Roeboides ilseae, n. sp., a new scale-eating characid fish from Costa Rica*

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Abstract: A new endemic characid fish from the wet rainforest region of Southeastern Costa Rica is described from extensive material. *Roeboides ilseae* is distinctive in Central America for its large black humeral spot and exceptionally high lateral line scale count. The species replaces the wide ranging *Roeboides guatemalensis* in southern Costa Rica and is apparently nowhere sympatric with it. It is probable that the new form is a sister species of *Roeboides occidentalis* of central and eastern Panama which also replaces *Roeboides guatemalensis* in that country.

Fish collections made in the last 24 years in southeastern Costa Rica have added substantially to the Costa Rican ichthyofauna, although several species have yet to be formally reported. Among the species taken for the first time is a distinctive scale-eating characid of the genus *Roeboides* in which teeth with greatly hypertrophied bases project from the front of the jaws. Other species of this prong-toothed genus range from the Pacific slope of Mexico and both slopes of Central America to Río de la Plata in South America.

MATERIAL AND METHODS

Proportional measurements are given as percent of standard length (SL) in the text and Table 1. Anterior unbranched fin rays are indicated by small Roman numerals. The last anal ray is consistently divided to the base and counted as one ray. Most meristic counts presented in Table 1 are based on ten cleared and alizarin-stained specimens each of *Roeboides ilseae* n. sp. and *Roeboides occidentalis* Meek & Hildebrand.

All proportional measurements of each species are also based on ten specimens of each species. Counts of anal fin rays, total gill rakers and lateral line scales are based on 100 specimens of each species.

Type specimens are deposited at the Natural History Museum of Los Angeles County (LACM), Museo de Zoología, Universidad de Costa Rica (UCR), Museum of Zoology, University of Michigan (UMMZ) and the National Museum of Natural History (USNM).

Roeboides ilseae, new species
(Fig. 1)

Holotype: LACM 43754-1: an adult male 119.7 mm standard length, from a collection made in Quebrada Bonita (elevation 10 m) S of Damas and 9 km NW of Quepos (original collection number UCR 311-5) 18 January 1969, by W. Bussing, C. Mata, R. Nishimoto and J. Perry.

Paratypes: All collections were made in either San José or Puntarenas provinces, Pacific versant of Costa Rica. Abbreviations are spelled out when used for the first time. The elevation of each locality is given in meters (m). Distances are expressed in kilometers (km). Collections are listed by principal drainage basins; following the collection date is the number of specimens in parentheses, and size range in millimeters standard length (SL).

Independent drainages, Parrita-Quepos area: UCR 304-3: Tributary (15 m) of Río Jicote 0.5 km S of Loma on Puriscal-Parrita road, 16

*Contribución N° 69 del Museo de Zoología, Universidad de Costa Rica.

