

A New Species of Whiptail Catfish, Genus *Loricaria* (Siluriformes: Loricariidae), from the Rio Curuá (Xingu Basin), Brazil

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***Loricaria birindellii*, new species, is described based on two specimens from the Rio Curuá, a tributary of the Rio Iriri in the lower Xingu basin of Brazil. In adults the new species is distinguished from all other congeners by having a combination of an elongate dorsal-fin spine (36.0% SL, based on the holotype vs. 16–29%, usually less than 26% SL) that is supported throughout most of its length by the first branched ray, and an inconspicuous (vs. prominent) post-orbital notch with minimum orbital diameter 95.4–97.2% (vs. 71.8–91.5%) of maximum orbital diameter. It is further distinguished from similar and geographically proximate species, *L. lata* and *L. simillima*, by having a more slender body, particularly head width (13.9–14.9% SL vs. 15.2–19.4% SL in *L. simillima* and 16.4–20.1% SL in *L. lata*). The larger specimen of *L. birindellii* exhibits male breeding characteristics known in other species of *Loricaria*, including expanded membranous portions of the lower lip, an increase in development of globular papillae on lip surfaces, rounded premaxillary- and dentary-tooth cusps, and slight thickening of the pectoral spine. The smaller specimen of *L. birindellii* exhibits a different caudal fin pigment pattern and lacks an elongate dorsal spine, suggesting that the species either undergoes ontogenetic transformation or exhibits sexual dimorphism in these characters. Two juvenile specimens (95.6 and 98.0 mm SL) from the Rio das Mortes (Araguaia-Tocantins basin) are tentatively regarded as *L. aff. birindellii*, based on shared morphological characters and geographic proximity.**

LORICARIA is a group of small to moderate sized Neotropical catfishes within the subfamily Loricariinae, widely distributed in the Amazonas, Orinoco, Paraguay, Paraná, and smaller coastal rivers draining the Guiana and Brazilian shields. The species of *Loricaria* typically occur over sandy or muddy substrates of insular streams to large lowland rivers, floodplain lakes, and coastal areas (Taylor, 1983; Burgess, 1989; Le Bail et al., 2000; pers. obs.).

In a review of the genus *Loricaria*, Isbrücker (1981) recognized 11 species and two undescribed forms. These species were distinguished from other loricariine genera based on external morphological characters, including elongate, slender filaments on the lips and a low number of bicuspid premaxillary teeth (usually three to four per ramus) that are about twice the length of the dentary teeth. *Loricaria*, as diagnosed by Isbrücker (1981), was recovered as a monophyletic group by Rapp Py-Daniel (1997) based on additional synapomorphies including an elongate palatine with a large lateral flange, lower pharyngeal plates with crests and a dorsal process, and a large flange for the *arrector ventralis* covering part of the basipterygium. Covain and Fisch-Muller (2007) constructed a key and provided a synopsis of the genera of Loricariinae, in which *Loricaria* was distinguished on the basis of lip and tooth morphology as described by Isbrücker (1981). Those authors performed a multivariate analysis of combined external qualitative and quantitative characters resulting in a phenetic group including *Loricaria*, *Paraloricaria*, *Ricola*, and *Brochiloricaria*. A phylogenetic analysis by Covain et al. (2008) using a combination of external morphological characters and partial 16S and 18S mitochondrial genes recovered *Loricaria* as monophyletic and sister to the *Pseudohemiodon* group (*Planiloricaria* and *Crossoloricaria*). Delineating species boundaries within the genus *Loricaria* remains problematic and geographic distributions of most species are incompletely known. This is particularly the case with species in

the *L. cataphracta* complex, of which Isbrücker (1981:58) remarked, “Many species of this complex show few distinctive characters when all populations combined are considered.”

During the course of a systematic revision of *Loricaria* by the senior author, several additional undescribed species have been identified in museum collections. After a twenty-year hiatus following Isbrücker’s (1981) review, four new *Loricaria* were recently described, including one from the Río Paraguay drainage (Rodríguez and Miquelarena, 2003) and three from deep channels of the lower Amazonas and Negro basins (Thomas and Rapp Py-Daniel, 2008). A recent expedition to the Xingu basin funded by the All Catfish Species Inventory (<http://silurus.acnatsci.org>) produced two specimens of a distinctive undescribed species that we formally describe in the genus *Loricaria* based on the external morphological characters described above.

MATERIALS AND METHODS

Institutional abbreviations are as listed at <http://www.asih.org/codons.pdf>.

Morphometric and meristic data were taken from 110 specimens of *Loricaria*, including two representing the new species described herein, two tentatively regarded as conspecific (i.e., *L. aff. birindellii*), and 106 representing similar and geographically proximate species for comparison. Morphometric methods follow Thomas and Rapp Py-Daniel (2008), which include 26 point-to-point distances (Fig. 1) expressed as percentages of either standard length (SL) or head length (HL; Table 1). Meristic methods and terminology follow Isbrücker and Nijssen (1978), in part. Dermal plate terminology follows Schaefer (1997), with the addition of three triangular plates on the base of caudal fin referred to herein as post-ural plates. The median post-ural plate was referred to as basicaudal plate by Thomas and Rapp Py-Daniel (2008). Bilaterally paired features were counted on

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Submitted: 22 May 2009. Accepted: 7 December 2009. Associate Editor: C. J. Ferraris.

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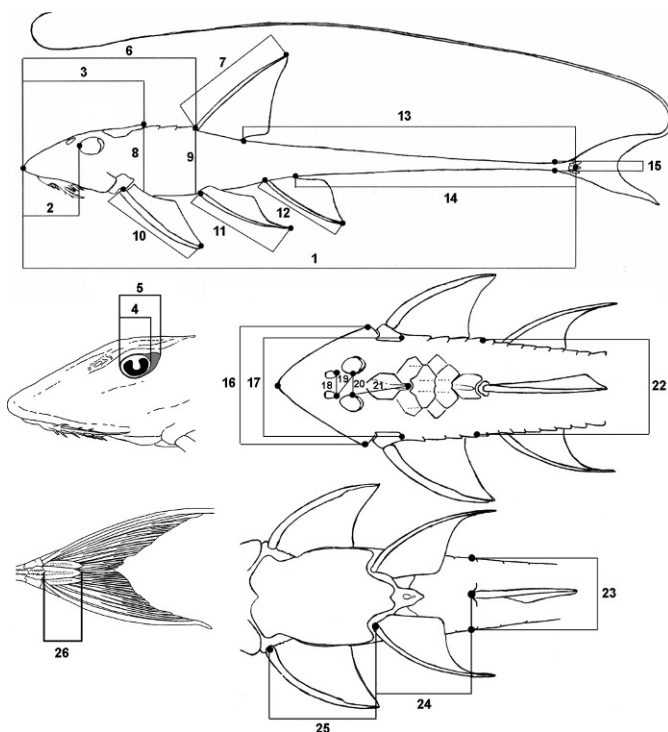


