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## A new species of *Ituglanis* from the Rio Xingu basin, Brazil, and the evolution of pelvic fin loss in trichomycterid catfishes (Teleostei: Siluriformes: Trichomycteridae)

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### Abstract

A new species of the trichomycterid catfish genus *Ituglanis* is described from the Rio Curuá, Rio Xingu basin, Rio Amazonas drainage, Brazil. *Ituglanis apteryx*, new species, is promptly distinguished from congeners, except some specimens of *I. parahybae* (Eigenmann), by the absence of pelvic fins, girdle, and muscles. The new species differs from *I. parahybae* in the pattern of the cephalic laterosensory system; the absence of a posterior cranial fontanel; the presence of an epural; and the number of branchiostegal rays, ribs, and vertebrae. *Ituglanis apteryx* is one among the several trichomycterids lacking pelvic fins. Analysis reveals that pelvic fin loss independently evolved several times during the trichomycterid radiation.

**Key words:** Loricarioidea, catfish, taxonomy, systematics, phylogeny, musculature

### Introduction

Trichomycteridae is a diversified family of catfishes (Siluriformes) with more than 260 valid species (Eschmeyer & Fong 2013). Trichomycterids inhabit the inland waters of almost the entire Neotropical region, occurring in a large array of habitats that include fast-flowing streams, lakes, large rivers, and subterranean watercourses (Berra 2007; de Pinna & Wosiacki 2003; Eigenmann 1918; Miles 1942; Rizzato *et al.* 2011). The most remarkable morphological feature of trichomycterids is their specialized opercular apparatus, in which the opercle and interopercle are drastically modified and equipped with noticeable patches of odontodes (= dermal teeth; Baskin 1973; de Pinna 1992a, 1998). By means of specialized muscles and ligaments, trichomycterids manoeuvre the opercle and interopercle, using the patches of odontodes to anchor and move along hard substrate of riverbeds (Adriaens *et al.* 2010; Datovo & Bockmann 2010). This sophisticated apparatus helps some trichomycterids to ascend torrential watercourses and even climb up vertical walls in rapids and waterfalls (Eigenmann 1918; Mikolji 2013). The candirus, a group of semi-parasitic trichomycterids (Stegophilinae and Vandelliinae) that feed on mucus, scales, or blood of other fishes, use their modified opercular apparatus for hanging onto the body of their hosts (de Pinna 1998; Zuanon & Sazima 2004).

The Trichomycterinae is the most abundant subfamily of the Trichomycteridae, encompassing more than 70% of its alpha diversity (Eschmeyer & Fong 2013). Among the eight genera currently allocated in the Trichomycterinae, *Ituglanis* is the second most speciose with more than 20 species recognized to date (Eschmeyer 2013). Nearly half of the species of the genus were described in the last decade, and several other known new species of *Ituglanis* still await formal description. The present study describes a new species of *Ituglanis* from the Curuá River, a tributary of the Iriri River in the Xingu basin, Amazonas drainage, Brazil.

### Material and methods

Measurements were point-to-point, taken with digital calipers and recorded to the nearest 0.1 mm following Datovo & Landim (2005). Number of post-Weberian vertebrae counts the compound caudal centrum (de Pinna &

Ng 2004; Lundberg & Baskin 1969) as one element. Number of odontodes, branchiostegal rays, unsegmented rays, fin radials, and elements of the axial skeleton were taken from stained and dissected specimens. In the fin counts, lower case Roman numerals represent unbranched soft rays and Arabic numerals branched soft rays. The two posteriormost closely set rays in dorsal and anal fins were counted separately. Osteological and myological terminologies follow Datovo & Bockmann (2010) and Datovo & Vari (2013). Nomenclature for the laterosensory system follows Bockmann *et al.* (2004). For the study of the musculoskeletal system, specimens were prepared according to the protocol of Datovo & Bockmann (2010).

Specimen-preparation abbreviations: CS, cleared and stained; MS, stained for musculoskeletal dissections; XR, radiographed; ML, tissue sampled for molecular analysis. Morphometric abbreviations: SL, standard length; HL, head length. Institutional acronyms (all from Brazil): LIRP, Laboratório de Ictiologia de Ribeirão Preto, Universidade de São Paulo; MCP, Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre; MZUSP, Museu de Zoologia da Universidade de São Paulo; MNRJ, Museu Nacional do Rio de Janeiro; NUP, Núcleo de Pesquisas em Limnologia, Ictiologia e Aquicultura, Maringá; UFRGS, Departamento de Zoologia, Universidade Federal do Rio Grande do Sul, Porto Alegre.

