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Description of a new species of *Characidium* Reinhardt, 1867 (Characiformes: Crenuchidae) from the Chapada Diamantina, Bahia, and redescription of *Characidium bimaculatum* Fowler, 1941

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Abstract

A new species of *Characidium* Reinhardt, 1867 endemic to tributaries of the upper rio Paraguaçu in the Chapada Diamantina, Bahia, Brazil, is described. The new species can be distinguished from its congeners except *C. bahiense*, *C. bimaculatum*, *C. laterale*, C. *nana*, *C. nupelia*, and *C. xavante*, by having a conspicuous peduncular blotch in addition to the basicaudal spot on the base of the middle caudal-fin rays. Among other features, the new species differs from *C. bahiense*, *C. laterale*, *C. nana*, *C. nupelia*, and *C. xavante* by having a complete lateral line with 32–36 perforated scales (*vs*. lateral line short, with 9–11 perforated scales), and from *C. bimaculatum* by the body pigmentation pattern, with secondary bars present (*vs*. absent), total bars 11–16 (*vs*. 10–12), peduncular blotch rounded (*vs*. horizontally elongated), and mature males not having a darker dorsal fin (*vs*. proximal third of dorsal fin darker in mature males). *Characidium bimaculatum*, a poorly known species from Northeastern Brazil, is redescribed.

Key words: Northeastern Brazil, rio São Francisco, Bacia do Nordeste Oriental, Caatinga, semiarid biome

Resumo

Uma nova espécie de *Characidium* Reinhardt, 1867, endêmica de tributários do alto rio Paraguaçu na Chapada Diamantina, Bahia, Brasil, é descrita. A nova espécie pode ser diferenciada de seus congêneres, exceto *C. bahiense*, *C. bimaculatum*, C. *nana*, *C. nupelia* e *C. xavante*, por possuir uma mancha peduncular conspícua, além da mancha basicaudal na base dos raios medianos da nadadeira caudal. Dentre outras características, a nova espécie difere de *C. bahiense*, *C. laterale*, *C. nana*, *C. nupelia* e *C. xavante* por possuir a linha lateral completa, com 32–36 escamas perfuradas (*vs*. linha lateral curta, com 9–11 escamas perfuradas), e de *C. bimaculatum* pelo padrão de pigmentação do corpo, com barras secundárias presentes (*vs*. ausentes), total de barras 11–16 (*vs*. 10–12), e machos maduros não possuindo a nadadeira dorsal mais escura (*vs*. terço proximal da nadadeira dorsal mais escura nos machos maduros). *Characidium bimaculatum*, uma espécie mal conhecida do Nordeste brasileiro, é redescrita.

Introduction

Characidium Reinhardt, 1867 is a highly diversified group of Neotropical fishes, currently including 67 valid species (Eschmeyer *et al*., 2016; Melo *et al.*, 2016). In the past 20 years, the taxonomic knowledge of the genus has improved considerably with descriptions of 25 new valid species (*e.g*., Buckup & Reis, 1997; Lujan *et al*., 2013; Zanata & Ohara, 2015). The coastal streams of the Northeastern Mata Atlântica freshwater ecoregion (Abell *et al*., 2008; Camelier & Zanata, 2014) are home for several endemic species of freshwater fishes, including six valid and a few undescribed species of *Characidium*: *C. bahiense* Almeida, 1971; *C. timbuiense* Travassos, 1946, *C. samurai* Zanata & Camelier, 2014; *C. kamakan* Zanata & Camelier, 2015; *C. helmeri* Zanata, Sarmento-Soares & Martins-Pinheiro, 2015; *C. deludens* Zanata & Camelier, 2015 (Travassos, 1946; Almeida, 1971; Sarmento-Soares *et al*.,

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2007, 2009; Sarmento-Soares & Martins-Pinheiro, 2009; Zanata & Camelier, 2014, 2015; Zanata *et al*., 2015). Herein, a new species of *Characidium* is described, endemic to the tributaries of the upper portion of rio Paraguaçu, in the Chapada Diamantina, Bahia, Northeastern Brazil. In addition, *Characidium bimaculatum* Fowler, 1941, a poorly diagnosed species, is redescribed based on specimens obtained from the coastal streams in the Nordeste Médio-Oriental hydrographic region and tributaries of the lower rio São Francisco Basin.

Material and methods

Morphometric and meristic data were obtained from the left side of specimens, under a binocular stereomicroscope, according to Buckup (1993a) with modifications proposed by Melo & Oyakawa (2015). Measurements were taken using a digital caliper to 0.1 mm. Counts are listed in the text, followed by their frequencies in parentheses; an asterisk indicates the value for the holotype.

Terminology for pigmentation of body follows Leitão & Buckup (2014), with bar referring to a vertical mark on the body; primary bar, to a bar contiguous to the dorsal midline; secondary bar to a bar disconnected dorsally or a branch of a primary bar; stripe, to a horizontal mark on the body; band, to a mark crossing any fin. Additionally, the peduncular blotch refers to an oval or rounded mark on the caudal peduncle, anterior to the basicaudal spot (*sensu* Buckup, 1993b).

Osteological characteristics were observed in cleared and stained specimens (cs), prepared according to Taylor & Van Dyke (1985). Terminology for caudal-fin elements follows Fujita (1990). The vertebral counts included the four anterior-most elements modified into the Weberian apparatus counted individually, the compound caudal-fin element was counted as a single element, and the supernumerary elements in dorsal and anal fins were counted only from cleared and stained individuals. Institutional abbreviations follow Sabaj-Pérez (2014), with the addition of MZFS for the Divisão de Peixes do Museu de Zoologia of the Universidade Estadual de Feira de Santana (former UESF).

Taxonomy

Characidium clistenesi, new species

Piaba-charuto, charutinho
(Figs. 1A–C, 2A–E, 3A–B, Table 1)

Characidium bimaculatum (non Fowler, 1941): Leitão & Buckup, 2014: 21 (material examined, in part. MNRJ 23757, 23764, both from rio São José, Lençóis, Bahia).

Characidium cf. *bimaculatum* (non Fowler, 1941): Santos, 2003: 27, 75, 77, 78 (checklist and estimative of abundance of species from rio Paraguaçu, Chapada Diamantina).

Holotype. MZUSP 120530, 27.4 mm SL, Rio Capivara, tributary of rio Paraguaçu, Chapada Diamantina, Lençóis, Bahia, Brazil, 12°27’27”S, 41°22’35.7”W, 31 Oct 2015, M.R.S. Melo, A.C.A. Santos, E. Santos, P. Moura, and C. Santos

Paratypes. All from rio Paraguaçu Basin, Chapada Diamantina, Bahia, Brazil: MNRJ 47511, 20, 24.3–30.3 mm SL, MZUSP 120532, 70 (3 CS), 22.8–34.7 mm SL, ZUEC 13030, 20, 25.1–31.0 mm SL, collected with holotype; MZFS 7214, 3, 31.7–36.9 mm SL, Ribeirão de Baixo, Lençóis, 12°35’10”S, 41°22’ 57.1”W, 3 Sept 2005, A.C.A. Santos; MZFS 13782, 4, 26.2–35.3 mm SL, rio Paraguaçu, Utinga, 12°06’44”S, 41°07’15”W, 11 Aug 2008, A.C.A. Santos; MZFS 14554, 1, 27.4 mm SL, Ribeirão de Baixo, Lençóis, 12°35’10”S, 41°22’57”W, 2 Jul 2010, A.C.A. Santos; MZFS 15189, 1, 29.0 mm SL, Rio Caldeirão, Lençóis, 12°39’33”S, 41°22’13”W, 21 Sept 2012, A.C.A. Santos; MZFS 15208, 4, 38.0–42.7 mm SL, rio Capivara, tributary of rio Paraguaçu, Lençóis, 21 Sept 2012, A.C.A. Santos; MZFS 15225, 7, 32.6–40.3 mm SL, rio Roncador, downstream from Poço do Roncador, Andaraí, 21 Sept 2012, A.C.A. Santos; MZFS 16548, 2, 22.7–23.5 mm SL, córrego dos Padres, Andaraí, 28 May 2014, A.C.A. Santos; MZFS 17012, 1, 28.7 mm SL, rio Caldeirão, Lençóis, 21 Sept 2012, A.C.A. Santos; MZFS 17014, 1, 25.5 mm SL; MZFS 17015, 2, 27.8–28.3 mm SL, rio Capivara, Lençóis, 14 Jul 2013, A.C.A. Santos; MZFS 17072, 40, 27.1–32.5 mm SL, rio São José, Lençóis, 12°37’27,1’’S, 41°22’35.7”W, 31 Mar 2016, P.E.S.

