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New species of the catfish genus *Trichomycterus* (Siluriformes, Trichomycteridae) from the headwaters of the rio São Francisco basin, Brazil

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Abstract

Trichomycterus trefauti, new species, is described based on eight specimens from the rio São Francisco basin, Minas Gerais, Brazil. The new species differs from all other trichomycterine species by the autapomorphic presence of an elliptical, vertically elongated, brown spot, at caudal-fin base, and the combination of homogeneously gray color pattern, first pectoral-fin ray prolonged as a filament, subterminal mouth, two supraorbital pores at interorbital space, caudal fin truncate with attenuated edges, pelvic fins covering anus and urogenital openings, interorbital space very wide (39.8–45.9 % head length), maxillary barbels very long (84.2–93.0 % head length), rictal barbels very long (67.6– 74.3 % head length). Systematics, diagnostic features, and putative information on phylogenetic relationships of *Trichomycterus* species are discussed.

Key words: catfish, *Trichomycterus*, species description, systematics, classification

Resumo

Trichomycterus trefauti, espécie nova, é descrita baseado em oito exemplares procedentes das cabeceiras da Bacia do Rio São Francisco, Minas Gerais, Brasil. *Trichomycterus trefauti* distingui-se das demais espécies de Trichomycterinae pela presença autapomórfica de uma mancha escura elíptica na base dos raios da nadadeira caudal e pela combinação de padrão de colorido cinza homogêneo, primeiro raio da nadadeira peitoral prolongado além dos demais como um filamento, boca subterminal, dois poros supra-orbitais no espaço interorbital, nadadeira caudal truncada, nadadeiras pélvicas cobrindo as aberturas uro-genitais, espaço interorbital amplo (39.8–45.9% comprimento da cabeça), barbilhão maxilar distintamente longo (84.2–93.0% comprimento da cabeça), barbilhão rictal distintamente longo (67.6–74.3% comprimento da cabeça). Sistemática, características diagnósticas e suas inferências nas relações filogenéticas em *Trichomycterus* são discutidas.

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Introduction

Trichomycteridae is a large, well-corroborated, and cohesive monophyletic group of freshwater fishes. The popular name “candiru” is related to the species of the subfamily Vandelliinae, but sometimes is used for all species of the family. It is distributed throughout South America, from Costa Rica (Central America) to Patagonia (south of Argentina and Chile), on both sides of the Andes from headwaters in this Cordillera to coastal rivers in lowlands.

Trichomycterinae is the largest trichomycterid subfamily, with 115 nominal species (Barbosa & Costa, 2003; Fernández & Schaefer, 2003; de Pinna & Wosiacki**,** 2003; and Wosiacki & Garavello, 2004) distributed among six genera, and many more are awaiting description (de Pinna, 1992a). The largest assemblage of species, in Trichomycterinae, is placed in *Trichomycterus*, as discussed below.

The most comprehensive overview of Trichomycterinae was made more than eighty years ago (as Pygidiinae) by Eigenmann (1918). Eigenmann presented a taxonomic review of all species known of Trichomycteridae (=Pygidiidae) and a “phylogenetic tree showing the relationships of the Pygidiidae” (Eigenmann, 1918: 277) that was partially corroborated by de Pinna (1998). There are some studies (Arratia, 1983, 1990; Arratia & Menu-Marques, 1981, 1984; Arratia et al. 1978; Costa, 1992; Costa & Bockmann, 1993; Fernandez, 2000a, b; Fernandez & Vari, 2000; de Pinna 1989, 1992a, b; de Pinna & Wosiacki, 2002, 2003, Wosiacki & Garavello, 2004, and Triques & Vono, 2004) focusing on the taxonomic and phylogenetic status of *Trichomycterus* and Trichomycterinae with descriptions of new species or supra-specific taxa.

The present paper is based on specimens collected in the riacho Andrequicé; branch of the rio Paraúna, a tributary of the rio das Velhas (rio São Francisco basin — Fig. 1), State of Minas Gerais, by Miguel Trefaut Rodrigues. The rio São Francisco basin has been intensively collected and several species of trichomycterids from this drainage have been described (Costa, 1992; Trajano & de Pinna, 1996).

