelvic fin ray longer, modally 4/10 length of fourth ray 19

19. A large, dark spot at base of caudal fin, below midline; base of pectoral fin with a dark to dusky spot on uppermost portion; a dark spot at origin of dorsal fin followed by a series of about 11 less intense spots along dorsal midline (Indonesia eastward in Oceania and the Great Barrier Reef) ..... ***E. prasites*** Jordan and Seale

Head and body pale, lacking any outstanding color marks (Marianas and Gilbert Is.) ..... ***E. pellucida*** Larson

20. Second dorsal fin almost always I,8; anal fin black, much darker than other fins; margins of upper and lower caudal fin at procurrent rays dark; a larger dark spot on caudal peduncle centrally located, deeper than wide; spinous dorsal fin not elongate (Seychelles Is., St. Brandon Shoals) ..... ***E. indica,*** new species

    Second dorsal fin almost always I,9 or I,10; anal fin may be dark but not noticeably darker than other fins; upper and lower caudal fin at procurrent rays may be dusky but not sharply offset from remainder of fin; caudal peduncle spot when present centrally located, circular or chevron shaped; one or more spines of spinous dorsal fin may be elongate 21

21. Caudal peduncle with a large, dark spot, moderately to well developed; genital papilla in male fimbriate or cup-shaped; fifth pelvic fin ray absent or rudimentary; dark spots on ventral midline from origin of anal fin number 4–5 22

    Caudal peduncle lacking a large dark spot, at most, a weak subcutaneous mark may be present often as part of the subcutanoues bar; genital papilla in male simple, not fimbriate or cup-shaped; fifth pelvic fin ray always present but short, about 1/10 length of fourth ray; dark spots on ventral midline from origin of anal fin posteriorly number 5–7, most often 6 25

22. Subcutaneous dark bars on lower caudal peduncle posteriorly from origin of anal fin number 4; dark, ventral midline spots associated with subcutaneous bars number 4; dark postocular spots or clusters of chromatophores absent; cheek with scattered chromatophores or chromatophores clustered into 2 bars below eye; base of pectoral fin pale; a moderately intense, circular, dark spot on midcaudal peduncle and a small, discrete, dark spot at midbase of caudal fin; spinous dorsal fin uniform dusky and similar to intensity to other vertical fins (Taiwan and from Palau northeast to Saipan) ..... ***E. saipanensis*** Fowler

    Subcutaneous dark bars on lower caudal peduncle posteriorly from origin of anal fin number 5; dark ventral midline spots associated with subcutaneous bars number 5; 2 weak to well-developed postocular spots or clusters of large chromatophores present; cheek and opercle variously pigmented but more than 2 barlike clusters of chromatophores below eye; dark spot on caudal peduncle circular, rectangular, or chevron shaped, centrally located or above midline, but no spot at midbase of caudal fin; spinous dorsal fin bicolored, dusky with light bars or spots near base and usually not as dusky or black as anal fin 23

23. A large, dark, rectangular subcutaneous spot on middle and upper portion of caudal peduncle, circular to chevron shaped at surface of midpeduncle; spinous dorsal fin darkest at band through middle of fin, the anterior basal area pale; postocular spots are mainly weak clusters of chromatophores; dorsal-anal fin ray formula almost always 9/8; subcutaneous bars on posterior trunk always number 4/5 (Timor Sea and the Caroline-Marianas Is. southeast to the Samoa Is.) ..... ***E. zonura*** Jordan and Seale

A well-developed dark, circular to chevron-shaped spot at midcaudal peduncle, mostly at surface and overlying subcutaneous bar; spinous dorsal fin with 3 light spots at base and with irregular dusky pigmentation on middle and outer portion, or a pale anterior basal area with the outer third darkest; 2 dark postocular spots or, usually, with moderately developed clusters of chromatophores; dorsal-anal fin formula usually higher, 9 or 10/8 or 9; subcutaneous bars on posterior trunk number 4/5 or 5/5 24

24. Spinous dorsal fin with 3 light spots at base and with irregular dusky pigmentation on middle and outer portion; two dark postocular spots present; filamentous spine of spinous dorsal fin with alternating dark and light spots extending from base nearly to tip; subcutaneous bars number 5/5; anal fin rays more numerous, usually I,9 (southern Great Barrier Reef) ..... ***E. variola,*** new species

Spinous dorsal fin with a pale anterior basal area, the outer four-fifths dusky to dark, or in some specimens the middle and outer portions with a dusky or dark band; two postocular spots are clusters of chromatophores, weak to moderately developed, dense, dark spots appear only in specimens from some areas of the southwestern Indian Ocean; first spine of spinous dorsal fin lacking spots; subcutaneous bars number 4/5 or 5/5 depending on major locality; anal fin with fewer rays, almost always I,8 (widespread from Red Sea, Indonesia, Philippines, southern Japan, Palau to Lord Howe and Norfolk Is., not known on the Great Barrier Reef) ..... ***E. prasina*** (Klunzinger)

25. Base of pectoral fin with 2 dark prominent spots; 2 dark postocular spots and dark spots on nape, cheek, and opercle, some of which are as intensely developed as spots on pectoral base; scale pockets often with prominent dark pigmentation, the margins deep and broad; a series of 12 to 15 dark spots along dorsal midline from origin of spinous dorsal fin to procurrent caudal fin rays; subcutaneous bars number 4/5 (Malaya Peninsula to Taiwan, southeast broadly to northwest Australia, lower Great Barrier Reef and the New Hebrides Is.) ..... ***E. queenslandica*** Whitley

Base of pectoral fins with 2 pale areas, with two very weak spots, or with faint scattered chromatophores, the 2 prominent dark spots always absent; 2 dark postocular spots present or absent, when present, much more intensely developed than dark spots on cheek; nape and opercle with only faint clusters of dark chromatophores or nearly uniformly pale; scale pockets usually only weakly pigmented; dorsal midline spots not noticeably developed; subcutaneous bars number 5/6 or 7-9/6 26

26. Two dark, prominent postocular spots present; cheek with 5 or more dark spots, and spots on nape, but not as intensely developed as occipital spots; first spine of spinous dorsal fin with a series of small, dark spots; spinous dorsal, second dorsal, and caudal fins with a series of from 3 to 8 small dark spots on rays of fins; anal fin darker than dorsal and caudal fins (Western and South Australia ***E. bimaculata,*** new species

Dark prominent postocular spots absent; cheek with several poorly devel-

oped clusters of chromatophores; nape mostly pale; first dorsal spine pale, not spotted; dorsal and caudal fins mostly dusky, no series of small dark spots on dorsal fin rays; anal fin about as dark as dorsal and caudal fins (Timor Sea, Great Barrier Reef and Oceania from the Marianas Is. to the Tuamotu Archipelago). ***E. afelei*** Jordan and Seale

27. Cephalic sensory pore system lacking the NA and the IT pores; a large, irregular to W-shaped mark on upper, anterior trunk above and just posterior to base of pectoral fin; length of fifth pelvic fin ray less than ½ length of fourth ray; dark, ventral midline spots and subcutaneous bars on lower trunk posteriorly from origin of anal fin each number 7 (wide ranging: Indian Ocean, Great Barrier Reef, and Oceania from the Palau Is. to the Tuamotu Archipelago; absent in the Indonesia, Philippine, New Guinea area) ..... ***E. infulata*** (Smith)

Cephalic sensory pore system lacking either the combination of the NA, PITO, and IT pores or the PITO and IT pores; no dark mark above base of pectoral fin, but other characteristic color marks are present elsewhere on trunk; length of fifth pelvic fin ray ½ or more length of fourth ray, modally 6/10 or 7/10; ventral midline spots and subcutaneous bars on trunk absent or obscure 28

28. Cephalic sensory pore system lacking the NA, PITO, and the IT pores; a large, dark spot present at midbase of caudal fin, the lower portion of spot extending posteriorly to end of fin; the fourth pelvic fin ray with many branches, modally 14, range 11–17; segments between branches of the fourth pelvic fin rays almost always absent; no spinous dorsal fin elongation (wide ranging, Red Sea eastward to central Oceania and the Great Barrier Reef) ..... ***E. sebreei*** Jordan and Seale

Cephalic sensory pore system lacking the PITO and IT pores, the AITO pore enlarged or paired; large dark spot at midbase of caudal fin absent, or without lower portion extending posteriorly but with other characteristic color marks on trunk; fourth pelvic fin ray with fewer branches, numbering less than 6; segments between branches of the fourth pelvic fin rays always present and range from 3 to 10; spinous dorsal fin elongate in both sexes 29

29. Dorsal-anal fin ray formula almost always 8/7; a large, black spot at midbase of caudal fin, the posterior margin developed into a black, crescent-shaped mark that extends forward, above and below, to bases of anterior procurrent caudal fin rays, and the central dark spot bordered above and below by smaller, discrete whitish spots; base of pectoral fin with a deep, dark spot, wider and darker dorsally and more evident in the males (eastern Indonesia, and Palau, Truk, and Guam) ..... ***E. lachdeberei*** Giltay

Dorsal-anal fin ray formula almost always 9/8 or 9; no large dark spot at midbase of caudal fin; dark spot on base of pectoral fin faint or absent 30

30. Prominent, dark bands present on basal portions of second dorsal and anal fins, extending on upper and lower trunk area; in most juveniles

and some adults the band on the second dorsal fin and upper trunk is absent; bands pass posteriorly on upper and lower caudal fin, constricting toward middle of caudal fin, where the bands are separated by a large, pale, midbasal spot on caudal fin; anal fin rays modally I,9; pectoral fin rays modally 15 (Indonesia, Philippines, and New Guinea) ..... ***E. bifasciata,*** new species

Dark bands not present on dorsal and anal fins and no large pale midbasal caudal fin spot, but with a large dark spot on lower base of caudal fin, with a dusky to dark band on entire lower trunk passing through spot to end of lower portion of caudal fin; anal fin rays modally I,8; pectoral fin rays modally 16 (Indonesia, New Guinea, northern Great Barrier Reef, and Fiji) ..... ***E. nigriventris*** Giltay

Eviota abax (Jordan and Snyder)

FIGURE 5

Asterropteryx abax Jordan and Snyder, 1901:40, fig. 2 [type-locality: Misaki, Sagami, Japan].

Eviota abax (Jordan and Snyder).—Jordan, Tanaka, and Snyder, 1913:338, fig. 287.

MATERIAL EXAMINED.—About 600 specimens from 5 localities in Japan and Okinawa; total size range 10.1–35.7; largest male 35.7, largest female 32.9; smallest gravid female 23.1.

Holotype: SU 6445, (31.6), male; Misaki, Sagami, Japan.

Paratypes: SU 9784, 17 (24.7–35.4), 1 unsexed, 8 males (35.4), 8 females (32.5); Tanegashima, Anderson and Anderson.

Other Material: JAPAN: SU 22574, 8 (21.6–29.6), 4 males (26.6), 4 females (29.6); Misaki, D. S. Jordan. CAS 40213, 1 (35.3), male; Misaki, 25 Jun 1929, A. W. Herre. FMNH 57472, 11 (ca. 17.0–34.9), 5 males (34.9), 6 females (28.6); Misaki, D. S. Jordan. USNM 71451, 75 (20.5–35.7), 33 males (35.7), 42 females (32.9); Misaki, Sagami, 1906, *Albatross.* AMS I.20799-001, 6 (24.1–32.8), 3 males (32.8), 3 females (31.5); same data as USNM 71451. ANSP 141212, 6 (24.5–30.4), 3 males (30.4), 3 females (28.0); same data as USNM 71451. USNM 53533, 10 (23.1–33.7), 3 unsexed, 2 males (33.7), 5 females (27.7); Tanegashima, R. V. Anderson. USNM 71405, ca. 200 (11.0–34.6), males (34.6), females (28.6); Tanegashima, 1906, *Albatross.* USNM 71450, 126 (10.1–27.3), males (22.6), females (27.3); Tanegashima, 1906, *Albatross.* FMNH 10796, 143 (10.4–30.5), males (30.5), females (29.9); Aikawa Rikuzen, 1906, *Albatross.* OKINAWA:

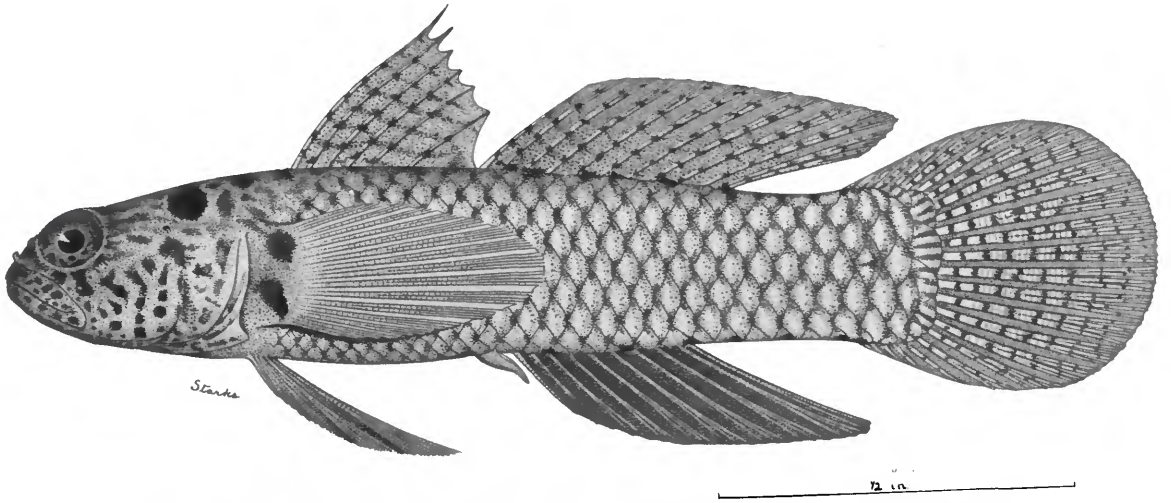

FIGURE 5.—*Eviota abax*, SU 6445, holotype, male, 31.6 mm SL, Misaki, Sagami, Japan. (Drawn by C. L. Starks.)

USNM 71485, 3 (18.6–19.5), males; Naha Okinawa, 1906, *Albatross.*

DIAGNOSIS.—Second through the seventeenth pectoral fin rays usually branched; spinous dorsal fin filamentous in males, slightly elongate in some females; pelvic fin usually reaching anal aperture, never beyond origin of anal fin; fifth pelvic ray almost always one-tenth to two-tenths length of fourth ray; head with a dark, circular to irregularly shaped spot, dorsolaterally on each side of occipital area; base of pectoral fin with an upper and lower, circular to irregularly shaped dark spot; head with scattered, small, dark, circular to somewhat angular spots, more evident laterally; body with moderate to strong, cresent-shaped marks at base of scales; dorsal midline with a series of 11–12 small dark spots from origin of first dorsal fin to end of caudal peduncle; ventral midline from origin of anal fin to end of caudal peduncle with a series of about 7 small, dark spots.

DESCRIPTION.—Dorsal fin V-I, 10(1), VI-I,9(2), VI-I,10(34); anal fin I,7(1), I,8(35), I,9(1); pectoral fin 15(1), 16(17), 17(16), 18(3); pelvic fin I,4 1/10(13), I,4 2/10(21), I,4 3/10(2); fourth ray of pelvic fin with an average of 6.3 branches; segments between consecutive branches of the fourth pelvic fin ray 2–9, most often 5; pelvic fin membrane well developed; branched caudal fin rays 13(1), 14(15), 15(7), 16(2); segmented caudal fin rays 17(37); lateral scale rows 23(5), 24(24), 25(7); transverse scale rows 7(10), 8(7); scales with 44–55 ctenii, 12–17 radii; breast scaleless.

First and second dorsal spines of males may be elongate or filamentous, the longest extending to end of second dorsal fin base; males as small as 13.8 mm SL have a filamentous dorsal spine; only a few females with first dorsal spine elongate, reaching base of second dorsal ray; pelvic fin comparatively short, not reaching anal fin origin.

Sensory pore system is pattern 1. Cutaneous papilla system is pattern A-1.

Genital papilla in male not fimbriate, but truncate, or sometimes expanded and slightly fringed at tip, moderately long, reaching beyond anal spine; papilla bulbous in female, with several fingerlike projections at each side of tip, and usually not reaching anal spine.

Gravid females range in length from 23.1–29.6 mm SL (8).

Vertebrae 10(16) precaudal and 16(16) caudal, total 26.

COLOR IN PRESERVATION.—Conspicuous dark brown to black, circular to irregularly shaped spot, dorsolaterally on each side of head, larger than diameter of pupil; many dark brown spots, usually smaller than diameter of pupil, circular to angular in shape, irregularly scattered on snout, chin, occipital area, cheek, and opercle, more intensely developed laterally on head; area between occipital spots and origin of spinous dorsal with 2 brownish crossbands; the 2 brown spots on the pectoral base are not as intense as the occipital spots, and are usually about the same size, but more irregular in shape, the upper one ascending onto the body; occipital and pectoral base spots highly variable in shape; crescent-shaped marks at base of scales, present throughout trunk, wide, the pigment pattern usually covering about one-third the exposed scale; the series of dark spots along midline dorsally and ventrally are smaller than diameter of pupil, moderately developed, more so along dorsal midline; 7 dark spots along ventral midline, subcutaneous bars obscure; remainder of trunk light brownish; spinous dorsal fin with a series of small brown spots on the spines, to the ends of the filamentous spines, the pigment pattern usually also present on the membrane, forming a series of narrow stripes on the fin, the spaces between stripes clear or light dusky; second dorsal fin with weaker and smaller brown spots on the rays, the spaces between spots on rays clear, membrane of fin pale to light brown; the 4 to 5 rows of spots may form narrow horizontal to oblique stripes, usually more pronounced in females than males; in males there is a tendency for the spots and stripes to be weaker, perhaps because they are obscured by the darker pigment on the membrane of males; anal fin pale to dusky brown; pectoral fin transparent; pelvic fins dusky, the membranes more so than the rays, and outer

portion of rays lighter; membrane of caudal fin dusky, the rays have small brownish spots irregularly scattered over all but the extreme posterior portion of fin. Males and females are illustrated in color by Masuda, Araga, and Yoshino (1975: 89, H and I).

GEOGRAPHIC DISTRIBUTION.—Our material is from four localities in Japan and one from Okinawa.

REMARKS.—Although Jordan and Snyder (1901:41) state that the body has "smooth scales," we find the scales have well-developed ctenii. They further state "inner ray much longer than the others" in reference to the pelvic fin. This statement refers to the fourth ray; the fifth (inner) ray is very small.

Eviota inutilis Whitley

FIGURES 6, 7

Eviota viridis inutilis Whitley, 1943:142 [type-locality: head of Useless Inlet, Sharks Bay, Western Australia].

MATERIAL EXAMINED.—Four specimens from 2 localities in Western Australia totaling 3 males, 1 female; size range of males 17.0–25.0, female 19.5, not gravid.

Lectotype: AMS IB.330, (20.4), male; head of Useless Inlet, Sharks Bay, Western Australia, 2 Jul 1939, G. P. Whitley.

Paralectotypes: AMS IB.331-332, (17.0, 19.5), male and female; same data as lectotype.

Other Material: AMS I.13268, 1 (25.0), male; freshwater creek, Albany, Western Australia.

DIAGNOSIS.—Pectoral fin rays 4–16 usually branched; spinous dorsal fin elongate or filamentous in males; fifth pelvic fin ray small, usually two-tenths the length of the fourth pelvic fin ray; outer half of spinous dorsal fin dark on membrane with a series of dark spots on pale colored spines; a dark lateral spot at base of each pelvic fin; a large, diffuse, dark spot, laterally on nape, just above and posterior to intertemporal sensory pore; 6 dark spots on ventral midline from origin of anal fin to end of lower caudal peduncle.

DESCRIPTION.—Dorsal fin VI-I,8(1), VI-I,9(3); anal fin I,8(4); pectoral fin 16(2), 17(2); pelvic fin I,4 2/10(4); fourth ray of pelvic fin with 4–6 branches; segments between consecutive branches of the fourth pelvic fin ray 5–6; pelvic fin membrane well developed; branched caudal fin rays 13(2); segmented caudal fin rays 17(4); lateral scale rows 23(2), 24(2); transverse scale rows 6(4); scales with about 20–38 ctenii, 9–14 primary radii, 1–3 secondary radii; breast scaleless.

First 2 dorsal spines of males elongate or filamentous, the first spine longest, the maximum

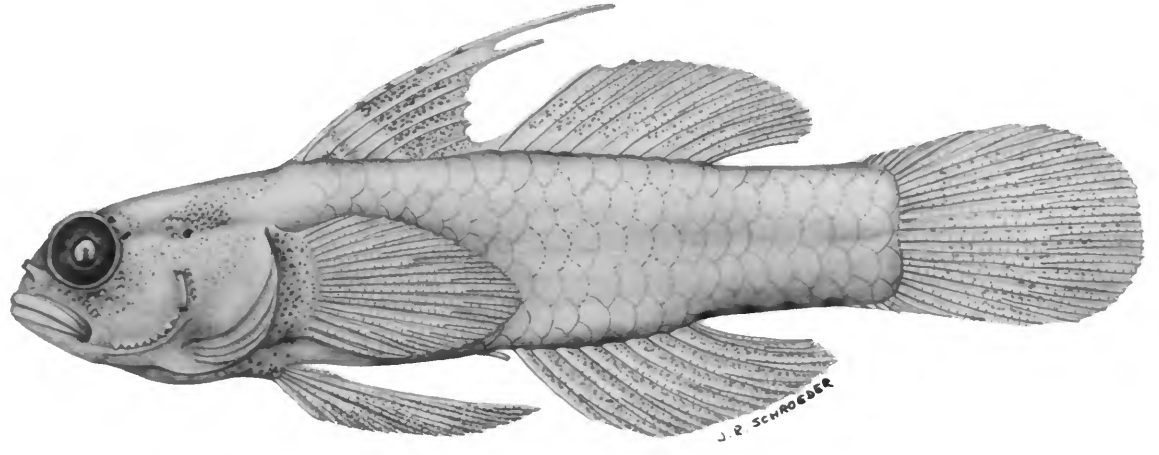

FIGURE 6.—*Eviota inutilis*, AMS IB. 330, lectotype, male, 20.4 mm SL, Useless Inlet, Western Australia. (Drawn by J. R. Schroeder.)

extension to midcaudal peduncle; no spinous dorsal elongation in females; pelvic fin length variable, the longest extension posterior to origin of anal fin.

The cephalic sensory pore system is pattern 1. Cutaneous papilla system is pattern A.

Genital papilla in male not fimbriate, long, slender, extending to second anal fin ray; female genital papilla short, bulbous, with 6 fingerlike projections at each side of tip.

The single female, 19.5 mm SL, was not gravid.

Vertebrate 10(4) precaudal and 16(4) caudal, total 26.

COLOR IN PRESERVATION.—Head with a large, dark diffuse spot above and posterior to intertemporal pore; 2–3 dark elongate marks on midline of nape; remainder of head with few scattered chromatophores, mostly pale; trunk pale, the scales, at most, weakly margined with chromatophores on dorsolateral portion of trunk; brown spots along dorsal midline of trunk weak or obscure; base of pectoral with irregular clusters of chromatophores on upper and lower portions, may be weak or obscure; 2 small dark spots, moderately developed, at outer base of pelvic fins; 6 dark spots about the size of the pupil, along ventral midline from origin of anal fin to end of caudal peduncle; subcutaneous trunk bars obscure; lower half of spinous dorsal fin light, with a narrow, weak, dark, oblique band at anterior part of base, membrane of outer half dark brown, and pale spines with a series of small dark brown spots that extend to tips of filamentous spines; membrane of second dorsal fin light brown with a series of about 5 dark brown spots on the pale rays (obscure on lectotype); anal fin brownish; caudal fin light brown with a series of small, alternating light and brown spots on rays of lower half of fin; pectoral fin pale; membrane of pelvic fin dark brown.

GEOGRAPHIC DISTRIBUTION.—Known from 2 localities in Western Australia: Sharks Bay (head of Useless Inlet) and Albany (freshwater creek) (Figure 7).

REMARKS.—This species was originally described by Whitley (1943:142) as a subspecies of *E. viridis*. We place *E. viridis* in the synonymy of *E. prasina*. *Eviota inutilis* differs from *E. prasina* in having an IT sensory pore, a nonfimbriate genital papilla, six rather than five ventral midline spots, and lacks the dark midcaudal peduncle spot present in *E. prasina*.

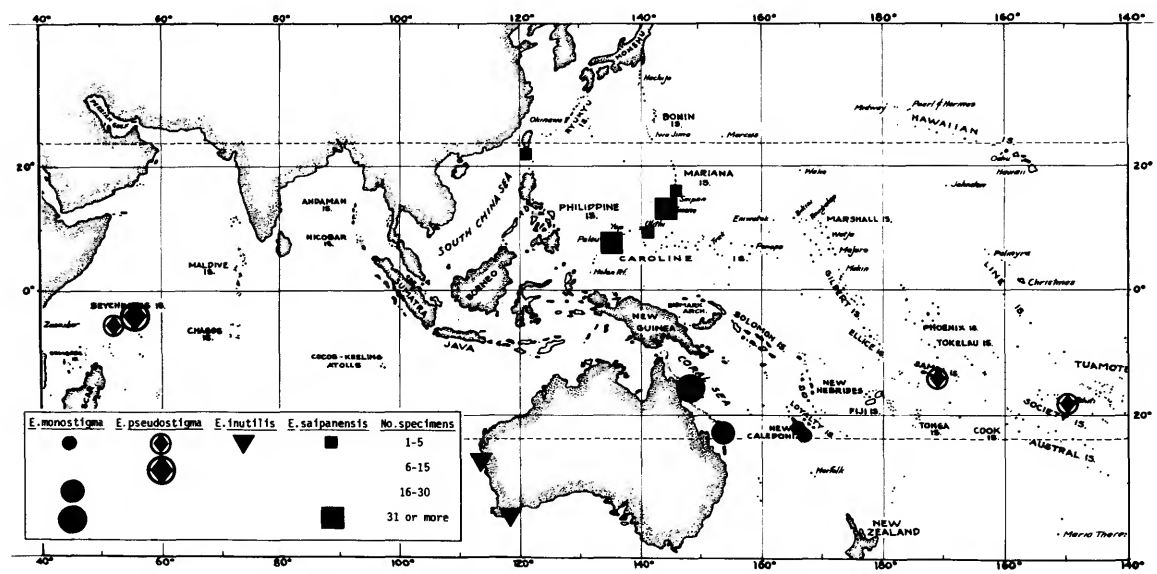

FIGURE 7.—Distributions of *Eviota inutilus*, *E. monostigma*, *E. pseudostigma*, and *E. saipanensis*.

Three specimens, AMS IB.334–336, included in the original paratypic material do not represent this species but a new species described herein as *E. bimaculata.*

Although a specimen was selected by Whitley as the holotype, it was subsequently stored in the same jar with two paratypes and its identity was lost. We therefore select the best and largest specimen as the lectotype, Figure 6, now catalogued as AMS IB.330. Whitley typically selected the largest specimen as a holotype (Hoese, pers. comm.).

Our data for the type specimens differs from that recorded by Whitley as follows: dorsal fin VI-I,9 not VI-I,10; pectoral rays 16–17, not 15–17; pelvic rays I,4 2/10, not I,4; scale rows 23–24, not 19–26; vertebrae 10 + 16 = 26, not 10 + 15 = 25. Whitley reported "nine blackish crossbands in the median (interior) line of the fish." These probably refer to subcutaneous bars that are now not visible. Some of his color description, such as the "sides and top of head with large round spots" refers to *E. bimaculata.*

Eviota inutilis is closely related to *E. smaragdus* and *E. melasma*, these species having similar important meristic characters and cephalic sensory pore systems and the subcutaneous trunk bars are obscure. *Eviota inutilis* differs chiefly from those two species in having the dark pelvic spots, a characteristic dark-colored dorsal fin, and a less dense occipital spot. Although our specimens of *E. inutilis* total only four, our comparisons made with other species involve hundreds of specimens and we find the above characters for *E. inutilis* to be unique. Our recognition of this species is tentative, for our material is old and limited.

Eviota smaragdus Jordan and Seale

FIGURES 8*a,b*, 9*a*, 10

Eviota smaragdus Jordan and Seale, 1906:388, fig. 78 [type-locality: Samoa].

MATERIAL EXAMINED.—207 specimens from 6 localities, totaling 97 males, 79 females, 27 juveniles and unsexed specimens; total size range 7.7–22.6; largest male 22.6, largest female 19.9; smallest gravid female 11.0.

Holotype: USNM 51764 (17.5), male; Apia, 1902, Jordan and Kellogg.

Paratypes: USNM 213872, 6 (13.3–15.2), 4 males (14.8), 2 females (15.2); same data as holotype. SU 8712, 7 (10.8–19.5), 4 males (19.5), 3 females (16.8); Pago Pago, summer 1902, D. S. Jordan.

Other Material: RYUKYU ISLANDS: USNM 123401, 1 (19.9), female; Okinawa, 1 Jul 1945, M. C. McBurney. MARIANAS ISLANDS: USNM 198175, 3 (12.2–18.2), 2 males (18.2), 1 female (12.2); Guam, 8 Jun 1963, D. F. Truett. CAS 43758, 36 (7.7–22.6), 6 juv., 21 males (22.6), 9 females (15.9); Guam, Inarajan, 15 Jul 1956, Gaines, Scott, sta 43, GVF Reg. 829. USNM 219447, 20 (11.4–16.9), 8 unsexed, 5 males (15.7), 7 females (16.9); Guam, 14 Apr 1973, H. and J. Larson, formerly UG 5878. UG 5879, 39 (10.5–21.7), 5 unsexed, 8 males (21.7), 26 females (18.1); Guam, Togcha Bay, 20 Nov 1972, H. Larson. UG 5880, 18 (11.1–19.6), 1 unsexed, 10 males (19.6), 7 females (16.3); Guam, Ypao Point, 7 Jun 1973, H. Larson. UG 5883, 22 (9.6–17.8), 7 unsexed, 12 males (17.8), 3 females (15.3); Guam, Tagachar Beach, 15 Jul 1973, H. Larson. NORFOLK ISLAND: AMS I.17930-001, 4 (17.6–21.5), 3 males (21.5), 1 female (17.6); coll. 1960, L. Marsh. NEW HEBRIDES: ANSP 98861, 2 (13.8, 17.7), males; Espiritu Santo I., 6 Sep 1952, E. M. Laird. AMS IB.5799, 8 (14.6–19.5), 6 males (19.5), 2 females (16.0); Santo, coll. 1952, Dr. Quaife. USNM 213930, 4 (13.6–19.0), 3 males (19.0), 1 female (15.0); no further data, formerly AMS I.6405. SAMOA ISLANDS: USNM 116148, 17 (11.5–18.5), 11 males (18.5), 6 females (17.0); Tau I., 27 Jun 1939, L. P. Schultz 880-934. USNM 116147, 1 (15.9), male; Tutuila I., 3 Jun 1939, L. P. Schultz 521-591. USNM 116146, 7 (10.1–14.7), 2 males (14.7), 5 females (13.4); Tutuila I., 5 Jun 1939, L. P. Schultz. BPBM 22568, 6 (16.1–19.6), 2 males (19.5), 4 females (19.6); E. of Apia, 4 Jan 1965, Snider. BPBM 22567, 1 (11.0), female; E. of Apia, 4 Jan 1965. FIJI ISLANDS: USNM 219425, 4 (11.7–14.1), 1 male (12.7), 3 females (14.1); Saolei, Rotuma I., 15 Feb 1973, M. Gawel.

DIAGNOSIS.—Fourth through the fifteenth pectoral fin rays usually branched; spinous dorsal fin elongate or filamentous in both sexes; pelvic fin usually not reaching origin of anal fin, never beyond; the fifth pelvic fin ray usually two-tenths length of fourth ray; head with a dark dorsolateral occipital spot on each side, round to vertically oval, above and anterior to the upper edge of the gill opening, sometimes barely meeting along the dorsal midline; a series of about 10–14 dark spots on dorsum, on each side of midline, sometimes confluent with spot on opposite side.

DESCRIPTION.—Dorsal fin VI–I,8(2), VI–I,9(20); anal fin I,7(1), I,8(21); pectoral fin 15(4),

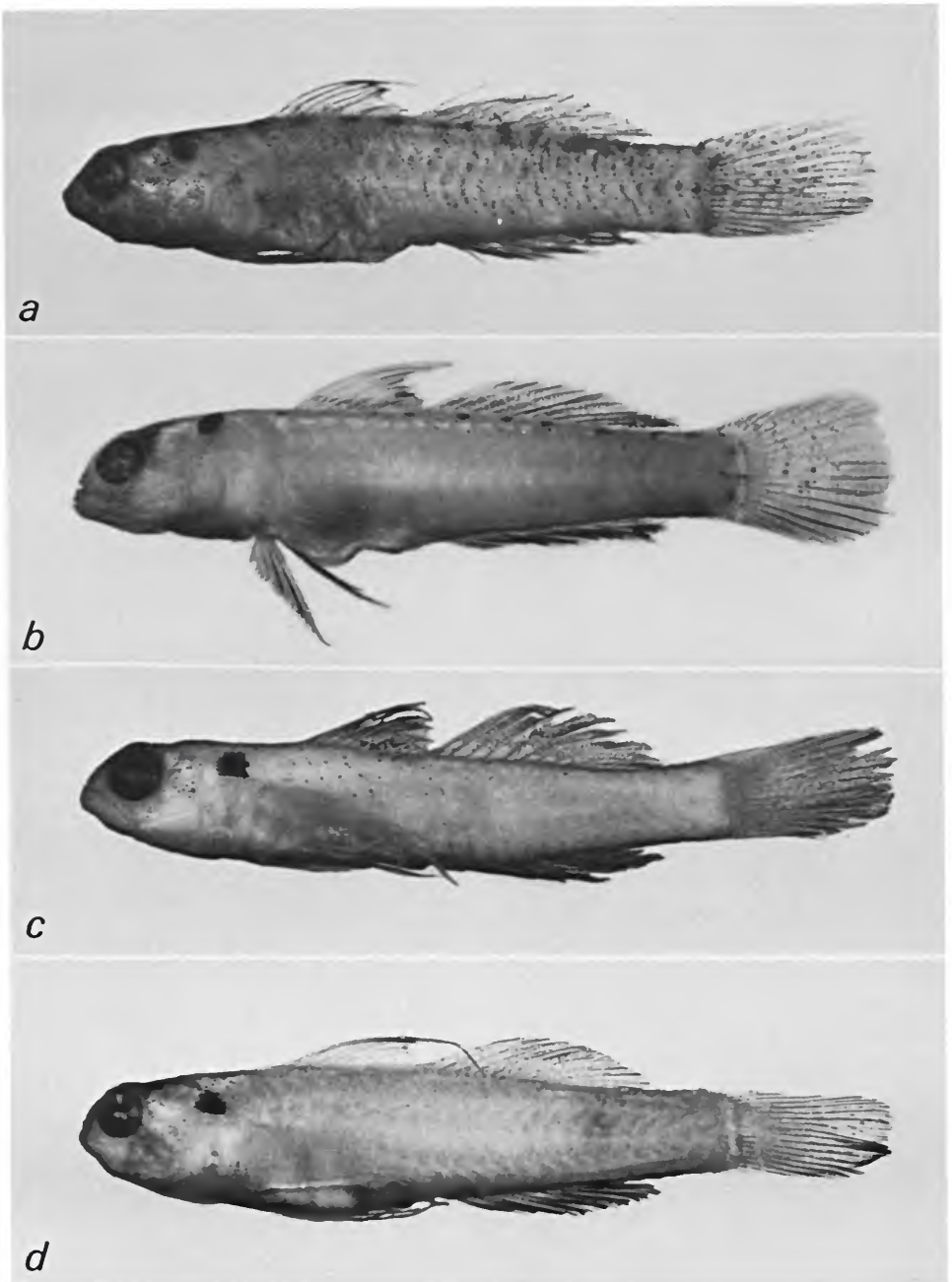

FIGURE 8.—Different color patterns of two species of *Eviota*. *Eviota smaragdus*: *a*, BPBM 22568, female, 19.5 mm SL, Samoa; *b*, UG 5878, male, 15.6 mm SL, Guam. *Eviota melasma*: *c*, USNM 216300, male, 15.3 mm SL, Kabaena I., Celebes; *d*, USNM 216286, holotype, male, 17.2 mm SL, Endeavour Reef, Australia.

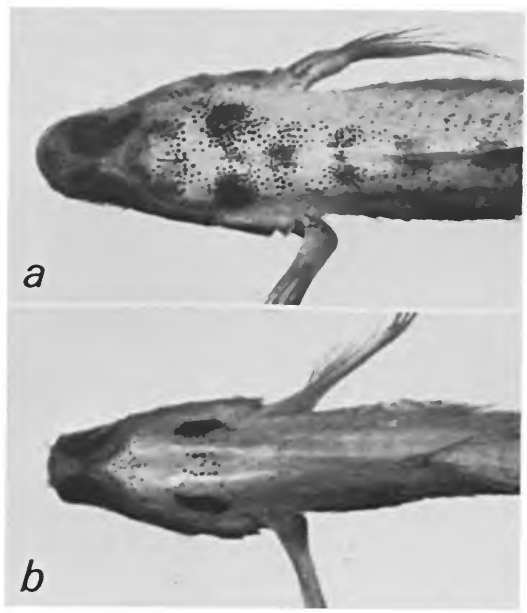

FIGURE 9.—Position of occipital spots: *a*, *Eviota smaragdus*, BPBM 22568, female, 19.5 mm SL, Samoa; *b*, *Eviota melasma*, USNM 216288, male, 16.1 mm SL, Endeavour Reef, Australia.

16(12), 17(3); pectoral fin rays 2–17 may be branched; pelvic fin I,4 1/10(1), I,4 2/10(11), I,4 3/10(2), I,4 4/10(1); fourth ray of pelvic fin modally with 5 branches; segments between consecutive branches of the fourth pelvic fin ray number 2–8, most often 3–5; pelvic fin membrane well developed; branched caudal fin rays 12(8), 13(1), 14(1); segmented caudal fin rays 17(21); lateral scale rows 23(7), 24(18), 25(3); transverse scale rows 5(1), 6(5), 7(5), 8(4). Scales with a single row of about 29–37 ctenii on posterior margin; about 11–16 primary radii on anterior field; no radii in lateral and posterior field; scales extremely eccentric, the radii converging broadly in focal area; breast scaleless.

First and second dorsal spines of males may be elongate and filamentous, the longest extending beyond end of second dorsal fin base; males as small as 11 mm SL possess filamentous dorsal spines; first spine of female elongate, extending to base of fifth dorsal fin ray; females 13 mm SL may have an elongate dorsal spine; pelvic fins usually not reaching origin of anal fin, never beyond.

Cephalic sensory pore system is pattern 1. Cutaneous papilla system is pattern A.

Genital papilla in male simple, short, and broad, not reaching anal spine; in female, papilla bulbous, short, with 4–8 fingerlike projections at tip, not extending to anal spine.

Gravid females ranged in length from 11.0–19.6 mm SL.

Vertebrae 10(40) precaudal and 15(1), 16(38), 17(1) caudal, total 25(1), 26(38), 27(1).

COLOR IN PRESERVATION.—Both sexes with a prominent, dark dorsolateral occipital spot on each side, round to slightly elongate vertically, above and anterior to the upper edge of the opercle; in more heavily pigmented specimens the paired spots may barely meet along the dorsal midline; occasionally spot may be faint, or intense and very small, but evident even in our smallest specimens; a faint vertical bar below eye and on midpreopercle; remainder of head pale or with fine, scattered chromatophores throughout, those immediately behind eye heavier, forming a dark narrow band bridging the eyes posteriorly; trunk usually pale, scale pockets of some specimens marked with dusky edges, especially dorsolaterally; belly usually pale; pectoral base pale to lightly dusky, chromatophores sometimes forming hourglass configuration centrally on base, which isolates an upper and lower pale spot; a series of about 10–14 dark spots dorsally on each side of midline from nape to end of caudal peduncle, 2 pairs between occipital spots and origin of spinous dorsal, sometimes joined at midline to form crossbands: a series of 5–6 dark spots ventrally along midline from anal fin origin to end of caudal peduncle, associated with 5–6 subcutaneous bars visible on lower trunk only; spots sometimes also present anteriorly as 2–3 paired, broad, subcutaneous spots laterally on belly, not meeting ventrally; diffuse spots sometimes present at end of caudal peduncle and on base of caudal fin; pectoral fins clear to light dusky; pelvics light dusky to dark dusky; spinous dorsal fin with band

of dusky pigment basally and bordering outer edge of fin, occasionally dusky throughout; second dorsal fin dusky throughout or sometimes only basally and along outer edge; anal dusky to nearly uniform dark brown; caudal dusky to brownish, usually darkest on about lower third and upper and outer one-quarter of fin; lighter midportion of the fin has irregularly arranged small brownish spots of varying intensity; no evident sexual dichromatism although the females are usually paler.

REMARKS.—Jordan and Seale (1906:388) listed for the holotype: dorsal fin VI, 10, and anal rays 9; our counts are VI-I,9 and I,7 respectively. Our specimens show a darker occipital spot than shown in figure 78 of Jordan and Seale (1906), the spinous dorsal has a dark basal band and the outer edge is pigmented. The caudal fin has a reticulated pigment pattern rather than the uniform bands shown on figure 78.

The original type series sent by David Starr Jordan from Stanford University (USNM Acc. No. 43712) contained a type and six cotypes (USNM 51764). We have cataloged the six specimens as paratypes, USNM 213872. Jordan and Seale's material was listed as 12 specimens from Pago Pago. Our type series is listed from Apia. The type series at CAS (SU 8712), seven specimens, are listed from Pago Pago. The original drawing in our files, U.S. Bureau of Fisheries No. 1950, is labeled "from type" 1 inch long, collected at Apia, Samoa. A single specimen in vial of SU 8712 bears the label (of recent origin) "drawn," which cannot be related by us to the original drawing, figure 78.

GEOGRAPHIC DISTRIBUTION.—Known from 5 localities: Okinawa, Guam, New Hebrides, Norfolk, and Samoa Islands (Figure 10).

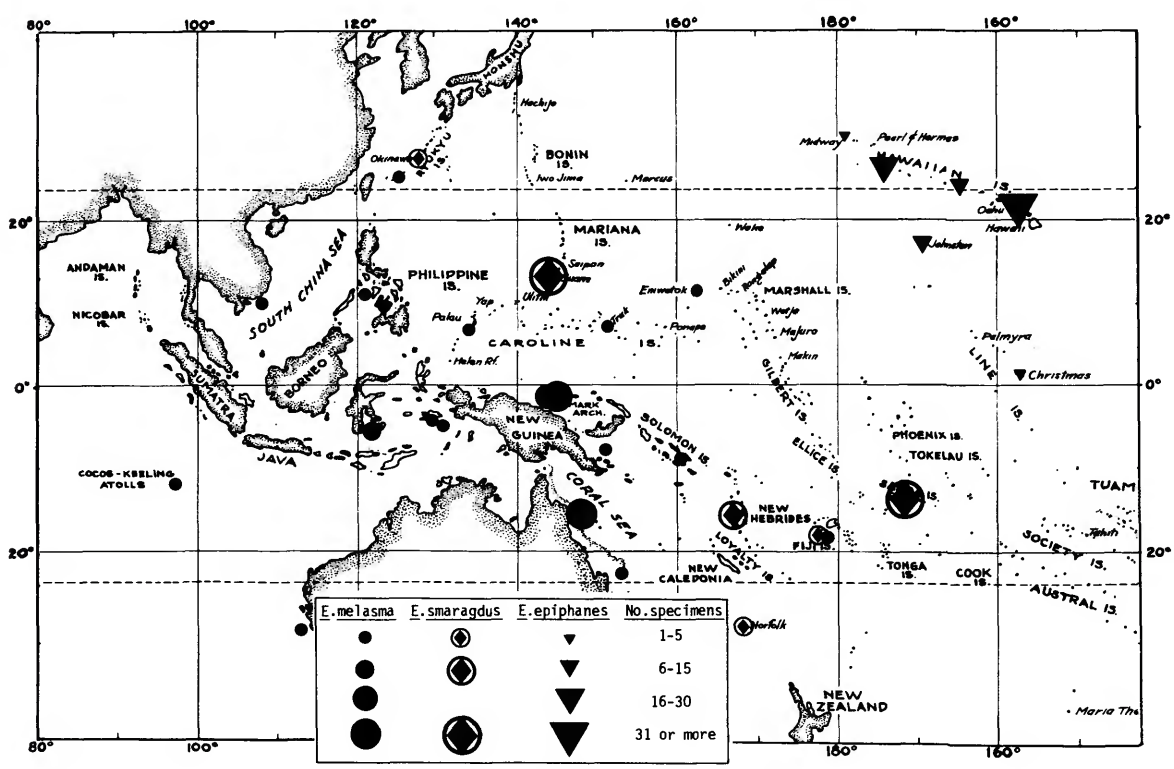

FIGURE 10.—Distributions of *Eviota epiphanes*, *E. melasma*, and *E. smaragdus*.

Eviota melasma new species

FIGURES 8*c,d*, 9*b*, 10

MATERIAL EXAMINED.—169 specimens from 14 localities, totaling 81 males, 57 females, 31 juvenile and unsexed specimens; total size range 8.4–26.6; largest male 26.6, largest female 20.5; smallest gravid female 14.1.

Holotype: USNM 216286, (17.2) male; Australia, Endeavour Reef, 5 Jan 1969, C. L. Smith, S69-5.

Paratypes: AUSTRALIA: GREAT BARRIER REEF (collected by C. L. Smith and J. Tyler): NORTHERN ESCAPE REEF: ANSP 14138, 7 (11.6–16.3), 4 juv., 3 males (16.3); 24 Jan 1969, TS,A-30. ANSP 141137, 2 (15.2, 11.0), male and female; 23 Jan 1969, TS,A-28. AMNH 39048, 1 (12.6), unsexed; 24 Jan 1969, S69-33. AMNH 39049, 4 (11.2–13.9), 2 juv., 1 male (13.9), 1 female (13.7); 24 Jan 1969, S69-32. HOPE ISLANDS: AMNH 39050, 2 (14.9, 16.2), females; Little Hope I., 19 Jan 1969, S69-23. ANSP 141130, 2 (14.3, 15.0), male and female; Little Hope I., 3 Jan 1969, TS,A-2. ANSP 141136, 4 (14.9–15.7), 3 males (15.7), 1 female (14.9); Big Hope I., 19 Jan 1969, TS,A-21. USNM 216287, 5 (14.4–15.4), 1 male (14.9), 4 females (15.4); Big Hope I., 19 Jan 1969, TS,A-22. ENDEAVOUR REEF: ANSP 141135, 6(9.6–17.1), 2 juv., 3 males (17.1), 1 female (16.8); 15 Jan 1969, TS,A-16. ANSP 141134, 2 (14.8, 17.7), males; 13 Jan 1969, TS,A-12. ANSP 141132, 2 (15.1, 15.5), male and female; 5 Jan 1969, TS,A-4. ANSP 141131, 6 (13.2–16.3), 4 males (16.3), 2 females (14.4); 4 Jan 1969, TS,A-3. ANSP 141133, 2 (14.0, 15.0), females; Cook wreck site, 11 Jan 1969, TS,A-11. AMS I.20798-001, 4 (10.8–16.5), 1 juv., 2 males (16.5), 1 female (14.1); 13 Jan 1969, TS,A-13. CAS 43546, 9 (10.4–17.5), 1 juv., 3 males (17.5), 5 females (15.5); 6 Jan 1969, S69-7. AMNH 39051, 5 (11.0–15.0), 2 juv., 3 males (15.0); 13 Jan 1969, S69-14. AMNH 39052, 7 (9.6–17.7), 3 juv., 3 males (16.8), 2 females (17.7); 15 Jan 1969, S69-18. AMNH 39053, 8 (10.1–16.3), 1 juv., 3 males (16.1), 4 females (16.3); 6 Jan 1969, S69-6. AMNH 39054, 4 (14.0–18.5), males; 5 Jan 1969, S69-4. AMNH 39055, 3 (12.2–18.4), 1 juv., 1 male (18.4), 1 female (15.3); 16 Jan 1969, S69-19. USNM 216288, 21 (8.4–17.1), 6 juv., 12 males (17.1), 3 females (17.1); 5 Jan 1969, S69-5. USNM 216293, 7 (13.5–16.4), 5 males (16.4), 2 females (15.1); 6 Jan 1969, TS,A-5. USNM 216289, 12 (11.6–17.9), 4 juv., 5 males (17.9), 3 females (17.8); 14 Jan 1969, S69-16.

Other Material: INDIAN OCEAN: ANSP 141221, 1 (16.6), male; Cocos (Keeling) Is., 6 Mar 1974, P. L. Colin. Sta. 22. WESTERN AUSTRALIA: WAM P25316-005, 1 (26.6) male; Abrolhos Is., 21 May 1975, G. Allen, ABR-10. SOUTH CHINA SEA: CAS 43812, 2 (19.2, 18.9), male and female; off Paulo Cecir de Mer, Vietnam, 10 Mar 1960, Bolin, sta 60-96, GVF Reg. 2113. RYUKYU ISLANDS: AMS I.18404-001, 2 (15.1, 20.5), females; Ishigaki, 22 May 1968, J. Randall. CAROLINE ISLANDS: AMS I.18400-001, 2 (14.3, 14.7), males; Palau Is., Aurapushekaru I., 16 Apr 1970, J. Randall. BPBM 9068, 3 (14.3–18.1), 1 unsexed, 2 males (18.1); Truk Is., Herit I., 11 Jul 1969, J. Randall. MARSHALL ISLANDS: LACM W63-283-2, 4 (12.9–19.0), 1 juv., 3 males (19.0); Eniwetok Atoll, 20 Jul 1963, W. J. Baldwin, W63-283. BPBM 8837, 1 (16.7), female; Eniwetok Atoll, 6 Jan 1970, G. R. Allen. INDONESIA (collected by V. G. Springer): USNM 216295, 1 (16.3), female; Celebes, Kabaena I., 24 Feb 1974, VGS 74-1. USNM 216300, 7 (14.3–17.9), 2 males (17.9), 5 females (16.0); Celebes, Kabaena I., 25 Feb 1974, VGS 74-2. USNM 216297, 3 (12.9–14.1), females; Moluccas, Ambon I., 14 Mar 1974, VGS 74-13. USNM 216299, 1 (13.8), female; Moluccas, Ambon I., 17 Mar 1974, VGS 74-19. USNM 216296, 7 (13.0–18.3), 3 males (18.3), 4 females (16.3); Banda Is., 8–9 Mar 1974, VGS 74-10, 74-11. USNM 216298, 1 (10.9), juv., Banda Is., 9 Mar 1974, VGS 74.11. OCEANIA: AMS I.17492-002, 1 (17.3), male; Solomon Is., Florida I., 19 Jul 1973, G. Allen. USNM 216294, 2 (16.7, 16.3), male and female; Fiji I., 8 May 1965, Bolin, *Te Vega* cr. 7, sta 278. USNM 219434, 1 (16.7), male; Samoa, Tutuila I., R. Wass. Jean P. Haydon Museum of American Samoa, 1 (14.0), male; Samoa, Tutuila I., 1975 or 1976, R. Wass. QUEENSLAND, AUSTRALIA: AMS I.20206-027, 1 (15.5), female; One Tree I., 3 Dec 1969, F. Talbot 426. AMS I.19338-020, 1 (15.9), male; One Tree I., 26 Nov 1969, F. Talbot 417. PAPUA NEW GUINEA: BISMARCK ARCHIPELAGO (collected by V. G. Springer in 1978): HERMIT ISLANDS: USNM 219662, 1 (13.9), female; 1 Nov, VGS 78-13. USNM 219660, 4 (11.0–18.1), 2 juv., 2 males (18.1); 5 Nov, VGS 78-20. USNM 219652, 34 (11.2–17.2), 19 juv., 9 males (17.2), 6 females (15.5); 31 Oct, VGS 78-12. USNM 219653, 3 (11.6–16.2), 1 juv., 1 male (14.8), 1 female (16.2); 2 Nov, VGS 78-16. NINIGO ISLANDS: USNM 219655, 4 (11.1–15.8), 1 juv., 2 males (15.8), 1 female (14.8); 22 Oct, VGS 78-1. USNM 219656, 4 (12.1–15.8), 3 juv., 1 female (15.8); 22 Oct, VGS 78-2. USNM 219657, 14 (11.4–19.6), 4 juv., 6 males (19.6), 4 females (16.5); 25 Oct, VGS 78-5. USNM 219661, 7 (10.0–14.2), 1 juv., 4 males (14.0), 2 females (14.2); 26 Oct, VGS 78-6. TROBRIAND ISLANDS: USNM 217590, 2 (11.9, 14.1), male and female; Kiriwina I., 19 Sep 1975, T. R. Roberts. BISMARCK ARCHIPELAGO: USNM 217589, 1 (16.3), female; New Ireland, 20–25 Jan 1976, T. R. Roberts. PHILIPPINE ISLANDS (collected in 1978 by V. G. Springer and Smithsonian team): USNM 219658, 1 (14.3), female; Palawan Prov., Tagauayan I., 25 May, SP 78-24. USNM 219433, 1 (15.3), male; Palawan Prov., Bararin I., 24 May, SP 78-21. USNM 219432, 1 (17.2), female; Palawan Prov., Bararin I., 23 May, SP 78-20. USNM 219430, 2 (15.8, 17.3), males; Palawan Prov., Cocoro I., 26 May, SP 78-27. USNM 219659, 1 (16.3), male; Apo I., 7 Jun, SP 78-36. USNM 219431, 1 (15.0), female; Oriental Negros, Bonbonon Point, 13 May, SP 78-11. USNM 219654, 2 (16.3, 17.5), females; Pamilican I., 12 Jun, SP 78-41.

DIAGNOSIS.—Tenth through the sixteenth pectoral fin rays usually branched; spinous dorsal fin elongate or filamentous in both sexes; pelvic fins

usually extending beyond origin of anal fin; fifth pelvic fin ray one to two-tenths length of fourth ray; head with a dark, occipital spot supralaterally on each side, squarish, round or oval, about one-half or larger than diameter of eye, the lower posterior portion usually touching upper edge of gill opening, not meeting along the dorsal midline; no dark spots along dorsal midline.

DESCRIPTION.—Dorsal fin IV-I,9(1), V-I,9(1), VI-I,8(1), VI-I,9(26), VI-I,10(1); anal fin I,8(29), I,9(1); pectoral fin 14(1), 15(2), 16(9), 17(11), 18(7); pectoral fin rays 3–18 may be branched; pelvic I,4 1/10(15), I,4 2/10(15); branches of fourth pelvic fin ray average 7.3; segments between consecutive branches of the fourth pelvic fin ray number 1–7, most often 2 or 3; membrane between the pelvic fin rays well developed; branched caudal fin rays 11(2), 12(15), 13(5), 14(2); segmented caudal fin rays 17(30); lateral scale rows 23(10), 24(18), 25(1); transverse scale rows 5(1), 6(18), 7(2).

Scales with a single row of about 29–38 ctenii on posterior margin; about 7–11 primary radii, and 1–2 secondary radii on anterior field; no radii in lateral and posterior fields; scales highly eccentric, converging in a broad focal area; breast scaleless.

First and second dorsal spines of males and females may be elongate and filamentous, the longest extending to the end of the second dorsal fin base; males and females at 13 mm SL may have filamentous dorsal spines; pelvic fins usually extending beyond origin of anal fin.

Cephalic sensory pore system is pattern 1; cutaneous papilla system is pattern A.

Genital papilla in male not fimbriate, moderately long, slender, and slightly flared and bilobed at tip, usually reaching beyond anal spine; in female, bulbous, short, with 4–8 fingerlike projections at tip, not extending to anal spine.

One gravid female, 14.1 mm SL.

Vertebrae 10(14) precaudal and 16(13), 17(1) caudal, total 26(13), 27(1).

COLOR IN PRESERVATION.—Conspicuous brown to black occipital spot, one-half diameter of eye or larger, on each side of head, present in both sexes, almost always well developed, squarish, round or oval, the lower posterior margin touching upper edge of gill opening, or nearly so, distinctly separated from dorsal midline; 2 elongate pale to brown predorsal spots along midline; anterior to these, immediately behind eyes, is a broad, transverse, pale to brownish band; 2 light brownish spots on upper cheek and another below middle of eye just behind rictus of jaw; all head markings other than occipital spot may be pale or obscure in males and females; trunk usually pale, scale pockets with dusky crescent-shaped marks on some specimens, more so dorsolaterally; base of pectoral fin with a weak brownish spot on lower anterior portion or in some a weak hourglass configuration as in *E. smaragdus*; 6 dark, moderate to weak, spots on ventral midline associated with 6 weak subcutaneous bars on lower trunk, or bars sometimes obscure; 3 dark subcutaneous bands on belly, the anterior 2 are wide ventrolaterally and narrow as they descend ventrally around the belly; lower part of head, breast, and belly pale or with fine scattered chromatophores; pectoral fins clear, some with fine dusky melanophores; pelvic fins clear, some with membranes light dusky; first and second dorsal fins clear basally, appearing like a narrow light stripe in some, outer portion of fin pale to dusky including filamentous rays; anal fin most heavily pigmented, dusky to moderately black, the immediate basal portion somewhat lighter; caudal fin dusky to light brownish, chiefly on outer half, the lower central portion mostly pale.

The single specimen from Western Australia (WAM P25316-005, 26.6 mm SL) is much larger than all other examined specimens of this species and the general body coloration is more pronounced, particularly the dark scale markings. The mark on the cheek below the eye, behind the rictus, is more elongate than that of other specimens.

GEOGRAPHIC DISTRIBUTION.—Widely distributed throughout the Indo-Pacific Archipelago, the extreme localities include the Ryukyu Islands, off Vietnam, Cocos (Keeling) Islands, Western Australia, Fiji, and Eniwetok Atoll (Figure 10)

ETYMOLOGY.—The specific name *melasma* is Greek, meaning black spot, and refers to the dark occipital spot on each side of the head.

REMARKS.—This species is most closely related to *E. smaragdus*, differing in having a longer pelvic fin, a shorter fifth pelvic fin ray (Table 6), more branches on the fourth pelvic fin ray (Table 4), fewer segments between the branches of the fourth pelvic fin ray (Table 5), fewer branched pectoral fin rays (Table 2), and the males have a longer genital papilla.

The salient color differences are: the dark occipital spots are more laterally located on the head and do not meet at the dorsal midline; no series of spots along the dorsal midline; usually a weak brownish spot on lower, anterior portion of pectoral fin base; subcutaneous marks on belly, bandlike, usually meeting ventrally; base of first dorsal fin lacking dark horizontal stripe; pelvic fins less pigmented, clear to pale brownish; no spots on caudal.

Eviota epiphanes Jenkins

FIGURES 10, 11

Eviota epiphanes Jenkins, 1903:501, fig. 42 [type-locality: Honolulu].

MATERIAL EXAMINED.—393 specimens from 6 localities, totaling 85 males, 106 females, 197 juveniles and unsexed specimens (due to dessication, etc.); total size range 7.7–15.7; largest male 15.7, largest female 15.7; smallest gravid female 11.6.

Holotype: USNM 50720, (14.1), male; Honolulu, coll. 1889, O. P. Jenkins.

Paratypes: SU 8707, 6 (ca. 11.7-ca. 14.2), 4 unsexed, 1 male (13.7), 1 female (ca. 14.2), Honolulu, summer 1889, O. P. Jenkins.

