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A new species of *Serrapinnus* Malabarba, 1998 (Characidae: Cheirodontinae) from Rio Grande do Norte State, northeastern Brazil

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Serrapinnus potiguar, new species, is described from the rio Ceará-Mirim, a coastal drainage in the Rio Grande do Norte State, northeastern Brazil. The new species is distinguished from the other species of the genus by the shape and arrangement of the ventral procurrent caudal-fin rays of the sexually dimorphic males; where the hypertrophied elements present the shape of a series of scimitars arranged radially, forming a semi-circle on the ventral margin of the caudal peduncle. Furthermore, the new species is diagnosed from *S. heterodon* and *S. piaba*, sympatric congeners from the northeastern Brazilian drainages, respectively by the presence of incomplete lateral line and teeth bearing at most five cusps.

Serrapinnus potiguar, espécie nova, é descrita para o rio Ceará-Mirim, uma drenagem costeira localizada no estado do Rio Grande do Norte, na região Nordeste do Brasil. A espécie nova distingue-se das demais espécies do gênero pela forma e arranjo dos raios procorrentes ventrais da nadadeira caudal nos machos sexualmente dimórficos; onde os elementos hipertrofiados possuem o formato de uma série de cimitarras arranjados radialmente na margem ventral do pedúnculo caudal, formando um semicírculo. Adicionalmente, a nova espécie diferencia-se de *S. heterodon* e *S. piaba*, congêneres simpátricos para as drenagens do Nordeste brasileiro, respectivamente pela presença de linha lateral incompleta e dentes com no máximo cinco cúspides.

Key words: Cheirodontini, Neotropics, Sexual Dimorphism, Taxonomy.

Introduction

The Neotropical freshwater genus *Serrapinnus* includes ten species distributed on the main Cis-Andean basins of South America (Malabarba, 2003; Zarske, 2012). The genus, erected to host a monophyletic assemblage of cheirodontines previously assigned to the genera *Cheirodon* Girard, *Odontostilbe* Cope, and *Holoshesthes* Eigenmann, was diagnosed by Malabarba (1998) along with the cladistic definition of the subfamily Cheirodontinae. In that work, *Serrapinnus*, a member of the tribe Cheirodontini, was supported by a series of synapomorphies related to the sexual dimorphism presented by mature males, such as the presence of a ventrally arched caudal peduncle and main axis of the ventral procurrent caudal-fin rays not supported by the parhypural, perpendicular to the longitudinal axis of the body, while the most anterior elements are anteriorly directed (Malabarba, 1998). Moreover, the species of the genus present a reduction of the number of pored scales on the lateral line, with a single exception found in *S. heterodon* (Eigenmann). A different hypothesis of relationship for the members of the Cheirodontinae was proposed by Mariguela *et al*. (2013) based on molecular inferences, where the monophyly of *Serrapinnus* and some major genera of the subfamily was questioned and not supported.

Two species of *Serrapinnus* commonly inhabit the northeastern coastal drainages of Brazil: *S. heterodon* and *S. piaba*. A third species presenting the morphological synapomorphies of the genus had been previously identified by LRM for the rio Ceará-Mirim in the Rio Grande do Norte State (Dias & Fialho, 2009), and it is herein described.

Material and Methods

Counts and measurements follow Fink & Weitzman (1974) except by the number of scale series below the lateral line, which was counted from the series just below the lateral line to the scale bordering anteriorly the pelvic-fin origin. Measurements

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were made with a caliper 0.01 mm precision under a microscope, and are presented as percentages of standard length (SL), or head length (HL) for subunits of the head. Teeth, tooth cusps, gill rakers, supraneurals, procurrent caudal-fin rays, and vertebrae were counted on specimens cleared and stained (c&s) according to Taylor & Van Dyke (1985) procedure. The four vertebrae of the Weberian apparatus and the terminal centrum were counted as a single element (Weitzman & Malabarba, 1999). On the description counts are followed by the number of occurrence in parentheses, and the value observed on the holotype is marked with asterisk. Images of jaws and teeth were taken on a Scanning Electron Microscope (SEM). Pictures of the ventral procurrent caudal-fin rays and anal fin were taken from cleared and stained specimens with a camera connected to a microscope. Nomenclature follows Weitzman (1962) and Zanata & Vari (2005) for bones. Museums abbreviations are: CAS - California Academy of Sciences, San Francisco, USA; FMNH - Field Museum of Natural History, Chicago, USA; MCP - Museu de Ciências e Tecnologia, Pontificia Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil; MZUSP - Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil; UFRGS - Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil. Measured and counted specimens are indicated between parentheses in the list of paratypes or comparative material.

Results

Serrapinnus potiguar, new species
Figs. 1-5

Serrapinnus sp. A. - Dias & Fialho, 2009: 242-248 [trophic category and feeding behavior].