Materials and Methods

All measurements were taken point-to-point with dial calipers, on the left side of the specimens. Caudal peduncle length was taken from the last anal-fin ray to the middle of the caudal-fin base; caudal-peduncle depth was measured at the middle of its length. Remaining measurements followed Tchernavin (1944). Dorsal- and anal-fin ray counts included all branched rays plus all unbranched rays, visible when back lighted. Weberian complex and compound caudal centrum are not included in vertebral counts. Osteological preparations were made according to a modified version of the method of Dingerkus & Uhler (1977). Radiographs were taken at 25 kv, 4mA, 4–12 sec. of dorsal and lateral view. Institutional abbreviations follow Leviton et al**.** (1985) with the addition of MHNCI for Museu de História Natural "Capão da Imbuia", Curitiba, PR, Brazil.

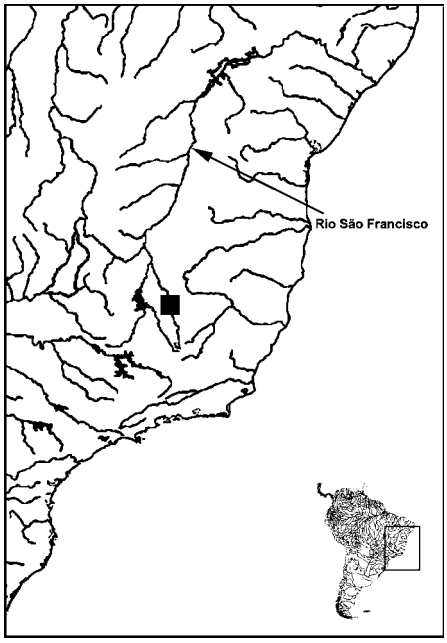

FIGURE 1. Approximate location of type locality for *Trichomycterus trefauti* (square). Riacho Andrequicé, Trinta Réis, Minas Gerais, Brazil.

***Trichomycterus trefauti* new species**
(Fig. 2, Table 1)

Holotype: MZUSP 79911, 49.5 mm SL, riacho Andrequicé, tributary of rio Paraúna, itself a tributary of rio das Velhas (rio São Francisco basin), approximately 18°30'S, 43°30'W, Município de Trinta Réis, Minas Gerais, Brazil; collected by M.T.U. Rodrigues; 8 September 1986.

Paratypes: Collected with the holotype: MZUSP 36966, 5 ex. (36.6–54.2 mm SL; 3 C&S); MPEG 7896, 2 ex. (37.2–47.3mm SL).

Diagnosis: *Trichomycterus trefauti* differs from all other known members of the subfamily Trichomycterinae by the autapomorphic presence of an elliptical, vertically elongated, brown spot, at caudal-fin base (*vs.* without elliptical spot at caudal-fin base), and the combination of homogeneously gray color pattern (*vs.* yellowish, presence of stripes or bands, or lack of color pattern), first pectoral-fin ray prolonged as a filament (*vs.* not prolonged), subterminal mouth (*vs.* inferior or terminal mouth), two supraorbital pores at interorbital space (*vs.* one supraorbital pore at mesial line), caudal fin truncate with attenuated edges (*vs.* caudal fin rounded), pelvic fins covering anus and urogenital openings (*vs.* not covering), interorbital space very wide — 39.8–45.9 % HL (*vs.* more or less than 39.8–45.9 % HL), maxillary barbels very long — 84.2–93.0 % HL (*vs.* more or less than 84.2–93.0 % HL), rictal barbels very long — 67.6–74.3 % HL (*vs.* more or less than 67.6–74.3 % HL).

FIGURE 2. *Trichomycterus trefauti*, holotype, MZUSP 79911, 49.5 mm SL. Riacho Andrequicé, Trinta Réis, Minas Gerais, Brazil: A) lateral; B) dorsal; and C) ventral views.

Description: Morphometric data for holotype and paratypes are given in Table 1.

Body elongate, roughly cylindrical close to head and gradually more compressed towards caudal fin. Dorsal and ventral profiles of trunk slightly convex. Dorsal and ventral profiles of caudal peduncle straight (Fig. 2). Integument thick, especially over base of pectoral and caudal fins. Small papillae on lips, and scattered on dorsal surface of head.

