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REDESCRIPTION OF POMACENTRUS OTOPHORUS
POEY 1860, A VALID SPECIES FROM THE
CARIBBEAN (PISCES: POMACENTRIDAE)Robert W. Topp¹

ABSTRACT. *Pomacentrus otophorus* Poey 1860 is restored to valid status and redescribed on the basis of material from Panama and Jamaica. It is distinguished from its western Atlantic congeners by a black opercular "earspot," soft vertical fin tips of bright yellow-orange, and the combination of short head, small eye, deep suborbital, absence of ocelli, and strong suborbital and preopercular serrations.

P. otophorus is unique among American damselfishes in that the adults are excluded from waters of sustained high salinity. This aspect of their ecology may have a bearing on the dissimilarity between Panama and Jamaica populations, as well as on the implied phyletic relationship between the Pomacentridae and Cichlidae.

INTRODUCTION

In late 1967 my attention was drawn to an unrecognized damselfish living in the Chagres River Estuary on the Caribbean coast of Panama. During subsequent months more than 60 specimens were collected from this and other Panama localities. In June, 1968, 10 additional specimens were obtained from Jamaica.

Upon review of nominal Caribbean species I found that this material seemed to agree in detail with the description of *Pomacentrus otophorus* Poey 1860. Examination of the holotype, USNM 4710, confirms the identity and thereby restores the species to valid status.

Poey's original description was drawn from a single 130 mm TL specimen and served as a model for his generic treatment. Jordan and Evermann's (1898: 1555) account was essentially an abridgment of Poey's original description.

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Rivas (1960) reviewed the Florida and western Bahamas species of *Pomacentrus*, but was unable to locate the holotype of *P. otophorus* at the Museum of Comparative Zoology (a depository of Poey's types). On the basis of Poey's unfigured description of its size, coloration, anterior profile, elongation of vertical fins, and number of pectoral rays, Rivas judged it to have been a large adult male of *P. leucostictus* Müller & Troschel 1848, and accordingly synonymized the two. Subsequent works have followed this synonymy by omitting *P. otophorus* from their lists.

METHODS

Panama specimens were obtained with Chem Fish Collector, a "bio-aquatic stupefier"; collecting was supplemented by diving observations. Methods for making counts and measurements follow those of Rivas (1960). In Table 1, positive or negative allometry resulting from ontogenetic change is indicated by (+) or (—). Color descriptions are based on 35 mm Kodachrome transparencies of fresh Panama material. Specimens have been placed in the following collections: USNM (United States National Museum), MCZ (Museum of Comparative Zoology), ANSP (Academy of Natural Sciences of Philadelphia), FMNH (Field Museum of Natural History, Chicago), UMML (Institute of Marine Sciences, University of Miami), FSBC (Florida [State] Board of Conservation, now the Florida Department of Natural Resources, St. Petersburg).

MATERIALS EXAMINED

Pomacentrus otophorus: USNM 4710 (holotype), 130 mm TL, Cuba, 1860. ANSP 109645, 102 mm, Port Antonio, Jamaica, E. C. Raney and D. P. de Sylva, 13 Oct. 1967. USNM 204607, (5) 39-88 mm, Port Antonio, 13 Oct. 1967. MCZ 46672, (4) 76-93 mm, Frenchman's Cove, Jamaica (11.9 ‰ salinity), H. Albrecht, 3 April 1968. MCZ 42737, (3) 32-62 mm, mouth of Chagres R., Canal Zone, Panama, I. and R. W. Rubinoff, 9 June 1962. MCZ 46671, (4) 44-95 mm, mouth of Chagres R., I. and R. W. Rubinoff, 13 Aug. 1966. USNM 204606, (14) 11-83 mm, mouth of Chagres R. (0 ‰ salinity), 24 Oct. 1967. FSBC 5596, 51 mm, Chagres R., Tarpon Club Boat Basin (fresh water), 24 June 1968. UMML 25066, (8) 14-56 mm, Panama Canal, Atlantic Third Locks (21.5 ‰ salinity), 4 Nov. 1967. FSBC 5597, (2) 16-32 mm, cleared and stained, Panama Canal, Atlantic Mine Docks (28.1 ‰ salinity), 4 Nov. 1967. FSBC

5598, (25) 13-79 mm, Panama Canal, Atlantic Mine Docks, 4 Nov. 1967. USNM 204608, (3) 40-64 mm, Panama Canal, Atlantic Mine Docks, 4 Nov. 1967. FSBC 5599, 49 mm, Chagres R., $\frac{1}{2}$ km from mouth (0 ‰ salinity), 24 Oct. 1967. FMNH 69519, (9) 11-92 mm, mouth of Chagres R., (31.5 ‰ salinity), 13 March 1968.

