Neotropical Ichthyology, 11(2):217-246, 2013

Taxonomic review of the genus *Trichomycterus* Valenciennes (Siluriformes: Trichomycteridae) from the laguna dos Patos system, Southern Brazil

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The species of the genus *Trichomycterus* inhabiting the laguna dos Patos system are reviewed and five species are recognized. *Trichomycterus tropeiro* Ferrer & Malabarba has a restricted range and is endemic to the uppermost portion of the rio das Antas. *Trichomycterus balios*, n. sp., is distributed in the upper portion of the rio das Antas and rio Caí basins. *Trichomycterus diatropoporos*, n. sp., is endemic to the rio da Prata basin, a tributary of the rio das Antas. *Trichomycterus poikilos*, n. sp., is widely distributed in the upper portion of the rio Jacuí basin and tributaries of the rio Taquari-Antas. *Trichomycterus brachykechenos*, n. sp., is endemic to the upper portion of the rio dos Sinos. The new species are distinguishable from most congeners, except for *T. davisi*, *T. mboycy*, *T. naipi*, *T. payaya*, *T. papilliferus*, *T. perkos*, *T. plumbeus*, and *T. tropeiro* by the lower number of pectoral-fin rays (I+5-6) and by the first pectoral-fin ray not prolonged as a filament. Other characters distinguish the new taxa from these eight species. The distribution of the genus in the laguna dos Patos system is discussed and a taxonomic key is provided.

O gênero *Trichomycterus* é revisado no sistema da laguna dos Patos e cinco espécies são reconhecidas. *Trichomycterus tropeiro* Ferrer & Malabarba tem distribuição restrita, ocorrendo somente na porção mais superior do rio das Antas. *Trichomycterus balios*, sp. n., distribui-se na porção superior das bacias dos rios das Antas e Caí. *Trichomycterus diatropoporos*, sp. n., é endêmica da bacia do rio da Prata, tributário do rio das Antas. *Trichomycterus poikilos*, sp. n., é amplamente distribuída nos cursos superiores da bacia do rio Jacuí e tributários dos rios Taquari-Antas. *Trichomycterus brachykechenos*, sp. n., é endêmica do curso superior do rio dos Sinos. As espécies novas distinguem-se de grande parte de seus congêneres pelo baixo número de raios na nadadeira peitoral (I+5-6) e o primeiro raio da nadadeira peitoral não prolongado como filamento, exceto de *T. davisi*, *T. mboycy*, *T. naipi*, *T. papilliferus*, *T. payaya*, *T. perkos*, *T. plumbeus* e *T. tropeiro*, distinguindo-se destas por outros caracteres. A distribuição do gênero no sistema da laguna dos Patos é discutida e uma chave taxonômica é fornecida.

Key words: Endemism, Neotropical, Rio Jacuí basin, *Trichomycterus tropeiro*, Trichomycterinae.

Introduction

The Trichomycteridae is a monophyletic group with a distribution covering practically all of South America and lower Central America, from Costa Rica to Argentina on both sides of the Andes (de Pinna & Wosiacki, 2003). Currently, the family is divided into seven monophyletic subfamilies (Copionodontinae, Glanapteryginae, Sarcoglanidinae, Stegophilinae, Trichogeninae, Tridentinae, and Vandelliinae) plus the Trichomycterinae which, as presently conceived, is demonstrably non-monophyletic (Baskin, 1973; de Pinna, 1998; Wosiacki, 2002; Datovo & Bockmann, 2010).

The Trichomycterinae is the only subfamily present throughout the whole range distribution of the Trichomycteridae and, despite its species richness, few genera are recognized in the subfamily (de Pinna & Wosiacki, 2003): *Bullockia* Arratia, Chang, Menu-Marque & Rojas, 1978, *Eremophilus* Humboldt, 1805, *Hatcheria* Eigenmann, 1909, *Ituglanis* Costa & Bockmann, 1993, *Rhizosomichthys* Miles, 1943, *Scleronema* Eigenmann, 1917, and *Silvinichthys* Arratia, 1998 which are monophyletic; and *Trichomycterus* Valenciennes, 1832, a polyphyletic group (Wosiacki, 2002) containing over 145 valid species (Eschmeyer & Fong, 2013).

Despite the high number of described species within *Trichomycterus*, Ferrer & Malabarba (2011) highlighted the lack of taxonomic studies of this genus in the laguna dos Patos and Uruguay basins in southern Brazil. Notwithstanding the common occurrence of the genus in

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these basins, *T. tropeiro* Ferrer & Malabarba, 2011 endemic to the headwaters of rio das Antas in laguna dos Patos system is so far the only member of the genus recognized for that drainage.

In the present study the *Trichomycterus* in the laguna dos Patos system are reviewed through an extensive analysis of large collections of specimens. Four new species are recognized in addition to *T. tropeiro*. Comments on distributions and an identification key are given for the species of *Trichomycterus* from the laguna dos Patos system.

Material and Methods

Measurements were made point-to-point with digital calipers to the nearest 0.1 mm. The measurements follow Tchernavin (1944) for the length of barbels, Wosiacki & de Pinna (2008) for the length and depth of the caudal peduncle and for the supraorbital pore distance, Ferrer & Malabarba (2011) for the scapular girdle and Costa (1992) for the remaining measurements.

The nomenclature for osteological structures and laterosensory canal system and associated pores followed Bockmann *et al*. (2004). Vertebral counts exclude those in the Weberian complex and the compound caudal centrum (PU1+U1) is counted as one element. For osteological analysis, 30 specimens were cleared and counterstained (c&s) following the method proposed by Taylor & van Dyke (1985) and nine were disarticulated. The counts of unsegmented rays in c&s specimens are given before the number of unbranched and segmented rays (represented by upper case Roman numerals) and branched and segmented rays (represented by Arabic numerals), counted in all specimens. The counts for holotypes are represented by an asterisk in variable meristics. Numbers of branchiostegal rays, odontodes, procurrent rays, basal radials, ribs, vertebrae, and unsegmented rays were counted only in c&s specimens. Drawings of the osteological structures were made only from c&s and disarticulated specimens.

Morphological data for species are based on literature, personal observations and photographs from image database of the All Catfishes Species Inventory (Morris *et al*., 2006), Muséum National d'histoire naturelle (http://coldb.mnhn.fr/Consultation?catalogue=7), and California Academy of Sciences (http://collections.calacademy.org/ich/). *Trichomycterus santaeritae* (Eigenmann, 1918) and the species from *T. hasemani* group were not included in comparisons due to their reported relationship with non-trichomycterine taxa (de Pinna, 1989; Dutra *et al*., 2012).

Data are not available for *T. arleoi* (Fernández-Yépez, 1972). Institutional abbreviations: Coleção Ictiológica, Universidade Federal de Santa Catarina, Florianópolis (CIUFSC); Instituto Biologia Animal de Mendoza, Mendoza (IBA); Fundación Miguel Lillo, San Miguel de Tucumán (FML); Museo de Ciencias Naturales, Facultad de Ciencias Naturales, Universidad de Salta, Salta (MCNI); Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre (MCN); Museu de Ciências e Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre (MCP); Museu Paraense Emílio Goeldi, Belém (MPEG); Museu Nacional, Rio de Janeiro (MNRJ); Museu de Zoologia, Universidade de São Paulo, São Paulo (MZUSP); and Departamento de Zoologia, Universidade Federal do Rio Grande do Sul, Porto Alegre (UFRGS). Other abbreviations used in the text: head length (HL), standard length (SL).

Results

Trichomycterus balios, new species
Figs. 1, 2a, 3a, 4a, 5a, 6a, 7

Trichomycterus sp. 2. Becker *et al*. (2013: Table 1, listed, Taquari-Antas river basin).

Holotype. UFRGS 16229, 82.0 mm SL, Brazil, Rio Grande do Sul State, municipality of São Francisco de Paula, rio Santa Cruz, rio Caí basin, 29º21'46"S 50º31'18"W, 11 Sep 2004, G. N. Silva, J. A. Anza, J. Ferrer & L. R. Malabarba.

Paratypes. All from Brazil, Rio Grande do Sul State. **Rio Caí basin:** UFRGS 6831, 14 (2 c&s), 27.3-87.5 mm SL, collected with holotype. UFRGS 16341, 3 (1 c&s), 35.2-67.2 mm SL, municipality of São Francisco de Paula, arroio Cará, 29º14'42"S 50º37'46"W, 12 Sep 2004, G. N. Silva, J. A. Anza, J. Ferrer & L. R. Malabarba. MCN 18927, 5, 32.1-56.7 mm SL, municipality of Canela, arroio Saiqui, 29º18'32"S 50º45'41"W, 19 Sep 2006, R. B. Dala-Corte. MCP 46943, 5 (1 c&s), 32.7-81.8 mm SL, municipality of São Francisco de Paula, arroio Lava-Pés, 29º12'49"S 50º44'59"W, 30 Mar 2002, V. A. Bertaco & V. C. Baumbach. **Rio Taquari-Antas basin:** MCN 14907, 1, 78.7 mm SL, municipality of São Francisco de Paula, rio Tomé, 11 Jul 1997, L. F. Guterrez & W. R. Koch. MCN 14879, 1, 74.6 mm SL, municipality of Bom Jesus, arroio do Barreiro, 10 Jul 1997, L. F. Guterrez & W. R. Koch. MCP 26920, 2, 27.6-79.6 mm SL, municipality of São Francisco de Paula, rio Contendas, 29º17'S 50º16'W, 2 May 1998, G. Vinciprova & W. Bruschi. MCP 35064, 3 (1 c&s), 33.0-71.0 mm SL, municipality of Lagoa Vermelha, rio Turvo, 28º24'19"S 51º29'25"W, 22 May 2004, A. M. Liedke, E. H. Pereira, T. P. Carvalho & R. E. Reis. MCP 42790, 7, 49.0-80.0 mm SL, municipality of Bom Jesus, arroio Bagual, 28º43'32"S 50º43'44"W, 18 Apr 2008, B. B. Calegari, E. H. Pereira & J. F. P. Silva. MCP 42794, 2, 35.3-80.8 mm SL, municipality of Bom Jesus, arroio Governador, 28º47'42"S 50º42'18"W, 17 Apr 2008, B. B. Calegari, E. H. Pereira & J. F. P. Silva. MCP 46944, 1, 79.0 mm SL, municipality of São Francisco de Paula, rio Lageado Grande, 29º13'26"S 50º28'14"W, 16 Dec 1998, A. R. Cardoso, F. Melo, P. A. Buckup & R. E. Reis. MCP 46945, 7 (2 c&s), 41.7-79.3 mm SL, municipality of São Francisco de Paula, rio Contendas, 29º16'45"S 50º14'43"W, 3 Feb 2007, C. A. Cramer, E. H. Pereira, T. P. Carvalho & R. E. Reis. MCP 46946, 3, 63.2-85.8 mm SL, municipality of Bom Jesus, arroio Governador, 28º44'23"S 50º40'42"W, 18 Apr 2008, B. B. Calegari, E. H. Pereira & J. F. P. Silva. MNRJ 18414, 6, 14.9-72.9 mm SL, municipality of São Francisco de Paula, unnamed stream tributary of rio Tainhas on road RS-453, 29º15'45"S 50º19'55"W, 16 Dec 1998, A. R. Cardoso, F. Melo, P. A. Buckup & R. E. Reis. MPEG 24030, 3, 48.4-78.1 mm SL, municipality of Cambará do Sul, unnamed stream tributary to rio Tainhas, 29º15'06"S 50º16'39"W, 27 Nov 2004, A. B. Schaan,

Fig. 1. *Trichomycterus balios*, holotype, UFRGS 16229, 82.0 mm SL, Brazil, Rio Grande do Sul State, municipality of São Francisco de Paula, rio Santa Cruz, rio Caí basin.

G. N. Silva, J. A. Anza & V. Lampert. MZUSP 110992, 5, 55.4-86.5 mm SL, municipality of Vacaria, unnamed stream tributary to rio Quebra-Dentes, 28º38'36"S 50º50'06"W, 10 Nov 2009, C. E. Machado & J. A. Anza. UFRGS 5570, 4 (1 c&s), 44.3-73.1 mm SL, municipality of Cambará do Sul, unnamed stream tributary to rio Camisas, 29º03'54"S 50º09'39"W, 1 Apr 2001, J. A. Anza, J. R. Bastos, L. R. Malabarba & T. O. B. Hasper. UFRGS 5571, 1, 50.9 mm SL, municipality of Bom Jesus, arroio das Nevilhas, 28º57'12"S 50º29'03"W, 31 Mar 2001, J. A. Anza, J. R. Bastos, L. R. Malabarba & T. O. B. Hasper. UFRGS 13898, 4, 42.4-92.4 mm SL, municipality of Monte Alegre dos Campos, arroio dos Cães, rio Quebra-Dentes basin, 28º39'26"S 50º49'06"W, 1 Jun 2010, F. G. Becker, G. Rosa & L. de Fries. UFRGS 16230, 2, 84.4-91.7 mm SL, municipality of São Francisco de Paula, unnamed stream tributary to rio Tainhas, 29º15'47"S 50º19'56"W, 30 Mar 2001, J. A. Anza, J. R. Bastos, L. R. Malabarba & T. O. B. Hasper. UFRGS 16231, 11 (2 c&s), 45.3-90.3 mm SL, municipality of Vacaria, unnamed stream tributary to rio Quebra-Dentes, 28º33'42"S 50º54'32"W, 10 Nov 2009, C. E. Machado & J. A. Anza. UFRGS 16232, 4 (2 c&s), 46.4-66.3 mm SL, municipality of Vacaria, arroio Maria Inácia, rio Quebra-Dentes basin, 28º27'52"S 51º02'W, 2 Jun 2010, F. G. Becker, G. Rosa & L. de Fries. UFRGS 16233, 3 (1 c&s), 47.1-81.9 mm SL, municipality of São Marcos, unnamed stream near Molin waterfall, tributary to arroio São Marcos, 29º02'35"S 51º01'29"W, F. G. Becker, G. Rosa & L. de Fries. UFRGS 16234, 2, 40.3-78.3 mm SL, municipality of São Francisco de Paula, rio Buriti, 29º09'40"S 50º32'37"W, 31 Mar 2001, J. A. Anza, J. R. Bastos, L. R. Malabarba & T. O. B. Hasper. UFRGS 16235, 3, 42.3-73.8 mm SL, municipality of São Francisco de Paula, arroio Ribeirão, 29º13'59"S 50º22'30"W, 29 Nov 2004, A. B. Schaan, G. N. Silva, J. A. Anza & V. Lampert. UFRGS 16236, 5 (1 c&s), 43.8-66.0 mm SL, municipality of Cambará do Sul, unnamed stream tributary to rio Camisas, 29º10'45"S 50º08'13"W, 27 Nov 2004, A. B. Schaan, G. N. Silva, J. A. Anza & V. Lampert.

