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A NEW SPECIES OF THE GENUS *RIVULUS* POEY, 1860
FROM THE PARNAIBA RIVER BASIN, NORTHEASTERN BRAZIL
(TELEOSTEI, CYPRINODONTIFORMES, RIVULIDAE)¹

(With 3 figures)

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ABSTRACT: *Rivulus parnaibensis* sp.nov. is described from a shallow lagoon in the upper Parnaíba river basin, northeastern Brazil. It is considered to be a member of the clade denominated *R. punctatus* species group based on the possession of an apomorphic shape of first epibranchial and a derived color pattern of female unpaired fins. It seems to be more closely related to *R. zygometes*, with which it shares two derived color patterns. The hypothesized close relationships between *R. parnaibensis* sp. nov. and *R. zygometes* suggest historical biogeographic affinities between southern Amazonian tributaries and the Parnaíba river.

Key words: Teleostei; Cyprinodontiformes; Rivulidae; *Rivulus parnaibensis* sp.nov.; Parnaíba river; Taxonomy.

RESUMO: Uma nova espécie do gênero *Rivulus* Poey, 1860 da Bacia do rio Parnaíba, nordeste do Brasil (Teleostei, Cyprinodontiformes, Rivulidae)

Rivulus parnaibensis sp.nov., coletada numa lagoa rasa na bacia do alto rio Parnaíba, nordeste do Brasil, é descrita e considerada membro do clado denominado grupo de espécies *R. punctatus*, com base na posse de uma forma apomórfica de primeiro epibrânquial e de padrão de colorido derivado de nadadeiras ímpares da fêmea. Parece mais estreitamente aparentada a *R. zygometes*, com a qual compartilha dois padrões de colorido derivados. A hipótese de estreitas relações entre *R. parnaibensis* sp.nov. e *R. zygometes* sugere afinidades biogeográficas históricas entre tributários sul-amazônicos e o rio Parnaíba.

Palavras-chave: Teleostei; Cyprinodontiformes; Rivulidae; *Rivulus parnaibensis* sp.nov.; Rio Parnaíba; Taxonomia.

INTRODUCTION

Rivulus Poey, 1860 constitutes the most diversified genus of neotropical aplocheiloids, comprising over 80 valid species (COSTA, 1998). Although extremely speciose in the Amazonian lowlands and river basins draining the Guianan Shield, with a total of about 45 valid species, only six species were recognized as valid in the recent revision

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of the only clade inhabiting central South America, known as *R. punctatus* species group (COSTA, 1995a): *R. punctatus* Boulenger, 1895, from the Paraguay-lower Paraná-Uruguay river system, *R. zygonectes* Myers, 1927, from the Tapajós, Xingu and Tocantins river basins, *R. pictus* Costa, 1989, from the upper Paraná river basin, *R. modestus* Costa, 1991, from the upper Tapajós river basin, *R. violaceus* Costa, 1991, from the upper Mortes river basin, and *R. decoratus* Costa, 1989, from the São Francisco river basin (COSTA, 1995a). In the present paper, a new species belonging to the *R. punctatus* group, from the Parnaíba river basin, is described.