Pomacentrus leucostictus: MCZ 25152, 70 mm, "Central America." MCZ 42728, (2) 53-62 mm, Galeta Pt., Canal Zone, Panama, I. and R. W. Rubinoff, 6 June 1961. MCZ 42731, 15 mm, Galeta Pt., I. and R. W. Rubinoff, 26 April 1962. MCZ 42732, (2) 20-50 mm, Galeta Pt., I. and R. W. Rubinoff, 26 April 1962. MCZ 42738, 18 mm, Galeta Pt., I. and R. W. Rubinoff, 20 June 1962. FSBC 5600, 69 mm, Galeta Pt., 7 Oct. 1967. 7 specimens, 15-70 mm, Devil's Beach, Ft. Sherman, Canal Zone, Panama, 12 Nov. 1967.

Pomacentrus fuscus: 10 specimens, 38-64 mm, Galeta Pt., Canal Zone, Panama, 25 July 1966.

Cichlasoma maculicauda: MCZ 46673, 104 mm, Chagres R., Tarpon Club Boat Basin (fresh water), Canal Zone, Panama, 24 June 1968. FSBC 5157, 62 mm, cleared and stained, Tarpon Club Boat Basin, 24 June 1968.

POMACENTRUS OTOPHORUS POEY

Figure 1.

Pomacentrus otophorus Poey, 1860: 188 (original description, Cuba); 1868: 326 (coloration, Cuba)

Eupomacentrus otophorus, Jordan and Evermann, 1898: 1555 (description after Poey, Cuba). Jordan, Evermann and Clark, 1930: 414 (listed, Cuba).

DIAGNOSIS

A euryhaline pomacentrid with short head, small eye, and deep suborbital. Dorsal fin XII (rarely XIII), 13-14 (rarely 12); anal II, 12 (rarely II, 11); pectoral rays 18 (occasionally 17 or 19). Suborbitals 4 and 5 and vertical margin of preopercle strongly serrate. Adults dark brown to blue-black; operculum with a black "earspot" at upper angle (*otophorus*=bearing an ear); distal one-third of soft dorsal, anal, and caudal fins bright yellow-orange; pectoral fin either unpigmented or tinged with orange except for a dark blotch at base. Juveniles blue-black with turquoise-blue stripes and spots; caudal fin and distal portions of soft vertical fins yellow, transparent at tips. Ocelli never present.

DESCRIPTION

A shallow-bodied species (depth 43-49% in SL), with dorsal outline more strongly rounded than ventral; anterior profile strongly convex. Caudal lobes rounded. Soft dorsal and anal fins rounded, both extending well beyond caudal fin base. Pelvics produced or not.

Dorsal and pelvic fins inserted well forward. Head short (29.7-33.3% in SL); orbital diameter small (7.5-11.5% in SL); sub-orbital deep (3.2-5.5% in SL). Table 1 lists proportional measurements for specimens greater than 39 mm.

Scales large, ctenoid; vertical fins with scale sheaths extending onto interradi al membranes about halfway to fin margins. Pectoral fin with small scales covering base. Pelvic fin naked, but with a strong ensiform scale at each fin axil and another between the fins. Cheeks scaled. Jaws, preorbital region, and suborbitals 1-3 naked; scale of suborbital 4 embedded when present. Lateral line terminating below base of first soft dorsal ray. Teeth uniserial, close-set, entire, similar in both jaws.

Fourth and fifth suborbital ossicles bearing 0 to 7 (mean, 2.4) moderate to strong posteriorly directed serrae, usually present in specimens 45-50 mm or larger. Vertical limb of preopercle with 5 to 15 (mean, 10.7) strong serrae; angle smoothly rounded. Dorsal spines 12, 1 of 60 with 13; dorsal rays 13 or 14, 2 of 60 with 12; anal rays 12, 2 of 60 with 11; pectoral rays 17-19. Body scales 26-29; tube-bearing scales in lateral line 16-19. Gill rakers on lower limb (including raker at angle), 8-10; on upper limb, 2-3. Trunk vertebrae 11; caudal, 15. Cheek scales 3-4 between sub-orbital edge and angle of preopercle. Distribution of meristic characters is shown in Table 2.

COLORATION

Typical of many pomacentrids, *P. otophorus* changes color with ontogeny, tending toward a less conspicuous adult.

