

## *Ituglanis macunaima*, a new catfish from the rio Araguaia basin, Brazil (Siluriformes: Trichomycteridae)

Aléssio Datovo\* and Maria Isabel Landim\*\*

*Ituglanis macunaima*, new species, is described from the rio Araguaia basin, Mato Grosso, Brazil. It is distinguished from its congeners by the following combination of characters: posterior fontanel absent; pectoral-fin rays usually i,4; pelvic-fin rays usually i,4; branched caudal-fin rays usually 5,5; mottled color pattern formed by irregular to roundish dark brown spots on whitish background; reduced supraorbital canal with pores s1 and s2 lacking; reduced infraorbital canal with pores i1 and i3 lacking; 2-3 pleural ribs; and 35-38 vertebrae. A detailed description and illustrations of the skeleton of *I. macunaima* are also provided. Comparisons with other trichomycterids are presented, and several reductive traits of *I. macunaima* are discussed. Some comments are made about the systematics and phylogeny of the genus.

*Ituglanis macunaima*, espécie nova, é descrita da bacia do rio Araguaia, Mato Grosso, Brasil. Distingue-se de seus congêneres pela seguinte combinação de caracteres: fontanela posterior ausente; raios da nadadeira peitoral principalmente i,4; raios da nadadeira pélvica principalmente i,4; raios ramificados na nadadeira caudal principalmente 5,5; padrão de coloração mosqueado formado por manchas marrom-escuro irregulares ou levemente arredondadas distribuídas sobre uma matriz de tonalidade esbranquiçada; canal supra-orbital reduzido com poros s1 e s2 ausentes; canal infra-orbital reduzido com poros i1 e i3 ausentes; 2-3 costelas pleurais; e 35-38 vértebras. São fornecidas também a descrição e ilustração detalhada do esqueleto de *I. macunaima*. Comparações com outros tricomicterídeos são feitas e vários caracteres reductivos de *I. macunaima* são apontados e discutidos. Alguns pontos sobre a sistemática e filogenia do gênero também são comentados.

**Key words:** Loricarioidea, Osteology, Paedomorphosis, Taxonomy, Systematics.

### Introduction

The Trichomycteridae is the second most diverse family of the Loricarioidea, with close to 200 described species (de Pinna & Wosiacki, 2003) and numerous undescribed ones (de Pinna, 1998). Trichomycterids are distributed throughout Central and South America, and despite its enormous abundance, knowledge about the biology of most of its species is still very scarce (de Pinna, 1998). The family presents some of the most extraordinary diversification of forms and habits among Siluriformes. There are active swimmers (Copionodontinae and Trichogeninae), torrent dwellers (most “Trichomycterinae”), litter leaf dwellers (most *Ituglanis* Costa & Bockmann), psamophilic forms (Glanapteryginae and Sarcoglanidinae), and semiparasitic (the so-called “candirus” – the lepidophagous Stegophilinae and hematophagous Vandelliinae) species among its members (Bockmann, pers. comm.; de Pinna, 1992; de Pinna & Wosiacki, 2003). The monophyly of the Trichomycteridae is supported by a large number of synapomorphies

(Baskin, 1973; de Pinna, 1992, 1998). The most conspicuous of these are from the opercular series, which bears patches of odontodes on the opercle and interopercle in most of its members (de Pinna, 1998). The drastic modifications of this apparatus allow trichomycterids to anchor themselves on the substrate or on to hosts (as seen in the “candirus”; de Pinna, 1998).

Costa & Bockmann (1993) described the genus *Ituglanis* to circumscribe a monophyletic group composed of nine species previously included in *Trichomycterus* Valenciennes. They also suggested that the genus *Ituglanis* was the sister-group of a large clade composed of the Tridentinae, Stegophilinae, Vandelliinae, Sarcoglanidinae and Glanapteryginae (the so-called TSVSG clade). For this reason, *Ituglanis* has been regarded as a key-taxon to the understanding of some of the remarkable modifications exhibited by the highly specialized members of the family (de Pinna, 1998). Detailed morphological studies concerning *Ituglanis*, as the herein presented, may constitute a valuable contribution to the comprehension of the anatomy of members of TSVSG clade.

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Recently, five new species were described, four of them for extremely modified forms that inhabit caves of Central Brazil (Fernández & Bichuette, 2002; Bichuette & Trajano, 2004) and another, *Ituglanis guayaberensis* (Dahl), was included in the genus by de Pinna & Keith (2003). With the description of *Ituglanis macunaima*, the genus now comprises 16 species, a number probably still far from representing the real diversity of the genus. With increasing collecting efforts, especially in the Amazon basin – where the greatest diversity of the genus seems to occur (de Pinna, pers. comm.) – and a detailed taxonomic study, the number of species of *Ituglanis* will probably increase substantially.

We describe herein a new species of *Ituglanis* from the rio Araguaia basin, State of Mato Grosso, Brazil, and discuss some issues about the systematics of the genus.

### Material and Methods

Measurements were point to point, taken with digital calipers, to the nearest 0.1 mm. Body depth was measured just anterior to dorsal fin; pectoral width was measured just anterior to basis of pectoral fins; snout length was measured from the anterior margin of eye to anteriormost tip of upper lip. Measurements of caudal-peduncle length and eye diameter follow de Pinna (1992); remaining measurements follow Tchernavin (1944). Counts are according to de Pinna (1992). Number of odontodes, branchiostegal rays, unsegmented rays and all other osteological counts, were taken from radiographed, or cleared and stained specimens.

Terminology for osteology and cephalic laterosensory system follow Bockmann *et al.* (2004). Myological nomenclature follows Winterbottom (1974). For skeletal examination, specimens were cleared and stained, according to Taylor & Van Dyke (1985), or radiographed. Illustrations were prepared using a stereomicroscope with a camera lucida attachment. In drawings, bones are filled with stipples, cartilages with large dots, and foramina are uniform black; cephalic laterosensory canals are not stippled and are outlined by dashed lines when occurring within soft tissue.

Material examined is from Laboratório de Ictiologia de Ribeirão Preto, Ribeirão Preto (LIRP); Museu de Ciências e Tecnologia da PUCRS, Porto Alegre (MCP); Museu Nacional, Rio de Janeiro (MNRJ); Museu de Zoologia da Universidade de São Paulo, São Paulo (MZUSP); and Núcleo de Pesquisas em Limnologia, Ictiologia e Aqüicultura, Maringá (NUP). Material of *Ituglanis guayaberensis*, *I. laticeps*, and *I. metae* was not available for examination. Whereabouts of the type-material of the two former species is unknown, and morphological data was obtained from literature only (Eigenmann, 1918; Dahl, 1960; Costa & Bockmann, 1993). Data concerning *I. metae* was based on literature (Eigenmann, 1918; Costa & Bockmann, 1993; de Pinna & Keith, 2003), and on photographs and radiographs of the holotype.