Moura, M. Carvalho, D. Vinicius & V.C. Espíndola; MZFS 17078, 5, 27.1–33.2 mm SL, rio São José, Lençóis, 11 Mar 2016, P.E.S. Moura, M. Carvalho, D. Vinicius, V.C. Espíndola; MZUSP 120464, 24, 26.4–32.4 mm SL, rio Capivara, tributary of rio São José, Lençóis, 12°37'24"S, 41°22'33"W, 20 Jul 2016, M.R.S. Melo, V.C. Espíndola, P.E.S. Moura; MZUSP 120474, 22, 26.8–34.8 mm SL, ribeirão de Baixo, tributary of rio São José, Lençóis, 12°39'32"S, 41°22'12.5"W, 20 Jul 2016, M.R.S. Melo, V.C. Espíndola, P.E.S. Moura; MZUSP 120487, 22, 24.5–31.7 mm SL, rio São José at crossing with BR 272, Balneário do rio São José, Lençóis, 20 Jul 2016, M.R.S. Melo, A.V.C. Espíndola, P.E.S. Moura; MZUSP 120547 (former MZFS 17095), 39, 20.1–23.6 mm SL, tributary of rio Paraguaçu, Lençóis, 15 Oct 2014, A.C.A. Santos; MZUSP 120548 (former MZFS 17097), 1, 29.8 mm SL, rio Capivara, tributary of rio Paraguaçu, Lençóis, 13 Dec 2013, A.C.A. Santos; MZUSP 120549 (former MZFS 17093), 11, 18.5–24.4 mm SL, rio Santo Antônio, tributary of rio Paraguaçu, Lençóis, 15 Oct 2014, A.C.A. Santos; MZUSP 120550 (former MZFS 17094), 19, 19.6–30.8 mm SL, rio Santo Antônio, tributary of rio Paraguaçu, Lençóis, 15 Oct 2014; A.C.A. Santos; MZUSP 120551 (former MZFS 17096), 10, 24.8–33.8 mm SL, rio Capivara, tributary of rio Paraguaçu, Lençóis, 14 Dec 2013, A.C.A. Santos; MZUSP 120552 (former MZFS 17098), 3, 32.8–26.6 mm SL, Córrego dos padres, tributary of rio Paraguaçu, Lençóis, 28 May 2014, A.C.A. Santos.

Diagnosis. *Characidium clistenesi* can be distinguished from its congeners except *C. bahiense*, *C. bimaculatum*, *C. laterale, C. nana*, *C. nupelia* and *C. xavante* by having a conspicuous peduncular blotch (*vs*. peduncular blotch absent). It can be distinguished from *C. bahiense*, *C. nana*, *C. nupelia*, and *C. xavante* by having a complete lateral line with 32–36 perforated scales (*vs*. lateral line short, not reaching level of dorsal-fin origin, with five to eleven perforated scales), and from *C. bimaculatum* by the presence of secondary bars in addition to primary bars, total bars 11–16 (*vs*. secondary bars absent, total bars 10–11), peduncular blotch rounded (*vs*. peduncular blotch horizontally elongated), and mature males with dorsal fin mostly hyaline with a band of melanophores on its proximal third and sparse melanophores between branches of dorsal-fin rays (*vs*. mature males with proximal third of dorsal fin dark). *Characidium clistenesi* further differs from *C. bimaculatum* and *C. xavante* by having 12–13 circumpeduncular scales (*vs*. 14 in *C. bimaculatum* and 10 in *C. xavante*); from *C. nana* by having well-elongated bars, reaching abdominal region (*vs*. transversal bars absent or short, not reaching midbody), stripe thinner than a scale (*vs*. stripe stout and wide, covering from one to one and a half scales), adipose fin present (*vs*. absent), and presence of hooks on branched pelvic-fin rays in mature males (*vs*. hooks absent); and *C. bahiense* by having secondary bars in addition to primary bars (*vs*. only primary bars present).

Description. Morphometric data summarized in Table 1. Small species of *Characidium,* reaching maximum size of 42.7 mm SL. Body elongated, dorsal profile moderately convex between tip of snout and dorsal-fin origin, gently arched at dorsal-fin base, almost straight between dorsal and caudal-fin bases. Ventral profile gently convex between anterior tip of dentary and anal-fin origin, slightly concave at anal-fin base; almost straight between anal and caudal-fin bases. Belly strongly arched in females with ovaries well developed. Greatest depth of body at dorsal-fin origin.

Snout short, gently rounded in lateral view, its tip at level of inferior margin of eye. Mouth small, terminal in juveniles (Fig. 2A, B), subterminal in adults (Fig. 2C, D). Maxilla reaching level of anterior margin of orbit. Orbit rounded or slightly elongated anterodorsally; margin of orbit free. Cheek depth about one third of eye diameter. Nares separated; distance between nares shorter than distance between posterior naris and eye. Dermal flap along entire border of anterior naris, crescent-shaped and restricted to anterior margin of posterior naris. Parietal branch of supraorbital laterosensory canal present. Fontanel limited anteriorly by frontals, posteriorly by parietals. Dentary teeth tricuspid, arranged in single row, increasing in size from lateral to medial, numbering 5(1), 6*(7), 7(6), 8(10), 9(6). Premaxillary teeth tricuspid, arranged in single row, increasing in size from lateral to medial portion, numbering 5(4), 6*(18), 7(8). Maxillary teeth absent. Ectopterygoid teeth arranged in single row, conical, small, 6(1), 7(1), 11(1). Mesopterygoid teeth absent. Branchiostegal rays 4(3); two attached to anterior ceratohyal (3). Total gill rakers on first arch 7(1), 8(1), 10(1); gill rakers attached to epibranchial 3(1), 4(2); gill rakers attached to ceratobranchial 4(2), 6(1).

Scales cycloid; parallel radii present on posterior field of scale, circuli absent. Lateral line complete; lateral-line scales 32(2), 33*(7), 34(19), 35(1), 36(1). Scales above lateral line 4*(30). Scales below lateral line 5*(28), 6(2). Circumpeduncular scales 12*(29), 13(1). Predorsal scales regularly distributed, numbering 9*(4), 10(23), 11(3). Scales between anus and anal-fin origin 2*(12), 3(16), 4(1) 5(1). Isthmus scaled.

Pectoral-fin rays iv,6,i(1), ii,6,ii(2), iii,7,i(8), iii,7,ii(12), iii,8,i(3), iii,8,ii(3), iii,9,i*(1). Pelvic-fin rays i,6,i(2), i,6,ii(3), i,7,i*(23), i,7,ii(1), i,8,i(1). Dorsal-fin rays ii,9*(29), ii,10(1); supranumerary element on first

pterygiophore of dorsal fin 1(1). Anal-fin rays ii,6*(30); supranumerary element on first pterygiophore of anal fin 1(1). Principal caudal-fin rays i,8,8,i*(1), i,8,9,i(29), i,9,9,i(3). Adipose fin present (30).

Precaudal vertebrae 18(3); total vertebrae 33(2), 34(1). Lower procurrent rays 6(3); upper procurrent rays 7(3). Hypurals 6(3). Epurals 2(3). Posterior chamber of swim bladder reduced, with same size as anterior chamber.

Color of preserved specimens. Ground color of head and trunk tan (Figs. 1A–C, 2A–C). Cheek, distal portion of upper jaw, ventral part of head and opercle pale spotted with widely spaced melanophores. Dorsal portion of snout and head brown. Dorsal portion of body dark brown; body beige; belly pale beige to whitish. Single, midlateral stripe present, stout, extending from tip of snout to posterodorsal angle of opercle on head, continuing along midbody dorsal to lateral line, extending along base of middle caudal-fin rays. Eyes black with ventral margin silver. Humeral blotch vertically elongated, over posttemporal and supracleithrum, overlapped by longitudinal stripe. Peduncular blotch brown, rounded. Basicaudal spot rounded, on base of middle caudal-fin rays, connected with peduncular blotch anteriorly.

TABLE 1. Morphometric data for *Characidium clistenesi*, **sp. nov.** Range values are for holotype and paratypes (MZFS 15208, 15225; MZUSP 120532, 120551, 120547, 120548); N: total number of specimens examined; SD: Standard Deviation.

Characters	Holotype	N	Range	Mean	SD
Total length (mm)	34.39	30	23.8–42.7	34.1	
Standard length (mm)	27.37	30	19.8–35.6	28.0	
Percentage of standard length					
Head length	26.9	30	24.8–29.6	27.1	1.4
Prepectoral distance	22.4	30	21.3–27.5	24.5	1.7
Pectoral-fin height	21.2	30	20.8–28.8	23.1	2.2
Predorsal distance	48.0	30	42.7–49.5	46.5	1.5
Dorsal-fin height	21.4	30	17.0–23.2	20.6	1.6
Dorsal-fin base	16.6	30	12.7–18.7	16.2	1.4
Prepelvic distance	52.3	30	49.8–57.0	53.1	2.0
Pelvic-fin height	12.5	30	12.3–21.2	14.6	1.5
Preanal distance	74.4	30	72.5–80.4	75.8	2.2
Anal-apex distance	93.9	30	86.6–97.4	92.7	2.3
Anus to anal fin distance	4.6	30	4.4–7.7	6.1	1.0
Anal-fin height	15.1	30	13.3–18.1	16.3	1.2
Anal-fin base	9.6	30	5.8–12.2	8.6	1.3
Adipose-fin height	5.8	30	3.4–6.1	4.6	0.8
Peduncle length	17.4	30	10.9–21.0	14.7	2.7
Body width	14.1	30	10.4–17.1	13.1	1.5
Body depth at dorsal-fin origin	23.4	30	17.6–26.0	21.3	2.2
Body depth at anal-fin origin	16.7	30	13.1–17.3	15.4	1.2
Body depth at caudal peduncle	11.3	30	9.2–12.2	10.7	0.7
Percentage of head length					
Snout length	21.7	30	18.8–25.0	21.8	1.4
Snout - maxillary tip	21.7	30	14.8–23.8	19.2	2.0
Anterior naris - orbit	10.3	30	6.5–13.3	10.0	1.7
Posterior naris - orbit	4.3	30	2.8–8.7	5.1	1.4
Cheek	10.4	30	7.4–12.9	10.2	1.3
Orbital diameter	29.6	30	22.4–31.2	26.6	2.2
Interorbital distance	17.8	30	14.2–21.6	17.7	2.0