Fig. 1. *Serrapinnus potiguar*, (**a**) holotype, male, MCP 48054, 26.6 mm SL, rio Ceará-Mirim, district of Umari, Taipu, Rio Grande do Norte, Brazil; (**b**) paratype, female, UFRGS 9226, 29.7 mm SL, same data as holotype.

Holotype. MCP 48054, 26.6 mm SL, male, Brazil, Rio Grande do Norte, Taipu, rio Ceará-Mirim, district of Umari, 05°37'47''S 35°37'09''W, 15 Oct 2000, H. Gurgel.

Paratypes. All from Rio Grande do Norte State, Brazil: MCP 34076, 5, 25.8-27.8 mm SL, Taipu, district of Umari, rio Ceará-Mirim, 5°37'47''S, 35°37'9''W, 24 Jul 2001, L. R. Malabarba & H. Gurgel. MCP 43320, 9, 17.5-29.5 mm SL, same as holotype. UFRGS 9216, 13, 22.6-29.5 mm SL (5, 25.6-29.1 mm SL), rio Ceará-Mirim, 5°37'46.9''S 35°37'9.1''W, 23 Feb 2002. UFRGS 9219, 27, 18.5-28.4 mm SL + 10 c&s 25.6-29.1 mm SL (5 measured, 26.2-28.7 mm SL), rio Ceará-Mirim, H. Rangel, Sep 2001. UFRGS 9226, 55, 22.4-32.3 mm SL (20, 26.5-32.3 mm SL), rio Ceará-Mirim, 5°37'46.9''S 35°37'9.1''W, H. Rangel, 27 Apr 2002, H. Rangel.

Diagnosis. *Serrapinnus potiguar* is distinguished from all congeners by the shape and arrangement of the ventral procurrent caudal-fin rays on mature males, where the hypertrophied elements are scimitar-shaped and arranged in a semi-circle through the ventral profile of the caudal peduncle (Fig. 2a) (*vs*. hypertrophied elements rod-shaped or pointed distally, arranged parallel to each other). Additionally *S. potiguar* can be diagnosed by the presence of 5 cusps in the premaxillary and dentary teeth (*vs.* 7 to 9 in *S. calliurus*, *S. micropterus*, and *S. piaba*, 9 to 11 in *S. sterbai*, and 10 to 12 in *S. gracilis* and *S. littoris*), terminal mouth (*vs*. slightly superior mouth in *S. microdon*), an incomplete lateral line (*vs.* complete lateral line in *S. heterodon*), dorsal fin mostly hyaline (*vs.* dorsal fin with an anterior and proximal dark blotch in *S. notomelas*), and absence of a black spot in the posteroventral region of the abdomen (*vs.* presence of a black spot in that region in *S. kriegi*).

Description. Morphometric data on Table 1. Body slightly short and compressed. Greatest body depth at vertical through dorsal-fin origin. Snout slightly rounded. Dorsal profile of head convex from snout to vertical through posterior border of nares, slightly convex from that point to distal tip of supraoccipital bone. Predorsal profile convex from posterior end of supraoccipital to dorsal-fin origin. Dorsal-fin origin located at vertical at midlength of standard length. Dorsal profile from last dorsal-fin ray to adipose-fin base slightly convex in females and strongly ventrally arched on preserved mature males. Caudal-peduncle dorsal profile slightly concave from adipose-fin origin to caudal-fin origin. Caudal-peduncle ventral profile straight to slightly concave in females, pronounced convex with exposed bony spines due to hypertrophy of ventral procurrent caudal-fin rays on males. Caudal peduncle slightly longer than deep. Ventral profile of head slightly convex from mouth to pelvic-fin origin; straight from that point to anal-fin origin in females and concave in mature males. Anal-fin base straight to slightly concave in females, convex anteriorly and deeply concave posteriorly on mature males. Head pointed on lateral view. Mouth terminal, at horizontal line through middle of pupil. Maxilla angled posteroventrally, posterior tip reaching vertical through anterior border of eye and surpassing ventrally the horizontal through ventral border of eye. Teeth pedunculated, distally expanded, with similar shape and cusp number. Four (1), 5(7), or 6(2) premaxillary teeth aligned in one single row, bearing 5 cusps. Midcentral cusp longer and wider than lateral ones. Three (3) or 4(7) maxillary teeth bearing 3 to 5 cusps. Six (8) to 7(2) large dentary teeth bearing 5 cusps, followed posteriorly by one smaller tooth with 3 to 4 cusps and one or two conical teeth. Central cusp larger than lateral cusps. All dentary tooth cusps slightly directed lingually (Fig. 3).

