



<http://dx.doi.org/10.11646/zootaxa.3948.2.4>

<http://zoobank.org/urn:lsid:zoobank.org:pub:E56EB1A5-D45F-4A2C-8BC8-19DCD5472F3A>

A new species of *Hemigrammus* Gill, 1858 (Characiformes: Characidae) from the central and western Amazon and rio Paraná-Paraguai basins

RAFAELA P. OTA^{1,4}, FLÁVIO C. T. LIMA² & CARLA S. PAVANELLI³

¹Programa de Pós-Graduação em Biologia de Água Doce e Pesca Interior, Instituto Nacional de Pesquisas da Amazônia, Coleção de Peixes, Avenida André Araújo, 2936, C. P. 2223, 69060-375 Manaus, Amazonas, Brazil

²Museu Zoologia da Universidade Estadual de Campinas “Adão José Cardoso, Caixa Postal 6109, 13083-863 Campinas, São Paulo, Brazil. E-mail: fctlima@gmail.com

³Núcleo de Pesquisas em Limnologia, Ictiologia e Aquicultura, Universidade Estadual de Maringá, Av. Colombo, 5790, 87020-900 Maringá, Paraná, Brazil. E-mail: carlasp@nupelia.uem.br

⁴Corresponding author. E-mail: rafinhaota@yahoo.com.br

Abstract

A new species of *Hemigrammus* is described from the middle rio Solimões/Amazonas and tributaries, upper and middle rio Madeira, and rio Paraná-Paraguai basins in Brazil and Paraguay. The new species is most similar among congeners with *Hemigrammus marginatus*, with which it shares similar caudal-fin pigmentation pattern. The new species can be distinguished from *Hemigrammus marginatus* by possessing two conspicuous dark patches of pigmentation on caudal fin, occupying most of caudal-fin lobes, except the tips, by having two dark narrow stripes along anal-fin base, and by possessing 5–8 pored lateral line scales. The new species differs from *Hyphessobrycon diancistrus*, which is similar in color pattern and general body shape, by the presence of small scales on caudal-fin lobes, occupying approximately its basal third, by the presence of two narrow stripes along anal fin base, and by the absence of bony hooks on anal fin in mature males. The occurrence of the new species in both Amazon and rio Paraná-Paraguai basins is discussed in order to clarify and expand recent discussions on the biogeographical relationships between both river systems.

Key words: *Hyphessobrycon otrynus*, *Hemigrammus marginatus*, *Hyphessobrycon diancistrus*, biogeography

Resumo

Uma nova espécie de *Hemigrammus* descrita do médio rio Solimões/Amazonas e afluentes, bem como da bacia do médio e alto rio Madeira, e bacia dos rios Paraná-Paraguai, no Brasil e Paraguai. A nova espécie entre as congêneres é mais similar a *Hemigrammus marginatus*, com a qual compartilha um padrão de pigmentação da nadadeira caudal similar. A nova espécie pode ser diferenciada de *Hemigrammus marginatus* por possuir duas áreas de pigmentação escuras nos lobos da nadadeira caudal muito conspícuas, ocupando a maior parte dos lobos da nadadeira caudal, exceto pelas extremidades, por possuir duas faixas escuras estreitas ao longo da base da nadadeira anal, e por possuir 5–8 escamas perfuradas na linha lateral. A nova espécie difere de *Hyphessobrycon diancistrus*, similar em padrão de colorido e forma geral do corpo, pela presença de escamas pequenas nos lobos da nadadeira caudal, ocupando aproximadamente o terço basal da mesma, pela presença de duas faixas estreitas ao longo da base da nadadeira anal e pela ausência de ganchos ósseos na nadadeira anal de machos maduros. A ocorrência da nova espécie tanto na bacia amazônica como na bacia do rio Paraná-Paraguai discutida com vista a esclarecer e expandir discussões recentes sobre as relações biogeográficas entre ambos sistemas hidrográficos.

Introduction

Hemigrammus Gill, 1858 is one of the most speciose genera in Characidae, with 56 species currently considered valid, including the one described herein (Lima *et al.*, 2003; Ota *et al.*, 2014; Marinho *et al.*, 2014). As several other genera in Characidae, *Hemigrammus* is not defined by synapomorphies and, as a matter of fact, is not deemed

to be a natural group since a very early time (Durbin in Eigenmann, 1918). Consequently, *Hemigrammus* is still characterized by a combination of characters, including premaxillary teeth arranged in two series, incomplete lateral line and caudal fin partially covered with small scales (Durbin in Eigenmann, 1918; Géry, 1977). None of these characters is exclusive of *Hemigrammus* and most of them are shared with *Hyphessobrycon* Durbin, *Moenkhausia* Eigenmann and another related Characidae genera, which also are not considered to be natural, monophyletic taxa (Weitzman & Fink, 1983).

Recently, some broad phylogenetic studies have been undertaken in the attempt to elucidate the relationships within Characidae. Mirande (2009), in an analysis using morphological data, obtained a monophyletic clade which he named *Hemigrammus* clade including, in addition to *Hemigrammus*, 11 other genera that were previously considered *incertae sedis* within Characidae (*Bario*, *Deuterodon*, *Hasemania*, *Hyphessobrycon*, *Moenkhausia*, *Myxiops*, *Paracheirodon*, *Petitella*, *Pristella*, *Probolodus*, and *Thayeria*). The same author presented a slightly different hypothesis, where *Hemigrammus*, along with the aforementioned genera and some additional genera, were included into a redefined subfamily Tetragonopterinae (Mirande, 2010: 500). In neither hypothesis, the four analyzed *Hemigrammus* species (*H. erythrozonus* Durbin, 1909, *H. cf. rhodostomus* Ahl, 1924, *H. ulreyi* (Boulenger, 1895), and *H. unilineatus* (Gill, 1858)) were recovered as a monophyletic lineage, but rather, mixed with species of *Hasemania*, *Hyphessobrycon*, *Paracheirodon*, *Pristella*, and *Thayeria* (Mirande, 2009:6, fig. 1; 2010:468, fig. 127).

Two recent phylogenetic hypotheses of Characidae based on molecular data are available, Javonillo *et al.* (2010) and Oliveira *et al.* (2011), which, although obtaining trees topologies quite distinct from the ones based on morphological data by Mirande (2009, 2010), agreed with the latter in showing a close relationship between the *Hemigrammus* species sampled and species of *Hyphessobrycon*, *Hasemania*, *Moenkhausia*, *Paracheirodon*, and *Pristella*, and in not recovering it as a monophyletic entity. Thus, both morphological and molecular data thus far do not support the monophyly of *Hemigrammus*. However, we still lack a phylogenetic hypothesis with a large sampling of both *Hemigrammus* species and species of related genera, and a classification reflecting actual relationships is still a goal far in the horizon for this group.

Another issue that hampers further advance in the knowledge of the relationships of *Hemigrammus* and related genera is the still poor knowledge of the alpha-taxonomy of most of taxa. Many species currently assigned to *Hemigrammus* are poorly known, and there are several species that still await description. In the present paper, we describe a new species which is widespread throughout the Amazon and the Paraná-Paraguai basins, and which was previously mistakenly identified in the literature as *Hemigrammus marginatus* Ellis, 1911, a species actually presenting a more restricted distribution than assumed.

Material and methods

Counts and measurements were taken according methodology presented by Fink & Weitzman (1974) and Menezes & Weitzman (1990), with addition of distance between the tip of supraoccipital spine to dorsal-fin origin, distance between the end of dorsal-fin basis to adipose-fin origin, distance from snout to the tip of the supraoccipital spine, distance from pelvic-fin origin to anal-fin origin, and head depth, taken at vertical through the base of supraoccipital spine. Measurements were taken with a caliper rule to the nearest 0.1 mm on the left side of the specimen, and expressed as percents of standard length (SL), except for subunits of the head, which are recorded as percents of head length (HL). Counts of horizontal scale rows between dorsal-fin origin and lateral line do not include scales of the median predorsal series situated immediately anterior to the first dorsal-fin ray. The horizontal scale rows below lateral line were counted to the pelvic-fin insertion.

Vertebrae, supraneurals, branchiostegal rays, gill rakers of first arch, teeth cusps, unbranched anal-fin rays, and procurrent caudal-fin rays counts were taken from cleared and stained specimens (c&s), prepared according to the method described by Taylor & Van Dyke (1985). Vertebrae of the Weberian apparatus were counted as four elements and included in the vertebral counts, and the fused PU1+U1 of the caudal region as a single element. Patterns of scale *circuli* and *radii* were described from scales sampled from the area between the lateral line and the dorsal-fin origin.