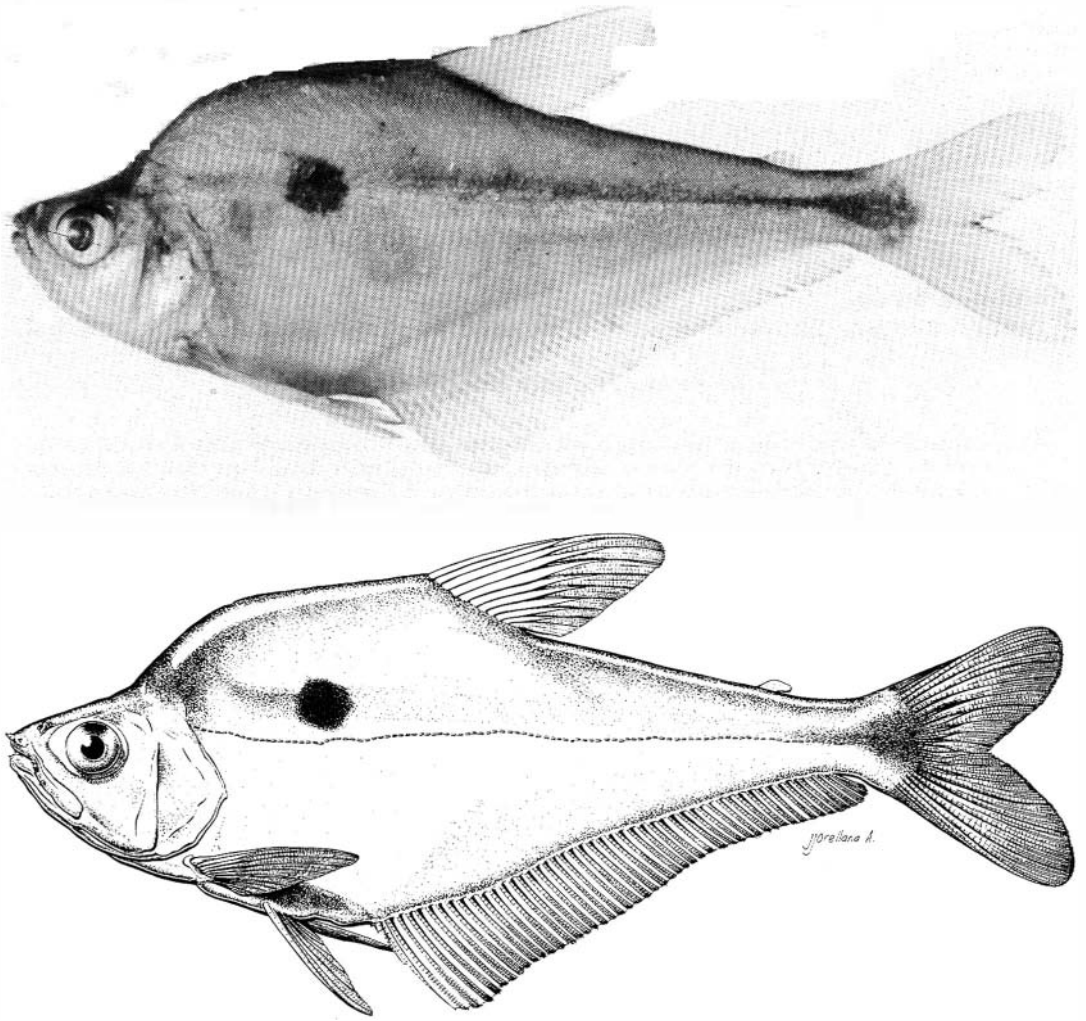

Fig. 1. *Roeboides ilseae,* new species, LACM 43754-1 adult male holotype 119.7 mm SL from Quebrada Bonita near Quepos, Costa Rica. A. Photograph of holotype; B. Drawing of holotype to point up certain details.

January 1969 (298, plus 15 cleared and stained specimens) 24.5-100.5 mm. LACM 43755-1: Same data as UCR 304-3 (10) 50.2-89.0 mm. UMMZ 212761: Same data as UCR 304-3 (20) 41.5-77.8 mm. USNM 268667: Same data as UCR 304-3 (20) 37.8-80.2 mm. UCR 306-9: Tributary (20 m) of Quebrada Visita ca. 4 km E of Esterillos on Loma-Esterillos road, 16 January 1969 (4) 39.5-79.0 mm. UCR 309-4: Drainage canal (20 m) tributary of Río Palo Seco, 4 km E of Parrita on Parrita-Quepos road, 17 January 1969 (6) 56.0-80.5 mm. UCR 1370-3: Same locality as UCR 309-4, 26 March 1982 (43) 20.5-57.0 mm. UCR 311-5: Same data as holtype (11) 49.5-117.5 mm.

Río Térraba Drainage: UCR 42-4: Quebrada Paja de Agua (610 m) 8 km S of San Isidro de El General, 29 July 1966 (1) 87.5 mm. UCR 393-2: Río Pedregoso (660 m) 3 km SW of San Isidro de El General on Dominical road, 3 February 1970 (2) 67.5-94.0 mm. UCR 593-9: Río Peje (560 m) 11 km S of San Isidro de El General at Interamerican Highway (IH), 8-24 May 1972 (1) 59.0 mm. LACM 2716: Same locality as UCR 593-9, 27 December 1961 (16) 22.0-41.0 mm. LACM 2938: Same locality as UCR 593-9, 16 July 1961 (26) 22.5-54.0 mm. LACM 2944: Same locality as 593-9, 18 July 1961 (9) 34.5-53.5 mm. LACM 2953: Same locality as UCR 593-9, 28 December 1961 (3)

