



Redescription of *Moenkhausia melogramma* (Characiformes: Characidae), a poorly known tetra from the western Amazon basin

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Moenkhausia melogramma is herein redescribed, based on the examination of the holotype plus additional specimens from the western Amazon basin in Brazil, Colombia, Peru, and Ecuador. *Moenkhausia melogramma* shares with *M. collettii*, *M. conspicua*, *M. copei*, *M. venerei*, and *M. flava* a broad dark longitudinal stripe across the eye, and a well-defined dark stripe on the anal-fin base. It can be promptly distinguished from these species by having two humeral blotches. Additionally, we provide comments on the putative relationships of *Moenkhausia melogramma* with the aforementioned congeners and the *Hemigrammus lunatus* species-group.

Keywords: Bony hooks, Color pattern, *Hemigrammus machadoi*, *Moenkhausia collettii* species-group, Taxonomy.

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Moenkhausia melogramma é redescrita com base no exame do holótipo e exemplares adicionais da bacia amazônica ocidental no Brasil, Colômbia, Peru e Equador. *Moenkhausia melogramma* compartilha com *M. collettii*, *M. conspicua*, *M. copei*, *M. venerei* e *M. flava* a presença de uma faixa larga longitudinal escura que atravessa os olhos e uma linha escura bem definida na base da nadadeira anal. Ela pode ser prontamente distinguida dessas espécies por ter duas manchas umerais. Adicionalmente, fornecemos comentários sobre as possíveis relações filogenéticas de *Moenkhausia melogramma* com as congêneres supramencionadas e com o grupo de espécies *Hemigrammus lunatus*.

Palavras-chave: Ganchos ósseos, Grupo de espécies *Moenkhausia collettii*, *Hemigrammus machadoi*, Padrão de colorido, Taxonomia.

INTRODUCTION

Moenkhausia Eigenmann, 1903 is one of the most species-rich genus in Characidae with 93 valid species (Soares, Benine, 2019; Soares *et al.*, 2019), behind only of *Hyphessobrycon* Durbin in Eigenmann, 1908 (158 spp.) and *Astyanax* Baird, Girard, 1854 (126 spp.) (Fricke *et al.*, 2020; Terán *et al.*, 2020), and widely distributed in the cis-Andean basins of South America. Not surprisingly, the latest hypotheses of phylogenetic relationships recovered *Moenkhausia* as paraphyletic, using morphological (Mirande, 2010), molecular (Oliveira *et al.*, 2011; Mariguela *et al.*, 2013) or combined morphological and molecular data (Mirande, 2019). Therefore, the genus remains diagnosed by a combination of characters that includes two series of teeth on premaxilla, five teeth in the inner tooth series of the premaxilla, a complete lateral line, and caudal fin partly covered by small scales (Eigenmann, 1917). Nonetheless, the lateral line completeness has been confirmed as a highly homoplastic character (Mirande, 2010, 2019), a suspected condition that has prompted some authors to assign species having incompletely pored lateral line in *Moenkhausia* (i.e., *M. pyrophthalma* Costa, 1994; *M. diktyota* Lima, Toledo-Piza, 2001; *M. cosmops* Lima, Britski, Machado, 2007; *M. forestii* Benine, Mariguela, Oliveira, 2009, and *M. uirapuru* Ohara, Lima, 2015).

Moenkhausia melogrammus was described by Eigenmann (1908) based on a single specimen from upper Amazon basin in Tabatinga, Amazonas State, Brazil (MCZ 20825), which was collected during the Thayer Expedition and was only described 43 years later (Fig. 1). The name of the species was later amended to *M. melogramma* by Eigenmann (1910). The original description only mentioned the number of fin rays, the misalignment of the third premaxillary tooth of the outer row in relation to the other teeth, and general color pattern, characterized by the absence of blotches, presence of a faint stripe along mid-body, and presence of a dark stripe along the anal-fin base.

Later, Eigenmann (1917: 78–79) provided a more detailed description of the species, including a retouched picture of the holotype (pl. 6, fig. 1) but, once again, solely based on the holotype. Géry (1977) proposed an artificial key to *Moenkhausia* and divided the genus into three groups of species — *M. lepidura*, *M. grandisquamis*, and *M. chrysargyrea* — according to the shape of body, number of scales above and below lateral line).

Géry (1977) placed *M. melogramma* within the *M. grandisquamis* group, composed by deep-bodied species, with five scale rows above and three or four rows below lateral line, whereas *M. collettii* (Steindachner, 1882) and *M. copei* (Steindachner, 1882) were allocated in the *M. lepidura* group, composed by small species with body depth usually more than 2.75 in the standard length. Since then, other than citations in checklists and catalogs (which did not add any additional information on the species) there was little mention for the species in the literature.

Moenkhausia melogramma was commonly misidentified as *M. collettii* or even as *Hemigrammus lunatus* Durbin, 1918 in fish collections, since these species are very similar in color and shape. In this context, our main goal is to redescribe *M. melogramma*, based on the examination of the holotype and additional material, including topotypes, identified during examination of extensive material by the first author. Additionally, we updated the geographic distribution of *M. melogramma*, and discussed the putative relationships between species sharing a broad dark longitudinal stripe across the eye and a dark longitudinal stripe on the anal-fin base.

MATERIAL AND METHODS

Counts and measurements were taken on the left side of specimens whenever possible, using a digital caliper with precision of 0.1 mm, and the methodology follow Fink, Weitzman (1974) and Menezes, Weitzman (1990), with addition of head depth, which was measured at the vertical through the tip of the supraoccipital spine. Measurements are given as percentage of standard length (SL), except subunits of head that are given as percentage of head length (HL). Counts of vertebrae, supraneurals, procurrent caudal-fin rays, and unbranched rays of the anal fin were taken from cleared and double-stained specimens (c&s) prepared according to Taylor, Van Dyke (1985). Total vertebral counts include the Weberian apparatus, counted as four elements, and the fused PU1+U1 counted as a single vertebral element. The gill raker at the junction of the ceratobranchial and the epibranchial is included in the count of gill rakers of the lower limb.

Counts and measurements of holotype were taken by the last author (RCB), while vertebral, supraneurals, and procurrent caudal-fin rays counts were taken from radiograph of the holotype, available on the website of the Museum of Comparative Zoology (MCZ). Counts are followed by the total number of examined specimens, which is given first, followed by the number of cleared and stained individuals (if any); asterisks indicate values for the holotype. The map was prepared using QGIS 3.4.6 Madeira (QGIS Geographic Information System, 2020). Institutional abbreviations are listed as in Sabaj (2019).

RESULTS

Moenkhausia melogramma Eigenmann, 1908

(Figs. 1–3; Tab. 1)

Moenkhausia melogrammus Eigenmann, 1908:102–103 [original description; type

- locality: “Tabatinga” (=Brazil, Amazonas State)].
- Moenkhausia melogramma*. —Eigenmann, 1910:437 [listed; adequacy of the specific epithet to the gender]. —Eigenmann, 1917:44; 67; 78–79; plates 6, 10 [diagnosis in key, redescription]. —Fowler, 1948:153 [listed]. —Géry, 1977:446 [diagnosis in key; allocation in the *M. grandisquamis* group]. —Axelrod *et al.*, 1995:282 [photo in life]. —Lima *et al.*, 2003:148 [listed]. —Arbeláez *et al.*, 2004:102 [Colombia, Leticia, Quebrada La Arenosa]. —Galvis *et al.*, 2006:221, 468 [short description, photo in life (pl. 43 b), ecological notes; Colombia, Amazonas, Leticia].
- Moenkhausia melanogramma* (spelling error). —Eigenmann, 1917:40 [comments about the third tooth on premaxilla].
- Hemigrammus lunatus* (not Durbin). —Ibarra, Stewart, 1989:369, 377 [in part; Ecuador, río Napo basin; abundance].
- Hemigrammus* cf. *lunatus* (not Durbin). —Galacatos *et al.*, 1996:881, 889 [in part; Ecuador, río Napo basin; abundance]. —Galacatos *et al.*, 2004:40–41, 44, 48 [in part; Ecuador, río Yasuni basin; abundance, habitat preference].
- Moenkhausia* sp. —Ota *et al.*, 2019:345 [comparison with *Hemigrammus changae*; Ecuador, Sucumbíos, río Putamayo basin].