Other Material: MIDWAY ISLANDS: UH 926, 3 (12.3–15.5), 1 unsexed, 2 females (12.6); E of Eastern I., 29 Jun 1950, Gosline. HAWAIIAN ISLANDS: LAYSAN: UH 1067, 2 (10.4, 12.7), males; 23 Jul 1950, Gosline. CAS 43817, 61 (8.2–14.7), 48 juv., 5 males (14.3), 8 females (14.7); 13 Jul 1951, sta 51-GV-26, GVF Reg. 26. CAS 43818, 9 (7.9–14.5), 6 juv., 1 male (12.2), 2 females (14.5); Jun 1951, George Vanderbilt Pacific Equatorial Exp. USNM 213868, 8 (8.7–15.2), 5 juv., 1 male (12.9), 2 females (15.2); same data as above. BPBM 4804, 2 (14.4, 12.7), male and female; May 1923, S. C. Ball. FRENCH FRIGATE SHOALS: UH 874, 6 (11.6–14.5), 2 males (14.5), 4 females (14.3); East I., 19 Jun 1950, Gosline. UH 891, 1 (13.0), male; Gin I., 20 Jun 1950, Gosline. ANSP 65673, 2 (10.2, 14.7), 1 juv., 1 male (14.7); Jul 1923, Tanager Exp. BPBM 4814, 3 (10.9–12.3), 2 males (11.0), 1 female (12.3); Jun 1923, Tanager Exp. OAHU: USNM 78064, 5 (8.9–12.5), 2 juv., 2 males (12.5), 1 female (12.1); Honolulu, coll. 1901, U. S. Fish Commission. USNM 126683, 9 (11.7–14.5), 2 juv., 2 males (13.1), 5 females (14.5); Honolulu, coll. 1901, Jordan and Evermann, USBF 1093. USNM 133656, 2 (13.6, 11.9), male and female; Haunama Bay, coll. 1937, S. F. Light. USNM 149976, 19 (8.4–15.7), 7 juv., 6 males (15.7), 6 females (14.6); Waikiki Lab., Mar–Apr 1942, Lt. G. S. Mansfield. USNM 143072, 1 (14.3) male; Honolulu, 8 May 1902, *Albatross*. USNM 216590, 11 (8.7–14.5), 3 juv., 2 males (14.5), 6 females (13.8); Kaneohe Bay, 13 Sep 1975, B. Carlson. USNM 213865, 61 (7.8–15.7), 26 juv., 15 males (14.8), 20 females (15.7); Kaneohe Bay, 19 Jun 1969, W. Baldwin, HIMB 69-9. CAS 43819, 5 (11.3–13.6), 1 juv., 2 males (13.6), 2 females (12.9); same data as above. AMS uncataloged, 6 (12.6–15.6), 3 males (13.8), 3 females (15.6); same data as above. SU 66899, 1 (13.7), female; Honolulu, coll. 1901, U. S. Fish Commission. FMNH 63600, 7 (10.4–14.2), 1 juv., 2 males (14.2), 4 females (13.1); Kahuku, 21 Apr 1961, L. P. Woods. ANSP 89161, 18 (8.1–13.6), 13 unsexed, 5 females (13.6); Makuleia, Sep 1936, Otto Degener. ANSP 94845, 1 (13.6) unsexed; (cleared and stained); Diamond Head, 18 Jun 1937, G. Vanderbilt Exp. E Pacific. ANSP 83861, 4 (8.5–13.5), 3 juv., 1 female (13.5); same data as above. ANSP 83821, 2 (9.7, 11.6). juv. and male; Diamond Head, 30 Jun 1937, G. Vanderbilt Exp. S Pacific. ANSP 77907, 1 (11.6), unsexed; Honolulu, coll. 1901, U. S. Fish Commission, no. 1718. ANSP 65815–65816, 2 (ca. 8.3, ca. 11.7), unsexed; Kaaawa Reef, 29 Jun 1923, C. H. Edmondson. ANSP 80658, 1 (13.7), female; Waikiki Reef, Nov 1938, G. B. Mainland, no. 5473. ANSP 77904, 4 (12.5–14.6), 1 unsexed, 2 males (14.3), 1 female (14.6); Waikiki, coll. 1922, C. H. Edmondson. BPBM 4802, 6 (13.0–15.1), 5 unsexed, 1 female (14.6); Waikiki, coll. 1922, C. H. Edmondson. BPBM 5310, 2 (11.5, 12.2), females; Waimanalo, T. T. Dranga. BPBM 7903, 9 (9.8–12.4), 7 males (12.4), 2 females (11.4); Moku Manu, 6 Oct 1969, J. Randall and W. Baldwin. BPBM 5474, 4 (10.3–13.5), 1 juv., 1 male (13.5), 2 females (13.0); Kaneohe Bay, Oct 1938, G. Mainland. BPBM 7909, 3 (10.3–11.1), 2 unsexed, 1 male (11.1); Moku Manu, 3 Oct 1969, J. Randall. BPBM 5474, 20 (7.7–15.2), 13 juv., 6 males (15.2), 1 female (14.3); Waikiki, Feb 1939, G. Mainland. BPBM 4810, 3 (8.0–12.5), 2 unsexed, 1 female (12.0); Malve Kahana, 7 May 1925, C. M. Cooke, Jr. BPBM 5473, 14 (8.0–15.3), 7 juv., 4 males (15.1), 3 females (15.3); Waikiki, 26 Nov 1938, G. Mainland. BPBM 5311, 6 (12.3–13.6), unsexed; Waikiki, 6 Nov 1927, Edmondson. BPBM 22572, 36 (8.1–14.3), 28 juv., 1 male (11.4), 7 females (ca. 14.3); Kahe Point, 8 Mar 1968, Doug Hume. UH 373, 3 (13.1–13.8), 1 male (13.1), 2 females 13.8); Hauula Park, 28 Jun 1949, Gosline. UH 767, 3 (13.5–14.4), 1 male (13.5), 2 females (14.4); Waimea. UH 715, 1 (15.5), male; Punalou

Point, 1 Apr 1950, Kangetter. UH 1214, 1 (13.5), female; Kahuku, 4 Feb 1951, Gosline. UH 30, 1 (14.1), male; Kaneohe Bay, 2 Oct 1948, Gosline. USNM 213899, 1 (14.4) male; Kaneohe Bay, Oct 1938 or Waikiki Reef, Feb 1939, G. B. Mainland, Univ. Washington Cat. 14505. JOHNSTON ISLAND: BPBM 22570, 4 (12.0–12.9), 2 males (12.9), 2 females (12.9); S of Sand I., 31 Jan 1965, Jones. ANSP 65795, 1 (12.7), female; inner reef, coll. 1923, Tanager Exp. BPBM 4815, 2 (11.9, 12.1), females; 18 Jul 1923, Tanager Exp. LINE ISLANDS: CAS 43820, 2 (8.1, 14.2), juv. and female; Christmas I., 25 Aug 1951, sta 51-GV-51, GVF Reg. 51.

DIAGNOSIS.—Pectoral fin rays 11–15 almost always branched; spinous dorsal fin not elongate; fifth pelvic fin ray absent; dark bars, dorsally on head and nape, weak to moderately developed, gradually reduced to spots along the midline, to end of second dorsal fin.

DESCRIPTION.—Dorsal fin VI-I,7(1), VI-I,8(8), VI-I,9(25); anal fin I,7(3), I,8(28), I,9(1); pectoral fin 15(2), 16(15), 17(13); pectoral fin rays 10–16 may be branched, 1–9 and 17 always unbranched; pelvic fin I,4(28), I,4 1/10(1); branches on fourth pelvic fin ray average 7.8; segments between consecutive branches of fourth pelvic fin ray usually 1, range 1–3; membrane between the pelvic fin rays reduced; branched caudal fin rays 11(2), 12(5), 13(4), 14(2); segmented caudal fin rays 17(29); lateral scale rows 23(19), 24(4); transverse scale rows 5(4), 6(10). Scales with 25–35 ctenii, 12–15 radii; breast scaleless.

No spinous dorsal elongation, the first spine always shorter or equal to second or third spine; pelvic fins rarely reaching origin of anal fin.

The cephalic sensory pore system is pattern 1. Cutaneous papilla system is pattern A.

Genital papilla in male not fimbriate, stout, short, and broad at base, tapering moderately and fringed at tip, usually not extending to anal spine; genital papilla in female bulbous, short, not reaching anal spine, the tip with 4–8 finger-like projections.

Nine females, 11.1–14.4 mm SL, from the Ha-

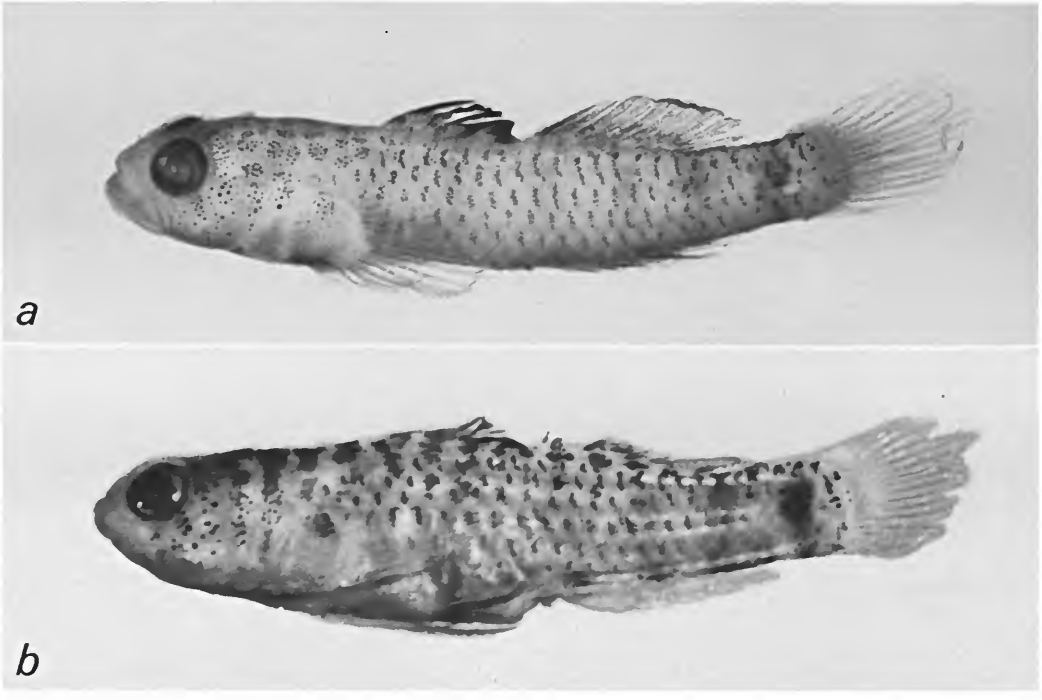

FIGURE 11.—*Eviota epiphanes: a*, USNM 216590, male, 13.3 mm SL, Oahu, Hawaiian Islands; *b*, FMNH 63600, female, 13.2 mm SL, Oahu, Hawaiian Islands.

waiian and Johnston Islands, were gravid or nearly so.

Veterbrae 10(19) pecaudal and 16(18), 17(1) caudal, total 26(18), 27(1).

COLOR IN PRESERVATION.—Head and nape of both sexes with well-defined transverse bars descending to midside of head and upper pectoral fin base; bars diminish in size at the spinous dorsal fin becoming spots along the midline to end of soft dorsal fin; bars on head and nape variable in intensity from solid dark to loose collections of chromatophores, bars sometimes broken into irregular patches; bar immediately behind eye usually most dense and extends forward into narrow interorbital; the second most anterior bar is sometimes V-shaped and directed posteriorly; the head bars on Christmas Island specimens descend to lower opercle and preopercle, and below the eye there are 3 well-defined small, vertical bars; snout, lower cheek, and pectoral base with fine scattered melanophores, underside at head pale; 5 spots on ventral midline, all but the fourth associated with a subcutaneous bar that extends to upper trunk; the fourth spot associated with a small ventral subcutaneous patch; the last bar forms a large, dark midpeduncular subcutaneous spot; the preanal subcutaneous bars terminate ventrolaterally in broad, dark, paired patches, those from the anal origin to the end of the caudal peduncle extend the depth of the trunk and terminate ventrally along the midline in dark patches of chromatophores; scale pockets on trunk with a narrow margin of 1–2 vertical rows of chromatophores, or with a solid dark margin, usually absent on scaled areas of belly and lower caudal peduncle; rays of the pectoral fin delicately dashed in black, from base to tip, membranes clear; pelvic fin clear; outer portion of spinous dorsal dark, the membrane between the fifth and sixth spines, and posterior to the sixth spine usually intensely black basally; the anterior basal portion of the fin pale between the dark medial spots on the trunk midline; second dorsal fin dusky, the area between the basal midline spots pale; anal fin pale to dusky; caudal fin pale, margins of rays sometimes finely outlined. Color pattern well developed in specimens of 8 mm SL.

GEOGRAPHIC DISTRIBUTION.—Restricted to the North Central Pacific, common in the Hawaiian Islands region. Found at Midway, Laysan, French Frigate Shoals, Oahu, Johnston Island, and Christmas Island (Figure 10).

REMARKS.—Dorsal fin ray counts average higher for the Hawaiian, Midway, and Christmas Island specimens I,8(3), I,9(24) than for those from Johnston Island, I,7(1), I,8(5), I,9(1).

Jenkins (1903:501) gave a pelvic count of I,5 for the holotype. Our data from the holotype is I,4 and from other specimens I,4(27), I,4 1/10(1). In his illustration of the holotype, Jenkins (fig. 42) shows diffuse, poorly defined bars on the head and nape. These bars are typically sharp and well defined, as shown in Figure 11*b*.

Eviota guttata Lachner and Karnella

FIGURES 12, 13

Eviota guttata Lachner and Karnella, 1978:9, fig. 5 [type-locality: Massawa, Red Sea].

MATERIAL EXAMINED.—Known from 152 specimens from several localities in the Red Sea and 1 specimen from the Gulf of Oman reported on by Lachner and Karnella (1978:9).

DIAGNOSIS.—Pectoral fin rays 4–17 may be branched, and 11–14 always branched; spinous dorsal fin elongate and filamentous in males; fifth pelvic fin ray small, one-tenth or two-tenths length of fourth fin ray, almost always one-tenth; head and trunk dorsolaterally and caudal fin dappled or finely speckled.

DESCRIPTION.—Tables 1–8 compare the salient species characters of *E. guttata* with 30 other species of *Eviota*.

COLOR IN PRESERVATION.—This species lacks outstanding color marks. The notable pattern consists of small dark spots on the dorsal midline of the trunk, numbering about 12–15; the series also extends forward on nape and occipital area as 3 marks along midline, which may be diffuse and broken up into widely scattered chromato-

FIGURE 12.—*Eviota guttata*, USNM 218013, holotype, female, 15.8 mm SL, Red Sea.

phores; trunk, mostly dorsolaterally, with fine dark speckling, the pigmentation in some specimens limited to scale pockets; small dark spots on membrane of caudal fin, usually about 5–7 along length of rays, remainder of caudal fin clear.

Head with short, weak horizontal bar, about at level of SOT pore, a similar small bar at about middle of preopercle, and a faint incomplete vertical mark from eye to rictus; snout with faint pigmentation, chin with weak spots or chromatophores, the most prominent spot along the midline posterior to gular area. Anterior lower portion of trunk and lower head unpigmented.

Seven weak to moderate spots along ventral midline from origin of anal fin to procurrent caudal fin rays, the first 6 largest, more pronounced, and associated with very weak, inconspicuous subcutaneous bars, the seventh spot questionably with a subcutaneous bar, the fifth and sixth bars possibly connected in middle region of trunk; 3 subcutaneous bars in belly region broaden to form dusky patches laterally, bars do not meet ventrally.

Spinous dorsal fin with a dusky horizontal band at or near base, some light brown pigmentation on spines, remainder of fin clear. Second dorsal fin has scattered brown speckling, mostly on membrane, remainder of fin clear. Anal fin uniform dusky brown, except basal area that is somewhat paler, and with a narrow clear margin. Rays of pectoral fin are bordered with fine dark chromatophores, remainder of fin clear. Pelvic fin clear. End of caudal peduncle with a narrow vertical bar composed of fine, dark pigment spots.

GEOGRAPHIC DISTRIBUTION.—Known from two areas of the Red Sea, the Gulf of Aqaba and the coastal waters and islands of Ethiopia, and from one locality in the Gulf of Oman (Figure 13).

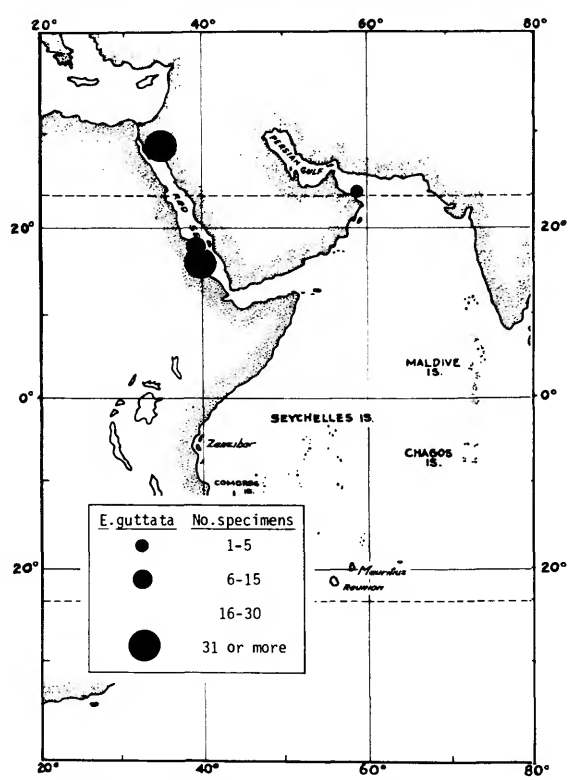

FIGURE 13.—Distribution of *Eviota guttata*.

Eviota pardalota Lachner and Karnella

FIGURES 14, 15

Eviota pardalota Lachner and Karnella, 1978:11, figs 6–7 [type-locality: Gulf of Suez, Red Sea].
Eviota stigmapteron.—Clark, 1968: 6 [in part].

MATERIAL EXAMINED.—Known from 31 specimens from several localities in the Red Sea reported on by Lachner and Karnella (1978:11).

DIAGNOSIS.—Pectoral fin rays 3–16 may be branched and 10–14 always branched; spinous dorsal fin elongate or filamentous in both sexes, longer in males; fifth pelvic fin ray small, one-tenth length of fourth ray or rudimentary; head with large dark spots, about the size of the pupil, nape with similar spots or transverse bars; 2 large dark spots on fleshy base of pectoral fin; a series of dark spots on trunk along the dorsal and ventral midlines.

DESCRIPTION.—The important species characters treated by Lachner and Karnella (1978) are compared with 30 other species of *Eviota* in Tables 1–8.

COLOR IN PRESERVATION.—Head with dark spots (about the size of pupil) dorsally, laterally, and ventrally, those on occipital area darker, larger, and sometimes joined to form transverse bars; spots ventrally on head small and weak; cheek with about 4 circular spots and a prominent vertical bar from eye to rictus; snout with moderate to weak spotting and faint pigmentation; spots crowded dorsally on head immediately behind eyes.

Predorsal area on trunk has 2–3 short, transverse dark bars, the posteriormost bar sometimes segmented into lateral spots and the posterior bars sometimes connecting laterally.

Two dark spots, about the size of pupil, on upper and lower fleshy base of pectoral fin, weak scattered chromatophores between spots.

A series of 10 spots along dorsal midline from about base of second spine of first dorsal fin to procurrent rays of caudal fin, the first to third spots passing onto base of spinous dorsal fin, and the fourth to sixth spots passing onto second dorsal fin, leaving clear spaces between spots.

A series of 6 dark spots along ventral midline from origin of anal fin to procurrent caudal fin rays, spots 1–2 adjacent to anal fin, spots 3–6 on caudal peduncle; spots 1–5 are associated with vertical subcutaneous bars extending dorsally on trunk.

Scales laterally over most of trunk with heavily pigmented scale pockets.

Pectoral fin rays with fine dark chromatophores, the membrane clear. Pelvic fins clear. Two, weak to moderately developed, dark spots on each side of anterior portion of base of pelvic fins. First dorsal fin with 3 broad, oblique, band-like marks, extending upward from the first 3 dorsal midline trunk spots, more or less joined in midsection of fin, leaving clear areas between dark basal spots. The filamentous dorsal spines have small dark spots to tip. Second dorsal fin

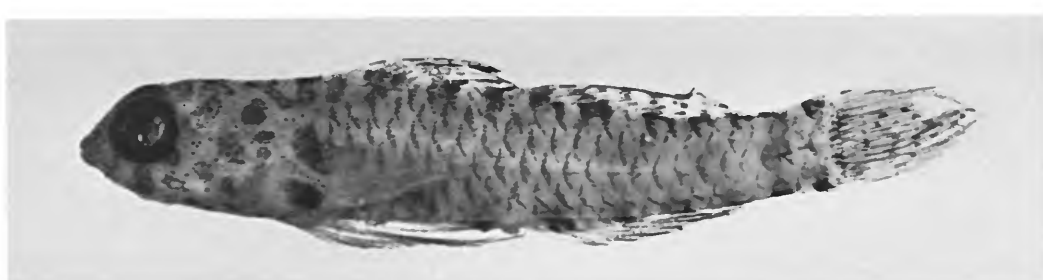

FIGURE 14.—*Eviota pardalota*, USNM 218011, female, 14.4 mm SL, Red Sea.

dusky, the spine and rays with small dark spots in a linear series of 3–4 rows, usually poorly developed. Anal fin uniformly dusky with a narrow, clear margin; area at base of anal fin between midline spots pale. Caudal fin dusky with a series of 4–5 irregularly arranged small spots on most branched rays, moderately developed. Weak vertical bar at base of fin rays.

Five weak to moderately developed subcutaneous bars aligned with the ventral midline spots, and a weak sixth bar on lower trunk above the sixth spot; third and fourth bars merge along midline and form a single bar on upper trunk; fifth bar widens at midline and may be divided at midline but is single above and below. Three weak, wide subcutaneous bars on belly region, not joined along ventral midline, posteriormost just lateral of anal aperture.

GEOGRAPHIC DISTRIBUTION.—This species is endemic to the Red Sea, taken at three general localities: the Gulf of Aqaba, Gulf of Suez, and the coastal and insular areas of Ethiopia (Figure 15).

REMARKS.—Clark (1968:5,6) reported *E. stigmapteron*, synonymyzed by Lachner and Karnella (1978) with *E. distigma*, and *E. prasina* from the Red Sea. We examined part of Clark's material reported on under *E. stigmapteron* (HUJ E62/514), 3 specimens) and allocated it to *E. pardalota* Lachner and Karnella (1978:11). Another specimen reported by Clark was not examined by us (HUJ E62/4323).

Eviota nebulosa Smith

FIGURES 15-17

Eviota nebulosa Smith, 1958:141, fig. 3 [type-locality: Pinda, Mozambique].—Larson, 1976:501.

MATERIAL EXAMINED.—138 specimens from 19 localities, totaling 48 males, 47 females, 43 juveniles; total size range 7.5–18.8; largest male 17.4, largest female 18.8; smallest gravid female 10.0.

Holotype: RUSI 259, (14.5), female; Mozambique, Pinda.

Paratype: USNM 209225, 1 (14.5), male ?; Mozambique, Pinda Reef, 3 Sep 1956, J.L.B. Smith.

Other Material: INDIAN OCEAN: SEYCHELLES ISLANDS:

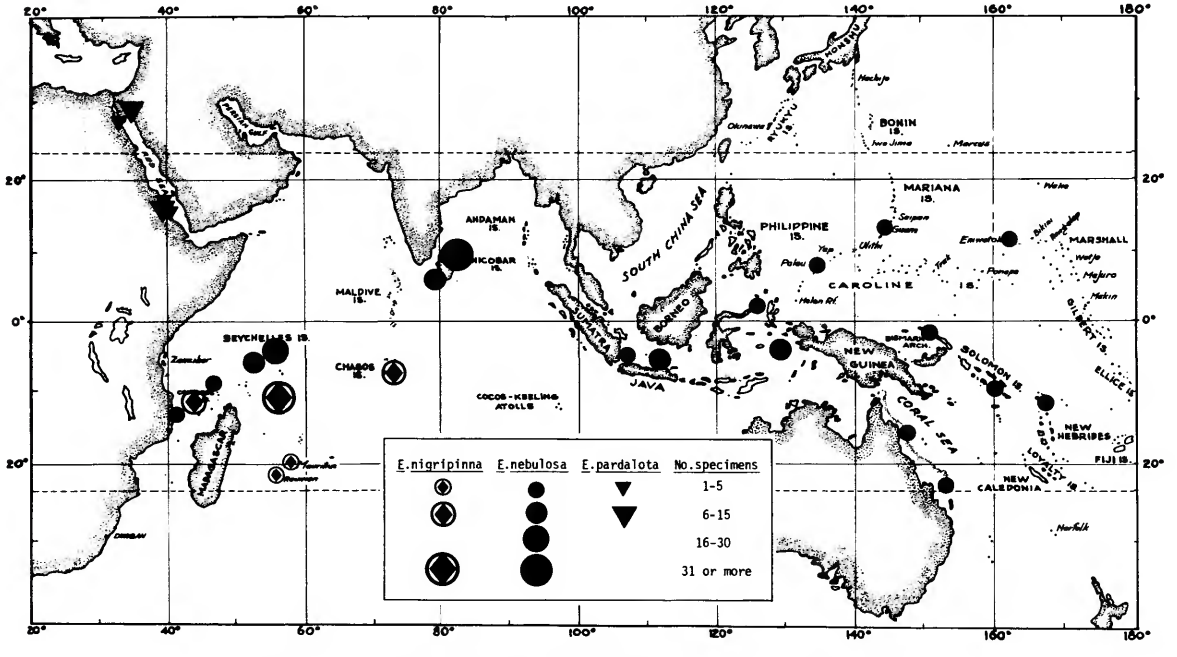

FIGURE 15.—Distributions of *Eviota nebulosa*, *E. nigripinna*, and *E. pardalota*.

ANSP 141182, 1 (14.6), female; Mahé vic., 2 Feb 1964, J. Böhlke, F-17. ANSP 141185, 11 (9.7–15.5), 3 juv., 3 males (15.5), 5 females (15.1); Praslin vic., 22 Feb 1964, J. Böhlke, F-61. ANSP 141186, 1, (14.7), female; Beacon I., 5 Feb 1964, D. Dockins, F-25. CAS 43550, 5 (7.5–15.2), 2 juv., 1 male (13.2), 2 females (15.2); Beacon I., 3 Feb 1964, J. Böhlke, F-18. AMIRANTES ISLANDS (collected by J. E. Böhlke): ANSP 141183, 1 (11.4), female; D'Arros I., 5 Mar 1964, F-87. ANSP 141184, 9 (9.8–11.6), 3 juv., 2 males (11.1), 4 females (11.6); Remire Reef, 4 Mar 1964, F-82. USNM 213918, 5 (8.4–15.0), 1 juv., 3 males (15.0), 1 female (12.2); African I., 3 Mar 1964, F-80. ALDABRA ISLANDS: USNM 219629, 3 (13.4–16.8), 1 juv., 2 females (16.8); Aldabra Atoll, 18 Aug 1967, H. A. Fehlmann, 67-56. SRI LANKA (collected by C. C. Koenig in 1970): USNM 213905, 6 (9.1–18.8), 1 juv., 2 males (17.4), 3 females (18.8); Galle, 16 Feb, 69-108. USNM 213906, 1 (13.0) male; Hikkaduwa, 17 Feb, 69-109. USNM 213908, 38 (7.9–16.1), 24 juv., 6 males (16.1), 8 females (15.5); Trincomalee, 6 Apr, 69-141. USNM 213909, 2 (13.8, 14.2), male and female; Weligama, 15 Feb, 69-107. AMS I-20795-001, 5 (8.4–15.9) 2 juv., 2 males (15.9), 1 female (13.5); Trincomalee, 4 Apr, 69-135. USNM 213910, 4 (9.4–12.8), 2 juv., 2 males (12.8); Hikkaduwa, 12 Feb., 69-100. USNM 213911, 2 (10.4, 11.0), females; Hikkaduwa, 13 Feb, 69-103. INDONESIA: USNM 213912, 2 (12.5, 12.1), male and female; Java Sea, Seribu I., 5 Apr 1974, V. G. Springer, 74-34. USNM 213913 8 (7.8–12.4), 1 juv., 2 males (12.4), 5 females (12.3); Java Sea, Bawean I., 28 Mar 1974, V. G. Springer, 74-27. USNM 213914, 5 (9.4–12.8), 4 males (12.8), 1 female (10.3); Moluccas, Ambon I., 14 Mar 1974, V. G. Springer, 74-13. USNM 213915, 7 (8.8–14.8), 3 juv., 2 males (12.8), 2 females (14.8); Moluccas, Haruku I., 15 Jan 1973, V. G. Springer, 73-9. CAS 43541, 1 (12.9), female; Celebes Sea, Lembeh Strait, 21 Jun 1929, A. W. Herre. OCEANIA: CAS 43753, 4 (11.9–13.7), 3 males (13.7), 1 female (12.6); Palau Is., Auluptagel I., 8 Jul 1956, H. A. Fehlmann, sta 12, GVF Reg. 798. UG 4335, 3 (10.1–14.2), male; Marianas Is., Guam, 25 Feb 1970, R. Jones, RSO-01, 250270. LACM W63-283-3, 1 (12.3), male; Marshall Is., Eniwetok Atoll, 20 Jul 1963, W. J. Baldwin, W63-283. AMS I.17486-001, 1 (13.0), male; Solomon Is., Guadalcanal, 11 Jul 1973, G. R. Allen. USNM 213916, 1 (13.0), male; Santa Cruz Is., Vanikoro I., 16 Apr 1965, Bolin, *Te Vega* cr. 7, sta 259. QUEENSLAND, AUSTRALIA: ENDEAVOUR REEF (collected by C. L. Smith and J. Tyler): AMNH 39067, 2 (12.4, 13.3), females; 5 Jan 1969; S69-5. AMNH 39068, 1 (13.0) male; 16 Jan 1969, S69-19. CAPRICORN GROUP: AMS I.19338-019, 1 (13.6), male; One Tree I., 26 Nov 1969, F. Talbot 417. AMS I.20210-038, 1 (12.6), male; One Tree I., 5 Oct 1971, D. F. Hoese 71-26. PAPUA NEW GUINEA: USNM 217593, 1 (14.5), female; New Ireland, Lemus, 20–25 Jan 1976, T. R. Roberts.

Questionable Allocation: CAS 14128, 1 (11.5), male; Line Is., Palmyra I., 17 Aug 1951, E. S. Herald, 51-GV-46. BPBM 9391, 1 (13.4), male; Line Is., Fanning I., 31 Oct 1968, J. E. Randall. BPBM 22575, 1 (12.2), female; Line Is., Fanning I., 7 Jan 1970, W. Gosline. ANSP 141220, 1 (14.2), male; Australia, Endeavour Reef, 6 Jan 1969, C. L. Smith, TS,A-5. USNM 219429, 1 (9.6), juv.; Philippine Is., Palawan Prov., Bararin I., 23 May 1978, V. G. Springer and Smithsonian team, SP 78-20.

DIAGNOSIS.—Eleventh through the fifteenth pectoral fin rays usually branched; spinous dorsal fin not elongate; pelvic fin moderate in length, almost always extending to anal fin origin; fifth pelvic fin ray rudimentary; upper pectoral fin base with a light unpigmented area; caudal peduncle with a dark, quadrangular mark on upper

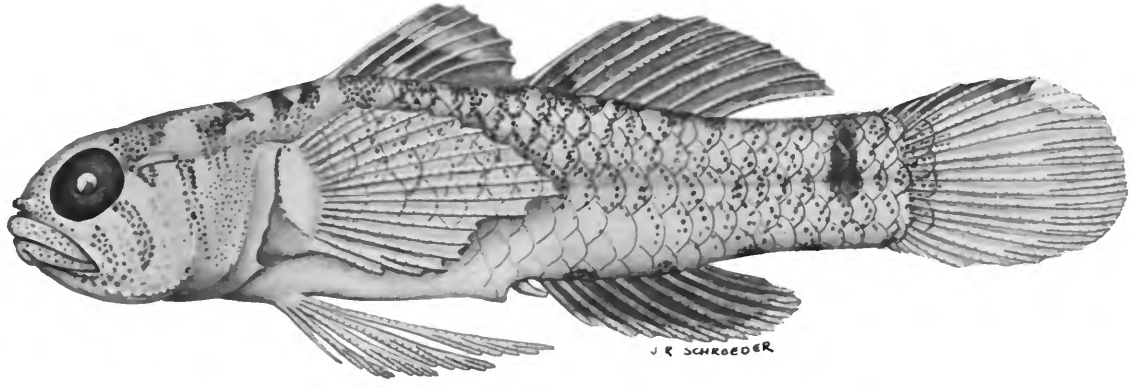

FIGURE 16.—*Eviota nebulosa*, USNM 213913, male, 11.9 mm SL, Bawean I., Java Sea. (Drawn by J. R. Schroeder.)

FIGURE 17.—*Eviota nebulosa: a*, AMS I.20795-001, male, 13.7 mm SL, Sri Lanka; *b*, ANSP 141182, female, 14.6 mm SL, Seychelles.

half; ventral midline from anal origin to end of caudal peduncle with a series of dark spots, sometimes confluent with dark, vertical, subcutaneous trunk bars.

DESCRIPTION.—Dorsal fin VI-I,8(14); anal fin I,8(14), I,9(1); pectoral fin 14(1), 15(3), 16(8), 17(3); pelvic fin I,4(1), I,4 + a rudiment (14); fourth ray of pelvic fin averages 6.7 branches; segments between consecutive branches of the fourth pelvic fin ray number 1–2; pelvic fin membrane reduced; branched caudal fin rays 12(3), 13(5), 14(2); segmented caudal fin rays 17(14); lateral scale rows 23(15), 24(4); transverse scale rows 5(1), 6(12); scales with 23–31 ctenii, 11–5 radii; breast scaleless.

Spinous dorsal fin not elongate; pelvic fin moderate in length, sometimes reaching anal fin origin, rarely beyond; contour of snout moderately rounded to somewhat sharp.

Cephalic sensory pore system is pattern 1. Cutaneous papilla system is pattern A.

Sex identification by genital papilla is often difficult. Male papilla not fimbriate, short, usually not reaching anal spine, truncate or wider centrally, fringed at tip; female papilla short, bulbous with 4 or more fingerlike projections at tip that may be confused with fringed papilla of male.

Gravid females range in length from 10.0–12.3 mm SL (5).

Vertebrae 10(11) precaudal and 16(11) caudal, total 26.

COLOR IN PRESERVATION.—Specific color marks or patterns on particular areas of the body characteristic of this species vary within and among certain localities. The variation of each of these is described below.

Light Mark on Pectoral Base: An unpigmented area on upper base bordered anteriorly and ventrally by a series of brown chromatophores, remainder of fin base with scattered chromatophores; light area enlarged in some specimens; material from Australia is variable, specimens from Endeavour Reef have large, scattered chro-

matophores in the light, upper area and the lower base is pale brownish; specimens from One Tree Island have the typical light base or a reduced light area.

Dark Subcutaneous Caudal Peduncle Spot: A conspicuous quadrate spot, on upper half of caudal peduncle, near base of caudal fin; obscure in a few specimens; rarely connected below to the last, dark, narrower, ventral midline spot.

Five dark, ventral midline spots, usually well developed; less dense vertical, subcutaneous bars on trunk, 4 on upper portion and 5 on lower portion; fourth lower bar sometimes reduced; ventral midline spots integrate with lower trunk bars; spots and bars may be obscure, bars more so.

Predorsal Color Pattern on Head and Nape: Variable development, from transverse bars to scattered chromatophores; the transverse bars on nape are usually uniform and well developed, those on head are broken up into irregular spots, forming various patterns; the typical pattern most often found is that of the dark outlined bars and spots composed of large chromatophores, with less densely pigmented interiors; other variations from this pattern are bars and spots with densely pigmented interiors, nape bars broken into spots as on head, bars and spots barely discernible, sometimes obscure, with chromatophores scattered over head and nape. Traces of the predorsal crossbars are evident on the dorsal midline to about the origin of the second dorsal fin in some specimens.

Cheek Marks: These consist of scattered, large, dark brown chromatophores that are often arranged in linear groups; one group of usually 2 rows from the eye to the rictus, a second group from the eye obliquely to about the angle of the preopercle and a third, less distinct group behind the eye, more or less parallel to the second group, and sometimes joined with a transverse head bar.

First Dorsal Fin: Pale to light dusky bars interspersed with dusky to dark bars, 2 or 3 of each; bars sometimes irregular, giving the fin pattern a mottled appearance.

Other Fins: Second dorsal and anal fins light to dusky, sometimes lighter basally, and the dusky pigmentation sometimes mottled; anal fin often with light outer edge; caudal fin usually somewhat dusky; pectoral fins clear or with some dusky color; pelvic fins clear.

Scales: Pockets outlined with a row or two of large, dark brown chromatophores, more so dorsolaterally on trunk; background of trunk uniform pale brown to dark brown.

GEOGRAPHIC DISTRIBUTION.—The species is wide ranging, known from 19 localities from Mozambique, Africa, to the Line Islands (Figure 15).

REMARKS.—This species is similar to *E. nigripinna*. *Eviota nebulosa* shows very little variation in meristic characters over its wide range, but some variation in the color pattern was observed. Specimens from Australia show variation in the development of the light pectoral base spot. A specimen from the Endeavour Reef (ANSP 141220) has clear circular areas along the base of both dorsal fins, the remainder of the fins are dusky.

Our examination of the holotype differs from the original description (Smith, 1958) as follows: the specimen is a female, 14.5 mm SL rather than a male, 20 mm; anal fin I,8 in holotype and all other specimens examined, except I,9 in one, rather than "I,7–8, normally 7"; sensory pore system complete for *Eviota*, not just "central median pore" in interorbital and "one behind opposite hind edge of pupil"; light spot on pectoral base is enlarged and exaggerated in figure 3 (Smith, 1958:141).

Eviota nigripinna, new species

FIGURES 15, 18, 19

MATERIAL EXAMINED.—206 specimens from 5 localities in the Indian Ocean, totaling 50 males, 58 females, 98 juveniles; total size range 8.6–14.0; largest male 14.0, largest female 13.9; smallest gravid female 12.0.

Holotype: USNM 213929, (12.5), male; Agalega Is., North I., 17 Apr 1976, V. G. Springer, 76-24.

Paratypes: COMORES ISLANDS: GRAND COMORE ISLAND (collected by J. E. McCosker in 1975): CAS 33436, 7 (10.5–13.4), 2 males (12.2), 5 females (13.4): 1 Mar, 75-29. USNM 213919, 1 (13.0), male; 9 Feb, 75-4. CAS 43536, 5 (9.3–13.4), 2 juv., 2 males (13.4), 1 female (12.2); 15 Feb, 75-11.

AGALEGA ISLANDS: North Island (collected by V. G. Springer in 1976): USNM 213925, 93 (8.6–14.0), 68 juv., 11 males (14.0), 14 females (13.7); 17 Apr, 76-24. USNM 213926, 6 (13.0–13.9), females; 18 Apr, 76-26. USNM 213927, 1 (13.1), female; 19 Apr, 76-28. USNM 213928, 74 (9.5–13.0), 28 juv., 22 males (13.0), 24 females (12.5); 19 Apr, 76-29. ANSP 141139, 5 (11.4–13.2), 3 males (13.2), 2 females (12.2); same as above. AMS I.20801-001, 5 (11.4–12.6), 3 males (12.6), 2 females (12.3); same as above. MAURITIUS: RUSI 1963, 1 (11.7), male; La Preneuse, 8 Mar 1971, T. H. Fraser, THF-SA-31. REUNION: BPBM 16285, 1 (ca. 12.4), male; Cap Houssaye, 27 Oct 1973, J. E. Randall. CHAGAS ARCHIPELAGO: Diego Garcia Atoll (collected by H. A. Fehlmann in 1967): USNM 213902, 1 (10.9), male; 9 Jul, 67-38. USNM 213903, 3 (12.4–13.5), females; 23 Jul, 67-51. USNM 213904, 2 (11.8, 12.1), males; 27 Jun, 67-20.

Diagnosis.—Eleventh through the fifteenth pectoral fin rays always branched; spinous dorsal fin not elongate; pelvic fin moderate in length, almost always not extending to anal fin origin; pelvic fin rays I,4, never a rudimentary fifth ray; subcutaneous dark caudal peduncle spot large and centrally located; first dorsal fin black; transverse bars dorsally on head and nape straight, almost never broken into spots, the margins of the bars darker than internal area.

Description.—Dorsal fin VI-I,8(19), VI-I,9(3); anal fin I,8(22), I,9(1); pectoral fin 15(1), 16(9), 17(2), 18(1); pelvic fin I,4(23); fourth ray of pelvic fin averages 8 branches; segments between consecutive branches of the fourth pelvic fin ray mostly 1; pelvic fin membrane reduced; branched caudal fin rays 11(3), 12(9), 13(3); segmented

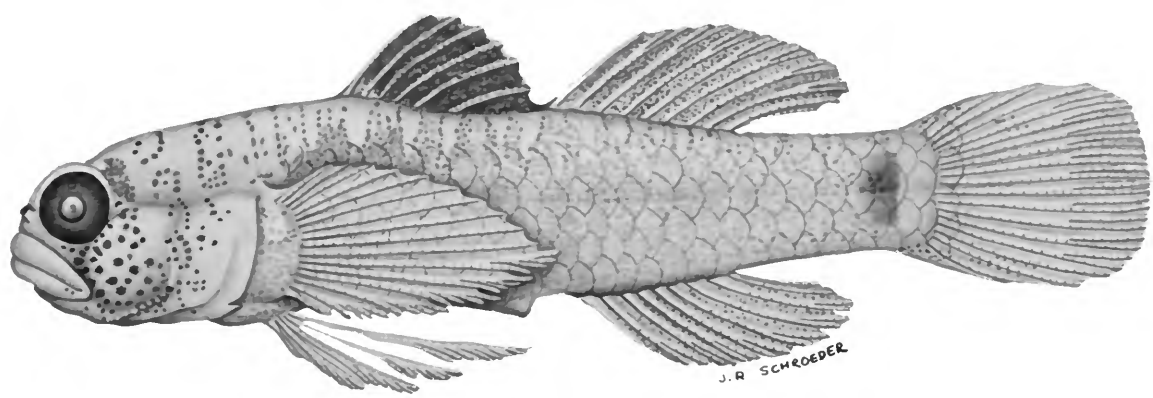

Figure 18.—*Eviota nigripinna*, USNM 213925, male, 12.5 mm SL, Agalega Is., Indian Ocean. (Drawn by J. R. Schroeder.)

Figure 19.—*Eviota nigripinna*, RUSI 1963, male, 11.7 mm SL, Mauritius, Indian Ocean.

caudal fin rays 17(22); lateral scale rows 22(2), 23(5), 24(1); transverse scale rows 5(3), 6(5). Scales with 16–23 ctenii, 10–14 radii; breast scaleless. Most specimens devoid of scales, apparently scales highly deciduous.

Spinous dorsal fin not elongate; pelvic fin moderate in length, usually reaching anal aperture, rarely to anal fin origin.

Cephalic sensory pore system is pattern 1. Cutaneous papilla system is pattern A, although poorly developed in most specimens.

Genital papilla in male not fimbriate, broad, flat, slightly tapered and fringed at tip; female papilla short, bulbous, with 4–8 fingerlike projections at tip.

Gravid females range in length from 12.0 to 13.0 mm SL (3).

Vertebrae 10(21) precaudal and 16(20), 17(1) caudal, total 26(20), 27(1).

COLOR IN PRESERVATION.—*Males*: Head with large, dark chromatophores on cheek and preopercle, usually scattered but sometimes arranged in a pattern approaching marks in *E. nebulosa*; opercle with finer and less dense dark chromatophores; head dorsally and nape with well-defined transverse bars, the borders of which are heavily pigmented with large, dark chromatophores, the interiors of the bars with finer, less dense chromatophores or lacking pigmentation, and the spaces between the bars usually without pigmentation, bars immediately behind eyes may be irregular, divided into 2 or 3 short bars or disassociated forming a patch of large chromatophores; bars or clear interspaces transgress onto upper pectoral base, resulting in a light area margined sometimes by dark chromatophores; the bars also transcend onto the dorsolateral trunk region forming a pattern that consists of light V-shaped areas descending from the dorsal midline to the dorsolateral area and continue posteriorly, but less defined, to the end of the second dorsal fin; the margins of the V-marks with heavier, dark chromatophores; remainder of trunk laterally and sometimes pectoral base with fine, dense, pale to brown pigmentation; ventral midline with 5 small, dark, subcutaneous spots from the origin of the anal fin to end of caudal peduncle, the fifth spot often connected with the central peduncle spot; same area of trunk with 4 subcutaneous bars on upper trunk and 5 below, the fourth lower bar sometimes rudimentary; a large, dark, mostly subcutaneous spot on midcaudal peduncle, anterior to base of caudal fin; caudal spot usually deeper than wide, its depth equal to or greater than one-half depth of peduncle, spot sometimes obscure; pectoral rays bordered with a fine line of dark chromatophores, sometimes line broken into fine spots, membrane clear; pelvic fin clear; membrane of first dorsal fin dense blackish, the spines clear; second dorsal fin dusky with fine dark chromatophores on membrane, rays clear; anal fin pale to light dusky, the basal portion usually with fine, dark pigmentation, the outer portion clear; caudal fin mostly clear with some fine scattered chromatophores.

Dark pigmentation usually reduced in females, resulting in a pale-colored body compared to males. Spinous dorsal fin as in males or with pigmentation reduced to a dark border, in some entirely lacking; pigmentation on second dorsal and anal fins reduced or fins clear; predorsal transverse bars less intensely developed; trunk coloration pale, lacking uniform brownish of males.

GEOGRAPHIC DISTRIBUTION.—Known from 5 small, insular localities in the Indian Ocean (Figure 15).

ETYMOLOGY.—The specific name *nigripinna* is from the Latin *nigra* (black) plus *pinna* (fin) and is in reference to the black first dorsal fin.

REMARKS.—This species resembles *E. nebulosa* but differs as follows: pelvic fin ray count of I,4; a central peduncle spot; a solid dark first dorsal fin in males; uniform predorsal bars; trunk coloration uniform brownish, scale pockets not outlined.

Eviota monostigma Fourmanoir

FIGURES 7, 20

Eviota monostigma Fourmanoir, 1971:498, fig. 6 [type-locality: New Caledonia].

MATERIAL EXAMINED.—132 specimens from 3 localities, totaling 27 males, 28 females, 77 juveniles; total size

range 8.3–27.0; largest male 27.0, largest females 21.0; smallest gravid female 14.3.

Holotype: MNHN 1979-241 (25.0), male; New Caledonia, Point Ma, 27 Dec 1970.

Paratypes: MNHN 1979-242 and 1979-243, 2 (22.0, 27.0), males; same data as holotype.

Other Material: QUEENSLAND, AUSTRALIA: Heron Island: LACM 32820-6, 1 (15.7), female; Dec 1961, G. Bartholomew. Lizard Island: USNM 213901, 2 (12.4, 16.6), juv. and female; 1 Feb 1975, D. F. Hoese, 75-38. USNM 213900, 7 (10.1–15.9), 5 juv., 1 male (15.9), 1 female (13.8); 30 Jan 1975, D. F. Hoese, 75-28. One Tree Island: USNM 219286, 1 (17.1), male; 7 Dec 1966, V. G. Springer, 66-16. USNM 219287, 1 (18.0), male; 30 Nov 1966, V. G. Springer, 66-13. AMS I.20211-039, 10 (13.5–19.0), 2 males (19.0), 8 females (17.1); 2 Oct 1971, D. F. Hoese, 71-20. AMS I.20210-036, 4 (15.4–17.5), 1 male (17.5), 3 females (15.8); 5 Oct 1971, D. F. Hoese, 71-26. AMS I.20212-027, 1 (13.7), female; 6 Oct 1971, D. F. Hoese, 71-27. AMS I.19338-018, 3 (14.3–16.3), females; 26 Nov 1969, F. Talbot, FT-417. Big Hope Island (collected by J. Tyler and C. L. Smith in 1969): ANSP 141198, 2 (8.7–11.8), juv.; 27 Jan, TS,A-33. ANSP 141192, 6 (9.0–17.1) 4 juv., 1 male (16.0), 1 female (17.1); 19 Jan, TS,A-21. ANSP 141193, 1 (ca. 11.6), juv.; 19 Jan, TS,A-22. Little Hope Island (collected by J. Tyler and C. L. Smith in 1969): AMNH 39056, 1 (10.6), juv.; 20 Jan 1969, S69-26. AMNH 39057, 1 (13.2), juv.; 19 Jan 1969, S69-23. USNM 219288, 1 (19.7), male; 20 Jan 1969, S69-27. AMNH 39058, 6 (13.1–18.1), 5 males (18.1), 1 female (17.1); 20 Jan 1969, S69-25. Endeavour Reef (collected by J. Tyler and C. L. Smith in 1969): AMNH 39059, 4 (9.1–17.5), 3 juv., 1 female (17.5); 5 Jan, S69-5. AMNH 39060, 3 (10.7–11.3), juv.; 6 Jan, S69-6. AMNH 39061, 1 (14.6), female; 7 Jan, S69-6? AMNH 39062, 4 (9.0–14.1), 2 juv., 2 males (14.1); 6 Jan, S69-7. AMNH 39063, 2 (9.0, 10.0), juv.; 13 Jan, S69-13. AMNH 39064, 3 (12.0–17.2), 1 juv., 1 male (17.2), 1 female (15.1); 14 Jan, S69-16. AMNH 39065, 4 (12.5–17.2), 2 juv., 1 male (17.2), 1 female (16.1); 15 Jan, S69-18. AMNH 39066, 4 (9.5–16.2), 3 juv., 1 male (16.2); 16 Jan, S69-19. ANSP 141187, 2 (13.6, 13.4), male and female; 4 Jan, TS, A-3. ANSP 141194, 5 (8.3–12.6), 4 juv., 1 female (12.6); 5 Jan, TS,A-4. ANSP 141188, 2 (10.9, 14.5), juv. and female; 6 Jan, TS,A-5. ANSP 141189, 1 (11.7), juv.; Cook wreck site, 11 Jan, TS,A-11. ANSP 141190, 2 (9.4, 11.3), juv.; 13 Jan, TS,A-12. ANSP 141195, 12 (9.3–15.6), 10 juv., 2 males (15.6); 13 Jan, TS,A-13. ANSP 141196, 2 (10.5, 11.3), juv.; 14 Jan, TS,A-15. ANSP 141191, 13 (9.0–14.9), 11 juv., 2 males (14.9); 15 Jan, TS,A-16. ANSP 141197, 17 (9.0–17.4), 15 juv., 2 males (17.4); 16 Jan, TS,A-17. NEW CALEDONIA: USNM 219290, 1 (21.0), female; Noumea, 15 Apr 1944, Chapman, C-17.

Diagnosis.—Pectoral rays more often simple than branched, except rays 12 and 13, occasionally all rays unbranched; rays 1–10 never branched; first dorsal spine filamentous in males, rarely in females; fifth pelvic fin ray rudimentary or absent; a dark crescent or semicircular mark at base of pectoral fin.

Description.—Dorsal fin rays VI–I,8(21), VI–I,9(1); anal fin rays I,8(21), I,9(1); pectoral fin rays 15(6), 16(11), 17(3); pectoral rays more often simple than branched except rays 12 and 13; rays 1–10 never branched; all rays unbranched in some specimens; pelvic fin rays I,4(2), I,4 + a rudiment(18), I,4 1/10(1); fourth ray of pelvic fin with 2–5 branches, averaging 3.7; segments between consecutive branches of fourth pelvic fin ray number 2–9, with a mode of 4; pelvic fin membrane reduced; branched caudal fin rays 11(2), 12(7), 13(5), 14(2), 15(1); segmented caudal fin rays 17(23); lateral scale rows 23(10), 24(6),

Figure 20.—*Eviota monostigma*, USNM 219288, male, 19.7 mm SL, Little Hope Island, Australia.

25(1); transverse scale rows 5(2), 6(10). Scales with 20–37 ctenii, 6–16 radii; breast scaleless.

First dorsal spine of male may be elongate or filamentous, the longest extending to end of second dorsal fin base; males as small as 13 mm SL have a filamentous dorsal spine; only one female, 16.6 mm SL, from Lizard Island had the first dorsal spine elongate, reaching base of second dorsal ray; pelvic fin most often reaches or extends beyond anal fin origin.

The cephalic sensory pore system is pattern 1. Cutaneous papilla system is pattern A.

Genital papilla in male simple, flat, wider at or near base, usually reaching anal spine or barely beyond; in female, papilla bulbous, short with 4 to 8 fingerlike projections at tip, usually not reaching anal spine.

Gravid females range in length from 14.3–15.7 mm SL (5).

Vertebrae, 10(9) precaudal, 16(9) caudal, total 26.

Color in Preservation.—Head and trunk covered with uniformly spaced fine brown spots giving the body an overall brown to dusky appearance. Head with 2–3 short dark streaks along dorsal midline between rear margin of eyes and origin of spinous dorsal; radiating from the eye is a small dark spot at approximately a 4 o'clock position, sometimes also one at about 2 o'clock, a dark bar from eye at 6 o'clock to rictus of jaw, sometimes reduced, appearing only as a spot at rictus, and a dark bar from margin of eye at about 7 o'clock extending across lips to chin; anterior nares dark; narrow dark bar along vertical edge, and small dark spot along lower edge of preopercle, diffuse to prominent; sometimes an elongate horizontal spot anterior to upper edge of gill opening; prominent dark crescent to semicircular shaped mark on basal region of pectoral fin, part on rayed portion and part on fleshy base, covering entire height of fin base; about 7 dark spots along dorsal midline from origin of spinous dorsal fin to caudal peduncle, typically poorly developed; similar, but more subcutaneous, spots along ventral midline from anal fin origin posteriorly to caudal peduncle, numbering up to 7; the subcutaneous bars that are frequently associated with ventral midline spots in *Eviota* are obscure; scale pockets edged in brown; pectoral fins clear to somewhat dusky in midportion; pelvic fins clear, dorsal, anal, and caudal fins uniformly dark to dusky, caudal often lighter, anal sometimes with clear outer margin; in smaller specimens the dorsal fins have a light spot in central region and tips of fins with a narrow clear margin. Females from the Australian populations tend to be lighter on the body than their male counterparts, but have more prominent head and midline body marks.

Geographic Distribution.—Known from the Great Barrier Reef and New Caledonia (Figure 7).

Remarks.—The type specimens sent to us on loan from P. Fourmanoir, received in a single package, measured 22.0, 25.0, and 27.0 mm SL. We presume that the 25.0-mm specimen represents the holotype measured as 24 mm by Fourmanoir (1971:498). The original description contains typographical errors corrected as follows: D.VI–I,8, not D.VI + IB and A.I,8, not A.18.

Eviota pseudostigma, new species

Figures 7, 21, 22

Material Examined.—Eighteen specimens from 4 localities totaling 9 males and 9 females; total size range 12.9–20.6; largest male 20.6, largest female 17.8; smallest gravid female 16.4.

Holotype: USNM 219289, (20.6), male; Seychelles Islands, Mahé vicinity, 10 Feb 1964, J. Böhlke, F-37.

Paratypes: SEYCHELLES ISLANDS, MAHÉ (collected by J. Böhlke in 1964): ANSP 141141, 6 (16.6–18.9), 3 males (18.9), 3 females (17.8); same data as holotype. USNM 219671, 3 (15.7–18.4), 1 male (18.4), 2 females (16.6); 4 Feb, F-23. ANSP 141140, 1 (16.4), female; 2 Feb, F-17. AMS I. 20796-001, 1 (16.5), male; 9 Feb, F-36. AMIRANTES ISLANDS: CAS 43545, 2 (14.7, 15.0), females; African Is., South I., 2 Mar 1964, J. Böhlke, F-75.

Other Material: SOCIETY ISLANDS, TAHITI: AMNH 39079, 1 (12.9), 21 Apr 1970, C. L. Smith, S70-41. BPBM 9419, 2 (14.8, 16.1), males; 13 Mar 1969, J. E. Randall. SAMOA ISLANDS, TUTUILA ISLAND: USNM 219672, 1 (16.6), male; Fagasa Bay, R. C. Wass.

Diagnosis.—Pectoral fin rays 3–16 may be branched, 1 specimen with all simple fin rays (branching greatly reduced in Oceanic popula-

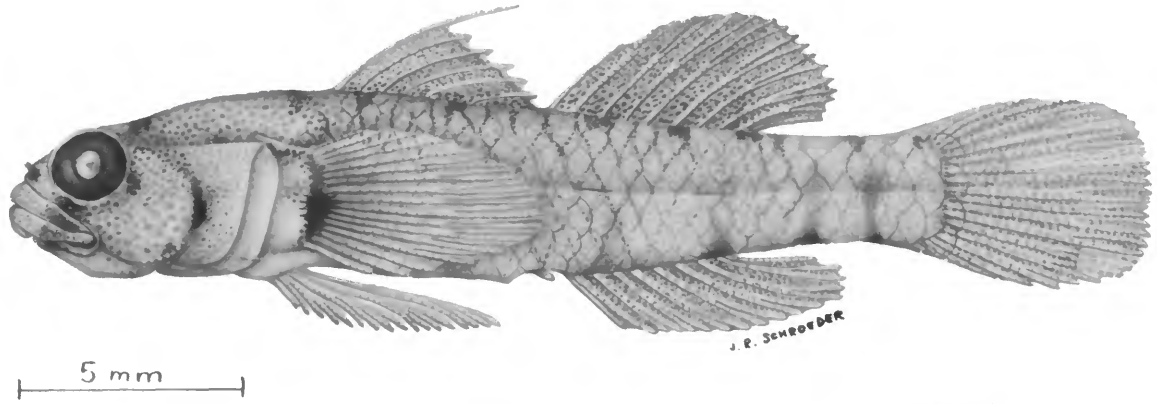

FIGURE 21.—*Eviota pseudostigma*, USNM 219289, holotype, male, 20.6 mm SL, Seychelles. (Drawn by J. R. Schroeder.)

FIGURE 22.—*Eviota pseudostigma*, CAS 43545, female, 15.0 mm SL, Seychelles.

tion, restricted to rays 12–15); first dorsal spine may be elongate or filamentous in males, extending posteriorly to base of sixth dorsal fin ray; fifth pelvic fin ray rudimentary, sometimes absent; a dark spot on lower portion of pectoral fin and base, deep and asymmetrical, larger and more intense on lower portion; 3–4 large dark spots on ventral midline posteriorly from origin of anal fin, sometimes an additional small spot at base of procurrent fin rays; 3–4 subcutaneous bars associated with the large ventral midline spots.

DESCRIPTION.—Dorsal fin VI-I,8(17), VI-I,9(1); anal fin I,7(1), I,8(17); pectoral fin 15(1), 16(6), 17(8), 18(2); pelvic fin I,4(3), I,4 + a rudiment (15); fourth ray of pelvic fin with 2–6 branches, averaging 4.4; segments between consecutive branches of the fourth pelvic fin ray 1–7, averaging 3.4; pelvic fin membrane reduced; branched caudal fin rays 11(2), 12(5), 13(1), 14(1); segmented caudal fin rays 17(18); lateral scale rows 23(4), 24(4); transverse scale rows 5(5), 6(2); breast scaleless. Scales with about 22–25 ctenii, 7–10 primary radii, and 1–3 secondary radii.

First dorsal spine of male may be elongate or filamentous, extending at most to base of sixth dorsal fin ray; no spinous dorsal fin elongation in females; length of pelvic fin usually extending to

origin of anal fin or beyond, in some shorter.

Cephalic sensory pore system is pattern 1. Cutaneous papilla system is pattern A.

Genital papilla in male not fimbriate, broad but narrower and fringed at tip, its length usually not reaching origin of anal fin; female papilla short, bulbous and with about 4 fingerlike projections at tip.

Only two gravid females found, 16.4 and 16.7 mm SL.

Vertebrae 10(3) precaudal and 16(3) caudal, total 26.