Comparative material: *Ituglanis amazonicus* (Steindachner): MCP 33722 (5 specimens: 1 CS), MCP 36252 (1 specimen), MCP 36257 (13 specimens: 1 CS, 2 XR), MZUSP 86801 (4 specimens), MZUSP 86820 (1 specimen XR), MZUSP 86821 (12 specimens: 1 CS, 1 MS); *I. australis* Datovo & de Pinna: MCP 10420 (4 paratypes: 1 CS), MCP 37695 (7 paratypes: 2 CS, 1 MS, 1 XR), MZUSP 81016 (1 paratype), MZUSP 112505 (holotype), MZUSP 112506 (2 paratypes), MZUSP 112507 (2 paratypes), UFRGS 7444 (1 paratype), UFRGS 12578 (1 paratype), UFRGS 13600 (1 paratype), UFRGS 15687 (1 paratype); *I. bambui* Bichuette & Trajano: MZUSP 79860 (holotype), MZUSP 79862 (4 paratypes: 1 CS), MZUSP 79864 (4 paratypes: 2 CS); *I. eichorniarum* (Miranda Ribeiro): MCP 36243 (1 specimen XR), MCP 36244 (1 specimen XR), MNRJ 780 (2 paralectotypes XR); *I. epikarsticus* Bichuette & Trajano: MZUSP 79869 (holotype), MZUSP 79870 (1 paratype), MZUSP 79871 (1 paratype CS), MZUSP 79872 (1 paratype CS); *I. herberti* (Miranda Ribeiro): MNRJ 1429 (3 paralectotypes XR), MNRJ 28466 (1 paralectotype XR), NUP 2238 (1 specimen), NUP 2239 (1 specimen XR), NUP 2240 (1 specimen), NUP 2241 (3 specimens: 1 CS, 2 XR), NUP 2242 (2 specimens XR), NUP 3187 (1 specimen); *I. ina* Wosiacki, Dutra & Mendonça: MZUSP 112508 (10 specimens: 2 CS, 1 XR); *I. macunaima* Datovo & Landim: MZUSP 88452 (holotype), LIRP 5642 (6 paratypes: 1CS), MZUSP 86237 (7 paratypes: 1CS), MZUSP 86251 (2 paratypes: 1 CS), MZUSP 86272 (1 paratype); *I. mambai* Bichuette & Trajano: MZUSP 94719 (4 paratypes); *I. nebulosus* de Pinna & Keith: MZUSP 69574 (1 paratype CS); *I. cf. macunaima*: MZUSP 103734 (35 specimens: 2 MS), MZUSP 103738 (18 specimens), MZUSP 103752 (20 specimens), MZUSP 103787 (7 specimens), MZUSP 103799 (10 specimens: 1 MS), MZUSP 103780 (9 specimens), MZUSP 103821 (4 specimens); *I. paraguassuensis* Campos-Paiva & Costa: MZUSP 102535 (6 specimens); *I. parahybae* (Eigenmann): MCP 17784 (1 specimen), MCP 18026 (1 specimen), MCP 18032 (1 specimen), MZUSP 71852 (3 specimens), MZUSP 114678 (3 specimens); *I. parkoi* (Miranda Ribeiro): MNRJ 3849 (holotype XR); *I. passensis* Fernández & Bichuette: MCP 27436 (3 specimens), MZUSP 80097 (3 specimens), MZUSP 80098 (3 specimens), MZUSP 80099 (2 specimens); *I. proops* (Miranda Ribeiro), MCP 20620 (9 specimens), MNRJ 781 (3 paralectotypes XR), MZUSP 60255 (94 specimens: 2 CS, 2 MS), MZUSP 70725 (15 specimens); *I. ramiroi* Bichuette & Trajano: MZUSP 79865 (holotype), MZUSP 79867 (3 paratypes: 2 CS), MZUSP 79868 (1 paratype); *I. sp. B*: MNRJ 11486 (36 specimens: 3CS, 1 MS), MNRJ 11490 (1 specimen); MZUSP 53976 (19 specimens: 1 MS); *I. sp. D*: MZUSP 52861 (1 specimen), MZUSP 52862 (1 specimen), MZUSP 53496 (13 specimens: 1 MS), MZUSP 69393 (12 specimens: 1 MS); *I. sp. G*: UFRGS 3245 (5 specimens: 1 MS).

### ***Ituglanis apteryx*, new species**

(Figs. 1–2, Table 1)

*Ituglanis* sp. F: Datovo & de Pinna (2014), p. 316 (list of material examined), 324 (discussion).

**Holotype.** MZUSP 115048, 63.4 mm SL; Brazil, Pará State, Altamira Municipality; Rio Amazonas drainage, Rio Xingu basin, Rio Iriiri sub-basin, Rio Curuá, cofferdam formed during the building of the Buriti Hydroelectric Dam (PCH); 08°46'09"S 54°57'02"W; collected by J. L. O. Birindelli, L. Souza, A. L. Netto-Ferreira, M. Sabaj-Perez, N. Lujan; 21 October 2007.

**Paratypes.** MZUSP 96876, 7 specimens (39.1–67.2 mm SL); 2 MS (56.9 mm SL; one specimen with anterior portion of head severed); same data as holotype.

