



Simpsonichthys punctulatus n. sp. – a new seasonal killifish (Teleostei: Cyprinodontiformes: Rivulidae) from the upper rio São Francisco basin, central Brazil

WILSON J. E. M. COSTA¹ & GILBERTO C. BRASIL²

¹ Laboratório de Ictiologia Geral e Aplicada, Departamento de Zoologia, Universidade Federal do Rio de Janeiro, Caixa Postal 68049, CEP 21944-970, Rio de Janeiro, RJ, Brazil
wcosta@acd.ufrj.br

² Secretaria de Qualidade Ambiental, Ministério de Meio Ambiente, Esplanada dos Ministérios, Bloco B, 8º andar, sala 324, CEP 70068-900, Brasília, DF, Brazil
gilberto.brasil@mma.gov.br

Received on March 6, 2007, accepted on March 12, 2007.

Published online at www.vertebrate-zoology.de on July 31, 2007.

> Abstract

Simpsonichthys punctulatus, new species, collected in a seasonal swamp of the upper rio Paracatu drainage, rio São Francisco basin, central Brazil, is described. It is a member of the eastern clade of the subgenus *Simpsonichthys*, which also includes *S. boitonei*, *S. santanae* and *S. zonatus*, and is diagnosed by pectoral fin red with blue spots in males. *Simpsonichthys punctulatus* is distinguished from all other species of the subgenus *Simpsonichthys* by the presence of longitudinal rows of light blue dots on flank in males and a long filamentous ray on tip of dorsal fin in males.

> Resumo

Simpsonichthys punctulatus, sp. n., coletada num alagado sazonal da drenagem do alto rio Paracatu, bacia do rio São Francisco, Brasil central, é descrita. Ela é um membro do clado oriental do subgênero *Simpsonichthys*, o qual também inclui *S. boitonei*, *S. santanae* e *S. zonatus*, e é diagnosticado pela nadadeira peitoral vermelha com manchas azuis em machos. *Simpsonichthys punctulatus* se distingue de todas as outras espécies do subgênero *Simpsonichthys* pela presença de fileiras longitudinais de pontos azuis no flanco em machos e de longo raio filamentosos na extremidade da nadadeira dorsal em machos.

> Kurzfassung

Simpsonichthys punctulatus, sp. n., aus einem temporären Sumpfgewässer des Einzugsgebietes des rio Paracatu, rio-São-Francisco-Becken, in Zentralbrasilien wird beschrieben. Die Art gehört zum östlichen Klade der Untergattung *Simpsonichthys*, welche *S. boitonei*, *S. santanae* und *S. zonatus* einschließt und durch rote Pectoralen mit blauen Punkten bei den Männchen charakterisiert ist. *Simpsonichthys punctulatus* unterscheidet sich von allen anderen Arten der Untergattung *Simpsonichthys* durch das Vorhandensein von hellblauen Punkten auf den Körperseiten der Männchen und lang ausgezogenen Flossenstrahlen der Dorsale der Männchen.

> Key words

Killifishes, Neotropica, Taxonomy, New species, *Simpsonichthys*.

Introduction

The genus *Simpsonichthys* constitutes a diversified assemblage of seasonal killifishes endemic to the Brazilian Shield, in central, northeastern and eastern South America (COSTA, 2006; in press). Presently it is divided into five allopatric subgenera, among which the subgenus *Simpsonichthys* is endemic to the higher

parts of the central Brazilian plateau (COSTA, 2006). Two clades are comprised in the subgenus *Simpsonichthys*: the western clade is endemic to the area between the upper rio Araguaia and the upper tributaries of the rio Paranaíba basins, in altitudes of about 750–800 m, including *S. parallelus* COSTA, *S. choloptyyx* COSTA,



Fig. 1. *Simpsonichthys punctulatus*, UFRJ 6478, male, holotype, 25.5 mm SL (one day after collection); Brazil: Goiás: Formosa (Photo by W.J.E.M. COSTA).