TABLE 1

Meristics and proportions in percent of standard length of holotype and 10 paratypes of Roeboides ilseae *and 11 specimens of* R. occidentalis

	R. ilseae		*R.occidentalis***	
	Holotype	Paratypes*	1 specimen	10 specimens
Dorsal rays	ii,9	ii, 9	ii, 9	ii, 9
Anal rays	iv, 49	iv-v, 41-50	v, 44	iv-v, 42-47
Pectoral rays	i, 14	i-ii, 12-15	i, 14	i, 13-15
Pelvic rays	i, 7	i, 7	i, 7	i, 7
Caudal rays	10/9	9-10/9	10/9	10/9
Total gill rakers	21	16-21	19	18-21
Lateral line scales	100	83-104	75	71-83
Scales above lat. line	23	22-25	19	17-20
Scales below lat. line	24	23-25	22	19-22
Maxillary teeth	10	11-18	13	10-17
Large dentary teeth	5/6	5-9	5/6	5-9
Premaxillary teeth	7/6	7-10	8/8	7-11
Standard length (mm)	119.7	50.2-89.0	100.5	49.5-90.6
Head length	26.0	26.6-28.3	27.8	27.7-29.5
Orbit diameter	6.9	7.4-8.2	7.1	6.7-8.0
Snout length	7.4	7.4-8.0	7.9	8.0-9.1
Maxillary length	10.4	9.3-10.0	10.8	9.9-11.0
Bony interorbital	6.6	6.8-7.8	7.0	7.1-8.2
Greatest depth	38.4	38.6-43.1	38.8	36.9-40.4
Peduncle depth	8.4	8.3-8.7	9.1	8.8-9.6
Peduncle length	8.5	7.5-8.5	9.0	8.1-8.8
Predorsal distance	51.1	49.4-54.0	53.8	52.8-55.2
Preanal distance	46.5	47.1-50.2	50.0	47.0-50.1
Prepectoral distance	25.8	25.6-27.5	27.9	27.5-28.3
Prepelvic distance	34.3	35.3-36.3	36.4	35.5-38.0
Height dorsal fin	25.7	27.3-29.2	27.0	27.9-30.7
Height anal fin	15.5	15.1-18.5	15.1	15.7-18.2
Length pectoral fin	19.2	19.1-21.8	20.4	21.0-23.5
Length pelvic fin	16.0	18.9-21.7	16.9	17.6-19.7

* From station UCR 304-3
** From station UCR 454-4

TABLE 2

Frequency distribution of pored lateral line scales in the three species of Roeboides *in Central America*

	<71	71-75	76-80	81-85	86-90	91-95	96-100	>100
R. guatemalensis	1	50	151	71	8			
R. occidentalis		24	67	9				
R. ilseae				9	23	80	24	4

33.0-49.5 mm. LACM 2849: Tributary of Río General ca. 2 km S of San Isidro de El General, 12 July 1962 (23) 18.5-42-5 mm. LACM 4809: Río Ceibo (260 m) at IH, 6 km W of Buenos Aires turnoff, 8 January 1964 (1) 37.5 mm.

Río Sierpe Drainage: UCR 112-5: Tributary (20 m) of Río Sierpe at IH, 1 km SE of Venecia and 200 m SE of Río Salamá Nuevo, 5 January 1967 (15) 42.0-92.5 mm. UCR 114-8: Tributary (20 m) of Río Sierpe, 2 km SE of Palmar Sur at IH, 6 January 1967 (5) 49.0-92.5 mm. LACM 4857: Stream (20 m) ca. 2 km S of Palmar Sur, 4 January 1964 (1) 52.5 mm.

Comparative material: *Roeboides occidentalis* Meek & Hildebrand: UCR 451-3: Panamá, Coclé Province, tributary of Río Santa María on IH at El Roble junction, 27 January 1971 (38) 21.0-58.0 mm. UCR 452-13: Panamá, Veraguas Province, Río Santa Clara, 48 km W of Santiago at IH, 27 January 1971 (14) 30.5-58.5 mm. UCR 453-3: Panamá, Veraguas Province, stream 3 km W of Río San Pedro at IH, 27 January 1971 (3) 44.5-52.0 mm. UCR 454-4: Panamá, Canal Zone, stream at Fort Clayton, 31 January 1971 (106, plus 10 cleared and stained specimens) 42.5-102 mm.

