

Two new species of *Characidium* Reinhardt (Characiformes: Crenuchidae) from northeastern Brazilian coastal drainages

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Two new species of *Characidium*, one from the rio Pardo basin, and another from the rio Paraguaçu basin, Bahia, Brazil, are described. The first new species is distinguished from its congeners by having conspicuous black vertical traces on body, formed by the concentration of melanophores along posterior margin of scales. The species further differs from most congeners by the presence of a conspicuous 3-shaped black blotch on the caudal fin and isthmus not covered by scales. The other new species is distinguished from congeners by having irregular dark blotches on dorsum alternating elongation to one or the other side of body, usually not connected to lateral blotches. The species can be further characterized by the absence of conspicuous blotches or bars on fins and the presence of secondary sexual dimorphism, such as pelvic fins of mature males longer than in females and with bony hooks.

Duas novas espécies de *Characidium*, uma da bacia do rio Pardo e outra da bacia do rio Paraguaçu, Bahia, Brasil, são descritas. A primeira espécie nova distingue-se das congêneres por ter traços verticais pretos e conspícuos nas laterais do corpo, formados pela concentração de melanóforos ao longo da margem posterior das escamas. A espécie difere ainda da maioria das congêneres pela presença de faixa preta conspícua em forma de 3 na nadadeira caudal e istmo não coberto por escamas. A outra espécie nova se distingue das congêneres por ter manchas dorsais irregulares alternando alongamento para um ou outro lado do corpo, a maioria não conectada às manchas laterais. A espécie pode ser ainda caracterizada pela ausência de manchas ou barras conspícuas nas nadadeiras e pela presença de dimorfismo sexual secundário, tais como nadadeiras pélvicas dos machos maduros mais longas que em fêmeas e com espinhos ósseos.

Keywords: Characidiinae, Neotropical region, Sexual dimorphism, Taxonomy.

Introduction

Characidium Reinhardt comprises 59 valid species of small Neotropical fishes distributed from Argentina to Panama (Eschmeyer, 2015). Half of these species were described before 1950 and about 15 species were described after the year 2000 (e.g., Melo & Buckup, 2002; Taphorn *et al.*, 2006; Graça *et al.*, 2008; Silveira *et al.*, 2008; Lujan *et al.*, 2013; Peixoto & Wosiacki, 2013; Leitão & Buckup, 2014; Zanata & Camelier, 2014), indicating recent efforts to increase the taxonomic knowledge of the genus. *Characidium* is currently considered a monophyletic group based on the presence of a black spot near the base of the middle caudal-fin rays (Buckup, 1993a). Limitations of the diagnosis of the genus, in addition to the need for further investigation

on its monophyly and phylogenetic relationships, were highlighted by Melo & Buckup (2002).

Here we describe two additional species, from rivers draining the Bahia State, northeastern Brazil. The first, a mountain-dwelling form with morphological characteristics possibly related to the inhabitation of fast flowing streams (e.g., a naked isthmus, a streamlined body, and paired-fins modifications), was collected in the lower rio Pardo basin within the domain of the Atlantic Forest. The other species has conspicuous secondary sexual dimorphic characters (e.g., mature males with longer and more pointed pelvic fins than females reaching the anal-fin origin and bony hooks on the pelvic fins) and was collected in tributaries of the upper rio Paraguaçu basin, on the west side of the Chapada Diamantina National Park, within the domain of the Cerrado-Caatinga ecotone.

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Material and Methods

Measurements and counts were performed according to the methods of Buckup (1993b). Measurements were taken with a digital caliper to the nearest 0.1 mm and expressed as percent of standard length (SL) for body parts and head length (HL) for parts of head. Frequencies are recorded (in parentheses), after the respective characteristic, and an asterisk indicates values for the holotype. Observations on vertebrae, ectopterygoid teeth, branchiostegal rays, procurrent caudal-fin rays, epural bones, and other osteologic observations were made only from cleared and stained (c&s) paratypes prepared according to the method of Taylor & Van Dyke (1985). The sex of some specimens was confirmed by dissection. The pseudotympanum morphology was assessed by removal of the overlying skin, adipose tissue, and lateral-line nerve of alcohol-preserved specimens. Color in life was described on the basis of photographs of live specimens taken in the field. Specimens examined belong to the following institutions: Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo; Museu Nacional da Universidade Federal do Rio de Janeiro (MNRJ), Rio de Janeiro; Museu de Zoologia da Universidade Federal da Bahia UFBA, Salvador.

Results

Characidium kamakan, new species

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Fig. 1

Holotype. MZUSP 115000, 51.9 mm SL, Brazil, Bahia, Camacan, rio Panelão on the road between Camacan and Jacareci, rio Pardo basin, 15°25'16"S 39°31'48"W, 162 m above sea level, 15 Sep 2013, A. M. Zanata, T. Ramos, L. Oliveira & T. Duarte.

Paratypes. All from Brazil, Bahia, rio Pardo basin. UFBA 7563, 5, 38.7-46.2 mm SL, collected with holotype. MNRJ 42132, 6, 39.8-47.2 mm SL, MZUSP 115008, 6, 34.7-53.7 mm SL, UFBA 5679, 14, 1 c&s, 29.6-55.3 mm SL, same locality as holotype, 4 Nov 2009, A. M. Zanata, P. Camelier & R. Burger; MZUSP 112697, 3, 42.6-52.6 mm SL, same locality as holotype, 11 Ago 2012, O. T. Oyakawa, A. M. Zanata, P. Camelier & T. F. Teixeira. UFBA 6531, 7, 32.6-54.3 mm SL, Camacan, rio Panelão, near the entrance to the Reserva Particular de Patrimônio Natural Serra Bonita, 15°22'46.1"S 39°32'34.5"W, 184 m above sea level, 2 Nov 2009, A. M. Zanata, P. Camelier & R. Burger. UFBA 7565, 1, 47.1 mm SL, same locality as UFBA 6531, 16 Sep 2013, A. M. Zanata, T. Ramos, L. Oliveira & T. Duarte. UFBA 7564, 11, 35.1-53.1 mm SL, Pau Brasil, rio Água Preta, 1 km from Pau Brasil, 15°25'51.1"S 39°39'34.4"W, 173 m above sea level, 16 Sep 2013, A. M. Zanata, T. Ramos, L. Oliveira & T. Duarte.

Diagnosis. *Characidium kamakan* can be readily distinguished from all congeners by its unique color pattern, with distinct black borders of scales forming short vertical traces on body. The new species is further distinguished from other congeners, except *C. alipioi* Travassos, *C. boavistae* Steindachner, *C. crandellii* Steindachner, *C. declivirostre* Steindachner, *C. gomesi* Travassos, *C. grajahuensis* Travassos, *C. japyhybense* Travassos, *C. lauroi* Travassos, *C. macrolepidotum* (Peters), *C. oiticicai* Travassos, *C. pterostictum* Gomes, *C. schubarti* Travassos, *C. timbuiense* Travassos, *C. vidali* Travassos, and members of the *C. fasciatum* Reinhardt clade, by lacking scales on isthmus. *Characidium kamakan* further differs from these congeners by the absence of conspicuous vertically elongated bars or blotches on body (vs. presence in *C. alipioi*, *C. declivirostre*, *C. fasciatum*, *C. gomesi*, *C. grajahuensis*, *C. lauroi*, *C. oiticicai*, *C. timbuiense*, and *C. vidali*), presence of a conspicuous black blotch at midlength of caudal-fin rays shaped like a 3 and unpigmented rounded



