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A New Species of *Hypostomus* (Siluriformes: Loricariidae) from the Upper Rio Paraguay Basin, Brazil

Fernanda O. Martins¹, Manoela M. F. Marinho², Francisco Langeani¹, and Jane P. Serra³

A new small Loricariidae, *Hypostomus careopinnatus*, is described from the Rio Taquari drainage, upper Rio Paraguay basin, Mato Grosso, Brazil. The new species can be easily distinguished from all congeners, except *Hypostomus levis*, by the absence of adipose fin. *Hypostomus careopinnatus* is distinguished from *H. levis* mainly by the presence of slender bifid teeth, with mesial cusp large and rounded, and lateral cusp small and pointed (vs. spoon-shaped teeth). The new species described herein completely lacks the adipose fin and also lacks the median pre-adipose plates in almost all specimens examined. The absence of adipose fin is probably an independent acquisition for *Hypostomus careopinnatus* and *Hypostomus levis*.

Um pequeno novo Loricariidae, *Hypostomus careopinnatus*, é descrito das drenagens do Rio Taquari, bacia do alto Rio Paraguai, Mato Grosso, Brasil. A nova espécie distingue-se facilmente de todas as demais congêneres, exceto de *Hypostomus levis*, pela ausência da nadadeira adiposa. *Hypostomus careopinnatus* distingue-se de *H. levis* pela presença de dentes delgados e bicuspídeos, com a cúspide mesial maior e arredondada, e a cúspide lateral menor e afilada (vs. dentes em forma de colher). A nova espécie aqui descrita não possui nadadeira adiposa, e também perdeu as placas medianas pré-adiposa, na maioria dos exemplares examinados. A ausência da nadadeira adiposa é provavelmente uma aquisição independente para *Hypostomus careopinnatus* e *Hypostomus levis*.

THE genus *Hypostomus* La Cépède is the most species-rich genus within the family Loricariidae, comprising 140 valid species according to Armbruster (2004), Armbruster et al. (2007), and recent descriptions (Zawadzki et al., 2008a, 2008b, 2010; Carvalho et al., 2010), occurring widely throughout the neotropics. The high intraspecific variation in its morphology results in many nominal species with unclear status in *Hypostomus* (Weber, 2003; Birindelli et al., 2007; Jerep et al., 2007). Also, the limits of the genus are yet to be unequivocally defined. Armbruster (2004) recovered a monophyletic *Hypostomus*, though not supported by exclusive features, and recognized *Aphanotorulus*, *Cheiridodus*, *Cochliodon*, *Isorineloricaria*, *Plecostomus*, *Squaliforma*, and *Watawata* as junior synonyms of *Hypostomus*. However, based on molecular data, Montoya-Burgos et al. (2002) considered *Aphanotorulus*, *Isorineloricaria*, and *Squaliforma* as valid genera.

A new *Hypostomus* described herein was recently collected in the headwaters of the Rio Taquari, Rio Paraguay basin. The new finding corroborates the statement of Lima and Britto (2001) that the ichthyofauna of this region, as the headwaters of several major river basin in the Neotropics, is still poorly known.

MATERIALS AND METHODS

Measurements were taken according to Boeseman (1968) and Armbruster (2003), with the inclusion of prepectoral length, taken from the snout tip to the pectoral-fin origin; premaxillary-ramus width, taken transversely from outer edge to inner edge; and preanal length, taken from the snout tip to the anal-fin origin. All measurements were taken point to point with digital calipers to the nearest

0.1 mm. Body measurements are given as percents of the standard length (SL), except when noted; subunits of the head are given as percents of head length (HL). Counts followed Armbruster (2003) and Zawadzki et al. (2008b), with the addition of ventral plates along the anal-fin base. Vertebrae counts included five from the Weberian apparatus, and the compound caudal centrum was counted as a single element. Body plate nomenclature was based on Schaefer (1997) with modifications of Oyakawa et al. (2005). In the description, the mode of each count is given in parentheses, after the respective count. Specimens were cleared and stained (CS) according to Taylor and Van Dyke (1985). Institutional abbreviations are as listed at <http://www.asih.org/node/204>, with the addition of the DZSJRP fish collection, Departamento de Zoologia e Botânica, Universidade Estadual Paulista, São José do Rio Preto, Brazil.