Diagnosis: The species differs from all known congeners by the following combination of characteristics: 1) A large (eye size) black humeral spot, 2) 83 to 104 pored scales in the lateral line, 3) 41 to 50 branched anal fin rays.

In Middle America it can be distinguished from *Roeboides guatemalensis* (Günther) by having a large humeral spot and a higher lateral line scale count (83-104 vs. 70-88). *Roeboides ilseae* differs from *R. occidentalis* which has a similar humeral spot, by having a higher lateral line scale count (83-104 vs. 71-83) and a shorter pectoral fin (19.1-21.8 vs. 20.4-23.5 percent of SL). *Roeboides microlepis* Reinhardt from the Orinoco and Amazon drainages also has a large spot and high lateral line scale count (about 110), but a considerably higher anal ray count of 60 (probably total) fin rays, whereas *R. ilseae* has 41-50 branched rays and 45-54 total fin ray elements.

Description: Body deep and angular, laterally compressed. Greatest body depth 38.4-43.1 percent of standard length. Predorsal profile concave at nape in specimens larger than 40 mm; profile convex between nape and dorsal fin origin; profile abruptly angular at dorsal fin origin. Post dorsal profile straight. Ventral profile rounded anteriorly, straight along anal fin base. Least depth of caudal peduncle 8.3-8.7; peduncle length from end of anal fin base to middle caudal base 7.5-8.5.

Head length 26.0-28.3. Eyes large, horizontal orbit diameter 6.9-8.2. Least width of bony interorbital 6.6-7.8. Snout length about the same as orbit diameter, 7.4-8.0. Maxillary long, forming a slight angle with premaxillary when mouth closed and reaching nearly to a vertical through middle of eye; length from angle with premaxillary to postero-ventral end, 9.3-10.4.

Maxillary teeth conical, arranged uniserially along proximal three quarters of free border; starting at angle with premaxillary, four to seven small slender teeth followed by seven to eleven stouter, wide-based teeth, the proximal two or three of which are enlarged and directed laterally in adult specimens; total tooth count on one side of ten cleared and stained specimens, 11-18. Premaxillary teeth in two imperfect series; middle teeth enlarged and weakly tricuspid, smaller lateral teeth slender, conical; total tooth count 6-10 teeth on each side; two larger tooth-like prongs projecting forward on each side of upper jaw at margin of lip. Dentary teeth uniserial; middle teeth enlarged and weakly tricuspid, 5-9 teeth on each side; lateral teeth slender and conical, 10-13 on each side; one large external tooth-like prong on each side of dentary. No teeth on vomer, palatines or pterygoids.

Cranial fontanel long and narrow, nearly closed in large adults. Gill rakers long, upper limb with 6-8 rakers; lower limb with 9-13 rakers; total rakers 16-21 including rudiments.

Scales minute, non-deciduous. Lateral line complete, 83-104 perforated scales. Specimens in northern part of range usually with 90-99 scales; material from the Río Grande de Térraba drainage usually have 83-91 scales. Scales above lateral line 22-25; scales below lateral line 23-25.

Origin of dorsal fin anterior to midpoint of standard length, with 2 undivided and 9 branched rays in all specimens; origin slightly anterior to analfin insertion. Predorsal distance 49.4-54.0. Height of dorsal fin from fin origin to tip of longest ray 25.7-29.2.

Anal fin usually with 5 (sometimes 4) undivided rays anteriorly and 41-50 branched rays, the last of which divided to the base. Anal fin origin anterior to dorsal fin origin. Preanal distance 46.5-50.2. Dorsally recurved hooks present on mature males; on posterior unbranched ray and on posterior branches of branched rays on anterior third or half of anal fin. Usually one hook pair per fin segment.

Pectoral fins low on body, usually with one (rarely two) unbranched rays and 12-15 branched rays. Prepectoral distance 25.6-27.5. Tips of fins reaching just past anus or sometimes to origin of anal fin. Length of pectoral fin from fin origin to tip of longest ray 19.1-21.8.