Melanophores more concentrated on posterior edge of scales, forming chain-like bars; primary and secondary bars present, total bars on body 11–16, irregularly distributed, fused along dorsal midline; extending ventrally on flank, not connected ventrally on midline on belly; connected ventrally on midline at level of anus and caudal peduncle. Last bar of body overlapped by peduncular botch. Total bars 11*(2), 12(6), 13(9), 14(7), 15(4), 16(1). Pectoral, pelvic and anal fins mostly hyaline, with melanophores concentrated at edges of lepidotrichia. Dorsal fin mostly hyaline, with melanophores concentrated at margin of lepidotrichia, a single band of melanophores present, on proximal third of dorsal fin, and on interradial membrane between branches of dorsal-fin branched rays. Adipose fin with melanophores widely spaced. Caudal fin with melanophores concentrated on margins of lepidotrichia.

FIGURE 1. *Characidium clistenesi***, sp. nov,** holotype (MZUSP 120530, 27.4 mm SL, male) in (A) lateral, (B) dorsal, and (C) ventral views.

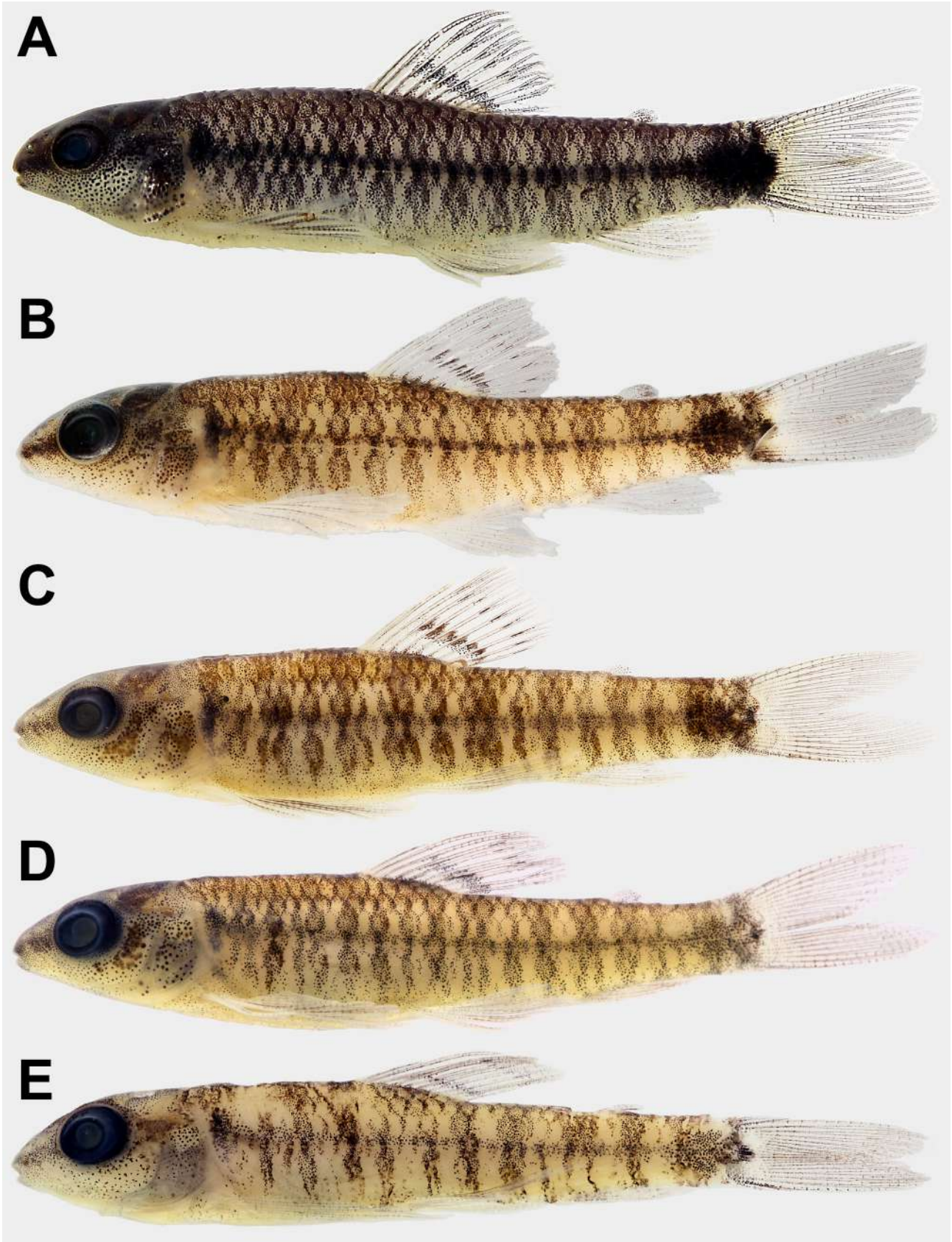

FIGURE 2. *Characidium clistenesi*, **sp. nov,** paratypes in lateral view. (A) MZUSP 120532, 27.5 mm SL, mature male, picture taken soon after formalin preservation; (B) MZUSP 120532, 22.7 mm SL, mature female; (C) MZUSP 120547, 23.3 mm SL, young male with hooks on branched pelvic-fin rays; (D) MZUSP 120547, 21.0 mm SL, juvenile, sex undetermined; and (E) MZUSP 120550 , 20.7 mm SL, juvenile, sex undetermined.

FIGURE 3. Field underwater photographs of *Characidium clistenesi* sp. nov. taken (A) in rio São José (voucher MZUSP 120487), and (B) in rio Capivara (voucher MZUSP 120464). Specimens not preserved.

Color in life. Description based on field observations. Most specimens observed on field pale yellow, with bars poorly marked. Yellow areas more evident on opercle, cleithrum and base of pectoral fin. Longitudinal stripe, peduncular blotch and basicaudal spot evident (Fig. 3A). Few specimens in nature considerably darker, with ground color of body color light-olive-green, bars well marked and base of dorsal fin yellowish (Figs. 2A, 3B).

Sexual dimorphism. No sexual dimorphism of color pattern. All mature males with numerous hooks on lepidotrichia of first to fifth branched pelvic-fin rays. Few mature males (MZUSP 120532, 1 specimen, 27.5 mm SL; MZFS 15225, 1 specimen, 32.6 mm SL) also having hooks on first and second branched pectoral-fin rays. Adult females and juveniles lacking hooks on fin rays. Smallest male with hooks on pelvic-fin rays at 23.3 mm SL (MZFS 15225).

Distribution. *Characidium clistenesi* is apparently endemic to streams draining the eastern side of the Chapada Diamantina Plateau, draining into rio Paraguaçu, a coastal drainage from Bahia, Brazil (Fig. 4).

Habitat. Streams with clear, fast-flowing water with rapids and small pools, and sand, gravel or rocky bottom.

Etymology. The specific name is dedicated to our colleague Dr. Alexandre Clistenes de Alcântara Santos, in recognition of his long time of dedication in researching the natural history of the ichthyofauna of the Chapada Diamantina, Bahia, Brazil.