**Comparative material** (total number of specimens in parenthesis; c&s, cleared and stained specimens): *Copionodon pecten*, LIRP

1012 (26, 2 c&s), LIRP 1013 (12); *Ituglanis amazonicus*, MCP 23074 (1), MCP 29346 (1), MCP 32886 (1), MZUSP 21842 (5), MZUSP 23368 (1), MZUSP 24128 (2 c&s); MZUSP 24153 (1), MZUSP 24184 (1), MZUSP 30449 (1), MZUSP 37640 (3), MZUSP 38184 (1), MZUSP 67824 (17); *Ituglanis bambui*, MZUSP 79860 (holotype), MZUSP 79862 (4 paratypes, 1 c&s), MZUSP 79864 (4 paratypes, 2 c&s); *Ituglanis eichorniarum*, MCP 36243 (1), MCP 36244 (1), MNRJ 780 (2 paralectotypes); MZUSP 24876 (1), MZUSP 37751 (1), MZUSP 37776 (1), MZUSP 37782 (4); *I. epikarsticus* MZUSP 79869 (holotype), MZUSP 79870 (1 paratype), MZUSP 79871 (1 paratype c&s), MZUSP 79872 (1 paratype c&s); *Ituglanis gracilior*, MCP 23077 (3), MCP 33848 (1), MCP 36241 (5), MCP 36242 (8), MCP 36245 (3), MCP 36247 (3), MCP 36249 (1), MCP 36250 (3), MCP 36252 (1), MCP 36253 (2), MCP 36254 (3), MCP 36255 (3), MCP 36256 (17), MCP 36257 (13, 1 c&s), MCP 36258 (17), MZUSP 24320 (1), MZUSP 63292 (1), MZUSP 85194 (9), MZUSP 86821 (12, 1 c&s), MZUSP 87126 (1), MZUSP 87251 (1); *Ituglanis herberti*, MNRJ 1429 (3 paralectotypes), MNRJ 28466 (1 paralectotype), NUP 2238 (1), NUP 2239 (1), NUP 2241 (3, 1 c&s), NUP 2242 (2), NUP 3187 (1); *Ituglanis nebulosus*, MZUSP 69574 (1 paratype c&s); *Ituglanis parahybae*, MCP 7784 (1), MCP 18026 (1), MCP 18032 (1); MZUSP 71852 (3), MZUSP 79810 (1); *Ituglanis parkoi*, MCP 36240 (1), MCP 36248 (1), MCP 36251 (1), MCP 36260 (1), MNRJ 3849 (holotype); *Ituglanis passensis*, MCP 27436 (3), MZUSP 80097 (3), MZUSP 80098 (3), MZUSP 80099 (2); *Ituglanis proops*, MCP 32509 (6), MCP 20620 (9), MNRJ 781 (3 paralectotypes); MZUSP 35481 (2), MZUSP 36502 (7), MZUSP 60255 (95, 2 c&s), MZUSP 63138 (1), MZUSP 83728 (2), MZUSP 83752 (4); *Ituglanis ramiroi*, MZUSP 79865 (holotype), MZUSP 79867 (3 paratypes, 2 c&s), MZUSP 79868 (1 paratype); *Ituglanis* sp. A, MCP 10420 (3, 1 c&s), MCP 37695 (7); *Ituglanis* sp. B, MCP 15911 (25), MCP 15930 (37), MCP 15938 (12), MCP 15942 (1); *Ituglanis* sp. C, MCP 23073 (5), NUP 1138 (4); *Pseudostegophilus nemurus*, LIRP uncat (1 c&s); *Trichogenes longipinnis*, LIRP 1023 (3), LIRP 1058 (4), LIRP 1059 (9, 1 c&s); *Trichomycterus davisii*, LIRP 2798 (18, 2 c&s), LIRP 2799 (33, 3 c&s), 2800 (1); *Trichomycterus brasiliensis*, LIRP 1968 (12, 2 c&s); *Trichomycterus variegatus*, LIRP 647 (189, 2 c&s); LIRP 3457 (3); *Vandellia* sp. LIRP 598 (10, 2 c&s).

### *Ituglanis macunaima*, new species

Figs. 1-9

**Holotype.** MZUSP 88452, 30.5 mm SL; Brazil, Mato Grosso, Cocalinho; rio Araguaia basin, corixo da Saudade (corixinho); 14°17'20.6"S 51°9'12.1"W; A. Datovo, A. Oliveira, C. R. Moreira, J. C. Nolasco, J. L. Birindelli, M. I. Landim & O. T. Oyakawa; 10 Oct 2004.

**Paratypes.** LIRP 5642, 6, 24.7-31.5 mm SL, 1 c&s (29.1 mm SL) and MZUSP 86237, 7, 23.4-31.1 mm SL, 1 c&s (25.5 mm SL); same data as holotype. MZUSP 86251, 2, 22.4-25.5 mm SL, 1 c&s (25.5 mm SL); Brazil, Mato Grosso, Cocalinho; rio Araguaia basin, rio Cristalino; 14°12'45"S 51°18'21"W; A. Datovo, A. Oliveira, C. R. Moreira, J. C. Nolasco, J. L. Birindelli, M. I. Landim, & O. Oyakawa; 14 Oct 2004. MZUSP 86272, 1, 26.4 mm SL; Brazil, Mato Grosso, Cocalinho; rio Araguaia basin, rio Cristalino drainage; Corixão do Meio 14°11'14.3"S 51°14'58"W; A. Datovo, A. Oliveira, C. R. Moreira, J. C. Nolasco, J. L. Birindelli, M. I. Landim, & O. T. Oyakawa; 14 Oct 2004.



**Fig. 1.** *Ituglanis macunaima*, holotype, MZUSP 88452, 30.5mm SL; Brazil, Mato Grosso, corixo da Saudade. a, lateral view; b, dorsal view; c, ventral view.

