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Ituglanis agreste, a new catfish from the rio de Contas basin, northeastern Brazil (Siluriformes: Trichomycteridae)

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Ituglanis agreste, a new species of catfish, is described from a tributary stream of the rio Gongogi drainage, rio de Contas basin, Bahia State, northeastern Brazil, from a transition area between the Atlantic Rain Forest and the semi-arid Caatinga savanna. This species is distinguished from its congeners by the following characters: elongate interopercle plate with high number of odontodes (26-30), high number of ribs (5-6), fewer vertebrae (36), number of branchiostegal rays (7), number of pectoral-fin rays (i,6) and absence of s1 pore. Comparisons with other *Ituglanis* species and putative plesiomorphic characters are presented. Some comments about conservation of *Ituglanis* species from northeastern Brazil are also made.

Ituglanis agreste, espécie nova, é descrita de um tributário da drenagem do rio Gongogi, bacia do rio de Contas, Bahia, nordeste do Brasil, de uma área de transição entre dois biomas, a Caatinga e a Mata Atlântica. Esta espécie distingue-se de todas as demais espécies do gênero pelas seguintes características: placa interopercular alongada com elevado número de odontódeos (26-30), número elevado de costelas (5-6), número reduzido de vértebras (36), número de raios branquiostégios (7), número de raios da nadadeira peitoral (i,6), e ausência do poro s1. Comparações com outras espécies de *Ituglanis* e a presença de supostos caracteres plesiomórficos são apresentados. Alguns comentários sobre conservação das espécies de *Ituglanis* do nordeste do Brasil também são feitos.

Key words: Atlantic Forest, Biome transition, Semi-arid Caatinga, Serra da Ouricana, Taxonomy.

Introduction

The genus *Ituglanis* Costa & Bockmann is a monophyletic assemblage of small trichomicterid catfishes, previously included in *Trichomycterus* Valenciennes (Trichomycterinae) due to its superficial similarity with the members of this genus. Thus, a new taxon was proposed to accommodate species that share three synapomorphies present in the neurocranium: sphenotic directed anteriorly, parieto-supraoccipital fontanel reduced to a small orifice or completely closed (*e.g.*, in *I. macunaima* Datovo & Landim, and some specimens of *I. epikarsticus* Bichuette & Trajano and *I. mambai* Bichuette & Trajano; Bichuette & Trajano, 2008), and autopalatine with a deep concavity in the inner medial portion (Costa & Bockmann, 1993). The *Ituglanis* assemblage has been considered essential for understanding the emergence of the morphological and ecological adaptations in the trichomycterids (de Pinna, 1998). This is due to the intermediary phylogenetic position between both the more generalized forms (Trichogeninae, Copionodontinae, and Trichomycterinae) as well as the specialized forms that comprise the TSVSG clade (Tridentinae, Stegophilinae, Vandelliinae, Sarcoglanidinae, and Glanapteryginae), which all share a smaller number of ribs (2-7) (*e.g.*, *I. passensis* Fernandez & Bichuette).

Currently comprised of twenty nominal valid species (Sarmento-Soares *et al*., 2006; Campos-Paiva & Costa, 2007; Bichuette & Trajano, 2008; Wosiacki *et al*., 2012), and therefore the second most speciose trichomycterid genus, *Ituglanis* has a wide distribution in the cisandine Neotropical region, from the Guianas to Uruguay (de Pinna & Keith, 2003), including five troglobitic species found in Central Brazil (Bichuette & Trajano, 2008) and miniaturized forms as *I. macunaima* from Araguaia Basin (Datovo & Landim, 2005). However, only recently two species of coastal basins of northeastern Brazil were described: *I. cahyensis* Sarmento-Soares, Martins-Pinheiro, Aranda & Chamon and *I. paraguassuensis* Campos-Paiva & Costa, respectively, from the rio Cahy and rio Paraguaçu coastal basins, in Bahia state (Sarmento-Soares *et al*., 2006, Campos-Paiva & Costa, 2007).

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The coastal watersheds of eastern Brazil north of the rio Pardo have their upper reaches within the temporary rivers of the Caatinga biome, while the lower reaches are in the Atlantic Forest biome. In contrast, watersheds south of the rio Jequitinhonha are entirely in the Atlantic Forest biome (Langeani *et al*., 2009). While *Ituglanis paraguassuensis* was only recorded in the semi-arid Caatinga, *I. cahyensis* is restricted to the pluvial Atlantic forest. This paper describes *Ituglanis agreste*, a new species of catfish from the rio de Contas basin, found in a transition area between the Atlantic Forest and the Caatinga savanna.

Material and Methods

Measurements and counts follow Costa (1992), and are presented as percentages of standard length (SL), except for subunits of head, which are presented as percentage of head length (HL). Terminology for osteology follows Adriaens *et al*. (2010), cephalic and lateral line systems follow Arratia & Huaquin (1995), and caudal-skeleton structures according to Bockmann *et al*. (2004). Counts of procurrent caudal-fin rays, vertebrae, branchiostegal rays, teeth and odontodes were made only in cleared and stained specimens (c&s) prepared according to Taylor & Van Dyke (1985). Vertebral counts do not include the Weberian complex or the compound caudal centrum. Numbers in parentheses indicate the number of specimens. Detailed osteological description focus on traits informative for future phylogenetic analyses of trichomycterid groups. Illustrations were prepared using a stereomicroscope with a camera lucida attachment. Morphological data of *Ituglanis bambui* Bichuette & Trajano; *I. epikarsticus*; *I. guayaberensis* Dahl; *I. herberti* (Miranda Ribeiro); *I. ina* Wosiacki, Dutra & Mendonça; *I. macunaima*; *I. mambai*; *I. nebulosus* de Pinna & Keith; *I. parkoi* (Miranda Ribeiro); *I. passensis* Fernández & Bichuette; *I. ramiroi* Bichuette & Trajano, were obtained in the original descriptions or in detailed redescriptions (Bichuette & Trajano, 2004, 2008; Canto, 2009; Dahl, 1960; Datovo & Landim, 2005; Eigenmann, 1918; Fernández & Bichuette, 2002; Miranda Ribeiro, 1940; de Pinna & Keith, 2003; Wosiacki *et al*., 2012). Data from caudal skeleton of *I. proops*, *I. nebulosus*, count of vertebrae and ribs of *I. proops*, *I. nebulosus* and *I. laticeps* were based on digital images of x-ray photographs available from the image base homepage of the All Catfish Species Inventory project (http://acsi.acnatsci.org/base/image_list.html?mode=genus&genus=Pygidium, 26 December 2012) and the research tool of the online collection homepage of USNM (http://collections.mnh.si.edu/search/fishes/, 16 January 2013).