MATERIAL AND METHODS

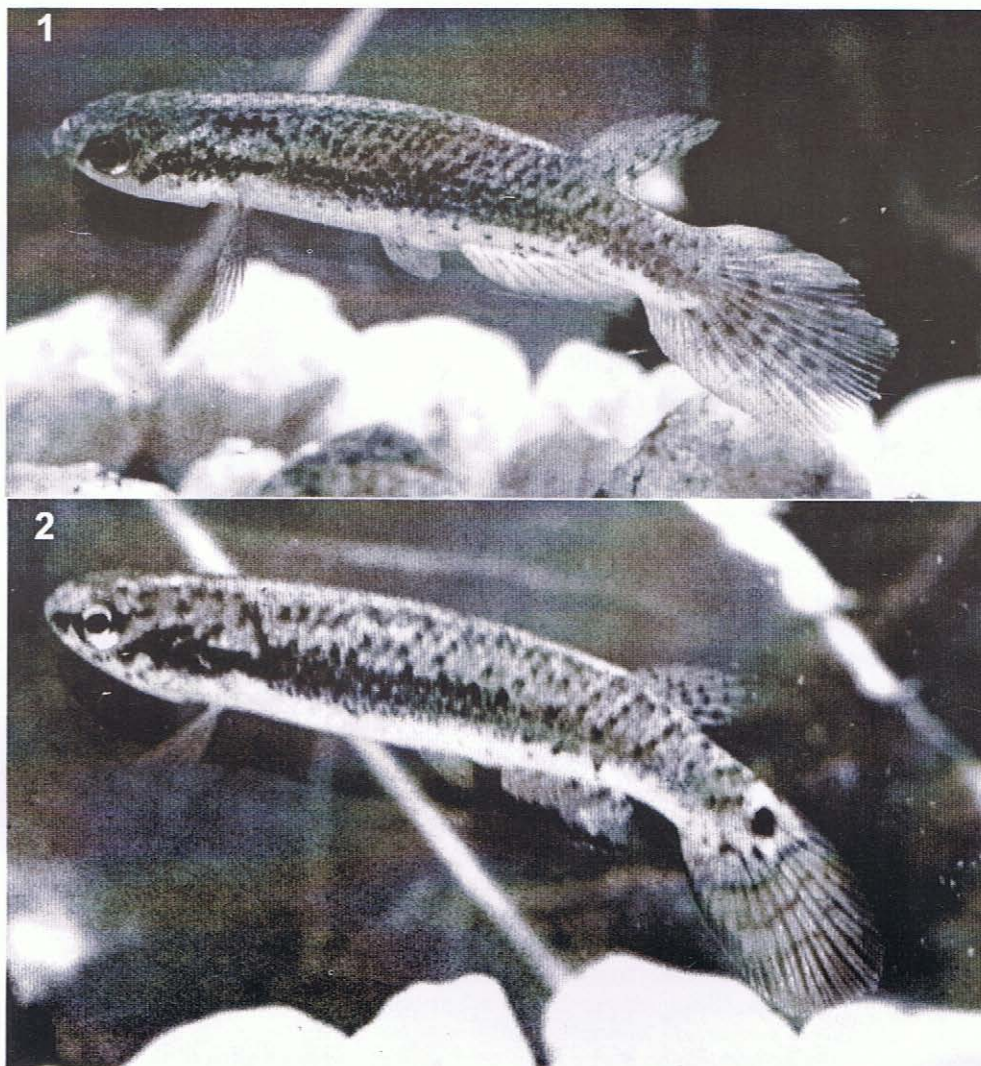
Measurements and counts are made according to COSTA (1995b), except body depth measured just posteriorly to pelvic-fin base; measurements are presented as percentages of standard length (SL), except parts of head, expressed as percentages of head length. Counts of pectoral, pelvic and caudal fin-rays, vertebrae, vomerine teeth, gill-rakers, and branchiostegal rays were made only on cleared and counterstained specimens (c&s) prepared according to TAYLOR & VAN DYKE (1985). In vertebral counts, the compound caudal centrum was counted as a single element. Osteological features presented in the description are those considered phylogenetically informative for *Rivulus* as discussed by COSTA (1998). Terminology for frontal squamation pattern is according to HOEDEMAN (1958), and for cephalic neuromasts is according to COSTA (2001). Comparative material is listed in COSTA (1995a, 1998). Institutional abbreviations are: MCP, Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, and UFRJ, Universidade Federal do Rio de Janeiro, Rio de Janeiro.

Rivulus parnaibensis sp.nov. (Figs.1-2)

Holotype – BRAZIL: PIAUÍ: lagoon close to the road BR-135, 18km NE of São Dimas, Parnaíba river basin (about 9°40'S, 45°00'W), MCP 29639, ♂, 19.0mm SL; W.J.E.M.Costa, F.Pupo, E.Araujo e A.C.Bacellar colls., 8/V/1999.

