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Moenkhausia uirapuru, a new species from the upper rio Guaporé, Chapada dos Parecis, Mato Grosso, Brazil (Teleostei: Characidae)

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Moenkhausia uirapuru, new species, is described from right side tributaries of the upper rio Guaporé (rio Madeira basin), Mato Grosso State, Brazil. Based on shared putative synapomorphies of the color pattern in life, the new species seem to be closely related with *M. cosmops* and the currently non-congeneric *Hemigrammus skolioplatus*, which are distributed in neighbouring hydrographical systems in the Chapada dos Parecis, a low-lying plateau at the divide of the upper rio Guaporé, upper rio Tapajós and upper rio Paraguai basins. These three species, in spite of typologically assignable to the genus *Hemigrammus* due to the incompleteness of the lateral line, are considered to be putative monophyletic group belonging to the *Moenkhausia oligolepis* species complex. The complementary distributions presented by *M. uirapuru*, *M. cosmops* and *H. skolioplatus* seems to indicate a complex vicariant scenario where hydrographical reconfigurations due to tectonic activity might have played a major role in the evolution this putatively monophyletic clade.

Moenkhausia uirapuru, espécie nova, é descrita de tributários de margem direita do alto rio Guaporé (bacia do rio Madeira), estado do Mato Grosso, Brasil. Baseado em presumíveis sinapomorfias do padrão de colorido em vida, a nova espécie parece ser proximamente relacionada a *Moenkhausia cosmops* e *Hemigrammus skolioplatus*, que são distribuídas em sistemas hidrográficos vizinhos na Chapada dos Parecis, um planalto baixo que é o divisor de águas das bacias do alto rio Guaporé, alto rio Tapajós e alto rio Paraguai. Estas três espécies, apesar de poderem ser alocadas no gênero *Hemigrammus* de um ponto de vista tipológico devido à presença de uma linha lateral incompleta, são consideradas como sendo um possível grupo monofilético que pertence ao complexo de espécies *Moenkhausia oligolepis*. As distribuições complementárias apresentadas por *M. uirapuru*, *M. cosmops* e *H. skolioplatus* parecem indicar um cenário complexo vicariante onde reconfigurações hidrográficas causadas por atividade tectônica podem ter tido um papel importante na evolução desse clado presumivelmente monofilético.

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Introduction

The genus *Moenkhausia* Eigenmann, 1908 is one of the most speciose characid genus, with currently 76 species recognized as valid (Lima et al., 2003; Lima et al., 2007; Zanata et al., 2009; Marinho & Langeani, 2010a–b; Sousa et al., 2010; Bertaco et al., 2011a–b; Pastana & Dagosta, 2014). As the majority of the genera previously included within the subfamily Tetragonopterinae (cf., e. g., Géry 1977), *Moenkhausia* is defined by a combination of non-exclusive characters, and very likely is not a monophyletic genus. In fact, Mirande (2010), in his broad morphological phylogenetic analysis of the Characidae, did not recover the genus as monophyletic, although his results should be viewed as preliminary since only four *Moenkhausia* species were included. More recently, Mariguela et al. (2013), were also unable to recover the genus as monophyletic in a molecular analysis that included 29 *Moenkhausia* species.

Lima et al. (2013) recorded twenty species of *Moenkhausia* in the rio Madeira basin in Brazil. During recent field work at the upper rio Guaporé drainage an additional and very distinctive undescribed species was discovered, closely resembling *Moenkhausia cosmops* Lima, Britski & Machado, 2007 in its unusual colour pattern in live specimens, which combines red pigmentation on the upper lip, eye with the upper half bright green and lower half bright blue, and for the transparency of the opercle, which allows a view of the pinkish-red colour of the gill filaments. Concomitantly, the collection of additional material of *Hemigrammus skolioplatus* Bertaco & Carvalho, 2005 revealed that this species, although currently allocated to a distinct genus, also shares those same pigmentary features in living specimens. The aim of the present paper is to describe this undescribed species and discuss its putative relationships with species currently assigned to the genera *Moenkhausia*, *Hemigrammus* and *Bario*.

Material and methods

Counts and measurements were taken according to Fink & Weitzman (1974) and Menezes & Weitzman (1990), except for counts of the horizontal scale rows below the lateral line, which are counted to the pelvic-fin insertion. Horizontal scale rows between the dorsal-fin origin and lateral line does not include the scale of median predorsal series situated just anterior to the first dorsal-fin ray. In the descriptions, the frequency of each count is given in parentheses after the respective count. An asterisk indicates counts of the holotype. Counts of supraneurals, procurrent caudal-fin rays, branchiostegal rays, gill-rakers and unbranched anal-fin rays were taken mostly from cleared and stained paratypes (CS), prepared according to Taylor & Van Dyke (1985). Vertebrae of the Weberian apparatus were counted as four elements and the fused PU1+U1 of the caudal region as a single element. In the list of material examined, the number of whole specimens is given first, followed by the number of those cleared and stained (if any). Institutional abbreviations used are as follows: ANSP, Academy of Natural Sciences of Philadelphia, Philadelphia; INPA, Instituto Nacional de Pesquisas da Amazônia, Manaus; UFRO, Universidade Federal de Rondônia, Porto Velho, Rondônia; MZUSP, Museu de Zoologia da Universidade de São Paulo, São Paulo; and ZUEC, Museu de Zoologia da Universidade Estadual de Campinas, Campinas.