Head wide and depressed, trapezoidal, slightly longer than wide, transverse section at posterior tip of opercle wider than anteriorly at nostril, anterior margin slightly rounded. Head lateral to eye slightly swollen by jaw muscles in large and small specimens. Dorsal and ventral profiles of head convex. Eyes rounded, dorsolaterally oriented. Eye covered by thin skin, transparent at its center, gradually opaque towards rim, distinctly separated from surface of eyeball. Ocular structures readily visible on surface of skin, not deeply sunken. Orbital rim not free. Anterior nare slightly larger than posterior, surrounded by fleshy flap of integument. Posterior nare surrounded anteriorly by thin flap of integument. Anterior and posterior nares about one third of eye diameter. Gill membranes thick, united to isthmus only at anteriormost point, forming small free fold across the isthmus. Gill openings not constricted. Branchiostegal rays 6–8 (6 in Holotype) visible from below (7–8 in C&S). Mouth subterminal, its corners laterally oriented. Lower lip with conspicuous lateral fleshy lobes, internal to origin of rictal barbels. Anterior margin of upper lip slightly

rounded. Small papillae on external surface of upper lip and large papillae inside mouth at region of teeth attachment. Barbels long (nasal 74.3–69.8; maxillary 93.0–84.2; and rictal barbel length 74.3–67.6 % of head length). Barbels with broad bases, gradually narrowing towards tip. Nasal barbels reaching median odontodes of interopercle; maxillary barbels reaching base of pectoral fin; rictal barbels reaching last interopercular odontode. Origin of nasal barbels on posterolateral portion of integument flap around anterior nostril. Interopercular patch of odontodes rounded, with 34–36 conical odontodes. Opercular patch of odontodes rounded, with 14–16 conical odontodes. Supraorbital canal complete and infraorbital incomplete. Infraorbital anterior section pores i1 and i3, and posterior section pores i10 and i11. Supraorbital pores s1, s2 and s4. Two pores s4 at interorbital space.

TABLE 1. Morphometric data for *Trichomycterus trefauti* based on the holotype and four paratypes.

	Holotype	Range	Mean
Standard length (mm)	54.3	54.3–37.2	
Percents of standard length			
Head length	18.6	20.0–18.2	19.3
Predorsal length	66.5	66.6–65.3	66.1
Prepelvic length	61.3	63.0–59.7	61.8
Preanal length	70.9	93.3–68.9	75.1
Pectoral girdle width	14.7	17.4–14.2	15.3
Trunk length	46	46.0–41.9	44
Pectoral-fin length	15.1	16.1–13.7	14.9
Pelvic-fin length	7.4	9.1–7.4	8.3
Pelvic-fin base anus distance	5.3	5.9–4.2	5.1
Caudal peduncle length	21.5	21.5–19.0	20.1
Caudal peduncle depth	10.5	11.9–9.5	10.8
Body depth	14.7	15.5–12.6	14.5
Dorsal-fin length	9.8	12.3–9.8	10.8
Anal-fin length	9.6	11.3–8.9	9.8
Percents of head length			
Head width	92.1	96.5–82.4	92.1
Nasal barbel length	74.3	74.3–69.8	72.4
Maxillary barbel length	84.2	93.0–84.2	87.2
Rictal barbel length	74.3	74.3–67.6	71.1
Snout length	40.6	45.3–39.8	42.7
Interorbital width	40.6	45.9–39.8	43
Mouth width	30.7	36.1–29.7	32.1
Eye diameter	15.8	18.9–14.5	15.9
Counts			
Dorsal-fin rays	II-7	II-7	
Pectoral-fin rays	I-6	I-6	
Pelvic-fin rays	5	5	
Anal-fin rays	I-6	I-6	
Caudal-fin rays	I-11-I	I-11-I	

Pectoral-fin margin truncate, I/6 rays, first ray longest with filamentous extension. Dorsal fin with margin semicircular when expanded, II/7 rays, third and fourth rays longest. Anal fin slightly elongate in overall shape, smaller than dorsal fin, I/6 rays, third ray longest, origin at vertical through sixth dorsal-fin ray. Pelvic fins with origin anterior to dorsal-fin origin, rounded margin beyond urogenital and anal openings when extended, 5 rays, second and third rays longest. Caudal fin truncate with attenuated margin edges, distinctly wider than remaining caudal region, I/11/I principal rays, principal central rays splitting once and dorsal and ventral principal rays splitting twice. Only first dorsal and ventral caudal-fin accessory rays visible. Anal and urogenital openings mid-way between pelvic fin base and anal-fin origin.