Fig. 1. *Characidium kamakan*, holotype, MZUSP 115000, 51.9 mm SL, Brazil, Bahia, Camacan, rio Panelão, tributary of lower rio Pardo basin.

areas close to the base of the lobes (*vs.* two or more dark bars on caudal fin and/or absence of rounded clear areas at the base of caudal-fin lobes in *C. gomesi*, *C. grajahuensis*, *C. japuhybense*, *C. lauroi*, *C. oiticicai*, *C. pterostictum*, *C. schubarti*, and *C. timbuiense*), having only the anteriormost portion of isthmus naked (*vs.* naked area broader, from isthmus to the vertical through contralateral bases of last pectoral-fin ray in *C. macrolepidotum*; from isthmus to median area of belly in *C. crandellii* and *C. declivirostre*), and presence of small foramen for the ophthalmic nerve bordered by a well-developed bony crest (*vs.* exceptionally large pterosphenoid foramen for the ophthalmic nerve, not usually bordered by bony crests in *C. boavistae*). More specifically, from congeners known to occur in rivers draining northeastern Brazil, *C. kamakan* further differs by having all fins with conspicuous dark bars or blotches (*vs.* absence of blotches on fins, except by an inconspicuous dark bar crossing dorsal-fin midlength of *C. bahiense*, *C. deludens* new species, and *C. samurai*, or a well-marked dark bar at base of dorsal-fin rays and a second faded bar at distal portion of fin in *C. bimaculatum*).

Description. Morphometric data for holotype and paratypes presented in Table 1. Body fusiform and moderately compressed. Greatest body depth at vertical through dorsal-fin origin. Dorsal profile convex from upper lip to vertical through nares, slightly convex from this point to end of occipital process, slightly convex or straight from this point to dorsal-fin base origin, slightly convex or straight along dorsal-fin base, straight between end of dorsal-fin base and adipose fin, and slightly concave from this point to origin of anteriormost dorsal procurrent caudal-fin ray. Ventral profile straight along length of head, slightly convex from isthmus to pelvic-fin origin, straight from latter point to origin of anal fin, and slightly concave from this point to origin of anteriormost ventral procurrent caudal-fin ray. Snout triangular-shaped from lateral view. Mouth subterminal, aligned with or slightly lower than ventral edge of orbit. Distal tip of maxilla barely reaching anterior margin of orbit. Orbit rounded, approximately with same length as snout. Cheek thin, its depth about a third of orbit diameter. Nares separated, both with skin flaps and raised margins; posterior naris closer to eye than to anterior naris. Supraorbital somewhat drop-shaped in dorsal view, medial margin convex abutting frontal and lateral margin straight to slightly concave, anterior portion directed away from frontal bone, somewhat wider than posterior portion. Parietal fontanel limited anteriorly by parietals. Parietal branch of supraorbital canal present, not trespassing frontal-parietal border. Orbitosphenoid slightly rectangular in lateral view, connected anteriorly to rhinosphenoid. Pterosphenoid foramen for ophthalmic nerve relatively small, formed by a tunnel crossing diagonally pterosphenoid and bordered by bony crest preventing direct lateral view of brain cavity through foramen.

Table 1. Morphometric data of holotype and paratypes of *Characidium kamakan* (n = 36). The range includes the holotype. SD = standard deviation.

	Holotype	Range	Mean	SD
Total length (mm)	62.5	38.1-66.0	-	-
Standard length (mm)	51.9	29.6-55.3	-	-
Percents of standard length				
Depth at dorsal-fin origin	22.9	19.5-25.1	21.7	1.4
Depth at anal-fin origin	16.8	15.2-19.6	17.3	0.8
Caudal-peduncle depth	12.5	11.3-13.8	12.5	0.5
Caudal-peduncle length	19.1	16.3-19.9	18.3	0.8
Snout to dorsal-fin origin	44.9	44.1-49.7	46.6	1.3
Snout to pectoral-fin origin	22.2	19.3-25.9	23.4	1.4
Snout to pelvic-fin origin	51.6	47.7-53.7	50.7	1.2
Snout to anal-fin origin	77.8	74.8-79.8	77.6	1.1
Anal-apex distance	95.4	91.9-99.0	95.3	1.6
Body width	14.6	11.3-14.6	12.8	0.9
Head length	23.1	21.9-27.4	24.5	1.0
Percents of head length				
Horizontal eye diameter	25.8	24.2-30.9	27.4	1.3
Snout length	27.5	24.0-28.9	26.2	1.2
Snout to maxillary tip	28.3	20.0-29.8	27.0	1.7
Anterior naris to orbit	8.3	8.1-12.5	10.2	1.0
Posterior naris to orbit	5.0	3.6-6.3	5.0	0.7
Cheek depth	12.5	8.6-13.4	10.5	1.1
Least interorbital width	18.3	16.0-21.2	18.3	1.2

Dentary teeth in two rows; outer series with 7(9), 8*(12), 9(8), or 10(4) teeth; anterior teeth tricuspid, posterior conical; teeth decreasing in size from symphysis; inner series, with several minute conical teeth inserted on edge of replacement tooth trench. Premaxilla with single series of 5(2), 6*(19), or 7(14) tricuspid teeth, decreasing in size from symphysis; lateral cusps very small, central somewhat elongate. Maxillary edentulous. Ectopterygoid teeth 20(1), conical, in a patch of two or three somewhat disorganized series. Mesopterygoid teeth absent.

Scales cycloid; *circulii* absent on posterior field of scales located immediately below 10th scale of lateral line, 17 to 20 *radii* present. Lateral line complete, pored scales 33(5), 34*(27), or 35(3); horizontal rows of scales above lateral line 3*(32) or 4(3); horizontal rows of scales below lateral line 3*(14) or 4(20). Scales along middorsal line between supraoccipital and origin of dorsal fin 9*(15), 10(11), or 11(1) in single row or irregularly arranged (6). Scales rows around caudal peduncle 12(7), 13(11), or 14*(16); some specimens with scale rows somewhat irregularly arranged. Axillary scale absent. Isthmus naked on its anterior portion; naked portion not reaching pectoral-fin area. Pseudotympanum present, represented by muscular hiatus at vertical through anterior portion of swim bladder; most of hiatus situated between ribs of fifth and sixth vertebrae, but with small opening anterior to rib of 5th vertebra (Fig. 2a).

