

A new *Moenkhausia* Eigenmann, 1903 (Ostariophysi: Characiformes) from Chapada Diamantina, rio Paraguaçu Basin, Bahia, Northeastern Brazil

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Moenkhausia diamantina, new species, is described from tributaries of the rio Paraguaçu, BA, northeastern Brazil. This species is distinguished from all congeners by features of body color pattern, the presence of scales on the predorsal median line and the number of anal-fin rays.

Moenkhausia diamantina, nova espécie, é descrita de tributário do rio Paraguaçu, BA, nordeste do Brasil. Esta espécie é distinguida das demais congêneres por caracteres relacionados ao padrão de coloração do corpo, pela presença de escamas na linha mediana pré-dorsal e número de raios da nadadeira anal.

Key words: Taxonomy, Neotropical, *Moenkhausia dyktiota*, *Moenkhausia levidorsa*.

Introduction

The genus *Moenkhausia* was proposed by Eigenmann (1903) and defined as comparable to *Tetragonopterus* but with a gently, downward curved lateral-line. Eigenmann (1917) presented a refined definition of *Moenkhausia* (in an identification key to the genera of Characidae) based on the presence of two parallel rows of premaxillary teeth, five or more teeth in the inner premaxillary tooth row, a completely pored lateral line, and scaled caudal-fin lobes. Due to the lack of a comprehensive phylogenetic analysis, the characters proposed by Eigenmann remain the only diagnosis for the genus and are currently used to verify the generic allocation of new species to *Moenkhausia* (e.g. Benine *et al.*, 2004; Géry & Zarske, 2004; Zarske *et al.*, 2004; Lima & Birindelli, 2006; Bertaco & Lucinda, 2006). Under this concept, *Moenkhausia* presently includes 63 species of a great variety of shapes and pigmentation patterns. The genus is widespread in the Neotropical Cis-Andean river basins, except for those in Patagonia, with its greatest diversity occurring in the basins of the Amazon and Guianas (Lima *et al.*, 2003). Comments about and inferences on putatively related genera and species suggest that *Moenkhausia* is most likely a polyphyletic genus (see Fink, 1979; Costa, 1994; Weitzman & Palmer, 1997), although it is possible that some natural groups exist in *Moenkhausia* (Benine, 2002). A

phylogenetic appraisal of this genus is being conducted by the first author.

The Chapada Diamantina forms a watershed between the rio São Francisco basin and the rivers east of that basin that discharge directly into the Atlantic Ocean. The rio Paraguaçu has its origin in the Chapada Diamantina extending for about 500 km to its estuary in the western portion of the Baía de Todos os Santos (Santos, 2005). Its headwaters host an endemic ichthyofauna (de Pinna, 1992; Britto *et al.*, 2005). During a broad, recent fish survey conducted in this area, one of the authors (ACAS) collected a distinctive *Moenkhausia* species that possesses unique features among the members of the genus. Examination of samples from rio Paraguaçu in the fish collection of the Laboratório de Ictiologia de Ribeirão Preto (LIRP) yielded additional material of the species which is described herein.

Materials and Methods

The examined material in this study is deposited in the following institutions: (AMNH) American Museum of Natural History, New York; (INPA) Instituto nacional de Pesquisas da Amazônia, Manaus; (LBP) Laboratório de Biologia e Genética de Peixes, Universidade Estadual Paulista, Botucatu; (LIRP) Laboratório de Ictiologia de Ribeirão Preto,

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Universidade de São Paulo, Ribeirão Preto; (MNRJ) Museu Nacional, Rio de Janeiro; (MZUEFS) Museu de Zoologia da Universidade Estadual de Feira de Santana, Feira de Santana; (MZUSP) Museu de Zoologia da Universidade de São Paulo, São Paulo.

Morphometric and meristic data of specimens were taken following Fink & Weitzman (1974). In the description, holotype values are in square brackets and are followed by the mode and the number of specimens from which the count was taken. Vertebral counts, which include the four vertebrae of the Weberian apparatus as one element and the terminal centrum, were taken from four cleared and stained (C&S) specimens. Specimens were cleared and counterstained following the method of Taylor & Van Dyke (1985).