Free vertebrae 37. Ribs 13–14 pairs, first thickest, second to 12–13th pairs slightly longest, the last pair rudimentary and free. Dorsal pterygiophores 8, first in front of neural spine of 21th free vertebrae. Anal pterygiophores 6, first in front of haemal spine of 24th free vertebrae. Procurrent rays of dorsal lobe 14–16. Procurrent rays of ventral lobe 12–16. Caudal skeleton pleurostyle, hypurals 4+5, hypural 3, and fused parahypural and hypurals 1+2.

Color in alcohol: Refer to figures 2 for general view of color pattern in alcohol. Uniform gray on dorsal surface and sides of head, trunk and caudal peduncle, darker at nape. Dark stripe from eyes to anterior nostril. Elliptical, vertically elongated dark spot with ill-defined borders at base of caudal fin. Few irregular spots on caudal peduncle in large specimens (48.9–54.3 mm SL) and on trunk and caudal peduncle in small (37.2–42.4 mm SL) specimens. Ventral surface of head and abdominal region without pigmentation. Dorsal surface of pectoral-fin base with few chromatophores, gradually scattered towards margin. Ventral surface of pectoral fin and pelvic fins unpigmented. Bases of dorsal and anal fin with chromatophores, more scattered towards margin over rays. Dorsal fin darker than anal fin. Chromatophores on base of caudal-fin rays, gradually more scattered towards margin. Nasal barbels with chromatophores all over their surface; maxillary barbels with chromatophores on their dorsal surface. Rictal barbels unpigmented. Internal surface of all barbels lighter than outer margin.

Distribution: Known only from the type-locality.

Etymology: Named after Dr. Miguel Trefaut Rodrigues, who discovered and collected the first specimens of the species.

Systematic and taxonomic comments: The genus *Trichomycterus* has been recognized as nonmonophyletic (Arratia, 1990, 1998, de Pinna, 1989; 1998), as is also true for the subfamily Trichomycterinae (de Pinna, 1989; 1998). Arratia (1990) proposed four "unique derived characters" for Trichomycterinae (1-"basioccipital"…" with well developed anterior membranous processes which lie ventrolateral to parasphenoid and prootics", 2-"an enarthrodial articulation between preopercle and opercle"…" is present in adults", 3-"vomer with only one long posterior process", and 4-"pronounced notch"…" on the posteroventral margin of ceratobranchial"). These features are present in all analyzed

Trichomycterinae species prepared for C&S and X-ray, including *Trichomycterus trefauti*. However, a more recent analysis (Costa & Bockmann, 1993) proposed *Scleronema* and the genus *Ituglanis* composed of species previously located in *Trichomycterus*, as two sequential monophyletic groups more related to the Glanapteryginae, Sarcoglanidinae, Tridentinae, Stegophilinae, and Vandelliinae, than to the other trichomycterine species. The lack of knowledge about the relationships among trichomycterine species, absence of definition of the genera *Trichomycterus* and *Eremophilus*, and the superficial definition of *Hatcheria*, *Bullockia*, *Silvinichthys*, and *Rhizosomichthys* make the allocation of new species difficult. Unfortunately, *Trichomycterus* has been considered as a group of species that do not possess the features present in other genera of trichomycterine. For this reason *Trichomycterus* has grown to a total of 96 nominal species (Barbosa & Costa, 2003; Fernández & Schaefer, 2003; de Pinna & Wosiacki**,** 2003; and Wosiacki & Garavello, 2004) in contrast with the other genera *Eremophilus*, *Bullockia*, *Hatcheria*, *Rhizosomichthys*, and *Silvinichthys* with only one species each.

