

A new species of the annual fish genus *Pterolebias* (Cyprinodontiformes: Rivulidae) from the Rio Mamoré basin, Bolivian Amazon

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Pterolebias obliquus, new species, is described from the Rio Mamoré basin, Departamento de Beni, northern Bolivia. It seems to be closely related to *P. rubrocaudatus* by the common possession of a widened posteriorly black border on the lower portion of caudal fin of males, and differing from it by different shape and colour pattern of caudal fin of males and greater body depth in males. The new species is distinguished from all other species of the genus by the presence of dark spots on pectoral fin of males and the light caudal fin stripe being oblique. Two other annual fishes, *Moema pepotei* and *Neofundulus ornatipinnis*, are first recorded to Bolivia.

Pterolebias obliquus, nueva especie, es descrita de la cuenca del río Mamoré, Departamento del Beni, Norte de Bolivia. Parece próximamente relacionada con *P. rubrocaudatus* por la posesión común de un borde inferior negro, más ancho posteriormente, en la porción inferior de la aleta caudal. La nueva especie se diferencia de todas las demás especies del género por la presencia de puntos oscuros en las aletas pectorales de machos y por la banda clara oblicua de la aleta caudal. Otros dos peces anuales, *Moema pepotei* y *Neofundulus ornatipinnis*, son registrados por primera vez para Bolivia.

Introduction

Pterolebias Garman is a genus of annual fishes endemic to northern and central South America comprising nine species (Costa, 1990a-b; Thomerson & Taphorn, 1992). The first mention of the occurrence of this genus in Bolivia was by Thomerson (1984) who demonstrated that *Rivulichthys luelingi* Meinken from Río Chapare drainage (Río Mamoré basin), Todos Santos (Departamento de

Cochabamba), is a synonym of *P. longipinnis* Garman. The second and latest record of a species of *Pterolebias* in Bolivia was by Schindler & Staeck (1994), who found *P. phasianus* Costa in Puerto Suarez, Departamento de Santa Cruz, Río Paraguay basin, a species first described from Cáceres, Estado de Mato Grosso, Brazil, also in Río Paraguay basin (Costa, 1988a). In the present paper, we describe a new species of *Pterolebias* from Departamento de Beni, northern Bolivia.

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Material and methods

Measurements and counts follow Costa (1988b). Measurements are presented as percentages of standard length (SL), except for subunits of head, which are presented as percentages of head length. Parentheses after counts indicate the number of specimens for that given count. Counts of pelvic, pectoral and caudal-fin rays, and vertebrae were made only in cleared and stained specimens for bone and cartilage (C&S). Cleared and stained specimens were prepared according to Taylor & Van Dyke (1985). Nomenclature for frontal squamation follows Hoedeman (1956), and that for cephalic neuromasts follows Gosline's (1949) nomenclature for head sensory canals. Institutional acronyms are: CBF, Colección Boliviana de Fauna, Museo Nacional de Historia Natural - Instituto de Ecología, La Paz; MUSM, Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos, Lima; MZUSP, Museu de Zoologia da Universidade de São Paulo, São Paulo; NRM, Naturhistoriska Riksmuseet, Stockholm; and UFRJ, Universidade Federal do Rio de Janeiro, Rio de Janeiro.

Pterolebias obliquus, new species (Figs. 1)

Holotype. CBF 2328, male, 47.9 mm SL; Bolivia: Departamento del Beni, Río Mamoré basin, temporary swamp associated with Arroyo Curiraba in Estación Biológica Beni; J. Sarmiento, 27 December 1987.

Paratypes. 59 specimens, 19.0-37.7 mm SL, largest male 37.4 mm SL, largest female 33.8 mm SL, all from Bolivia, Departamento del Beni, Reserva de la Biosfera Estación Biológica Beni (EBB).