COLOR IN PRESERVATION.—The salient color pattern consists of a series of spots on the side of head and along dorsal and ventral midlines, broad subcutaneous trunk bars, and a deep, dark asymmetrical spot on lower portion of pectoral fin and base. The head, laterally, has moderately developed spots at positions 2 and 4 o'clock, in relation to eye, and a dark bar at position 8 o'clock, extending across lips; spot at 2 o'clock weak, sometimes absent or integrated with transverse bar over head; dark spot at rictus, which (in a few specimens) may connect to eye in form of a bar at the 6 o'clock position; head and nape predorsally with 2–3 transverse bars consisting of clustered chromatophores, or area without bars and with uniformly scattered chromatophores; dark spot laterally on middle of anterior opercle, just touching preopercular margin, deeper than wide, and another spot, almost always subcutaneous, on lower preopercular margin; a pale band extending from ventral portion of pectoral fin base to bases of pelvic fins; dark spot on pectoral fin base and basal portions of rays, crescent shaped and asymmetrical, denser and more intense ventrally; in some specimens the pectoral base spot is divided into an upper and lower portion, and in some only the dark lower portion persists, the upper part nearly absent; dorsal midline from origin of spinous dorsal fin to base of procurrent caudal rays with 7–9 dark spots; ventral midline from origin of anal fin to base of procurrent caudal rays with 3–4 prominent spots and often an additional small spot at base of procurrent rays; 3/3 or 4/4 wide subcutaneous bars on trunk, rarely 3/4; 2 broad subcutaneous bands on belly; a narrow dusky bar traversing base of caudal fin; median fins dusky, paired fins pale; head and trunk more or less uniform dusky brown.

GEOGRAPHIC DISTRIBUTION.—Known from two disjunct areas, the Seychelles and Amirantes Islands, Indian Ocean, and the Samoa and Society Islands in Oceania (Figure 7).

ETYMOLOGY.—The specific name *pseudostigma* is from the Greek *pseudos* (fallacy) plus *stigma* (a mark, brand, spot) and is in reference to the incomplete development of the pectoral base spot in comparison to that of *E. monostigma.*

REMARKS.—*Eviota pseudostigma* is similar to *E. monostigma* in many merisitic, morphological, and color characters, and poorly preserved specimens may be confused if their allopatric distributions are not considered. These species share the following characters: cephalic sensory pore system complete for the genus; vertebrae 26; genital papilla in male nonfimbriate; dorsal-anal fin formula usually 8/8; pelvic membrane reduced; spinous dorsal fin elongate in males; fifth pelvic fin ray rudimentary; a large, deep, dark spot on lower pectoral fin and base; pale area, lacking chromatophores, through and joining pectoral and pelvic fin bases; spots along dorsal midline from origin of spinous dorsal fin to procurrent caudal fin rays almost always 8–9; a faint, dark vertical bar near base of caudal fin present; first dorsal, second dorsal, anal, and caudal fins with almost uniform, dusky pigmentation; small dark spots present on cheek adjacent to eye at positions of 2 and about 4 o'clock with respect to eye, dark spot or bar at position of 6 o'clock and bar at 8 o'clock; nape with 2–3 faint transverse bars composed of scattered chromatophores or nape uniform with fine, scattered chromatophores; a faint spot on midpreopercular margin and one on lower preopercular margin, the latter often subcutaneous and both spots may be obscure in some specimens.

Eviota pseudostigma differs from *E. monostigma* in always having a less intense spot at base of pectoral fin, which is crescent shaped and asymmetrical, denser below; on some specimens the spot

is nearly divided into an upper and lower portion, and some have a very dark lower portion, the upper portion nearly absent; the dark spots along the ventral midline from the origin of the anal fin posteriorly to the procurrent caudal fin rays are enlarged and number 3–4 with an additional small, weak spot sometimes present at the base of the procurrent caudal fin rays; the dark subcutaneous bars are moderately intense, comparatively wide, and number 4/4 or 3/3, rarely 3/4; and many more rays of the pectoral fin are branched, the branching occurring from the third to the sixteenth rays. *Eviota monostigma* has a uniformly shaped, deep, black spot on base and lower pectoral fin, which is semicircular or crescent shaped; the dark spots along the ventral midline are small, weak to moderately intense, and number 6–7, the seventh or last spot at base of procurrent caudal fin rays often weak and sometimes absent; the subcutaneous bars are almost always obscure but, when visible, may number 4/4 or 4/5; the pectoral fin rays are mostly simple, the branching occurring in a few specimens from the eleventh to the fourteenth rays.

The two widely separated populations of *E. pseudostigma* may represent distinct species, but we are limited to only 4 specimens of the Oceania population from the Samoa and Society Islands and 14 specimens from the Seychelles and Amirantes Islands. Both populations are similar in their color pattern and its intensity and in almost all meristic characters. The Indian Ocean population almost always has 4/4 subcutaneous bars, rarely 3/4, whereas the Oceania population has 3/3 in three specimens and 3/4 in the fourth specimen. The Indian Ocean specimens have extensive branching of the pectoral fin rays, occurring from the third ray through the sixteenth ray, the rays 11–14 are always branched, whereas the 4 Oceania specimens have the pectoral branching restricted to the twelfth through the fifteenth rays. One of the Samoan specimens had all simple pectoral fin rays. The number of pectoral fin rays of the Oceania population is somewhat higher (17–18, av. 17.5 in 4 specimens) compared to those of the Indian Ocean (15–17, av. 16.4 in 13 specimens). An interesting feature of these greatly disjunct populations is their comparative similarity, and that the distribution of *E. monostigma*, a sister species, is located more or less between these populations.

Eviota distigma Jordan and Seale

FIGURES 23, 24

Eviota distigma Jordan and Seale, 1906:389, fig. 79 [type-locality: Pago Pago, Samoa].

Eviota stigmapteron Smith, 1958:141, pls. I-H, fig. 2 [type-locality: Aldabra; incorrectly listed in publication as Mahé, Seychelles (Fraser, pers. comm.)].

MATERIAL EXAMINED.—323 specimens from 25 localities, totaling 150 males, 106 females, 67 juveniles; total size range 6.7–20.3; largest male 20.3, largest female 18.6; smallest gravid female 11.5.

Lectotype: SU 8710 (ca. 13.1), male; Samoa, Pago Pago, summer 1902, D. S. Jordan.

Paralectotypes: USNM 51767, 4 (11.3–12.1), 2 males (12.1), 2 females (11.6); Samoa, Pago Pago, 1902, Jordan and Kellogg.

Other Material: RED SEA: USNM 216575, 5 (9.6–16.0), 3 males (15.5), 2 females (16.0); Gulf of Suez, 27 Sep 1969, V. G. Springer, 69-29. FMNH 83849, 1 (11.6), juv.; Elat, coll. 1972, J. Sohn, 16. GULF OF AQABA (collected in 1969 by V. G. Springer): USNM 216583, 7 (7.1–14.4), 2 juv., 1 male (13.2), 4 females (14.4); 15 Jul, 69-1. USNM 216578, 1 (10.9), male; 21 Jul, 69-6. USNM 216581, 1 (13.8), male; 23 Jul, 69-7. USNM 216582, 3 (13.9–14.9), 2 males (14.9), 1 female (13.9); 29 Jul, 69-8. USNM 216574, 1 (11.2), male; 8 Sep, 69-23. ETHIOPIA (collected in 1969 by V. G. Springer): USNM 216573, 1 (14.7), male; 9 Aug, 69-10. USNM 216577, 1 (13.0), female; 13 Aug, 69-13. AMS I. 20059-001, 3 (12.1–15.1), 1 juv., 1 male (15.1), 1 female (12.7); 12 Aug, 69-12. INDIAN OCEAN: ALDABRA ISLANDS: RUSI 260, holotype of *E. stigmapteron* Smith, (15.6), male; Aldabra (locality incorrectly given as Mahé in original description), 13 Nov 1954, Sey. 2956. SEYCHELLES ISLANDS (collected in 1964 by J. E. Böhlke): ANSP 141154, 1 (13.3), male; Faon I., 29 Jan, F-11. ANSP 141158, 1 (13.6), female; Mahé, 9 Feb, F-36. ANSP 138924, 17 (7.8–16.2), 11 juv., 4 males (16.2), 2 females (15.3); Mahé vic., 10 Feb, F-37. ANSP 141156, 9 (9.3–17.1), 4 juv., 4 males (17.1), 1 female (14.9); Mahé vic., 11 Feb, F-44. ANSP 141152, 1 (12.5), male; Mahé, 16 Feb, F-53. ANSP 141157, 31 (6.7–15.7), 13 juv., 11 male (15.7), 7 females (10.3); Praslin I., 22 Feb, F-59. AMS I. 20805-001, 3 (11.1–13.0), 2 males (13.0), 1 female (11.1); Mahé, 31 Jan, F-13. USNM 216580, 15 (10.1–17.5), 5 juv., 4 males (17.5), 6 females (15.2); Mahé vic., 2 Feb, F-17. MAURITIUS: RUSI

2160, 1 (11.4), male; E of Beauchamp, 7 Mar 1971, T. H. Fraser, THF-SA-29. India: FMNH 83871, 1 (15.7), male; W of Cochin Harbor entrance, Kalava, 7 Apr 1964, Beardsley, LW-30. AUSTRALIA: QUEENSLAND: ANSP 141165, 2 (16.5, 14.8), male and female; Musgrove I., coll. 1935, G. Vanderbilt. ANSP 113523, 2 (ca. 6.9, 10.1), juv., Endeavour Reef, Cook wreck site, 14 Jan 1969, J. Tyler, TS,A-14. ANSP 141153, 2 (14.8, 15.4), male; Endeavour Reef, 13 Jan 1969, J. Tyler, TS,A-13. ANSP 141155, 1 (14.2), male; Big Hope I., 19 Jan 1969, J. Tyler, TS,A-21. ANSP 141392, 1 (14.8), male; Little Hope I., 20 Jan 1969, J. Tyler, TS,A-23a. AMNH 39025, 5 (9.5–13.7), 3 juv., 1 male (13.7), 1 female (12.5); Endeavour Reef, 13 Jan 1969, C. L. Smith, S69-15. AMNH 39026, 4 (10.3–14.0), 1 juv., 3 females (14.0); Endeavour Reef, 5 Jan 1969, C. L. Smith, S69-5. AMNH 39027, 2 (9.9, 13.5), juv. and male; Little Hope I., 19 Jan 1969, C. L. Smith, S69-23. AMS I. 20210-037, 16 (10.8–16.8), 10 males (16.8), 6 females (14.5); One Tree I., Microatoll, 5 Oct 1971, D. F. Hoese, 71-26. AMS I. 18739-095, 5 (10.4–12.5), 2 males (12.4), 3 females (12.5); Lizard I., Palfrey I., 21 Nov 1975, D. F. Hoese, LZ 75-49. AMS I. 19108-104, 7 (8.9–11.8), 5 juv., 2 males (11.8); Lizard I., Bird I., 17 Nov 1975, D. F. Hoese, LZ 75-42. USNM 216584, 1 (13.4), female; W of Lizard I., Eagle Cay, 12 Feb 1975, D. F. Hoese, LZ 75-133. INDONESIA: USNM 209980, 1 (9.8), female; Saparua, 18 Jan 1973, V. G. Springer, 73-14. USNM uncat., 2 (10.9, 15.1), male; Netherland Indies, Longley. USNM uncat., 8 (9.4–17.1), 2 juv., 6 females (17.1); Netherland Indies, Longley. OCEANIA: CAROLINE ISLANDS: CAS 43806, 1 (13.4), male; Yap I., 29 Dec 1969, Bapilung, sta 101, GVF Reg. 1924. CAS 43768, 2 (13.0, 15.4), males; Sorol Atoll, 28 Oct 1956, Scott, sta 196, GVF Reg. 993. CAS 43705, 2 (15.3, 16.5), males; Ifaluk Atoll, 13 Sep 1953, R. R. Harry, sta 1, GVF Reg. 122. AMS I. 18398-001, 3 (12.1–16.8), 2 males (16.8), 1 female (12.1); Truk, 10 Jul 1969, J. E. Randall. Kapingamarangi Atoll, collected in 1954 by R. R. Harry: CAS 43729, 1 (12.0), male; 13 Aug, sta 143, GVF Reg. 446. CAS 43718, 1 (12.0), male; 24 Jul, sta 74, GVF Reg. 377. CAS 43709, 2 (12.8, 14.0), males; 28 Jun, sta 6, GVF Reg. 309. CAS 43713, 1 (12.5), male; 17 Jul, sta 51, GVF Reg. 354. USNM 216569, 5 (12.4–15.0), 3 males (15.0), 2 females (13.1); 20 Jul, sta 60, GVF Reg. 363. CAS 43727, 4 (11.6–13.6), 2 males (13.6), 2 females (12.2); 9 Aug, sta 126, GVF Reg. 429. CAS 43711, 1 (13.3), female; 13 Jul, sta 38, GVF Reg. 341. CAS 43719, 3 (10.4–14.2), 2 males (10.8), 1 female (14.2); 26 Jul, sta 77, GVF Reg. 380. CAS 43721, 1 (10.6), female; 27 Jul, sta 83, GVF Reg. 386. CAS 43715, 2 (13.0, 11.3), male and female; 23 Jul, sta 71, GVF Reg. 374. CAS 43725, 1 (13.4), male; 6 Aug 1954, sta 117, GVF Reg. 420. CAS 43731, 2 (9.4, 11.1), juv. and female; 16 Aug, sta 159, GVF Reg. 462. MARIANAS ISLANDS: CAS 43802, 5 (14.2–16.7), 3 males (16.7), 2 females (14.3); Guam, 7 Apr 1959, H. A. Fehlmann, 59-31, GVF Reg. 1859. UG 4242, 11 (11.3–15.9), 2 juv., 5 males (15.9), 4 females (13.8); Guam, 6 Dec 1969, H. Kami, RSJ-01. UG 5293, 3 (9.6–12.3), 2 juv., 1 female (12.3); Guam, 3 Oct 1970, R. Jones, RSJ-02. MARSHALL ISLANDS: USNM 216567, 11 (9.8–14.9), 5 males (14.9), 6 females (14.6); Eniwetok Atoll, 20 Jul 1963, W. J. Baldwin, W 63-283. USNM 216570, 1 (15.3), male; Eniwetok Atoll, 15 Jul 1954, A. D. Welander, Univ. Washington cat no. 14488. BPBM 8872–8873, 2 (12.5, 14.7), males; Eniwetok Atoll, 2 and 6 Jan 1970, G. R. Allen. USNM 216572, 3 (12.4–15.4), 2 males (15.4), 1 female (13.6); Eniwetok Atoll, Rigili I., 26 Sep 1969, C. E. Dawson, 1381. USNM 216568, 2 (11.5, 12.1), males; Bikini Atoll, 12 Aug 1946, Univ. Washington cat. no. 8479. Gilbert Islands: AMS I. 18031-001, 1 (14.8), female; Abaiang Atoll, 3 Nov 1973, D. F. Hoese. AMS I.18043-004, 9 (11.7–14.0), 5 males (13.1), 4 females (14.0); Abaiang Atoll, 6 Nov 1973, D. F. Hoese. USNM 216591, 1 (15.1), male; Onotoa Atoll, North I., 25 Jul 1951, D. Strasburg, NL-U-216. LINE ISLANDS, PALMYRA: CAS 43693, 8 (16.1–20.3), 6 males (20.3), 2 females (18.6), 15 Aug 1951, 51-GV-44. USNM 216579, 2 (18.5, 15.8), male and female; same data as above. USNM 216576, 3 (8.5–14.6), 2 juv., 1 male (14.6); 10 Aug 1951, 51-GV-45. CAS 43692, 5 (15.2–19.4), 4 males (19.4), 1 female (15.2); 14 Aug 1951, Herald. CAS 43696, 6 (13.4–15.5), 4 males (15.5), 2 females (15.4); 20 Aug 1951, 51-GV-48. BPBM 22573, 1 (16.4), male; 12 Nov 1968, J. E. Randall. BPBM 22561, 3 (17.5–18.3), male; J. E. King. BPBM 22562, 1 (17.7), male; 29 Dec 1959, Gosline. SAMOA ISLANDS: USNM 216566, 1 (13.8), male; Tutuila I, R. Wass. ANSP 51011–51012, 2 (11.5, ca. 11.9), females; Pago Pago, 1917, Capt. C. F. Silvester. COOK ISLANDS: BPBM 22569, 2 (14.1, 16.0), males; Aitutaki, 10 Jan 1965, Snyder. SOCIETY ISLANDS: TAHITI (collected in 1970 by C. L. Smith): AMNH 39028, 1 (9.5), female; 25 Apr, S70-60. AMNH 39029, 1 (14.6), male; 23 Apr, S70-52. AMNH 39030, 1 (14.3), female; 25 Apr, S70-59. AMNH 39031, 6 (8.7–12.8), 5 juv., 1 female (12.8); 22 Apr, S70-48. AMNH 39032, 2 (13.8, 10.9), male and female; 23 Apr, S70-51. AMNH 39033, 1 (9.9), juv.; 22 Apr, S70-47. MOOREA (collected in 1970 by C. L. Smith): AMNH 39034, 1 (12.9), male; 27 Apr, S70-66. AMNH 39035, 6 (9.4–14.2), 1 juv., 3 males (14.2), 2 females (13.0); 26 Apr, S70-62. TUAMOTU ARCHIPELAGO: BPBM 13603, 1 (12.6), female; Mangareva, 14 Dec 1970, J. E. Randall. RAROIA ATOLL (collected in 1952 by R. R. Harry): CAS 43701, 1 (14.5), male; 18 Jul, sta 23, GVF Reg. 77. CAS 43703, 16 (10.4–14.4), 2 juv., 6 males (13.7), 6 females (14.4); 23 Jul, sta. 28, GVF Reg. 82. USNM 216571, 2 (12.5, 14.8), male and female; same data as above. CAS 43698, 1 (13.1), female; 30 Jun, sta 7, GVF Reg. 61. CAS 43704, 1 (13.0), female; 31 Jul, sta 42, GVF Reg. 96.

Tentative Identification: AMNH 39036, 2 (12.6, 12.7), females; Queensland, Little Hope I., 20 Jan 1969, C. L. Smith, S69-27.

DIAGNOSIS.—Pectoral rays 10–15 almost always branched; spinous dorsal fin elongate or filamentous in males; fifth pelvic fin ray small or rudi-

mentary, usually about one-tenth the length of the fourth pelvic fin ray; males with 2 dark conspicuous spots on base of pectoral fin, absent or faintly developed in females.

DESCRIPTION.—Dorsal fin VI-I,7(3), VI-I,8-(45), VI-I,9(3); anal fin I,7(11), I,8(42); pectoral fin 14(2), 15(16), 16(30), 17(2); pelvic fin I,4 + a rudiment (7), I,4 1/10 (25), I,4 2/10(5); fourth ray of pelvic fin with an average of 7.1 branches; segments between consecutive branches of the fourth pelvic fin ray number 1–4, averaging 2.0; pelvic fin membrane medium or well developed; branched caudal fin rays 12(4), 13(16), 14(7), 15(1); segmented caudal fin rays 16(2), 17(50); lateral scale rows 22(4), 23(30), 24(7), 25(1); transverse scale rows 5(3), 6(11); breast scaleless. Scales with about 21–29 ctenii, 10–13 primary radii.

First 3 dorsal spines of males may be elongate, the first two filamentous and the first usually longest, the maximum length not exceeding end of depressed second dorsal fin; no spinous dorsal elongation in females; pelvic fins moderately long, usually reaching the origin of the anal fin or extending beyond it.

The cephalic sensory pore system is pattern 1. Cutaneous papilla system is pattern A.

Genital papilla in male not fimbriate, moderately broad and long, sometimes reaching base of first anal ray, and occasionally flared at tip; female papilla bulbous, reaching at most to anal spine, the tip with 4–6 fingerlike projections.

Gravid females range in size from 11.5–14.5 mm SL.

Vertebrae 10(23) precaudal and 15(1), 16(20), 17(2) caudal, total 25(1), 26(20), and 27(2).

COLOR IN PRESERVATION.—This species has prominent sexual dichromatism as illustrated in Figure 23*a,c* (male) and *b,d* (female). Males commonly with prominent dark spots predorsally from origin of first dorsal fin to eyes, spots round to transversely elongate, usually more prominent laterally in occipital area, spots occasionally joined to form transverse bands; cheek with oblong to circular brownish spots, more weakly developed than those on nape; snout and chin pale to brownish; base of pectoral fin with two intensely developed brownish-black spots about equal in size to pupil; an intense dark, subcutaneous caudal peduncular spot, usually squarish or irregular shaped, somewhat deeper than wide, its depth at least one-half that of caudal peduncle; trunk with 7 or 8 conspicuous subcutaneous bars, the first passing through the anterior part of spinous dorsal fin and the last sometimes joined with the caudal peduncular spot; six bars from origin of anal fin posteriorly; bars sometimes broken into upper and lower portions, the upper then numbering 5 or 6, always most heavily developed along ventral midline of caudal peduncle; bars sometimes emerging on dorsal and ventral midlines and extending onto respective portions of first and second dorsal fins and anal fin; trunk uniformly pale to brownish with scale pockets heavily pigmented; when scales are absent, the pigmented diamond-shaped scale pattern persists; first dorsal fin uniform brownish with an anterior basal pale area and, in some, a broad, oblique dark band in midportion; second dorsal and anal with outer half uniform brownish, the basal area sometimes with pale and brown mottlings; caudal fin brownish, outer half finely pigmented, basal portion with coarser pale to light and brown to black chromatophores, the immediate base pale; rays of pectoral fins with fine chromatophores, membranes clear; rays of pelvic fins with some fine chromatophores, less than pectoral, membranes clear.

Females differ from males primarily in the absence of two spots on the fleshy base of the pectoral fin, these almost always very diffuse or indistinguishable; predorsal area is weakly spotted, sometimes rather uniformly brownish, never with conspicuous lateral occipital spots; cheek marks weak, sometimes broken up into scattered chromatophores; first dorsal fin with 3 dark oblique bars, 1 basally, 1 in midportion, and 1 along margin separated by pale bands, sometimes dark bars diffuse.

Our material from Australia differs somewhat in the intensity of certain color marks, such as: males with twin pectoral base spots not conspic-

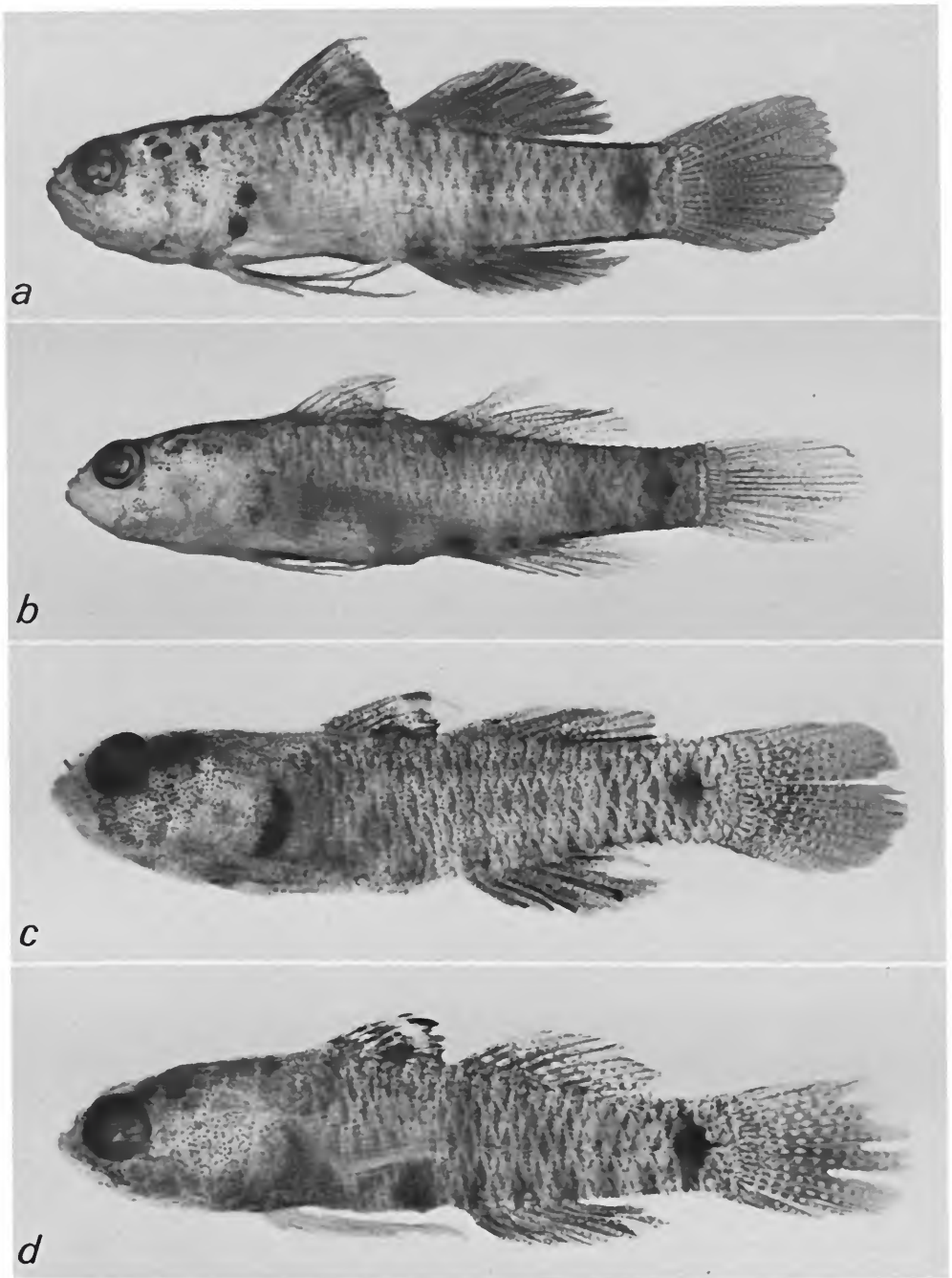

FIGURE 23.—Geographic and sexual differences in the color pattern of *Eviota distigma: a*, USNM 216576, male, 14.6 mm SL, Palmyra; *b*, CAS 43693, female, 15.8 mm SL, Palmyra; *c*, RUSI 2160, male, 11.5 mm SL, Mauritius; *d*, ANSP 138924, female, 10.5 mm SL, Seychelles.

uous, weakly developed and brownish, lateral occipital spots also weak; females with weakly developed twin pectoral base spots, about as intense as in males, and brown predorsal spots occasionally arranged into transverse bands, first dorsal fin with black bars interspersed with less dense brownish black pigmentation. Both sexes with the subcutaneous bars emerging along the midlines more commonly than in specimens from other areas, and extending more conspicuously into the fins.

GEOGRAPHIC DISTRIBUTION.—A wide-ranging species, occurring in the Red Sea and western Indian Ocean, absent from Sri Lanka to New Guinea except for a specimen taken at Saparua Island, and broadly distributed in Oceania and the Great Barrier Reef eastward to the Tuamotu Archipelago (Figure 24).

REMARKS.—Our analysis and interpretation of the extant original material and our designation of the specimen SU 8710, a male 13.1 mm SL, as the lectotype of *E. distigma* is discussed by Lachner and Karnella (1978: 9).

We find no major differences between the Red Sea and Indian Ocean specimens of this species, including the type material of *E. stigmapteron* Smith, compared with those of Oceania. A paratype of *E. stigmapteron* received from RUSI now catalogued as USNM 209226, represents an undescribed species of *Eviota*.

Two females from Little Hope Island, AMNH 39036, tentatively placed with *E. distigma*, differ in coloration. The trunk is more heavily mottled in brownish; the twin pectoral base spots are comparatively well developed; the second dorsal fin has four irregular oblique bars, almost as well developed as those of the first; the anal fin is bicolored at base, pale and brownish; the area posterior to the dark peduncular spot is pale with an upper and lower dark spot on the small procurrent rays; the caudal rays basally with a weak brownish vertical bar, the remainder of the fin rays with light and dark flecks, the membranes clear.

Eviota herrei Jordan and Seale

FIGURES 25, 26

Eviota herrei Jordan and Seale, 1906:390, fig. 81 [type-locality: Apia, Samoa].

MATERIAL EXAMINED.—Twenty-two specimens from 8 widely scattered localities totaling 8 males, 12 females, and 2 juveniles; total size range 8.1–13.6; largest male 13.6, largest female 13.0; smallest gravid female 12.2.

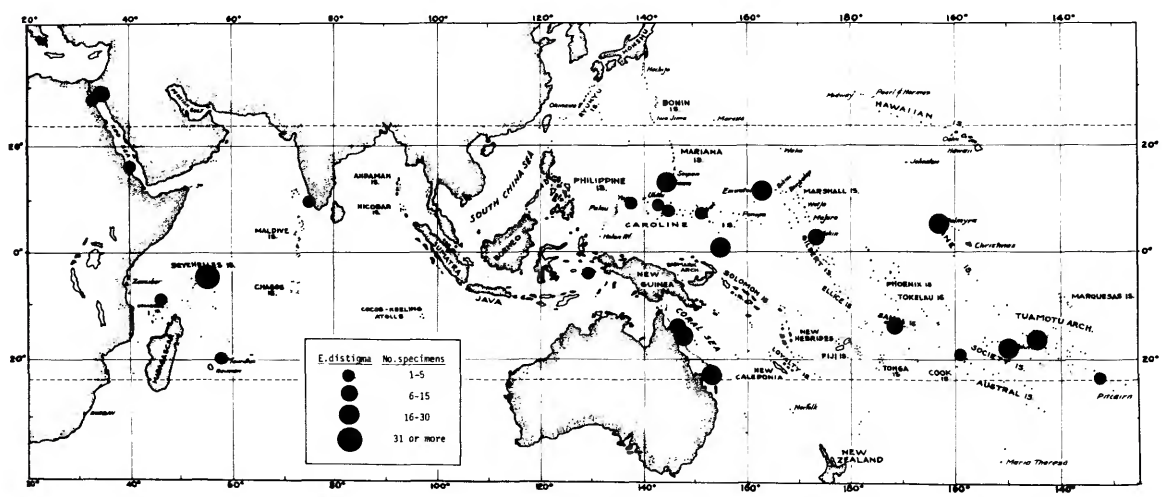

FIGURE 24.—Distribution of *Eviota distigma*.

Lectotype: USNM 51769, (12.9), male; Samoa Is., Apia, Jordan and Kellogg.

Paralectotypes: USNM 219448, 2 (10.3, 11.7), male and female; same data as lectotype, removed from USNM 51769.

Other Material: INDONESIA: USNM 213923, 1 (13.0), female; Java Sea, Seribu I., 5 Apr 1974, V. G. Springer, 74-33. USNM 213921, 1 (9.2), female; Java Sea, Karimundjawa I., 29 Mar 1974, V. G. Springer, 74-28. USNM 213922, 1 (9.5), male; Java Sea, Karimundjawa I., 30 Mar 1974, V. G. Springer, 74-30. USNM 213924, 9 (8.1-11.5), 2 juv., 2 males (11.5), 5 females (10.1); Banda Is., Naira I., 7 Mar 1974, V. G. Springer, 74-7. OCEANIA: CAS 43821, 1 (11.7), female, Palau Is., Koror I., 8 Jul 1955, H. A. Fehlmann, sta 10, GVF Reg. 509. CAS 43822, 3 (12.2-13.5), 1 male (13.5), 2 females (12.3); Palau Is., Koror I., 16 Oct 1955 (or 14 Nov 1956), H. A. Fehlmann (or Gaines), sta 232. AMNH 39037, 1 (13.6), male; Queensland, Australia, Little Hope I., 21 Jan 1969, C. L. Smith, S69-29. USNM 219630, 1 (13.2), male; vic. Tonga Is., 18°40'30"S, 173°59'60"W, 25 Jun 1965, R. Bolin, Te Vega cr. 8, sta 305. BPBM 17198, 1 (10.5), female; Tubuai Is., Rapa, off Haurei Bay, 27 Jan 1971, Randall.

DIAGNOSIS.—A stout, deep-bodied species; pectoral fin rays usually 14, rays 9–14 almost always branched; fifth pelvic fin ray short, one-tenth to three-tenths length of fourth pelvic fin ray, usually two-tenths; both sexes lack conspicuous color marks, body generally brownish.

DESCRIPTION.—Dorsal fin VI-I,8(15); anal fin I,8(15); pectoral fin 14(11), 15(3), 16(1); pelvic fin I,4 1/10(1), I,4 2/10(8), I,4 3/10(2); fourth ray of pelvic fin with 4–7 branches; segments between consecutive branches of the fourth pelvic fin ray number 1–7, modally 3; pelvic membrane well developed; branched caudal fin rays 12(3), 13(4); segmented caudal fin rays 17(13); lateral scale rows 21(1), 22(1), 23(7), 24(2); transverse scale rows 6(7), 7(5); scales with 8–12 primary radii and 17–25 ctenii; breast scaleless.

Some males with the first and second spines of the spinous dorsal fin elongate, one specimen, 9.5 mm, with first spine filamentous and extending to end of second dorsal fin base; no spinous dorsal elongation in females; pelvic fins moderately long, usually reaching anal fin origin or beyond.

The cephalic sensory pore system is pattern 1. Cutaneous papilla system is pattern A.

The male genital papilla not fimbriate, elongate, flat, and somewhat bifurcate at tip, reaching beyond origin of anal fin; female papilla short, slightly longer than wide, and with 4–6 fingerlike projections on tip.

Smallest gravid female 12.2 mm SL from Koror Island, Palau Islands.

Vertebrae 10(32), 11(1) precaudal and 16(33) caudal, total 26(32), 27(1).

COLOR IN PRESERVATION.—Head and trunk brownish in both sexes, lacking prominent color marks. Predorsal area with small, faint, round brownish spots extending anteriorly to eyes, sometimes broken up into diffuse spots or uniform brownish; occipital area lacking heavy dark spots; cheek with weak spots or oblong bars, sometimes diffuse brownish; pectoral base with uniform fine

FIGURE 25.—*Eviota herrei*, USNM 213924, male, 10.9 mm SL, Banda Islands.

brownish speckling; caudal peduncle with a faint subcutaneous dark bar, deeper than wide, one-half or more depth of caudal peduncle; trunk with about 8 weakly developed subcutaneous bars, 6 from origin of anal fin to end of caudal peduncle, usually more heavily developed on lower caudal peduncle than elsewhere on trunk, and emerge as 6 spots on ventral midline; some smaller specimens with 7–8 dark spots along dorsal midline from origin of first dorsal fin to end of caudal peduncle; body laterally brownish, more so on scale pockets; first dorsal fin in male usually uniformly dark, mottled in light to dark brown or with indistinct brown bars; first dorsal fin in females as in males but more frequently with contrasting light and dark bars; second dorsal and anal fins brownish, usually mottled in light to brown basally, more so on anal fin; caudal fin brownish, the outer portion with finer chromatophores than basal portion; pectoral and pelvic fins largely pale.

GEOGRAPHIC DISTRIBUTION.—An uncommon species, known from 8 scattered localities from the Java Sea eastward within a relatively narrow latitudinal belt to Rapa Island, Tubuai Islands (Figure 26).

REMARKS.—This species may be confused with *E. distigma* but differs in the following characters: the dark, prominent twin pectoral spots of males of *E. distigma* are absent; the dark lateral occipital spots are lacking; the cheek and predorsal spots are smaller, less intense, and more diffuse; the subcutaneous bars are less prominent, often only visible on the ventral midline; the dark peduncle

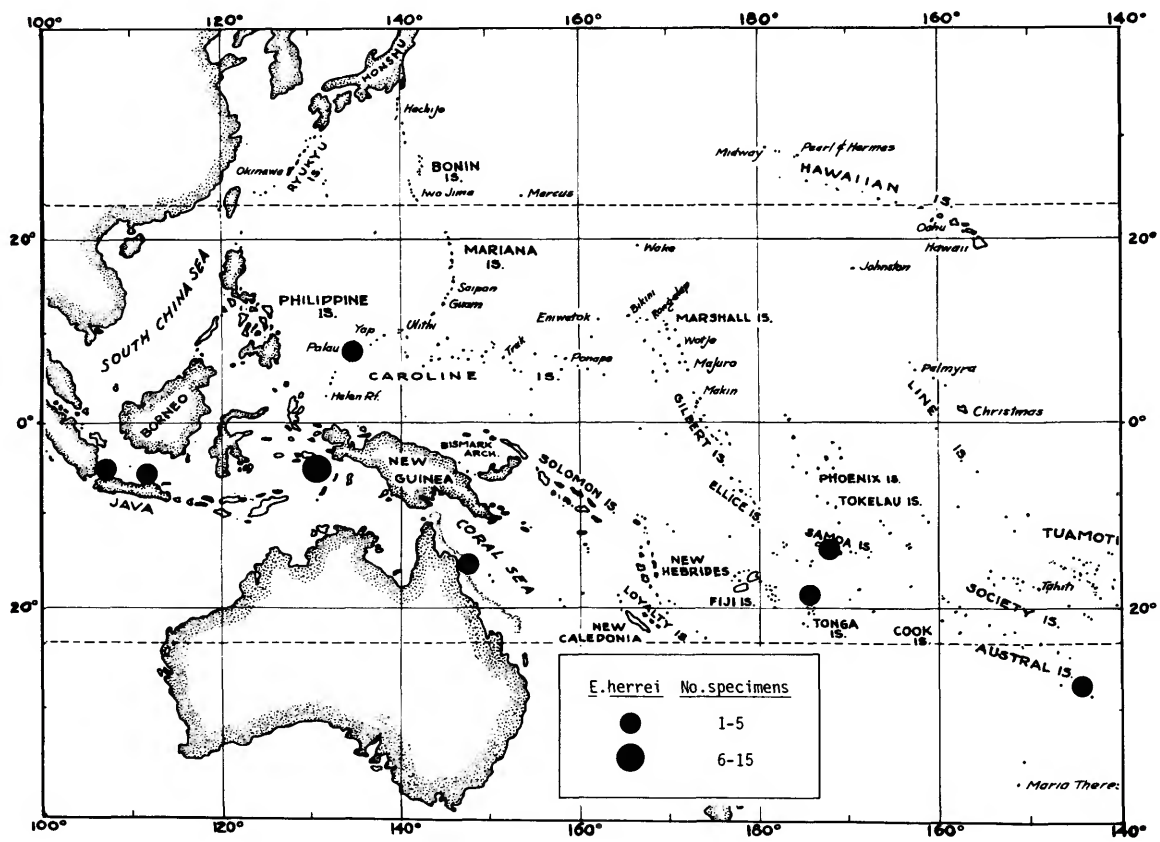

FIGURE 26.—Distribution of *Eviota herrei*.

spot is less intense and narrower; body and fins more uniform brownish; body stout, head deeper.

Our data for the following characters do not agree with those given by Jordan and Seale (1906: 390–391): anal fin rays I,8, not 8; no longitudinal white lines on body; no dark line behind eye; no spot at base of pectoral fin; figure 81 shows all the fins uniformly dark but we find the paired fins are pale or light and the dorsal and anal fins are mottled in varying degrees.

In the original description, Jordan and Seale stated the type is USNM 51769 from Apia, Samoa, which was illustrated as a male, length 0.75 inch. The jar, USNM 51769, contained two males, 10.3 and 12.9 mm SL, and one female. We designated the 12.9-mm specimen as the lectotype, since it most closely approaches the stated length of the type.

Eviota zebrina Lachner and Karnella

FIGURES 27, 28

Eviota zebrina Lachner and Karnella, 1978:15, figs. 10–11 [type-locality: Seychelles Islands, Curieuse I.].

MATERIAL EXAMINED.—All of the available collections of this species were reported on by Lachner and Karnella (1978:15), totaling 824 specimens from 13 major localities in the Red Sea, Indian Ocean, eastward to eastern Australia. The material consists of 348 males, 205 females, and 271 juveniles; total size ranged from 7.1–19.0 mm SL; the largest male was 19.0, the largest female 17.4, the smallest gravid female 10.8.

DIAGNOSIS.—Pectoral fin rays not branched; spinous dorsal fin elongate or filamentous in both sexes, longer in males; fifth pelvic fin ray inconspicuous, usually one-tenth length of fourth ray; midbase of caudal fin with a dark spot and a short vertical bar; caudal fin with 3–4 dark, wavy, narrow vertical bars; spinous dorsal fin with a dark, narrow horizontal band near base.

DESCRIPTION.—Merisitic and morphological data are given by Lachner and Karnella (1978: 17). Important characters of *E. zebrina* are compared with 30 other species of *Eviota* in Tables 1–8.

COLOR IN PRESERVATION.—Important specific color marks show local variation and differentiation among certain localities over the geographical range of this species that extends from the Red Sea to the Great Barrier Reef. Each salient color mark or fin pattern and its differentiation is therefore treated separately.

Dark Dorsal Midline Spots: Typically 3 spots along midline in occipital-nape area and 10–12 (usually 11–12) spots on trunk midline, the first occurring just before spinous dorsal fin and extending to just before procurrent caudal fin rays. The occipital-nape spots and the first trunk spot widen to form transverse bars in some specimens from Sri Lanka and the Great Barrier Reef. All collections from Australia have 13 trunk spots, and spots on specimens from the Great Barrier Reef are enlarged and saddlelike.

Dark Ventral Midline Spots: Typically 6 subcutaneous spots occurring along ventral midline from about the base of the second anal fin ray to end of caudal peduncle. The third to fifth spots usually with surface pigmentation. The sixth spot is usually weak and sometimes a weak, small, seventh spot is present. The subcutaneous bar, above the sixth spot, extends obliquely forward. The bars extending upward from spots 1–5 branch along middle of trunk, becoming Y-shaped or H-shaped marks, and they merge to form a continuous but irregular subcutaneous midtrunk band. The Seychelles and Red Sea collections have 6 ventral spots, St. Brandon collections have 6–7 (usually 7), and all other collections have 7 spots. The spots are very weak or obscure in St. Brandon specimens and prominent in the Red Sea and all Australian material.

Head Marks: A dark horseshoe-shaped mark on snout, extends from anterior portion of eye, encircles anterior nostril, then passes posteriorly to upper portion of eye mesiad to nasal sensory pores. Two dark, short, bilateral postocular bars extend posteriorly on head, dorsally to occipital area. Bars on each side may join posteriorly and consist of a loose aggregate of chromatophores or are uniform pale to dark brown. The horseshoe-shaped snout mark is weakly developed in collections from the Seychelles, St. Brandon, and Western Australia. The postocular bars are weak in collections from the Seychelles, St. Brandon, and

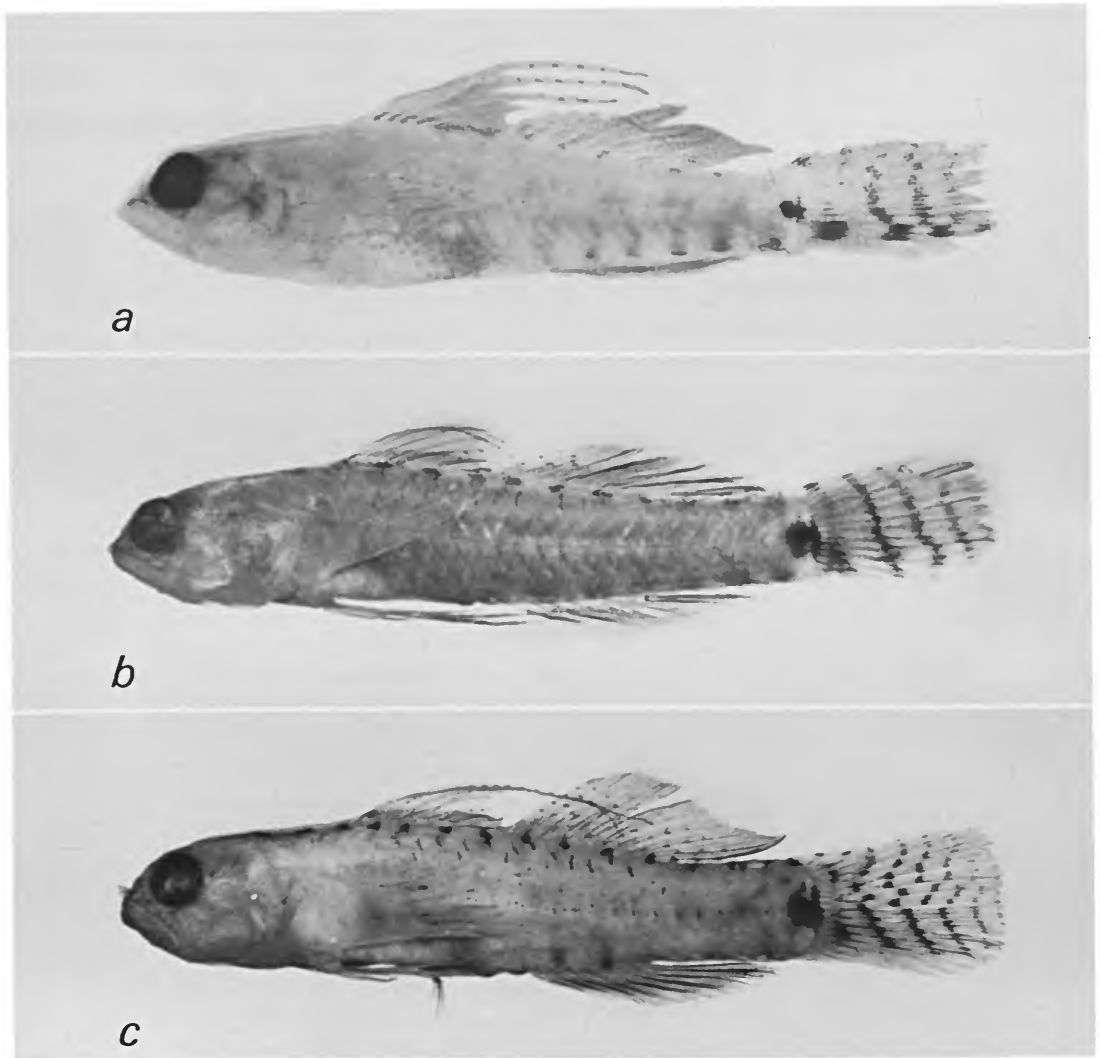

FIGURE 27.—Differences in the spot at the base of the caudal fin and in the dark, wavy bars on the caudal fin in *Eviota zebrina* from three localities: *a*, USNM 218034, male, 13.2 mm SL, Red Sea; *b*, USNM 218027, male, 14.8 mm SL, Seychelles; *c*, WAM P.25608-036, male, 18.0 mm SL, Western Australia.

the Great Barrier Reef and are replaced in Western Australia by uniformly scattered brown chromatophores. Specimens from Sri Lanka have a distinct dark bar from eye to rictus, passing onto lower jaw and forward to its tip.

Basicaudal Spot: A dark circular spot at end of midcaudal peduncle, barely touching a narrow, vertical dark bar at base of caudal fin rays. The circular spot is smaller than the pupil in Red Sea specimens and it is equal to or, more commonly, larger than the pupil in all other specimens. The circular spot may be deeper than wide in some specimens, particularly those from the Seychelles and St. Brandon. The vertical bar is as deep or

deeper than diameter of spot and it may be separated from spot by a narrow clear area or joined to it.

Dark Oblique Caudal Fin Bars: A series of about 3½–4½ narrow wavy oblique bars in adults, reduced to 3 bars in some smaller specimens, and up to 5½ bars in Western Australia. Bars weak to moderately developed, the first and second from base may be enlarged ventrally, the first widest, may equal width of basicaudal spot and may merge slightly with it; bars fainter on upper part of fin. Bars may be broken into segments, the first one commonly broken near middle portion, the upper section sometimes absent, lower portion of first bar sometimes joining upper portion of second (Sri Lanka), bars often divided into several sections (all of Australian collections). Ventral portion of bars of Red Sea collections enlarged, forming spots, the basal one largest; slight enlargements also observed in specimens from the Seychelles and Western Australia. A dusky streak on lower half of caudal fin from its base to the tip, but excluding a narrow portion of the lower margin, occurs on St. Brandon specimens and on a few from the Red Sea. The oblique bars are weakly developed in specimens from St. Brandon and they are prominent in Australian fish.

Spinous Dorsal Fin: A dark, narrow band near base of fin, the remainder of membrane pale; a series of small dark spots on filaments and outer portions of spines, absent basally.

Second Dorsal Fin: Light to moderately dusky, lower portion darker in some; 4–5 small spots on rays in a horizontal linear series, poorly developed or absent in many areas, conspicuous in specimens from Sri Lanka and Australia.

Anal Fin: Dusky, usually darker than second dorsal fin and with a narrow, pale margin.

Scale Pigmentation: The scale pockets are weakly pigmented except in Australian collections, where the pigmentation is heavy.

DIVERGENCE AMONG POPULATIONS.—Notable

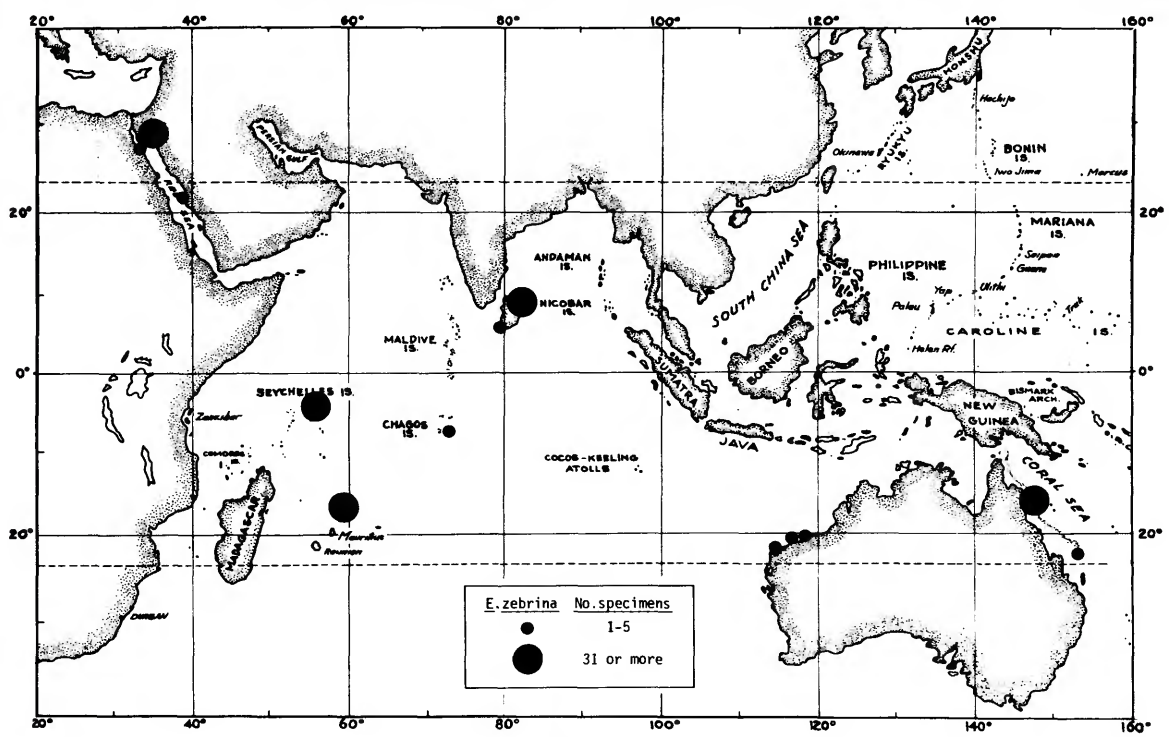

FIGURE 28.—Distribution of *Eviota zebrina*.

differences among populations from several localities are summarized below. The Red Sea population showed the greatest divergence both in meristic characters and in discrete color marks.

It is difficult, however, to recognize subspecific divergence within this species because the characters described for the Red Sea population are variously shared by specimens from other localities and the problem is compounded by variability in state of preservation among the specimens examined.

1. Red Sea: Anal fin rays number I,7; Indo-Australian specimens number I,7–I,9, of which 72 percent have I,8–I,9; basicaudal spot smaller, usually slightly smaller than diameter of pupil, whereas this spot is equal to or larger than pupil on specimens from other localities; lower portions of first 3 basal bars on caudal fin enlarged, mainly on the most basal bar, forming spotlike marks; a dusky streak occasionally developed along lower portion of caudal fin.

2. Seychelles: Bars on the lower caudal fin are sometimes enlarged.

3. St. Brandon: Lower caudal fin typically has a well-developed dusky streak; most of the pronounced color marks characteristic of other populations are pale, with the exception of the prominent, dark basicaudal spot; body not as deep compared with specimens from other localities.

4. Sri Lanka: A well-developed dark bar of moderate intensity from eye to rictus, incompletely developed or absent in specimens from other localities; small dark spots, arranged in linear series, present on the second dorsal fin; dark, transverse occipital-nape bars present.

5. Western Australia: The second dorsal fin, as in Sri Lanka collections, has a series of spots; these specimens also have a higher number of wavy bars on the caudal fin (up to 5½), which are frequently broken up into irregular sections and sometimes enlarged on the lower portion to form spots.

6. Great Barrier Reef: As in Western Australia the second dorsal fin has a series of spots on the rays and membranes, and the caudal fin has a high number of bars that are frequently interrupted; transverse occipital-nape bars, present in Sri Lanka specimens, are also present here.

Color in Life.—See Lachner and Karnella (1978: 19).

Geographic Distribution.—Extends from the Red Sea eastward to the Great Barrier Reef. Not known from Indonesia, Philippine Islands, and Oceania (Figure 28).

Eviota spilota, new species

Figures 29–31

Material Examined.—Fifteen specimens from 6 localities totaling 7 males, 7 females, and 1 juvenile; total size range 13.0–24.9; largest male 24.9, largest female 21.3; smallest gravid female 19.0.

Holotype: USNM 219853, (23.0), male; Papua New Guinea, Ninigo Is., SE of Ami I., 23 Oct 1978, V. G. Springer, 78-3.

Paratypes: USNM 219852, 3 (13.0 22.5), 1 juv., 1 male (22.5), 1 female (17.9); same data as holotype. USNM 219438, 1 (19.0), female; Philippine Is., Palawan Prov., Cuyo I., Bararin I., 23 May 1978, V. G. Springer and Smithsonian team, SP 78-20. USNM 219439, 1 (22.8), male; Philippine Is., Palawan Prov., Cuyo I., Bararin I., 24 May 1978, V. G. Springer and Smithsonian team, SP 78-21. CAS 43811, 2 (21.3, 21.3), male and female; Vietnam, Nhatrang Bay, 22 Feb 1960, R. Bolin, sta 60-56, GVF Reg. 2072. CAS 43816, 1 (24.9), male; Vietnam, Nhatrang Bay, 1 Feb 1961, Fehlmann, sta 60-516, GVF Reg. 2791. USNM 213886, 1 (20.7), female; Borneo, Darvel Bay, 1 Feb 1965, Cohen and Davis, *Te Vega* cr. 6, sta 213. USNM 213898, 1 (21.5), male; Java Sea, Seribu I., 4 Apr 1974, V. G. Springer, 74-32. USNM 213888, 4 (13.8–17.9), 1 male (17.4), 3 females (17.9); Celebes, Kabaena I., 24 Feb 1974, V. G. Springer, 74-1.

Diagnosis.—A deep-bodied *Eviota*; pectoral rays simple; spinous dorsal fin elongate or filamentous in both sexes, less so in females; rays of pelvic fins moderately fringed; the fifth pelvic fin ray conspicuous, about three-tenths to four-tenths length of fourth ray; color pattern resembles *E. prasites*, including the two paired, dark streaks on snout and the dark spot on upper pectoral base but differs in lacking the dark spot on lower caudal base.

Description.—Dorsal fin VI-I,8(1), VI-I,9-(14); anal fin I,7(14), I,8(1); pectoral fin 14(5), 15(3), 16(5), 17(2); pelvic fin I,4 3/10(3), I,4 4/10(9); fourth ray of pelvic fin with 3–8 branches,

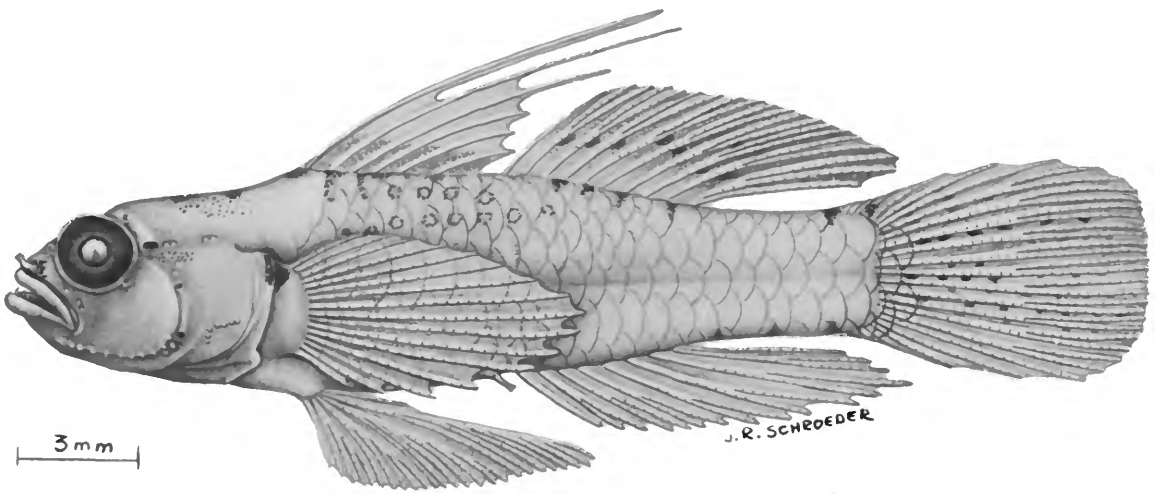

FIGURE 29.—*Eviota spilota*, USNM 213887, male, 21.3 mm SL, Vietnam. (Drawn by J. R. Schroeder.)

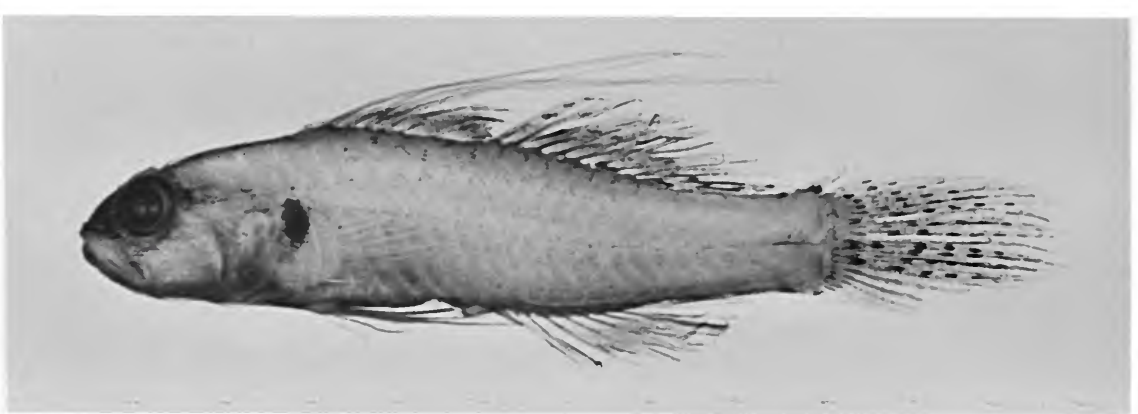

FIGURE 30.—*Eviota spilota*, holotype, USNM 219853, male, 23.0 mm SL, Ninigo Is., Papua New Guinea.

averaging 5.7; segments between consecutive branches of the fourth pelvic fin ray number 3–10, averaging 5.3; pelvic fin membrane well developed; branched caudal fin rays 9(1), 11(8), 12(3); segmented caudal fin rays 17(15); lateral scale rows 22–23(3); scales with about 27–41 ctenii, 8–15 primary radii; breast scaled.

First five dorsal spines of males may be elongate, the first three filamentous, the first, second, and third spines longest and may be equal in length, extending beyond base of caudal fin when depressed; first three spines of females may be elongate, the longest extending to base of second dorsal fin ray; pelvic fins long, extending beyond origin of anal fin, usually reaching midportion of anal fin base.

Cephalic sensory pore system is pattern 2. Cutaneous papilla system is pattern B.