In the description, counts are followed by their frequency in parentheses, and an asterisk indicates the count of the holotype. In the list of analyzed material, total number of specimens of each lot is giving first, followed by the

number of analyzed specimens in parentheses (when different from total number of the lot), and then by those cleared and stained (c&s). Information of sexual dimorphism, including sex and breeding condition of the dissected examined material was determined according to Vazzoler (1996). Institutional abbreviations are Academy of Natural Sciences of Drexel University, Philadelphia (ANSP), California Academy of Sciences, San Francisco (CAS), Colección Zoológica de la Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Asunción, Asunción (CZFCEN), Field Museum of Natural History, Chicago (FMNH), Instituto Nacional de Pesquisas da Amazônia, Manaus (INPA), Museo Nacional de Historia Natural del Paraguay, Asunción (MNHNP), Museo de Biología de la Universidad Central de Venezuela, Caracas (MBUCV), Museo de Ciencias Naturales de la Universidad Nacional Experimental de los Llanos Occidentales Ezequiel Zamora, Guanare (MCNG), Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre (MCP), Museu de Zoologia da Universidade de São Paulo, São Paulo (MZUSP), Coleção Ictiológica do Nupélia, Maringá (NUP), Universidade Federal de Rondônia, Porto Velho (UFRO-I), and Museu de Zoologia da Universidade Estadual de Campinas, Campinas (ZUEC).

Hemigrammus durbinae, new species

(Figs. 1–4)

Hemigrammus marginatus (not Ellis, 1911) — Veríssimo *et al.*, 2005: 4 [Brazil, Mato Grosso, rio Cuiabá, Manso Reservoir].

Hemigrammus sp. “falso marginatus” Lima *et al.*, 2013: 270–271 [Brazil, rio Madeira basin: photo, short description, diagnosis, habitat preferences, distribution in the rio Madeira basin].

Holotype. MZUSP 115984, 23.1 mm SL: Brazil, Amazonas, Careiro, lago Castanho, lago Janauacá complex, rio Solimões basin, c. 3°48'S, 60°23'W, P. Bayley, 5 Jul 1977.

Paratypes. Brazil, Amazonas, rio Solimões basin: MZUSP 102967, 282, 18.1–28.0 mm SL, same data as holotype; MZUSP 102732, 60, 14.0–27.1 mm SL, Careiro, Lago do Castanho, São José, rio Solimões basin, c. 3°48'S, 60°23'W, P. Bayley, 27 Apr 1977; MZUSP 102433, 240, 14.6–27.0 mm SL; ZUEC 7774, 40, 19.3–27.7 mm SL, Careiro, Lago do Castanho, Lago Janauacá complex, c. 3°48'S, 60°23'W, P. Bayley, 13 Apr 1977; MZUSP 100610, 422, 19.1–27.1 mm SL, Careiro, Lago Castanho, lago Janauacá complex, c. 3°48'S, 60°23'W, P. Bayley, 1 Mar 1977; ZUEC 8392, 318, 14.4–22.5 mm SL, Manaquiri, Lago Murumuru, Lago Janauacá complex, c. 3°24'S, 60°16'W, P. Bayley, 7 Dec 1977; MZUSP 102978, 2, 23.5–23.8 mm SL, “furo” between Lago Murumuru and Paraná de Janauacá, c. 3°24'S, 60°16'W, P. Bayley, 6 Jul 1977; MZUSP 102759, 2, 20.4–21.4 mm SL, “furo” between Lago Murumuru and Paraná de Janauacá, c. 3°24'S, 60°16'W, P. Bayley, 22 Jun 1977; MZUSP 102765, 1, 23.5 mm SL, Manaquiri, Lago Murumuru, Lago Janauacá, c. 3°24'S, 60°16'W, P. Bayley, 11 May 1977; MZUSP 27113, 641, 15.1–27.6 mm SL; MCP 48335, 30, 19.5–26.0 mm SL; CAS 237761, 20, 20.0–25.4 mm SL; ANSP 197274, 30, 19.0–25.7 mm SL, Manaquiri, lago Janauacá, c. 3°24'S, 60°16'W, Alpha Helix Expedition, 7–25 Jan 1977; ZUEC 8323, 31, 16.7–25.9 mm SL, Iranduba, Lago Cantagalo, Lago Januari complex, c. 3°12'S, 60°13'W, P. Bayley, 24 Jan 1979; MZUSP 102446, 934, 18.8–26.2 mm SL, Iranduba, lago Januari, Olaria, c. 3°12'S 60°01'W, P. Bayley, 14 Apr 1977. **Rio Purus basin:** INPA 17482, 9, 22.1–24.4 mm SL, Beruri, igarapé Duas Bocas, Paraná do Jari, tributary of rio Purus, 4°53'07"S 62°20'11"W, L. H. Rapp Py-Daniel & C. P. Deus, 7 Jul 2001. **Rondônia, rio Madeira basin:** INPA 39505, 5, 2 c&s, 22.7–24.9 mm SL, Porto Velho, lago Xodó, near comunidade São Carlos, 8°26'15"S 63°29'56"W, Lúcia H. R. Py-Daniel, 19 Apr 2005; UFRO-I 685, 14, 23.4–26.5 mm SL, Humaitá, lago Puruzinho, rio Madeira, 7°22'04"S 63°03'40"W, 10 Feb 2012, A. Cella-Ribeiro UFRO-I 10619, 7, 19.2–20.3 mm SL; UFRO-I 10620, 13, 18.3–24.8 mm SL, Porto Velho, lago Cuniã, rio Madeira, 8°19'11"S 63°30'01"W, E. R. Silva, 10 Mar 2010; UFRO-I 11580, 20, 15.2–18.6 mm SL, Cerejeiras, igarapé Azul, 10 km on road RO-399, 13°19'10"S 61°03'16"W, Equipe LIP/UNIR, 2 Sep 2011. **Mato Grosso, rio Paraguai basin:** NUP 6265, 10, 19.1–21.7 mm SL; NUP 9547, 1 c&s, 26.1 mm SL, Chapada dos Guimarães boundary with Nobres, córrego Forquilha, tributary of rio Cuiabá, 14°41'00"S 55°32'00"W, Nupélia staff, 24 Apr 2000; NUP 2153, 158, 21.5–25.4 mm SL, Barão de Melgaço, baía de Chacororé, tributary of rio Cuiabá, 14°57'07"S 55°42'59"W, Nupélia staff, 24 Feb 2003; NUP 6260, 19, 19.1–21.3 mm SL, Nupélia staff, 26 Apr 2003; NUP 9543, 22 c&s, 21.6–24.1 mm SL, Nupélia staff, 24 Feb 2003; NUP 6261, 50, 19.4–22.5 mm SL, Barão de Melgaço, baía Sinhá Mariana, tributary of rio Cuiabá, 16°20'20"S 55°54'10"W, Nupélia staff, 20 Mar 2002. **Paraguay, Ñeembucu, río Paraguay basin:** CZFCEN 323, 5, 19.6–23.7 mm SL, Mburicá, arroio Yacaré, tributary of rio Paraguay, 26°39'S

58°05'W, H. V. Alcaraz *et al.*, 17 Nov 2006. **Concepción:** MNHNP 3679, 31, 18.8–20.7 mm SL, San Carlos, Arroyo Blandengue, next to the rio Apa mouth, 22°14'15"S 57°22'19"W, J. Sarmiento *et al.*, 15 Sep 1997. **Itapúa, rio Paraná basin:** MNHNP 3683, 3, 29.0–21.9 mm SL, Carmen del Paraná, arroyo Tacuary (on route 1 bridge), tributary of rio Paraná, 27°13'11"S 56°09'53"W, M. Medina & S. Kullander, 20 Nov 1998.



FIGURE 1. *Hemigrammus durbinae*, new species, MZUSP 115984, holotype, 23.1 mm SL, Brazil, Amazonas, Careiro, lago Castanho, rio Solimões basin.