MOREIRA & LIMA, and an undescribed species; and, the eastern clade, endemic to the area between the upper tributaries of western rio São Francisco basin and the upper tributaries of the rio Paranaíba basin, in altitudes of about 900–1000 m, including *S. boitonei* CARVALHO, *S. santanae* (SHIBATA & GARAVELLO) and *S. zonatus* (COSTA & BRASIL) (COSTA, 2006). Herein we describe a new species of the eastern clade, collected in the upper rio Preto drainage, rio São Francisco basin.

Material and methods

Measurements and counts follow COSTA (1995b). Measurements are presented as percentages of standard length (SL), except for those related to head morphology, which are expressed as percentages of head length. Fin-ray counts include all elements. Number of vertebrae, gill-rakers, and pectoral, pelvic 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). The abbreviation c&s means specimens cleared and stained for bone and cartilage. Material is deposited in UFRJ, Departamento de Zoologia, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil.

Simpsonichthys punctulatus n. sp.

(Figs. 1–2)

Holotype. UFRJ 6478, male, 25.5 mm SL; Brazil: Estado de Goiás: Município de Formosa: temporary swamp adjacent to a stream tributary to rio Bezerra, rio Preto drainage, rio São Francisco basin, near the road BR-020, 15°33'1.0"S 47°10'33.2"W, altitude 901 m; W.J.E.M. COSTA, C.P. BOVE, B.B. COSTA & G.C. BRASIL, 24 January 2007.

Paratypes. UFRJ 6479, 1 male, 29.1 mm SL, 2 females, 19.4–24.0 mm SL; UFRJ 6480, 2 males, 19.7–21.0 mm SL, 3 females, 15.7–16.0 mm SL (c&s); collected with holotype.

Diagnosis. Distinguished from all other species of the subgenus *Simpsonichthys* by the presence of longitudinal rows of light blue dots on flank in males (*vs.* absence) and a long filamentous ray on tip of dorsal fin in males, reaching the posterior portion of caudal fin (*vs.* reaching basal portion of caudal fin). Distinguished from all congeners by the unique combination of the following features: pelvic fin present (*vs.* pelvic fin absent), second pharyngobranchial teeth absent (*vs.* present), ventral process of posttemporal short (*vs.* long), 18–19 dorsal-fin rays in males and 14–15 in females (*vs.* 15–17 in males, 12–13 in females), long filamentous ray on tip of dorsal fin in males (*vs.* filamentous rays short or absent), five alternating bright



Fig. 2. *Simpsonichthys punctulatus*, UFRJ 6479, female, paratype, 19.4 mm SL (one day after collection); Brazil: Goiás: Formosa (Photo by W.J.E.M. COSTA).

blue and pink to red bars on head side in males (*vs.* never a similar color pattern), pectoral fin pink with blue spots in males (*vs.* hyaline), and no black spots on dorsal fin in males (*vs.* black spots on basal portion of dorsal fin).

Description. Morphometric data appear in Table 1. Largest male examined 29.1 mm SL; largest female examined 24.0 mm SL. Dorsal profile convex from snout to end of dorsal-fin base, approximately straight on caudal peduncle. Ventral profile gently convex from lower jaw to end of anal-fin base, nearly straight on caudal peduncle. Body moderately deep, compressed, greatest body depth in vertical just anterior to anal-fin origin. Eye positioned on dorsal portion of head side. Snout blunt. Urogenital papilla cylindrical and short in males, pocket-shaped in females.

Dorsal and anal fins pointed in males, rounded in females; dorsal fin with long filamentous ray, reaching posterior margin of caudal fin. Dorsal-fin rays unbranched. Caudal fin round. Pectoral fin elliptical. Posterior margin of pectoral fin reaching vertical through base of 7th anal-fin ray in males, through urogenital papilla in females. Pelvic fin short and pointed, tip reaching between base of 1st and 3rd anal-fin rays in males, between anus and urogenital papilla in females. Dorsal-fin origin on vertical between base of 3rd and 4th anal-fin rays; dorsal-fin origin between neural spines of vertebrae 8 and 9 in males, and vertebrae 10 and 12 in females. Anal-fin origin between pleural ribs of vertebrae 7 and 9 in males, and vertebrae 8 and 10 in females. Dorsal-fin rays 18–19 in males, 14–15 in females; anal-fin rays 18–19 in males, 17–18 in females; caudal-fin rays 27–29; pectoral-fin rays 13.