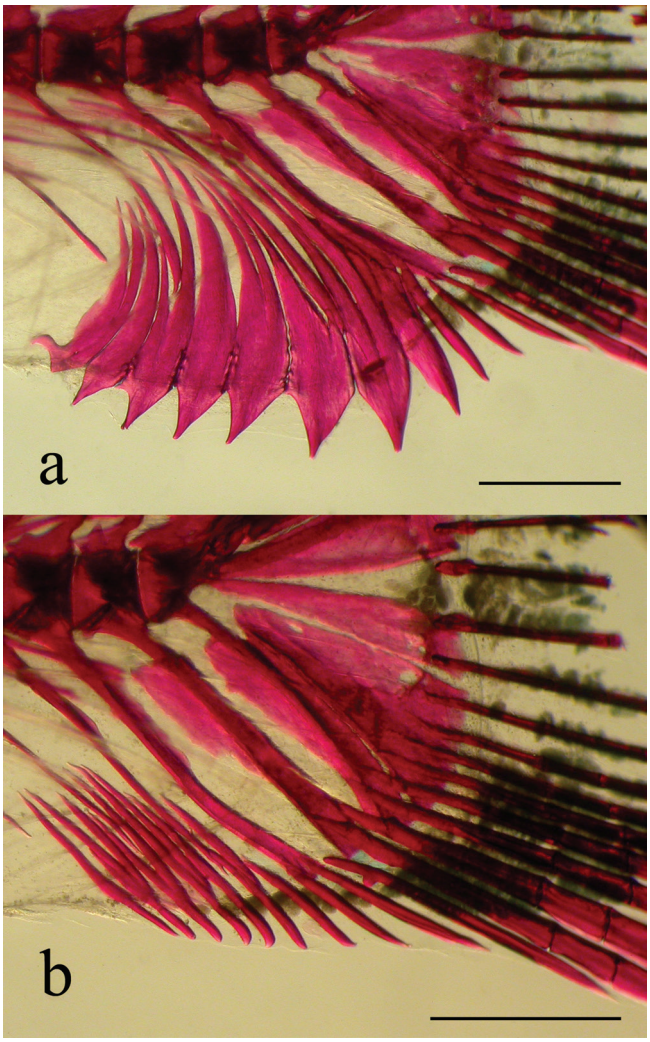

Fig. 2. Ventral procurrent caudal-fin rays of *Serrapinnus potiguar*: (**a**) paratype, male, UFRGS 9216, 27.4 mm SL; (**b**) paratype, female, UFRGS 9216, 27.6 mm SL. Lateral view, anterior to the left. Scale bars = 1 mm.

Dorsal-fin origin on midlength of standard length. Dorsal-fin rays ii,9*(31). First unbranched dorsal-fin ray about half length of second unbranched dorsal-fin ray, following branched rays

gradually decreasing in size posteriorly. Adipose-fin origin slightly posterior to vertical through base of last anal fin. Anal-fin origin posterior to vertical through base of last dorsal-fin ray. Anal-fin rays ii(5), iii*(17), or iv(7), 17(1), 18(10), 19*(16), or 20(4). Anal-fin distal profile rounded on anterior lobe and concave posteriorly on females; pointed on anterior lobe and deeply concave posteriorly on males. Last unbranched and first two branched anal-fin rays longer, remaining rays decreasing in size posteriorly. Distal tip of anterior anal-fin rays of mature males overlapping laterally last anal-fin rays, commonly reaching ventral procurrent caudal-fin rays when caudal peduncle deeply arched. Males with acute, retrorse hooks on posterior border and posterior branches of anal-fin rays, posterolaterally arranged on last unbranched to 8th, 9th or 10th branched rays, rarely on 12th (Fig. 4). Two to three unpaired hooks per ray segment of lepidotrichia. Hooks mostly distributed along middle third of anal-fin ray's length. Hook-bearing rays with segments and branches progressively fused according to degree of maturation on males. Hypertrophied soft tissue associated to hook bearing anal-fin rays. Pectoral-fin rays i*(31), 10*(16), or 11(12), rarely 9(1) or 12(2). Unbranched pectoral-fin ray falling short of pelvic-fin origin on females, and extending beyond that point on adult males. Pelvic-fin origin anterior to vertical through dorsal-fin origin. Pelvic-fin rays i,7*(30), rarely i,8(1). Unbranched and branched pelvic-fin rays with acute hooks on males, 1 pair per segment of lepidotrichia, ventromedially placed on rays, associated with hypertrophied soft tissue. Principal caudal-fin rays 16(1), 17(1), 18(1), 19*(25), or 20(1). Procurrent caudal-fin rays 9(1), 10(4), 11(2), or 12(2) dorsal; 11(5), 12(3), or 13(2) ventral. Ventral procurrent caudal-fin rays hypertrophied on mature males, trespassing muscles and skin on ventral margin of caudal-peduncle, resulting in semicircular profile. Hypertrophied ventral procurrent ray scimitar-shaped: anteriorly bent, proximally acute, expanding distally, abruptly ending in pointed distal tip (Fig. 2a).