Moenkhausia uirapuru, new species

(Figs. 1, 3)

Holotype. MZUSP 115988, 54.7 mm SL; Brazil: Mato Grosso: Nova Lacerda: tributary of rio Galera (itself a tributary of rio Guaporé), upstream cascata Uirapuru, rio Madeira basin, 14°25'00"S 59°27'17"W; W. M. Ohara, F. G. Vieira, D. B. Hungria & J. A. Filho, 11 Dec 2011.

Paratypes. Brazil, Mato Grosso State: ANSP 197275, 2, 23.6–44.3 mm SL; INPA 46656, 3, 27.1-55.1 mm SL; MZUSP 115989, 1, 53.8 mm SL; MZUSP 115990, 2, 48.4–59.7 mm SL; MZUSP 115991, 42, 38.5–54.1 mm SL, 5 CS, 24.1–28.9 mm SL; MZUSP 117129, 1, 49.3 mm SL; MZUSP 117130, 2, 30–32 mm SL; UFRO 12267, 1, 33.1 mm SL; UFRO 22864, 45, 11.5–54.2 mm SL; ZUEC 8915, 6, 24.2–44.4 mm SL; same data as holotype. – MZUSP 115525, 1, 45.7 mm SL; Comodoro: tributary of rio Piolho, upper rio Guaporé basin, near road BR 174, 13°46'15"S 59°46'08"W; W. M. Ohara & P. Cunha, 4 Sep 2014.

Diagnosis. *Moenkhausia uirapuru* is distinguished from all congeners, except *M. cosmops*, by the presence of the red pigmentation on the upper

Fig. 1. **a,** *Moenkhausia uirapuru*, MZUSP 115988, holotype, 54.7 mm SL; Brazil: Mato Grosso: Nova Lacerda, tributary of rio Galera, rio Guaporé drainage, rio Madeira basin; **b,** *Moenkhausia cosmops*, MZUSP 117128, 49.9 mm SL; Brazil: Mato Grosso: Sapezal, tributary of rio Papagaio drainage, rio Tapajós basin; **c,** *Hemigrammus skolioplatus*, MZUSP 115497, 40.0 mm SL; Brazil: Mato Grosso: Comodoro, tributary of rio Doze de Outubro, rio Juruena drainage, rio Tapajós basin.

lip, eye with green to blue bright pigments, and for the transparency of the opercle, which allows a view of the pinkish red gill filaments. Preserved specimens of *M. uirapuru* can be distinguished from the remaining congeners, with the exception of *M. cosmops*, *M. dyktiota*, *M. forestii* and *M. pyrophthalma*, by the presence of an incomplete lateral line (vs. complete lateral line in the remaining *Moenkhausia* species) and by the presence of wavy longitudinal stripes between scale rows along lateral sides (vs. absence of wavy longitudinal stripes between scale rows along lateral sides in all remaining *Moenkhausia* species (Fig. 1a), with the exception of *M. agnesae*). It is easily distinguished from *M. cosmops* by the presence of dark (light-brown to greenish in life), wavy longitudinal lines between scale rows along lateral portions of body (vs. wavy longitudinal stripes absent), caudal fin with a narrow dark stripe on middle rays (vs. narrow dark stripe on middle rays absent) (Fig. 1b), and by the number of longitudinal scales (28–30, vs. 23–26). It can be diagnosed from *H. skolioplatus*, a similar and putatively related species by the absence of a longitudinal blurred, curved dark stripe on the lower portion flank (vs. longitudinal blurred, curved dark stripe present) (Fig. 1c), a large dark blotch on the caudal peduncle of similar size to the diameter of the eye (vs. caudal peduncle blotch, when present, less than half the diameter), absence of red pigmentation on the peduncle (vs. red pigmentation present over much of upper and lower half of caudal peduncle in living specimens), and by the number of horizontal scale rows between the lateral line and the origin of the dorsal fin (4 vs. 5).