Non types. Brazil, Amazonas, rio Solimões basin: ZUEC 8255, 95, 16.3–25.6 mm SL, Careiro, Lago Castanho (Lago Janauacá complex), São José, c. 3°48'S, 60°23'W, P. Bayley, 15 Feb 1978; MZUSP 100458, 101, 15.2–26.8 mm SL, Careiro, Lago do Castanho (Lago Janauacá complex), São José, c. 3°48'S, 60°23'W, P. Bayley, 10 Feb 1977; MCP 43962, 49, 15.5–23.4 mm SL, Manaquiri, Paraná de Janauacá, mouth of Lago Castanho, c. 3°24'S, 60°16'W, P. Bayley 24 Nov 1977; MZUSP 50074, 50, 17.7–27.1 mm SL, Careiro, Lago Castanho, lago Janauacá complex, c. 3°48'S, 60°23'W, Alpha Helix Amazon Expedition, 7–25 Jan 1977; ZUEC 6751, 1, 14.1 mm SL, Careiro, Lago Castanho, c. 3°48'S, 60°23'W, K. Okushigue, 6 Aug 1977; ZUEC 8470, 224, 14.5–21.2 mm SL, Manaquiri, Lago Murumuru (Lago Janauacá complex), c. 3°24'S, 60°16'W, P. Bayley, 21 Dec 1977; ZUEC 8459, 95, 14.2–21.5 mm SL, Manaquiri, Lago Murumuru (Lago Janauacá complex), c. 3°24'S, 60°16'W, P. Bayley, 7 Dec 1977; MZUSP 102738, 1, 26.3 mm SL, Manaquiri, Paraná de Janauacá, entrance of Lago Castanho, c. 3°28'S, 60°17'W, P. Bayley, 27 Apr 1977; ZUEC 8382, 141, 17.1–22.3 mm SL, Iranduba, Lago Januári, Olaria, c. 3°12'S, 60°13'W, P. Bayley, 19 Jan 1978; ZUEC 8373, 252, 14.4–21.0 mm SL, Iranduba, Lago Januári, near mouth, c. 3°12'S, 60°13'W; P. Bayley 21 Nov 1977; ZUEC 8316, 58, 13.7–19.8 mm SL, Iranduba, Lago Januári, Olaria, c. 3°12'S, 60°13'W, P. Bayley, 22 Nov 1977; ZUEC 8400, 53, 17.5–21.9 mm SL, Iranduba, Lago Cantagalo, Lago Januári complex, c. 3°12'S, 60°13'W, P. Bayley, 5 Jan 1978; ZUEC 8335, 453, 13.2–20.2 mm SL, Iranduba, Lago Januári, c. 3°12'S, 60°13'W, P. Bayley, 10 Nov 1977; ZUEC 8454, 96, 17.3–23.2 mm SL, Iranduba, Lago Januári, c. 3°12'S, 60°13'W, P. Bayley, 2 Feb 1978; MZUSP 102439, 461, 11.4–20.9 mm SL, Iranduba, Lago Januári, near Canta Galo, c. 3°12'S, 60°13'W, P. Bayley, 14 Apr 1977; MZUSP 102744, 478, 14.9–22.6 mm SL, Iranduba, Lago Januári, c. 3°12'S, 60°13'W, P. Bayley, 28 Apr 1977; MCP 43955, 340, 13.4–21.0 mm SL, Iranduba, rio Negro, lago Januári, c. 3°13'S, 60°01'W, P. Bayley, 22 Nov 1977; MZUSP 100785, 17, 21.6–25.1 mm SL, Iranduba, Lago Januári, at mouth, between Furo de Paracuaba and Lagoa Terra Preta, c. 3°12'S, 60°13'W, P. Bayley, 3 March 1977; MZUSP 102744, 478, 14.9–22.7 mm SL, Iranduba, Lagoa Januári, Olaria, c. 3°13'S, 60°01'W, P. Bayley, 28 Apr 1977; MZUSP 63246, 47, 15.9–18.9 mm SL, Tefé, igarapé Cacao, 3°19'14"S 64°43'24"W, M. Goulding, 9 Sep 1979; INPA 17441, 6, 14.5–17.9 mm SL, Beruri, lago Ayapuá, tributary of rio Purus, 4°26'17"S 62°07'24"W, L. H. Rapp Py-Daniel & C. P. Deus, 10 Jun 2001; MZUSP 6012, 32, 15.6–17.3 mm SL, Beruri, lago Beruri, rio Purus basin, 3°50'S 61°20'W, Expedição Permanente à Amazônia. **Pará, rio Amazonas basin:** MZUSP 9156, 107, 12.1–15.6 mm SL; MZUSP 50079, 25, 9.9–23.3 mm SL, Santarém, rio Maicá, tributary of rio Amazonas, 2°27'S 54°40'W, Expedição Permanente a Amazônia, 19–27 Oct 1971. **Rondônia, rio Madeira basin:** UFRO-I 10818, 19, 11.8–14.8 mm SL, Porto Velho, lago Cuniã, tributary of rio Madeira, 8°19'17"S 63°30'29"W, D. S. Souza, 16 Jun 2010; UFRO-I 10822, 2, 11.2–11.5 mm SL, Porto Velho, lago do Cuniã, 8°19'40"S 63°29'50"W, F. G. Vieira, 12 May 2009; UFRO-I 11132, 3, 11.6–11.7 mm SL, Pimenteiras do Oeste, rio Guaporé, 13°19'03"S 62°01'37"W, G. Torrente-Vilara, 25 May 2010; UFRO-I 10623, 3, 12.2–12.3 mm SL, Pimenteiras do Oeste, rio Guaporé, near

ECOVALE, 12°29'59"S 63°33'51"W, T. H. S. Pires, 26 May 2010. **Mato Grosso, rio Guaporé basin:** MZUSP 37455, 40, 15.0–19.3 mm SL, Vila Bela da Santíssima Trindade, rio Alegre, trib. Rio Guaporé, 30 km from Vila Bela da Santíssima Trindade, c. 15°2' S, 59°58'W; MZ/Polonoroeste, 28–30 Sept 1984; MZUSP 18686, 2, 19.2–20.4 mm SL, Vila Bela da Santíssima Trindade, rio Guaporé, c. 15°0' S, 59°57'W, P.E. Vanzolini, 16 Dec 1976. **Mato Grosso, rio Paraguai basin:** NUP 9547, 1 c&s, 26.1 mm SL, Chapada dos Guimarães boundary with Nobres, córrego Forquilha, tributary of rio Cuiabá, 14°41'00"S 55°32'00"W, Nupélia staff, 24 Apr 2000. Following lots from Barão de Melgaço, baía Sinhá Mariana, tributary of rio Cuiabá, 16°20'20"S 55°54'10"W: NUP 6262, 19, 21.1–22.3 mm SL, Nupélia staff, 24 Mar 2003; NUP 6264, 20, 18.9–22.4 mm SL, Nupélia staff, 21 Mar 2002; NUP 6259, 1, 26.8 mm SL, Nupélia staff, 22 Apr 2004; NUP 6263, 27, 18.6–21.9 mm SL, Nupélia staff, 19–20 Mar 2002; NUP 9545, 8 c&s, 20.1–21.3 mm SL, 24 Mar 2003; NUP 9546, 2 c&s, 19.1–20.4 mm SL, Nupélia staff, 20 Mar 2002; NUP 9647, 18.3–20.7 mm SL, Nupélia staff, 24 Mar 2003.



FIGURE 2. **A.** UFRO-I 685, paratype, 26.5 mm SL, Brazil, Rondônia, lago Puruzinho, rio Madeira basin. **B.** CZEN 323, paratype, 23.7 mm SL, Paraguay, Ñeembucu Departament, Mburicá, Arroyo Yacaré, rio Paraguai/Paraná basin.

Diagnosis. *Hemigrammus durbinae* differs from most congeners, with the exception of *He. marginatus*, by the absence of a conspicuous humeral spot and by possessing two dark patches of pigmentation on caudal-fin lobes. The new species can be distinguished from *He. marginatus* by possessing two conspicuous patches of dark pigmentation occupying most of the caudal-fin lobes, except the tips, which are hyaline (*vs.* relatively faint dark pigmentation along caudal-fin distal portion, tips of caudal fin dark), by having two dark narrow stripes along anal-fin base, the first sub-parallel to anal-fin base, extending approximately along region where hypaxial musculature and the muscles of anal fin meet, and the second along anal-fin base (*vs.* only an inconspicuous dark stripe along anal-fin base present). Additionally, *He. durbinae* can be diagnosed from *He. marginatus* by possessing 5–8 pored lateral line scales (*vs.* 8–14), upper jaw length 32.1–41.6% in head length (*vs.* 42.3–46.0%), dorsal-fin base length 9.9–13.1% of SL (*vs.* 13.6–15.1% of SL), dorsal-fin length 22.7–27.1% of SL (*vs.* 27.6–32.6% of SL), and distance

from eye to dorsal-fin origin 38.7–45.9% of SL (vs. 34.6–37.8% of SL). For a diagnosis from the similar-looking *Hyphessobrycon diancistrus*, see the Discussion, below.