Non-type material. UFRGS 16295, 15, 36.1-81.6 mm SL, municipality of Cambará do Sul, arroio Perdizes on Parque Nacional Aparados da Serra, rio Mampituba basin, 29º09'25"S 50º03'06"W, 12 May 2012, A. Souza, J. Ferrer, L. Santos, P. Lehmann & T. Guimarães. UFRGS 16299, 7, 26.4-61.6 mm SL, municipality of Cambará do Sul, arroio Perdizes on Parque Nacional Aparados da Serra, rio Mampituba basin, 29º09'31"S 50º04'49"W, 11 May 2012, J. Ferrer, L. Santos & T. Guimarães.

Diagnosis. *Trichomycterus balios* is distinguishable from all congeners except *T. davisi* (Haseman, 1911); *T. diatropoporos*; *T. papilliferus* Wosiacki & Garavello, 2004; *T. payaya* Sarmento-Soares, Zanata & Martins-Pinheiro, 2011; *T. perkos* Datovo, Carvalho & Ferrer, 2012; *T. plumbeus* Wosiacki &

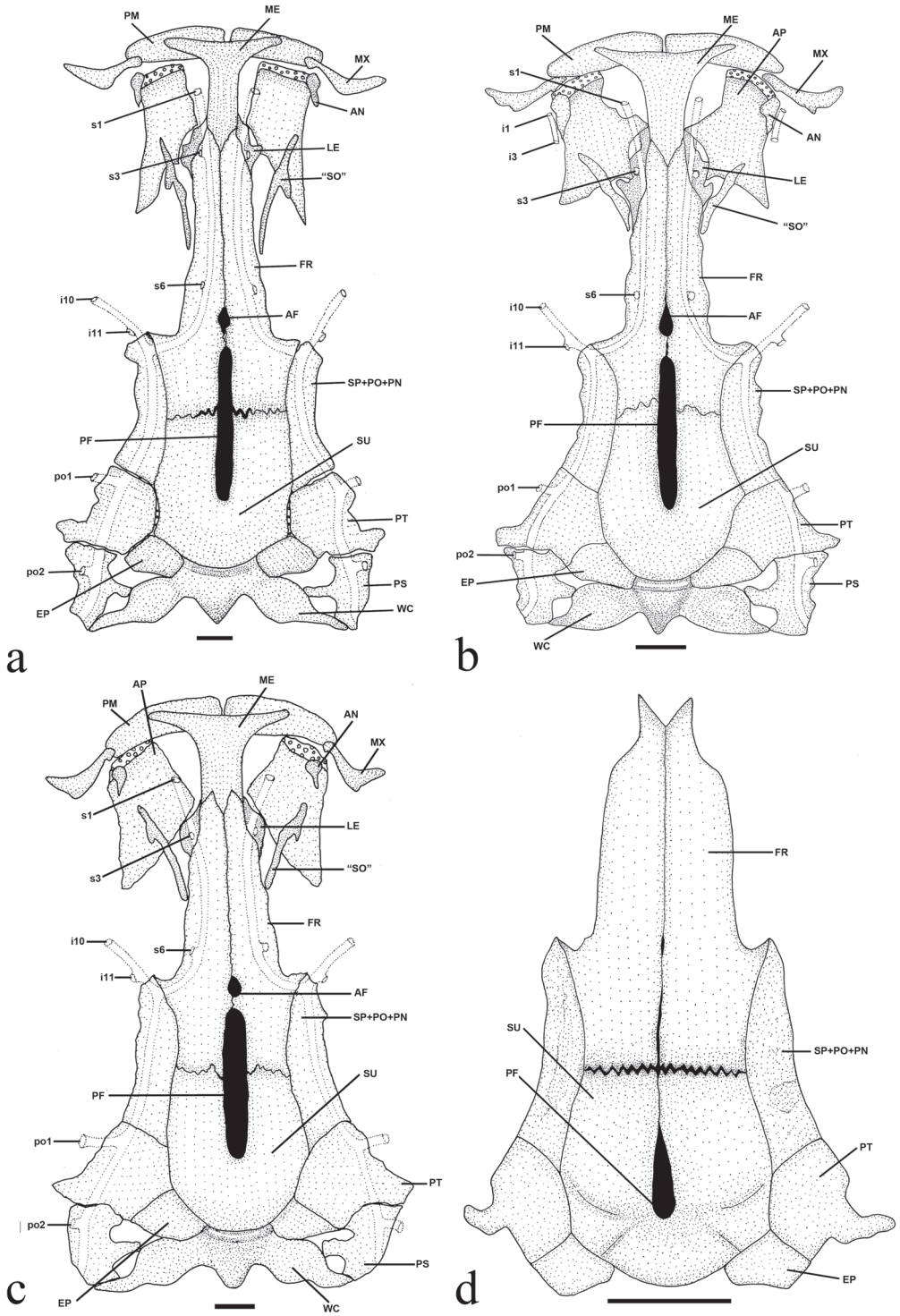

Fig. 2. Dorsal view of neurocranium of (**a**) *Trichomycterus balios*, paratype, UFRGS 6831, 81.7 mm SL; (**b**) *T. diatropoporos*, paratype, UFRGS 16237, 57.8 mm SL; (**c**) *T. poikilos*, paratype, MCP 22699, 79.0 mm SL, and (**d**) *T. brachykechenos*, paratype, UFRGS 16245, 41.9 mm SL, some elements not shown. Abbreviations: AF, anterior fontanel; AN, antorbital; AP, autopalatine; EP, epioccipital; FR, frontal; LE, lateral ethmoid; i1, infraorbital sensory branch 1; i3, infraorbital sensory branch 3; i10-11, infraorbital sensory branch 10 and 11; ME, mesethmoid; MX, maxilla; PF, posterior fontanel; PM, premaxilla; po1-2, postotic sensory branches 1 and 2; PS, posttemporosupracleithrum; PT, pterotic; s1, supraorbital sensory branch 1; s3, supraorbital sensory branch 3; s6, supraorbital sensory branch 6 (epiphyseal branch); SO, tendon-bone supraorbital; SP+PO+PN, sphenotic-prootic-pterosphenoid complex bone; SU, parieto-supraoccipital; WC, Weberian capsule. Scale bar = 2 mm.

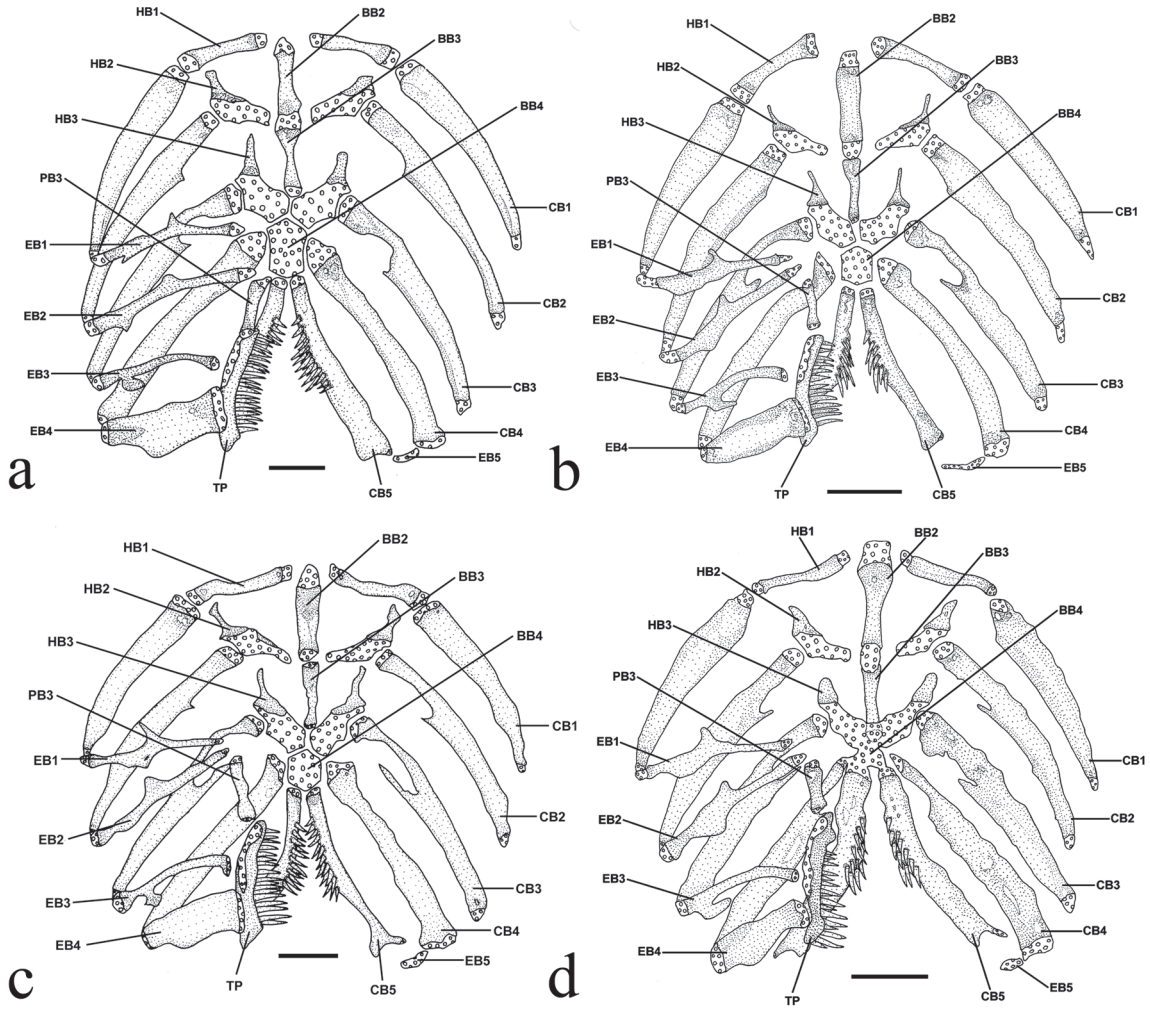

Fig. 3. Dorsal view of gill arches (right dorsal elements and gill rakers not show) of (**a**) *Trichomycterus balios*, paratype, UFRGS 6831, 81.7 mm SL; (**b**) *T. diatropoporos*, paratype, UFRGS 16237, 57.8 mm SL; (**c**) *T. poikilos*, paratype, MCP 22699, 79.0 mm SL; and (**d**) *T. brachykechenos*, paratype, UFRGS 16244, 51.6 mm SL. Abbreviations: BB2-4, basibranchials 2 to 4; CB1-5, ceratobranchials 1 to 5; EB1-5, epibranchials 1 to 5; HB1-3, hypobranchials 1 to 3; PB3, pharyngobranchial 3; TP; tooth plate. Scale bar = 1 mm.

Garavello, 2004; and *T. tropeiro* by the modal possession of I+6 pectoral-fin rays (one among 108 specimens with I+7; *vs*. I+5, I+7, or more pectoral-fin rays) and the first ray of the pectoral fin not prolonged as a filament (Fig. 1; *vs*. the first ray of the pectoral fin prolonged as a filament). *Trichomycterus balios* is distinguished from *T. davisi*, *T. diatropoporos*, *T. papilliferus*, *T. payaya*, *T. perkos*, and *T. plumbeus* by the color pattern of the dorsal and lateral surfaces of body, which presents circular black blotches variable in size (Fig. 1; *vs*. the head and trunk with dark irregularly shaped spots scattered in *T. davisi*; lateral surface of body with dark blotches variable in size and shape progressively larger and coalescent dorsally thus forming extensive black pigmented regions with light yellow gaps in *T. diatropoporos*; dorsal and lateral surfaces of body pale brown to light gray in *T. payaya*; dorsal and lateral surfaces of body gray in *T. papilliferus* and *T. plumbeus*; lateral surface of body with three wide dark brown stripes in *T. perkos*). *Trichomycterus balios* is distinguished from *T. tropeiro* by the presence of the pelvic girdle and pelvic fins (Fig. 1; *vs*. absence); and the absence of pores i1 and i3 of the infraorbital sensory canal (Fig. 2a; *vs*. presence). Additionally, *T. balios* is distinguished from the remaining congeners in the laguna dos Patos system by the possession of 36-39 teeth on ceratobranchial 5 (Fig. 3a; *vs*. 12-13 in *T. diatropoporos* and 20-23 in *T. poikilos*); 35-40 teeth on plate connected to pharyngobranchial 4 (Fig. 3a; *vs*. 18-20 in *T. diatropoporos* and 23-25 in *T. poikilos*); by the color pattern of the dorsal and lateral surfaces of body with circular black blotches variable in size [Fig. 1; *vs*. the dorsal and lateral surfaces of body mottled dark brown over a light yellow

background or with three stripes (dorsosagittal, midlateral, and ventrolateral) with notched borders in *T. poikilos*; the dorsal and lateral surface of body densely mottled dark brown over a light yellow background in *T. brachykechenos*]. *Trichomycterus balios* is further distinguishable from *T. poikilos* by having the origin of the dorsal fin located at the vertical through the last third of the pelvic fin (Fig. 1; *vs*. at the vertical falling between the tip of the pelvic fin and the anterior insertion of anal fin). *Trichomycterus balios* is further distinguishable from *T. brachykechenos* by having a posterior cranial fontanel extending from the parieto-supraoccipital to the frontals (Fig. 2a; *vs*. the posterior cranial fontanel restricted to the parieto-supraoccipital); the maxillary barbel length (37.8-66.6% *vs*. 68.2-87.7% HL), the number of odontodes of the opercular patch (13-19 *vs*. 8-11). *Trichomycterus balios* is further distinguishable from *T. diatropoporos* by the insertion of the first dorsal-fin basal radial anterior to the neural spine of the 19th-22th vertebrae (*vs*. anterior to the neural spine of the 17th or 18th vertebrae).