Moenkhausia diamantina, new species

Fig. 1

Holotype. MNRJ 30168, 48.5 mm SL, foz do rio Toalhas, rio Paraguaçu basin, município de Lençóis, Bahia, Brazil; 11 Mar 1999, A. C. A. Santos.

Paratypes. MNRJ 21995, 17, 32.6-58.5 mm SL, 2 C&S; AMNH 239393, 5, 33.4-57.5 mm SL, collected with holotype. LIRP 768, 14, 28.1-48.5 mm SL, 2 C&S, Olho d'água do Almerindo, rio Una (tributary of rio Paraguaçu), ca. 18 Km SE of Andaraí, município de Itaetê, Bahia, Brazil; 2 Sep 1991, R. M. C. Castro, E. Trajano, L. F. Mendes & L. Krug. MZUSP 49233, 4, 28.1-38.0 mm SL, rio Una, município de Itaetê, Bahia, Brazil; Jun 1993, A. M. Zanata, L. F. Mendes & A. Gamberini.

Non-type material. All from rio São José, município de Lençóis, Bahia, Brazil. MZUEFS 3597, 2, 62.0-64.9 mm SL. MZUEFS 3943, 2, 62.8-65.6 mm SL. MZUEFS 4507, 1, 17.9 mm SL. MZUEFS 4814, 2, 54.5-57.5 mm SL. MZUEFS 7793, 2, 28.1-30.9 mm SL. MZUEFS 7817, 1, 31.7 mm SL. MZUEFS 7835, 2, 30.7-33.4 mm SL.

Diagnosis. *Moenkhausia diamantina* is most similar within that genus to *M. levidorsa* in its morphometric and meristic data, and general body color pattern. *Moenkhausia diamantina* differs from *M. levidorsa* in the presence of a regularly scaled predorsal line vs a naked predorsal line in the latter. *M. diamantina* is easily distinguished from other congeners, except for *M. oligolepis*, *M. sanctaefilomenae*, *M. pyrophthalma*, *M. nigromarginata* and *M. diktyota*, by the presence of a reticulated body pigmentation pattern. *Moenkhausia diamantina* differs from all congeners with a reticulated body pigmentation pattern, except for *M. nigromarginata*, by the absence of a conspicuous dark blotch in the caudal peduncle. *Moenkhausia diamantina* is further distinguished from *M. sanctaefilomenae* and *M. oligolepis* by its higher number of pored lateral line scales (32-34 vs 22-24, 27-30 respectively). *Moenkhausia diamantina* further differs from *M. diktyota* in the extent of the poring of the lateral line (complete vs incomplete, respectively). *Moenkhausia diamantina* differs from *M. nigromarginata* by the absence of a black stripe on the anterior edge of dorsal, pelvic and anal fins, and absence of longitudinal stripes on the body positioned over the center of the scales (vs presence of both pigmentation patterns in the latter species). In addition, *M. diamantina* differs from *M. nigromarginata* in the number of anal-fin rays (iv, 24-26; vs ii-iv, 20-22, respectively).

Description. Morphometric data summarized in Table 1. Overall size small (27.4-58.3 mm SL). Greatest depth at origin of dorsal fin. Dorsal profile of head straight or slightly concave. Dorsal profile of body slightly convex from posterior tip of supraoccipital to end of dorsal-fin base; slightly convex from rear of dorsal-fin base to end of adipose fin. Caudal peduncle profile slightly concave both dorsal and ventrally. Ventral profile of body convex from tip of lower jaw to caudal pe-



Fig. 1. *Moenkhausia diamantina*, MNRJ 30168, holotype, 48.5 mm SL.

duncle origin. Prepelvic region transversely flattened, flattening more pronounced proximate to pelvic-fin insertion. Postpelvic median keel extending from pelvic-fin insertion to anal-fin origin.

Mouth terminal, with lower jaw as long as or somewhat longer than upper jaw. Premaxillary teeth in two rows; outer row teeth 2-5 [2] (mode=4, n=32), with 3-5 cusps, midcentral cusp longer than others; inner row teeth 5-6 [value of holotype], with 4-5 cusps and rarely one most lateral tooth with 3 cusps, midcentral cusp longer than others. Maxillary teeth 2-4 [2] (mode=2, n=30), with 3 cusps. Dentary teeth 4-5, with 4-5 cusps, midcentral cusp longer than others, [holotype with 5 teeth in left side and 4 teeth in right side, two specimens with 4 teeth in the left side and 5 teeth in right side] (mode=5, n=30), followed by series of small teeth with 1-3 cusps (Fig. 2).

