

Rivulus gransabanae, a new species of killifish from Venezuela (Cyprinodontiformes: Rivulidae)

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Rivulus gransabanae, new species, is often the only fish species present in small upper tributaries of the Mazaruni (Essequibo) and Caroní (Orinoco) rivers in the Gran Sabana, Bolívar, Venezuela. It is a small, plain, non-annual species which differs from all known species of *Rivulus* by the extreme elongation of the dorsal and anal fins in dominant males. Females do not have a rivulus spot.

Se describe una nueva especie, *Rivulus gransabanae*, proveniente de pequeños afluentes de los ríos Caroní (Orinoco) y Mazaruni (Essequibo), en la Gran Sabana, Guayana Venezolana. Es una pequeña especie sin un patrón de coloración llamativo, que difiere de las otras especies del género por el marcado alargamiento de la aleta dorsal y anal en machos. Las hembras de esta especie no tienen la típica mancha peduncular presente en otras especies de *Rivulus*.

Introduction

The Gran Sabana of Venezuela (Fig. 1) includes approximately 96,000 km² of the Guyana Shield. Some 20,000 km² are below 500 m elevation, 50,000 km² are between 500 and 1,000 m, 20,000 km² are between 1,000 and 1,500 m, and only 6,000 km² are higher (Galán, 1984). The typical Gran Sabana landscape is an undulating high altitude savanna, from 800 to 1,300 m elevation (Huber, 1986). Most of the area is in the upper Caroní River basin. The principle sources of that river arise in the extreme southeast of the Gran Sabana and drain Roraima (2723 m), Kukenan (2700 m) Yuruaní (2450 m) and Ilú (2650 m) te-

puis. A small portion of the northeastern Gran Sabana is drained to the Essequibo River by tributaries of the Mazaruni River. There is evidence that stream captures have occurred in this area and in many areas water current patterns run contrary to the underlying rock structures (López et al., 1942).

The fish fauna of the Gran Sabana, some 52 species, is naturally depauperate (Lasso, in press). The small *Rivulus* species described herein occurs in both Caroní and Mazaruni drainages, in blackwater and clearwater alike. In small streams, it is often the numerically dominant fish species.

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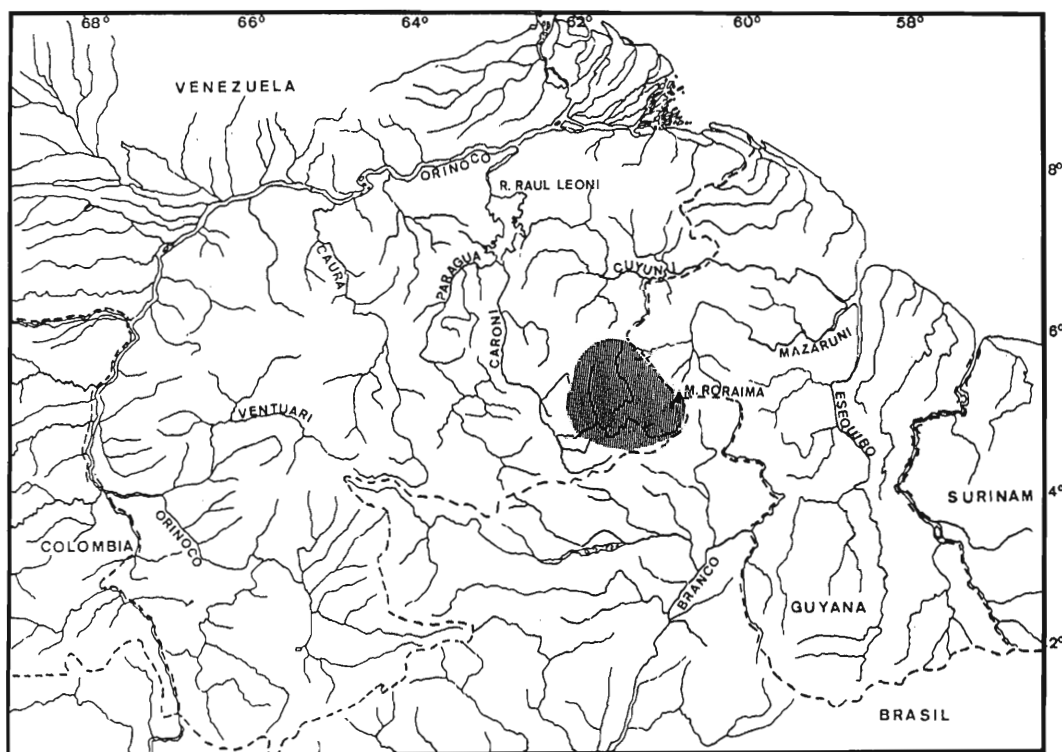