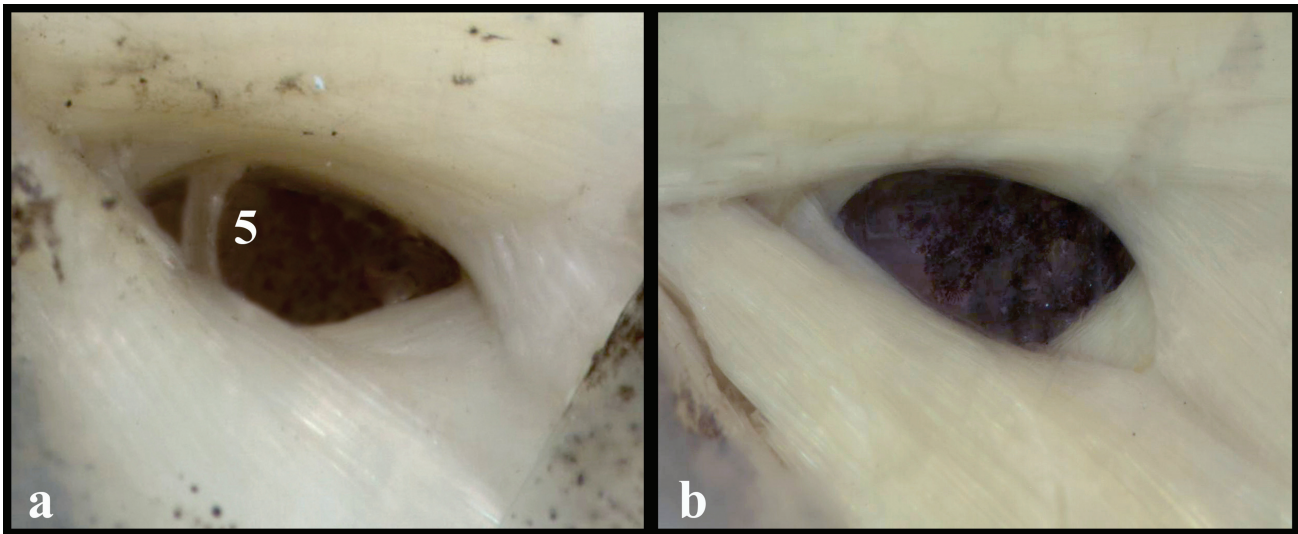


Fig. 2. Pseudotympanum of (a) *Characidium kamakan*, paratype, UFBA 5679, 45.7 mm SL, and (b) *C. deludens*, paratype, UFBA 3850, 41.9 mm SL. Number corresponds to the pleural rib of the 5th vertebra. Left side, anterior to left. Overlying skin, adipose tissue, and lateral-line nerve removed.

Dorsal-fin rays ii,9*(36); distal margin of dorsal fin somewhat rounded. Adipose fin present. Pectoral-fin rays highly variable iii,7,ii(2), iii,8,i(24), iii,8,ii(5), iii,9(7), iii,9,i(8), iii,10*(2), iv,8,i(2), iv,9,i(1), or v,8,i(1), with 3rd and 4th branched pectoral-fin rays longest; posterior tip of pectoral fin usually reaching pelvic-fin insertion. Pelvic-fin rays ii,5,i(1), i,6,i(1), ii,6,i(2), i,7,i(26), ii,7*(4), or i,8(2), with 3rd or 4th branched pelvic-fin rays longest; posterior tip of pelvic fin not reaching anal-fin origin. Anal-fin rays ii,5(2) or ii,6*(34); posterior margin of anal fin straight, slightly rounded, or somewhat pointed in some mature males. Caudal-fin rays i,9,8,i*(30). Dorsal procurrent caudal-fin rays 7(1); ventral procurrent caudal-fin rays 6(1).

Total number of vertebrae 34(1); precaudal vertebrae 16(1); caudal vertebrae 18(1). Supraneural bones 5(1), 1 anterior to neural spine of 5th centrum. Epural bones 2(1). Uroneural bones 1(1). Branchiostegal rays 4(1); 3 connected to anterior ceratohyal, 1 connected to area between anterior and posterior ceratohyal.

Color in alcohol. Ground color of head and body whitish to pale yellow (Fig. 1). Dark stripe from snout tip to anterior margin of orbit. Dark blotch posterior to orbit usually separated from it by narrow clear area; some specimens with blotch forming stripe aligned with that of snout, although somewhat broader. Opercle dark, mainly in its dorsal half. Dark irregular blotches on head dorsum. Area around nares somewhat clear. Ventral half of head clear, with sparse small melanophores. Scales with melanophores densely concentrated along posterior margin, forming short vertical black traces; some specimens with dark borders of scales aligned, forming traces somewhat longer; few scales on lateral surface of body without concentration of melanophores, resulting in small clear areas. Dark midlateral stripe inconspicuous,

formed by underlying dark pigment, extending from rear of head to caudal peduncle. Dark humeral blotch on rear of opercle usually inconspicuous, merged with longitudinal band. Nine or 10 inconspicuous dark vertical bars formed by underlying pigment on lateral surface of body, usually more visible on area over longitudinal stripe; some specimens without vertical bars. Ventral portion of body yellowish; area anterior to pelvic fins usually without concentration of melanophores on scale margins, area posterior to pelvic fins with borders of scales dark. All fins with dark pigmentation pattern. Dorsal-fin base with a dark bar formed by melanophores over rays and interradiar membranes, broader anteriorly; second dark bar around midlength of rays, usually broad anteriorly over two or three branched rays, divided into two bands posteriorly; or, in some specimens, continuous throughout fin, without division; distal borders of rays usually dark. Caudal fin with conspicuous 3-shaped black blotch covering basal portion of four or five median caudal-fin rays black and midlength of lobes; area of lobes anterior to blotch completely clear; distal margins of caudal-fin rays somewhat dark. Some specimens with 3-shaped blotch somewhat inconspicuous due to extra short dark traces on posterior half of fin. Pectoral fin with concentration of melanophores at dorsal portion of rays, usually more evident on distal half. Pelvic fin with dark bar over midlength of rays. Anal fin with similar dark bar, primarily at midlength of rays. Central portion or posterior half of adipose fin usually darkly colored.

Color in life. Dark pattern on scales and fins similar to that of specimens in alcohol. Ground color of body and fins yellow or orange; dorsal and caudal-fins strongly pigmented, particularly with yellow marks at base of caudal-fin lobes. Lateral of head silvery.

Sexual dimorphism. No hooks were observed on fins of the specimens examined. Mature males (around 50.0 mm SL) have the 3rd and 4th branched pelvic-fin rays somewhat longer than in females of similar standard length, reaching closer to anal-fin origin when adpressed. Furthermore, in some mature males the posterior border of the anal fin is somewhat more pointed due to the elongation of some branched rays (especially the 2nd), while in females the branched anal-fin rays usually have similar lengths and straight or rounded fin border. However, a more detailed analysis of a greater number of mature specimens is necessary for a precise evaluation of the dimorphic features described above.

Distribution. *Characidium kamakan* was sampled in the rio Água Preta and rio Panelão, tributaries of the lower portion of rio Pardo basin, Bahia State, Brazil (Fig. 3).

Habitat and ecological notes. The rio Pardo is an eastern coastal drainage with its upper and part of middle portions located in the state of Minas Gerais and its lower portion in the state of Bahia, within the domain of the Atlantic Forest. The new species occurs in the latter area and was captured in stretches of the rio Água Preta and rio Panelão (Fig. 4), at altitudes ranging from 162-184 m above sea level, with moderate to rapid water current, running over rock, pebbles and sand bottoms, 0.3-1.5 m deep, with rapids, pools, and meanders. Locally, the riparian vegetation has shrubs, trees,

and grass. The surrounding original Atlantic Forest had been converted to cocoa plantations and more recently to cattle ranches, coffee, and rubber crops. *Characidium kamakan* inhabits places with fast water current over substrate composed of medium to somewhat large sized stones. The analysis of stomach contents of two specimens revealed the presence of allochthonous and autochthonous items, composed by fragments of vascular plants, organic debris, insect larvae (Diptera: Chironomidae and other unidentified orders), and fragments of unidentified arthropods.

Etymology. Named after the Kamakã indigenous people that originally inhabited the area. A noun in apposition.