Hypostomus careopinnatus, new species

Figure 1, Table 1

Holotype.—DZSJRP 12231, 57.9 mm SL, Brazil, Mato Grosso State, Alto Araguaia, tributary of Rio Ariranha, Rio Taquari drainage, upper Rio Paraguay basin, 17°18'37"S, 53°32'22"W, F. Langeani, J. P. Serra, M. M. F. Marinho, A. Manzale, 11 August 2009.

Paratypes.—Brazil, Mato Grosso State, Alto Araguaia: DZSJRP 12447, 70, 21.2–57.0 mm SL; MCP 45987, 5, 28.7–52.0 mm SL; MNRJ 38309, 5, 30.3–50.6 mm SL; collected with the holotype. ANSP 190960, 5, 29.5–51.7 mm SL; AUM 51645, 5, 25.9–55.9 mm SL; CUPFMT 690, 5, 33.9–49.0 mm

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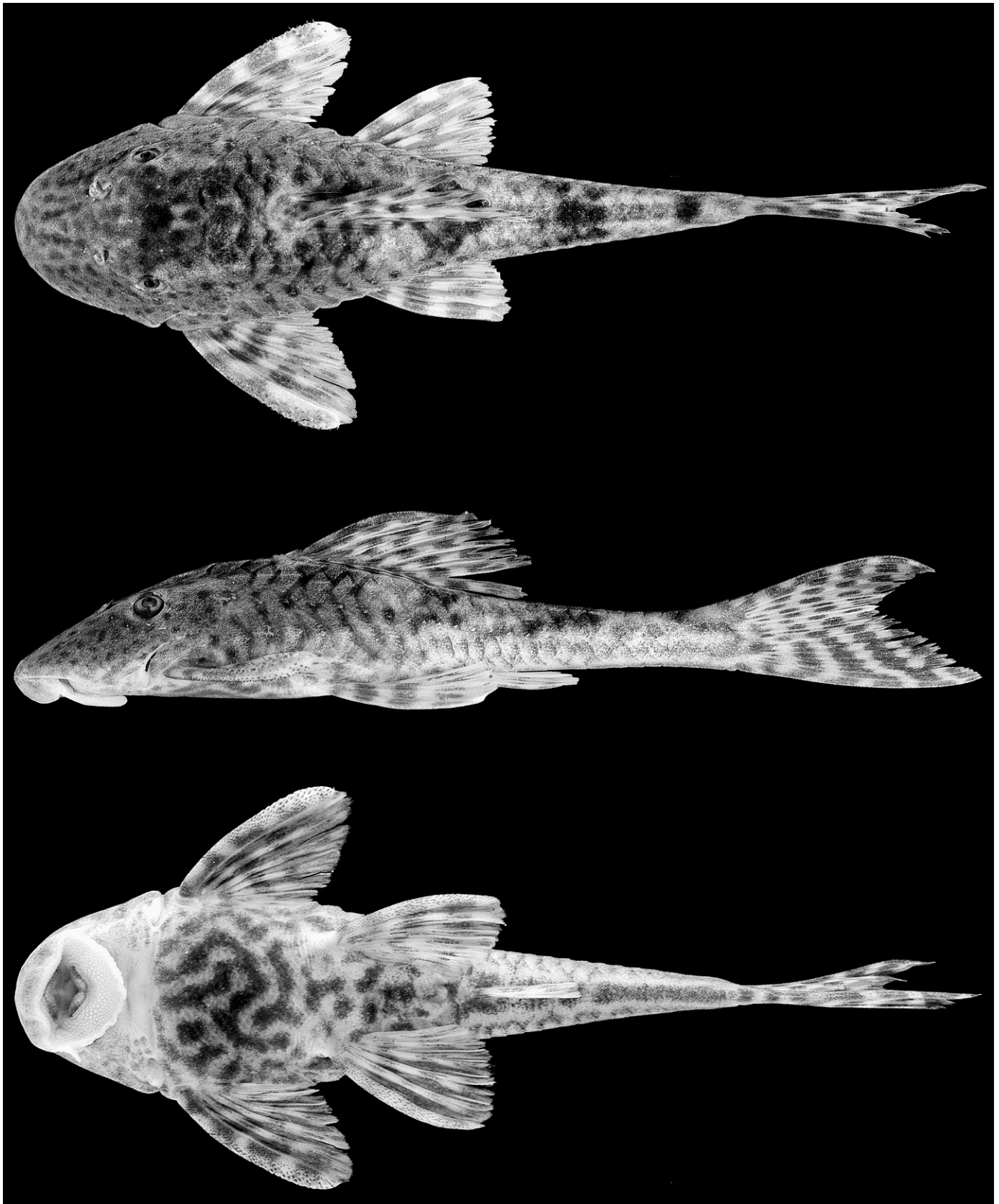