Diagnosis. *Moenkhausia melogramma* differs from all congeners, except *M. collettii*, *M. copei*, *M. veneri* Petroli, Azevedo-Santos, Benine, 2016, *M. conspicua* Soares, Bührnheim, 2016, and *M. flava* Britzke, Troy, Oliveira, Benine, 2018, by the presence of a broad dark longitudinal stripe across the eye (*vs.* absent) and a well-defined dark longitudinal stripe on the anal-fin base (*vs.* absent). *Moenkhausia melogramma* is promptly distinguished from *M. collettii*, *M. copei*, *M. veneri*, *M. conspicua*, and *M. flava* by having two humeral blotches (*vs.* a single humeral blotch). It differs from *M. flava* by the overall body coloration clear in live specimens (*vs.* pale-yellowish). *Moenkhausia melogramma* can be distinguished from *M. collettii* by having the first humeral blotch approximately triangular (*vs.* oval, horizontally elongated). It is further distinguished from *M. conspicua*, *M. copei*, and *M. veneri* by having a narrow, longitudinal, midlateral stripe, occupying one longitudinal series of scales (*vs.* longitudinal stripe wide, occupying two longitudinal series of scales).

Description. Morphometric data summarized in Tab. 1. Body compressed, moderately deep; greatest body depth anterior to dorsal-fin origin. Dorsal profile of head convex from tip of snout to anterior nostrils, straight to slightly concave from anterior nostrils to tip of supraoccipital spine. Dorsal profile of body moderately convex from tip of supraoccipital spine to dorsal-fin origin, posteroventrally slanted and straight from latter point to adipose fin, and slightly concave to straight along caudal peduncle. Ventral profile of body convex from anterior tip of lower jaw to pelvic fin; straight to slightly convex from pelvic-fin origin to anal-fin origin; posterodorsally slanted and straight along anal-fin base, and slightly to moderately concave along caudal peduncle.

Mouth terminal, isognathous. Two tooth rows in premaxilla: outer with three (42), four (211), or five* (22) tricuspid teeth; only specimens with five teeth have third tooth misaligned. Inner row with four (6), five*(265), or six (4) penta- to heptacuspids teeth. Maxilla with one (11), two *(139), three (104), or four (21) tri- to pentacuspids teeth. Dentary with anteriormost four* (270) or five (5) teeth penta- to heptacuspids,



FIGURE 1 | *Moenkhausia melogramma*, holotype, MCZ 20285, 38.3 mm SL, Brazil, Amazonas, Tabatinga. **A.** recent photograph, available on MCZ website (all rights reserved); **B.** after Eigenmann, 1917 (pl. 6, fig. 1).

followed by middle-sized tricuspid tooth, and posteriormost five (3), six (1), 10 (1), or 11 (1) smaller, tricuspid or conical teeth. Central cusp of all teeth larger than lateral cusps.

Scales cycloid. Lateral line completely pored, slightly curved anteriorly, with 32 (34), 33 (71), 34* (84) 35 (30), or 36 (3) perforated scales. Six specimens with discontinuous lateral line, with solely one or two scales lacking pore (LBP 23758, 3, 33.9–36.0 mm SL; ZUEC 13213, 2, 30.6–41.5 mm SL; ZUEC 15479, 1, 33.1 mm SL). Longitudinal scale rows between dorsal-fin origin and lateral line five (135), six* (137) or seven (2); longitudinal scale rows between lateral line and pelvic-fin origin three (6), four* (246) or five (21). Predorsal scale row with eight (4), nine (154) or 10 scales (105). Circumpeduncular scales 14 (221). Scale sheath along anal-fin base with up to seven small scales, in single row, overlying proximal portion of anteriormost anal-fin rays. Caudal fin scaled, scales covering proximal half of caudal-fin lobes.

Dorsal-fin rays ii (311), eight (7), nine* (302) or 10 (2). Dorsal-fin origin at midbody or slightly behind this point, slightly posterior to vertical through pelvic-fin origin. First unbranched ray shorter than second ray. Adipose fin at vertical through 12th or 13th caudal vertebrae. Pectoral-fin rays i (310), 10 (22), 11 (160), 12* (116) or 13 (12); tip of

addressed longest rays usually reaching pelvic-fin insertion. Pelvic-fin rays i (311), 6 (3), 7* (299) or 8 (9); tip of addressed longest rays usually reaching anal-fin insertion. Anal-fin rays iv* (6), 20 (11), 21 (53), 22 (73), 23* (82), 24 (55), 25 (25) or 26 (6); anteriormost rays slightly longer, subsequent rays gradually decreasing in size. Principal caudal-fin rays i (278), eight (4) or nine* (274) + seven (2) or eight (276), i*(278). Dorsal procurrent caudal-fin rays 10 (3) or 11* (3) and ventral procurrent caudal-fin rays seven (2), eight (3) or nine* (1). Caudal fin forked; lobes similar in size.

Supraneurals four* (6), “I” or “Y” shaped with laminar bone almost along entire length. Precaudal vertebrae 15* (6); caudal vertebrae 18* (3) or 19 (3); total vertebrae 33* (3) or 34 (3). First gill arch with five (68), six (161) or seven (34) gill rakers on upper limb and 10 (59), 11 (151) or 12 (53) gill rakers on lower limb.

Color in alcohol. Overall ground color pale beige. Upper and lower lips, anterior portion of maxilla, snout, top of head and dorsal portion of opercle with scattered small dark chromatophores. Scales from two or three first longitudinal series of dorsal region posteriorly bordered by dark chromatophores, forming slightly reticulate pattern; scattered dark chromatophores concentrated along margins of myosepta of posterior half of lower portion of body, between lateral line and anal-fin base. Broad, dark

TABLE 1 | Morphometric data of *Moenkhausia melogramma*. Values for the holotype (MCZ 20825), range, and mean \pm SD (standard deviation).