Abbreviations for institutions are: LIRP, Laboratório de Ictiologia de Ribeirão Preto, Ribeirão Preto; MNRJ, Museu Nacional, Rio de Janeiro; MZUSP, Museu de Zoologia da Universidade de São Paulo, São Paulo; UFBA, Universidade Federal da Bahia, Salvador; UFRJ, Laboratório de Sistemática e Evolução de Peixes Teleósteos, Universidade Federal do Rio de Janeiro, Rio de Janeiro; UFRN, Universidade Federal do Rio Grande do Norte, Natal, and USNM, National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Ituglanis agreste, new species
Fig. 1

Holotype. MNRJ 40196, 40.5 mm SL, Brazil, Bahia, municipality of Boa Nova; rio de Contas basin, rio Gongogi drainage, rio Tarugo, tributary of rio Uruba, 14º22'08.95"S 40º11'45.33"W, 09 Jul 2008, S. M. Q. Lima, R. M. Campos-Paiva, P. Hollanda Carvalho & H. Lazzarotto.

Paratypes. MNRJ 40197, 5, 32.4-40.8 mm SL; UFBA 7134, 5, 33.4-41.7 mm SL; UFRN 29, 6, 32.8-41.9 mm SL (3 c&s), all collected with holotype. MZUSP 102535, 6., 38.4-44.1 mm SL, same locality as holotype, 10 Feb 2009, S. M. Q. Lima, R. M. Campos-Paiva, P. Hollanda Carvalho & D. F. Almeida.

Diagnosis. *Ituglanis agreste* is distinguished from all species of the genus, except *I. paraguassuensis* by the reduced number of vertebrae 36 (*vs*. 38 or more in all other *Ituglanis*, except in *I. paraguassuensis*, *I. nebulosus*, *I. bambui*, *I. epikarsticus*, *I. ramiroi*, and *I. passensis*; unknown for *I. guayaberensis*); number of ribs (5-6) (*vs*. 2 or 3 in *I. amazonicus*, *I. eichorniarum*, *I. gracilior*, *I. ina*, *I. macunaima*, *I. nebulosus*, and *I. parkoi* ; 4 in *I. laticeps* and *I. cahyensis*; 7 in *I. passensis*); number of pectoral-fin rays i,6 (*vs*. i,4 in *I. cahyensis*, *I. macunaima*, and *I. parahybae* ; i,5 in *I. amazonicus*, *I. eichorniarum*, *I. metae*, and *I. nebulosus*; i,7 in *I. bambui*, *I. epikarsticus*, *I. mambai*, *I. passensis*; iii,5 in *I. guayaberensis*; i,8 in *I. ramiroi*); and skin covered by irregular brown blotches (*vs*. distinct color pattern in all other *Ituglanis*; absence in *I. ina* and the subterranean species, *I. bambui*, *I. passensis*, *I. epikarsticus*, and *I. ramiroi*).

Ituglanis agreste is also easily distinguished from the subterranean species by large eyes (*vs*. minute eyes) and intense pigmentation (*vs*. pigmentation absent or almost lack).

Ituglanis agreste is distinguished from *I. paraguassuensis*, its geographically closest species, by a higher number of odontodes in an elongate interopercle patch (26-30) (*vs*. reduced with 14-15 odontodes); seven branchiostegal rays (*vs*. 8) and pore s1 lacking (*vs*. s1 present).

Description. Morphometric data for holotype and paratypes are given in Table 1. Body elongated, subcylindrical about to dorsal-fin origin, and gradually compressed in caudal peduncle. Dorsal and ventral side view straights, except in dorsal part of the head, which is slightly convex. Head depressed, longer than wide, rounded in dorsal view. Eyes rounded and small, without free orbital margin, covered by a thin translucid membrane, lightly located on anterior half

Fig. 1. *Ituglanis agreste*, new species, holotype, MNRJ 40196, 40.5 mm SL, Brazil, Bahia State, municipality of Boa Nova, rio de Contas basin. **a** - lateral; **b** - dorsal; **c** - ventral views.

of head. Barbels and head covered by minute papillae. Mouth subterminal. Tip of nasal barbel reaching posterior edge of opercular patch of odontodes; tip of maxillary barbel reaching pectoral-fin base and tip of rictal barbel reaching posterior edge of interopercular patch of odontodes or the anterior edge of pectoral-fin.

Total vertebrae 36, 12-13 precaudal and 23-24 caudal. Ribs 5 (2) or 6 (1). Origin of dorsal-fin in a vertical through the 22nd vertebra. Origin of anal-fin in a vertical through the 23rd vertebra and through the base of the 7th ray of dorsal fin. Origin of pelvic fin in a vertical through the 17th-18th vertebra. Pectoral-fin rays i,6, pectoral fin triangular, first ray simple and pectoral filament absent (holotype plus one specimen) or ranging from 5-25% (16) greater than the other rays of the pectoral fin. Pelvic-fin rays 5 (i,4). End of pelvic fin overreach the urogenital papilla. Dorsal-fin rays 11-12 (v-vi,6), anal-fin rays 10-11 (v-vi,5). Principal caudal-fin rays 13 (i,11,i), procurrent dorsal rays 13 (2) or14 (1) and ventral 10 (2) or14 (1). Caudal fin subtruncate.

Mesethmoid with the anterior portion and shaft nearly straight, gradually tapering at proximal tip (Fig. 2a). Lateral ethmoid without lateral projections. Anterior fontanel restricted to small pit with small enlargement in posterior third of frontals. Posterior fontanel as small round opening on posterior portion of parieto-supraoccipital. Sesamoid supraorbital elongate, slender and curved, without lateral process, slightly longer than autopalatine; sphenotic-prootic-pterosphenoid narrow, with anterior portion anteriorly directed (Fig. 2a). Pterotic with posterolateral projection.

Autopalatine with a deep concavity on the internal medial border; posterior process moderate, about 50% of the length of the autopalatine (Fig. 2a). Posttemporo-supracleithrum with anterior and posterior processes.

Table 1. Morphometric data of holotype and 17 paratypes of *Ituglanis agreste*. SD = standard deviation.

	Holotype	Paratypes		
		Range	Mean	SD
Standard length (mm)	40.5	32.9-41.9	38.0	3.35
Percentage of standard length				
Body depth	12.4	11.6-15.1	13.5	1.1
Caudal peduncle depth	10.8	8.9-11.1	10.1	0.9
Body width	7.5	6.4-9.3	7.4	1.9
Caudal peduncle width	4.2	3.7-4.7	4.7	0.6
Dorsal-fin base length	10.9	8.6-11.8	10.3	0.8
Anal-fin base length	7.3	6.2-11.6	8.3	1.4
Pectoral-fin length	12.8	11.0-15.1	13.5	1.1
Predorsal length	69.1	64.1-73-3	69.1	1.9
Head length	16.9	15.9-19.6	17.8	1.1
Percentage of head length				
Head depth	77.5	41.8-77.5	53.9	8.4
Head width	98.7	83.5-107.9	93.9	6.8
Interorbital width	18.9	14.4-22.8	19.7	2.4
Preorbital length	32.5	30.4-39.6	33.2	4.5
Eye diameter	9.8	8.1-14.5	9.9	1.9

Vomer arrow-shaped, with thin lateral projections and long posterior process (Fig. 2b). Parasphenoid with two anterior and one posterior processes. Weberian capsule fused to basioccipital and exoccipital and with small lateral opening on each side. Premaxilla trapezoidal and curved with two rows of conical teeth. Maxilla curved with developed ventral process, smaller than premaxilla (Fig. 2a). Dentary almost straight with two regular rows of conical teeth and with pronounced coronoid process (Fig. 3).