Fig. 1. *Hypostomus careopinnatus*, holotype, DZSJRP 12231, 57.9 mm SL, Rio Taquari drainage, upper Rio Paraguay basin, Mato Grosso State, Brazil.

SL; DZSJRP 12611, 56, 16.9–59.1 mm SL; INPA 35151, 5, 32.2–56.3 mm SL; NUP 11257, 5, 30.2–53.8 mm SL; UFRGS 14043, 5, 34.4–50.8 mm SL; same locality as holotype, F. Langeani, J. P. Serra, M. M. F. Marinho, F. O. Martins, 3

June 2010. MZUSP 41483, 10, 19.5–47.0 mm SL, Córrego do Mato, Fazenda Córrego do Mato, Rio Taquari drainage, upper Rio Paraguay basin, L. P. S. Portugal, F. Langeani, 9 March 1989.

Table 1. Morphometric and Meristic Data of the Holotype and 29 Paratypes of *Hypostomus careopinnatus*. Means are presented for measurements, and modes for counts. The range includes the holotype. SD = standard deviation.

	Measurements				
	Holotype	<i>n</i>	Range	Mean	SD
Standard length (mm)	57.9	30	41.3–57.9	—	—
Percents of standard length					
Predorsal length	43.2	30	40.2–46.0	43.4	1.3
Preanal length	62.2	30	60.9–65.6	63.2	1.3
Head length	32.5	30	31.7–37.5	34.0	1.3
Thoracic length	25.4	30	19.8–25.4	22.3	1.3
Abdominal length	19.0	30	18.0–22.8	20.4	1.1
Dorsal-fin unbranched ray length	23.7	30	21.2–26.8	23.6	1.3
Dorsal-fin base length	20.0	30	19.0–24.5	20.8	1.2
Pectoral-fin unbranched ray length	26.3	30	23.9–27.9	25.8	1.1
Pelvic-fin unbranched ray length	23.3	30	21.1–25.6	23.5	1.0
Anal fin length	14.7	29	12.7–16.4	14.0	0.8
Cleithral width	29.9	30	26.6–30.3	28.3	1.0
Caudal peduncle length	32.6	30	30.5–36.9	33.3	1.5
Caudal peduncle depth	8.1	30	7.4–8.6	7.9	0.3
Prepectoral length	26.4	29	25.1–29.5	27.0	1.1
Dorsal–pectoral length	28.7	29	26.6–29.6	28.3	0.9
Dorsal–pelvic length	19.5	29	15.5–22.8	19.2	1.6
Dorsal–anal length	32.3	29	29.0–34.7	31.4	1.2
Percents of head length					
Head depth	52.1	30	48.6–58.2	52.3	2.6
Head width	83.0	30	70.3–84.8	78.8	4.1
Snout length	67.0	30	54.8–68.9	63.8	3.1
Orbital diameter	14.9	30	14.3–18.6	16.0	1.0
Interorbital width	46.8	29	36.8–46.8	42.7	2.3
Mandibular ramus length	11.2	30	7.8–15.6	12.9	1.7
Premaxillary ramus width	13.8	30	9.2–18.1	14.4	1.7
Eye–nostril distance	11.7	29	9.9–14.6	11.6	1.1
Snout–nostril distance	47.3	29	38.1–48.7	45.3	2.3
Internostril width	18.6	29	14.8–20.0	17.3	1.2
Other percents					
C. peduncle depth/C. peduncle length	24.9	30	20.1–26.3	23.9	1.3
	Counts				
	Holotype	<i>n</i>	Range	Mode	
Median plates series	27	32	26–27	27	
Predorsal plates	3	32	3–3	3	
Dorsal plates below dorsal-fin base	7	32	6–9	7	
Ventral plates in anal-fin base	2	32	2–3	2	
Ventral plates between end anal-fin base and caudal fin	13	32	12–14	13	
Dorsal-fin branched rays	7	29	7–7	7	
Anal-fin branched rays	4	29	4–5	4	
Caudal-fin branched rays	14	29	14	14	
Pectoral-fin branched rays	6	29	6–6	6	
Pelvic-fin branched rays	5	29	5–5	5	
Premaxillary teeth	30	29	23–42	35	
Dentary teeth	25	29	25–42	32	