Description. Morphometric data summarized in Table 1. Body compressed, moderately elongate; greatest body depth located anteriorly to dorsal-fin origin. Dorsal profile of head convex from premaxilla through anterior nostril, straight to slightly concave from latter point to tip of supraoccipital spine. Dorsal profile of trunk moderately convex from tip of supraoccipital spine through dorsal-fin origin; tilted down from latter point to adipose-fin origin and slightly concave along caudal peduncle. Ventral profile of body convex from tip of lower jaw to pelvic-fin origin; straight or slightly convex between pelvic-fin and anal-fin origin; tilted up along anal-fin base. Ventral profile of caudal peduncle slightly concave.

TABLE 1. Morphometric data of *Hemigrammus durbinae*, new species. N = Number of specimens, and SD = standard deviation.

	N	Holotype	Paratypes	Mean	SD
Standard length (mm)	154	23.1	14.3–28.0	22.6	-
Percents of Standard length					
Depth at dorsal-fin origin	150	29.1	25.2–35.6	29.1	1.80
Snout to dorsal-fin origin	149	52.8	49.6–56.1	53.0	1.15
Snout to pectoral-fin origin	149	28.8	26.7–34.7	29.2	1.33
Snout to pelvic-fin origin	149	45.7	44.2–51.0	47.5	1.29
Snout to anal-fin origin	149	61.7	59.5–65.6	62.8	1.49
Caudal-peduncle depth	148	10.0	7.2–11.7	9.6	0.82
Caudal-peduncle length	148	11.2	8.6–14.0	11.5	0.99
Pectoral-fin length	149	19.8	18.4–25.3	21.3	1.27
Pelvic-fin length	147	16.6	14.6–17.8	16.5	0.70
Dorsal-fin base length	149	12.2	9.9–13.1	12.1	0.58
Dorsal-fin length	148	25.4	22.7–27.1	25.6	1.03
Anal-fin base length	149	25.7	22.4–29.9	25.5	1.27
Anal-fin lobe length	148	20.1	17.9–23.8	20.7	1.06
Eye to dorsal-fin origin	149	42.0	38.7–45.9	42.1	1.31
Dorsal-fin origin to caudal-fin base	148	49.0	45.6–51.4	48.6	1.27
Bony head depth	149	23.4	21.3–27.5	23.8	1.23
Bony head length	149	25.1	23.0–30.4	25.0	1.06
End of dorsal-fin base to adipose-fin origin	149	21.5	19.2–24.1	22.0	0.90
Pelvic-fin origin to anal-fin origin	151	17.9	15.2–20.9	18.3	1.15
Supraoccipital spine to dorsal-fin origin	151	30.0	25.2–33.9	29.7	1.67
Snout to supraoccipital spine tip	151	23.3	21.3–27.3	23.4	1.12
Percents of Head length					
Horizontal eye diameter	149	40.1	36.8–46.4	40.3	2.00
Snout length	149	28.0	21.3–30.9	27.4	2.45
Least interorbital distance	149	34.6	27.1–36.4	32.6	2.53
Upper jaw length	149	35.5	32.1–41.6	38.0	1.55

Jaws unequal, heterognathous, lower jaw protruding slightly ahead of upper jaw; mouth slightly superior. Maxillary slightly curved; posterior terminus slightly surpassing vertical through anterior margin of eye. Premaxillary teeth in two rows, outer row composed of 1*(95), 2(66), or 3(27) tricuspid teeth, central cusp longer; inner row with 5*(178) or 6(8) tri- to pentacusp teeth, central cusp longer and broader. Maxilla with 0*(119), 1(40), 2(6) or rarely 3(2) uni- or tricuspid teeth along anteroventral margin, all equal in size. Dentary with 7–12

teeth, anteriormost four teeth larger than remaining, with 3–5 cusps, central cusp longer and broader, followed by a series decreasing gradually of size of 1(27) tricuspid teeth, and remaining two to nine unicuspid, smaller teeth (Fig. 2).

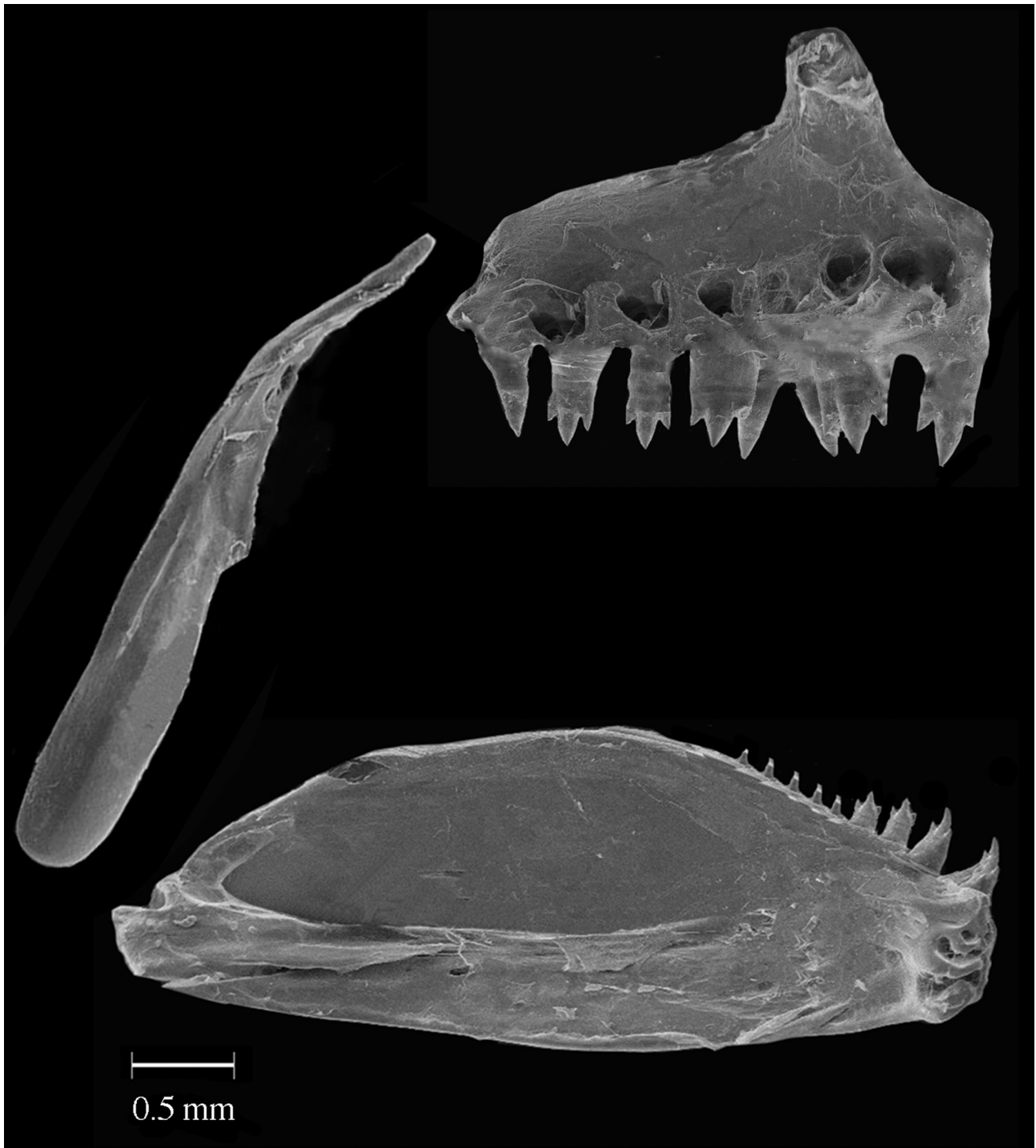


FIGURE 3. *Hemigrammus durbinae*, new species, scanning electron micrographs (SEM) showing mesial view of left premaxillary and lateral view of left maxillary (NUP 9543, 20.1 mm SL, paratype); mesial view of left dentary (NUP 9543, 20.2 mm SL, paratype).