Hyomandibula with an anterior laminar projection, a deep depression in dorsolateral portion and pores on anterior and dorsomedian regions (Fig. 4). Anterior portion of quadrate laminar and pronounced. Metapterygoid large, laminar and somewhat trapezoidal, articulating to quadrate by a cartilaginous block and to hyomandibula by bone contact area. Interopercular plate broad and elongate bearing conspicuous posterior projection, with 26-30 odontodes placed in two rows, including in anteroventral projection (Fig. 4). Opercle with 16-17 odontodes. Odontodes conical, curved on the opercular patch of odontodes and thinner on interopercular patch of odontodes.

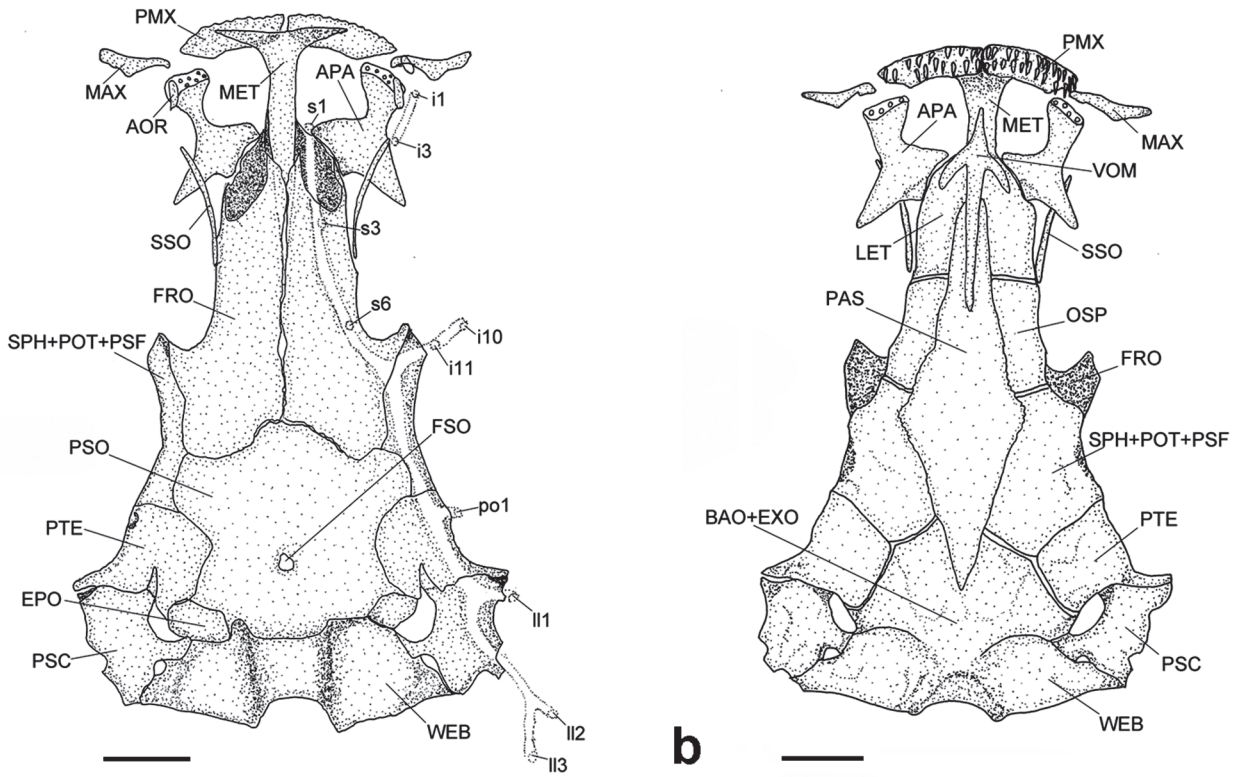

Fig. 2. Neurocranium and Weberian capsule of *Ituglanis agreste*, UFRN 38, 41.8 mm SL; **a**, dorsal view; **b**, ventral view. Abbreviations: AOR, antorbital; APA, autopalatine; BAO+EXO, basioccipital-exoccipital bone; EPO, epioccipital; FRO, frontal; FSO, parieto-supraoccipital fontanel; i1-i11, infraorbital pores; ll1-ll3, lateral line pores; LET, lateral ethmoid; MAX, maxilla; MET, mesethmoid; ORB, orbitosphenoid; PAS, parasphenoid; PMX, premaxilla; po1, preopercular pore; PSO, parieto-supraoccipital; PSC, posttemporo-supracleithrum; PTE, pterotic; s1-s6, supraorbital pores; SPH+POT+PSF, sphenotic-prootic-pterosphenoid; SSO, sesamoid supraorbital; VOM, vomer; WEB, Capsule of Weberian apparatus. Scale bar = 1 mm.

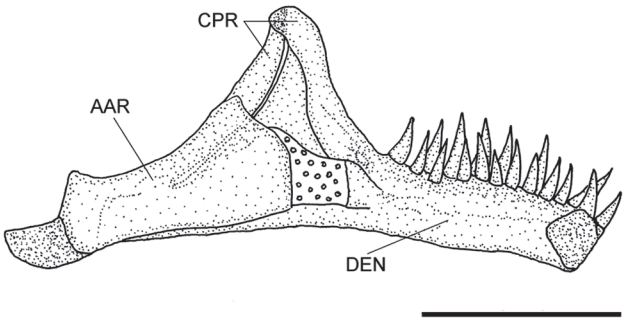

Fig. 3. Left mandible of *Ituglanis agreste*, paratype, UFRN 38, 41.8 mm SL. Medial view. Abbreviations: AAR, angulo-articulo-retroarticular; CPR, coronoid process; DEN, dentary. Scale bar = 1 mm.