Genital papilla in male simple, moderately long, extending beyond base of first anal fin ray,

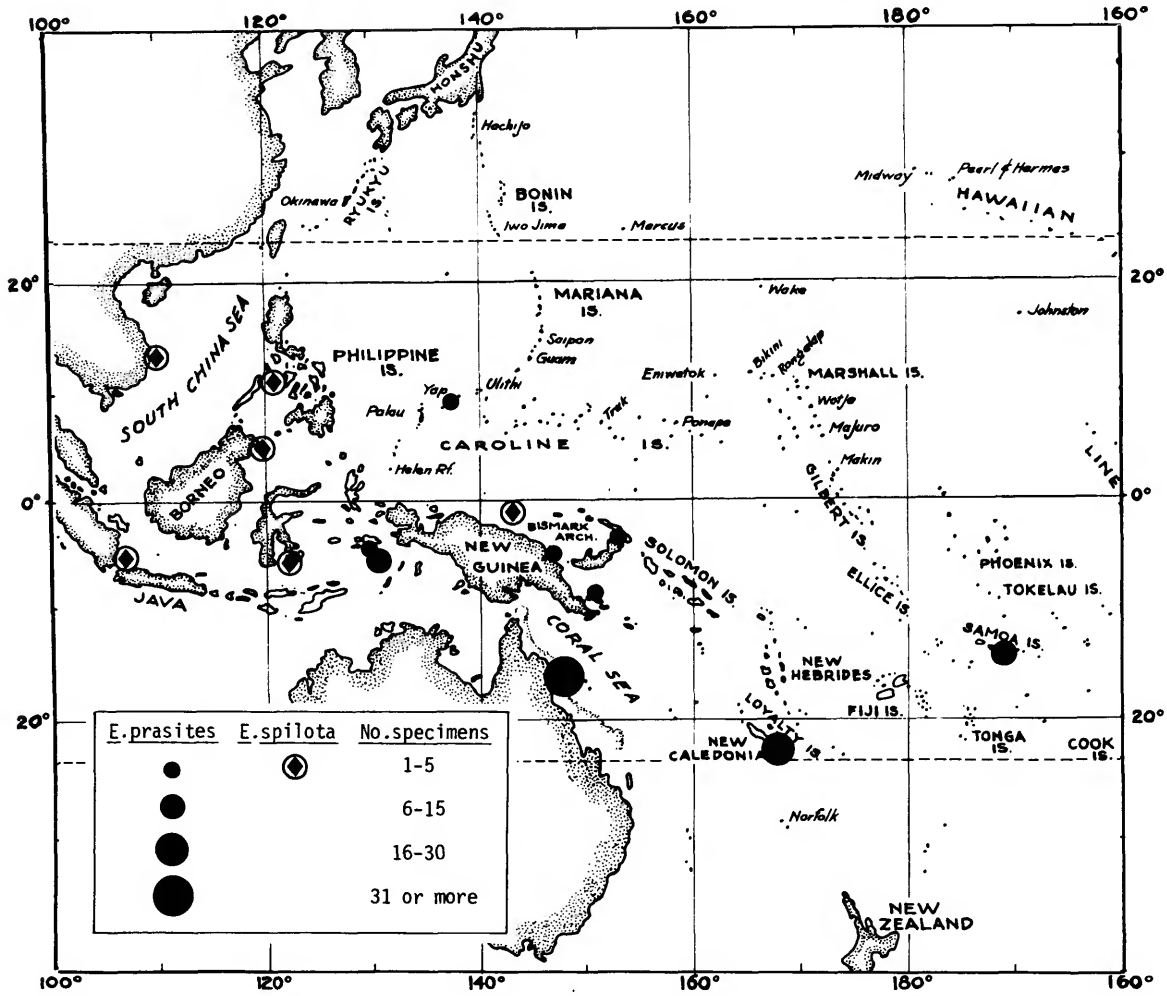

FIGURE 31.—Distributions of *Eviota prasites* and *E. spilota*.

flared and bilobed at tip; in female, papilla bulbous, short, not reaching anal spine.

Two gravid females: 21.3 mm SL taken in Bay of Nhatrang, Vietnam, and 19.0 mm SL from Bararin Island, Philippine Islands.

Vertebrae 10(9) precaudal and 15(9) caudal, total 25(9).

COLOR IN PRESERVATION.—*Adult Male*: Snout with 2 pairs of broad dark stripes dorsally extending from tip posteriorly to eye, rarely beyond; in some specimens scattered dusky pigmentation behind eye, anterior narial tubes dark; margin of lower jaw blackish, midchin area light dusky; a dusky mark from rictus to margin of eye; cheek, opercle, and top of head with scattered chromatophores; 1–3 somewhat elongate dark predorsal spots on midline, the middle spot persisting most often; trunk pale to dusky, the margins of the scale pockets outlined with duskiness, particularly dorsolaterally on body; a dark spot at upper portion of the pectoral fin base, its depth greater than its width, and greater than diameter of pupil, sometimes descending diffusely to lower portion of base of pectoral; a linear series of 12–13 spots, sometimes faded, along dorsal midline from origin of first dorsal fin to upper portion of caudal fin base; the first spot is often enlarged and darker; a series of about 5–6 weak subcuta-

neous spots ventrally along midline from approximately the midbase of anal fin to lower portion of base of caudal fin, mostly faded; subcutaneous trunk bars obscure; midbody septum dusky; pectoral and pelvic fins transparent; spinous dorsal fin light dusky basally, remainder of fin including filamentous portion pale; second dorsal mostly dusky with small brownish spots on the membrane, arranged more or less in 3–4 horizontal to oblique rows, often obscure or absent; immediate basal portion of spinous and soft dorsal fins touched by midline spots on trunk; anal fin dusky, more so posteriorly; caudal fin pale to light dusky, with 4–6 rows of 3–8 small brown spots, slightly longer than deep, on membrane of fin from base to outer portion; no spots on lower fourth of fin.

Sexual Dichromatism in Females: Females lack the heavy dark spot at base of first dorsal spine; second dorsal and caudal fins finely dusky and lacking the linear rows of spots; anal fin less dusky than males; spots along midlines dorsally and ventrally posterior to anal fin are less well developed than in males.

GEOGRAPHIC DISTRIBUTION.—Known from six localities: Vietnam, Seribu Island in Java Sea, S Celebes, NE Borneo, Philippine Islands and Ninigo Islands, Bismarck Archipelago (Figure 31).

ETYMOLOGY.—The specific name is derived from the Greek *spilos* (a spot), and is in reference to the spots on the second dorsal fin.

REMARKS.—This species differs in coloration from *E. prasites* in that both sexes lack the dark spot at the lower base of the caudal fin. The similarities in the color pattern of these two species are the paired dark snout stripes, the dark spot at upper portion of base of pectoral, the dark spot at base of first dorsal spine, the crescent-shaped scale pocket marks, the dorsal midline and ventral midline trunk spots, and the linear series of small spots on the caudal fin.

Eviota storthynx (Rofen)

FIGURES 32, 33

Eviotops storthynx Rofen, 1959:237, fig. 3 [type-locality: Bungau, Sulu Province, Philippine Islands].—Larson, 1976: 500.

MATERAL EXAMINED.—709 specimens from 5 localities, totaling 297 males, 240 females, 172 juveniles; total size range 4.9–20.9; largest male 20.9, largest female 16.6; smallest gravid female 11.4.

Holotype: SU 52108, (16.9), male; Philippine Is., Sulu Prov., Bungau, 17 Sep 1940, A. W. Herre.

Paratype: SU 39853, 1 (14.4), male; same data as holotype.

Other Material: PHILIPPINE ISLANDS: USNM 219424, 5 (12.0–15.1), 4 males (15.1), 1 female (12.0); Palawan Prov., Cuyo I., 21 May 1978, V. G. Springer and Smithsonian team, SP 78-17. PALAU ISLANDS: CAS 43783, 28 (10.5–18.3), 1 juv., 12 males (18.3), 15 females (15.9); off Kaibakku I., 3 Oct 1957, DeWitt, sta 57-30, GVF Reg. 1408. USNM 213875, 28 (10.6–18.6), 13 males (18.6), 15 females (15.9); same data as above. CAS 43793, 34 (9.9–16.5), 11 juv., 11 males (16.5), 12 females (15.7); reef between Koror I. and Ho I., 19 Nov 1957, DeWitt, sta 57-62, GVF Reg. 1442. CAS 43794, 42 (8.0–17.7), 11 juv., 20 males (17.7), 11 females (15.8); Koror I., 21 Nov 1957, DeWitt, sta 57-65, GVF Reg. 1445. CAS 43741, 3 (14.5–17.3), males; Koror I., 4 Aug 1955, H. A. Fehlmann, sta 59, GVF Reg. 558. CAS 43774, 4 (12.9–16.3), 1 male (15.6), 3 females (16.3); Koror I., 7 Sep 1957, DeWitt, sta 57-5, GVF Reg. 1380. CAS 43804, 4 (14.2–15.9), 2 males (15.9), 2 females (14.6); Koror I., 19 Jun 1959, Y. Sumang, sta 59-67, GVF Reg. 1894. CAS 43734, 9 (9.1–ca.18.0), 1 juv., 5 males (ca.18.0), 3 females (13.9); Koror I., 19 Sep 1954, R. R. Harry, sta 186, GVF Reg. 489. ANSP 141213, 19 (12.3–16.2), 11 males (16.2), 8 females (13.8); Koror I., 23 Jul 1955, H. A. Fehlmann, sta 33, GVF Reg. 532. CAS 43736, 7 (13.6–19.9), 6 males (19.9), 1 female (14.1); Koror I., 18 Jul 1955, H. A. Fehlmann, sta 10, GVF Reg. 509. CAS 43749, 61 (8.8–20.9), 9 juv., 26 males (20.9), 26 females (14.2); Iwayama Bay, 21 Oct 1955, H. A. Fehlmann, sta 244, GVF Reg. 754. CAS 43791, 95 (7.4–19.3), 55 juv., 24 males (19.3), 16 females (16.6); Iwayama Bay, 18 Nov 1957, DeWitt, sta 57-59. GVF Reg. 1439. CAS 43788, 27 (7.3–17.3), 15 juv., 7 males (17.3), 5 females (15.3); Iwayama Bay, 31 Oct 1957, DeWitt, sta 57-53, GVF Reg. 1433. CAS 43747, 3 (ca. 9.7–17.2), 1 male (17.2), 2 females (13.2); Iwayama Bay, 28 Aug 1955, H. A. Fehlmann, sta 133, GVF Reg. 639. CAS 43733, 3 (11.8–15.3), 2 males (15.3), 1 female (11.9); Urukthapel I., 12 Sep 1954, R. R. Harry, sta 180, GVF Reg. 483. CAS 43803, 1 (20.7), male; Urukthapel I., 19 Apr 1959, H. A. Fehlmann, sta 59-42, GVF Reg. 1870. USNM 213883, 60 (9.1–18.5), 12 juv., 34 males (18.5), 14 females (16.3); Urukthapel I., 20 Jul 1955, H. A. Fehlmann, sta 27, GVF Reg. 526. AMS I. 20810-001, 25 (11.7–15.8), 11 males (15.8), 14 females (13.1); Auluptagel I., 18 Sep 1957, DeWitt, sta 57-15, GVF Reg. 1390. CAS 43744, 8 (7.7–12.5), 2 juv., 2 males (11.7), 4 females (12.5); Auluptagel I., 16 Aug 1955, H. A. Fehlmann, sta 100, GVF Reg. 602. CAS 43739, 9 (10.5–15.4), 1 juv., 4 males (15.4), 4 females (13.7); Auluptagel I., 22 Jul 1955, H. A. Fehlmann, sta 30, GVF Reg. 529. CAS 43795, 2 (14.5–12.0), male and female; Auluptagel I., 29 Nov 1957, DeWitt sta 57-71, GVF Reg. 1451. CAS 43743, 2 (11.7, 12.2), males; Auluptagel I.,

12 Aug 1955, H. A. Fehlmann, sta 85A, GVF Reg. 586. CAS 43777, 23 (6.3–15.5), 10 juv., 7 males (15.5), 6 females (14.4); Auluptagel I., 19 Sep 1957, DeWitt, sta 57-16, GVF Reg. 1391. CAS 43784, 18 (11.1–15.5), 11 males (15.5), 7 females (12.9); Auluptagel I., 7 Oct 1957, H. A. Fehlmann, sta 57-36, GVF Reg. 1414. CAS 43785, 118 (4.9–16.0), 41 juv., 39 males (16.0), 38 females (14.6); Auluptagel I., 9 Oct 1957, H. A. Fehlmann, sta 57-37, GVF Reg. 1415. CAS 43781, 4 (7.3–11.2), 3 juv., 1 male (11.2); Babelthaup I., 25 Sep 1957, DeWitt, sta 57-22, GVF Reg. 1400. CAS 43780, 61 (10.6–17.7), 33 males (17.7), 28 females (15.8); Babelthaup I., 22 Sep 1957, H. A. Fehlmann, sta 57-19, GVF Reg. 1397. YAP ISLANDS: CAS 43807, 1 (15.3) male; Tarang I., 12 Jan 1960, Sumang, sta 118, GVF Reg. 1941. CAS 43805, 6 (14.4–19.6), 4 males (19.6), 2 females (14.8); Map I., 16 Dec 1959, Bapilung, sta 87, GVF Reg. 1910. JAVA SEA: USNM 213871, 1 (16.3), male; Pulau Seribu, 5 Apr 1974, V. G. Springer 74-33. WESTERN AUSTRALIA: WAM P.25315-004, 2 (17.7, 16.0), male and female; Abrolhos Is., 20 May 1975, G. R. Allen.

DIAGNOSIS.—Pectoral fin rays not branched; spinous dorsal fin elongate or filamentous in both sexes; rays of pelvic fins moderately fringed, the fifth pelvic fin ray inconspicuous, one-tenth to two-tenths length of fourth ray; a dark postocular spot; trunk with a series of moderately dark spots along the midline, dorsally and ventrally, sometimes forming weak subcutaneous vertical bars; caudal fin with dark reticulated markings or dark, irregular vertical bars.

DESCRIPTION.—Dorsal fin VI-I,8(12), VI-I,9(1), VI-II,8(1); anal fin I,7(14); pectoral fin 14(1), 15(7), 16(6); pelvic fin I,4 1/10(9), I,4 2/10(4); fourth ray of pelvic fin modally with 5 branches, the branches are fairly long; segments between consecutive branches of the fourth pelvic fin ray number 2–8; pelvic fin membrane well developed; branched caudal fin rays 11(9), 12(1), 13(1); segmented caudal fin rays 17(14); lateral scale rows 22(10), 23(3); transverse scale rows 5(4), 6(17). Scales with a single row of about 18–31 fairly large ctenii on posterior margin; 8–10 radii in anterior field, none in lateral fields but radii approach them; scale eccentric with a broad focal area. Breast rarely with scales, no scales (33 specimens), 1(2), 3(1).

First four dorsal fin spines may be filamentous in large males, the second or third spine longest, often extending to the end of the depressed second dorsal fin; first and second dorsal spines of females may be elongate, reaching the base of the sixth dorsal fin ray; pelvic fins long, extending beyond origin of anal fin, usually reaching midportion of anal fin base.

The cephalic sensory pore system is pattern 2. Cutaneous papilla system is pattern B-1.

Genital papilla in male not fimbriate, elongate, extending to first anal fin ray, bilobed at tip; female with bulbous papilla about as long as its width, not extending beyond anal fin spine.

Vertebrae 10(7), 11(2) precaudal and 14(2), 15(7) caudal, total 25.

COLOR IN PRESERVATION.—Head with a prominent, postocular, dark brown spot on each side, deeper than wide, its greatest dimension larger than one-half diameter of eye, smaller or nearly obsolete in young and juveniles; remainder of head more or less uniformly pigmented with fine, light brown to blackish, chromatophores; trunk with characteristic dark brown to black crescent-shaped marks, formed by concentrated chromatophores at the scale pockets, in about 6–7 horizontal rows on midbody area; a series of conspicuous dark brown spots, about the size of the pupil or somewhat larger, on middorsal and midventral areas; these spots, dorsally, extend from the occipital area to the anterior portion of the upper procurrent caudal rays, 3 on the nape, 4 in the spinous dorsal area, 4 in the soft dorsal area, and 4 over the caudal peduncle; 7–8 spots on ventral midline, from about the origin of the anal fin posteriorly to end of lower peduncle; the dark brown midline spots transcend into the lower parts of the first and second dorsal and anal fins, and subcutaneously on lower trunk only.

First dorsal fin clear at base between the dark brown spots, the membrane above base dusky, the outer one-fourth to three-fourths of the anterior portion clear; a series of small brown spots, numbering 12 or more, on filamentous spines, extending to their extremities; the second dorsal fin with 4 basal spots separated by clear areas, about one-sixth depth of fin, the remainder of fin dusky with 2–3 scattered rows of more densely pigmented small spots, on the fin rays, that in

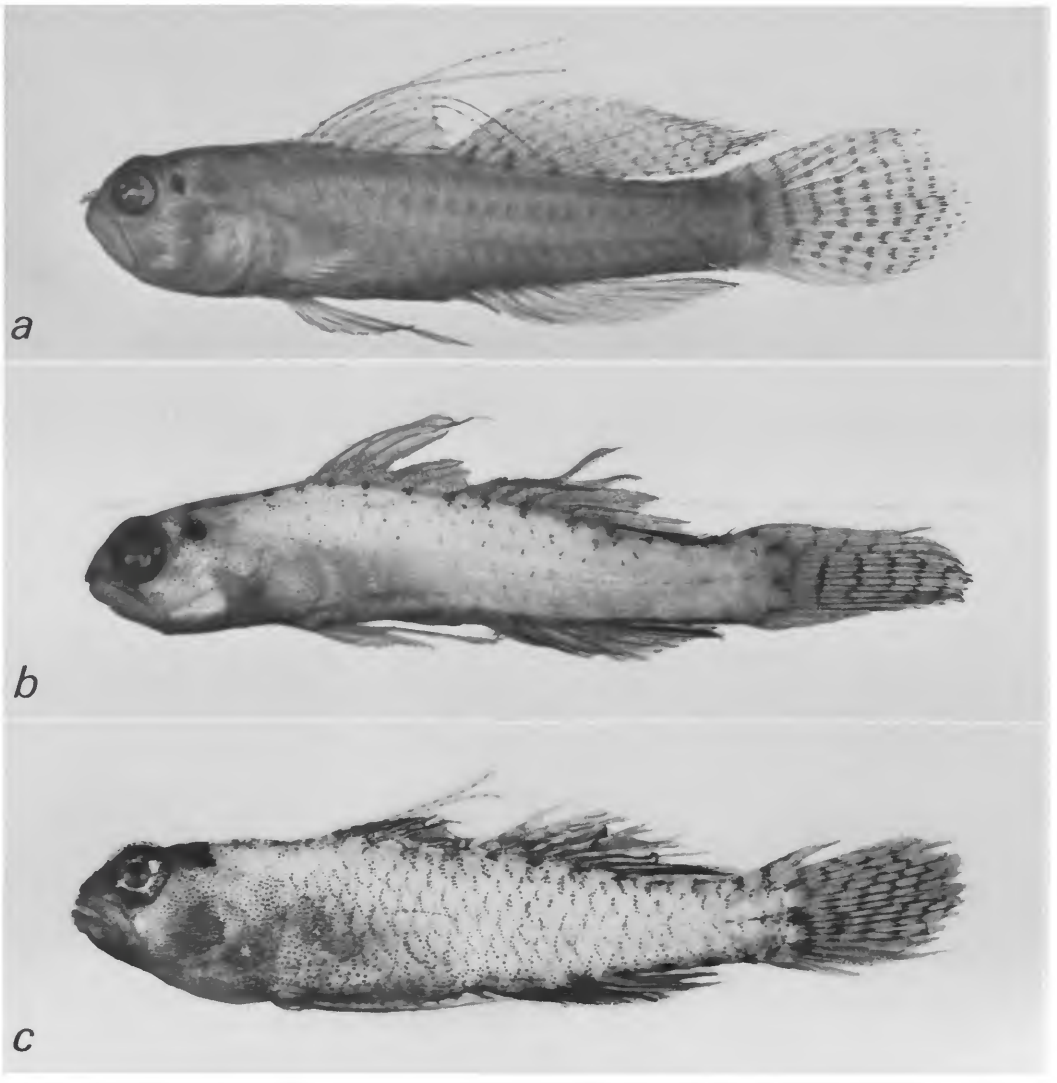

FIGURE 32.—Variation in the color pattern of *Eviota storthynx* from three localities: *a*, CAS 43749, male, 20.9 mm SL, Palau Islands; *b*, USNM 213871, male, 16.4 mm SL, Seribu Island, Java Sea; *c*, WAM P.25315-004, male, 17.7 mm SL, Abrolhos Islands, Western Australia.

some specimens are separated from one another by a series of larger, clear, roughly circular spots; anal fin uniformly dusky with a narrow clear margin; caudal fin with a small brown central spot basally, about the size of the pupil or slightly smaller, and a similar spot on the midupper base and midlower base of fin, remainder of fin membrane clear and series of dark brown spots forming about 5–7 wavy lines, more or less vertically aligned on fin, the pigment on the rays, not the membrane; base of pectoral fin with fine, uniform, light brown to dark pigment; pectoral and pelvic fins clear or lightly dusky. Male genital papilla sometimes speckled.

The above color description was based on males about 15–19 mm SL. Females about 16 mm SL,

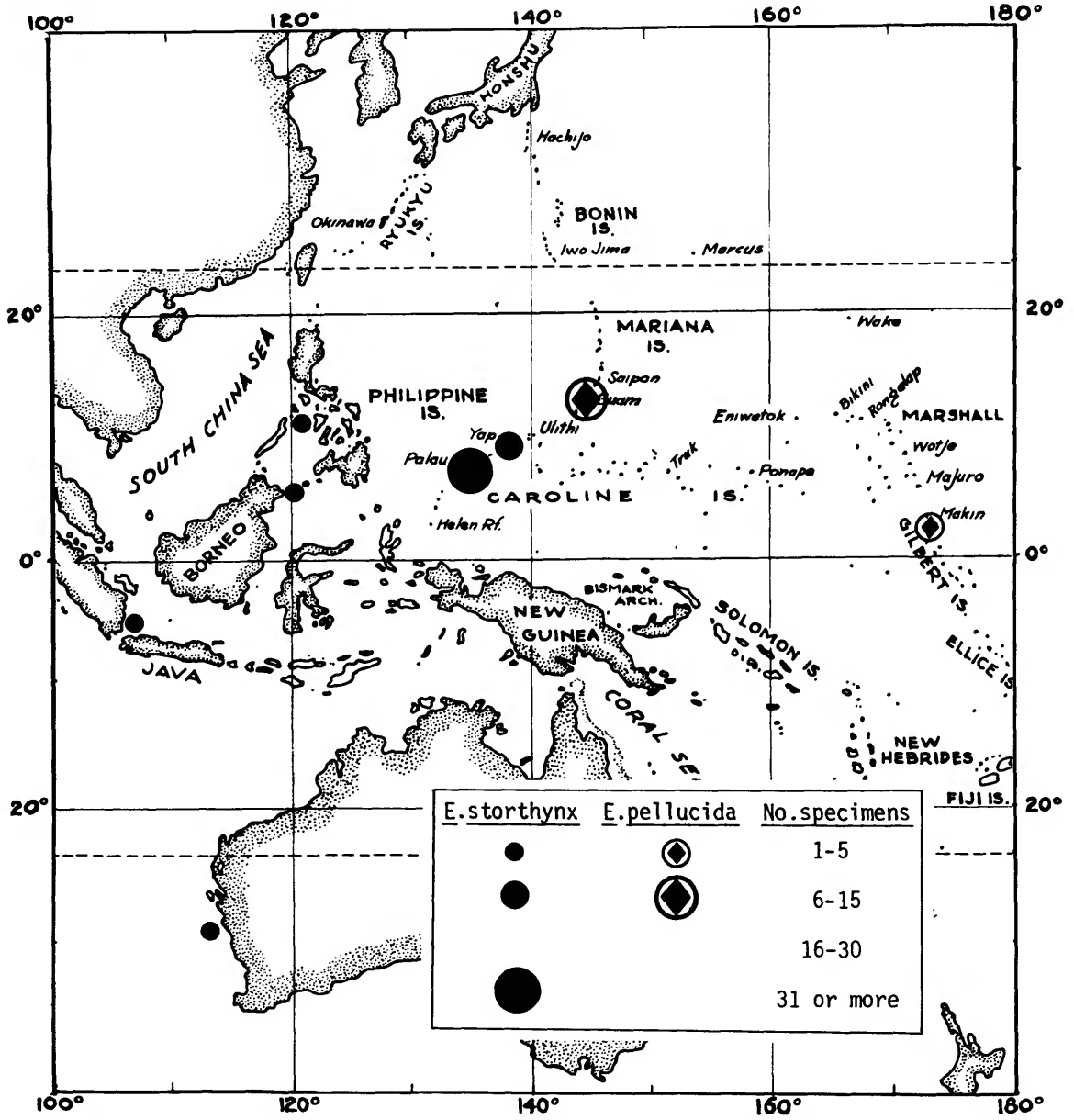

FIGURE 33.—Distributions of *Eviota pellucida* and *E. storthynx*.

or smaller, have the same general color pattern, although the intensity, particularly that of the second dorsal, anal, and caudal fins, is often greatly reduced, necessitating the examination of many specimens in order to determine the basic color pattern.

GEOGRAPHIC DISTRIBUTION.—Known from the Philippine Islands; Yap and Palau Islands, Caroline Group; Seribu Island, Java Sea; and the Abrolhos Islands, Western Australia (Figure 33).

REMARKS.—The following discrepancies in data are noted between ours and that given in the original description (Rofen, 1959). The lateral scale count for the holotype was given as "perhaps 27," but we count 22 for the holotype and 22–23 (13) for the species. Figure 1 (Rofen, 1959) does not show the preopercular sensory pores and the nasal sensory pores are not clearly defined. In Figure 2 (Rofen, 1959) the fifth pelvic fin ray is not shown and the membranes connecting the adjacent pelvic rays are not included. The holotype and other specimens have dark spots on the caudal rays forming narrow, wavy, parallel vertical bars, not vertical, straight bars as shown in Figure 3 (Rofen, 1959). Rofen (1959:238) incorrectly states, "All but third preopercular pore absent." The holotype and all other specimens have two preopercular pores on each side.

Eviota prasites Jordan and Seale

FIGURES 31, 34

Eviota prasites Jordan and Seale, 1906:387, fig. 76 [type-locality: Pago Pago, Samoa Islands].

MATERIAL EXAMINED.—160 specimens from 9 localities, totaling 39 males, 24 females, 97 sexually immature and juvenile specimens; total size range 7.5–21.3; largest male 21.3, largest female 20.6; largest immature specimen 18.6; smallest gravid female 13.3.

Holotype: USNM 51768 (20.4), male; Pago Pago, 1902, Jordan and Kellogg.

Other Material: INDONESIA (collected by V. G. Springer): USNM 209977, 3 (11.0–20.4), 1 juv., 2 males (20.4); Saparua, 18 Jan 1973, VGS 73-14. USNM 213889, 12 (13.3–19.0), 5 males (19.0), 7 females (16.0); Banda Is., Goenoeng Api, 7 Mar 1974, VGS 74-8. CAS 43554, 1 (15.2), female; Banda Is., Naira, 7 Mar 1974, VGS 74-7. USNM 213890, 1 (17.1), male; Banda Is., Naira I., 8 Mar 1974, VGS 74-9. CAROLINE ISLANDS: CAS 43751, 2 (13.6, 15.3), male and female; Yap I., 5 Jul 1956, H. A. Fehlmann, sta 8, GVF Reg. 794. NEW GUINEA: USNM 213891, 2 (16.0, 19.6), males; Madang Harbor, 26 May 1970, B. B. Collette, 1488 and 1490. USNM 213892, 1 (16.8), female; Trobriand Is., Kiriwina, 8 Jun 1970, B. B. Collette, 1509. BISMARCK ARCHIPELAGO: USNM 213893, 1 (17.3), female; Keraward I., between New Britain and New Ireland, 25 Feb 1965, Cohen and Davis, *Te Vega* cr. 6, sta 234. AUSTRALIA: QUEENSLAND (collected by J. Tyler and C. L. Smith in 1969): ANSP 141144, 1 (11.2), immature; Cook wreck site, 11 Jan, TS,A-11. AMNH 39070, 2 (14.2, 16.8), 1 immature, 1 female (16.8); Northern Escape Reef, 24 Jan, S69-32. AMNH 39071, 2 (16.0, 21.3), males; Northern Escape Reef, 24 Jan, S69-33. ENDEAVOUR REEF: USNM 213895, 7 (13.6–20.4), 5 immature (18.6), 2 immature females (20.4); 4 Jan 1969, TS,A-3. CAS 43548, 4 (15.4–17.0), immature; 5 Jan 1969, TS,A-4. ANSP 141146, 12 (9.1–15.6), immature; 6 Jan 1969, TS,A-5. USNM 213894, 23 (7.5–18.5), immature; 15 Jan 1969, TS,A-16. AMS I.20807-001, 14 (9.9–18.8), 4 immature, 7 males (18.8); 3 females (15.3), 5 Jan 1969, S69-5. AMNH 39072, 13 (10.0–18.5), 8 immature, 5 males (18.5); 6 Jan 1969, S69-6. AMNH 39073, 12 (9.2–16.8), immature; 6 Jan 1969, S69-7. AMNH 39074, 2 (12.8–15.2), 1 immature, 1 male (15.2); 13 Jan 1969, S69-14. AMNH 39075, 15 (12.2–19.1), 11 immature, 4 males (19.1); 14 Jan 1969, S69-16. AMNH 39076, 16 (7.9–18.3), 9 immature, 6 males (18.3), 1 female (15.6); 15 Jan 1969, S69-18. HOPE ISLANDS: AMNH 39077, 3 (16.2–20.0), 2 males (18.6), 1 female (20.0); Little Hope I., 19 Jan 1969, S69-23. AMNH 39078, 1 (16.9), male; Little Hope I., 20 Jan 1969, S69-27. ANSP 141143, 2 (15.2, 17.0), immature; Little Hope I., 3 Jan 1969, TS,A-2. ANSP 141147, 2 (14.6, 16.2), immature; Big Hope I., 19 Jan 1969, TS,A-21. ANSP 141145, 2 (15.0, 19.5), 1 immature, 1 male (19.5); Big Hope I., 19 Jan 1969, TS,A-22. NEW CALEDONIA: USNM 213896, 2 (18.1, 20.7), males; Noumea, 13 Apr 1944, Chapman, C-18. USNM 213897, 5 (16.3–20.6), 2 males (19.0), 3 females (20.6); Noumea, 15 Apr 1944, Chapman, C-17. SAMOA ISLANDS: USNM 219638, 9 (8.2–23.6), 3 juv., 5 males (23.6), 1 female (17.8); Tutuila I., R. Wass. USNM 206518, 2 (15.9, 17.2), females; same data as holotype.

Questionable Allocation: USNM 210150, 1 (10.5), male; Saparua, 17 Jan 1973, V. G. Springer, 73-12.

DIAGNOSIS.—A deep-bodied species; pectoral rays simple; spinous dorsal fin elongate or filamentous in both sexes; the fifth pelvic fin ray conspicuous, about three-tenths to five-tenths length of fourth ray; two paired dark streaks on snout, a dark spot at base of caudal fin below

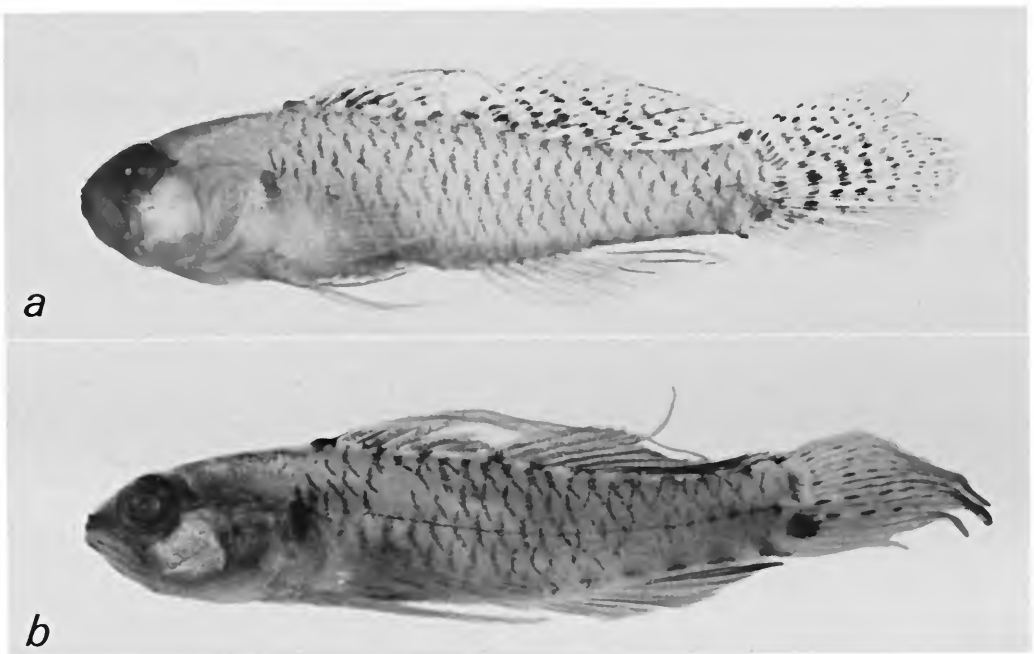

FIGURE 34.—Variation in the development and intensity of the color pattern on or at the base of the fins in *Eviota prasites* from two localities: *a*, USNM 219638, male, 23.6 mm SL, Tutuila, Samoa; *b*, USNM 213889, male, 19.2 mm SL, Banda Islands.

midline, a dark to dusky spot at upper portion of base of pectoral fin.

DESCRIPTION.—Dorsal fin VI-I,8(28), VI-I,9(2); anal fin I,6(1), I,7(27); pectoral fin 14(1), 15(9), 16(15), 17(4); pelvic fin I,4 3/10(2), I,4 4/10(13), I,4 5/10(6), I,4 6/10(1), I,4 7/10(1); fourth ray of pelvic fin modally with 5 branches; segments between consecutive branches of the fourth pelvic ray number 1–10, most often 4–5; pelvic fin membrane well developed; branched caudal fin rays 9(1), 10(1), 11(14), 12(3); segmented caudal fin rays 16(2), 17(25); lateral scale rows 21(5), 22(10), 23(4); transverse scale rows 5(7), 6(4), 7(1); breast scaled. Scales with a single row of about 20–40 ctenii on posterior margin; about 7–15 primary radii on anterior field; no radii in posterior and lateral fields; scales extremely eccentric, the radii converging broadly in focal area.

The cephalic sensory pore system is pattern 2, with the AOT pore enlarged and elongate. Cutaneous papilla system is pattern B.

First 5 dorsal spines of males may be elongate, the first 3 filamentous, the second spine longest, often extending to the first procurrent caudal fin rays; first 3 spines of females may be elongate, the longest extending to the base of the second dorsal fin ray; pelvic fins long, extending beyond origin of anal fin, usually reaching midportion of anal fin base.

Genital papilla in male simple, elongate, extending beyond base of first anal fin ray, bilobed at tip; in female, papilla bulbous, short, not reaching anal spine.

A female from Banda Island was gravid at 13.3 mm; some specimens as large as 18.5 mm from the Australian collections could not be sexed.

Vertebrae 10(3), 11(2) precaudal and 14(2), 15(3) caudal, total 25.

COLOR IN PRESERVATION.—*Adult Male*: Head with 2 pairs of broad dark stripes dorsally, extending from tip of snout posteriorly to vertical through preopercle, sometimes obliterated behind

the eye by scattered dusky pigmentation; anterior narial tube dark; margin of lower jaw and midchin area dark to dusky; cheek and angle of jaw dusky; 2 narrow elongate black streaks on nape along midline, about as long as diameter of pupil; trunk dusky with prominent dark crescent marks at scale pockets; a dark spot at upper portion of base of pectoral, its depth greater than diameter of pupil; some duskiness throughout base of pectoral; a prominent dark predorsal spot on small, crestlike, tissue touching base of first dorsal spine, followed by linear series of about 11 lesser spots along dorsal midline to upper portion of caudal base; a similar series of about 6 spots ventrally, mostly subcutaneous, associated with faint subcutaneous bars, beginning at origin of anal fin and ending at lower portion of base of caudal fin; bars on upper trunk obscure; a dark spot at base of caudal fin below midline, equal in size to pupil, diffusely streaking onto lower caudal fin; midbody septum dusky; pectoral and pelvic fins transparent; membrane of lower half of spiny dorsal fin dusky; on best preserved specimens, filamentous spines finely dusky; second dorsal membrane and rays dusky, heavier basally, sometimes with 4–5 irregular rows of small dark spots; immediate basal area of dorsal fins pale between series of dark midline spots; anal fin usually dusky, somewhat heavier posteriorly; immediate basal area of anal fin between ventral series of spots, and ventrally on peduncle between spots, pale; caudal fin dusky, with 3–4 horizontal rows of 3–5 dark elongate spots on membrane of central part of fin, from base to outer portion, upper portion of fin with smaller and less intense spots, lower third of fin lacking spots.

Sexual Dichromatism in Females: Body and fins usually paler, the heavy dark spots on caudal membrane absent, otherwise general color pattern as in males.

Some collections, such as those from New Caledonia, were largely faded and showed only traces of the otherwise prominent pigment features.

Color in Life.—The following color notes were taken from a recently captured specimen (now cataloged as USNM 219638) by Richard Wass of the Office of Marine Resources, Government of American Samoa: body pale, posterior edge of scales dusky red; lips and snout rose colored; about 16 red saddles from nape to base of caudal fin; distinct black spot at upper portion of base of pectoral fin; dusky red internal spot below midbase of caudal fin; 3 red internal blotches at base of anal and 3 more ventrally on caudal peduncle; first dorsal spines orange, the rays pale on other fins; dusky red spots on membranes of second dorsal and caudal fins.

Geographic Distribution.—Known from 12 localities in a broad band extending from the Caroline Islands and Indonesia southeastward to the Samoa Islands (Figure 31).

Remarks.—Jordan and Seale (1906:387) listed for the holotype: dorsal fin VI,9, anal rays 9, and figure 76 shows 5 branched pelvic fin rays. Our counts are: dorsal VI–I,8, anal I,7 and the fifth pelvic fin ray is unbranched and about six-tenths the length of the fourth ray. Also, our material does not agree with the color pattern in preservation shown on figure 76 and the data in the original description as follows: there is no distinct dusky blotch on upper caudal base; the black stripe on snout does not continue to upper edge of opercle; the black spot on upper portion of base of pectoral fin is well developed, as intense as spot on lower portion of caudal base; the longitudinal rows of fine spots on second dorsal fin are lacking.

This species is closely related to the new species *E. spilota* that occurs in Vietnam, the Philippine Islands, Bismarck Archipelago, and in three localities of Indonesia. *Eviota spilota* has a dorsal count of VI–I,9 and lacks the black basal spot on lower portion of caudal fin.

Eviota pellucida Larson

Figures 33, 35

Eviota pellucidus Larson, 1976:498, fig. 1 [type-locality: Guam, Marianas Islands].

Material Examined.—Fifteen specimens from 2 localities totaling 5 males, 6 females, and 4 juveniles; total size range 10.4–20.9; largest male 20.9, largest female 16.9; smallest gravid female 10.4.

Paratypes: UG 5299, 11 (12.8–18.0), 4 juv., 4 males (18.0), 3 females (16.5); Marianas Islands, Guam, 3 Oct 1970, R. S. Jones, 031070. AMS I.18043-006, 4 (10.4–20.9), 1 male (20.9), 3 females (16.9); Gilbert Islands, Abaiang Atoll, 6 Nov 1973, D. Hoese.

DIAGNOSIS.—Head somewhat angular, the snout pointed, the lower jaw slightly projecting; pectoral fin rays simple; spinous dorsal fin elongate or filamentous in both sexes; fifth pelvic fin ray conspicuous, about three-tenths to five-tenths length of fourth fin ray; breast with scales; head and trunk lacking well-developed color marks, the snout dusky or with dusky streaks, and the spinous dorsal, soft dorsal, and anal fins mostly dusky.

DESCRIPTION.—Dorsal fin VI–I,7(2), VI–I,8(12), VI–I,9(1); anal fin I,7(15); pectoral fin 15(2), 16(11); pelvic fin I,4 3/10(5) I,4 4/10(7), I,4 5/10(2); fourth ray of pelvic fin with 4–6 branches, modally 5; segments between consecutive branches of the fourth pelvic ray number 3–8, averaging 5.0; pelvic fin membrane well developed; branched caudal fin rays 11(3); segmented caudal fin rays 17(15); lateral scale rows 21(2), 22(9); transverse scale rows 5(7), 6(4). Breast with 2–5 partially embedded, cycloid scales. Scales with a single row of about 23–28 ctenii, 7–9 primary radii, and 1–3 secondary radii.

The cephalic sensory pore system is pattern 2. Cutaneous papilla system is pattern B.

First 4 dorsal spines of males may be elongate or filamentous, the first 2 longest and about equal in length, extending posteriorly to a vertical passing through end of hypural. The first spine may be filamentous in females and it may extend to base of seventh dorsal fin ray. Pelvic fins long, always extending beyond origin of anal fin.

Genital papilla in male simple, slender, slightly flared, fringed and bilobed at tip, extending to base of first anal fin ray; genital papilla in females small, bulbous, with 4–6 fingerlike projections at tip, papilla usually not reaching base of anal fin spine.

Gravid females range in size from 10.4–16.9 mm SL, all from Abaiang Atoll.

Vertebrae 10(9) precaudal and 15(9) caudal, total 25.

COLOR IN PRESERVATION.—Pigmentation in preserved specimens is weakly developed. Snout with a dusky midline streak extending to anterior interorbital area and two smaller dusky streaks laterally, passing through nares, snout sometimes uniformly dusky; tip of lower jaw dusky; a narrow dusky bar from eye to middle of upper jaw; a dusky mark below eye; a dark spot behind eye, probably entirely subcutaneous; nape pale with traces of fine chromatophores in an irregular pattern; a weak dusky spot may be present beneath end of midopercular flap on anterior portion of base of pectoral fin; upper portion of base of pectoral fin with a dusky spot, remainder of pectoral base usually pale; trunk mostly pale, some weak dusky pigmentation on upper anterior portion; no evident subcutaneous trunk bars or

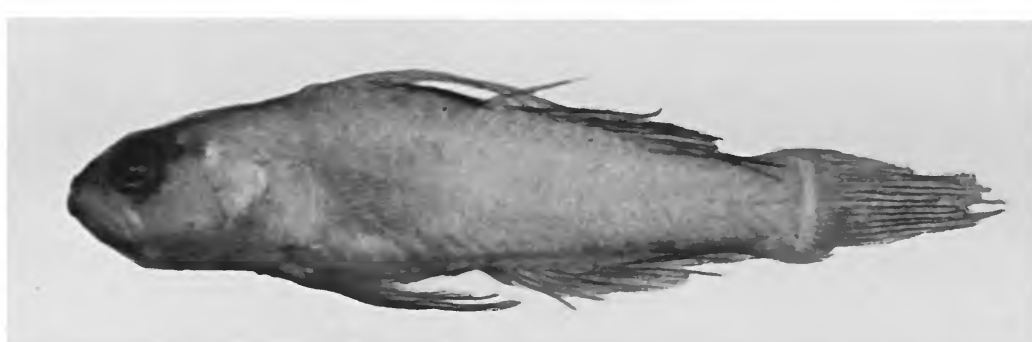

FIGURE 35.—*Eviota pellucida*, AMS I.18043-006, male, 20.9 mm SL, Abaiang Atoll, Gilbert Islands.

caudal peduncle spot; no dark ventral midline spots in positions normally associated with the subcutaneous bars; some surface pigment along midline of lower portion of peduncle, posterior to anal fin, in an elongate broken pattern; faint dusky spots, not discernible in most preserved specimens, along dorsal fin ray bases, probably remnants of the red spots described for life colors by Larson (1976:500); dusky spot at origin of spinous dorsal fin sometimes more pronounced than other spots in midline series; spinous dorsal fin with membrane dusky basally, narrower anteriorly and broader posteriorly, extending to margin of fin at fifth spine; anterior, lower portion and distal portion of fin and spines pale; second dorsal fin with membranes entirely dusky in larger specimens, pigmentation reduced to basal portion in smaller specimens, the rays clear; second dorsal fin about as dark as first dorsal; anal fin with dusky membranes, the rays clear; immediate basal portion of second dorsal and anal fins pale; anal fin somewhat lighter than dorsal fins; caudal fin irregular light dusky; pectoral and pelvic fins clear; sides of belly with dusky to brown subcutaneous pigmentation patch, where many species of *Eviota* have 2–3 broad, dark subcutaneous bars.

GEOGRAPHIC DISTRIBUTION.—Known from Guam and Abaiang Atoll, Gilbert Islands (Figure 33).

REMARKS.—*Eviota pellucida* is probably most closely related to *E. prasites* and *E. storthynx* in having similar meristic characters, simple pectoral fin rays, lacking the IT sensory pore, having nonfimbriate male genital papillae, filamentation of the spinous dorsal fin in both sexes, and in having some scales on the breast. These species differ in the extent of development of the fifth pelvic fin rays, three-tenths to five-tenths in *E. pellucida*, three-tenths to seven-tenths in *E. prasites*, and one-tenth to two-tenths in *E. storthynx*. They differ in coloration in that *E. pellucida* lacks prominent color marks, whereas *E. prasites* has a well-developed dark spot on upper portion of base of pectoral fin and a dark spot on lower basal portion of caudal fin, and *E. storthynx* has a dark postocular spot.

Larson (1976:500) stated that *E. pellucida* differed from *E. storthynx* in that the latter species had a posterior lateral canal, but we find that the IT pore and canal are always absent. Further, Larson stated that *E. storthynx* lacked breast scales but these are present in some specimens.

Eviota indica, new species

FIGURES 36–38

MATERIAL EXAMINED.—141 specimens from 2 areas in the western Indian Ocean, totaling 66 males, 49 females, 26 juveniles; total size range 8.1–15.4; largest male 15.4, largest female 14.4; smallest gravid female 11.6.

Holotype: USNM 219663, (15.4), male; St. Brandon Shoals, 0.5 mi S of Isle Raphael, 12 Apr 1976, V. G. Springer, 76-20.

Paratypes: ST. BRANDON SHOALS: RUSI 2219, 12 (8.1–13.8), 3 juv., 2 males (13.0), 7 females (13.8); Raphael I., 18 Mar 1971, T. H. Fraser, SA-36. COLLECTED BY V. G. SPRINGER IN 1976: USNM 219664, 1 female (13.4); 30 Mar, VGS 76-1. AMNH 39038, 9 (11.6–13.9), 3 males (13.7), 6 females (13.9); east of Raphael I., 3 Apr, VGS 76-7. AMS I.20806-001, 13 (11.4–13.5), 4 juv., 4 males (13.5), 5 females (12.7); east of Raphael I., 4 Apr, VGS 76-8. USNM 220896, 1 (15.5), male; Grande Passe, 5 Apr, VGS 76-9. USNM 220897, 1 (14.2), male; northern tip, 6 Apr, VGS 76-10. USNM 219667, 36 (10.4–14.3), 7 juv., 18 males (14.3), 11 females (13.9); Raphael I., 8 Apr, VGS 76-12. CAS 43544, 9 (9.9–13.6), 3 juv., 4 males (13.1), 2 females (13.6); 11 Apr, VGS 76-17. USNM 219666, 18 (12.6–14.8), 3 juv., 9 males (14.8) and 6 females (14.4); same data as holotype.

Other Material: SEYCHELLES ISLANDS: (collected by J. E. Böhlke in 1964): ANSP 141215, 2 (11.7–12.4), females; Mahé I., 31 Jan–2 Feb, F-13 and/or F-17. ANSP 141217, 20 (8.5–14.1), 5 juv., 12 males (14.1), 3 females (11.7); Mahé vic., 2 Feb, F-17. USNM 219665, 15 (10.6–15.3), 9 males (15.3), 6 females (13.4); Mahé vic., 10 Feb, F-37. ANSP 141216, 4 (8.8–10.9), 1 juv., 3 males (10.9); Praslin vic., 22 Feb, F-61.

DIAGNOSIS.—Pectoral fin rays 11–14 always branched; spinous dorsal fin not elongate or filamentous in either sex; fifth pelvic fin ray small or rudimentary, usually about one-tenth the length of the fourth pelvic fin ray; spinous dorsal fin mostly pale, much lighter than anal fin; chromatophores on cheek scattered, linearly arranged, or outlining patches on the cheek and preopercle; 6 dark subcutaneous bars and spots on lower trunk from origin of anal fin to end of caudal peduncle, in some specimens a seventh spot at

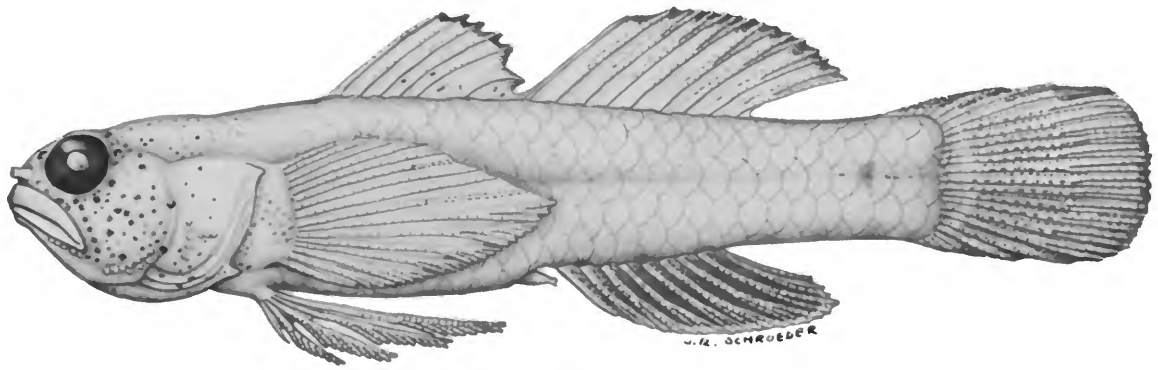

FIGURE 36.—*Eviota indica*, USNM 219663, holotype, male, 15.4 mm SL, St. Brandon Shoals, Indian Ocean. (Drawn by J. R. Schroeder.)

FIGURE 37.—*Eviota indica*, USNM 219665, male, 14.1 mm SL, Seychelles.

procurrent rays; the same area of upper trunk with 5 bars. This species is most closely related to *E. afelei*, but differs in almost always having 8 dorsal fin rays rather than 9; a light to pale, rather than dark, spinous dorsal fin; cheek lacking distinct clusters of chromatophores; upper and lower margins of caudal fin dark rather than pale; the lower portion of caudal fin somewhat darker than upper compared to the uniform coloration in *E. afelei*; and the base of the pectoral fin with light upper and lower areas or spots, compared to various color patterns in *E. afelei*.

DESCRIPTION.—Dorsal fin VI-I,8(27), VI-I,9(2); anal fin I,7(1), I,8(27); pectoral fin 15(17), 16(11), 17(1); pelvic fin I,4 + a rudiment (4), I,4 1/10(25); fourth ray of pelvic fin with 6–13 branches, averaging 10.7; segments between the consecutive branches of the fourth pelvic fin ray 1–3, averaging 1.2; pelvic fin membrane reduced; branched caudal fin rays 12(10), 13(7), 14(1); segmented caudal fin rays 17(29); lateral scale rows 23(1), 24(6), 25(7); transverse scale rows 6(4), 7(1); breast scaleless. Scales with about 21–27 ctenii, 6–12 primary radii, and 1–3 secondary radii.

Spinous dorsal fin not elongate in either sex; pelvic fin usually reaches to origin of anal fin or beyond, shorter in some specimens.

The cephalic sensory pore system is pattern 2. Cutaneous papilla system is pattern B.

Genital papilla in male not fimbriate, broad, flattened, not reaching beyond anal spine, the tip not constricted or bilobed; female papilla bulbous with 3–4 fingerlike projections on each side of tip,

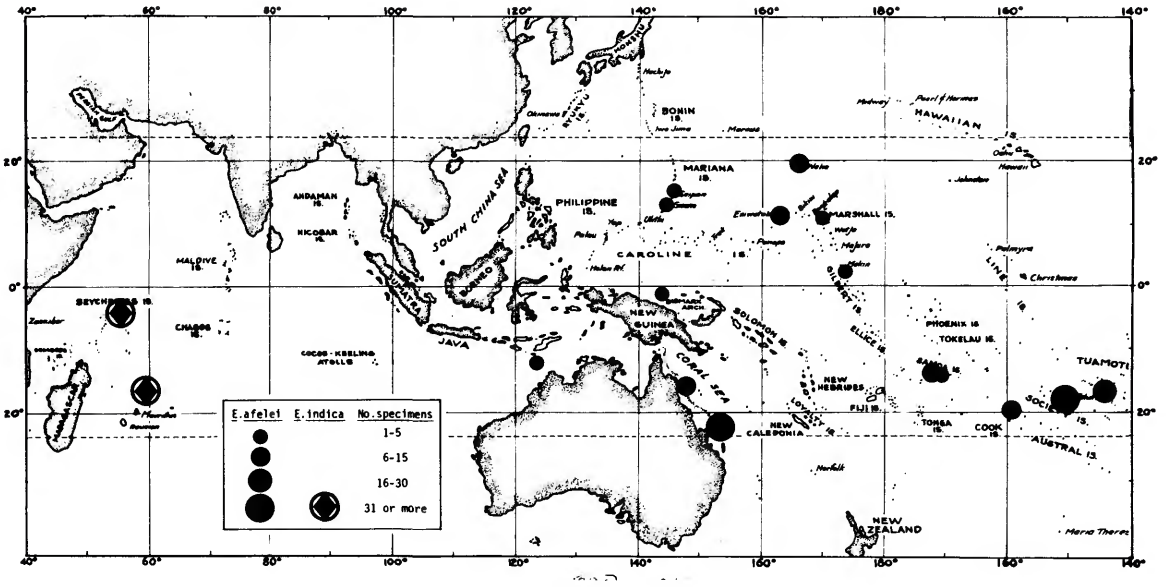

FIGURE 38.—Distributions of *Eviota afelei* and *E. indica*.

the length at most extending to anal spine.

Gravid females range from 11.6 mm to 13.9 mm SL.

Vertebrae 10(25) precaudal and 15(1), 16(24) caudal, total 25(1), 26(24).

COLOR IN PRESERVATION.—Head mostly with large, scattered chromatophores, trunk pale, lacking any notable surface pigmentation. Males usually more heavily pigmented than females. Cheeks, chin, preopercle, and anterior breast with large dark chromatophores that are usually scattered, but may be arranged linearly, particularly on cheek, or outlining irregular, elongate areas on cheek; sometimes chromatophores form up to 6 transverse bars on nape; nape usually with a few scattered dark chromatophores; opercle pale or with some scattered chromatophores; base of pectoral fin with upper and lower pale areas separated by an oblique row of chromatophores or a wider, somewhat horizontal, hourglass-shaped pigmented area; trunk surface lacking pigmentation; 6 weak to moderate subcutaneous bars on lower posterior trunk, emerging as spots on ventral midline, from origin of anal fin to end of lower peduncle over hypural base; in some specimens an additional small spot is visible on ventral midline beneath midcaudal peduncle spot; upper posterior trunk with 5 bars, the fourth midway between the fourth and fifth lower bars, the fifth upper bar almost entirely integrated with the midcaudal peduncle spot; dark, subcutaneous midcaudal peduncle spot moderate to well developed, equal to or somewhat larger than pupil, deeper than wide, centrally located on peduncle or slightly more developed above midline than below; belly with 2–3 wide subcutaneous bars or with nearly uniform dusky pigmentation; spinous dorsal fin mostly pale, with a narrow dark margin distally, and with a weak speckled band through basal quarter of fin; basal band usually broken up and represented by weak, irregularly scattered pigmentation; spines bordered by fine dark chromatophores; second dorsal fin much like spinous fin, with fine pigmentation confined to borders of rays, some weak, scattered pigmentation in basal region of fin, and with a narrow, dark, distal margin; anal fin much darker than other fins, usually uniformly dark dusky with narrow pale margin; some specimens with a series of pale spots on the branched portions of

the anal rays, giving an appearance of alternating dark and light spots; caudal fin dusky, darker on lower half with very dark narrow borders dorsally and ventrally in region of procurrent and unbranched fin rays, and to a lesser degree distally on fin; many specimens with alternating dark and pale spots on the fin rays, more developed on lower part of fin; pectoral fin membrane pale, rays bordered by fine, dark chromatophores; pelvic fin mostly pale, with a few scattered chromatophores.

GEOGRAPHIC DISTRIBUTION.—Restricted to the Seychelles Islands and St. Brandon Shoals in the Indian Ocean (Figure 38).

ETYMOLOGY.—The specific name *indica* is in reference to the geographic distribution of this species in the Indian Ocean.

REMARKS.—This species is closely related to *E. afelei*. The differences between these two species are discussed in the "Remarks" section of *E. afelei*.

Eviota saipanensis Fowler

FIGURES 7, 39

Eviota saipanensis Fowler, 1945:66, figs. 8, 9 [type-locality: Saipan Island, Marianas Islands].

MATERIAL EXAMINED.—221 specimens from 5 localities totaling 108 males, 73 females, 40 juvenile and unsexed specimens; total size range 6.9–26.3; largest male 26.3, largest female 22.0; smallest gravid female 11.5.

Holotype: ANSP 71594, (14.6), female; Saipan I., Micronesia, Mar-May 1945, E. R. Tinkham.

Other Material: PALAU ISLANDS: CAS 43787, 91 (6.9–20.0), 7 juv., 57 males (20.0), 27 females (16.0); Angaur I., 24 Oct 1957, DeWitt, sta 57-48, GVF Reg. 1428. USNM 218509, 10 (14.2–19.4), 5 males (19.4), 5 females (15.7); same data as CAS 43787. AMS I.20797-001, 10 (12.6–18.4), 5 males (18.4), 5 females (16.0); same data as CAS 43787. W CAROLINE ISLANDS: CAS 43769, 1 (13.7), female; Fais I., 2 Nov 1956, Scott, sta 212, GVF Reg. 1009. MARIANAS ISLANDS, GUAM: CAS 43757, 9 (13.0–ca.18.0), 5 males (ca.18.0), 4 females (13.9); Inarajan, 15 Jul 1956, Gaines and Scott, sta 43, GVF Reg. 829. USNM 219628, 19 (10.3–16.3), 4 unsexed, 8 males (16.3), 7 females (15.2); Tagachan Beach, 14 Jul 1973, H. Larson. UG 5899, 14 (12.5–16.3), 4 males (16.1), 10 females (16.3); Tagachan Beach, 5 Mar 1973, H. Larson. UG 5920, 28 (8.0–15.5), 13 juv. and unsexed, 11 males (15.5), 4 females (13.6); 9 Aug 1972, H. Larson. UG 5895, 31 (7.3–17.9), 16 juv. and unsexed, 10 males (17.9), 5 females (16.4); Tagachan Beach, 19 May 1973, H. Larson. UG uncat., 1 (11.1), female; 4 Oct 1969, R. S. Jones 01041069. TAIWAN: USNM 218510, 6 (12.0–26.3), 3 males (26.3), 3 females (22.0); Mao-Pit'ou, 25 Apr 1969, V. G. Springer, 68-5.

DIAGNOSIS.—Pectoral fin rays 11–15 almost always branched; spinous dorsal fin elongate or filamentous in both sexes; fifth pelvic fin ray absent; genital papilla in males wide, the lateral margins fold inward forming a cuplike structure (Figure 3); subcutaneous bars on posterior trunk number 4, broad and widely spaced; head and trunk lacking prominent color marks; a dark, mostly subcutaneous, spot on midcaudal peduncle over posteriormost subcutaneous bar, about equal to diameter of pupil; a small dark spot on surface, centrally located, at end of hypural plate; fins dusky, the anal fin darkest.

DESCRIPTION.—Dorsal fin VI-I,9(19), VI-I,10(8); anal fin I,7(1), I,8(26); pectoral fin 15(1), 16(14), 17(12); pelvic fin I,4(27); fourth ray of pelvic fin with 7–14 branches, averaging 9.6; segments between the consecutive branches of the fourth pelvic fin ray 1–4, averaging 1.4; pelvic fin membrane reduced; branched caudal fin rays 11(1), 12(12), 13(7), 14(3); segmented caudal fin rays 16(1), 17(26); lateral scale rows 22(1), 23(3), 24(17), 25(5); transverse scale rows 6(2), 7(6), 8(8); breast scaleless. Scales with about 23–34 ctenii, 8–19 primary radii, 1–2 secondary radii.