Description. Morphometric data for holotype and paratypes in Table 1. Body elongate, trunk roughly cylindrical and gradually compressed towards caudal fin. Dorsal profile of trunk convex along anterior half then straight to insertion of dorsal fin. Ventral profile of trunk straight to slightly convex. Dorsal and ventral profile of caudal peduncle straight to slightly concave.

Head depressed, trapezoidal from dorsal view, wider posteriorly. Dorsal profile straight and ventral profile straight to slightly convex. Snout rounded from dorsal view. Eyes readily visible, anteroposteriorly elliptical to rounded, dorsally oriented; orbital rim not free, eyes covered with skin thin and transparent. Each eye located over posterior termination of shallow and small longitudinal crest beginning at posterior nostril and making eyes visible from lateral view.

Nostrils of same size and smaller than eye diameter. Anterior nostril surrounded by fleshy flap of integument posterolaterally continuous with nasal barbel. Posterior nostril surrounded anterolaterally by thin flap of integument. Gill openings not constricted but united with isthmus anteriorly forming a free fold. Mouth subterminal with corners posteriorly oriented. Lower lip with conspicuous fleshy lobes along lateral limits internal to origin of rictal barbels. Lips with small papillae; papillae largest on inner surface of upper lip.

Barbels with large bases and tapering gradually towards tip. Tip of nasal barbel usually reaching to between eye and pore i11 or at most slightly extending beyond pore i11. Origin of nasal barbels on posterolateral portion of integument flap around anterior nostril. Maxillary barbel usually extending between anterior and posterior margins of interopercular patch of odontodes or at most slightly extending beyond to posterior margin but never reaching pectoral-fin insertion. Rictal barbel slightly shorter than maxillary barbel.

Mesethmoid with anterior margin slightly concave, cornua short and thick, width of their bases similar to their length (Fig. 2a). Anterior cranial fontanel restricted to small rounded opening situated between frontals and epiphyseal bar. Posterior cranial fontanel long and narrow, extending from posterior portion of

Table 1. Morphometric data for holotype and paratypes of *Trichomycterus balios*. SD = standard deviation; N = number of specimens.

	Holotype	Range	Mean	SD	N
Standard length (mm)	82.0	27.3-100.9	62.98	-	103
Percent of Standard Length					
Head length	18.0	19.5-25.7	21.7	1.00	103
Predorsal length	54.8	62.3-67.8	65.9	1.13	103
Prepelvic length	49.0	55.9-61.3	58.4	1.13	103
Preanal length	60.3	69.5-75.6	72.5	1.27	103
Scapular girdle width	12.4	13.4-18.9	15.3	0.72	103
Trunk length	31.5	34.9-41.4	38.7	1.09	103
Pectoral-fin length	10.0	10.6-14.5	12.4	0.76	103
Pelvic-fin length	7.3	7.1-10.7	8.4	0.60	103
Distance between pelvic-fin base and anus	7.8	8.1-11.9	9.9	0.74	103
Caudal peduncle length	13.7	16.5-22.3	19.3	0.99	103
Caudal peduncle depth	9.00	10.1-13.7	11.3	0.63	103
Body depth	12.6	10.8-17.6	14.2	1.10	101
Length of dorsal-fin base	9.1	8.6-12.7	11.0	0.67	103
Length of anal-fin base	7.5	6.9-10.5	8.8	0.67	103
Percents of Head Length					
Head width	15.0	76.4-89.1	82.3	2.70	103
Nasal barbel length	8.0	35.0-62.9	49.3	5.68	103
Maxillary barbel length	7.9	37.8-66.6	53.2	6.71	103
Rictal barbel length	7.7	31.9-59.8	47.7	6.22	103
Snout length	8.1	40.2-48.2	44.8	1.92	103
Interorbital	4.0	17.8-26.3	22.2	1.70	103
Mouth width	8.1	33.7-50.3	43.3	3.09	103
Eye diameter	1.5	6.8-15.2	9.7	1.58	103
Supra-orbital pore distance	1.8	4.4-16.9	9.7	2.49	102

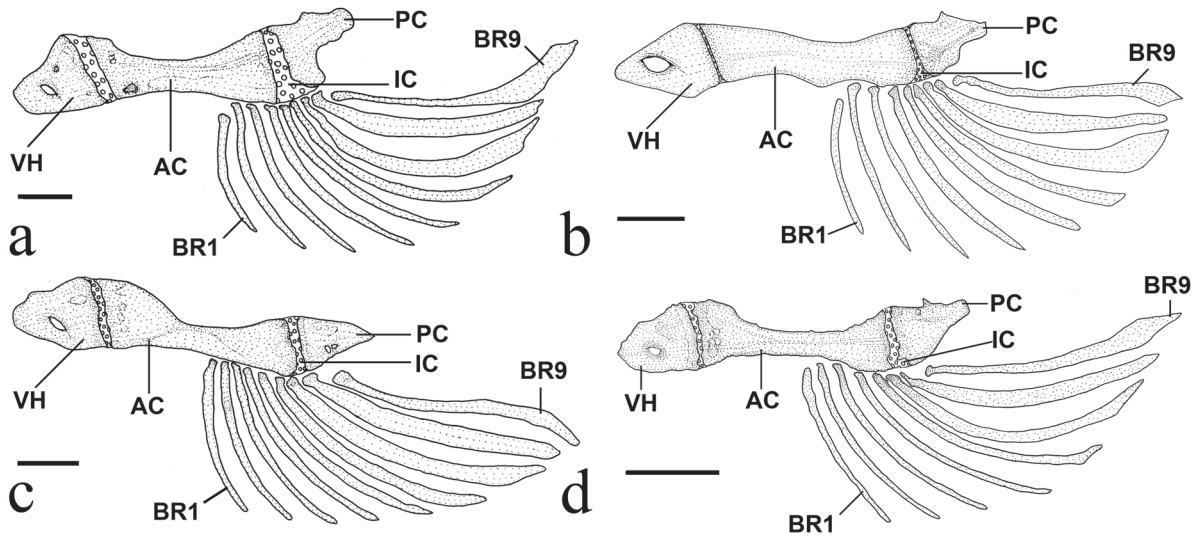

Fig. 4. Lateral view of left hyoid arch of (**a**) *Trichomycterus balios*, paratype, UFRGS 6831, 81.7 mm SL; (**b**) *T. diatropoporos*, paratype, UFRGS 16237, 57.8 mm SL; (**c**) *T. poikilos*, paratype, MCP 22699, 79.0 mm SL; and (**d**) *T. brachykechenos*, paratype, UFRGS 16245, 41.9 mm SL. Abbreviations: AC, anterior ceratohyal; BR1-9, branchiostegal rays 1 to 9; IC, inter-ceratohyal cartilage; PC, posterior ceratohyal; VH, ventral hypohyal. Scale bar = 1 mm.

frontals to parieto-supraoccipital. Epiphyseal bar longer than wide (absent in one of 14 specimens). Antorbital short and anteriorly expanded. Tendon-bone supraorbital elongate, approximately three times larger than antorbital, with process along distal margin. Anterior portion of sphenotic laterally directed from dorsal view. Sphenotic, prootic, and pterosphenoid totally fused. Vomer arrow-shaped with long posterior process extending to parasphenoid. Parasphenoid with long pointed process extending to basioccipital. Anterior portion of Weberian complex fused to basioccipital. Weberian capsule with lateral opening smaller than lateral profile of capsule.

Premaxilla rectangular with 75-101 conical, curved and pointed teeth (n = 2). Teeth variable in size and distributed with some irregularity in up to four rows. Maxilla large, boomerang-shaped and shorter than premaxilla. Lower jaw with 89-107 conical, curved and pointed teeth variable in size (n = 2). Outer teeth row slightly flat vertically with blunt tips in largest specimens (greater than 85.4 mm SL). Teeth range from few teeth at base of coronoid process to four discernible rows near dentary symphysis. Autopalatine with anterior margin straight, mesial margin straight to slightly concave, distal margin slightly concave, and large posterior process extending to middle of metapterygoid.

Metapterygoid large and laminar and connecting with quadrate through cartilage. Hyomandibula well-developed. Preopercle long and narrow and in contact with ventral margins of quadrate and hyomandibula. Opercular patch of odontodes rounded with 13-19 conical odontodes (n = 14). Interopercular

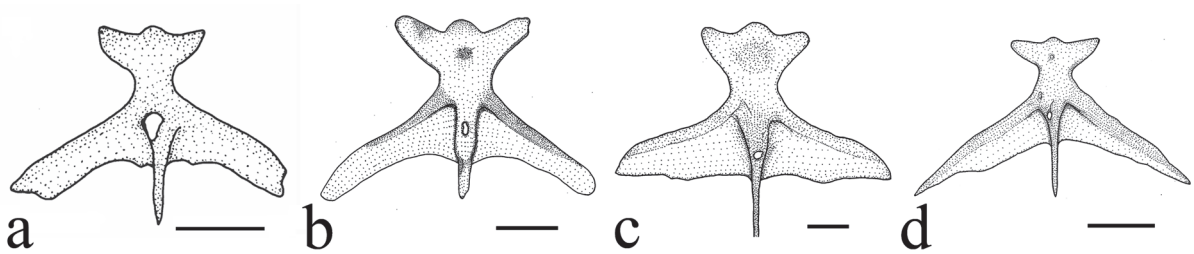

Fig. 5. Dorsal view of urohyal of (**a**) *Trichomycterus balios*, paratype, UFRGS 6831, 81.7 mm SL; (**b**) *T. diatropoporos*, paratype, UFRGS 16237, 57.8 mm SL; (**c**) *T. poikilos*, paratype, MCP 22699, 79.0 mm SL; and (**d**) *T. brachykechenos*, paratype, UFRGS 16245, 41.9 mm SL. Scale bar = 0.5 mm.

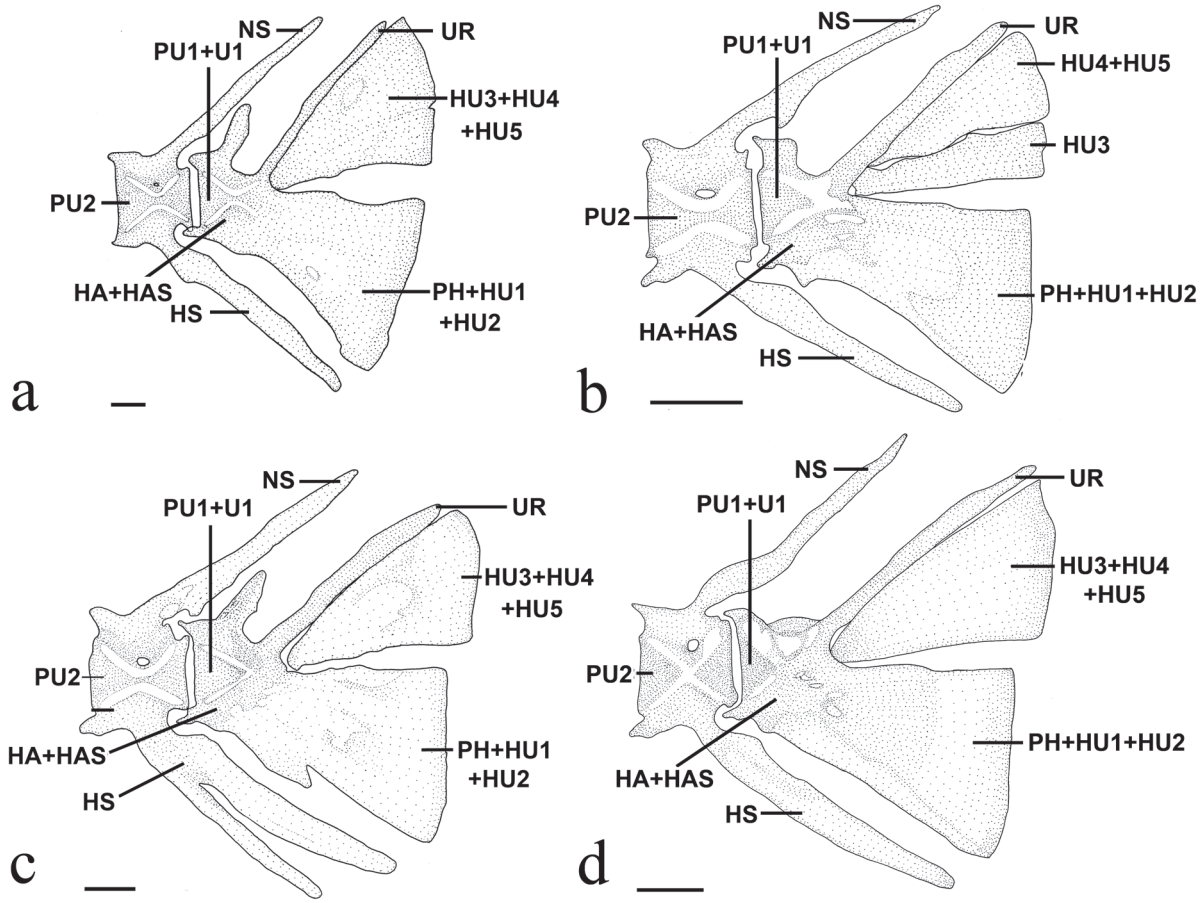

Fig. 6. Lateral view, anterior to left, of caudal skeleton of (**a**) *Trichomycterus balios*, paratype, UFRGS 6831, 81.7 mm SL; (**b**) *T. diatropoporos*, paratype, UFRGS 16237, 57.8 mm SL; (**c**) *T. poikilos*, paratype, MCP 22699, 79.0 mm SL; and (**d**) *T. brachykechenos*, paratype, UFRGS 16244, 51.6 mm SL. Abbreviations: HA+HAS, complex hypurapophysis composed of hypurapophysis and secondary hypurapophysis; HS, haemal spine; HU3, hypural 3; HU4+HU5, complex plate formed by co-ossification of hypurals 4 and 5; HU3+HU4+HU5, complex plate formed by co-ossification of hypurals 3 to 5; NS, neural spine; PH+HU1+HU2, complex plate formed by co-ossification of hypurals 1 and 2 and parhypural; PU1+U1, complex centrum composed of preural centrum 1 and ural centrum 1; PU2, preural centrum; UR, uroneural. Scale bar = 0.5 mm.

patch of odontodes elongate with 15-25 conical odontodes (n = 14) more concentrated posteriorly. Odontodes of both opercular and interopercular patches gradually curving medially and increasing in size posteriorly.