	holotype	n	range	mean \pm SD
Standard length (mm)	38.3	341	21.9–52.4	33.9 \pm 5.7
Head length (mm)	10.0	341	6.2–14.0	9.2 \pm 1.4
Percentages of standard length				
Depth at dorsal-fin origin	39.9	341	28.5–45.0	37.7 \pm 3.1
Head length	26.0	341	24.6–30.1	27.2 \pm 1.1
Head depth	31.3	341	23.6–35.5	29.9 \pm 2.0
Dorsal-fin length	24.1	305	29.9–40.5	35.2 \pm 2.1
Dorsal-fin base		340	13.4–19.0	16.4 \pm 1.0
Pectoral-fin length	20.5	337	20.6–26.6	23.3 \pm 1.0
Pelvic-fin length	14.9	336	16.9–23.5	19.9 \pm 1.0
Anal-fin length	14.6	289	21.5–31.5	26.1 \pm 1.9
Anal-fin base		339	27.0–37.3	32.7 \pm 2.2
Caudal peduncle length	11.0	338	5.3–12.9	8.4 \pm 1.4
Caudal peduncle depth	9.6	338	6.9–12.0	10.1 \pm 0.8
Eye to dorsal-fin origin	37.1	341	30.0–38.1	34.3 \pm 1.4
Snout to dorsal-fin origin	51.2	340	45.1–53.2	49.3 \pm 1.4
Snout to pectoral-fin origin	29.7	341	26.3–32.2	29.0 \pm 1.1
Snout to pelvic-fin origin	46.4	340	42.9–63.9	47.7 \pm 2.2
Snout to anal-fin origin	62.9	341	59.7–70.3	64.8 \pm 2.2
Percentages of head length				
Snout length	29.6	341	16.2–26.5	20.7 \pm 1.8
Upper jaw length	42.3	340	35.7–47.9	42.9 \pm 2.3
Horizontal eye diameter	40.5	341	34.7–49.9	41.8 \pm 2.4
Least interorbital width	32.8	341	27.4–36.7	32.7 \pm 1.6

longitudinal stripe crossing middle portion of eye, inconspicuous in specimens stored for long time in formalin. Two humeral blotches formed by brown chromatophores. First humeral blotch vertically elongated, slightly oblique, approximately triangular, roughly rounded in its upper portion and with irregular projections in its lower portion, extending vertically through two longitudinal scales series above lateral line and two series below it, more pigmented in the two series above lateral line. First humeral blotch followed posteriorly by clear area. Second humeral blotch inconspicuous, irregular, roughly oblique, comma-shaped, or a narrow vertical stripe, more concentrated above lateral line, with its limits well-defined (Figs. 2A, D, F) or progressively fading posteriorly as a longitudinal stripe (Figs. 2B, C, E). Few chromatophores scattered on region of hypural plate. Conspicuous longitudinal dark line along anal-fin base, formed by melanophores, covering base of anal-fin rays and proximal portion of interradial membranes. Dorsal fin with scattered dark chromatophores on interradial membranes. Adipose fin with few scattered dark chromatophores concentrated on anterior margin. Pectoral, pelvic, and caudal fins with few scattered dark chromatophores on interradial membranes (Fig. 2).

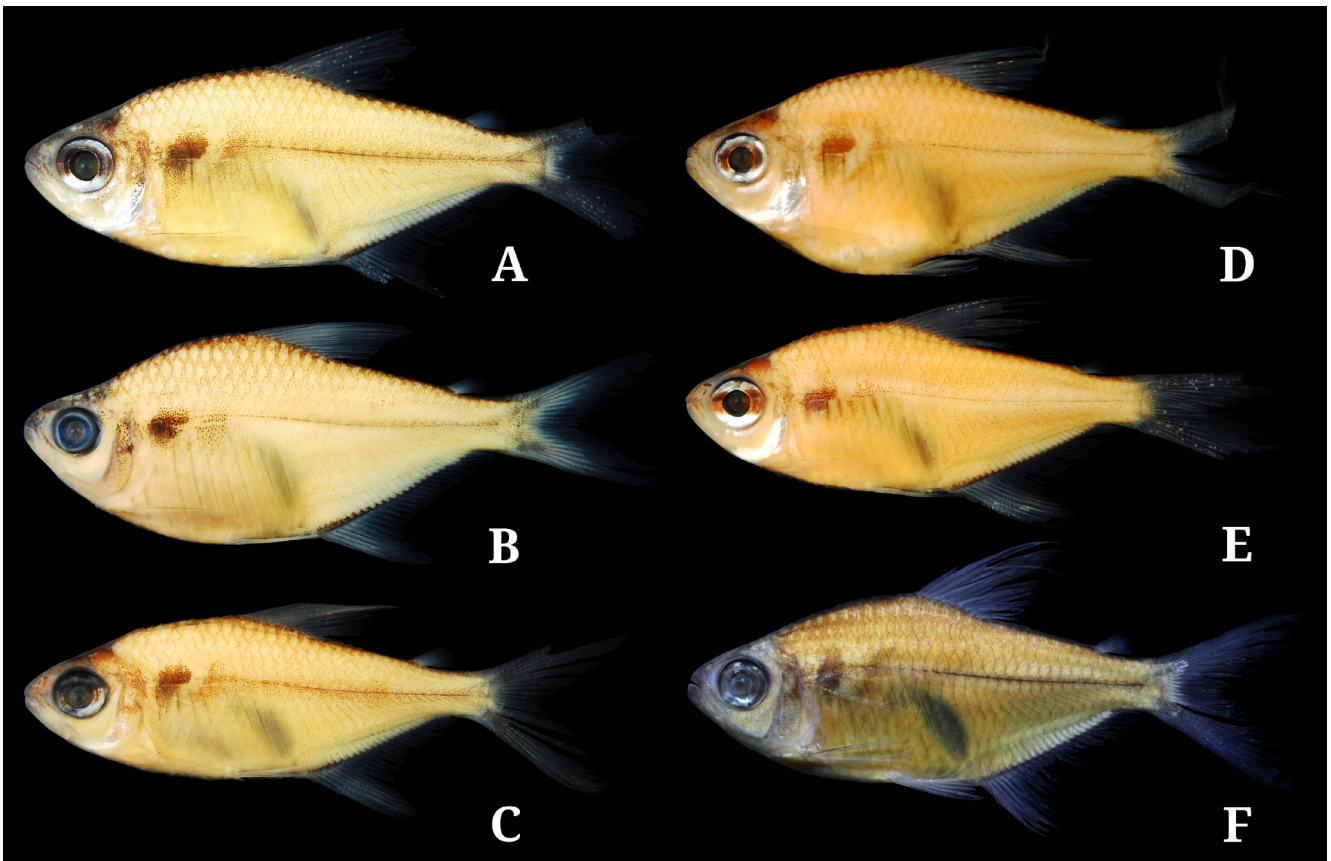


FIGURE 2 | *Moenkhausia melogramma*. **A.** ZUEC 14912, female, 39.9 mm SL, Brazil, Amazonas, Tabatinga, rio Solimões basin. **B.** ZUEC 15479, female, 38.1 mm SL, Brazil, Amazonas, Atalaia do Norte, rio Javari. **C.** MZUSP 122033, male, 33.2 mm SL, Brazil, Amazonas, Manicoré, rio Madeira basin. **D.** ZUEC 11327, female, 30.2 mm SL, Ecuador, Sucumbíos, río Gueppi, río Putumayo basin. **E.** MUSM 30440, male, 34.0 mm SL, Peru, Loreto, Maynas, Iquitos, quebrada San Lucas. **F.** MZUSP 106697, female, 43.2 mm SL, Peru, Madre de Dios, Mazuko, río Planchón.

Color in life. Based on pictures of five specimens photographed in life (ZUEC 14944, ZUEC 15479; Fig. 3) and in the photo of one specimen provided by Galvis *et al.* (2006: 468, pl. 43 b). Overall color pattern clear, dorsum light grey, with an olive hue; top of head with metallic green-coppery color; midline with metallic green color, especially intense in area immediately before first humeral blotch. Lower portion of head and abdominal region clear, with silvery hue. Area immediately above anal fin slightly translucent. Fins mostly hyaline, yellowish pigmentation on anterior portion of dorsal, anal, and pelvic fins; tip of dorsal and anal fins whitish in some specimens. Black markings as in preserved specimens.