Fig. 1. Measurements used in morphometric analyses, as listed in Table 1. Figure modified from Thomas and Rapp Py-Daniel (2008).

the left side of the body when possible; in cases of broken or damaged features on the left side, counts were made on the right side. Counts of plates in the lateral series include total lateral plates and posterior (coalesced) lateral plates. Total lateral plates include those in the median series bearing two parallel longitudinal odontode keels beginning with the first plate posterior to the cleithrum (bearing a single odontode ridge) and ending with the last plate at end of caudal peduncle, not counting the median post-ural plate. Posterior (coalesced) lateral plates include those in the lateral series beginning with the first plate on which the dorsal and ventral odontode keels meet and continue parallel to each other to the end of the caudal peduncle. Post-anal plates include those between the anal-fin insertion and end of caudal peduncle. Abdominal plates are divided into lateral abdominal and median abdominal series. Lateral abdominal plates are the paired series of oblong or rectangular large plates situated between the pectoral- and pelvic-fin origins. Median abdominal plates are polygonal to round in shape, forming a pre-anal shield posteriorly, extending anteriorly to fill the space between the lateral abdominal plates, and often covering the pectoral girdle. Among species of *Loricaria*, median abdominal plates vary in size, spacing, coverage, and the number of rows they form between the lateral abdominal plates. The dorsal flap-like extension of the iris is referred to as the iris operculum following Douglas et al. (2002).

Table 1. Proportional Measurements for *Loricaria birindellii* (n = 2) and *L. aff. birindellii* Non-Types (n = 2). Numbers at left margins correspond to measurements in Figure 1.

Measurement	<i>Loricaria birindellii</i>		<i>Loricaria aff. birindellii</i>	
	Holotype	Paratype		
1 Standard length (mm)	231.9	165.1	95.6	98.0
Percents of standard length				
3 Head length	20.2	19.6	22.0	22.8
6 Predorsal length	29.0	27.2	31.6	31.8
7 Dorsal spine length	35.8	22.5	23.2	22.0
9 Body depth	10.1	8.7	9.7	9.4
10 Pectoral spine length	19.9	18.0	20.5	19.2
11 Pelvic spine length	19.4	16.2	20.6	19.6
12 Anal spine length	16.9	15.5	18.0	17.7
13 Post-dorsal length	61.7	63.6	60.2	60.4
14 Post-anal length	52.3	55.7	50.8	51.4
16 Head width	14.9	13.9	16.7	16.0
17 Body width at post-cleithral tip	11.6	10.6	12.3	12.1
22 Body width at dorsal-spine origin	13.0	12.5	12.7	13.1
23 Body width at anal-spine origin	11.7	10.5	11.8	11.5
24 Abdominal length	14.1	12.1	14.0	14.6
25 Thoracic length	16.0	15.7	15.6	15.0
Percents of head length				
2 Snout length	54.7	52.9	53.1	52.6
4 Minimum orbital diameter	14.4	17.3	19.8	19.3
5 Maximum orbital diameter	15.7	18.0	20.4	19.9
8 Head depth	42.3	37.4	42.7	40.4
15 Caudal peduncle least depth	6.6	5.9	5.9	5.7
18 Internares width at posterior bony nostrils	11.0	10.8	12.5	10.9
19 Nares to orbit at frontal-sphenotic juncture	18.9	18.7	22.9	21.3
20 Interorbital width at frontal-sphenotic juncture	19.3	18.9	22.3	20.1
21 Orbit at frontal sphenotic juncture to supraoccipital tip	37.2	38.2	37.7	38.1
26 Basicaudal plate length	16.9	13.8	13.7	13.8

***Loricaria birindellii*, new species**

Figures 2, 3B, 4B–C, 5, 6; Table 1

Holotype.—MZUSP 97210, 231.9 mm SL (male), Brazil, Pará, Altamira Municipality, Rio Curuá, Iriri-Xingu drainage, near town of Castelo dos Sonhos, 08°19'07"S, 055°05'23"W, 23 October 2007, J. L. O. Birindelli, M. H. Sabaj Pérez, L. M. Sousa, A. N. Netto-Ferreira, and N. K. Lujan.

Paratype.—ANSP 189318, 165.1 mm SL, same data as holotype.

Diagnosis.—In adults *Loricaria birindellii* is distinguished from all other nominal species of *Loricaria* by having a combination of an elongate dorsal-fin spine (36.0% SL based on the holotype vs. 16–29%, usually less than 26% SL) that is supported throughout most of its length by the first branched ray (Fig. 2A) and an inconspicuous (vs. prominent) post-orbital notch (Fig. 3) with minimum orbital diameter 95.4–97.2% (vs. 71.8–91.5%) of maximum orbital diameter. It is further distinguished from similar and geographically proximate species, *L. lata* and *L. simillima*, by having a narrower head width (13.9–14.9% SL vs. 15.2–19.4% SL in *L. simillima* and 16.4–20.1% SL in *L. lata*), from *L. clavipinna* by having more divergent plates (21 vs. 18–19) and fewer coalesced plates (13 vs. 15–16) in the lateral series, and from *L. cataphracta* by having weakly (vs. strongly) developed odontode crests on head and dorsal trunk plates, more divergent plates (21 vs. 17–20, usually 19) and fewer coalesced plates (13 vs. 13–17, usually 15–16) in the lateral series.

Description.—Standard length of specimens examined 231.9 mm (holotype) and 165.1 mm (paratype). Additional morphometric data presented in Table 1. Body elongate and slender, dorsoventrally depressed, widest at cleithrum. In dorsal view, head acutely triangular with slightly rounded snout and shallowly convex lateral margins from snout tip to opercula. In frontal view, head broadly triangular. Dorsal profile of head from snout tip to parieto-supraoccipital tip convex, from parieto-supraoccipital tip to dorsal-fin origin shallowly concave. Dorsal profile of body from dorsal-fin origin to caudal peduncle shallowly concave. Greatest body depth at dorsal-fin origin, 10.1% SL (holotype) and 8.7% SL (paratype). Eye moderately large, minimum orbital diameter 14.4% HL (holotype) and 17.3% HL (paratype); iris operculum present. Post-orbital notch present, but shallow, inconspicuous (Fig. 3B); maximum orbital diameter 15.7% HL (holotype) and 18.0% HL (paratype).