Diagnosis.—*Hypostomus careopinnatus* can be readily distinguished from all congeners, except *Hypostomus levis*, by the complete absence of adipose fin (vs. presence). *Hypostomus careopinnatus* is distinguished from *H. levis* mainly by the slender bifid teeth, with mesial cusp large and rounded, and lateral cusp small and pointed (vs. spoon-shaped teeth), by

having 23–42 premaxillary and 25–42 dentary teeth (vs. 11–17 for both premaxillary and dentary); and body covered with black spots (vs. spots absent). Additionally, the new species differs from all species of *Hypostomus* which occur in the La Plata basin (except *H. ancistroides*, *H. angipinnatus*, *H. aspilogaster*, *H. borellii*, *H. boulengeri*, *H. brevis*, *H. commersoni*,

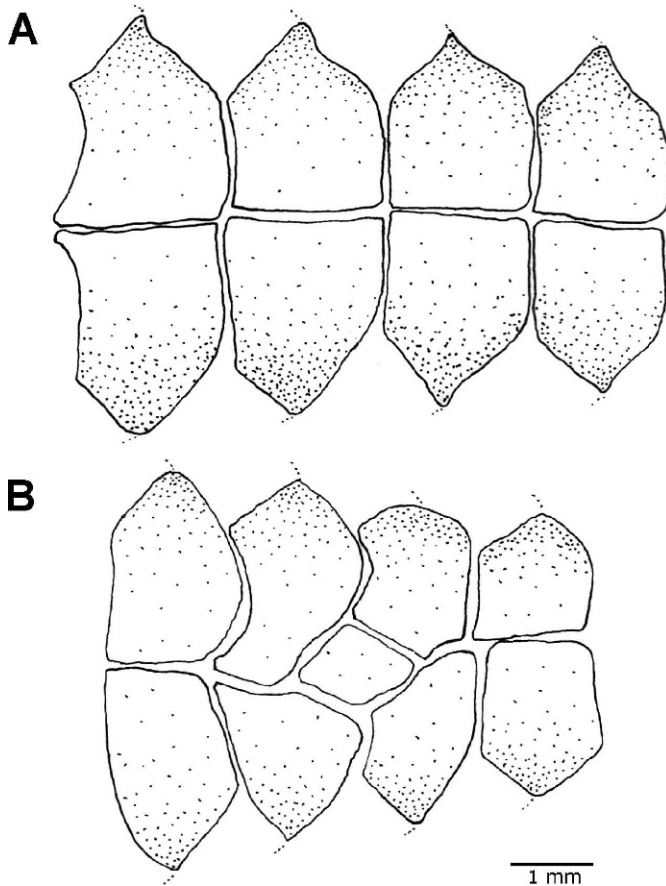


Fig. 2. Dorsal view of caudal peduncle of *Hypostomus careopinnatus*: pre-adipose plates (A) absent, (B) present. DZSJRP 12447, paratypes, 42.4 and 56.3 mm SL, respectively.