CBF 2278, 5, 21.4-30.8 mm SL; EBB, Arroyo Aguas Negras, tributary of Arroyo Curiraba; J. Sarmiento, 26 Dec. 1987. - CBF 2279, 8, 19.5-34.2 mm SL; EBB, temporary ponds in the floodplain of Arroyo Aguas Negras; J. Sarmiento, 26 Dec. 1987. - CBF 2280, 13, 21.5-37.4 mm SL; EBB, Arroyo Aguas Negras; J. Sarmiento, 27 Dec. 1987. - CBF 2281, 25, 19.0-33.6 mm SL; UFRJ 3034, 4, 26.5-33.9 mm SL; UFRJ 3035, 2 (C&S), 27.5-37.7 mm SL; MZUSP 48347, 2, 28.6-32.7 mm SL; collected with the holotype.

Diagnosis. *Pterolebias obliquus* males have posterior prolongations of the upper and lower caudal-fin margins. These are similar to that found in *P. peruensis* Myers, *P. wischmanni* Seegers, *P. rubrocaudatus* Seegers, and *P. xiphophorus* Thomerson & Taphorn, but do not occur in the four other, presently known, species of the genus (*P. longipinnis* Garman, *P. zonatus* Myers, *P. hoignei* Thomerson, and *P. phasianus* Costa). It differs from *P. peruensis*, *P. rubrocaudatus* and *P. xiphophorus* by having more anal fin rays (16-18, vs. 14-15 in *P. peruensis*, 13-15 in *P. rubrocaudatus*, and 12-13 in *P. xiphophorus*); it differs from *P. wischmanni* by having fewer scales in longitudinal series (33-35, vs. 35-38) and the absence of oblique bars on body sides of males. *Pterolebias obliquus* is distinguished from all other species of the genus by the presence in males of a light oblique stripe on the lower portion of caudal fin and rounded dark brown spots on pectoral fin.

Description. Morphometric data are given in Table 1. Dorsal and anal fins pointed in males, rounded in females. No filamentous rays in dorsal and anal fins. Caudal fin moderate in length, about 35 % SL in the largest male (holotype); caudal fin approximately subtruncate in males, with an elongate posterior prolongation of lower border, a short almost imperceptible posterior prolongation of upper border, and short filamentous rays on posterior margin; caudal fin rounded in females, without filamentous rays or posterior prolongation. Pectoral fin pointed. Tip of the pectoral fin reaches between pelvic fin base and anus. Tip of pelvic fin reaches between urogenital papilla and the base of 2nd anal ray. Dorsal-fin origin in front of middle of anal fin base, in a vertical through base of 11th anal ray. Head squamation E-patterned.

Dorsal-fin rays 9(3) or 10(4). Anal-fin rays 16(2), 17(4) or 18(1). Total caudal-fin rays 27 and 30 (15 or 18 branched); pectoral-fin rays 14 and 16; pelvic-fin rays 7, in two C&S specimens. Scales in longitudinal series 33(1), 34(2) or 35(4). Scales in transverse series 8(7). Horizontal scale rows around caudal peduncle 16(7). Neuromasts in supraorbital series 3+3(7). Vertebrae 34. One vomerian tooth.

Colouration in alcohol. Sides of body pale brown, darker on dorsum; sometimes with a few scattered dark brown dots, more conspicuous in

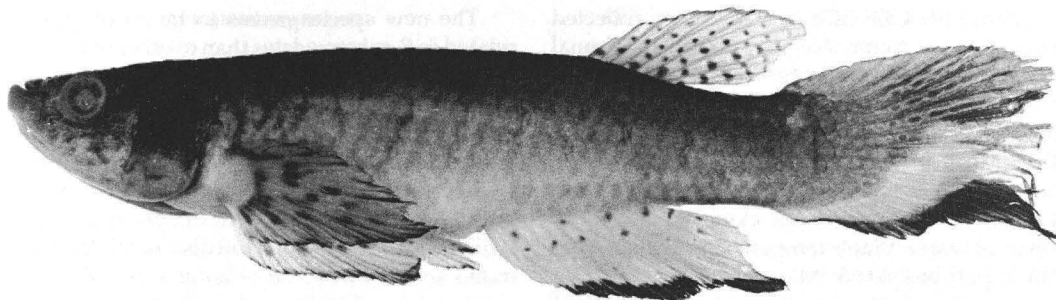


Fig. 1. *Pterolebias obliquus*, holotype, male, 47.9 mm SL, CDB 2328.