Entire body covered with dermal plates except for ventral surface of head anterior to branchiostegals, portions of median abdominal area, around bases of pelvic fins, and V-shaped area surrounding anus. Dermal plates on dorsum of body from snout tip to dorsal-fin origin with weakly developed odontode crests. Odontodes weakly developed on lateral margins of head from snout tip to opercle and along anterodorsal margin of orbit. Single weakly developed odontode crest originating on each frontal, converging posteriorly with its pair to form two parallel, narrowly separated crests on parieto-supraoccipital plate. Dorsal and mid-dorsal plate series between compound pterotic and dorsal-fin origin each with weakly developed single median crest of odontodes. Lateral surface of exposed cleithrum with median keel of odontodes.

Upper lip narrow with numerous marginal fringe barbels, each simple, bifid, or trifid (Fig. 6). Maxillary barbel short,

even with or slightly longer than marginal fringe barbels on lower lip, with simple or bifid secondary barbels. Lower lip well developed with conspicuous median notch; surfaces covered with numerous elongate filaments; marginal fringe barbels simple. Premaxillary teeth three to four (modally three) per ramus, each tooth consisting of slender stalk ending in enlarged bilobed crown; lateral cusp small, rounded or conical; medial large, rounded (holotype) or conical (paratype). Buccal papillae dorsal to premaxillary teeth as long or longer than premaxillary teeth, arranged in cluster of approximately 16. Dentary teeth six to nine (modally eight) per ramus; less than half length of premaxillary teeth; structure similar to that of premaxillary teeth except cusps shorter, more rounded, especially in holotype.

Total plates in lateral series 34. Anterior 21 lateral plates with two parallel odontode keels widely separated, converging posteriorly toward midline on caudal peduncle; posterior (coalesced) lateral plates 13. Post-anal plates 20 (holotype) and 21 (paratype). Lateral abdominal plates nine, rectangular and elongate. Median abdominal area almost completely covered with large polygonal plates, arranged in four to six rows in space between lateral abdominal plates, becoming smaller and more irregularly distributed anteriorly and across pectoral girdle (Figs. 4B–C).

Dorsal-fin rays I,6, last ray split to base. Adpressed dorsal fin reaching thirteenth (holotype) and ninth (paratype) plate posterior to its origin; distal margin of fin shallowly concave when erected; dorsal-fin spine in holotype elongate (36% SL) and flexible distally, supported throughout most its length by first branched ray (Fig. 2A). Pectoral-fin rays I,6. Adpressed pectoral fin reaching seventh lateral plate posterior to cleithrum; distal margin of fin shallowly concave when erected. Pelvic-fin rays I,5. Unbranched pelvic-fin ray (spine) longest, reaching to anterior third of anal-fin length. Anal-fin rays I,4, last ray split to base. Adpressed anal fin reaching seventh plate posterior to its origin; distal margin of fin straight to shallowly convex when erected. Principal caudal-fin rays i,10,i. Distal margin of caudal fin concave, dorsal principal unbranched ray produced into extremely long trailing filament (Fig. 2).

Coloration.—In alcohol, ground color light brown dorsally and laterally, pale yellow ventrally. Head and nuchal region with diffuse pattern of darker brown vermiculations; portion from snout just anterior to nares to posterior margin of parieto-supraoccipital slightly darker than remaining head and predorsal (nuchal) region of body. Lips and barbels pale except dorsal surface of maxillary barbel and upper lip light brown; naked region between upper lip and plated margin of snout with few small irregular patches of dark pigment.

Body with about six extremely faint brown saddles in holotype (Fig. 2A); saddles darker brown and better defined in paratype (Fig. 2B) as follows. First saddle approximately situated on two to three plates along bases of second to fifth dorsal-fin rays, and expanded ventrally. Second saddle poorly distinguished from first, on about four plates beginning at posterior insertion of dorsal fin. Third saddle narrowest and diffuse, on seventh and small portion of eighth plate from dorsal fin. Fourth saddle distinct, on tenth and eleventh plates from dorsal fin. Fifth and sixth saddles similarly distinct, on fifteenth and part of sixteenth and nineteenth and twentieth plates from dorsal fin, respec-

