

## A new cave dwelling species of *Ituglanis* from the São Domingos karst, central Brazil (Siluriformes: Trichomycteridae)

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*Ituglanis passensis*, new species, is described from a small subterranean stream in the Passa Três cave, Goiás, Brazil. It is the first record of a species of *Ituglanis* from subterranean environment. It differs from all congeners in the reduction of the dark pigmentation and the regression to varying degrees in the development of the eyes. It is distinguished from other troglomorphic species of the Trichomycteridae in having a maxillary barbel extending to anterior margin of the pectoral fin, a first pectoral-fin ray as a short filament, 8 pectoral-fin rays and 7 ribs, head length 16-17 % SL; and a rectangular premaxilla with 3 or 4 rows of teeth, those of the outer row conic.

*Ituglanis passensis*, espécie nova, é descrita de um riacho subterrâneo da caverna Passa Três, Goiás, Brasil. Trata-se do primeiro registro de uma espécie de *Ituglanis* para o ambiente subterrâneo. Esta espécie difere de todos os outros congêneres pela redução da pigmentação escura e regressão no desenvolvimento dos olhos, com variação intrapopulacional. Comparando-se com outras espécies troglóbias de Trichomycteridae, as seguintes diferenças são observadas: o barbilhão do maxilar estende-se até a margem anterior da nadadeira peitoral; o primeiro raio da nadadeira peitoral é prolongado como um curto filamento; a presença de oito raios na nadadeira peitoral e sete costelas; o comprimento da cabeça entre 16 - 17 % do comprimento-padrão e um pré-maxilar retangular, com três ou quatro fileiras de dentes, com dentes cônicos na fileira mais externa.

### Introduction

The Neotropical catfish family Trichomycteridae is widely distributed from Costa Rica in the North to Patagonia in the South, and from the Atlantic rainforest to Andean streams (Campanario & de Pinna, 2000). Costa & Bockmann (1993) recognized a group of species formerly included in *Trichomycterus*, as a new genus *Ituglanis* that they hypothesized was the closest relative of a large

clade composed of the Tridentinae, Stegophilinae, Vandelliinae, Sarcoglanidinae, and Glanapteryginae.

*Trichomycterus* is one of several genera in the Trichomycteridae with a relatively numerous subterranean populations that show reductions in the degree of development of the eyes and dark pigmentation (troglomorphy). Some of these species are thought to be troglolithes exclusively found in that habitat (*T. chaberti* from the Umay-

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lanta cave, Bolivia, *T. guianense* from the Guacharo cave, Venezuela, *T. itacarambiensis* from the Olhos d'Água cave, Brazil, and at least three undescribed species from the Colombian Andes [Sket, 1988], Bahia, northeastern Brazil, and Mato Grosso do Sul, central Brazil [E. Trajano, pers. comm.]. In addition there are four populations of troglotic trichomycterid species from caves near São Domingos, Goiás, Brazil (M. E. Bichuette, pers. obs.).

Caves in the São Domingos karst are inhabited by a particularly diversified ichthyofauna, with at least three troglotic species, of which two are siluriforms, including one species of *Ituglanis*, described here. This species was reported on in some detail by Trajano & Souza (1994), who mentioned behavioral specializations related to the subterranean life, but it was not formally named and we do so herein.

### Materials and methods

Measurements follow the methods by Tchernavin (1944), Ringuelet et al. (1967) and de Pinna (1992). Measurements were taken on the left side of each specimen with digital calipers under a stereomicroscope. Osteological preparations follow Tay-

lor & Van Dyke (1985) and Wassersug (1976) and osteological terminology follow Baskin (1973) and de Pinna (1989, 1998). Counts of dorsal and anal fin rays and vertebrae follow de Pinna (1992). Institutional abbreviation follow Leviton et al. (1985), with the addition of IBA, Instituto de Biología Animal, Mendoza, and MFA-ZV, Museo Provincial de Ciencias Naturales Florentino Ameghino, Santa Fe.