First 2 dorsal spines of males may be elongate or filamentous, the first spine longest, extending in some to base of eighth dorsal fin ray; first dorsal spine of females may be elongate, extending in some to base of fourth dorsal fin ray; pelvic fin usually not extending to origin of anal fin, but in some it may reach origin of anal fin or extend just beyond it.

The cephalic sensory pore system is pattern 2. Cutaneous papilla system is pattern B, except for a reduced number (only 2–3) of widely spaced papillae in upper lateral cephalic row.

Genital papilla in male broad, slightly fringed at tip, the lateral portions enlarged, somewhat convoluted and folded inward; lateral folds not developed in some small males; females with short, bulbous papilla with fingerlike projections at tip.

FIGURE 39.—*Eviota saipanensis: a*, USNM 219628, male, 16.3 mm SL, Guam; *b*, UG 5899, male, 18.9 mm SL, Guam.

Gravid females range in size from 11.5–16.0 mm SL.

Vertebrae 10(12) precaudal and 15(2), 16(10) caudal, total 25(2), 26(10).

COLOR IN PRESERVATION.—Body lacking prominent color marks. The females somewhat more lightly pigmented than the males. Head with large dark chromatophores on cheek, usually clustered into elongate barlike marks, one from eye to rictus, a larger mark from eye to angle of preopercle, and sometimes a small cluster between eye and upper lip; cheek bars may be uniformly shaded in some specimens; scattered chromatophores replace cheek bars in many specimens from the Palau Islands; scattered chromatophores may occur dorsally behind eyes and transcend onto anterior upper opercle; pectoral base usually with fine, scattered chromatophores and occasionally, in both sexes, pectoral base also with a smaller unpigmented elongate area in the dorsal posterior portion; fine speckling also occurs on chin, breast, belly, and laterally on lower three-fourths of trunk, usually reduced posteriorly; trunk shading subtle, and may be absent or barely discernible on some specimens; dorsolateral portion of trunk and predorsal region to occiput abruptly pale, devoid of chromatophores; scale pockets not outlined by dark pigmentation; trunk with 6 widely spaced, broad, subcutaneous bars, 2 on the belly region and 4 from origin of anal fin to end of caudal peduncle, the last bar in line with the midcaudal peduncle spot; bars extend from ventral midline, where they emerge as dark spots, to upper trunk, and do not break up or become irregular in shape in midtrunk region; midcaudal peduncle spot with some surface pigmentation, usually chevron shaped and about the size of the pupil; a very small, dark spot on lateral midline of trunk, at end of hypural plate, present in most specimens, but may be weakly developed or absent, particularly in females from the Palau Islands; all fins except pelvics dark dusky, the

anal usually darkest, but in some specimens the dorsal and anal fins may be equally dark; filamentous portion of spinous dorsal fin paler than remainder of fin; spinous dorsal fin of either sex may have 1–5 tiny, dark-centered ocelli on membrane between first and sixth spines; second dorsal fin and anal fin sometimes with weak alternating light and dark spots on outer portions of rays; a narrow pale margin on anal fin; caudal fin rays frequently with alternating dark and light spots, or only dark spots, most highly developed in central portion of fin and more so basally than distally; pectoral fin with dusky membrane, and margins of rays dotted with fine chromatophores; pelvics pale.

GEOGRAPHIC DISTRIBUTION.—Known from Taiwan, Palau, Fais I., Guam, and Saipan (Figure 7).

REMARKS.—*Eviota saipanensis* is similar to *E. zonura* in important meristic characters, in the development of the sensory pore system, and in general coloration. They differ mainly in the following characters: *Eviota saipanensis* has 4 subcutaneous bars and ventral midline spots on the posterior trunk; a cuplike male genital papilla; a dark, central, chevron-shaped caudal peduncle spot over the last subcutaneous bar; and a small dark spot at end of hypural base. *Eviota zonura* has 5 subcutaneous bars ventrolaterally and 4 dorsolaterally, and 5 ventral midline spots; a fimbriate male genital papilla; a large, dark, rectangular subcutaneous caudal peduncle spot at and above midline over last subcutaneous bar, as well as a smaller, round or chevron-shaped, surface spot at midline; no small dark spot at end of hypural base. Other small but distinctive differences in the color patterns of these two species are treated in their color descriptions.

We note the following discrepancies between our data and that listed in the original description by Fowler (1945:66): Fowler gives VI-I,10 for the dorsal fin ray count; we find VI-I,9 for the holotype and 18 other specimens and VI-I,10(8); Fowler lists 15 pelvic fin rays, all simple, whereas we find 17 rays, of which rays 11–16 are branched for the holotype, and 15–17 rays in 26 specimens, of which rays 7–17 may be branched; pelvic I,5 whereas we find the pelvic count to be always I,4; "fins all more or less pale to whitish or transparent," whereas our specimens, including the holotype, consistently have dusky or dark fins except for the pale pelvic fins. The six trunk bars shown on figure 9 by Fowler (1945:64) are subcutaneous bars. The paratype, ANSP 71595, from Saipan is missing.

Eviota zonura Jordan and Seale

FIGURE 40–42

Eviota zonura Jordan and Seale, 1906:386, fig. 75 [type-locality: Samoa].

Eviota gymnocephalus Weber, 1913:452, fig. 87 [type-locality: Indonesia].

Eviota afelei.—Larson, 1976:501.

MATERIAL EXAMINED.—264 specimens from 14 general localities, totaling 127 males, 97 females, and 40 juveniles; total size range 6.9–20.4; largest male 20.4, largest female 18.0; smallest gravid female 11.0.

Lectotype: USNM 51766, (16.1), male; Pago Pago, Samoa, coll. 1902, Jordan and Kellogg.

Paralectotypes: USNM 218352, 14 (10.0–16.0), 2 juv., 9 males (16.0), 3 females (13.2); same data as above. SU 8709, 20 (12.0–17.2), 11 males (17.2), 9 females (15.4); Apia, Samoa, coll. 1902, Jordan and Kellogg.

Other Material: CAROLINE ISLANDS: IFALUK ATOLL (collected by R. R. Harry in 1953): CAS 43706, 1 (12.9), female; Nimweo Pass, 17 Sep, sta 3, GVF Reg. 124. CAS 43707, 2 (14.1, 11.3), male and female; Falarik I., 1 Oct, sta 31, GVF Reg. 152. CAS 43708, 1 (13.9), female; Falarik I., 2 Oct, sta 35, GVF Reg. 156. KAPINGAMARANGI ATOLL (collected by R. R. Harry in 1954): CAS 43710, 1 (14.6), male; Hare I., 28 Jun, sta 6, GVF Reg. 309. CAS 43712, 1 (12.1), male; 16 Jul, sta 48, GVF Reg. 351. CAS 43714, 14 (6.9–12.9), 8 juv., 4 males (12.9), 2 females (12.9); Tapatuaitu, 21 Jul, sta 63, GVF Reg. 366. CAS 43720, 16 (9.8–14.5), 4 juv., 10 males (14.5), 2 females (12.1); Matukerekere I., 27 Jul, sta 82, GVF Reg. 385. CAS 43722, 3 (11.1–12.3), females; 27 Jul, sta 83, GVF Reg. 386. CAS 43723, 2 (14.0–12.4), male and female; 28 Jul, sta 85, GVF Reg. 388. CAS 43724, 11 (9.4–14.7), 3 juv., 4 males (14.7), 4 females (12.4); 2 Aug, sta 99, GVF Reg. 402. CAS 43730, 2 (13.3, 14.3), males; 13 Aug, sta 143, GVF Reg. 446. CAS 43732, 11 (7.9–13.2), 3 juv., 2 males (13.2), 6 females (12.6); 16 Aug, sta 159, GVF Reg. 462. PALAU ISLANDS: CAS 43746, 4 (13.0–14.8), 2 males (13.6), 2 females (14.8); Ngadarak Reef, 17 Aug, 1955, H. A. Fehlmann, sta 106, GVF Reg. 612. CAS 43770, 1 (16.1), male; Koror I., 14 Nov 1956, Gaines, sta 232, GVF Reg. 1029, or 16 Oct 1955, H. A. Fehlmann, sta 232. ULITHI ATOLL: CAS 43766, 1 (13.6), female; 21 Sep

1956, Anthony, sta 178, GVF Reg. 975. CAS 43767, 1 (13.3), female; 23 Sep 1956, McDaniel, sta 181, GVF Reg. 978. MARIANAS ISLANDS: GUAM: CAS 43756, 8 (10.0–19.8), 2 juv., 4 males (19.8), 2 females (16.9); Inarajan, 15 Jul 1956, Gaines, sta. 43, GVF Reg. 829. USNM 219219, 1 (16.3), male; 9 Aug 1972, H. Larson. UG 5811, 12 (9.5–20.4), 9 males (20.4), 3 females (17.3); Pago Bay, 28 Jun 1972, H. and J. Larson. UG uncat., 11 (12.5–17.3), 8 males (17.3), 3 females (15.5); 4 Oct 1969, R. S. Jones, 01041069. SAIPAN: CAS 43759, 1 (16.6), male; Unai Obyan Reef, 18 Jul 1956, Gaines, sta 46, GVF Reg. 832. CAS 43760, 1 (10.5), juv.; Kagman area, 19 Jul 1956, Gaines, sta 47, GVF Reg. 833. MARSHALL ISLANDS: ENIWETOK ATOLL: BPBM 18402, 2 (16.1, 17.9), male and female; Parry I., 10 Jul 1975, J. Randall. USNM 219185, 7 (15.8–17.4), 3 males (17.4), 4 females (16.9); Runit I., 28 Sep 1969, C. E. Dawson, 1384. USNM 219186, 6 (13.3–15.1), 2 juv., 2 males (14.4), 2 females (15.1); Eniwetok I., 23 Sep 1969, C. E. Dawson, 1375. USNM 219184, 6 (10.6–17.4), 1 juv., 3 males (15.9), 2 females (17.4); Eniwetok I., 24 Sep 1969, C. E. Dawson, 1378. LACM W63-282-1, 12 (10.6–16.8), 1 juv., 6 males (16.8), 5 females (14.1); Rigili I., 15 Jul 1963, W. J. Baldwin, W63-282. LACM W63-281-1, 2 (13.4, 15.6), males; Eniwetok I., 13 Jul 1963, W. J. Baldwin, W63-281. GILBERT ISLANDS: AMS I.18052-002, 34 (7.5–16.5), 6 juv., 13 males (16.5), 15 females (15.4); Abaiang Atoll, 11 Nov 1973, D. Hoese. FIJI ISLANDS: SU 24838, 2 (15.1, 14.2), male and female; Suva, 23 Mar 1929, Herre. SAMOA ISLANDS: USNM 116152, 35 (7.4–16.1), 6 juv., 16 males (16.1), 13 females (15.8); Tau I., 27 Jun 1939, L. P. Schultz, U-39-880-934. TIMOR SEA: AMS I.17687-001, 7 (11.0–16.3), 4 males (16.3), 3 females (14.0); East Ashmore Reef, 12 Jan 1973, J. McCosker. AMS I.17688-005, 5 (11.6–15.7), 1 juv., 1 male (15.7), 3 females (14.8); Ashmore Reef, 11 Jan 1973, J. McCosker. INDONESIA: ZMA 110.965, 1 (18.6), female; lectotype of *E. gymnocephalus*; W of New Guinea, N coast of Waigeu I, Wunoh-Baai, 12–13 Aug 1899, M. Weber, *Siboga* Exp., sta 152.

Tentative Identifications: SOLOMON ISLANDS: CAS 5752, 1 (16.6), male; Rennell I., 12 Jun 1933, Crocker Exp. FIJI ISLANDS: ANSP 93920, 1 (15.9), male; Makuluva I., 21 Feb 1954, M. Laird. CELEBES SEA: SU 28846, 1 (18.0), female; Lembeh Strait, 21 Jun 1929, A. W. Herre. WESTERN AUSTRALIA: BPBM 17397, 2 (11.2, 13.8), females; Dampier Archipelago, Kendrew I., 16 Oct 1973, J. Randall.

DIAGNOSIS.—Pectoral fin rays 11 through 15 almost always branched; first spine of spinous dorsal fin may be elongate or somewhat filamentous in males; fifth pelvic fin ray rudimentary or absent; genital papilla highly fimbriate in male; a large, dark, mostly subcutaneous, circular to rectangular spot on upper and central portion of caudal peduncle about 3 scale rows anterior to hypural base.

DESCRIPTION.—Dorsal fin VI-I,8(1), VI-I,9(55), VI-I,10(2); anal fin I-7(2), I,8(55); pectoral fin 15(1), 16(28), 17(10); pelvic fin I,4(26), I,4 + a rudiment (13); fourth ray of pelvic fin with an average of 7.6 branches; segments between consecutive branches of the fourth pelvic fin ray number 1–5, averaging 1.8; pelvic fin membrane reduced; branched caudal fin rays 11(1), 12(12), 13(9), 14(1); segmented caudal fin rays 16(1), 17(38); lateral scale rows 23(8), 24(15); transverse

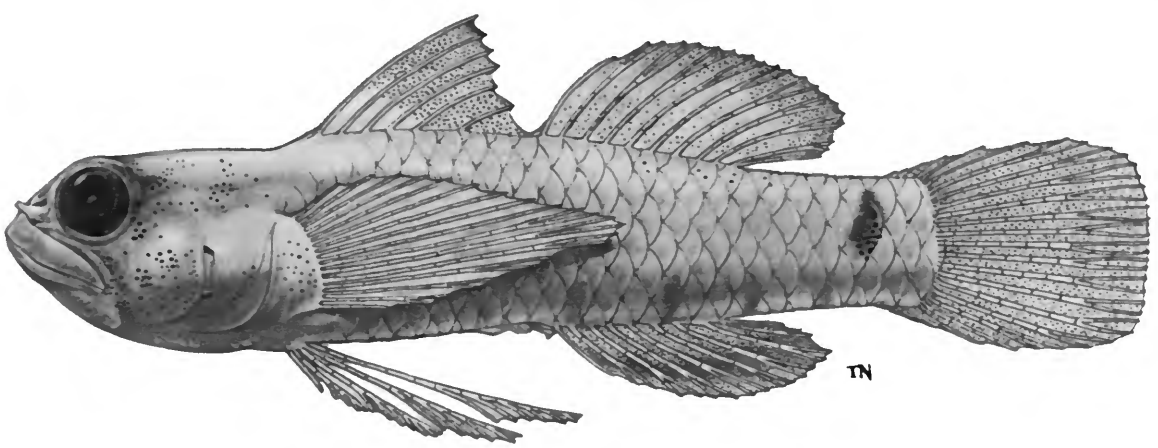

FIGURE 40.—*Eviota zonura*, CAS 43710, male, 14.6 mm SL, Kapingamarangi Atoll, Caroline Islands. (Drawn by Trudy Nicholson.)

FIGURE 41.—Typical coloration of *Eviota zonura* and pronounced subcutaneous trunk bars due to partial dessication: *a*, UG 5811, male, 15.9 mm SL, Guam; *b*, female, 17.3 mm SL, same collection.

scale rows 6(1), 7(4); breast scaleless. Scales with 20–30 ctenii, 9–10 primary radii, and 1–3 secondary radii.

First 2 spines of spinous dorsal fin of males may be elongate, the first spine longer, it may be filamentous, extending to base of fifth dorsal fin ray; the second dorsal spine seldom elongate and not filamentous; no spinous dorsal elongation in females; pelvic fins usually extending to anal papilla or anal fin origin.

Cephalic sensory pore system is pattern 2. Cutaneous papilla system is pattern B.

Genital papilla in male highly fimbriate along lateral edges, the papilla extending to base of first anal fin ray; female papilla bulbous, reaching anal spine, the tip with 4–6 fingerlike projections.

Gravid females range in size from 11.0 to 17.9 mm SL.

Vertebrae 10(16) precaudal and 16(16) caudal, total 26.

COLOR IN PRESERVATION.—Head, dorsally to occipital area, with clusters of brown chromatophores forming weak, large spots, weak transverse bars, or with some scattered chromatophores; 2 weak postorbital clusters of chromatophores, sometimes faded; cheek with 5–6 spotlike aggregations of brown chromatophores, only weakly developed; 3–4 similar spots sometimes present on opercle; sometimes spots on cheek and opercle are diffuse or broken into scattered chromatophores; snout anteriorly and laterally with chromatophores arranged in irregular spots or bandlike marks; the lower jaw, branchiostegal area, breast, and belly with large diffuse spots or scattered brownish chromatophores; base of pectoral fin with loose or weak clusters of dark chromato-

phores forming spots on upper and lower areas, separated by finer light brown chromatophores; in specimens from Guam and Samoa the 2 clusters are frequently replaced by pale, unpigmented, circular areas; in some specimens, over the range, the pectoral base is uniformly speckled with weak chromatophores; trunk with weak scattered chromatophores or pale, the margins of scale pockets at most poorly outlined with dark chromatophores; dark, dorsal midline spots absent; large, dark, conspicuous spot on caudal peduncle, consisting of surface and subcutaneous portions, about 3 scale rows anterior to caudal fin base; the densely pigmented surface portion circular or chevron shaped, almost always at midportion of peduncle or sometimes slightly above; the subcutaneous portion is a dark rectangular spot, deeper than wide, at and above midportion of peduncle, sometimes extending to dorsal midline; subcutaneous spot with a narrow extension from the lower, anterior margin ventrally to the fifth ventral midline spot; the surface portion of the midpeduncular spot may be enlarged in some specimens and more or less integrated with the larger upper subcutaneous portion; the subcutaneous spot is weakly developed or only slightly enlarged above the midline in some specimens; 5 dark circular spots on ventral midline from base of first anal fin ray posteriorly to caudal peduncle; these spots associated with 5 weak subcutaneous bars on lower portion of trunk that integrate with 4 bars on mid and upper trunk; the third and fourth lower bars combine to form the third upper bar; 3 subcutaneous bars on belly, the 2 posterior bars merge into one dorsolaterally; a weak dorsolateral subcutaneous bar anterior to origin of spinous dorsal fin; outer four-fifths of first dorsal fin dusky, the lower one-fifth pale, never pigmented, pale area enlarged anteriorly, tapering downward to base of fifth spine; chromatophores larger and darker in midportion of fin, forming an oblique band and a very fine and somewhat lighter brownish pigmentation on outer two-fifths; sometimes outer portion faded or pale, leaving only dusky oblique central band on fin; occasionally small solid black spots on middle band, between second, third, and fourth spines; second dorsal fin dusky, more so on basal half, the outer portion finely pigmented to pale; second dorsal fin considerably lighter than anal fin; anal fin brownish, the margin usually pale, and the basal portion sometimes with larger and less dense chromatophores; caudal fin light brown, finely pigmented, the rays with pale spots interspersed with small brown spots, mostly on middle and dorsal portions; pectoral fins pale, with fine dusky pigmentation bordering the rays; pelvic fins clear.

Sexual dichromatism is relatively minor, the main differences are the somewhat lighter coloration of the median fins and the wider, more heavily pigmented, subcutaneous belly bars in females.

GEOGRAPHIC DISTRIBUTION.—This species is found mainly in the small islands of Oceania occurring from the Palau and Marianas Islands eastward to the Samoa Islands. We also have 2 good collections from the Timor Sea, but a specimen from the Celebes Sea and 2 from Dampier Archipelago, Western Australia, are only tentatively identified (Figure 42).

REMARKS.—*Eviota zonura* is most closely related to *E. prasina.* These species are similar in the meristic characters that we have investigated, as well as in the cephalic sensory pore systems, the cutaneous papilla systems, morphology of the genital papilla, and in the general body physiognomy.

These species differ in the presence and intensity of the color pattern on the head, trunk, and fins. Not all specimens can be identified because they are variously preserved, some being greatly faded, or they are juveniles. Adding to the problem of identification are the collections composed of a single specimen or two, especially when they are taken at or near the area of geographic overlap. Collections made at such localities involving one or two specimens were tentatively identified as either *E. zonura* or *E. prasina.*

The salient differences in the color patterns distinguishing *E. zonura* from *E. prasina* are: the dark spot on the caudal peduncle in *E. zonura* is large, rectangular, almost always deeper than

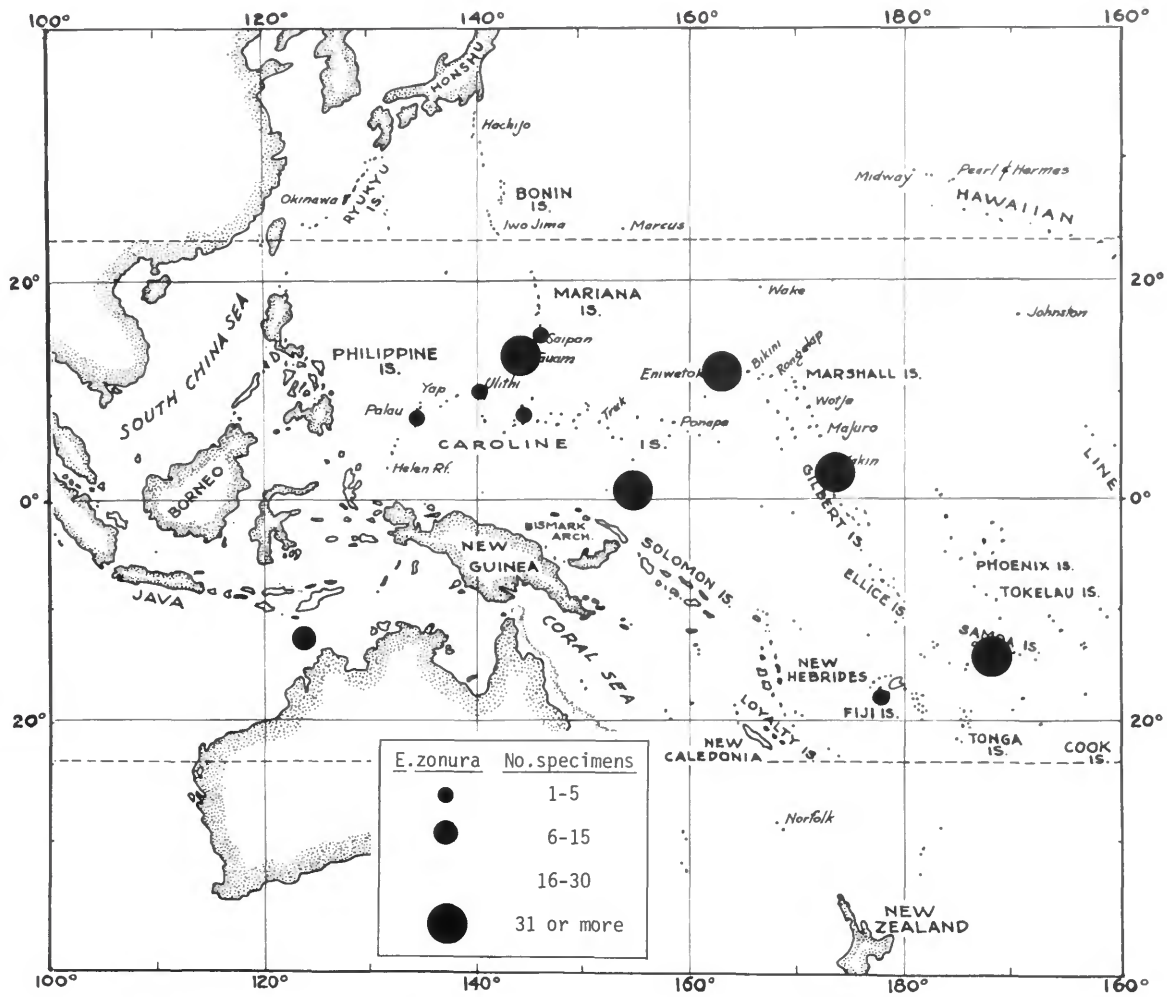

FIGURE 42.—Distribution of *Eviota zonura*.

wide, on surface at midpeduncle and mostly subcutaneous about midpeduncle area. In *E. prasina* the spot is moderate in size, round, or chevron shaped and only on midpeduncle area; the dark spots along the dorsal midline are absent in *E. zonura*, present and moderately intense in *E. prasina*; the pigmentation on the scale pockets over the trunk is practically absent, the trunk mostly pale, in *E. zonura*, whereas the trunk usually has some scattered pigment or the scale pockets are moderately outlined in the dorsolateral area in *E. prasina*; the dark clusters of chromatophores on the head (dorsally), on cheek and postorbital area are often faint and poorly defined in *E. zonura*, but they are usually clearly discernible in *E. prasina*; the subcutaneous caudal trunk bars number 4/5 in *E. zonura* and 4/5 or 5/5 in *E. prasina*, the latter data usually relate to locality; the first dorsal fin is pale at its base in *E. zonura*, without an anterior dark mark, often present in *E. prasina*; the second dorsal fin is light dusky to brown in *E. zonura*, much lighter than anal fin, and in *E. prasina* this fin is brownish, only somewhat lighter than anal fin; the fine light and dark spots on the

caudal fin rays are weakly developed and sometimes wanting in *E. zonura*, usually more heavily developed in *E. prasina*.

Jordan and Seale state in the original description of *E. zonura* (1906:386–387): "Of this species we have 16 specimens from Apia and 28 from Pago Pago. The type is no. 51776, U. S. National Museum, seven-eighteenths of an inch in total length." Based on catalog records, the type jar at the National Museum of Natural History is USNM 51766, not 51776. The jar, USNM 51766, contains 16 specimens originally cataloged from Apia and later changed to Pago Pago. A second type series, SU 8709, contains 20 specimens (not 16) taken at Apia. There has been some mix-up in the number of specimens between these two localities and we cannot account for eight of the original specimens.

The USNM files contain the original drawing of *E. zonura* published by Jordan and Seale (1906) and it is labeled "type, 7/8th inches long, collected Apia, Samoa." The length of seven-eighteenths of an inch given by Jordan and Seale was probably an error. The largest specimen contained in USNM 51766, 16.1 mm SL, was segregated in a vial from the 15 other specimens and has an atypical dorsal fin ray count of VI-I,10, which corresponds to the count in the original description, VI,11. All other specimens in USNM 51766 have a dorsal fin ray count of VI-I,9, except for one specimen, representing another species of *Eviota*, with a count of VI-I,8. No specimen in either of these two series has a label stating that it was drawn. We select the segregated specimen in USNM 51766, a male, 16.1 mm SL, as a lectotype.

Jordan and Seale list 28 scales in the lateral count, whereas we record 23–24 for the species.

The non-*E. zonura* in the USNM 51766 type series (13.6 mm SL, a female, recatologed as USNM 218353) cannot be identified to the species level due, in part, to a nearly total loss of color pattern. If differs, however, from *E. zonura* in having an intertemporal cephalic pore, a dorsal fin ray count of I,8, and a series of faded, dark spots along the dorsal midline.

Analysis of *Eviota gymnocephalus* Weber (1913: 452–453, fig. 87).—The type material of *E. gymnocephalus* was listed by station numbers, locality, number of specimens, and size. These specimens, now cataloged as ZMA 110.957 through 110.968, were available to us for study. We find that these types represent several species of *Eviota* and three specimens of gobies other than *Eviota*. The taxonomic problem is further complicated because no holotype was designated, the specimens are faded, most of them beyond species recognition, and the original description contains data pertaining to more than one species of *Eviota*. We designate as the lectotype the specimen from station 152, illustrated in figure 87 and cataloged as ZMA 110.965 (18.6 mm SL, female). We identify this specimen as *E. zonura* Jordan and Seale (1906) for the following reasons: pectoral fin rays branched; cephalic sensory pore system as in pattern 2, lacking the IT pore; dorsal fin rays VI-I,9 and anal fin rays I,8; the broad band in the middle of the spinous dorsal fin, characteristic of *E. zonura*, persists as weakly scattered chromatophores and this band is also shown in figure 87; a small dark caudal spot is present on the midpeduncle about 3 scale rows anterior to end of the hypural. This was illustrated (fig. 87) as a large spot, darkest at midline but extending in upper portion of peduncle as a less intense spot and is probably the subcutaneous pigment characteristically developed in *E. zonura*. The clusters of chromatophores on the cheek and on the base of the pectoral fin are shown on figure 87 and these persist as traces of chromatophores on the lectotype. Although many of the specimens in the type series are identified below as belonging to the *E. prasina–zonura* complex, the combination of the coloration of the spinous dorsal fin and the asymmetry of the caudal peduncle spot, clearly shown in figure 87, are unique to *E. zonura*. We thus synonymize *E. gymnocephalus* with *E. zonura*.

The 30 other specimens in Weber's type material are identified below. Catalog and station numbers and important distinguishing characters are listed.

Eviota prasina–E. zonura: ZMA 110.959, sta. 93

(11.6 mm SL, male); ZMA 110.962, sta. 129 (1 male, 20.0 mm SL and 3 females, 15.5, 16.7, and 17.6 mm SL); ZMA 110.961, sta. 125 (15.3 mm SL, male); ZMA 110.964, sta. 193 (16.9 mm SL, male). Pectoral rays branched; sensory pore system 2; D.VI-I,9; A.I,8; pelvic fin membrane reduced in 3, not discernible in the others; pelvic fins I,4 or I,4 plus a rudiment; male genital papilla fimbriate; vertebrae 10 + 16(6), 9 + 17(1). The color marks characteristic of *E. prasina* and *E. zonura*, such as the coloration of the spinous dorsal fin, dark caudal spot, 5 ventral midline spots, and weak spots on base of pectoral fin are evident on these specimens but the coloration is also sufficiently faded that distinction between these 2 species is not possible.

Eviota herrei, tentative identifications: ZMA 110.958, sta. 79 (3 of the 5 specimens in this lot, 1 female 12.3 mm, 2 males 13.1 and 13.2 mm). These specimens have branched pectoral fin rays; sensory pore system 1; D.VI-I,8; A.I,8; pelvic fin membrane well developed; pelvic fin rays I,4 or I,4 plus a rudiment; a short, stout body shape; body pale, lacking prominent color marks.

Eviota nebulosa, tentative identification: ZMA 110.958, sta. 79, 1 of 5 specimens, a female, 11.7 mm SL.

Eviota queenslandica: ZMA 110.963, sta. 133 (1 male, 16.6 mm SL); ZMA 110.966, sta. 213 (2 of the 5 specimens in the lot, 2 females, 12.5 and 13.3 mm SL). Pectoral rays branched; sensory pore system 2; D.VI-I,9; A.I,8; pelvic fin rays I,4 1/10; male genital papilla not fimbriate. Dark circular spots on cheek, nape, and base of pectoral fin.

Eviota (several species involved in the following collections, but the poor state of preservation prohibits specific identifications):

ZMA 110.958, sta. 79 (1 of 5 specimens, male, 12.8 mm SL). Pectoral rays branched; sensory pore system 2; D.VI-I,8; A.I,8; pelvic fin membrane reduced; pelvic fin I,4 + a rudiment; male genital papilla not fimbriate; vertebrae 10 + 16. Specimens pale, no chromatophores visible in areas where diagnostic color marks are normally present.

ZMA 110.960, sta. 115 (4 specimens, 2 males, 9.5 and 10.4 mm SL, 2 females, 12.5 and 13.8 mm SL). Pectoral rays branched in 1 specimen, fins destroyed in the other specimens; sensory pore system 2; dorsal-anal fin formulas, I,9/I,7(1), I,9/I,8(2), I,10/I,8(1); pelvic fin membranes destroyed; pelvic fin I,4 1/10(3), I,4 2/10(1); male genital papilla not fimbriate (2); vertebrae 10 + 16(4). Color pale.

ZMA 110.966, sta. 213 (3 of 5 specimens, 1 male, 13.7 mm SL, 2 females, 12.1 and ca. 15.0 mm SL, poorly preserved, 1 lacking head). The male has branched pectoral rays; sensory pore system 2; D.VI-I,8; A.I,8; pelvic membrane intermediate; pelvic fin I,4 + a rudiment; genital papilla not fimbriate; vertebrae 10 + 16. Specimens mostly pale, lacking diagnostic color characters.

ZMA 110.957, sta. 31 (5 specimens, 2 juveniles, 8.7 and 10.6 mm SL, 1 male, 11.0 mm SL and 2 females, 10.9 and 11.2 mm SL). Females with branched pectoral rays; sensory pore system 2; D.VI-I,8; A.I,8; pelvic fin I,4 + a rudiment and I,4 1/10; vertebrae 10 + 16. Color pale.

Gobiidae other than *Eviota:* ZMA 110.967, sta. 282 (1 specimen, 16.0 mm SL); ZMA 110.968, sta. 144 (2 specimens, 11.1 and 11.9 mm SL). Pelvic fins joined, the fifth ray long and branched, the other rays lacking the multiple branching diagnostic of *Eviota.*

Eviota variola, new species

FIGURES 43–45

MATERIAL EXAMINED.—170 specimens from 3 localities in the southernmost part of the Great Barrier Reef, Australia, totaling 87 males, 41 females, 42 juveniles; total size range 7.8–21.5; largest male 21.5, largest female 20.8; smallest gravid female 17.4.

Holotype: USNM 219238 (20.3), male; One Tree I., 22 Nov 1969, B. B. Collette, 1385, FT-409.

Paratypes: ONE TREE ISLAND: USNM 219239, 3 (12.9–17.8), 1 juv., 1 male (17.6), 1 female (17.8); same data as holotype. CAS 13783, 48 (8.9–21.5), 18 juv., 19 males (21.5), 11 females (19.1); same data as holotype. LACM 33723-28, 6 (11.2–19.0), 1 juv., 2 males (18.1), 3 females (19.0); Australian Museum staff, DFH 72-79. BPBM 22576, 2 (15.3, 17.4), juv. and female; 14 Jan 1973, J. E. Randall. AMS

I.20204-018, 15 (7.8–21.0), 7 juv., 6 males (21.0), 2 females (20.8); 20 Nov 1969, F. Talbot 404. AMS I.20202-014, 23 (11.3–20.4), 1 juv., 12 males (19.4), 10 females (20.4); 4 Oct 1971, D. F. Hoese, 71-24. ANSP 141142, 2 (12.4, 15.2), juv. and male; 18 Nov 1966, V. G. Springer, 66-3. USNM 219244, 1 (14.1), juv.; 18 and 19 Nov 1966, V. G. Springer, 66-4 and 66-5, collections mixed. USNM 219241, 43 (9.7–20.9), 6 juv., 32 males (20.9), 5 females (19.4); 27 Nov 1966, V. G. Springer, 66-9. USNM 219240, 5 (11.9–17.9), 4 males (13.8), 1 female (17.9); 30 Nov 1966, V. G. Springer, 66-13. USNM 219243, 2 (14.3, 14.5), males; 9 Dec 1966, V. G. Springer, 66-18. HERON ISLAND: BPBM 22564, 2 (12.1, 12.8), juv. and female; 7 Oct 1964, Snider. LACM 32819-1, 13 (9.0–20.2), 4 juv., 5 males (18.3), 4 females (20.2); Dec 1961, G. Bartholomew. USNM 219242, 1 (18.5), female; 21 Feb 1967, J. Choat.

Other Material.—AMS IB.6251, 3 (17.3–19.6), 2 males (19.6), 1 female (18.2); Swain Reefs, Gillett Cay, 1962, AMS expedition.

DIAGNOSIS.—This species is most closely related to the *E. prasina* complex but differs from it in the following characters: anal fin rays usually I,9 rather than I,8; pelvic fin usually with a rudimentary fifth ray, usually absent in *E. prasina*; first filamentous dorsal spine with alternating dark and light spots to tip; occipital spots dark, prominent in adults, faint in young; dark peduncle spot more circular than chevron shaped; dark subcutaneous bars on posterior portion of trunk

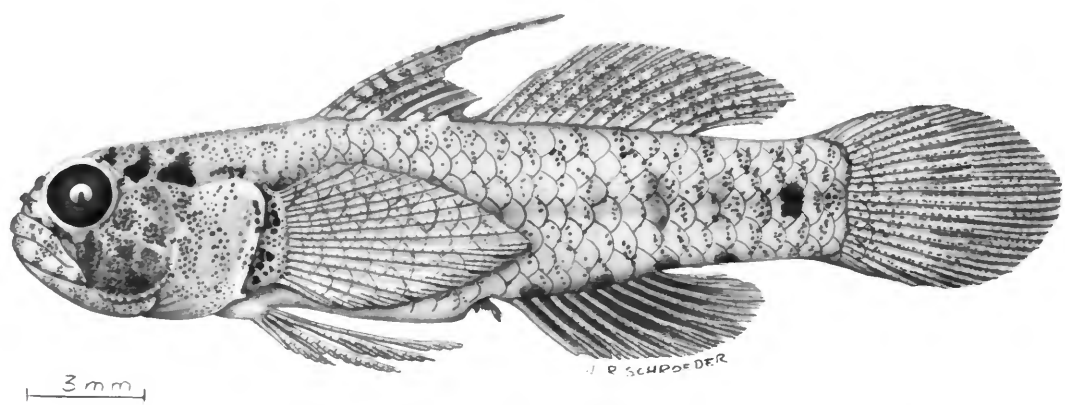

FIGURE 43.—*Eviota variola*, CAS 13783, male, 20.3 mm SL, One Tree Island, Australia. (Drawn by J. R. Schroeder.)

FIGURE 44.—*Eviota variola*, CAS 13783, male, 17.6 mm SL, One Tree Island, Australia.

5/5, never 4/5.

DESCRIPTION.—Data for certain characters are compared with populations of *E. prasina* in Tables 9–12. Dorsal fin VI-I,9(8), VI-I,10(28); anal fin I,8(10), I,9(26); pectoral fin 16(8), 17(24), 18(4); pelvic fin I,4(10), I,4 + a rudiment(26); fourth ray of pelvic fin with 4–10 branches; segments between consecutive branches of the fourth pelvic fin ray number 1–5, usually 2–3; pelvic fin membrane reduced; branched caudal fin rays 12(5), 13(11), 14(10), 15(2); segmented caudal fin rays 17(36); lateral scale rows 23(2), 24(22), 25(2); transverse scale rows 7(8), 8(3); scales with about 25–31 ctenii, 10–14 primary radii; breast scaleless.

First and second dorsal spines filamentous in males, maximum length of first spine, when depressed, extends to base of seventh dorsal fin ray; no spinous dorsal fin elongation in females; pelvic fins may extend beyond origin of anal fin.

The cephalic sensory pore system is pattern 2. Cutaneous papilla system is pattern B.

Genital papilla in male broad, the tip fringed and moderately indented, and with fimbriations on outer edges; fimbriations lacking in small males; papilla usually not extending beyond first anal ray; female papilla bulbous, reaching to first anal ray, the tip with 6–8 fingerlike projections.

One gravid female was 17.4 mm SL.

Vertebrae 10(13) precaudal and 16(13) caudal, total 26(13).

COLOR IN PRESERVATION.—The general color pattern of this species closely resembles that of *E. prasina*. As in *E. prasina*, there are differences in coloration related to sex and quality of preservation. Certain specific color marks vary with SL. These prominent color patterns are compared in Figure 46 *a–e* for *E. prasina*, and Figures 43 and 44 for *E. variola*. Additionally *E. variola* has prominent dark and light spots on the first filamentous dorsal spine, from the base to its extremity.

The presence, size, and intensity of the salient color marks are reviewed below in the order presented for *E. prasina*. Occipital spots: 2 prominent, dark, irregularly round spots dorsolaterally behind eye, the posterior one larger, the anterior one often weakly integrated with chromatophores dorsally over head; a pair of dark spots, smaller than occipital spots, dorsally just behind eyes (Figures 43–44), common also to *E. prasina*. The occipital spots in the adult male of *E. variola* are more intense than those of adult males of *E. prasina*, with the exception of specimens of *E. prasina* found in the southern portion of the western Indian Ocean population, where the spots are intense. These spots are most poorly developed in the Lord Howe–Norfolk Islands population of *E. prasina*.

Cheek Spots: About 4–10 irregularly shaped clusters of small to large chromatophores on cheek and opercle, less intense than occipital spots in adults; spots rarely replaced by uniformly scattered chromatophores as sometimes occurs in *E. prasina*.

Predorsal Area: Region from origin of first dorsal fin to eyes has weak to moderate groups of chromatophores, suggestive of transverse bars, that are usually more pronounced anteriorly on nape; sometimes predorsal area with fine scattered chromatophores, or area occasionally pale except for the pair of spots behind eyes. Predorsal area more heavily marked in many collections of *E. prasina*.

Spots along Dorsal Midline of Trunk: A linear series of about 12–14 weak, dark spots along dorsal midline extending from origin of first dorsal fin posteriorly to area just before procurrent caudal rays, faint in most specimens and obscure in some, more so anteriorly; the spots never as prominent as in some *E. prasina* collections.

Spots on Pectoral Base: A dark spot on upper and lower part of pectoral base, each consisting of a cluster of usually large chromatophores, separated by an area of fine chromatophores, or less commonly by a paler brown area. Sometimes spots replaced by uniformly scattered chromatophores, particularly in juveniles.

Caudal Peduncle Spot: A conspicuous, black, more or less circular-shaped spot located medially on caudal peduncle on about the third scale row anterior to base of caudal fin and overlying dark posteriormost subcutaneous bar; spot equal to or larger than pupil, sometimes deeper than wide, occasionally chevron shaped.

Dark Spots on Ventral Midline: A series of 5 spots,

mostly subcutaneous, extend from origin of anal fin posteriorly on peduncle to area below midcaudal peduncle spot.

Subcutaneous Bars: Trunk with 5 dark subcutaneous bars integrated with the 5 ventral midline spots; bars usually conspicuous, rarely staggered and never 4 above on trunk and 5 below, as described for *E. prasina* from certain localities. The 3 lower and 2 upper subcutaneous bars on belly are present as in *E. prasina*, these usually weaker than those on posterior part of trunk and more enlarged and prominent in mature females. Two weak subcutaneous spots on posterior part of nape beneath the 2 narrow elongate midline spots that are usually present, as in *E. prasina.*

Scale Pigmentation: Scale pockets weakly margined with dark chromatophores, somewhat more evident on upper part of trunk.

First Dorsal Fin: Outer half, or more dark brown; usually with a series of 4 or 5 light spots at base, the largest equal to the pupil in size, located at the base of the first spine, and behind the third, fifth, and sixth spines; spots separated by brownish pigmentation that is sometimes integrated with the dark spots along dorsal midline of trunk; brown pigmentation may be irregular on anterior basal part of fin; a series of small dark and light spots on first spine of large males; when spine filamentous, spots continue to tip and spots usually visible on second spine of larger specimens and on filament, if present; small intense black spots, usually 2, on membrane above pale basal area posterior to the second and third spines, commonly present in juveniles and smaller males but lacking in large females.

Second Dorsal Fin: Dusky to light brown, the rays mostly clear; some specimens with outer one-half shaded in brown, the basal portion uniformly shaded with fine light brown to dusky chromatophores, or in some specimens with irregular shading of fine dusky chromatophores; in a few specimens the deeper brown shading is on the lower half, the outer portion having less dense and light brown to dusky chromatophores. Light round to elongate spots occur near midportion of fin in some specimens, mostly located over the rays and adjoining membrane; about 5 small light spots at base of fin, between dark dorsal trunk spots, smaller than those at base of first dorsal fin; a series of light and dark spots sometimes on spine of second dorsal fin, similar to those on spine of first dorsal fin.

Anal Fin: Dark brown to blackish, always darker than second dorsal fin, usually uniformly colored, the basal portion light brown or light dusky in some specimens, the fin margin clear or light. Females with slightly less pigmentation.

Caudal Fin: Dusky to light brown with small dark and light spots on rays, mostly on upper basal area of fin, spots sometimes absent.

Pectoral and Pelvic Fins: Membrane clear, the rays of pectoral fin with fine, weak, dark chromatophores.

Sexual Dimorphic Features.—The prominent features are the fimbriate genital papilla, the filamentous first dorsal fin, and the darker coloration of the male. The occipital spots are most intense in males; the fins, particularly the anal fin, are somewhat lighter in females; the subcutaneous belly bars are wider and more prominent on females; the intense black spots, commonly present on the spinous dorsal fin of juveniles and smaller adult males, are lacking in adult females. The general body condition, including the fins, appears to be ragged or frayed in females as compared to the males.

Geographic Distribution.—Taken only from the following localities of the southern Great Barrier Reef, Australia: One Tree and Heron Islands of the Capricorn Group and Gillett Cay, Swain Reefs (Figure 45).

Etymology.—The specific name *variola* is a Latin word (spotted) and refers to the spots on the first dorsal spine and filament.

Remarks.—This species is most closely related to *E. prasina*, sharing with it many meristic characters (Tables 9–12) and specific aspects of body color pattern. We recognize *E. variola* as a distinct species because it has the following unique characters: spotting on the filamentous first dorsal spines, and the light and dark spots on basal portion of first dorsal fin. Other differences are a higher anal fin ray count, usually I,9 in *E. variola*, and almost always I,8 in *E. prasina*; the dark

occipital spots of *E. variola*, common only to a part of the western Indian Ocean population of *E. prasina*, and weak or obscure in the adjacent Lord Howe–Norfolk population; the subcutaneous bars on the posterior part of trunk always number 5/5 in *E. variola*, whereas the Japanese and Philippine–Indonesia populations of *E. prasina* and those from Thailand almost always have 4/5; the subcutaneous bars are well developed in *E. variola*, whereas in *E. prasina* they are obscure or weakly developed in some collections. Another important factor in the recognition of *E. variola*, at the species level, is that we have no specimens that indicate any pattern of intergradation of characters. In our analysis of the many collections of *E. prasina*, in five populations, we never found the combination of characters we describe above for *E. variola*.

Eviota prasina (Klunzinger)

FIGURES 45, 46

Eleotris prasinus Klunzinger, 1871:481 [type-locality: Koseir, Red Sea].

Allogobius viridis Waite, 1904:177, pl. 23: fig. 3 [type-locality: Lord Howe Island].

Eviota verna Smith, 1958:139, pl. I(J,K,L): fig. 1 [type-locality: Aldabra].

MATERIAL EXAMINED.—907 specimens from 30 major localities, totaling 404 males, 331 females, 172 juveniles and unsexed specimens; total size range 7.0–30.9; largest male 30.9, largest female 26.5; smallest gravid female 10.9.

Lectotype: NFIS 1693, (11.6), female; Koseir, Red Sea, B. Klunzinger.

Other Material: RED SEA POPULATION: GULF OF AQABA: USNM 191716, 1 (14.8), female; Elat, 5–9 Sep 1960, E. Clarke. ANSP 83366, 2 (14.3–16.1), males; Elat, 26 Apr 1950, H. Steinitz, 2050. HUJ E62/39, 1 (14.7), male; Elat, 4 May 1960. USNM 218003, 7 (8.5–15.5), 2 juv., 4 males (15.5), 1 female (10.9); Marsa Muqabila, 29 Jul 1969, V. G. Springer, 69-8. AMS I.20061-002, 2 (11.8, ca. 14.0), males; Ras Burqa, 23 Jul 1969, V. G. Springer, 69-7. DIFNEIN ISLAND: USNM 218004, 2 (13.2, 13.7), 1 juv., 1 male (13.7); south shore Ethiopia, 15 Aug 1969, V. G. Springer, 69-15. DAHLAK ARCHIPELAGO: HUJ E62/3678g, 4 (11.7–14.3), females; Um Aabak, 6 Apr 1962, E. Clark. HUJ E62/507, 39 (7.0–14.9), 17 juv., 10 males (14.9), 12 females (13.8); Entedebir, 7 Apr 1962. HUJ E62/4313, 25 (8.0–15.6), 3 juv., 13 males (15.6), 9 females (14.5); Entedebir, 7 Apr 1962. ZUBAIR ISLAND: USNM 218005, 12 (10.9-15.2), 6 males (15.2), 6 females (14.0); 30 Sep 1967, E. Clark. WESTERN INDIAN OCEAN POPULATION: KENYA: RUSI 3865, 5 (ca. 15.6–19.5), 2 males (19.5), 3 females (15.9); Shimoni; questionable

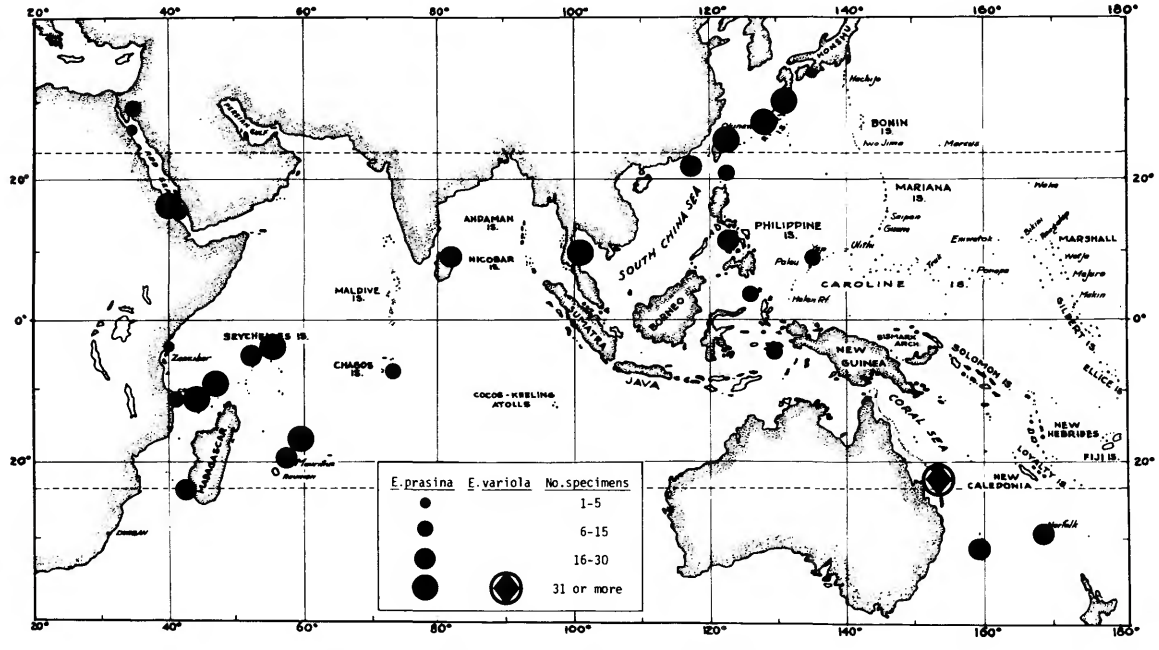

FIGURE 45.—Distributions of *Eviota prasina* and *E. variola*.

paratypes of *E. verna* Smith. MOZAMBIQUE: RUSI 3864, 7 (11.0–17.6), 3 males (17.6), 4 females (14.1); Wamezi I.; questionable paratypes of *E. verna* Smith. RUSI 3867, 2 (16.8, 15.9), male and female; Baixa Pinda; questionable paratypes of *E. verna* Smith. MADAGASCAR: UMMZ 186039, 22 (16.8–20.4), 11 males (20.4), 11 females (18.6); Tulear, 24 Jul 1964, J. Bardach and L. A. Mauge, B64-24. GRAND COMORE ISLAND: CAS 33256, 3 (11.5–16.4), males; 9 Feb 1975, J. E. McCosker, 75-4. CAS 33465, 15 (9.5–17.7), 2 juv., 6 males (17.7), 7 females (16.6); 13 Feb 1975, J. E. McCosker, 75-8. CAS 33052, 1 (17.5), female; 8 Feb 1975, J. E. McCosker, 75-2. CAS 33604, 19 (7.6–17.8), 5 juv., 9 males (17.8), 5 females (15.5); 15 Feb 1975, J. E. McCosker, 75-11. ALDABRA: RUSI 255, holotype of *Eviota verna* Smith, (18.6), male. USNM 219261, 9 (12.5–17.9), 7 males (17.9), 2 females (14.1); 3 Sep 1967, H. A. Fehlmann, 67-66. USNM 219266, 2 (15.5–15.6), males; 26 Aug 1967, H. A. Fehlmann, 67-62. USNM 219264, 2 (14.6, 14.3), male and female; 10 Sep 1967, H. A. Fehlmann, 67-74. USNM 219245, 1 (12.0), females; 6 Sep 1967, H. A. Fehlmann, 67-69. USNM 219258, 1 (17.8), male; 4 Sep 1967, H. A. Fehlmann, 67-67. BPBM 22571, 3 (14.8–17.5), 2 males (17.5), 1 female (14.8); 18 Aug 1967, H. A. Fehlmann, 67-56. AMS I.20808-001, 8 (13.1–16.5), 4 males (16.5), 4 females (ca. 14.8); 25 Aug 1967, H. A. Fehlmann, 67-61. USNM 219235, 5 (13.1–16.1), 2 males (16.1), 3 females (15.0); 14 Sep 1967, H. A. Fehlmann, 67-76. USNM 219269, 2 (15.2–15.4), females; 24 Aug 1967, H. A. Fehlmann, 67-60. USNM 219247, 1 (16.4), female; 8 Sep 1967, H. A. Fehlmann, 67-71. AMIRANTES ISLANDS: ANSP 141211, 19 (7.3–16.8), 10 juv., 5 males (16.8), 4 females (13.7); D' Arros I., 6 Mar 1964, J. E. Böhlke, F-91. SEYCHELLES ISLANDS: ANSP 141209, 2 (13.8, 14.2), males; Mahé, 4 Feb 1964, J. E. Böhlke, F-23. ANSP 141210, 12 (11.8–17.1), 8 males (17.1), 4 females (16.3); Mahé, 10 Feb 1964, J. E. Böhlke, F-37. ANSP 141207, 29 (10.2–16.5), 18 males (16.5), 11 females (14.8); Mahé, 2 Feb 1964, J. E. Böhlke, F-17. ANSP 138925, 15 (11.4–15.8), 10 males (15.8), 15 females (14.9); Mahé, 31 Jan 1964, J. E. Böhlke, F-13. USNM 209208, 1 (17.5), male; Mahé, 12 Sep 1954, J.L.B. Smith; questionable paratype of *E. verna* Smith. RUSI 3866, 8 (14.2–16.4), 3 males (16.4), 5 females (16.1); Mahé. ANSP 141208, 27 (8.7–18.2), 10 juv., 8 males (18.2), 9 females (14.9); Anonyme I., 4 Feb 1964, J. E. Böhlke, F-21. AGALEGA ISLANDS: USNM 219248, 1 (15.8), male; North I., 19 Apr 1976, V. G. Springer, 76-29. USNM 219270, 1 (14.6), male; North I., 17 Apr 1976, V. G. Springer, 76-24. ST. BRANDON SHOALS (collected by V. G. Springer in 1976): USNM 219234, 1, (14.8), female; 30 Mar, 76-1. USNM 219229, 12 (15.8–20.4), 6 males (19.7), 6 females (20.4); 1 Apr, 76-4. USNM 219237, 1 (18.7), female; 2 Apr, 76-6. USNM 219257, 39 (7.9–17.8), 1 juv., 18 males (17.8), 20 females (15.2); 3 Apr, 76-7. AMS I.20804-001, 1 (16.8), male; 5 Apr, 76-9. USNM 219231, 8 (10.0–16.8), 1 juv., 3 males (16.8), 4 females (14.9); 7 Apr, 76-11. USNM 219228, 8 (9.5–19.1), 3 juv., 5 males (19.1); 11 Apr, 76-17. MAURITIUS: RUSI 2276, 19 (10.1–14.9), 2 juv., 7 males (13.9), 10 females (14.9); 26 Mar 1971, T. H. Fraser, THF-SA-43. RUSI 2182, 11 (9.9–16.4), 4 juv., 4 males (16.4), 3 females (14.0); 7 Mar 1971, T. H. Fraser, THF-SA-30. CHAGAS ARCHIPELAGO, DIEGO GARCIA ATOLL (collected by H. A. Fehlmann in 1967): USNM 219254, 3 (11.6–12.6), 2 males (12.6), 1 female (12.1); 11 Jun, 67-2. USNM 219250, 1 (13.8), male; 15 Jun, 67-7. USNM 219259, 1 (ca. 13.5), male; 22 Jun, 67-16. USNM 219251, 5 (12.4–14.8), 4 males (14.8), 1 female (12.4); 9 Jul, 67-38. USNM 219249, 4 (13.6–16.1), 3 males (16.1), 1 female (13.6); 24 Jul, 67-52. SRI LANKA: TRINCOMALEE. (Collected in 1969): USNM 219255, 2 (16.1, 14.9), male and female; 30 Jun, W. F. Smith-Vaniz, 69-125. USNM 219256, 4 (12.8–14.8), 1 male (12.8), 3 females (14.8); 26 Jun, W. F. Smith-Vaniz, 69-119. USNM 219262, 1 (15.2), male; 1 Jul, W. F. Smith-Vaniz, 69-127. USNM 219253, 1 (16.0), male; 27 Jun, W. F. Smith-Vaniz, 69-120. USNM 219271, 9 (10.8–18.3), 2 juv., 6 males (18.3), 1 female (13.5); 30 Sep, P. C. Heemstra, 69-278. GULF OF THAILAND: CAS 43808, 39 (17.0–24.2), 12 males (24.2), 27 females (19.5); 8°26′06″N, 100°45′06″E, 25 Jan 1960, R. Bolin, 60-26, GVF Reg. 2037. CAS 43810, 1 (18.8), male; 8°26′N, 100°45′E, 26 Jan 1960, R. Bolin, 60-28, GVF Reg. 2039. INDONESIA–PHILLIPPINE POPULATION: PHILIPPINE ISLANDS: USNM 161214, 1 (16.0), male; Batan, 22 Jul 1909, *Albatross*. USNM 161215, 4 (13.6–16.6), 3 males (16.6), 1 female (15.4); Batan, 5 Jun 1909, *Albatross*. USNM 161216, 1 (14.5), female; Batan, 22 Jul 1909, *Albatross*. USNM 161213, 2 (16.4, 16.9), females; Panay, 4 Feb 1908, *Albatross*. SU 51566, 4 (ca. 8.6–13.6), 1 juv., 1 male (13.5), 2 females (13.6); Panay, 26 Jun 1953, G. W. Barlow. PALAU ISLANDS: CAS 43765, 7 (11.0–14.5), 1 juv., 5 males (14.5), 1 female (12.0); Kayangel I., 8 Oct 1956, H. A. Fehlmann, sta 161, GVF Reg. 947. INDONESIA: SU 30041, 10 (11.8–15.0), 4 males (15.0), 6 females (14.9); Sangi I., 24 Jun 1929, A. W. Herre, USNM 219246, 5 (11.3–19.2), 4 males (19.2), 1 female (16.4); Moluccas, Ambon, 13 Mar 1974, V. G. Springer, 74-12. AMS I.20803-001, 1 (16.4), male; same data as above. USNM 210962, 2 (15.8–16.2), females; Moluccas, Saparua, 20 Jan 1973, V. G. Springer, *Rumphius* Exp. 1, sta IP-1. USNM 211039, 1 (17.4), male; Moluccas, Saparua, 18 Jan 1973, V. G. Springer, *Rumphius* Exp. 1, sta IP-3. NEW GUINEA: USNM 219230, 2 (14.1, 15.9), males; Trobriand I., 17 Jun 1970, B. B. Collette, 1522. SOUTH CHINA SEA–JAPAN POPULATION: SOUTH CHINA SEA: CAS 43799, 16 (7.4–14.6), 11 juv., 3 males (14.6) 2 females (13.2); Pratas Reef, 23 May 1958, R. L. Bolin. Taiwan, Yeh-lin, collected 16–18 May 1968 by V. G. Springer: USNM 219265, 19 (18.7–26.2), 12 males (26.2), 7 females (22.6); VGS 68-24. USNM 219252, 8 (19.5–23.1), 7 males (23.1), 1 female (19.5); VGS 68-25. USNM 219260, 4 (18.1–21.7), females; VGS 68-26. AMS I.20809-001, 5 (17.6–21.7), 2 males (21.7), 3 females (21.4); VGS 68-27. USNM 219267, 6 (15.7–19.0), 4 males (19.0), 2 females (16.9); VGS 68-28. RYUKYU ISLANDS: ANSP 85044, 1 (13.1), female; Aguni Shima, 2 Aug 1945, E. R. Tinkham. ANSP 89822, 1 (17.8), female; Aguni Shima, 29 Jul 1945, E. R. Tinkham. ANSP 85043, 1 (15.2), female; Aguni Shima, 27 Jul 1945, E.