**Diagnosis.** *Ituglanis apteryx* is promptly distinguished from all congeners, except some specimens of *I. parahybae*, by the absence of pelvic fins, girdle, and muscles (Fig. 1; vs. presence). Pelvic structures are absent in all known individuals of *I. apteryx*, whereas in *I. parahybae* only some specimens lack pelvic elements (Costa & Bockmann 1993; Datovo & de Pinna 2014). *Ituglanis apteryx* differs from *I. parahybae* in the following traits: presence of a supraorbital laterosensory canal with pores  $s_1$ ,  $s_3$ , and  $s_6$  (Fig. 2; vs. entire supraorbital canal lacking); absence of a posterior cranial fontanel (Fig. 2; vs. presence); six branchiostegal rays (vs. eight); two pair of ribs (vs. six); 43–45 post-Weberian vertebrae (vs. 38); 27 predorsal post-Weberian vertebrae (vs. 22); and presence of an epural (vs. absence; Costa & Bockmann 1993; Morris *et al.* 2006; Sarmiento-Soares *et al.* 2006).

**Description.** Morphometrics given in Table 1; see Fig. 1 for general external aspects. Body elongate with dorsal and ventral profiles ranging from straight to slightly convex on trunk and from straight to gently convex along caudal peduncle. Cross section of trunk at pectoral girdle nearly circular and becoming gradually more compressed posteriorly.

**TABLE 1.** Morphometrics of *Ituglanis apteryx*, new species. Range, mean, and standard deviation (SD) include holotype and paratypes.

Measurement	Holotype	Range	Mean	SD
STANDARD LENGTH (mm)	63.4	39.1–67.2	–	–
PERCENT OF STANDARD LENGTH				
Total length	109.8	107.9–110.3	109.2	1,6
Predorsal length	73.3	71.0–73.3	72.3	1,7
Preanal length	71.3	71.0–71.3	71.2	0,9
Caudal peduncle length	21.0	18.9–21.0	19.8	1,5
Body depth	11.8	9.2–10.6	11.3	2,6
Caudal peduncle depth	10.6	8.0–	9.3	1,8
Dorsal-fin base length	7.6	7.1–7.7	7.5	0,4
Anal-fin base length	7.1	4.8–7.1	6.0	1,7
Head length	14.2	13.7–15.9	14.6	1,5
PERCENT OF HEAD LENGTH				
Head depth	41.1	41.1–51.6	47.2	4,0
Head width	83.3	81.0–85.9	84.1	3,5
Interorbital width	22.2	22.2–23.9	23.2	1,2
Eye diameter	8.9	7.6–9.4	8.6	1,2
Snout length	34.4	30.4–34.4	32.6	2,8
Maxillary barbel length	56.7	53.1–56.7	55.1	2,5
Rictal barbel length	44.4	44.4–47.8	45.9	2,4
Nasal barbel length	50.0	50.0–53.3	51.6	2,3
Breadth of mouth	33.3	31.3–39.1	33.5	3,3

Head wide and depressed, with anterior margin rounded, dorsal profile straight, and ventral profile convex. Eyes situated on anterior half of head, near to posterior nostril. Orbital rim not free. Elliptical ocular capsule formed by thin and translucent skin not adhered to eyeball's surface. Anterior nostril surrounded by tubular flap continuous with base of nasal barbel; posterior nostril opening with crescent thin flap along its anterior border only.

Mouth subterminal and slightly convex in ventral view. Lower lip with lateral fleshy folds continuous with rictal barbel base. Nasal barbel emerging from lateral region of anterior nostril and not reaching occiput. Maxillary and rictal barbels nearly of same size with tips reaching middle region of interopercular patch of odontodes. Branchial membranes thick, united to isthmus only anteriorly and forming small free fold across isthmus. Branchiostegal rays six; median most rays barely visualized through skin.

Opercular patch of odontodes rounded and dorsolaterally placed on head; 13 (1 specimen) or 16 (1 specimen) conical opercular odontodes. Interopercular patch of odontodes narrow, elongate and posteriorly curved; 20 (1 specimen) or 25 (1 specimen) conical interopercular odontodes.