### *Ituglanis passensis*, new species (Fig. 1)

*Trichomycterus* sp.: Trajano & Souza 1994 (notes).  
*Trichomycterus* sp. 1: Trajano 1997 (citation).

**Holotype.** MCP 27382, 62.6 mm SL; Brazil: Goiás: São Domingos: Passa Três cave: subterranean stream in the Tocantins drainage, 13°36'S 46°23'W; R. E. Reis, E. Trajano, L. Finley & P. Slavec; 27 July 1988.

**Paratypes.** MCP 12941, 3, 37.8–62.2 mm SL (1 C&S); same data as holotype. –MFA-ZV 554-1, 1, 57.1 mm SL; MFA-ZV 554-2, 1, 60.5 mm SL; same locality as holotype; R. Ferrari; 26 July 1978.

Table 1. Morphometric data of holotype and 5 paratypes of *Ituglanis passensis*.

	holotype	paratypes				
Standard length (mm)	62.6	37.8	57.6	60.5	61.1	62.2
Total length (mm)	69.0	43.5	66.0	69.3	69.9	71.6
<b>Percentages of standard length</b>						
Body depth	15.2	14.3	14.4	16.2	14.4	14.6
Caudal peduncle length	19.9	24.1	23.6	25.3	22.7	22.7
Caudal peduncle depth	10.5	9.5	10.2	10.2	10.8	9.6
Predorsal length	67.6	67.2	65.1	66.8	67.6	66.9
Preanal length	72.4	71.4	70.6	69.9	73.9	70.9
Prepelvic length	59.1	56.6	56.6	56.7	60.2	57.9
Dorsal-fin base length	10.2	10.8	11.3	12.9	10.3	9.8
Anal-fin base length	8.6	7.9	8.3	9.2	8.7	8.7
Head length	16.8	16.7	16.7	17.5	16.8	16.9
Head width	18.0	15.6	15.3	15.5	16.7	17.4
Head depth	9.6	8.2	8.7	8.9	8.7	9.5
<b>Percentages of head length</b>						
Nasal barbel length	86.7	82.5	103.1	93.4	91.3	87.6
Maxillary barbel length	100.0	107.9	118.7	122.6	117.5	100.9
Submaxillary barbel length	67.6	66.7	75.0	76.4	72.8	77.1
Mouth width	40.0	41.3	40.0	34.9	46.6	48.6

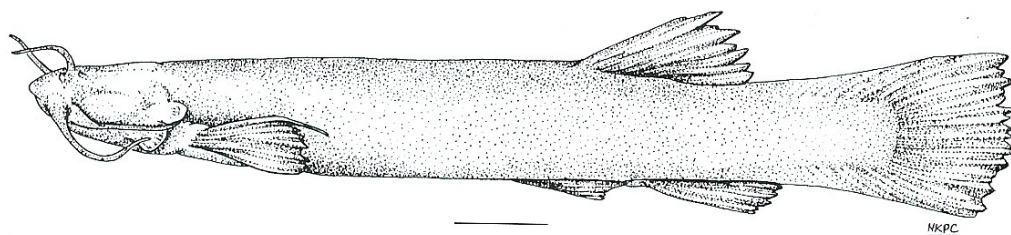


Fig. 1. *Ituglanis passensis*, holotype, MCP 27382, 62.6 mm SL. Drawing N. K. Perez Carbajal.

**Diagnosis.** *Ituglanis passensis* differs from all other members of the genus in the reduction of dark pigmentation on the head and body and variable regression of the degree of development of the eyes (Fig. 1). The head and body pigmentation varies from yellowish to light gray, with scattered melanophores limited to the dorsal region of the body. The degree of development of the eyes ranges from their appearing as black dots to being externally invisible. The new species is further distinguished from other troglotic species of Trichomycteridae by the following combination of characters: a maxillary barbel extending to the anterior margin of pectoral fin (Fig. 2); a first pectoral-fin ray prolonged as a short filament (Fig. 2); 8 pectoral-fin rays and 7 ribs; head length 16-17% SL; and the rectangular premaxilla with 3 or 4 rows of teeth, those of the outer row conic.