Small juveniles (<15 mm) of blue-black ground color, with turquoise-blue markings arranged as follows (Fig. 2): 1) a conspicuous arc along dorsal one-third of corneal perimeter, colinear with a postorbital stripe, continuing as a row of spots along scale row just above lateral line, extending to posterior dorsal fin base; 2) successively less distinct rows immediately below lateral line, each row extending caudad from operculum, but failing to reach peduncle; 3) prominent markings on scales bordering dorsal fin

base, with spots extending onto scales of interradi al membranes; 4) a pair of variably broken lines on head and nape extending from premaxillary groove posteriad between orbits and converging at dorsal fin origin; 5) several markings arranged circumorbitally, including a conspicuous line on vertical limb of preopercle. Pectoral fin either transparent or tinged with orange, except at base. Pelvic fin pigmented, sometimes transparent or orange near tip. Posterior tip of opercle transparent. Caudal yellow, becoming transparent near tips of rays. Ocelli absent.

Larger juveniles with reduced turquoise-blue markings, which by 30 mm appear as small circular blue spots on scales above lateral line, on operculum, around eye, and occasionally elsewhere. Preopercular markings and those below lateral line now barely visible; paired lines on head reduced in breadth. Operculum developing a blue-black "earspot" resembling that of the primary freshwater centrarchid fishes of North America, and shared by a few western Pacific pomacentrid species.

Subadults and adults with head and body dark brown to sooty blue-black. Centers of scales black, producing vertical striations. Blue markings indistinct or absent. Distal one-third to two-thirds of soft vertical fins yellow-orange, this proportion generally decreasing with size; dark ground color encroaching well distad along interradi al membranes. Pectoral fin transparent or tinged with orange, except for a black inverted triangle at base. Earspot now prominent, blue-black to black. Opercular spine and fleshy flap unpigmented. Sexual dichromism not apparent in preserved specimens.

Most Panama specimens with a pair of dusky lines on caudal fin, generally present by 35 mm, often obscured by extensive body pigmentation in large fish; their extent and prominence variable, but occurring in a constant position relative to caudal skeleton: counting ventrad on third hypural, ventral line occupies membrane between third and fourth lepidotrichs; counting dorsad on fourth hypural, dorsal line lies between fourth and fifth lepidotrichs. These lines not present on Jamaica specimens.

COMPARISONS

Pomacentrus otophorus differs from all other western Atlantic congeners by its distinctive "earspot." Fresh adults are quickly distinguished by their bright yellow-orange fin tips, juveniles by their bright turquoise-blue markings. Additional differences include the small number of dorsal and anal rays, and the combination of short head, small eye, and deep suborbital.

Although *P. otophorus* closely resembles *P. leucostictus* in general physiognomy, preserved material is readily distinguished by the suborbital and preopercular serrations and the persistent ear-spot. Subadults are further separated by the lack of ocelli. Comparative morphometric and meristic data for *P. leucostictus* from Panama is included in Tables 1 and 2.

GEOGRAPHICAL VARIATION

Although comparative material is limited, differences between Panama and Jamaica collections are readily apparent. Caudal lines, for example, present on most Panama specimens greater than 35 mm, are lacking in similar material from Jamaica. Ranges of measurements and counts for specimens from the two populations are included in Tables 1 and 2. Using "t" tests on material of comparable size, significant differences ($P=0.01$, d. f. =28) can be recognized in snout length ($t=4.78$) and interorbital width ($t=4.79$). Figure 3 shows separation of the two populations on the basis of these two characters.

To evaluate the taxonomic status of the two populations, inter- and intraspecific differences among closely related species were assessed, following suggestions of Mayr (1969: 197):

1) Degree of difference among closely related sympatric species was evaluated by comparing Panama collections of *Pomacentrus otophorus*, *P. leucostictus*, and *P. fuscus*.

2) Degree of difference between geographically separated populations of *P. leucostictus* and of *P. fuscus* were evaluated by comparing Panama data with those of Rivas (1960) for similar material from Florida-western Bahamas.

The coefficient of difference, CD, defined as the difference between means divided by the sum of standard deviations, was determined for the same 10 sets of characters in each comparison. Sums of the 10 coefficients, SCD, for the various combinations are:

Sympatric species

<i>P. otophorus</i> vs. <i>P. fuscus</i>	13.91
<i>P. otophorus</i> vs. <i>P. leucostictus</i>	8.56
<i>P. leucostictus</i> vs. <i>P. fuscus</i>	7.41

Widespread populations

<i>P. fuscus</i> (Panama vs. Florida)	4.47
<i>P. otophorus</i> (Panama vs. Jamaica)	3.89
<i>P. leucostictus</i> (Panama vs. Florida)	2.46

The observed differences between Panama and Jamaica populations of *P. otophorus* are consistent with those of widespread populations of related species, but do not approach those of interspecific rank. The two populations are, on this basis, judged to be conspecific.