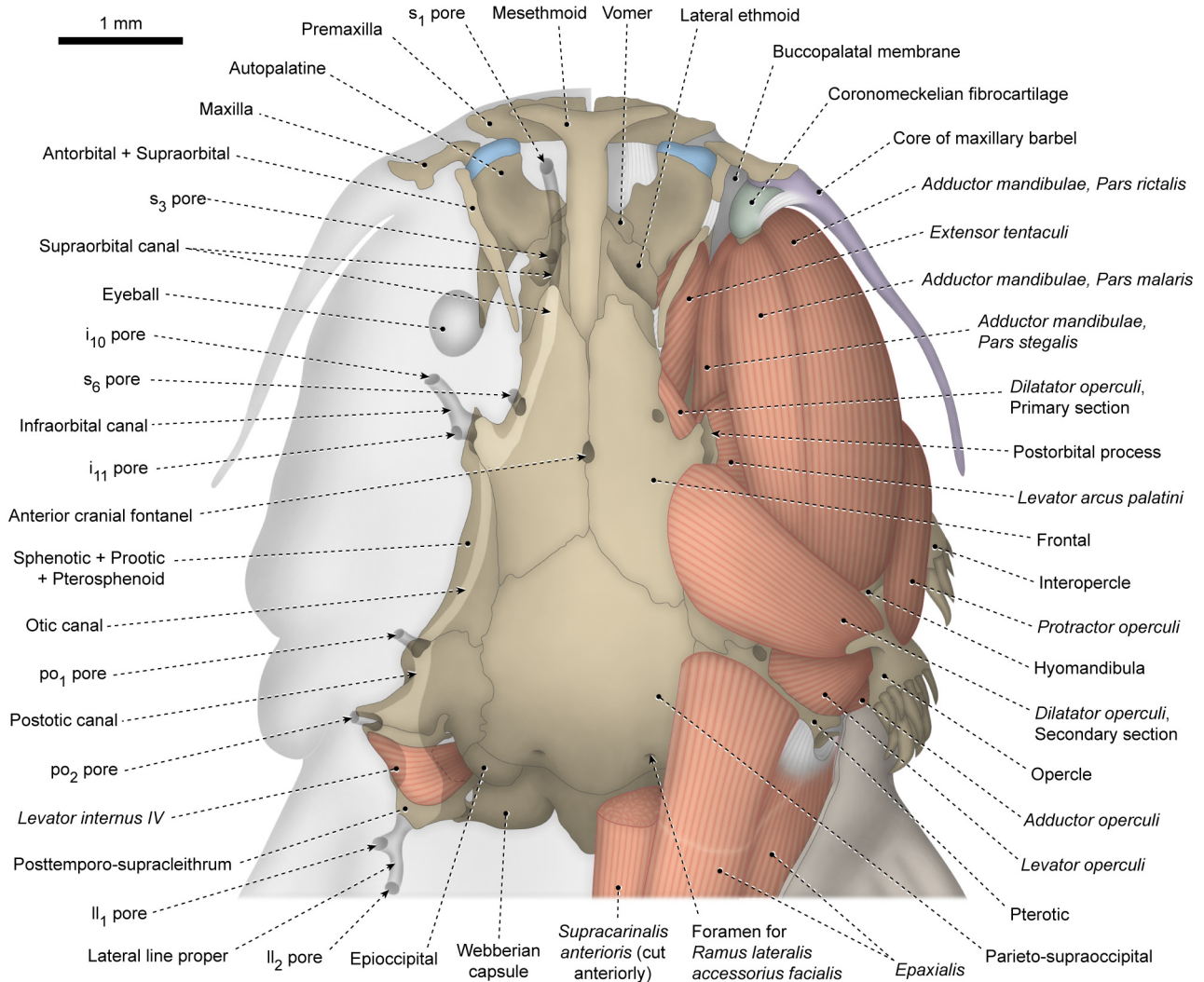
Pectoral fin with first ray slightly longer than remaining rays and forming short pectoral filament; remaining rays nearly same size resulting in straight distal margin of fin. Pectoral-fin rays i,4 (both sides of 7 specimens, including holotype; one side of 1 specimen) or, rarely, i,3 (one side of 1 specimen). Anterior portion of pectoral-fin base partially covered by branchial membrane. Axillary pore present (7 specimens; holotype) or, rarely, absent (1 specimen).

Pelvic fin, girdle, and muscles absent in all examined specimens.

Dorsal fin on posterior third of body, with origin situated approximately at vertical through anal-fin origin. Dorsal fin with distal margin convex; principal rays ii,7 (6 specimens; holotype), rarely i,7 (1 specimen) or ii,6 (1 specimen); unsegmented rays iii (2 specimens); and eight basal radials (2 specimens) located between neural spines of 27<sup>th</sup> and 31<sup>st</sup> (1 specimen) or 27<sup>th</sup> and 32<sup>nd</sup> (1 specimen) post-Weberian vertebrae.



**FIGURE 1.** *Ituglanis apteryx*, new species, holotype, MZUSP 115048, 63.4 mm SL; Brazil, Pará State, Altamira Municipality; Rio Amazonas drainage, Rio Xingu basin, Rio Iriri sub-basin, Rio Curuá.



**FIGURE 2.** Dorsal cephalic musculoskeletal system of *Ituglanis apteryx*, paratype, MZUSP 96876, 56.9 mm SL. Dorsal view; left superficial muscles, right eyeball, and right laterosensory system not shown.

Anal fin originating approximately at vertical through dorsal-fin origin. Anal fin with distal margin convex; principal rays ii,5 (6 specimens; holotype), rarely i,5 (1 specimen) or ii,4 (1 specimen); unsegmented rays ii (1 specimen) or iii (1 specimen); and six basal radials (2 specimens) located between haemal spines of 27<sup>th</sup> and 31<sup>st</sup> (1 specimen) or 28<sup>th</sup> and 32<sup>nd</sup> (1 specimen) post-Weberian vertebrae.