Description. Morphometric data for the holotype and paratypes presented in Table 1. Body compressed, moderately elongate. Greatest body depth slightly anterior to vertical through dorsal-fin origin. Dorsal profile of head convex from tip of upper jaw to vertical through anterior nostril; straight or slightly concave from that point to tip of supraoccipital spine. Dorsal body profile convex from supraoccipital tip to base of last dorsal-fin ray, approximately straight from latter point to adipose-fin insertion and slightly concave between adipose-fin insertion and origin

Table 1. Morphometric data for holotype and paratypes of *Moenkhausia uirapuru*. Values for the holotype (included in range, n = 19), range and mean ± SD (standard deviation).

characters	holotype	range	mean ± SD
Standard length (mm)	54.7	30.0–59.7	45.9
Percentages of standard length			
Depth at dorsal-fin origin	33.6	32.2–37.6	34.4 ± 1.5
Snout to dorsal-fin origin	54.4	52.8–57.4	55.3 ± 1.3
Snout to pectoral-fin origin	30.1	30.0–31.9	30.8 ± 0.7
Snout to pelvic-fin origin	52.7	49.6–55.3	52.6 ± 1.6
Snout to anal-fin origin	70.3	67.8–71.1	69.6 ± 0.9
Caudal-peduncle depth	13.1	12.2–14.0	13.3 ± 0.6
Caudal-peduncle length	16.1	11.9–16.1	13.5 ± 1.2
Pectoral-fin length	19.1	19.1–21.6	20.2 ± 0.9
Pelvic-fin length	15.8	15.8–17.9	17.0 ± 0.7
Pelvic-fin to anal-fin distance	19.8	17.0–20.6	18.9 ± 1.2
Dorsal-fin base	13.9	13.8–16.1	14.6 ± 0.7
Dorsal-fin length	26.9	25.5–28.4	27.5 ± 0.8
Dorsal-fin origin to caudal-fin origin	52.0	48.8–53.0	50.9 ± 1.2
Dorsal-fin end to adipose-fin origin	23.4	21.7–23.4	22.5 ± 0.6
Anal-fin base	21.4	21.4–25.2	23.6 ± 1.0
Anal-fin length	18.1	17.8–21.1	19.4 ± 1.1
Posterior margin of eye to dorsal-fin origin	41.2	38.9–42.1	41.1 ± 0.9
Percentages of head length			
Head length	30	29–32	30.2 ± 1.2
Horizontal eye diameter	31	29–35	31.7 ± 1.5
Snout length	30	27–30	28.5 ± 1.0
Least interorbital width	40	37–42	39.6 ± 1.3
Upper jaw length	48	47–53	50.0 ± 1.9

of anteriormost dorsal procurrent caudal-fin ray. Ventral profile of body convex from tip of dentary to anal-fin insertion. Body profile along anal-fin base straight and posterodorsally slanted. Ventral profile of caudal peduncle slightly concave.

Mouth terminal, upper jaw slightly longer than lower jaw. Posterior terminus of maxilla reaching vertical through slightly anterior to middle of pupil. Maxilla approximately at 45 degrees angle relative to longitudinal axis of body. Nostrils close to each other, anterior opening circular, posterior opening crescent-shaped. Nostrils separated by narrow skin flap.

Premaxillary teeth in two rows; outer teeth row with 3 (2), 4* (12), 5 (4) or 6 (1) tricuspid teeth; inner teeth row with 5* (24) teeth bearing three to five cusps, symphyseal tooth of inner series narrow, asymmetric and with four cusps. Maxilla with 1 (1), 2 (2), 3* (17) and 4 (4) teeth along anterodorsal margin, bearing one to five cusps (Fig. 2); anteriormost tooth usually the largest. Dentary with 4 (24) tri- to pentacuspid teeth, followed by a series of 8 (1), 10 (1), 11 (2) or 15 (1) small teeth, conical or tricuspid, considerably smaller than the anteriormost larger teeth. Central cusp of all teeth more developed than remaining lateral cusps; cusp tips slightly curved inwardly on dentary teeth, and outwardly on premaxillary teeth.

Scales cycloid, moderately large, *circuli* distributed over whole area of scales, with 5–16 slightly divergent *radii* extending to posterior margin of scales in longitudinal scale series. Lateral line incompletely pored, slightly deflected downward, with 8 (1), 9 (2), 10* (8), 11 (4) or 12 (2) perforated scales. Longitudinal scales series including lateral-line scales 28 (9), 29 (3) or 30* (4). Longitudinal scale rows between dorsal-fin origin and lateral line 4* (19). Longitudinal scale rows between lateral line and pelvic-fin origin 3* (10) or 4 (9). Median series of scales along dorsal line between tip of supraoccipital spine and dorsal-fin origin 8 (1), 9* (13) or 10 (2). Horizontal scale rows around caudal peduncle 12 (2), 13 (3) or 14* (12). Single row of 4 (3), 5 (9) or 6 (3) scales covering base of anteriormost anal-fin rays. Caudal fin scaled, small scales present on upper and lower caudal lobes basal third, scales sheath on lower lobe slightly more developed than upper one.