**Diagnosis.** *Ituglanis macunaima* is distinguished from all congeners by the following characters in combination: posterior fontanel absent (vs. present in all other *Ituglanis* except some *I. epikarstikus*); pectoral-fin rays usually i,4 (vs. i,5 or more in all other *Ituglanis* except *I. parahybae*); pelvic-fin rays usually i,4 (vs. i,3 or pelvic fin absent in *I. parahybae*); branched caudal-fin rays usually 5,5 (vs. 5,6 or more in all other *Ituglanis* except *I. nebulosus*); mottled color pattern formed by irregular to roughly roundish dark brown spots distributed on whitish background (vs. distinct color pattern in all other *Ituglanis* except some *I. eichorniarum*, *I. gracilior*, and *I. proops*). Although data were not available from all other *Ituglanis* species, the following reductive characters in combination further diagnose *I. macunaima*: reduced supraorbital canal with pores s1 and s2 lacking (vs. s1 present in *I. amazonicus*, *I. eichorniarum*, *I. gracilior*, *I. herberti*, *I. nebulosus*, *I. parkoi*, and *I. proops*; and s2 present in *I. proops*; not seen in *I. guayaberensis*, *I. laticeps*, and *I. metae*); reduced infraorbital canal with pores i1 and i3 lacking (vs. both present in *I. proops*; not seen in *I. guayaberensis*, *I. laticeps*, and *I. metae*); 2-3 pleural ribs (vs. 5 or more in *I. bambui*, *I. epikarsticus*, *I. parahybae*, *I. passensis*, *I. proops*, and *I. ramiroi*; not seen in *I. guayaberensis* and *I. laticeps*); 35-38 vertebrae (vs. 39 or more in *I. amazonicus*, *I. eichorniarum*, *I. gracilior*, *I. herberti*, *I. metae*, *I. parahybae*, *I. parkoi*, *I. proops*; not seen in *I. guayaberensis* and *I. laticeps*).

**Description.** Morphometrics given in Table 1. Refer to Fig. 1 for general aspects.

**External morphology.** Body elongate. Dorsal and ventral profiles of body straight or slightly convex in trunk and straight on caudal peduncle. Cross section of trunk nearly oval and becoming gradually more compressed posterior to pectoral girdle.

Head wide and strongly depressed, often slightly concave with swollen lateral cephalic musculature (*adductor mandibulae* and *dilatator operculi* muscles); cordiform in dorsal view. Dorsal profile of head straight; ventral profile ranging from straight to somewhat convex. Eyes slightly anteroposteriorly elongated and dorsally placed on anterior half of head; orbital rim not free. Thin and translucent skin covering eye, not adhered to surface of eyeball. Anterior nostril surrounded by tubular flap continuous with nasal barbel base; posterior nostril opening slightly larger than anterior one and with crescent thin flap on its anterior border.

Mouth subterminal and curved. Inferior lip with lateral tegumentar folds continuous with rictal barbel base. Nasal barbel emerging from lateral region of anterior nostril and usually reaching center of cranial crown. Maxillary barbel reaching pectoral-fin base. Rictal barbel usually somewhat shorter than nasal and crossing posterior edge of interopercular patch of odontodes. Branchial membranes thick, united to isthmus only anteriorly and forming small free fold across isthmus. Median most branchiostegal rays barely visualized through skin.

Opecular patch of odontodes rounded, posteriorly detached from head surface and dorsolaterally placed. Interopercular patch of odontodes narrow, elongate, posteriorly

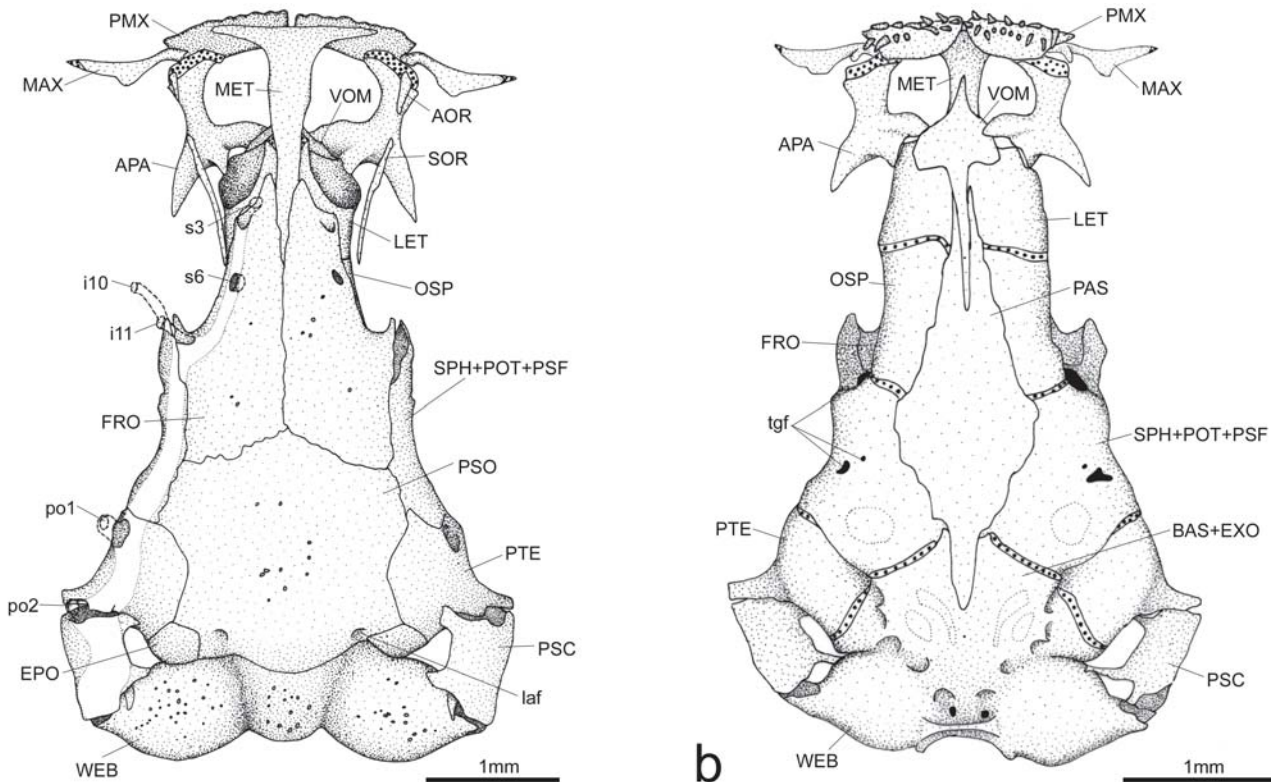


**Table 1.** Morphometrics of *Ituglanis macunaima*. Abbreviations: SD, standard deviation; n, number of specimens measured.