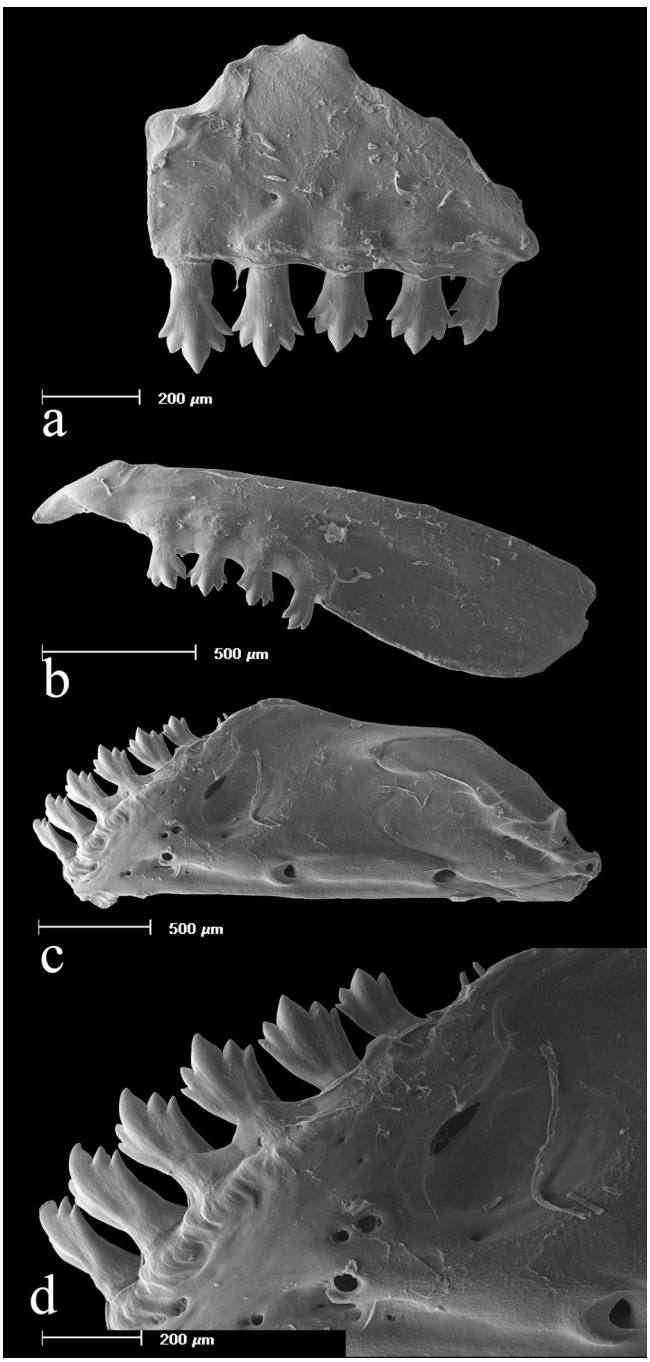

Fig. 3. Scanning Electron Microscopy (SEM) images of dentition of *Serrapinnus potiguar*, paratype, UFRGS 9216, 29.1 mm SL: (**a**) right side premaxilla; (**b**) maxilla; (**c**) dentary; (**d**) detail of the teeth.

Scales cycloid. Pored scales on lateral line 6*(1), 7(6), 8*(12), 9(10), or 10(2); scales on longitudinal line 30(1), 31(4), 32*(6), 33(13), 34(6), or 35(1); predorsal scales 10*(5), 11(16), or 12(10); scale rows from lateral line to dorsal-fin origin 6(28) or 7*(3); scale rows from lateral line to pelvic-fin origin 4*(30) or 5(1); circumpeduncular scale rows 12(2), 13(16), or 14*(13). Scales along anal-fin base 9(1), 10(2), 11*(13), 12(9), 13(5), or 14(1).

Supraneurals 4(6) or 5(4); abdominal vertebrae 15(10); caudal vertebrae 18(9) or 19(1). Gill rakers 8(1), 9(2), or 10(2) on lower branch; 3(1) or 4(4) on upper branch.

Color in alcohol. Overall body coloration yellowish to dun. Head darker over dorsal region of neurocranium, snout and maxilla, due to higher concentration of dark chromatophores. Dark brown chromatophores sparsely scattered over infraorbitals and opercular apparatus. Opercular apparatus, some infraorbitals and branchiostegal rays silver in some individuals. Ventral region of head and abdomen light. Humeral region with triangular darkened area due to pseudotympanum muscular hiatus. Longitudinal line of dorsum darker than lateral of body. Body scales with higher concentration of black chromatophores on distal margin, resulting in reticulated coloration pattern more conspicuous on upper portion of body. Longitudinal black subcutaneous

Table 1. Morphometric data for *Serrapinnus potiguar*. N = number of specimens; SD = Standard deviation. Male range includes the holotype.