Dorsal-fin rays ii, 9* (19), its origin near middle of standard length and slightly posterior to vertical through pelvic-fin origin. First unbranched dorsal-fin ray shorter than second one. First dorsal-fin pterygiophore behind neural spine of

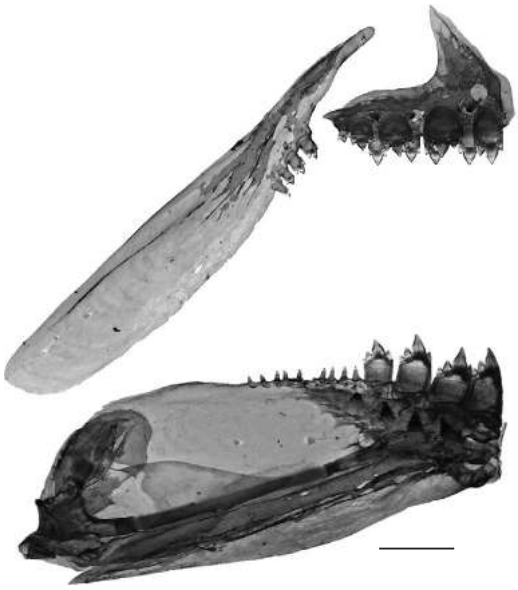

Fig. 2. *Moenkhausia uirapuru*, MZUSP 115991, 25.1 mm SL; medial view of left side, premaxillary, maxillary, and dentary. Scale bar: 1 mm.

10^{th} (4) vertebra. Adipose fin present. Anal-fin rays v, 14* (6), 15 (5), 16 (10) or 17 (4), anteriormost rays slightly longer, subsequent rays gradually decreasing in size; distal margin of anal fin slightly concave. Pectoral-fin rays i, 11 (8), 12* (9), or 13 (2), its tip not reaching pelvic-fin insertion in specimens larger than 22.8 mm SL. Pelvic-fin rays i, 7* (19), its tips not reaching anterior portion of anal fin in specimens larger than 26.9 mm SL. Principal caudal-fin rays 10 + 9 (19); caudal fin forked, lobes slightly pointed, of similar size. 10 (2) or 11 (3) dorsal procurrent caudal-fin rays, and 8 (1), 9 (3) or 10 (1) ventral procurrent caudal-fin rays. Vertebrae 30 (3) or 31 (2). Supraneurals 5 (5), dorsal portion with laminar projections. Branchiostegal rays 4. First gill arch with 2 (5) hypobranchial, 8 (5) ceratobranchial, 1 on cartilage between ceratobranchial and epibranchial, and 6 (3) or 7 (2) epibranchial gill-rakers. Precaudal and caudal vertebrae 15 (4) or 16 (1) and 19 (4) or 20 (1), respectively.

Color in alcohol. Ground colour tan, slightly darker dorsally. Small dark chromatophores densely concentrated on dorsal surface of head, premaxilla, anterior portion of maxillary and dentary, antorbital and infraorbitals 1 and 2. Infraorbitals 3–5, preopercle and opercle with