females. Head pale brown, with small dark brown spots on sides, darker in males. Dorsal fin gray with about seven transverse rows of dark brown dots. Anal fin of males light gray, with dark brown dots on basal region and a black stripe on distal border; in females, anal fin pale gray, with dark brown dots scattered over fin. Caudal fin of males dark gray with dark brown dots on upper portion, a white oblique stripe, ascending posteriorly, on ventral portion, and a black stripe, widened posteriorly, on ventral border; in females, caudal fin gray with small rounded white spots regularly scattered over fin. Pectoral fin hyaline with longitudinally elongated dark brown spots in males, hyaline in females. Pelvic fin gray with dark brown dots in both sexes.

Ecological notes. The holotype and paratypes CBF 2281 were caught in a temporary swamp (bajío) of seasonally flooded forest, connected to Arroyo Curiraba. The total area of the bajío is less than two hectares. The habitat is partially covered with emergent aquatic plants and shadowed by terrestrial vegetation. It has a depth of up to 70 cm during the wet season and can dry out completely in the dry season. The clay-mud bottom is covered with leaves from the adjacent forest. The water is dark brown, with a transparency of less than 10 cm and pH 6.5. On 27 December 1987, at 10:00 am the temperature of water and air in the shadow was the same (23 °C). The fish community includes *Callichthys callichthys* (Linnaeus) and *Hoplerythrinus unitaeniatus* (Spix).

Table 1. Morphometric data of *Pterolebias obliquus*. H, holotype.

	males				females		
	H	paratypes					
	CBF 2328	UFRJ 3035	UFRJ 3034	MZUSP 48347	MZUSP 48347	UFRJ 3035	UFRJ 3034
Standard length (mm)	47.9	37.7	33.9	32.7	28.6	27.5	27.5
Percentages of standard length							
Body depth	23.6	22.0	22.8	22.2	21.3	23.0	21.6
Depth of caudal peduncle	14.9	14.1	15.3	14.5	13.7	14.6	14.1
Predorsal length	70.3	69.3	74.8	75.9	74.7	76.9	72.8
Prepelvic length	51.9	50.7	55.6	51.9	53.1	55.0	54.7
Length of dorsal-fin base	11.5	12.8	11.1	11.1	9.7	8.2	10.4
Length of anal-fin base	22.5	23.2	23.6	22.7	20.3	19.5	19.7
Head length	25.0	25.4	27.3	27.3	26.1	26.9	27.1
Percentages of head length							
Head depth	76.8	70.6	72.7	73.7	70.8	71.2	67.5
Head width	76.2	71.1	68.8	68.4	70.6	74.2	71.8
Eye diameter	29.8	31.3	32.1	31.4	32.3	36.0	34.1

Paratypes CBF 2278 and 2280 were collected from Arroyo Aguas Negras, a highly seasonal stream more than five meters deep at high waters and less than one meter at low waters. It originates in open swamps and swamp forests in the EBB. Most of the year the water is brown. The bottom is clay-mud topped by a layer of leaves. Collecting was carried out along the shores in 1.8 m of water. Water temperature was 25-27 °C (13:30 pm) and pH 6.5. Many post larval stages of species such as *Abramites hypselonotus* (Günther) and *Schizodon fasciatus* Agassiz were found.

