Four New Species of the Fish Genus *Ecsenius* with Notes on Other Species of the Genus (Blenniidae: Salariini)

JAMES F. McKINNEY
and
VICTOR G. SPRINGER

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 236

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ABSTRACT

McKinney, James F., and Victor G. Springer. Four New Species of the Fish Genus *Ecsenius* with Notes on Other Species of the Genus (Blenniidae: Salariini). *Smithsonian Contributions to Zoology,* number 236, 27 pages, 11 figures, 12 tables, 1976.—Four new species of *Ecsenius* are described: *E. isos* (from the New Hebrides), *E. melarchus* (from islands in the Java Sea, Celebes, and Borneo), *E. pictus* (from the Moluccas and the Solomon Islands), and *E. schroederi* (from the Moluccas). New information (locality records and geographic and individual morphological variation) is given for 13 previously described species, one of which, *E. oculus,* is represented by 6 allopatric populations, each completely separable from the others only by features of its color pattern. A key to all *Ecsenius* species (25) is presented.

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Introduction

Numerous specimens of the genus *Ecsenius* McCulloch, including representatives of four new species, have come to our attention since Springer's (1971, 1972) studies of this genus. The purpose of this paper is to describe the new species (all in the subgenus *Ecsenius*) and present new data for thirteen other species of *Ecsenius*. A key to the 25 species of *Ecsenius* (probably the most speciose genus of blenniids) is included. Two species, *E. bandanus* and *E. trilineatus*, hypothesized by Springer (1971:42–43) to occur in the Banda Sea, based on collections lacking locality data, are now demonstrated to occur in that area; a collection of *E. oculus* also hypothesized by Springer to have come from the Banda Sea, now appears more probably to have been collected at Samoa (see "Remarks" under each species). We are of the opinion that there are more undescribed species of *Ecsenius*, particularly in areas (for instance the Philippines) that have not been subjected to intensive collecting.

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Methods of reporting data are the same as thos given by Springer (1971). Material lists include ai abbreviated locality, followed by institutional abbreviation, catalog number, and (except for *E. bicolor*, *E. nalolo*, and *E. yaeyamaensis*) the number of specimens and size range, in parentheses, as mm SL.

ABBREVIATIONS.—The following institutional abbreviations are used to indicate the location of specimens studied: AM = Australian Museum, Sydney; ANSP = Academy of Natural Sciences of Philadelphia; BMNH = British Museum (Natural History), London; BPBM = Bernice P. Bishop Museum, Honolulu; CAS = California Academy of Sciences, San Francisco; DASF = Department of Agriculture, Stock and Fisheries (Fisheries Research), Papua; FMNH = Field Museum of Natural History; NMNH = National Museum of Natural History (Division of Fishes), Smithsonian Institution, Washington; UG = University of Guam, Agana; USNM = former United States National Museum (specimens in NMNH); WAM = Western Australian Museum, Perth.

ACKNOWLEDGMENTS.—We wish to thank the following individuals for loans or exchanges of specimens and for providing information on material

housed in their institutions: J. R. Paxton and D. F. Hoese (AM); J. E. Böhlke and W. F. Smith-Vaniz (ANSP); J. E. Randall (BPBM); W. N. Eschmeyer and T. Iwamoto (CAS); P. Kailola (formerly of DASF); L. P. Woods (FMNH); H. T. Kami (UG); G. R. Allen (WAM); B. Carlson, formerly of the University of South Pacific, Suva, Fiji; P. Fourmanoir, New Caledonia. Allen, Randall, and Carlson also provided color transparencies of freshly preserved specimens of some species.

The manuscript was critically reviewed by W. D. Anderson, Jr. (Grice Marine Biological Laboratory, College of Charleston), W. F. Smith-Vaniz, and R. H. Gibbs, Jr. (NMNH).

Illustrations were prepared by S. L. Chambers (Figure 5), P. K. Hollingsworth (Figures 2 and 7), and J. R. Schroeder (Figures 1, 4, 10, and 11).

Many of the Indonesian specimens included in our study were obtained on an expedition funded by a National Geographic Society research grant to Springer. Springer also wishes to thank Dr. Aprilani Soegiarto, National Institute of Oceanology of Indonesia, for his generous help during Springer's visits to Indonesia.

Ecsenius bandanus Springer

FIGURE 1

Since publication of the original description, based on a single specimen (from a Longley collection of dubious origin), 124 specimens of *E. bandanus* from various localities in Indonesia (see "New Material") have been obtained. On the basis of these specimens the species is redescribed.

DESCRIPTION (Table 1 gives frequency distributions for certain meristic characters; other characters, with frequencies in parentheses, are as follows).—Dorsal-fin spines 11(2), 12(119), 13(1); pectoral-fin rays 12(2), 13(70); segmented caudal-fin rays 13(39); dorsal procurrent caudal-fin rays 6(2), 7(24), 8(13); ventral procurrent caudal-fin rays 6(7), 7(30), 8(2); total caudal-fin elements 25(2), 26(3), 27(23), 28(9), 29(2); gill rakers 11(16), 12(21), 13(8); pseudobranchial filaments 5(8), 6(41), 7(2); lower jaw (one side) posterior canine teeth 0(1), 1(84), 2(1); total lower jaw posterior canine teeth 1(1), 2(84), 3(1); precaudal vertebrae 10(111); epipleural ribs 11(4), 12(36), 13(16), 14(1). Lateral line with no paired pores, extending posteriorly to below level of 8th(5), 9th(30), or 10th(27) dorsal-fin spine. Dorsal fin notched seven-ninths (2) or eight-ninths(44) length of first segmented dorsal-fin ray.

Color Pattern: In preservative, specimens are as described and figured by Springer (1971, fig. 35), or the dorsum of the head and body are considerably darker (Figure 1); dark head stripe may end at posterior margin of opercle or extend on to body, gradually fading out beneath spinous dorsal fin. Dorsal half of body either with faint, broad saddles or uniformly dusky, usually darker than ventral half of body.

In life, body pale buff and pink. Head stripe black, margined ventrally by bright yellowish stripe. Yellow stripes present on snout and dorsum of head.

Sexual dichromatism of the ventral side of the head is present and concerns the presence and nature of spots (Springer, 1971:39). The following tabulation indicates the frequencies (with size ranges in mm SL in parentheses) of the four types of pattern found on the underside of the head.

	2 pairs of dark spots	2 pairs of unpigmented spots	both dark and unpigmented spots	uniformly dusky
Males	38(20–34)	8(15–25)	3(15–25)	16(13–32)
Females ..	–	37(17–30)	–	4(17–23)
Sex?	–	3(14–18)	–	14(13–18)

A color transparency of a freshly preserved male specimen (BPBM 18054, 22.6 mm SL) shows the ventral head spots to be yellow; the yellow color is now faded and the spots are unpigmented.

The limited material of three of the other four species in the *prooculis* subgroup (of which *E. bandanus* is a member) shows similar dichromatism. Two of the three specimens of *E. bimaculatus* (all males) have dark spots on the ventral surface of the head (the third specimen is uniformly dusky); five of six *E. collettei* males have dark spots (the sixth is uniformly dusky), whereas the two females have unpigmented spots; seven of the nine *E. prooculis* males have dark spots; the other two, and the only known female, have unpigmented spots. The remaining species, *E. isos*, is characterized by having dark ventral head spots in both males and females. None of the other species of *Ecsenius* exhibit this type of spotting on the ventral surface of the head.

TABLE 1.—Frequency distributions for certain characters in populations of *Ecsenius bandanus*

Population	Segmented dorsal-fin rays				Segmented anal-fin rays				Caudal vertebrae			
	13	14	15	x̄	15	16	17	x̄	21	22	23	x̄
Seribu.....	13	27		13.7	8	25		15.8	5	23	1	21.9
Karimundjawa...	4	7		13.6	5	6		15.5	3	7	1	21.8
Kabaena.....	7	17		13.7	3	21		15.9	7	15	1	21.7
Ambon.....	1	3		13.8		4		16.0	1	3		21.8
Saparua.....		8	1	14.1		8	1	16.1	1	7	1	22.0
Ceram.....	1	31	1	14.0		31	2	16.1	3	29	3	22.0
Banda Sea*.....		1				1			1			

	Dentary incisor teeth									
	39	40	41	42	43	44	45	46	47	x̄
Seribu										
males.....	1	-	1	2	2	4	1			42.8
females...			1	1	-	-	3	2	1	44.6
Karimundjawa										
males.....				1	3	2				43.2
females...		1	-	-	-	2	1			43.3
Kabaena										
males.....		2	1	6	2					41.7
females...					3	4	3	3		44.5
Ambon										
males.....				1	-	-	1			43.5
females...							1	1		45.5
Saparua										
males.....				3	2	2				42.9
fenales...						1	-	-	1	45.5
Ceram										
males.....		1	3	5	2	2				42.1
females...						2	3	3	1	45.3
Banda Sea										
male*.....					1					

*holotype

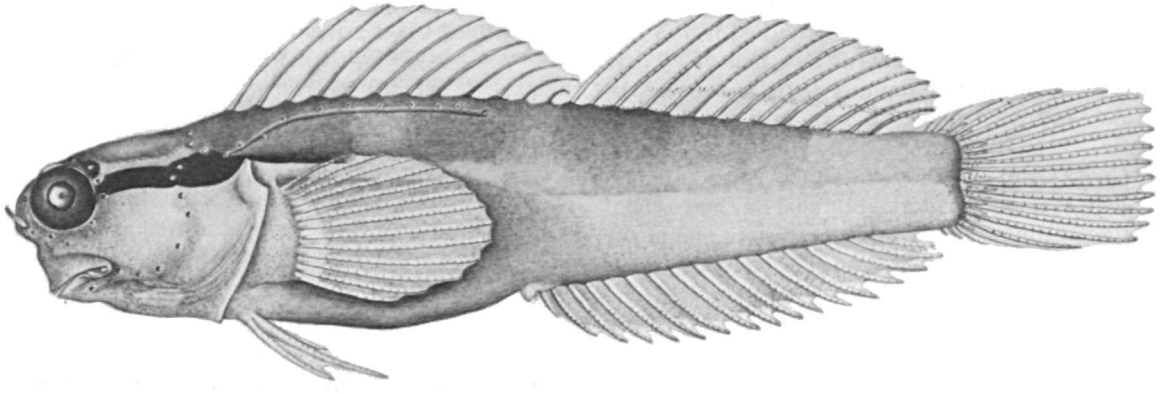


FIGURE 1.—*Ecsenius bandanus*, USNM 209767, female, 25.8 mm SL, Ambon Island, Moluccas. (Drawn by J. R. Schroeder.)

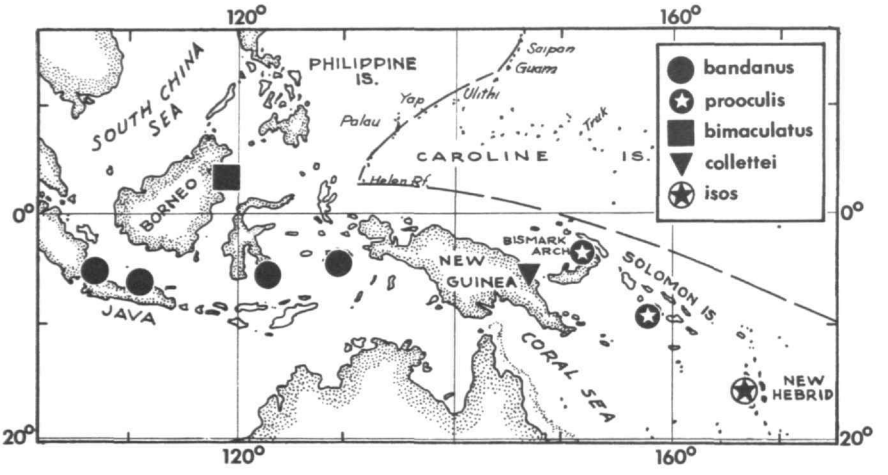


FIGURE 2.—Distribution of the species of the *Ecsenius prooculis* subgroup. (Irregular broken line indicates approximate position of Andesite Line.)

SEXUAL DIMORPHISM.—In addition to the sexual dichromatism noted above, females of *E. bandanus* have higher mean dentary tooth counts than males (Table 1). Significant differences occur in the following populations: Seribu (t = 2.07; df = 17; $0.1 > p > .05$); Kabaena (t = 6.21; df = 22; $p < .001$); and Ceram (t = 6.73; df = 20; $p < .001$).

The upper and/or lower segmented caudal-fin rays of males, but not females, tend to become elongated with increase in SL. The longest caudal-fin ray of males ranges from 22.3–43.8 percent SL; the longest caudal-fin ray of females ranges from 20.1–25.6 percent SL.

Males tend to exceed females in maximum standard length. The largest male examined is 33.5 mm SL, and the largest female is 29.2 mm SL. There are 11 collections containing both males and females, and the largest specimen in 9 of these is a male.

GEOGRAPHIC VARIATION.—Other than slightly higher averages for dorsal-fin, anal-fin, and caudal vertebral counts (Table 1) in the eastern end of the known range of *E. bandanus*, no geographic trends are noted.

