

A New Species of Miniature Fish of the Genus *Microphilypnus* Myers, 1927 (Gobioidae: Eleotridae) from the Upper Rio Negro Basin, Amazonas, Brazil

Rodrigo A. Caires¹ and Mônica Toledo-Piza²

A new species of the eleotrid genus *Microphilypnus* from the Upper Rio Negro basin is described herein. It differs from all congeners in the presence of 5–6 arched rows of melanophores on the abdominal region, posterior to the base of the pelvic fins, followed by six large irregularly oval black blotches, with the tips of the three posteriormost blotches visible in lateral view; a dark teardrop-shaped blotch on the caudal peduncle, extending to the base of the ventral caudal rays; five light brown blotches along the dorsal profile of the body, between the origin of the second dorsal fin and the caudal peduncle; and the poorly developed laterosensory system on the head, with horizontal rows of head papillae *b* and *d* absent. A key to the species of *Microphilypnus* is presented.

MICROPHILYPNUS is a genus of miniature (maximum total length: 25 mm) eleotrid fishes inhabiting the Amazon and Orinoco river basins. Four species are currently included in this genus: *Microphilypnus acangaquara* Caires and Figueiredo, 2011, from the middle Rio Tapajós; *M. macrostoma* Myers, 1927, from central and lower Amazon and upper Orinoco basins; *M. tapajosensis* Caires, 2013a, from the lower Tapajós; and *M. ternetzi* Myers, 1927, the most widely distributed species, that occurs in the Rio Amazonas, Rio Negro, Rio Orinoco, Rio Tocantins, Rio Madeira, Rio Solimões, and Rio Trombetas (Caires and Figueiredo, 2011; Caires, 2013a, 2013b; Myers, 1927).

After examining samples taken in 2011 from the Upper Rio Negro basin, Amazonas, Brazil, we have found some specimens of *Microphilypnus* that are strikingly different from all congeners in the pattern of pigmentation of the body. The purpose of the present study is to describe this new species.

MATERIALS AND METHODS

Counts and measurements follow Pezold and Cage (2002), with some modifications as published by Caires and Figueiredo (2011) and Caires (2013a). Measurements were taken point to point from digital photographs of specimens taken under the stereomicroscope and rounded to the nearest 0.1 mm. Vertebral counts were made from images of specimens scanned using high-resolution x-ray computed tomography equipment (SkyScan 1176, Bruker AXS Corporation) and included the urostyle. The first abdominal vertebra was considered as the element with the first hemal arch. Counts of pterygiophores of the first dorsal and anal fins follow Birdsong et al. (1988). Gill raker counts include those on the upper and lower limbs of the first gill arch. Terminology of head papillae follows Wongrat and Miller (1991). In the description, values of meristic data in parentheses indicate the number of specimens that possess that count, and values of the holotype are indicated with an asterisk. Specimens examined for this study are deposited in Museu de Zoologia da Universidade de São Paulo (MZUSP).

A urogenital papilla was present in only one of the 13 specimens examined, a female. Therefore, it was not possible to sex the remaining specimens.

Microphilypnus hypolyrasimeion, new species

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Figures 1, 2, 3, 4, 5

Holotype.—MZUSP 121679, 1, 12.1 mm SL, Brazil, Amazonas, Igarapé do Maiuxi, right margin of Rio Negro, downstream mouth of Rio Aiuanã, 0°32'42.4"S, 64°52'54.7"W, 28 October 2011, M. Toledo-Piza et al.