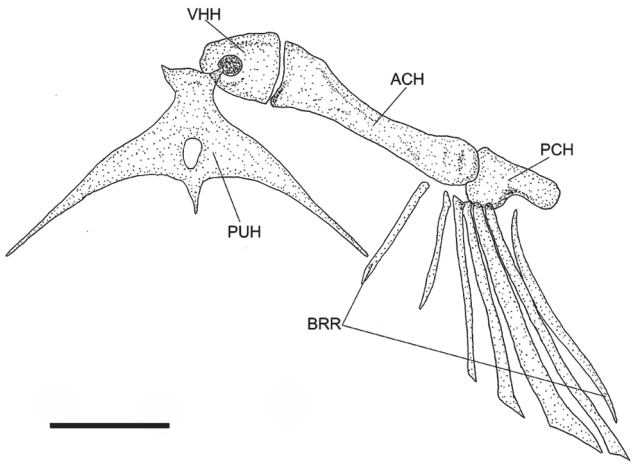

Fig. 5. Left hyoid arch of *Ituglanis agreste*, paratype, UFRN 38, 41.8 mm SL. Ventral view. Abbreviations: ACH, anterior ceratohyal; BRR, branchiostegal rays; PCH, posterior ceratohyal; PUH, parurohyal; VHH, ventral hypohyal. Scale bar = 1 mm.

Parurohyal with conspicuous central foramen and lateral process laminar and elongated, gradually tapering from base to tip, with about same length of ceratohyal (Fig. 5). Ventral hypohyal with deep depressions for articulation with parurohyal condyles. Seven branchiostegal rays.

First basibranchial absent, second and third basibranchials ossified with anterior and posterior cartilaginous tips; and fourth basibranchial consisting of elongated, flattened and rounded cartilage (Fig. 6). First hypobranchial 1 ossified and stem-like; second elongate somewhat trapezoidal, mostly cartilaginous except for anterolateral process; third flattened cartilaginous with ossified anterolateral process. First, second, third, and fourth ceratobranchials ossified with cartilaginous tips, and with posterolateral laminar expansions; fifth one curved with small teeth on anterior half. First epibranchial with long anterior process; second with two small alternated process; third with one rounded posterior process; fourth flattened, somewhat rectangular; fifth absent or not evident. First and second pharyngobranchials absent; third and fourth stem-like, this last attached to tooth plate. Upper pharyngeal tooth plate with conical teeth arranged in two rows in ventromedial region (Fig. 6).

Cleithrum flatenned, curved and slightly triangular. Scapulocoracoid trapezoidal, ossified with cartilaginous tip (Fig. 7). Pelvic girdle slender and mostly ossified, with cartilage restricted to posteromedial margins (Fig. 8).

Upper caudal plates composed of pleurostyle and hypural plates (hypurals 3-5) fused in a single triangular element (1), or with hypural 3 and hypurals 4-5 not fused (2) (Fig. 9). Parhypural partially fused to hypurals 1-2, with distal portion forming a spine-like structure (Fig. 9).

Cephalic sensory and lateral line channels composed by simple tubes ending in single pore, continuous and interconnected on pterotic, sphenotic-prootic-pterosphenoid, and lateral border of frontals. All cephalic pores paired (18): supraorbital 2-3 (s2, s3, and s6; one specimen with s2 absent), infraorbital 4-5 (i1, i3, i10, and i11; one specimen with i9), preopercular 1 and lateral line 3 (ll1, ll2, and ll3).

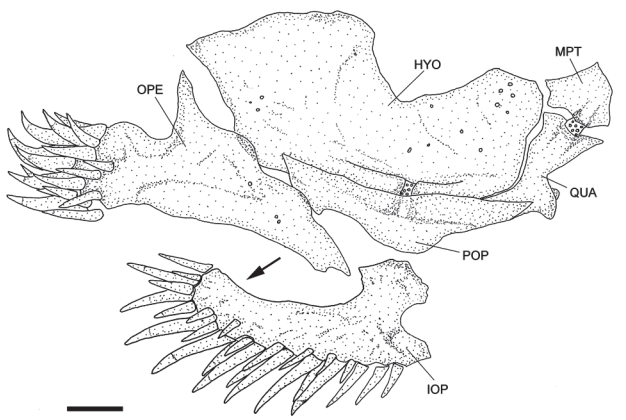

Fig. 4. Right suspensorium and opercular series of *Ituglanis agreste*, UFRN 38, 41.8 mm SL. Lateral view. The arrow indicates the interopercle plate broad and elongate. Abbreviations: HYO, hyomandibula; IOP, interopercle; MPT, metapterygoid; OPE, opercle; POP, preopercle; QUA, quadrate. Scale bar = 1 mm.

Coloration. Body with diffuse and irregular blotches on yellow background. Chromatophores more concentrated in dorsal and lateral region of body, forming large and irregular blotches. In lateral region, chromatophores less concentrated and blotches more dispersed. Ventral region spotless from isthmus to pelvic-fin base, region posterior to pelvic fin with diffuse, irregular and scattered blotches. Caudal penducle with smaller irregular blotches, but more

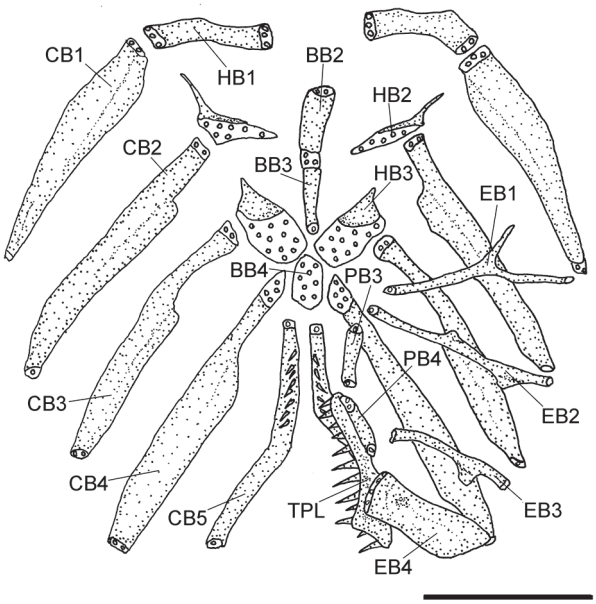

Fig. 6. Branchial skeleton of *Ituglanis agreste*, paratype, UFRN 38, 41.8 mm SL. Dorsal view (left dorsal elements and gill rakers not shown). Abbreviations: BB2-4, basibranchials 2 to 4; CB1-5, ceratobranchials 1 to 5; EB1-4, epibranchials 1 to 4; HB1-3, hypobranchials 1 to 3; PB3-4, pharyngobranchials 3 to 4; TPL, tooth plate. Scale bar = 1 mm.