REMARKS.—The holotype of *E. bandanus*, collected by W. H. Longley, was hypothesized to have come from the Banda Sea (Springer, 1971:42–43). The recent collection of *E. bandanus* from Ambon (=Amboina) in the Banda Sea supports Springer's hypothesis that Longley's collection was from the Banda Sea area rather than from Samoa or the Hawaiian Islands, the only other Pacific areas where Longley is known to have collected.

Ecsenius bandanus is known to occur in the following biogeographical areas as defined by Thorne (1963): the Javan district of the Malayan province and the Celebesian province (both in the Indo-Malayan subregion) and the Moluccan province of the Papuan subregion. No other member of the *prooculis* subgroup has been collected in these areas (Figure 2).

NEW MATERIAL.—INDONESIA. JAVA SEA: Seribu Islands, USNM 211988 (1 specimen: 21.2), 211993 (17:13.3–29.2), 211996 (18:15.6–33.5), BPBM 10854 (5:15.9–22.6); Karimundjawa Islands, USNM 211979 (11:23.7–31.6). CELEBES: Kabaena Island, AM I.18490-001 (10:17.3–28.6), USNM 211916 (14:22.5–29.2). MOLUCCAS: Ambon Island, USNM 209767 (3:25.8–29.2), 211958 (1:25.4); Ceram Island, USNM 209660 (2:19.4–20.2), 210171 (24:13.4–29.2), CAS 34243 (6:14.9–22.6), BMNH 1975.11.19.1–3 (3:22.0–24.6); Saparua Island, USNM 209991 (7:17.0–31.2), 210111 (1:26.5), 210374 (1:25.2).

Ecsenius bicolor (Day)

FIGURE 3

New locality records of *E. bicolor* are given in "New Material." Springer (1971:27) reported that two basic color patterns are found in preserved specimens and noted also that some specimens

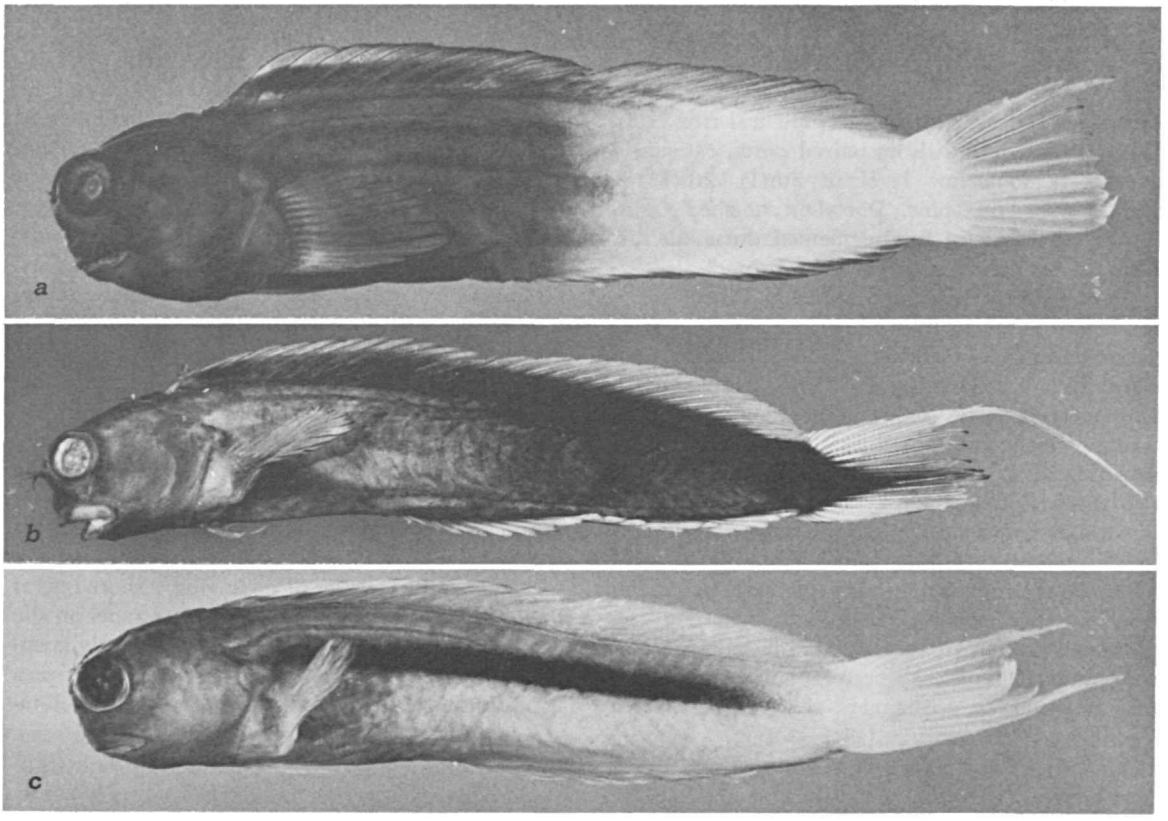


FIGURE 3.—The 3 color patterns of *Ecsenius bicolor*: *a*, bicolored pattern, USNM 214812, female, 43.3 mm SL, Efate, New Hebrides; *b*, uniformly dark pattern, WAM P25111-008, male, 54.0 mm SL, Dampier Archipelgao, Western Australia; *c*, striped pattern, ANSP 128012, male, 43.2 mm SL, Horsburgh Island, Cocos Keeling Islands.

exhibit a broad longitudinal stripe on the body. Inasmuch as only the "bicolored" pattern has been illustrated (Springer, 1971, figs. 20, 21), we present all three in Figure 3.

NEW MATERIAL.—COCOS KEELING ISLAND. ANSP 128009, 128010, 128012. INDONESIA. JAVA SEA: Seribu Islands, USNM 211991, 211997; Karimundjawa Islands, USNM 211980; Bawean Island, USNM 211972. CELEBES: Kabaena Island, USNM 211905, 211914; Boeton (= Butung) Island, USNM 211970. MOLUCCAS: Ambon Island, USNM 210262, 211950; Haruku Island, USNM 209563; Saparua Island, USNM 211927; Banda Island, USNM 211932. WESTERN AUSTRALIA. Dampier Archipelago, WAM P25111-008. QUEENSLAND. Lizard Island, BPBM 15550. NEW GUINEA. Trobriand Islands, USNM 214734, 214735. SOLOMON ISLANDS. Florida Island, BPBM 15629; Guadalcanal, USNM 212031. NEW HEBRIDES. Efate Island, USNM 214812. AMERICAN SAMOA. Tutuila Island, BPBM 17516. MARIANA ISLANDS. Tinian Island, UG 5145. CAROLINE ISLANDS. Truk Island, BPBM 9073.

Ecsenius isos, new species

FIGURE 4

Ecsenius yaeyamaensis (Aoyagi).—Springer, 1971:32 [in part].
Ecsenius trilineatus Springer, 1972:2 [in part].

DESCRIPTION.—Dorsal-fin spines 12(4); segmented dorsal-fin rays 14(3), 15(1); segmented anal-fin rays 16 (4); pectoral-fin rays 13(4); segmented caudal-fin rays 13(4); dorsal procurrent caudal-fin rays 6(1), 7(2), 8(1); ventral procurrent caudal-fin rays 6(2), 7(1), 8(1); total caudal-fin elements 25(1), 26(1), 27(1), 29(1); gill rakers 13(1), 14(2); pseudo-

branchial filaments 5(4); dentary incisor teeth 43(1), 45(1), 46(1), 50(1); lower jaw (one side) posterior canine teeth 0(3), 1(1); total lower jaw posterior canine teeth 0(3), 2(1); precaudal vertebrae 10(4); caudal vertebrae 22(3), 23(1); epipleural ribs 11(3), 12(1). Lateral line with no paired pores, extending posteriorly to below level of 8th(1), 9th(1) or 10th(2) dorsal-fin spine. Dorsal-fin notched eight-ninths (3) length of first segmented dorsal-fin ray. Data for the holotype are given in Table 2.

Color Pattern: Head with series of diffuse, dusky markings extending from upper portion of opercle anteroventrally to underside of head (similar in position to dark head stripe of *E. trilineatus*), ventralmost mark in series is a prominent spot. Scattered dusky pigment and very diffuse spots elsewhere on side of head. Lower lip dusky anteriorly. Body with two rows of diffuse, dusky blotches, which grade into smaller, more discrete spots posteriorly; spots in the two rows faintly connected as if to form bars; slight amount of dusky pigment extending from posteriormost spots of both rows out on proximal portion of caudal fin; caudal fin otherwise immaculate. Fleshy pectoral-fin base with diffuse dusky marks; upper mark along dorsal margin of fin base, lower mark at mid-base and extending onto base of middle ray as dark spot; pectoral fin otherwise unmarked. Narrow dusky stripe on both spinous and segmented-ray portions of dorsal fin just distal to fin base (prominent on males, faint on females). Distal margin of segmented-ray portion of dorsal fin with dusky stripe. Anal fin with broad dusky stripe, tips of rays pale. Pelvic fins unmarked.

RELATIONSHIPS.—The specimen designated below as the holotype of *E. isos* was tentatively identified by Springer (1972) as *E. trilineatus* in his description of that species. The paratypes were treated by Springer (1971) as color pattern variants of *E. yaeyamaensis* (as were specimens of the then undescribed *E. trilineatus*) and were overlooked in the 1972 study. The specimens of *E. isos* were confused with *E. yaeyamaensis* and *E. trilineatus* because the specimens have diffuse, but similar, markings on the fleshy pectoral-fin base. However, *E. isos* belongs in the *prooculis* subgroup of the *yaeyamaensis* species group by virtue of its having a short lateral line, short nasal cirri and discrete dark spots on the ventral surface of the head. *E. isos* is the only member of the *prooculis* subgroup that has dark spots beneath the head in both sexes. In overall colora-

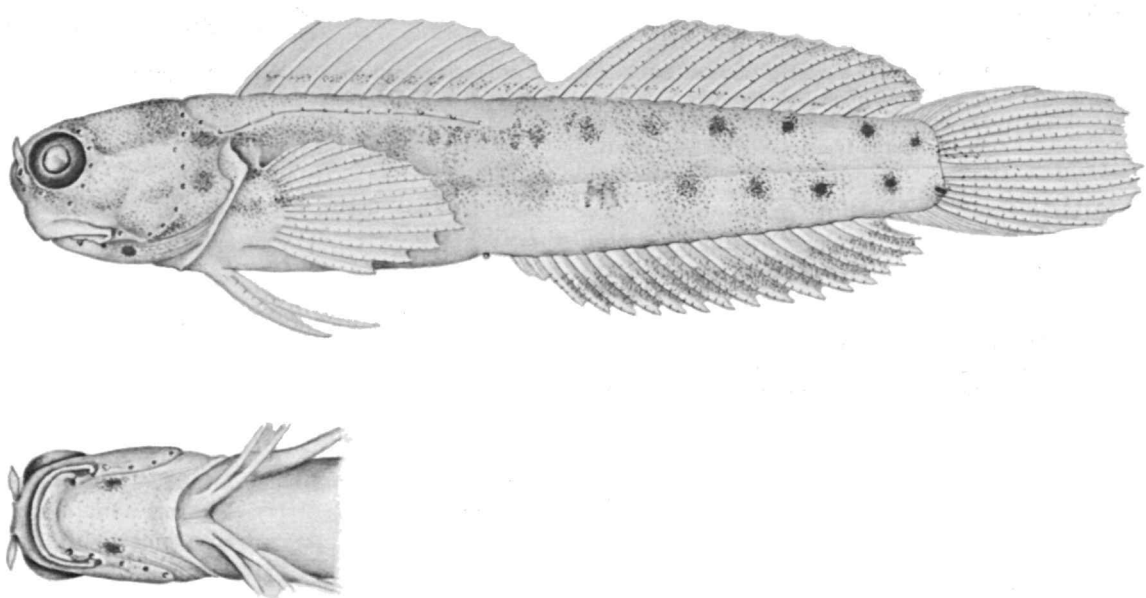


FIGURE 4.—*Ecsenius isos*, BPBM 12122, holotype male, 26.2 mm SL, Efate, New Hebrides, lateral view and ventral view of anterior region. (Drawn by J. R. Schroeder.)

TABLE 2.—Selected counts and measurements (percent SL) from the holotypes of some species of *Ecsenius*

Character	*E. isos* BPBM 12122	*E. melarchus* USNM 212229	*E. pictus* USNM 213853	*E. schroederi* USNM 209743
Sex	male	male	female	male
Dorsal fin	XII,14	XII,15	XII,14	XII,13
Anal fin	II,16	II,17	II,15	II,15
Pectoral fins	13-13	14-14	13-13	13-13
Caudal fin				
segmented rays	13	14	13	13
dorsal procurrent rays	8	7	7	7
ventral procurrent rays	8	6	7	7
Vertebrae	10+22	10+22	10+21	10+22
Epipleural ribs	12	12	12	13
Dentary incisor teeth	45	38	41	44
Dorsal-fin notch*	8	7	7	8
Lateral line**	10	9	10	11
Standard length (mm)	26.2	39.0	33.3	24.0
Third dorsal-fin spine	11.5	13.3	14.1	16.3
Last dorsal-fin spine	1.9	3.8	3.0	2.5
Fifth segmented dorsal-fin ray	13.7	17.4	16.5	15.8
Longest caudal-fin ray	22.9	48.7	24.6	24.2
Nasal cirrus	2.2	5.1	3.3	1.3

*Given as nearest ninth of first segmented dorsal-fin ray length.
**Given as dorsal-fin spine under which lateral line terminates.

tion, *E. isos* most closely resembles *E. collettei* but differs from the latter by having diffuse dusky marks on the pectoral-fin base, a narrow dusky stripe in the spinous portion of the dorsal fin and a series of dusky markings extending from the upper opercle anteroventrally to the underside of the head. Also, the anterior markings on the body of *E. isos* are much less discrete than those of *E. collettei*.