Paratypes.—MZUSP 95404, 7, 11.0–12.3 mm SL, Brazil, Amazonas, Igarapé Tibarrá, tributary in left margin of Rio Negro, nearly 1.5 h upstream of Santa Isabel do Rio Negro, 10 min on boat above Tibarrá community, 0°25'25.5"S, 64°57'2.7"W, 23 October 2011, M. Toledo-Piza et al.; MZUSP 95405, 1, 11.0 mm SL, Amazonas, Igarapé Tibarrá, tributary to left margin of Rio Negro, ca. 1.5 h upstream of Santa Isabel do Rio Negro, at Tibarrá community, near harbor, 0°25'50.8"S, 64°56'45.7"W, 24 October 2011, M. Toledo-Piza et al.; MZUSP 95406, 2, 10.9–14.4 mm SL, Brazil, Amazonas, Igarapé Tibarrá, tributary to left margin of Rio Negro, 1.5 h upstream Santa Isabel do Rio Negro, 2 h above mouth of Igarapé Tibarrá, 0°23'47"S, 64°56'39.4"W, 24 October 2011, M. Toledo-Piza et al.; MZUSP 109589, 2, 12.7–13.2 mm SL, Brazil, Amazonas, Santa Isabel do Rio Negro, Igarapé do Bitiana, nearby mouth of Rio Neuixi, 0°34'07"S, 65°04'17"W, 8 February 2011, O. T. Oyakawa et al.

Diagnosis.—*Microphilypnus hypolyrasimeion* is distinguished from all congeners by its color pattern which consists of 5–6 transverse arched rows of melanophores on the abdominal region, posterior to the base of the pelvic fins, followed by six large irregularly oval black blotches, the tips of the largest ones visible in lateral view (Figs. 1, 3; vs. abdominal region with dark area ventrally and two dark blotches, followed by 3–5 slender ventral black lines; Fig. 3), and a brown teardrop-shaped blotch (sometimes faint) on the caudal peduncle, reaching the base of the ventralmost caudal-fin rays (vs. faint round blotch on caudal peduncle). The species also differs from congeners in having the head papillae poorly developed with the longitudinal series *b* and *d* absent (vs. present) and four transverse rows of sensory papillae below eye (vs. 5–7) and each with fewer papillae.

¹ Seção de Peixes, Museu de Zoologia da Universidade de São Paulo, Avenida Nazaré, 481, 04299-970, São Paulo, SP Brazil; Email: rodricares@yahoo.com.br. Send reprint requests to this address.

² Departamento de Zoologia, Instituto de Biociências da Universidade de São Paulo, Rua do Matão, travessa 14, no. 101, 05508-090, São Paulo, SP Brazil; Email: mtpiza@usp.br.

Submitted: 19 May 2017. Accepted: 19 September 2017. Associate Editor: R. E. Reis.

© 2018 by the American Society of Ichthyologists and Herpetologists DOI: 10.1643/CI-17-634 Published online: 9 February 2018



Fig. 1. *Microphilypnus hypolyrasimeion*, new species, MZUSP 121679. Holotype in dorsal (upper), lateral (middle), and ventral views (lower). Photograph by Eduardo Baena.

Microphilypnus hypolyrasimeion also differs from congeners in having fewer scales along the longitudinal row in the trunk: 21–23 ($n = 13$), vs. 22–25, 23–30, 27–32, and 23–26, respectively, in *M. macrostoma*, *M. ternetzi*, *M. acangaquara*, and *M. tapajosensis*. The new species further differs from *M. acangaquara* in the absence of head pores (vs. anterior

supraocular [SOT] and preopercular [POP] pores present; Fig. 2).

Description.—Morphometric data presented in Table 1. Body elongate, moderately compressed. Caudal peduncle slender, length/depth ratio 2.2–2.8. Head short, moderately convex in lateral view; mouth large, oblique, forming an angle of about 45° relative to body axis. Distal tip of upper jaw barely reaching vertical through middle of eye. Lower jaw prognathous, lips slender, lip fold not continuous under jaw symphysis. Anterior naris a tube over lip, posterior naris oval-shaped. Eyes relatively large, orbital diameter larger than snout length; interorbital width very narrow, interorbital region slightly convex. Snout relatively short, conical in lateral view. Gill opening extending anteriorly to vertical through middle of eye; gill rakers on leading edge of first gill arch 0+6* (5), 0+7 (6), 0+8 (1), 1+6 (1), without teeth, slender near angle of arch, becoming progressively shorter anteriorly. Basihyal short, anterior margin slightly emarginated; six branchiostegal rays. Jaws with two series of small, conical, closely spaced teeth. Vomer and palatine toothless.