Sexual dimorphism. Mature males possess bony hooks on pelvic- and anal-fin rays or only on anal-fin rays. Pelvic fin with one small and slender bony hook per lepidotrichium segment, arranged along the middle portion of the unbranched ray and anteriormost first to second branched fin rays. Anal fin with one or two (rarely three) pairs or unpaired bony



FIGURE 3 | *Moenkhausia melogramma*, immediately before preservation. **A.** ZUEC 15479, female, 37.6 mm SL, Brazil, Amazonas, Atalaia do Norte, rio Javari, igarapé do Adolfo. Photo: G. N. Salvador. **B.** ZUEC 13213, female, 41.5 mm SL, Brazil, Acre, Cruzeiro do Sul, igarapé Paleral, affluent of rio Moa. Photo: T. C. Pessali.

hooks per lepidotrichium segment, arranged along distal half of last unbranched ray and from first to fourth branched rays, larger on middle portion of ray.

Geographic distribution. *Moenkhausia melogramma* is distributed across the western portion of the Amazon basin in Brazil, Colombia, Peru, and Ecuador, with its easternmost records for the rio Curuá and rio Tapajós basins on the lower Amazon basin (Fig. 4). Although we have examined only two lots of *M. melogramma* from Ecuador in the present study, a cursory examination of the material identified as *Hemigrammus lunatus* from both the Napo and Putumayo basins in Ecuador, deposited at FMNH and MEPN, by one of the authors (FCTL), showed it to belong mostly to *M. melogramma* (see also comments in Ota *et al.*, 2019: 343). Records in the literature for the species, outside the range discussed above (Lasso *et al.*, 2004) are discussed in the “Remarks” below.

Ecological notes. *Moenkhausia melogramma* was collected in moderate to relatively large clearwater terra firme streams, in the area of Tabatinga and Benjamin Constant,

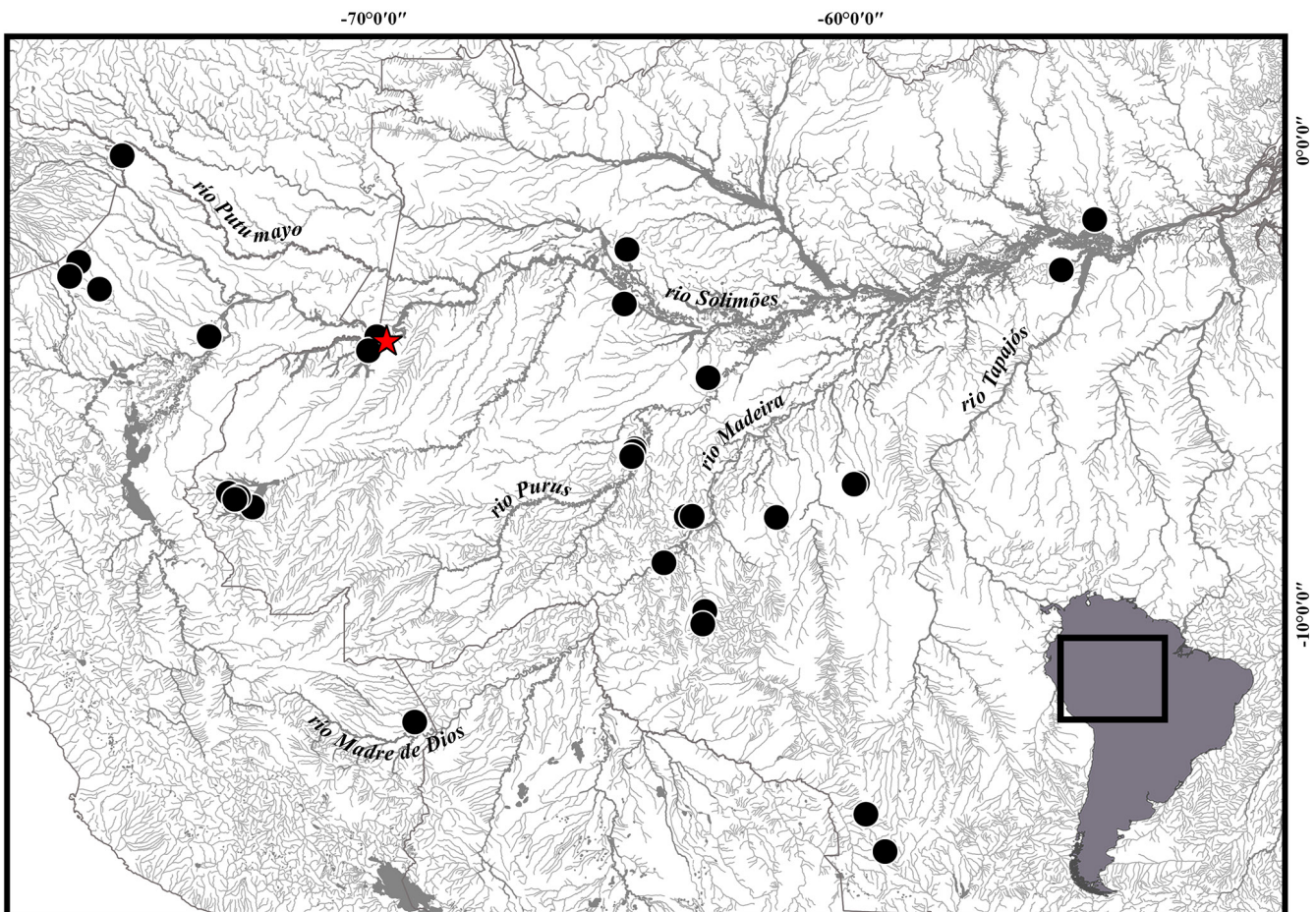


FIGURE 4 | Distribution of *Moenkhausia melogramma* in the western Amazon basin. Red star represents the type locality; black circles represent remaining known localities (one symbol may represent more than one lot).

Amazon State, western Amazon basin of Brazil, and both black and slightly muddy water terra firme streams in the rio Juruá basin, Acre State (Flávio C. T. Lima, 2016–2017, pers. obs.). The species was collected in the same type of habitat in the region of Leticia, Colombia (Galvis *et al.*, 2006: 221). *Moenkhausia melogramma* was considered to be ubiquitous in both piedmont (235–295 m asl) and lowland (below 220 m asl) areas in the río Napo basin (Galacatos *et al.*, 1996; as *Hemigrammus cf. lunatus*, in part). *Moenkhausia melogramma* was collected in syntopy with *M. collettii* at the lago Amanã, rio Solimões basin (INPA 32161) and in a tributary of the middle rio Madeira (ZUEC 6736). The species was found to be an omnivore, ingesting terrestrial invertebrates and aquatic vegetation (Galvis *et al.*, 2006: 221).

Conservation status. *Moenkhausia melogramma* is broadly distributed across the western Amazon basin, in relatively little disturbed areas, and it is considerably abundant at several sites. The species is known to occur in at least three Conservation Units: Canutama State Forest and Canutama Extractive Forest (rio Purus), both in Brazil, and at the Yasuní National Park in Ecuador. Due to broad geographical distribution, relatively high abundance, and relatively little impact from anthropogenic activities in the areas inhabited by the species, *M. melogramma* is herein categorized as Least Concern (LC), according to the International Union for Conservation of Nature (IUCN) categories and criteria (IUCN Standards and Petitions Subcommittee, 2017).

Remarks. Despite recorded in the literature, we were unable to confirm the occurrence of *Moenkhausia melogramma* from the río Orinoco basin (Lasso *et al.*, 2004: 115). We consider this record as very likely the result of a misidentification of a similar-looking species occurring in that basin, such as *Hemigrammus barrigonae* Eigenmann, Henn, 1914 or *M. collettii*. The only previous records for the species in the literature that we were able to confirm were those by Arbeláez *et al.* (2004) and Galvis *et al.* (2006), from the region of Leticia in Departamento Amazonas, Colombia, from which the voucher material (not cited in the Material Examined) was cursorily examined by one of the authors (FCTL) during a visit to the ICN-MHN and IAvH-P collections.