Ventral hypohyal trapezoid-shaped (Fig. 4a). Anterior ceratohyal elongate and widening at anterior and posterior limits. Posterior ceratohyal short and triangular. Branchiostegal rays 8-9 (n = 14), usually 9, five on anterior ceratohyal, one on ceratohyal posterior and three articulated on interceratohyal cartilage. Last three branchiostegal rays widest. Dorsal hypohyal and interhyal absent. Urohyal with expanded anterior head, two elongate lateral processes with wide bases and decreasing in width distally with rounded tips and laminar, elongate, narrow posterior process (Fig. 5a).

Basibranchial 1 absent. Basibranchials 2 and 3 connected to each other, of approximately equal lengths and with cartilage at tips (Fig. 3a). Ossified portion of basibranchial 2 distinctly wider than basibranchial 3. Hexagonal basibranchial 4 completely cartilaginous. Hypobranchial 1 of similar size but narrower than basibranchial 2 with cartilage at tips. Hypobranchials 2 and 3 with narrow anterolateral ossified processes; ossified portion more elongate on hypobranchial 3 with large area of cartilage distally; larger in hypobranchial 3. Hypobranchial 4 absent. Five elongate and narrow ceratobranchials with cartilage at tips. Ceratobranchials 2 and 3 with concavity along posterior margins; concavity larger in ceratobranchial 3. Ceratobranchial 5 expanded posteromedially with 36-39 conical, elongate and pointed teeth arranged in 3 rows (n = 1). Five epibranchials, first three elongate and narrow with cartilage at tips. Epibranchials 1 and 2 with triangular process along anterior margins; process slightly larger in epibranchial 1. Epibranchial 3 with robust

uncinate process along posterior margin. Epibranchial 4 rectangular. Epibranchial 5 small, narrow, curved and completely cartilaginous. Pharyngobranchials 1 and 2 absent. Pharyngobranchial 3 similar in form but shorter than hypobranchial 1 with cartilage at tips. Pharyngobranchial 4 curved and well ossified connected to plate with 35-40 conical, elongate and pointed teeth arranged in up to 3 rows; teeth increasing in length posteriorly (n = 1).

Sensory canals on head with simple (non-dendritic) tubes ending in single pores (Fig. 2a). Supraorbital sensory canal complete with paired pores s1, s3 and s6. Pore s1 located between anterior nostrils, pore s3 located in same longitudinal row of pore s1 after posterior nostrils and pore s6 in interorbital space. Infraorbital sensory canal incomplete; pores i1 and i3 absent, pore i10 located behind eye and pore i11 located lateral to posterior margin of eye. Postotic pore po1 located lateral to anterior margin of opercular patch of odontodes. Postotic pore po2 located lateral to middle of length of opercular patch of odontodes. Lateral-line canal very short with 2 pores located above insertion of pectoral fin and just posterior of gill openings.

Pectoral fin with distal margin rounded, I+6* rays (1 of 108 specimens with I+7), first ray short and not prolonged as filament. Pelvic fin with distal margin rounded, reaching at most anterior margin of urogenital papilla, I+4 rays (n = 108). Inner margin of pelvic fins very close basally. Pelvic girdle with two basipterygia united medially by cartilage with two elongate bifid processes (external process and internal process) and medial process short (one of 14 specimens with medial process united to internal process). Pelvic splint thin, comma-shaped and parallel to first pelvic-fin ray. Urogenital papilla nearer tip of pelvic fin than origin of anal fin.

Dorsal fin with distal margin rounded, semicircular when fin expanded with two to four unsegmented rays (n = 14), II+5-8 rays (n = 108), usually II+7*. Dorsal-fin origin located at vertical through the last third of pelvic fin. Dorsal-fin basal radials 8 (n = 14); first inserting anterior to neural spine of 19th to 22th vertebrae.

Anal fin slightly smaller than dorsal fin with distal margin rounded, two to four unsegmented rays (n = 14), II+4-6 rays (n = 108), usually II+5*. Anal-fin origin located at vertical through middle of dorsal-fin base. Anal-fin basal radials 6 (n = 14); first inserting anterior to haemal spine of 22th to 25th vertebrae.

Caudal fin with distal margin straight and dorsal and ventral lobes rounded at limits. Procurrent caudal-fin rays 14-17 dorsally (n = 14) and 10-13 ventrally (n = 14). Principal rays I+5+5-7+I (n = 108), usually I+5+6+I*, branched rays splitting two or three times. Lower caudal plate with parhypural and hypurals 1 and 2 co-ossified and fused to compound caudal centrum. Upper caudal plate with a separate uroneural; hypurals 3, 4, and 5 completely fused (n = 3) (Fig. 6a) or with hypural 3 autogenous (n = 8) or partly fused (n = 3) with hypurals 4 and 5 (Fig. 7).

Vertebrae 38-41 (n = 14); ribs 12-15 (n = 14) with first rib straight and thickest and last rib rudimentary.

Coloration in alcohol. Dorsal and lateral surface of body with circular black blotches variable in size over light yellowish background; dark pigmentation more concentrated dorsally (Fig. 1). Ventral surface of body light yellow with diffuse small black spots laterally and between pectoral-fin insertions; spots larger and more concentrated between pelvic and anal fins and caudal peduncle. Dorsal surface of head with greater concentration of irregular black rounded blotches variable in size; blotches becoming more scattered on lateral surface, smaller ventrally and restricted to lateral and posterior margins of gill openings. Pectoral, dorsal, anal and caudal fins spotted basally, spotting becoming inconspicuous towards tips and margins lighter. Pelvic fin unpigmented. Barbels with dark pigmentation on both surfaces. Larger specimens (greater than 43.2 mm SL) with pigmentation arranged in two distinct layers; large rounded black spots on inner skin layer and small black spots on outer skin layer (Fig. 1).

Distribution and ecological notes. *Trichomycterus balios* is distributed in the upper portions of the rio das Antas and rio Caí tributaries to the laguna dos Patos system and in the

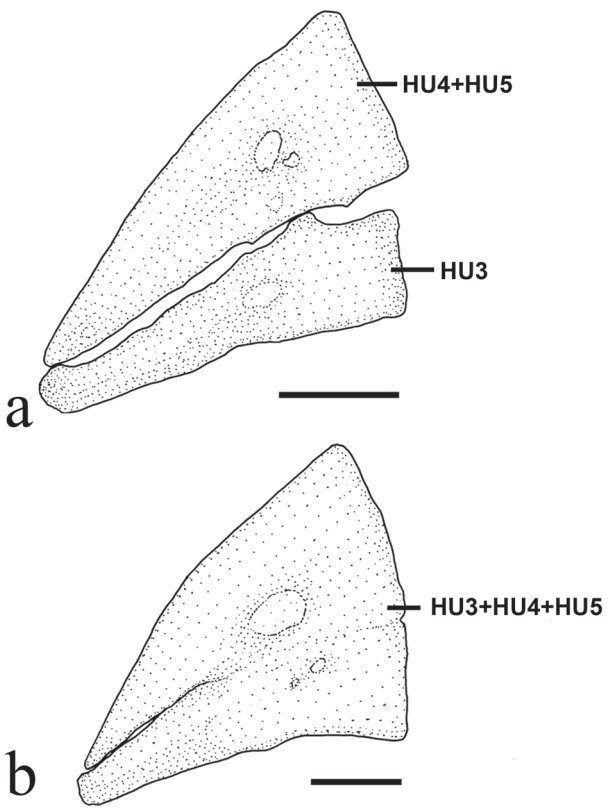

Fig. 7. Upper caudal plates of *Trichomycterus balios*, lateral view, anterior to left. **(a)** = paratype, MCP 41292, 64.7 mm SL; (**b**) paratype, MCP 41292, 72.3 mm SL. Abbreviations: HU3, hypural 3; HU4+HU5, complex plate formed by co-ossification of hypurals 4 and 5; HU3+HU4+HU5, complex plate formed by co-ossification of hypurals 3, 4 and 5. Scale bar = 0.5 mm.

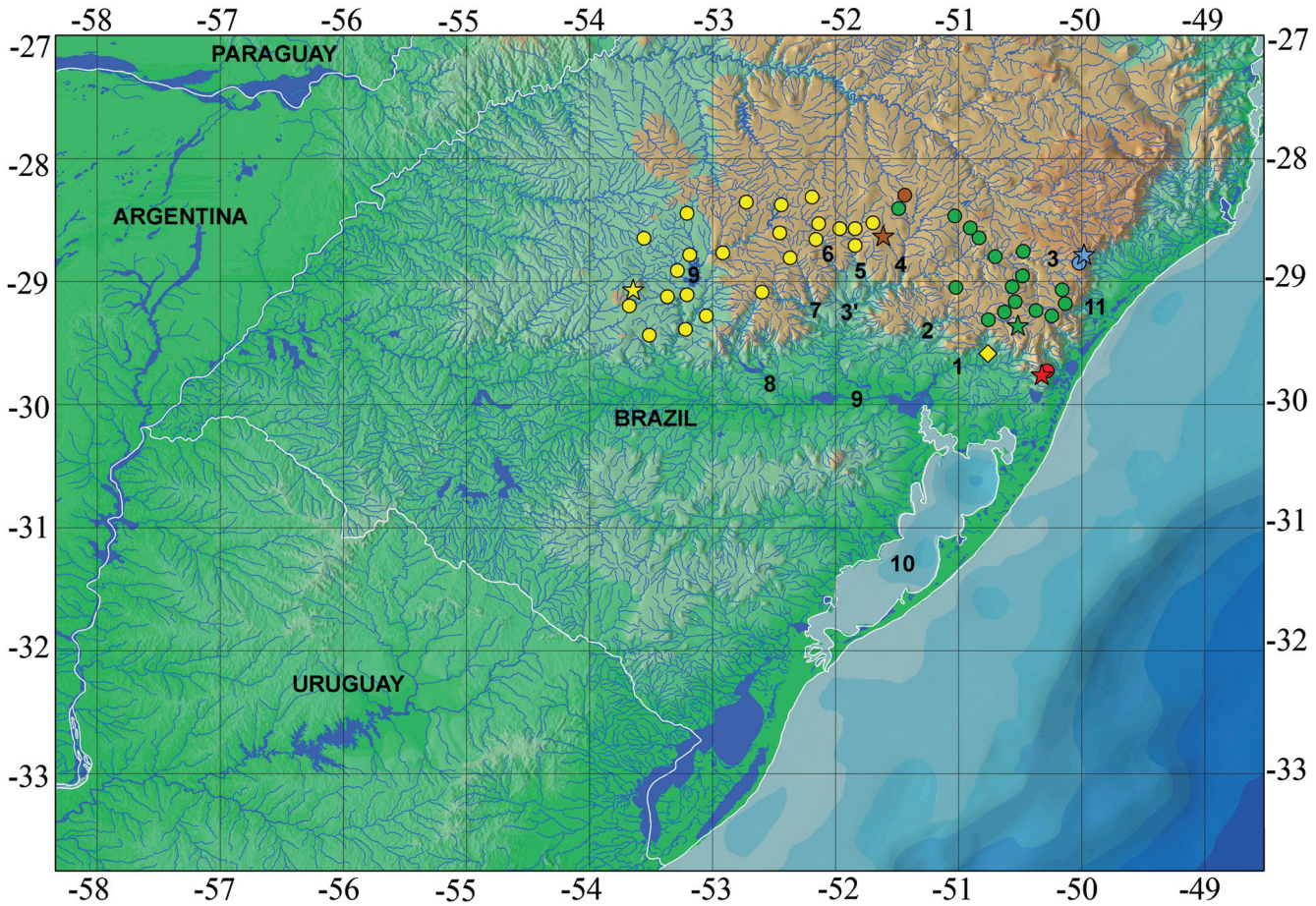

Fig. 8. Geographic distribution of species of *Trichomycterus* in the laguna dos Patos system. Some symbols represent more than one collection locality. Stars represent type localities. *Trichomycterus balios* (green symbols), *T. brachykechenos* (red symbols), *T. diatropoporos* (brown symbols), *T. poikilos* (yellow symbols), *Trichomycterus* cf. *poikilos* (yellow lozenge) and *T. tropeiro* (blue symbols), Abbreviations: 1, rio dos Sinos; 2, rio Caí; 3, rio das Antas; 3', rio Taquari-Antas; 4, rio da Prata; 5, rio Carreiro; 6, rio Guaporé; 7, rio Forqueta; 8, rio Pardo; 9, rio Jacuí; 10, laguna dos Patos; and 11, rio Mampituba basin.

headwaters of the rio Mampituba (Fig. 8). The type locality is located at approximately 792 m a.s.l. and the remaining localities of collection between 681 and 941 m a.s.l. The lower portions of the laguna dos Patos system and of the rio Mampituba are widely separated by the rio Tramandaí drainage, were *T. balios* is unknow to occur (Malabarba *et al*., 2013). The occurrence of the species in the headwaters of these two unconnected and distant drainages (laguna dos Patos system and of the rio Mampituba) is possibly related to headwater capture events.