Caudal fin with posterior margin ranging from straight to slightly convex and rounded dorsal and ventral corners. Principal caudal-fin rays i,5 (8 specimens; holotype) on dorsal lobe and i,6 (7 specimens; holotype) or, rarely, i,5 on ventral lobe (1 specimen); procurrent rays xi (1 specimen) or xv (1 specimen) on dorsal lobe and ix (1 specimen) or xi (1 specimen) on ventral lobe. Upper caudal plate formed by one – presumably compound hypural 3+4+5 (1 specimen) – or two separate elements – presumably hypural 3 and compound hypural 4+5 (1 specimen). Lower caudal plate consisting of single element presumably formed by fusion of parhypural with hypurals 1 and 2 (2 specimens). Single elongated epural present.

Post-Weberian vertebrae 43 (1 specimen) or 45 (1 specimen). First complete haemal arch on fifth post-Weberian vertebrae (2 specimens); first complete haemal spine on 22<sup>th</sup> (1 specimen) or 24<sup>th</sup> (1 specimen) post-Weberian vertebrae. Ribs two (2 specimens).

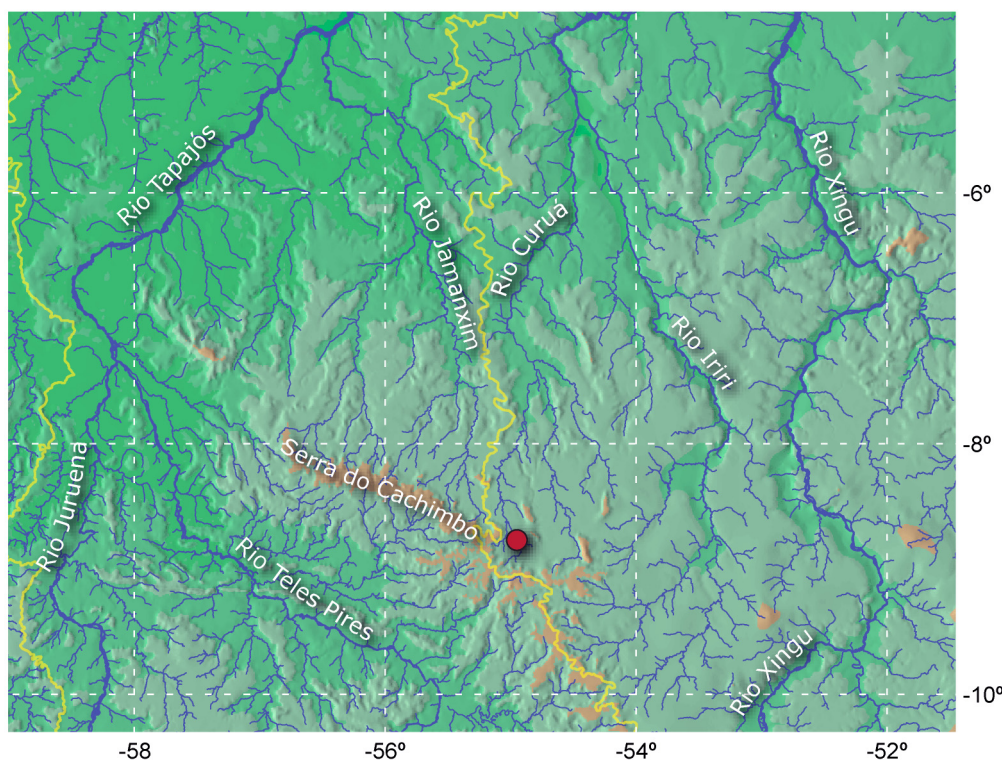
Laterosensory canals with simple (non-dendritic) tubes ending in single pores (Fig. 2). Supraorbital canal mostly within frontal bone with pores s<sub>1</sub>, s<sub>3</sub> and s<sub>6</sub>. Infraorbital canal consisting of posterior segment only, with branches and pores i<sub>10</sub> and i<sub>11</sub>. Otic canal without pores and running through sphenotic-prootic-pterosphenoid.

Postotic canal traversing pterotic and posttemporo-supracleithrum, with pores  $po_1$  and  $po_2$  located anterodorsal to opercular patch of odontodes. Short lateral line proper with pores  $ll_1$  invariably present and  $ll_2$  present (both sides of 7 specimens, one side of 1 specimen) or, rarely, absent (one side of 1 specimen).

**Coloration in ethanol.** Unpigmented body background white to pale yellow (Fig. 1). Dark brown melanophores almost uniformly scattered on dorsolateral region of trunk in smaller specimens (less than 39.7 mm SL). Larger individuals (more than 56.9 mm SL) with melanophores more concentrated into specific regions forming irregularly shaped, nebulous spots. Most conspicuous spots arranged into two, three, or four longitudinal rows. Dorsolateral and midlateral bilaterally paired rows invariably present and running from anterior portion of trunk to caudal-fin base. Additional ventrolateral bilaterally paired row on caudal peduncle and dorsosagittal unpaired row on anterior region of body sometimes present. Spots arranged into rows occasionally coalesced in specific regions. Ventral surface of abdomen fully or mostly devoid of dark pigmentation. Proximal regions of fins with brown melanophores sometimes forming spots, especially on caudal fin. Dorsolateral and anteroventral regions of head covered with scattered brown melanophores not forming discrete spots. Barbels with scattered dark melanophores at least on their proximal portions. Dark pigmentation on membrane covering brain sometimes visible externally as a large trapezoidal dark mark on dorsoposterior region of head.