Scales cycloid, with two to four *radii*; *circuli* marked anteriorly, but absent distally (*'Hemigrammus type'* according to Cockerell (1914)). Lateral line incomplete, slightly curved ventrally, with 5(27), 6(64), 7(33), or 8*(19) pored scales; longitudinal series including perforated scales, 27(11), 28(22), 29(46), 30(41), 31(15), 32*(11), or 33(2) scales; 4*(113) or 5(42) scales rows between dorsal-fin origin and lateral line; 3*(150) scales

rows between lateral line and pelvic-fin origin. Predorsal scales 10(81), 11*(56), 12(13), or 13(3). Anal sheath along anal-fin base composed of 3(4), 4*(18), or 5(5) scales in a single row, covering the base of first unbranched rays to third to sixth branched anal-fin rays. Circumpeduncular scales 10(108), 11*(40) or 12(5). Caudal-fin scales covering about basal third of upper and lower caudal-fin lobes, mainly on upper and lower caudal lobes margins, gradually decreasing in size.

Dorsal-fin rays ii,8(60) or 9*(125); first unbranched ray approximately one-third of second unbranched ray; small ossification anterior to first unbranched ray present in all 35 c&s specimens examined. Distal margin of dorsal fin straight. Dorsal-fin origin at midbody or slightly behind this point; base of posteriormost dorsal-fin ray slightly behind vertical through anal-fin origin. First dorsal-fin pterygiophore inserting posterior to neural spine of eleventh vertebra. Pectoral-fin rays i,9(91), 10*(72), or 11(22). Pelvic-fin rays i,6*(139) or 7(46); its origin ahead of vertical through dorsal-fin origin; tip of longest ray surpassing anal-fin origin. Adipose fin small. Anal-fin rays iv,16(56), 17*(50), 18(39), 19(34), 20(6), or 21(1); anal fin falcated, last unbranched ray to fourth branched ray longest, with remaining rays decreasing gradually in size towards anal-fin end; last anal-fin pterygiophore inserting behind hemal spine of fourteenth caudal vertebrae (35). Caudal fin bifurcated; lobes slightly pointed, almost equal in size, inferior lobe slightly longer than superior. Principal caudal-fin rays i,17,i*(186); dorsal procurrent caudal-fin rays 9(8), 10(15), or 11(12); ventral procurrent caudal-fin rays 7(3), 8(31), or 9(1). Precaudal vertebrae 12(19) or 13(16); caudal vertebrae 19(2), 20(15), 21(17), or 22(1); total vertebrae 32(5), 33(27), or 34(3). Supraneurals 4(9) or 5(26). Branchiostegal rays 4(35). First gill arch with 6(15) or 7(20) gill rakers on epibranchial, one at angle (35), 11(12), or 12(23) in ceratobranchial, and 2(12) or 3(23) on hypobranchial.

Color in alcohol. Overall ground coloration of body light tan. Anterior portion of lower jaw, snout and dorsal portion of head covered by relatively dense concentration of small dark chromatophores, imparting an overall darker color. Opercle and fourth and fifth infraorbital with scattered relatively large dark chromatophores. Third infraorbital and opercle silvery in specimens retaining guanine pigmentation. Narrow dark midlateral stripe formed by chromatophores at myosepta between hypaxial and epaxial bundles of muscles, more conspicuous posteriorly to dorsal-fin base. Faint longitudinal dark stripe along midline of body originating at vertical through dorsal-fin origin, becoming wider and more conspicuous at caudal peduncle. Scales from predorsal row to second or third row above lateral line posteriorly bordered with dark chromatophores, forming a subtle reticulated pattern. Dark humeral spot absent. Two dark narrow stripes situated along anal-fin base, the first extending approximately along region where hypaxial musculature and muscles of anal fin meet, sub-parallel to anal-fin base, second along anal-fin base; subjacent dark chromatophores forming thin lines over myomere margins above anal-fin base. Dorsal fin mostly hyaline, with few dark chromatophores concentrated along inferior third of unbranched rays to second or third branched rays and interradiation membranes. Adipose, pectoral and pelvic fins hyaline, with few dark chromatophores scattered mainly along their distal tips. Anal fin hyaline, with dark chromatophores scattered on proximal region, mainly on third to fourth branched rays and interradiation membranes. Caudal fin hyaline at its basal half with conspicuous patches of black pigmentation occupying most of the fin lobes except the tips, which are hyaline. Dark patches typically not continuous, continuous in some specimens through darkened tips of middle caudal-fin rays (e.g., CZFCEN 323, NUP 2153, NUP 9546).

Sexual dimorphism. None was found. Bony fin hooks, a common dimorphic feature of mature characid males (Malabarba & Weitzman, 2003) were not found in any of the specimens examined, including 15 c&s male specimens (INPA 39505, 1 ex.; NUP 9543, 10 ex.; NUP 9545, 3 ex.; NUP 9546, 1 ex.) and several dissected males presenting mature testes (see "Ecological notes", below).

Distribution. *Hemigrammus durbinae* is known from the central and western portions of the Amazon basins, at the middle and upper portions of the rio Madeira, lower rio Purus, middle rio Solimões/Amazonas, and lower rio Tapajós in Brazil, from the rio Paraguai basin in Brazil and Paraguay, and from the rio Paraná basin in Paraguay (Fig. 4). The comparison of specimens collected throughout its range did not revealed morphometric or meristic differences between the different populations (Fig. 2).

Ecological notes. *Hemigrammus durbinae* is typically found in large floodplain lakes, both in the Amazon basin (e.g., Lago Janauacá at the rio Solimões, Lago Januari at the lower rio Negro, Lago Cuniã and Lago Puruzinho at the rio Madeira) and rio Paraguai basin (e.g., Baía de Chacororé and Baía Sinhá Mariana). Stomach contents of five specimens from the rio Paraguai basin in Brazil were analyzed, and consisted mainly in terrestrial insects. Four dissected females ranging between 18.3–26.3 mm SL (NUP 2153, 2; NUP 6263, 1; NUP 9647, 1; MZUSP 27113, 1) possessed large yellowish oocytes and five dissected males between 17.7–22.8 mm SL (CZCEN

323, MHNP 3679, NUP 2153, and NUP 9647) possessed well-developed, lobular, whitish-colored testes, and consequently all were mature. All dissected specimens cited above were from the rio Paraguai basin and were collected in January, February, April, September, and November, indicating an extensive breeding period for the species, at least for that river basin. The single dissected breeding female from the Amazon basin (MZUSP 27113) was collected in January.

Etymology. The specific epithet honors Marion Durbin Ellis (née Marion Lee Durbin) (born 1887, deceased apparently in 1972), Carl Eigenmann's student and latter a limnologist and environmental toxicologist working at the University of Missouri in Columbia, who devoted herself diligently into the most comprehensive study on *Hemigrammus* so far. A genitive noun.