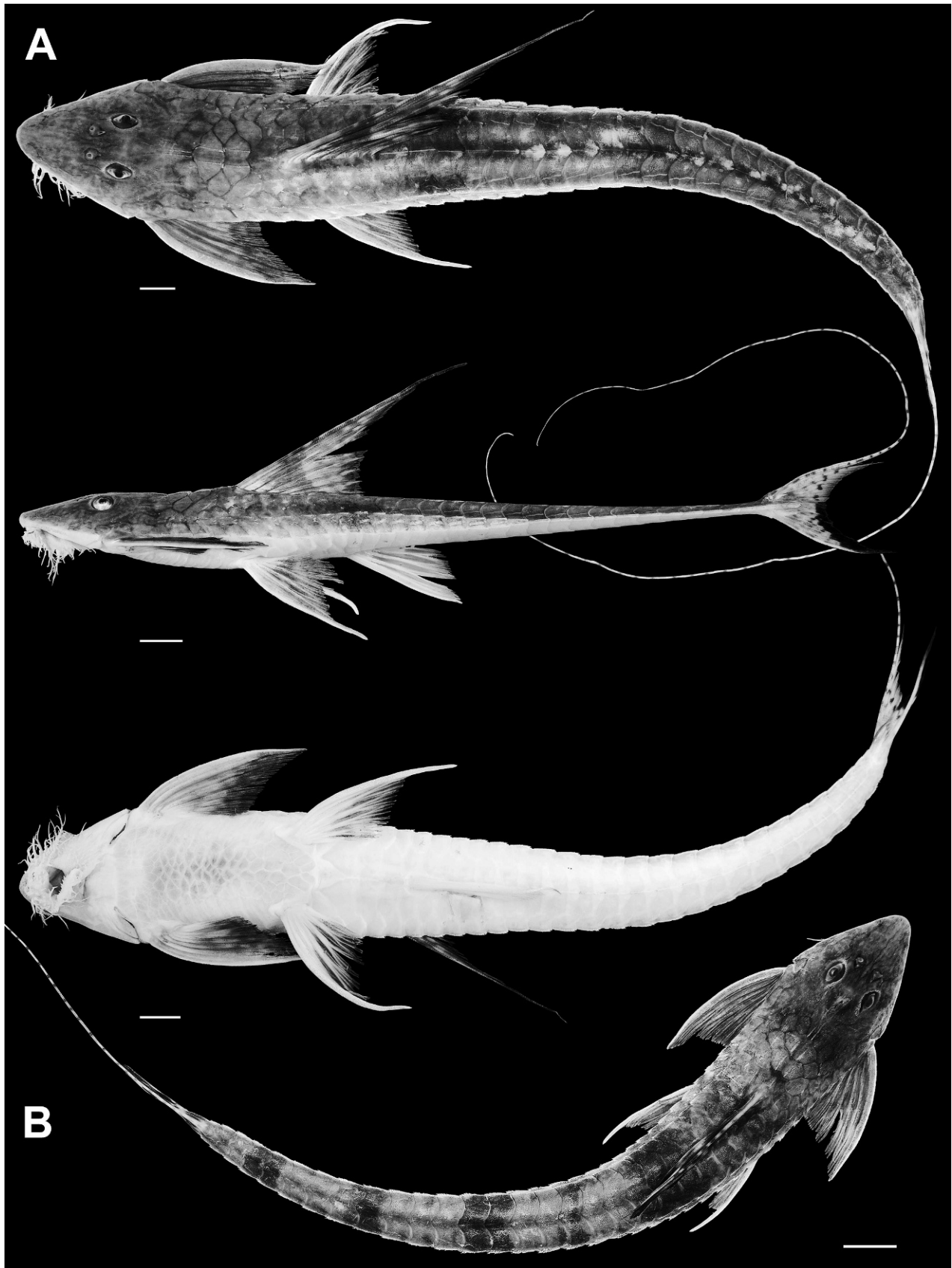


Fig. 2. *Loricaria birindellii*, new species: (A) holotype, MZUSP 97210, 231.9 mm SL, dorsal, lateral, and ventral views; (B) paratype, ANSP 189318, 165.1 mm SL, dorsal view. Scale bars = 1 cm.

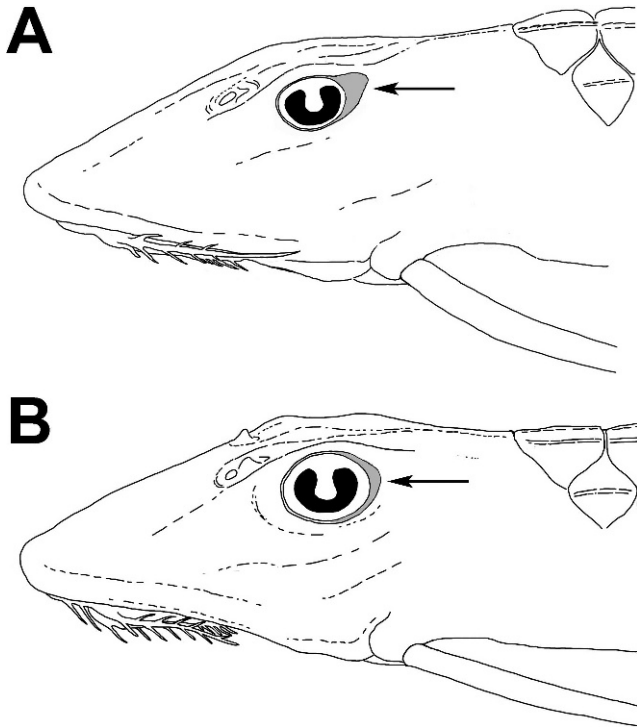


Fig. 3. Head in lateral view comparing post-orbital notch (shaded) development: (A) *Loricaria simillima*, INHS 39968, 217.7 mm SL, with deep and angular notch, also observed in *L. cataphracta*, *L. clavipinna*, and *L. lata*; and (B) *L. birindellii*, ANSP 189318, paratype, 165.1 mm SL, with shallow notch, also observed in *L. aff. birindellii*.

tively. Widths of three posteriormost saddles nearly constant, but lighter interspaces slightly decreasing posteriorly.

Dorsal-fin spine with faint and irregular bands in holotype; with dark brown bands separated by lighter interspaces of nearly equal width in paratype. Dorsal-fin membranes and rays basally with large triangular dark gray-brown blotch, its distal border extending obliquely from about mid-lengths of first to last rays; central portion relatively depigmented on membranes, forming partially clear band; distal third dark gray-brown becoming black towards margin, and with few pale windows centered on

rays. Pectoral fin variably dusky, but without distinct marks; leading margin of spine slightly depigmented (particularly ventrally), lighter than remaining fin. Pelvic fin variably dusky with lighter spine; basalmost portion paler, depigmented relative to remaining fin in holotype. Anal fin pale in holotype; paratype with some dark pigment scattered near bases of two posteriormost rays, in extremely faint narrow band near mid-length, and along distal margin.

Caudal fin marked distally with dark vertical crescent; shape of crescent, as well as other details of color pattern, differs accordingly. Holotype (Fig. 5A) with extremely faint vertical lenticular blotch on base of caudal fin followed by pale region with diffuse elongate blotches; distal crescent with continuous portion confined to lower lobe (truncated dorsally), more or less uniformly black to margin; upper portion of crescent broken into five small dark brown submarginal blotches paralleling distalmost curvature of fin. Paratype (Fig. 5B) differs by having distinct dark gray-brown vertical lenticular blotch on post-ural plates and bases of rays and membranes followed by depigmented pale band; distal half dominated by dark brown to black submarginal crescent irregularly interrupted by small pale to clear oval windows; margin relatively depigmented except for ventral-most portion. In both specimens upper spine and filamentous extension with narrow dark brown bands separated by wider pale interspaces; lower spine pale with few faint bands along proximal two-thirds and distal third black to tip, completing dark crescent.

In life, based on holotype collected at night, lighter ground color tan to copper dorsally and laterally; darker vermiculations on head and nuchal region raw umber; dark saddles not evident (Fig. 6). Naked regions on breast and abdomen white; abdominal plates with golden-yellow iridescence. Paired fins tan to copper dorsally; pelvic fin with salmon tint and slightly lighter than pectoral fin. Crescent along distal margin of lower caudal-fin lobe jet-black.