**Etymology.** The specific epithet derives from the Greek *a*, meaning without, and *pteryx*, meaning fin. In reference to the absence of pelvic fins in the new species.

**Distribution.** *Ituglanis apteryx* is known only from its type series collected in the reservoir formed during the building of the Buriti Hydroelectric Dam, across the Rio Curuá, Rio Irii sub-basin, Rio Xingu basin, Rio Amazonas drainage, Brazil (Fig. 3).



**FIGURE 3.** Geographic distribution of *Ituglanis apteryx* (red circle). Yellow lines indicate boundaries between basins of Rio Madeira (left), Rio Tapajós (center) and Rio Xingu (right). Intermittent and first-order watercourses not shown.

## Discussion

The taxonomic allocation of *Ituglanis apteryx* is unequivocal as it exhibits the ten synapomorphies for the Trichomycteridae, the 11 synapomorphies for the clade formed by all non-copionodontine and non-trichogenine trichomycterids, and none of the four synapomorphies for the TSVSG clade—a lineage consisting of the five

apical-most trichomycterid subfamilies, the Tridentinae, Stegophilinae, Vandelliinae, Sarcoglanidinae, and Glanapteryginae (Fig. 4; Baskin 1973; Datovo & Bockmann 2010; de Pinna 1992b, 1998). *Ituglanis apteryx* further presents the single possible synapomorphy for the Trichomycterinae advanced by Datovo & Bockmann (2010): the *levator internus IV* muscle (*sensu* Springer & Johnson 2004) attached to the dorsal face of the posttemporo-supracleithrum (Fig. 2; *vs.* muscle attached solely to the ventral face of this bone).

Costa & Bockmann (1993) established the genus *Ituglanis* to circumscribe a number of closely related species previously allocated in *Trichomycterus*, a diverse non-monophyletic assemblage that primarily includes all trichomycterines lacking the diagnostic features of the other genera of the subfamily (Datovo & Bockmann 2010; de Pinna 1998). *Ituglanis* is traditionally diagnosed by three osteological synapomorphies: a posterior cranial fontanel absent or reduced to a small circular opening on the posterior region of the parieto-supraoccipital; an anteriorly directed postorbital process of sphenotic-prootic-pterosphenoid; and the deeply concave medial border of the autopalatine (Costa & Bockmann 1993; Datovo & Landim 2005). *Ituglanis apteryx* possesses these three characters (Fig. 2), as well as the four additional features proposed by Wosiacki *et al.* (2012) as diagnostic of their sample of *Ituglanis* (*I. amazonicus*, *I. eichorniarum*, *I. ina*, *I. proops* and their *Ituglanis* sp.): five or more post-Weberian vertebrae lacking both a complete haemal spine and an associated rib; medially directed parapophyses of the first four post-Weberian vertebrae; two or fewer vertebrae between the first dorsal-fin pterygiophore and the first anal-fin pterygiophore; and 23 or more post-Weberian vertebrae anterior to the first dorsal-fin pterygiophore. While the first character of Wosiacki *et al.* (2012) in fact may be a synapomorphy for *Ituglanis*, the remaining characters advanced by these authors are either not universal across the genus or are also found in other trichomycterines (Datovo & de Pinna 2014). As a consequence, the optimization of the tree latter characters of Wosiacki *et al.* (2012) as synapomorphies for *Ituglanis* is disputable (Datovo & de Pinna 2014).

Traditional phylogenetic schemes place *Scleronema* and *Ituglanis* as successive sister taxa to the TSVSG clade on the basis of the sharing of three characters: a reduced interopercular patch of odontodes; the thin and elongated lateral processes of the parurohyal; and the possession of three or fewer abdominal vertebrae (Costa & Bockmann 1993, 1994; de Pinna 1998). The reduced number of ribs (1–6) was further offered as evidence for the grouping of *Ituglanis* with the TSVSG clade (Costa & Bockmann 1993; de Pinna 1998). Datovo & Bockmann (2010), however, reviewed and demonstrated the invalidity of all these characters as supporting a *Scleronema–Ituglanis–TSVSG* alignment. These authors further proposed that both *Ituglanis* and *Scleronema* should be alternatively grouped with other trichomycterines into a monophyletic lineage (Fig. 4), which was diagnosed by the unique possession of a *levator internus IV* muscle attaching onto the dorsal face of the posttemporo-supracleithrum (Fig. 2). Subsequent studies confirm the presence of this character in a number of other species of *Trichomycterus* and *Ituglanis*, including *I. apteryx* (Fig. 2; Datovo *et al.* 2012; Datovo & de Pinna 2014). Recent discoveries of new species also seem to corroborate the hypothesis that *Ituglanis* is more closely related to generalized trichomycterines than to the TSVSG clade. *Trichomycterus cachiraensis* Ardila Rodríguez, from Río Magdalena, Colombia, is perhaps the most remarkable of these discoveries. This species presents the two most conspicuous diagnostic characters of *Ituglanis*—the small circular posterior cranial fontanel and the anteriorly directed postorbital process of the sphenotic-prootic-pterosphenoid—but lack all characters purportedly supporting the alignment of *Ituglanis* and *Scleronema* with the TSVSG clade (Ardila Rodríguez 2008). *Trichomycterus brachykechenos* Ferrer & Malabarba, from Laguna dos Patos drainage, Brazil, also exhibits conditions that might be interpreted as intermediate between those of *Ituglanis* and generalized trichomycterines (Ferrer & Malabarba 2013).