Paratypes CBF 2279 came from small ponds less than 50 m², in flooded forest drained by Arroyo Aguas Negras. During the rainy season these small ponds are filled by nearby streams. The water remains for a few months, and they completely dry out in the dry season. The depth is less than 50 cm. The water is brown with a high transparency. The clay-mud bottom is covered by a dense litter.

Distribution. Known only from the type locality.

Etymology. From the Latin *obliquus* (oblique), an allusion to the presence of a light oblique stripe on the lower portion of caudal fin of males. An adjective.

Discussion

Pterolebias obliquus belongs to a putative monophyletic assemblage of species comprising *P. peruensis*, *P. wischmanni*, *P. rubrocaudatus*, and *P. xiphophorus*, defined by the presence of posterior prolongations of upper and lower margins of the caudal fin of males. This condition does not occur in closely related genera (e.g. *Trigonectes* Myers, *Moema* Costa, and *Neofundulus* Myers) and therefore is considered apomorphic. It was not reported in the original description of *P. rubrocaudatus* (Seegers, 1984); however, the recent examination of older specimens of *P. rubrocaudatus* (MUSM 3119, 7 ex., about 35-40 mm SL, vs. 31.5 mm SL in the single male of the type series) from Tambopata, Departamento de Madre de Dios, Peru (close to the type locality) indicates that larger males of this species too have posterior prolongations of upper and lower margins of the caudal fin.

The new species seems to be more closely related to *P. rubrocaudatus* than to other species of the genus; only these two species exhibit a light stripe on the lower portion of caudal fin of males with a black margin below, which is widened posteriorly. Some other species (*P. peruensis*, *P. phasianus*, *P. xiphophorus*) may have a narrow dark border on lower caudal fin, but the pattern is distinct from the condition discussed and illustrated above. *Pterolebias obliquus* is easily distinguished from *P. rubrocaudatus* by the lower caudal prolongation of males which is much longer than the upper one (vs. about equal in length in *P. rubrocaudatus*), by the greater body depth in older males (23.6 % SL in 47.9 mm SL holotype and 22.0-22.8 % SL in 32.7-37.7 mm SL paratypes, vs. 19.9-21.1 % SL in 34.0-39.8 mm SL specimens of *P. rubrocaudatus*), and by the absence of a black stripe on upper caudal fin border. A study of intrageneric relationships is in progress by the first author.

The discovery of *P. obliquus* constitutes the fourth record of an annual fish in Bolivia. Besides *P. longipinnis* from Río Mamoré basin and *P. phasianus* from Río Paraguay basin (see Introduction), *Trigonectes rogoaguae* (Myers) is known only from the Bolivian section of the Beni-Mamoré-Guaporé system (Costa, 1990c). Furthermore, *Moema pepotei* Costa, a species first described from rio Guaporé basin in Brazil, close to the frontier of Bolivia (Costa, 1993), has been also found in some northern Bolivian localities of the Río Mamoré basin by the second author (CBF uncat.), and four specimens of *Neofundulus ornatipinnis* Myers (NRM 9622) were collected in the Chaco region of Bolivia, between Crevaux and Tatarenda, Río Paraguay basin, by Erland Nordenskiöld in 1902. Additionally, it is probable that some of the recently described species of annual fishes from the Mamoré-Guaporé and Paraguay basins of adjacent countries (Brazil, Peru and Paraguay) may also occur in Bolivia, e.g. *Pt. rubrocaudatus*, *Plesiolebias glaucopterus* Costa & Lacerda, *Pl. bitteri* Costa, *Pl. damasceni* Costa (Costa, 1990d, 1991), *Neofundulus parvipinnis* Costa, *N. guaporensis* Costa (Costa, 1988c), and *Cynolebias chacoensis* Amato (Amato, 1986).

Acknowledgments

We are grateful to H. Ortega and S. Kullander for the loan of *P. rubrocaudatus* and *N. ornatipinnis* material. The first author received financial support by CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico - Brazilian Federal Government).

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Received 10 July 1995

Revised 9 October 1995

Accepted 18 November 1995