Pelvic fin with one conspicuous unbranched ray with a separate short splint joined to its anterior margin and 7 branched rays in all specimens. Prepelvic distance 34.3-36.3. Tips of pelvic fins reaching posterior to origin of anal fin. Length of pelvic fin from fin origin to tip of longest ray 16.1-21.7. Hooks present on ventral surface of several rays.

Caudal fin with 10/9 principal caudal rays (17 branched rays); one specimen with 9/9. Precaudal vertebrae 14; caudal vertebrae including hypural complex 22-23, usually 23. Total vertebrae 36-37, usually 37.

Coloration in life: Silvery with a greenish cast on sides, head and belly in reflected light, posterior half of body translucent in transmitted light. Dark lateral band, humeral and caudal spots apparent in life as darkened regions overlaid by silvery guanine pigment. Lateral band extending between head and caudal base above lateral line. Back tan with silvery highlights in reflected light. Darker pigmentation along entire dorsal midline and upper edge of eye. All fins pale orange or yellowish; first dorsal ray and borders of dorsal, anal and caudal fins dusky.

Coloration in alcohol: Ground color yellow-tan. Dorsum, upper head and upper fifth of eye dark brown. A diffuse plumbous band less than eye's diameter in width, extending between upper margin of opercle and caudal base. A black humeral spot equidistant between nape and dorsal fin origin; about eye's diameter in width, circular, irregular or roughly rectangular in shape. A black triangular marking on base of caudal peduncle, the apex continuing anteriorly into lateral band. Fins dusky especially along margins.

Etymology: The species in named for my daughter Ilse, who has accompanied us on numerous collecting trips and assisted in the collection and sorting of specimens.

Ecology: *Roeboides ilseae* is most abundant in streams of moderate size between 10 and 660 meters above sea level. The species was collected in standing waters as well as streams of slow to moderate current velocity in temperatures between 28 and 30°C.

Nearly all of the 14 specimens examined contained fish scales of other species. Some large specimens contained only scales, the smaller specimens usually had ingested crustaceans or larval insects as well. Roberts (1970) reported on similar scale-eating habits of other Neotropical characoids including four species of *Roeboides* from Central and South America.

Mature males collected during the dry season from December to March reveal poorly developed or reduced hooks on the anal and pelvic fins. Breeding males with well developed hooks were collected in July during the rainy season.

Geographic distribution: *Roeboides ilseae* is known only from southeastern Costa Rica on the Pacific slope. Specimens were collected in drainages from just south of Punta Mala (Punta Judas) to the Río Grande de Térraba and Río Sierpe drainage basins. The species is not sympatric with *R. guatemalensis* which occurs just to the north and to the south in the Río Coto drainage of Costa Rica and in western Panama. *Roeboides occidentalis* likewise replaces *R. guatemalensis* in central and eastern Panama.

REMARKS

The total of endemic southeastern Costa Rican fishes now comes to eleven species. On the basis of the overall similarity between *R. ilseae* and *R. occidentalis* and the proximity of their respective populations, it is probable that they are sister species who shared a common ancestor in the not too distant past. Seven other genera (*Bryconamericus, Hyphessobrycon, Piabucina, Nannorhamdia, Pterobrycon, Rivulus* and *Poecilia*) have similar discontinuous distribution patterns in which a species from each genus or species complex is

absent from the Pacific versant of western Panama, but represented by species both to the north and south. Bussing (1974) suggested that xeric climate and a reduction in the area of the Isthmus during interglacial times may have contributed to the extinction of some fish populations in this region.

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RESUMEN

Se describe un nuevo pez carácido del Pacífico Sur de Costa Rica, con base en numerosos ejemplares colectados en toda esa zona. Esta nueva especie endémica, *Roeboides ilseae,* se distingue de sus congéneres en Centroamérica por su mancha humeral grande y por el alto número de escamas en la línea lateral. *Roeboides guatemalensis,* de amplia distribución en Centroamérica, se reemplaza por *R. ilseae* en el sur de Costa Rica y aparentemente las dos formas no son simpátricas en ninguna parte. Es probable que la especie nueva sea una especie hermana de *R. occidentalis* de Panamá central y oriental.

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