Tab. 1. Morphometric data of *Simpsonichthys punctulatus*.

	males (n = 2)	females (n = 2)
Standard length (mm)	25.5–29.1	19.4–24.0
Percents of standard length		
Body depth	30.9	29.2–29.7
Caudal peduncle depth	15.3–16.3	14.4–13.6
Pre-dorsal length	52.6–53.3	61.9–64.9
Pre-pelvic length	44.6–46.3	52.1–54.7
Length of dorsal-fin base	31.0–31.5	20.4–20.5
Length of anal-fin base	32.4–33.6	21.0–22.1
Caudal-fin length	40.8–41.3	38.8–39.1
Pectoral-fin length	29.3–30.7	24.6–25.9
Pelvic-fin length	9.0–9.4	5.3–8.3
Head length	30.3–30.4	31.4–31.6
Percents of head length		
Head depth	87.8–89.7	84.6–89.3
Head width	65.0–68.4	68.3–73.1
Snout length	13.3–14.5	12.5–13.6
Lower jaw length	18.6–19.3	14.8–14.9
Eye diameter	34.7–35.0	35.1–36.8

Frontal squamation E-patterned; E-scales medially overlapped; no scale anterior to G-scale. One or two supraorbital scale. Longitudinal series of scales 25; transverse series of scales 8; scale rows around caudal peduncle 12. Minute contact organ on each scale of anteroventral portion of lateral surface of body in ma-

les. Minute papillate contact organs on medial surface of first two pectoral-fin rays in males.

Cephalic neuromasts: supraorbital 11–12, parietal 1–2, anterior rostral 1, posterior rostral 1, infraorbital 2+15–16, preorbital 2, otic 1, post-otic 2, supratemporal 1, median opercular 1, ventral opercular 2, preopercular 12–14, mandibular 8, lateral mandibular 3–5, paramandibular 1. One neuromast on center of each scale of lateral line, sometimes absent in few scales. Two neuromasts on caudal-fin base.

Basihyal subtriangular, width about 50 % of length; basihyal cartilage about 20 % of total length of basihyal. Six branchiostegal rays. Second pharyngobranchial teeth absent. Gill-rakers on first branchial arch 2+9. Vomerine teeth absent. Dermosphenotic absent. Ventral process of posttemporal short. Total vertebrae 26–27.

Coloration. Males. Side of body light red with 12–13 series of small bright blue spots, spots of four or five series coalesced to form bars; longitudinal rows of light blue dots, each dot on center of each scale of flank. Five narrow alternating light blue and light red bars on side of head; dorsolateral portion light blue with light red scale margins. Iris light yellow; brownish red bar through center of eye. Dorsal and anal fins light red with small bright blue spots, distal portion dark red without spots; basal portion of anal fin yellowish orange. Caudal fin light red with light blue dots; narrow bright blue line along entire margin of fin. Pectoral fin light red with small light blue spots on basal portion. Pelvic fin light red with light blue base.

Females. Side of head and body light yellowish brown, with 12–13 gray bars; one or two rounded black blotches on anterocentral portion of flank. Iris yellow, with dark brown bar through center of eye. Unpaired fins hyaline; faint yellowish gray spots on dorsal and anal fins. Paired fins grayish hyaline.

Distribution and habitat. Known only from the type locality, temporary canals (about 50–100 cm deep) at the floodplains of a tributary stream of the rio Bezerra, upper rio Paracatu drainage, rio São Francisco basin. The area, exposed to sunlight, is locally known as Campo Úmido, a kind of vegetation typical of floodplains of streams draining the higher plateau lands of the Cerrado, the savannas of central Brazil.

Etymology. From the Latin *punctulatus* (with dots), referring to the rows of blue dots on flank in males, a condition distinguishing *S. punctulatus* from all other species of the subgenus *Simpsonichthys*.