R. Tinkham. USNM 219268, 1 (23.9), male; Okinawa, Sate, 9 Apr 1965, C. R. Johnson. USNM 219233, 1 (18.0), male; Okinawa, Sate, 23 Jan 1965, C. R. Johnson. USNM 71452, 132 (9.5–20.5), 15 juv., 65 males (20.5), 50 females (19.9); Okinawa, Luchu I., 1906, *Albatross*. JAPAN: USNM 219232, 31 (12.1–26.5), 8 juv., 15 males (26.1), 8 females (26.5); Tanegashima I., 1906, *Albatross*. USNM 219263, 66 (8.3–14.7), 50 juv., 11 males (13.9), 5 females (14.7); Tanegashima I., 1906, *Albatross*. CAS 43748, 1 (21.6), female; Tanabe Bay, 17 Sep 1955, R. Rofen, sta 238 J-2, GVF Reg. 748. FMNH 83873, 23 (11.8–22.9), 11 juv., 7 males (22.2), 5 females (22.9); Aikawa Rikuzen, 1906, *Albatross*. LORD HOWE–NORFOLK ISLANDS POPULATION: LORD HOWE ISLAND: AMS I.5880–5884, syntypes of *Allogobius viridis* Waite, 13 (19.9–30.5), 7 males (30.5), 6 females (24.6); Feb 1903, Waite and McCulloch. USNM 219302, 2 (23.8, 22.4), male and female; removed from AMS I.5880–5884. AMS I.17368-050, 4 (12.6–21.7), 2 males (21.7), 2 females (15.8); Feb 1973, LHI 73-49. BPBM 17569, 2 (15.9, 16.1), 1 juv., 1 female (16.1); 7 Feb 1973, D. Hoese, LHI 73-22. NORFOLK ISLAND: AMS IB.5365, 1 (20.6), female; ANSP 75301, 21 (8.5–25.9), 11 unsexed, 8 males (25.9), 2 females (20.9); Kingston, Feb 1952, M. Laird.

Tentative Identifications: CAS 43815, 10 (14.0–17.9), 7 males (17.9), 3 females (16.5); Apo I., Negros Oriental, 10 May 1960, D. Empeso, D-2, GVF Reg. 2667. USNM 219236, 1 (21.5), female; Taiwan, 5 May 1968, V. G. Springer, 68-18.

DIAGNOSIS.—Pectoral rays branched, usually the eleventh through the sixteenth; spinous dorsal fin elongate or filamentous in males; fifth pelvic ray usually absent, rudimentary when present; genital papilla in male highly fimbriate; a dark circular to chevron-shaped spot on middle of caudal peduncle, about 3 scale rows from caudal fin base; usually 2 weak to moderately developed, dark spots laterally on occipital area, obscure or intense in some populations; 2 weak spots usually on pectoral base; dark subcutaneous bars on posterior portion of trunk number 4/5 or 5/5.

DESCRIPTION.—Comparisons of certain data by populations are given in Tables 9–12. Dorsal fin VI-I,8(5), VI-I,9(158), VI-I,10(78), VI-I,11(1); anal fin I,7(1), I,8(91), I,9(2); pectoral fin 14(3), 15(25), 16(88), 17(85), 18(25), 19(1); pelvic fin I,4(191), I,4 + a rudiment (41); fourth ray of pelvic fin with 4–14 branches averaging 8.0; segments between consecutive branches of the fourth pelvic fin ray number 1–6, usually 1–3, average 1.9; pelvic fin membrane reduced; branched caudal fin rays 11(1), 12(31), 13(31), 14(6); segmented caudal fin rays 16(4), 17(90); lateral scale rows 23(15), 24(73), 25(2); transverse scale rows 6(16), 7(40), 8(3); scales with about 27–35 ctenii, 11–16 primary radii; breast scaleless.

First dorsal fin spine filamentous in males, maximum length, when depressed, may reach to base of seventh dorsal fin ray; second spine rarely elongate; no spinous dorsal elongation in females; pelvic fins usually reach area just anterior to origin of anal fin.

The cephalic sensory pore system is pattern 2. The cutaneous papilla system is pattern B.

Genital papilla in male highly fimbriate along lateral edges, the tip moderately indented and fringed, papilla extends to the first anal spine; female papilla bulbous, reaching at most to anal spine, the tip with 4–6 fingerlike projections.

Gravid females range in size from 10.9–22.6 mm SL.

Vertebrae 10(24) precaudal and 16(23) caudal, total 26(23).

COLOR IN PRESERVATION.—The intensity of prominent color marks varies among individuals within a population as well as among the 5 populations that we recognize (Tables 9–12). There are also differences related to sexual dichromatism and quality of preservation. Based on color marks and meristic characters the 5 populations recognized are tentatively assigned to racial levels of differentiation.

The prominent color pattern of the species (Figure 46*a–e*) consists of a dark caudal peduncle spot; usually 2 occipital spots and 2 weak pectoral spots; small weak spots on dorsal midline, often obscure; cheek and predorsal areas often spotted or with scattered chromatophores; outer four-fifths of first dorsal fin usually dark; second dorsal fin dusky to dark; anal fin dark, more so than second dorsal fin; caudal fin dusky, with fine spots mostly in upper, basal portion; scale pockets with weak dark margins; 5 dark spots along ventral midline of posterior portion of trunk coalesced with subcutaneous bars.

In order to analyze the significance of numerous color marks on the head and trunk, we evaluated and recorded, by collection and population, the presence, size, and intensity of each mark.

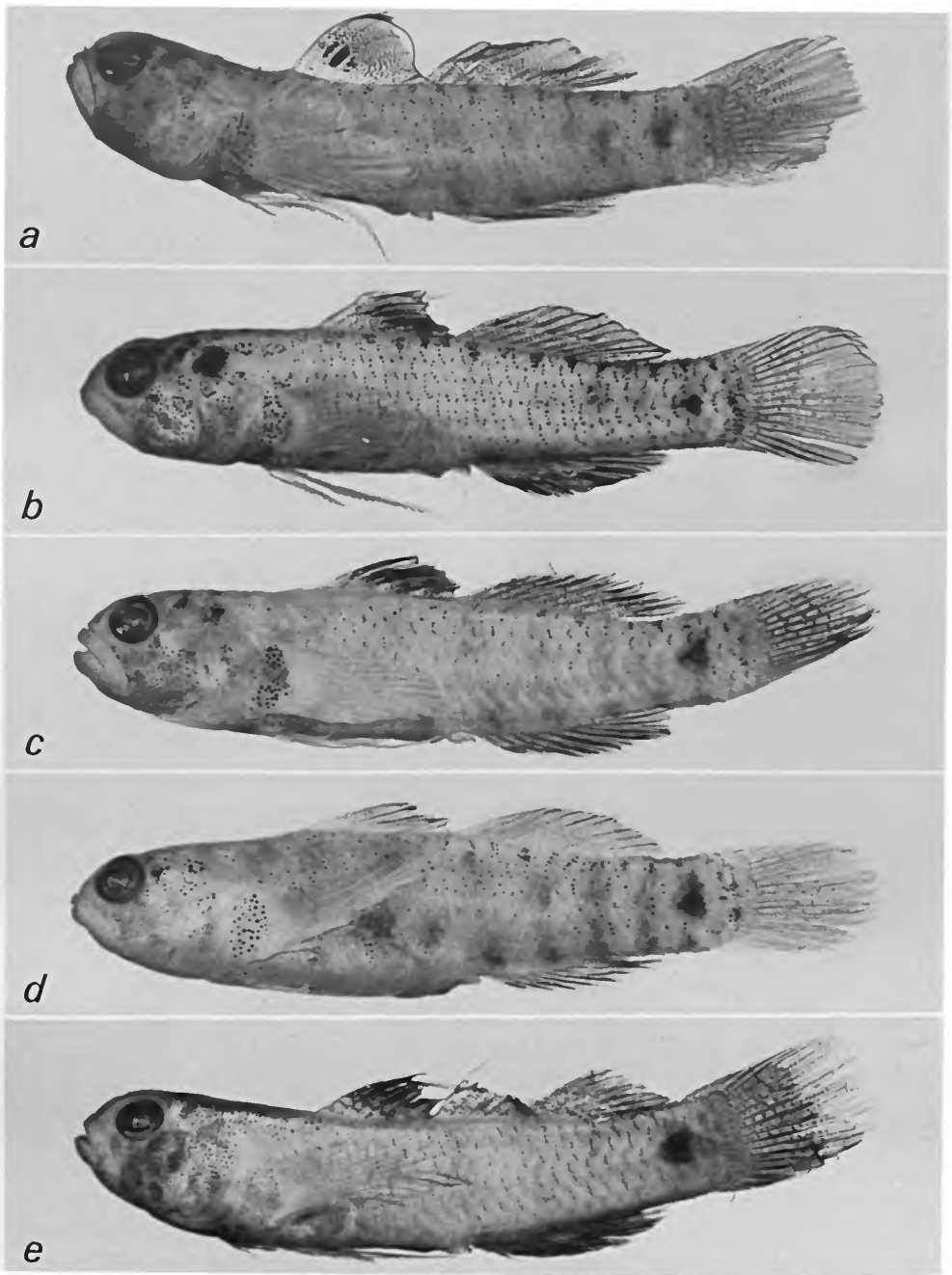

FIGURE 46.—Differences in the color pattern of *Eviota prasina* related to sex and major geographic localities: *a*, ANSP 83366, male, 16.1 mm SL, Red Sea; *b*, RUSI 2182, male, 15.6 mm SL, Mauritius; *c*, UMMZ 186039, male, 20.4 mm SL, Madagascar; *d*, UMMZ 186039, female, 18.6 mm SL, Madagascar; *e*, AMS I.17368-050, male, 21.7 mm SL, Lord Howe Island, Australia.

These data are reviewed and those indicating populational divergence are discussed below.

Occipital Spots: Two dark spots dorsolaterally behind eye (usually a dense cluster of small to large chromatophores), the anterior one smaller, vertically elongate and often integrated with chromatophores forming a bandlike arrangement of spots over head behind eyes; the posterior spot is round, larger and usually not integrated with transverse band on head. Spots weak to moderate except in fish from Madagascar, Mauritius, and in some from St. Brandon Shoals in the southern portion of the west Indian Ocean population where the chormatophores are coalesced to form an intense black spot. These spots may be obscure in some specimens from Lord Howe and Norfolk Islands. Spots weaker in females.

Cheek Spots: About 4–7 irregular clusters of small to large chromatophores on cheek and anterior part of opercle, usually equal in intensity to occipital spots. Spots more intense in Lord Howe–Norfolk population and less intense in some southern insular areas of the western Indian Ocean. Sometimes the spots are replaced by more or less uniformly scattered chromatophores.

Predorsal Area: Area from origin of first dorsal fin anterior to eyes is usually spotted, with weak to moderate clusters of chromatophores, often suggestive of transverse bars; spots sometimes replaced by scattered chromatophores and sometimes area is pale, except for spots persisting just behind eyes.

Spots along Dorsal Midline of Trunk: A linear series of about 13 dark spots extending from origin of first dorsal fin posteriorly to area just before procurrent caudal rays, present in all populations but faint or obscure in most specimens, particularly the Lord Howe–Norfolk population.

Spots on Pectoral Base: Two dark spots on upper and lower part of pectoral base, consisting of clusters of large chromatophores separated by an area of equally large but paler chromatophores or, less commonly, by an area of fine dark chromatophores, or by a pale unpigmented area; spots sometimes replaced by scattered chromatophores, particularly in the Lord Howe-Norfolk population.

Caudal Peduncle Spot: A conspicuous black circular or chevron-shaped spot, equal to size of pupil or larger, located medially on peduncle, about 3 scale rows anterior to base of caudal fin, overlying dark, posteriormost subcutaneous bar. Caudal peduncle spot small and weak in Red Sea population.

Dark Spots on Ventral Midline: A series of 5 spots, mostly subcutaneous, extend from origin of anal fin posteriorly on peduncle to area below midcaudal peduncle spot.

Subcutaneous Bars: Lower posterior part of trunk with 5 dark subcutaneous bars coalesced with ventral midline spots and somewhat fainter than spots; upper portion of trunk with 4 or 5 bars; when 5 bars are present they are usually continuous with lower bars, but they are sometimes discontinuous along midline of trunk and the upper portion is staggered anteriorly; this condition occurs more so at the first bar above origin of anal fin, or at the fourth bar; the Japanese and Indonesia-Philippine populations almost always have 4 bars in the upper trunk series, the third upper bar located between the third and fourth lower bars. All specimens from Thailand and 1 specimen from Sri Lanka also have a 4 upper–5 lower bar ratio. These bars are usually weak to moderately developed, obscure in some. There are 3 lower and 2 upper subcutaneous bars on belly area, usually weaker than those on peduncle, except in gravid females, where the lower bars are wide and prominent.

Scale Pigmentation: Scale pockets margined with dark chromatophores, weakly developed but more evident on upper part of trunk and more pronounced in males.

First Dorsal Fin: Anterior basal portion from first to fifth spine and about one-fifth of height of fin, pale or with a small dark mark near base of first spine, the outer four-fifths dusky to dark; fin barred in some specimens, the dark area being divided into a lower dusky portion and a darker outer portion. Pale basal area larger in females. Usually 2 or 3 small, intense black spots on membrane above pale basal area between second and fifth dorsal spines, commonly present in Red Sea and Japanese populations, absent in some

collections from other populations; pronounced in males and juveniles and absent in large females.

Second Dorsal Fin: Dusky to light brown in most specimens, lighter in females. Some specimens in each population have the outer one-third to one-half uniformly shaded in brown, the basal portion with fine brown chromatophores, the rays mostly clear. Some specimens with brownish shading on lower portion, the outer part with less dense chromatophores. Light round spots are present near the midportion of the fin in some collections over the range.

Anal Fin: Dark brown, always darker than second dorsal fin; usually uniformly colored, less often with the basal portion lighter. Fin with light margin. Females with less intense pigmentation.

Caudal Fin: Usually dusky with small dark and light spots on rays of basal area of fin, more so on upper, basal portion.

Pectoral and Pelvic Fins: Membrane pale, the rays of pectoral fin with weak, dark outline.

Sexual Dimorphic Features.—The prominent features are the fimbriate genital papilla, filamentous first dorsal fin, and the darker coloration of the male. Specifically, the male has darker occipital spots, scale pocket pigmentation, and second dorsal, anal, and caudal fins. The pale, anterior basal portion of first dorsal fin is enlarged in females. The small intense black spots commonly present on the spinous dorsal fin of juveniles and some adult males are lacking in adult females. Females have enlarged and more prominent subcutaneous bars on the belly, especially in gravid specimens. The general body condition, including the fins, is ragged in the females as compared to the males.

Geographic Distribution.—This species occurs in the Red Sea, is widely distributed in the western Indian Ocean, Sri Lanka, Gulf of Thailand, Indonesia, and New Guinea, and ranges northward to Japan and southward to the Lord Howe and Norfolk Islands (Figure 45). It has not been taken on the Great Barrier Reef.

Remarks.—The meristic data that we record for the lectotype (NFIS 1693) of *E. prasina* (Klunzinger) are underlined in the description and agree with data given by Klunzinger (1871:481) with the exception of the pelvic fin ray count, which we find to be I,4 or I,4 + a rudiment rather than I,5. The specimen is in a poor state of preservation, but we note traces of the following diagnostic color marks: faint pigmentation in the typical position of the dark caudal peduncle spot; groups of fine occipital chromatophores laterally on head and just behind the eyes; some chromatophores dorsally on head between the first occipital spots; cheek and opercle with about five groups of chromatophores, some scattered; pectoral base on one side with some pigmentation where the two spots normally occur; basal portion of first dorsal fin light, more so anteriorly, and the remainder dusky to dark; second dorsal and anal fins are dusky.

The five populations that we have identified in the description and listed in the study material do not merit taxonomic recognition because the level of differentiation of the meristic characters is not large enough to warrant subspecific designations and the critical color marks show considerable variation within and among the populations. More important is the fact that values for particular characters fall in a mosaic pattern among the populations, rather than in an expected inheritance pattern with regard to geographic distribution.

Divergence among Populations.—The important characters that show some differences among the populations are summarized below and in Tables 9–12, and the populations sharing similar values for these characters are enumerated:

Number of Second Dorsal Fin Rays: The Lord Howe–Norfolk and Japanese populations have higher values, the means are 9.7 and 9.9. The Indonesian-Philippine population, located between these two populations, has the lowest mean, 9.0.

Number of Pectoral Fin Rays: High mean values in Lord Howe-Norfolk (17.5) and Japanese (16.8) populations, lowest in Indonesia-Philippine (15.9) population.

Number of Pelvic Fin Rays: About one-third of the specimens from the Lord Howe–Norfolk and Indonesia-Philippine populations have a rudimen-

tary fifth pelvic fin ray, the other populations almost always have I,4 elements.

Number of Segments between Consecutive Branches on the Fourth Pelvic Ray: Higher means occur in Lord Howe-Norfolk and Japanese populations (2.5 and 2.3) and the Indonesia-Philippine, western Indian Ocean, and Red Sea Populations have respective values of 1.8, 1.4, 1.5.

Number of Subcutaneous Bars: The Indonesia-Philippine and Japanese populations have 4/5 bars (only 1 specimen with 5/5 staggered bars), whereas the Red Sea and Lord Howe–Norfolk populations usually have 5/5 bars, sometimes 5/5 staggered bars but never 4/5 bars. In the western Indian Ocean, all three values occur but 5/5 is common.

Size and Intensity of Caudal Peduncle Spot: Smaller and weaker in the Red Sea, and fairly uniform elsewhere.

Intensity of Occipital Spots: The two black spots are the dominant color marks and are intense only on specimens from Madagascar, Mauritius, and some from St. Brandon Shoals, a portion of the western Indian Ocean population.

Intensity of Cheek Spots: Equal to or more intense than occipital spots in Lord Howe-Norfolk population, equal to or less intense in western Indian Ocean population, and about equally intense elsewhere.

Black Marks on First Dorsal Fin: Common and well developed in the Red Sea and Japanese populations but rare or uncommon elsewhere.

Pigmentation on Base of Pectoral Fin: Usually forming 2 weak spots in all populations except at Lord Howe-Norfolk, where it is usually scattered.

Our limited collections from Sri Lanka and the Gulf of Thailand share some meristic and color characters that may be found in any of the populations, but these are not consistent with any one of the major recognized populations.

The Lord Howe-Norfolk population shows the greatest level of differentiation.

Our conclusions are tentative and further studies, particularly field observations of living colors and life history data, may provide additional basis for the taxonomic understanding of this complex species.

Eviota queenslandica Whitley

FIGURES 47–50

Eviota viridis queenslandica Whitley, 1932:301 [type-locality: Batt Reef, Queensland, Australia].

MATERIAL EXAMINED.—320 specimens from 20 localities, totaling 145 males, 120 females, and 55 juveniles; total size range 7.8–25.1; largest male 24.3, largest female 20.0; smallest gravid female 12.8.

Holotype: AMS IA.4068, (19.8), male; Batt Reef off Port Douglas, northern Queensland, Australia, collected 1928, G. P. Whitley and W. Boardman.

Other Material: QUEENSLAND, AUSTRALIA: ANSP 93289, 3 (16.8–19.1), females; Musgrove I., coll. 1935, G. Vanderbilt. AMNH 39080, 11 (13.4–17.0), 2 juv., 3 males (16.7), 6 females (17.0); Mackay Reef, 29 Jan 1969, C. L. Smith, S69-38. LIZARD ISLAND: AMS I.19473-176, 10 (8.8–16.5), 7 juv., 2 males (16.5), 1 female (14.2); Coconut Beach, 24 Nov 1975, AMS staff, LZ 75-60. ENDEAVOUR REEF (collected by C. L. Smith and J. Tyler in 1969): AMNH 39081, 4 (8.6–14.6), juv.; 5 Jan, S69-5. AMNH 39082, 4 (11.5–14.7), 2 juv., 2 males (14.7); 6 Jan, S69-7. ANSP 141150, 6 (8.7–12.9), juv.; 6 Jan, TS,A-6. AMNH 39083, 2 (13.5–13.6), juv.; 11 Jan, S69-12. ANSP 141151, 3 (11.0–15.3), juv.; 13 Jan, TS,A-13. AMNH 39084, 2 (15.1, 15.3), juv.; 13 Jan, S69-15. ANSP 141148, 1 (15.3), male; 15 Jan, TS,A-16. AMNH 39085, 7 (11.8–17.5), 5 juv., 2 females (17.5); 15 Jan, S69-17. AMNH 39086, 12 (13.0–19.5), 5 juv., 5 males (18.0), 2 females (19.5); 15 Jan, S69-18. AMNH 39087, 1 (13.1), juv.; 16 Jan, S69-19. ANSP 141149, 3 (11.4–17.1), 1 juv., 2 males (17.1); 16 Jan, TS,A-17. BIG HOPE ISLAND (collected by C. L. Smith and J. Tyler, 1969): AMNH 39088, 4 (14.9–19.4), 2 juv., 1 male (19.4), 1 female (17.4); 19 Jan, S69-24. LITTLE HOPE ISLAND (collected by C. L. Smith and J. Tyler, 1969): AMNH 39089, 6 (15.0–18.5), 1 juv., 3 males (18.5), 2 females (16.7); 17 Jan, S69-20. ANSP 113451, 3 (17.6–19.9), males; 17 Jan, TS,A-19. ANSP 113521, 1 (16.1), female; 20 Jan, TS,A-23a. ANSP 113524, 1 (11.5), juv.; 20 Jan, TS,A-24a. ANSP 113548, 1 (17.2), female; 20 Jan, TS,A-24b. AMNH 39090, 2 (17.5–17.7), males; 20 Jan, S69-26. AMNH 39091, 1 (15.7), juv.; 20 Jan, S69-27. AMNH 39092, 1 (11.0), juv.; 21 Jan, S69-28. HERON ISLAND: LACM 32820-7, 1 (17.9), female; Dec. 1961, G. Bartholomew. ONE TREE ISLAND: CAS 43538, 13 (14.0–17.8), 5 males (17.8), 8 females (16.9); 22 Nov 1969, B. B. Collette, 1385, FT-409. BPBM 14419, 2 (17.8–19.6), males; 14 Jan 1973, J. E. Randall. AMS I.20201-076, 34 (12.1–18.9), 2 juv., 24 males (18.9), 8 females (17.7); 29 Sep 1971, D. F. Hoese, 71-17. (Collected by V. G. Springer in 1966): USNM 219203, 1 (15.8), male; 18 Nov, VGS 66-3. USNM 219214, 1 (14.5), male; 20 Nov, VGS 66-6. USNM 219198, 2 (16.8, 20.0), male and female; 22 Nov, VGS 66-7. USNM 219199, 1 (20.9), male; 25 Nov, VGS 66-8. USNM 219204, 39 (14.9–18.9), 20 males (18.9), 19 females (16.9); 27 Nov, VGS 66-9. USNM 219221, 4 (13.8–19.1), 3 males

(19.1), 1 female (13.8); 30 Nov, VGS 66-13. USNM 219212, 1 (14.7), female; 1 Dec, VGS 66-14. USNM 219205, 5 (14.6–17.5), 2 males (17.5), 3 females (15.6); 9 Dec, VGS 66-18. NORTHERN TERRITORY, AUSTRALIA: ARNHEM LAND (collected by R. R. Miller in 1948): USNM 219210, 4 (16.3–17.6), females; Groote Eylandt, 25 Apr, M48-9a. USNM 219209, 4 (18.3–24.3), 2 males (24.3), 2 females (19.5); Yirrkalla, 14 Jul, M48-21. USNM 219213, 1 (19.3), female; Yirrkalla, 6–12 Aug, M48-21. USNM 219201, 6 (17.4–23.2), 4 males (23.2), 2 females (18.6); Yirrkalla, 12 Aug, M48-21. WESTERN AUSTRALIA: WAM P.20074, 1 (17.3), male; Dampier Archipelago, Rosemary I., 5 Nov 1971, R.J.M. AMNH 39093, 5 (15.3–25.1), 3 males, (25.1), 2 females (18.2); Cape Bossut, 16 Apr 1969, D. Rosen, DR-1969-78. TIMOR SEA: ASHMORE REEF (collected by J. McCosker, 11–12 Jan 1973): AMS I.17685-001, 1 (13.0), female. AMS I.17688-003, 19 (8.2–18.5), 6 juv., 6 males (18.5), 7 females (16.6). THAILAND: CAS 43814, 2 (21.3–18.1), male and female; Chumphon Prov., tip of Goh Chorakhay, 25 May 1960, Bronson, sta 60-183, GVF Reg. 2200. CAS 43813, 1 (16.7), male; Chumphon Prov., off Goh Martra, 19 May 1960, Bronson, sta 60-173, GVF Reg. 2190. CAS 43796, 3 (9.9–21.4), 1 juv., 1 male (21.4), 1 female (18.9); Ao Mae Hat Bay, W side of Goh Tao I., 10 Nov 1957, Rofen, sta 77, GVF Reg. 1535. USNM 219215, 2 (16.3–16.1), male and female; Patong Bay, Phuket, 22 Mar 1963, *Anton Bruun* cruise I. SINGAPORE: FMNH 83872, 3 (15.3–16.1), 1 male (16.0), 2 females (16.1); Pulau Sudong, 19 Feb 1955, D. S. Johnson. SU 30356, 1 (19.0), male; 14 Mar 1934, A. W. Herre. JAVA SEA: SERIBU ISLANDS: USNM 219217, 1 (15.7), female; off Pulau Tikus, Pulau Pari group, 5 Apr 1974, V. G. Springer, 74-34. USNM 219193, 2 (12.1–15.2), males; off Pulau Tikus, Pulau Pari group, 5 Apr 1974, V. G. Springer, 74-33. BPBM 18556, 1 (13.4), female; Pulau Putri, N of Jakarta, 16 Feb 1975, J. Randall. BAWEAN ISLAND: USNM 219222, 1 (13.3), juv.; 28 Mar 1974, V. G. Springer, 74-27. KARIMUNDJAWA ISLAND: USNM 219195, 1 (18.2), male; 29 Mar 1974, V. G. Springer, 74-28. CELEBES: KABAENA ISLAND: USNM 219200, 5 (10.9–16.0), 1 juv., 3 males (16.0), 1 female (13.8); Big Damalawa I., 25 Feb 1974, V. G. Springer, 74-2. GREAT TOBEA ISLAND: USNM 139363, 3 (15.7–17.5), males; Tidepool, 15 Dec 1909, *Albatross*. USNM 161211, 7 (12.2–19.9), 3 males (19.9), 4 females (14.8); 15 Dec 1909, *Albatross*. CELEBES SEA: SU 29486, 1 (16.7), female; Lembeh Strait, 17 Jun 1929, A. W. Herre. MOLUCCAS: USNM 209774, 4 (7.8–16.2), 2 juv., 2 males (16.2); Ambon I., 11 Jan 1973, V. G. Springer, 73-8. USNM 219208, 1 (14.1), male; Ambon I., 14 Mar 1974, V. G. Springer, 74-13. USNM 209820, 1 (18.3), male; Ceram, Piru Bay, 9 Jan 1973, V. G. Springer, 73-5. USNM 219207, 5 (11.0–18.0), 1 juv., 3 males (18.0), 1 female (15.7); Saparua, 5 Mar 1974, V. G. Springer, 74-5. USNM 219194, 1 (15.3), male; Banda Is., Goenoeng Api I., 7 Mar 1974, V. G. Springer, 74-8. USNM 219211, 1 (14.8), female; Banda Is., 8–9 Mar 1974, V. G. Springer, 74-10 or 74-11. NEW GUINEA: USNM 219192, 16 (10.6–17.1), 2 juv., 5 males (17.1), 9 females (13.4); Madang, 22 May 1970, B. B. Collette, 1479. CAS 43543, 1 (15.5), male; Waigiu, 8 Jun 1929, A. W. Herre. USNM 219631, 2 (16.5, 17.1), females; Bismarch Archipelago, Ninigo Is., 23 Oct 1978, V. G. Springer, 78-3. USNM 219632, 2 (16.6, 18.8), males; Bismarck Archipelago, Ninigo Is., 22 Oct 1978, V. G. Springer, 78-2. SOLOMON ISLANDS: USNM 219216, 1 (12.3), female; New Georgia, 19 Jun 1944, Chapman, C-43. USNM 219202, (13.3), female; New Georgia, 11 May 1944, Chapman, C-9. USNM 219218, 3 (12.7–17.5), males; New Georgia, 20 May 1944, Chapman, C-37. USNM 219220, 1 (12.0), female; [off Bougainville], 10 Sep 1963, *Te Vega* cruise 1, sta 45-4. NEW HEBRIDES: CAS 43800, 1 (11.3), juv.; Espiritu Santo I., 7 Oct 1958, R. L. Bolin, sta HK 147, GVF Reg. 1826. PALAU ISLANDS: CAS 43745, 1 (17.0), male; Ngadarak Reef, N of Malakal Pass, 17 Aug 1955, H. A. Fehlmann, sta 106, GVF Reg. 612. CAS 43738, 1 (16.6), female; Iwayama Bay in Geruherugairu Pass, 22 Jul 1955, H. A. Fehlmann, sta 30, GVF Reg. 529. CAS 43742, 1 (18.5), male; Iwayama Bay in Geruherugairu Pass, 12 Aug 1955, H. A. Fehlmann, sta 85A, GVF Reg. 586. CAS 43754, 25 (9.6–17.3), 3 juv., 15 males (17.3), 7 females (15.4); Auluptagel I., 8 Jul 1956, H. A. Fehlmann, sta 12, GVF Reg. 798. CAS 43755, 4 (12.2–14.8), 1 male (14.4), 3 females (14.8); E of Babelthaup-Koror causeway, 5 Aug 1956, H. A. Fehlmann, sta 41, GVF Reg. 827. CAS 43775, 1 (13.8), female; Koror I., 11 Sep 1957, Sumang, sta 57-11, GVF Reg. 1386. CAS 43761, 1 (16.4), female; Garukoru I., N of Babelthaup I., 16 Aug 1956, H. A. Fehlmann, sta 57, GVF Reg. 843. CAS 43786, 1 (14.3), female; Angaur I., 22 Oct 1957, DeWitt, sta 57-45, GVF Reg. 1425. CAS 43762, 1 (15.4), female; Nardueis I., 4 Sep 1956, H. A. Fehlmann, sta 95, GVF Reg. 881. SU 29239, 2 (17.5, 19.6), males; 15 Oct 1933, A. W. Herre. YAP ISLANDS: CAS 43750, 4 (8.1–19.0), 1 juv., 2 males (19.0), 1 female (14.2); 4 Jul 1956, H. A. Fehlmann, sta 7, GVF Reg. 793. CAS 43752, 1 (11.5), juv.; 5 Jul 1956, H. A. Fehlmann, sta 8, GVF Reg. 794. PHILIPPINE ISLANDS: SU 26257, 6 (12.6–16.2), 1 male (15.5), 5 females (16.2); Culion and Dumaguete, 3 May 1931, A. W. Herre. USNM 219196, 15 (11.6–19.2), 7 males (19.2), 8 females (17.0); Palawan Prov., Cuyo I., 21 May 1978, Smithsonian team, SP 78-17. CAS 43798, 4 (12.8–14.3), 1 male (13.5), 3 females (14.3); Negros Orientale, Siaton, Albiga, 16 Aug 1958, GVF Reg. 1615. CAS 43797, 1 (13.6), male; Negros Orientale, Dumaguete, 3 Jul 1958, D. Empeso, sta 65a, GVF Reg. 1610. CAS 30523, 1 (13.1), male; Mindanao, Surigao del Norte, Nonoc, 26 Sep 1973, F. B. Steiner. CAS 43535, 1 (12.7), male; Catanduanes Prov., Panay I., 26 Jun 1953, G. W. Barlow. TAIWAN: USNM 219206, 1 (18.6), female; SW shore, off Ch'uan-fan-shih, 3 May 1968, V. G. Springer, 68-14. USNM 219197, 4 (8.3–18.0), 1 juv., 2 males (18.0), 1 female (17.5); bay between K'en-ting and Ta-yuan Shan, 1 May 1968, V. G. Springer, 68-12.

DIAGNOSIS—Pectoral fin rays 11–15 almost always branched; spinous dorsal fin may be elon-

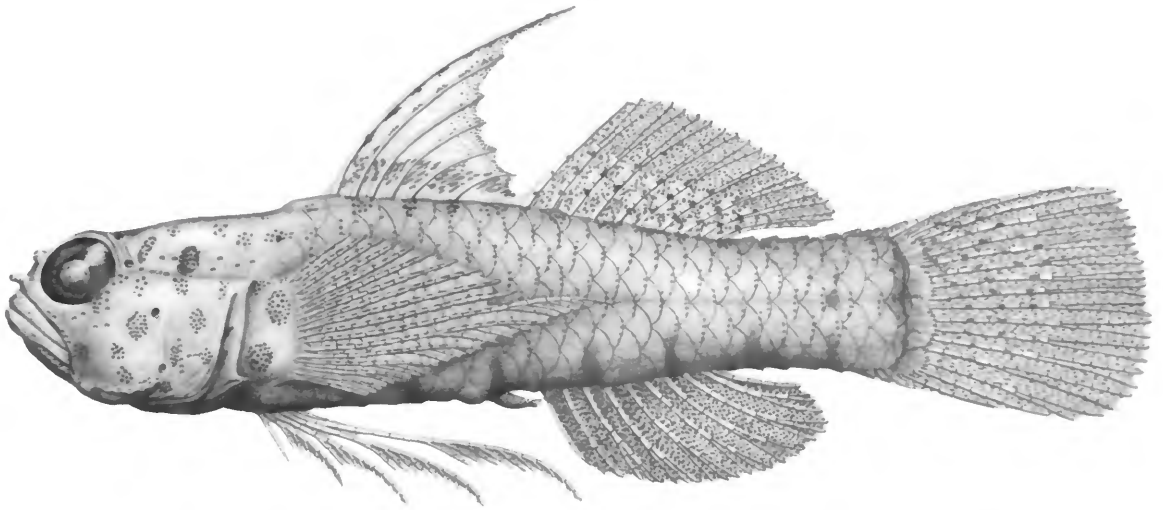

FIGURE 47.—*Eviota queenslandica* with basal dusky band through spinous dorsal fin, CAS 43754, male, 17.0 mm SL, Palau Islands. (Drawn by Paul Mazer.)

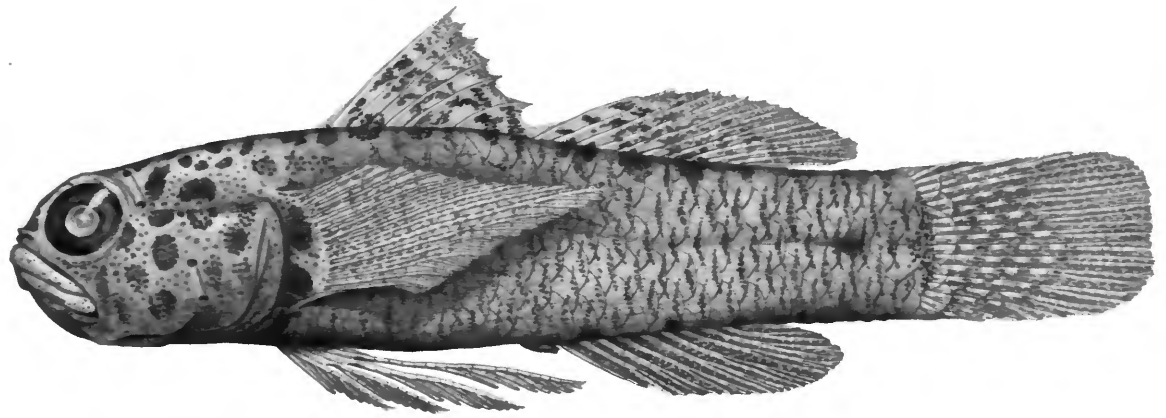

FIGURE 48.—Well developed dark head and middorsal trunk spots and irregular markings on spinous dorsal fin of *Eviota queenslandica* from Little Hope Island, Queensland, Australia: ANSP 113451, male, 19.9 mm SL. (Drawn by Paul Mazer.)

gate or filamentous in males; fifth pelvic fin ray small or rudimentary, usually about one-tenth the length of the fourth pelvic fin ray; genital papilla in male not fimbriate; nape, cheek, opercle, and base of pectoral fin with conspicuous, large, circular to oval, dark spots; 5 large dark spots on ventral midline from origin of anal fin to vertical through midpeduncular spot; spot on midcaudal peduncle and subcutaneous trunk bars not heavily developed; scale pockets often with prominent pigmentation, the margins broad and dark. In faded or poorly preserved specimens, this species resembles *E. prasina* but can be distinguished in having a nonfimbriate male genital papilla and the subcutaneous trunk bars are never heavily developed as in *E. prasina*.

DESCRIPTION.—Dorsal fin VI-I,8(2), VI-I,9(43), VI-I,10(5); anal fin I,7(3), I,8(45), I,9(2); pectoral

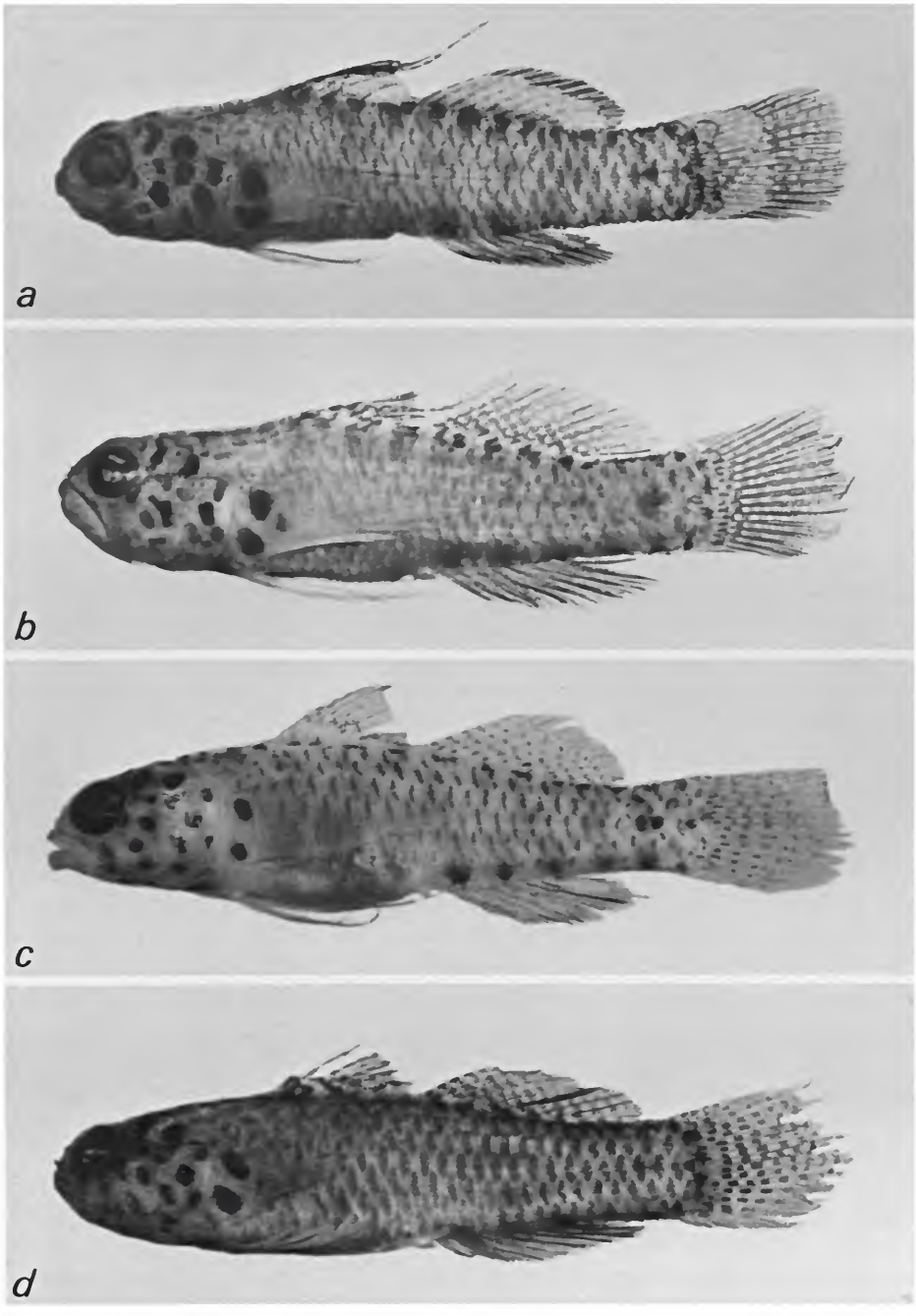

FIGURE 49.—Major differences in the color pattern of the head, trunk, and fins of *Eviota queenslandica* from four localities: *a*, USNM 219196, male, 15.1 mm SL, Philippine Islands; *b*, AMNH 39093, male, 19.0 mm SL, Western Australia; *c*, AMS I.17688-003, female, 16.6 mm SL, Timor Sea; *d*, USNM 219209, female, 18.1 mm SL, Cape Arnhem, northern Australia.

fin 15(10), 16(23), 17(17); pelvic fin I,4 + a rudiment(4), I,4 1/10(44), I,4 2/10(2); fourth ray of pelvic fin with 4–12 branches, averaging 8.2; segments between consecutive branches of the fourth pelvic fin ray 1–5, averaging 1.9; pelvic fin membrane reduced; branched caudal fin rays 11(1), 12(17), 13(14), 14(6), 15(3), 16(1); segmented caudal fin rays 16(2), 17(38); lateral scale rows 23(13), 24(29), 25(1); transverse scale rows 6(8), 7(4); scales with 27–30 ctenii, 9–11 primary radii, and 1–3 secondary radii; breast scaleless.

First two dorsal spines of males may be elongate or filamentous, the first longer, extending to end of base of second dorsal fin; no spinous dorsal fin elongation in females. Length of pelvic fin usually extending posteriorly beyond origin of anal fin.

The cephalic sensory pore system is pattern 2. Cutaneous papilla system is pattern B.

Genital papilla in male not fimbriate, broad and straight or tapering slightly, the tip fringed and slightly indented, its length usually extending to origin of anal fin, or at most to base of first anal fin ray. Genital papilla pigmented in midportion with brown, pepperlike chromatophores; female papilla not pigmented, short, bulbous, not extending beyond origin of anal fin, with 2–4 fingerlike projections on each side of tip.

Gravid females range from 12.8–19.3 mm SL. Vertebrae 10(21) precaudal and 15(1), 16(19), 17(1) caudal, total 25(1), 26(19), 27(1).

Color in Preservation.—The dominant color pattern of this species consists of 2 dark occipital spots, dark, circular to oval cheek and opercular spots, a pair of large dark spots on base of pectoral fin and well-defined scale outlines, consisting of narrow to broad, vertical pigment patches on the scale pockets. Some variations of the color pattern are shown in Figures 47–50.

Head with 2 occipital spots behind eye, the spot nearest eye deeper than wide and sometimes integrated with a crossbar or spots over nape; the posteriormost spot circular to oval shaped, joined to or nearly meeting spot at upper anterior part of opercle; occipital spots about the size of pupil or slightly larger, and equal to or more intense than other spots on side of head. A dark bar, variable in intensity, extends from lower part of eye to rictus of jaw. Cheek with 4–8, usually about 5, dark circular- to oval-shaped spots, opercle with 4–5 similar spots; cheek and opercle spots equal to or less intense than occipital spots, and usually darker on upper portions of cheek and opercle than on lower portions. Two circular- to oval-shaped dark spots on base of pectoral fin, equal in intensity to, but usually larger than, cheek and opercle spots, sometimes separated by paler brownish chromatophores. On some Arnhem Land specimens, a smaller third spot present on bases of middle pectoral rays, between upper and lower large spots. Nape with 4–5 dark transverse bars, which may be broken into spots, or with large chromatophores arranged transversely; in some specimens, the nape pigmented with uniformly scattered chromatophores. Nape pigmentation less intense than spots on side of head.

Scale pockets prominently pigmented uniformly over trunk, the patches deeper than wide, horizontally broad (Figure 49*d*) or reduced to a single vertical row of chromatophores. A small, dark, mostly subcutaneous spot on midcaudal peduncle about 3 scale rows anterior to end of hypural plate, obscure in some specimens. Five dark subcutaneous bars on lower posterior part of trunk from about the origin of the anal fin to a vertical through the midcaudal peduncle spot, integrated with 5 prominent, ventral midline spots. Four subcutaneous bars on upper part of trunk, the lower third and fourth bars combining to form the third upper bar. Subcutaneous bars usually faintly developed, often obscure. A sixth, very small, ventral midline spot usually present on posterior caudal peduncle, just touching lower procurrent rays, and sometimes associated with a small diffuse subcutaneous mark. Belly with 3 wide, weakly developed, subcutaneous bars. A pair of oval to circular spots, laterad to bony bases of pelvic fins, sometimes touching lower portion of base of pectoral fin, absent in many specimens from various localities. Another pair of dark spots, usually smaller and less intense than previous pair, at anterior area of bony base of pelvic fin on each side of midline, often absent. Trunk with 12–15 small, dark, dorsal midline

spots from origin of spinous dorsal fin to base of procurrent caudal fin rays, sometimes faintly developed.

First dorsal fin variously pigmented but usually 1 of 3 principal patterns is developed. Australian specimens have 3–4 dark, irregular, oblique bars and a dusky distal margin, the bars aligned ventrally with the dark dorsal midline spots on trunk; the anterior spines usually with a series of small dark spots extending to tips. This fin pattern is also found in various specimens over the range of the species (Figure 47). A second dorsal fin pattern is shown in Figure 49, wherein the prominent feature is a dark horizontal band just above base of fin, the rest of the fin is pale, bordered with a narrow dusky margin. A third pattern, found in Taiwan and some Philippine specimens, consists of uniformly scattered brownish pigmentation throughout the fin. The first two patterns appear to break up in many specimens to form more irregular configurations than described. Second dorsal fin pale to dark dusky, usually with a series of small dark spots separated by pale areas on the rays. Sometimes basal portion of fin lighter than or darker than outer half. Spots on rays may be faint or absent, or may be well developed, forming a series of narrow, somewhat irregular, oblique bars. Caudal fin pale to moderately dusky with alternating small, elongate, dark and pale spots usually present on rays, usually more developed on basal portion of fin. The second dorsal and caudal fins of some specimens appear to have light spots on a dark background, whereas others appear to have dark spots on a light background. Anal fin uniformly dark dusky brown with a pale margin, rarely darker on distal portion. Anal fin darker than second dorsal fin. Pectoral and pelvic fins pale.

GEOGRAPHIC DISTRIBUTION.—This species is uniformly distributed throughout the Indo–Australian Archipelago extending from southern Taiwan and the Malay Peninsula, southeastward to the Dampier Archipelago in Western Australia, the lower Great Barrier Reef, and the New Hebrides Islands on the eastern extremity (Figure 50).

REMARKS.—Whitley (1932) treated *E. queenslandica* as a subspecies of *E. viridis* (Waite). We place *E. viridis* in the synonymy of *E. prasina* (Klunzinger). The diagnostic characters we list for *E. queenslandica* distinguish it from *E. prasina*, and we have no basis to support subspeciation between these two forms.

Eviota queenslandica closely resembles *E. pardalota*, endemic to the Red Sea, especially in body coloration, but differs in lacking the IT pore and having a dorsal-anal fin formula of I,9/I,8 rather than I,8/I,7 as in *E. pardalota*.

In our analysis of the color pattern we tabulated data for specific color marks by locality. We found no consistent difference in the development of any specific color mark within major geographic areas, but the first dorsal fin pattern of several oblique bars is more commonly present in Australian specimens.

Eviota bimaculata, new species

FIGURES 50–52

Eviota viridis inutilis Whitley, 1943:142 [in part].

MATERIAL EXAMINED.—Thirty one specimens from 5 general localities in Western and South Australia totaling 15 males, 12 females, and 4 specimens of undetermined sex; total size range 14.9–22.7; largest male 22.7, largest female 22.4; smallest gravid female 17.8.

Holotype: WAM P.10110, (19.5), male; Western Australia, Rottnest Island, E end of Nancy Cove, 18 Jan 1954, A. R. Main.

Paratypes: WESTERN AUSTRALIA, ROTTNEST ISLAND: WAM P.10111–12, 2 (20.2, 17.8), male and female; same data as holotype. WAM P.10129, 1 (22.4), female; W end of Nancy Cove, 19 Jan 1954, A. R. Main. WAM P.25725–019, 4 (18.5–21.6), 2 males (21.6), 2 females (20.5); S side of Nancy Cove, 27 Jan 1977, Hutchins and Bryce. USNM 219435, 8 (14.9–19.9), 5 males (19.9), 3 females (18.3); Fish-Hook Bay, 8 Mar 1977, B. Hutchins. SU 50154, 3 (17.7–20.6), 1 male (17.7), 2 females (20.6); 18 Jan 1954, G. Bartholomew. GARDEN ISLAND: WAM P.10445–48, 4 (19.2–22.7), 3 unsexed, 1 male (22.7); 25 Nov 1961, A. Dawson;

Other Material: WESTERN AUSTRALIA: AMNH 39023, 1 (19.6), female; Cape Freycinet, 22 Mar 1969, D. E. Rosen, DR-1969-39. AMS IB.334–336, 3 (18.6–19.1), 1 unsexed, 2 males (19.0); Shark's Bay, head of Useless Inlet, 2 Jul 1939, G. P. Whitley, paratypes of *Eviota viridis inutilis* Whitley. AMNH 39024, 1 (18.0), female; North West Cape, S of mouth of Mandu Mandu Creek, 4 Apr 1969, D. E. Rosen,

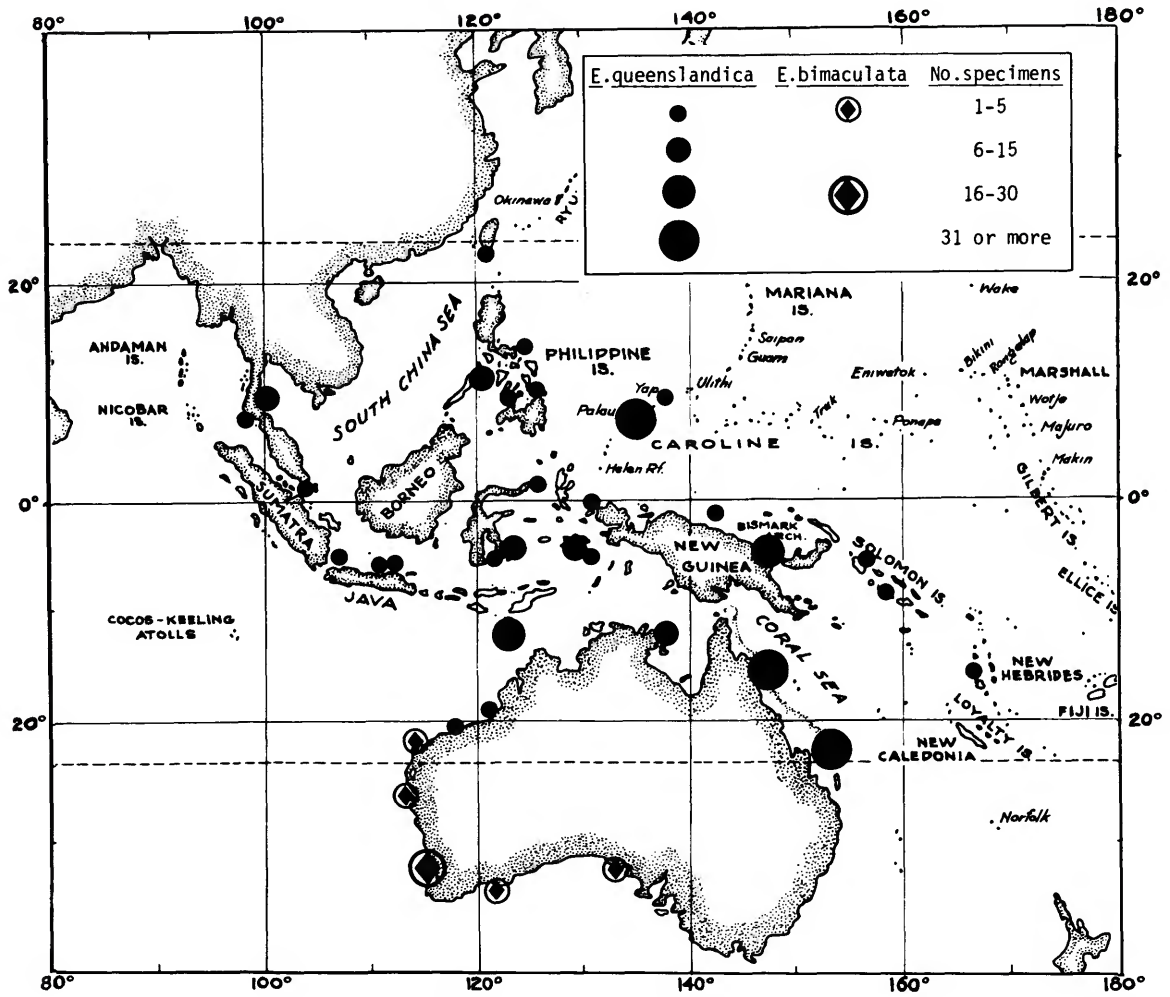

FIGURE 50.—Distributions of *Eviota bimaculata* and *E. queenslandica.*

DR-1969-59. WAM P.26000-003, 1 (16.4), male; Recherche Archipelago, W side of Lucky Bay, 12 Mar 1978, B. Hutchins. WAM P.26006-011, 1 (21.2), male; Recherche Archipelago, NE side of Mondrain I., 19 Mar 1978, B. Hutchins. SOUTH AUSTRALIA: AMS I.20215-001, 1 (21.4), female; Ceduna, Apr 1978, R. Kuites.

DIAGNOSIS.—Pectoral fin rays 11–14 always branched; spinous dorsal fin elongate or filamentous in males, rarely elongate in females; fifth pelvic fin ray small or rudimentary; IT pore absent; ratio of upper subcutaneous trunk bars to lower trunk bars 5/6; paired, bilateral dark occipital spots of head, more prominent than other spots on head.

DESCRIPTION.—Dorsal fin VI-I,9(22), VI-I,10(1); anal fin I,8(23); pectoral fin 15(1), 16 (13), 17(9), 18(1); pelvic fin I,4(1), I,4 + a rudiment (4), I,4 1/10(16), I,4 2/10(3); fourth ray of pelvic fin with 5-11 branches, averaging 8.9; segments between consecutive branches of the fourth pelvic fin ray number 1–6, averaging 1.6; pelvic fin membrane reduced; branched caudal fin rays 12(1), 13(5), 14(12), 15(3); segmented caudal fin rays 16(1), 17(23); lateral scale rows 24(4),

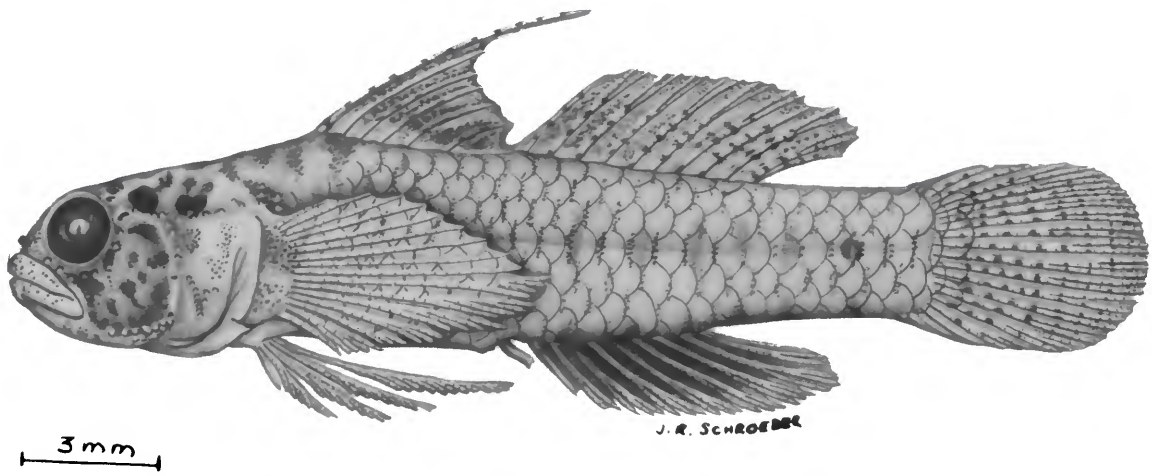

FIGURE 51.—*Eviota bimaculata*, WAM P.10110, holotype, male, 19.5 mm SL, Rottnest Island, Western Australia. (Drawn by J. R. Schroeder.)

25(16), 26(1); transverse scale rows 6(6), 7(10), 8(2); scales with about 23–32 ctenii, 8–9 primary radii, and 1–2 secondary radii; breast scaleless.

The first two dorsal spines may be elongate or filamentous in males, the first spine not extending past base of sixth ray of second dorsal fin; the second spine, rarely filamentous, may extend to base of third ray; females without filamentous dorsal spine but a slight elongation of first spine noted in one specimen; pelvic fin extending to anal aperture or beyond.

The cephalic sensory pore system is pattern 2. The cutaneous papilla system is pattern B.

Genital papilla in male not fimbriate, broad, slightly fringed at tip; female papilla short and bulbous, with three fingerlike projections at each side of tip.

Gravid females range in size from 17.8–18.3 mm SL.

Vertebrae 10(14) precaudal and 16(14) caudal, total 26.

COLOR IN PRESERVATION.—Characteristic color marks consist of a pair of dark occipital spots on each side of head; moderately developed dark cheek spots; small dark spots on the second dorsal and caudal fins; subcutaneous trunk bars that number 5 above and 6 below and a subcutaneous midcaudal peduncle spot, which is coalesced with the last trunk bar.

Head dorsally with a series of transverse spots anteriorly and 3 or 4 transverse bars posteriorly to origin of spinous dorsal fin; spots and transverse bars usually with lighter interiors, spots usually darker than bars; two black occipital spots on each side of head, the posterior spot larger, and both spots may be integrated with dorsal spots, the anterior occipital spot more frequently; both occipital spots larger than pupil; a series of 7–9 spots on side of head, mostly on cheek, always less intense than occipital spots, and usually having light interiors; opercle with weak, scattered, chromatophores; base of pectoral fin most often with weak clusters of large brown chromatophores on upper and lower portions, separated at midportion by pale area or fine brownish pigmentation; in some specimens scattered chromatophores occur throughout pectoral fin base and, in fewer specimens, the base may have pale areas above and below, which are sharply separated by an area of brown chromatophores; pigmentation at scale pockets moderately developed and uniform throughout trunk, the pigmentation consisting of 1 to several vertical rows of chromatophores; a series of about 10 weakly developed

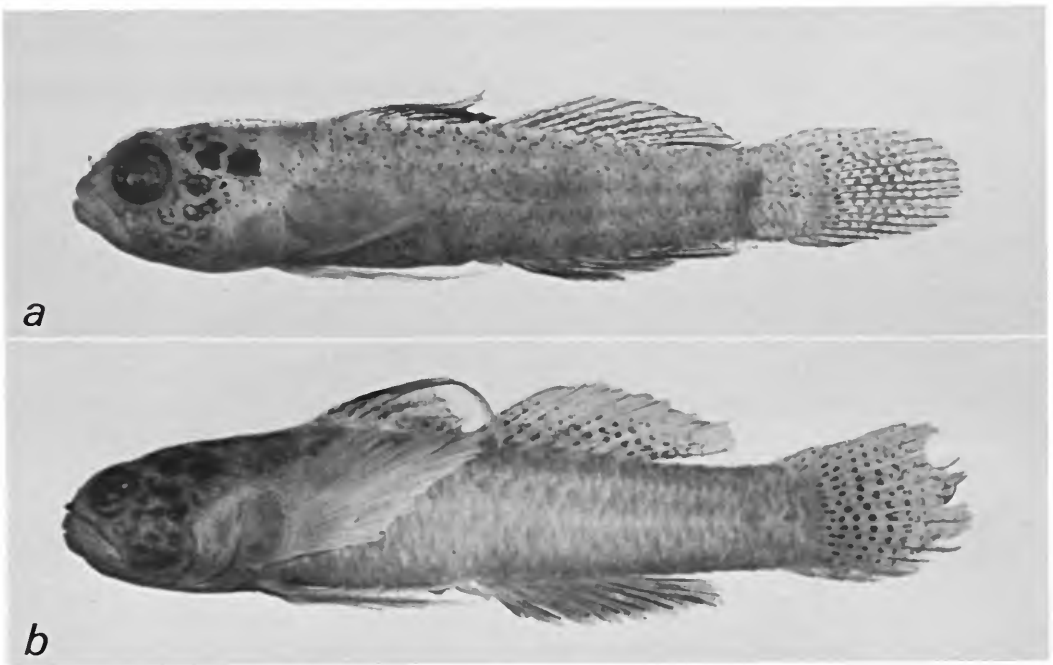

FIGURE 52.—Variation in the development of the color pattern in two specimens of *Eviota bimaculata* from Rottnest Island, Western Australia: *a*, WAM P.25758-013, male, 17.1 mm SL; *b*, WAM P.10110, holotype.

dark spots alternating with light spots along the dorsal midline, often obscure; posterior area of trunk, from origin of anal fin to a vertical through midcaudal peduncle spot, with a series of 6 dark spots along ventral midline, confluent with 6 subcutaneous bars along lower trunk; upper trunk with 5 bars, the fifth integrated with a midcaudal peduncle spot that is about 3 scale rows anterior to end of hypural plate; sometimes a small, weak seventh ventral midline spot is located at base of procurrent rays; first dorsal fin uniform dusky with a series of dark spots on first spine that extend almost to its extremity; 2–3 similar spots on midsection of remaining spines of holotype, not present in most other specimens; 3–4 pale spots on dorsal midline, along base of spinous dorsal fin, extend slightly onto basal portion of fin membrane; second dorsal fin with a series of 4–6 small dark spots on spine and rays over a pale to dusky background, spots more conspicuous on basal half of fin; in some specimens, the spots obscure and the fin nearly uniform dusky brown, about equal in intensity to spinous dorsal fin; anal fin dark brown, usually darker than dorsal fins, sometimes with a narrow pale margin; caudal fin with a series of 7–9 small dark spots on the rays, best developed on basal two-thirds of fin, over a pale to dusky background, the pattern similar to that of the second dorsal fin; spots on caudal fin sometimes absent, the fin nearly uniform dusky brown; pectoral and pelvic fins pale.