**Description.** Morphometric data for holotype and five paratypes in Table 1. Body elongate, cy-

lindrical, with trunk region compressed, becoming progressively more compressed towards caudal fin. Dorsal and ventral profiles of trunk and caudal peduncle nearly straight. Lips and barbels covered by papillae. Anus located approximately midway between pelvic fin insertion and anal-fin origin.

Head wide and depressed, trapezoidal in dorsal view. Eyes typically not visible externally but two paratypes (37.8 and 62.2 mm SL) with eyes that appear as black spots. When present, eyes ovoid and never as large as those observed in epigeal *Ituglanis* species. Skin covering eyes thin and transparent, separated from surface of eyeball; orbital rim not free.

Anterior nostril slightly smaller than posterior nostril, surrounded medially by fleshy flap of integument and laterally by barbels. Posterior nostril partially surrounded anteriorly by a flap of thin skin.

Mouth subterminal, with rictus directed pos-

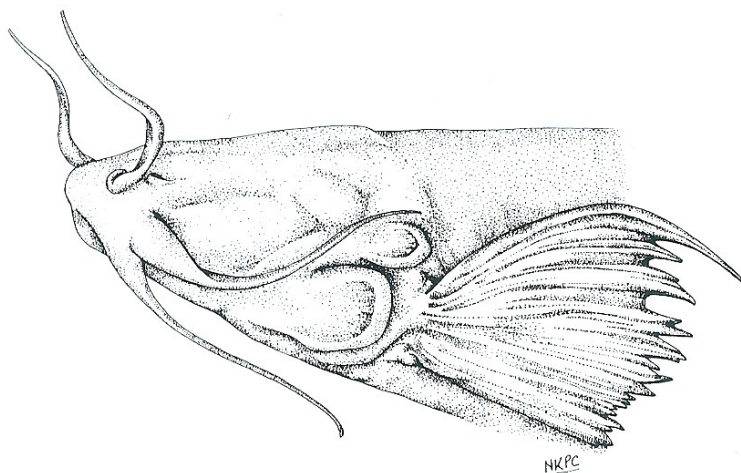


Fig. 2. *Ituglanis passensis*, holotype, MCP 27382; lateral view of head showing length of maxillary barbels and reduced size of eyes. Drawing N. K. Perez Carbajal.





Fig. 3. *Ituglanis passensis*, about 60.0 mm SL, not preserved; Brazil: Passa Três cave. Photo Ivan Sazima.

teriorly. Premaxillae rectangular, larger than width of palatine and larger than maxilla. Premaxilla with 3 or 4 rows of teeth; outer row with 9 conic teeth. Lower lip with prominent fleshy lobes along lateral limits, lobes situated internal to base of rictal barbels.

Barbels relatively long and without the distal branching. Maxillary barbels extend posteriorly to interopercular patch of odontodes and to pectoral-fin origin. Nasal barbels extends to posterior border of eye and reaches to opercular odontodes. Submaxillary barbels shorter than maxillary barbels and reach interopercular odontodes.

Pectoral-fin margin rounded; first ray prolonged as a filament. Pectoral fin with 8 rays, first ray unbranched. Distal margin of dorsal fin rounded; semicircular when fin expanded; with 7 branched and 4 unbranched rays; base fleshy. Dorsal-fin origin anterior of vertical through anus. Anal fin with 5 branched and 4 unbranched rays; base fleshy, similar to that of dorsal fin, distal margin slightly rounded. Pelvic fin rays 5 plus one splint; second and third rays longest. Tip of adpressed pelvic fin extends posteriorly beyond anus, but falls short of anal-fin origin. Caudal-fin margin nearly straight, with dorsal and ventral portions rounded. Caudal fin with 13 principal rays (6+7). Dorsal procurrent rays 15 and ventral 11.

Interopercular patch of odontodes anteroposteriorly elongate; odontodes imbedded in fleshy covering over interopercle. Opercular patch of odontodes small and rounded, with odontodes imbedded in fleshy covering of opercle.