Paratypes – Same data as holotype: UFRJ 4962, 13♂, 16.3-27.3mm SL, and 12♀, 15.6-26.2mm SL; UFRJ 5449, 2♂, 22.1-22.9mm SL, and 2♀, 22.1-23.3mm SL (c&s); MCP 29640, 2♂, 19.7-23.3mm SL, and 3♀, 20.8-22.0mm SL.

Diagnosis – Similar to *R. punctatus*, *R. zygonectes*, *R. pictus*, *R. modestus*, *R. violaceus*, and *R. decoratus*, which comprise the *R. punctatus* species group, and distinguished from all other species of the genus by having first epibranchial strongly bent, forming angle of approximately 90° (*vs.* straight to slightly bent), and unpaired fins of female with dark gray to black borders. Similar to *R. zygonectes* and distinguished from the remaining species of the *R. punctatus* species group by having a dark gray stripe between eye and caudal-fin base and a yellow stripe along dorsal and ventral margins of male caudal fin (*vs.* never these color patterns). Differs from *R. zygonectes* by having fewer scales on the longitudinal series (32-33 *vs.* 35-38), and red spots on male caudal fin (*vs.* caudal fin pink to orange without spots).



Rivulus parnaibensis sp.nov., fig.1- MCP 29639, ♂, holotype, 27.1mm SL; Fig.2- UFRJ 4962, ♀, paratype, 26.2 mm SL.

Description – Morphometric data of holotype and nine paratypes are given in table 1. Male larger than female, largest male 27.3mm SL. Dorsal profile slightly convex between snout and dorsal-fin base end, approximately straight on caudal peduncle. Ventral profile slightly convex from lower jaw to end of anal-fin base, nearly straight on caudal peduncle. Body slender, subcylindrical, body depth approximately 1.1

times body width. Greatest body depth on vertical through pelvic-fin base. Jaws short, snout blunt.

Tip of dorsal and anal fins rounded. Caudal fin elliptical. Pectoral fin elliptical, its tip reaching a point anterior to pelvic-fin base. Pelvic fin short, its tip reaching between base of first and third anal-fin rays, and anus in female. Dorsal-fin origin in a vertical between base of ninth and tenth anal-fin rays. Dorsal-fin rays 9-10, anal-fin rays 13-14, caudal-fin rays 28-31, pelvic-fin rays 7, pectoral-fin rays 13.

Scales large, cycloid. Body and head entirely scaled, except on chin. Scales restricted to caudal-fin base; no scales on dorsal and anal fins. Frontal squamation F-patterned, scales arranged circularly around A-scale. Longitudinal series of scales 32-33, transverse series of scales 8, scale rows around caudal peduncle 16. Contact organs absent. Supraorbital neuromasts 3+3.

TABLE 1

Morphometric data of *Rivulus parnaibensis* sp.nov.

	H		Paratypes - UFRJ 4962							
	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
SL (mm)	27.1	27.3	26.1	23.3	22.6	26.2	25.6	25.2	23.1	22.7
In percents of standard length										
Body depth	22.2	20.9	22.0	22.4	21.8	21.8	23.0	21.0	22.4	22.7
Caudal peduncle depth	14.4	13.6	13.9	14.4	14.1	13.6	13.4	13.7	12.8	14.1
Predorsal length	74.5	77.8	78.8	77.5	77.0	79.2	76.9	79.5	78.9	78.6
Prepelvic length	53.1	53.0	55.0	53.6	53.8	57.4	54.9	56.4	55.8	55.5
Length of dorsal-fin base	9.9	10.8	10.7	11.9	11.2	9.5	10.9	10.9	11.3	9.7
Length of anal-fin base	19.3	20.9	21.4	21.8	19.0	17.8	19.6	19.0	19.9	17.8
Caudal-fin length	40.0	39.1	37.5	38.2	40.4	37.8	37.7	39.5	37.2	39.0
Pectoral-fin length	21.8	20.8	20.7	20.3	21.1	21.0	20.5	20.9	20.5	20.1
Pelvic-fin length	15.1	13.1	12.7	12.3	13.4	10.8	10.1	11.0	10.6	11.5
Head length	26.5	26.4	27.1	26.7	26.3	25.6	26.4	27.2	25.6	27.0
Head depth	17.2	16.7	17.4	17.6	17.6	18.2	17.9	17.2	17.2	17.7
Head width	19.4	19.8	20.3	20.6	20.1	19.6	21.5	20.0	20.6	20.6
In percents of head length										
Snout length	14.6	15.8	14.3	14.6	15.1	15.2	15.6	14.5	14.7	14.2
Lower jaw length	22.0	21.9	21.2	22.6	21.0	21.9	21.3	21.2	22.9	19.4
Eye diameter	32.2	30.7	32.2	34.2	34.4	34.6	32.3	32.5	36.9	32.6