ECOLOGY AND BEHAVIOR

Recognized species of *Pomacentrus* in the western Atlantic are, as adults, typically obligate coral reef dwellers, and are thus principally stenohaline. Juveniles of some, however, regularly inhabit lagoons and rock pools, where they are exposed to fluctuating salinities. Representatives of the genera *Abudefduf* and *Nexilarius* are still more broadly tolerant of environmental extremes, especially as juveniles, and can be experimentally maintained in fresh water for indefinite periods.

P. otophorus is unique among western Atlantic pomacentrids since the adults are excluded from waters of sustained high salinity. Jamaica specimens were collected in salinity of 11.9 ‰, whereas Panama specimens were collected in salinities of 0 to 31.5 ‰. The species is common in the Atlantic end of the Panama Canal and adjacent brackish waters, where salinities of 21.5 to 28.1 ‰ were recorded, and in the Chagres River Estuary, where salinities ranged over the full regime of 0 to 31.5 ‰. Specimens have also been collected from the river proper, and from the Tarpon Club Boat Basin adjacent to Gatun Dam spillway, over 10 km upstream. Figure 4 shows Panama collection localities.

In waters of sustained high salinity (> 30 ‰) its absence is notable; not a single specimen has been collected in coral reef habitats during some eight years of sampling by the Smithsonian Tropical Research Institute.

In Panama, *P. otophorus* was collected from waters subject to occasional high turbidity and turbulence. In the Panama Canal and Chagres estuary, substrate is of moderately sedimented rubble; in the Third Locks, rubble and mud. The Tarpon Club Boat Basin is lacustrine, of good transparency, with dense growths of phanerogams along the shore and heavy algal growth on the docks and pilings. A single 51 mm specimen of *P. otophorus* was collected there on 24 June 1968, along with the following associates, now in MCZ and FSBC collections:

- 1 *Gambusia episcopi*, 35 mm
- 2 *Cichlasoma maculicauda*, 62-104 mm

- 12 *Eucinostomus* sp., 35-58 mm
- 3 *Diapterus rhombeus*, 30-43 mm
- 4 *Centropomus pectinatus*, 88-110 mm
- 20 *Gobionellus* sp., 22-55 mm
- 8 *Microeleotris* sp., 17-40 mm
- 1 *Eleotris isthmensis*, 22 mm

P. otophorus is exclusively herbivorous throughout life, as far as is known. The only animal material present in gut samples was small invertebrates probably ingested incidental to grazing.

In Panama, reproductive activity was not observed. In Jamaica, the color pattern of courting males apparently involves a concentration of dark pigment in the anterior parts, while the posterior body and vertical fins remain yellow. Nest-guarding males retain the yellow in parts of each scale (Alan Emery, personal communication, 27 June 1968).

DISTRIBUTION

Although the degree of difference between Panama and Jamaica populations of *P. otophorus* is consistent with that demonstrated between Panama and Florida populations of related species, only about one-half the latitudinal distance is involved, suggesting that intraspecific heterogeneity in *P. otophorus* may exceed that of its Caribbean congeners. There is, indeed, ample ecological basis for such an expectation:

The exclusion of *P. otophorus* from waters of persistently high salinity may effectively give rise to geographically isolated demes along the Caribbean coast of Central America. If its reproductive activities include the nest building and parental care typical of other damselfishes, genetic exchange between demes is probably limited. Their Caribbean congeners, however, have no extrinsic salinity barriers to continuous populations along the coast. This greater freedom of gene flow can be expected to result in more panmictic populations.

RELATIONSHIPS

A close relationship has long been suspected between the pan-tropical marine Pomacentridae and the secondary freshwater Cichlidae. The two share a number of anatomical similarities (e. g., united lower pharyngeals) and have been united into the order Chromides by Jordan and Evermann (1898: 1511) and Jordan (1923: 218). They are mutually unique among the Perciformes

in having but a single pair of external nostrils. Despite their divergence of habitat, the two families also show close similarities in reproduction and behavior (Wickler, 1967).

In Panama, one specimen of *P. otophorus* (FSBC 5596) was taken in company with two specimens of the cichlid fish, *Cichlasoma maculicauda*; gut analyses showed that both species had been feeding on filamentous green algae. This ecological overlap strengthens the implication of close phyletic proximity for the two families.

