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Piabucina pleurotaenia Regan, a Synonym of *P. erythrinoides* Valenciennes (Pisces: Lebiasinidae); Its Distribution, Diet and Habitat in Lake Maracaibo Basin, Venezuela

DONALD C. TAPHORN AND CRAIG G. LILYESTROM

Based on meristic, morphometric, coloration and distributional data, arguments are presented to support placing *Piabucina pleurotaenia* in the synonomy of *P. erythrinoides* (the volador). The volador inhabits most of the clear upland streams of the Maracaibo Basin where it feeds primarily on insects, fish and some vegetable matter. Sexual dimorphism in body and fin size is pronounced, and males have a peculiar modification of the scales above the anal fin. The sensory pore system is well developed in this species. All Maracaibo Basin specimens have an adipose dorsal fin.

PIABUCINA and *Lebiasina*, the only genera of the tribe Lebiasinini (Weitzman, 1964) are distinguished from other characoids in having one row of tricuspid premaxillary teeth, two rows on the mandible (the outer tricuspid, inner conical), four branchiostegal rays and a well divided premaxillary bone with distinct upper and lower rami. Traditionally, *Lebiasina* has been distinguished from *Piabucina* by the absence of an adipose dorsal fin and a smooth (as opposed to cellular) anterior wall of the posterior air bladder (Weitzman, 1964). Dahl (1971) pointed out that because the adipose fin may be present or absent even within a species, its absence is not sufficient to justify generic distinction. We retain both generic names until detailed comparisons are made of the species involved.

The two nominal species treated here, *P. pleurotaenia* and *P. erythrinoides* (Fig. 1), were described originally from material collected in the Maracaibo Basin of Venezuela, and have been reported from Colombia and Guyana (Machado, 1974).

Schultz (1944) had no *Piabucina* from the Sierra de Perijá (type-locality of *P. erythrinoides*) and, therefore, could not compare that form with *P. pleurotaenia* (type-locality: state of Mérida, Río Chama drainage). He thus applied the latter name to all specimens examined. Fernández-Yepez and Martín (1953) identified their material from Perijá as *P. pleurotaenia.*

During the course of our survey of the fishes of Lake Maracaibo and the surrounding river systems, we examined specimens of *Piabucina* from many localities, including type-localities of *P. erythrinoides* and *P. pleurotaenia.* Based on our studies we conclude that a single species of *Piabucina* (*P. erythrinoides*) is present in the Maracaibo Basin.

METHODS AND MATERIALS

We examined nearly 400 specimens from 55 localities. The map of distribution (Fig. 2) is based mostly on material we collected, but also includes records of material from the Museo de Biología of the Universidad Central de Venezuela, Fishes (MBUCV-$\tilde{V}$); from the Museo de Historia Natural La Salle; and from sites listed by Schultz (1944). Our material is now in the collection of the Dirección de Investigación del Ambiente (DISCA), Maracaibo. Specimens examined are cataloged as follows—50, 61, 66, 67, 68, 75, 76, 77, 78, 79, 81, 108, 151, 153, 155, 162, 196, 198, 199, 203, 205, 208, 217, 218, 221, 224, 225, 227, 247, 248, 249, 280, 290, 324, 327, 328, 335-1, 335-2, 335-3, 335-4, 335-5, 337; MBUCV-$\tilde{V}$ nos.—2167, 2919, 2938, 2969, 2982, 9397; La Salle nos.—783, 784, 785, 790, 792, 794, 795, 799, 2257, 2410, 2412.

Measurements follow Hubbs and Lagler (1947) except as noted. Because the lower jaw figures prominently in the head profile, and head length was one of the principal characters used to distinguish the nominal species, we use in place of "tip of snout," tip of lower jaw. Because bones are not easily detectable, interorbital space includes the flesh between the eyes. Maximum height and width of spot at base of caudal fin were recorded, but found to be too variable within single populations to be useful taxonomically. Measurements were recorded to nearest 0.1 mm. Standard length (SL) is expressed in mm, other measurements as thousandths of SL.