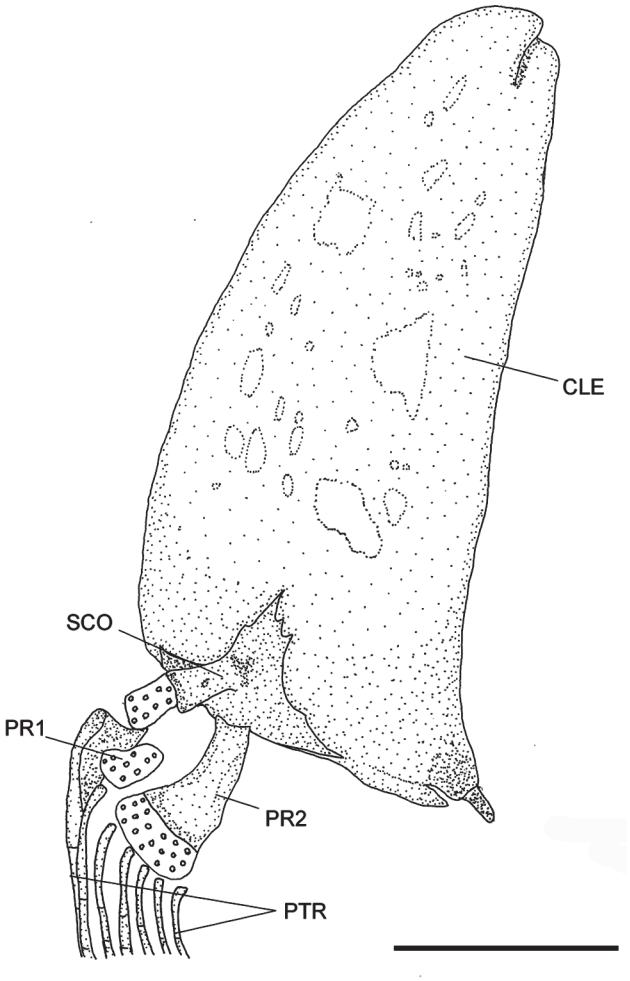

Fig. 7. Left Pectoral girdle of *Ituglanis agreste*, paratype, UFRN 38, 41.8 mm SL. Ventral view. Abbreviations: CLE, cleithrum; PTR, pectoral rays; PR1, proximal radial 1 (cartilaginous); PR2, proximal radial 2; SCO, scapulocoracoid. Scale bar = 1 mm.

defined. Chromatophores more concentrated in dorsolateral region of head and opercular patch of odontodes. Nasal, maxillary, and rictal barbels with chromatophores irregularly distributed throughout its entire length. Ventral region of head with chromatophores forming conspicuous spot on lower lip and with irregular and scattered blotches in anterior region to isthmus and interopercle (Fig. 1c). Fins with few chromatophores, more often at base of these. Some individuals exhibit lighter color than others, but following same color pattern.

Distribution. *Ituglanis agreste* is only known from the type locality, in rio Tarugo, municipality of Boa Nova, Bahia, northeastern Brazil. This river is a tributary of the rio Uruba, that flows into rio Gongogi, principal drainage of right margin on the middle section of rio de Contas basin (Fig. 10). This is the transition zone of the Serra da Ouricana, where small remnants of a formerly extensive humid forest that delineates the limits of the Atlantic Forest domain in the region (Gonzaga *et al*., 1995). Just a few kilometers to the west, the landscape gives way to the semi-arid Caatinga region, typically known for regular droughts. Thus, it is possible that the rio Tarugo represents the western geographical limit of distribution for this species. During a two year sampling (2008 - 2009) along a 325 km transect of the rio de Contas (between the municipalities of Ibuaçussê and Uruçuca), *Ituglanis agreste* was found only at one site.

Etymology. The specific name "agreste" (from latim *agrestis*, which means relative to land, field, wild, or rustic) refers to a semi-humid narrow strip parallel to the coast in northeastern Brazil, encompassing the area between the Rio Grande do Norte State to the middle section of rio de Contas basin in Bahia State (Forattini *et al*., 1981), that marks the transition between two distinct biomes, the Atlantic Forest and the semi-arid Caatinga (Prado, 2003), where the new species was discovered. A noun in apposition.

Ecological notes. *Ituglanis agreste* was found along a stretch of about 200 m in a mid-small size river with width up to 8 m, in a moderate slope with clear and cold water, with transparency of about 2 m (Fig. 7). The water flow was mainly turbulent, with alternating areas of currents and pools, though a predominance of moderate to strong

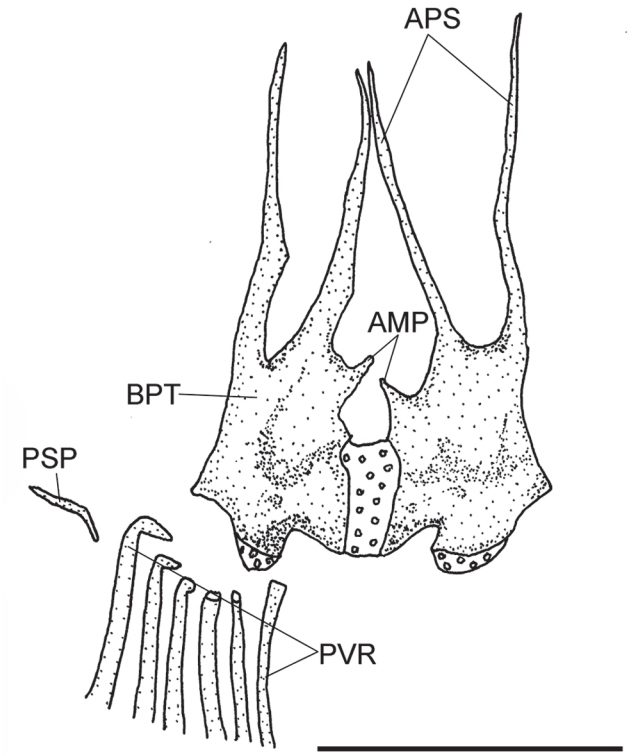

Fig. 8. Pelvic girdle of *Ituglanis agreste*, paratype, UFRN 38, 41.8 mm SL. Dorsal view. Abbreviations: APS, anterior processes; AMP, anterior medium processes; BPT, basipterygium; PSP, pelvic splint; PVR, pelvic rays. Scale bar = 1 mm.