The lack of pelvic fins and girdle has been used to diagnose *Eremophilus*, the only recognized distinction from *Trichomycterus*. These features were observed and discussed by Myers (1944), Miranda-Ribeiro (1949), de Pinna (1989, 1998), Costa & Bockmann (1993), Trajano & de Pinna (1996), Fernández & Vari (2000), and de Pinna & Wosiacki (2003). These papers have demonstrated that the lack of pelvic fins and girdle are highly homoplastic and for this reason, weak features to define a genus. Recently de Pinna & Wosiacki (2003) reallocated *Eremophilus candidus* Miranda-Ribeiro to the genus *Trichomycterus* (*T. candidus*) based on detailed phylogenetic analysis which indicates that it is more related to *Trichomycterus* species than to *E. mutisii* Humboldt. Arratia et al. (1978) proposed the genus *Bullockia* based on several features slightly similar to those of *Hatcheria* diagnosed in the same paper and in Arratia & Menu-Marques (1981).These features are clearly distinct from those observed in species of *Trichomycterus*. Characters like a narrow and strongly compressed caudal peduncle and a long dorsal fin with more than 17 rays are present in *Hatcheria* and *Bullockia* but are not present in species of *Trichomycterus*. *Silvinichthys* differs by having the entire surface of body skin perforated by pores of ampullary organs and a unique combination of characters (Arratia, 1998). *Rhizosomichthys totae* (Miles) is an atypical freshwater fish that has the unique character of thick fat tissue forming folds covering the entire body. Its osteology is unknown, and its relationship among trichomycterine is totally obscure.

Trichomycterus trefauti does not have the features above mentioned for *Eremophilus*, *Bullockia*, *Hatcheria*, *Rhizosomichthys*, and *Silvinichthys* and can not be allocated to any of these genera. In order to maintain nomeclatural stability it does not seem desirable to propose a new genus for one new species. It seems more parsimonious and coherent to allocate the new species in *Trichomycterus*.

The majority of the species of *Trichomycterus* are morphologically very similar to each other and the diagnosis of most species is only possible by a combination of several

characters. Sometimes these features concern to internal anatomy and are difficult to analyze. Few species, like *Trichomycterus castroi* de Pinna, *T. papilliferus* Wosiacki & Garavello, *T. trefauti* have external autapomorphies that make them easy to identify

Phylogenetic assignment and comparisons: The presence of stripes or bands in Trichomycteridae has been frequently recorded (e.g., *Scleronema operculatum* (Eigenmann), *T. barbouri* (Eigenmann), *T. castroi*, *T. itatiayae* Miranda-Ribeiro, *T. reinhardti* (Eigenmann), *T. taeniops* Fowler, *T. taenia* Kner). A transverse band at the caudal fin has been recorded only in *S. operculatum*, *T. castroi*, and *T. trefauti*. The presence of a vertical caudal-fin band in *T. castroi* and *S. operculatum was* discussed by de Pinna (1992a) who interpreted these as autapomorphies for these species. The spot at the caudal-fin base of *Trichomycterus trefauti* has a different topology from the band of *T. castroi* that is at the distal margin of the caudal fin. In addition, the vertical spot at the caudal-fin base distinguishes *T. trefauti* from its sympatric congeners in the rio São Francisco basin (*T. brasiliensis* Lütken, *T. concolor* Costa, *T. itacarambiensis* Trajano & Pinna, *T. reinhardti*, *T. variegatus* Costa), and all other trichomycterins species. The spot at the caudal-fin base of *T. trefauti* is unique within trichomycterids and it is hypothesized to be an autapomorphy for this species.

The first pectoral-fin ray prolonged as a filament, present in *T. trefauti*, is present in all species of *Ituglanis*, *Trichomycterus hasemani* (Eigenmann), *T. johnsoni* (Fowler) and several other species (*T. candidus*, *T. alternatus* (Eigenmann), *T. punctulatus* Valenciennes, *T. brasiliensis*, *T. reinhardti*, *T. itacarambiensis*, *T. auroguttatus* Costa, *T. longibarbatus* Costa, *T. bahianus* Costa, *T. mimonha* Costa, *T. mirissumba* Costa, *T. itatiayae* Miranda-Ribeiro, and *T. immaculatus* (Eigenmann & Eigenmann)) among others. According to Costa & Bockmann (1993), *Ituglanis* is a monophyletic sister group of the Glanapteryginae, Sarcoglanidinae, Tridentinae, Stegophilinae, and Vandelliinae, and *T. hasemani* and *T. johnsoni* could be more closely related to other subfamilies (de Pinna, 1989). Therefore it is hypothesized that the first pectoral-fin rays prolonged as a filament is a homoplastic feature that has evolved several times in Trichomycteridae.

Ecology: The specimens were collected in a stream 2–4m wide, with an average depth of 10cm, and with a bottom of pebbles of variable size and rocks, at an elevation of approximately 1000m. The vegetation was of “campos rupestres”.