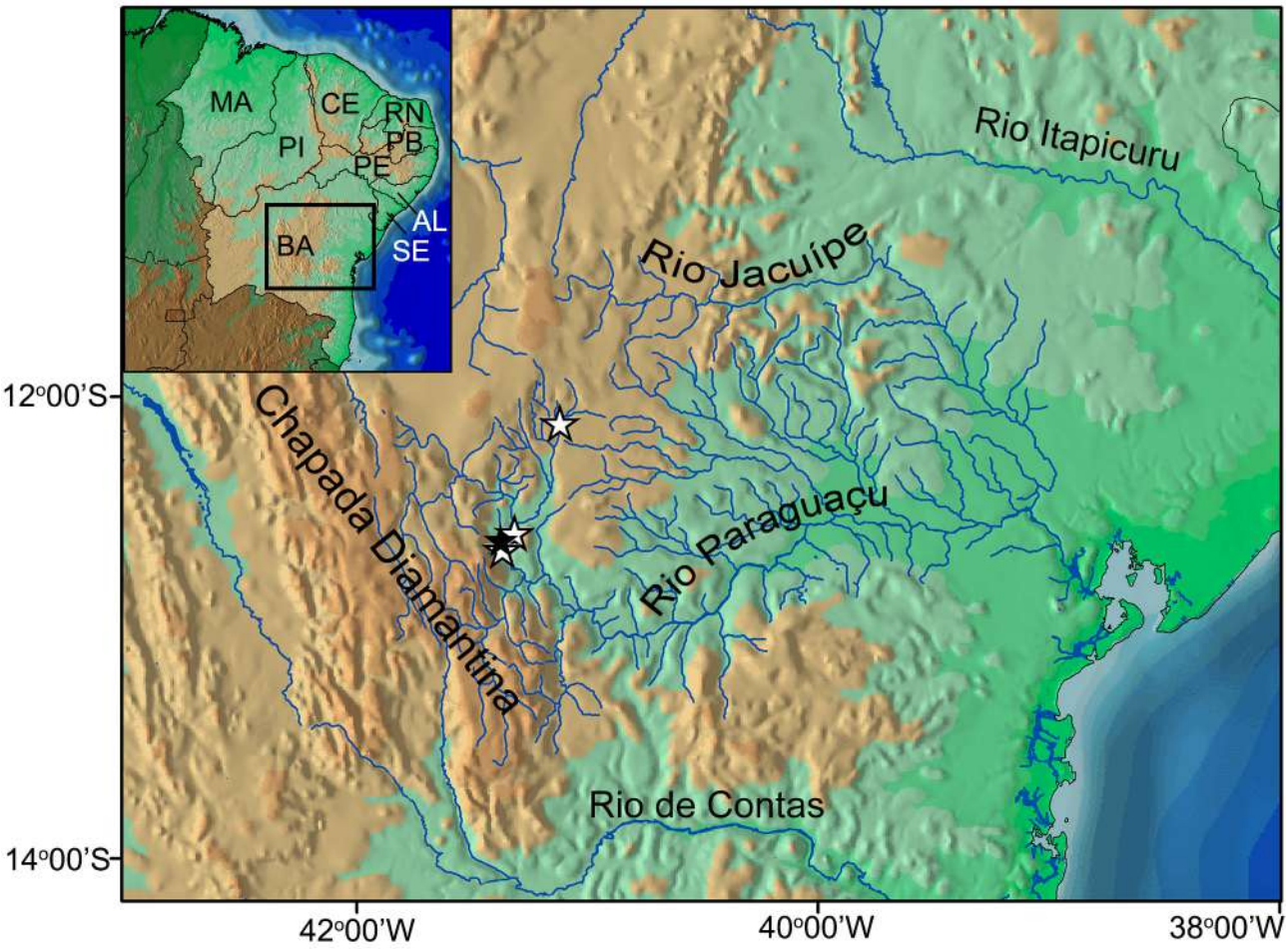

FIGURE 4. The rio Paraguaçu Basin with the known distribution of *Characidium clistenesi* **sp. nov.** Highlighting in the inset indicates Northeastern Brazil, with a square indicating the expanded area. A black star indicates the type locality, and white stars additional known records. Each symbol may represent more than one lot.

Characidium bimaculatum Fowler, 1941

(Figs. 5A–C, 6A–F; Table 2)

Characidium bimaculatum: Fowler, 1941, pp. 179–180, fig. 90 (original description, "Forteleza (sic), Ceará"); Rosa *et al*., 2003: 153, 176 (listed; Caatinga biome).

Holotype. ANSP 69523, 43.0 mm SL, Fortaleza, Ceará State, Brazil, col. R. von Ihering, 1937 (pictures examined) **Paratypes**. ANSP 69524 (4), 69528 (1, CS), 29.0–40.0 mm SL, collected with holotype (not examined).

Additional material examined. All from Brazil. MZFS 15015, 1, 23.1 mm SL, riacho Vaca Brava, Brejo Paraibano, Areias, Paraíba, 7°00'12.3"S, 35°44'04"W, 10 Jul 2012, A.C.A Santos *et al*.; MZFS 15036, 14, 22.63–28.31 mm SL, rio Araçaji-Mirim, Brejo Paraibano, Pilões, Paraíba, 6°51'58.6"S, 35°37'17.3"W, 08 Jul 2012, A.C.A. Santos *et al*.; MZFS 15037, 2, 20.1–30.2 mm SL, rio Macaíba, Brejo Paraibano, Areias, Paraíba, 7°01'23.9"S, 35°42' 41.9"W; 10 Jul 2012, A.C.A. Santos *et al*.; MZFS 15038, 2, 27.6–30.2 mm SL, MZFS 15282, 4, 24.6–28.5 mm SL, Rio Pintura, Brejo Paraibano, Pilões, Paraíba, 6°52'07"S, 35°38'57"W, 8 Jul 2012, A.C.A. Santos *et al*.; MZFS 15039, 1, 25.7 mm SL, MZFS 15329, 6, 24.0–34.2 mm SL, rio Fechada, Brejo Paraibano, Areias, Paraíba, 6°54"39"S, 35°38'58"W, 8 Jul 2012, A.C.A. Santos *et al*.; MZFS 15066, 1, 28.1 mm SL, rio

Riachão, Brejo Paraibano, Areias, Paraíba, 7°01'39"S, 35°44'22"W, 10 Jul 2012, A.C.A. Santos *et al*.; MZFS 15068, 1, 26.7 mm SL, rio Pintura, Brejo Paraibano, Pilões, Paraíba, 6°52'07.0"S, 35°38'57"W, 8 Jul 2012, A.C.A. Santos *et al*.; MZFS 15073, 1, 34.0 mm SL, rio Macaíba, Brejo Paraibano, Areias, Paraíba, 7°01'24"S, 35°42'42"W, 10 Jul 2012, A.C.A. Santos *et al*.; MZFS 15097, 4, 26.4–36.2 mm SL, MZFS 15254, 9, 24.7–30.6 mm SL, rio Ouricuri, Brejo Paraibano, Pilões, Paraíba, 6°53'23"S, 35°34'03"W, 9 Jul 2012, A.C.A. Santos *et al*.; MZFS 15103, 13, 19.4–38.1 mm SL, Balneário Vale Escuro, Brejo Paraibano, Pilões, Paraíba, 6°52'48,5"S, 35°34'19.2"W, 9 Jul 2012, A.C.A. Santos *et al*.; MZFS 15240, 2, 27.9–38.4 mm SL, rio Coringa, Brejo Paraibano, Alagoa Nova, Paraíba, 7°04'42"S, 35°45'35.7"W, 10 Jul 2012, A.C.A. Santos *et al*.; MZFS 15287, 12, 27.1–30.2 mm SL, riacho no sítio Guarabiraba, Brejo Paraibano, Pilõezinhos, Paraíba, 9 Jul 2002, A.C.A. Santos *et al*.; MZFS 15326, 17.8–33.4 mm SL, rio Araçaji-mirim, Brejo Paraibano, Pilões, Paraíba, 8 Jul 2002, A.C.A. Santos *et al*.; MZFS 15519, 9, 29.0–30.0 mm SL, stream at Patamuté, Curaçá, Bahia, 9°25'07"S, 39°28'18"W, 1 Dec 2010, E. Santos *et al*.; MZFS 15529, 11, 15.7–30.0 mm SL, riacho Olho d'água, Curaçá, Bahia, 9°16'46"S, 39°48'55"W, 17 Apr 2011, E. Santos *et al*.; MZFS 15689, 2, 28.2–30.2 mm SL, Sitio Guarabira, Brejo Paraibano, Areia, Paraíba, 19 May 2013, A.C.A. Santos *et al*.; MZFS 15690, 10, 17.4–30.4 mm SL, MZFS 15954, 6, 14.7–27.3 mm SL, rio Macaíba, Brejo Paraibano, Areia, Paraíba, 20 May 2013, A.C.A. Santos *et al*.; MZFS 15724, 3, 31.9–34.3 mm SL, MZFS 15727, 3, 7.5–11.2 mm SL, MZFS 15820, 3, 14.9–33.4 mm SL, Balneário Vale Escuro, Brejo Paraibano, Pilões Paraíba, 19 May 2013, A.C.A. Santos *et al*.; MZFS 15725, 3, 23.4–34.9 mm SL, MZFS 15915, 1, 22.4 mm SL, rio Fechada, Brejo Paraibano, Areia, Paraíba, 19 May 2013, A.C.A. Santos *et al*.; MZFS 15738, 2, 27.7–28.6 mm SL, MZFS 15752, 1, 30.1 mm SL, MZFS 15822, 1, 26.67 mm SL, rio Araçaji-Mirim, Brejo Paraibano, Pilões, Paraíba, 19 May 2013, A.C.A. Santos *et al*.; MZFS 15781, 9, 24.4–33.4 mm SL, MZFS 15786, 5, 14.4–27.8 mm SL, MZFS 15808, 1, 30.8 mm SL, MZFS 15889, 23, 26.9–36.7 mm SL, rio Pintura, Brejo Paraibano, Pilões, Paraíba, 6°52'07.0"S, 35°38'56.6"W, 19 May 2013, A.C.A. Santos *et al*.; MZFS 15896, 1, 26.6 mm SL, MZFS 15965, 1, 27.2 mm SL, rio Riachão, Brejo Paraibano, Areia, Paraíba, 20 May 2013, A.C.A. Santos *et al*.; MZFS 15964, 1, 33.4 mm SL, rio Ouricuri, Brejo Paraibano, Pilões, Paraíba, 19 May 2013, A.C.A. Santos *et al*.; MZUSP 120553 (former MZFS 17100), 1, 10.5 mm SL, rio Coringa, Brejo Paraibano, Alagoa Nova, Paraíba, 12 Jul 2013, A.R. Carneiro; MZUSP 77917, 1, 30.1 mm SL, rio Pitimbu, Paranamirim, Rio Grande do Norte, 5°55'S, 35°15'W [coordinates inferred], 25 Aug 2001, R. Alzier; MZUSP 57040, 4, 23.6–27.5 mm SL, Umari, Taipu, Rio Grande do Norte, 5°28'S, 35°35'W [coordinates inferred], 21 Apr 1999, H.C.B. Gurgel *et al*.; MZUSP 68965, 2, 26.3–27.0 mm SL, rio Pitimbu, Macaíba, Rio Grande do Norte, 5°51'S, 35°21'W [coordinates inferred], 18 Feb 2000, T. Oliveira; MZUSP 68962, 1, 32.1 mm SL, Rio Guajiru, Ceará-Mirim, Rio Grande do Norte, 5°40'S, 35°25'W [coordinates inferred], 15 Oct 2000, H. Gurgel *et al*.; MZUSP 114779, 1, 36.6 mm SL, stream tributary of riacho dos Carás, rio Jaguaribe drainage, Crato, Ceará, 7°15'S, 39°24'W [coordinates inferred], 28 Apr 1985, W. Gomes; MZUSP 110781, 1, 27.4 mm SL, Rio Acaraú, Nova Russas, Ceará, 4°41'36"S, 40°30'03"W, 23 Jul 2009, C.F. Rezende *et al*.