REMARKS.—*E. isos*, the fifth species of the *prooculis* subgroup to be discovered, occupies the New Hebridean district of the Fijian province of the Polynesian subregion (as defined by Thorne, 1963). All five species of the *prooculis* subgroup are allopatric and relatively restricted in distribution (Figure 2).

ETYMOLOGY.—The specific name, from the Greek *isos* (equal or like) alludes to the presence of dark spots beneath the head on specimens of both sexes.

HOLOTYPE.—BPBM 12122, male, 26.2 mm SL, New Hebrides, Efate, British Bathing Beach, Pango Peninsula, collected by R. H. Snider, 22 November 1964.

PARATYPES.—USNM 195787, male, 20.6 mm SL and two females, 22.5 and 26.0 mm SL, New Hebrides, around coral heads in Espiritu Santo Harbor, collected by W. M. Chapman and H. Cheyne, 24 April 1944.

Ecsenius lineatus Klausewitz

New records (see "New Material") extend the range of *E. lineatus* considerably. Also, Masuda, Araga, and Yoshino (1975) reported *E. lineatus* from Okinawa, Taketomi Island, the Bonin Islands, and the Izu Islands, all northern range extensions. On the basis of the specimen they illustrated (pl. 86 Q) we accept their records.

Although there are few specimens from any locality, geographic variation in frequency distributions for some meristic characters, especially precaudal vertebrae (Table 3), is apparent. Geographic variation in number of precaudal vertebrae has been reported also for *Ecsenius namiyei* (Springer, 1971) and some species of *Omobranchus* (Springer and Gomon, 1975).

NEW MATERIAL.—CEYLON. USNM 213493 (1 specimen: 19.7), BPBM 18056 (3:35.3–40.1). MAURITIUS. BPBM 15943 (4:44.9–54.0), 15946 (1:25.9), 15947 (2:19.7–56.5). REUNION ISLAND. BPBM 16276 (1:22.3). WESTERN AUSTRALIA. North West Cape, WAM P25371-006 (2:45.2–53.9).

Ecsenius lividinalis Chapman and Schultz

Nine additional specimens of *E. lividinalis* representing new locality records have been procured (see

TABLE 3.—Frequency distributions for certain characters in populations of *Ecsenius lineatus*

Population	Segmented dorsal-fin rays			Precaudal vertebrae			Caudal vertebrae					Total vertebrae				Dentary incisor teeth							
	17	18	x̄	10	11	x̄	23	24	25	26	x̄	34	35	36	x̄	45	46	47	48	49	50	51	x̄
Taiwan	9	1	17.1	9	1	10.1		2	8		24.8	1	9		34.9	3	1	2	3	1			46.8
Pratas Reef		1		1						1				1					1				
Vietnam		1			1			1					1			1							
Ceylon	3	1	17.3	2	2	10.5		2	2		24.5		4		35.0	1	-	1	1	1			47.3
Maldive Islands	1			1					1				1						1				
Mauritius	1	6	17.9	1	6	10.9			6	1	25.1			7	36.0			1	2	1	-	1	48.6
Reunion		1		1						1				1									
Western Australia	1	1	17.5	1	1	10.5	1	-	1		24.0	1	1		34.5	1	-	1					46.0

"New Material"). Ranges for meristic characters, where different from those given by Springer (1971), are as follows: dorsal procurrent caudal-fin rays 5–7; ventral procurrent caudal-fin rays 5–7 (count of 4, was recorded by Springer from specimen less than 25 mm SL, and should have been excluded); total caudal-fin elements 23–27; dentary incisor teeth 29–37; precaudal vertebrae 11; caudal vertebrae 18–19 (see below); epipleural ribs 11–14; lateral line ending posteriorly below level of 8th–11th dorsal-fin spine.

Ecsenius lividinalis was reported by Springer (1971) to have 10 precaudal vertebrae in 9 of 10 specimens examined. Re-evaluation of his radiographs and radiographs of the new material show 11 to be the characteristic precaudal count.

Color Pattern: An Ektachrome slide of a freshly preserved Florida Island specimen (BPBM 16141, 21.4 mm SL) shows the following: top and sides of head dark brown, underside of head lighter with metallic blue tint. Body beneath spinous dorsal fin brown, grading into dirty yellow posteriorly; belly and ventrolateral part of body yellow. Black spot encompassing anus surrounded by brilliant white ring. Basal halves of dorsal and anal fins yellow, distal portions clear; lower two or three pectoral-fin rays black-tipped; scattered dark pigment along pectoral-fin and caudal-fin rays; interradial membranes clear; pelvic fins creamy white. Color in preservative: no distinct markings other than black anal spot; body dusky, darker anterodorsally.

GEOGRAPHIC VARIATION.—Specimens from the Solomon Islands have higher mean numbers of dentary incisor teeth and caudal vertebrae than do specimens from other localities (Table 4).

NEW MATERIAL.—INDONESIA. CELEBES: Boeton (= Butung) Island, USNM 211966 (5 specimens:27.6–37.1). MOLUCCAS. Saparua Island, USNM 209992 (2:18.0–26.1), 210105 (1:22.1). SOLOMON ISLANDS. Florida Island, BPBM 16141 (1:21.4).

TABLE 4.—Frequency distributions for certain characters in populations of *Ecsenius lividinalis*

Population	Dentary incisor teeth										Caudal vertebrae		
	29	30	31	32	33	34	35	36	37	x̄	18	19	x̄
Philippine Islands		1											
Celebes		3	2							30.4	4		18.0
Moluccas	1	-	-	2						31.0	3		18.0
Solomon Islands				2	1	4	3	-	1	34.1	1	10	18.9

Ecsenius melarchus, new species

FIGURE 5

Ecsenius stigmatura Fowler.—Springer, 1971:30 [in part].

DESCRIPTION (see Table 5 for frequencies of certain counts; other counts, with frequencies in parentheses, as follows).—Dorsal-fin spines 12(73); pectoral-fin rays 13(3), 14(57); segmented caudal-fin rays 13(5), 14(33); dorsal procurrent caudal-fin rays 7(22), 8(12); ventral procurrent caudal-fin rays 6(16), 7(16), 8(2); total caudal-fin elements 26(1), 27(13), 28(9), 29(10); pseudobranchial filaments 6(34), 7(1); lower jaw (one side) posterior canine teeth 0(13), 1(44), 2(1); total lower jaw posterior canine teeth 0(3), 1(12), 2(41), 3(1), 4(1); precaudal vertebrae 10(63), 11(1); caudal vertebrae 22(6), 23(50), 24(8); total vertebrae 32(6), 33(54), 34(10); epipleural ribs 11(2), 12(14), 13(4). Lateral line with no paired pores, extending posteriorly to below level of 8th(35), 9th(22) or 10th(1) dorsal-fin spine. Dorsal fin notched six-ninths (4), seven-ninths (26), or eight-ninths (2) length of first segmented dorsal-fin ray. Data for the holotype are given in Table 2.

Color Pattern: In preservative, head and body dusky brown, darker dorsally. Indistinct, narrow, dark stripe extends from posteroventral margin of eye to posterior margin of opercle at upper pectoral-fin base. Prominent dark spot extends anteriorly from anus. Dorsal fin dusky basally and along margins of rays; interradial membranes clear. Anal fin dusky with indistinct light stripe proximally. Basal portion of all caudal-fin rays and entire length of middle four rays dusky, remainder of fin immaculate. Pectoral and pelvic fins with dark pigment along rays; interradial membranes clear.

Ground color is variable; usually it is quite dark, but some specimens appear faded. Delay in fixation of specimens in the field, however, often results in specimens having a faded appearance.

One male specimen (34.5 mm SL) from Karimundjawa has a light stripe beneath the dusky head stripe (not as distinct as the pale stripe on the opercle of the closely related *E. stigmatura*). One male specimen (33.1 mm SL) from Kabaena exhibits a row of seven small, pale spots on its body beneath the dorsal fin, a row of six slightly larger, pale spots mid-laterally, and a pale triangular patch just anterior to the first dorsal-fin spine. Another male (29.5 mm SL) from Kabaena shows similar but more irregular spots on its body.

A Kodachrome slide of a freshly preserved specimen from the Seribu Islands shows a brilliant white stripe extending from beneath eye to upper base of pectoral fin and a faint orange stripe beneath the white stripe. Otherwise, the color shown is similar to that of alcohol-preserved specimens.

GEOGRAPHIC VARIATION.—No significant meristic differences between populations were noted.

SEXUAL DIMORPHISM.—The upper and/or lower caudal-fin rays of males generally become longer with increase in SL, a condition not found to any appreciable extent in females (males with longest caudal-fin ray ranging from 23.1–48.7 percent SL; females with longest ray 21.3–31.9 percent SL). No other significant meristic or morphometric differences between sexes were noted.

RELATIONSHIPS.—*E. melarchus, E. stigmatura,* and *E. lividinalis* constitute the *stigmatura* species group, which is characterized by having a black anal spot and typically 14 segmented caudal-fin rays. *E. melarchus* has higher numbers of dorsal-, anal-, and pectoral-fin rays and vertebrae than *E. lividinalis*. The depth of the dorsal-fin notch is typically greater for *E. melarchus* than *E. lividinalis*. *E. melarchus* can be distinguished from *E. stigmatura* primarily by the absence of the large, dark spot on the caudal peduncle. Additionally, the fresh color of *E. melarchus* is strikingly different from that of *E. stigmatura* (see above and color pattern description for *E. stigmatura*). Although all the counts for *E. melarchus* and *E. stigmatura* over-

TABLE 5.—Frequency distributions for certain characters of *Ecsenius melarchus* and *E. stigmatura*

	Segmented dorsal-fin rays				Segmented anal-fin rays				Dentary incisory teeth										Gill rakers					
Species	15	16	17	$\bar{x}$	17	18	19	$\bar{x}$	34	35	36	37	38	39	40	41	42	$\bar{x}$	13	14	15	16	17	$\bar{x}$
melarchus....	17	54	2	15.8	16	55	1	17.8			4	5	15	10	11	8	7	39.2		1	16	11	3	15.5
stigmatura...		19	6	16.2	3	15	7	18.2	2	1	3	2	5	2	1			37.1	3	7	3	1	1	14.3

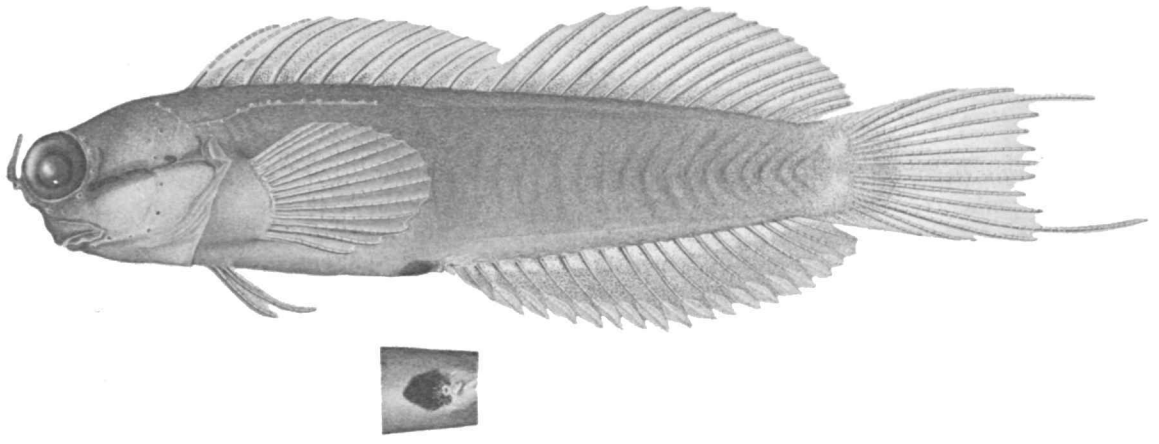


FIGURE 5.—*Ecsenius melarchus*, USNM 201815, paratype, male, 37.7 mm SL, Pulau Gaya, Darvel Bay, Borneo (anterior two dorsal-fin spines damaged), lateral view and ventral view of anal region. (Drawn by S. L. Chambers.)

lap (Table 5), significant differences between the species exist in the means for segmented dorsal-fin rays (t = 3.84; df = 95; p = < .001), segmented anal-fin rays (t = 2.89; df = 94; .01 > p > .001), dentary incisor teeth (t = 4.35; df = 73; p = < .001), and gill rakers (t = 4.34; df = 44; p = < .001).