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TABLE 1
Proportional characters of *Pomacentrus otophorus* and *P. leucostictus*

Character	<i>P. otophorus</i> Holotype (Cuba) USNM 4710		<i>P. otophorus</i> Panama (20)		<i>P. otophorus</i> Jamaica (10)		<i>P. leucostictus</i> Panama (6)	
			Range	Mean	Range	Mean	Range	Mean
Standard length (mm)	103		41-95	72	39-102	74	32-70	56
Predorsal length (-)	359		353-397	371	374-415	388	361-394	379
Preanal length (-)	714		652-706	669	670-717	691	675-702	689
Prepelvic length (-)	388		361-383	372	362-397	380	376-431	398
Head length (-)	291		297-314	305	299-333	312	301-319	309
Snout length (+)	107		80-109	96	99-116	107	78-95	87
Maxillary length (-)	83		78-95	84	82-94	86	83-92	88
Orbit diameter (-)	73		76-98	86	75-115	86	86-116	97
Suborbital width (+)	49		32-51	46	38-55	48	25-37	33
Interorbital width (-)	91		94-108	101	87-96	92	84-97	88
Body depth	437		439-486	458	433-483	456	425-472	450
Caudal peduncle depth	160		156-168	162	145-168	154	140-154	149
Pectoral fin length	262		268-298	283	259-307	283	263-277	271
Pelvic fin length	291		273-332	305	270-338	313	292-360	326
Anal fin length (+)	393		402-464	429	358-433	399	381-437	416
Upper caudal lobe length (+)	286		286-342	325	286-349	317	308-366	338

TABLE 2

Distribution of meristic characters in *Pomacentrus otophorus* and *P. leucostictus*

Dorsal rays		No.	12	13	14	15	16	Range	Mean
<i>P. otophorus</i> (Panama)		50	1	23	26			12-14	13.5
<i>P. otophorus</i> (Jamaica)		10	1	8	1			12-14	13.0
<i>P. leucostictus</i> (Panama)		15			1	12	2	14-16	15.1
Anal rays		No.	11	12	13	14		Range	Mean
<i>P. otophorus</i> (Panama)		49	2	47				11-12	13.0
<i>P. otophorus</i> (Jamaica)		10		10				12	12.0
<i>P. leucostictus</i> (Panama)		15		3	8	4		12-14	13.1
Pectoral rays		No.	17	18	19			Range	Mean
<i>P. otophorus</i> (Panama)		50	6	40	4			17-19	18.0
<i>P. otophorus</i> (Jamaica)		10		10				18	18.0
<i>P. leucostictus</i> (Panama)		15		10	5			18-19	18.3
Lateral line scales		No.	16	17	18	19	20	Range	Mean
<i>P. otophorus</i> (Panama)		49	1	6	32	10		16-19	18.0
<i>P. otophorus</i> (Jamaica)		10		1	4	5		17-19	18.4
<i>P. leucostictus</i> (Panama)		15			2	7	6	18-20	19.3
Body scales		No.	26	27	28	29		Range	Mean
<i>P. otophorus</i> (Panama)		49	1	14	33	1		26-29	27.7
<i>P. otophorus</i> (Jamaica)		10		1	8	1		27-29	28.0
<i>P. leucostictus</i> (Panama)		15		2	10	3		27-29	28.1