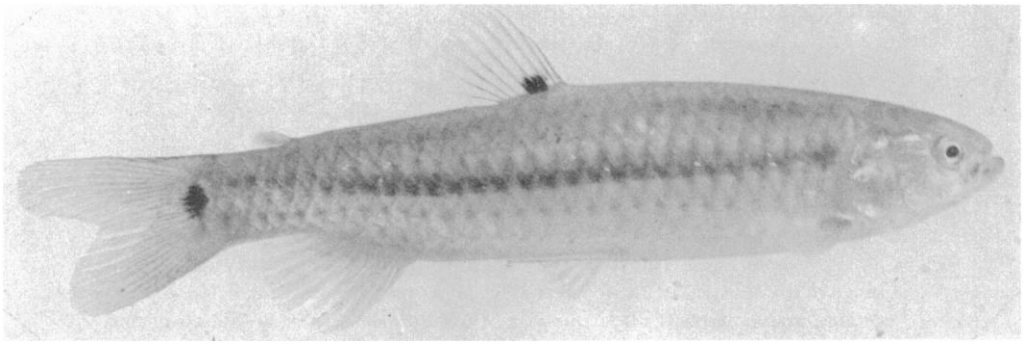

Fig. 1. Young specimen (95 mm SL) of *Piabucina erythrinoides* from Caño Azul, trib. of Rio de Oro, Catatumbo drainage, Sierra de Perijá, Venezuela.

Lateral scales were counted from junction of free margin of operculum with body to end of hypural plate (usually just anterior to caudal spot). Scales continuing beyond this point were recorded as caudal scales and were counted out along the central caudal-fin rays. Scales from between opercula on throat down venter to between pelvic fins are called abdominal scales. Transverse scales start at base of dorsal-fin origin and were counted in a zigzag fashion to pelvic-fin origin. Often, one scale was directly anterior to first pelvic ray and only half of it above origin of pelvic fin. Such a scale was recorded as ½. Caudal-peduncle scales were counted from scale on dorsal midline just behind posterior edge of adipose fin in a zigzag fashion around peduncle. All fin rays were counted separately, recorded as unbranched (i,ii) or as branched (1,2).

In the description of the sensory system we

TABLE 1. FREQUENCY DISTRIBUTIONS FOR COUNTS OF POPULATIONS OF *Piabucina erythrinoides* FROM MARACAIBO BASIN; N = 143.

Dorsal rays	i7	ii7	i8	iii7	ii8		
	2	6	1	5	129		
Anal rays	ii8	iii8	ii9	i10	iii9	ii10	
	6	1	116	4	13	3	
Pectoral rays	i11	i12	i13	i14	i15	i16	
	1	18	91	32	6	2	
Pelvic rays	i6	i7	i8				
	2	139	2				
Lateral scales	29	30	31	32	33	34	35
	1	4	27	53	39	14	5
Caudal-peduncle scales		11	12	13	14		
		4	56	39	44		
Predorsal scales		14	15	16			
		30	101	12			
Transverse scales		6½	7	7½	8	8½	
		3	1	69	18	52	
Abdominal scales		14	15	16	17	18	
		11	66	53	8	3	
Caudal scales	2	3	4	5	6	7	
	1	13	48	56	18	7	

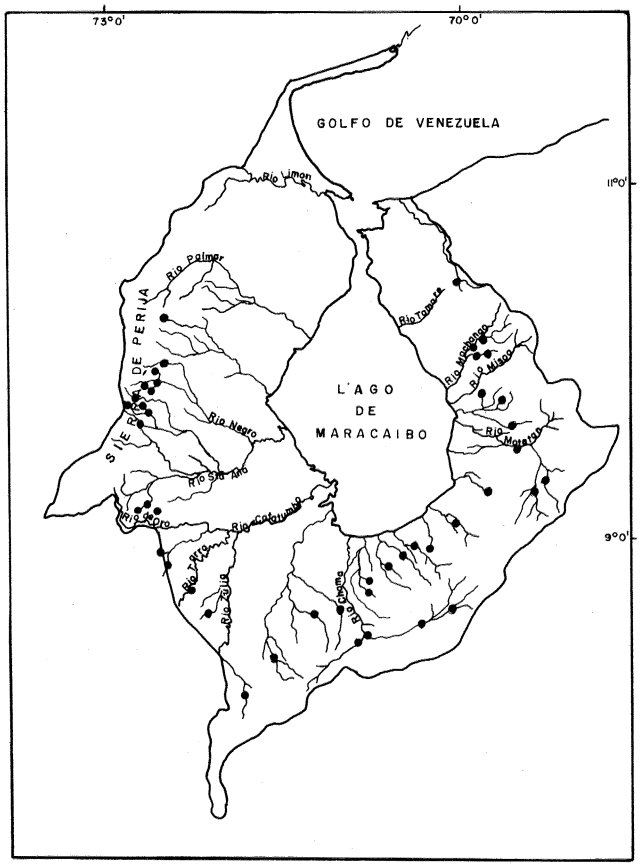

Fig. 2. Distribution of *P. erythrinoides* in Maracaibo Basin, Venezuela. Some sites in proximity plotted as one due to map scale.

refer to depressions with visible bottoms as "pits" and holes connecting to canals beneath the skin as "pores."