		Males					Females				
	Holotype	N	Min	Max	Mean	SD	N	Min	Max	Mean	SD
Standard length	26.6	16	25.6	29.4	27.6		15	26.4	32.3	29.4	
Percentages of standard length											
Head length (HL)	26.4	16	25.8	27.9	26.9	0.7	15	24.9	27.7	26.6	0.9
Bony head length	25.3	16	25.0	26.6	25.7	0.5	15	24.5	26.5	25.5	0.6
Snout-anal fin distance	64.3	16	60.7	65.3	63.6	1.2	15	63.3	67.9	65.9	1.5
Snout-dorsal fin distance	52.8	16	50.5	54.2	52.4	1.1	15	52.1	56.3	53.9	1.2
Snout-pelvic fin distance	44.6	16	41.8	45.7	44.0	1.1	15	44.1	49.0	46.6	1.5
Snout-pectoral fin distance	27.3	16	25.2	28.5	27.1	0.8	15	26.0	29.3	27.5	0.8
Dorsal-fin base length	15.8	16	13.5	15.8	14.3	0.6	15	12.6	14.8	13.8	0.6
Anal-fin base length	24.2	16	21.8	24.7	23.5	0.8	15	21.5	27.1	24.9	1.5
Length of caudal peduncle	18.0	16	17.6	20.7	18.9	0.8	15	15.5	18.3	16.8	0.8
Depth of caudal peduncle	17.8	16	11.7	17.8	15.2	1.5	15	11.0	14.4	13.4	0.9
Body depth at dorsal fin	38.8	16	34.2	38.8	36.7	1.5	15	31.8	42.6	39.3	2.9
Dorsal-fin length	29.4	16	27.1	30.5	29.1	0.8	14	26.7	31.4	29.0	1.2
Pelvic-fin length	19.6	16	17.9	20.5	19.0	0.6	15	16.4	18.6	17.3	0.6
Pectoral-fin length	20.3	16	18.8	21.0	19.7	0.7	15	18.6	20.8	19.5	0.6
Percentages of head length											
Snout length	27.2	16	22.5	27.2	24.4	1.1	15	22.2	26.3	23.8	1.2
Upper jaw length	28.1	16	25.1	30.5	27.8	1.3	15	25.5	31.3	28.5	1.5
Horizontal orbit diameter	39.1	16	35.6	40.2	37.9	1.6	15	36.4	40.9	38.3	1.6
Interorbital width	34.5	15	31.2	36.9	33.5	1.5	15	30.5	36.4	34.2	1.6

line on lateral of body extending from vertical through dorsal-fin insertion to caudal peduncle spot. Black chromatophores aligned and following line of miosepta on body above anal fin. Caudal spot black, slightly rounded, occupying most of caudal peduncle termination, not reaching upper or lower margins of caudal peduncle. Dorsal, anal, pectoral, pelvic, and caudal fins mostly hyaline, with dark chromatophores scattered on interradial membrane. Unbranched dorsal-fin rays darker than branched rays due to higher concentration of black chromatophores. Adipose fin mostly hyaline, with few black chromatophores distributed near dorsal margin. Caudal fin with clear yellowish areas on base of caudal-fin lobes, bordering caudal-fin spot posteriorly.

Color in life. Dark pigmentation as described on alcohol preserved specimens. Body light olive brown slightly translucent. Pectoral fin slightly orange or red; dorsal, anal, pelvic and caudal fins intense orange or red (Fig. 5). Distal tip of longest anal- and pelvic-fin rays white or hyaline. Middle caudal-fin rays hyaline.

Sexual dimorphism. Bony hooks were only observed on pelvic and anal-fin rays of sexually dimorphic males, as well as hypertrophied and ventrally exposed procurrent caudal-fin rays (Fig. 2a). Sexually dimorphic males also present those anal-fin rays that bear bony hooks hypertrophied and expanded in the sagittal plane (Fig. 4). On fixed and preserved specimens the caudal peduncle is generally found arched ventrally only on adult males (Fig. 1a). Furthermore, sexually mature males have gill glands, located on the anteriormost portion of the lower branch of the first gill arch, extending posteriorly through six to eight of gill filaments.

Distribution. *Serrapinnus potiguar* is known to inhabit the rio Ceará-Mirim basin, Rio Grande do Norte State, northeastern Brazil.

Etymology. The epithet *potiguar* refers to "potiguar", a term traditionally used in Brazil to refer to someone born in the Rio Grande do Norte State. An adjective.