Conservation status. *Characidium kamakan* is so far known from localities in the lower rio Pardo basin, with a relatively restricted distribution. The species occurs in rapid water stretches within domain originally covered by the Atlantic Forest, posteriorly converted to cocoa plantations and more recently to cattle ranches, coffee, and rubber crops. However, since no imminent threats to the species were detected *C. kamakan* could be classified as east Concern (LC) according to the International Union for Conservation of Nature (IUCN) categories and criteria (IUCN Standards and Petitions Subcommittee, 2014). Additional collecting efforts should be conducted in that region in order to better understand biological aspects and distribution of the species.

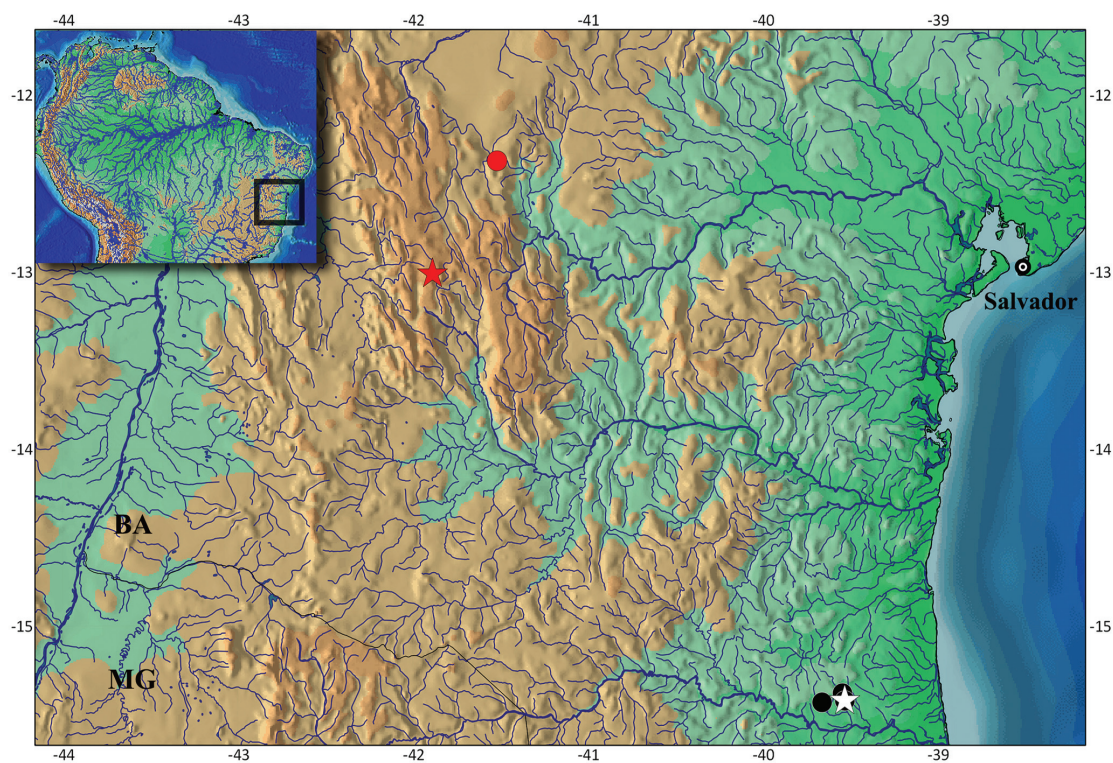


Fig. 3. Map of distribution of *Characidium kamakan* (black and white symbols) and *C. deludens* (red symbols) in middle and lower rio Pardo basin and upper rio Paraguaçu basin, respectively, Bahia State, northeastern Brazil; type localities indicated by stars.



Fig. 4. Type locality of *Characidium kamakan*, Bahia, Camacan, rio Panelão, lower rio Pardo basin.

Characidium deludens, new species

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Fig. 5

Holotype. MZUSP 115009, 48.3 mm SL, Brazil, Bahia, Piatã, rio Cochó, tributary of the upper rio Paraguaçu, 13°00'37"S 41°53'14"W, 1,231 m above sea level, 15 Sep 2007, A. M. Zanata, P. Camelier & A. B. A. Góes.

Paratypes. MNRJ 42133, 8, 27.3–45.1 mm SL, MZUSP 115010, 9, 26.6–40.8 mm SL, UFBA 3850, 22, 1 c&s, 27.0–47.8 mm SL, collected with holotype. UFBA 7720, 14, 34.7–39.1 mm SL, same locality as holotype, 1 Dec 2013, A. T. da Silva, S. B. Barreto & L. Argôlo. UFBA 7815, 4, 35.0–44.7 mm SL, Brazil, Bahia, Palmeiras, rio Santo Antônio, tributary of the upper rio Paraguaçu, 12°22'17.3"S 41°31'05"W, 641 m above sea level, 28 Jan 2014, A. M. Zanata, R. Burger, L. Sales & R. Abreu.

Diagnosis. *Characidium deludens* can be distinguished from congeners by having dark blotches irregular in form along dorsum, alternating elongation to one or other side of body and usually not connected to lateral blotches. The new species further differs from congeners that occur in Brazilian rivers by having isthmus completely covered by scales (vs. naked isthmus or partially covered by scales in *C. alipioi*, *C. boavistae*, *C. crandellii*, *C. declivirostre*, *C. fasciatum*, *C. gomesi*, *C. grajahuensis*, *C. japyhybense*, *C. kamakan* new species, *C. lauroi*, *C. macrolepidotum*, *C. oiticicaí*, *C. pterostictum*, *C. schubarti*, *C. timbuiense*, and *C. vidali*), lateral line complete (vs. incomplete in *C. bahiense*, *C. interruptum* Pellegrin, *C. laterale* (Boulenger), *C. mirim* Netto-Ferreira, Birindelli & Buckup, *C. nupelia* da Graça, Pavanelli & Buckup, *C. rachovii* Regan, *C. stigmosum* Melo & Buckup, and *C. xavante* da Graça, Pavanelli & Buckup), 14 scales around caudal peduncle (vs. 10 or 12 in *C. bahiense*, *C. brevirostre* Pellegrin, *C. gomesi* Travassos, *C. heirmostigmata* da Graça & Pavanelli, *C.*

lagosantense Travassos, *C. litorale* Leitão & Buckup, *C. macrolepidotum* (Peters), *C. mirim*, *C. nupelia*, *C. occidentale* Buckup & Reis, *C. orientale* Buckup & Reis, *C. papachibe* Peixoto & Wosiacki, *C. rachovii*, *C. serrano* Buckup & Reis, *C. tenue* (Cope), *C. xanthopterygium* Silveira, Langeani, da Graça, Pavanelli & Buckup, *C. xavante*, and *C. zebra* Eigenmann), and presence of adipose fin (vs. absent in *C. mirim*, *C. nupelia*, *C. stigmosum*, *C. xavante*, and absent or reduced in *C. vestigipinne*). *Characidium deludens* differs further from *C. satoi* Melo & Oyakawa, by having one or two scales between anus and origin of anal fin (vs. 4–7 scales), area between pelvic and anal-fin origin straight (vs. area moderate to strongly convex), and absence of sexually dimorphic coloration (vs. presence). More specifically, from congeners known to occur in rivers draining northeastern Brazil and adjacent drainages to south of Bahia, *C. deludens* further differs from *C. bahiense* by the presence of parietal branch of supraorbital canal (vs. absence); from *C. bimaculatum* by having a higher number of lateral line scales (35–37 vs. 32–34), one faded dark bar on proximal half of dorsal-fin rays (vs. a well-marked dark bar at proximal portion of rays and a second faded bar on distal portion); from *C. fasciatum* by having one series of dentary teeth (vs. two). In addition to distinctive color pattern, *C. deludens* can be further distinguished from *C. kamakan* by having 5 series of scales between lateral line and insertion of pelvic fin (vs. 3 or 4); from *C. samurai* by the presence of dark marks on ventral half of body and the presence of a narrow dark stripe on lateral of body (vs. ventral half of body without dark marks and presence of a broad dark stripe on lateral of the body), dentary with one series of 6–10 teeth (vs. dentary with two series of teeth, outer series with 10–13 teeth), and premaxilla with 5–7 teeth (vs. 7–10); and from *C. timbuiense* by having one faded dark bar on proximal half of dorsal-fin rays (vs. two dark bars crossing dorsal fin).