	Holotype	Range (n = 17)	Mean	SD
Standard length (mm)	30.50	22.40-31.50	-	-
<b>Percents of Standard length</b>				
Total length	118.69	115.9-122.6	119.4	2.2
Predorsal length	75.74	71.38-76.53	74.28	1.48
Preanal length	74.10	70.67-75.89	73.66	1.43
Prepelvic length	63.61	59.22-67.41	63.57	2.26
Caudal peduncle length	17.05	13.14-17.81	16.41	1.20
Body depth	10.49	10.49-15.18	12.34	1.32
Caudal peduncle depth	8.52	7.54-11.16	8.93	0.85
Dorsal-fin base length	8.52	8.04-12.41	10.05	1.21
Anal-fin base length	7.87	6.35-10.28	8.55	1.18
First pectoral-fin length	13.11	11.11-14.57	12.96	0.99
Pectoral width	13.44	11.75-15.18	13.13	0.94
Head length	18.03	17.44-19.64	18.24	0.70
<b>Percents of Head length</b>				
Head depth	43.64	34.00-47.73	41.19	4.60
Head width	92.73	82.69-98.00	90.78	4.41
Interorbital width	21.82	15.91-31.91	21.32	3.67
Eye diameter	9.09	8.89-11.36	9.68	0.82
Snout length	29.09	28.85-36.17	31.96	1.95
Maxillary barbel length	87.27	64.29-100.00	80.83	10.52
Rictal barbel length	65.45	46.81-67.31	60.02	6.58
Nasal barbel length	43.64	43.64-71.43	62.73	6.17
Width of mouth	32.73	26.79-40.91	33.11	3.92

curved, and placed fully anterior to opercular patch. Odontodes markedly erected from integument in most specimens.

Pectoral-fin rays i,4 (two specimens i,3 on one side of body; two i,5 on one side and two on both sides). Origin of pectoral fin just posterior to branchial membrane. First pectoral-fin ray distinctly longer than remaining rays and continued distally as filament. Remaining rays gradually shorter than lateral one, making distal margin of pectoral fin obliquely straight. Inconspicuous axillary pore present. Pelvic-fin rays, i,4 (three specimens i,3 on one side of body), origin anterior to origin of dorsal fin; posterior margin convex. Bases of pelvic fins close to each other. Tip of adpressed pelvic fin not reaching anal-fin origin. Urogenital and anal openings at posterior half of pelvic-fin length. Dorsal-fin rays ii,6 (one specimen ii,5, two ii,7, one iii,5, three iii,6), located on posterior one-third of trunk; distal margin convex. Anal-fin rays ii,5 (one specimen ii,4, one iii,4), origin of fin approximately at vertical through origin of dorsal fin; distal margin convex. Caudal fin with posterior margin ranging from convex to nearly straight. Principal caudal-fin rays 12: i,5 on both dorsal and ventral lobes (two specimens i,4 on dorsal lobe). Unsegmented rays of unpaired fins hardly visible through skin (see Osteology).



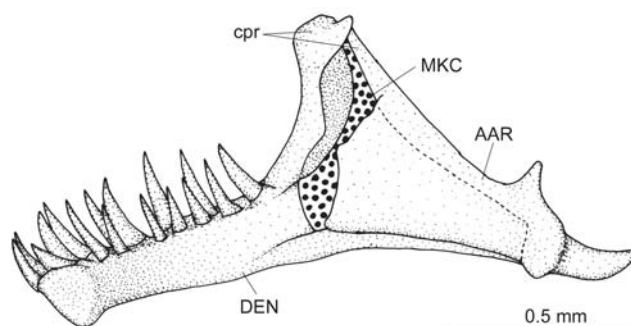
**Fig. 2.** Skull and Weberian apparatus of *Ituglanis macunaima*. a, paratype, LIRP 5642, 29.1 mm SL, dorsal view; b, paratype, MZUSP 86251 (25.5 mm SL), ventral view. Abbreviations: AOR, antorbital; APA, autopalatine; BAO+EXO, basioccipital-exoccipital bone; EPO, epioccipital; FRO, frontal; i10-11, infraorbital sensory pores 10 to 11; laf, ramus lateralis accessorius facialis foramen; LET, lateral ethmoid; MAX, maxilla; MET, mesethmoid; OSP, orbitosphenoid; PAS, parasphenoid; PMX, premaxilla; po1-2, postotic sensory pores 1 to 2; PSC, “posttemporosupraclathrum”; PSO, parieto-supraoccipital; PTE, pterotic; SOR, supraorbital tendon-bone; so3, 6, supraorbital sensory pores 3 and 6; SPH+POT+PSF, sphenotic-prootic-pterosphenoid bone; tgf, trigeminofacial nerve foramina; VOM, vomer; WEB, Weberian apparatus.

**Color in alcohol.** General color pattern mottled, formed by irregular to roughly circular dark brown spots distributed on whitish background. Skin separated into two principal layers. Outer layer thicker, translucent and without pigmentation, allowing external examination of inner tissue pattern. Tiny brown chromatophores distributed on inner integumentary layer. Most chromatophores grouped into brown spots, but some scattered between spots. Spots ranging from one to two times eye diameter and, in most cases, have irregular shapes and margins; few specimens with roughly rounded spots; one specimen more densely pigmented with larger and coalesced spots. Pigmentation more densely scattered on dorsum, becoming gradually smaller, clearer and sparser towards ventral region. Spots rarely contact each other and never appear to form stripes. On ventral surface of body, spots occur only posterior to origin of anal fin; most of trunk without brown pigmentation. On head, spots smaller and even more irregular than on body. Maxillary and nasal barbels nearly banded; diffuse spots occur on ventral surface of head, rictal barbel base, and between interopercular odontodes. Small irregular spots appear on proximal portions of fins, more intensely on caudal fin. Background color – which ranges from white to pale yellow – provided by color of musculature and connective tissues visible through translucent layer of skin. Head with large irregular dark blotch on posterior part of cranial roof. Its origin on dark pigments present on membrane that covers brain, and externally visible by transparent laminar bones of cranial roof.

**Osteology.** Mesethmoid with anterior margin straight; shaft not as wide as cornua (Fig. 2). Lateral ethmoid without lateral projections. Frontal and parieto-supraoccipital fully joined by sutures; anterior and posterior fontanelles absent. Co-ossified sphenotic-prootic-pterosphenoid with anterior projection with infraorbital sensory canal opening. Vomer arrow-shaped and with long posterior process. Synchondrosis between orbito-sphenoid and sphenotic-prootic-pterosphenoid above and below anterior most trigeminofacialis foramen. Parasphenoid with two anterior and one posterior processes. Co-ossified basioccipital-exoccipital posteriorly fused to Weberian capsule and without anterior processes. Weberian capsule with small lateral opening and tiny pores on entire surface.

Autopalatine with deep medial notch, posteriorly expanded with wide lateral process and separate socket-type articulations with lateral ethmoid and with vomer (Fig. 2). Pre-maxilla rectangular with two regular rows of conical teeth. Maxilla nearly as long as premaxilla and with well developed anteroventral process. Angulo-articular with elevated coronoid process (Fig. 3). Dentary with two regular rows of conical teeth and long coronoid process with posteromedially curved tip.