Fig. 1. Location of the Gran Sabana, Bolívar State, Venezuela.

Methods

Measurements were made with Helios dial calipers, and follow Hoedeman (1959), with the exception that head depth (HD) was measured at the posterior margin of the preopercle, and body depth (BD) was measured at the anal-fin origin. Measurements not taken by Hoedeman include orbit diameter (OD). Ratios are expressed in thousandths so that the reader can reconstruct measurements to the precision with which we recorded them. Fin ray counts were made on preserved specimens using a dissecting microscope with light transmitted through the fins, and include all discernible fin rays. Color descriptions are based on field notes, photographs, and observation of live fish in the aquarium. Institutional abbreviations follow Leviton et al. (1985) with the exception of MHNLS for the Museo de Historia Natural La Salle, Caracas, to reflect current institutional practice.

Rivulus gransabanae, new species (Figs. 2-3)

Holotype. MHNLS 3883, male, 30.6 mm; Quebrada Pacheco, a small creek located between the Tuperere River II and San Ignacio Yuruaní on the road from Kamá to San Ignacio Yuruaní; Gran Sabana, Bolívar State, 17 August 1984; collectors: J. Salcedo, B. Haiek.

Paratypes. MBUCV 13768, male, 29.1 mm; Chirimatá, 28 III 1983, G. Pereira & A. Paolillo. - MBUCV 17444, 1 male, 3 females, 22.0-28.3 mm; small creek between Río Tuperere I and Río Kamá, 23 III 1986, C. Lasso. - CVULA 5614, 2 males, 33.6 & 34.1 mm; Luepa, 10 III 1983, J. Pefaur. - MHNLS 5182, 3 males, 28.1-28.9 mm; Río Tuperere II, 18 IX 1987, C. Lasso. - MHNLS 5184, 2 males & 2 females, 22.5 to 33.4 mm; small creek 37 km S of Río Anauaic, 17 IX 1987, C. Lasso. - MHNLS 4594, 1 female, 23.1 mm; small