Tip of supraoccipital spine extending posterior beyond vertical through posterior margin of opercle.

Dorsal-fin rays ii,9. Pectoral-fin rays i,11-13 [i,12] (mode = i,12, n = 32); tip of adpressed fin extends posterior of mid length of adpressed pelvic-fin. Adipose fin well developed. Pelvic-fin rays i,7; tip of fin reaches origin of anal fin. Anal-fin rays iv, 24-27 [26] (mode = iv, 26, n = 29); distal margin of fin somewhat concave. Principal caudal-fin rays i,17,i.

Scales cycloid. Lateral line with 32-34 [33] (mode = 33, n = 21) pored scales. Lateral line ventrally curved anteriorly, with 6 (n = 34) rows of scales above and 4-5 [5] (mode = 5, only two specimens with 4, n = 34) rows of scales below; 12-14 [12] (mode = 12, n = 19) scales around caudal peduncle. A single row of scales overlying basal portion of anterior rays of anal fin. Sheet of scales covering proximal third of upper caudal-fin lobe and proximal one-half of lower caudal-fin lobe.

First gill arch with 6-7 [7] (mode = 7, n = 28) gill-rakers on upper limb and 11 (n = 28) gill-rakers on lower limb. Precaudal vertebrae 11, caudal vertebrae 18 (n = 4). Supraneurals 4 (n = 4).

Sexual dimorphism. Very small hooks present on the segments of the first two branched anal-fin rays (one hook per

segment). Only one male (58.5 mm SL) with small hooks on the segments of first two branched pelvic-fin rays (one hook per segment).

Color in alcohol. Overall coloration brown or yellow tannish. Dorsal and dorsolateral portion of head, and mid-dorsal body region dark brown. Dark chromatophores scattered on infraorbitals, opercle, and branchiostegal rays. Jaws homogeneously covered with dark chromatophores. Posterior margin of scales with brown chromatophores outlining scales resulting in reticulated color pattern. Humeral region with conspicuous dark vertical blotch followed by light blotch. Caudal peduncle with an inconspicuous darker region. Dorsal fin dark with concentration of dark chromatophores on anterior two-thirds. Adipose fin densely pigmented by dark chromatophores. Pectoral, pelvic, and anal fins dark with concentration of dark pigmentation on anterior rays. Caudal fin homogeneously dark.

Distribution and habitat. Known from the upper and middle course of rio Paraguaçu which have several relatively small tributaries entering its margins. The species was collected in seven tributaries of rio São José and Santo Antônio, two of the main tributaries of the upper course of rio Paraguaçu. These tributaries are all blackwater rivers. The type locality of *Moenkhausia diamantina*, the rio Toalhas, has a sandy and rocky bottom, with little riparian and submerged vegetation.

Etymology. The name *diamantina* is in reference to the type region, the Chapada Diamantina. A noun in apposition.

Remarks. Costa (1994) discussed a putative relationship between *M. oligolepis*, *M. sanctaefilomenae*, and *M.*

Table 1. Morphometric data for *Moenkhausia diamantina*.

	Holotype		Paratypes	
		n	Range	Mean
Standard length (mm)	57.3	42	27.4-58.3	
Percents of standard length				
Greatest depth	43.8	42	36.3-45.1	40.2
Snout to dorsal-fin origin	53.6	42	50.5-56.4	53.5
Snout to pectoral-fin origin	29.4	42	28.5-34.9	31.1
Snout to pelvic-fin origin	47.8	42	44.9-50.7	48.1
Snout to anal-fin origin	63.5	42	60.6-67.1	64.1
Caudal peduncle depth	12.0	42	9.7-12.9	11.1
Caudal peduncle length	10.6	42	7.6-12.8	9.7
Pectoral-fin length	24.5	42	21.5-25.5	23.1
Pelvic-fin length	21.0	42	18.7-22.4	20.2
Dorsal-fin length	33.1	37	30.0-35.4	32.8
Dorsal-fin base	15.7	28	13.1-17.1	15.4
Anal-fin length	23.4	37	19.6-27.1	23.9
Anal-fin base	35.5	28	28.0-36.7	33.0
Eye to dorsal-fin origin	40.8	42	34.9-40.8	37.8
Dorsal-fin origin to caudal-fin origin	54.0	42	49.9-56.0	52.9
Head length	27.3	42	26.8-32.4	29.6
Head depth	21.7	42	19.3-23.9	22.2
Percents of head length				
Snout length	29.8	42	25.5-35.9	30.9
Upper jaw length	45.6	42	44.1-54.1	48.7
Horizontal orbital diameter	43.0	42	39.3-46.7	43.4
Least interorbital width	37.5	42	25.1-38.6	33.1