Hyomandibula with conspicuous lateral depression for *levator arcus palatini* insertion and perforated by pores on dorsomedian region (Fig. 4). Dorsal portion of quadrate laminar and nearly triangular. Metapterygoid articulating with hyomandibula and with quadrate through cartilaginous block.

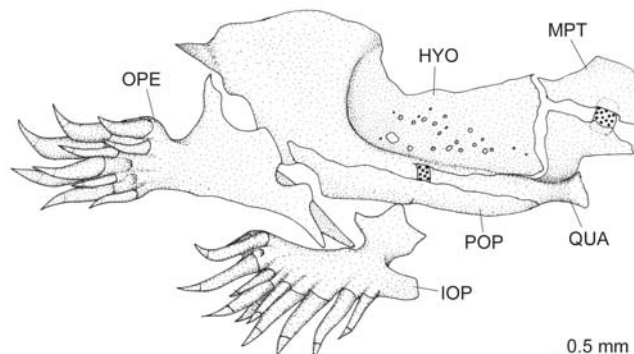


**Fig. 3.** Mandible of *Ituglanis macunaima*, paratype, MZUSP 86251 (25.5 mm SL), medial view of right side. Abbreviations: AAR, anguloarticular; cpr, coronoid process; DEN, dentary; MKC, Meckel's cartilage.

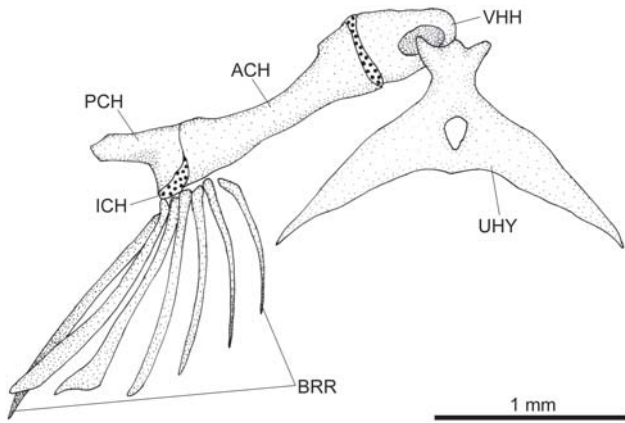
Opercle with 10-15 odontodes (Fig. 4). Interopercle with 10-15 odontodes, none on anteroventral projection. Odontodes progressively larger and more curved towards posterior region of patches.

Urohyal with thin, pointed and elongated lateral process and two small dorsal condyles (Fig. 5). Deep depressions on ventral hypohyal for articulation with urohyal condyles. Branchiostegal rays 7.

Basibranchials: first absent; second and third ossified and stem-like; fourth flattened and fully cartilaginous, larger in width than in length (Fig. 6). Hypobranchials: first ossified and stem-like; second and third flattened, cartilaginous and with ossified anterolateral process; fourth absent. Ceratobranchials: first, second and third with posterior laminar expansions; fourth flattened; fifth posteriorly divergently curved with small teeth on anterior half. Epibranchials: first with long anterior process; second with two discrete processes; third with one posterior process; fourth flattened with no process; fifth absent or not evident. Pharyngobranchials: first and second absents; third stem-like; fourth firmly attached to tooth plate. Upper pharyngeal tooth plate with long ventromedially oriented conical teeth.



**Fig. 4.** Suspensorial and opercular series of *Ituglanis macunaima*, paratype, MZUSP 86251 (25.5 mm SL), lateral view of right side. Abbreviations: HYO, hyomandibula; IOP, interopercle; MPT, metapterygoid; OPE, opercle; POP, preopercle; QUA, quadrate.

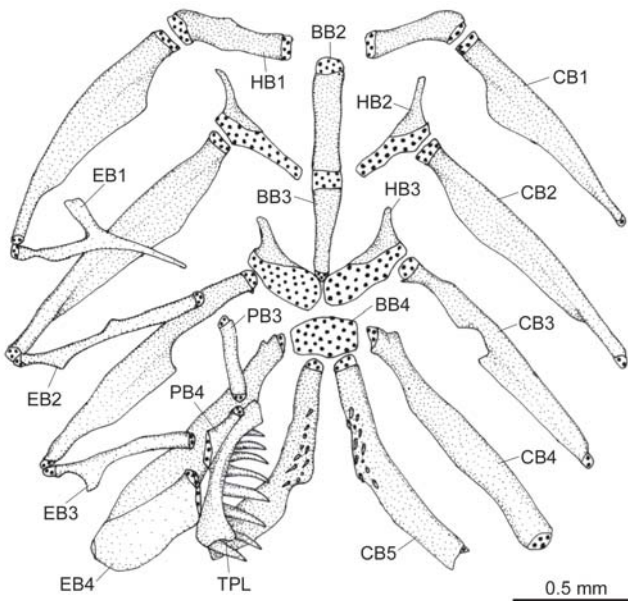


**Fig. 5.** Hyoid arch of *Ituglanis macunaima*, paratype, LIRP 5642 (29.1 mm SL), ventral view, left hyoid bar not shown. Abbreviations: ACH, anterior ceratohyal; BRR, branchiostegal rays; ICH, interceratohyal cartilage; PCH, posterior ceratohyal; UHY, urohyal; VHH, ventral hypohyal.

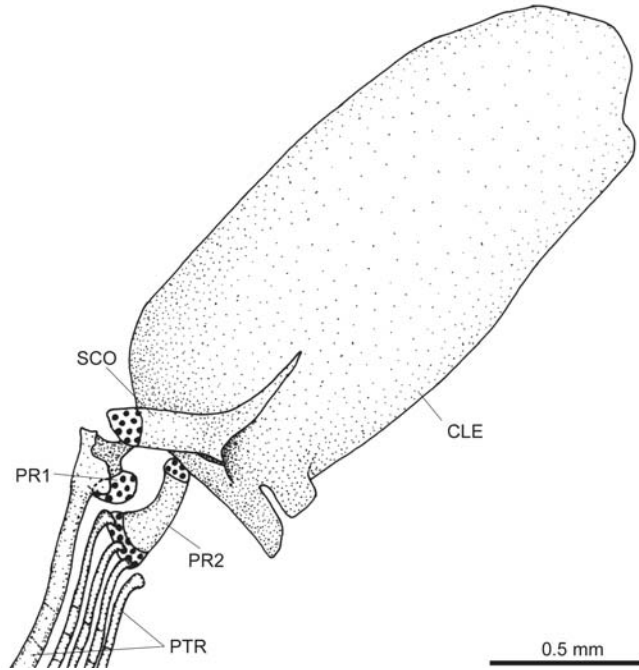
First complete hemal canal on fourth or fifth vertebra past Weberian complex. Long and medially curved parapophysis on vertebrae with complete hemal canal but incomplete hemal spine. First complete hemal spine on 14th or 15th vertebra. Total vertebrae 35-38. Pleural ribs 2-3.