Comparative material

Copionodon pecten MZUSP 48962 (7 ex. Alc. 3 ex. C&S); MZUSP 42462 (5 ex.) Paratypes; *C. orthiocarinatus* MZUSP 42464 (1 ex.) Paratype; *C. lianae* MZUSP 42470 (2 ex.) Paratypes; MZUSP 39995 (1 ex. C&S); *Glaphyropoma rodriguesi* MZUSP 42466 (3 ex.) Paratypes; *Trichogenes longipinnis* MZUSP 40238 (2 ex); MZUSP 63478 (15 ex. Alc., 3 ex. C&S); *Bullockia maldonadoi* CAS 63842, Holotype; CAS 63843 (43 ex.) Paratypes; MZUSP 36958 (1 ex. C&S); *Eremophilus candidus* MNRJ 11762 (2 ex. C&S) Paratypes; *E. mutisii* MZUSP 35409 (1 ex. C&S) AMNH 56092 (1 ex. C&S); CAS 6595 (13 ex.); *Hatcheria macraei* MZUSP 35687 (3 C&S); *H. patagoniensis* CAS 63844 (2 ex.)

Paratypes; *H. titcombi* CAS 28557, Holotype; *Ituglanis amazonicus* MUSP 30449 (1 ex.); *I. eichorniarum* MZUSP 37763 (1 ex.); MNRJ 780 (2 ex.) Syntypes; *I. gracilior* FMNH 53264 (X-ray) Holotype; *I. guianensis* FMNH 52676 (X-ray) Holotype; *I. laticeps* CAS 32458 (1 ex.); *I. metae* CAS 118214 (1 ex.); CAS 124227 (1 ex.); CAS 58138, Holotype; *I. parahybae* FMNH 58576 (X-ray) Holotype; *I. proops* MZUSP 84190 (12 ex. Alc, 2 ex. C&S); MNRJ 781 (3 ex.) Syntypes; *Ituglanis* n. sp. MNRJ 11489 (13 ex. 5 C&S); *Pygidium angustirostris* MNRJ 3605 (2 ex.) Syntypes; *P. florense* MNRJ 3751, Holotype; *P. paquequerensis* MNRJ 1159, Holotype; *P. parkoi* MNRJ 3849, Holotype; *P. travassosi* MNRJ 5424, Holotype; *Rhizosomichthys totae* SU 37074 (2 ex.) Paratypes; *Scleronema minutum* MCP 11169 (3 ex. C&S); *S. operculatum* FMNH 58080 (X-ray) Holotype; MCP 9315 (1 ex.); *Scleronema* n. sp. UFRGS 3955 (2 ex.); *Trichomycterus albinotatus* MZUSP 35817 (2 ex.); *T. alternatus* CAS 64575 (4 ex.) Paratypes; FMNH 58082 (X-ray) Holotype; FMNH 58083 (62 ex. 2 X-ray) Paratypes; MZUSP 67913 (5 ex.); MZUSP 52541 (4 ex. Alc.,1 ex. C&S); *T. areolatus* CAS 15649 (47 ex.); *T. atochae* CAS 64576, Holotype; CAS 64577 (4 ex.) Paratypes; USNM 301837 (5 ex.); *T. auroguttatus* MZUSP 84191. (1 ex.); *T. bahianus* MZUSP 38636 (1 ex.) Paratype; *T. banneaui* CAS 