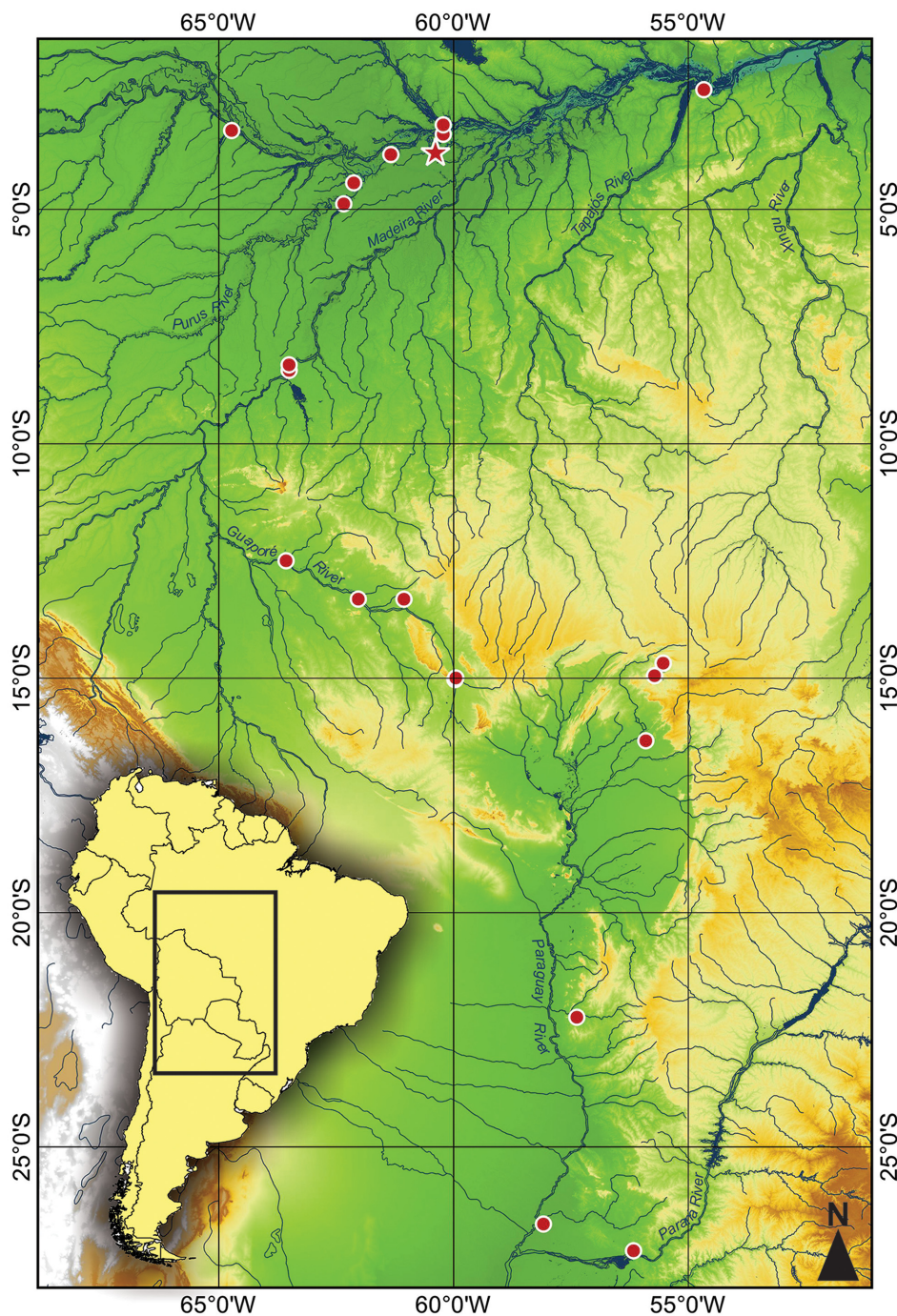


FIGURE 4. Map of Central South America showing distribution of *Hemigrammus durbiniae* (red dots; red star, type locality).

Discussion

The new species described herein is similar to *Hemigrammus marginatus* in both body shape and color pattern and could be plausibly identified as such. However, apart from Veríssimo *et al.* (2005), citations of *Hemigrammus marginatus* for the rio Paraguai basin (including Britski *et al.*, 2007) were apparently all solely derived from the original description of the species, where two paratypes from two distinct localities in the rio Paraguai basin were cited, one from “Sapucaí (Sapucaí, a locality in Paraguai, Depto. Paraguai, approx. 25°40’S, 56°57’W) and another from “Caceres (Cáceres, a locality in Brazil, Mato Grosso State, approx. 16°6’S, 57°42’W) (Ellis, 1911). The examination of the type-series of *Hemigrammus marginatus* by F. R. Carvalho (pers. comm.) revealed it to be composite. One of the paratypes from the rio Paraguai basin (FMNH 54452, 40.0 mm SL), from Cáceres, is actually a specimen of *Moenkhausia intermedia* (Kner, 1858), whereas the paratype from Sapucaí (FMNH 54443, 21.0 mm SL) is actually a small specimen of a unidentified *Moenkhausia* species, still retaining a larval pectoral fin, that could not be identified at specific level. Additionally, the paratype from the rio Guaporé basin (collected at “Maciel, FMNH 54457, 40.0 mm SL) belongs to a species of the *Moenkhausia lepidura* group (Kner, 1858). Thus, *Hemigrammus marginatus* seems to be restricted to rivers from northeastern Brazil (including the rio São Francisco), and the upper rio Paraná. However, a work in progress by one of the authors (FCTL) and collaborators indicates that the populations assigned to *Hemigrammus marginatus* from the upper rio Paraná basin are a distinct species from the populations from the rio São Francisco basin and rivers from northeastern Brazil. Consequently, the following comparisons with *He. marginatus* are restricted to specimens from the rio São Francisco basin and rivers from northeastern Brazil. As mentioned in the Diagnosis, the main difference between both species is in the dark pigmentation pattern at the caudal fin. The vertical dark bar on the caudal fin in *Hemigrammus durbiniae* is considerably wider and more conspicuous when compared with specimens of *He. marginatus*, which shows a narrower and faded vertical bar at the caudal fin. Also, the dark pigmentation at caudal-fin lobes in *He. durbiniae* is subdistal, and as such, never reaches the lobes tips, which are hyaline, whereas in *He. marginatus* the dark pigmentation is present along the distal margin of the caudal fin.

Apart from the records of *Hemigrammus marginatus* from the upper rio Paraná basin, discussed above, records for the species from other areas of South America other than the rio São Francisco basin and other river drainages of northeastern Brazil all appear to be due to misidentifications. According to the examination of extensive material deposited at MBUCV and MCGN by one of the authors (RPO), records of *He. marginatus* from the Río Orinoco basin (*e.g.*, río Apure basin, Venezuela (Taphorn, 1992)) probably all refer to the recently described *Hyphessobrycon otrynus* Benine & Lopes (2008). The record of *He. marginatus* from the rio Negro basin by Goulding *et al.* (1988) is actually a misidentification of *Hyphessobrycon diancistrus* Weitzman, according to the examination of voucher lots used in that study deposited at MZUSP. In fact, *Hyphessobrycon diancistrus*, and the recently described *Hy. otrynus* are similar in color pattern and general body shape to both *Hemigrammus durbiniae* and *He. marginatus*, and a comparison between these species is worthwhile. The first obvious feature distinguishing these species is the presence of small scales at the caudal-fin basis in *Hemigrammus durbiniae* and *He. marginatus*, versus its absence in *Hyphessobrycon diancistrus* and *Hy. otrynus*. The presence of scales on the caudal-fin base, which is the character still in use to distinguish species of *Hemigrammus* and *Hyphessobrycon*, is actually of little practical use because very often those scales are missing in preserved specimens, since they are very deciduous and easily lost except in very well preserved specimens (*e.g.*, Carvalho *et al.*, 2010: 252). A second obvious feature distinguishing both pair of species is the presence of two large fin hooks in the last unbranched and in the first branched rays in mature males of *Hyphessobrycon diancistrus* and *Hy. otrynus*, which are absent, as well as any fin hooks, in mature males from both *Hemigrammus durbiniae* and *He. marginatus*. Head shape is also a useful feature distinguishing at least *Hemigrammus durbiniae* from *Hy. diancistrus*. *Hemigrammus durbiniae* possess an overall rounded head profile, in contrast with the more slender, acute head profile in *Hy. diancistrus*. *Hemigrammus durbiniae* can be additionally diagnosed from *Hyphessobrycon otrynus* by possessing 5–8 pored scales on lateral line (*vs.* 8–12), and a lower head depth, 22.0–27.5% of SL (*vs.* 16.6–19.6% of SL).

Other small Characidae that possess a color pattern that bears some resemblance to *Hemigrammus durbiniae* are *Moenkhausia bonita* Benine *et al.*, 2004, *M. dichroura*, *M. intermedia* and *Thrissobrycon pectinifer* Böhlke, 1953. The new species can be immediately distinguished from *M. bonita*, *M. dichroura* and *M. intermedia* by the presence of an incomplete lateral line (*vs.* completely pored lateral line). *Thrissobrycon pectinifer* can be easily distinguished from *Hemigrammus durbiniae* by its greatly upturned and almost toothless mouth, a greatly expanded maxillary, and very long and numerous gill-rakers.

Besides the differences pointed above, the new species differs from all these species by the possession of two dark stripes along anal-fin base, the first extending approximately along region where hypaxial musculature and the muscles of the anal fin meet, sub-parallel to anal-fin base, and the second along anal-fin base (vs. only a dark stripe at the base of anal-fin rays in *Hyphessobrycon diancistrus*, *Moenkhausia bonita*, *M. dichrourea*, *M. intermedia* and absence of dark stripes in *Hyphessobrycon otrynus* and *Thrissobrycon pectinifer*).