Cleithrum roughly recteangular or triangular in ventral view (Fig. 7). Scapulocoracoid restricted to lateral region of cleithrum.

Pelvic girdle delicate and poorly ossified (Fig. 8). Basipterygium with no cartilaginous tips on anterior processes; posteromedial margins fully cartilaginous. Thin pelvic splint parallel to first pelvic ray.



**Fig. 6.** Branchial skeleton of *Ituglanis macunaima*, paratype, MZUSP 86251 (25.5 mm SL), dorsal view, right dorsal elements and gill rakers not shown. Abbreviations: BB2-4, basibranchials 2 to 4; CB1-5, ceratobranchials 1 to 5; EB1-4, epibranchials 1 to 4; HB1-3, hypobranchials 1 to 3; PB3-4, pharyngobranchials 3 to 4; TPL, tooth plate.



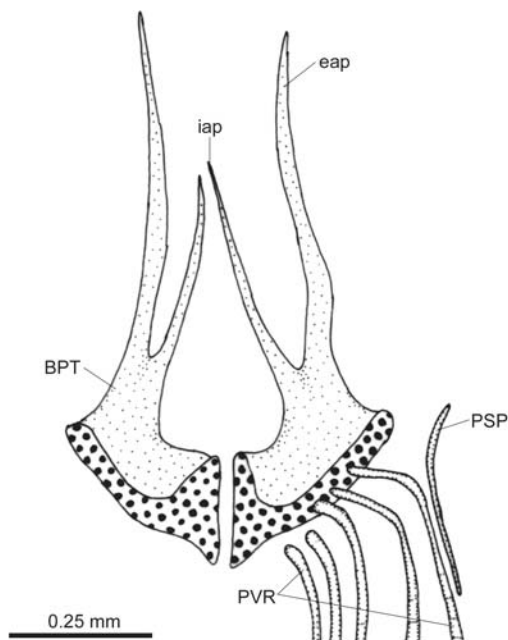
**Fig. 7.** Pectoral girdle of *Ituglanis macunaima*, paratype, LIRP 5642 (29.1 mm SL), ventral view of right side. Abbreviations: CLE, cleithrum; PTR, pectoral rays; PR1, proximal radial 1 (cartilaginous); PR2, proximal radial 2; SCO, scapulocoracoid.

Dorsal fin with 7-8 basal radials distributed between neural spines of 22-24th to 26-28th vertebrae; unsegmented dorsal-fin rays 2. Anal fin with 6 basal radials distributed between hemal spines of 23-24th to 27-28th vertebrae; unsegmented anal-fin rays 1-2.

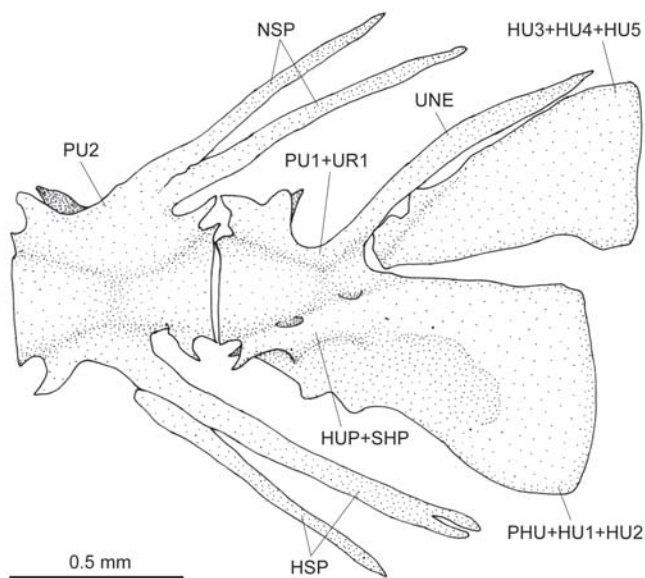
Preural centrum with each half of hemal and/or neural spines often not aligned, sometimes forming double spine (Fig. 9). Upper caudal plate composed of uroneural and one single triangular element (co-ossified hypurals 3-5). Lower caudal plate as one element (co-ossified hypurals 1-2 and parhypural), which is fused to compound caudal centrum (preural 1 + ural 1). Hypurapophysis complex (hypurapophysis-secondary hypurapophysis) of "type B" (Lundberg & Baskin, 1969). Procurent caudal rays 11-12 dorsal, 8-10 ventral.

**Laterosensory system.** Cephalic laterosensory canals with simple (non-dendritic) tubes ending in simple pores (Fig. 2a). All canals continuous and connected to each other. Supraorbital canal present mostly in frontal bone and bearing only pores s3 and s6 placed on interorbital region; pores s1 and s2 absent. Infraorbital canal present mostly in soft tissue and restricted to branches and pores i10 and i11 located ventroposteriorly to eyeball; pores i1 and i3 absent. Otic canal without pores and passing through sphenotic-proticterosphenoïd. Postotic (temporal) canal with branches and pores po1 (mostly in pterotic bone) and po2 (mostly in posttemporosupracleithrum); pores placed anterodorsally to opercular patch of odontodes. Body with short lateral line canal with only pores ll1 and ll2 located dorsoposteriorly to pectoral-fin base.





**Fig. 8.** Pelvic girdle of *Ituglanis macunaima*, paratype, LIRP 5642 (29.1 mm SL), ventral view, right pelvic rays and splint not shown. Abbreviations: BPT, basipterygium; eap, external anterior process; iap, internal anterior process; PSP, pelvic splint; PVR, pelvic rays.



**Fig. 9.** Caudal skeleton of *Ituglanis macunaima*, paratype, LIRP 5642 (29.1 mm SL), left lateral view. Abbreviations: HSP, hemal spine; HUP+SHP, hypurapophysis-secondary hypurapophysis fused; HU3+HU4+HU5, fused hypural 3-hypural 4-hypural 5; NSP, neural spine; PHU+HU1+HU2, fused parhypural-hypural 1-hypural 2; PU1+UR1, preural 1-ural 1 compound centrum; PU2, preural centrum 2; UNE, uroneural.