(H) holotype - MCP 29639, (SL) standard length.

Rostral cartilage broad, its width about 80% of length. Basihyal subtriangular, its greatest width about 45% of length; basihyal cartilage moderate, about 25% of total basihyal length. Six branchiostegal rays. No teeth on second pharyngobranchial. First epibranchial bent, forming angle of about 90°. Medial surface of first hypobranchial with minute median gap separating cartilage. Gill-rakers of first branchial arch 1+7. One or two vomerine teeth. Interhyal not ossified. Ventral process of posttemporal absent. Dorsal-fin origin between neural spines of vertebrae 18-20. Dorsal and ventral hypural plates separated by interspace. Epipleural ribs not bifid. Total vertebrae 30-31.

Coloration in life – Male: Side of body pale brown with oblique rows of small red spots; dark gray stripe between eye and caudal-fin base; lateroventral portion of body below stripe white. Dorsal portion of head pale brown; lower jaw dark gray. Iris pale yellow. Dorsal and anal fins yellow with short, oblique red stripes along base and posterior region of fins. Caudal fin pale yellow with red spots; bright yellow stripe along dorsal and other along ventral margin of fin. Pectoral fin hyaline. Pelvic fin pale yellow with red dots on fin base.

♀ : Side of body pale brown with oblique rows of small reddish brown spots; dark gray stripe between eye and caudal-fin base; lateroventral portion of body below stripe white. Dorsal portion of head pale brown; lower jaw dark gray. Iris pale yellow. Dorsal and anal fins yellowish white with reddish brown dots on base and posterior region of fins, and a dark gray distal stripe. Caudal fin yellowish white with three to five dark gray bars; a dark gray stripe along entire fin edge; a black round spot on the upper portion of caudal-fin base. Pectoral fin hyaline. Pelvic fin pale yellow with gray tip.

Distribution – Known only from the type locality, a shallow lagoon near São Dimas, Gurguéia river drainage, upper Parnaíba river basin, southern State of Piauí, northeastern Brazil (Fig.3).

Etymology – The name *parnaibensis* is an allusion to the occurrence of the new species in the Parnaíba river basin, which is unique for the genus. An adjective.

DISCUSSION

Rivulus parnaibensis sp.nov. is hypothesized to be a member of the clade *R. punctatus* species group, as defined by COSTA (1995a, 1998). The new species possesses the two diagnostic apomorphic conditions for the clade: the L-shaped first epibranchial and the unique color pattern of unpaired fins of female, consisting of dark gray bars and dark gray borders deeply contrasting with white color ground. Among species of this clade, *R. parnaibensis* sp.nov. seems to be more closely related to *R. zygometes*, both sharing a dark median stripe along flank and yellow dorsal and ventral borders of male caudal fin. These two color patterns are not found among species of the *R. punctatus* group nor among species of the *R. geayi* group, which is the putative sister group to the former clade (COSTA, 1995a). *Rivulus zygometes* is widespread along the middle section of southern Amazonian tributaries between Tapajós and Tocantins rivers, central Brazil (Fig.3). The herein hypothesized close relationships between *R. zygometes* and *R. parnaibensis* sp.nov., the latter constituting the only species of *Rivulus* endemic to the Parnaíba river basin, suggests historical biogeographic relationships between southern Amazonian tributaries and the Parnaíba river.



Fig.3- Geographic distribution of (*) *Rivulus parnaibensis* sp.nov. and (▲) *R. zygonectes*.

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