Material examined. Holotype of *Moenkhausia melogramma*: MCZ 20825, 38.3 mm SL, Brazil, Amazonas State, Tabatinga, Sep–Oct 1865, D. Bourget (Thayer Expedition) (photos and radiographs only). Non-type specimens: **Brazil: Rio Juruá basin:** LBP 4112, 3, 26.2–31.4 mm SL, Acre, Mâncio Lima, rio Japiim, tributary of rio Moa, 7°34'28.8"S 72°55'24.9"W, 24 Oct 2006, C. Oliveira, R. C. Benine & C. S. Silva; LBP 4133, 12, 21.9–28.5 mm SL, Acre, Mâncio Lima, rio Moa, 7°26'35.5"S 73°3'33.5"W, 24 Oct 2006, C. Oliveira, R. C. Benine & C. S. Silva; LBP 4148, 3, 31.9–38.8 mm SL, same data as LBP 4133; ZUEC 13414, 271, 23.5–41.5 mm SL, Acre, Mâncio Lima, igarapé Branco, 7°38'43"S 72°52'55"W, 30 Sep 2016, T. C. Pessali, T. R. F. Jacó, T. L. Silva, A. Casas & F. C. T. Lima; ZUEC 13314, 87, 20.8–31.6 mm SL, Mâncio Lima, Paraná de Pentecostes (trib. rio Moa), 7°28'2"S 72°57'38"W, 29 Sep 2016, F. C. T. Lima, T. C. Pessali, T. R. F. Jacó & T. L. Silva; ZUEC 13213, 36, 22.3–46.3 mm SL (2 c&s 34.4–34.5 mm SL), Acre, Cruzeiro do Sul, igarapé Paleral, affluent of rio Moa, 7°31'48"S 72°51'08"W, 29 Sep 2016, F. C. T. Lima, T. C. Pessali & T. R. F. Jacó; ZUEC 13188, 189, 19.9–30.1 mm SL, Cruzeiro do Sul, lago Vermelho, rio Moa, 7°36'48"S 72°48'10"W,

23 Sep 2006, F. C. T. Lima, T. C. Pessali, T. R. F. Jacó, T. L. Silva & R. Rubens; ZUEC 13221, 52, 26.6–35.8 mm SL, Acre, Cruzeiro do Sul, rio Croa, near BR-364, 7°44'16"S 72°32'59"W, 26 Sep 2016, F. C. T. Lima, T. C. Pessali, T. R. F. Jacó & A. Casas. ZUEC 13555, 100, 23.2–30.4 mm SL, Cruzeiro do Sul, igarapé Preto, 7°36'15"S 72°44'59"W, 24–26 Oct 2016, T. Jacó, T. Souza, R. Souza, J. Souza & T. Nascimento; ZUEC 13102, 117, 21.5–28.9 mm SL, same locality as previous, 22 Sep 2016, F. C. T. Lima, T. C. Pessali, T. R. F. Jacó, A. Casas & T. L. Silva; ZUEC 13819, 750, 24.5–39.9 mm SL, Amazonas, rio Gama, village of Gama, 7°17'38"S 72°38'36"W, 24 Nov 2016, T. Jacó, A. Casas, J. Souza & T. Souza; **Amazonas: Rio Javari basin:** ZUEC 15436, 2, 33.1–38.3 mm SL, Benjamin Constant, igarapé do Negão, road Benjamin Constant/Atalaia do Norte, 4°25'50"S 70°4'10"W, 17 Nov 2017, F. C. T. Lima, G. N. Salvador & N. Flausino Jr.; ZUEC 15479, 26, 31.9–39.3 mm SL, Atalaia do Norte, igarapé do Adolfo, road Benjamin Constant/Atalaia do Norte, 4°26'5"S 70°7'19"W, 11 Nov 2017, F. C. T. Lima, C. R. Moreira, G. N. Salvador & N. Flausino Jr.; ZUEC 15625, 1, 35.7 mm SL, Atalaia do Norte, igarapé Branco, road Benjamin Constant/Atalaia do Norte, 4°25'1"S 70°8'37"W, 9 Nov 2017, F. C. T. Lima, G. N. Salvador & N. Flausino Jr. **Rio Madeira basin:** MZUSP 117596, 44, 16.0–44.3 mm SL (10, 27.8–44.3 mm SL), rio Juma, affluent of rio Aripuanã at BR-230 between Vila dos 180 and Apuí, 7°12'43"S 59°55'18"W, 22 Jun 2015, W. M. Ohara & V. Abrahão; MZUSP 122033, 13, 26.0–35.1 mm SL, Manicoré, igarapé on side road S of Santo Antônio do Matupi district, km 180 of Transamazônica road (BR-230), 7°57'20.8"S 61°34'2.3"W, 3 Oct 2016, O. Oyakawa, W. Ohara, T. Teixeira & M. Pastana; MZUSP 122525, 7, 21.8–35.4 mm SL (5, 28.9–35.4 mm SL), igarapé affluent of rio Juma, left to Transamazônica (BR-230), 7°15'16"S 59°56'14.4"W, 8 Oct 2016, O. Oyakawa, W. Ohara, T. Teixeira & M. Pastana; MZUSP 122544, 5, 27.6–32.9 mm SL, Apuí, rio Juma, igarapé affluent of rio Coruja, 7°13'35.1"S 59°52'16.7"W, 8 Oct 2016, O. Oyakawa, W. Ohara, T. Teixeira & M. Pastana. **Rio Purus basin:** INPA 23564, 1, 21.5 mm SL, Canutama, Canutama State Forest, rio Paisé, igarapé da Flor, 6°32'28.7"S 64°32'49.8"W, 27 May 2013, G. G. Barros; INPA 23577, 1, 25.1 mm SL, Canutama, Canutama State Forest, rio Paisé, 6°30'56.7"S 64°32'18.2"W, 28 Apr 2013, G. G. Barros; INPA 23774, 1, 20.3 mm SL, Canutama, Canutama State Forest, rio Paisé, 6°30'23.2"S 64°32'10.3"W, 11 May 2013, T. B. A. Couto; INPA 23801, 3, 23.9–26.2 mm SL, Canutama, Canutama Extractive Reserve, rio Paisé, 6°33'45.7"S 64°33'34.2"W, 11 May 2013, G. G. Barros; INPA 35017, 3, 26.4–30.1 mm SL, Canutama, igarapé at Canutama Extractive Reserve, 6°39'59"S 64°37'3"W, 2 Sep 2010, S. Arrolho & R. Rosa; INPA 35028, 16, 22.6–28.9 mm SL, Canutama, igarapé at Canutama Extractive Reserve, 6°40'34"S 64°36'47"W, 2 Sep 2010, S. Arrolho & R. Rosa; INPA 36442, 19, 21.3–29.0 mm SL, Canutama, igarapé at Canutama Extractive Reserve, 6°40'19"S 64°36'5"W, 2 Sep 2010, S. Arrolho & R. Rosa; INPA 53275, 1, 30.1 mm SL, Tapauá, Turiaçu community, igarapé do Cemitério, 5°0'24"S 63°0'3"W, 12 Aug 2012, T. B. A. Couto; LBP 12017, 6, 26.3–31.7 mm SL, Lábrea, tributary of rio Purus, 7°56'6.6"S 63°27'21.2"W, 24 Aug 2010, C. Oliveira, M. Alexandrou, G. J. C. Silva & M. Taylor; MCP 54148, 3, 23.6–25.6 mm SL, Canutama, igarapé São João, tributary of rio Ipixuna, BR-319, about 60 km south of Humaitá, 7°55'53"S 63°20'3"W, 28 Jul 2004, P. Buckup, P. Lehman, F. Lima & J. Pezzi. **Rio Solimões basin:** INPA 32161, 24, 31.9–52.4 mm SL (1 c&s 40.7 mm SL), Tefé, igarapé Baré, lago Amanã, 2°17'50"S 64°42'2"W, 6 Nov 2002, M. Catarino; ZUEC 15150, 6, 32.9–41.1 mm SL,