H. cordovae, *H. denticulatus*, *H. dlouhyi*, *H. fluviatilis*, *H. heraldoi*, *H. hermanni*, *H. isbrueckeri*, *H. laplatae*, *H. latifrons*, *H. mutuae*, *H. nigromaculatus*, *H. peckoltoides*, *H. piratatu*, *H. topavae*, *H. uruguayensis*, and *H. variostictus*) by the presence of darker spot on body (vs. spot on body lighter than background or absent). It can be distinguished from *H. brevis*, *H. denticulatus*, *H. derbyi*, *H. isbrueckeri*, *H. mutuae*, *H. nigromaculatus*, and *H. peckoltoides* by the abdomen entirely covered by small plates (vs. completely naked or with wide naked areas); from *H. aspilogaster*, *H. commersoni*, *H. cordovae*, *H. derbyi*, and *H. laplatae* by having 26–27 lateral median plates (vs. 29–31, 28–30, 28–30, 28, and 31–32, respectively); from *H. angipinnatus*, *H. borellii*, *H. boulengeri*, *H. fluviatilis*, *H. heraldoi*, *H. hermanni*, *H. latifrons*, *H. piratatu*, *H. topavae*, and *H. uruguayensis* by the caudal peduncle depth, 20.1–26.3% in its length (vs. 29–40%); from *H. variostictus* by the orbital diameter 14.3–18.6% of head length (vs. 20%), and tip of pelvic fin not reaching middle anal-fin base (vs. reaching); from *H. dlouhyi* by having five longitudinal plate series at the end of caudal peduncle (vs. four); and from *H. ancistroides* by the weak keels on dorsal and mid-dorsal plate series, formed by one or two well-developed odontodes on each plate (vs. conspicuous keels, formed by a cluster of three or more well-developed odontodes on each plate), and by the caudal peduncle depth 7.4–8.6% in the SL (vs. 9.9–12.3%).

Description.—Morphometric and meristic data in Table 1. Largest specimen examined 57.9 mm SL. Body deepest at dorsal-fin origin. Dorsal profile of body straight from tip of

snout to nares; convex from nares to dorsal-fin origin; straight along dorsal-fin base; slightly concave from base of last dorsal-fin ray to caudal-fin base. Ventral profile of body almost straight from tip of snout to pelvic-fin origin; posterodorsally inclined from pelvic-fin origin to anal-fin origin; straight from anal fin to caudal-fin origin. Caudal peduncle rounded in cross-section, with shallow concave area near caudal-fin origin. Anterior profile of snout rounded in dorsal view. Head with lateral ridge from nares to posterior margin of compound pterotic; distinctly raised on posterodorsal corner of orbit, and poorly developed along compound pterotic. Posterior process of supraoccipital bordered by single predorsal plate, partially divided in some specimens. Opercle hatchet-shaped, with small to well-developed odontodes (up to 40). Preopercle without odontodes, partially covered by three to four plates. Cheek plates slightly evertible with large and strong odontodes. Eye moderate in size, dorsolaterally placed; iris operculum present, well developed; space between orbits concave; dorsal edge of orbit slightly elevated. Nares separated by flap of skin. Oral disk round, medium-sized. Outer edge of upper lip without platelets and odontodes. Maxillary barbel shorter than eye diameter, linked to lip proximally, ornamented with small papillae. Lower lip with fringed edges, not reaching transversal line through gill openings and scapular bridge; its ventral surface covered with numerous diminute papillae decreasing in size posteriorly, except for smooth region posterior to symphyseal region. Dentary angle averaging 90° or more. Premaxillary teeth 23 to 42 (mode 35); dentary teeth 25 to 42 (mode 32). Teeth bicuspid, curved inward distally; medial cusp considerably larger than lateral cusp.