Head pores absent. Head papillae poorly developed; one longitudinal row over upper jaw, below anterior margin of eye, barely reaching vertical passing through anterior pupil

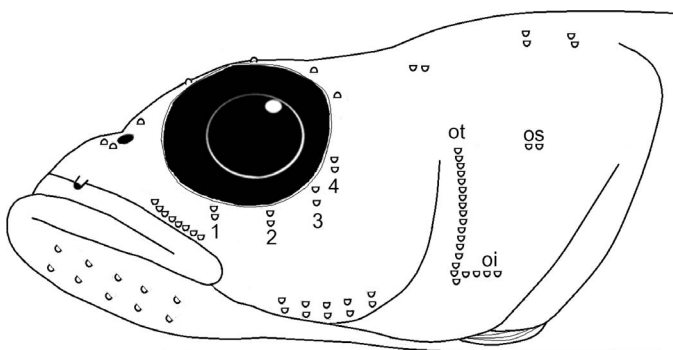


Fig. 2. *Microphilypnus hypolyrasimeion*, new species, drawing of head in lateral view. Abbreviations: 1–4—infraorbital transverse rows; oi—opercular inferior longitudinal row; os—opercular superior longitudinal row; ot—opercular transverse row.

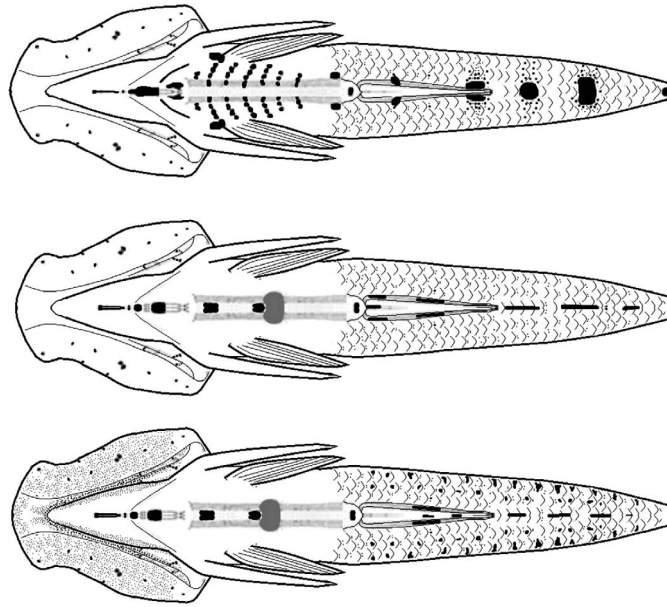


Fig. 3. Diagram of body in ventral view of *Microphilypnus hypolyrasimeion* (upper), *M. acangaquara* (middle), and *M. tapajosensis* (lower).

margin; longitudinal series *b* and *d* absent; four short transversal rows below eye (infraorbital), each with two papillae, one papilla behind eye, followed by three pairs of papillae on oculoscapular region. Interorbital with one row of four spaced papillae on each side; three rows on opercle, one vertical, long (*ot*), one longitudinal, short, joined to *ot* row (*oi*), other extremely short, with only two papillae (*os*; Fig. 2).

Trunk covered with peripheral ctenoid scales (anteriormost scale sometimes cycloid); circumpeduncular scales 11 (7), 12* (5); lateral scales 21 (3), 22 (3), 23* (7); transversal scales 6 (6), 7* (7); predorsal scales 0* (12), 1 (1). Scales absent on head, pectoral base, and abdominal region.