Sexual dimorphism.—The holotype is an adult male, exhibiting filaments on the lower lip that are reduced in length, with an increased development of globular papillae on the lip surfaces surrounding the bases of the filaments. The surface area of the lower lip is slightly enlarged through expansion of membranous connections between the lower

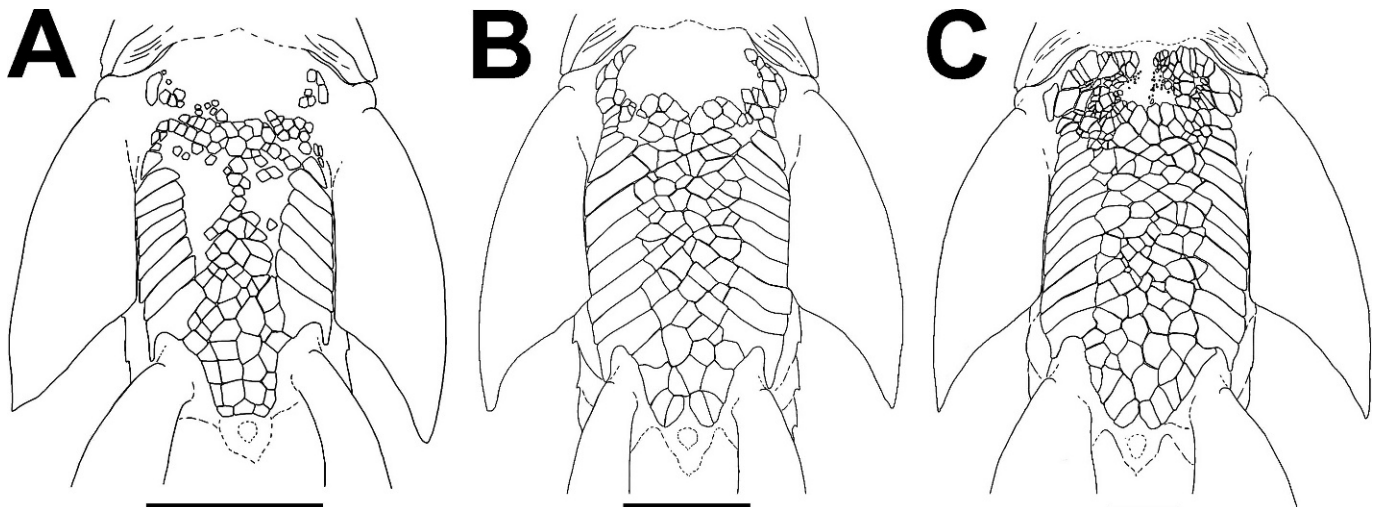


Fig. 4. Abdominal plate development and configuration in (A) *Loricaria aff. birindellii*, MNRJ 25209, 98 mm SL; and *L. birindellii* (B) paratype, ANSP 189318, 165.1 mm SL, and (C) holotype, MZUSP 97210, 231.9 mm SL. Scale bars = 1 cm.

lip and rictal barbel, and at the median cleft. Premaxillary- and dentary-tooth cusps are slightly shortened and rounded (vs. more elongate and conical in the smaller paratype). Odontodes on the pelvic- and anal-fin spines are blunt (vs. conical in the paratype). The pectoral-fin spine is evenly thickened from its base to approximately three-fourths its length.

Remarks.—Among the species of *Loricaria*, an elongate dorsal-fin spine supported by a similar elongation in the first branched ray is a condition known only for the holotype of *L. birindellii*. *Loricaria apeltogaster* shares an elongate dorsal-fin spine; however, the dorsal- as well as the pectoral-fin spines develop into long trailing filaments similar to that produced from the dorsal principal unbranched ray of the caudal fin. These trailing filaments are longer than that produced from the dorsal-fin spine of *L. birindellii*, and are not supported by a similar elongation of the most proximate branched ray. *Loricaria birindellii* is further distinguished from *L. apeltogaster* by having weakly (vs. strongly) developed odontode crests on the head and trunk plates, large polygonal plates (vs. numerous small or granular plates) in the median abdominal space, narrower head width (13.9–14.9% SL vs. 17.4–20.4% SL) and narrower body width at dorsal-fin origin (12.5–13.0% SL vs. 14.6–19.9% SL). Because of the substantial size difference between the holotype and paratype, and lack of additional comparative material, it is unknown if dorsal-fin spine elongation in *L. birindellii* is a sexually dimorphic character possessed only by males in breeding condition, or if it is an ontogenetic character of adult males and females.

The color pattern (dark saddles separated by light inter-spaces that decrease in size posteriorly) and body shape (attenuate posteriorly) of *Loricaria birindellii* and most other species of *Loricaria* is comparable to that of other benthic fishes that live in flowing water over rocky substrates. Armbruster and Page (1996) hypothesized that North American fishes with such patterns (e.g., sculpins, darters, and suckers) achieve crypsis through disruptive coloration. The light spaces between the saddles mimic rocks and the dark saddles appear as shadows or gaps between rocks.

Distribution and habitat.—*Loricaria birindellii* is known only from the type locality in the Rio Curuá, Iriri-Xingu drainage (Fig. 7). In the Rio Curuá, the type specimens were collected at night at a depth of one to two meters in moderate current in a wide run below an extensive cataract. The water was relatively clear and substrate below the cataract was predominantly sand with patches of bedrock and large lateritic boulders. The type locality was illustrated in Sabaj Pérez and Birindelli (2008:233). Two juvenile specimens tentatively regarded as *L. aff. birindellii* were collected in the Rio das Mortes, Araguaia-Tocantins drainage, Brazil.

Etymology.—In honor of Brazilian ichthyologist José Luís O. Birindelli, Museu de Zoologia, Universidade de São Paulo, who helped collect the type material and deftly commanded the 2007 Pipe Expedition to Serra do Cachimbo, Brazil, leading to the discovery of this species and many other undescribed fishes.

DISCUSSION

Prior to the discovery of *Loricaria birindellii* in the Rio Curuá, the only other species of *Loricaria* reported from the Xingu

basin is an undescribed form, "*Loricaria* sp. α ", by Isbrücker (1981), based on three juvenile specimens (BMNH uncatalogued, 37.9–76.6 mm SL) from the Rio Suyazinha [=Suiazinho], a tributary of the Rio Suiá-Missu, in the upper Xingu drainage. Isbrücker (1981) described these specimens as being reminiscent of *L. simillima*, but did not elaborate on how they differed from other species of *Loricaria*. Based on the description of these small specimens and photograph of a single individual (Isbrücker, 1981:82), we do not consider them to be conspecific with *L. birindellii*, but rather likely juveniles of *L. simillima* or *L. lata*, both of which share a broader head width and well developed post-orbital notch. In juvenile and sometimes adult specimens of *L. simillima*, we have observed the V-shaped pale area on the dorsum of the snout, as well as other pigmentation features Isbrücker (1981) described for "*Loricaria* sp. α ". For example, recent collections from the upper Rio Tocantins contain juveniles resembling this putatively undescribed form mixed with larger and likely conspecific specimens we identified as *L. simillima*. In contrast to *L. birindellii*, all of these specimens have a distinctly broader head and trunk, shorter caudal peduncle, well developed post-orbital notch, and different pigmentation features. Apart from the elongate dorsal-fin spine, *L. birindellii* is more similar to *L. cataphracta* in body shape, but differs in having weakly (vs. strongly) developed odontode crests on the dorsal head and trunk plates, as well as meristic features (see Diagnosis). The holotype of *L. birindellii* exhibits characteristics of the lips, teeth, and fin odontodes reported for breeding males in *Loricaria* and other putatively derived members of the Loricariini (Isbrücker, 1981; Isbrücker and Nijssen, 1992).