Tip of snout mostly naked, with two lateral pointed patches of small plates with odontodes. Ventral surface of head mostly naked, except for few small plates anterior to gill opening. Five complete lateral series of plates. Dorsal plate series with six to nine (mode seven) plates, limiting naked area along dorsal-fin base. Median series with 26–27 (mode 27) perforated plates. Mid-ventral plates keeled up to vertical through pelvic-fin origin. Ventral plate series starting slightly posterior to vertical through pelvic-fin origin, with two to three ventral plates along anal-fin base, and 12 to 14 ventral plates from end of anal-fin base to caudal fin. Dorsal, mid-dorsal, and mid-ventral plate series with poorly developed longitudinal keels. Abdomen completely covered by small plates, except near pectoral-fin insertion, around pelvic-fin base, and urogenital opening. Pre-anal plate absent.

Dorsal fin with seven branched rays, posterior border straight; tip of rays extending to vertical through median portion of anal fin; well-developed, V-shaped spinelet present, locking mechanism functional. Tip of first and last proximal radials of dorsal fin contacting neural spine of seventh and 16th vertebrae, respectively. Adipose fin absent; typical azygous pre-adipose plates often absent (159 specimens), some individuals with one to two (18 specimens; Fig. 2). Pectoral fin with strong spine, covered by well-developed odontodes distally on outer portion, and with six branched rays; tip of adpressed pectoral fin reaching posteriormost portion of pelvic-fin base. Cleithrum exposed process located dorsally to pectoral-fin rays, tapering posteriorly. Pelvic fin with thin and flexible spine, covered by well-developed odontodes in ventral portion, and with five branched rays; tip of adpressed pelvic fin surpassing