Diagnosis. *Characidium bimaculatum* can be distinguished from its congeners except *C. bahiense*, *C. clistenesi*, *C. laterale*, *C. nana*, *C. nupelia*, and *C. xavante* by having an enlarged conspicuous peduncular blotch (*vs*. peduncular blotch absent). It can be distinguished from *C. bahiense*, *C. laterale*, *C. nana*, *C. nupelia*, and *C. xavante* by having a complete lateral line with 32 or 33 perforated scales (*vs*. lateral line short, not reaching level of dorsal-fin origin, with five to eleven perforated scales), and from *Characidium clistenesi* by lacking secondary bars, total bars 10–11 (*vs*. secondary and primary bars bars present, total bars 13–16), peduncular blotch horizontally elongated (*vs*. peduncular blotch rounded), and mature males having the proximal third of dorsal fin dark (*vs*. mature males with mostly hyaline dorsal fin with a band of melanophores on its proximal third and sparse melanophores between branches of dorsal-fin rays). *Characidium bimaculatum* further differs from *C. bahiense*, *C. laterale*, *C. nana*, *C. nupelia*, and *C. xavante* by having 14 circumpeduncular scales (*vs*. 12 in *C. bahiense*, *C. laterale*, *C. nana*, *C. nupelia*, and *C. xavante*, and 10 in *C. xavante*); from *C. nana* by having bars elongated, reaching lower portion of body (*vs*. transversal bars absent or short, not reaching the midbody), stripe thinner than a scale (*vs*. stripe stout and wide, covering from one to one and a half scales), adipose fin present (*vs*. absent), and presence of hooks on the branched pelvic-fin rays in mature males (*vs*. hooks absent).

Description. Morphometric data summarized in Table 2. Small species of *Characidium*, reaching maximum size of 43.0 mm SL. Body elongated. Dorsal profile moderately convex between tip of snout and dorsal-fin origin, gently arched at dorsal-fin base, almost straight between dorsal and caudal-fin bases. Ventral profile gently convex between anterior tip of dentary and anal-fin origin, slightly convex at anal-fin base; almost straight between anal and caudal-fin bases. Greatest depth of body at dorsal-fin origin.

TABLE 2. Morphometric data for *Characidium bimaculatum*. Range values are for selected specimens (MZFS 15103, 15786, 15889, MZUSP 57040, 68962, 68965, 114779). N: total number of specimens examined; SD: Standard Deviation.

Characters	N	Range	Mean	SD
Total length (mm)	30	23.7–46.3	35.9	
Standard length (mm)	30	19.4–38.1	29.1	
Percentage of standard length				
Head length	30	23.6–30.8	27.0	1.9
Prepectoral distance	30	21.2–29.0	25.6	2.1
Pectoral-fin height	29	19.1–24.8	21.6	1.7
Predorsal distance	30	43.8–52.7	48.1	2.1
Dorsal-fin height	27	18.9–25.1	21.4	1.7
Dorsal-fin base	30	11.8–21.0	15.7	2.3
Prepelvic distance	30	47.4–60.2	54.0	3.1
Pelvic-fin height	30	12.6–19.7	15.8	1.6
Preanal distance	30	71.1–79.3	74.9	2.2
Anal-apex distance	30	85.7–95.7	91.2	2.7
Anus to anal fin distance	30	5.8–12.1	8.0	1.5
Anal-fin height	30	12.7–18.7	15.9	1.6
Anal-fin base	30	6.9–13.0	10.1	1.9
Adipose-fin height	28	4.5–7.1	5.6	0.6
Peduncle length	30	7.9–15.6	12.3	1.8
Body width	30	11.6–15.2	13.0	1.0
Body depth at dorsal-fin origin	30	21.0–29.1	24.9	1.7
Body depth at anal-fin origin	30	15.3–21.0	17.8	1.3
Body depth at caudal peduncle	30	10.8–13.8	12.3	0.8
Percentage of head length				
Snout length	30	17.7–24.2	20.8	1.8
Snout - maxillary tip	30	17.7–25.2	22.2	1.9
Anterior naris - orbit	30	7.5–13.6	10.1.8	1.5
Posterior naris - orbit	30	3.2–6.7	4.6	0.9
Cheek	30	7.5–11.7	9.2	1.2
Orbital diameter	30	21.2–30.6	26.6	2.3
Interorbital distance	30	18.1–23.6	20.7	1.7

Snout short, gently rounded, its tip at level of inferior margin of eye. Mouth small, terminal. Snout to maxillary tip distance equal or slightly longer than eye diameter; maxilla reaching level of anterior margin of orbit. Orbit rounded or slightly elongated antero-dorsally; margin of orbit free. Cheek depth about one third of eye diameter. Nares distinctly separated; distance between nares shorter than distance between posterior naris and eye. Dermal flap along entire border of anterior naris, crescent-shaped and restricted to anterior margin of posterior naris. Parietal branch of supraorbital laterosensory canal absent. Fontanel limited anteriorly by frontals, posteriorly by parietals. Dentary in two rows; outer dentary teeth tricuspid, arranged in single row, increasing in size from lateral to medial portion, numbering 7(3), 8(11), 9(15), 10(1); inner dentary teeth conical, minute, numerous, arranged in single row. Premaxillary teeth tricuspid, arranged in single row, increasing in size from lateral to medial, numbering 6(11), 7(17), 8(1), 9(1). Maxillary teeth absent. Ectopterygoid teeth small, arranged in single row, conical, 9(1), 11(1). Mesopterygoid teeth absent. Branchiostegal rays 4(1); two attached to anterior ceratohyal (1). Total gill rakers on first arch 10(2); gill rakers attached to epibranchial 4(1), 5(1); gill rakers attached to ceratobranchial 5(1), 6(1).

Scales cycloid; parallel radii present on posterior field of scale; circuli absent. Lateral line complete, with all scales perforated; lateral-line scales 30(3), 31(2), 32(6), 33(14), 34(4), 36(1). Scales above lateral line 4(30). Scales below lateral line 5(24), 6(6). Circumpeduncular scales 14(30). Pre-dorsal scales regularly distributed, numbering 10(22), 11(1). Scales between anus and anal fin 2(2), 3(14), 4(9). Isthmus scaled to anterior margin of cleithrum.

Pectoral-fin rays iii,5,iii(1), iii,6,ii(4), iii,7,i(1), iii,7,ii(19), iii,8,i(1), iii,8,ii(3), iii,9,i(1). Pelvic-fin rays i,7,i(30). Dorsal-fin rays ii,9(30); supranumerary element on first pterygiophore of dorsal fin 1(1). Anal-fin rays ii,6(30); supranumerary element on first pterygiophore of anal fin 1(1). Principal caudal-fin rays i,8,9,i (30). Adipose fin present (30).