Ecological notes. The type locality of *Serrapinnus potiguar* in the rio Ceará-Mirim (05°37'47''S 35°37'09''W) was described by Dias & Fialho (2009) as clear and transparent water, sandy bottom high depth 1.2 m. The water current varied from slow to

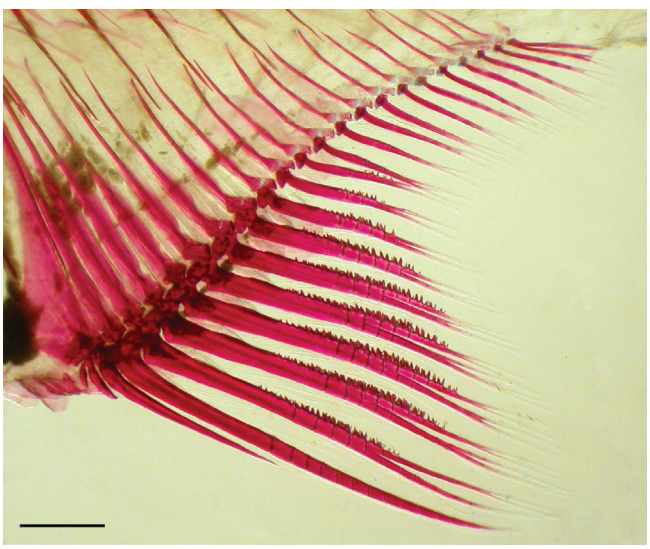

Fig. 4. Anal fin of a mature male of the *Serrapinnus potiguar*, paratype, UFRGS 9216, 27.4 mm SL, showing hypertrophied anal-fin rays and hooks shape and distribution. Lateral view, anterior to the left. Scale bar = 1 mm.

Fig. 5. Coloration just after preservation of *Serrapinnus potiguar*, adult male, approximately 25.0 mm SL, from the rio Ceará-Mirim, Rio Grande do Norte State, Brazil.

moderate and in that stretch the river presented a large amount of floating and submerse vegetation. In that locality *S. potiguar* is sympatric and syntopic with the cheirodontines *Compsura heterura*, *S. heterodon* and *S. piaba*; and its diet was mainly composed by vegetal matter and algae, but also by insects and microcrustaceans (Dias & Fialho, 2009).

Discussion

The new species is herein assigned to the genus *Serrapinnus* as diagnosed by Malabarba (1998). Mariguela *et al*. (2013), in a phylogenetic analysis based on molecular data, proposed *Serrapinnus* as polyphyletic, with its species distributed among different clades in the Cheirodontinae, including genera of both tribes Cheirodontini and Compsurini, as well as *incertae sedis* cheirodontine genera *sensu* Malabarba (1998). Based on their results, Mariguela *et al*. (2013) discussed species relationships and tentatively assigned a few selected morphological characters that agreed with the topology of their cladogram to support some of their hypotheses of relationships, but failed to find characters defining several of their clades, as well as their newly defined tribes Cheirodontini, Compsurini and for their new tribe Pseudocheirodontini. Our main criticism to Mariguela *et al*. (2013) is that they ignored and did not discuss the large amount of evidences, including those associated to the primary and secondary sexual systems, that supports the recognition of the tribes Cheirodontini and Compsurini *sensu* Malabarba (1998), as well as several cheirodontine genera. We will exemplify those problems with *Serrapinnus* that is directly related to the taxonomic decisions of this paper.

Mariguela *et al*. (2013) included six species of *Serrapinnus* in their analysis, *S. calliurus*, *S. heterodon*, S. *kriegi*, *S. microdon*, *S. notomelas*, and *S. piaba*. Those species were not recovered as a natural lineage. Instead, *S. microdon* was found to be sister group of (*Odontostilbe pequira* (*Odontostilbe* sp.2 + *Serrapinnus heterodon*)); and in another distant clade *S. kriegi* was found as sister group of (*Odontostilbe fugitiva* (*O. ecuadorensis* + *O. paraguayensis*) + ((*C. heterura* + *S. piaba*) (*S. calliurus* (*S. calliurus* + *S. notomelas*)))). Species of *Serrapinnus* present a unique set of morphological characters related to the number and shape of the ventral procurrent caudal-fin rays, sexually dimorphic hypertrophy of these structures and ventral curvature of the caudal peduncle on males, which are not found in any other genera of the Cheirodontinae (Figs. 2a; Malabarba, 1998: figs. 4, 13 a,b). Those characters, as well as the hypertrophy of the anal-fin rays of mature males and the remaining synapomorphies shared by *Serrapinnus* and other genera of the tribe Cheirodontini *sensu* Malabarba, 1998 (Bührnheim *et al*., 2008) are absent in all members of *Compsura* and *Odontostilbe*. Secondary sexual dimorphism in *Compsura* as well as in other members of the Compsurini is expressed in other body parts, mostly by the presence of hooks, hypertrophied scales and hypertrophied tissues on caudal fin (Eigenmann, 1915; López, 1972; Fink & Weitzman, 1974; Malabarba, 1998; Malabarba & Weitzman, 1999; Malabarba *et al*., 2004; Jerep & Malabarba, 2011), that are absent in *Serrapinnus*. Conversely, *Odontostilbe* species lack most secondary sexual characters observed in the representatives of the Cheirodontini and Compsurini, being otherwise characterized by the elongation of unbranched rays of the dorsal and pelvic fins (Bührnheim & Malabarba, 2006, 2007). The acceptance of Mariguela *et al*. (2013) hypothesis would require the recognition that the whole set of secondary sexual characters of both the Cheirodontini, the Compsurini and of *Odontostilbe* had multiple origins in the Cheirodontinae.