Dorsal-fin elements VI,7 (2), VI,8* (11). First dorsal fin low, 2nd and 3rd spines longer, not reaching base of second dorsal fin. Second dorsal fin slightly higher than first, triangular-shaped. Anal-fin rays 6 (1), 7 (4), 8* (8). Pectoral-fin rays 12 (1), 13* (10), 14 (2); middle rays of pectoral fin longest, with unbranched tips reaching vertical through origin of second

dorsal fin. Pelvic-fin rays i,5, rays unbranched, 4th longest. Caudal-fin rays i,12–13,i; posterior margin of caudal fin convex. Upper procurent caudal-fin rays 6–9, lower rays 5–9. Vertebrae 10+16; first two pterygiophores of first dorsal fin inserting on third interneural space, followed by, respectively, two, one, and one pterygiophore in subsequent interneural spaces (pterygiophore formula 3[22110]; holotype and ten paratypes radiographed); two pterygiophores anterior to first hemal arch (*n* = 1).

Color in alcohol.—Ground color light yellowish beige. Head covered with scattered melanophores, more concentrated dorsally from interorbital region to posterior margin of head, sometimes leaving light narrow transverse line in the middle. Melanophores forming three short irregular dark stripes irradiating from eye, one anteriorly to lower jaw, another vertical to posterior tip of upper jaw, and one posteriorly to preopercle. Two brown spots ventrally on head, one larger on suture between lower jaw and quadrate, and the other



Fig. 4. *Microphilypnus hypolyrasimeion*, new species, live specimen photographed right after capture. Photograph by Ralf Britz.

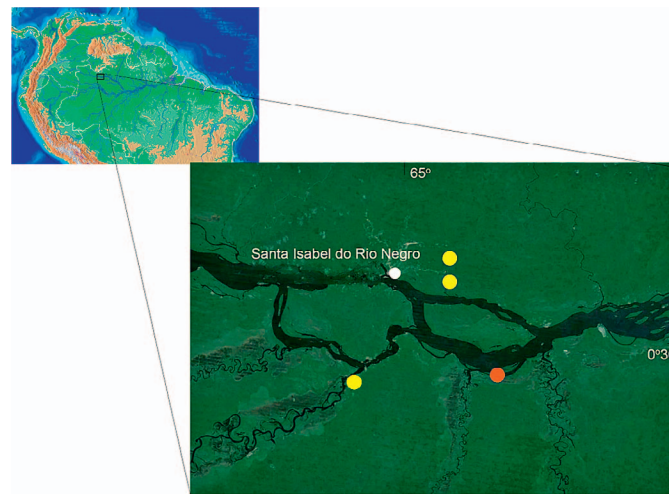


Fig. 5. Map of central and northern South America indicating Rio Negro basin (rectangle) and surroundings of Santa Isabel do Rio Negro (detail), showing the distribution of *Microphilypnus hypolyrasimeion*, new species. Type locality (red circle) and other collection sites (yellow circles).

smaller anteriorly on dentary. Scattered brown dots on preopercle and opercle. Flank with tiny, dark dots scattered anteriorly. Scales usually with dark edges posteriorly; longitudinal row of 7–9 dark markings laterally on lateral midline from vertical through origin of first dorsal fin to caudal peduncle, two anteriormost ones darker, becoming smaller and gradually slender posteriorly; dark brown teardrop-shaped blotch on caudal peduncle (sometimes faint), reaching base of ventral caudal-fin rays. Two narrow, transversal light brown bars along dorsal profile of body anterior to 1st dorsal origin, and five wider bars (sometimes adjoining, and forming round-shaped blotches) from 2nd dorsal-fin origin to caudal peduncle, with portions visible in lateral view. Ventral region with two very short dark lines slightly anterior to pelvic bones, followed by 5–6 transversal arching rows of melanophores forming lyre-like pattern (Figs. 1, 3), tips of anteriormost arching rows visible in lateral view; series of dark blotches posteriorly on ventral margin of body, first anterior to anal-fin base followed by other five, two along anal-fin base and three along caudal peduncle; larger blotches with portions visible in lateral view. Markings on ventral abdominal region pale on holotype, more conspicuous on paratypes. First dorsal fin mostly dark with vertical pale line on middle region; second dorsal with two light brown oblique lines. Pectoral-fin base with row of melanophores ventrally forming horseshoe-shaped marking, and scattered brown dots dorsally. Base of pectoral-fin rays covered with tiny brown dots forming vertical band, middle and distal portion of pectoral-fin rays with melanophores forming tiny longitudinal lines. Pelvic fin with brown dot at base of outermost ray, scattered brown dots on remaining rays; anal and caudal fins mostly hyaline, with dots or lines of brown chromatophores along rays.