**Etymology.** From the modernist Brazilian masterpiece by Mário de Andrade – “Macunaíma: o herói sem nenhum caráter” – meaning the hero without any character, in reference of the absence of any exclusive (taxonomic) character for the new species. Mário de Andrade’s Macunaíma was based in folk Amazonian indian myth, and also presents infantile features, in allusion to the paedomorphic characters of the new species. Treated here as a noun in apposition.

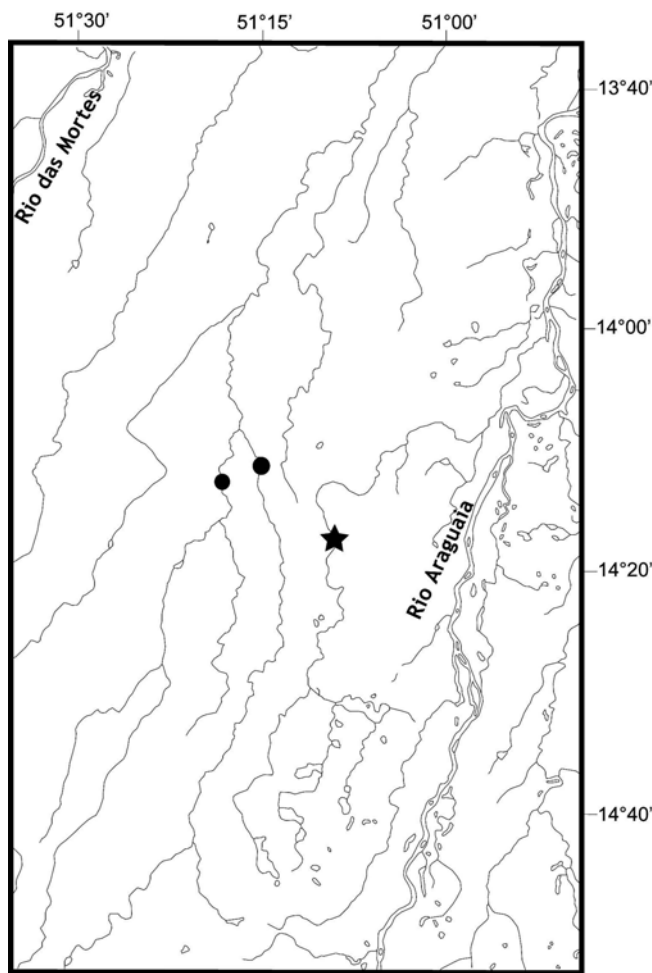
**Distribution and habitat notes.** The new species is known only from three localities from two tributaries (rio Cristalino and corixo da Saudade) of the left margin of the rio Araguaia basin (Fig. 10). The new species was found always associated with leaf litter, or other decomposing vegetal matter, accumulated in shallow (not deeper than 1 m), slow flowing portions of the river. At the type-locality (Fig. 11), specimens were found also associated with a partially decomposed log, resting on the litter bed. These specimens were found more externally on crevices in the bark, together with an undescribed species of *Microglanis*. Several specimens of an undescribed species of *Centromochlus* were found more deeply associated in the log.

## Discussion

**Intragenetic comparisons.** *Ituglanis macunaima* shares with its congeners the synapomorphies proposed by Costa & Bockmann (1993) for *Ituglanis*. Two of them are unambiguously present in *I. macunaima*: autopalatine with deep concavity on its medial margin, and anterior portion of sphenotic (co-ossified sphenotic-prootic-pterosphenoid) anteriorly directed. The third synapomorphy of Costa & Bockmann (1993), supraoccipital (or posterior) fontanel reduced to a small round orifice, seems to have achieved in *I. macunaima* a more derived condition where it is completely closed. A closed posterior fontanel also occurs in two paratypes of *I. epikarstikus* (in *I. macunaima*, it is closed in all cleared and stained specimens). Actually, the small rounded posterior fontanel of *Ituglanis* seems to be a derived state of the condition found in most trichomycterids, which possess a large, elongate posterior fontanel (pers. obs.; Arratia, 1998; Bockmann *et al.*, 2004). Otherwise, the closed anterior cranial fontanel of *I. macunaima*, which is shared with several other *Ituglanis* species, may also be regarded as a derived condition within the genus. The described plesiomorphic state for this character in trichomycterids (pers. obs.; de Pinna, 1992; Arratia, 1998; Bockmann *et al.*, 2004) is a wide aperture. The total absence of cranial fontanels also occurs in all the Glanapteryginae and several Stegophilinae and the Vandelliinae species, but according to the most accepted trichomycterid phylogeny (de Pinna, 1998), these occurrences are more parsimoniously interpreted as homoplastic.

The mottled color pattern in alcohol of *I. macunaima*, formed by irregular to roughly roundish dark brown spots distributed on whitish background is clearly distinct from those of *I. amazonicus* (fine dark grayish dots over a clear

background), *I. bambui* (uniform pale light brown to yellowish), *I. epikarsticus* (pale yellowish with very few scattered black chromatophores), *I. herberti* (faint light brown spots over yellowish background; see below), *I. laticeps* (obscure spots over a dark brown background), *I. nebulosus* (large rounded dark blotches over clear background), *I. parahybae* (large irregular dark brown spots coalescing in two or three longitudinal stripes), *I. parkoi* (brownish background, lighter on belly, with obscure dark spots), *I. passensis* (uniform yellowish to light gray, sometimes with scattered melanophores on dorsum), and *I. ramiroi* (uniform pale yellowish to white). The color pattern of *Ituglanis gracilior* (see de Pinna & Keith, 2003), *I. guayaberensis*, and *I. metae* resembles in some aspects that of *I. macunaima*, but their spots are more rounded (especially on dorsum) and with better limited borders. The spaces between spots on the new species are filled by numerous dispersed chromatophores, a character not usual but sometimes found in some *I. gracilior*. *Ituglanis eichorniarum* and *I. proops* exhibits a color pattern almost identical to that of *I. macunaima*, although their spots are usually paler.



**Fig. 10.** Hydrographic map showing geographic distribution of the *Ituglanis macunaima*. Symbols: star, holotype; circles, paratypes.