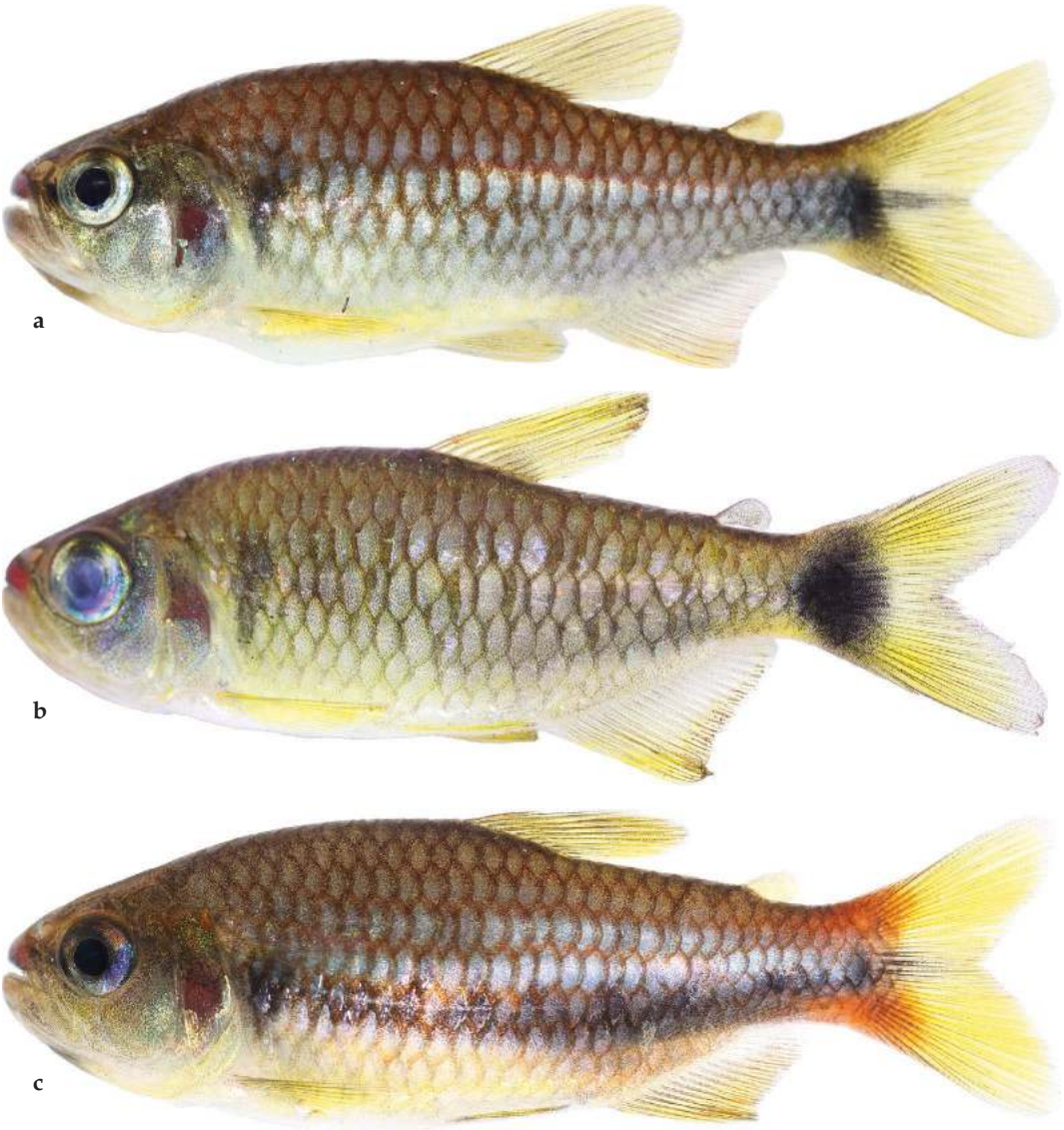

Fig. 3. Color in life of: **a,** *Moenkhausia uirapuru*, MZUSP 115525, 45.7 mm SL; Brazil; Mato Grosso: Nova Lacerda, tributary of rio Galera; **b,** *M. cosmops*, MZUSP 117131, 36.6 mm SL; Brazil: Mato Grosso: Campos Novos do Parecis, headwater of rio Verde, tributary of rio Papagaio; and **c,** *Hemigrammus skolioplatus*, MZUSP 115497, 41.4 mm SL; Brazil: Mato Grosso: Comodoro, tributary of rio Doze de Outubro, rio Juruena drainage.

scattered dark chromatophores. Ventral portion of head with small dark chromatophores densely concentrated on isthmus. Scales on body except ventral region anterior to anal fin, mid-dorsal area, and dorsal and ventral portions of caudal peduncle bordered by dark pigmentation and forming a conspicuous reticulated pattern. Dark pigmentation more developed along lateral portions of body forming wavy longitudinal stripes formed by pigmentation concentrated between scale rows. Specimens larger than 32.7 mm SL with four conspicuous longitudinal black wavy stripes, two midlateral stripes densely pigmented immediately above and below perforated scale series, and two faintly pigmented above and below of aforementioned midlateral black lines.