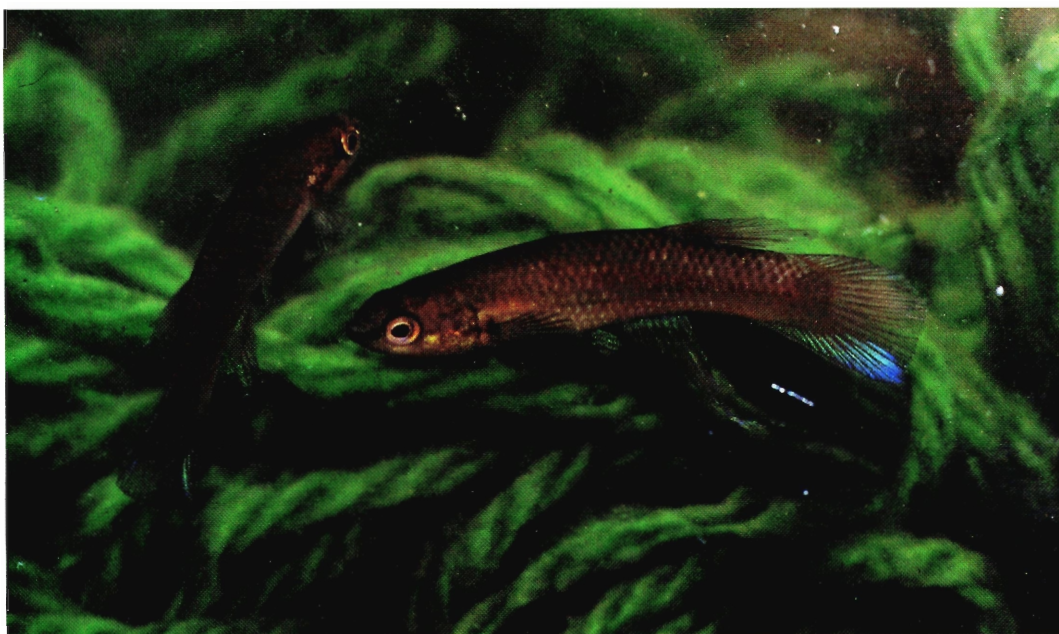


Fig. 2. *Rivulus gransabanae*, male, paratype, about 32 mm SL, from MCNG 21351.

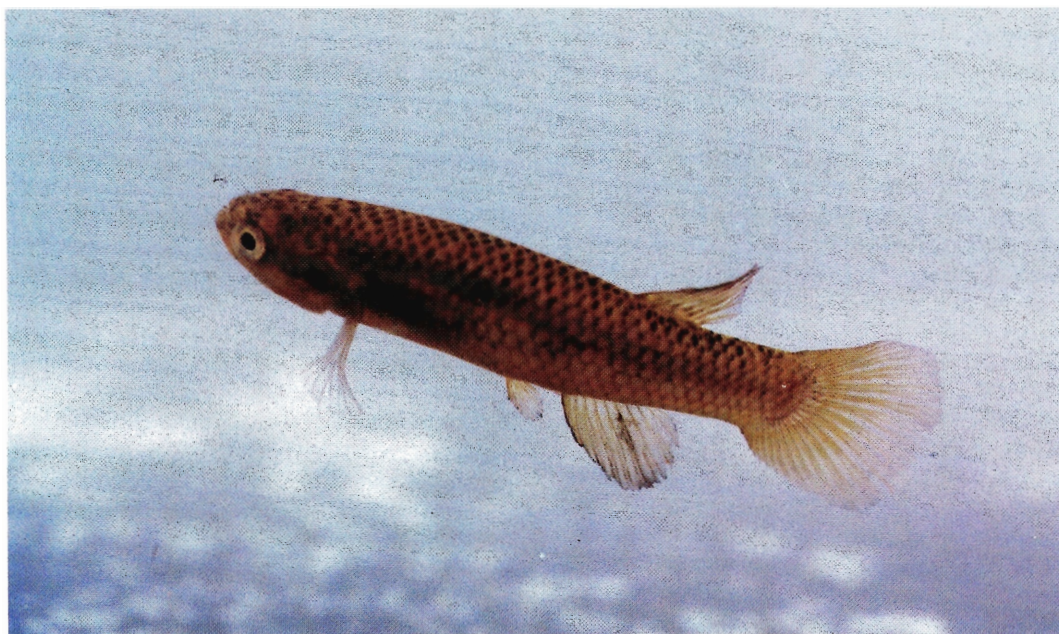


Fig. 3. *Rivulus gransabanae*, female, paratype, about 28 mm SL, from MCNG 21349.

creek between Rio Tuperere I and Kama, 23 III 1986, C. Lasso. - MHNLS 5182, 1 female, 32.6 mm; Rio Tuperere II, 18 IX 1987. - MCNG 16293,

14, 18.3-28.9mm, WC 85-6, road to Sta. Elena, Gran Sabana, 24 II 1985. - MCNG 18990 24, 13.8-21.2mm, km 149, blackwater creek in sight of

Table 1. Proportional measurements for holotype and 37 paratypes of *Rivulus gransabanae*.