Color in life.—(Fig. 4) Background color translucent; head with three short irregular brown stripes irradiating from eye; preopercle and opercle with coarse dark brown blotches and small reddish brown flecks; iris dark brown with two paler radiating stripes and small white flecks. Three orange-red blotches along dorsal midline of body, one larger, under base of first dorsal fin, other two smaller, under base of second dorsal fin, followed by three large light brown blotches along dorsal margin of caudal peduncle. Pigmentation on dorsal half of flanks mostly reddish-orange and on ventral half

mostly brown to black. Posterior margin of scales with dots forming a large dark area under pectoral-fin base, and interrupted black lines; five irregular reddish-orange blotches along dorsal half of flank, first two on vertical line through the first and second dorsal fins, respectively, third and fourth larger and on caudal peduncle, last on caudal-fin base; 5–6 transversal arching rows of black stripes on abdominal region, forming a lyre-like pattern, with tips visible in lateral view, followed by row of six black round blotches, last three on caudal peduncle and joined by a conspicuous black line laterally on the caudal peduncle that bends downward, reaching ventral procurent caudal-fin rays. Two conspicuous dark blotches laterally on anterior portion of body, anteriormost much larger and posteriormost reaching and joining tips of lyre-shaped abdominal stripes. Pectoral-fin base with oblique dark brown stripe, fin rays hyaline; first dorsal fin light brown, with pale blotch on 4th–5th interspinal membranes and small black dots on middle of first spine; second dorsal fin with two irregular, oblique light brown stripes, pale otherwise; anal fin mostly hyaline with rows of small, dark dots along rays; pelvic fin hyaline; base of caudal fin with teardrop-shaped dark brown blotch underneath, reddish-orange blotch, reaching ventral procurent rays; caudal-fin rays hyaline with lengthwise series of orange-red flecks, forming wavy lines.

Distribution.—Known to date only from five localities upstream of Santa Isabel do Rio Negro, Upper Rio Negro basin, Amazonas, Brazil (Fig. 5).

Ecological notes.—Specimens originated from the black acidic waters of tributaries of the Rio Negro. Most of them were collected between 1100 and 1800 hrs during the dry season (October); two specimens were collected in February (MZUSP 109589). The localities were in calm, shallow waters, close to the shore line where there was emergent and marginal vegetation, and usually submerged leaf litter covering the soil of silt and/or sand (Fig. 6). It was collected together with other miniature taxa such as *Microcharacidium* sp. and *Odontocharacidium* sp.

Etymology.—The specific epithet is a combination of the Greek words *hypo*, meaning under, *lyra*, meaning lyre, and *simeion*: marking, in allusion of the arched rows of melano-

Table 1. Measurements of specimens of *Microphilypnus hypolyrasimeion*.

	Holotype	Range (n = 12)	Mean	SD
Standard length (mm)	12.1	11–14	11.9	
% SL				
Head length	31	28–33	31.2	1.2
Preal anal distance	57	55–61	58.1	2.0
Post anal distance	45	41–46	43.4	1.8
Caudal peduncle length	31	23–28	25.7	1.4
Caudal peduncle depth	10	9–12	10.7	0.8
1 st dorsal-fin base length	9	9–12	10.1	0.9
2 nd dorsal-fin base length	16	14–19	16.8	1.7
Anal-fin base length	16	16–20	18.2	1.4
Pectoral fin length	24	21–29	25.5	2.3
Pelvic fin length	30	21–31	27.3	3.6
Caudal fin length	—	26–29	27.9	1.2
% HL				
Orbital diameter	32	28–32	30.1	1.4
Snout length	16	17–22	19.6	1.2
Interorbital width	5	2–7	5.4	1.2
Upper jaw length	32	29–35	32.2	2.0
Lower jaw length	46	42–50	44.2	2.2
Head width	57	54–66	56.8	3.1
Head depth	57	53–69	57.8	3.9
Predorsal distance	119	119–129	125.0	3.1
Body width at 2 nd dorsal	38	25–39	33.6	4.4

