

Rivulus albae, a new species of killifish (Teleostei: Cyprinodontiformes: Rivulidae) from northeastern Brazil

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> Abstract

Rivulus albae, new species, from northeastern Brazil, is described. It is a member of the subgenus *Melanorivulus* and distinguished from all other species of this assemblage having brown oblique bars on the entire flank often form chevron-like marks with a posterior vertex and differs from *R. decoratus* by having less scales on lateral series and more branchiostegal and anal fin rays.

> Resumo

Rivulus albae, uma nova espécie é descrita da região norte do Brasil. É um membro do subgênero *Melanorivulus* e se distingue das demais espécies deste clado por possuir barras marrons oblíquas no flanco, frequentemente em forma de divisas com o vértice posterior. Difere de *Rivulus decoratus* por ter menos escamas em séries laterais, mais raios branquiostegal e mais raios na nadadeira anal.

> Key words

Killifish, Rivulidae, *Rivulus*, *Melanorivulus*, new species, Taxonomy, Brazil.

Introduction

The killifish genus *Rivulus* constitutes the most speciose and geographically widespread assemblage of aplocheiloid fishes. It is widely distributed in both Middle and South America, where it occurs from Mexico and the Caribbean islands to Argentina. According to COSTA (2006) the subgenus *Melanorivulus*, a well supported monophyletic clade endemic to central South America, is diagnosed by an osteological feature (dorsal portion of preopercle short and pointed) and three derived color patterns (melanophores concentrated on opercular region form oblique stripes; females with melanophores concentrated on margins of unpaired and pelvic fins and with black spot on upper portion of caudal-fin base not close to fin margin).

Melanorivulus includes 33 valid species (COSTA, 2010). The species known so far occur in the rivers south of the main channel of the Amazon River. The new species (belonging to this subgenus) described here is from Amapá and hence the first one collected north of the Amazon River.

Materials and Methods

Measurements and counts were taken as described in AMIET (1987), HUBER (1992) and VALDESALICI (2010). Measurements were made with a digital calli-



Fig. 1. *Rivulus albae*, adult male from the type locality.



Fig. 2. *Rivulus albae*, male just collected from Tartaruga Grande drainage.

per under a dissecting microscope and rounded to the nearest 0.1 mm.

Nine measurements are presented as percentages of standard length (SL), except for eye diameter and snout length, which are given as a percentage of head length (HL). Terminology for the cephalic neuromast series follows COSTA (2001), for the frontal squamation as described in HOEDEMAN (1958). Osteological preparations (cleared & stained, C&S) were made according to TAYLOR & VAN DYKE (1985).

Type specimens and additional material are deposited in the following institutions: Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo, Brazil; Museum für Tierkunde, (MTD), Dresden, Germany; Museo Civico di Storia Naturale “Giacomo Doria” (MSNG), Genova, Italy.

Rivulus albae new species

Fig. 1; Table 1

Rivulus spec. “Savanne” HESSFELD & BITTER 1998

Holotype. MZUSP 108783, male, 15.4 mm SL; Brazil: Estado de Amapá: Lago Comprido floodplains: Poço Bacabae, 01° 44.270' N, 50° 50.904' W, altitude 8 m, 28th July 2007, José Ramón García Gil.

Paratypes. MZUSP 108784, female, 21.2 mm SL; MTD 32342, 1 male 12.5 mm SL; MTD F 32343, 1 female, 15.9 mm SL; MSNG 56259a+b, 1 male, 13.6 mm SL & 1 female, 15.6 mm SL; MSNG 56259c–d, 1 male 13.0 mm & 1 female 14.6 mm SL (C&S); all collected with holotype.