Character	Holotype	max	(avg)	min	max	(avg)	min
sex	male		males			females	
SL/mm	30.6	34.1	29.8	25.4	37.0	30.2	22.0
TL/SL	1.252	1.273	1.250	1.235	1.297	1.231	1.169
PDL/SL	0.672	0.700	0.682	0.646	0.711	0.681	0.645
PAL/SL	0.595	0.648	0.625	0.569	0.655	0.617	0.572
HL/SL	0.275	0.298	0.274	0.250	0.293	0.261	0.235
P1L/SL	0.183	0.199	0.189	0.157	0.202	0.178	0.142
P2L/SL	0.089	0.116	0.092	0.080	0.105	0.088	0.068
DB/SL	0.111	0.125	0.101	0.089	0.117	0.101	0.084
DL/SL	0.297	0.375	0.282	0.240	0.266	0.240	0.211
AB/SL	0.160	0.167	0.145	0.117	0.161	0.135	0.113
AL/SL	0.353	0.384	0.294	0.249	0.273	0.251	0.210
BD/SL	0.222	0.246	0.203	0.187	0.239	0.203	0.187
CPD/SL	0.157	0.168	0.150	0.134	0.153	0.140	0.120
OD/HL	0.075	0.397	0.347	0.250	0.388	0.366	0.284
HW/HL	0.607	0.721	0.683	0.620	0.804	0.725	0.696
HD/HL	0.655	0.662	0.636	0.606	0.667	0.646	0.614

Guardia tower, 25 VII 88, 5°50'N 61°27'W, trib. to Rio Apongua, LN88-7, JET 88-6, J. Thomerson, L. Nico, E. Hoigne, E. Sutton. - MCNG 18993, 30, 13.9-29.3 mm, km 171, blackwater creek, 5°22'N 61°11'W, trib. to Rio Apongua, 25 VII 88, LN 88-8, JET 88-7, J. Thomerson, L. Nico, E. Hoigne, E. Sutton.- MCNG 19007, 29, 12.9-24.9 mm, creek about 22 km S of turn off to Whao-Whao, 5°00'N 61°10'W, 26 VII 88, LN 88-13, JET 88-8, J. Thomerson, L. Nico, E. Hoigne, E. Sutton. - MCNG 19008, 44, 17.4-30.2 mm, Rio Tuperere at 41 km S of turn-off to Kavanayen, 5°32'N 61°18'W, 26 VIII 1988, LN 88-14, JET 88-9, J. Thomerson, L. Nico, E. Hoigne, E. Sutton. - MCNG 21349, 12, 25.3-34.2mm, small creek 33 km south of Salto El Kama, 5°10'N 61°04'W, 21 VII 1989, DCT 89-44, D, Taphorn, J. Thomerson, Luis Balbás. - MCNG 21351, 9, 14.2-32.5 mm; small creek 15 km S Salto El Kama, 5°19'N 61°09'W, 21 VII 1989, DCT 89-46, D, Taphorn, J. Thomerson, Luis Balbás. - MCNG 21353, 21, 10.2-25.3 mm, same as MCNG 18990, 21 VII 1989, DCT 89-45, D, Taphorn, J. Thomerson, Luis Balbás. FMNH 101112, 10, 15.7-24.8mm, same data as MCNG 21353.

