

## *Rivulus unaensis*, a new aplocheiloid killifish of the subgenus *Atlantirivulus* from eastern Brazil (Cyprinodontiformes: Rivulidae)

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*Rivulus unaensis*, new species, from Una, Bahia, eastern Brazil, is described. It is similar and possibly closely related to *R. depressus* by both possessing few mandibular neuromasts and the anterior portion of the trunk wider than deep. It differs from *R. depressus* in having fewer caudal-fin rays, fewer scales in the longitudinal series and more pelvic-fin rays.

*Rivulus unaensis*, sp. n., de Una, Bahia, leste do Brasil, é descrita. Ela se assemelha e é possivelmente mais estreitamente aparentada a *R. depressus* pelas duas possuírem poucos neuromastos mandibulares e a porção anterior do tronco mais largo que alto. Ela difere de *R. depressus* por possuir menos raios na nadadeira caudal, menos escamas na série longitudinal e mais raios na nadadeira pélvica.

### Introduction

*Rivulus* is a speciose assemblage of small killifishes containing over 125 species inhabiting shallow streams and swamps of most river basins between southern Mexico and southern Brazil (e.g., Costa, 2008a). *Rivulus* is not diagnosable by unique morphological features (Costa, 2006) and possibly constitutes a paraphyletic assemblage (e.g., Murphy et al., 1999). As a consequence of the poor generic delimitation, *Rivulus* has been divided into a series of well-supported species assemblages (e.g., Huber, 1992; Costa, 1998), often formally recognized as subgenera (e.g., Costa, 2006).

*Atlantirivulus* was recently established (Costa, 2008b) to comprise a monophyletic group of spe-

cies formerly known as *R. santensis* superspecies (Huber, 1992) or *R. janeiroensis* species group (Costa, 1998). The assemblage was first diagnosed by Costa & Brasil (1991) by the unique morphology of the angulo-articular, in which there is a recurved ventral process (vs. straight in all other rivulids). A second unique derived condition for the group, consisting of an elaborate series of neuromasts around the orbit (the infra-orbital series according to Costa, 2001), was described by Costa (2007a). In all species of *Atlantirivulus* the infra-orbital neuromasts are numerous and arranged in a zigzag pattern (Costa, 2007a, 2008b), a condition not occurring in other aplocheiloid fishes. *Atlantirivulus* presently includes nine valid species: *R. depressus*, *R. haraldioli*, *R. janeiroensis*, *R. jurubatibensis*, *R. lazzarotoi*, *R. luelingi*,

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*R. nudiventris*, *R. santensis* and *R. simplicis* (Köhler, 1906; Berkenkamp, 1984; Seegers, 1984; Costa, 1991, 2003, 2007a-b, 2008c; Costa & Brasil, 1991). A new species of *Atlantirivulus* from the coastal plains of southern Bahia state, eastern Brazil, is described.

### Material and methods

Measurements and counts follow Costa (1995). Measurements are presented as percent of standard length (SL), except for those related to head morphology, which are expressed as percent of head length. Fin-ray counts include all elements. Number of vertebrae, gill-rakers, and caudal-fin rays were recorded only from cleared and stained specimens; the compound caudal centrum was counted as a single element. Osteological preparations were made according to Taylor & Van Dyke (1985). Terminology for frontal squamation follows Hoedeman (1958) and for cephalic neuromast series Costa (2001). Material is deposited in the ichthyological collection of the Instituto de Biologia, Universidade Federal do Rio de Janeiro, Rio de Janeiro (UFRJ).

### *Rivulus unaensis*, new species

(Fig. 1)

**Holotype.** UFRJ 6595, male, 25.2 mm SL; Brazil: Estado da Bahia: Município de Una: stream within forest northwest of Una, 15°10'48"S 39°10'48"W, altitude about 100 m; A. C. De Luca, 2007.

**Paratypes.** UFRJ 6596, 1 male, 25.8 mm SL, 4 females, 16.1-26.9 mm SL; UFRJ 6597, 2 males, 22.1-30.0 mm SL, 1 female, 22.1 mm SL (c&s); collected with holotype.

**Diagnosis.** *Rivulus unaensis* is similar to *R. depressus* and distinguished from the remaining species of *Atlantirivulus* by having fewer neuromasts in the mandibular series (3+1 in *R. unaensis* and *R. depressus*, vs. 3+2 in *R. luelingi* and 4+2 in the remaining species of *Atlantirivulus*) and the anterior portion of the trunk wider than deep (vs. deeper than wide). *Rivulus unaensis* differs from *R. depressus* in having fewer caudal-fin rays (24-25 vs. 27-28), fewer scales in the longitudinal series (31-32 vs. 33-34) and more pelvic-fin rays (6 vs. 4-5). *Rivulus unaensis* differs from all other species of *Atlantirivulus* in having a narrower basihyal (basihyal width about 30 % of basihyal length vs. 45-60 %).

**Description.** Morphometric data appear in Table 1. Largest male examined 30.0 mm SL; largest female examined 26.9 mm SL. Dorsal profile gently convex from snout to end of dorsal-fin base, approximately straight on caudal peduncle. Ventral profile weakly convex from lower jaw to end of anal-fin base, about straight on caudal peduncle. Body slender, subcylindrical anteriorly, wider than deep, to compressed posteriorly. Greatest body depth at vertical through pelvic-fin base. Jaws short, snout rounded.