Diagnosis

Rivulus albae is a member of the subgenus *Melanorivulus* by having all the subgeneric synapomorphic features: dorsal portion of preopercle short and pointed, melanophores concentrated on opercular region to

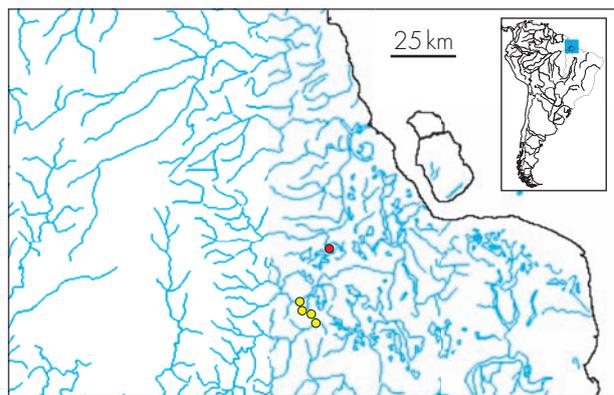


Fig. 3. Collecting sites of *Rivulus albae* (dark circle: type locality).

form oblique stripes, females with melanophores concentrated on margins of unpaired fins and with a black spot on upper portion of caudal-fin base not close to fin margin in females.

It is similar to *Rivulus decoratus* and distinguished from all other species of *Melanorivulus* by brown oblique bars on the entire flank, which on the dorsal portion of the flank often form chevron-like marks with a posterior vertex (vs. chevron-like pattern with vertex pointing anteriorly when present). It differs from *R. decoratus* by the possession of 6 branchiostegal rays (versus 5), 13 anal fin rays (versus 10–11) and 24–26 scales on lateral series (versus 25–28).

Description

For morphometric data see Table 1. Largest male examined 15.4 mm SL; largest female examined 21.2 mm SL. Dorsal profile slightly convex from snout to posterior end of dorsal-fin base, about straight to slightly concave on caudal peduncle. Ventral profile weakly convex from lower jaw to anal-fin origin, approximately straight or slightly concave to end of caudal peduncle. Body slender, cylindrical, greatest body depth at midlength between pectoral-fin base and anal-

Table 1. Morphometric data of *Rivulus albae*. All measurements are presented as percentages of standard length, except eye diameter and snout length as percentages of head length, standard length in mm. Excluded C&S specimens.

	Holotype	All males (n = 4)	Females (n = 3)
Standard length	15.4	12.5–15.4	15.6–21.2
Depth at pelvic fins	16.2	15.2–16.2	16.0–17.0
Predorsal length	75.9	75.9–80.0	76.7–78.7
Preanal length	62.3	61.6–66.1	60.8–67.9
Prepelvic length	48.7	32.8–58.8	48.1–54.0
Caudal peduncle length	21.4	19.8–21.4	18.8–22.4
Caudal peduncle depth	11	11.0–12.0	11.3–11.9
Head length	28.5	28.5–30.4	21.2–27.5
Snout length	27.2	23.0–28.9	20.0–23.2
Eye diameter	34.0	34.0–41.0	30.0–34.8

fin origin. Snout short, rounded. Dorsal and anal fins rounded, without filaments in both sexes. Pectoral fin rounded, its posterior margin reaching about 65% of distance between pectoral-fin base and anal-fin origin. Pelvic fin small, elliptical tip reaching the anus. Caudal fin elliptical. Dorsal-fin origin in vertical through base of 7th or 8th anal-fin ray, between neural spines of vertebrae 18 and 19. Anal-fin origin between pleural ribs of vertebrae 12 and 13. Dorsal-fin rays 6–7; anal-fin rays 13; caudal-fin rays 24–26; pectoral-fin rays 13; pelvic-fin rays 6. Scales large, cycloid. Body and head entirely scaled. No scales on dorsal- and anal-fin bases. Frontal squamation F-patterned. Longitudinal series of scales 24–26. No contact organs on fin rays. Cephalic neuromasts: supraorbital 3+3. Lateral line interrupted. Six branchiostegal rays. Second pharyngo-branchial with one tooth. Gill-rakers on first branchial arch 1+6. Vomerine teeth 2–3. Total vertebrae 30.