Mariguela *et al*. (2013: 32) also argues that the expansion of the three posteriormost ventral procurrent caudal-fin rays forming a small caudal keel in *Serrapinnus calliurus*, *S. kriegi*, *S. notomelas*, and *S. piaba* "reinforc(es) the hypothesis of their possible close relationship". This assumption lacks phylogenetic support and fails as a premise to justify the relationship of those species in the cladogram found in their molecular study for two reasons: 1) *S. kriegi* is sister group of the remaining species of that clade, hence it is as related to the species of *Serrapinnus* as to *Compsura heterura* and to the species of *Odontostilbe*; 2) according to their cladogram, the independent acquisition of such character in those four species of *Serrapinnus* is more parsimonious than a hypothetic synapomorphy for the clade with reversion in *Compsura heterura* and species of *Odontostilbe*. In this context, this character does not support their hypothesis of relationships among those species as proposed.

Serrapinnus potiguar presents all the synapomorphies proposed by Malabarba (1998: 207-211) to the subfamily Cheirodontinae, to the tribe Cheirodontini, as well as the synapomorphies proposed for the genus (Malabarba, 1998: 216). *Serrapinnus potiguar* is the only known species of the Cheirodontinae whose mature males present scimitar-shaped ventral procurrent caudal-fin rays (Fig. 2), a condition

considered herein to be an autapomorphy of that species. On the remaining species of *Serrapinnus*, the hypertrophied ventral procurrent caudal-fin rays on mature males are rod-shaped with an acute distal tip (Zarske, 2012: fig. 3), or spatulate, with a rounded or square-shaped distal tip (Malabarba, 1998: fig. 13a-b). On both conditions mentioned above each ventral element present few variation in width along its length; nevertheless in *S. potiguar*, those elements are noticeable expanded on the longitudinal axis, reaching maximum width in the muscular ventral line of the caudal peduncle, than narrowing distally as they project outside the body (Fig. 2).

On northwestern Brazil, *Serrapinnus potiguar* is sympatric and syntopic with *S. heterodon* and *S. piaba* in the rio Ceará-Mirim. According to Dias & Fialho (2009) these three species present an overlap in their diet all year long. *Serrapinnus heterodon* and *S. potiguar* are omnivores species with a very similar diet based on algae, vegetal matter and invertebrates, while *S. piaba*, also classified as omnivore, has a tendency to herbivory. Moreover, *Compsura heterura* also occurs in the same locality and shares with *S. piaba* the same feeding habit. The coexistence of these species partitioning the same alimentary source can be explained by two possible hypotheses: the abundance of food resources and/or the existence of a spatial or temporal segregation, which may avoid interspecific competition (Dias & Fialho, 2009).

Comparative material examined. *Cheirodon microdon*: FMNH 57867, holotype, 32.2 mm SL, Brazil, Caceres, rio Ibicuhy. *Cheirodon micropterus*: CAS 59780, holotype, 23.9 mm SL, Brazil, Pará, rio Amazonas drainage at Santarém. *Cheirodon notomelas*: FMNH 57829, holotype, 28.2 mm SL, Brazil, Miguel Calmone. *Holesthes heterodon* (= *Serrapinnus heterodon*): CAS 117522, paratypes, 4, 32.2-36.5 mm SL, Brazil, Minas Gerais, rio Grande, Jaguara. *Serrapinnus calliurus*: MCP 12537, 4 c&s of 21, Brazil, Rio Grande do Sul, São Nicolau, arroio Canoin. *Serrapinnus kriegi*: MCP 12043, 5 c&s, Paraguay, Cerrito, Estância Montreal Potrero. *Serrapinnus piaba*: MCP 14007, 4 c&s of 25, Brazil, Minas Gerais, Moema, rio São Francisco. *Serrapinnus sterbai*: MZUSP 40359, 69, 22.2-26.7 mm SL, 4c&s, 23.6-25.8 mm SL, Brazil, Tocantins, município de Arraias, temporary pond on rio Paraná and rio Bezerra confluence, Tocantins drainage. *Spintherobolus broccae*: FMNH 58864, paratype, 1, 18.7 mm SL, Brazil, Rio de Janeiro. *Spintherobolus papilliferus*: FMNH 104802, holotype, 32.9 mm SL, Brazil, São Paulo, Alto da Serra.