Description. Morphometric data of holotype and paratypes presented in Table 2. Body fusiform and moderately compressed. Greatest body depth at vertical through dorsal-fin origin. Dorsal profile convex from upper lip to vertical through nares, slightly convex to nearly straight from this point to end of occipital process, slightly convex from this point to origin of dorsal-fin base, convex along dorsal-fin base, almost straight between end of dorsal-fin base and adipose fin and slightly concave from this point to origin of anteriormost dorsal procurrent caudal-fin ray. Ventral profile straight to slightly convex along length of head, slightly convex from isthmus to origin of pelvic-fin origin, straight from latter point to origin of anal-fin, and slightly concave from this point to origin of anteriormost ventral procurrent caudal-fin ray. Snout triangular-shaped from lateral view. Mouth subterminal, aligned with or slightly lower than ventral edge of orbit. Distal tip of maxilla barely reaching anterior margin of orbit. Orbit approximately rounded, horizontal length similar to or slightly longer than snout length. Cheek thin, its depth about a third to a quarter of

orbital diameter. Nares separated; anterior naris with raised margins; posterior naris considerably closer to orbit than to anterior naris, usually without skin flaps. Supraorbital elongated in dorsal view, medial margin abutting frontal, slightly convex on posterior half and concave on anterior; lateral slightly straight; anterior portion directed away from frontal bone, somewhat narrower than posterior portion. Parietal fontanel limited anteriorly by frontals. Parietal branch of supraorbital canal present, slightly exceeding frontal-parietal border. Orbithosfenoid slightly rectangular from lateral view, connected anteriorly to rhinosphenoid. Pterosphenoid foramen for ophthalmic nerve relatively small, formed by a tunnel crossing pterosphenoid diagonally, bordered by bony crest that prevents direct lateral view of brain cavity through foramen.

Dentary with a single series of 6(2), 7(13), 8*(12), 9(1), or 10(1) teeth; anterior three or four teeth from the symphysis usually tricuspid, posterior teeth triangular or conical; teeth decreasing in size from symphysis. Dentary teeth usually inclined anteriomedially; distal portion of symphyseal tooth overlapping its contralateral in some specimens. Premaxilla with a single series of 5(1), 6*(21), or 7(8) tricuspid teeth, decreasing in size from symphysis; smaller specimens with some conical teeth. Maxillary edentulous. Ectopterygoid teeth 12(1), conical, distributed in one or two series somewhat disorganized. Mesopterygoid teeth absent.

Scales cycloid; *circulii* absent on posterior field of scales located immediately below 10th scale of lateral line, 10 to 16 *radii* present. Lateral line complete, perforated scales 35(4), 36*(22), or 37(1); horizontal scale rows above lateral line 4*(30); horizontal scale rows below lateral line 5*(30). Scales along middorsal line between supraoccipital and origin of dorsal fin 10(11), 11*(13), or 12(3) in a single row. Scales rows around caudal peduncle 14*(30). Axillary scale absent. Isthmus completely covered by scales. Pseudotympanum present, represented by muscular hiatus at vertical through anterior portion of swimbladder; hiatus situated between ribs of 5th and 6th vertebrae (Fig. 2b).

Dorsal-fin rays ii,9*(30); distal margin of dorsal fin slightly rounded. Adipose fin present. Pectoral-fin rays highly variable iii,6,ii(2), iii,6,iii(6), iii,7,i*(1), iii,7,ii(5), iii,8,1(7), iii,8ii(1), iii,9,i(3), iv,7,i(1) or iv,8,i(1); 1st and 2nd branched pectoral-fin rays longest; posterior tip of pectoral fin not reaching pelvic-fin insertion. Pelvic-fin rays i,6,ii(3), i,7,i*(26), or i,7,ii(1); 2nd to 4th branched pelvic-fin rays longest; posterior tip of pelvic fin usually not reaching anal-fin origin. Anal-fin rays ii,6(1) or ii,7*(28); posterior margin of anal fin straight or slightly rounded. Caudal-fin rays i,9,8,i*(26). Dorsal procurrent caudal-fin rays 8(1); ventral procurrent caudal-fin rays 7(1).



Fig. 5. *Characidium deludens*, holotype, MZUSP 115009, 48.3 mm SL, female, Brazil, Bahia, Piatã, rio Cochó, tributary of upper rio Paraguaçu basin: (a) lateral and (b) dorsal views.

Total number of vertebrae 34(1); precaudal vertebrae 19(1); caudal vertebrae 15(1). Supraneural bones 6(1), one anterior to neural spine of 5th centrum. Epural bones 2(1). Uroneural bones 1(1). Branchiostegal rays 4(1); 3 connected to anterior ceratohyal, 1 connected to area between anterior and posterior ceratohyal.

Table 2. Morphometric data of holotype and paratypes of *Characidium deludens* (n = 30). The range includes the holotype. SD = standard deviation.

	Holotype	Range	Mean	SD
Total length (mm)	59.2	33.0-59.3	-	-
Standard length (mm)	48.3	26.6-48.3	-	-
Percents of standard length				
Depth at dorsal-fin origin	24.0	21.1-26.0	23.6	1.0
Depth at anal-fin origin	17.0	14.3-17.8	16.5	0.8
Caudal-peduncle depth	12.4	10.5-12.8	11.9	0.5
Caudal-peduncle length	19.7	17.1-20.8	18.8	0.8
Snout to dorsal-fin origin	48.9	47.0-51.5	49.3	1.1
Snout to pectoral-fin origin	22.4	22.4-26.4	24.4	1.1
Snout to pelvic-fin origin	51.1	50.4-55.2	52.5	1.1
Snout to anal-fin origin	76.0	74.4-77.9	75.8	0.9
Anal-apex distance	91.3	90.5-94.8	92.1	1.1
Body width	13.0	11.5-14.3	12.7	0.7
Head length	22.6	22.6-26.3	24.4	1.0
Percents of head length				
Horizontal eye diameter	23.9	23.9-28.8	26.1	1.5
Snout length	23.9	19.4-24.4	22.3	1.3
Snout to maxillary tip	24.8	19.4-25.2	22.8	1.2
Anterior naris to orbit	11.0	6.9-11.0	9.2	0.8
Posterior naris to orbit	3.7	2.6-5.3	3.4	0.6
Cheek depth	9.2	6.5-9.7	7.7	0.9
Least interorbital width	22.0	18.2-22.6	20.1	1.2