**Coloration in alcohol.** Scattered melanophores limited to the dorsal region of body. Coloration varies from yellowish to light gray (Fig. 3). Fins lack dark pigmentation, except for few chromato-

phores at base of dorsal fin (Fig. 3). Field observations by MEB did not indicate the presence of albinic individuals.

**Osteology.** General morphology of cranium, suspensorium, opercular apparatus, and hyoid arch does not show any significant differences with that described and illustrated for *Ituglanis* by Costa & Bockmann (1993: fig. 3-6), except for the following characters. The supraorbital compact tendon-bone lacks a lateral expansion. The lachrymal is slightly less than one-half length of maxilla. The posttemporo-supracleithrum (= supracleithrum of Costa & Bockmann, 1993: fig. 3) is formed by the posttemporal with its characteristic dorsal limb lying on the pterotic (Arratia & Menu-Marque, 1984). The presence of three or four premaxillary tooth rows; with the outer row having nine conic teeth. Branchiostegal rays six. Opercle with 16 odontodes and interopercle with 24 odontodes in the cleared and stained specimen.

Postcranial skeleton. Total vertebrae 36, with 7 precaudal and 29 caudal vertebrae (counted in one specimen). The first dorsal fin pterygiophore inserts posterior to vertebrae 21, and the first anal fin pterygiophore inserts posterior to vertebrae 23. There are seven pairs of ribs. The pectoral girdle is formed by the posttemporosupracleithrum (see above), with a large triangular cleithrum-coracoid and one large, triangular and ossified proximal radial. The pelvic girdle has a single bone bearing three process anteriorly (two anterolateral and one medial process) and caudally a short posterior process. The caudal skeleton lacks the epural and the neural spine of preural centrum 1. Hypural 3 unfused to hypurals 4 and 5; hypurals 1 and 2 fused to parhypural.



The laterosensory canal system on the body is surrounded by one ossicle.

**Ecology.** *Ituglanis passensis* inhabits small riffles with slow current 15-20 cm deep on average. It has cryptobiotic habits, hiding in the gravel bottom or under limestone blocks. No agonistic behavior was observed. Based on mark-recapture methods for estimating of population and on the length (for about 2,000 m) and width (1.0 m in average) of the stream section traversing the Passa Três cave, it is estimated that the total population of *I. passensis* in the cave is approximately 530 individuals (0.265 individuals/m<sup>2</sup>). Water temperature and pH measured in the years of 1999 to 2001 varied little during the dry, or at the end of the rainy, seasons. The pH shows a range of 7.6-8.4 and the water temperature a range of 19.0-20.0 °C, contrasting with the water temperature for the epigeal reach of 18.7-22.8 °C, presumably as a consequence of the buffering effect of the subterranean environment. It is noteworthy that although several different collecting methods were utilized outside the caves during the ecological study (1999 to 2001) no specimens of *Trichomycterus* and *Ituglanis* were found in the epigeal course of Passa Três stream, further evidence of the troglobite character of the species.

**Distribution.** *Ituglanis passensis* is known only from a subterranean stream traversing the Passa Três cave, Município de São Domingos, Goiás, Brazil.

The Passa Três stream is a small tributary of the Rio São Vicente system (13°25'S 46°22'W). After a surface course, it sinks into the Passa Três conduit that is more than 2,000 m long with a mean width of approximately 1.0 m. About 100 m from the cave entrance, there is a major waterfall about 5 m high in the dry season. Upstream and downstream from the waterfall the stream is nearly horizontal, with shallow riffles and moderate current over a rocky and graveled bottom, alternating with some deep, soft-bottomed pools. A very low, but short, underwater passage separates the upper 400 m from the remaining 1,500 m long reach, that joins the large São Vicente stream inside São Vicente I cave. The climate in the area is tropical semiarid, with a severe dry season between April and September and rainy season during October and April (Ab'Saber, 1977). Thus, the caves are subject to seasonality and are flooded during part of the rainy season.