Individuals (usually <100 mm SL) for which sex could not be determined by gross examination of the gonads are considered juveniles.

Results and Discussion

Taxonomic comparison.—According to the original descriptions, major differences between *P. erythrinoides* and *P. pleurotaenia* are: a) number of lateral scales (37 vs. 31–32, respectively); b) transverse scales (9 vs. 7–7½); c) predorsal length (shorter in *P. erythrinoides*); and d) shape of caudal-peduncle spot (higher than wide vs. round). We cannot confirm any of these presumed differences and conclude that they most likely resulted from variations in methods of counting and measuring.

Valenciennes' (1849) count of 37 lateral scales differs from our modal count of 32, but he probably also enumerated caudal scales. If we add 5, our modal number of caudal scales, to our modal lateral-scale count we get 37. Regan (1903) counted lateral scales only to the end of the hypural plate, and his tally of 31–32 agrees with ours. Transverse-scale counts in one population (from a stream 5 km E of the Misión de Santa Rosa, Río Sta. Ana system, Sierra de Perijá) almost encompass the extremes given in both original descriptions (Table 1). Predorsal length, and thus dorsal fin position, are nearly identical in specimens from the two areas (Perijá $\bar{x}$: 54.8% SL, Mérida $\bar{x}$: 55.3% SL).

It is clear from our data that the two nominal species cannot be distinguished using characters in the original descriptions. Their identity is further substantiated by overall similarity in

TABLE 2. MORPHOMETRIC DATA FOR SPECIMENS OF *Piabucina erythrinoides* EXAMINED FROM MARACAIBO BASIN. $\bar{x}$ = mean, S = standard deviation, S/√N = standard error of mean, j = juvenile (N = 49), m = male (N = 29), f = female (N = 65); SL in mm, other measurements in thousandths of SL.

	$\bar{x}$	S	S/√N	Range
Standard length	108.7	42.7	3.57	22.2–96.9 j 176.2 m 234.5 f
Predorsal length	550	013	1.1	509–584
Prepelvic length	511	014	1.2	474–554
Head length	255	072	6.0	221–315
Maximum body depth	204	063	5.3	176–238
Least caudal-peduncle depth	106	001	0.1	090–123
Dorsal-fin base length	088	066	0.5	063–104
Anal-fin base length	107	011	0.9	089–127 j 105–142 m 080–127 f
Interorbital width	094	007	0.6	081–114
Eye diameter	049	012	1.0	031–085
Preorbital head length	073	006	0.5	060–087
Caudal-spot height	042	006	0.5	028–054
Caudal-spot width	036	005	0.4	025–052
Dorsal-fin length	186	020	1.7	142–236
Anal-fin length	190	017	1.4	168–243 j 184–244 m 159–212 f
Pectoral-fin length	164	015	1.3	128–208
Pelvic-fin length	135	009	0.8	115–162

counts, measurements (Tables 1, 2) and coloration (Schultz, 1944), as well as habitat (both nominal species inhabit cool mountain streams) and continuous distribution in the Maracaibo Basin (Fig. 2). (Localities in Fig. 2 south and east of Lake Maracaibo may seem to be in the lowlands, but actually, the mountains in those regions are closer to the lake. The elevations of these sites are similar to those in the Sierra de Perijá. Due to map scale, not every site could be plotted.) We thus conclude, that *Piabucina pleurotaenia* Regan, 1903, is a junior synonym of *Piabucina erythrinoides* Valenciennes, 1849.

Sexual dimorphism.—Sexual dimorphism is pronounced in lengths of anal fin and anal-fin base. Males average longer anal fins with longer bases than females (Table 2). These secondary sexual characters start to develop in juveniles at about 100 mm SL. Anal fins of adults and juveniles of both sexes have a well developed basal sheath of scales. Some males (breeding?) develop an unusual modification of the scales on side of body, dorsal to anal fin (Fig. 3), consisting of a row of some 7 scales which have their central portions raised to form a curved ridge. The function of these scales is unknown. We have seen a similar modification in males of an erythrinid, *Hoplerythrinus unitaeniatus,* from the Orinoco River Basin. We suspect that the modified scales of male *P. erythrinoides* serve some function in courtship or spawning, but note that Machado (1974) did not mention these scales in his description of prespawning behavior of *P. pleurotaenia* in aquaria.