Color in alcohol. Ground color of head and body yellowish (Fig. 5). Dorsal half of head darker due to concentration of small melanophores. Majority of specimens with dark band from tip of the snout to anterior margin of orbit. Ventral half of head clearer, with sparsely distributed melanophores; fewer or no melanophores at isthmus, contrasting the dotted pattern around it. Scales on dorsal half of body with melanophores concentrated on exposed margin, resulting in a somewhat reticulated aspect; some of these scales darker overall, forming blotches that extend partially lateroventrally (Fig. 5b); blotches observed in dorsal view usually alternating elongation to one or the other side of body and not conforming continuous bars through the lateral of body. Vertically elongated dark blotches on lateral of body, usually not corresponding in number and position with middorsal blotches; usually 8 to 12, although variable; lateral blotches centered mainly over narrow dark longitudinal stripe that extends from rear of head to caudal peduncle, though some of them are positioned exclusively

ventral or dorsal to dark median stripe. Small and somewhat inconspicuous vertically elongated dark humeral blotch on rear of opercle. Body yellowish in ventral view, without dark bars or spots, except by a narrow dark band in the median area between pelvic and anal fins, formed by underlying pigment. Fins with sparsely-distributed melanophores on border of rays and between ray segments. Fins without blotches, except by a faded dark band that may occurs below midlength of dorsal-fin rays. Small rounded black spot near base of middle caudal-fin rays. Adipose fin somewhat dark, with sparse melanophores.

Color in life. Pattern of coloration similar to that of specimens in alcohol, except for a well-defined yellow background.

Sexual dimorphism. Small bony hooks on pelvic fins were observed in 18 mature males of *Characidium deludens*, around 34.0 mm SL or larger (Fig. 6a). Well-developed hooks are distributed usually over distal half of 2nd to 4th branched rays but four specimens have also hooks on 1st branched ray. In large mature males hooks are more numerous on 3rd and 4th rays, with around 20 hooks dorsally directed; 1st and 2nd with a few similar hooks. Hooks on maturing males occur in lower number and are distributed solely on distal 3rd of pelvic rays. The mature females examined had no bony hooks on any of fins. Along with the presence of hooks, mature males have 3rd to 5th branched pelvic-fin rays somewhat more elongate than in females, reaching or almost reaching anal-fin origin when adpressed (Fig. 6a). Females of similar size possess a more rounded pelvic-fin border, distant from anal-fin origin when adpressed (Fig. 6b).



Fig. 6. Pelvic and anal fins of *Characidium deludens*, paratypes, UFBA 3850: (a) male, 35.3 mm SL, and (b) female, 36.1 mm SL.

Distribution. *Characidium deludens* is known from the rio Cochó and rio Santo Antônio, tributaries of upper rio Paraguaçu basin, Bahia State, Brazil (Fig. 3).

Habitat and ecological notes. The rio Cochó has part of its headwaters in Piatã, around 1,200 m above sea level, and runs on the eastern slopes of the Serra do Sincorá, on the west side of the Chapada Diamantina National Park. Included in the Cerrado-Caatinga ecotone, the area of the rio Cochó is dominated by Cerrado vegetation, usually composed of scattered small trees, shrubs and grasses. The stretch of the rio Cochó sampled is 5-10 m wide, up to one m deep, characterized by relatively slow water current and clear water running over portions of rocky bed alternating with sandy substrate (Fig. 7). The river is perennial in Piatã, but may become intermittent in several sections downstream, suffering considerable impact along its course due to frequent burning cycles of native vegetation, impoundment of the river associated with irrigation, and use of pesticides for coffee, sugar cane and fruit farming (Rocha, 2002). The stretch sampled in the rio Santo Antônio is around 7 m wide, a few centimeters to 1.5 m deep, surrounded by trees and shrubs, and with clear water running on sandy bottom with rocks and pebbles. The analysis of stomach contents of two specimens of *C. deludens* revealed the presence of allochthonous and autochthonous items, composed by fragments of vascular plants, organic debris, insect aquatic larvae and shelters (Trichoptera: Hydroptilidae), Crustacea, and fragments of unidentified arthropods.



Fig. 7. Type locality of *Characidium deludens*, Bahia, Piatã, rio Cochó, upper rio Paraguaçu basin.

Etymology. From the Latin *delude*, which means false, deceive, alluding to the deceitful vertical bars on body, in comparison to those common in congeners as *Characidium fasciatum*.

Conservation status. *Characidium deludens* is so far known only from two localities on the upper rio Paraguaçu basin, one of them represented by a small intermittent river, suffering considerable impact along its course due to frequent burning cycles of native vegetation, impoundment of the river associated with irrigation, and use of pesticides for coffee, sugar cane, and fruit farming. However, given the absence of studies on population biology and on geographical range reductions for the species, we are unable to assess the effect of these putative threats on the conservation of *C. deludens* and on the maintenance of its populations. Thus, *C. deludens* could be classified as data deficient (DD) according to the International Union for Conservation of Nature (IUCN) categories and criteria (IUCN Standards and Petitions Subcommittee, 2014). Additional collecting efforts should be conducted in that region in order to better understand biological aspects and distribution of the species.

Discussion

Characidium kamakan shares the potential synapomorphies proposed by Buckup (1993a) to Clade C1: poscleithrum 1 reduced or absent (absent in the species), a scaleless area on the isthmus, and reduction of the fontanel with exclusion of the frontals from its anterior margin. According to the author, within Clade C1, the Clade C2 (composed by *C. boavistae*, *C. bolivianum* Pearson, *C. fasciatum*, *C. gomesi*, and *C. purpuratum* Steindachner) is diagnosed by having an exceptionally large foramen on the pterosphenoid for the ophthalmic nerve usually not bordered by bony crests and a second vertebral centrum with a pair of ventral processes, extending anteroventrally along the connective tissue surrounding the dorsal aorta and the anterior wall of the swimbladder. *Characidium kamakan* has the processes of the second vertebral centrum similar to the condition described for members of Clade C2 but does not share the large pterosphenoid foramen. Instead, the foramen for the ophthalmic nerve in *C. kamakan* is relatively small and bordered by a well-developed bony crest. The diagnostic features proposed by Buckup (1993a) for the second subgroup of C1, named Clade C3 (composed by *C. crandellii* and *C. declivirostre* and diagnosed by having scaleless area of isthmus extending onto the ventral body surface located posterior to the pectoral girdle, branchiostegal membranes united across the isthmus, independent dermal flaps surrounding the anterior and posterior naris but touching each other distally, and the posterior process of the coracoid reduced to a squarish protuberance), are not observed in *C. kamakan*. The basicaudal spot, whose absence was attributed by the

author as diagnostic to Clade C3, is also not evident in *C. kamakan*, being possibly overlapped by the black blotch on the anterior portion of median caudal-fin rays. Buckup & Reis (1997) suggested that *C. alipioi*, *C. japuhybense*, *C. pterostictum*, and *C. timbuiense* could be provisionally assigned also to Clade C1, based on the shared absence of scales at the isthmus. Of these four species, *C. timbuiense* was examined herein in detail and along with the naked isthmus it shares the other two diagnostic features for Clade C1 (poscleithrum 1 reduced, reduction of the fontanel, and exclusion of the frontals from its anterior margin). However, *C. timbuiense* does not share any of the synapomorphies of Clade C2 or C3, and thus, differs from *C. kamakan* by the absence of a pair of ventral processes extending anteroventrally from the second vertebral centrum.