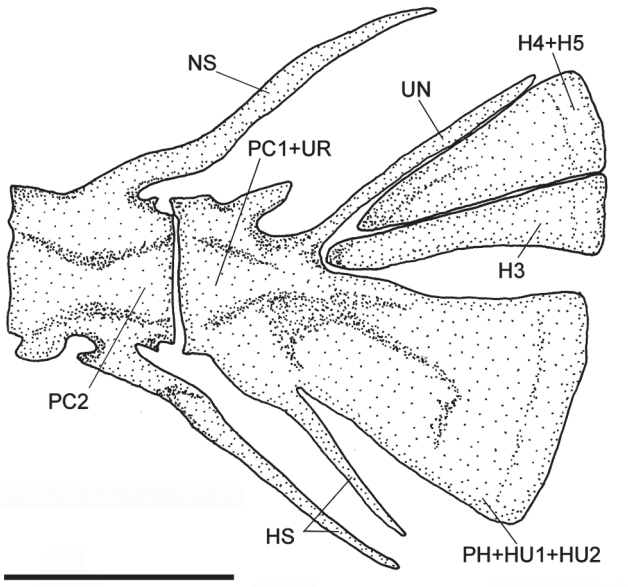

Fig. 9. Caudal skeleton of *Ituglanis agreste*, paratype, UFRN 38, 41.8 mm SL. Left lateral view. Abbreviations: HS, hemal spines; H3, hypural 3; H4+H5, hypurals 4 and 5 fused; NS, neural spine; PC1+UR, pleural 1 and ural fused; PC2, pleural centrum 2; PH+HU1+HU2, parhypural partially fused to hypurals 1-2; UN, uroneural. Scale bar = 1 mm.

drifts. Substrate consists of rocks or sand. The most common depth observed was about 0.5 m, but some parts had about 1.7 m. Some sites had underwater aquatic macrophytes and riparian vegetation. The backwaters area had vegetation composed of *Typha* sp. The margins were deforested and the environment was mainly composed of pastures. A reservoir without a lake formed by the dam of the river was observed above the collection site. Other species collected with *Ituglanis agreste* were: *Astyanax bimaculatus* (Linnaeus), *Callichthys callichthys* (Linnaeus), *Geophagus brasiliensis* (Quoy & Gaimard), *Rhamdia quelen* (Quoy & Gaimard) and *Poecilia reticulata* Peters, this last an exotic species.

Discussion

The new species is recognized as a member of *Ituglanis* because it possesses all three synapomorphies proposed for the genus by Costa & Bockmann (1993). However, among the genus, *Ituglanis agreste* has some characters that are apparently a plesiomorphic condition, characteristic of the most basal trichomycterid taxa: the high number of ribs (5-6), since it is present in a highest number (more than eight) in Copionodontinae, Trichogeninae, and Trichomycterinae (Sarmento-Soares *et al*., 2006) and the large interopercular plate bearing numerous odontodes (de Pinna, 1998; Adriaens *et al*., 2010). Most *Ituglanis* species have a low rib count (2-3; Sarmento-Soares *et al*., 2006), but all cave species (*I. bambui*, *I. epikarsticus*, *I. mambai*, *I. passensis*, and *I. ramiroi*; Fernández & Bichuette, 2002; Bichuette & Trajano, 2004, 2008) and at least some other species (*I. parahybae*, *I. paraguassuensis*, and *I. proops*) present a large number of ribs (5-7) (de Pinna & Keith, 2003; Datovo & Landim, 2005).

Ituglanis valid species usually show interopercle plate reduction and less odontodes (10-17), a derived character shared with the most specialized forms of the family, assembled in the large clade TSVSG (de Pinna, 1998). At least *I. proops* presents an elongate interopercle plate (de Pinna & Keith, 2003; Datovo & Bockmann, 2010), a character also observed in *I. agreste*. *Ituglanis agreste* also presents some others putative plesiomorphic characters, observed in most species of *Trichomycterus* and *Trichogenes* Britski & Ortega: the few number of vertebrae (36) and anal-fin origin inserted on a vertical at 23rd vertebra. Both features are also present in *I. paraguassuensis* (Campos-Paiva & Costa, 2007), which suggests a basal position to these species within the genus. Nevertheless, no formal phylogenetic analysis among *Ituglanis* species has been made yet, and the relationships among them remain unknown (Datovo & Landim, 2005; Wosiacki *et al*., 2012).

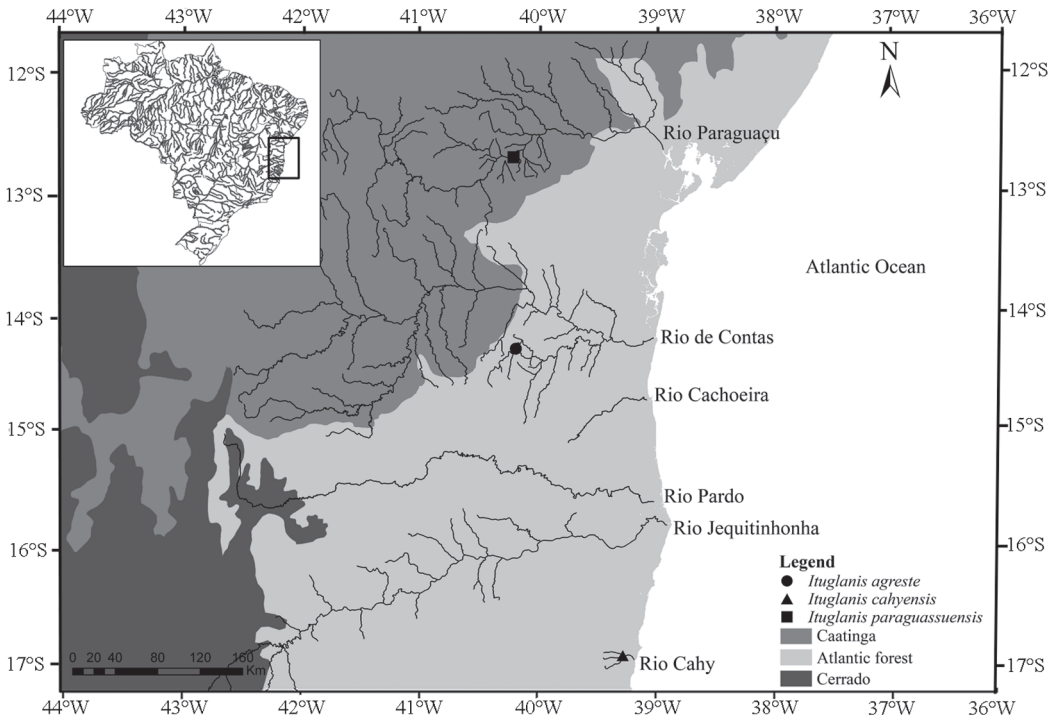

Fig. 10. Geographic distribution of the three *Ituglanis* species in northeastern Brazil. The locality of *Ituglanis agreste* (rio Tarugo) represents the type locality.

If corroborated, these results indicate that the genus *Ituglanis* could be another example of the "biogeographic pattern B" proposed by Ribeiro (2006) for several freshwater fish groups in the coastal drainages of eastern Brazil, including another trichomycterid genus, the Sarcoglanidinae *Microcambeva* Costa & Bockmann. Such pattern makes sister-group relationships found in the coastal basins of Brazil and subsequent irradiation with the most inclusive groups located inside the Brazilian Shield and the rio Amazonas basin (Ribeiro, 2006).