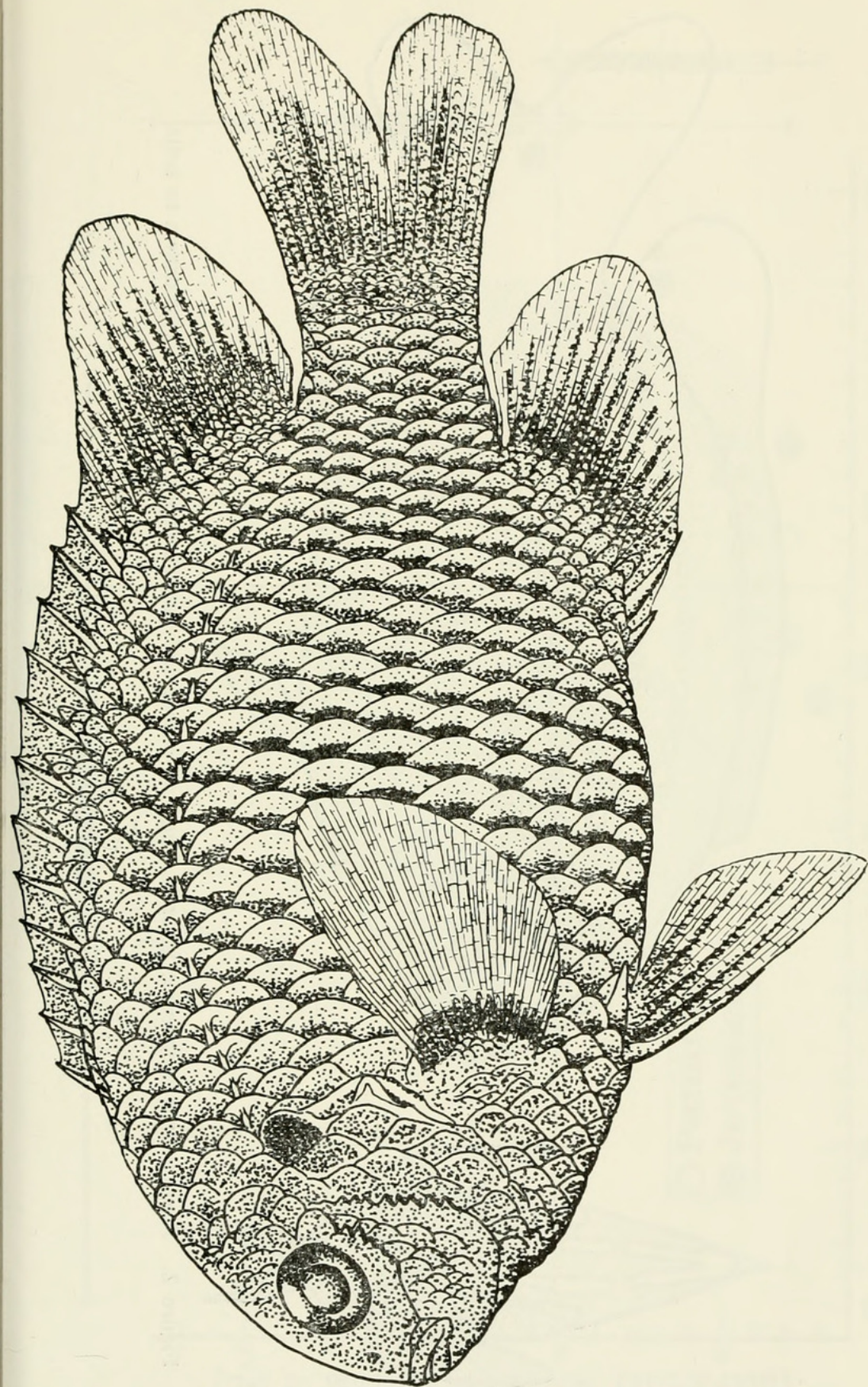


Figure 1. *Pomacentrus otophorus*, 78 mm SL, mouth of Chagres R., Panama, 24 Oct. 1967.