58127 (26 ex.) Paratypes; FMNH 56025 (X-ray) Holotype; *T. barbouri* CAS 64578 (1 ex.) Paratype; FMNH 53946 (5 ex. 2 X-ray). Syntypes; ROM – OR# 403409 (1 ex.); ROM 51722 (1 ex.); *T. bogotense* CAS 58118 (27 ex.) Paratypes; FMNH 56030 (X-ray) Holotype; FMNH 56031 (264 ex. 2 X-ray) Paratypes; *T. boylei* MZUSP 84192 (2 ex.); *T. brasiliensis* MZUSP 37145 (2 ex.); *T. caliense* CAS 132081 (3 ex.); FMNH 56029 (X-ray) Holotype; *T. candidus* MPEG 6711 (1 ex.); MZUSP 79910 (4 ex.); MPEG 6712 (5 ex.); MHNCI 8075 (2 ex.); *T. castroi* NUPELIA uncat. (1 ex.– Rio Iguaçu, Segredo, PR); NUPELIA uncat. (1 ex.– Rio Iguaçu, Segredo, PR); MHNCI 7643 (2 ex. 1 C&S); *T. chapmani* FMNH 56027 (X-ray) Holotype; FMNH 56028(10 ex. 2 X-ray) Paratype; FMNH 69813 (16 ex. 2 X-ray) Paratypes; CAS 58128 (8 ex.) Paratypes; *T. chiltoni* ANSP 91039 (1 ex.); CAS 57596, Holotype; CAS 57597(68 ex.) Paratypes; CAS 57598(4 ex.) Paratypes; *T. conradi* CAS 58257 (ex. 1) Paratype; FMNH 53721 (X-ray) Holotype; *T. cubataonis* MNRJ 12490, Holotype; MNRJ 12491 (9 ex.) Paratypes; *T. davisi* FMNH 54242 (9 ex. 2 X-ray) Syntypes; FMNH 54242 (9 ex.) Syntypes; FMNH 60309 (X-ray) Holotype; MCP 10646 (2 ex.); *T. dorsostriatus* CAS 64579 (2 ex.) Paratypes; FMNH 58096 (X-ray) Holotype; FMNH 58097 (X-ray) Paratype; *T. duellmani* UMMZ 204202 (3 ex.); *T. eichorniarum* MNRJ 780 (2 ex.) Syntypes; *T. emanueli* (CAS 147810); *T. gabrieli* CAS 64583 (4 ex.) Syntypes; *T. gabrieli* SU 36556 (1 ex.) Syntype; *T. hasemani* CAS 54584 (36 ex.) Paratypes; FMNH 56424 (X-ray) Holotype; FMNH 56425 (2 X-ray) Paratypes; MZUSP 23600 (5 ex. C&S); *T. heterodontus* CAS 58139 (1 ex.) Paratype; *T. iheringi* CAS 64585, Holotype; CAS 64586 (3 ex.) Paratypes; FMNH 58074 (2 ex.) Paratypes; *T. itacarambiensis* MZUSP 67914 (3 ex. C&S); MZUSP 40329 (5 ex.); *T. johnsoni* MZUSP 59367 (1 ex.); *T. latidens* CAS 76335, Holotype; *T. latistriatus* FMNH 58449 (X-ray) Holotype; *T. longibarbatus* MZUSP 67915 (3 ex. C&S); *T. mboycy* MPEG 6695 Holotype; MPEG 6696 (2