The females are somewhat paler than the males, particularly the spots on the cheek and pectoral base and the general coloration of the fins. The paired dark occipital spots show no sexual dimorphism.

The general color pattern of the species shows little variation except for the pattern on the pectoral base and the reduction of the spots on the second dorsal and caudal fins.

COLOR IN LIFE.—Described from a Koda-

chrome provided by Barry Hutchins, Western Australian Museum, taken 12 March 1978 (WAM P.26000-003, 16.4mm SL, male). Spots on cheek and opercle deep orange red, the margins irregularly bordered with black chromatophores; orange red spots on chin; upper and lower jaws with black and orange red chromatophores; tube of anterior nares orange, tipped in black; pupil dark, iris orangish, rim of eye blackish; occipital spots deep black; base of pectoral, subcutaneous bars including 3 belly bars and bar on nape, and dorsal and ventral midline spots orange red; irregular, scattered, deep orangish marks on scales; spinous dorsal fin blackish, with a series of 3-5 elongate orange spots on spines, spots on elongate first spine dusky to orange; second dorsal fin dusky, with a series of 4-6 small orange spots overlying dusky spots on rays of lower three-fourths of fin; anal fin blackish, as dark as spinous dorsal but darker than second dorsal, with a series of orange spots at or near bases of rays, those adjacent to orange red ventral midline spots larger; caudal fin transparent, with a series of about 8-10 small dark spots on each interradial membrane over most of fin.

GEOGRAPHIC DISTRIBUTION.—Found only in Western and South Australia: Our material collected from Rottnest and Garden Islands, Cape Freycinet, Shark's Bay, North West Cape, and Recherche Archipelago in Western Australia and consisting of a single specimen from Ceduna, South Australia (Figure 50).

ETYMOLOGY.—The specific epithet *bimaculata* is a Latin combination referring to the twin, dark occipital spots that are prominent on this species.

REMARKS.—The paratypes of *Eviota viridis inutilis*, included in "Material Examined" for this species, clearly represent *E. bimaculata* in having no IT pore, a reduced pelvic membrane, no spots at the base of pelvic fins, and in having two occipital spots.

Eviota afelei Jordan and Seale

FIGURES 38, 53, 54

Eviota afelei Jordan and Seale, 1906:387, fig. 77 [type-locality: Pago Pago, Samoa].

MATERIAL EXAMINED.—367 specimens from 12 general localities, totaling 183 males, 131 females, 53 juveniles; total size range 7.1-18.2; largest male 18.2, largest female 15.6; smallest gravid female 9.7.

Lectotype: SU 8715, (11.9), male; Apia, Samoa, summer 1902, D. S. Jordan.

Paralectotypes: CAS 43542, 6 (10.4-16.0), 4 males (16.0), 2 females (11.1); removed from SU 8715. USNM 51763, 3 (12.6-14.4), males; Pago Pago, Samoa, 1902, Jordan and Kellogg.

Other Material: MARIANAS ISLANDS: CAS 43801, 1 (17.6), male; Guam, Agana Bay, 7 Apr 1959, H. A. Fehlmann. USNM 219181, 3 (11.9-13.7), 2 males (13.7) 1 female (11.9); Saipan, coll. 1945, A. H. Banner. MARSHALL ISLANDS: LACM W63-283-1, 7 (9.6-14.5), 3 juv., 3 males (14.5), 1 female (13.7); Eniwetok Atoll, 20 Jul 1963, W. J. Baldwin, W63-283. USNM 219178, 8 (10.8-16.4), males; Rigili I., 26 Sep 1969, C. E. Dawson, 1381. USNM 219175, 2 (11.2, 10.8), male and female; Utirik Atoll, 3-5 July 1975, S. Ralston and R. Brock. WAKE ISLAND: BPBM 15343, 12 (10.9-18.2), 2 juv., 7 males (18.2), 3 females (15.3); Wilkes I., 8 Jun 1953, Gosline and Randall. BPBM 15166, 3 (14.5-18.2), males; Peale I., 10 Jun 1953, Gosline and Randall. GILBERT ISLANDS: AMS I.18039-001, 1 (13.0), male; Abaiang Atoll, 5 Nov 1973, D Hoese and B. Goldman. SAMOA ISLANDS: BPBM 22566, 1 (12.1), female; E of Apia, 4 Jan 1964. BPBM 17731, 2 (9.9, 9.7), male and female; Apia, 1 Oct 1967, J. Randall. Jean P. Haydon Museum of American Samoa, 2 (9.0, 9.0), juv.; Tutuila I., 8 Dec 1976, R. Wass. COOK ISLANDS: BPBM 10712, 9 (9.3-17.9), 3 juv., 6 males (17.9); Aitutaki, 10 Jan 1965, Snider. SOCIETY ISLANDS: BORA BORA: AMNH 39016, 10 (9.8-14.5), 5 males (14.5), 5 females (12.4); Topua I., 6 Apr 1970, C. L. Smith, S70-14. AMNH 39096, 2 (13.2, 10.8), male and female; Topua I., 7 Apr 1970, C. L. Smith, S70-15. Huahine Nui: AMNH 39017, 17 (8.4-18.0), 3 juv., 8 males (18.0), 6 females (14.4); 4 Apr 1970, C. L. Smith, S70-7. AMNH 39018, 6 (7.1-13.6), 3 juv., 2 males (13.6), 1 female (12.4); 3 Apr 1970, C. L. Smith, S70-3. USNM 219176, 2 (12.9-11.9), male and female; Port du Bourayne, 1 May 1957, sta 86b-57. RAIATEA: AMNH 39019, 4 (7.6-12.4), 1 juv., 2 males (12.4), 1 female (11.1); 5 Apr 1970, C. L. Smith, S70-9. MAIAO: CAS 43773, 8 (10.3-13.4), 3 males (13.4), 4 females (11.8); 29 Jul 1957, Bingman, Sta 22, GVF Reg. 1354. MOOREA: SU 24751, 2 (11.1-11.9), females; 23 Feb 1929, A. W. Herre. CAS 43771, 2 (13.0, 16.8), males; 12 Aug 1956, J. Randall, sta 84, GVF Reg. 1160. TAHITI: SU 24602, 20 (7.4-17.0), 8 juv., 7 males (17.0), 5 females (12.9); Maraa, 18 Feb 1929, A. W. Herre. CAS 43772, 1 (11.0), male; Papeari dist., Teputo Pass, 4 Jul 1957, Ellsworth, sta 10, GVF Reg. 1342. ANSP 141214, 2 (11.3, 10.3), male and female; South of Tapueraha, 21 Apr 1970, C. L. Smith, S70-44. AMNH 39020, 1 (12.5), male; Papeari, 23 Apr 1970, C. L. Smith, S70-52. AMNH 39021, 6 (9.8-12.3), 1 male (12.3), 5 females (11.1); Papeari, 23 Apr 1970, C. L. Smith, S70-53.

TUAMOTU ARCHIPELAGO: RAROIA ATOLL: CAS 43700, 9 (10.0–14.7), males; 18 Jul 1952, R. R. Harry, sta 23, GVF Reg. 77. CAS 43702, 7 (8.7–14.2), 1 juv., 4 males (12.5), 2 females (14.2), 23 Jul 1952, R. R. Harry, sta 28, GVF Reg. 82. TIMOR SEA: AMS I. 17688-009, 2 (13.3, 11.6), male and female; Ashmore Reef, 11 Jan 1973, J. McCosker. GREAT BARRIER REEF, AUSTRALIA: ENDEAVOUR REEF: AMNH 39022, 1 (15.8), male; 13 Jan 1969, C. L. Smith, S69-15. ANSP 141219, 5 (13.2–15.3), 2 males (15.3), 3 females (14.7); 16 Jan 1969, J. Tyler, TS,A-17. SWAIN REEFS: AMS I.17933-001, 10 (9.4–16.9), 3 juv., 5 males (16.9), 2 females (14.5); Gillett Cay, coll. 1962, AMS Exp. HERON ISLAND: BPBM 22563, 2 (12.0, 15.2), females; 7 Oct 1964, Snider, no. 2. BPBM 22565, 6 (12.6–16.4), 4 males (16.4), 2 females (14.2); 9 Oct 1964, no. 4. LACM 32819-6, 14 (11.3–16.6), 2 juv., 7 males (16.6), 5 females (15.0); Dec 1961, G. Bartholomew. ONE TREE ISLAND: BPBM 14422, 3 (14.2–15.8), males; 14 Jan 1973, J. E. Randall. AMS I.20201-015, 106 (8.9–16.4), 14 juv., 42 males (16.4), 50 females (14.0); 29 Sep 1971, D. Hoese 71-17. AMS 20204-017, 10 (12.4–15.7), 5 males (15.7), 5 females (14.9); 20 Nov 1969, F. Talbot 404. LACM 33723-76, 3 (12.9–16.8), males; Australian Museum staff, DFH 72-79. ONE TREE ISLAND (collected by V. G. Springer in 1966): USNM 219183, 3 (10.6–12.7), 1 juv., 2 females (12.7); 18 Nov, VGS 66-3. USNM 219174, 5 (12.3–15.7), 2 males (15.7), 3 females (15.6); 22 Nov, VGS 66-7. USNM 219179, 4 (11.7–14.9), 3 males 14.9), 1 female (13.6); 27 Nov, VGS 66-9. USNM 219180, 17 (11.7–17.3), 1 juv., 10 males (17.3), 6 females (15.0), 30 Nov, VGS 66-13. USNM 219182, 13 (11.8–14.8), 5 juv., 4 males (13.8), 4 females (14.8); 7 Dec, VGS 66-16. USNM 219177, 2 (13.9, 14.3), males; 9 Dec, VGS 66-18. PAPUA NEW GUINEA: USNM 219633, 2 (10.6, 13.5), juv. and female; Ninigo Is., Ami I., 22 Oct 1978, V. G. Springer, 78-1.

DIAGNOSIS.—Pectoral fin rays 11-15 almost always branched; spinous dorsal fin elongate or filamentous in males; fifth pelvic fin ray small or rudimentary, usually about one-tenth the length of the fourth pelvic fin ray; head and trunk lacking prominent color marks; spinous dorsal fin uniformly dark, equal in intensity to color of anal fin; chromatophores on cheek and opercle grouped in clusters; six dark subcutaneous bars from origin of anal fin to end of caudal peduncle.

DESCRIPTION.—Dorsal fin VI-I,8(4), VI-I,9-(39); anal fin I,6(1), I,7(1), I,8(41); pectoral fin 14(1), 15(6), 16(19), 17 (12), 18(4); pelvic fin I,4(1), I,4 + a rudiment (10), I,4 1/10(21), I,4 2/10(8), I,4 3/10(1); fourth ray of pelvic fin with 6-15 branches, averaging 11.5; segments between the consecutive branches of the fourth pelvic fin ray almost always 1, occasionally 2, rarely 3 or 0; pelvic fin membrane reduced; branched caudal fin rays 11(2), 12(8), 13(10), 14(4), 15(1); segmented caudal fin rays 16(2), 17(40); lateral scale rows 23(2), 24(14), 25(3); transverse scale rows 6(9), 7(7); scales with about 21-32 cteni, 8-11 primary radii, and 2-3 secondary radii; breast scaleless.

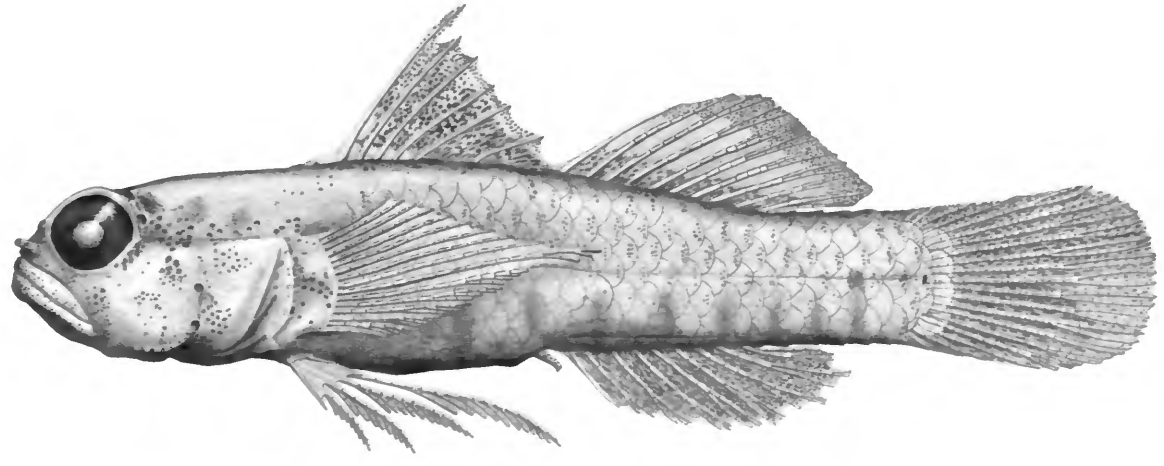

FIGURE 53.—*Eviota afelei*, AMNH 39017, male, 12.8 mm SL, Huahine Nui, Society Islands. (Drawn by Paul Mazer.)

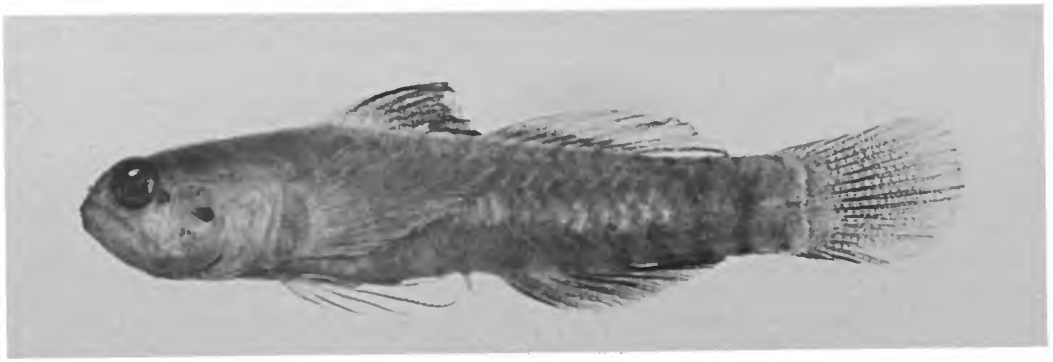

FIGURE 54.—*Eviota afelei*, CAS 43771, male, 16.8 mm SL, Moorea.

First two dorsal spines of males may be elongate or filamentous, the first spine longest and extending at most to posterior end of base of second dorsal fin, the second spine reaching base of second ray of soft dorsal fin; no spinous dorsal elongation in females; pelvic fin length usually reaches to origin of anal fin. The cephalic sensory pore system is pattern 2. Cutaneous papilla system is pattern B.

Genital papilla in male not fimbriate, its length extending to anal spine; female papilla bulbous, also reaching anal spine and tipped with 4–6 fingerlike projections.

Gravid females range in size from 9.7–15.6 mm SL.

Vertebrae 10(16) precaudal and 16(16) caudal, total 26.

COLOR IN PRESERVATION.—This species lacks outstanding color marks. The color marks discussed below, although somewhat variable in development and intensity, consistently occur throughout the geographic range and aid in recognizing the species.

Dark Clusters of Chromatophores on Cheek and Opercle: Usually 3–5 on cheek, somewhat enlarged and darker on specimens from Wake Island, and the clusters are elongate or replaced by scattered chromatophores in some Australian specimens; a dark barlike cluster of chromatophores from lower part of eye to angle of jaw, variable in intensity from moderate to faint; position of cheek marks is shown in Figure 54; opercle pale or with 2–4 clusters of dark chromatophores, often obscure or more weakly developed than those of cheek.

Marks on Head and Nape: Most specimens pale or with some scattered brown chromatophores; in some, the chromatophores on predorsal region are arranged linearly, forming 1–4 outlined transverse bars with pale centers.

Dark Marks on Base of Pectoral Fin: Highly variable, the most common pattern consisting of pale areas on upper and lower portions, with the central portion composed of an oblique cluster of brown chromatophores, which may be enlarged anteriorly or posteriorly, sometimes cluster reduced to one or two rows; in some specimens, the upper or lower pale area may be partially or completely outlined by a circular row of brown chromatophores and, rarely, the upper or lower pale portion may be filled with scattered brown chromatophores; pectoral base never with two dark spots.

Dark Scale Pigmentation: Most specimens are pale with little pigmentation on trunk, but scale pockets are moderately outlined in some specimens, especially dorsolaterally on trunk.

Dark Subcutaneous Bars: Six bars occur on the lower trunk from the origin of the anal fin to the end of the caudal peduncle; these bars may surface on the ventral midline; bars on upper part of trunk divide into 7 or 9 segments; belly with 3 broad bars, the anterior two sometimes forked above; 2 bars over nape usually faint, the anterior mostly obscure; wide bars in some specimens, more so than in other *Eviota*, particulary in spec-

imens from Australia; the belly bands wide in most specimens.

Dark Caudal Peduncle Spot: A subcutaneous spot located on middle of peduncle about 3 scale rows anterior to hypural base; spot nearly circular or deeper than wide, often larger than pupil and almost always wider than the underlying subcutaneous bar; spot variable in intensity from weak to moderately visible.

Spinous Dorsal Fin: Dark brown to dusky over most of the geographic range, the intensity equal to that of anal fin; some Cook Island specimens with light narrow basal area; sexual dichromatism evident in Australian collections, wherein females usually have a dark basal band and sometimes a dark margin and the middle portion pale, and the males have the typical, uniform dark coloration.

Second Dorsal Fin: Typically with a dusky to brown horizontal band at base, about one-fifth height of fin and a similar band at margin, the middle portion pale; second dorsal fin always lighter than spinous dorsal fin, sometimes pale, the dark bands not discernible.

Anal Fin: Uniformly dark brown, equal in intensity to the spinous dorsal fin, often with a narrow pale margin; a light basal band rarely present.

Caudal Fin: Generally uniform brownish, lighter than spinous dorsal and anal fins; rays often with small, alternating, dark and light spots, the membrane often with brown or pepperlike spots, sometimes uniformly brown.

Sexual Dichromatism: Other than differences noted above for the spinous dorsal fin, sexual dichromatism is also evident in the paler median fins of the females.

Geographic Distribution.—In Oceania, from the Marianas Islands southeastward to the Tuamotu Archipelago, and the Great Barrier Reef, Australia, and the Timor Sea (Figure 38).

Remarks.—*Eviota afelei* is closely related to *E. indica* in most meristic characters and in the general color pattern. The pelvic fin membranes are reduced, the fifth pelvic fin rays are small, and both species have 6 subcutaneous trunk bars from the origin of the anal fin to the midcaudal peduncle spot. These species differ in *E. afelei*, having typically I,9 rays in the second dorsal fin rather than I,8 as in *E. indica*; usually 3–5 clusters of chromatophores on the cheek rather than having the chromatophores scattered or linearly arranged on cheek; spinous dorsal fin uniformly dark, as dark as anal fin in *E. afelei*, rather than the fin mostly light, much lighter than anal fin and with a narrow dark margin in *E. indica*; the margins of the upper and lower caudal fin, excluding the tips of the branched fin rays, not edged in dark pigment compared to the dark margins in *E. indica*; caudal fin not darker on lower half than upper in *E. afelei*, but noticeably so in *E. indica*; base of pectoral fin in *E. afelei* with a variable color pattern of pale spots, circles, or semicircles and scattered pigment, compared with the more consistent pattern of pale upper and lower areas separated by an oblique patch of dark chromatophores in *E. indica*.

We regard *E. afelai* and *E. indica* as distinct species because the diagnostic characters are constant over the range of each species, and their allopatric distributions (Figure 38) do not provide evidence for possible intergradation.

Our data for the lateral scale rows and the anal fin rays differ from those given by Jordan and Seale (1906:387–388, fig. 77): 23–24 lateral scale rows rather than 27, and I,8 anal fin rays rather than 8(I,7). The original description reported on 10 specimens from Pago Pago, but the only allocation of these specimens was given as "Type no. 51763, U.S. National Museum, five-eights inch long, from Pago Pago." Presently, this jar contains three specimens, and the locality was first cataloged from Apia and subsequently changed to Pago Pago. The other seven specimens of the original series are at CAS (SU 8715) and recorded from Apia. Three specimens in the SU 8715 series are in a vial with a tag stating "drawn." We have selected a specimen from this vial as the lectotype (SU 8715) for this species. Our decision in the selection of the lectotype, although arbitrary, is based on the following reasons: the illustration shown in the original description (fig. 77) is la-

beled "type," but none of the USNM specimens are labeled as drawn; of the three CAS-SU specimens in the vial with a "drawn" label, two are approximately of the size given for the type; of these two we chose the specimen in the best condition and from which we could obtain reliable counts. The six remaining CAS-SU specimens are cataloged as CAS 43542, paralectotypes.

Eviota infulata (Smith)

FIGURES 55, 56

Eviotops infulatus Smith, 1956:826, fig. 4 [type-locality: Mahé, Seychelles].

MATERIAL EXAMINED.—217 specimens from 16 localities, totaling 180 males, 35 females, 2 juveniles; total size range 7.6–19.5; largest male 19.5, largest female 14.0; smallest gravid female 8.9.

Holotype: RUSI 223, (15.5), male; Seychelles Is., Mahé.

Paratypes: USNM 181858, 3 (10.0–13.5), males; Seychelles Is., 28 Sep 1954, J.L.B. Smith. USNM 209224, 1 (11.4), male; Seychelles Is., Mahé, Sep 1954, J.L.B. and M. M. Smith, formerly RUSI 636.

Other Material: WESTERN INDIAN OCEAN: SEYCHELLES ISLANDS: ANSP 141163, 1 (8.2), male; Mahé vic., 11 Feb 1964, J. Böhlke, F-44. ASNP 141164, 10 (8.1–15.3), males; Praslin I., 22 Feb 1964, J. Böhlke, F-59, CAS 43549, 1 (13.3), male; same data as above. MASCARENE ISLANDS: RUSI 2215, 4 (10.1–12.0), males; St. Brandon Shoals, 18 Mar 1971, T. H. Fraser, SA-36. WESTERN AUSTRALIA: WAM P.25315-003, 4 (14.0–16.5), 3 males (16.5), 1 female (14.0); Abrolhos Is., 20 May 1975, G. Allen. QUEENSLAND, AUSTRALIA: ONE TREE ISLAND: AMS I.20208-022, 3 (11.2–12.6), 2 males (11.5), 1 female (12.6); 27 Sep 1971, D. Hoese, 71-13. AMS I.20201-014, 3 (11.7–12.0), 1 male (11.7), 2 females (12.0); 29 Sep 1971, D. Hoese, 71-17. LACM 33723-27, 1 (13.4), male; Australian Museum staff, DFH 72-79. USNM 213874, 1 (12.3), male; 30 Nov 1966, V. G. Springer, 66-13. LITTLE HOPE ISLAND (collected in 1969 by C. L. Smith): AMNH 39039, 1 (11.1), male; 21 Jan. AMNH 39040, 2 (10.1, 10.5), females; 21 Jan, S69-28. AMNH 39041, 1 (11.9), male; 2 Jan, S69-1. USNM 213880, 2 (10.4, 13.0) males; 21 Jan, S69-30. ENDEAVOUR REEF (collected in 1969 by J. Tyler and C. L. Smith): ANSP 141161, 3 (8.3–9.5), males; 4 Jan, TS,A-3. ANSP 141162, 1 (8.3), male; 5 Jan, TS,A-4. ANSP 141160, 6 (9.4–12.0), males; 6 Jan, TS,A-5. ANSP 141159, 13 (8.5–12.2), males; 15 Jan, TS,A-16. CAS 43551, 2 (10.7, 10.8), males; 11 Jan, TS,A-11. USNM 213870, 4 (9.8–10.2), 3 males (10.2), 1 female (10.2); 14 Jan, TS,A-15. USNM 213873, 21 (8.9–11.6), 11 males (11.6), 10 females (10.7); 14 Jan, S69-16. AMNH 39042, 2 (10.0, 10.9), males; 5 Jan, S69-5. AMNH 39043, 4 (10.0–10.6), males; 6 Jan, S69-6. AMNH 39044, 10 (9.1–11.3), 9 males (11.3), 1 female (9.7); 6 Jan, S69-7. CAROLINE ISLANDS: PALAU ISLANDS: CAS 43737, 2 (10.6, 12.5), males; Iwayama Bay, 22 Jul 1955, H. A. Fehlmann, sta 30, GVF Reg. 529. CAS 43764, 1 (9.9), male; Kayuangel I., 7 Oct 1956, Scott, sta 156, GVF 942. CAS 43740, 2 (10.6, 11.5), males; Koror I., 23 Jul 1955, Fehlmann, sta 33, GVF Reg. 532. USNM 213884, 1 (10.4), female; Babelthaup-Koror Causeway, 5 Aug 1956, Fehlmann, sta 41, GVF Reg. 827. USNM 213885, 1 (12.5), male; Ngaruangl reef, 5 Oct 1956, Fehlmann, sta 139, GVF Reg. 925. KAPINGAMARANGI ATOLL (collected by R. R. Harry in 1954): CAS 43728, 1 (9.6), male; Ringutoru I., 11 Aug, sta 133, GVF Reg. 436. CAS 43716, 1 (10.5), male; between Nanakita and Parakahi Is., 23 Jul, sta 71, GVF Reg. 374. CAS 43726, 1 (9.7), male; Tirakau I., 6 Aug, sta 117, GVF Reg. 420. USNM 213869, 5 (7.6–10.5), 1 juv., 3 males (10.5), 1 female (9.6); Hare I., 4 Aug, sta 107, GVF Reg. 410. GILBERT ISLANDS: AMS I.18043-005, 1 (11.6), male; Abaiang Atoll, 6 Nov 1973, D. Hoese. LINE ISLANDS: BPBM 14065, 1 (12.6), male; Fanning I., Aug 1972. CAS 43695, 12 (9.5–17.3), 10 males (17.3), 2 females (12.2); Palmyra I., 10 Aug 1951, sta 51-GV-45, GVF Reg. 45. CAS 43697, 4 (12.0–13.5), 2 males (12.6), 2 females (13.5); Palmyra I., 20 Aug 1951, sta 51-GV-48, GVF Reg. 48. CAS 43694, 62 (7.7–19.5), 1 juv., 53 males (19.5), 8 females (12.0); Palmyra I., 15 Aug 1951, sta 51-GV-44, GVF Reg. 44. SOCIETY ISLANDS: USNM 213881, 2 (10.0, 9.0), male and female; Tahiti, Papeari, 22 Apr 1970, C. L. Smith, S70-48. AMNH 39045, 2 (10.7, 11.3), males; Tahiti, Papeari, 23 Apr 1970, C. L. Smith, S70-51. AMNH 39046, 1 (9.9), male; Huahine, 4 Apr 1970, C. L. Smith, S70-7. AUSTRAL ISLANDS: AMNH 39047, 1 (11.0), female; Rapa, 15 Apr 1970, C. L. Smith, S70-35. TUAMOTU ARCHIPELAGO: CAS 43699, 3 (8.6–10.1), 2 males (10.1), 1 female (10.0); Raroia Atoll, 30 Jun 1952, R. R. Harry, Sta 7, GVF Reg. 61. USNM 213882, 1 (13.1), male; Raroia Atoll, 23 Jul 1952, R. R. Harry, sta 28, GVF Reg. 82. BPBM 13602, 1 (15.7), male; Mangareva, 14 Dec 1970, J. E. Randall.

DIAGNOSIS.—Pectoral rays simple; first and second spines of spinous dorsal fin elongate and filamentous in males; rays of pelvic fins highly fringed; the fifth pelvic fin ray conspicuous, about three-tenths length of fourth ray; nasal pores and sensory canals absent, AITO present, opening anteriorly and positioned far forward; a large, dark irregular mark, sometimes W-shaped, on trunk just above and posterior to the base of pectoral fin.

DESCRIPTION.—Dorsal fin rays VI-I,7(3), VI-I,8(22), V-I,7(1); anal fin rays I,6(2), I,7(23); pec-

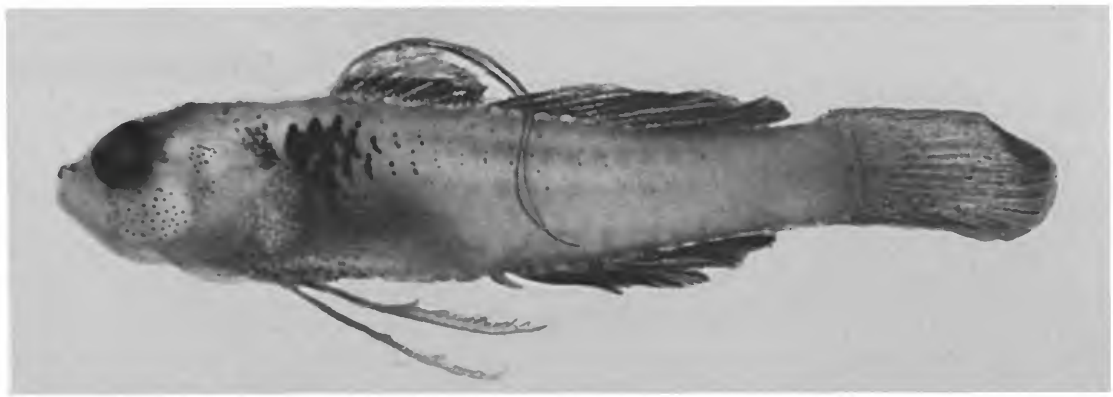

FIGURE 55.—*Eviota infulata*, RUSI 2215, male, 12.0 mm SL, Mauritius.

toral fin rays 13(4), 14(10), 15(10); pelvic fin rays I,4 1/10(1), I,4 2/10(8), I,4 3/10(11), I,4 4/10(2); branches on fourth pelvic fin ray average 11.2; segments between consecutive branches of the fourth pelvic fin ray usually 2; pelvic fin membrane well developed; branched caudal fin rays 10(1), 11(13), 12(1); segmented caudal fin rays 16(1), 17(23), 18(1); lateral scale rows 21(3), 22(5), 23(2); transverse scale rows 5(9), 6(5); scales with a single row of ctenii numbering 15–30 on posterior margin; anterior field with about 6–13 radii; almost always none in lateral fields; no posterior radii; scales highly eccentric, the radii of the anterior field meeting in a moderately to broad focal area; breast usually without scales, but some specimens with 1–2 embedded scales, 0 scales (31 specimens), 1(9), 2(1).

First and second dorsal spines elongate, filamentous in males, the first spine always longer and, when depressed, it may reach the posterior tip of the second dorsal fin; spinous dorsal filamentous at about 10 mm; pelvic fins almost always extend well beyond origin of anal fin.

The cephalic sensory pore system is pattern 4. Cutaneous papilla system is a variation of pattern B-1.

Genital papilla in male simple, elongate, extending to the first anal ray, tapering slightly, the tip moderately flared and bilobed; female papilla bulbous, sometimes extending to the origin of the anal fin.

Vertebrae 10(10), 11(2) precaudal and 14(2), 15(10) caudal, total 25.

COLOR IN PRESERVATION.—A prominent, dark brown W-shaped mark or irregular blotch anteriorly on trunk, above and just posterior to base of pectoral fin, its depth and width about equal to or somewhat larger than diameter of eye; remainder of head and trunk with pale to light brown, scattered melanophores, these mostly on cheek and preopercular area below eye and on head dorsally behind eye; predorsal area with three narrow, dark brown spots along midline; a patch of scattered melanophores behind eye, midway between the eye and upper edge of opercle, sometimes joined with cheek patch; a more concentrated group of small brown, doughnutlike melanophores with light centers preceding the large W-shaped mark; scattered melanophores at base of scales dorsolaterally posterior to W-shaped mark, few in number and dissipating below second dorsal fin; scattered doughnut-shaped pale to intense pigmentation on base and behind base of pectoral fin, descending ventrally on breast and belly to posterior margins of gill membrane; a small, brown midchin spot below vertical through middle of eye; first dorsal fin with a dark brown to blackish band on lower one-third of fin, sharply defined from the lighter, upper portion, the distal edge dusky; filamentous spines blackish; second dorsal fin dark brown to black with the outer anterior portion light to transparent;

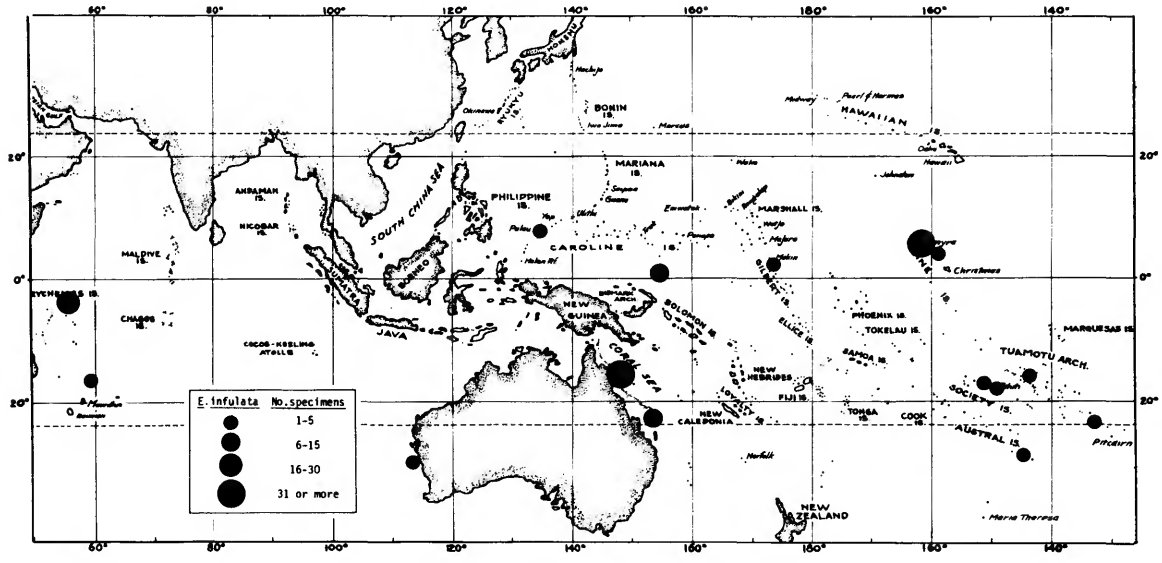

FIGURE 56.—Distribution of *Eviota infulata*.

anal fin dark brown to blackish; spines and rays in dorsal and anal fins clear, the membranes bear the dark color; pectoral and pelvic fins transparent; caudal fin dusky on outer fifth, the margin with a narrow, light border; some dusky pigment on margins of procurrent rays, often faint or absent; rays of caudal fin with fine brown spots, sometimes forming narrow, wavy vertical bands; a series of 7 spots and subcutaneous bars ventrally on trunk from origin of anal fin to caudal fin, the spots more pronounced on caudal peduncle; bars obscure on dorsal part of trunk; occasionally spots also on dorsal midline, from predorsal area to caudal fin; nares brownish; male genital papilla pale or lightly speckled. Smaller specimens, particularly females, have round to elongate, upper and lower patches of brown speckling at base of pectoral fin, the postscapular mark greatly reduced or absent, and the fins pale. This color pattern, although characteristic of the smaller specimens of both sexes, is retained in the females at larger sizes. There is great variation in the intensity of the color pattern, ranging from a subdued pattern to the intense coloration shown on Figure 55 of a specimen taken at St. Brandon Shoals. Smith (1956:827) described living colors.

GEOGRAPHIC DISTRIBUTION.—Wide-ranging, from islands in the western Indian Ocean, Caroline Islands, Great Barrier Reef, Line Islands, the Tuamotu Archipelago as far eastward as Mangareva and Rapa (Figure 56).

REMARKS.—We note the following discrepancies between our data and those given by Smith (1956). The vertebral count for the holotype is 10+15; other specimens have 11+14, and the total number is 25, never 26. The pectoral fin ray count varies from 13 to 15. The pectoral fin rays are not apically free from membrane in specimens in good condition. There are rows of fine papillae on the head not described by Smith. Breast occasionally with scales.

Eviota sebreei Jordan and Seale

FIGURES 57, 58

Eviota sebreei Jordan and Seale 1906:390, fig. 80 [type-locality: Apia, Samoa Islands].

MATERIAL EXAMINED.—170 specimens from 15 localities, totaling 77 males, 44 females, 49 juveniles, total size range 7.3–20.4; largest male 20.4, largest female 19.8; smallest gravid female 11.6.

Holotype: USNM 51765 (13.5), male; Samoa Is., Apia,

1902, Jordan and Kellogg.

Other Material: RED SEA: GULF OF AQABA (collected by V. G. Springer): USNM 213855, 1 (17.0), male; El Himeira, 16 Jul 1969, 69-2. USNM 213856, 2 (8.6, 9.0), juv.; Marsa Muqabila, 17 Jul 1969, 69-3. USNM 213857, 1(13.6), female; Ras Burqa, 21 Jul 1969, 69-6. USNM 213858, 1 (16.6), male; Marsa Muqabila, 29 Jul 1969, 69-8. USNM 213859, 9 (12.0–14.1), 3 juv., 6 males (14.1); El Himeira, 8 Sep 1969, 69-23. CAS 40596, 2 (12.5, 12.0), male and female; El Himeira, 9 Sep 1969, 69-24. INDIAN OCEAN: ALDABRA: USNM 213854, 1 (17.1), male; West I., (Ile Picard), 4 Dec 1964, H. A. Fehlmann 17, Anton Bruun Cr. 9. AMIRANTES ISLANDS: USNM 213860, 2 (10.7, 12.4), male and female; Remire reef, NE of Eagle I., 4 Mar 1964, J. Böhlke, F-82. ANSP 141204, 5 (8.0–10.0), 4 juv., 1 male (10.0); D'Arros I., 6 Mar 1964, J. Böhlke, F-89. ANSP 141205, 1 (14.6), male; vic. St. Joseph I., 10 Mar 1964, D. Dockins, F-110. SEYCHELLES ISLANDS: USNM 213876, 8 (11.5–18.7), 2 males (18.7), 6 females (14.3); Mahé, Beau Vallon Bay, 15 Mar 1964, D. Dockins, F-114. ANSP 141201, 16 (8.0–14.1), 10 juv., 5 males (14.1), 1 female (12.9); between Anonyme and Mahé Is., 11 Feb 1964, J. Böhlke, F-44. ANSP 141206, 1 (11.3), female; Mahé, Beau Vallon Bay, 19 Mar 1964, D. Dockins, F-119. ANSP 141202, 1 (14.6), male; Mahé, Souris I., 16 Feb 1964, D. Dockins, F-53. ANSP 141200, 1 (15.7), male; Mahé, Anonyme I., 2 Feb 1964, J. Böhlke, F-17. USNM 213877, 5 (8.3–16.0), 2 juv., 1 male (16.0), 2 females (13.3); Curieuse I., 24 Feb 1964, J. Böhlke, F-66. ANSP 141203, 1 (12.3), female; Curieuse I., 23 Feb 1964, J. Böhlke, F-64. CAS 43552, 3 (13.9–15.8), males; Faon I., 28 Jan 1964, D. Dockins, F-10. ANSP 141199, 8 (8.5–15.0), 2 juv., 2 males (15.0), 4 females (13.1); Faon I., 29 Jan 1964, J. Böhlke, F-11. MASCARENE ISLANDS: USNM 219187, 31 (8.8–18.1), 14 juv., 10 males (18.1), 7 females (14.9); St. Brandon Shoals, 2 Apr 1976, V. G. Springer, 76-5. RUSI 1887, 1 (12.7), male; St. Brandon Shoals, 15 Mar 1971, T. H. Fraser, SA-35. SRI LANKA: USNM 213861, 3 (11.8–14.8), 1 juv., 2 males (14.8); Batticaloa Dist., Passakudah Bay, 10 Jun 1970, T. Iwamoto, 70-349. USNM 213862, 11 (8.3–14.4), 6 juv., 5 females (14.4); Trincomalee, 6 Apr 1970, C. C. Koenig, 69-141. USNM 213863, 1 (10.0), juv., Trincomalee, 4 Apr 1970, C. C. Koenig, 69-135. INDONESIA: USNM 213867, 1 (14.7), male; Celebes, Kabaena I., 25 Feb 1974, V. G. Springer, 74-2. CAS 43553, 1 (14.0), male; Ceram, Tandjung Namatatuni, 19 Jan 1973, V. G. Springer, 73-15, *Rumphius* Exp. 1, sta Na-1. USNM 209983, 6 (7.3–15.9), 4 juv., 1 male (11.7), 1 female (15.9); Saparua, 18 Jan 1973, V. G. Springer, 73-14, *Rumphius* Exp. 1, sta IP-2. USNM 213864, 1 (17.0), female; Banda I., Goenoeng Api, 7 Mar 1974, V. G. Springer, 74-8. AUSTRALIA: USNM 213866, 2 (15.0, 15.6), juv. and female; Queensland, Endeavour Reef, 6 Jan 1969, J. Tyler, TS,A-5. AMNH 39094, 1 (17.7), female; Queensland, Endeavour Reef, 14 Jan 1969, C. L. Smith, S69-16. AMNH 39095, 1 (16.7), male; Queensland, Endeavour Reef, 5 Jan 1969, C. L. Smith, S69-5. CAROLINE ISLANDS: BPBM 9069, 2 (20.4, 19.8), male and female; Truk, Herit I., 11 Jul 1969, J. Randall. KAPINGAMARANGI ATOLL (collected by R. R. Harry): USNM 210007, 1 (19.9), male; Tiutua, 13 Jul 1954, sta 38, GVF Reg. 341. USNM 213878, 1 (14.1), female; Tirakau I., 6 Aug 1954, sta 117, formerly CAS 13581, GVF Reg. 420. CAS 43717, 5 (14.4–16.8), males; between Nunakita and Parakahi I., 23 Jul 1954, sta 71, GVF Reg. 374. CAS 13585, 1 (16.9), male; Tihatukira region, 13 Aug 1954, sta 143, GVF Reg. 446. CAS 13583, 1 (15.0), male; Ringutoru I., 11 Aug 1954, sta 133, GVF Reg. 436. USNM 213879, 3 (17.0–17.3), males; Tewawaelal, 14 Jul 1954, sta 42, GVF Reg. 345. CAS 13580, 1 (13.9), male; Hare I., sta 107, GVF Reg. 107. CAS 13582, 2 (16.5, 12.7), male and female; Matukerekere I., 7 Aug 1954, sta 121, GVF Reg. 424. CAS 13586, 2 (13.0, 15.0), male and female; Tokoteihi region, 16 Aug 1954, sta 159, GVF Reg. 462. CAS 13576, 1 (15.0), male; 9 Jul 1954, sta 29, GVF Reg. 332. CAS 13584, 2 (14.4, 15.4), males; 12 Aug 1954, sta 137, GVF Reg. 440. CAS 13579, 4 (12.8–15.0), males; 26 Jul 1954, sta 77, GVF Reg. 380. CAS 13578, 1 (14.6), male; Hare I., 20 Jul 1954, sta 60, GVF Reg. 363. MARSHALL ISLANDS: USNM 164441, 2 (14.4, 17.6), males; Eniwetok, Parry I., 23 Jul 1955, D. Strasburg, no. 255. BPBM 8842, 1 (12.7), male; Eniwetok, between Rojoa and Biijiri I., 6 Jan 1970, G. R. Allen. AMS I.18401-002, 6 (11.5–18.0), 5 males (18.0), 1 female (12.8); Eniwetok, 26 Nov 1967, J. Randall, 4-101. GILBERT ISLANDS: AMS I.18038-001, 5 (15.3–16.3), females; Abaiang Atoll, 5 Nov 1973, D. Hoese.

DIAGNOSIS.—A slender species, body elongate, not deep, the snout pointed, more conical than most other *Eviota*; pectoral fin rays not branched; spinous dorsal fin not elongate; rays of pelvic fins highly fringed; the fifth pelvic fin ray well developed, about seven-tenths length of the fourth ray; nasal pores and sensory canals absent, AITO present, opening anteriorly, PITO absent; a large, dark basicaudal spot, the lower portion streaking to tip of caudal fin.

DESCRIPTION.—Dorsal fin VI-I,8(3), VI-I,9(25), VI-I,10(1), V-I,9(1), V-I,10(1); anal I,8(28), I,9(2); most of the rays of the dorsal and anal fins unbranched; pectoral fin 15(3), 16(12), 17(14); pelvic fin I,4 5/10(2), I,4 6/10(4), I,4 7/10(18), I,4 8/10(2); branches on fourth pelvic fin ray number 11-19, average 14.3; segments almost always absent between consecutive branches of fourth pelvic fin ray; pelvic fin membrane well developed (Figure 1*b*); branched caudal fin rays 10(5), 11(18); segmented caudal fin rays 17(29); lateral scale rows 23(18), 24(6); transverse scale

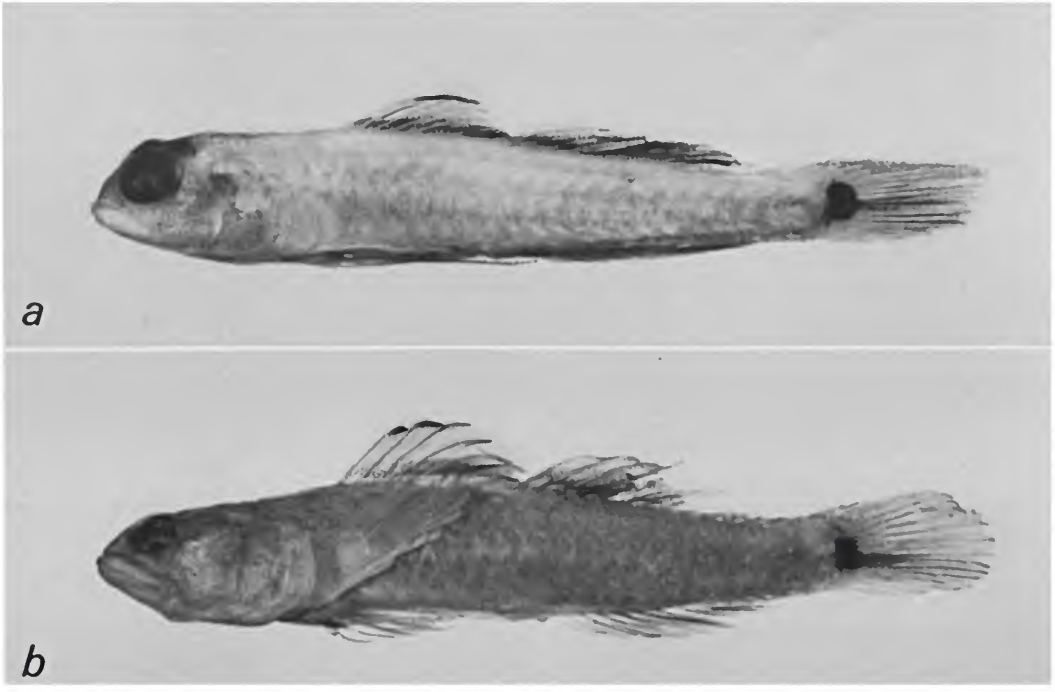

FIGURE 57.—Differences in the shape of the head and the color pattern in *Eviota sebreei* from two localities in the Indian Ocean: *a*, USNM 219187, male, 15.7 mm SL, St. Brandon Shoals; *b*, USNM 213876, male, 18.7 mm SL, Seychelles.

rows 6(10), 7(3); scales with a single row of 6-22 ctenii on posterior margin; about 10–12 primary radii on anterior field, no radii in lateral fields; scale moderately eccentric, the radii converging broadly in focal area; breast scaleless.

Second or third dorsal spine longest, slightly longer than first spine; pelvic fins almost always extend to origin of anal fin or slightly beyond.

Cephalic sensory pore system is pattern 6. Cutaneous papilla system is pattern C.

Genital papilla in male simple, elongate, sometimes reaching base of second anal fin ray, tapering gently and slightly bilobed at tip; bulbous papilla of female longer than in most species, usually reaching beyond anal fin origin, occasionally to base of second anal fin ray.

Vertebrae 10(1), 11(6) precaudal and 14(6), 15(1) caudal, total 25.

COLOR IN PRESERVATION.—Head, dorsally behind eyes, laterally on cheek and opercle and snout with fine, uniformly scattered, brownish pigmentation; smaller specimens have a concentration of fine, sharp black chromatophores behind eye, on each side of midline, the cluster of chromatophores slightly smaller than diameter of eye; a darker pigment concentration, forming a preorbital stripe from tip of snout to eye; base of pectoral fin usually speckled; chin and branchiostegal area pale; trunk with scattered brown chromatophores on upper half, the pigment concentrated at base of scales, forming half-moon-shaped marks; some males with fine light pigmentation, surrounded with fine brownish pigmentation, forming tiny doughnut-shaped spots on the upper posterior portion of the head, cheek, and dorsolaterally on nape and trunk; in females, the doughnut-shaped marks are usually broken up, and those on nape and upper trunk are

blackish and smaller than on males; this sexual dichromatism may reflect color differences in living specimens; lower part of trunk pale, some scattered chromatophores at base of scale pockets and some scattered brownish melanophores on lower part of caudal peduncle; belly pale, not pigmented, or at most, subcutaneously; interradial membranes of first and second dorsal fins dusky to brown, some specimens with dark pigmentation on lower portion of first dorsal fin, forming a band, sometimes middle portion transparent and distal margin dark; second dorsal fin dark to brownish, with heavier dark pigmentation on basal portion, some small males with a narrow, pale, basal area and outer two-thirds of fin pale or slightly dark pigmented; anal fin membrane uniformly light brown and with a narrow, clear margin, but in smaller specimens fin lighter anteriorly, darker brown posteriorly and distally; pectoral and pelvic fins transparent; caudal fin with a large, dark brown basal spot, more or less vertically rectangular, kidney or oval shaped, and with a dark streak or broad band extending from the lower portion to the posterior margin of the caudal fin, the streak located on the lower five branched caudal rays; a light area above and somewhat anterior of the dark basal caudal spot; a narrow dark brown semicircular mark above and posterior to the light area, on the lower portion of the upper procurrent caudal rays and the basal portion of the upper branched caudal rays; outer portion of upper procurrent caudal rays and upper unbranched caudal rays brownish, remainder of caudal pale or transparent. A dark diffuse subcutaneous band extending from pectoral base to area just anterior of basicaudal spot, its posterior edge forming an oblique angle. Subcutaneous trunk bars and ventral midline spots absent.

Some specimens are generally lighter, lacking the brownish color on the trunk; larger males are usually most highly pigmented.

GEOGRAPHIC DISTRIBUTION.—Wide-ranging, extending from the Red Sea, Indian Ocean, and Sri Lanka eastward in southern Indonesia, west and northeast Australia eastward to the Samoa Islands (Figure 58).

REMARKS.—The illustration by Jordan and Seale (1906:390, fig. 80) of the type specimen from Samoa agrees generally in coloration with our specimens, but it does show reduced pigmentation on the body compared with our typical

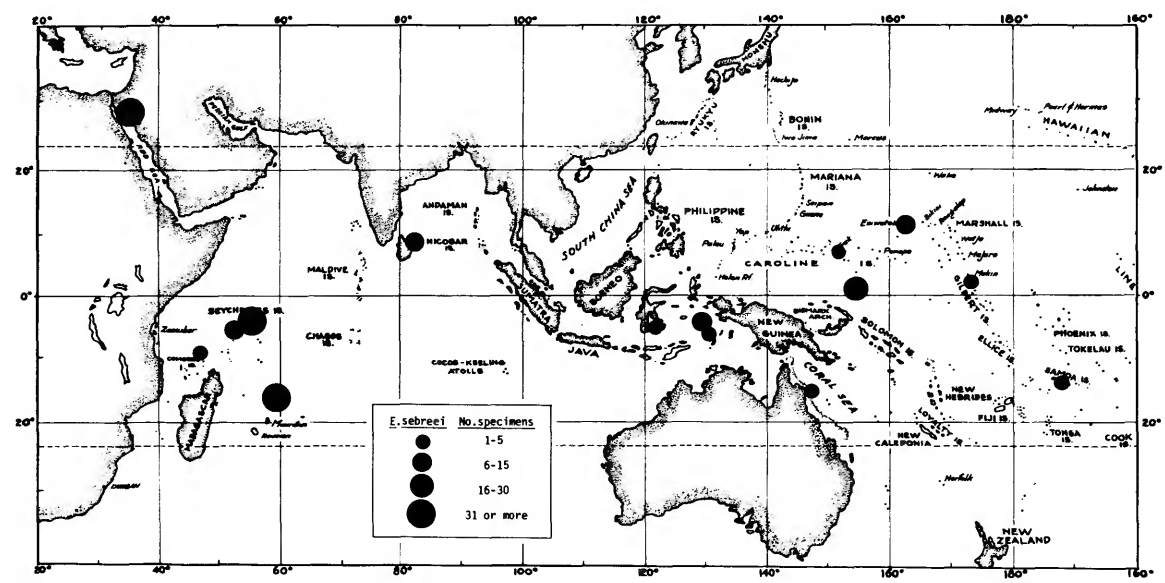

FIGURE 58.—Distribution of *Eviota sebreei*.

specimens; it has a poorly developed basal band in the first and second dorsal fins, the anal fin is weakly pigmented, and the light caudal mark above the dark basal spot is more pronounced than on most of our preserved specimens.

The holotype (USNM 51765) is in a poor state of preservation, the color is faint light brown, and the only obvious pigmentation is the basicaudal spot. In figure 80 of Jordan and Seale (1906), this basicaudal spot is illustrated more anterior than it is on the holotype and other specimens. The spot is actually located basally on the caudal rays.

Other characters of the original description and illustration that are in error are: the wide, grayish band is on the middle and lower portion of the trunk rather than lower trunk; the narrow brown line from the posterior of eye along middle of body to caudal is actually the midbody septum; the outer edge of spinous dorsal is tipped with black rather than being whitish; lateral scale rows about 22 (holotype), 23–24 in 24 other specimens, 26 given in original description; dorsal fins V-I,9 (holotype), V-I,10 (1 specimen), and VI-I,8 to I,10 (30 specimens), and VI,9 in Jordan and Seale (1906:390); anal fin I,8 (holotype), I,8-I,9 (30 specimens), and 10 in original description.

Eviota lachdeberei Giltay

FIGURES 59–61

Eviota lachdeberei Giltay, 1933:93, fig. 27 [type-locality: Banda Neira and Goenoeng Api, Indonesia].
Eviota distigma.—Larson, 1976:501 [in part].

MATERIAL EXAMINED.—154 specimens from 6 general localities, totaling 51 males, 68 females, and 35 juveniles; total size range 5.8–21.0; largest male 21.0, largest female 16.2; smallest gravid female 11.6

Syntypes: ISNB 41, 2 (15.6, 14.4), male and female; Entre Banda Neira et Goenoeng Api, 24 Feb 1929, S.A.R. le Prince Leopold de Belgique.

Other Material: INDONESIA: Banda ISLANDS: USNM 219190, 1 (9.8), female; Goenoeng Api I., 7 Mar 1974, V. G. Springer, 74-8. USNM 219189, 5 (10.1–12.3), 2 males (10.4), 3 females (12.3); Naira I., 7 Mar 1974, V. G. Springer, 74-7. KABAENA ISLAND: USNM 219191, 1 (12.0), female; Tallabassi Bay, 24 Feb 1974, V. G. Springer, 74-1. PALAU ISLANDS: USNM 165716, 1 (16.0), male; Koror I., 27 Jul 1949, E. Clark, sta 5. CAS 43735, 4 (13.4–19.9), males; Koror I., 8 Jul 1955, H. A. Fehlmann, sta 10, GVF Reg 509. CAS 43776, 1 (18.7), male; Auluptagel I., 19 Sep 1957, DeWitt, sta 57-16, GVF Reg. 1391. CAS 43779, 92 (6.0–17.9), 18 juv., 29 males (17.9), 45 females (14.2); Babelthaup I., 22 Sep 1957, H. A. Fehlmann, sta 57-19, GVF Reg. 1397. CAS 43782, 3 (9.0–15.4), 1 juv., 2 males (15.4); Kaibukku I., 3 Oct 1957, DeWitt, sta 57-30, GVF Reg. 1408. CAS 43790, 1 (12.6), female; Iwayama Bay, 18 Nov 1957, DeWitt, sta 57-59, GVF Reg 1439. AMS I.20802-001, 15 (5.8–16.2), 10 juv., 1 male (11.2), 4 females (16.2); between Koror I. and Ho I., 19 Nov 1957, DeWitt, sta 57-62. TRUK ISLANDS: BPBM 22574, 1 (14.0), female; Herit I., 11 Jul 1969, J. Randall. MARIANAS ISLANDS: UG 5346, 6 (9.9–21.0), 1 juv., 4 males (21.0), 1 female (13.1); Guam, 15 Dec 1970, R. Struch. PAPUA NEW GUINEA: USNM 219651, 21 (8.8–18.5), 5 juv., 6 males (18.5), 10 females (16.2); Kranket I., 7 Nov 1978, V. G. Springer, 78-23.

DIAGNOSIS.—A deep-bodied species; pectoral fin rays simple; spinous dorsal fin elongate or filamentous in both sexes; spines II-IV longest in males; fifth pelvic fin ray well developed, five tenths to seven-tenths length of fourth ray; the caphalic sensory pore system lacks two pores, the IT pore and one of the interorbital pores, probably the PITO pore; a deep, dark spot on base of pectoral fin, wider and darker dorsally and most pronounced in males; a large, black mark at midbase of caudal fin, the posterior portion developed into a black crescent-shaped mark that extends above and below to the base of the anterior procurrent rays; the central, dark spot bordered above and below by smaller but discreet whitish spots.

DESCRIPTION.—Dorsal fin VI-I,7(1), VI-I,8(18), VI-I,9(1); anal fin I,6(2), I,7(18); pectoral fin 14(3), 15(14), 16(3); pelvic fin I,4 5/10(4), I,4 6/10(7), I,4 7/10(6); fourth ray of pelvic fin with 3–6 branches averaging 3.6; segments between consecutive branches of the fourth pelvic fin ray number 3-10, averaging 7.2; pelvic fin membrane well developed; branched caudal fin rays 11(14); segmented caudal fin rays 16(2), 17(18); lateral scale rows 21(2), 22(13), 23(1); transverse scale rows 6(5), 7(2); scales with 25-31 ctenii, 9–13 primary radii, 1–3 secondary radii; breast with scales.