Another relevant point concerning the new species is its distribution. *Hemigrammus durbinae* is widespread throughout the rio Paraná-Paraguai basin and central southwestern portions of Amazon basin. Recently, Carvalho & Albert (2011) summarized and discussed the present status of knowledge of the biogeographical relationships based on fish distributions between these two huge South American hydrographic basins. These authors listed 111 species shared between the rio Paraguai and the Amazon basins (Carvalho & Albert, 2011: 201). However, these authors have conflated in their list species shared between shield-draining headwater areas (e.g., those shared between the upper tributaries of the rio Tapajós and upper tributaries of the rio Paraguai) and those occurring only in lowland areas (i.e., the upper tributaries of the rio Madeira basin), which are fish assemblages with very distinct histories (Lima & Ribeiro, 2011; Ribeiro *et al.*, 2013). *Hemigrammus durbinae* occurs only in the lowland areas of both the rio Paraná-Paraguai and Amazon basins and clearly belongs to this category, which was influenced by the geomorphological evolution of the foreland basins from the western Amazon and the rio Paraguai basins (see Lima & Ribeiro, 2011, table 9.2, for another examples of this pattern). We are, however, unaware of records of *He. durbinae* from upper tributaries of the rio Mamoré (rio Madeira basin), which drains the Beni-Mamoré foreland basin, at the divide with the Chaco-Paraguai foreland basins (Lima & Ribeiro, 2011, fig. 9.1). The uppermost records of *He. durbinae* in the rio Madeira system are from the rio Guaporé basin in Mato Grosso state. The rio Guaporé, however, drains at the contact between the Mamoré-Beni foreland basin and the Brazilian shield (Souza-Filho *et al.*, 1999), and its geomorphological evolution cannot be subsumed by the history of the latter. An updated discussion on the biogeographic relationships between the rio Guaporé and the rio Paraguai basins can be found in Ota *et al.* (2014).

Comparative material examined. All from Brazil, unless otherwise indicated. *Hemigrammus marginatus*: FMNH 54430, holotype, 1, 38.0 mm SL, Bahia, Queimadas, rio Itapicuru basin; MCP 17989, 10, 19.2–24.9 mm SL, Bahia, Ribeirão Visagem; NUP 4151, 10, 24.4–30.0 mm SL, Bahia, Queimadas, rio Itapicuru basin; NUP 6140, 10, 23.8–30.9 mm SL, Minas Gerais, represa Três Marias, rio São Francisco basin; NUP 7276, 8, 24.5–24.7 mm SL, Minas Gerais, Santo Hipólito, rio Pardo Grande, rio São Francisco basin; ZUEC 8104, 95, 12.4–30.1 mm SL, Minas Gerais, represa Três Marias, rio São Francisco basin; ZUEC 8111, 2, 33.1–33.5 mm SL, Minas Gerais, represa Três Marias, rio São Francisco basin; ZUEC 8099, 18, 21.8–27.2 mm SL, Minas Gerais, represa Três Marias, rio São Francisco basin; ZUEC 6912, 1, 34.7 mm SL, Minas Gerais, rio Jequitinhonha. *Hemigrammus* aff. *marginatus* (upper rio Paraná basin): NUP 2333, 1, 26.6 mm SL, São Paulo, rio do Pântano, upper rio Paraná basin; NUP 6521, 1, 30.2 mm SL, Paraná, rio Paraná, upper rio Paraná basin; NUP 7764, 1, 29.9 mm SL, Mato Grosso do Sul, lagoa Ventura, upper rio Paraná basin; NUP 8033, 1, 25.2 mm SL, Paraná, Canal Cortado, upper rio Paraná basin; ZUEC 4411, 1, 34.1 mm SL, São Paulo, Artur Nogueira; ZUEC 4615, 3, 28.7–30.8 mm SL, São Paulo, Mogi Mirim, rio Mogi Guaçu; ZUEC 4590, 2, 22.8–24.6 mm SL, São Paulo, Artur Nogueira. *Hemigrammus* aff. *marginatus* (western Amazon): MCP 39780, 99, 26.0–29.6 mm SL, Acre, Sena Madureira, trib. rio Purus; MCP 37771, 27, 25.7–29.0 mm SL: Acre, rio Purus basin. *Hyphessobrycon diancistrus*: INPA 39275, 93, 23.2–26.8 mm SL, Amazonas, rio Negro basin; INPA 39276, 50, 21.0–25.9 mm SL, Amazonas, rio Negro basin; INPA 38281, 5, 17.4–18.3 mm SL, Amazonas, rio Purus basin; UFRO-I 4402, 6, 15.6–20.12 mm SL, Rondônia, rio Madeira basin; UFRO-I 5049, 1, 27.9 mm SL, Rondônia, rio Madeira basin; UFRO-I 5409, 3, 22.5–23.9 mm SL, Rondônia, rio Madeira basin; MZUSP 96516, 16, 25.8–28.4 mm SL: Venezuela, Bolívar, Río Parguaza; MZUSP 13179, paratype, 25.9 mm SL, Colombia, Vichada, Orinoco river basin. *Hyphessobrycon otrynus*: INPA 39274, 1, 32.0 mm SL, Amazonas, rio Solimões basin; MBUCV 31340, 1, 30 mm SL, Venezuela, Bolívar, rio Aro; MCNG 4710, 3, 26.7–32.0 mm SL, Venezuela, Portuguesa, rio Guanare basin; MCNG 11950, 15, 28.4–28.5 mm SL, Venezuela, Barinas, rio Canaguá basin; MCNG 30119, 84, 25.4–33.8 mm SL, Venezuela, Barinas, rio Canaguá basin; MCNG 55760, 7, 26.4–27.8 mm SL, Colombia, Casanare, El Triunfo. *Moenkhausia bonita*: NUP 3234, 17, 27.0–32.5 mm SL, Mato Grosso do Sul, rio Paraná basin; NUP 9317, 3, 31.8–35.0 mm SL, Mato Grosso do Sul, rio Paraná basin. *Moenkhausia dichrourea*: NUP 8749, 4, 54.0–56.0 mm SL, Mato Grosso rio Paraguai basin; NUP 8930, 6, 59.0–66.0 mm SL, Mato Grosso, rio Paraguai basin. *Moenkhausia intermedia*: NUP 8026, 4, 34.1–40.9 mm SL,

Amazonas, rio Solimões basin; NUP 8033, 7, 25.6–41.3 mm SL, Amazonas, rio Solimões basin. *Thrissobrycon pectinifer*; INPA 17503, 3, 25.7–27.9 mm SL, Amazonas, rio Negro basin.

Acknowledgments

We are grateful to Osvaldo Oyakawa, Mário de Pinna, Michel D. Gianetti, and José Lima de Figueiredo (MZUSP), Andrea Weiler (CZCEN), Fabíola Vieira, Carolina Dória, and João Alves de Lima Filho (UFRO), Karina Almeida (ZUEC), Francisco Provenzano (MBUCV), Oscar Leon and Otto E. Castilo (MCNG) for museum and technical support and/or loan of material. Data on diet and reproduction of the new species was obtained through the Nupélia project “Biologia pesqueira e pesca na área de influência do APM Manso, funded by Furnas Centrais Elétricas. We are grateful to Fernando R. Carvalho (DZSJRP) for the data on the type series of *Hemigrammus marginatus*. We are indebted to Héctor Alcaraz, who provided invaluable assistance to the senior author during her stay at Asunción as well as museum and technical support at MNHNP and CZCEN. For assistance with scanning electron microscopy images we thank Laboratório Temático de Microscopia Óptica e Eletrônica – LTMOE (INPA). Gilberto N. Salvador prepared Fig. 4. We are grateful to Marcos Mirande (FML) for useful comments on the manuscript. Travels to Manaus in November–December 2012 and Porto Alegre in July 2013 by the second author (FCTL) were funded by CNPq (visiting scholar fellowship to INPA, November–December 2012 and project Qualificação taxonômica da base de dados da coleção de peixes do Museu de Ciências e Tecnologia – PUCRS para uso *on-line*”, grant # 504177/2012-5 to Carlos A.S. Lucena, MCP). RPO was supported by a M.Sc. scholarship from Capes, and currently has a Ph.D. scholarship from CNPq. FCTL is supported by FAPESP (grants # 2011/51532-7 and 2013/20936-0). CSP is supported by CNPq (grant #308946/2012-0).