In a collection (MNRJ 25209) containing eight juvenile specimens from the Rio das Mortes (Araguaia-Tocantins drainage), six are here identified as *L. aff. lata*, but two (95.6 and 98.0 mm SL) possess characteristics of *L. birindellii*, specifically the relatively large size of the orbit, lack of a conspicuous post-orbital notch, and abdominal plate pattern (Figs. 3B, 4A). The presence of a notch extending from the posterior orbital rim is a character shared among most members of the Loricariini (Isbrücker, 1981; Burgess, 1989). Most species of *Loricaria* have a prominent post-orbital notch that is angular in shape (Fig. 3A), whereas in some it is present, but weakly developed and inconspicuous (as in *L. birindellii*; Fig. 3B). The only species lacking the notch entirely are *L. piracicabae*, *L. prolixa*, and *L. lentiginosa* (Isbrücker, 1981; Isbrücker and Nijssen, 1978; pers. obs.). In addition to having a shallow, inconspicuous post-orbital notch, the two juvenile specimens in MNRJ 25209 exhibit a nascent abdominal plate pattern that is similar to, although less developed than the two larger types of *L. birindellii* (Fig. 4A vs. B–C). Apart from the size discrepancy, they differ from the types of *L. birindellii* by lacking conspicuous dorsal saddles and caudal fin banding patterns, and by having fewer total lateral plates (32–33 vs. 34) and lateral abdominal plates (7–8 vs. 9).

Lack of sufficient material makes it impossible to determine at present whether the two juveniles from Rio das Mortes (Araguaia-Tocantins drainage) represent a distinct undescribed species of *Loricaria*, or broaden the known distribution of *L. birindellii* beyond its type locality in Rio Curuá. Either case is corroborated by distribution patterns of other fishes. For example, *Doras higuchii*, a species of thorny catfish, occurs in the Curuá (as well as the Jari, lower Trombetas, and Xingu, including its upper tributaries), but

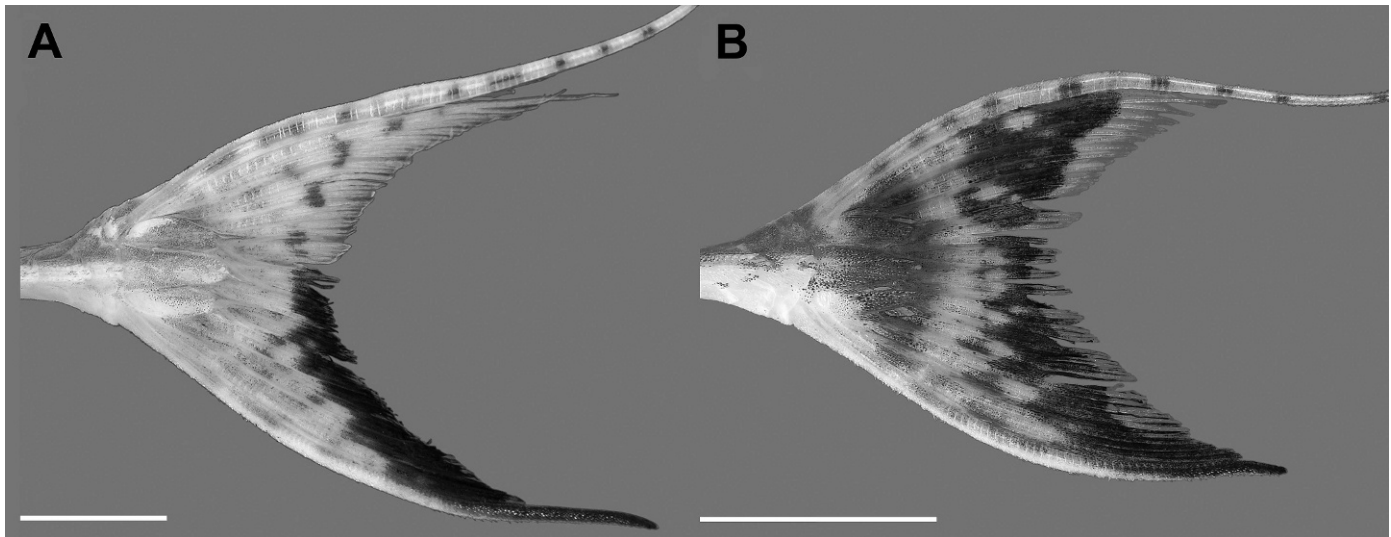


Fig. 5. Variation in caudal fin pigmentation in *Loricaria birindellii*, new species. (A) Holotype, MZUSP 97210, 231.9 mm SL and (B) paratype, ANSP 189318, 165.1 mm SL. Scale bars = 1 cm.

is apparently replaced by *D. higuchii* in the Araguaia-Tocantins basin (Sabaj Pérez and Birindelli, 2008). Likewise, *Hassar*, another genus of thorny catfish, is represented by *H. cf. affinis* in the Curuá and Rio Culuene, a tributary of the upper Xingu (Fig. 7), and *H. wilderi* in the lower Tocantins and Rio Araguaia including its tributary Rio das Mortes (MHSP, pers. obs.). Although these doradid distributions argue against the occurrence of *Loricaria birindellii* in the Tocantins-Araguaia basin, they do anticipate its occurrence in the upper Xingu. Support for the alternative scenario wherein the distribution of *Loricaria birindellii* includes the Araguaia-Tocantins exists among ghost knife-fishes (Apterontidae). *Apterontus camposdapazi*, a species described by de Santana and Lehmann (2006) from its type locality in the upper Tocantins (Fig. 7), was more recently discovered in the Rio Curuá (MZUSP 96187; MHSP, pers. obs.).