The caudal skeleton of *Ituglanis agreste* presents two conditions: upper hypural 3, 4, and 5 fused (one specimen) or hypural 3 detached from 4 and 5 (two specimens). Both attributes occurring within the same species was also reported for *I. ina* (Wosiacki *et al*., 2012), *Trichomycterus tupinamba* Wosiacki & Oyakawa (Wosiacki & Oyakawa, 2005), and vary among the genus in the subfamily Trichomycterinae (Arratia *et al*., 1978; comparative material). Within *Ituglanis*, some species has the hypural 3 detached from 4 and 5 (*I. amazonicus* and *I. eichorniarum*), but at least eight species (*I. paraguassuensis*, *I. parahybae*, *I. proops*, *I. macunaima*, *I. nebulosus*, *I. bambui*, *I. epikarticus*, and *I. ramiroi* have the hypurals fused, also seen in the specialized species of the TSVSG clade (Bichuette & Trajano, 2004; Datovo & Landim, 2005).

Although situated between two coastal basins of Bahia with *Ituglanis* species previously described: *I. paraguassuensis*, from the rio Paraguaçu basin adjacent in the north; and *I. cahyensis* from rio Cahy basin in the south, the diagnostic features of the new species of rio de Contas basin gives enough evidence to differentiate from these two species formally described, confirming the restricted distribution of most species of the genus.

The most conspicuous differences between *I. agreste* and *I. paraguassuensis* are found in interopercle patch of odontodes (elongate with 26-30 odontodes *vs*. reduced with 14-15 odontodes), and should not be related to ontogenetic development once individuals of similar range size were observed (3 c&s, 32.8-41.9 mm SL *vs*. 3 c&s, 30.3-39.6 mm SL). According to Arratia *et al*. (1990) these integumentary teeth arise very early during ontogeny (Datovo & Bockmann, 2010), indicating that *Ituglanis* from rio de Contas and rio Paraguaçu are not conspecific. They can be also distinguished by the number of branchiostegal rays, (7 *vs*. 8) and lack of s1 pore (*vs*. presence). Nevertheless, they share some diagnostic features used to distinguish other *Ituglanis*, as 36 vertebrae, seven pectoral-fin rays (i,6) and six pair of ribs. The number of vertebrae shared by them, was referred as an unusual condition among the genus (Campos-Paiva & Costa, 2007), but it is shared at least by other five species (*I. nebulosus*, *I. passensis*, *I. ramiroi*, *I. epikarstikus* and *I. bambui*; Fernández & Bichuette, 2002; de Pinna & Keith, 2003; Bichuette & Trajano, 2004). The troglomorphic species from Central

Brazil and a few specimens of *I. ina* also presents a high number of interopercle odontodes (more than 24, except in *I. epikarsticus*) but differ in some aspects from *I. agreste* (pectoral-fin rays i,7 or i,8 and some degree of reduction of eyes and pigmentation in subterranean species or usually i,5 and homogeneous color pattern with dark vertical bar in caudal peduncle in *I. ina vs*. i,6 and spotted color pattern; Bichuette & Trajano, 2008; Wosiacki *et al*., 2012).

Although the color pattern of *I. agreste* is similar to *I. paraguassuensis*, both with a yellow background body covered by blotches, in *I. agreste* the spots are more diffuse and irregular than *I. paraguassuensis*, that presents blotches more conspicuous (Campos-Paiva & Costa, 2007). The concentration of chromatophores is more intense in *I. agreste*, covering the dorsal and lateral region of the body, which gives a darker appearance to *I. agreste*, if compared to *I. paraguassuensis*, in which the pigmentation is slightly more concentrated near the eyes and opercular region.

The color pattern of *Ituglanis agreste* also differs clearly from *I. cahyensis* that presents longitudinal rows of coalescing blotches (Sarmento-Soares *et al*., 2006). They also differs by several features, as the higher number of pectoral fin-rays (i,6 *vs*. i,4), higher number of opercular (17 *vs*. 9-12) and interopercle (26-30 *vs*. 16) odontodes, fewer vertebrae (36 *vs*. 38 or more), higher number of branchiostegal rays (7 *vs*. 4-6), higher number of ribs (5-6 *vs*. 4), 13 caudal-fin rays (*vs*. 10-11), 10-11 anal-fin rays (*vs*. 7-8), the position of the pelvic fin, with its origin inserted on a vertical at 17th and 18th vertebra (*vs*. 20th) and metapterygoid large in contact with the quadrate and the hyomandibular (*vs*. metapterygoid short, laminar, almost rectangular joined only with the quadrate; Sarmento-Soares *et al*., 2006). Despite of that, they shared at least one character, the absence of s1 pore.

The type locality of *Ituglanis agreste* is located in the coastal strand of the Serra da Ouricana, which holds important small remnants of a formerly humid forest (Gonzaga *et al*., 1995) and delineates the westernmost limits of the Atlantic Forest domain bordering with the Caatinga biome. In northeastern Brazil these transition zone are referred as "agreste", which corresponds to a semi-humid climate (Fig. 10).

The three species of *Ituglanis* described to the northeastern Brazil were found in streams placed in distinct climate and vegetation domains: *I. paraguassuensis* in the Caatinga, *I. cahyensis* in the Atlantic Forest and *I. agreste* was collected in a transition area between these two biomes. Unlike rio Cahy basin, which is a small coastal basin fully inserted in the Atlantic forest domains, the rio Paraguaçu and Contas basins are perennial middle size rivers, with some intermittent tributaries in the upper and middle stretches in the Caatinga region, and lower stretches in the Atlantic Forest (Rosa *et al*., 2003).

The collection site was highly degraded due to anthropogenic impacts, mainly removal of riparian vegetation for agriculture and cattle (Fig. 11) in Boa Nova adjacencies. According to Gonzaga *et al*. (1995) the forest environments in Serra da Ouricana are among the most neglected habitats for conservation. Only recently this region was recognized of a high importance for conservation (MMA, 2007), which led to the creation of new conservation units in 2010: Boa Nova National Park (PARNA) and Boa Nova Wildlife Refuge (REVIS), with the aim to preserve the natural ecosystems of the transition area between Atlantic forest and Caatinga, protect endangered species and maintain water sources/springs and streams (Brasil, 2010). Cetra *et al*. (2010), in a study of freshwater fish promoting the expansion and implementation of conservation units in southern Bahia, conduct ichthyological surveys in the rio Cachoeira, Colônia, Contas, and Jequié basins, including these new protected areas in Boa Nova, near the type locality (about 9 km east). These authors only recorded the presence of *Ituglanis* sp. about 120 km south of the type locality of *I. agreste*, in the rio Cachoeira basin. Because the taxonomic status of *Ituglanis* sp. collected in the rio Cachoeira basin remains uncertain, it could belong to a previously described species or a distinct new species. Regardless, *I. agreste* most likely occurs in the new conservation areas in Boa Nova (PARNA and/or REVIS), since these protected areas are situated near the type locality where the new species was collected.