REMARKS.—Springer (1971) had a single specimen (of *E. melarchus*) which he questionably assigned to *E. stigmatura*. The considerable additional material now available shows that the differences between the single specimen and *E. stigmatura* noted by Springer are constant and that the two forms are allopatric.

E. melarchus occurs on coral reefs at depths as shallow as 1.5 m, and was taken at one station where the maximum depth recorded was 30.5 m.

ETYMOLOGY.—The specific epithet, from the Greek *mela* (black) + *archos* (anus), refers to the characteristic black mark that extends from the anus and is herein used as a noun in apposition.

HOLOTYPE.—USNM 212229, male, 39.0 mm SL, Indonesia, off southwest coast of Karimundjawa, somewhat north of Greater Mendjangan Island, coral reef, ca. 05°52′30″S, ca. 110°25′40″E, depth 1.0–12.2 m, collected by V. G. Springer, et al, VGS 74-28, 29 March 1974.

PARATYPES.—INDONESIA. JAVA SEA. USNM 211896, 6 males, 3 females, 3 unsexed, 16.4–44.4 mm SL, taken with the holotype. USNM 212893, 10 males, 18 females, 4 unsexed, 17.5–35.9 mm SL, Seribu Islands, off west side of Pulau Ajer, ca. 05°46′S, ca. 106°35′E, depth to 18.3 m, VGS 74-32, 4 April 1974. CAS 34244, 2 males, 1 female, 30.2–32.0 mm SL, Seribu Islands, off west side of Pulau Tikus, Pulau Pari Group, ca. 05°51′S, ca. 106°34′E, depth 0–30.5 m, VGS 74-35, 6 April 1974. BPBM 18053, 2 males, 2 females, 22.4–25.2 mm SL, Seribu Islands, Pulau Putri, depth 1–1.5 m, collected by J. E. Randall, 16 February 1975. USNM 211894, 3 males, 5 females, 24.3–38.4 mm SL, Karimundjawa Islands, just south of Lesser Mendjangan Island, ca. 05°52′50″S, ca. 110°24′40″E, depth to 18.3 m, VGS 74-30, 30 March 1974. Celebes: USNM 211897, 2 males, 4 females, 24.0–36.1 mm SL, Kabaena Island, Tallabassi Bay, ca. 05°17′20″S, ca 122°04′E, depth 4–8 m, VGS 74-1 24 February 1974. AM I.18491-001, 5 males, 1 female, 25.0–45.3 mm SL, Kabaena Island, close to locality of USNM 211897, depth 2–15 m, VGS 74-2, 25 February 1974. Borneo: USNM 201815, male, 37.7 mm SL, Darvel Bay, Pulau Gaya, E. end of Borneo, depth to 3 m, TE VEGA Sta. 6, 1 February 1965.

Ecsenius midas Starck

New locality records for *E. midas* are given in the list below. Also, we have been informed of one specimen (CAS 34384, 40.2 mm SL) from Grand Comore Island. The eight specimens from Maré were reportedly collected at a depth of 55 m, the deepest known for any species of *Ecsenius*. The single specimen from Kabaena Island has a segmented dorsal-fin ray count of 18, one less than previously reported for this species.

NEW MATERIAL.—MAURITIUS. BPBM 15941 (1 specimen: 86.4), 15944 (3:35.2–77.3). COCOS KEELING ISLANDS. ANSP 128011 (2:42.0–48.6). INDONESIA. CELEBES: Kabaena Island, USNM 211913 (1:46.3). SOLOMON ISLANDS. Florida Island, AM I.17532-001 (1:75.5). NEW HEBRIDES, Efate Island, USNM 214736 (1:52.4). FIJI ISLANDS. USNM 214786 (1:67.2). LOYALTY ISLANDS. Maré Island, USNM 213727 (3:33.5–36.3), BPBM 19701 (5:31.2–40.5).

Ecsenius nalolo Smith

Thirty-five additional specimens of *E. nalolo* (FMNH 71367, 71368, BPBM 18055) collected in the Maldive Islands have the characteristic single dark stripe on the pectoral-fin base that distinguishes *E. nalolo* from its closest relative, *E. yaeyamaensis*, which has a Y-shaped stripe. The two species are allopatric: *nalolo* occurs only west of, and *yaeyamaensis* only east of, 75°E longitude. It would be important for determining the validity of the distinction between *E. nalolo* and *E. yaeyamaensis* to have specimens from points around the southernmost coast of India, if the species occur there.

Ecsenius namiyei (Jordan and Evermann)

Since Springer's (1971) account of *E. namiyei*, we have obtained 57 specimens that represent new locality records, and 7 additional specimens from Taiwan (see "New Material"). Examination of these and the previously recorded specimens indicates the existence of significant differences in meristics between the sexes and among the populations (Table 6).

SEXUAL DIMORPHISM.—In addition to the earlier

TABLE 6.—Frequency distributions for certain characters in populations of *Ecsenius namiyei*

Population	Segmented dorsal-fin rays					Segmented anal-fin rays					Precaudal vertebrae			Caudal vertebrae						Total vertebrae						
	18	19	20	21	$\bar{x}$	19	20	21	22	$\bar{x}$	10	11	$\bar{x}$	24	25	26	27	28	$\bar{x}$	34	35	36	37	38	$\bar{x}$
Taiwan and Pescadores																									
males.....		3	15	1	19.9			6	13	21.7	17	2	10.1		1	8	9	1	26.5			8	10	1	36.6
females...		9	2		19.2			10	1	21.1	9	2	10.2		2	9			25.8			11			36.0
Celebes																									
males.....	4	16	2		18.9	1	9	12		20.5	19	3	10.1	1	15	6			25.2	1	12	9			35.4
females...	11	1			18.1	1	9	2		20.1	9		10.0		8	1			25.1		9	1			35.1
Moluccas																									
males.....	2	3	1		18.8		4	2		20.3	5	1	10.2		4	2			25.3		3	3			35.5
females...	3				18.0	1	2			19.7	3		10.0	1	2				24.7	1	2				34.7
New Guinea																									
males.....		1	1		19.5		1	-	1	21.0	2		10.0		1	1			25.5		1	1			35.5
females...		3			19.0		1	2		20.6	2		10.0		2				25.0		2	1			35.3
Bismarck Archipelago																									
male.....		1					1					1			1							1			
female....	1										1				1						1				
Solomon Islands																									
males.....	2	3			18.6		3	2		20.4		5	11.0	2	3				24.6		2	3			35.6
females...	2	1			18.3		2	1		20.3		3	11.0	3					24.0		3				35.0

Population	Dentary incisor teeth												Lateral-line pore pairs										
	34	35	36	37	38	39	40	41	42	43	44	45	$\bar{x}$	0	1	2	3	4	5	6	7	8	9	10	$\bar{x}$
Taiwan and Pescadores																									
males.....		1	-	1	-	1	4	6	2	4			40.7		1	3	3	5	4	1	-	-	1	1	4.3
females...						1	1	1	2	-	4	2	42.7			1	4	-	1	2	-	1			4.3
Celebes																									
males.....	2	3	4	4	2	3	2						36.9	10	6	-	1	-	-	1	-	-	1		1.3
females...		1	4	2	3	1	1						37.2	9	2	1									0.3
Moluccas																									
males.....			2	3	1								36.8	6											0.0
females...				1	1	-	-	-	-	1			39.3	2	-	-	1								1.0
New Guinea																									
males.....			1	1									36.5	2											0.0
females...			1	-	1	-	1						38.0	1	1	-	1								1.3
Bismarck Archipelago																									
male.....					1											1									
female....			1											1											
Solomon Islands																									
males.....			2	2	1								36.8	4	-	-	1								0.6
females...				1	2								37.7	1	-	-	-	-	1	-	1				4.0

report of higher dorsal- and anal-fin ray and caudal vertebral counts for males from Taiwan, we found that Taiwan females have a higher mean number of dentary teeth than do Taiwan males ($t = 2.62$; df = 28; $.02 > p > .01$). There are indications (Table 6) that these sexual differences also occur in the other populations of *E. namiyei*.

GEOGRAPHIC VARIATION.—Specimens from Taiwan exhibit considerably higher numbers of segmented dorsal- and anal-fin rays, caudal vertebrae, and dentary teeth than do specimens from other populations. Additionally, the majority of specimens from areas other than Taiwan have no paired lateral-line pores, while all specimens from Taiwan have at least one pair of pores. The Solomon Islands population of *E. namiyei* has more precaudal vertebrae and fewer caudal vertebrae than any of the other populations. Increase in number of precaudal vertebrae also occurs in the Mauritius population of *E. lineatus*, and Springer and Gomon (1975) have reported similar increases in western Australian populations of three species of *Omobranchus*. The factors causing this type of variation are unknown.

NEW MATERIAL (all represent new locality records except the Taiwan specimens).—TAIWAN: USNM 211323 (7 specimens:53.3–65.7). INDONESIA. CELEBES: Boeton (=Butung) Island, USNM 211969 (14:17.0–63.3); Kabaena Island, USNM 211904 (3:32.7–48.2), 211915 (18:25.6–60.1). MOLUCCAS: Ambon Island, USNM 209736 (1:43.6), 211951 (1:51.7), 211957 (1:52.3); Saparua Island, USNM 210088 (2:21.9–33.9), 210345 (4:23.3–51.4). NEW GUINEA. Port Moresby, BPBM 15930 (1:55.8), DASF uncataloged (4:45.5–63.0). SOLOMON ISLANDS. Florida Island, AM I.17500-002 (2:45.5–52.7), BPBM 15644 (4:49.1–60.8); Guadalcanal, USNM 212038 (1:32.0), 212040 (1:50.8).

Ecsenius oculus Springer

FIGURE 6

A total of 146 specimens of *E. oculus*, most from collections representing new locality records (see "New Material"), have been examined for this study. Analysis of data obtained from this material together with a re-examination of previously reported specimens has revealed significant variation among and within populations of this wide-ranging species.

Springer (1971) mentioned the possibility that the color-pattern variations he noted were representative of population differences. His specimens embrace five of the six types we recognize, but Springer recognized only four types, confusing our types A and B. All six of the color-pattern types we recognize occur allopatrically (Figure 7) and, in general, are restricted in distribution. The salient characters of the types are described as follows (and briefly compared in Table 7).

TYPE A.—Nape and predorsal area with indistinct pale stripes, no prominent dark spots; prominent postocular stripe extending from posterior margin of eye to or slightly beyond dorsal insertion of pectoral fin; row of 7 or 8 (modally 8) pale-margined dark spots, each about equal in size to eye diameter, usually arranged in pairs on body; anterior body spots at level of postocular stripe; posteriormost body spot forming saddle at rear base of dorsal fin; 4 pairs of small, dark spots along dorsal body profile, 2 pairs beneath spinous dorsal fin and 2 beneath segmented-ray portion of dorsal fin.

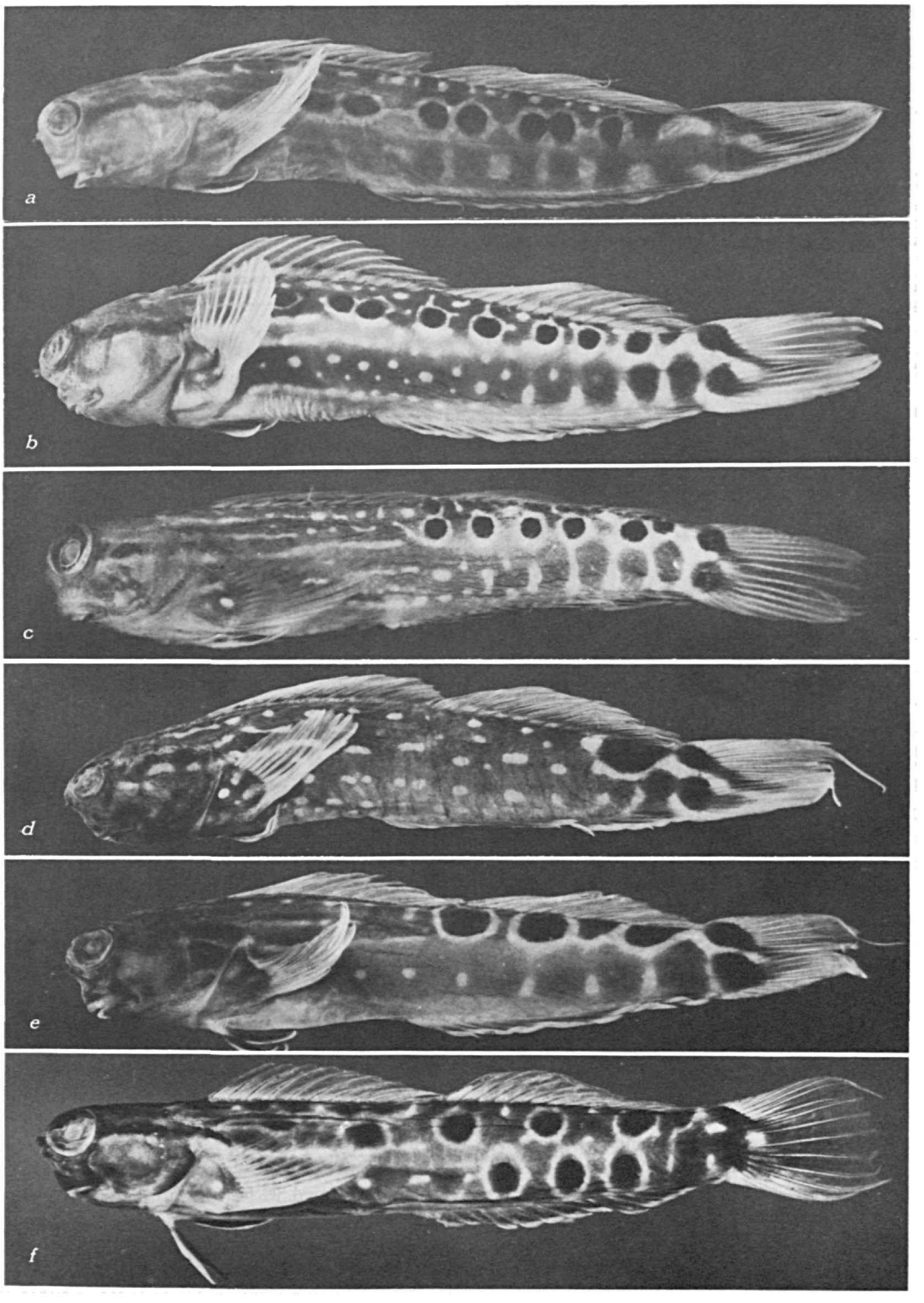
TYPE B.—Nape with prominent dark spot on each side of midline; prominent dark postocular stripe present as in type A; row of 7–10 (modally 9) pale-margined dark spots on body, similar to those of type A, but somewhat smaller; anterior body spots above level of postocular stripe; dark spots along dorsal body profile absent or indistinct.