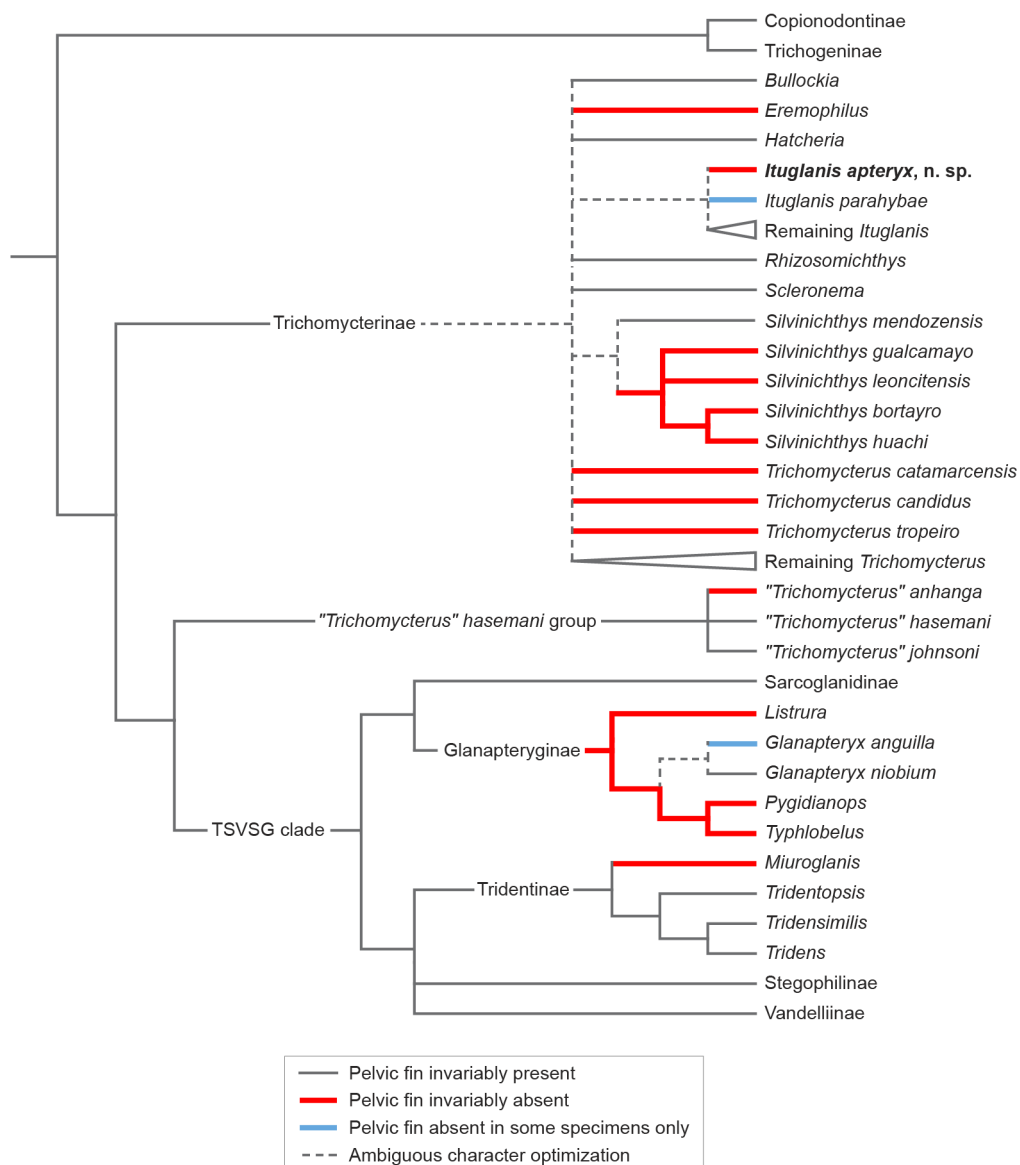
Datovo & de Pinna (2014) reviewed previous attempts to delimit monophyletic groups within *Ituglanis* (de Pinna & Keith 2003; Wosiacki *et al.* 2012) and concluded that the internal relationships of the genus remain unknown (Fig. 4). *Ituglanis apteryx* shares a number of derived characters with different sets of congeners, thus portraying the difficulties in resolving the internal relationships of the genus. The most noticeable of these characters are discussed in the following paragraphs.