The localities where the types were collected had clear water with current water and rocky bottoms (Fig. 9a). *Trichomycterus balios* was collected with *Cnesterodon brevirostratus* Rosa & Costa, 1993; *Pareiorhaphis hystrix* (Pereira & Reis, 2002); and *Bryconamericus patriciae* da Silva, 2004 at the type locality, other species that show some degree of endemism in the region associated with high altitudes (Rosa & Costa, 1993; Pereira & Reis, 2002, da Silva, 2004). The stomach of 13 c&s specimens contained larvae of Diptera (Chironomidae, Simuliidae), Lepidoptera, and Trichoptera; and nymphs of Ephemeroptera and Plecoptera.

Remarks. The type series includes only specimens from laguna dos Patos system. Data of specimens from the rio Mampituba identified as *T. balios* are not included in the species description.

Etymology. From the Greek *balios* meaning spotted, in reference to the color pattern of the new species formed by circular black blotches. An adjective.

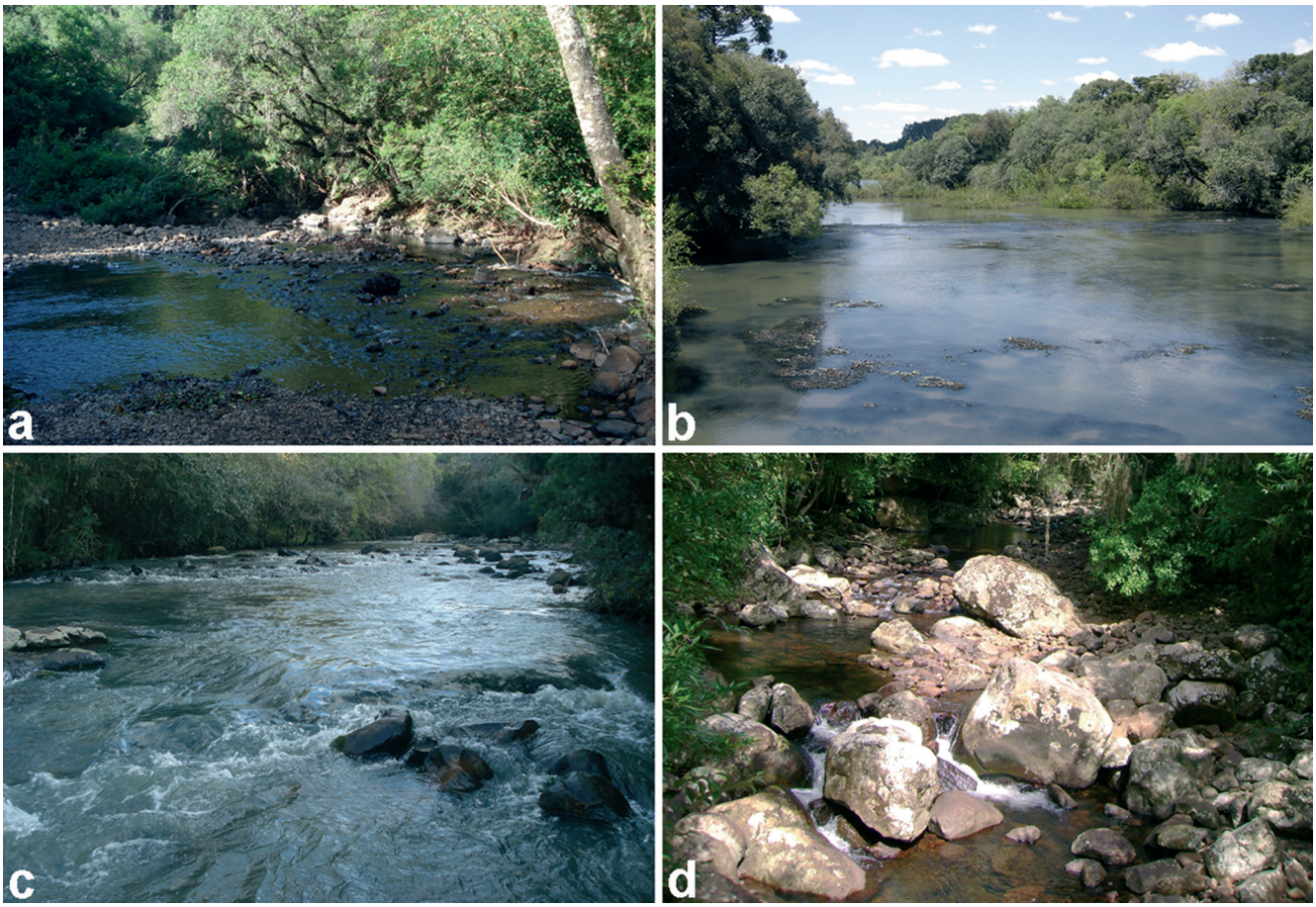

Fig. 9. Arroio Bagual, municipality of Bom Jesus, locality of collection of some type specimens of *Trichomycterus balios* (**a**). Type locality of *T. diatropoporos*: rio da Prata at Passo do Despraiado, municipality of Nova Prata (**b**, photo by T. P. Carvalho). Type locality of *T. poikilos*: arroio Passo dos Buracos or Tipiaia on road BR-158, municipality of Júlio de Castilhos (**c**). Locality where most type specimens of *T. brachykechenos* (11 specimens) were collected: rio dos Sinos, municipality of Caraá (**d**, photo by R. B. Dala-Corte). All localities from Rio Grande do Sul State, Brazil.

Trichomycterus diatropoporos, new species
Figs. 2b, 3b, 4b, 5b 6b, 10, 11a, 12

Trichomycterus sp. 1. Becker *et al*. (2013: Table 1, listed, Taquari-Antas river basin).

Holotype. MCP 46947, 58.8 mm SL, Brazil, Rio Grande do Sul State, municipality of Nova Prata, rio da Prata on Passo do Despraiado, 28º38'04"S 51º36'53"W, 22 May 2004, A. M. Liedke, E. H. Pereira, R. E. Reis & T. P. Carvalho.

Paratypes. All from Brazil, Rio Grande do Sul State, rio Taquari-Antas basin. MCP 35050, 8, 21.6-58.2 mm SL, collected with holotype. MCP 40933, 2 (c&s), 38.8-39.7 mm SL, collected at type locality, 24 Oct 2006, T. P. Carvalho & V. A. Bertaco. MCP 22789, 2, 39.1-57.1 mm SL, municipality of Lagoa Vermelha, arroio Carazinho, rio Turvo basin, 28º17'36"S 51º24'42"W, 3 Apr 1999, E. H. Pereira, R. E. Reis & V. A. Bertaco. MCP 40940, 2, 47.9-67.0 mm SL, municipality of André da Rocha, arroio Herval, rio da Prata basin, 28º39'32"S 51º37'03"W, 24 Oct 2006, T. P. Carvalho & V. A. Bertaco. MCN 18928, 5, 30.7-37.8 mm SL, collected at type locality, 24 Oct 2006, T. P. Carvalho & V. A. Bertaco. UFRGS 16237, 1 (c&s), 57.8 mm SL, collected with holotype. UFRGS 16238, 4 (1c&s), 57.4-68.3 mm SL, collected at type locality, 20 Jan 1999, E. H. Pereira, J. F. P. Silva & R. E. Reis.

Non-type material. MCP 22785, 1, 59.1 mm SL, municipality of Muitos Capões, arroio Espeto, rio Turvo basin, 28º23'26"S 51º03'22"W, 3 Apr 1999. E. H. Pereira, R. E. Reis & V. A. Bertaco.

Diagnosis. *Trichomycterus diatropoporos* is distinguishable from all congeners except *T. balios*, *T. davisi*, *T. papilliferus*, *T. payaya*, *T. perkos*, *T. plumbeus*, and *T. tropeiro* by the possession of I+6 pectoral-fin rays (*vs*. I+5, I+7, or more) and the first ray of the pectoral fin not prolonged as a filament (Fig. 10; *vs*. the first ray of the pectoral fin prolonged as a filament).

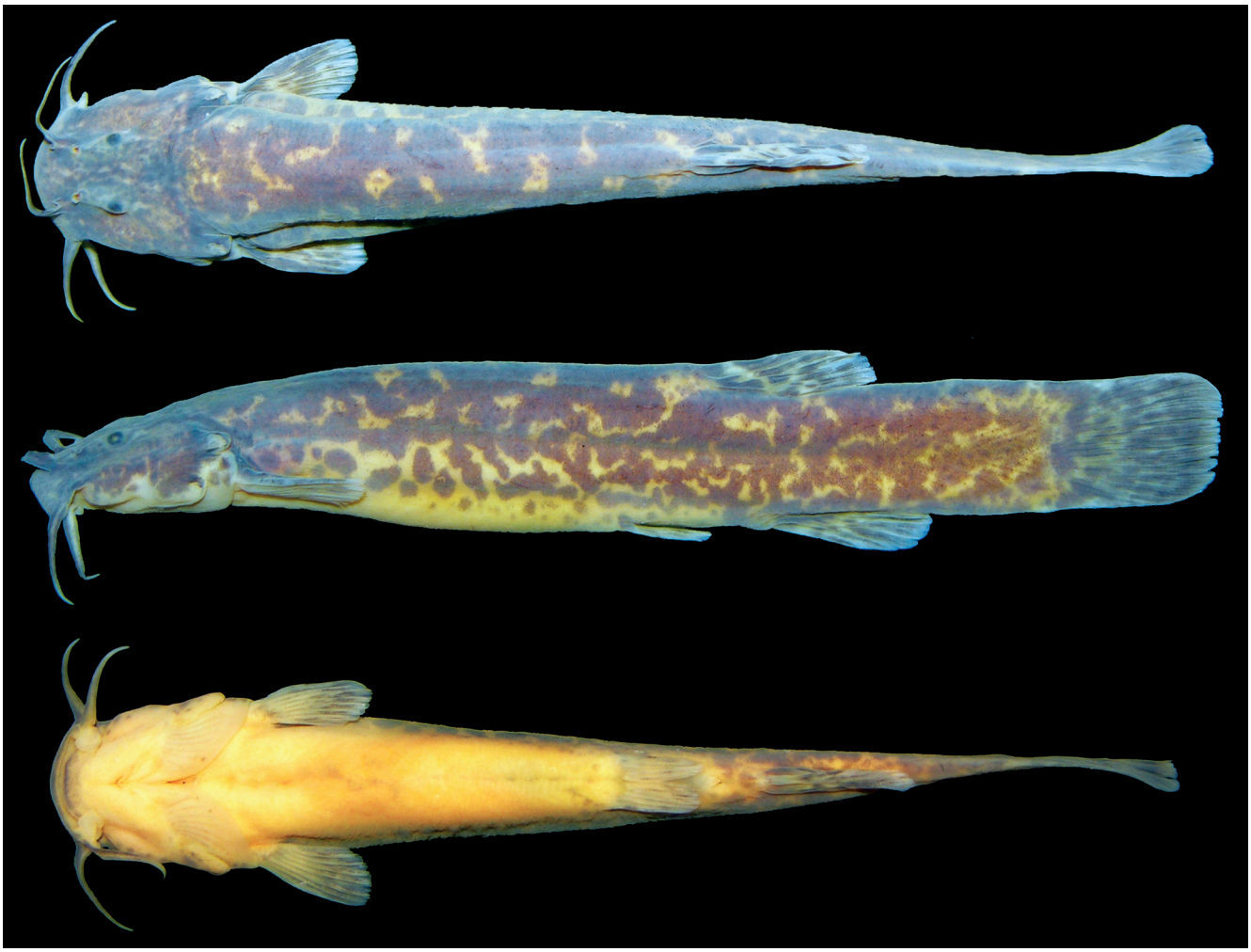

Fig. 10. *Trichomycterus diatropoporos*, holotype, MCP 46947, 58.8 mm SL, Brazil, Rio Grande do Sul State, municipality of Nova Prata, rio da Prata at Passo do Despraiado.

Trichomycterus diatropoporos is distinguished from *T. balios*, *T. brachykechenos*, *T. davisi*, *T. papilliferus*, *T. payaya*, *T. perkos*, *T. plumbeus*, *T. poikilos*, and *T. tropeiro* by the color pattern of dark blotches variable in size and shape progressively larger and coalescent dorsally thus forming extensive black pigmented regions with light yellow gaps (Fig. 10; *vs*. the dorsal and lateral surface of body with circular black blotches variable in size in *T. balios* and *T. tropeiro*; the dorsal and lateral surfaces of body densely mottled dark brown over a light yellow background in *T. brachykechenos*; head and trunk with dark brown irregularly shaped spots scattered in *T. davisi*; dorsal and lateral surface of body pale brown to light gray in *T. payaya*, dorsal and lateral surface of body gray in *T. papilliferus* and *T. plumbeus*; lateral surface of body with three wide dark brown stripes in *T. perkos*; dorsal and lateral surface of body mottled dark brown over a light yellow background and sometimes forming two stripes, midlateral and ventrolateral, with notched borders in *T. poikilos*). *Trichomycterus diatropoporos* is further distinguishable from *T. poikilos* by having the origin of the dorsal fin located at the vertical through the last third of the pelvic fin (Fig. 10; *vs*. at vertical falling between tip of the pelvic fin and the anterior insertion of anal fin) and the origin of the anal fin located at the vertical through the base of the last dorsal-fin ray (Fig. 10; *vs*. at the vertical falling between the anterior insertion of the dorsal fin and the middle of its length). *Trichomycterus diatropoporos* is further distinguishable from *T. brachykechenos* by having the posterior cranial fontanel extending from the parieto-supraoccipital to the frontals (Fig. 2b; *vs*. the posterior cranial fontanel restricted to the parieto-supraoccipital); the maxillary barbel length (38.3-53.9% *vs*.68.2-87.7% HL); and the number of odontodes on the opercular patch (13-19 *vs*. 8-11). *Trichomycterus diatropoporos* is further distinguishable from *T. balios* by location of the insertion of the first dorsal-fin basal radial anterior to neural spine of 17th or 18th vertebrae (*vs*. anterior to neural spine of 19th-22th vertebrae); and the number of teeth on ceratobranchial 5 and on plate connected to pharyngobranchial 4 (Fig. 2b; 12-13 *vs*. 36-39 and 18-20 *vs*. 35-40, respectively). *Trichomycterus diatropoporos*

Table 2. Morphometric data for holotype and paratypes of *Trichomycterus diatropoporos*. SD = standard deviation; N = number of specimens.