MATERIAL EXAMINED

Loricaria apeltogaster: Argentina, Santa Fé: MCP 10979, 1, 324 mm SL, Río Paraná (Río de la Plata drainage), La Isla Carabajal, 31°35'S, 60°41'W. Brazil, Mato Grosso State: MZUSP 24848, 1, 205 mm SL, Rio Cuiabá (Paraguay drainage), Baía do Mimoso, mouth of Baía da Mata, 16°11'S, 55°57'W; Rio Grande do Sul State: MCP 11891, 1, 264.5 mm SL, MCP 12424, 4, 266.7–282.8 mm SL, Rio Uruguai (Río de la Plata drainage), Rancho da Amizade, 28°38'S, 56°02'W. Paraguay: BMNH 1895.5.17.105 (lectotype), 176.9 mm SL, BMNH 1895.5.17.106 (paralectotype), 185.5 mm SL, BMNH 1895.5.17.107 (paralectotype), 189.9 mm SL (no specific locality); NMW 45151, 2, 191.6–192.3 mm SL, NMW 46152, 1, 196.5 mm SL, NMW 46159, 1, 204.9 mm SL, “Hapitapunta” (location unknown).

Loricaria aff. birindellii: Brazil, Mato Grosso State: MNRJ 25209, 2 of 8, 95.6–98.0 mm SL, Rio das Mortes (Araguaia drainage), Nova Xavantina, 14°40'9"S, 52°21'12"W.

Loricaria cataphracta: Brazil, Amazonas State: MCZ 8130, 1, 145 mm SL, Rio Negro; Pará State: MCZ 8129, 1, 150.5 mm SL, Rio Pará, Belém and environs, 01°27'S, 48°29'W. French Guiana, Cayenne: NRM 18186, 3, 134.1–170.5 mm SL,

Grand Bagot River (Comte drainage), sand banks downstream of Bagot. Guyana: AMNH 214812, 1, 111.7 mm SL, Berbice River (Atlantic drainage); AMNH 215086, 2, 121.4–129.3 mm SL, AMNH 215180, 1, 115.0 mm SL, Demerara River (Atlantic drainage), Malali; FMNH 53076, 1, 108.6 mm SL, Creek in Mora Passage, connection between lower Waini and Barima Rivers, near Morawhanna and Mabaruma; ROM 66708, 2, 135–151 mm SL, ROM 66729, 1, 120.5 mm SL, Waini River (Atlantic drainage), Kaniaballi, at Santa Cruz, 07°40'N, 59°14'W; ROM 66723, 2, 102.4–149.4 mm SL, ROM 66727, 1, 150.8 mm SL, Waini River (Atlantic drainage), Chinese Landing at base camp, 07°31'N, 59°33'W; ROM 66732, 2, 139.2–194.1 mm SL, Waikerebi Creek (Waini drainage), Waikerebi Indian Village, 07°31'N, 59°23'W; ROM 66731, 1, 108.6 mm SL, Pomeroun River (Atlantic drainage), Moruka-Pomeroun, 10 km downstream of Charity, 07°29'N, 58°38'W. Suriname, Brokopondo District: ZMA 106.233, 5, 97.7–106.5 mm SL, Sara Creek (Suriname drainage), 27 km S of village dam; Marowijne District: ZMA 106.230, 8, 250.6–280.3 mm SL, Marowijne River, near village Galibi, 05°45'N, 54°00'W.

Loricaria clavipinna: Peru, Loreto Department: ANSP 68665 (holotype), 138.5 mm SL, Río Ucayali (Amazonas drainage), Contamaná, 07°19'S, 75°04'W; INHS 40389, 1, 126.4 mm SL, INHS 40468, 1, 157.4 mm SL, INHS 53748, 4, 88.3–173.9 mm SL, Río Nanay (Amazonas drainage), Pampa Chica, N edge of Iquitos, 3°45'07"N, 73°16'59"W; INHS 40453, 156.3 mm SL, Río Nanay (Amazonas drainage), beach about one hour by canoe upstream from Santa Clara, 3°46.63'N, 73°22.21'W; INHS 44218, 4, 102.2–162.6 mm SL, Río Nanay (Amazonas drainage), beach upstream from Santa Clara, 13.9 km W Iquitos bearing 78°, 3°46'54.6"N, 73°21'49.6"W.

Loricaria lata: Brazil, Goiás State: BMNH 1889.11.14.64 (paralectotype), 163.1 mm SL, MCZ 46721 (lectotype), 267 mm SL, MCZ 8123 (2 paralectotypes), 195.5–255.6 mm SL, ZMA 123.731 (paralectotype), 218 mm SL, Rio Vermelho (Araguaia drainage), Goyaz; MCP 15891, 1, 113.9 mm SL, Rio Bagagem (Tocantins drainage), 13°59'S, 48°19'W; MNRJ 13006, 1, 138.9 mm SL, Rio Tocantins, Porto do Garimpo, 13°34'05"S, 48°06'04"W; MNRJ 13008, 1, 159.6 mm SL, Rio São Félix (Tocantins drainage), 13°32'07"S, 48°05'05"W;



Fig. 6. *Loricaria birindellii*, new species, holotype, MZUSP 97210, 231.9 mm SL, dorsal and ventral views of adult male in life.

MNRJ 18364, 5, 103–158.3 mm SL, Rio Tocantins, pools along left bank, Ponte Rubão; MNRJ 18554, 2, 94.9–158 mm SL, Rio Tocantins, downstream of Serra da Mesa Dam, 13°49'S, 48°01'W.

Loricaria simillima: Bolivia, Beni Department: FMNH 55111, 1, 131.5 mm SL, San Joaquin (Mamoré drainage); UMMZ 204971, 6, 205.6–224.7 mm SL, Río Itenez, (Mamoré drainage), 9 km SE Costa Marques, 12°32'S, 24°64'W. Brazil,