Most species of *Ituglanis* have a posterior cranial fontanel reduced to a small circular opening in the parieto-supraoccipital, a condition considered synapomorphic for the genus (Costa & Bockmann 1993). This morphology contrasts with the longitudinally elongated fontanel enclosed by the frontal and parieto-supraoccipital, a condition that characterizes nematogenyids and primitive trichomycterids. In *I. apteryx*, *I. macunaima*, *I. mambai*, and some specimens of *I. epikarstikus* the reduction of the posterior cranial fontanel is carried further and this opening is completely absent (Fig. 2; Bichuette & Trajano 2004, 2008; Datovo & Landim 2005). Stegophilines and several glanapterygines, sarcoglanidines, and vandelliines also lack a posterior cranial fontanel (Baskin 1973; de Pinna

1989a; de Pinna & Starnes 1990). Such absences, however, are most parsimoniously interpreted as parallelisms relative to those occurring within *Ituglanis*.

The two specimens of *Ituglanis apteryx* prepared for musculoskeletal study exhibit a single elongated epural. The presence of this ossification is uncommon within *Ituglanis* and was also found in only one among the seven examined specimens of *I. proops*.

The distinctive meristic features of *Ituglanis apteryx* seem to have a mosaic distribution among species of the genus. The new species has 43–45 post-Weberian vertebrae, the highest vertebral count known to date within *Ituglanis*. Only *I. parkoi* and a few specimens of *I. amazonicus* and *I. herberti* also present 43 post-Weberian vertebrae. *Ituglanis apteryx* further shares a reduced number of pectoral-fin rays (i,4 vs. i,5 or more) with *I. cahyensis* Sarmiento-Soares, Martins-Pinheiro, Aranda & Chamon, *I. macunaima*, and *I. parahybae*; and a reduced number of ribs (one to three vs. five or more) with *I. amazonicus*, *I. eichorniarum*, *I. gracilior* (Eigenmann), *I. herberti*, *I. ina*, *I. macunaima*, *I. metae* (Dahl), *I. nebulosus*, and *I. parkoi* (pers. obs.; Datovo & Landim 2005; de Pinna & Keith 2003; Morris *et al.* 2006).



**FIGURE 4.** Maximum parsimony optimization of the pelvic fin loss superimposed on the cladogram of the Trichomycteridae. Topology primarily based on Datovo & Bockmann (2010), with the inclusion of data from Baskin (1973) on the Tridentinae, de Pinna (1989b) on the Glanapteryginae, Dutra *et al.* (2012) on the *Trichomycterus hasemani* group, and Fernández *et al.* (2014) on *Silvinichthys*.



The most notable morphological feature of *Ituglanis apteryx* is the absence of pelvic fin, girdle and muscles (Fig. 1). Many other trichomycterids also lack pelvic fins: *Eremophilus mutisii* Humboldt, *I. parahybae*, *Silvinichthys bortayro* Fernández & de Pinna, *S. gualcamayo* Fernández, Sanabria & Quiroga, *S. huachi* Fernández, Sanabria, Quiroga & Vari, *S. leoncitis* Fernández, Dominino, Brancolini & Baigún, *Trichomycterus catamarcensis* Fernández & Vari, *T. candidus* Miranda Ribeiro, *T. tropeiro* Ferrer & Malabarba, "*T.*" *anhanga* Dutra, Wosiacki & de Pinna, *Miuroglanis platycephalus* Eigenmann & Eigenmann, and all glanapterygines except some specimens of *Glanapteryx* (pers. obs.; de Pinna 1989b; de Pinna & Wosiacki 2003; Dutra *et al.* 2012; Eigenmann 1918; Fernández & de Pinna 2005; Fernández & Vari 2000; Fernandez *et al.* 2014; Ferrer & Malabarba 2011; Myers 1927). In light of the currently accepted hypotheses of relationships among the Trichomycteridae, the loss of pelvic fins clearly evolved several times during the radiation of the family (Fig. 4; de Pinna 1989a, b; Fernandez *et al.* 2014). In the well-resolved regions of the trichomycterid cladogram, the pelvic fins are optimized as having been lost independently at the base of the Glanapteryginae, in *Miuroglanis* (Tridentinae), and in "*Trichomycterus*" *anhanga* (no designated subfamily). The number of events of pelvic fin loss within the Trichomycterinae remains undetermined in function of the current lack of phylogenetic resolution of the subfamily. Among species of *Ituglanis*, only some individuals of *I. parahybae* also lack pelvic structures (Costa & Bockmann 1993). While many morphological features discard a possible conspecificity between *I. apteryx* and *I. parahybae* (see Diagnosis), a closer relationship between the two species is unwarranted given the above discussed characters shared with other congeners. Therefore, it is impossible to determine at this time whether or not the pelvic fin loss in *I. apteryx* and *I. parahybae* evolved independently.

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