Apart from the putative groups cited in the literature, *C. kamakan* shares the presence of the dark blotch crossing the caudal fin and similar overall body morphology with a series of species occurring along coastal Brazilian drainages, such as *C. alipioi*, *C. grajahuensis*, *C. japuhybense*, *C. lauroi*, *C. oiticicaei*, *C. pterostictum*, *C. timbuiense*, and *C. vidali*. In fact, these species share a naked isthmus, a streamlined body, and paired-fins modifications possibly related to the inhabitation of fast flowing streams (Buckup *et al.*, 2000). *Characidium kamakan* is also a fast water current dwelling fish and possess body features possibly related to that life style. Along with a streamlined body, *C. kamakan* possess the 4 or 5 first pectoral-fin rays and the 2 or 3 first pelvic-fin rays covered with thick skin and the distal portion of the 4 first pectoral-fin rays protruded beyond the margin of the inter-radial membrane. Similar conditions were previously described for *C. cf. timbuiense* by Buckup *et al.* (2000: 275, fig. 3) as putative adaptations for waterfall climbing. Furthermore, examination of c&s specimen of *C. kamakan* revealed 4 or 5 anterior rays of the pectoral- and pelvic-fin thick rays and formed by shorter ray segments, when compared to posterior rays of these fins. Similar enlargement of anterior rays and different length among ray segments of the fin was also observed herein in *C. timbuiense*. A distinct condition, without enlargement pectoral- and pelvic-fin rays, was observed in the species of *Characidium* that inhabit more lentic environments, as *C. bahiense*, *C. bimaculatum*, and *C. samurai*. No waterfall climbing was observed so far for *C. kamakan* and the described adaptations possibly provide adherence, resistance, and strength to avoid being swept downstream in the fast flowing water where the species inhabits.

Characidium deludens, on the other hand, does not appear to fit in any group of *Characidium* previously proposed in the literature (*e.g.*, Buckup & Reis, 1997; Buckup & Hahn, 2000; Graça & Pavanelli, 2008; Netto-Ferreira *et al.*, 2013) and does not share any of the synapomorphies proposed by Buckup (1993a) for any particular group of the proposed Clade C. Although possessing a streamlined body, somewhat wide paired-fins and some of the adaptations observed in *C. kamakan* (*e.g.*, first rays protruded beyond the margin

of the inter-radial membrane and formed by shorter ray-segments), examined specimens of *C. deludens* do not have thick skin over the leading-edge pectoral and pelvic-fin rays or enlargement of these rays.

Patterns of sexual dimorphism in species of *Characidium* previously cited in the literature are a conspicuous black band along the distal margin of pelvic and anal fins in males, an enlarged anal fin with a rounded distal profile in adult males, brightly colored fins with orange or red chromatophores in live adult males (Buckup & Hahn, 2000 for *C. occidentale*, *C. orientale*, *C. rachovii*, and *C. vestigipinne*), a distinct color pattern of fins, conspicuously marked or dark in males (Melo & Buckup, 2002 for *C. stigmosum*; Graça *et al.*, 2008 for *C. nupelia* and *C. xavante*), hooks on the rays of pelvic and pectoral fins of mature males (Almeida, 1971 for *C. bahiense*; Graça *et al.*, 2008 for *C. nupelia* and *C. xavante*; Silveira *et al.*, 2008 for *C. xanthopterus*; Netto-Ferreira *et al.*, 2013 for *C. mirim*), and a less intensely colored dorsum coloration in mature males (Netto-Ferreira *et al.*, 2013 for *C. mirim*). Mature males of *C. deludens* have longer pelvic fins than females, reaching the anal-fin origin, and bony hooks on the pelvic fins (Fig. 6). The somewhat elongated and pointed pelvic fins observed for mature males of *C. deludens* is reported for the first time as a dimorphic feature for species of *Characidium*. Although some mature males of *C. kamakan* have elongation of pelvic-fin rays, not observed in mature females, a more detailed analysis of a greater number of mature specimens is necessary to confirm this putative dimorphic feature. Hooks were not observed in the species.

The presence of pseudotympanum in species of *Characidium* was cited in the description of a few species and in phylogenetic studies including few species of the genus (*e.g.*, Géry, 1977; Graça *et al.*, 2008; Silveira *et al.*, 2008; Peixoto & Wosiacki, 2013; Mirande, 2010). Recently, Zanata & Camelier (2014) provided a somewhat detailed description of the pseudotympanum of *C. bahiense*, *C. bimaculatum*, *C. samurai*, and *C. timbuiense*. The *pseudotympana* of *C. deludens* and *C. kamakan* are similar to the overall structure described previously for those four species. However, in these species the pseudotympanum has oval hiatus with anterior and posterior margins somewhat pointed (Fig. 2), instead of having the triangular overall form and more rounded apertures present in *C. bahiense* and *C. samurai* or the elongate form present in *C. timbuiense* (see Zanata & Camelier, 2014).

Comparative material examined. All listed specimens are alcohol-preserved (except when noted). *Characidium alipioi*: **rio Paraíba do Sul basin:** MNRJ 5550, holotype, 50.0 mm SL, Brazil, Rio de Janeiro. MNRJ 5551, 1 paratype, 51.0 mm SL, Brazil, Rio de Janeiro. MNRJ 5552, 1 paratype, 48.3 mm SL, Brazil, Rio de Janeiro. MNRJ 5553, 1 paratype, 45.0 mm SL, Brazil, Rio de Janeiro. MZUSP 112331, 6, 50.3-72.3 mm SL, Brazil, São Paulo. **Rio São João basin:** MZUSP 80224, 12, 36.5-61.9 mm SL, Brazil, Rio de Janeiro. *Characidium bahiense*: **Brazil:** MZUSP