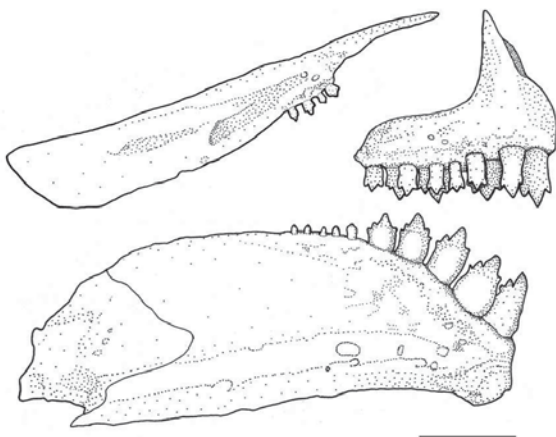


Fig. 2. *Moenkhausia diamantina*, paratype, LIRP 768, 47.3 mm SL, premaxillary, maxillary and dentary; left side, lateral view (maxillary and dentary) or frontal view (premaxillary). Scale bar = 1 mm.

pyrophthalma based on the reticulated color pattern of the body, red pigmentation of dorsal portion of the eye, and the presence of a lightly colored area followed by a dark blotch on the caudal peduncle. Based on these shared characters, Costa assigned his new species (*M. pyrophthalma*) to the genus *Moenkhausia*, even though it better conformed to the traditional concept of *Hemigrammus* as a consequence of its incomplete lateral line. Similarly, Lima & Toledo-Piza (2001) described *M. dyktiota* which also has an incomplete lateral line, noting that it shares the color pattern of the members of the assemblage proposed by Costa (1994). Benine (2002) mentioned a putative close relationship between *M. oligolepis*, *M. sanctaefilomenae*, *M. cotinho*, *M. grandisquamis* and his new species *M. levidorsa*, based on a broad ectopterygoid and palatine. *Moenkhausia diamantina* also shows a reticulate color pattern and the condition described by Benine (2002) for the palatine and ectopterygoid bones. That could be indicative of a close relationship between *M. diamantina* and the above-mentioned species. Nonetheless, these characters seem to be relatively widespread among characids and need to be evaluated in a more comprehensive phylogenetic context before a rigorous hypothesis of relationships is proposed.

Comparative material examined. All from Brazil. *Moenkhausia cotinho*. MZUSP 29829, Amazonas, Barcelos, rio Negro. *Moenkhausia diktyota*. MZUSP 62615, paratype, Amazonas, rio Negro, Igarapé at São João, near Santa Isabel do Rio Negro. *M. levidorsa*. INPA 16774, holotype, Mato Grosso, Núcleo Aripuanã, Igarapé do Aeroporto, furo Bahia, above cachoeira de Dardanelos. *M. nigromarginata*. MZUSP 45289, paratypes, Mato Grosso, stream tributary of rio Cravari about 10 km N of Campo Novo do Parecis, rio Tapajós. *Moenkhausia oligolepis*. MZUSP 17478, Amazonas, Fonte Boa, rio Solimões, Igarapé Tomé, Ati-Paraná. *M. pyrophthalma*. MZUSP 45290, paratypes, Mato Grosso, stream crossing the road between Água Boa and Cocalinho, rio das Mortes, rio Araguaia-Tocantins basin. *Moenkhausia sanctaefilomenae*. MZUSP 94090, Piauí, Santa Filomena, rio Parnaíba. *M. xinguensis*. MZUSP36806, Pará; Cachoeira do Espelho, rio Xingu.

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