Literature cited

- Benine, R.C. & Lopes, G.A.M. (2008) A new species of *Hyphessobrycon* (Characiformes: Characidae) from rio Portuguesa, rio Orinoco basin, Venezuela. *Zootaxa*, 1747, 61–68.
- Britski, H.A., de Silimon, K. & Lopes, B.S. (2007) *Peixes do Pantanal – manual de identificação*. 2nd Edition. Embrapa, Brasília, 230 pp.
- Carvalho, F.R., Bertaco, V.A. & Jerep, F.C. (2010) *Hemigrammus tocantinsi*: a new species from the upper rio Tocantins basin, Central Brazil (Characiformes: Characidae). *Neotropical Ichthyology*, 8 (2), 247–254.
<http://dx.doi.org/10.1590/S1679-62252010000200002>
- Carvalho, T.P. & Albert, J.S. (2011) The Amazon – Paraguay divide. In: Albert, J.S. & Reis, R.E. (Eds.), *Historical Biogeography of Neotropical Freshwater Fishes*. University of California Press, Berkeley, pp. 193–202.
- Cockerell, T.D.A. (1914) The scales of the South American characinid fishes. *Annals of the Carnegie Museum*, 9, 92–113.
- Eigenmann, C.H. (1918) The American Characidae [II]. *Memoirs of Museum of Comparative Zoology*, 43, 103–208, pls. 9–11, 13, 17–29, 33, 78–80, 93.
- Ellis, M.D. (1911) On the species of *Hasemanina*, *Hyphessobrycon*, and *Hemigrammus* collected by J.D. Haseman for the Carnegie Museum. *Annals of the Carnegie Museum*, 8 (1), 148–183, pls. 1–3.
- Fink, W.L. & Weitzman, S.H. (1974) The so-called Cheirodontin fishes of Central America with descriptions of two new species (Pisces: Characidae). *Smithsonian Contributions to Zoology*, 172, 1–46.
<http://dx.doi.org/10.5479/si.00810282.172>
- Géry, J. (1977) *Characoids of the World*. T. F. H. Publications, Neptune City, New Jersey, 672 pp.
- Goulding, M., Carvalho, M.L. & Ferreira, E.G. (1988) *Rio Negro, Rich Life in Poor Waters*. The Hague, SPB Academic Publishing, 200 pp.
- Javonillo, R., Malabarba, L.R., Weitzman, S.H. & Burns, J.R. (2010) Relationships among major lineages of characid fishes (Teleostei: Ostariophysi: Characiformes), based on molecular sequence data. *Molecular Phylogenetics and Evolution*, 54 (2), 498–511.
<http://dx.doi.org/10.1016/j.ympev.2009.08.026>
- Lima, F.C.T., Malabarba, L.R., Buckup P.A., Silva, J.F.P., Vari, R.P., Harold, A., Benine, R., Oyakawa, O.T., Pavanelli, C.S., Menezes, N.A., Lucena, C.A.S., Malabarba, M.C.S.L., Lucena, Z.M.S., Reis, R.E., Langeani, F., Casatti, L., Bertaco, V.A., Moreira, C. & Lucinda, P.H.F. (2003) Genera *Incertae Sedis* in Characidae. In: Reis, R.E., Kullander, S.O. & Ferraris Jr., C.J. (Eds.), *Check List of the Freshwater Fishes of South and Central America*, Edipucrs, Porto Alegre, pp. 106–169.
- Lima, F.C.T. & Ribeiro, A.C. (2011) Continental-scale tectonic controls of biogeography and ecology. In: Albert, J.S. & Reis, R.E. (Eds.), *Historical Biogeography of Neotropical Freshwater Fishes*, University of California Press, Berkeley, pp. 145–164.

<http://dx.doi.org/10.1525/california/9780520268685.003.0009>

- Lima, F.C.T., Pires, T.H.S., Ohara, W.M., Jerep, F.C., Carvalho, F.R., Marinho, M.M.F. & Zuanon, J.A. S. (2013) Characidae. In: Queiroz, L.J., Torrente-Vilara, G., Ohara, W.M., Pires, T.H.S., Zuanon, J.A.S. & Dória, C. (Eds.), *Peixes do rio Madeira. Vol. I. a ictiofauna do rio Madeira*. Diaeto Latin American Documentary, São Paulo, pp. 213–395.
- Malabarba, L.R. & Weitzman, S.H. (2003) Description of a new genus with six species from southern Brazil, Uruguay and Argentina, with a discussion of a putative characid clade (Teleostei: Characiformes: Characidae). *Comunicações do Museu de Ciências da PUCRS, Série Zoologia*, 16, 67–151.
- Marinho, M.F., Dagosta, F.C.P. & Birindelli, J.L.O. (2014) *Hemigrammus ataktos*: a new species from the rio Tocantins basin, Central Brasil (Characiformes: Characidae). *Neotropical Ichthyology*, 12 (2), 257–264.
<http://dx.doi.org/10.1590/1982-0224-20130091>
- Menezes, N.A. & Weitzman, S.H. (1990) Two new species of *Mimagoniates* (Teleostei: Characidae: Glandulocaudinae), their phylogeny and biogeography and a key to the glandulocaudin fishes of Brazil and Paraguay. *Proceedings of the Biological Society of Washington*, 103 (2), 380–426.
- Mirande, J.M. (2009) Weighted parsimony phylogeny of the family Characidae (Teleostei: Characiformes). *Cladistics*, 25, 1–40.
- Mirande, J.M. (2010) Phylogeny of the family Characidae (Teleostei: Characiformes): from characters to taxonomy. *Neotropical Ichthyology*, 8 (3), 385–568.
<http://dx.doi.org/10.1590/S1679-62252010000300001>
- Oliveira, C., Avelino, G.S., Abe, K.T., Mariguela, T.C., Benine, R.C., Ort, G., Vari, R.P. & Castro, R.M. C. (2011) Phylogenetic relationships within the speciose family Characidae (Teleostei: Ostariophysi: Characiformes) based on multilocus analysis and extensive ingroup sampling. *BMC Evolutionary Biology*, 11 (275), 1–25.
<http://dx.doi.org/10.1186/1471-2148-11-275>
- Ota, R.P., Lima, F.C.T. & Pavanelli, C.S. (2014) A new species of *Hemigrammus* Gill, 1858 (Characiformes: Characidae) from the rio Madeira and rio Paraguai basins, with a redescription of *H. lunatus*. *Neotropical Ichthyology*, 12 (2), 265–279.
<http://dx.doi.org/10.1590/1982-0224-20130176>
- Ribeiro, A.C., Jacob, R.M., Silva, R.R.S.R., Lima, F.C.T., Ferreira, D.C., Ferreira, K.M., Mariguela, T.C., Pereira, L.H.G. & Oliveira, C. (2013) Distributions and phylogeographic data of rheophilic freshwater fishes provide evidences on the geographic extension of a central-brazilian amazonian palaeoplateau in the area of the present day Pantanal Wetland. *Neotropical Ichthyology*, 11 (2), 319–326.
<http://dx.doi.org/10.1590/S1679-62252013000200010>
- Souza-Filho, P.W., Quadros, M.L.E.S., Scandolara, J.E., Silva Filho, E.P. & Reis, M.R. (1999) Compartimentação morfoestrutural e neotectônica do sistema fluvial Guapor-Mamor-alto Madeira, Rondônia-Brasil. *Revista Brasileira de Geociências*, 29 (4), 469–476.
- Taphorn, D.C. (1992) *The characiform fishes from the Apure River Drainage, Venezuela. BioLlania Edición Especial - No. 4, Monografías Científicas del Museo de Ciencias Naturales*. UNELLEZ -- Guanara, Estado Portuguesa, Venezuela, 537pp.
- Taylor, W.R. & van Dyke, G.C. (1985) Revised procedures for staining and clearing small fishes and other vertebrates for bone and cartilage study. *Cybium*, 9, 107–109.
- Vazzoler, A.E.A.M. (1996) *Biologia da Reprodução de Peixes Teleósteos: Teoria e Prática*. Maring, Editora Universidade Estadual de Maring, Maring, 169 pp.
- Verissimo, S., Pavanelli, C.S., Britski, H.A. & Moreira, M.M.M. (2005) Fishes from the Manso Reservoir region of influence, rio Paraguay basin, Mato Grosso State, Brazil. *Check List*, 1 (1), 1–9.
<http://dx.doi.org/10.15560/1.1.1>
- Weitzman, S.H. & Fink, W.L. (1983) Relationships of the neon tetras, a group of South American freshwater fishes (Teleostei, Characidae), with comments on the phylogeny of New World characiforms. *Bulletin of the Museum of Comparative Zoology*, 150, 339–395.