8940, holotype, 16.0 mm SL, Bahia, Arembepe. MZUSP 8923, 1 paratype, 18.7 mm SL, Bahia, Arembepe. MZUSP 8924, 1 paratype, 21.5 mm SL, Bahia, Arembepe. **Rio Inhambupe basin:** UFBA 2882, 6, 18.4-24.0 mm SL, Brazil, Bahia. UFBA 2886, 4, 19.1-22.0 mm SL, Brazil, Bahia. **Rio Paraguaçu basin:** UFBA 4348, 18, 18.0-24.1 mm SL, Brazil, Bahia. **Rio Capivara basin:** UFBA 4685, 20, 17.2-22.2 mm SL, Brazil, Bahia. **Rio Itapicuru basin:** UFBA 7167, 23, 3 c&s, 21.1-26.0 mm SL, Brazil, Bahia. *Characidium bimaculatum:* **rio Curu basin:** MNRJ 21249, 14, 20.5-41.4 mm SL, Brazil, Ceará. MNRJ 4925, 1, 25.5 mm SL, Brazil, Ceará. **Rio Salgado basin:** MNRJ 4928, 1, 28.7 mm SL, Brazil, Ceará. MNRJ 4959, 1, 23.2 mm SL, Brazil, Ceará. MNRJ 4964, 1, 28.8 mm SL, Brazil, Ceará. **Rio Cotuí basin:** MNRJ 4975, 1, 29.4 mm SL, Brazil, Ceará. **Rio Acaraú basin:** MZUSP 1107779, 8, 29.4-24.3 mm SL, Brazil, Paraíba. **Rio Piranhas basin:** UFBA 3829, 6, 1 c&s, 22.5-30.8 mm SL, Brazil, Paraíba. *Characidium cf. declivirostre:* **rio Xingu basin:** MZUSP 97137, 1, 35.4 mm SL, Brazil, Pará. **Rio Jurueña basin:** MZUSP 82084, 2, 44.5-46.5 mm SL, Brazil, Mato Grosso. *Characidium fasciatum:* **rio São Francisco basin:** MZUSP 39676, 15, 32.7-36.4 mm SL, Brazil, Minas Gerais. **Rio Paraguaçu basin:** MZUSP 49261, 6, 22.2-35.0 mm SL, Brazil, Bahia. *Characidium gomesi:* **rio Paranaíba basin:** MZUSP 73193, 47, 25.8-32.0 mm SL, Brazil, Minas Gerais. **Rio Corumbataí basin:** MZUSP 88440, 3, 29.5-42.8 mm SL, Brazil, São Paulo. *Characidium grajahuensis:* MNRJ 3855, holotype, (snout damaged, precise measurement currently not possible), Brazil, Rio de Janeiro, Grajaú. *Characidium hasemani:* MZUSP 91785, 4, 44.0-58.0 mm SL, Brazil, Mato Grosso, rio Xingu basin. *Characidium heirmostigmata:* MZUSP 97738, holotype, 34.6 mm SL, Brazil, Paraná, rio Paraná basin. *Characidium interruptum:* MZUSP 58992, 1, 30.9 mm SL, Brazil, Rio de Janeiro, rio São João basin. *Characidium japuhybense:* MNRJ 5194, holotype, (snout damaged, precise measurement currently not possible), Brazil, Rio de Janeiro, Angra dos Reis. *Characidium lagosantense:* **rio São Francisco basin:** MNRJ 3852, holotype, (snout damaged, precise measurement currently not possible), Brazil, Minas Gerais. MNRJ 18108, 71, 11.2-31.2 mm SL, Brazil, Minas Gerais. *Characidium lanei:* **rio Ribeira do Iguape basin:** MNRJ 6185, holotype, 40.8 mm SL, Brazil, São Paulo. MNRJ 9766, 1 paratype, 36.2 mm SL, Brazil, São Paulo. MZUSP 69585, 7, 25.2-31.0 mm SL, Brazil, São Paulo. **Rio Lajeado basin:** MNRJ 32884, 38, 20.9-36.4, Brazil, São Paulo. *Characidium laterale:* **rio Paraguai basin:** MZUSP 90204, 2, 20.6-25.1 mm SL, Brazil, Mato Grosso. MZUSP 96687, 80, 15.7-24.0 mm SL, Brazil, Mato Grosso. *Characidium lauroi:* **rio Paraíba do Sul basin:** MNRJ 5529, holotype, 60.4 mm SL, Brazil, Rio de Janeiro. MNRJ 5530, 1 paratype, 56.8 mm SL, Brazil, Rio de Janeiro. MZUSP 110359, 5, 31.1-45.9 mm SL, Brazil, São Paulo. *Characidium nupelia:* MZUSP 87743, holotype, 29.0 mm SL, Brazil, Mato Grosso, rio Paraguai basin. *Characidium oiticica:* **rio Tietê basin:** MNRJ 9480, holotype, 35.3 mm SL, Brazil, São Paulo. MZUSP 108640, 2, 37.4-38.1 mm SL, Brazil, São Paulo. *Characidium cf. pteroides:* MZUSP 85653, 81, 16.3-28.7 mm SL, Brazil, Amazonas, rio Negro basin. *Characidium pterostictum:* MZUSP 43547, 15, 28.7-37.8 mm SL, Brazil, Rio Grande do Sul, Mampituba system. *Characidium rachovii:* MZUSP 49163, 8, 25.9-34.2 mm SL, Brazil, Rio Grande

do Sul Laguna dos Patos drainage. *Characidium samurai:* **rio das Almas basin:** MNRJ 40727, 4 paratypes, 31.6-39.2 mm SL, Brazil, Bahia. MZUSP 108188, holotype, 46.6 mm SL, Brazil, Bahia. MZUSP 111239, 5 paratypes, 1 c&s, 1 mol, 28.1-42.6 mm SL, Brazil, Bahia. MZUSP 112385, 9 paratypes, 1 mol, 25.4-42.7 mm SL, Brazil, Bahia. UFBA 5726, 3 paratypes, 26.4-31.3 mm SL, Brazil, Bahia. UFBA 5971, 9 paratypes, 2 c&s, 29.3-40.9 mm SL, Brazil, Bahia. UFBA 7259, 7 paratypes, 20.8-42.6 mm SL, Brazil, Bahia. **Rio Vermelho basin:** UFBA 7258, 5 paratypes, 27.9-34.0 mm SL, Brazil, Bahia. *Characidium stigmosum:* MZUSP 40804, holotype, 33.5 mm SL, Brazil, Goiás, rio Tocantins basin. *Characidium tenue:* MZUSP 63803, 6, 31.0-42.2 mm SL, Brazil, Rio Grande do Sul, rio Jacuí basin. *Characidium timbuiense:* **rio Timbui basin:** MNRJ 4285, holotype, 51.8 mm SL, Brazil, Espírito Santo. MNRJ 4284, 1 paratype, 56.9 mm SL, Brazil, Espírito Santo. MNRJ 4292, 1 paratype, 53.1 mm SL, Brazil, Espírito Santo. MNRJ 4315, 1 paratype, 48.8 mm SL, Brazil, Espírito Santo. UFBA 6506, 6, 1 c&s, 27.9-44.0 mm SL, Brazil, Espírito Santo. *Characidium vidali:* MNRJ 9757, holotype, 47.8 mm SL, Brazil, Rio de Janeiro, rio Soberbo. *Characidium xavante:* MZUSP 87745, 20 paratypes, 13.9-22.7 mm SL, Brazil, Mato Grosso, rio Xingu basin. *Characidium cf. zebra:* **Brazil:** MZUSP 85091, 2, 52.0-57.8 mm SL, Amazonas, rio Negro basin. MZUSP 92910, 7, 26.5-29.0 mm SL, Amazonas, rio Negro basin. MZUSP 98203, 11, 26.5-31.4 mm SL, Mato Grosso, rio Xingu basin. **Peru:** MZUSP 77838, 2, 23.5-27.1 mm SL, Loreto, rio Pastaza basin. **Venezuela:** MZUSP 96477, 1, 35.0 mm SL, Bolivar, rio Orinoco basin. *Characidium sp.:* **rio Almada basin:** MZUSP 112736, 18, 26.3-48.8 mm SL, Brazil, Bahia. MZUSP 112738, 19, 28.1-53.9 mm SL, Brazil, Bahia. **Rio Jequiriça basin:** MNRJ 22424, 21, 27.8-42.3 mm SL, Brazil, Bahia. MNRJ 23756, 2, 22.2-25.6 mm SL, Brazil, Bahia. MNRJ 23758, 1, 30.1 mm SL, Brazil, Bahia. **Rio Paraguaçu basin:** MNRJ 23752, 3, 22.2-24.1 mm SL, Brazil, Bahia. MNRJ 23755, 1, 24.6 mm SL, Brazil, Bahia. MNRJ 23757, 2, 21.2-22.5 mm SL, Brazil, Bahia. MNRJ 23764, 1, 20.3 mm SL, Brazil, Bahia. MZUSP 100772, 11, 23.4-34.4 mm SL, Brazil, Bahia. **Rio Pardo basin:** MZUSP 112697, 3, 42.6-52.6, Brazil, Bahia.

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