	Holotype	Range	Mean	SD	N
Standard length (mm)	58.8	25.8-68.3	50.1	-	18
Percent of Standard Length					
Head length	12.9	19.9-24.0	22.7	1.02	18
Predorsal length	36.6	61.8-67.0	64.6	1.40	18
Prepelvic length	33.1	56.0-59.3	57.7	0.91	18
Preanal length	41.8	67.6-74.0	71.9	1.48	18
Scapular girdle width	9.3	14.9-17.3	16.1	0.65	18
Trunk length	21.5	35.4-41.0	37.7	1.27	18
Pectoral-fin length	7.5	11.8-14.5	13.2	0.75	18
Pelvic-fin length	5.0	8.2-9.6	9.0	0.44	18
Distance between pelvic-fin base and anus	5.8	8.6-10.3	9.6	0.48	18
Caudal peduncle length	11.1	18.3-21.9	19.4	1.05	18
Caudal peduncle depth	7.5	11.5-14.3	12.7	0.77	18
Body depth	9.6	14.2-18.0	16.0	0.94	18
Length of dorsal-fin base	7.1	10.3-12.5	11.6	0.61	18
Length of anal-fin base	5.3	7.9-9.7	8.5	0.46	18
Percent of Head Length					
Head width	10.6	74.1-93.8	82.4	4.12	18
Nasal barbel length	5.4	38.3-51.6	43.9	3.33	18
Maxillary barbel length	6.9	38.3-53.9	48.9	4.07	17
Rictal barbel length	6.9	42.7-53.5	47.5	3.02	18
Snout length	5.2	40.5-45.3	43.4	1.36	18
Interorbital	2.9	19.0-25.3	21.9	1.60	18
Mouth width	5.6	43.9-52.5	47.7	2.41	18
Eye diameter	1.1	7.8-12.6	10.1	1.49	18
Supra-orbital pore distance	1.4	6.8-14.0	11.1	2.17	17

is further distinguishable from *T. tropeiro* by the presence of the pelvic girdle and pelvic fins (Fig. 10; *vs*. absence); and the insertion of the first dorsal-fin basal radial anterior to neural spine of 17th or 18th vertebrae (*vs*. anterior to neural spine of 19th-20th vertebrae).

Description. Morphometric data for holotype and paratypes in Table 2. Body elongate, trunk roughly cylindrical and gradually compressed towards caudal fin. Dorsal profile of trunk convex along anterior half then straight to insertion of dorsal fin. Dorsal profile of caudal peduncle straight to slightly convex. Ventral profile of trunk and caudal peduncle nearly straight.

Head depressed, trapezoidal from dorsal view, wider posteriorly. Dorsal profile of head straight and ventral profile straight to slightly convex. Snout rounded from dorsal view. Eyes readily visible, anteroposteriorly elliptical and dorsally oriented, orbital rim not free, eyes covered with skin thin and transparent. Each eye located over posterior termination of small longitudinal ridge beginning at posterior nostril and making eyes fully visible from lateral view.

Nostrils of same size and smaller than diameter of eye. Anterior nostril surrounded by fleshy flap of integument posterolaterally continuous with nasal barbel. Posterior nostril surrounded anterolaterally by thin flap of integument. Gill openings not constricted but united with isthmus anteriorly forming a large free fold. Mouth subterminal, corners posteriorly oriented. Lower lip with conspicuous fleshy lobes along lateral limits internal to origin of rictal barbels. Lips with small papillae; papillae largest on inner surface of upper lip.

Barbels with large bases and tapering gradually towards tip. Tip of nasal barbel usually reaching to between eye and pore i11 or at most slightly extending beyond pore i11. Origin of nasal barbels on posterolateral portion of integument flap around anterior nostril. Maxillary barbel usually extending posteriorly to between anterior margin of interopercular patch of odontodes and middle of patch but never reaching posterior margin of patch. Rictal barbel slightly shorter than maxillary barbel.

Mesethmoid with anterior margin slightly concave, cornua short and thick, width of their bases similar to their length (Fig. 2b). Anterior cranial fontanel restricted to small rounded opening situated between frontals and epiphyseal bar. Posterior cranial fontanel narrow and long extending from posterior portion of frontals to parieto-supraoccipital. Epiphyseal bar longer than wide. Antorbital short and anteriorly expanded. Tendon-bone supraorbital elongate, approximately three times larger than antorbital. Anterior portion of sphenotic anterolaterally directed from dorsal view. Sphenotic, prootic and pterosphenoid totally fused. Vomer arrow-shaped with long posterior process extending to parasphenoid. Parasphenoid with long pointed process extending to basioccipital. Anterior portion of Weberian complex fused to basioccipital. Weberian capsule with lateral opening smaller than lateral profile of capsule.

Premaxilla rectangular with 103 conical, curved and pointed teeth (n = 1). Teeth variable in size and irregularly distributed in up to three rows. Maxilla large, boomerang-shaped and shorter than premaxilla. Lower jaw with 75 conical to slightly

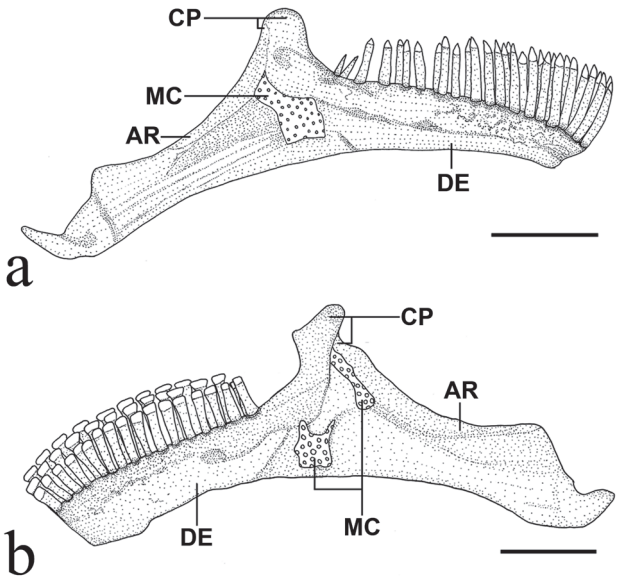

Fig. 11. Right lower jaw of (**a**) *Trichomycterus diatropoporos*, paratype, UFRGS 16237, 57.8 mm SL in lateral view and (**b**) *T. poikilos*, paratype, MCP 22699, 79.0 mm SL, in medial view. Abbreviations: AR, anguloarticular; CP, coronoid process; DE, dentary; MC, Meckel's cartilage. Scale bar = 1 mm.

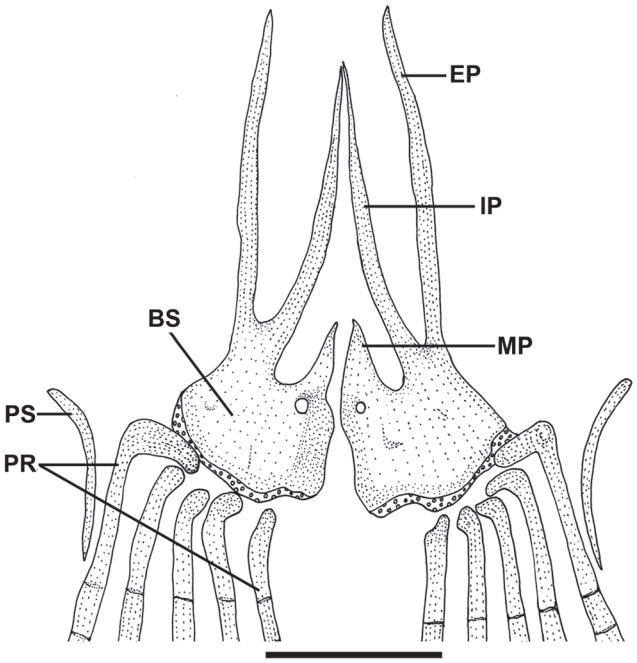

Fig. 12. Pelvic girdle of *Trichomycterus diatropoporos*, paratype, UFRGS 16237, 57.8 mm SL, dorsal view. Abbreviations: BS, basipterygium; EP, external process; IP, internal process; MP, medial process; PR, pelvic-fin rays; PS, pelvic splint. Scale bar = 1 mm.

vertically flat, curved and pointed teeth of variable size (n = 1). Few teeth at base of coronoid process and up to three discernible rows near dentary symphysis (Fig. 11a). Autopalatine with anterior margin convex, mesial margin concave, distal margin slightly concave and small posterior process extending slightly over metapterygoid.

Metapterygoid large, laminar and connecting with quadrate through cartilage. Hyomandibula well-developed. Preopercle long and narrow and in contact with ventral margins of quadrate and hyomandibula. Opercular patch of odontodes rounded with 13-19 conical odontodes (n = 4). Interopercular patch of odontodes elongate with 20-23 conical odontodes (n = 4) more concentrated posteriorly. Odontodes of both opercular and interopercular patches gradually curving medially and increasing in size posteriorly.

Ventral hypohyal trapezoidal (Fig. 4b). Anterior ceratohyal elongate and widening at anterior and posterior limits. Posterior ceratohyal short and triangular. Nine branchiostegal rays (n = 4); five on anterior ceratohyal, one on posterior ceratohyal and three on interceratohyal cartilage. Last three branchiostegal rays widest. Dorsal hypohyal and interhyal absent. Urohyal with expanded anterior head, two elongate lateral processes with wide bases and decreasing in width distally and bearing rounded tips; and laminar, elongate, narrow posterior process (Fig. 5b).

Basibranchial 1 absent. Basibranchials 2 and 3 of approximately equal lengths connected to each other with cartilage at tips (Fig. 3b). Ossified portion of basibranchial 2 distinctly wider than basibranchial 3. Hexagonal basibranchial 4 completely cartilaginous. Hypobranchial 1 of similar size but narrower than basibranchial 2 with cartilage at tips. Hypobranchials 2 and 3 with reduced portion ossified anterolaterally; ossified portion slightly more elongate on hypobranchial 3; large area of cartilage distally, larger in hypobranchial 3. Hypobranchial 4 absent. Five elongate narrow ceratobranchials with cartilage at tips. Ceratobranchial 3 with concavity along posterior margin. Ceratobranchial 5 expanded posteromedially with 12-13 conical, elongate and pointed teeth arranged in 2 rows (n = 1). Five epibranchials, first three elongate and narrow with cartilage at tips. Epibranchials 1 and 2 with triangular process along anterior margins. Epibranchial 3 with robust uncinate process at posterior margin. Epibranchial 4 rectangular. Epibranchial 5 small, narrow, curved and completely cartilaginous. Pharyngobranchials 1 and 2 absent. Pharyngobranchial 3 similar in form but shorter than hypobranchial 1 with cartilage at tips. Pharyngobranchial 4 curved, well ossified, and connected to plate with 18-20 elongate, conical and pointed teeth arranged in 2 rows; teeth growing in length posteriorly (n = 1).

Sensory canals on head with simple (non-dendritic) tubes ending in single pores (Fig. 2b). Supraorbital sensory canal complete with pores s1, s3 and s6. Pore s1 located between

anterior nostrils; pore s3 located in a longitudinal line passing through pore s1, after posterior nostrils, and pore s6 in interorbital space. Infraorbital sensory canal incomplete; presence of pores i1 and i3 variable (present in 8 specimens, including holotype and absent in 17 specimens); when present located beside nostrils. Pore i10 located behind eye. Pore i11 located laterally to posterior margin of eye. Postotic pore po1 located lateral to anterior margin of opercular patch of odontodes. Postotic pore po2 located lateral to middle of opercular patch of odontodes. Lateral-line very short with 2 pores located above insertion of pectoral fin and just posterior to gill openings.

Pectoral fin with distal margin truncate to slightly rounded, I+6 rays (n = 25), first ray short and not prolonged as filament. Pelvic fin with distal margin rounded reaching at most anterior margin of urogenital papilla, I+4* rays (1 of 25 specimens with I+3). Inner margin of pelvic fins very close basally and sometimes in contact. Pelvic girdle with two basipterygia united medially by cartilage with two elongate bifid processes (external process and internal process) and medial process short (Fig. 12). Pelvic splint thin, comma-shaped, and parallel to first pelvic-fin ray. Urogenital papilla nearer tip of pelvic fin than anal-fin origin.

Dorsal fin with distal margin rounded, semicircular when fin expanded with two unsegmented rays (n = 4), II+6-8 rays (n = 25), usually II+7*. Dorsal-fin origin located at vertical through last third of pelvic fin. Dorsal-fin basal radials 8 (n = 4); first inserting anterior to neural spine of 17th or 18th vertebrae.

Anal fin slightly smaller than dorsal fin with distal margin rounded, two or three unsegmented rays (n = 4), II+5 (n = 25). Anal-fin origin located at vertical through base of last dorsal-fin ray. Anal-fin basal radials 6 (n = 4); first inserting anterior to haemal spine of 21th or 22th vertebrae.