TYPE C.—Dark spots on nape present but less distinct than those of type B; postocular stripe present but not as prominent as that of type B; 6–9 (modally 9) pale-margined dark spots on body, similar in size to those of type B; anterior body spots above level of postocular stripe; dark spots along dorsal body profile absent or indistinct.

TYPE D.—Dark nape spots present but less obvious than those of type B; postocular stripe absent or indistinct; single, large, pale-margined dark spot on body, forming saddle at end of dorsal-fin base; spots along dorsal body profile absent.

TYPE E.—Two dark spots on nape as in type B; no postocular stripe but opercle with vertical pair

FIGURE 6.—The six color pattern types of *Ecsenius oculus*: *a*, type A, USNM 203140, holotype, male, 53.8 mm SL, Taiwan; *b*, type B, USNM 211995, male, 33.7 mm SL, Seribu Islands, Java Sea; *c*, type C, WAM P25374-018, female, 29.5 mm SL, North West Cape, Western Australia; *d*, type D, USNM 209577, male, 48.7 mm SL, Haruku Island, Moluccas; *e*, type E. USNM 206431, male, 37.1 mm SL, Trobriand Island, New Guinea; *f*, type F, USNM 214520, male, 37.8 mm SL, Viti Levu, Fiji.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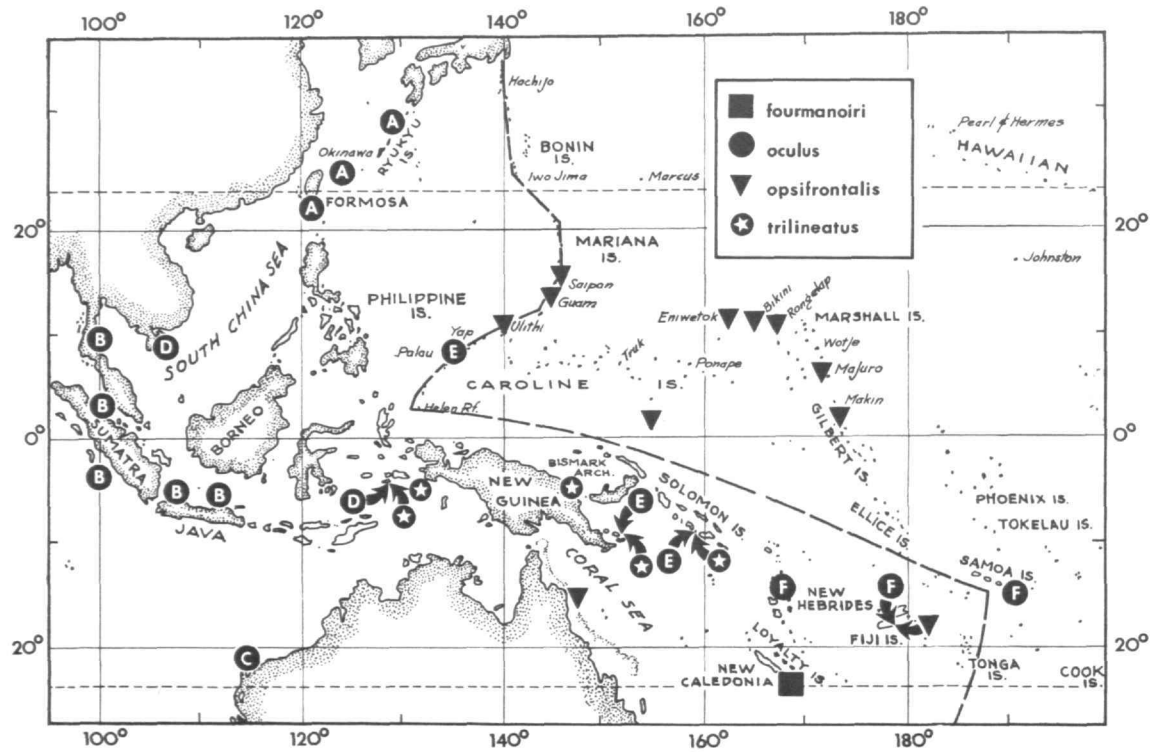


FIGURE 7.—Distribution of the *Ecsenius oculus* subgroup; the 6 color pattern types (A-F) of *E. oculus* indicated. (Irregular broken line indicates approximate position of Andesite Line.)

of dark spots separated by narrow light stripe; 3–5 (modally 4) large, pale-margined, dark spots on body at base of segmented-ray portion of dorsal fin; 4–6 small, pale spots along spinous dorsal-fin base.

TYPE F.—Dark spots on nape absent or indistinct; postocular stripe prominent as in type A; row of 5 or 6 (modally 6) pale-margined dark spots on body at level of postocular stripe plus ventrolateral row of 3 to 5 (modally 4) pale-margined dark spots; 4 or 5 smaller dark spots along dorsal body profile beneath spinous dorsal-fin base and 0–2 beneath segmented-ray portion of dorsal fin.

DISCUSSION.—Meristic data from the new material re-enforces Springer's (1971, 1972) evidence for the existence of north-south clines (Figure 8 shows means for number of dentary teeth plotted against latitude as an example of a cline; means for segmented dorsal-fin, anal-fin, and caudal vertebral counts exhibit similar clines). These clines do not appear to be correlated with color pattern type (Tables 8 and 9). For example, the B and D color pattern types are least similar, yet these types are very similar in meristics. The least degree of similarity in meristics between contiguous populations exists between types A and B, whereas their color patterns are quite similar. The type F color pattern shows similarities to that of type A (both have prominent postocular stripes and lack dark spots on the nape) and both populations exhibit high counts, yet of all the populations of *E. oculus*, these are separated by the greatest distance. Clearly, these examples show that expression of the color pattern is independent of meristic variation, although both can be correlated with geography.

The six color pattern types of *E. oculus* could reasonably be recognized nomenclaturally, especially as no two types occur sympatrically. Our decision not to name some or all of them is subjective

TABLE 7.—Comparison of certain aspects of the 6 color pattern types of *Ecsenius oculus*

Color pattern types	Dark spots on nape	Postocular stripe	Number and position of pale-margined dark spots on body
A.....	Absent	Distinct	Row of 7-8 (modally 8) spots; anterior spots at level of postocular stripe
B.....	Two, prominent	Distinct	Row of 7-10 (modally 9) spots; anterior spots above level of postocular stripe
C.....	Two, usually not prominent	Indistinct	Row of 6-9 (modally 6) spots; anterior spots above level of postocular stripe
D.....	Two, not prominent	Absent or indistinct	Single spot forming saddle at posterior dorsal-fin base
E.....	Two, prominent	Absent	Row of 3-5 (modally 4) spots along dorsal body profile under segmented dorsal-fin rays
F.....	Absent or indistinct	Distinct	Dorsal row of 5-6 (modally 6) spots and ventral row of 3-4 (modally 4) spots

and intuitive. On the other hand, we have recognized nomenclaturally other species of the *yaeyamaensis* species group of *Ecsenius* solely on the basis of color pattern. For instance *E. yaeyamaensis* and *E. nalolo* are distinguishable only on the basis of a slight but consistent difference in color pattern. In contrast to the color-pattern types of *E. oculus*, however, the two species occupy extensive, allopatric (parapatric?) ranges. The important issue, we believe, is not nomenclatural consistency but a description of the circumstances that will alert the reader and allow him to come to his own conclusions.

REMARKS.—The three specimens collected by Longley (USNM 195716), which were hypothesized by Springer (1971:35, 42–43) to have come from the Banda Sea, have been re-examined. Although quite faded, they most closely resemble specimens with the type F color pattern. Also, they agree with type F specimens in meristics (Table 7). Our specimens from the Moluccas, the same area as that of Longley's collection sites in the Banda Sea, have lower counts and a strikingly different color pattern. This evidence leads us to believe that Longley collected *E. oculus* in Samoa rather than in the Banda Sea as proposed by Springer. These are the

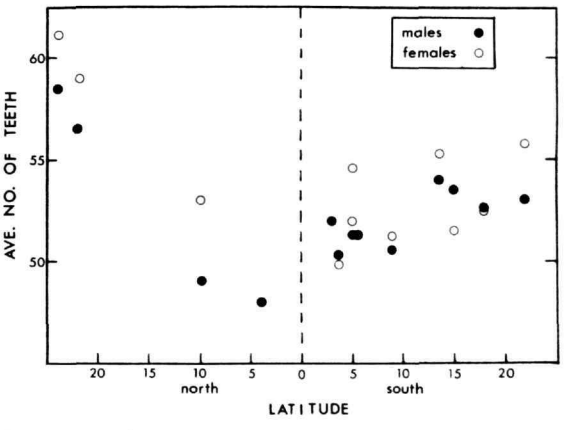


FIGURE 8.—Variation in mean numbers of dentary incisor teeth of *Ecsenius oculus* as correlated with latitude (based on data in Table 9).

TABLE 8.—Color pattern types (CPT) and frequency distributions for certain characters in populations of *Ecsenius oculus* (see text for discussion of CPT)

Population	CPT	Segmented dorsal-fin rays 12	13	14	15	$\bar{x}$	Segmented anal-fin rays 14	15	16	17	$\bar{x}$	Caudal vertebrae 20	21	22	23	24	$\bar{x}$
Ryukyu Islands	A			13	2	14.1			12	3	16.2				4	10 1	22.8
Taiwan	A	1	3	12		13.7		3	13		15.8		1	11	3		22.1
Ilot du Sud	D			1					1							1	
Thailand	B			3	1	13.2		3	1		15.2		1	3			21.8
Palau	E			1					1						1		
Strait of Malacca	B	1	1			12.5	1	1			14.5		1	1			21.5
Mentawei Islands	B			3		13.0			3		15.0		1	2			21.7
Seribu Islands	B			12	1	13.1			13		15.0		5	4			21.4
Bawean Island	B	1	18	1		13.0	3	16	1		14.9	1	12	7			21.3
Moluccas	D			14	7	13.3	1	14	4		15.2			3	17		21.8
New Guinea	E			9		13.0			9		15.0		1	7			21.9
Solomon Islands	E				1				1						1		
New Hebrides	F				4	14.0				4	16.0					4	23.0
Fiji	F				15	1 14.1			12	3	16.2			1	12		22.9
American Samoa	F				4	1 14.2			5		16.0					5	23.0
Longley's specimens*	F			1	1	1 14.0		1	2		15.7			1	2		22.7
Western Australia	C			2	5	1 13.9			7	1	16.1			6	2		22.2

*presumably from Samoa; see text for discussion

only Longley specimens that we know of that appear to have come from Samoa.

Springer's (1972) key differentiated *E. oculus* from other species of the *yaeyamaensis* species group by the presence of two dark basi-caudal spots, more than half orbital diameter, extending with little or no decrease in intensity well out on caudal fin. Among our new material, we find some *E. opsifrontalis* specimens with considerable dusky pigment on the caudal fin, and they could be misidentified as *E. oculus* using this character. However, *E. oculus* always has an obvious dark mark covering the proximal portion of the outermost segmented pelvic-fin ray and distal two-thirds of the remainder of the pelvic-fin, while *E. opsifrontalis* has uniformly pale pelvic fins. These two species are quite dissimilar in overall coloration (compare Figures 6 and 9).