Tefé, igarapé of Miriti (trib. rio Tefé), road of Agrovila, 3°26'55"S 64°45'23"W, 30 Nov 2017, F. C. T. Lima, G. N. Salvador & N. Flausino Jr.; LBP 22682, 2, 34.7–37.9 mm SL; LBP 22683, 7, 30.7–37.9 mm SL, Tabatinga, igarapé Xingu, 4°12'02.7"S 69°55'35.3"W, 16 Nov 2016, C. Oliveira, B. F. Melo, J. M. Marin & G. Aricari; LBP 23758, 59, 31.6–42.1 mm SL (1 c&s 34.2 mm SL), Tabatinga, igarapé Xingu, 4°11'25.5"S 69°55'40.3"W, 17 Nov 2016, C. Oliveira, B. F. Melo, J. M. Marin & G. Aricari; ZUEC 14944, 85, 24.8–42.3 mm SL (3 c&s 27.2–35.6 mm SL); MCZ 173933, 10, 27.7–34.6 mm SL; LBP 26160, 5, 26.6–28.8 mm SL, Tabatinga, igarapé do Urumutum, 4°12'34"S 69°54'47"W, 21 Nov 2017, F. C. T. Lima, C. R. Moreira, G. N. Salvador & N. Flausino Jr.; ZUEC 14912, 49, 22.9–39.8 mm SL, Tabatinga, same locality as previous lot, 3 May 2017, F. C. T. Lima, A. Acosta & J. D. Bogotá-Gregory; ZUEC 14879, 13, 30.2–35.4 mm SL, Tabatinga, igarapé do Olivério, ramal do Urumutum, 4°10'58"S 69°54'22"W, 3 May 2017, F. C. T. Lima, A. Acosta & J. D. Bogotá-Gregory; ZUEC 15331, 6, 38.5–41.2 mm, Tabatinga, stream at Ramal do Urumutum, 4°10'3"S 69°54'15"W, 20 Nov 2017, F. C. T. Lima, C. R. Moreira, G. N. Salvador & N. Flausino Jr.; ZUEC 15068, 2, 30.2–33.7 mm SL, Benjamin Constant, igarapé Cajarizinho, 4°26'41"S 69°59'56"W, 17 Nov 2017, F. C. T. Lima, C. R. Moreira, G. N. Salvador & N. Flausino Jr. **Mato Grosso: Rio Guaporé basin:** MCP 39927, 19, 24.8–35.5 mm SL (12, 27.0–35.5 mm SL), Comodoro, stream affluent of rio Novo, at road BR-174, between Pontes e Lacerda and Comodoro, 14°13'26"S 59°41'27"W, 12 Jul 2004, V. Bertaco, F. Lima, J. P. Silva & P. Lehmann; MCP 44561, 18, 25.1–36.1 mm SL (10, 27.3–36.1 mm SL), Pontes e Lacerda, rio Pindaituba, at road BR-174, between Pontes e Lacerda and Comodoro, 15°0'41"S 59°17'18"W, 12 Jul 2004, V. Bertaco, F. Lima, J. P. Silva & P. Lehmann. **Pará: Rio Curuá basin:** UFOPA 968, 12, 28.2–38.4 mm SL, Alenquer, tributary of rio Curuá, 1°39'57.5"S 54°53'37.8"W, 6 Jan 2017, A. Silva, A. Canto, C. Silva, F. Ribeiro & J. Souza. **Rio Tapajós basin:** ZUEC 12094, 11, 21.4–43.2 mm SL, Santarém, rio Mentalá, Cachoeirinha community, 2°43'49"S 55°35'34"W, 27 Nov 2015, F. C. T. Lima, B. B. Calegari, W. G. R. Crampton & E. Cerdeira. **Rondônia: Rio Guaporé basin:** INPA 44330, 11, 25.0–38.6 (9, 30.7–38.6 mm SL), middle rio Cautário, 14 Jul 2003, G. Torrente-Vilara. **Rio Jamari basin:** NUP 20808, 1, 43.8 mm SL, Ariquemes, rio Jamari, 9°56'20.7"S 63°4'8.1"W, Jan 2016, J. R. Gonçalves; NUP 20809, 5, 30.0–38.0 mm SL, Ariquemes, rio Canaã, 10°12'27.5"S 63°6'40.5"W, Dec 2016, J. R. Gonçalves; NUP 20811, 1, 38.5 mm SL, Ariquemes, rio Canaã, affluent of rio Jamari, 10°12'27.5"S 63°6'40.5"W, Nov 2015, J. R. Gonçalves; NUP 20812, 3, 29.0–36.7 mm SL, Ariquemes, rio Itapoana, 9°57'22.8"S 63°5'45.7"W, Dec 2016, J. R. Gonçalves. ZUEC 6736, 5, 26.2–32.3 mm SL, Porto Velho, stream at Balneário Cachoeirinha, 8°54'50"S 63°55'52"W, 12 Jul 2012, W. M. Ohara, T. H. S. Pires & F. C. T. Lima. **Colombia: Rio Amazonas basin:** LBP 22468, 1, 34.0 mm SL, Leticia, quebrada La Ponderosa, 4°8'24.4"S 69°56'53.4"W, 11 Nov 2016, C. Oliveira, B. F. Melo, J. M. Marin & G. Aricari. **Ecuador: Sucumbíos: Río Putumayo basin:** ZUEC 11327, 15, 26.4–37.5 mm SL, río Gueppi, 0°18'59"S 75°17'13"W, 8–11 Aug 2000, R. Barriga & A. Machado. **Peru: Loreto: Río Amazonas basin:** MUSM 30440, 37, 21.7–39.7 mm SL (20, 29.1–39.4 mm SL; 2 c&s 33.8–34.7 mm SL), Maynas, Iquitos, quebrada San Lucas, 4°8'14.9"S 73°27'48.2"W, 15 Feb 1998, H. Ortega & F. Chang; ZUEC 17118, 1, 34.7 mm SL, Iquitos, quebrada Lindero, road Iquitos/Nauta, 4°9'3"S 73°28'23"W, 7 Jan 2004, W. G. R. Crampton, H. Ortega, R. E. Reis & F. C. T. Lima. **Río Madre de Dios basin:**

MZUSP 106697, 11, 21.2–44.6 mm SL (8, 21.2–44.6 mm SL), Mazuko, río Planchon, 36.3 km N of Puerto Maldonado, 12° 16'38"S 69° 9'9"W, 28 Jul 2010, J. L. Birindelli, N. Lujan, D. Taphorn & D. Brooks. **Río Marañón basin:** MUSM 25616, 8, 17.6–33.0 mm SL, Andoas, near río Corrientes, 2° 33'53.7"S 76° 11'53.1"W, 18 Aug 2005, B. Rengifo; MUSM 38008, 9, 29.6–37.6 mm SL, Andoas, río Plantayacu, 3° 8'8.4"S 75° 45'43.5"W, 18 Aug 2008, R. Quispe.