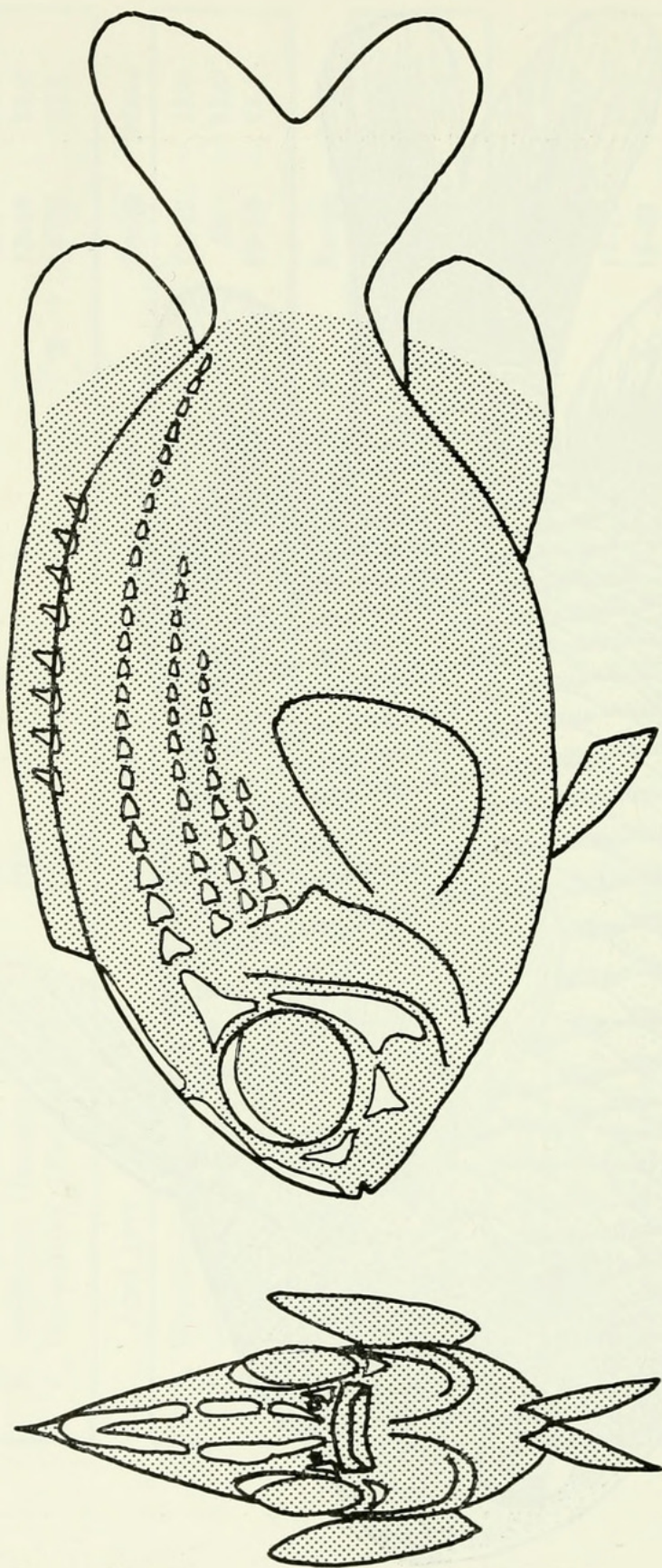


Figure 2. *Pomacentrus tophorus*, juvenile, showing extent and pattern of pigmentation. Not drawn to scale.

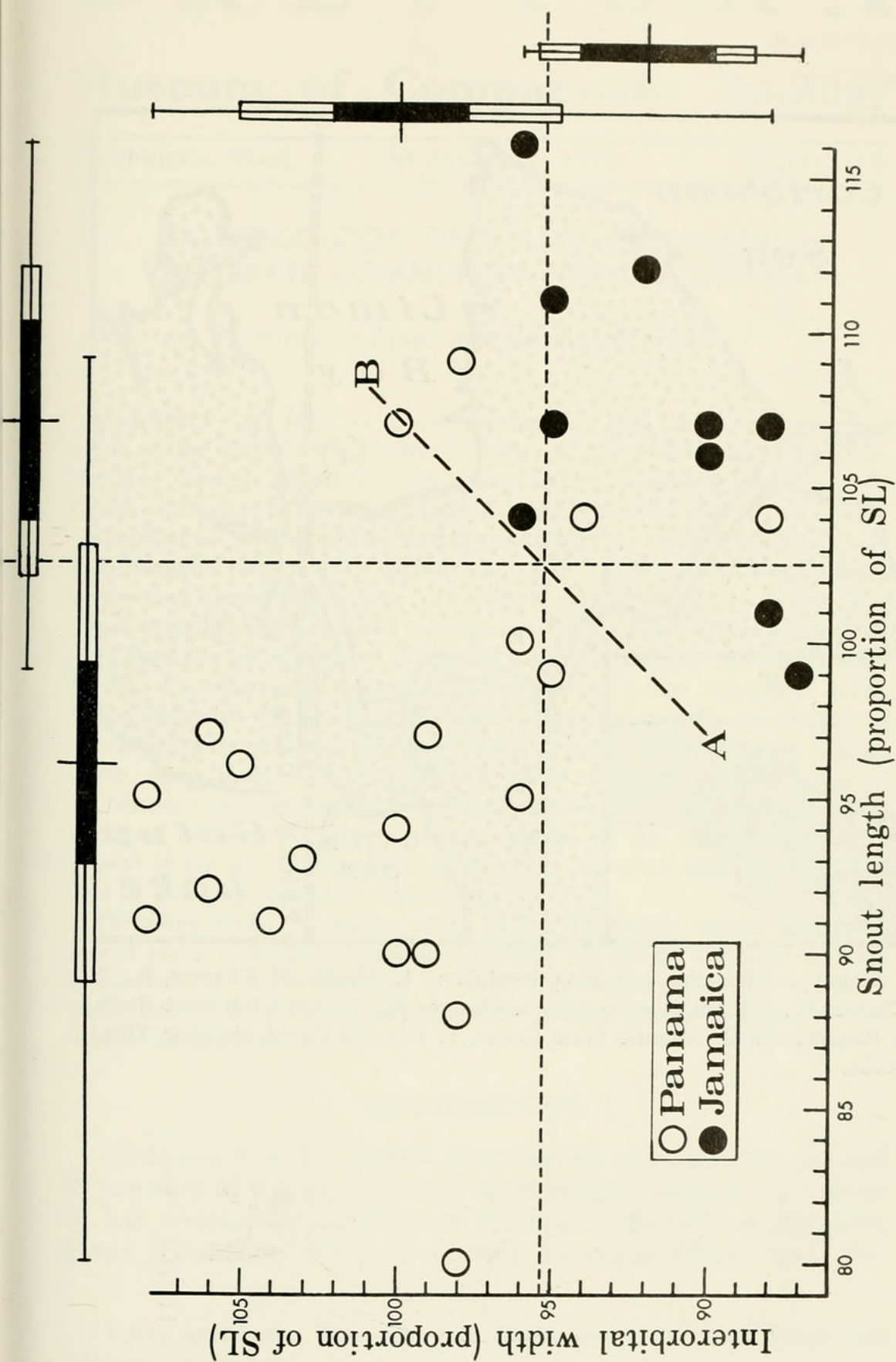


Figure 3. Separation of Panama and Jamaica populations of *Pomacentrus otophorus* on basis of relative snout length and interorbital width. Range, mean, standard deviation, and 2 standard errors on either side of mean are shown. AB=line of best separation.