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Literature Cited

Bührnheim, C. M., T. P. Carvalho, L. R. Malabarba & S. H. Weitzman. 2008. A new genus and species of characid fish from the Amazon basin: the recognition of a relictual lineage of characid fishes (Ostariophysi: Cheirodontinae: Cheirodontini). Neotropical Ichthyology, 6: 663-678.

Bührnheim, C. M. & L. R. Malabarba. 2006. Redescription of the type species of *Odontostilbe* Cope, 1870 (Teleostei: Characidae: Cheirodontinae), and description of three new species from the Amazon basin. Neotropical Ichthyology, 4: 167-196.

Bührnheim, C. M. & L. R. Malabarba. 2007. Redescription of *Odontostilbe pulchra* (Gill, 1858) (Teleostei: Characidae: Cheirodontinae), and description of two new species from the río Orinoco basin. Neotropical Ichthyology, 5: 1-20.

Dias, T. S. & C. B. Fialho. 2009. Biologia alimentar de quatro espécies simpátricas de Cheirodontinae (Characiformes, Characidae) do rio Ceará Mirim, Rio Grande do Norte. Iheringia, Série Zoologia, 99: 242-248.

Eigenmann, C. H. 1915. The Cheirodontinae, a subfamily of minute characid fishes of South America. Memoirs of the Carnegie Museum, 7: 1-99.

Fink, W. L. & S. H. Weitzman. 1974. The so-called cheirodontin fishes of Central America with descriptions of two new species (Pisces: Characidae). Smithsonian Contributions to Zoology, 172: 1-46.

Jerep, F. C. & L. R. Malabarba. 2011. Revision of the genus *Macropsobrycon* Eigenmann, 1915 (Characidae: Cheirodontinae: Compsurini). Neotropical Ichthyology, 9: 299-312.

López, M. I. 1972. Contribución al studio de los peces Cheirodontinae (Familia Characidae) de Costa Rica y Panama: generous *Compsura* y *Pseudocheirodon*. Revista de Biologia Tropical, 20: 93-129.

Malabarba, L. R. 1998. Monophyly of the Cheirodontinae, characters and majors clades (Ostariophysi: Characidae). Pp. 193-233. In: Malabarba, L. R., R. E. Reis, R. P. Vari, Z. M. S. Lucena & C. A. S. Lucena (Eds.). Phylogeny and Classification of Neotropical Fishes. Edipucrs, Porto Alegre.

Malabarba, L. R. 2003. Subfamily Cheirodontinae (Characins, tetras). Pp. 215-221. In: Reis, R. E., S. O. Kullander & C. Ferraris Jr. (Eds.). Check list of the freshwater fishes of South and Central America. Edipucrs, Porto Alegre.

Malabarba, L. R., F. C. T. Lima & S. H. Weitzman. 2004. A new species of *Kolpotocheirodon* (Teleostei: Characidae: Cheirodontinae: Compsurini) from Bahia, Northeastern Brazil, with new diagnosis of the genus. Proceedings of the Biological Society of Washington, 117: 317-329.

Malabarba, L. R. & S. H. Weitzman. 1999. A new genus and new species of South American fishes (Teleostei: Characidae: Cheirodontinae) with a derived caudal fin, together with comments on internally inseminated Cheirodontines. Proceedings of the Biological Society of Washington, 112: 410-432.

Mariguela, T. C., G. Ortí, G. S. Avelino, K. T. Abe & C. Oliveira. 2013. Composition and interrelationships of a large Neotropical freshwater fish group, the subfamily Cheirodontinae (Characiformes: Characidae): a case study based on mitochondrial and nuclear DNA sequences. Molecular Phylogenetics and Evolution, 68: 23-34.

Taylor, W. R. & G. C. Van Dyke. 1985. Revised procedures for staining and clearing small fishes and other vertebrates for bone and cartilage. Cybium, 9: 107-119.

Weitzman, S. H. 1962. The osteology of *Brycon meeki*, a generalized Characidae fish, with an osteological definition of the family. Stanford Ichthyological Bulletin, 8: 1-77.

Weitzman, S. H. & L. R. Malabarba. 1999. Systematics of *Spintherobolus* (Teleostei: Characidae: Cheirodontinae) from eastern Brazil. Ichthyological Exploration of Freshwaters, 10: 1-43.

Zanata, A. M. & R. P. Vari. 2005. The family Alestidae (Ostariophysi, Characiformes): a phylogenetic analysis of a trans-Atlantic clade. Zoological Journal of the Linnean Society, 145: 1-144.

Zarske, A. 2012. *Serrapinnus sterbai* spec. nov. Beschreibung eines neuen Salmlers (Teleostei: Characiformes: Characidae: Cheirodontinae) aus Brasilien mit Bemerkungen zu *S. gracilis* (Géry, 1960) comb. nov. und *S. littoris* (Géry, 1960) comb. nov. Vertebrate Zoology, 62: 3-17.

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