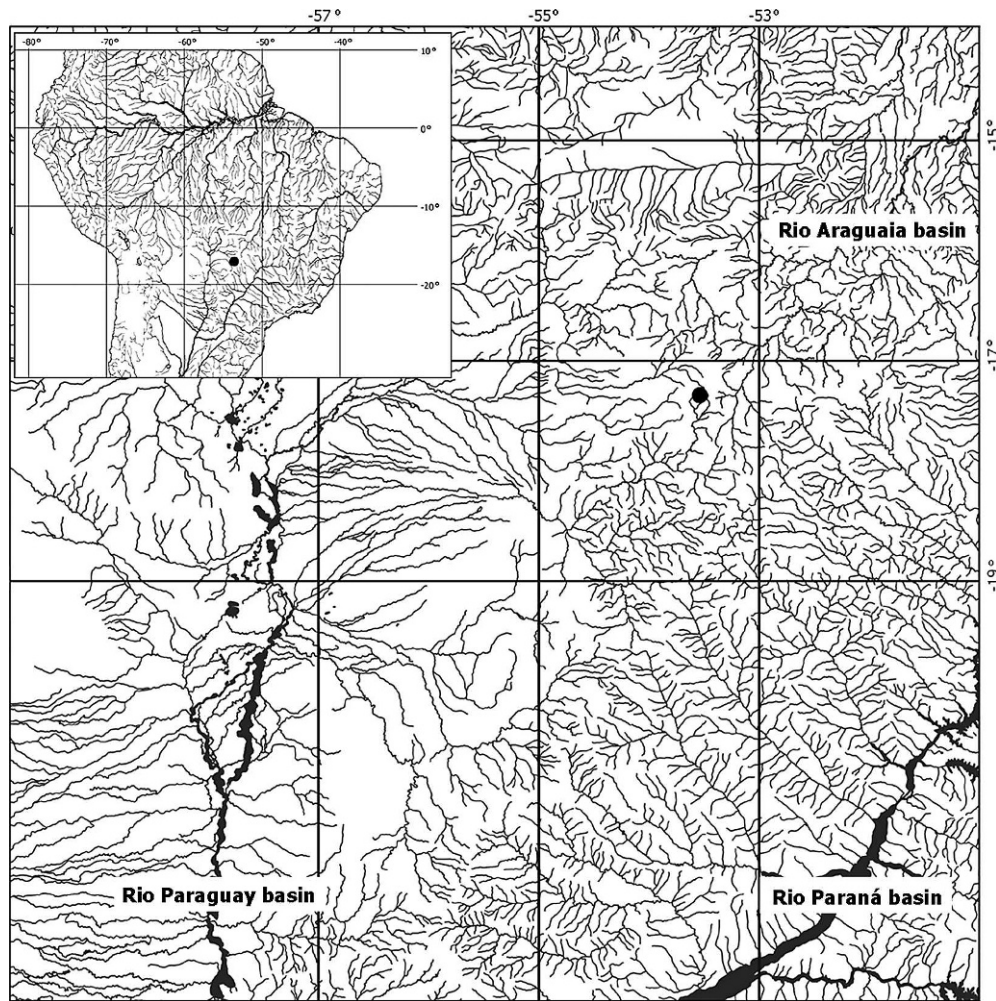


Fig. 3. Type locality of *Hypostomus careopinnatus*, tributary of Rio Ariranha, Rio Taquari drainage, upper Rio Paraguay basin, Brazil.

anal-fin origin. Anal fin with thin and flexible unbranched ray, and four or five branched rays; plate of first proximal radial of anal fin exposed, with 10 to 20 odontodes; tip of first and last proximal radials of anal fin contacting hemal spine of 15th and 19th or 20th vertebrae, respectively. Caudal fin concave, with two outer unbranched rays and 14 inner branched rays; lower lobe longer than upper one; five dorsal and four or five ventral procurent rays. Vertebrae 31–32.

Color in alcohol.—Overall ground color light brown. Dorsal and lateral surfaces of head and body covered by small dark spots, about four times in orbital diameter; more numerous on head. Ventral surface of body lighter than dorsal and lateral, cream colored. Abdominal coloration varying, not according to size; commonly, abdomen with dark spots slightly larger, one to two times in orbital diameter, occasionally extending to posteroventral portion of head; some specimens with conspicuous dark vermiculations on abdomen, other specimens with abdomen entirely pale. Interradial membrane of fins mostly hyaline. Fin rays with dark spots larger than those on ventral portion of body, also over membrane, forming transverse bars more conspicuous on the caudal fin.

Geographic distribution and habitat.—Only known from the Rio Taquari drainage, upper Rio Paraguay basin, Alto Araguaia, Mato Grosso State, Brazil (Fig. 3). The type locality

of *Hypostomus careopinnatus* is a small stream about two meters wide and 0.4–0.5 m deep, silted, bottom predominantly with pebble, sand, and mud, running through a grazing area, with very poor riparian vegetation.

Etymology.—The specific name *careopinnatus* comes from the Latin *careo*, be deprived of, and the Latin *pinnatus*, with fin, in reference to the absence of adipose fin.

DISCUSSION

Armbruster (2004) performed a morphological phylogenetic analysis of Loricariidae emphasizing the Hypostominae and redefined the genus *Hypostomus* based on three non-exclusive synapomorphies: (1) hatchet-shaped opercle; (2) anterior process of the compound pterotic passing halfway through the orbit; and (3) pointed cleithral process. *Hypostomus careopinnatus* share the three synapomorphies.

Several loricariids have lost the adipose fin (Pereira and Reis, 1992; Fisch-Muller et al., 2005a, 2005b): all Loricariinae, most of the Hypoptopomatinae, some Hypostominae, and a species of Neoplecostominae (*Neoplecostomus paranaensis*). Generally, the adipose fin is preceded by one or a series of median pre-adipose plates. The presence of pre-adipose plates is common in the Hypostominae which lack adipose fin (e.g., most *Pareiorhina*, *Rhinelepis* spp.). Some of them also have a raised crest on such plates (e.g., *Ancistrus*

tombador, *A. reisi*, *A. jataiensis*, *Corymbophanes* spp., *Pareiorhaphis vestigipinnis*, *Leptoancistrus* spp., *Pareiorhina carranacas*); others lack the adipose fin and also the pre-adipose plates (*Pseudorinelepis* and *Hypostomus levis* [Armbruster, 2003]). The new species herein described completely lacks the adipose fin in all specimens collected. Also, *Hypostomus careopinnatus* lacks the median pre-adipose plates in almost all specimens examined (159), except for some (18) with one or two, never with raised crest.