There is also sexual dimorphism in that males are slimmer and do not grow as large (maximum SL in males 176 mm, females 234 mm). Males and females not in breeding condition are similar in color and pattern, but during the breeding season males have intensified colors as compared with females.

Allometric growth.—The eyes and fins of *P. erythrinoides* grow allometrically. Small specimens have proportionately larger eyes than larger specimens. Dorsal, anal, pectoral and pelvic fins also grow more slowly than the body as a whole; thus, care must be exercised in using those structures as taxonomic characters.

Sensory-pore system.—Sensory pit and pore system in *P. erythrinoides* extensive, with receptors widely distributed over body. Head system elaborate; series of pores extending from nostrils posteriorly along top of head on each side (Fig. 3). Below nostril, another series of pores extending down edge of maxillary. System of pores along margin of preopercle well developed and continuing along ventral surface of head to tip of chin. Series of sensory pits extending dorsally from head (between pores) to caudal fin. Sides of body with pits arranged in several short lines in part of each horizontal row of scales; abdomen with few scattered shallow pits. *P. erythrinoides* probably locates prey and avoids predators by using sensory pore systems.

Adipose fin.—Considerable significance has been attached to the presence or absence of the adipose fin in the genera *Piabucina* and *Lebiasina* (Eigenmann, 1923; Weitzman, 1964; Dahl, 1971). All specimens of *P. erythrinoides* from the Maracaibo Basin have an adipose dorsal fin.

Habitat.—At each collection site (list available from senior author), we recorded data that allow us to characterize, in a general way, the habitat of *P. erythrinoides.* This species was usually found in shaded upland tropical streams with clear clean water of fair to strong current; substrate of rock, pebbles or sand; temperature from 17.5 to 32.5 C ($\bar{x}$: 26 C); pH near 7; with no or sparse aquatic vegetation.

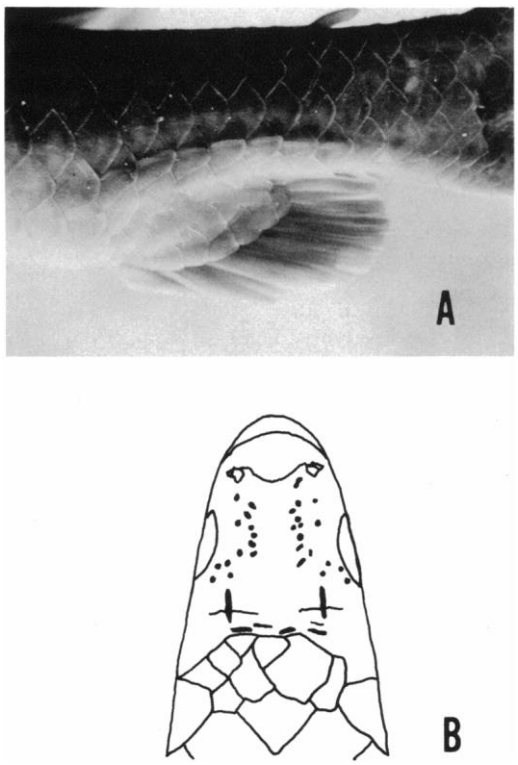

Fig. 3. A) Photograph of modified scales above anal fin of adult male *P. erythrinoides* (MBUCV-$\bar{V}$ 9397, 120 mm SL), upper Rio Zulia system. B) Diagrammatic sketch of top of head of adult *P. erythrinoides* showing sensory system.

Food.—Stomach contents of 20 specimens of *P. erythrinoides* from a tributary of the Río Sucumú in the Sierra de Perijá, collected 28 May 1974, were examined. This species is omnivorous, but prefers insects (found in 80% of specimens). The diet included Coleoptera, Hymenoptera (ants), adult Hemiptera (Nepidae and Belostomatidae), Odonata (naiads), adult and larval Diptera and other insects. We also found flesh and scales of fishes, fruits, algae and plant roots. Zaret and Rand (1971) characterized a similar species, *P. panamensis,* as a bottom feeder. Our results and field observations indicate that *P. erythrinoides* feeds, at least part of the time, at the surface. Ants and adult flies which fall occasionally on the water's surface were common in its diet. Bright spots on the dorsum of this species make field recognition easy. Small groups are frequently observed just under the surface, presumably seeking food. Insects tossed into the water are attacked at the surface. We have kept juveniles in large (2 kl) aquaria where they fed vigorously at the surface, but seldom followed food to the bottom. Fishes might learn to take floating food in aquaria, but it is most unlikely that they would ignore food on the bottom if they normally fed there. The extended lower jaw and superior mouth further indicate surface-feeding habits.

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