**Etymology.** The specific name, *passensis*, makes reference to the type-locality, the Passa Três cave.

## Discussion

The inclusion of the new species in the genus *Ituglanis* is appropriate since it shares the three autapomorphies proposed for the genus by Costa & Bockmann (1993) and de Pinna (1998): 1) the supraoccipital fontanel reduced to small round orifice, 2) a palatine with a deep concavity on its medial margin, and 3) the anterior portion of sphenotic directed anteriorly.

*Ituglanis passensis* is differentiated from all other species of *Ituglanis* by the reduction of pigmentation and the reduction of eyes. The coloration varies from yellowish to light gray, with scattered melanophores limited to the dorsal region of body. The degree of eye development ranges from black spots to no external indication of eyes. In contrast, most epigeal species of *Ituglanis* have dark melanophores on the body and eyes fully developed. The pattern of colorations of epigeal species is typically represented by variable ground color, ranging from chocolate brown with faint darker spots or dark brown with numerous spots.

*Ituglanis passensis* can be distinguished from other troglobitic species of Trichomycteridae by various features. *Ituglanis passensis* new species has 8 pectoral fin rays which differentiates it from *Trichomycterus chaberti* that has 10 rays (Durand, 1968), and from *T. itacarambiensis* that has 7 rays (Trajano & de Pinna, 1996). The maxillary barbel that extends to the anterior margin of the pectoral fin separates *I. passensis* from *T. chaberti* in which this barbel reaches to the opercular patch of odontodes but falls short of pectoral fin (LF, pers. obs.). The head length 16-17 % SL and the presence of seven ribs distinguishes *I. passensis* from *T. itacarambiensis*, which has a head length 19-21 % SL and 9-13 ribs (LF, pers. obs.).

**Comparative material.** *Bullockia maldonadoi*: USNM 167872, 9 paratypes; USNM 84344, 2 paratypes; Chile: Nonquén. - MZUSP 28307, 1; Chile: río Andalién. *Eremophilus mutisi*: AMNH 7072, 1 (C&S); CAS 76887, 3; FML uncat., 1; Colombia. *Hatcheria macraei*: CAS 28551, 2; Argentina: río San Juan. - CAS 76889, 1; FML uncat., 2 (1 C&S); Argentina: río Calingasta. *Ituglanis amazonicus*: ANSP 160591, 2; Venezuela: río Orinoco. *I. eichorniarus*: MNRJ 780, lectotype; Brazil: Mato Grosso. *I. gracilior*: ANSP 175852, 2; Guyana: río Kurupukari. *I. her-*

*berti*: MNRJ: 1429, 1 syntype; Brazil: Mato Grosso. *I. laticeps*: AMNH 3641, 2; Colombia: Río Negro. *I. metae*: ANSP 160231, 2; Venezuela: Río Parguaza. *I. parahybae*: FMNH 58576, holotype; Brazil: Río Parahyba. *I. proops*: MNRJ 781, lectotype; Brazil: Iguape. *Rhizomichthys totae*: CAS-SU 37074, 2 paratypes (1 x-ray); USNM 120130, 4; Colombia: lago Tota. *Silvinichthys mendozensis*: IBA 81, 3 paratypes; IBA 31, 1; IBA 32, 3; FML 2100, 49 (5 C&S); Argentina: Mendoza. *Trichomycterus brasiliensis*: ANSP 170011, 2; MZUSP 28135, 2; Brazil: Minas Gerais. *T. castroi*: MZUSP 36965, holotype; Brazil. *T. conradi*: CAS 58257, 1 paratype; Guyana: río Essequibo. *T. chaberti*: ANSP 140068, 1 paratype; Bolivia: Grotte Umayalanta. *T. davisii*: FMNH 60309, holotype; Brazil: Serrinha Paraná. *T. hasemani*: CAS 64584, 1 paratype; Brasil: Santarem. *T. johnsoni*: ANSP 53873, holotype; Brasil: Matto Grosso. *T. paolence*: FMNH 58085, 1 paratype; Brasil: río Tiete. *T. reinhardti*: MZUSP 39132, 2; Brazil: Minas Gerais.

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