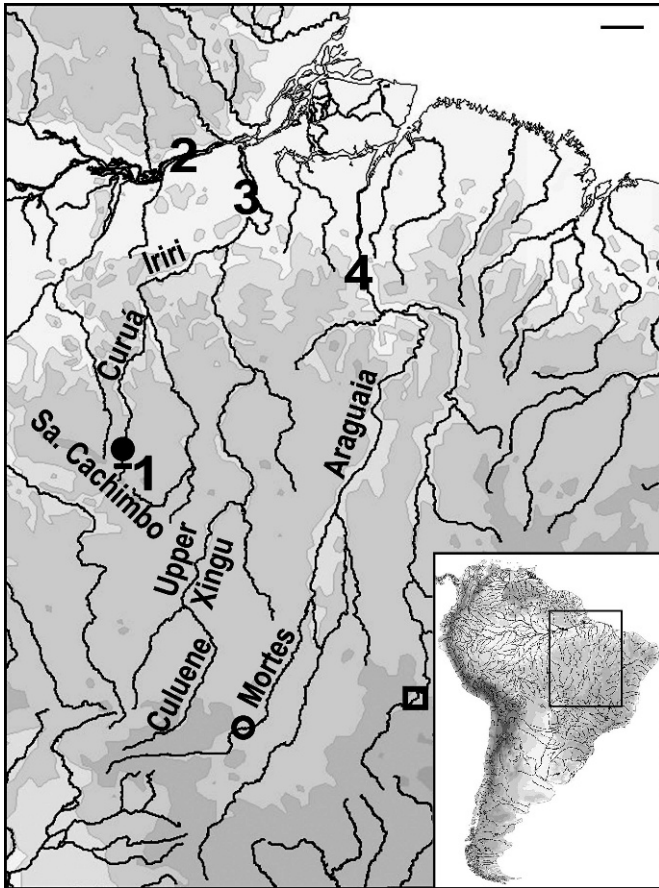


Fig. 7. Geographic distribution of *Loricaria birindellii* (closed circle, type locality shared with that of *Doras higuchii* and occurrence of *Hassar cf. affinis*) and *L. aff. birindellii* (open circle), and type locality of *Apteronotus camposdapazi* (open square). 1 = large falls separating upper from lower Rio Curua, 2 = Rio Amazonas, 3 = lower Rio Xingu, 4 = Rio Tocantins. Scale bar ca. 100 km.

Amazonas State: INHS 73014, 1, 125 mm SL, Lago Janauacá (Amazonas drainage), ca. 42 km SW of Manaus; MZUSP 56657, 2, 101.6–111.6 mm SL, Rio Amazonas, 03°22'48"S, 58°47'25"W; Goiás State: CAS 6463, 1, 143.2 mm SL, Rio Santa Teresa (Tocantins drainage), Barra Fazenda; MZUSP 89428, 6, 107–213 mm SL, Rio Palmital, tributary Rio Crixás (Araguaia drainage), near Mundo Novo, under GO-156 bridge, 13°46'28"S, 50°16'W; Rondônia State: FMNH 59669, 3, 124.4–163.9 mm SL, Rio Guaporé (Madeira drainage), Maciel rubber farm; UF 100669, 1, 179.2 mm SL, Rio Madeira (Amazonas drainage), ca. 40 km upstream from Jaciparaná. Ecuador, Pastaza Province: BMNH 1880.12.8.77 (lectotype), 163.1 mm SL, BMNH 1880.12.8.78 (paralectotype), 158 mm SL, BMNH 1880.12.8.79 (paralectotype), 151.3 mm SL, Rio Bobonaza, tributary Rio Pastaza (Marañon drainage), at Canelos, 01°39'S, 77°46'W. Peru, Huanuco Department: ROM 55695, 1 of 7, 106.9 mm SL, Río Llullapichis (Ucayali drainage), ca. 2 km upstream from mouth at Río Pachitea, 09°37'S, 74°57'W; ROM 55696, 1, 175.8 mm SL, mouth of Río Llullapichis tributary (Ucayali drainage), ca. 2 km E of Panguana Station, 09°37'S, 74°55'W; Loreto Department: ANSP 138928, 5, 117.9–188.6 mm SL, Río Amazonas, vicinity Iquitos, between Isla Iquitos and Isla Lapuna, near Isla Lapuna shore; FMNH 111003, 4, 156.5–189.7 mm SL, Laguna Rimachi, near Caño Rimachi (Pastaza-Marañon drainage), 4°25'49"S, 76°40'20"W; INHS 39873, 1, 89.3 mm SL, Río Amazonas, across from Puebla Gallito, 7.68 mi SE Iquitos,

3°49'15"S, 73°09'43"W; INHS 39968, 1, 217.7 mm SL, Río Itaya (Amazonas drainage), ca. 4–5 km upstream from Iquitos (Belém) above and below mouth of Quebrada Mazana, 3°47'71"S, 73°17'29"W; INHS 43343, 1, 164.4 mm SL, Río Itaya (Amazonas drainage), 11 km SSW center of Iquitos, bearing 39°, 3°49'47.6"S, 73°18'02.9"W; INHS 52729, 1, 135.1 mm SL, Río Marañon (Amazonas drainage), along S bank of N channel of Río Marañon opposite Nauta, 4°30.649'S, 73°34.092'W; INHS 53846, 1, 101.3 mm SL, INHS 54992, 1, 116.3 mm SL, SIUC 37868, 1, 100 mm SL, Río Napo (Amazonas drainage), opposite Mazan, N channel of Río Napo, N of Isla Milagro, 3°28.986'S, 73°05.203'W; INHS 54791, 1, 106 mm SL, Río Marañon (Amazonas drainage), floodplain along S bank of S channel of Río Marañon due S of Nauta, 4°30.6'S, 73°34.1'W; INHS 55407, 1, 150.5 mm SL, Río Amazonas, beach along E bank of E channel, opposite Iquitos; Ucayali Department: NRM 28570, 1, 106.2 mm SL, Lago Yarinacocha (Ucayali drainage), 8°22'S, 74°33'W.

ACKNOWLEDGMENTS

We thank the following individuals and institutions for loans of material and hosting museum visits: B. Brown and S. Schaefer (AMNH); J. Lundberg (ANSP); J. Maclaine and O. Crimmen (BMNH); D. Catania and T. Iwamoto (CAS); M. A. Rogers, K. Swagel, and P. Willink (FMNH); C. Mayer and M. Retzer (INHS); R. Reis (MCP); K. Hartel (MCZ); P. Buckup (MNRJ); L. Sousa, O. Oyakawa, J. Birindelli, and M. de Pinna (MZUSP); H. Wellendorf and E. Mikschi (NMW); E. Ahlander and S. Kullander (NRM); E. Holm and R. Winterbottom (ROM); B. Burr and J. Stewart (SIUC); R. Robins and L. Page (UF); D. Nelson (UMMZ); and I. Isbrücker (ZMA). Special thanks to N. Lujan, A. Netto-Ferreira and L. Sousa for their expertise in the field on the Pipe expedition. B. Burr provided invaluable support and guidance to MRT throughout graduate studies. This research was supported in part through grants to MRT, including a Field Museum Visiting Scientist Scholarship, Böhlke Award (Academy of Natural Sciences, Philadelphia), Ernst Mayr Award (Harvard University Museum of Comparative Zoology), Dissertation Research Award (Southern Illinois University), and the All Catfish Species Inventory (DEB-0315963).

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