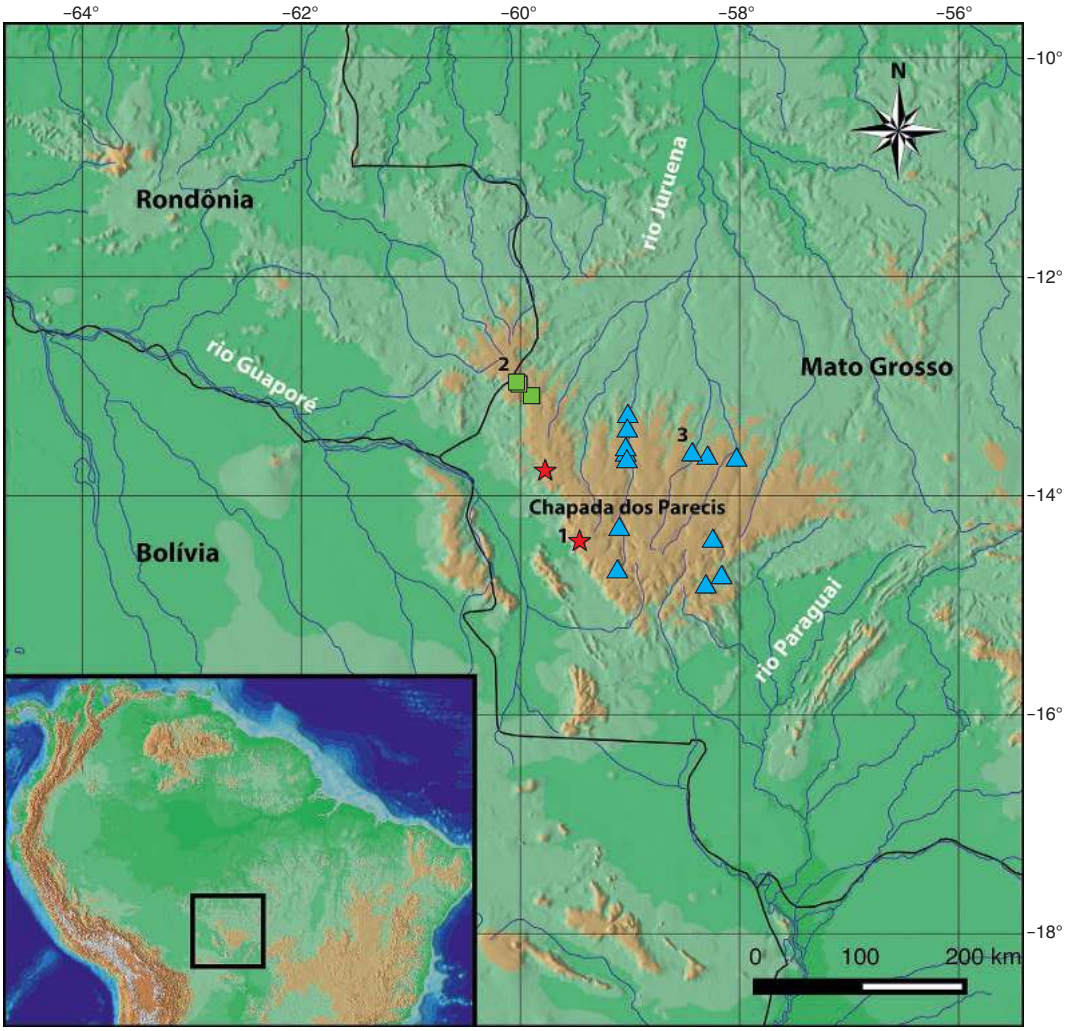

Fig. 4. Map of upper rio Guaporé, upper rio Juruena, and upper rio Paraguai basins in central Brazil showing the distribution of *Moenkhausia uirapuru* (★; 1 is type locality), *Hemigrammus skolioplatus* (■; 2 is type locality) and *Moenkhausia cosmops* (▲; 3 is type locality).

Humeral blotch present, narrow and vertically elongate, upper portion wider, located at the level of third to fourth lateral line scales and extending over two horizontal series of scales, below lateral line. Caudal peduncle blotch conspicuous, variably developed, from a roughly rounded blotch covering caudal peduncle central area to a horizontally elongated blotch extending from vertical through last anal-fin ray to insertion of middle caudal-fin rays. Caudal-fin median rays with narrow dark stripe continuous with caudal peduncle blotch, extending to caudal-fin distal margin. Small black chromatophores scattered on interradial membranes of all fins, sometimes over rays of caudal and dorsal fins. Pelvic, dorsal and anal fins with dark chromatophores scattered along interradial membranes, mainly on fin tips. Adipose fin with dark chromatophores present mainly along its anteriormost margin.

Color in life. Based on photographs taken in the field of five specimens (see Fig. 3a). Overall body coloration light brown dorsally, yellow to greenish colored ventrally with light gray to bluish hue.

Upper lip and upper half of dentary reddish. Isthmus, subopercle, lower half of maxillary, infraorbital 1, and dentary light brown. Opercle mostly translucent, exposing pinkish-red colour of gills. A black blotch between infraorbital 1 and anterior margin of eye. Part of opercle, infraorbitals 2–6 and preopercle densely covered with yellow to green chromatophores. Eye lower half bright blue, upper half bright green, with a bright golden tinge. All fins yellowish with different intensity among specimens, except anal fin that is typically mostly hyaline. Humeral and caudal peduncle blotches conspicuous. Wavy longitudinal lines in the lateral of body conspicuous, light brown dorsally, greenish ventrally. Ventral portion of head and body whitish.

Sexual dimorphism. None observed in examined specimens.

Distribution. *Moenkhausia uirapuru* is so far known from two headwater tributaries of the upper rio Guaporé, Mato Grosso State, Brazil (Fig. 4).