DISCUSSION

Eigenmann (1908) mentioned that the color pattern of *Moenkhausia melogramma* consisted in the presence of a line along the anal-fin base, a faint longitudinal midlateral dark stripe, and absence of blotches. Topotypes and additional material from other localities in western Amazon revealed that *M. melogramma* also possess other conspicuous pigmentation features, *i.e.*, a broad dark stripe across the eye, and two humeral blotches, the first vertically elongated, and the second faint and inconspicuous. Although Eigenmann (1908, 1917) did not refer to the presence of the dark stripe across the eye, the examination of a picture of the holotype revealed that this feature is still discernible. The humeral blotches, however, cannot be in fact discerned in the holotype (Fig. 1). The holotype pigmentation is currently faded and judging from the retouched picture provided by Eigenmann (1917: pl. 6, fig. 1), it already was at the time of its description, so the lack of humeral blotches is considered as a preservation artifact.

Among congeners, *Moenkhausia melogramma* shares with *M. collettii*, *M. copei*, *M. veneri*, *M. conspicua*, and *M. flava* the presence of a broad longitudinal dark band across the eye, and a well-defined dark stripe on the anal-fin base (see Diagnosis). Among the aforementioned species, *M. melogramma* is more similar to *M. flava* due to the absence of a large longitudinal midlateral stripe, presence of six rows of scales between dorsal-fin origin and lateral line, and four rows of scales between lateral line and pelvic-fin origin. However, *M. melogramma* differs from *M. flava* by the presence of two humeral blotches, the first very conspicuous (*vs.* only one inconspicuous humeral blotch), and by the general clear body color pattern in live specimens (*vs.* pale-yellowish — see Britzke *et al.*, 2018: fig. 4).

The presence of a broad stripe across the eye and a dark stripe along the anal-fin base are color features that *Moenkhausia melogramma* also shares with the *Hemigrammus lunatus* species-group (*sensu* Ota *et al.*, 2014; 2019), which is composed by *H. barrigonae*, *H. lunatus*, *H. machadoi* Ota, Lima, Pavanelli, 2014, *H. ulreyi* (Boulenger, 1895), and the recently described *H. changae* Ota, Lima, Hidalgo, 2019. *Moenkhausia melogramma* can be distinguished from all aforementioned species by having a complete lateral line (*vs.* incomplete in *H. lunatus*, *H. machadoi*, *H. ulreyi*, and *H. changae*, discontinuous in some *H. barrigonae* specimens), and by the presence of two humeral blotches (*vs.* one, with the exception of *H. machadoi* that can eventually present a second faded humeral blotch). It is further distinguished from *H. changae* and *H. lunatus* by having a relatively broad dark stripe on all extension of anal-fin base (*vs.* narrow dark stripe). *Moenkhausia melogramma* can be differentiated from *H. barrigonae* and *H. ulreyi* by having a very narrow and faint longitudinal midlateral stripe (*vs.* wide and conspicuous midlateral stripe in *H. barrigonae* and *H. ulreyi*).

Additionally, the species differs from *Hemigrammus machadoi*, the most similar non-congener species, by having a higher number of precaudal (15 *vs.* 13–14) and lower number of caudal vertebrae (18–19 *vs.* 21), 5–8 (mode 6) gill rakers on upper limb and 9–13 (mode 11) gill rakers on lower limb (*vs.* 4–5, mode 5 and 9–10, mode 10, respectively) of the first branchial arch. Furthermore, *M. melogramma* is larger (reaching 50 mm SL), whereas *H. machadoi* is smaller (never surpassing 35 mm SL).

Ota *et al.* (2014), when discussing the *Hemigrammus lunatus* species-group, highlighted the similarity between those species with *M. collettii* and congeners with similar color pattern (*i.e.*, a broad stripe across the eye and a dark line along anal-fin basin), that it might indicate a close relationship between the latter species and this species-group. This putative monophyletic group had been partially supported by molecular hypotheses, that recovered a clade composed by the aforementioned species plus *M. hemigrammoides* Géry, 1965 and *Aphyodite grammica* Eigenmann, 1912 (Mariguela *et al.*, 2013; Britzke *et al.*, 2018; Mirande, 2019).

In fact, as argued by Britzke *et al.* (2018), the putative close relationship between *M. collettii*, *M. copei*, and *M. flava* with *H. unilineatus* Gill, 1858, the type species of *Hemigrammus*, highlights the weakness of the degree of lateral line perforation as a diagnostic character to distinguish both genera. As earlier remarked by Weitzman, Fink (1983), this character clearly is highly homoplastic, with non-homologous reductions occurring many times within Characidae. The presence of the discontinuous lateral line is a rare condition in *M. melogramma*, and it also occurs in some specimens of *M. collettii* and *M. copei*, even though the pores and canals extend to caudal fin in all specimens analyzed (Isabel M. Soares, 2020, pers. obs.).

A phylogenetic analysis including the species of *Hemigrammus lunatus* species-group and the similar-looking species of *Moenkhausia* (*i.e.*, *M. collettii*, *M. copei*, *M. conspicua*, *M. flava*, *M. melogramma*, and *M. venerei*) is currently being conducted by the first author to test the relationships within this putative monophyletic clade and its relationships with the remaining Characidae.

Comparative material examined. *Hemigrammus barrigonae*: **Colombia**: INPA 49986, 25, 22.2–37.3 mm SL (1 c&s 31.8 mm SL). *Hemigrammus changae*: see Ota *et al.* (2019). *Hemigrammus lunatus*: see Ota *et al.* (2019). *Hemigrammus machadoi*: **Brazil**: MZUSP 115629, 11, 29.7–38.2 mm SL. *Hemigrammus ulreyi*: **Brazil**: LBP 7604, 13, 25.2–33.6 mm SL. *Moenkhausia collettii*: **Brazil**: INPA 52697, 5, 33.5–45.9 mm SL (1c&s 41.8 mm SL). **Colombia**: ANSP 128697, 20, 34.2–48.2 mm SL (1 c&s 43.3 mm SL). *Moenkhausia conspicua*: see Soares, Bührnheim (2016). *Moenkhausia copei*: **Brazil**: UFOPA 144, 2, 28.8–32.0 mm SL; UFOPA 719, 2, 29.3–29.8 mm SL. *Moenkhausia flava*: **Brazil**: MZUSP 123719, 33.6 mm SL, holotype; LBP 9031, 10, 20.0–35.4 mm SL, paratypes; LBP 18414, 15, 18.6–37.8 mm SL; MZUSP 123720, 10, 26.6–34.3 mm SL. *Moenkhausia venerei*: **Brazil**: NUP 8104, 10, 23.7–28.6 mm SL.