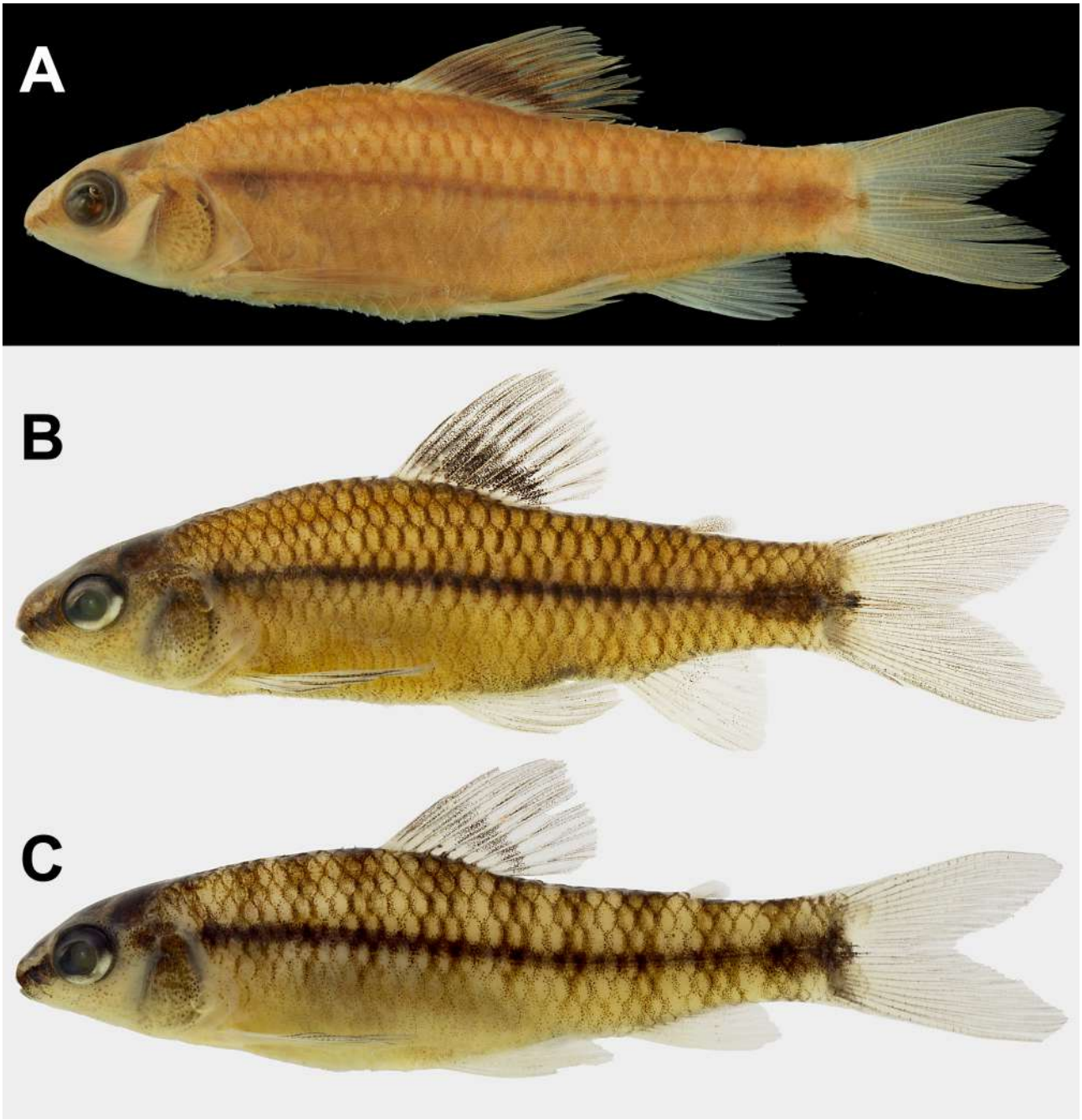

FIGURE 5. *Characidium bimaculatum*, (A) ANSP 69523, 43.0 mm SL, holotype in lateral view, male; (B) MZFS 15889, 36.7 mm SL, male; (C) MZFS 15889, 29.3 mm SL, female. Photo of holotype courtesy of M. Sabaj.

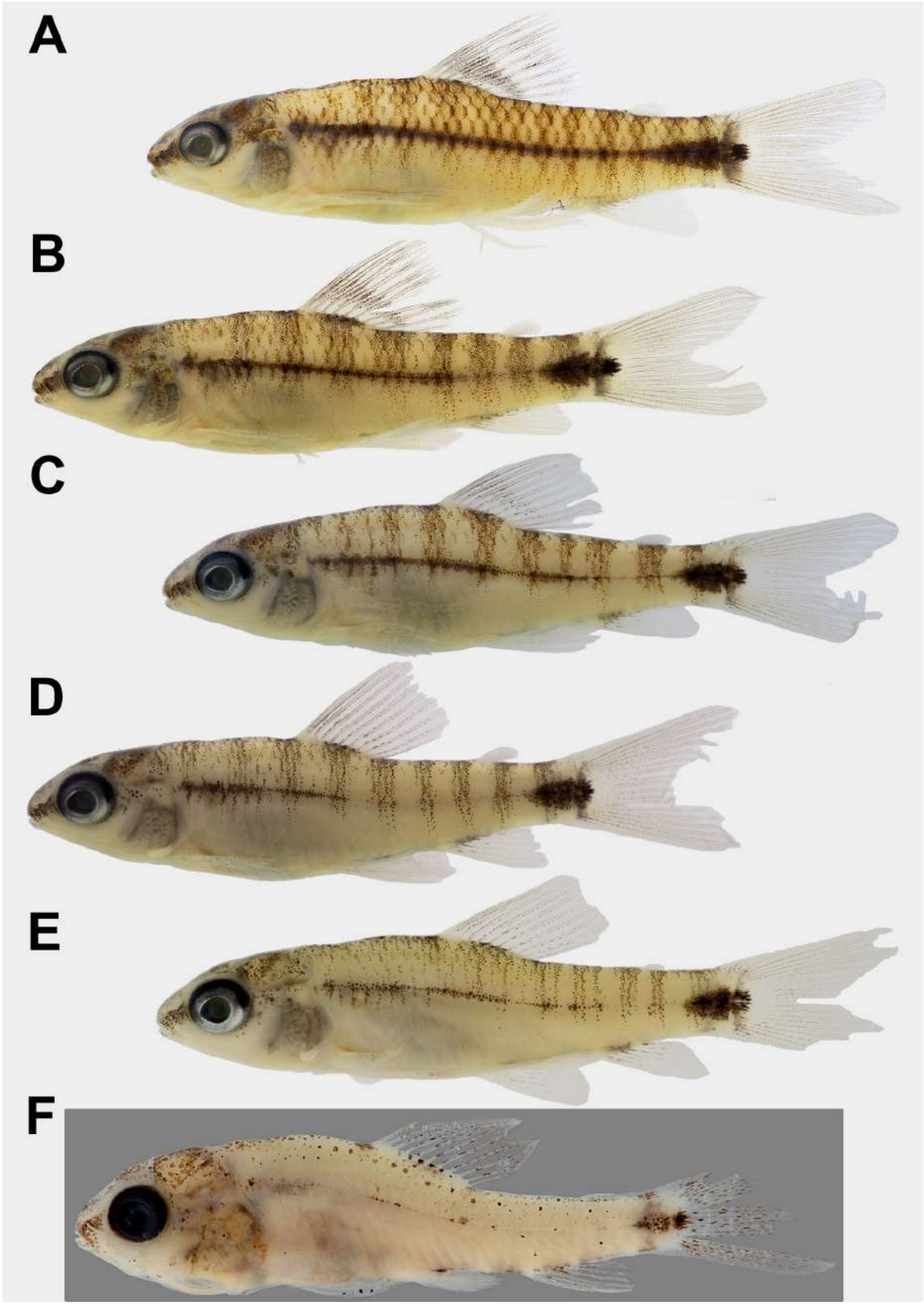

FIGURE 6. Ontogenetic series of *Characidium bimaculatum* in lateral view. (A) MZFS 15786, 25.1 mm SL (male, with hooks on branched pelvic-fin rays); (B) MZFS 15786, 18.3 mm SL (juvenile, immature); (C) MZFS 15786, 18.3 mm SL (juvenile, immature); (D) MZFS 15786, 16.3 mm SL (juvenile, immature); (E) MZFS 15786, 14.4 mm SL (juvenile, immature); and (F) MZUSP 120553, 10.5 mm SL (juvenile, immature).