Colouration. Males (Fig. 1). Body side light metallic greenish to light greenish blue, yellow greenish on dorsolateral portion of body between postorbital region and anterior portion of flank; wide brown to grey oblique bars on entire flank, often forming chevron-like marks; black melanophores irregularly extending between postorbital and humeral regions and forming irregular oblique stripes. Dorsum dark yellow. Venter white. Ventral part of head white. Upper jaw yellow greenish, lower jaw dark brown to black. Iris pale yellow to light brown. Dorsal fin pale yellow with 3 oblique reddish to dark brown stripes, its margin dark grey to black.

Anal fin pale yellow, base whitish to light blue, with 4 oblique brownish bars. Caudal fin pale yellow to greenish with 5 to 6 narrow brownish to red bars crossing fin except on dorsal and ventral portion, margin dark grey to black. Pectoral fin yellowish to



Fig. 4. *Rivulus albae*, type locality: Brazil: Amapa: Lago Comprido floodplains, Pozo Bacabae.

hyaline. **Females:** Body side light metallic greenish, pale brownish on dorsolateral portion of body between postorbital region and anterior portion of flank; wide brown oblique bars on entire flank, which often form chevron-like marks; black melanophores forming oblique stripes irregularly extending between postorbital and humeral regions. Dorsum brownish. Venter white. Opercular region greenish. Ventral part of head white. Upper jaw light brown, lower jaw dark brown. Iris pale yellow to light brown. Dorsal fin pale yellow with 3 oblique reddish gray stripes, its margin dark gray to black. Anal fin pale yellow, base whitish, with short oblique brownish bars on posterior portion, distal margin dark gray to black. Caudal fin pale yellow to greenish with 5 narrow brownish bars; margin dark grey to black; on dorsal portion of caudal-fin base a small, vertically elongate, dark grey spot, dorsally margined by short yellow zone. Pectoral fin yellowish to hyaline.

Distribution (Fig. 3). *Rivulus albae* is known only from few localities belonging to Comprido Lake and Tartaruga Grande River (Amapa state, northeastern Brazil) at an altitude up to about 50 meter above sea level.

Habitat notes (Fig. 4). *Rivulus albae* was collected in the transition areas between savannah and forests near to the banks of clear and transparent large water bodies, lakes and lagoons with a dense underwater vegetation. At the type locality the water temperature was about 38 °C at 12:00 a.m. The water was acidic (between pH 6 and 6.5), with a very low conductivity (about 30 microsiemens/cm). A *Fluviophylax* species was caught together with *R. albae* at all collecting sites. Additionally, in some localities *Copella arnoldi*, *Hoplias malabaricus*, and *Nannostomus* species were caught.

Etymology. Named in honor of ALBA GARCÍA, the daughter of the second author.

Discussion

South America is composed of several well defined geological units. The oldest are the Brazilian Shield and the Guyana Shield, which both own different rivulids faunas (COSTA, 1998; HRBEK & LARSON, 1999). All the *Melanorivulus* species described so far are limited to the river basins draining the Brazilian Shield. *Rivulus albae*, however, was collected on the Guiana Shield, i. e. north of the Amazon River, where a member of *Melanorivulus* has not been expected.

Another group of minute rivulids, the members of the subgenus *Anablespoides* (COSTA, 2006; HUBER, 1992), inhabits the Amazon basin. *Rivulus albae* has a similar banding colouration as known for the species of *Anablespoides*. But it is readily distinguished from this assemblage by the possession of the following characters: rostral cartilage elongated (vs. rounded), absence of external medial teeth laterally displaced of premaxilla and dentary (vs. presence), elliptical caudal fin (vs. acuminate), H-scale with two margins covered (vs. H-scale with all margins free), males without transverse stripe through chin (vs. present), females with black spot on dorsal portion of caudal-fin (vs. without).

Field observation in the habitats of Amazonian species of *Rivulus* revealed that different lineages have distinct habitat preferences, thus suggesting divergent specializations during the evolution of the groups. Species of *Melanorivulus*, including *R. albae*, are found in sunny creeks in savanna-like environments (COSTA, 2006; SCHINDLER & ETZEL, 2008).

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