phores on the abdominal region which resemble a lyre. To be used as a noun in apposition.

DISCUSSION

Currently there is no phylogenetic diagnosis of *Microphilypnus*. The genus is mostly similar to *Leptophilypnus* Meek and Hildebrand, 1916 and to the recently described *Leptophilypnion* Roberts, 2013. *Microphilypnus* can be distinguished from *Leptophilypnus* by lacking pores on the oculoscapular region (vs. pores usually present), by having the interorbital region very narrow, shorter than pupil length (vs. interorbital region larger than pupil length), by the presence of 11–15 pectoral-fin rays (vs. 17–20), and 21–32 scales in longitudinal

series (vs. 30–36; for details see Thacker et al., 2006). In addition, species of *Microphilypnus* are always smaller than species of *Leptophilypnus* (smaller than 25 mm SL, vs. larger than 50 mm SL, respectively). *Microphilypnus* differs from *Leptophilypnion* in the presence of six branchiostegal rays (vs. five), trunk covered with scales under the pectoral-fin base and sometimes in the predorsal region (vs. trunk naked anteriorly, with 12–18 scales in longitudinal series, pers. obs.), and in the absence of long, threadlike pelvic-fin rays (vs. threadlike pelvic-fin rays present; see Roberts, 2013). Our new species is included in the genus *Microphilypnus* based on the absence of the abovementioned features recognizable in *Leptophilypnion*, and on the narrow interorbital region, lack of pores in the head sensory system, and the lower counts of scales and pectoral-fin rays.

Microphilypnus hypolyrasimeion is the sixth nominal species included in the genus. Three species were described 90 years ago by Myers (1927) from the Rio Negro basin and the upper Rio Orinoco, two of which are currently considered as valid (*M. ternetzi* and *M. macrostoma*). Taxonomic studies based on more recently collected material have shown that the genus is more diverse and species more widespread than previously recorded: two species have been described from the Rio Tapajós basin, and *M. ternetzi* is widely distributed in drainages throughout the Amazon basin (Caires and Figueiredo, 2011; Caires, 2013a, 2013b).

Microphilypnus hypolyrasimeion is the third species of the genus reported for the Rio Negro here, and it appears to be restricted to the upper portions of this river drainage where it is found at river banks covered with floodplain forest. *Microphilypnus macrostoma* and *M. ternetzi*, the other two species recorded from this drainage (Caires and Figueiredo, 2011), have not so far been found together with *M. hypolyrasimeion*. Although *M. ternetzi* has been collected from a great variety of environments such as sandy bottoms, leaf litter, silt, and algae (Carvalho et al., 2006), it does not seem to occur in same sites where the new species was collected.



Fig. 6. Locality at Igarapé Tibarrá, tributary on left margin of Rio Negro, approximately 1.5 h upstream of Santa Isabel do Rio Negro, where some of the paratypes of *Microphilypnus hypolyrasimeion* were collected. Photograph by Manoela Marinho.

Microphilypnus hypolyrasimeion was caught together with specimens of *Microcharacidium* sp. Both species are very similar in having a mottled color pattern, and it would be interesting to gather evidence that could indicate a possible ecological relationship (e.g., mimicry) between those two species similar to that proposed for *M. amazonicus* (= *M. ternetzi*), the characid *Priocharax ariel*, and palaemonid shrimps (Carvalho et al., 2006).