Caudal fin with distal margin straight and dorsal and ventral lobes rounded at limits. Procurrent caudal-fin rays 15-16 dorsally (n = 4) and 10-12 ventrally (n = 4). Principal rays I+5+6+I (n = 18), branched rays splitting two or three times. Lower caudal plate with parhypural and hypurals 1 and 2 co-ossified and fused to compound caudal centrum (Fig. 6b). Upper caudal plate with uroneural and hypural 3 autogenous, hypurals 4 and 5 fused.

Vertebrae 36-38 (n = 4); ribs 12-13 (n = 4) with first rib straight and thickest and last rib rudimentary.

Coloration in alcohol. Lateral surface of body covered with dark blotches variable in size and shape over light yellow background (Fig. 10). Blotches progressively larger and coalescent dorsally thus forming extensive black pigmented regions with light yellow gaps. Ventral surface of body yellow on trunk with irregular black blotches between pelvic and anal fins and on caudal peduncle. Dorsal and lateral surface of head black with small lighter areas; ventral surface yellow. Pectoral, dorsal, anal and caudal fins spotted with irregular black marks and lighter along margins. Pelvic fin unpigmented. Barbels with dark pigmentation dorsally and yellow ventrally. Larger specimens (greater than 57.4 mm SL) with pigmentation arranged in two distinct layers; dark blotches variable in size and shape on inner skin layer and small black spots on outer skin layer more evident in caudal peduncle.

Distribution and ecological notes. *Trichomycterus diatropoporos* is apparently endemic to the rio da Prata and rio Turvo basins, tributaries of rio das Antas, in the laguna dos Patos system (Fig. 8). At the type locality the rio da Prata is a rapid flowing, wide and shallow, with an average depth of 0.5 m, with clear water, rocky bottom and large amounts of submerged vegetation (Carvalho & Reis, 2011) (Fig. 9b). It is upstream of a waterfall known as Cascata da Usina at approximately 660 m a.s.l. At this site *T. diatropoporos* occurs sympatrically with *Hisonotus prata* Carvalho & Reis, 2011, another endemic species to the rio da Prata. The other two localities of the paratypes are located at approximately 642 m and 825 m a.s.l. The stomach of three c&s specimens contained larvae of Diptera (Chironomidae, Simuliidae) and nymphs of Ephemeroptera.

Remarks. The presence of the infraorbital sensory canal is variable among the specimens of *T. diatropoporos*, even in specimens from same lot and of the same size (*e.g.*, MCP 40933). Although characters related to the reduction of the sensory canal have been used in defining species and even genera in the Trichomycterinae (see Arratia, 1998), there are no additional detectable differences in morphometrics, meristics data and coloration pattern among specimens bearing or lacking pores i1 and i3 of infraorbital sensory canal to justify the recognition of two different species. Apparently, this variation in the presence of pores i1 and i3 of infraorbital sensory canal is unique among species of *Trichomycterus*. One specimen (MCP 22785) also from rio da Prata basin with counts, morphometrics, and color pattern similar to *T. diatropoporos* lacks pelvic fins and was not included in type-series. The specimen definitely is not *T. tropeiro*, the species from laguna dos Patos system that consistently lacks pelvic fins, but rather appears to be an anomalous individual of *T. diatropoporos*. Among other trichomycterines, intraspecific variation in the presence/absence of pelvic fins is also known in *Ituglanis parahybae* (Eigenmann, 1918) (Costa & Bockmann, 1993).

Etymology. From the Greek *diatropos* meaning variable, and *poros* meaning pore, in reference to the variation in the presence of pores i1 and i3 of infraorbital sensory canal of the new species. A noun in apposition.

Trichomycterus poikilos, new species
Figs. 2c, 3c, 4c, 5c 6c, 11b, 13, 14

Trichomycterus sp. 3. Becker *et al*. (2013: Table 1, listed, Taquari-Antas river basin).

Holotype. UFRGS 16239, 63.3 mm SL, Brazil, Rio Grande do Sul State, municipality of Júlio de Castilhos, arroio Passo dos Buracos or Tipiaia on road BR-158, alto rio Jacuí basin, 29º06'50"S 53º39'04"W, 20 May 2011, A. T. Thomaz, F. R. Carvalho, J. Ferrer & L. R. Malabarba.

Paratypes. All from Brazil, Rio Grande do Sul State. **Alto Jacuí basin.** UFRGS 16240, 10 (3 c&s), 33.1-66.8 mm SL collected with holotype. UFRGS 11856, 2, 41.4-45.2 mm SL, municipality of Júlio de Castilhos, unnamed stream tributary to rio Iauí, 29º07'S 53º22'W, 5 Aug 2009, A. R. Cardoso & V. A. Bertaco. UFRGS 14992, 6 (1 c&s), 40.5-92.5 mm SL, municipality of Cruz Alta, rio Passo Novo, 28º38'43"S 53º33'36"W, 20 May 2011, A. T. Thomaz, F. R. Carvalho, J. Ferrer & L. R. Malabarba. MCN 16089, 5 (1 c&s), 52.0-60.9 mm SL, municipality of Estrela Velha, unnamed stream tributary to rio Jacuí, 29º10'20"S 53º09'27"W, 19 Jan 1999, W.R. Koch & C. J. Mansan. MCP 18253, 1, 65.6 mm SL, municipality of Faxinal do Soturno, unnamed stream tributary to rio Soturno, 29º25'29"S 53º30'59"W, 28 Jul 1995, G. F. Rey, M. P. Barros & N. F. Fontoura. MCP 21231, 2, 46.8-54.1 mm SL, municipality of Agudo, arroio Linha Louca on road to Dona Francisca dam, 29º29'09"S 53º17'09"W, 22 Aug 1998, J. F. P. Silva, R. E. Reis & V. A. Bertaco. MCP 21237, 1, 59.7 mm SL, municipality of Arroio do Tigre, arroio Tamanduá, 29º16'39"S 53º03'10"W, 24 Aug 1998, J. F. P. Silva R. E. Reis & V. A. Bertaco. MCP 21252, 1, 66.9 mm SL, municipality of Espumoso, unnamed stream on road from Espumoso to Campos Borges, 28º45'51"S 52º55'10"W, 24 Aug 1998, J. F. P. Silva R. E. Reis & V. A. Bertaco. MCP 21464, 1, 64.7 mm SL, municipality of Fortaleza dos Valos, arroio Lajeado Fortaleza, 28º46'45"S 53º11'15"W, 11 Oct 1998, E. H. Pereira, J. F. P. Silva & R. E. Reis. MCP 21508, 3, 37.4-59.7 mm SL, municipality of Fortaleza dos Valos, unnamed stream tributary to rio Lajeado Fortaleza, 28º47'39"S 53º12'17"W, 11 Oct 1998, E. H. Pereira, J. F. P. Silva & R. E. Reis. MCP 21522, 1, 64.5 mm SL, municipality of Fortaleza dos Valos, unnamed stream tributary to rio Ingai, 28º54'29"S 53º17'08"W, 11 Oct 1998, E. H. Pereira, J. F. P. Silva & R. E. Reis. MCP 22127, 1, 43.6 mm SL, municipality of Santo Antônio do Planalto, rio da Glória, 28º21'02"S 52º43'16"W, 18 Jan 1999, E. H. Pereira, J. F. P. Silva & R. E. Reis. MCP 22193, 1, 64.0 mm SL, municipality of Passo Fundo, arroio Pinheiro Torto, 28º22'23"S 52º26'38"W, 19 Jan 1999, E. H. Pereira, J. F. P. Silva & R. E. Reis. MCP 22219, 3, 24.9-43.3 mm SL, municipality of Nicolau Vergueiro, arroio Quebra Dentes, 28º36'09"S 52º27'23"W, 19 Jan 1999, E. H. Pereira, J. F. P. Silva & R. E. Reis. MCP 22699, 6 (1 c&s), 26.1-79.0 mm SL, municipality of Cruz Alta, rio Passo Novo, 28º38'43"S 53º33'35"W, 2 Apr 1999, E. H. Pereira, R. E. Reis & V. A. Bertaco. MCP 22778, 1, 54.6 mm SL, municipality of Santa Bárbara do Sul, arroio das Figueiras on road from Cruz Alta to Saldanha Marinho, 28º26'39"S 53º12'37"W, 2 Apr 1999, E. H. Pereira, R. E. Reis & V. A. Bertaco. MCP 26540, 2, 43.9-56.6 mm SL, municipality of Agudo, unnamed stream tributary to rio Jacuí, 29º31'38"S 53º16'01"W, 10 Nov 2000, A. R. Cardoso, C. Kaefer, J. F. P. Silva & V. A. Bertaco. MCP 26974, 1, 51.2 mm SL, municipality

Fig. 13. *Trichomycterus poikilos*, holotype, UFRGS 16239, 63.3 mm SL, Brazil, Rio Grande do Sul State, municipality of Júlio de Castilhos, arroio Passo dos Buracos or Tipiaia on road BR-158, upper rio Jacuí basin.

of Ibarama, unnamed stream tributary to reservoir of Dona Francisca dam, 2 Feb 2001, R. E. Reis & V. A. Bertaco. MCP 46948, 7 (1c&s), 34.9-61.0 mm SL, municipality of Nova Jacuí, unnamed stream on road from Estado Velho to Nova Jacuí, 29º06'20"S 53º12'32"W, 11 Oct 1998, E. H. Pereira, J. F. P. Silva & R. E. Reis. **Rio Taquari-Antas basin.** CIUFSC 2117, 4, 13.8-64.1 mm SL, municipality of Passo Fundo, unnamed stream at Floresta Nacional of Passo Fundo, 28º18'46"S 52º11'30"W, 24 Nov 2008, B. Marterer. MCN 15679, 1, 61.0 mm SL, municipality of Guabiju, arroio Erval on the road between Nova Araçá and São Jorge, rio Carreiro basin, 28º33'34"S 51º43'12"W, 16 Apr 1998, W. R. Koch. MCP 21203, 1, 51.2 mm SL, municipality of Soledade, unnamed stream on road from Soledade to Arvorezinha, 28º48'17"S 52º22'20"W, 25 Aug 1998, J. F. P. Silva R. E. Reis & V. A. Bertaco. MCP 22237, 2, 73.4-75.4 mm SL, municipality of Vila Maria, arroio Porongas, 28º31'34"S 52º08'22"W, 20 Jan 1999, E. H. Pereira, J. F. P. Silva & R. E. Reis. MPEG 24031, 2, 39.8-48.3 mm SL, municipality of Nova Bassano, arroio Caçador, tributary to rio Carreiro, 28º42'16"S 51º50'38"W, 10 Mar 2010, J. Ferrer & J. M. Wingert. MZUSP 110993, 5, 38.0-74.5 mm SL, municipality of Nova Alvorada, rio Lajeado Engenho Velho, rio Guaporé basin, 28º39'23"S 52º09'40"W, 14 May 2010, C. Vogel, G. Rosa, L. de Fries & L. Santos. UFRGS 13892, 2, 50.6-56.9 mm SL, municipality of Nova Bassano, arroio Caçador, tributary to rio Carreiro, 28º42'16"S 51º50'38"W, 7 Dec 2010, J. Ferrer & J. M. Wingert. UFRGS 16241, 6 (1 c&s), 32.0-71.2 mm SL, municipality of Nova Alvorada, rio Lajeado Engenho Velho, rio Guaporé basin, 28º39'23"S 52º09'40"W, 14 May 2010, C. Vogel, G. Rosa, L. de Fries & L. Santos. UFRGS 16342, 2 (1 c&s), 59.8-64.2 mm SL, municipality of Vila Maria, rio Jordão, rio Guaporé basin, 28º32'48"S 52º06'38"W, 13 May 2010, C. Vogel, G. Rosa, L. de Fries & L. Santos. **Rio Pardo basin.** MCP 26725, 2, 34.6-39.6 mm SL, municipality of Barros Cassal, arroio Pessegueiro on reservoir of Corsan, rio Pardo basin, 29º05'04"S 52º36'02"W, 08 Dec 2000, J. F. P. Silva & J. R. Marinho.

Fig. 14. Paratypes of *Trichomycterus poikilos* (UFRGS 14992, 40.5-92.5 mm SL) with ontogenetic variation in coloration. Specimens represented in scale.

Non-type material. All from Brazil, Rio Grande do Sul State. **Rio do Sinos basin.** MCP 26148, 7 (1 c&s), 31.3-57.0 mm SL, municipality of Igrejinha, arroio Solitária, 29º35'S 50º46'W, 10 Jun 2000, M. Moreira, R. Costa & U. Schulz.