Extremity of dorsal and anal fins rounded. Caudal fin elliptical. Pectoral fin rounded, posterior margin reaching vertical at about 90 % of length between pectoral-fin and pelvic-fin bases. Pelvic fin small, elliptical, tip reaching urogenital papilla in males and anus in females. Pelvic-fin bases medially in close proximity. Dorsal-fin origin on vertical between base of 10th and 11th anal-fin rays, between neural spines of 20th and 22nd vertebrae. Anal-fin origin between pleural ribs of 14th and 15th vertebrae. Dorsal-fin rays 7-9; anal-fin rays 13-14; caudal-fin rays 24-25; pectoral-fin rays 14-15; pelvic-fin rays 6.

Table 1. Morphometric data of *Rivulus unaensis*.

	holotype	paratypes	
	UFRJ 6595	(UFRJ 6596)	
	male	male	females
		(n=1)	(n=2)
Standard length (mm)	25.2	25.8	21.4-26.9
<b>Percent of standard length</b>			
Body depth	19.6	20.3	18.8-19.4
Caudal peduncle depth	12.8	12.8	12.1-12.7
Predorsal length	77.0	76.0	77.3-77.7
Prepelvic length	56.0	53.0	54.1-55.5
Length of dorsal-fin base	9.7	9.6	8.6-8.9
Length of anal-fin base	19.6	21.0	18.3-18.8
Caudal-fin length	40.1	36.5	36.6-40.6
Pectoral-fin length	21.4	22.4	21.1-21.9
Pelvic-fin length	8.8	7.7	7.4-8.0
Head length	27.6	26.9	26.6-27.1
<b>Percent of head length</b>			
Head depth	59.9	62.5	60.9-62.7
Head width	73.8	75.8	76.6-78.5
Snout length	12.8	13.3	12.1-13.4
Lower jaw length	20.0	20.0	16.7-18.3
Eye diameter	32.8	35.9	36.0-36.6





Fig. 1. *Rivulus unaensis*, UFRJ 6595, holotype, male, 25.2 mm SL; Brazil: Bahia: Una.

Scales large, cycloid. Trunk and head entirely scaled, except anterior ventral surface of head. Body squamation extending over anterior 25 % of caudal fin; no scales on dorsal and anal-fin bases. Frontal squamation E-patterned; E-scales not overlapping medially; scales arranged in regular circular pattern around A-scale without exposed margins; anterior portion of G-scale overlapping H-scale; transverse row of scales anterior to H-scale. Five supraorbital scales. Longitudinal series of scales 31-32; transverse series of scales 7; scale rows around caudal peduncle 16. Minute contact organ in each scale of middle part of flank in males. No contact organs on fins.

Cephalic neuromasts: supraorbital 3+3, parietal 1, anterior rostral 1, posterior rostral 1, infraorbital 1+16-18+1, preorbital 2, otic 1, postotic 1, supratemporal 1, median opercular 1, ventral opercular 1, preopercular 2+4, mandibular 3+1, lateral mandibular 1, paramandibular 1. Lateral line interrupted, alternating sets of 3-4 scales without neuromasts and one with one neuromast. Two neuromasts on caudal-fin base.

Basihyal subtriangular, slender, greatest width about 30 % of length; basihyal cartilage about 30 % of total length of basihyal. Six branchiostegal rays. One or two teeth on second pharyngobranchial. Gill-rakers on first branchial arch 1+9. Vomerine teeth 2-3. Dermosphenotic present. Ventral process of posttemporal absent. Total vertebrae 32.

**Coloration.** Live colors unknown; the following description is based on preserved specimens only. Side of body brown, with almost inconspicuous vertically elongate brown marks. Dorsum brown. Venter light gray. Side of head and jaws brown, to light gray below orbit. Ventral portion of head light gray, with dark brown pigment concen-

trated on chin and sensory-lateral zone of mandibular and anterior portion of preopercular regions. Dorsal fin hyaline with dark brown reticulation in males, hyaline with dark brown transverse stripes in females. Anal fin brown in males, hyaline in females. Caudal fin brown in males, hyaline with transverse series of horizontally elongate spots in females; small rounded black spot on dorsal portion of fin base in females. Pectoral fin hyaline. Pelvic fin hyaline with brown lateral margin in males, hyaline in females.

**Distribution and habitat.** *Rivulus unaensis* is known only from the type locality, a clear water small stream within forest, northwest of Una, Bahia, eastern Brazil. The stream was about 100 cm wide and 30 cm deep, with sandy bottom covered by litter. The stream is part of the Una River basin, a small, isolated coastal river basin.

**Etymology.** The name *unaensis* is a reference to the occurrence of the new species near Una, a well preserved area of Atlantic forest in eastern Brazil.

## Discussion

*Rivulus unaensis* is possibly closely related to *R. depressus*. Both species share two derived conditions not occurring in other species of *Atlantirivulus*: posterior section of mandibular neuromasts with a single neuromast (vs. two) and anterior portion of the trunk wider than deep (vs. deep than wider). One derived feature is uniquely found in *R. unaensis* among species of *Atlantirivulus*, thus considered as an autapomorphy: a narrow basihyal (basihyal width about 30 % of basihyal length vs. 45-60 %).

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