Springer (1971, 1972) believed that *E. oculus* and *E. opsifrontalis* were a closely related species pair, and (1971) that their distributions were separated by the Andesite Line. All collections of *E. oculus* are from localities on or to the west of the Line, and all collections, except two, of *E. opsifrontalis* have been taken on or to the east of the Line (Figure 7). Both species occur together at only one locality, Fiji, where they were taken in the same collection. It is at Fiji where the most distinctive color patterns of *E. opsifrontalis* occur (see account of *E. opsifrontalis*). Although sympatric, *E. opsifrontalis* and *E. oculus* appear not to be syntopic. *E. oculus* occurs at the shallower ends of surge channels ("spur and groove" areas) of coral reefs while *E. opsifrontalis* tends to be found along vertical walls of the fore-reef, usually in small barren areas surrounded by coral growth (B. Carlson, personal com-

TABLE 9.—Color pattern types (CPT) and frequency distributions for number of dentary incisor teeth in populations of *Ecsenius oculus* (see text for discussion of CPT)

Population	CPT	Dentary incisor teeth																			$\bar{x}$
		47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64		
Ryukyu Islands	A																				
males									1	-	-	-	1	2	1	1					58.5
females													2	-	-	-	2	1	1		61.2
Taiwan	A																				
males										1	2	1	-	1							56.6
females											1	2	2	1	3	1	1				58.9
Ilot du Sud	D																				
male														1							
Thailand	B																				
males			1	-	1																49.0
females							1	-	1												53.0
Palau	E																				
male							1														
Strait of Malacca	B																				
males		1	-	1																	48.0
Mentawei Islands	B																				
males					1	-	-	-	1												52.0
Seribu Islands	B																				
males					1	4	3														51.3
females					1	1	1	1	1												52.0
Bawean Island	B																				
males			1	1	-	3	3	1	1												51.3
females							1	2	2	2	2	-	1								54.6
Moluccas	D																				
males			1	-	-	1	1														50.3
females		1	-	1	2	-	-	1													49.8
New Guinea	E																				
males					3	-	1														50.5
females					2	1	1	-	1												51.2
Solomon Islands	E																				
male							1														
New Hebrides	F																				
males								1	1												53.5
females					1	-	-	1													51.5
Fiji	F																				
males				1	1	-	1	1	2	-	1										52.6
females						4	1	-	2	-	1										52.5
American Samoa	F																				
males								1	-	1											54.0
females								1	-	-	1	1									55.3
Longley's specimens*	F																				
males										2											55.0
female								1													
Western Australia	C																				
males							1	-	1	1											52.7
females									1	2	-	1	-	1	-	1					55.8

*presumably from Samoa; see text for discussion

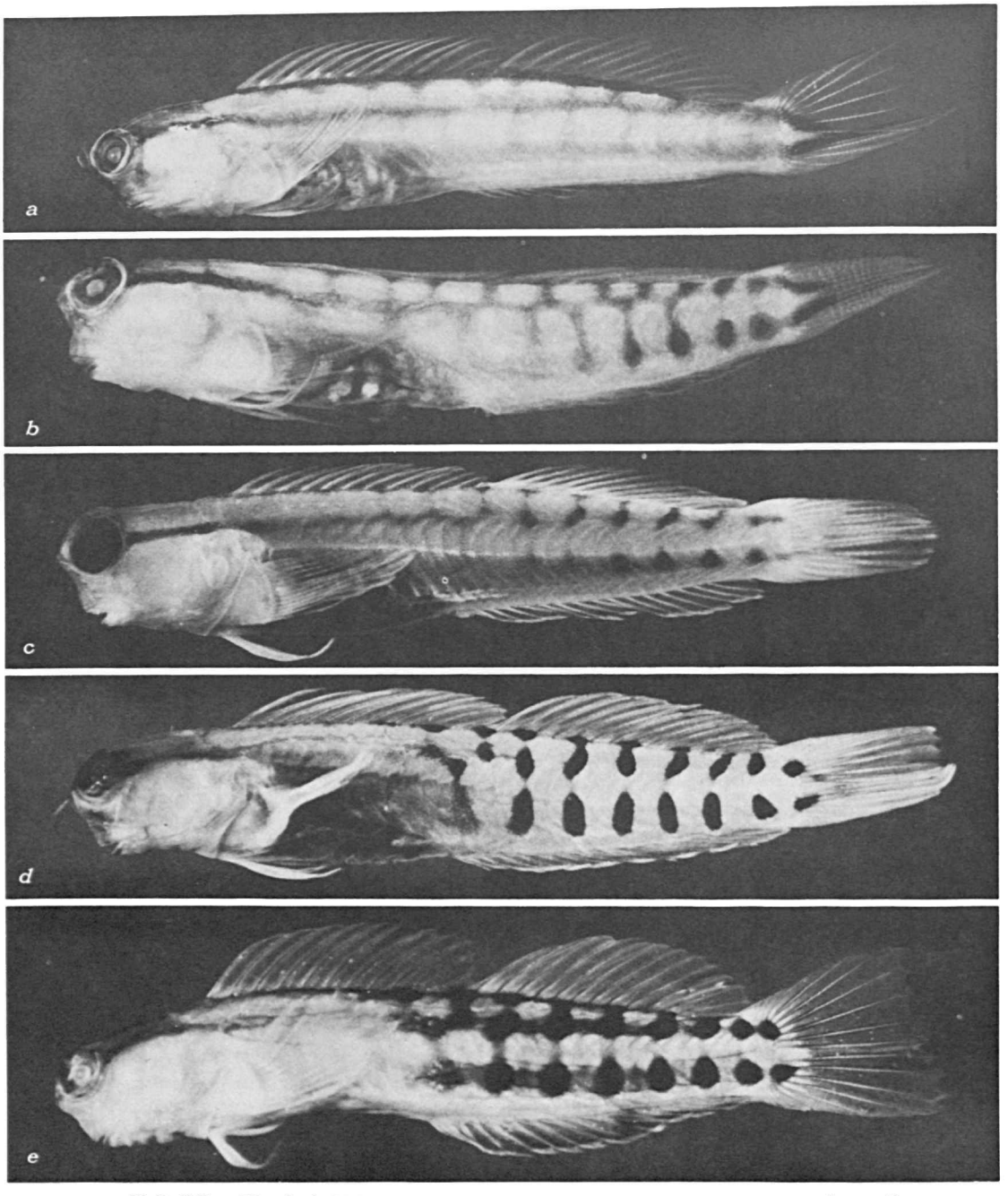
munication). Thus the geographic distributions of *E. oculus* and *E. opsifrontalis* are known to coincide at Fiji where their habitat preferences appear to be different.

NEW MATERIAL (asterisk denotes previously reported localities; all others are new locality records).—RYUKYU ISLANDS. *Ishigaki, BPBM 8694 (1 specimen:18.5). INDONESIA. JAVA SEA: Seribu Islands, USNM 211995 (19:14.5–33.7); Bawean Island, USNM 211975 (87:12.8–38.3). MOLUCCAS: Ambon Island, BPBM 18046 (1:27.1), 18048 (1:19.7), 18049 (1:28.2), 18052 (4:19.3–32.7); Saparua Island, USNM 211925 (7:13.2–17.0); Haruku Island USNM 209577 (7:13.1–48.7). SOLOMON ISLANDS. Savo Island, AM I.17490-001 (1:40.5). FIJI ISLANDS. *Viti Levu, BPBM 11270 (3:34.0–42.9), 14584 (2:45.0–46.4), USNM 214520 (3:31.8–37.8), 214787 (1:18.1); Moala Island, USNM 214788 (4:30.8–39.7). AMERICAN SAMOA. Tutuila Island, BPBM 17514 (5:22.0–36.8). WESTERN AUSTRALIA. North West Cape, WAM P25374-018 (9:26.3–33.4).

Ecsenius opsifrontalis Chapman and Schultz

FIGURE 9

Fifty-nine specimens of *E. opsifrontalis* have been obtained; all but two (from Guam) represent new locality records (see "New Material"). These specimens show that *E. opsifrontalis* varies geograph-



Atoll, Gilbert Islands: *b*, BPBM 17958, female, 29.6 mm SL, Eniwetok; *c*, UG 1746, female, 26.8 mm SL, Guam; *d*, ANSP 128013, male, 37.5 mm SL, Viti Levu, Fiji; *e*, USNM 211285, male, 35.3 mm SL, Kandavu, Fiji.

TABLE 10.—Frequency distributions for certain characters in populations of *Ecsenius opsifrontalis*

Population	Segmented dorsal-fin rays			Segmented anal-fin rays				Caudal vertebrae			Dentary incisor teeth										
	13	14	$\bar{x}$	14	15	16	17	$\bar{x}$	21	22	23	$\bar{x}$	41	42	43	44	45	46	47	48	49	50	$\bar{x}$
Mariana Islands.....	24	3	13.1	24	3			15.1	2	20	1	22.0	1	-	2	5	5	-	-	1			44.3
Ulithi Atoll.....	3		13.0	3				15.0		3		22.0				2	-	1					44.7
Marshall Islands.....	7		13.0	7				15.0	1	6		21.9					2	1	2	2			46.6
Gilbert Islands.....	14	1	13.1	14	1			15.1	3	12		21.8				1	2	3	1				45.6
Kapingamarangi Atoll...	32	5	13.1	1	32	3		15.1	3	30		21.9			2	3	5	2	14	8	-	3	46.7
Fiji Islands.....	3	6	13.7		2	7		15.8		8	1	22.1		1	-	1	1	-	3	1	1	1	46.6
Great Barrier Reef.....		3	14.0			2	1	16.3		2	1	22.3						1	-	1	-	1	48.0

ically as well as individually in color pattern and meristics.

The basic color pattern of *E. opsifrontalis* is that of 2 stripes on the side of the body (a third is present along the dorsal body contour) crossed by a series of up to 10 bars that extend to the dorsal contour. Springer (1971) reported that these markings were usually faint and of equal intensity, but we find considerable individual and population variation in the intensity of their pigmentation. While some specimens from Oceania are faintly marked (Figure 9*a* and Springer, 1971, fig. 32), others have the bars more intensely pigmented than the stripes (Chapman and Schultz, 1952, fig. 93). A few specimens have the pigment most intense at the points where the bars cross the stripes, thus presenting the appearance of a series of dark spots with diffuse horizontal and vertical connections (Figure 9*b–c*). The specimens from Fiji (second record from west of the Andesite Line) have the most intense pigment and the most distinctive patterns (Figure 9*d–e*). In the Fijian specimens the points of intersection are darker and the connections less evident than in specimens from other localities.

Some specimens from Oceania have a considerable amount of dark dusky pigment extending out on the caudal fin, and, thus, could be misidentified as *E. oculus* in Springer's (1972) revised key to *Ecsenius*. *E. opsifrontalis*, however, always has uniformly pale pelvic fins, whereas *E. oculus* has very darkly pigmented pelvic fins. These two species are known to occur together at only one locality, Fiji (see "Remarks" under *E. oculus*).

The Fijian forms of *E. opsifrontalis* superficially resemble *E. collettei* in color pattern but are easily distinguished. *E. collettei* lacks dark marks extending to the dorsal body contour and has a shorter lateral line and shorter nasal cirri than does *E. opsifrontalis*. In addition, *E. collettei* males have dark spots on the underside of the head, which are absent in *E. opsifrontalis*.

The frequency distributions for numbers of segmented dorsal-fin and anal-fin rays and caudal vertebrae (Table 10) in the Fijian population show a closer similarity to those of the Australian population (reported by Springer, 1972) than to those of other populations. The Australian specimens, however, do not show the intensification of pigment typical of the Fijian specimens.

NEW MATERIAL.—CAROLINE ISLANDS. Ulithi Atoll, BPBM 11487 (3 specimens:22.9–35.1). MARIANA ISLANDS. Guam, UG 1542 (1:28.3), 1746 (1:26.8); Saipan, UG 4892 (7:18.8–32.5), 5097 (3:27.2–35.5); Tinian, UG 5146 (16:15.9–29.5). MARSHALL ISLANDS. Eniwetok, BPBM 12896 (1:23.3), 17958 (1:29.6); Majuro Atoll, BPBM 17740 (1:25.2). GILBERT ISLANDS. Abiang Atoll, AM I.18044-004 (16:18.2–39.1). FIJI ISLANDS. Viti Levu, ANSP 128013 (4:33.2–39.3), 128014 (1:30.9), USNM 214521 (1:37.0); Kandavu, USNM 210562 (1:32.0), 211285 (2:34.2–35.2).