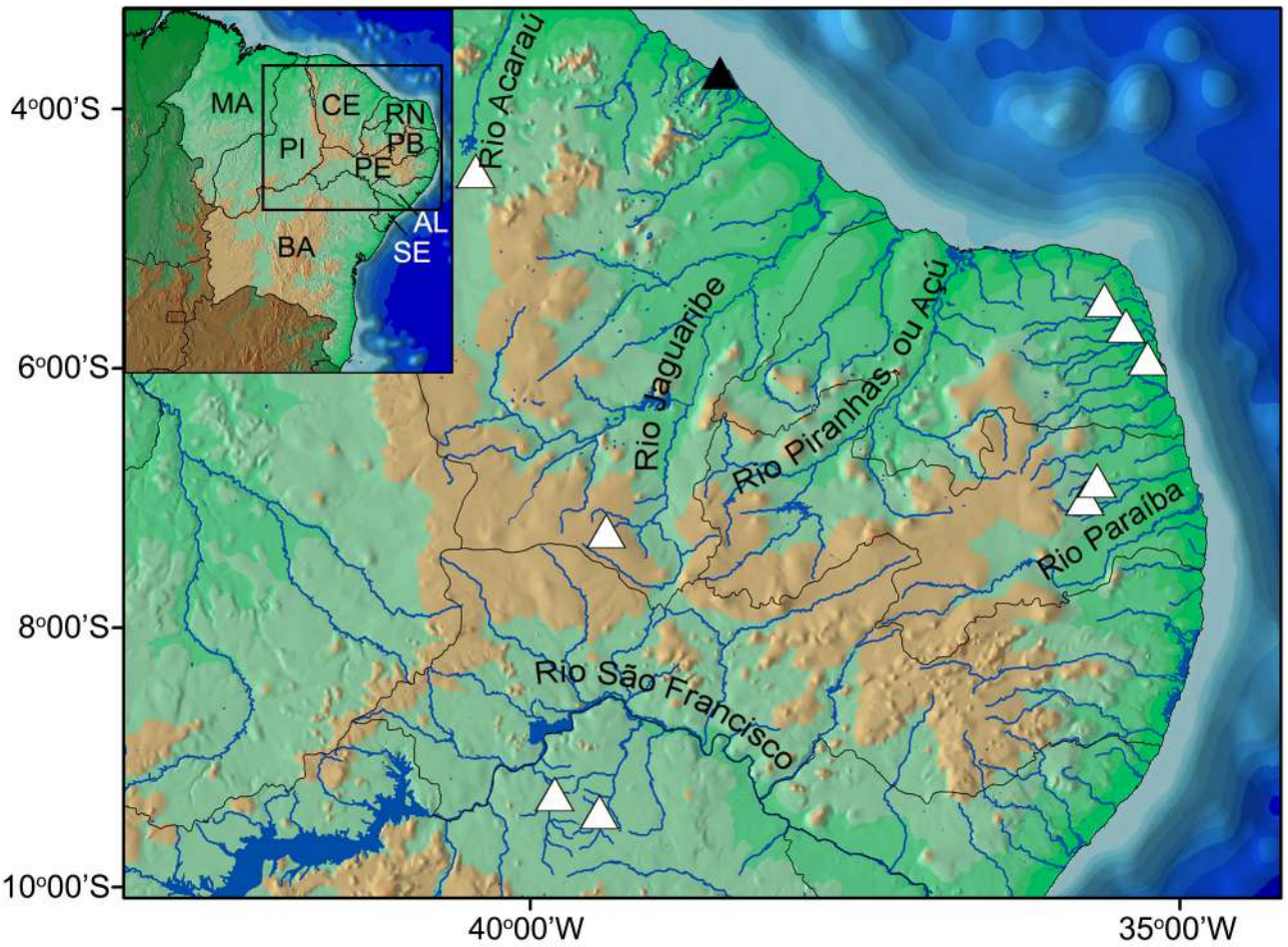

FIGURE. 7. Map of distribution of *Characidium bimaculatum*. Highlighting in the inset indicates Northeastern Brazil, with a square indicating the expanded area. Black triangle indicates the type locality, and white triangles additional known records. Each symbol may represent more than one lot. Abbreviations of the Brazilian states are as follows: AL, Alagoas; BA, Bahia; CE, Ceará; MA, Maranhão; PB, Paraíba; PE, Pernambuco; and RN, Rio Grande do Norte.

Precaudal vertebrae 18*(3); total vertebrae 33*(3). Lower procurrent rays 6(1), 7(1); upper procurrent rays 8(1), 9(1). Hypurals 6(2). Epurals 1(2), 3(1). Posterior chamber of swim bladder enlarged, occupying most of peritoneal cavity.

Color of preserved specimens. Ground color of head and trunk tan (Figs. 5 A–C, 6 E–F). Cheek, distal portion of upper jaw, ventral part of head and opercle, and area around nares pale, with widely spaced melanophores on maxilla and ventral lip; melanophores few or absent on cheek. Dorsal portion of snout and head brown. Dorsal portion of body brown; body yellow; belly pale yellow. Single stripe present, stout, extending from tip of snout to posterodorsal angle of opercle on head, continuing along midbody dorsally to lateral line, extending along base of middle caudal-fin rays. Eyes black with ventral silvery margin. Humeral blotch small, almost indistinguishable, positioned over posttemporal and supracleithrum, overlapped by longitudinal stripe. Peduncular blotch brown, oval, horizontally elongated or arrow-shaped. Basicaudal spot rounded, on base of middle caudal-fin rays, connected with peduncular blotch anteriorly.

Melanophores on body more concentrated on posterior edge of scales, forming overall reticulate pattern on body, bars with chain-like appearance; only primary bars present, secondary bars absent; when present, total bars on body nine to eleven, regularly distributed, not fused on dorsal midline. Bars extending ventrally on flank, not connected ventrally on midline at level of abdominal region; connected ventrally on midline at level of anus and caudal peduncle. Last bar of body overlapped by peduncular botch. Bars more evident in juveniles and females, total bars 9 (1), 10 (7), 11 (7), 12 (6), 13 (1), absent in adult males (8).

Pectoral, pelvic and anal fins mostly hyaline, with interradial membrane hyaline, and melanophores at edges of lepidotrichia. Dorsal fin mostly hyaline, with melanophores concentrated at margin of lepidotrichia, a single band

of melanophores present, on proximal third of dorsal fin, and on interradial membrane between branches of dorsal-fin branched rays. Dorsal-fin rays and interradial membrane of males with proximal third dark. Adipose fin with melanophores widely spaced. Caudal fin with interradial membrane hyaline, with melanophores concentrated on margins of lepidotrichia.

Sexual dimorphism. Mature males with hooks on pelvic-fin rays and, less often, pectoral-fin rays. Hooks on pelvic-fin rays numerous and irregularly distributed on lepidotrichia of branched rays; hooks on pectoral fin present only in few specimens examined (e.g., MZFS 15103, 1 of 6, MZFS 15889, 1 of 5), one to five irregularly distributed on first and second branched rays. Smallest male with hooks on pelvic-fin rays with 26.9 mm SL (MZFS 15889). Except for female (MZFS 15103, 37.8 mm SL), females and juveniles lacking hooks on fin rays. Males larger than 26.0 mm SL with bars less evident, and bars absent in larger males (>30.0 mm SL), general color pattern reticulated, with melanophores concentrated on distal part of scales. Dorsal fin with proximal third uniformly dark; melanophores on interradial membrane between branches of fin rays also darker than in females and juveniles (Fig. 5A, B).

Distribution. *Characidium bimaculatum* is widespread in Northeastern Brazil, along the coastal drainages in Ceará, Rio Grande do Norte, and Paraíba States, and in the tributaries of the lower portion of rio São Francisco, northern Bahia State (Fig. 7).

Habitat. Small coastal streams in Northeastern Brazil and perennial creeks of the Caatinga, a semiarid biome.

Discussion

The genus *Characidium* is considered to be a monophyletic group based on a single synapomorphy, the presence of the basicaudal spot, a black spot at the base of the middle caudal-fin rays (Buckup, 1993b). The shape of the basicaudal spot varies from a small, circular dot as in *C. litorale*, *C. satoi*, *C. tenue*, and *C. zebra* (Buckup & Reis, 1997; Leitão & Buckup, 2014), vertically elongated as in *C. fasciatum* (Buckup, 1992), inconspicuous as in *C. lauroi* and *C. helmeri* (Gomes, 1947; Travassos, 1949; Zanata *et al*., 2015), or even absent as in *C. amaila*, *C. occidentale*, *C. mirim*, *C. orientale*, *C. stigmosum* and *C. kamakan* (Buckup & Reis, 1997; Melo & Buckup, 2002; Netto-Ferreira *et al*., 2013; Lujan *et al*., 2013; Zanata & Camelier, 2015). The absence of the basicaudal spot in *Characidium* is considered as a secondary reversion, even though such variation has not been properly evaluated in a phylogenetic analysis. (Buckup & Reis, 1997; Melo & Buckup, 2002; Netto-Ferreira *et al*., 2013: Zanata & Camelier, 2015).

In addition to *C. bimaculatum* and *C. clistenesi*, the peduncular blotch is present in *C. bahiense*, *C. laterale*, *C. nana*, *C. nupelia*, and *C. xavante* (Fig. 8). An undescribed species from the rio Paraná Basin introduced by Silveira (2008) also have this same characteristic. The peduncular blotch is a dark, oval or rounded mark, located on the caudal peduncle, anterior to the basicaudal spot. In *C. bahiense*, *C. bimaculatum*, *C. clistenesi*, *C. nupelia*, and *C. xavante* the peduncular blotch is stout and conspicuous (Figs. 1, 2, 3, 5, 6, 8A, E, F); in *C. laterale*, the peduncular blotch is a widened portion of the longitudinal stripe (Fig. 8B); and in *C. nana*, the peduncular blotch is evident only in juveniles, becoming embedded within the wide longitudinal stripe in adults (Fig. 8C, D).

The species with a peduncular blotch are members of clade C4, which was firstly proposed Buckup (1993b) to include the species previously allocated in the genus *Jobertina* Pellegrin, 1909: *C. bahiense*, *C. interruptum* (Pellegrin, 1909), *C. lanei* Travassos, 1967, *C. laterale* Boulenger, 1895, and *C. rachovii* Regan, 1913 (Géry, 1977). More recently, Netto-Ferreira *et al*. (2013) and Mendonça & Netto-Ferreira (2015) expanded the taxonomic limits of clade C4, including *C. lagosantense* Travassos, 1947, *C. mirim* Netto-Ferreira, Birindelli & Buckup, 2013, *C. nana* Mendonça & Netto-Ferreira, 2015, *C. nupelia* Graça, Pavanelli & Buckup, 2008, *C. occidentale* Buckup & Reis, 1987, *C. orientale* Buckup & Reis, 1987, *C. stigmosum* Melo & Buckup, 2002, *C. vestigipinne* Buckup & Hahn, 2000 and *C. xavante* Graça, Pavanelli & Buckup, 2008. The monophyly of clade C4 is supported by the absence of the parietal branch of the supraorbital canal, the presence of more than 12 bars on body, and the presence of a single row of dentary teeth (Buckup, 1993b; Netto-Ferreira *et al*., 2013; Mendonça & Netto-Ferreira, 2015), however, some of these characteristics were not evaluated correctly as discussed below.