Diagnosis. Differs from all known species of *Rivulus* Poey, 1860 by the exceptional elongation, in many males, of the dorsal and anal fins (calling to mind those of *Terranatos* Taphorn & Thomerson 1978), which in most highly developed individuals extend near the distal edge of the caudal fin. Most like *R. lyricauda* Thomerson, Berken-

kamp & Taphorn, 1991, which also occurs in the Caroní basin, but differs in more subdued coloration and the shape of the caudal fin, which though distally truncated in males, is not known to develop elongated rays to form the points of a lyretail. Caudal peduncle depth greater; average values for *R. gransabanae* are similar to maximum values for *R. lyricauda*.

Description. A small species of *Rivulus*; both sexes become sexually mature by 25 mm SL. Eggs are approximately 1.7 mm diameter and show normal development without diapauses. Morphometric values for the holotype along with ranges and averages of values for holotype and 37 paratypes are given in Table 1. Great development of the dorsal and anal fins in males is reflected in the higher dorsal-fin length and anal-fin length ratios for males. Males have slightly elongated caudal and pelvic fins in comparison to females, but both sexes have short, rounded pectoral fins. Meristic values for the holotype are indicated with *; number of individuals with each value is given in parenthesis after the value: lateral scales 30(3), 31(9), 32(15)*, 33(8), 34 (3) plus 2 or 3 scales on the caudal fin; predorsal scales 18(1), 19(18), 20(13), 21(6)*, 22(2); transverse scales 9(25)*, 10(3); dorsal-fin rays 7(1), 8(8), 9(27)*, 10(1), 11(1); anal-fin rays 9(1), 10(6), 11(23), 12(6)*, 13(2); pectoral-fin rays 12(2), 13(13), 14(16)*, 15(7); left pelvic-fin rays 6(17), 7(21)*.



Fig. 5. *Rivulus gransabanae* collecting site DCT 89-44, a clear-water stream.

gransabanae. In addition to the *R. gransabanae* collections reported here, two other species are known from the upper Cuyuni and Mazaruni drainages in Venezuela. *Rivulus immaculatus* Thomerson, Nico & Taphorn, 1991 occurs in the rugged La Escalera area just north of the Gran Sabana, and *R. deltaphilus* is known from just south of Km 88 (MCNG 16645) on the main highway into the Gran Sabana, and is widely distributed in the lower part of the Venezuelan Cuyuni basin.

Relationships of *R. gransabanae* to other species of *Rivulus* are obscure. It is not particularly similar to any of the species previously reported from the Essequibo (Eigenmann, 1912; Myers, 1924; Thomerson, Nico & Taphorn, 1991) nor to *R. deltaphilus*. It shares perhaps superficial similarities of small size, relatively large eggs, general body morphology, and lack of a rivulus spot with *R. lyri-cauda*, but does not show any trace of the dark lateral stripe exhibited by excited *R. lyri-cauda*. Head scale patterns are somewhat irregular but seem to include subequal numbers of individuals with $d - d$ and $e - e$ scales uppermost.

Reproduction is non-annual. In the aquarium, eggs were laid in floating spawning mops. These eggs, incubated on damp peat in a petri dish, develop to hatching in about 15 days with no sign of diapause. During much of embryonic development, in addition to the usual melanophores, *R. gransabanae* eggs contain several unique large pigment cells that look like splotches of gold metal and cover a large portion of the yolk and developing embryo. One wild-caught female had five mature eggs.

Rivulus gransabanae occurs in both blackwater and clearwater streams. It is often the only fish present, or there may also be a few individuals of *Lebiasina* sp., which we suspect prey on *R. gransabanae*. In blackwater streams it was usually associated with aquatic vegetation and plant debris. In clearwater streams, it was usually in backwaters and other low current areas (Fig. 5). It also occurs in flooded areas among savanna vegetation, and in small crystal-clear rivulets meandering through areas of sparsely vegetated white sand. Even though clear water streams and blackwater streams of the area look quite diffe-

rent, both had pH values from 4.5 to 5.0, and Total Dissolved Solid values from 0 to 10 ppm. Temperatures at time of collection ranged from 22 to 24.5° C.

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