**Paedomorphosis.** *Ituglanis macunaima* exhibits a large number of reductive features for the genus: fewest pectoral-fin rays (mainly i,4); fewest branched caudal-fin rays (mainly 5,5); fewer pleural ribs (2-3); fewer vertebrae (35-38); fewer interopercular odontodes (10-15); reduced cephalic laterosensory system (s1, s2, i1, and i3 branches lacking); and small body size (maximum 31.5 mm SL). On the other hand, *I. macunaima* possesses several features indicative of adult stages in catfishes: well calcified and firmly attached premaxillary and dentary teeth; neurocranial bones fully connected to each other; presence of sutural joints in neurocranium; bones of the neurocranium with well-defined borders; three ossified hypobranchials; hypurals on upper and lower caudal plates completely fused to each other and without cartilaginous borders (de Pinna, 1989; de Pinna & Ng, 2004). Additionally, the gonadal stages of two paratypes were examined and both were maturing males. Comparisons with other trichomycterids (*Trichomycterus davisi* [Haseman] and *T. variegatus* Costa; pers. obs.) show that maturing individuals do not differ from the fully mature ones in any of the reductive traits observed for *I. macunaima*. So, the apparently juvenile reduced features found in *I. macunaima* must actually be interpreted as paedomorphic. Such reductions are regarded to be due to the loss of terminal stages in the developmental sequence (Weitzman & Vari, 1988). Its small body size is probably another diagnostic character for *I. macunaima*, but due to the absence of comparative material with a wide range of body size for most other *Ituglanis* species, the distribution of such a character could not be satisfactorily determined.

*Ituglanis macunaima* fits in the definition of “elongate miniature” of Weitzman & Vari (1988) once it presents a large number of paedomorphic/reductive features but exceed the cut-off of 26 mm SL. Miniaturization events seem to have occurred at least three times within Trichomycteridae: at the Glanapteryginae + Sarcoglanidinae + *Trichomycterus santaeritae* clade, at the Tridentinae + *Trichomycterus hasemani* + *T. johnsoni* clade, and at *Paravandellia* (Vandelliinae) (de Pinna, 1989). With the discovery of *I. macunaima*, a fourth miniaturization event within



**Fig. 11.** Type locality of *Ituglanis macunaima*, corixo da Saudade (14°17'20.6"S 51°09'12.1"W); Brazil, Mato Grosso.



Trichomycteridae could have occurred inside *Ituglanis*, including only the new species. Three other species of *Ituglanis* are known only from small size specimens – *I. epikarsticus*, *I. nebulosus*, and *I. ramiroi* – but none of them possesses a significant number of reductive characters, which is the primary criterion for distinguishing miniature fishes (Weitzman & Vari, 1988). However, all the reductive traits of *I. macunaima* are shared with different congeners, some of them with even more extreme reduction than those exhibited by the new species. *Ituglanis parahybae*, for example, has more a reduced laterosensory system (entire supraorbital canal lacking) and pelvic fin (I,3 rays or pelvic fin absent), but possesses a higher number of pleural ribs (6), vertebrae (39), and can reach at least 51.3 mm SL (Costa & Bockmann, 1993). Thus, as the phylogenetic relationships inside *Ituglanis* are still not solved (see below) and the distribution of the reduced characters within the genus is not known, the miniaturization event of *I. macunaima* may be regarded as a suggestion.

**Comments on *Ituglanis* taxonomy.** There is great difficulty in the application of names previously available for *Ituglanis*, mainly due to the fact that most older descriptions and diagnoses of *Ituglanis* species are somewhat superficial, with few morphologic details or considerations about intraspecific variation. Except for the most recently described species (Fernández & Bichuette, 2002; de Pinna & Keith, 2003; Bichuette & Trajano, 2004), all other descriptions of *Ituglanis* only report its external morphology; not descriptions of the osteology and laterosensory system. The anatomical description presented here for *I. macunaima* is an attempt to provide characters useful for future taxonomic and phylogenetic studies.

The unique effort of discussing relevant issues of *Ituglanis* taxonomy was made by de Pinna & Keith (2003). One of their suggestions was that *I. eichorniarum* and *I. herberti*, both from the Paraguay drainage, could be synonyms. We agree with their statement that the color pattern formed by a series of vertical stripes mentioned in the original description of *I. herberti* (Miranda Ribeiro, 1940) is artifactual, and that its coloration is similar in several aspects to that of *I. eichorniarum*. However, we observed other traits that indicate that they are not conspecific. *Ituglanis eichorniarum* posses i,5 pectoral-fin rays and 38-39 vertebrae, whereas *I. herberti* posses i,6 rays on pectoral fin and 42-43 vertebrae.

**Comments on *Ituglanis* phylogeny.** Even though they recognized the present difficulty in formulating phylogenetic hypothesis among *Ituglanis* species, de Pinna & Keith (2003) proposed two putatively monophyletic groups within the genus. Following their suggestion, *I. macunaima* appears to be more closely related to *I. amazonicus*, *I. gracilior*, *I. nebulosus*, and *Ituglanis* sp. 2, on the basis of a reduced number of pleural ribs (2-3). However, these authors committed at least one misinterpretation. *Ituglanis eichorniarum*, which was grouped in the other putative clade on basis of possessing a conspicuous process on antorbital (probably the here called supraorbital tendon-bone) and a larger num-

ber of pleural ribs (5-7), actually has only two pleural ribs according to material examined, which included two paralectotypes. Furthermore, certain characters shared between *I. macunaima* and its congeners outside of this group (see Diagnosis and Intrageneric comparisons), the high intraspecific variation of several traits, the large number of undescribed species, and the current incomplete knowledge of *Ituglanis* taxonomy, makes it impossible to satisfactorily infer any hypothesis of relationship for *I. macunaima*. Therefore, we believe that any proposal of relationships for *Ituglanis* species without a revisionary study will be premature.

### Acknowledgments

The expedition in which this new species was found was supported by the All Catfish Species Inventory, ACSI (NSF award DEB 0315963). Special thanks are due to A. Oliveira, C. R. Moreira, José C. Nolasco, José L. Birindelli, and Osvaldo T. Oyakawa (the “Araguaia-Xingu Catfish Expedition” team) for the help on field and laboratory work. Thanks to Carla S. Pavanelli, Mário C. C. de Pinna, Osvaldo T. Oyakawa, Paulo A. Buckup, Roberto E. Reis, and Zilda M. Lucena, for the loan of comparative material. Alexandre C. Ribeiro and Murilo Carvalho helped with holotype photographs and Katiane M. Ferreira with identification of gonadal stages. The distribution map was prepared by Cristiano R. Moreira, who also suggested some improvements on an early version of the manuscript. Marcelo R. Carvalho made pertinent suggestions and reviewed the English translation. Mário C. C. de Pinna generously discusses significant issues of systematics of *Ituglanis* and other trichomycterids. Flávio A. Bockmann reviewed the manuscript and discussed relevant points of phylogeny of trichomycterids and heterochrony. The manuscript was greatly improved by the suggestions of two anonymous reviewers. ACSI additionally supported the visit of AD to MCP for examination of material. AD and MIL are sponsored by FAPESP fellowships (04/05425-0 and 03/01059-7 respectively).

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Received August 2005  
Accepted October 2005