Ecsenius pictus, new species

FIGURE 10

DESCRIPTION (see Table 11 for frequencies of certain counts; other counts, with frequencies in parentheses, as follows).—Dorsal-fin spines 12(8); pectoral-fin rays 13(8, 1 specimen with 14 on right side only); segmented caudal-fin rays 13(5); dorsal procurrent caudal-fin rays 7(3), 8(1); ventral procurrent caudal-fin rays 6(2), 7(1), 8(1); total

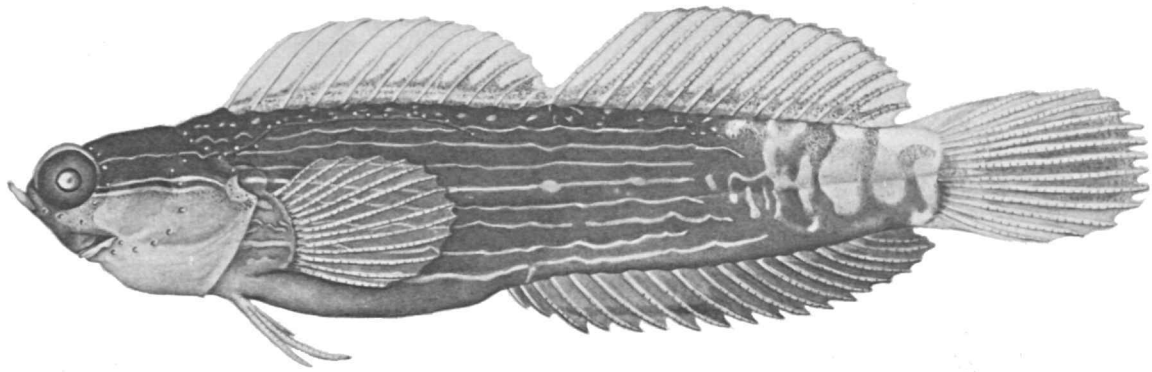


FIGURE 10.—*Ecsenius pictus*, BPBM 15612, paratype, male, 41.6 mm SL, Alite Reef off Malaita, Solomon Islands. (Drawn by J. R. Schroeder.)

caudal-fin elements 26(2), 27(1), 29(1); pseudobranchial filaments 6(6); lower jaw (one side) posterior canine teeth 1(7); total lower jaw posterior canine teeth 1(1), 2(6); precaudal vertebrae 10(7); total vertebrae 31(3), 32(4). Lateral line with no paired pores, extending to below level of 9th(1), 10th(6), or 11th(1) dorsal-fin spine. Dorsal fin notched seven-ninths(6) length of first segmented dorsal-fin ray. Data for the holotype are given in Table 2.

Color Pattern: In preservative, body dark brown with 7 or 8 pale pinstripes, mid-lateral stripe with series of 2–6 pale enlargements (spots) along its length; irregular row of numerous light spots dorsal to dorsalmost pinstripe; stripes and dorsal row of spots end posteriorly below level of 7th to 10th segmented dorsal-fin ray, anterior to area of alternating pale and dark irregular bars that extends to caudal-fin base. Mid-lateral stripe and second stripe above it extend anteriorly on head to posterior margin of orbit. Top of head and cheeks as dark as body or considerably lighter; underside of head less dusky than dorsal surface of head; light area present along lower lip. Pectoral-fin base with prominent light stripe; irregular light markings may be present dorsal to pectoral-fin base stripe. Pectoral and caudal fins with dusky pigment along rays, membranes immaculate. Anal fin dusky with indistinct light basal stripe. Dorsal fin dusky at base and along proximal half of rays; diffuse light stripe may interrupt dusky basal area. Pelvic fins unmarked or faintly pigmented proximally.

Color transparencies of specimens from the Moluccas and the Solomon Islands show the following: ground color chocolate-brown; pinstripes on head and body, and pectoral-fin base stripe brilliant white; area around mouth and underside of head yellow; light irregular areas posteriorly on body yellow interspersed with brown. Fins clear.

TABLE 11.—Frequency distributions for certain characters in populations of *Ecsenius pictus*

Population	Segmented dorsal-fin rays				Segmented anal-fin rays				Caudal vertebrae			Gill rakers			
	13	14	15	$\bar{x}$	15	16	17	$\bar{x}$	21	22	$\bar{x}$	10	11	12	$\bar{x}$
Moluccas.....	3	1		13.3	3	1		15.3	3	1	21.3	1	2		10.7
Solomon Islands...			4	15.0			4	17.0		4	22.0		1	2	11.7

Population	Dentary teeth										Epipleural ribs			
	40	41	42	43	44	45	46	47	48	$\bar{x}$	11	12	13	$\bar{x}$
Moluccas.....	1	1	2							41.3	1	2		11.7
Solomon Islands...							1	1	1	47.0		1	1	12.5

SEXUAL DIMORPHISM.—We found no significant differences in meristic or morphometric characters between the sexes.

GEOGRAPHICAL VARIATION.—Specimens from the Moluccas have lower means for counts of segmented dorsal-fin and anal-fin rays, caudal vertebrae, dentary teeth, epipleural ribs, and gill rakers than do specimens from the Solomon Islands (Table 11).

RELATIONSHIPS.—*Ecsenius pictus* belongs to the *yaeyamaensis* species group, which is characterized by a deeply notched dorsal fin and low counts of vertebrae and vertical fin rays. *E. pictus* does not easily fit into any of the three subgroups of the *yaeyamaensis* group; it does not have the reduced thirteenth dorsal-fin spine or long lateral line typical of the *oculus* subgroup, nor does it have the short nasal cirri characteristic of the *prooculis* subgroup. The pectoral-fin base of *E. pictus* has a distinct pale stripe, whereas the species of the *yaeyamaensis* subgroup have dark stripes or marks on the pectoral-fin base. The distinctive color pattern of *E. pictus* is also quite unlike that of any of the other species of the *yaeyamaensis* group. We, therefore, consider *E. pictus* to represent a fourth subgroup, the *pictus* subgroup, within the *yaeyamaensis* group of species.

REMARKS.—*Ecsenius pictus* is one of the deeper dwelling species of *Ecsenius*, having been taken (on coral reefs) at depths of 1–38 m; however, most specimens have come from depths greater than 10 m.

ETYMOLOGY.—The specific name, from the Latin *pictus* (painted or colored), refers to the unique and striking color pattern of this species.

HOLOTYPE.—USNM 213853, female 33.3 mm SL, Indonesia, Moluccas, just west of northernmost tip of Great Banda Island, reef and rock slope area, 04°30′30″S, 129°56′10″E, depth 10.7–18.3 m, collected by V. G. Springer and M. F. Gomon, VGS 74-11, 9 March 1974.

PARATYPES.—INDONESIA. MOLUCCAS: CAS 34245, male, 22.7 mm SL, and USNM 211895, female, 30.9 mm SL, collected with the holotype. USNM 210056, male, 17.7 mm SL, Saparua Island, off Kampungmaha, coral heads, depth 13.7–16.8 m, VGS 73-12, 17 January 1973. SOLOMON ISLANDS. BPBM 15612, male, 35.1 mm SL, Alite Reef off Malaita, lagoon reef in 12 m, collected by G. R. Allen and J. E. Randall, 24 July 1973. BPBM 15624, female, 35.1 mm SL, Alite Reef, outer reef slope in 38 m, J. E. Randall and B. Goldman, 25 July 1973. BPBM 15940, male, 37.3 mm SL, Alite Reef, from stomach of *Lethrinus* sp, collected by J. E. Randall, 25 July, 1973. BPBM 19016, male, 20.3 mm SL, Guadalcanal, 7 miles (11.7 km) W. of Honiara, reef in 1–2 m, J. E. Randall, G. R. Allen and M. McCoy, 11 July 1973.

Ecsenius prooculis Chapman and Schultz

Five additional specimens of *E. prooculis* have been obtained from New Britain, one of which is the only female known for this species. The female specimen has 15 segmented anal-fin rays (1 male with 15, 8 males with 16 anal-fin rays). The lateral line terminates below the tenth dorsal-fin spine (4 males with lateral line terminating below eighth, 5 males with lateral line terminating below ninth dorsal-fin spine). Additionally, where 7 males have concentrations of dark pigment on the underside of the head, the female and 2 males have pale areas devoid of pigment (see account of sexual dichromatism under "Color Pattern" in *E. bandanus*).

NEW MATERIAL.—New Britain: AM 17503-001 (1 specimen: 27.2), BPBM 15719 (4:23.0–36.0).

Ecsenius schroederi, new species

FIGURE 11

DESCRIPTION (certain counts and measurements for the holotype and only known specimen are given in Table 2; other data, with counts indicated for both sides, are as follows).—Gill rakers 14–14; pseudobranchial filaments 5–6; lower jaw posterior canine teeth 5–4. Lateral line with no paired pores.

Color Pattern: Head dusky, darker dorsally and anteriorly; distinct dusky postocular stripe extends from posterior margin of orbit to upper edge of opercle; an indistinct, thin dusky stripe extends across lower cheek onto opercle at level of mid-base of pectoral fin. Body pale with three wavy, dark pinstripes; dorsalmost pinstripe extends from supratemporal canal posteriorly to base of twelfth segmented dorsal-fin ray; mid-lateral pinstripe is a continuation of postocular head stripe and extends posteriorly to caudal-fin base; ventralmost pinstripe extends from upper pectoral-fin insertion posteriorly to caudal-fin base. Three or four indistinct, pale spots present between mid-lateral and ventral pinstripes. Dorsal fin with concentration of dusky pigment along base, indistinct dusky stripe proxi-

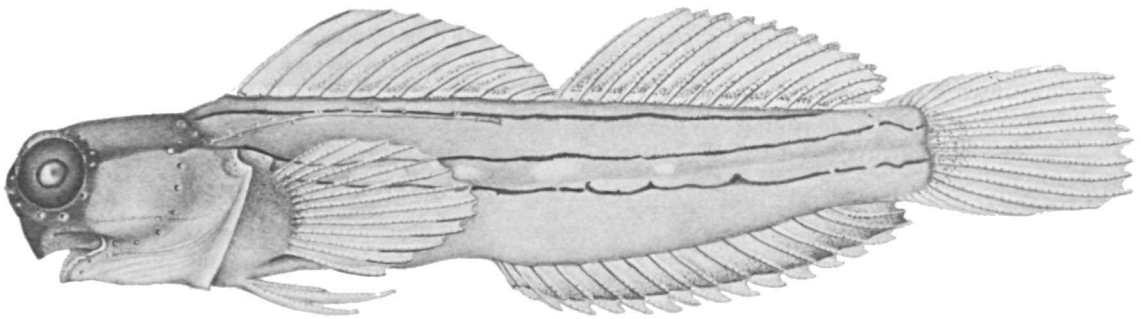


FIGURE 11.—*Ecsenius schroederi*, USNM 209743, holotype, male, 24.0 mm SL, Ambon Island, Moluccas. (Drawn by J. R. Schroeder.)

mally, and dusky pigment extending outward along rays. Anal fin with dusky stripe on outer third of fin, tips of rays pale. Caudal fin with scattered dusky pigment proximally and along rays, interradial membranes clear. Pectoral fin with scattered dark pigment proximally; tips of five lowermost rays dark. Pelvic fin with scattered dusky pigment distally, otherwise unmarked.

RELATIONSHIPS.—*Ecsenius schroederi* and *E. mandibularis* are the only species of *Ecsenius* with more than two posterior canine teeth on each side of the lower jaw. *E. schroederi* can be distinguished from *E. mandibularis* by its very different color pattern and by having fewer segmented dorsal-fin and anal-fin rays (see "Key to the Species of *Ecsenius*").

ETYMOLOGY.—Named for Jack R. Schroeder, whose excellent illustrations have so greatly enhanced the usefulness of our blennioid studies.

HOLOTYPE.—USNM 209743, male, 24.0 mm SL, Indonesia, Moluccas, Ambon Island, off Tandjung Suli, shallow coral reef, depth to 2.4 m, collected by V. G. Springer and M. F. Gomon, VGS 73-8, 11 January 1973.

Ecsenius stigmatura Fowler

New material (and records) of *E. stigmatura* expands the ranges of meristics for this species as given by Springer (1971). The ranges are as follows: segmented anal-fin rays 17–19; dorsal procurrent caudal-fin rays 6–8; ventral procurrent caudal-fin rays 5–7; total caudal-fin elements 26–28; gill rakers 13–17; pseudobranchial filaments 5–6; dentary incisor teeth 34–40; epipleural ribs 12–13; lateral line extending posteriorly to below level of 7th to 9th dorsal-fin spine.

A color transparency taken shortly after the capture of a specimen of *E. stigmatura* shows color similar to that described by Springer (1971), which was taken from a color sketch of the holotype. However, the transparency shows the body to be dusky gray anteriorly and bright orange-red posteriorly. The orange opercular stripe is prominent but does not extend anteriorly on the cheek. The black spot on the caudal peduncle is bordered anteriorly by a white semicircle.

REMARKS.—The specimen from Darvel Bay, Borneo, questionably assigned to *E. stigmatura* by Springer (1971), has been found to represent a new species, *E. melarchus*. Comparisons of *E. melarchus* and *E. stigmatura* are given in Table 5 and under "Relationships" for *E. melarchus*.

NEW MATERIAL.—INDONESIA. MOLUCCAS: Ambon Island, BPBM 18613 (1 specimen:25.1), USNM 210445 (1:42.8); Ceram Island, USNM 209696 (2:19.6–21.8), 209851 (12:16.4–31.5); Saparua Island, USNM 209993 (1:24.2), 210146 (5:26.2–36.6).