Discussion

The subgenus *Simpsonichthys* is diagnosed by three synapomorphies: minute pelvic fins or pelvic fins secondarily lost in some species, mesopterygoid reduced, and by the presence of five alternating bright blue and pink to red bars on head side in males (COSTA, 2006, in press), besides other derived features that independently occur in other subgenera: ventral process of posttemporal minute or absent (*vs.* long) and flank predominantly pink to red in males (*vs.* other colors) (COSTA, 2006). *Simpsonichthys punctulatus* exhibits all the derived states described above. The presence of longitudinal rows of light blue dots on flank in males (*vs.* absence) and a long filamentous ray on tip of dorsal fin in males, reaching the distal portion of caudal fin (*vs.* reaching basal portion of caudal fin) distinguish *S. punctulatus* from all other species of the subgenus *Simpsonichthys*.

The eastern clade of the subgenus *Simpsonichthys* comprises *S. boitonei* and *S. santanae*, from the upper rio Corumbá drainage, rio Paraná basin, and *S. zonatus*, from the upper rio Urucuia drainage, rio São Francisco basin. Monophyly of the eastern clade of *Simpsonichthys* is supported by their members having pectoral fin red with blue spots on its basal portion (COSTA, 2006), a derived condition conspicuous in *S. punctulatus*. The presence of pelvic fins in *S. punctulatus* and the dorsal fin originating posteriorly to the anal-fin origin readily distinguishes it from *S. boitonei*, in which both the pelvic fin and the pelvic girdle are absent and the dorsal-fin origin is anterior to the anal-fin origin. *S. punctulatus* is distinguished from *S. santanae* and *S. zonatus* by the absence of black spots on the dorsal-fin base in males (*vs.* presence) and in having longer pelvic fin in males (pelvic-fin length 9.0–9.4 in *S. punctulatus*, *vs.* 5.7–7.4 in *S. santanae* and *S. zonatus*). *Simpsonichthys punctulatus* is further distinguished from *S. zonatus*, the only other species of the subgenus *Simpsonichthys* occurring in the São Francisco basin, by having more dorsal-fin rays (18–19 *vs.* 15–17 in males, 14–15 *vs.* 12–13 in females), shorter pre-dorsal length in males (52.6–53.3 % SL *vs.* 55.4–59.6 % SL), longer dorsal-fin base in males (31.0–31.5 % SL *vs.* 23.5–28.1 % SL), longer caudal fin (40.8–41.3 % SL *vs.* 35.9–38.5 % SL in males, 38.8–39.1 % SL *vs.* 30.4–33.3 % SL in females), longer pectoral fin in males (29.3–30.7 % SL *vs.* 23.5–26.6 % SL), and shorter anal-fin base in females (21.0–22.1 % SL *vs.* 24.0–25.9 % SL).

Acknowledgements

We are grateful to C.P. BOVE and B.B. COSTA for help during the collecting trip. This study was supported by CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico - Ministério de Ciência e Tecnologia) and FAPERJ (Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro).

References

- COSTA, W.J.E.M. (1995): Pearl killifishes – the Cynolebiatinae: systematics and biogeography of the neotropical annual fish subfamily. – tfh-publications, Neptune City inc., 128 pp.
- COSTA, W.J.E.M. (2001): The neotropical annual fish genus *Cynolebias* (Cyprinodontiformes: Rivulidae): phylogenetic relationships, taxonomic revision and biogeography. – Ichthyological Exploration of Freshwaters, **12**: 333–383.
- COSTA, W.J.E.M. (2006): Descriptive morphology and phylogenetic relationships among species of the Neotropical annual killifish genera *Nematolebias* and *Simpsonichthys* (Cyprinodontiformes: Aplocheiloidei: Rivulidae). – Neotropical Ichthyology, **4**: 1–26.
- COSTA, W.J.E.M. (in press): Taxonomic revision of the seasonal South American killifish genus *Simpsonichthys* (Teleostei: Cyprinodontiformes: Aplocheiloidei). – Zootaxa.
- HOEDEMAN, J.J. (1958): The frontal scalation pattern in some groups of toothcarps (Pisces, Cyprinodontiformes). – Bulletin of Aquatic Biology, **1**: 23–28.
- TAYLOR, W.R. & VAN DYKE, G.C. (1985): Revised procedures for staining and clearing small fishes and other vertebrates for bone and cartilage study. – Cybium, **9**: 107–109.