The cephalic sensory pore system is pattern 3, wherein IT and the PITO pores are absent. The AITO pore is enlarged and located more posteriorly than in patterns 1 and 2. In one specimen,

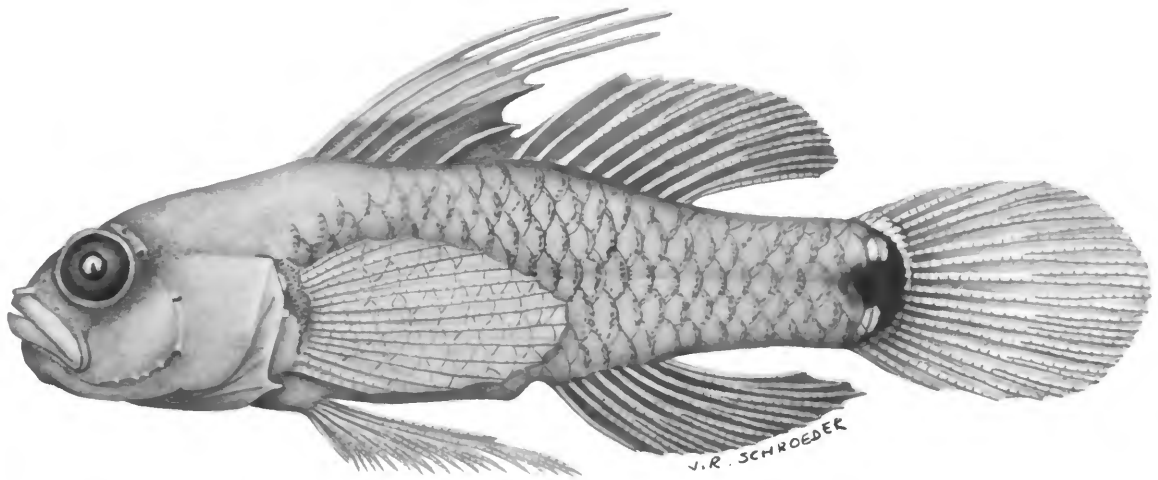

FIGURE 59.—*Eviota lachdeberei*, CAS 43735, male, 19.9 mm SL, Palau Islands. (Drawn by J. R. Schroeder.)

FIGURE 60.—*Eviota lachdeberei*, CAS 43779, male, 17.9, Palau Islands.

9.8 mm SL, the interorbital canal has a double pore at the AITO position. The cutaneous papilla system basically is pattern B. In the interorbital area there are pairs of stout papillae bordering the AITO pore, on inner margins of nasal pores, bordering orbits between NA and AITO pores and on lower posterior borders of SOT pores; the row of papillae along upper lip branches toward eye, where there are two stout papillae along anterior margin of orbit.

Dorsal spines I–IV may be elongate or filamentous in males, spines II–IV are longest, extending beyond end of base of second dorsal fin; first two spines of females may be long or filamentous, either the longer, extending to base of fifth ray when depressed; pelvic fin long, usually extending beyond anal fin origin.

Genital papilla in male not fimbriate, long and slender, may extend to base of the third anal fin ray, slightly indented and fringed at tip. Female papilla bulbous, with 4 fingerlike projections on each side of tip.

Gravid females range in size from 11.6–16.2 mm SL.

Vertebrae 10(10) precaudal and 15(10) caudal, total 25.

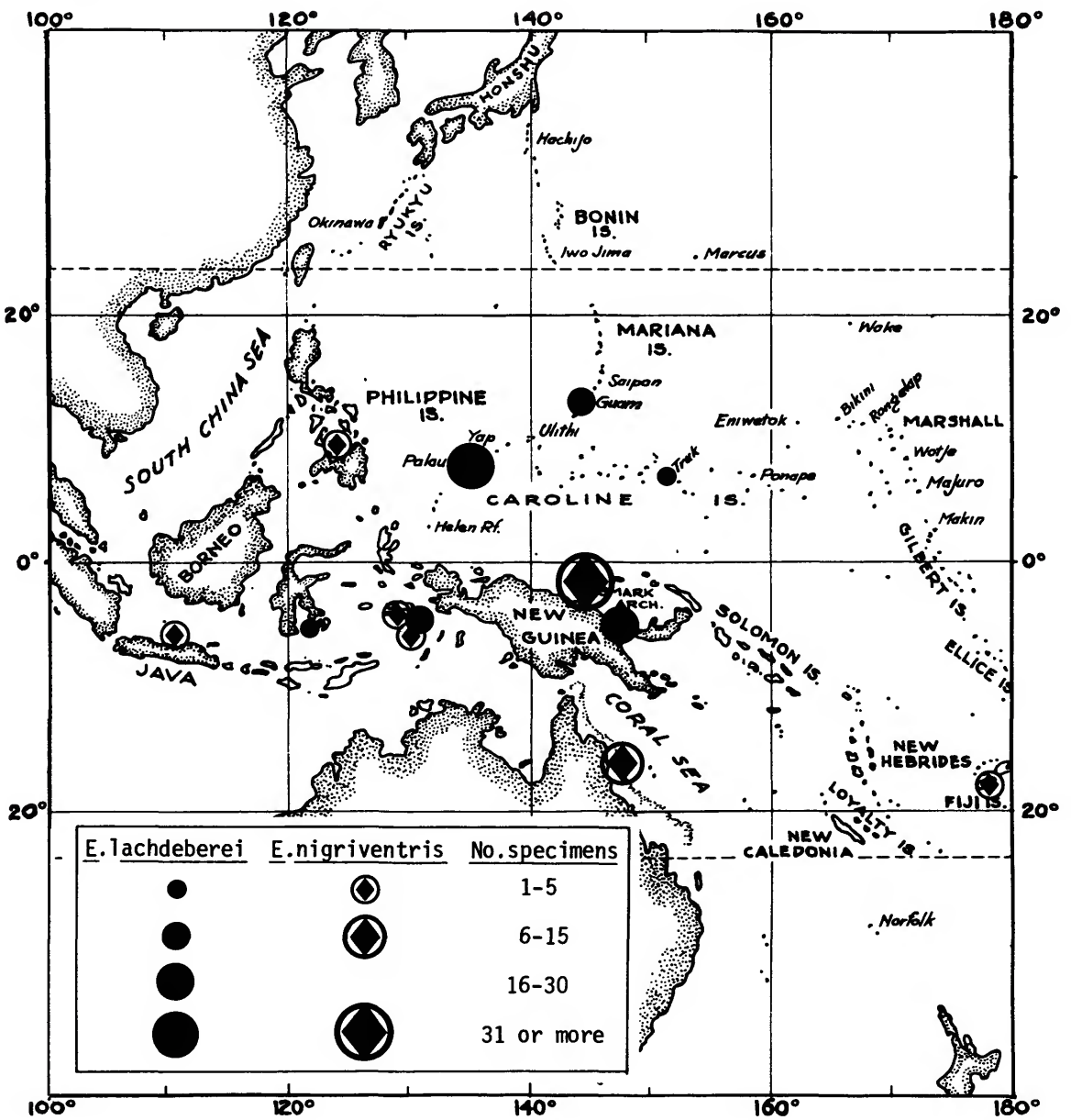

FIGURE 61.—Distributions of *Eviota lachdeberei* and *E. nigriventris*.

COLOR IN PRESERVATION.—Head uniform light brown, lacking any prominent color marks; a pair of dark brown spots below the rictus on each side of the isthmus, more or less concealed by the lower jaws; spots pronounced in females, somewhat diffuse in males, or area generally brownish; trunk uniform brownish, the scales sometimes outlined with a broad patch of chromatophores, more commonly in males; no subcutaneous bars visible on belly or trunk, and spots along ventral midline not developed; a deep, dark mark on base of pectoral fin, wider and more pronounced on

uppermost portion of base, narrowing and fading on middle and lower portions; widest upper part of dark mark bordered immediately anteriorly by a light area, and an additional light spot immediately anterior to middle portion of dark mark, about at the point where mark becomes narrow; light areas may be contiguous or separated by a narrow group of dark chromatophores; light spots most pronounced and well defined in specimens from the Palau Islands; entire pectoral base mark paler and less well developed in females; a large, black mark at midbase of caudal fin, the posterior portion developed into a black crescent-shaped mark that extends, above and below, to the base of the anterior procurrent rays; the central dark spot bordered, above and below, by smaller but discreet whitish spots; the dark crescent-shaped portion of the mark bordered above, posteriorly, by a narrow, pale halo at base of caudal rays; lower portion of spinous dorsal fin brownish, the pigmented portion narrower anteriorly but extending to margin of fin posterior to fifth spine; outer parts of anterior spines nearly pale; second dorsal and anal fins dusky brown, about equal in intensity to spinous dorsal fin or somewhat heavier colored; caudal fin light brownish, slightly darker on lower half; pectoral and pelvic fins pale.

GEOGRAPHIC DISTRIBUTION.—Known from 6 localities: Banda Islands (type-locality) and Kabaena Island, Indonesia; Kranket I., Papua New Guinea; and the Palau, Guam, Truk Islands (Figure 61).

REMARKS.—Giltay's (1933:93, fig. 27) illustration clearly depicts the characteristic caudal mark, unique for this species. Our collections are more extensive than the two specimens Giltay described. Thus our ranges for meristic values are greater. One important difference is found in the dorsal fin ray count, given as D.VI.10 by Giltay and VI-I,7 (1 specimen), VI-I,8(18), VI-I,9(1) by us.

Eviota bifasciata, new species

FIGURES 62–64

MATERIAL EXAMINED.—158 specimens from 8 localities totaling 69 males, 50 females, and 39 juveniles; total size range 7.6–22.5; largest male 22.5, largest female 17.7; smallest gravid female 12.6.

Holotype: USNM 219276 (22.5), male; Philippine Islands, Palawan Province, Bararin I., 23 May 1978, Smithsonian team, SP78-20.

Paratypes: PHILIPPINE ISLANDS: USNM 219272, 4 (15.3–21.8), 3 males (21.8), 1 female (15.3); same data as holotype. JAVA SEA: AMS I.20794-001, 2 (21.5, 22.3), males; Bawean I. or Pulau Seribus (collections mixed), Mar-Apr 1974, V. G. Springer. KARIMUNDJAWA ISLANDS (collected by V. G. Springer in 1974); USNM 219277, 1 (15.8), female; 29 Mar, VGS 74-28. USNM 219275, 14 (14.1–17.9), 4 males (17.9), 10 females (16.8); 30 Mar, VGS 74-30. MOLUCCAS: (collected by V. G. Springer in 1973): USNM 210148, 1 (12.7), male; Saparua, 17 Jan, VGS 73-12, *Rumphius* Exp. 1, sta IP-1. USNM 210248, 5 (7.6–10.7), juv.; Ambon I., 8 Jan, VGS 73-4, *Rumphius* Exp. 1, sta MO-2. USNM 209638, 14 (10.7–18.7), 3 juv., 8 males (18.7), 3 females (12.9); Ceram, 10 Jan, VGS 73-6, *Rumphius* Exp. 1, sta Li-1. ANSP 141129, 2 (10.1, 13.5), 1 juv., 1 male (13.5); Ceram, 10 Jan, VGS 73-7, *Rumphius* Exp. 1, sta Li-1. CAS 43547, 8 (10.6–14.7), 4 juv., 1 male (14.7), 3 females (13.0); Ceram, 9 Jan, VGS 73-5, *Rumphius* Exp. 1, sta Pi-1. PAPUA NEW GUINEA: USNM 219273, 18 (12.1–17.4), 13 males (17.4), 5 females (14.7); Madang Harbor, 30 May 1970, B. B. Collette, 1495. AMS I.20800-001, 6 (13.5–16.1), 3 males (16.1), 3 females (14.7); same data as above. USNM 219669, 12 (9.7–18.4), 2 juv., 6 males (18.4), 4 females (15.4); Kranket Is., 7 Nov 1978, V. G. Springer, 78-23. USNM 219668, 65 (7.6–21.8), 22 juv., 24 males (21.8), 19 females (17.6); Hermit Is., 1 Nov 1978, V. G. Springer, 78-13. USNM 219670, 2 (16.2, 17.2), males; Hermit Is., 2 Nov 1978, V. G. Springer, 78-16.

Other Material: PALAU ISLANDS: CAS 43789, 1 (10.2), juv., Iwayama Bay, 18 Nov 1957, DeWitt, sta 57-59, GVF Reg. 1439. CELEBES: USNM 219278, 1 (10.8), juv., Kabaena I., 24 Feb 1974, V. G. Springer, 74-1. BORNEO: USNM 219274, 1 (17.7), female; Pulau Gaya, Darvel Bay, 1 Feb 1965, Cohen and Davis, *Te Vega* cr. 6, sta 213.

DIAGNOSIS.—Pectoral fin rays simple; spinous dorsal fin elongate or filamentous in both sexes, the second to fourth spines longest; fifth pelvic fin ray well developed, six-tenths to eight-tenths length of fourth ray; cephalic sensory pore system lacking the IT and the PITO pores, and the AITO pore may be single or double; posterior rays of second dorsal and anal fins elongate; central rays of caudal fin may be elongate, forming a lanceolate fin; basal portion of second dorsal and anal fins and membrane of elongate rays brown to black; upper and lower posterior portion

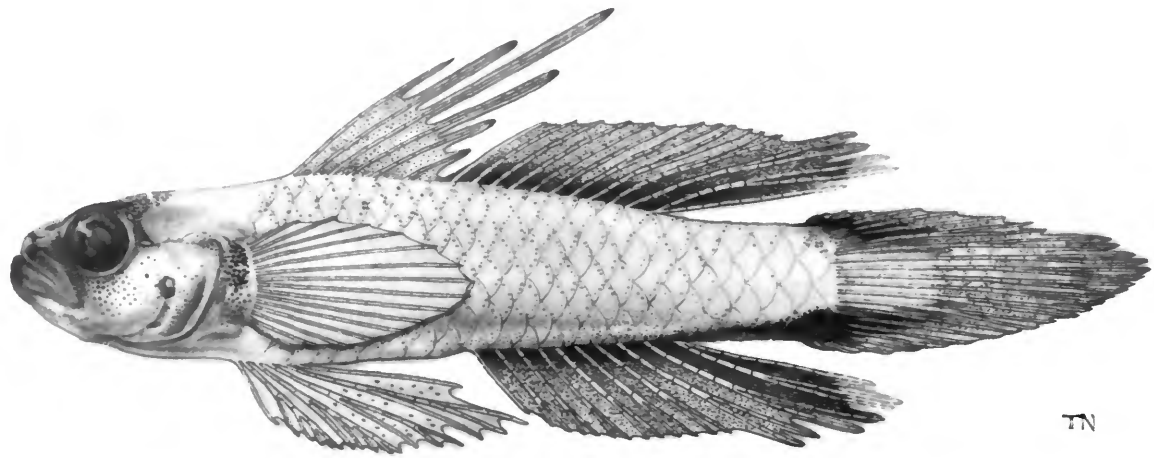

FIGURE 62.—*Eviota bifasciata*, USNM 209638, male, 18.4 mm SL, Ceram. (Drawn by Trudy Nicholson.)

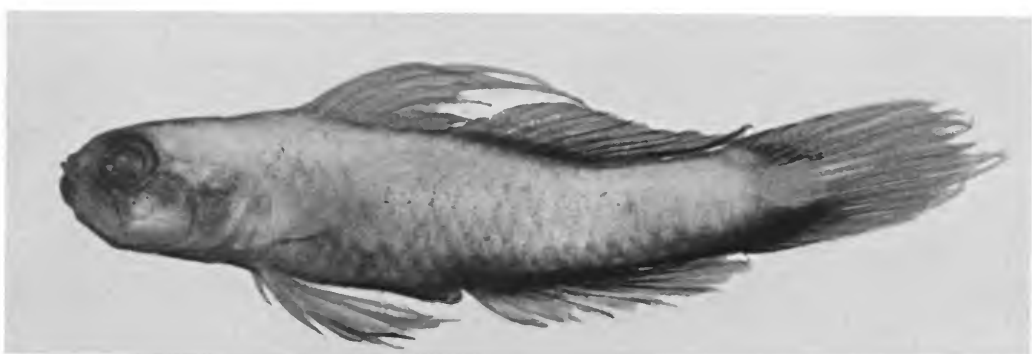

FIGURE 63.—*Eviota bifasciata*, USNM 219276, holotype, male, 22.5 mm SL, Palawan Province, Philippine Islands.

of caudal peduncle and caudal fin with black streaks.

DESCRIPTION.—Dorsal fin VI-I,8(1), VI-I,9-(27), VI-I,10(3); anal fin I,8(9), I,9(19), I,10(1); pectoral fin 14(4), 15(22), 16(5); pelvic fin I,4 6/10(9), I,4 7/10(14), I,4 8/10(2); fourth ray of pelvic fin with 2–5 branches, averaging 3.2; segments between consecutive branches of the fourth pelvic fin ray number 4–10, averaging 6.1; pelvic fin membrane well developed; branched caudal fin rays 8(1), 10(1), 11(11), 12(2); segmented caudal fin rays 17(29); lateral scale rows 22(8); transverse scale rows 6(2), 7(5); scales with 28–32 ctenii, 9–10 primary radii, 1–2 secondary radii; breast usually scaled.

The cephalic sensory pore system is pattern 3, except that 11 of 30 specimens have a double bilateral AITO pore. The cutaneous papilla system is pattern B, as described for *Eviota lachdeberei*.

The first five dorsal spines elongate or filamentous in males, the second, third or fourth may be longest, the longest filament extending to beyond end of base of second dorsal fin, the fifth and sixth spines may be slightly elongate in some specimens; dorsal spine elongation reduced in females, found only in the first three spines, the

second may be filamentous, extending at most to base of third ray of second dorsal fin; the pelvic fin commonly extends beyond origin of anal fin, but shorter in some specimens.

Genital papilla in male not fimbriate, long and slender, slightly bilobed at tip, its maximum length to base of third anal fin ray; female papilla short, bulbous, with 2–3 fingerlike projections at each side of tip, and extends to anal spine.

Gravid females range in size from 12.6–17.7 mm SL.

Vertebrae 10(9) precaudal and 14(1), 15(8) caudal, total 24(1), 25(8).

Color in Preservation.—Chin black; snout blackish, pigmentation extending to interorbital area; a small dark, mostly subcutaneous spot, smaller than pupil, beneath upper preopercular pore; cheek and opercle with uniformly scattered chromatophores, often faded or pale; some scattered chromatophores on occiput on each side of midline, rest of nape mostly pale; base of pectoral fin with a dark spot on upper portion, sometimes deep, with weak extension onto lower base, spot often diffuse; scales margined with single rows of chromatophores, more developed on lower half of trunk; spinous dorsal fin finely dusky, larger specimens with a narrow dark band basally; ends of filmanentous spines may be tipped with brown; basal third of second dorsal fin dark brown, the posterior elongate portion brownish black to distal margin, the outer anterior portion of the fin pale to dusky; basal third of anal fin dark brown, elongate posterior portion brownish black, outer anterior portion pale to dusky; the longest portions of the second dorsal and anal fins are also the darkest; end of upper portion of caudal peduncle, in the region at the procurrent rays, and upper part of caudal fin with dark brown streak extending about halfway out the length of caudal fin; a similar but darker streak on lower part of caudal peduncle, along ventral midline posterior to anal fin, and extending halfway out the lower part of caudal fin as a streak; the lower streak is widest at the lower part of hypural base, where it occupies about a fourth to a third the height of the caudal peduncle, and tapers caudad as it extends out the caudal fin; tips of lower procurrent rays excluded from dark streak; basal third of central area of caudal fin pale, remainder of fin finely dusky; pectoral fins pale; pelvic fins pale to finely dusky in larger specimens. No ventral midline spots or subcutaneous bars.

The color pattern is weaker and not as extensively developed in females or juveniles, compared to the larger males. In females, the spot on the preopercle often weak or obscure; spot on upper pectoral base greatly reduced and of weaker intensity; dark streak on upper part of caudal peduncle and caudal fin greatly reduced and faint; streak on lower part of peduncle and fin somewhat reduced; pigmentation of dorsal and anal fins reduced and, in smaller specimens, fins nearly pale; pigmentation outlining scales much reduced.

Geographic Distribution.—Restricted to the Philippine Islands, Indonesia, Papua New Guinea, and Palau Islands. Known from seven

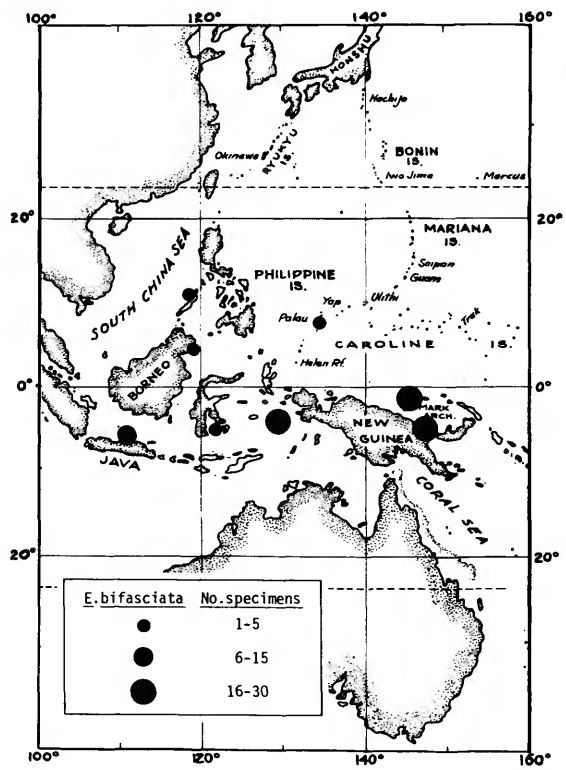

Figure 64.—Distribution of *Eviota bifasciata*.

localities: the Java Sea; Kabaena Island, lower Celebes; Darvel Bay, northeast Borneo; Palawan Province, P.I.; Ceram and Saparua; Iwayama Bay, Palau Islands; Madang Harbor, Papua New Guinea (Figure 64).

ETYMOLOGY.—The specific name *bifasciata*, derived from the Latin, is in reference to the upper and lower dark streaks on the caudal peduncle and caudal fin.

REMARKS.—*Eviota bifasciata* is placed with *E. lachdeberei* and *E. nigriventris* as a closely related group, sharing the following important characters: pectoral fin rays simple; cephalic sensory pore systems (pattern 3) lacking the IT and PITO pores, and having a single AITO pore located more posteriorly in the interorbital area than in patterns 1 and 2, and in some the AITO pore is double and bilateral; subcutaneous bars on trunk absent; a well-developed fifth pelvic fin ray; and each species has a characteristic color pattern at the end of the caudal peduncle and on the caudal fin.

Eviota nigriventris Giltay

FIGURES 61, 65, 66

Eviota nigriventris Giltay, 1933:93, fig. 28 [type-locality: Banda Neira and Goenoeng Api].

MATERIAL EXAMINED.—133 specimens from 6 localities totaling 42 males, 54 females, and 37 juveniles; total size range 8.3–18.9; largest male 18.9, largest female 16.7; smallest gravid female 13.6.

Syntypes: ISNB 42, 2(12.5, 12.0), male and female; Entre Banda Neira et Goenoeng Api, 24 Feb 1929, S.A.R. le Prince Leopold de Belgique.

Other Material: INDONESIA: KARIMUNDJAWA ISLAND: USNM 219279, 1 (12.7), male; 29 Mar 1974, V. G. Springer, 74-28. USNM 219280, 2 (13.0, 13.6), females; 30 Mar 1974, V. G. Springer, 74-30. USNM 209680, 5 (10.6–13.2), 1 male (13.1), 4 females (13.2); Ceram, 10 Jan 73, V. G. Springer, 73-6. FIJI ISLANDS: BPBM 11584, 2 (14.2, 11.3), male and female; Nukulau I., 26 Apr 1970, M. Gawel, USP 1503. GREAT BARRIER REEF: ANSP 141218, 1 (10.7), juv., northern Escape Reef, 24 Jan 1969, J. Tyler, TS,A-30. AMNH 39069, 5 (8.3–14.3), 1 juv., 2 males (10.8), 2 females (14.3); northern Escape Reef, 24 Jan 1969, C. L. Smith, S69-33. PAPUA NEW GUINEA: BISMARCK ARCHIPELAGO, Hermit Is. (collected by V. G. Springer in 1978): USNM 219648, 64 (5.7–17.0), 25 juv., 20 males (17.0), 19 females (15.5); 1 Nov, VGS 78-13. USNM 219645, 17 (7.8–18.9), 4 juv., 6 males (18.9), 7 females (16.7); 2 Nov, VGS 78-16. USNM 219647, 4 (9.0–15.7), 1 juv., 1 male (14.5), 2 females (15.7); 31 Oct, VGS 78-12. USNM 219650, 26 (10.6–17.3), 5 juv., 9 males (17.3), 12 females (14.5); 5 Nov, VGS 78-20. USNM 219646, 2 (11.9, 12.1), females; 4 Nov, VGS 78-19. PHILIPPINE ISLANDS: USNM 219649, 2 (14.4, 15.1), females; Balicasag I., 10 Jun 1978, V. G. Springer, SP78-38.

DIAGNOSIS.—Pectoral rays simple; spinous dorsal fin elongate or filamentous in both sexes, the second or third spine longest; fifth pelvic fin ray

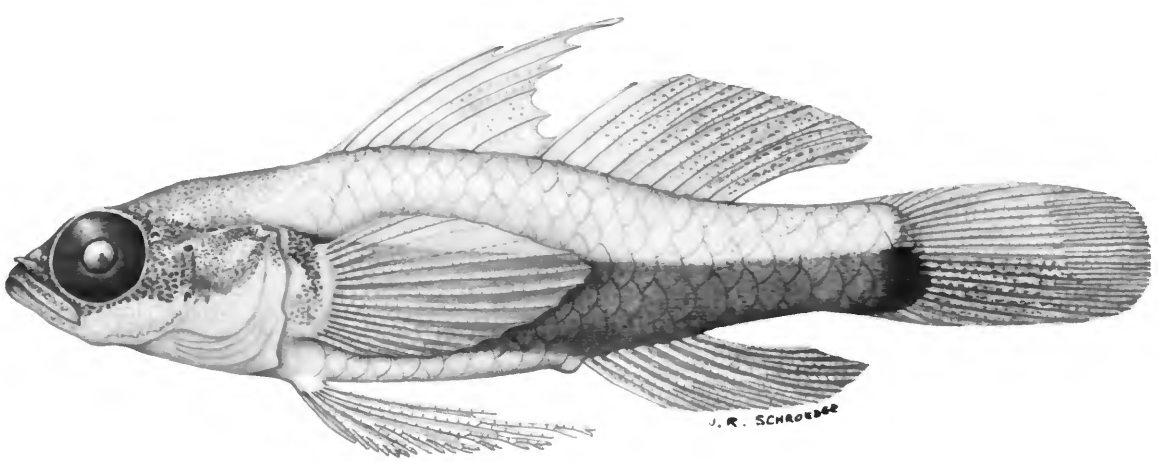

FIGURE 65.—*Eviota nigriventris*, USNM 209680, female, 13.2 mm SL, Ceram. (Drawn by J. R. Schroeder.)

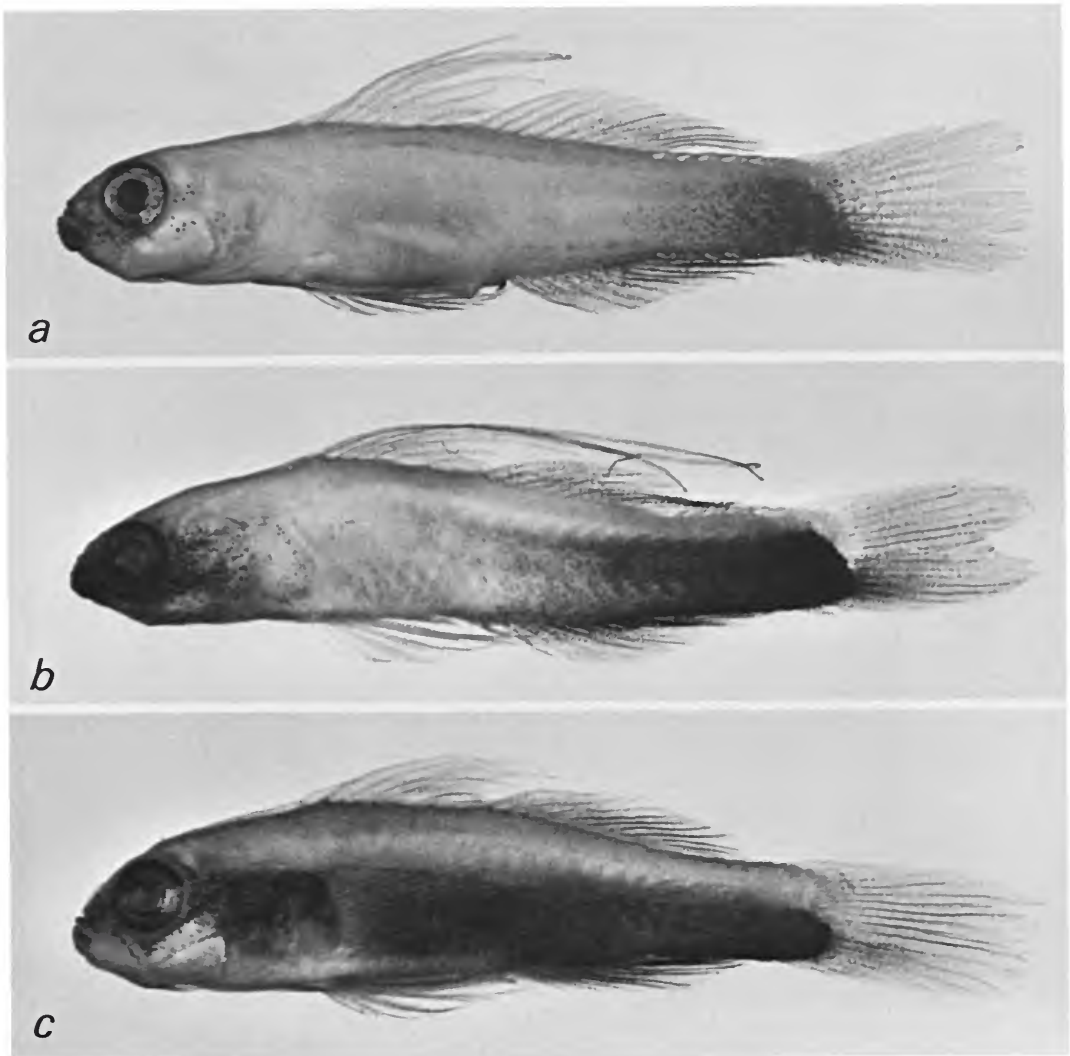

FIGURE 66.—Development of the dark band on the lower portion of the body in *E. nigrinentris*. The following examples collected at Papua New Guinea: *a*, USNM 219645, male, 18.7 mm SL; *b*, USNM 219648, male, 16.2 mm SL; *c*, USNM 219645, male, 14.2 mm SL.

well developed, five-tenths to seven tenths length of fourth ray; cephalic sensory pore system lacking IT and PITO pores; a broad, dark band on lower body, from snout to end of caudal fin, with an enlarged black spot at base of lower caudal fin rays, band may be variously reduced (Figure 66*a-c*).

DESCRIPTION.—Dorsal fin VI-I,9(14), VI-I,10-(1); anal fin I,8(9), I,9(5); pectoral fin 15(3), 16(8), 17(3), 18(1); pelvic fin I,4 5/10(1), I,4 6/10(3), I,4 7/10(5); fourth ray of pelvic fin with 3–5 branches, averaging 3.8; segments between consecutive branches of the fourth pelvic fin ray number 3–6, averaging 4.3; pelvic fin membrane well developed; branched caudal fin rays 11(6); segmented caudal fin rays 17(16); lateral scale

rows 21(1), 22(1), 23(1); transverse scale rows 5(1), 6(1); scales with 23–36 ctenii, 10–13 primary radii, 1–2 secondary radii; breast scaled.

The cephalic sensory pore system is pattern 3. The cutaneous papilla system is pattern B, as described for *Eviota lachdeberei*. The postocular area is considerably eroded in our specimens.

First four spines of dorsal fin may be elongate or filamentous in both sexes, the second or third spine longest in males, extending to end of second dorsal fin base, when depressed, and to the base of the eighth dorsal ray in females; pelvic fins long, extending beyond origin of anal fin.

Genital papilla in males not fimbriate, very long, slender, slightly flared, and bilobed at tip, extending, in some, to base of third anal fin ray; female papilla bulbous, extending to first anal fin ray, with 2–4 fingerlike projections on each side.

One female from Karimundjawa, 13.6 mm SL, was gravid.

Vertebrae 10(6), 11(1) precaudal and 15(7) caudal, total 25(6), 26(1).

Color in Preservation.—The prominent coloration is a broad, dark band from tip of snout, through tip of lower jaw, eye, cheek and opercle, base of pectoral fin, and, ventrolaterally, through trunk to end of caudal peduncle, where it terminates in an intense, black spot at the lower part of base of the caudal fin, the round portion of the spot directed posteriorly onto lower caudal rays; lower part of caudal fin dusky, with remnants of the dark band; anteriorly on body, the band is about as wide as the height of the pectoral fin base, and meets the upper and lower margins of the pectoral base, but becomes slightly narrower on caudal peduncle; the dorsal border of the band follows the midbody septum; lower portion of cheek and opercle dusky or pale; chin and breast pale; nape pale or with fine dark chromatophores; base of pectoral fin with a deep, dark mark, located mostly on posterior portion; anterior portion of pectoral base, especially centrally, usually pale; upper part of dark pectoral mark more intense than lower, the ventral portion of the base sometimes pale; belly, below ventrolateral dark band, slightly dusky to pale; upper part of trunk pale, with traces of fine chromatophores; no subcutaneous bars or caudal peduncle spot visible on trunk; first and second dorsal fins finely dusky; anal fin dusky to brown, the posterior portion more heavily brown and darker than the dorsal fins; upper part of caudal fin mostly pale with some fine chromatophores; pectoral and pelvic fins pale. Females somewhat paler than males.

Geographic Distribution.—Known from 6 widely separated localities: Balicasag Island, Philippine Islands; Karimundjawa Island in the Java Sea; Ceram and Banda Islands, Indonesia; Bismarck Archipelago; northern Escape Reef, New South Wales, Australia; and the Fiji Islands (Figure 61).

Remarks.—The broad, dark ventrolateral band, terminating in an intense black spot on lower basal portion of caudal fin, is unique to this species of *Eviota* and this pattern is clearly shown in Giltay's illustration (1933:94, fig. 28).

Our counts differ from those presented by Giltay (1933:93) as follows: dorsal fin rays VI-I,9 or VI-I,10, not VI,9; anal fin rays I,8 or I,9, not 7; pectoral fin rays 15–18, not 14.

Relationships

It is premature to attempt to relate, in a satisfactory manner, the 31 species involved in this study when we know that at least an equal number of new species remain to be described. Yet we can place these 31 species in major groups or categories on the basis of combinations of shared characters, which may represent natural or artificial groupings.

Group I.—Cephalic sensory pore system complete; vertebrae almost always number 26; some branched pectoral fin rays (except some specimens of *E. monostigma* and *E. pseudostigma*); genital papilla of male nonfimbriate. This category contains 13 species, *E. abax, E. inutilis, E. smaragdus, E. melasma, E. epiphanes, E. guttata, E. pardalota, E. nebulosa, E. nigripinna, E. monostigma, E. pseudostigma, E. distigma,* and *E. herrei.*

The species that are closely related in this group are *E. melasma* and *E. smaragdus,* each possessing

a strong dark occipital spot; *E. monostigma* and *E. pseudostigma* having a large, dark spot on the pectoral base; *E. distigma* (females) and *E. herrei* in lacking outstanding color marks; *E. nebulosa* and *E. nigripinna* in sharing many similar meristic and color characters.

GROUP II.—Cephalic sensory pore system lacks the IT pore; vertebrae almost always number 26; always some branching of the pectoral fin rays; the pelvic fin membrane joining the first four rays always reduced; the fifth pelvic fin ray absent, reduced or very short, one-tenth length of fourth ray. This category contains 8 species, *E. prasina, E. variola, E. zonura, E. saipanensis, E. afelei, E. queenslandica, E. bimaculata,* and *E. indica.*

The species group *E. prasina,* including *E. variola* and *E. zonura,* share meristic, morphological, and color pattern characters, and the related pair, *E. afelei* and *E. indica,* share similarities in coloration.

GROUP III.—Cephalic sensory pore system lacks the IT pore; vertebrae 25; pectoral fin rays never branched; genital papilla of male nonfimbriate; dorsal fin elongate or filamentous; pelvic fin membrane well developed. This category embraces 5 species, *E. zebrina, E. spilota, E. pellucida, E. storthynx,* and *E. prasites.*

Two species in this category are closely related, *E. prasites* and *E. spilota,* sharing most meristic and color characters. *Eviota prasites* has a dark spot at the base of the caudal fin below the midline, which is absent in *E. spilota.*

GROUP IV.—Cephalic sensory pore system lacking the PITO and the IT pores, the AITO pore is enlarged or paired; vertebrae number 25; pectoral fin rays never branched; genital papilla of male nonfimbriate; pelvic membrane well developed; spinous dorsal fin elongate or filamentous; fifth ray of pelvic fin more than one-half length of fourth ray; upper and lower subcutaneous bars and ventral midline spots on trunk posterior to origin of anal fin absent. This category is a closely related species group comprising *E. lachdeberei, E. bifasciata,* and *E. nigriventris.* They possess characteristic, specific color markings on the posterior trunk and fins.

GROUP V.—Cephalic sensory pore system lacks the NA, PITO, and the IT pores; vertebrae number 25; pectoral fin rays never branched; genital papilla of male nonfimbriate; pelvic membrane well developed; fourth ray of pelvic fin with numerous branches, modally 14; segments between branches of the fourth pelvic fin rays lacking; fifth pelvic fin ray modally seven-tenths length of fourth ray; subcutaneous bars and ventral midline spots absent. One species in this category, *E. sebreei.*

GROUP VI.—Cephalic sensory pore system lacks the NA and the IT pores; vertebrae number 25; pectoral fin rays never branched; genital papilla of male nonfimbriate; pelvic membrane well developed; dorsal fin elongate or filamentous; branches on the fourth pelvic fin rays numerous, modally 11; subcutaneous bars on lower trunk and ventral midline spots number 7, bars on upper trunk obscure. One species in this category, *E. infulata.*

Biogeography

Fourteen of the 31 species of *Eviota* treated in this study are endemic to particular areas of the vast Indo-Pacific region or they have restricted distributions. Those species having restricted or endemic distributions are identified by locality below: Red Sea, *E. pardalota*; Red Sea and the Gulf of Oman, *E. guttata*; Indian Ocean islands, *E. indica, E. nigripinna,* and *E. pseudostigma* (the Seychelles and Amirantes population); Vietnam and Indonesia (Seribu, Borneo and Celebes), *E. spilota*; Western Australia, *E. bimaculata* and *E. inutilis*; Japan and Okinawa, *E. abax*; Great Barrier Reef, *E. variola* (lower portion only) and *E. monostigma* (also at New Caledonia); islands of Taiwan, Palau, Ulithi, Guam, Saipan, *E. saipanensis.* Species restricted to certain island of Oceania are: Marianas and Gilbert Islands, *E. pellucida*; Samoa and Society Islands, *E. pseudostigma* (Oceanic population); Hawaiian Islands, Johnson Island, and Christmas Island, *E. epiphanes.*

Three species, *E. distigma, E. sebreei,* and *E. prasina,* are extremely widespread, occurring from the Red Sea to islands of Oceania or to the Lord

Howe–Norfolk Islands. Two species, *E. nebulosa* and *E. infulata,* are distributed from Africa or the islands of the Indian Ocean to eastern Oceania. Two of these widespread species, *E. distigma* and *E. infulata*, have discontinuous distributions, not occurring in the Indonesia-Philippine-New Guinea area, whereas *E. bifasciata* is confined to the Indo–Pacific Archipelago. *Eviota lachdeberei* has a somewhat greater distrubtion than *E. bifasciata,* found in the Celebes and Banda Islands, Palau and Truk Islands of the Carolines, and Guam Island in the Marianas.

It is of interest to note that 14 of the 31 species treated were taken in the Caroline Islands, an area of small land masses. The large and small islands of Indonesia had 13 species; 11 were found on the Great Barrier Reef, and 9 of these were from Endeavour Reef. One collection by C. L. Smith (S69-5, 5 Jan 1969) at Endeavour Reef contained eight species.

Appendix: Tables

TABLE 1.—Summary of number of specimens examined, size of largest male, largest female and smallest gravid female (in mm SL), and type of genital papilla in males of 31 species of *Eviota* (N = nonfimbriate. F = fimbriate, C = cuplike with lateral portions folded inward)

Species	N	Largest male	Male genital papilla	Largest female	Smallest gravid female
abax	600	35.7	N	32.9	23.1
afelei	365	18.2	N	15.6	9.7
bifasciata	79	22.5	N	17.7	12.6
bimaculata	28	22.7	N	22.4	17.8
distigma	323	20.3	N	18.6	11.5
epiphanes	393	15.7	N	15.7	11.6
guttata	152	17.4	N	18.5	13.0
herrei	22	13.6	N	13.0	12.2
indica	141	15.4	N	14.4	11.6
infulata	217	19.5	N	14.0	8.9
inutilis	4	25.0	N	19.5	-
lachdeberei	131	21.0	N	16.2	11.6
melasma	168	26.6	N	20.5	14.1
monostigma	133	27.0	N	21.0	14.3
nebulosa	138	17.4	N	18.8	10.0
nigripinna	206	14.0	N	13.9	12.0
nigriventris	16	14.2	N	14.3	13.6
pardalota	31	18.8	N	17.4	-
pellucida	15	20.9	N	16.9	10.4
prasina	907	30.9	F	26.5	10.9
prasites	160	21.3	N	20.6	13.3
pseudostigma	18	20.6	N	17.8	14.7
queenslandica ...	316	24.3	N	20.0	12.8
saipanensis	221	26.3	C	22.0	11.5
sebreei	140	20.4	N	19.8	11.6
smaragdus	203	22.6	N	19.9	11.0
spilota	9	24.9	N	21.3	19.0
storthynx	713	20.9	N	16.6	11.4
variola	170	21.5	F	20.8	17.4
zebrina	824	19.0	N	17.4	10.8
zonura	264	20.4	F	18.0	11.0

TABLE 2.—Frequency distributions for number of branched and unbranched pectoral fin rays of 31 species of *Eviota* (frequencies in upper row for each species refer to number of unbranched rays and those in lower rows to branched rays; pectoral rays are numbered sequentially from most dorsal ray, number 1, to most ventral ray)

Species	Pectoral fin rays																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
abax	23	3	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	1
	9	29	35	35	36	36	36	36	36	36	36	37	37	36	36	33	16	2
afelei	36	36	36	34	33	32	31	31	27	9	-	-	-	-	2	11	9	4
									3	18	30	36	36	36	33	19	6	
bimaculata	23	23	23	23	22	21	15	14	13	2	-	-	-	-	1	9	4	1
				1	2	2	6	7	10	20	22	22	23	23	22	13	5	
distigma	38	38	37	37	35	34	32	29	13	-	1	-	-	-	6	16	2	
					1	1	1	1	7	20	29	33	35	36	28	5		
epiphanes	25	25	25	25	24	23	23	22	21	9	1	-	-	-	-	8	10	
										6	20	24	26	25	25	14		
guttata	26	24	24	24	22	16	16	12	7	2	-	-	-	-	1	9	14	1
				1	2	6	11	13	13	15	23	27	30	29	27	17	1	
herrei	14	14	13	13	12	13	11	9	2	1	-	-	-	2	3	1		
					1	-	1	2	8	12	13	12	12	12	1			
indica	27	27	27	27	27	27	27	27	23	10	-	-	-	-	10	9	1	
									9	21	24	27	27	27	16	2		
inutilis	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	1	2	
				2	2	2	2	2	2	2	3	3	3	3	3	2		
melasma	28	28	26	24	20	21	18	19	13	7	3	-	-	1	2	11	9	4
			1	3	6	7	9	9	13	18	22	27	27	27	24	15	6	1
monostigma	16	15	15	15	13	13	12	12	11	10	7	6	7	12	14	9	1	
											3	5	6	2				
nebulosa	14	14	14	14	14	13	13	12	12	6	-	-	-	2	1	7	3	
									1	5	8	13	13	12	12	3		
nigripinna	23	23	23	23	23	23	23	23	21	9	-	-	-	-	-	18	2	1
										11	19	19	22	22	20	3	1	
pardalota	22	18	18	15	12	9	11	6	4	-	-	-	-	-	8	4		
			1	1	4	5	2	4	7	14	18	19	19	18	12	2		
prasina	92	92	92	92	92	91	88	84	77	50	15	4	-	1	8	21	29	10
								1	5	26	61	83	87	90	80	54	17	
pseudostigma	15	15	13	14	12	11	9	9	7	4	3	1	2	3	4	10	8	2
			1	1	2	3	5	4	5	5	6	9	11	11	11	5		
queenslandica	35	35	35	35	35	35	34	33	31	18	2	-	-	-	2	10	13	
									1	9	24	29	32	34	33	20	1	
saipanensis	27	27	27	27	27	27	26	26	25	19	2	-	-	-	-	11	8	
							1	1	1	6	22	27	27	27	27	13	4	
smaragdus	18	15	14	8	4	1	1	-	-	-	-	-	-	-	3	10	2	
		2	3	10	13	16	16	16	17	18	18	19	19	19	17	4	1	
variola	35	35	35	35	35	35	35	34	32	23	5	-	-	-	-	8	19	3
								1	-	3	18	30	33	33	33	24	7	
zonura	31	31	31	30	29	29	28	26	24	17	-	-	-	-	1	16	10	
										4	24	33	33	34	33	15		

TABLE 3.—Frequency distributions for number of pectoral fin rays and vertebrae for 31 species of *Eviota*

Species	Pectoral fin rays							Vertebrae		
	13	14	15	16	17	18	19	25	26	27
abax			1	17	16	3			16	
afelei		1	6	19	12	4			16	
bifasciata		4	21	5				8		
bimaculata			1	13	9	1			14	
distigma		2	16	30	2			1	20	2
epiphanes			2	15	12				19	1
guttata			2	12	23	1			15	
herrei		13	3	1					32	1
indica			17	11	1				24	
infulata	4	10	10					12		
inutilis				2	2				4	
lachdeberei		3	14	3				10		
melasma		1	2	9	11	7			13	1
monostigma			6	11	3				9	
nebulosa		1	3	8	3				11	
nigripinna			1	19	2	1			20	1
nigriventris			3	8	3	1		6	1	
pardalota			19	9					12	
pellucida			2	11				9		
prasina		3	25	88	85	25	1		23	
prasites		1	9	15	4			5		
pseudostigma			1	6	8	2			3	
queenslandica ...			10	23	17			1	19	1
saipanensis			1	14	12			2	10	
sebreei			3	12	14			7		
smaragdus			4	12	3			1	38	1
spilota		5	3	5	2			9		
storthynx		1	7	6				7		
variola				8	24	4			13	
zebrina		3	20	31	37	9		19	1	
zonura			1	28	10				16	

TABLE 4.—Frequency distributions for number of primary branches on fourth pelvic fin ray of 31 species of *Eviota*

Species	Number of primary branches																	
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
abax			4	3	10	9	3	2										
afelei					1	1	-	3	3	6	9	4	4	1				
bifasciata	5	10	8	1														
bimaculata				1	1	2	1	3	7	2								
distigma				4	5	9	6	3	1									
epiphanes					4	13	6	8	1	1								
guttata					5	7	8	4										
herrei			3	3	3	1												
indica					1	-	-	5	4	7	5	3						
infulata					1	1	2	1	3	6	3	2	2	1				
inutilis			1	-	2													
lachdeberei		9	6	1	1													
melasma			1	2	4	7	7	6										
monostigma	1	6	5	3														
nebulosa				2	3	2	2	1										
nigripinna						6	9	5										
nigriventris		4	4	2														
pardalota				1	2	3	4	5	3									
pellucida			1	5	1													
prasina			2	7	13	38	32	29	18	3	1	1	1					
prasites			4	8	7	2	-	2	-	-	1							
pseudostigma	1	1	8	2	4													
queenslandica ...			1	4	2	10	9	8	5	3	3							
saipanensis						2	5	8	4	4	1	1	1					
sebreei										1	3	2	10	3	3	1	-	1
smaragdus			6	10	7	7												
spilota		1	1	3	3	1	2											
storthynx		1	-	6	3	1	1											
variola			2	2	3	9	8	1	1									
zebrina				2	4	11	3	1	3	1								
zonura				1	4	10	8	1	2	2								

TABLE 5.—Frequency distributions for number of segments between consecutive branches of fourth pelvic fin ray of 31 species of *Eviota*

Species	Number of segments										
	0	1	2	3	4	5	6	7	8	9	10
abax			4	8	11	24	15	4	2	3	
afelei	2	206	22	3							
bifasciata					4	2	6	3	1	1	1
bimaculata		63	54	9	1	-	1				
distigma		23	68	28	6						
epiphanes		90	10	1							
guttata		14	87	18	1						
herrei		1	1	5	-	1	-	1			
indica		149	29	5							
infulata		23	87	23	4	1	1				
inutilis						1	4				
lachdeberei				1	1	3	4	5	3	5	3
melasma		6	76	45	9	2	-	1			
monostigma			4	6	10	5	1	2	-	1	
nebulosa		17	16								
nigripinna	1	91	16								
nigriventris				2	9	5	1				
pardalota		36	62	7	3						
pellucida				2	5	4	4	1	1		
prasina		278	487	121	19	1	2				
prasites		1	6	8	21	18	12	3	1	1	
pseudostigma		1	5	17	12	2	1	1			
queenslandica		67	130	30	6	1					
saipanensis		100	56	1	2						
sebreei	311	2									
smaragdus			2	10	17	8	3	1	1		
spilota				3	9	10	7	4	3	1	1
storthynx			9	10	11	5	3	2	2		
variola		1	63	51	16	3					
zebrina		22	68	37	8	1	2				
zonura		54	103	15	2	1					

TABLE 6.—Frequency distributions for length of fifth pelvic fin ray of 31 species of *Eviota* (expressed in tenths of length of fourth fin ray, or as rudimentary, R, or absent, A)

Species	Length of fifth pelvic fin ray									
	A	R	1/10	2/10	3/10	4/10	5/10	6/10	7/10	8/10
abax			13	21	2					
afelei	1	10	21	8	1					
bifasciata								9	13	2
bimaculata	1	4	16	3						
distigma		7	25	5						
epiphanes	27	-	1							
guttata			35	3						
herrei			2	11	4					
indica		4	25							
infulata			1	8	11	2				
inutilis				4						
lachdeberei							4	7	6	
melasma			5	15						
monostigma	2	18	1							
nebulosa	1	14								
nigripinna	23									
nigriventris							1	3	5	
pardalota		8	20							
pellucida					5	7	2			
prasina	191	41								
prasites					2	13	6	1	1	
pseudostigma	3	15								
queenslandica		4	44	2						
saipanensis	27									
sebreei							2	4	18	2
smaragdus			1	11	2	1				
spilota					3	9				
storthynx			9	4						
variola	9	26								
zebrina		2	35	3						
zonura	26	13								

TABLE 7.—Frequency distributions for number of elements in second dorsal fin and anal fin of 31 species of *Eviota*

Species	Second dorsal fin elements					Anal fin elements				
	I,7	I,8	I,9	I,10	I,11	I,6	I,7	I,8	I,9	I,10
abax			2	35			1	35	1	
afelei		4	39			1	1	41		
bifasciata		1	26	3				9	18	1
bimaculata			22	1				23		
distigma	3	45	3				11	42		
epiphanes	1	8	24				3	27	1	
guttata		3	36					37	1	
herrei		17						16		
indica		27	2				1	27		
infulata	4	22				2	23			
inutilis		1	3					4		
lachdeberei	1	18	1			2	18			
melasma		1	28	1				29	1	
monostigma		21	1					21	1	
nebulosa		14						14	1	
nigripinna		19	3					22	1	
nigriventris			14	1				9	5	
pardalota	2	26				2	26			
pellucida	2	12	1				15			
prasina		5	158	78	1		1	91	2	
prasites		28	2			1	27			
pseudostigma		17	1				1	17		
queenslandica ...		2	43	5			3	45		
saipanensis			19	8			1	26		
sebreei		3	26	2				28	2	
smaragdus		2	20				1	21		
spilota		1	14				14			
storthynx		12	1				14			
variola			8	28				10	26	
zebrina	1	38	94	3			36	99	6	
zonura		1	55	2			2	55		

TABLE 8.—Summary of types of cephalic sensory pore and cutaneous papilla patterns; number of dark ventral midline spots occurring from origin of anal fin to end of caudal peduncle; and number of subcutaneous bars, within same region, on upper and lower trunk, of 31 species of *Eviota* (Ob = obscure, A = absent, R = rudimentary bar or small mark, Wk = weakly developed bars, Br = branched or variously divided bars; see discussion under "Methods")

Species	Pore patterns					Papillae patterns			Number of ventral midline spots	Subcutaneous bars on trunk	
	1	2	3	4	6	A	B	C		Upper	Lower
abax	x					x			7	Ob	Ob
afelei		x					x		6	7-9	6
bifasciata			x				x		A	A	A
bimaculata		x					x		6-7	5	6
distigma	x					x			6	5-6	6
epiphanes	x					x			5	4	4+R
guttata	x					x			7	5-6	6
herrei	x					x			6	5?	6
indica		x					x		6-7	5	6
infulata				x			x		7	Ob	7
inutilis	x					x			6	Ob	Ob
lachdeberei			x				x		A	A	A
melasma	x					x			6-7	Ob	6WK
monostigma	x					x			7	Ob	Ob
nebulosa	x					x			5	4	4+R-5
nigripinna	x					x			5	4	4+R-5
nigriventris			x				x		A	A	A
pardalota	x					x			6	4	5
pellucida		x					x		A	A	A
prasina		x					x		5	4-5	5
prasites		x					x		6	Ob	6WK
pseudostigma	x					x			4	3-4	3-4
queenslandica		x					x		6	4	5
saipanensis		x					x		4	4	4
sebreei					x			x	A	A	A
smaragdus	x					x			5-6	Ob	5-6
spilota		x					x		5-6	Ob	Ob
storthynx		x					x		7-8	Ob	7-8
variola		x					x		5	5	5
zebrina		x					x		6-7	Br	6-7
zonura		x					x		5	4	5

TABLE 9.—Frequency distributions for number of fin rays of *Eviota prasina*, segregated by major localities, and of *E. variola* from Australia (R under pelvic fin indicates presence of a rudimentary fifth pelvic ray)

Species and localities	Second dorsal fin				Anal fin			Pectoral fin						Branched caudal fin rays					Pelvic fin	
	8	9	10	11	7	8	9	14	15	16	17	18	19	11	12	13	14	15	4	4R
prasina																				
Red Sea pop		29	4		1	12			5	18	8			1	1	5			31	1
W. Indian O. pop	1	34	3			14		1	6	20	9	2			8	2	1		32	6
Ceylon	1	9	5			4			2	9	4				2				14	2
Thailand	1	30	4			5			1	5	9	3			2	3			20	1
Indonesia pop	2	41	2			14	1	2	9	27	8	1			7	2			30	16
Japan pop		4	38			21	1		2	9	27	4			5	8	1		40	1
Lord Howe I. pop		11	22	1		21					20	15	1		6	11	4		24	14
variola		8	28			10	26			8	24	4			5	11	10	2	10	26

TABLE 10.—Frequency distributions for number of branched and unbranched pectoral fin rays of *Eviota prasina*, segregated by major localities, and of *E. variola* (frequencies in the upper row for each locality refer to number of unbranched rays, and those in lower rows to branched rays; pectoral rays are numbered sequentially from most dorsal ray, number 1, to most ventral ray)

Species and localities	Pectoral fin rays																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
prasina																		
Red Sea pop	12	12	12	12	12	12	12	11	9	5	-	-	-	-	1	7	4	
										2	8	13	14	14	12	4		
W. Indian O. pop	14	14	14	14	14	14	13	13	12	6	-	-	-	-	3	3	2	1
										7	13	13	14	14	10	7	1	
Ceylon	3	3	3	3	3	3	2	2	2	2	-	-	-	-	-	-	1	
											3	3	3	3	3	2		
Thailand	5	5	5	5	5	5	5	4	4	4	3	-	-	-	-	1	3	1
								1	1	1	2	5	5	5	5	4	1	
Indonesia pop	15	15	15	15	15	15	14	12	10	4	-	-	-	1	3	7	1	
									2	8	12	15	15	14	10	2		
Japan pop	23	23	23	23	23	23	22	22	21	13	2	1	-	-	1	3	11	2
									1	5	17	21	22	23	21	17	5	
Lord Howe I. pop	20	20	20	20	20	19	20	20	19	16	10	3	-	-	-	-	7	6
									1	3	6	13	14	17	19	18	10	
variola	35	35	35	35	35	35	35	34	32	23	5	-	-	-	-	8	19	3
								1	-	3	18	30	33	33	33	24	7	

TABLE 11.—Frequency distributions for meristic characters involving fourth pelvic fin ray and subcutaneous bars of *Eviota prasina*, segregated by major localities, and of *E. variola* (data referring to subcutaneous bars is given as a ratio of number of upper to lower posterior trunk bars; S in middle column indicates staggered condition of some bars)

Species and localities	Number of branches on fourth pelvic fin ray											Number of segments between consecutive branches of the fourth pelvic fin ray						Subcutaneous bars		
	4	5	6	7	8	9	10	11	12	13	14	1	2	3	4	5	6	4/5	5/5S	5/5
prasina																				
Red Sea pop	1	1	7	10	10	1	4					73	56	-	1				2	44
W. Indian O. pop		1	-	5	7	11	7	1	1	1	1	109	70	4				3	16	86
Ceylon		2	3	4	2	2						33	18					3	1	13
Thailand		1	-	3	3	4	3					14	49	7	3			21	8	4
Indonesia pop		3	13	5	7							34	92	3				38		
Japan pop	1	2	3	6	10	7	6	1				15	124	56	6	-	1	43	1	
Lord Howe I. pop		1	4	10	5	2	2	1					78	51	9	1	1		6	31
variola	3	2	3	9	8	1	1					1	63	52	16	4			2	24

TABLE 12.—Summary of range and mean values of certain meristic characters of *Eviota prasina*, segregated by major localities, and of *E. variola*

Species and localities	Second dorsal fin rays			Anal fin rays			Pectoral fin rays			Fourth pelvic fin ray branches			Segments between consecutive branches of the fourth pelvic fin ray		
	range	N	$\bar{x}$	range	N	$\bar{x}$	range	N	$\bar{x}$	range	N	$\bar{x}$	range	N	$\bar{x}$
prasina															
Red Sea pop	9-10	33	9.1	7-8	13	7.9	15-17	31	16.1	4-10	34	7.4	1-4	130	1.5
W. Indian O. pop	8-10	38	9.1	8	14	8.0	14-18	38	16.1	5-14	35	9.0	1-3	183	1.4
Ceylon	8-10	15	9.3	8	4	8.0	15-17	15	16.1	5-9	13	6.9	1-2	51	1.4
Thailand	8-10	35	9.1	8	4	8.0	15-18	18	16.8	5-10	14	8.3	1-4	73	2.0
Indonesia pop	8-10	45	9.0	8-9	15	8.1	14-18	47	15.9	6-9	28	7.6	1-3	129	1.8
Japan pop	9-10	42	9.9	8-9	22	8.1	15-18	42	16.8	4-11	36	8.0	1-6	202	2.3
Lord Howe I. pop	9-10	33	9.7	8	21	8.0	17-19	36	17.5	5-11	25	7.5	2-6	140	2.5
Total	8-10	241	9.3	7-9	93	8.0	14-19	227	16.5	4-14	145	8.0	1-6	908	1.9
variola	9-10	36	9.8	8-9	36	8.7	16-18	36	16.9	4-10	26	7.0	1-5	134	2.7

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