Ecological notes. The type locality of *Moenkhausia uirapuru* is located at 615 meters a.s.l., and is a small, clear water stream 2–3 m wide and 0.5–2 m deep, with preserved riparian vegetation, swift current, and bottom composed of sand and dead leaves. The cascata Uirapuru (14°25'02"S 59°27'16"W) is formed by two separate falls (Figs. 5a–b) and *M. uirapuru* was collected only immediately upstream of the falls (Fig. 5c); attempts at collecting the species below the falls were unsuccessful. Individuals of *M. uirapuru* were observed during snorkeling swimming in deep portions of the stream. During the night, adult individuals were collected singly in shallow areas and near the shore. Other species collected syntopically were *Hoplias aimara*, *Aequidens* cf. *rondoni*, *Hyphessobrycon cyanotaenia*, *Megalechis thoracata* and an additional undescribed species of *Moenkhausia*. A single *M. uirapuru* specimen was collected syntopically with the recently described *M. rubra* near the town of Comodoro in a small, clear water stream 1–1.5 m wide and 0.3–1 m deep, with swift current and sandy bottom. The analysis of the stomach contents of five cleared and stained paratypes revealed the presence of ants, a dragonfly, a beetle, a spider, Diptera, larvae of Diptera (Chironomidae) and Odonata, unidentified insect fragments, unidentified vegetal fragments and sediments.

Etymology. The specific epithet, *uirapuru*, is a noun and is in reference to the cascata Uirapuru, the type locality of the species. Uirapuru is the common name of the Musician wren, *Cyphorhinus arada*. A noun in apposition.

Discussion

Moenkhausia uirapuru shares with *M. cosmops* and *H. skolioplatus* a derived color pattern on the head in living specimens, consisting in red pigmentation on the upper lip, eye with green to blue bright pigments, and for the transparency of the opercle, which allows a view of the pinkish red gill filaments (Figs. 3a–c). These pigmentary features were considered by Lima et al. (2007) as an autapomorphy of *M. cosmops*. The discovery of *M. uirapuru* and the documentation of the color pattern in life of *H. skolioplatus* has showed that, rather than autapomorphies for *M. cosmops*, these pigmentary features are in fact putative synapomorphies indicating that the three species are very likely closely related to each other (Figs. 3a–c). In spite of the fact that *H. skolioplatus* is currently not considered to be congeneric with *M. uirapuru* and *M. cosmops*, its generic assignement to *Hemigrammus* was based on the traditional definition of the genus proposed by Eigenmann (1918). Both *M. uirapuru* and *M. cosmops* have the scales of lateral line incompletely perforated and fit the traditional, typological definition of *Hemigrammus*, rather than *Moenkhausia*. The length of poring on lateral line is, however, known to be quite variable in several characid lineages and not necessarily a reliable character for reconstructing relationships (Weitzman & Fink, 1983; Mirande, 2010). The genus *Moenkhausia* is diagnosed from *Hemigrammus* solely by having a completely pored lateral line, vs. incompletely pored lateral line, but intraspecific variation of the lateral line perforation is known for several species currently included in *Moenkhausia*, as *M. celibela* (Marinho & Langeani, 2010a: 884), *M. cotinho* (Eigenmann, 1918: 111), and *M. naponis* (FCTL, pers. obs.). Several species with scales of lateral line incompletely perforated have been described within the genus *Moenkhausia* and hypothesized as closely related to species of the *M. oligolepis* group (Costa, 1994; Lima & Toledo-Piza, 2001; Lima et al., 2007; Benine et al., 2009). As remarked by Lima et al. (2007: 52) and Benine et al. (2009), the reduction of the laterosensory canal system in *M. cosmops*

and another species of the *M. oligolepis* group is very likely a homoplastic feature in relation to the presence of the same condition in most species currently assigned to *Hemigrammus*. *Moenkhausia cosmops* was hypothesized by Lima et al. (2007: 51) to belong to the *M. oligolepis* species group due to the presence of two purported synapomorphies of the group, i.e., a reticulated color pattern and a large blotch on the caudal peduncle. The putative close relationship of *M. cosmops* with the *M. oligolepis* species group [as well with *Bario steindachneri* (Eigenmann, 1893)] has recently received support from molecular data (Mariguela et al., 2013). Both *M. uirapuru* and *H. skolioplatus* present a reticulated color pattern, although not as conspicuous as in most species of the *M. oligolepis* group, and *M. uirapuru* and *H. skolioplatus* possess a dark blotch on the caudal peduncle, albeit not as developed as the one present in most species of the *M. oligolepis* group. Additionally, *H. skolioplatus* and *M. cosmops* share a longitudinal, blurred, curved dark stripe on the lower portion of the flank (in *M. cosmops* it is more conspicuous in freshly preserved individuals). We hypothesize a close relationship among *M. uirapuru*, *M. cosmops*, and *H. skoliplatus*, and the clade containing these species consequently as belonging to the *M. oligolepis* species group. In spite of that, we do not propose herein a generic rearrangement for *H. skolioplatus*, which in our view should only be undertaken after a broad phylogenetic analysis of the species belonging to *Moenkhausia*, *Hemigrammus*, and related genera.