Ecsenius trilineatus Springer

Since the description of *E. trilineatus* (Springer, 1972), 31 additional specimens representing new locality records have been obtained (see "New Material"). Springer (1971) had available only one specimen of *E. trilineatus*, which he questionably identified as *E. yaeyamaensis* and hypothesized (1971, "Appendix") as having come from the Banda

TABLE 12.—Frequency distributions for certain characters in populations of *Ecsenius trilineatus*

Population	Segmented dorsal-fin rays				Segmented anal-fin rays				Caudal vertebrae				Dentary incisor teeth							
	13	14	15	$\bar{x}$	15	16	17	$\bar{x}$	21	22	23	$\bar{x}$	40	41	42	43	44	45	46	$\bar{x}$
Saparua.....	5	11		13.7	5	10	1	15.8	1	11	2	22.1		1	1	3	3	2		43.4
Banda Islands.....	1	11	2	14.1		13	1	16.1		14		22.0	1	2	2	-	4	-	1	42.8
New Guinea.....		5	1	14.2		4	2	16.3		4	2	22.3				2	2	2		44.0
Solomon Islands...		1				1				1								1		

Sea. Our new material includes the first definite records of *E. trilineatus* from Banda Sea localities.

The new material expands the ranges for the meristics of certain characters. Some of these characters, which hint at possible geographic variation, are given in Table 12; other characters are as follows: pectoral-fin rays 12–14 (3 counts of 12 recorded); dorsal procurrent caudal-fin rays 6–9; ventral procurrent caudal-fin rays 6–8; total caudal-fin elements 26–30; epipleural ribs 11–13. The depth of the dorsal-fin notch of the holotype was printed erroneously as 0 (Springer, 1972, table 1); the correct figure is 9 (nine-ninths the length of the first segmented dorsal-fin ray).

REMARKS.—The single specimen from Efate, New Hebrides (BPBM 12122), tentatively identified as *E. trilineatus* by Springer (1972), has proven to be of a new species, *E. isos*. Comparisons of this new species with *E. trilineatus* are given in the account of *E. isos*.

NEW MATERIAL.—INDONESIA. MOLUCCAS: Saparua Island, USNM 211926 (17 specimens:14.0–27.2); Banda Islands, Goenoeng (= Gunung) Api Island, USNM 211930 (5:13.8–25.6), Naira Island, USNM 211941 (1:14.8), Great Banda Island, USNM 211945 (7:21.5–27.1). SOLOMON ISLANDS. Florida Island, AM I.17497-001 (1:26.0).

Ecsenius yaeyamaensis (Aoyagi)

New locality records for *E. yaeyamaensis* are given in "New Material." All specimens in the list, including the Western Australian specimen, do not have the fine dark spots posteriorly on the body that are typical of specimens from the Great Barrier Reef, but instead have the common color pattern.

Springer (1971) reported three specimens of *E. yaeyamaensis* from New Hebrides with variant color patterns similar to that of the species he subsequently described as *E. trilineatus*. The recent collection of normally patterned *E. yaeyamaensis* from New Hebrides has prompted us to reassess the identification of the earlier specimens, and we find them to represent a new species, *E. isos* (see "Relationships" for *E. isos*).

NEW MATERIAL.—WESTERN AUSTRALIA. Dampier Archipelago, WAM P25107-021. INDONESIA. JAVA SEA: Seribu Islands, USNM 211994; Karimundjawa Islands, USNM 211981; Bawean Island, USNM 211974. CELEBES: Boeton (= Butung) Island, USNM 211967. MOLUCCAS: Ambon Island, BPBM 18051, USNM 209735; Haruku Island, USNM 209603; Saparua Island, USNM 211924. SOLOMON ISLANDS. Guadalcanal, AM I.17486-002; Florida Island, AM I.17497-002. NEW HEBRIDES. Efate Island, USNM 214819, BPBM 19577.

Key to the Species of *Ecsenius*

1. Total teeth in lower jaw 13–16 (excludes posterior canine teeth: see Springer, 1968, pl. 9; Smith-Vaniz and Springer, 1971, fig. 5), in upper jaw 26–34; mid-predorsal pore of supratemporal commissural series in advance of level of posterior orbital margin (see Smith-Vaniz and Springer, 1971, fig. 18); dark spot extending anteriorly from anus ..... ***E. midas*** (Indian, west and central Pacific oceans)

   Total teeth in lower jaw more than 29 (excludes posterior canine teeth), in upper jaw more than 95; mid-predorsal pore of supratemporal commissural series well posterior to level of posterior orbital margin (see Smith-Vaniz and Springer, 1971, fig. 17); dark spot extending anteriorly from anus present or absent 2

2. Total posterior canine teeth in lower jaw 7–15 (2–8 on each side) 3

   Total posterior canine teeth in lower jaw 0–4 (usually 1 on each side) 4

3. Segmented dorsal-fin rays 14–16; segmented anal-fin rays 16–18; body uniformly pale to dusky, with or without 2 longitudinal rows of small dark spots (Springer 1971, fig. 36) ..... ***E. mandibularis***
(eastern Australia)

Segmented dorsal-fin rays 13; segmented anal-fin rays 15; body pale with 3 narrow, dark stripes (Figure 11) ..... ***E. schroederi,*** new species
(Moluccas)

4. Dorsal fin without notch between spinous and rayed portions; last dorsal-fin spine more than 10 percent SL 5

Dorsal fin notched between spinous and rayed portions; last dorsal-fin spine less than 11 percent SL (usually less than 8 percent) 6

5. Anterior nostril with cirrus on posterior margin only; pectoral-fin rays 14–16 (14 in only 5 percent of specimens); segmented caudal-fin rays in specimens longer than 25 mm SL 13–14 (14 in only 3 percent of specimens); dentary incisor teeth 40–53 (45 or more in 94 percent of specimens) ..... ***E. frontalis***
(Red Sea and Gulf of Tadjourah)

Anterior nostril with cirri on both anterior and posterior margins; pectoral-fin rays 13–14 (14 in only 2 percent of specimens); segmented caudal-fin rays in specimens longer than 25 mm SL 13–14 (13 in only 6 percent of specimens); dentary incisor teeth 34–45 (43 or less in 93 percent of specimens) ..... ***E. namiyei***
(western Pacific)

6. Lateral line with vertically paired pores for one-third to all its length; anterior nostril with cirri on both anterior and posterior margins; no dark spot extending anteriorly from anus ..... ***E. bicolor***
(Indian, west and central Pacific oceans)

Lateral line of simple pores only (rarely with vertical pair at origin); anterior nostril with cirrus on posterior margin only; dark spot extending anteriorly from anus present or absent 7

7. Dark spot extending anteriorly from anus 8

No dark spot extending anteriorly from anus (occasionally black lining of gut protrudes slightly through anus giving appearance of dark ring) 10

8. Segmented dorsal-fin rays 12–14; segmented anal-fin rays 13–14; total vertebrae 29–30; no dark stripe extending posteriorly across head from ventroposterior margin of orbit ..... ***E. lividinalis***
(western Pacific)

Segmented dorsal-fin rays 15–17; segmented anal-fin rays 17–19; total vertebrae 32–34; dark stripe extending posteriorly across head from ventroposterior margin of orbit 9

9. Large dark spot on middle of caudal peduncle extending onto bases of caudal-fin rays (see Springer, 1971, fig. 24) ..... ***E. stigmatura***
(western Pacific)

No dark spot on caudal peduncle (body uniformly dusky) ..... ***E. melarchus,*** new species
(Indonesia)

10. Segmented dorsal-fin rays 16–20; segmented anal-fin rays 18–23; total vertebrae 34–39 (rarely 34) 11

Segmented dorsal-fin rays 12–15; segmented anal-fin rays 14–17; total vertebrae 30–34 (rarely 34) 14

11. Dorsal-fin spines 12; pectoral-fin rays 13–14 (14 in only 5 percent of specimens); body at about midlevel with broad, dark stripe, either continuous or as series of dark bars, extending length of body onto caudal-fin base ..... ***E. lineatus***
(western Pacific and Indian oceans)

Dorsal-fin spines 12–14 (12 in only 4–6 percent of specimens); pectoral-fin rays 13–15 (13 in 1–2 percent of specimens); body without broad, dark stripe (occasionally with slender dark stripe on dorsal fourth of body ceasing well anterior to caudal-fin base) 12

12. Mid-portion of distal half of at least spinous dorsal fin black or with black spots in interradial membranes; dorsal and ventral lobes of caudal fin darker than remainder of fin; usually several small, dark spots on posterior third of body and a narrow, black stripe on dorsoanterior portion of body ..... ***E. gravieri***
(Red Sea and Bay of Tadjourah)

Mid-portion of distal half of dorsal fin not noticeably marked; dorsal and ventral lobes of caudal fin not darker than remainder of fin; no black spots or stripes on body (body uniformly dark, with a dusky spot at caudal-fin base, or posterior half pale with irregular, dark bars) 13

13. Body uniformly dark with darker spot at caudal-fin base; segmented dorsal-fin rays 17–18; segmented anal-fin rays 19–20; total vertebrae 34–37 (37 in 6 percent of specimens) ..... ***E. aroni***
(Red Sea)

Body uniformly dark or posterior half pale with contrasting dark bars; segmented dorsal-fin rays 18–20 (18 in 17 percent of specimens); segmented anal-fin rays 19–23 (19 in 2 percent and 20 in 5 percent of specimens); total vertebrae 37–39 (37 in 8 percent of specimens) ..... ***E. pulcher***
(Persian Gulf and northern Arabian Sea)

14. One to 10 dark, pale–margined, round or oval spots on body, the largest spot equal to or more than one-half eye diameter (Figure 6*a–f*); pelvic fins with prominent dark pigment ..... ***E. oculus***
(Pacific)

Dark, round or oval spots, if present, on body not pale-margined and usually not more than one-half eye diameter (more than one-half diameter only in *E. opsifrontalis* from Fiji and *E. bimaculatus*); pelvic fins varying from pale to having scattered or prominent dark pigment (prominent only in *E. fourmanoiri* and some specimens of *E. nalolo, E. trilineatus,* and *E. yaeyamaensis*) 15

15. Fleshy pectoral-fin base with one or two discrete, dark or light stripes, or dark Y-shaped mark 16

Fleshy pectoral-fin base uniformly pigmented or with dark marks only diffusely present 20

16. Fleshy pectoral-fin base with distinct pale stripe on dark background; head and body with pale pinstripes on dark background; posterior region of body with alternating, irregular, pale and dark bars (Figure 10) ..... ***E. pictus,*** new species
(Banda Sea, Solomon Islands)

Fleshy pectoral-fin base with one or two distinct dark stripes or dark Y-shaped mark on pale background; head and body without pale pinstripes and alternating pale and dark irregular bars 17

17. Fleshy pectoral-fin base with two distinct dark stripes or dark Y-shaped mark 18

Fleshy pectoral-fin base with single dark stripe 19

18. Fleshy pectoral-fin base with dark, Y-shaped mark; dark stripe extending posteriorly from posterior margin of orbit; body without distinct pinstripes ..... ***E. yaeyamaensis***
(eastern Indian and western Pacific oceans)

Fleshy pectoral-fin base with 2, more or less parallel, dark stripes; no dark stripe extending posteriorly from posterior margin of orbit; body with 2 parallel, dark pinstripes anteriorly, which break into spots and dashes posteriorly ..... ***E. trilineatus***
(Banda Sea, New Guinea, Solomon Islands)

19. Dark stripe extends from posterior margin of orbit along body well out on caudal fin; dark stripe on lower side of body extending well out on caudal fin; 7–10 slender, dusky bars connecting stripes on body ..... ***E. fourmanoiri***
(New Caledonia)

Dark stripe extends from posterior margin of orbit only to posterior margin of opercle or slightly on body; no stripe on lower side of body extending out on caudal fin; body variable dusky with pale spots ..... ***E. nalolo***
(Red Sea, western Indian Ocean)

20. Lateral line extends posteriorly to below level of 10th–12th dorsal-fin spine (one of 46 specimens with lateral line below 10th spine); underside of head uniformly pigmented, without distinct dark or pale spots or marks; narrow, faintly dusky to dark bars or spots on body extending to dorsal profile (Figure 9*a-e*); nasal cirrus 2.3–6.5 percent SL ..... ***E. opsifrontalis***
(western and central Pacific)

Lateral line extends posteriorly to below level of 8th to 10th dorsal-fin spine; underside of head usually with distinct dark or pale spots or marks; dark spots on body, if present, not extending to dorsal profile; nasal cirrus 0.7–2.8 percent SL 21

21. Body with two longitudinal rows of dark spots on each side 22
Body variably marked; plain, with only two dark spots, or with alternating pale and dark stripes 23

22. Two rows of discrete dark spots present along entire length of body; spinous dorsal fin without dusky stripe; fleshy pectoral-fin base without diffuse dusky marks; dark marks beneath head present in males only ..... ***E. collettei***
(New Guinea)

Two rows of diffuse dusky blotches anteriorly on body grading into discrete dark spots beneath segmented-ray portion of dorsal fin; spinous dorsal fin with dusky stripe proximally; fleshy pectoral-fin base with diffuse dusky marks, the lower mark terminating on base of middle rays as dark spot; dark spots beneath head present in both sexes (Figure 4) ..... ***E. isos*** new species
(New Hebrides)

23. Two conspicuous dark spots on side of body in area covered by appressed pectoral fin ..... ***E. bimaculatus***
(Borneo)

Body without conspicuous dark spots 24

24. Body with alternating pale and dark stripes ..... ***E. prooculis***
(New Georgia, New Britain)

Body uniformly dusky or with faint, dusky saddles (Figure 1) ..... ***E. bandanus***
(Indonesia)

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