The Neotropical freshwater ichthyofauna is extraordinarily diverse in terms of miniature taxa, and the past three decades have seen a major increase in the number of descriptions of new miniature species (85 species listed by Weitzman and Vari, 1988; and 213 by Toledo-Piza et al., 2014), a large number of them in Rio Negro basin. The description of *Microphilypnus hypolyrasimeion* increases to seven the number of miniature eleotrid species in the Neotropical region. *Microphilypnus hypolyrasimeion* is clearly a miniature species (*sensu* Weitzman and Vari, 1988), with the largest specimen reaching 14.5 mm SL, so far the smallest in size recorded among species of the genus (14.5 vs. 18.5–23.2 mm SL for the other four species). Moreover, this species presents at least two reductive characters compared to its congeners. All previously known species of *Microphilypnus* possess a well-developed cutaneous papillae system, with 5–7 vertical and 2 horizontal (series *b* and *d*) infraorbital rows. *Microphilypnus hypolyrasimeion* has four vertical infraorbital rows, each of them shorter than in congeners, with only two papillae, and series *b* and *d* absent. Our new species also has unbranched pelvic-fin rays (vs. branched).

KEY TO THE SPECIES OF MICROPHILYPNUS

- 1a. Abdominal region with lyre-shaped black markings, followed by a row of large dark spots ventrally; caudal peduncle with teardrop-shaped black blotch laterally (sometimes faint), reaching ventral procurrent rays; series *b* and *d* of head papillae absent ***M. hypolyrasimeion*, new species** (Upper Rio Negro)
- 1b. Abdominal region without lyre-shaped markings, a row of slender longitudinal dark lines ventrally; faint black spot on caudal-fin base laterally, not reaching ventral procurrent rays; series *b* and *d* of head papillae present 2
- 2a. Two preopercular pores present ***M. acangaquara*** (Middle Tapajós River)
- 2b. Preopercular pores absent 3
- 3a. Males with irregular dark brown blotches on flanks and head dusky, females paler; cycloid scales on opercle, usually covered with skin on males; head deep, rounded in lateral view (see Caires, 2013a; Fig. 1) ***M. tapajosensis*** (Middle Tapajós River)
- 3b. Males and females similar in color, with sparse black blotches on flanks; usually ctenoid, exposed scales on opercle; head longer than deep, pointed in lateral view (see Caires and Figueiredo, 2011; Figs. 2, 5) 4
- 4a. Scales on lateral series 22–25, circumpeduncular scales 8–11; snout very pointed, as long as eye; vertebrae 26; pterygiophore formula on first dorsal fin 3(12210) ***M. macrostoma*** (Orinoco and Lower Amazon river basins)
- 4b. Scales on lateral series usually 26 or more, circumpeduncular scales 11–13; snout less pointed, shorter

than eye; vertebrae 27–29; pterygiophore formula on first dorsal fin 3(22110).....

..... ***M. ternetzi*** (widespread in Orinoco and Amazon river basins)

ACKNOWLEDGMENTS

Authors are greatly indebted to O. Oyakawa, A. Datovo, and M. Gianetti (MZUSP) for allowing access to the fish collection and infrastructure. Photographs were provided by R. Britz, M. Pastana, M. Marinho, and E. Baena. P. Lenktaitis prepared CT scan images and provided assistance with image analysis. G. Mattox, M. Marinho, R. Britz, C. Jesus, and R. J. Machado are acknowledged for assistance in fieldwork. The fieldtrip was partially supported by a grant from FAPESP (proc. no. 2011/13735-3). The project South American Characiformes Inventory (FAPESP proc. no. 2011/50282-7, <http://ictio.saci.mz.usp.br>) provided funds for the optic equipment used to carry out this study. MTP acknowledges partial funding from Conselho Nacional de Desenvolvimento Científico e Tecnológico-CNPq (proc. no. 307067/2010-6) and RAC (proc. CNPq No. 140053/2008-5).

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