Fig. 11. Type locality of *Ituglanis agreste*, Brazil, Bahia State, Boa Nova municipality, rio Tarugo, rio de Contas basin.

The protection of water courses and their riparian margins through the creation of conservation units is among the most important measures concerning the future and diversity of fish species of the coastal basins of Brazil (Menezes *et al*., 2007). Fortunately, the three species of *Ituglanis* known from Bahia (including the one described herein), are found in hydrographic basins that pass through integral protection conservation units: *I. paraguassuensis* in the rio Paraguaçu basin that passes through the Chapada Diamantina National Park, *I. cahyensis* in the rio Cahy basin that has part of it course protected by the

Descobrimento National Park and *I. agreste* in the rio de Contas basin with the type locality close to the recently created Boa Nova National Park and Boa Nova Wildlife Refuge.

The discovery of this new species in the rio de Contas basin reinforces the necessity for ichthyofaunal inventories in northeastern Brazil, especially in the numerous isolated coastal watersheds south of rio São Francisco, where more undescribed species are expected to exist (Langeani *et al*., 2009). In the last three years, six new fish species were described for the rio de Contas basin: *Cyphocharax pinnilepis* Vari, Zanata & Camelier, *Gymnotus interruptus* Rangel-Pereira, *Hasemania piatan* Zanata & Serra, *Hyphessobrycon brumado* Zanata & Camelier, a distinct species from *H. negodagua* that inhabits the rio Paraguaçu basin, *Leporinus brinco* Birindelli, Britski & Garavello, *Trichomycterus tete* Barbosa & Costa (Vari *et al*., 2010; Zanata & Camelier, 2010; Zanata & Serra, 2010; Barbosa & Costa, 2011; Rangel-Pereira, 2012; Birindelli *et al*., 2013). Hence, the case of *Ituglanis agreste*, together with the recently discovered endemic fish above, suggests that the rio de Contas basin contains several endemic species (Zanata & Camelier, 2010).

Comparative material examined. *Trichogenes longipinnis*, UFRJ 894, 9, 29.7-46.5 mm SL, **Brazil**, São Paulo State, Ubatuba municipality, affluent of rio Camburi; UFRJ 682, 1 c&s, 48.4 mm SL, São Paulo, Ubatuba, affluent of rio Camburi. *Trichomycterus potschi*, UFRJ 719, 2 c&s 33.4-47.6 mm SL, **Brazil**, Rio de Janeiro State, Itaguaí municipality; *Trichomycterus giganteus*, UFRJ 5999, holotype, 120.6 mm SL, **Brazil**, Rio de Janeiro State, Campo Grande municipality, rio Guandu-Mirim; UFRJ 5730, paratypes, 10, 116.2-138.7 mm SL, same locality. *Ituglanis amazonicus*, MNRJ 35401, 3, 38.8-56.6 mm SL, **Brazil**, Pará State, Uruará municipality, tributary of rio Uruará; USNM 305468, 2, 31.6-31.7 mm SL, **Bolivia,** Beni, Ballivián, 40 km east San Borja; USNM 317738, 1 c&s, 42.3 mm SL, same locality; USNM 300990, 1, 33.2 mm SL, **Peru**, Madre de Dios, Manu National Park; USNM 263929, 1, 43.4 mm SL, Madre de Dios, Reserva Natural de Tambopata, on trail to laguna Cococha; USNM 263930, 1, 34.0 mm SL, Madre de Dios, rio Tambopata. *Ituglanis cahyensis*, MNRJ 32080, 1, 39.30 mm SL, **Brazil**, Bahia State, Prado municipality, rio Cahy. *Ituglanis eichorniarum*, UFRJ 5474, 1, 24.3 mm SL, **Brazil**, Mato Grosso State, Porto Cercado, Corixo Santa Rosa in rio Cuiabá; UFRJ 5608, 1 c&s, 29.4 mm SL, same locality. *Ituglanis gracilior*, USNM 272287, 1, 50.8 mm SL, **Venezuela**, Amazonas, caño Temblador, in the road between San Carlos do Rio Negro and Solano; USNM 272288, 1 c&s, 56.2 mm SL, Amazonas, caño Loro, in the road between San Carlos do Rio Negro and Solano; USNM 272289, 1, 50.0 mm SL, Amazonas, caño Urami, upriver of Santa Lucia. *Ituglanis laticeps*, USNM 163907, 2, 56.7-73.2 mm SL, **Ecuador**, Pastaza, rio Bobonaza. *Ituglanis metae*, USNM 100765, 1, 54.3 mm SL, **Colombia**, Villavivencio. *Ituglanis parahybae*, UFRJ 761, 1, 43.8 mm SL, **Brazil**, Rio de Janeiro State, Silva Jardim municipality, rio São João, close to Gaviões; UFRJ 702, 6, 41.4-51.4 mm SL; UFRJ 704, 1, 42.1 mm SL, same locality. *Ituglanis paraguassuensis*, LIRP 5780, 1, 41.2 mm SL, holotype, **Brazil**, Bahia State, Iassú municipality, rio Paraguaçu; LIRP 5834, paratypes, 5, 34.8-41.3 mm SL; UFRJ 7209, paratype, 1, 36.5 mm SL; UFRJ 7282, paratype, 1 c&s, 39.6 mm SL; USNM 301016, paratypes, 5 (2 c&s), 33.7-41.6 mm SL, same locality. *Ituglanis proops*, MZUSP 39027, 2 c&s, 34.8-40.7 mm SL, Brazil, São Paulo State, Iporanga municipality; *Ituglanis* sp., UFRJ 7237, 8, 31.6-40.7 mm SL, **Brazil**, Pará State, Primavera municipality, small stream on the road to Bragança; UFRJ 7238, 2 c&s, 29.8-32.6 mm SL; UFRJ 7239, 2 c&s, 28.3-33.4 mm SL, same locality. *Ituglanis* sp., MNRJ 37539, 4, 46.6-54.0 mm SL, **Brazil**, Mato Grosso State, Aripuanã municipality, rio Aripuanã, upstream Dardanelos waterfall. *Microcambeva ribeirae*, MZUSP 78617, paratypes, 5, 41.3-48.1 mm SL, **Brazil**, São Paulo State, Pedro de Toledo municipality, rio São Lourencinho; MZUSP 68169, paratypes, 3 c&s, 37.7-41.8 mm SL, **Brazil**, São Paulo State, Juquiá, ribeirão Poço Grande. *Listrura picinguabae*, UFRJ 6111, 1, holotype, 48.6 mm SL, **Brazil**, São Paulo State, Ubatuba municipality, small tributary of rio da Fazenda, near Km 11 of the road BR-101 in Serra do Mar state Park; UFRJ 5951, 4 c&s, 31.3-35.5 mm SL, São Paulo State, Ubatuba municipality, small tributary of rio da Fazenda in Serra do Mar state Park.

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