Also noteworthy are the biogeographical implications of the hypothesized monophyletic clade formed by *M. uirapuru*, *M. cosmops*, and *H. skolioplatus*. These three species occur in neighbouring hydrographical systems in the Chapada dos Parecis, *M. uirapuru* in a headwater tributary of the rio Guaporé (rio Madeira basin), *M. cosmops* in tributaries of the upper rio Juruena (rio Tapajós basin) and upper rio Paraguai basins, and *H. skolioplatus* in tributaries of the rio Juruena close to the water divide with the upper rio Guaporé basin (Fig. 5). A similar pattern of distribution also occurs in species of *Ancistrus* lacking an adipose fin described from the Chapada dos Parecis, viz., *A. verecundus* from the upper rio Madeira, *A. tombador* known from the rio Arinos, rio Juruena drainage, and *A. parecis* from upper rio Juruena (Fisch-Muller et al., 2005a–b). These seemingly complementary distributions seems to indicate a complex vicariant scenario where hydrographical reconfigurations due to tectonic activity might have played a major role in the evolution of the clade, and provide another example of the "shield distribution pattern" discussed by Lima & Ribeiro (2011). Also, this remarkable radiation is paralleled with a similar radiation of *Moenkhausia* species in the upper rio Xingu basin at the Serra do Cachimbo, Pará, Brazil (Sousa et al., 2010). In both cases, closely related yet clearly distinctive taxa are found in adjacent river drainages. The watershed divide betweeen the middle rio Xingu and middle rio Tapajós basins at the Serra do Cachimbo has been suggested to be a hotspot of fish endemicity (e.g., Birindelli et al., 2009; Netto-Ferreira, 2012; Varella & Sabaj-Pérez, 2014) and the same seems to hold true for the watershed between the rio Juruena and the rio Guaporé (for a list of species apparently endemic to the area, see Ohara & Lima, 2015).

Comparative material. *Moenkhausia cosmops*, all from Brazil, Mato Grosso State. MZUSP 93494, holotype, 42.9 mm SL; Sapezal, córrego Vinte e Cinco de Maio, nears its mouth at the rio Papagaio. – MZUSP 93495, 17 paratypes, 22.3–48.3 mm SL; Sapezal, córrego Vinte e Cinco de Maio, near its mouth at the rio Papagaio. – MZUSP 91122, 3 paratypes, 21.4–23.3 mm SL; Barra do Bugres, rio Juba, tributary of rio Sepotuba. – MZUSP 93496, 3 paratypes, 30.5–34.1 mm SL; Tangará da Sera, rio Juba. – MZUSP 78722, 2 paratypes, 39.9–48.2 mm SL; Barra do Bugres, rio Jubinha, at the confluence with the rio São Tomé, tributary of the rio Sepotuba. – MZUSP 93555, 1, 22.7 mm SL; MZUSP 93558, 3, 23.0–30.9 mm SL; MZUSP 93551, 3, 22.2–31.5 mm SL; Sapezal, rio Juruena, above Santa Lúcia hydroelectric dam. – MZUSP 93556, 6, 21.2–30.9 mm SL; Sapezal, rio Juruena, below Sapezal hydroelectric dam. – MZUSP 93553, 11, 19.3–31.8 mm SL; Campos de Júlio, rio Juruena, fazenda Tiroleza. – MZUSP 96042, 5, 37.3–50.7 mm SL; Sapezal, ribeirão Vinte Cinco de Maio, tributary of the rio Papagaio. – MZUSP 93552, 2, 17.2–25.4 mm SL; Campos de Júlio, rio Juruena. – LIRP 8181, 6 (3 measured), 45.3–53.1 mm SL; Sapezal, PCH Cidezal, rio Juruena. – MZUEL 8750, 1, 33.5 mm SL; Campos Novos do Parecis, rio Verde, tributary of the rio Papagaio. – MZUEL 8749, 95 (18 measured), 19.5–30.8 mm SL; Sapezal, rio Juruena.

Hemigrammus skolioplatus: MZUSP 115497, 6, 28.5–41.7 mm SL; Comodoro, tributary of rio Doze de Outubro. – UFRO 22883, 1, 48.1 mm SL; Comodoro, rio Mutum.

Fig. 5. The cascata Uirapuru (**a**, **b**), Nova Lacerda, Mato Grosso State, Brazil. Type locality (**c**) of *Moenkhausia uirapuru*, upstream cascata Uirapuru tributary of rio Galera, upper rio Guaporé, rio Madeira basin. Photographs by Diogo Hungria.

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