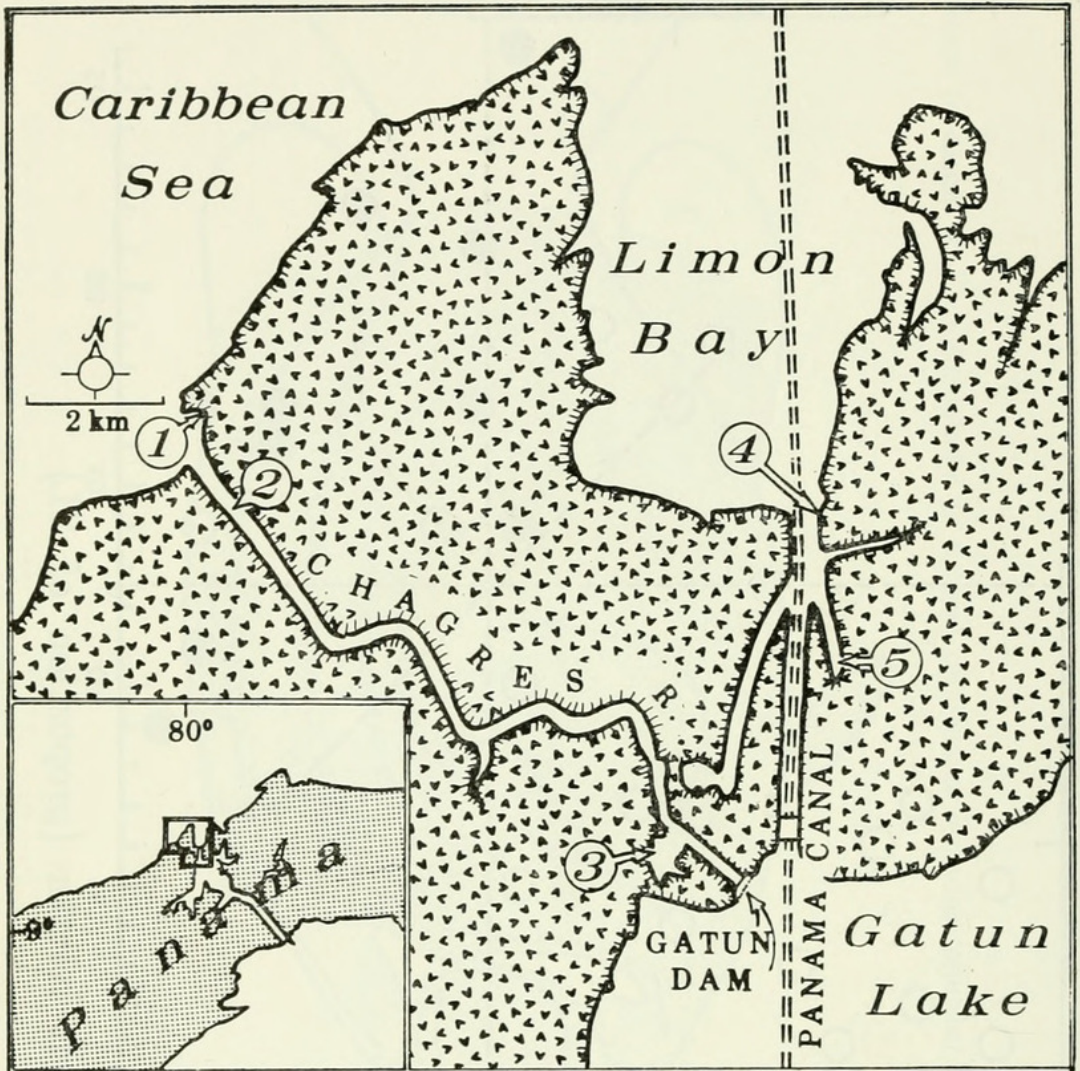


Figure 4. Panama collection localities: 1. Mouth of Chagres R., 2. Chagres R., 1/2 km from mouth, 3. Chagres R., Tarpon Club Boat Basin, 4. Panama Canal, Atlantic Mine Docks, 5. Panama Canal, Atlantic Third Locks.



Topp, R. W. 1970. "Redescription of *Pomacentrus otophorus* Poey 1860, a valid species from the Caribbean (Pisces: Pomacentridae)." *Breviora* 342, 1–16.

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