ex.) Paratypes; MPEG 6697 Paratype; MPEG 6698 (2 ex.) Paratypes; *T. meridae* CAS 147809 (14 ex.); UMMZ 145374 (5 ex.); *T. mimonha* MZUSP 49486 (3 ex. C&S); *T. mirissumba* MZUSP 44500 (3 ex. C&S); *T. naipi* MPEG 6699 Holotype, MPEG 6700 (2 ex.) Paratypes, MPEG 6701 Paratype, MPEG 6702 (2 ex.) Paratypes; *T. oroyae* CAS 58104 (43 ex.); *T. paolence* FMNH 58085 (X-ray) Holotype; FMNH 58575 (X-ray) Paratype; *T. papilliferus* MPEG 6692 Holotype; MPEG 6693 (4 ex.) Paratypes; MPEG 6694 (3 ex.) Paratypes; NUPELIA 1615 Paratypes; MPEG 6703 Paratype; *T. paquequerense* MNRJ 1159, Holotype; *T. pardus* ROM 51717 (3 ex.); *T.plumbeus* MPEG 6686 Holotype; MPEG 6688 (20 ex.) Paratypes; MPEG 6687 (2 ex.) Paratypes; NUPELIA 1614 (3 ex.) Paratypes; *T. proops* MNRJ 781 (3 ex.) Syntypes; *T. punctulatus* ROM 51725 (2 ex.); CAS 58094 (4 ex.); *T. punctulatus piurae* CAS 58119, Holotype ; CAS 58120 (14 ex.) Paratypes; FMNH 77904 (5 ex. 2 X-ray) Paratypes; FMNH 58672 (3 ex. 2 X-ray) Paratypes; *T. quechuorum* AMNH 2035/sw (1 ex.); *T. regani* CAS 64591, Holotype; *T. reinhardti* FMNH 58081 (X-ray) Holotype; MZUSP uncat. (2 ex.-Rio Bonito, Lauras, MG); *T. rivulatus* CAS 58092 (2 ex.); CAS 58093 (3 ex.); ROM 40769 (1 ex.); *T. santaeritae* FMNH 58577 (X-ray) Holotype; MNRJ 14380 (3 ex. 1 C&S); *T. septentrionale* CAS 77008 (3 ex.); CAS 77009 (3 ex.); FMNH 59522 (X-ray) Holotype; FMNH 59195 (X-ray) Paratype; *T. stawiarski* NUPELIA uncat. (1 ex. Rio Jordão, Segredo, PR); *T. stellatus* CAS 58121 (3 ex.) Paratypes; FMNH 58100 (3 ex. 2 X-ray) Paratypes; FMNH 58101 (X-ray) Holotype; FMNH 58102 (3 ex. 2 X-ray) Paratypes; *T. stramineus* CAS 58105 (4 ex. 1 X-ray) Paratypes; CAS 58148 (1 ex.) Paratype; FMNH 58092 (3 ex. 1 X-ray) Paratype; FMNH 58105 (X-ray) Holotype; *T. striatum* ANSP 104215 (1 ex.); *T. striatus* CAS 64593 (1 ex.) Paratype; FMNH 26660 (1 ex.), 26661 (X-ray), 26662 (X-ray) Paratype; FMNH 55233 (X-ray) Paratype; FMNH 7579 (X-ray) Holotype; *T. taczanowskii* CAS 76966 (12 ex.); *T. taroba* MPEG 6689 Holotype; MPEG 6690 (15 ex.) Paratypes; MPEG 6691 (10 ex.) Paratypes; NUPELIA 1616 (3 ex.) Paratypes; *T. travassosi* MNRJ 5424, Holotype; *T. triguttatus* FMNH 58670 (X-ray) Holotype; FMNH 58671 (3 ex. 2 X-ray) Paratypes; CAS 64596 (1 ex.) Paratype; *T. unicolor* ROM 51718 (3 ex.); *T. vermiculatus* FMNH 58077 (X-ray) Holotype; MZUSP 67912 (4 ex. C&S); *T. zonatus* FMNH 58572 (1 ex. R-ray) Paratype; FMNH 58573 (X-ray) Holotype; FMNH 58574 (2 ex. 1X-ray) Paratypes; MZUSP 67913 (6 ex. C&S); *T.* cf. *nigricans* MCP 10649 (1 ex. C&S); *Trichomycterus* sp. n. (Bahia) MZUSP 67910; *Trichomycterus* sp. n. (Mato Grosso) MZUSP 67905 (1 ex.); MZUSP 67906 (1 ex.); MZUSP 67909 (1 ex.); *Trichomycterus* sp. n. ("pelvic less") MPEG uncat. (1 ex. – Rio Roseira, Concórdia, RS); *Vandellia beccarii* AMNH 55625 sw (1 ex.); *V. cirrohosa* AMNH 20497 (1 ex.); *V. ix* MZUSP 29155 (2 ex.) Paratypes**;** *V. plazai* USNM 302683 (1 ex.); *Paracanthopoma* sp. MZUSP 30401 (2 ex.); *Homodiaetus haemomyzon* ANSP 137581 (1 ex.); *H. anisitsi* MCP 9987 (1 ex.); *Pseudostegophilus nemurus* MZUSP 30431 (2 ex.); *Pareiodon* sp. MZUSP 32522 (3 ex.); *Stegophilus passarelli* UFRJ 0653 (2 ex.); *S. insidiosus* MZUSP 40048 (1 ex.); *Henonemus* sp. MZUSP 30414 (2 ex.); *Acanthopoma annectens* MZUSP 30420 (1 ex.); *A. bondi* MZUSP 30418 (2 ex.);

Megalocentor echthrus MZUSP 30391 (1 ex.); *M. echthrus* MZUSP 30380 (1 ex.); *Parastegophilus maculatus* MZUSP 35736 (2 ex.); *Ochmacanthus orinoco* MZUSP 30477 (2 ex.); *O. alternus* MZUSP 30473 (3 ex.); *Haemomaster venezuelae* MZUSP 30375 (1 ex.); *Listrura nematopteryx* MZUSP 37138 (2 ex.). *Tridensimilis venezuelae* USNM 121291 (2 ex.); *Tridentopsis* sp. MZUSP 63092; *Sarcoglanis simplex* INPA 8165 (2 ex.).

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