Neither the presence of a peduncular blotch was evaluated as a character, nor a hypothesis of closer relationship between *C. bahiense*, *C. bimaculatum*, *C. clistenesi*, *C. laterale*, *C. nana*, *C. nupelia*, and *C. xavante* was recovered in any of the previous phylogenies (Buckup, 1993b; Netto-Ferreira *et al*., 2013; Mendonça & Netto-

Ferreira, 2015). Indeed, those species also share the presence of hooks on the branched pelvic-fin rays (Almeida, 1971; Graça *et al*., 2008; Mendonça & Netto-Ferreira, 2015; Melo & Oyakawa, 2015, this study) – erroneously coded as absent in *C*. *laterale*, and as a question mark (?) for *C*. *bahiense* (Netto-Ferreira *et al.*, 2014; Mendonça & Netto-Ferreira, 2015). The presence of hooks on pelvic-fin rays, however, is not exclusive to these species, being also present in *C*. *deludens*, *C*. *litorale*, *C*. *satoi*, and *C*. *stigmosum* (Zanata & Camelier, 2015; Melo & Oyawaka, 2015). The following characteristics are ambiguous or were also miscoded by Netto-Ferreira *et al*. (2014) and Mendonça & Netto-Ferreira (2015) and, therefore, are not useful to diagnose clade C4: in *C. clistenesi*, the parietal branch of the laterosensory canal of head is present; in *C. bimaculatum*, two rows of dentary teeth are present; in *C*. *bahiense*, *C*. *bimaculatum*, *C*. *laterale* and juveniles of *C. nana*, only the primary bars are present and the total number of bars rarely exceed 10 and do not exceed 12; and the bars are completely lost in adults of *C. nana* (Fowler, 1941; Almeida, 1971; Figs. 5A–C, 6A–F, 8A, B, C, D).

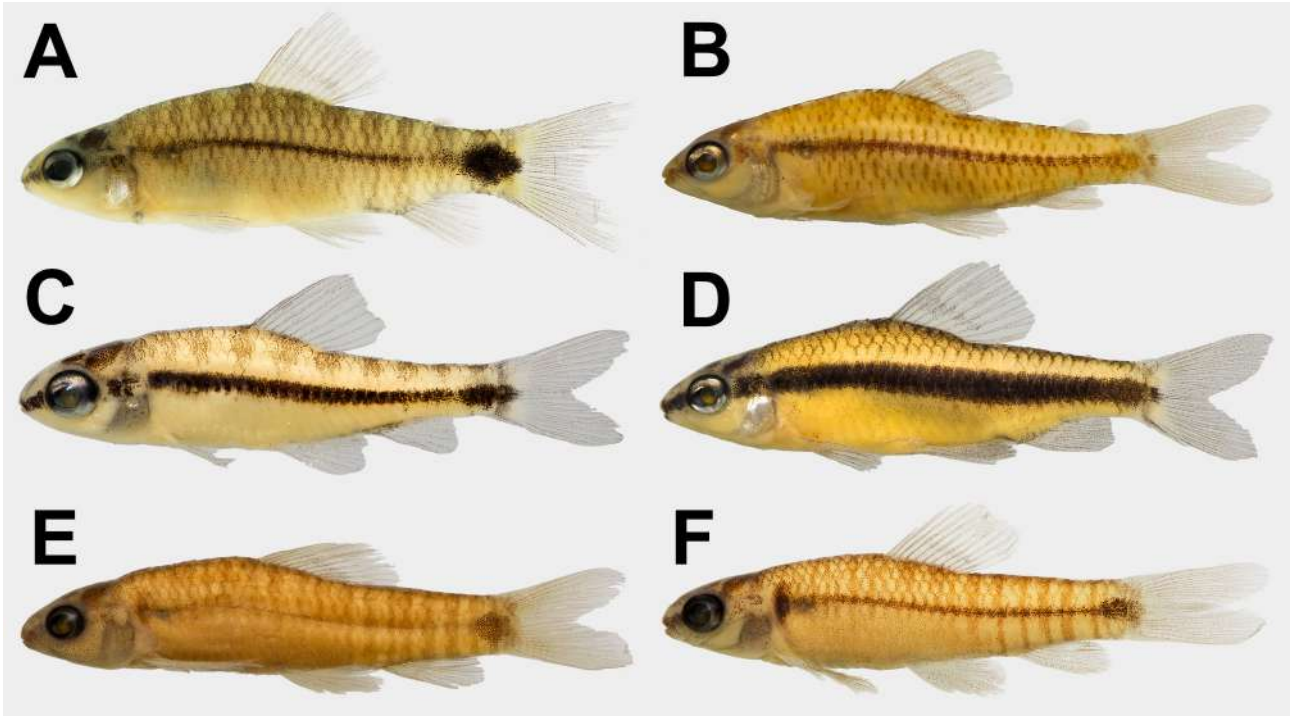

FIGURE 8. Species of *Characidium* with a conspicuous peduncular botch, in addition to *Characidium clistenesi* and *C*. *bimaculatum*. (A) *C*. *bahiense*, MZUSP 120542, 23.7 mm SL; (B) *C*. *laterale*, MZUSP 19981, 25.1 mm SL; (C) *C*. *nana*, MZUSP 119140, 15.0 mm SL; (D) *C*. *nana* MZUSP 119140, 23.9 mm SL; (E) *C*. *nupelia*, MZUSP 87742 (paratype), 26.2 mm SL; and (F) *C*. *xavante*, MZUSP 95551, 21.8 mm SL.

Comparative material examined. All from Brazil. *Characidium bahiense*. MZFS 2684, 3, 18.3–21.9 mm SL, rio Santo Antônio, Lençóis, Bahia, 12°39’ 37”S, 41°19’43”W; MZFS 7705, 3, 18.8–19.3 mm SL, rio Represado em Andorinhas, Senhor do Bomfim, Bahia, 10°20’51”S, 43°33’45”W; MZFS 8724, 36, 22.0–25.8 mm SL, rio Vaza-Barris, Jeremoabo, Bahia, 10°05’51”S, 38°18’37”W; MZFS 13672, 21, 13.7–24.0 mm SL, rio Utinga, Wagner, Bahia, 12°30’00”S, 41°12’26”W; MZFS 15527, 5, 12.3–14.4 mm SL, riacho Olho d’água, Curaçá, Bahia, 9°16’46”S, 39°48’55”W; MZUSP 8940, holotype, 16.4 mm SL, Arembepe, Bahia, 12°45’S, 38°10’W; MZUSP 58924, 114, 12.5–19.8 mm SL, córrego Livramento, tributary of rio Sapão, Formosa do Rio Preto, Bahia, 10°59’26”S, 45°31’48”W, MZUSP 120542, 13, 18.2–27. mm SL, rio Santo Antônio, Lençóis, Bahia, 12°39’57.2”S, 41°19’32”W. *Characidium laterale*. MZUSP 96659, 4, 20.3–22.3 mm SL, Pantanal de Paiaguás, rio Paraguai, Barão de Melgaço, Mato Grosso; MZUSP 96687, 80, 14.1–24.4 mm SL, rio Mutum, rio Paraguai drainage, Barão de Melgaço, Mato Grosso, 16°19’30”S, 55°49’59”W; MZUSP 19981, 7, 20.4–25.3 mm SL, Ilha de Taiamã, rio Paraguai, Cáceres, Mato Grosso. *Characidium mirim*. MZUSP 188683, 39, 14.8–18.1 mm SL, stream tributary of rio das Mortes, tributary of rio Araguaia, rio Tocantins drainage, Paranatinga, Mato Grosso, 14°52’30.92”S, 54°05’01.47”W. *Characidium nana*. MZUSP 119149, 23, 15.0–24.6 mm SL, Igarapé tributary of rio Treze de Maio near village Cachoeira do Curuá, rio Curuá drainage, Altamira, Pará, 8°39’08.42”S, 55°02’08.38”W; MZUSP 119265, 5, 18.0–28.5 mm SL, rio Curuá,

Altamira, Pará. *Characidium nupelia*. MZUSP 87743, holotype, 30.2 mm SL, Brazil, Córrego Forquilha, tributary to rio Manso, rio Paraguay basin, Rosário Oeste, Mato Grosso, 14°44'58"S, 56°07'39"W; MZUSP 87742, 20 (paratypes), 21.6–28.7 mm SL; Chapada dos Guimarães, Córrego Lajinha, tributary to rio Manso (upstream from Manso Reservoir), Areia Branca, Mato Grosso, 14°57'18"S, 55°41'15"W. *Characidium xavante* MZUSP 87744, 20 (paratypes, 11.7–21.9 mm SL, first stream after rio Culuene bridge, from Paranatinga to Canarana, Paranatinga, Mato Grosso, 13°55'43"S, 53°41'45"W; MZUSP 95551, 1, 21.8 mm SL, rio Couto de Magalhães, rio Xingu drainage, Campinapolis, Mato Grosso, 13°50'17"S, 53°03'53"W.

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