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REFERENCES

- **Arbelález F, Gálvis G, Mojica JI, Duque S.** Composition and richness of the ichthyofauna in a *terra firme* forest stream of the Colombian Amazonia. *Amazoniana*. 2004; 18(1/2):95–107.
- **Axelrod HR, Burgess WE, Pronek N, Walls JG.** Dr. Axelrod's atlas of freshwater aquarium fishes. Neptune City: T.F.H. Publications; 1995.
- **Britzke R, Troy WP, Oliveira C, Benine RC.** Description of a new species of *Moenkhausia* (Characiformes: Characidae) from the upper Paraguay basin, Central Brazil, with comments on its phylogenetic relationships. *Neotrop Ichthyol*. 2018; 16(2):e170086. <http://dx.doi.org/10.1590/1982-0224-20170086>
- **Eigenmann CH.** Preliminary descriptions of new genera and species of tetragonopterid characins (Zoölogical Results of the Thayer Brazilian expedition). *Bull Mus Comp Zool*. 1908; 52:91–106.
- **Eigenmann CH.** Catalogue of the freshwater fishes of tropical and south temperate America. Reports of the Princeton University expeditions to Patagonia 1896–1899. *Zoology*. 1910; 3(4):375–511.
- **Eigenmann CH.** The American Characidae. *Mem Mus Comp Zool*. 1917; 43(1):1–102, pt. 1.
- **Fink WL, Weitzman SH.** The so-called Cheirodontin fishes of Central America with descriptions of two new species (Pisces: Characidae). Washington: Smithsonian Institution Press; 1974. (Smithsonian Contributions to Zoology; No 172).
- **Fowler HW.** Os peixes de água doce do Brasil. *Arq Zool(São Paulo)*. 1948; 6(1-12):1–204.
- **Fricke R, Eschmeyer WN, Van der Laan R.** Eschmeyer's catalog of fishes: genera, species, references [Internet]. San Francisco: California Academy of Sciences; 2020. Available from: <http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>
- **Galacatos K, Barriga-Salazar R, Stewart DJ.** Seasonal and habitat influences on fish communities within the lower Yasuni River basin of the Ecuadorian Amazon. *Environ Biol Fish*. 2004; 71:33–51. <https://doi.org/10.1023/B:EBFI.0000043156.69324.94>
- **Galacatos K, Stewart DJ, Ibarra M.** Fish community patterns of lagoons and associated tributaries in the Ecuadorian Amazon. *Copeia*. 1996; 1996(4):875–94. Available from: <https://www.jstor.org/stable/1447650>

- **Galvis G, Mojica JI, Duque SR, Castellanos C, Sánchez-Duarte P, Arce M, Gutiérrez Á, Jiménez LF, Santos M, Vejarano S, Arbeláez F, Prieto E, Leiva M.** Peces del medio Amazonas. Región de Leticia. Bogotá: Conservación Internacional; 2006. (Serie de Guías Tropicales de Campo 5).
- **Géry J.** Characoids of the world. Neptune City: T.F.H. Publications; 1977.
- **Ibarra M, Stewart DJ.** Longitudinal zonation of sandy beach fishes in the Napo River basin, eastern Ecuador. *Copeia*. 1989; 1989(2):364–81. Available from: <https://www.jstor.org/stable/1445433>
- **International Union for Conservation of Nature (IUCN).** Standards and Petitions Subcommittee. Guidelines for using the IUCN Red List Categories and Criteria. Version 13 [Internet]. Gland; 2017. Available from: <http://cmsdocs.s3.amazonaws.com/RedListGuidelines.pdf>
- **Lasso CA, Mojica JI, Usma JS, Maldonado-Ocampo JA, DoNascimento C, Taphorn DC, Provenzano F, Lasso-Alcalá OM, Galvis G, Vásquez L, Lugo M, Machado-Allison A, Royero R, Suárez C, Ortega-Lara A.** Peces de la cuenca del río Orinoco. Parte I: lista de especies y distribución por subcuencas. *Biota Colomb*. 2004; 5(2):95–158.
- **Lima FCT, Malabarba LR, Buckup PA, Silva JFP, Vari RP, Harold A, Benine RC, Oyakawa OT, Pavanelli CS, Menezes NA, Lucena CAS, Malabarba MCSL, Lucena ZMS, Reis RE, Langeani F, Casatti L, Bertaco VA, Moreira CR, Lucinda PHF.** Genera *Incertae Sedis* in Characidae. In: Reis RE, Kullander SO, Ferraris CJ, Jr., editors. Check List of the Freshwater Fishes of South and Central America. Porto Alegre: Edipucrs; 2003. p.106–69.
- **Mariguela TC, Benine RC, Abe KT, Avelino GS, Oliveira C.** Molecular phylogeny of *Moenkhausia* (Characidae) inferred from mitochondrial and nuclear DNA evidence. *J Zool Syst Evol Res*. 2013; 51(4):327–32. <http://dx.doi.org/10.1111/jzs.12025>
- **Menezes NA, Weitzman SH.** Two new species of *Mimagoniates* (Teleostei: Characidae: Glandulocaudinae), their phylogeny and biogeography and a key to the glandulocaudin fishes of Brazil and Paraguay. *Proc Biol Soc Wash*. 1990; 103(2):380–426.
- **Mirande JM.** Phylogeny of the family Characidae (Teleostei: Characiformes): from characters to taxonomy. *Neotrop Ichthyol*. 2010; 8(3):385–568. <http://dx.doi.org/10.1590/S1679-62252010000300001>
- **Mirande JM.** Morphology, molecules and the phylogeny of Characidae (Teleostei, Characiformes). *Cladistics*. 2019; 35(3):282–300. <https://doi.org/10.1111/cla.12345>
- **Oliveira C, Avelino GS, Abe KT, Mariguela TC, Benine RC, Orti G, Vari RP, Castro RMC.** Phylogenetic relationships within the speciose family Characidae (Teleostei: Ostariophysi: Characiformes) based on multilocus analysis and extensive ingroup sampling. *BMC Evol Biol*. 2011; 11(275):1–25. <https://doi.org/10.1186/1471-2148-11-275>
- **Ota RP, Lima FCT, Pavanelli CS.** A new species of *Hemigrammus* Gill, 1858 (Characiformes: Characidae) from the rio Madeira and rio Paraguai basins, with redescription of *H. lunatus*. *Neotrop Ichthyol*. 2014; 12(2):265–79. <http://dx.doi.org/10.1590/1982-0224-20130176>
- **Ota RP, Lima FCT, Hidalgo MH.** Description of a new *Hemigrammus* Gill (Characiformes: Characidae) from the rio Madeira basin in Peru and Bolivia. *Zootaxa*. 2019; 4577(2):335–47. <http://dx.doi.org/10.11646/zootaxa.4577.2.6>
- **Qgis.org.** QGIS Geographic Information System. Open Source Geospatial Foundation Project. Available from: <https://www.qgis.org/>
- **Sabaj MH.** Standard symbolic codes for institutional resource collections in herpetology and ichthyology: an Online Reference [Internet]. Washington: American Society of Ichthyologists and Herpetologists. Available from: <https://asih.org/standard-symbolic-codes>
- **Soares IM, Bastos DA, Lima FCT, Rapp Py-Daniel LH.** A new species of *Moenkhausia* Eigenmann, 1903 (Characiformes, Characidae) from the upper rio Negro basin, Brazil. *Copeia*. 2019; 107(2):232–38. <https://doi.org/10.1643/C18-149>
- **Soares IM, Bührnheim CM.** A new species of *Moenkhausia* Eigenmann, 1903 (Characiformes: Characidae) from Amazon basin, Brazil. *Zootaxa*. 2016; 4208(4):392–400. <http://dx.doi.org/10.11646/zootaxa.4208.4.6>

- **Soares NC, Benine RC.** *Moenkhausia restricta*, a new species from the upper Rio Negro, Amazon basin, northwestern Brazil (Characiformes: Characidae). *Zootaxa*. 2019; 4700(4):487–93. <http://dx.doi.org/10.11646/zootaxa.4700.4.7>
- **Taylor WR, Van Dyke GC.** Revised procedures for staining and clearing small fishes and other vertebrates for bone and cartilage study. *Cybiurn*. 1985; 9(2):107–19.
- **Terán GE, Benitez MF, Mirande JM.** Opening the Trojan horse: phylogeny of *Astyanax*, two new genera and resurrection of *Psalidodon* (Teleostei: Characidae). *Zool J Linnean Soc.* 2020; 1–18. <https://doi.org/10.1093/zoolinnea/zlaa019>
- **Weitzman SH, Fink WL.** Relationships of the neon tetras, a group of South American freshwater fishes (Teleostei, Characidae), with comments on the phylogeny of New World characiforms. *Bull Mus Comp Zool.* 1983; 150(6):339–95.

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