Within the genus, the loss of the adipose fin is a derived feature shared by *H. levis*, a *Hypostomus cochliodon* group member. According to Armbruster (2003) and Armbruster and de Souza (2005), the *Hypostomus cochliodon* group is defined by the distinctly spoon-shaped teeth, the preoperculo-hyomandibular ridge deflected posterior to the main body of the hyomandibula, and the dentary angle averaging less than 80°. *Hypostomus careopinnatus* has elongate, not spoon-shaped teeth, and dentary angle averaging 90° or more, but, as in the members of the *Hypostomus cochliodon* group, the preoperculo-hyomandibular ridge is deflected posterior to the main body of the hyomandibula. We are unable to establish any relationships of *Hypostomus careopinnatus* and congeners. Nevertheless, the absence of the adipose fin is probably an independent acquisition for the new species and *Hypostomus levis*.

MATERIAL EXAMINED

All from Brazil.

Rio Amazonas drainage: *Pseudorinelepis genibarbis*: MZUSP 26833, 1, 129.3 mm SL.

Rio Paraguay drainage: *Hypostomus boulengeri*: MZUSP 40092, 4, 98.0–142.7 mm SL; MZUSP 95075, 8, 15.3–88.8 mm SL. *Hypostomus cochliodon*: DZSJRP 3077, 2, 100.9–110.4 mm SL; MZUSP 44313, 4, 31.2–112.9 mm SL; MZUSP 60009, 17, 26.8–78.8 mm SL; MZUSP 87803, 1, 53.8 mm SL. *Hypostomus dlouhyi*: MZUSP 46036, 1, paratype, 153.0 mm SL. *Hypostomus latifrons*: MZUSP 38193, 2, 178.2–232.3 mm SL. *Hypostomus peckoltoides*: MZUSP 105226, holotype, 108.0 mm SL. *Hypostomus piratatu*: MZUSP 3234, 4, 107.13–129.7 mm SL; MZUSP 46038, holotype, 167.6 mm SL. *Hypostomus regani*: MZUSP 78880, 2, 124.2–150.8 mm SL. *Plecostomus variostictus*: MNRJ 1072, holotype, 31.9 mm SL. Rio Paraná drainage: *Hypostomus ancistroides*: DZSJRP 5806, 7, 30.6–92.5 mm SL; DZSJRP 6334, 3, 73.7–97.8 mm SL; DZSJRP 7112, 18, 15.9–96.2 mm SL; DZSJRP 10788, 32, 15.9–69.9 mm SL; DZSJRP 13311, 23, 34.1–71.2 mm SL. *Hypostomus denticulatus*: MZUSP 98770, holotype, 159.5 mm SL. *Hypostomus heraldoi*: MZUSP 98771, holotype, 204.7 mm SL. *Hypostomus margaritifer*: MZUSP 43776, 1, 205.6 mm SL. *Hypostomus regani*: MZUSP 85891, 13, 70.1–141.2 mm SL. *Hypostomus topavae*: MZUSP 97834, 8, 57.2–114.3 mm SL. *Plecostomus scaphyceps*: MZUSP 1014, 1 paratype, 38.3 mm SL. *Rhinelepis aspera*: DZSJRP 4478, 2, 103.1–132.3 mm SL; DZSJRP 4495, 1, 114.1 mm SL.

Rio Uruguay drainage: *Hypostomus isbrueckeri*: MZUSP 40257, 3 of 5 paratypes, 81.6–150.8 mm SL. *Hypostomus roseopunctatus*: MZUSP 40344, holotype, 211.5 mm SL.

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