Diagnosis. *Trichomycterus poikilos* is distinguishable from all congeners except *T. brachykechenos*; *T. mboycy* Wosiacki & Garavello, 2004; and *T. naipi* Wosiacki & Garavello, 2004 by the modal possession of I+5 pectoral-fin rays (one among 82 specimens with I+6; *vs*. I+6 or more pectoral-fin rays) and the first ray of the pectoral fin not prolonged as a filament (Figs. 13-14; *vs*. the first ray of the pectoral fin prolonged as a filament). *Trichomycterus poikilos* is distinguished from *T. brachykechenos* by having the posterior fontanel extending from the parieto-supraoccipital to the frontals (Fig. 2c; *vs*. the posterior cranial fontanel restricted to the parieto-supraoccipital), the origin of dorsal fin located at the vertical falling between the tip of the pelvic fin and the anterior insertion of the anal fin (Figs. 13-14; *vs*. the origin of dorsal fin located at the vertical through the last third of the pelvic fin), the maxillary barbel length (33.2-60.4% *vs*. 68.2-87.7% HL), and the number of odontodes of the opercular patch (13-17 *vs*. 8-11). *Trichomycterus poikilos* is distinguished from *T. mboycy* by the pectoral-fin length (7.7-9.1% *vs*. 9.9-13.8% SL) and skin color (Figs. 13-14; yellow background *vs*. gray background); and from *T. naipi* in the number of odontodes of the interopercular patch (20-32 *vs*. 12-15), number of dorsal-fin rays (I-II+6-7 *vs*. I+8), and absence of a thin unpaired dark dorsosagittal body stripe in larger specimens (Fig. 13; *vs*. presence of a thin unpaired dark dorsosagittal stripe in larger specimens). Additionally, *T. poikilos* is distinguished from remaining congeners in the laguna dos Patos system by having the origin of the dorsal fin located at the vertical falling between the tip of the pelvic fin and the anterior insertion of the anal fin (Figs. 13-14; *vs*. at the vertical through the last third of the pelvic fin in *T. balios* and *T. diatropoporos*); 20-23 teeth on ceratobranchial 5 (Fig. 3c; *vs*. 36-39 in *T. balios* and 12-13 in *T. diatropoporos*); 23-25 teeth on plate connected to pharyngobranchial 4 (Fig. 3c; *vs*. 35-40 in *T. balios* and 18-20 in *T. diatropoporos*); color pattern of the dorsal and lateral surfaces of body mottled dark brown over a light yellow background or with three stripes with notched borders (dorsosagittal, midlateral, and ventrolateral) (Figs. 13-14 *vs*. the dorsal and lateral surfaces of body with circular black blotches variable in size in *T. balios* and *T. tropeiro*, the lateral surface of body with dark blotches variable in size and shape progressively larger and coalescent dorsally thus forming extensive black pigmented regions with light yellow gaps in *T. diatropoporos*). *Trichomycterus poikilos* is further distinguishable from *T. diatropoporos* by the insertion of the first dorsal-fin basal radial anterior to the neural spine of the 20th-22th vertebrae (*vs*. anterior to the neural spine of the 17th or 18th vertebrae). *Trichomycterus poikilos* is further distinguishable from *T. tropeiro* by the presence of the pelvic girdle and pelvic fins (Figs. 13-14; *vs*. absence); and the absence of the pores i1 and i3 of the infraorbital sensory canal (Fig. 2c; *vs*. presence).

Table 3. Morphometric data for holotype and paratypes of *Trichomycterus poikilos*. SD = standard deviation; N = number of specimens.

	Holotype	Range	Mean	SD	N
Standard length (mm)	63.3	29.1-92.5	55.4	-	77
Percent of Standard Length					
Head length	18.5	17.5-21.8	19.7	0.92	77
Predorsal length	66.3	63.6-70.1	66.5	1.37	77
Prepelvic length	55.5	54.0-60.5	57.5	1.34	77
Preanal length	71.2	68.3-76.3	71.4	1.30	77
Scapular girdle width	13.5	13.0-15.4	14.0	0.60	76
Trunk length	39.0	36.5-43.1	39.6	1.47	77
Pectoral-fin length	10.7	9.9-13.8	11.7	0.88	77
Pelvic-fin length	7.8	6.9-9.5	8.2	0.52	77
Distance between pelvic-fin base and anus	9.7	7.2-10.9	8.9	0.86	77
Caudal peduncle length	20.1	18.6-23.1	20.9	0.88	77
Caudal peduncle depth	12.4	9.3-14.7	12.1	0.98	77
Body depth	14.0	11.6-16.4	14.1	0.91	77
Length of dorsal-fin base	11.6	7.1-12.2	10.7	0.77	77
Length of anal-fin base	9.1	6.9-9.5	8.3	0.54	77
Percent of Head Length					
Head width	82.0	75.3-94.5	83.2	3.61	77
Nasal barbel length	51.8	37.8-62.3	51.2	5.05	77
Maxillary barbel length	52.4	33.2-60.4	51.9	6.12	77
Rictal barbel length	53.3	34.1-66.6	50.3	6.19	77
Snout length	41.4	35.7-42.7	39.8	1.78	76
Interorbital	19.8	17.1-25.9	21.6	1.79	76
Mouth width	46.0	35.5-53.5	43.8	3.62	77
Eye diameter	10.6	6.8-14.1	10.5	1.62	77
Supra-orbital pore distance	11.8	7.3-16.3	12.2	1.87	76

Description. Morphometric data for holotype and paratypes in Table 3. Body elongate, trunk roughly cylindrical and gradually compressed towards caudal fin. Dorsal profile of trunk convex along anterior half, then straight to insertion of dorsal fin. Ventral profile of trunk straight to slightly convex. Dorsal and ventral profile of caudal peduncle straight.

Head depressed, trapezoidal from dorsal view, wider posteriorly. Dorsal profile straight and ventral profile straight to slightly convex. Snout rounded from dorsal view. Eyes readily visible, anteroposteriorly elliptical and dorsally oriented; orbital rim not free, eyes covered with skin thin and transparent. Each eye located over posterior termination of shallow small longitudinal crest beginning at posterior nostril and making eyes visible from lateral view.

Nostrils of same size and smaller than diameter of eye. Anterior nostril surrounded by fleshy flap of integument posterolaterally continuous with nasal barbel. Posterior nostril surrounded anterolaterally by thin flap of integument. Gill openings not constricted but united with isthmus anteriorly forming a free fold. Mouth subterminal with corners posteriorly oriented. Lower lip with conspicuous fleshy lobes along lateral limits internal to origin of rictal barbels. Lips with small papillae; papillae largest on inner surface of upper lip.

Barbels with large bases and tapering gradually towards tips. Tip of nasal barbel usually reaching to between pore i11 and pore po1 or at most to middle of distance between them. Origin of nasal barbels on posterolateral portion of integument flap around anterior nostril. Maxillary barbel usually extending between to anterior and posterior margins of interopercular patch of odontodes. Rictal barbel slightly shorter than maxillary barbel.

Mesethmoid with anterior margin slightly concave, cornua short and thick, width of their bases similar to their length (Fig. 2c). Anterior cranial fontanel restricted to small rounded opening situated between frontals and epiphyseal bar. Posterior cranial fontanel long and narrow extending from posterior portion of frontals to parieto-supraoccipital. Epiphyseal bar longer than wide. Antorbital short and anteriorly expanded. Tendon-bone supraorbital elongate, anteriorly expanded and approximately three times larger than antorbital. Anterior portion of sphenotic anterolaterally directed from dorsal view. Sphenotic, prootic and pterosphenoid totally fused. Vomer arrow-shaped with long posterior process extending to parasphenoid. Parasphenoid with long and pointed process extending to basioccipital. Anterior portion of Weberian complex fused to basioccipital. Weberian capsule with lateral opening smaller than lateral profile of capsule.

Premaxilla rectangular with 74-76 curved, flat vertically to slightly conical and blunt teeth (n = 3). Teeth of variable size, irregularly distributed in three rows. Maxilla large, boomerang-shaped and shorter than premaxilla. Lower jaw with 79-91 curved, flat vertically and blunt teeth of variable size (n =3). Few teeth at base of coronoid process and three discernible rows near dentary symphysis (Fig. 11b). Autopalatine with anterior and mesial margins straight, distal margin straight to slightly concave and small posterior process extending slightly over metapterygoid.

Metapterygoid large and laminar and connecting with quadrate through cartilage. Hyomandibula well-developed. Preopercle long and narrow and in contact with ventral margins of quadrate and hyomandibula. Opercular patch of odontodes rounded with 13-17 conical odontodes (n = 9). Interopercular patch of odontodes elongate with 20-32 conical odontodes (n = 9) more concentrated posteriorly. Odontodes of both opercular and interopercular patches gradually curving medially and increasing in size posteriorly.

Ventral hypohyal triangular (Fig. 4c). Anterior ceratohyal elongate and widening at anterior and posterior limits. Posterior ceratohyal short and triangular. Nine branchiostegal rays (eight in one side of 1 specimen) (n = 9); five on anterior ceratohyal, one on posterior ceratohyal and three on interceratohyal cartilage. Last four branchiostegal rays widest. Dorsal hypohyal and interhyal absent. Urohyal with expanded anterior head; two elongate lateral processes with wide bases narrowing distally and bearing rounded tips; and laminar, elongate, narrow posterior process (Fig. 5c).

Basibranchial 1 absent. Basibranchials 2 and 3 connected to each other of approximately equal lengths with cartilage at tips (Fig. 3c). Ossified portion of basibranchial 2 distinctly wider than basibranchial 3. Hexagonal basibranchial 4 completely cartilaginous. Hypobranchial 1 of similar size as but narrower than basibranchial 2 with cartilage at tips. Hypobranchials 2 and 3 with narrow ossified portion slightly more elongate on hypobranchial 3, and large area of cartilage; cartilage slightly larger in hypobranchial 3. Hypobranchial 4 absent. Five elongate narrow ceratobranchials with cartilage at tips. Ceratobranchials 2 and 3 with concavity along posterior margins; concavity larger in ceratobranchial 3. Ceratobranchial 5 expanded posteromedially with 20-23 conical, elongate pointed teeth arranged in 3 rows (n = 2). Five epibranchials; first three elongate and narrow with cartilage at tips. Epibranchials 1 and 2 with triangular process along anterior margins; process larger in epibranchial 1. Epibranchial 3 with robust uncinate process along posterior margin. Epibranchial 4 rectangular. Epibranchial 5 small, narrow, curved and completely cartilaginous. Pharyngobranchials 1 and 2 absent. Pharyngobranchial 3 similar in form to hypobranchial 1 but shorter with cartilage at tips. Pharyngobranchial 4 curved and well ossified connected to plate with 23-25 conical, elongate pointed teeth arranged in 3 rows; teeth growing in length posteriorly (n = 2).

Sensory canals on head with simple (non-dendritic) tubes ending in single pores. Supraorbital sensory canal complete with pores s1, s3 and s6 (Fig. 2c). Pore s1 located between anterior nostrils, pore s3 located in same longitudinal row of pore s1 after posterior nostrils and pore s6 in interorbital space. Infraorbital sensory canal incomplete; pores i1 and i3 absent, pore i10 located behind eye and pore i11 located lateral to posterior margin of eye. Postotic pore po1 located lateral to anterior margin of opercular patch of odontodes. Postotic pore po2 located lateral to middle of length of opercular patch of odontodes. Lateral-line very short with 2 pores located above insertion of pectoral fin and just posterior of gill openings.

Pectoral fin with distal margin rounded, I+5* rays (1 of 82 specimens with I+6), first ray short and not prolonged as filament. Pelvic fin with distal margin rounded reaching at most anterior margin of urogenital papilla, I+4* rays (1 of 82 specimens with I+3). Inner margin of pelvic fins very close basally. Pelvic girdle with two basipterygia united medially by cartilage with two elongate bifid processes (external process and internal process) and medial process short (in two of eight specimens medial process united to internal process). Pelvic splint thin, comma-shaped and parallel to first pelvic-fin ray. Urogenital papilla nearer tip of pelvic fin than origin of anal fin.

Dorsal fin with distal margin rounded, semicircular when fin expanded with one to three unsegmented rays (n = 9), I-II+6-7 rays (n = 82), usually II+7*. Dorsal-fin origin located at vertical between tip of pelvic fin and anterior insertion of anal fin, usually in the papillae urogenital. Dorsal-fin basal radials 7-8 (n = 9); first inserting anterior to neural spine of 20th to 22th vertebrae.

Anal fin slightly smaller than dorsal fin with distal margin rounded; one to three unsegmented rays (n = 9), II+4-5-6* rays (n = 82), usually II+5. Anal-fin origin located at vertical between anterior insertion and middle of dorsal fin base. Anal-fin basal radials 5-6 (n = 9); first inserting anterior to haemal spine of 22th to 24th vertebrae.

Caudal fin with distal margin rounded to straight with dorsal and ventral lobes rounded at limits. Procurrent caudal-fin rays 15-19 dorsally (n = 9) and 11-15 ventrally (n = 9). Principal rays I+5+5-6+I-II (n = 82), usually I+5+6+I*, branched rays splitting up to three times. Lower caudal plate with parhypural and hypurals 1 and 2 co-ossified and fused to compound caudal centrum (Fig. 6c). Upper caudal plate with uroneural and fused hypurals 3, 4, and 5.

Vertebrae 38-40 (n = 9); ribs 12-15 (n = 9) with first rib straight and thickest and last rib rudimentary.

Coloration in alcohol. *Trichomycterus poikilos* demonstrates a variable color pattern. Most of types present the dorsum and lateral surface of body mottled dark brown over a light yellow background (Fig. 13 and 14a). Some specimens have a wide unpaired dorsosagittal stripe and midlateral and ventrolateral bilaterally paired stripes with notched borders (Fig. 14c). Smallest specimens with midlateral stripe more evident and ventrolateral stripe diffuse (Fig. 14d and 14e). Ventral surface of body light yellow with diffuse and small black spots between pectoral-fin insertion and near pelvic-fin insertion. Area between pelvic and anal fins and caudal peduncle mottled dark brown over light yellow background. Head dark brown mottled over light yellow background dorsally and yellow ventrally. Pectoral, dorsal, anal and caudal fins spotted basally with dark pigmentation becoming inconspicuous towards tips, and lighter along margins. Pelvic fin unpigmented. Barbels with dark pigmentation dorsally and lighter ventrally. Large specimens (greater than 46.6 mm SL) with pigmentation arranged in two distinct layers; mottled dark brown or with three stripes (dorsosagittal, midlateral, and ventrolateral) with notched borders on inner skin layer and small black spots on outer skin layer (Fig. 13, 14a-c).

Distribution and ecological notes. *Trichomycterus poikilos* is distributed in the rio Jacuí, rio Pardo and rio Taquari-Antas basins, in the laguna dos Patos system (Fig. 8). The species is widely distributed in the upper portion of rio Jacuí basin, occurring at elevations of 124 to 700 m a.s.l. One lot is from the headwaters of rio Pardo basin, at 625 m a.s.l. In the Taquari-Antas basin the species occurs in the upper portions of the Carreiro, Guaporé, and Forqueta rivers, between 417 and 688 m a.s.l. The type locality is a rapid flow river with clear water, a rocky bottom and submerged vegetation (Fig. 9c), located at approximately 405 m a.s.l. At this site the specimens were associated with submerged vegetation and collected with *Ancistrus brevipinnis* (Regan, 1904), *Eurycheilichthys limulus* Reis & Schaefer, 1998, and *Rineloricaria cadeae* (Hensel, 1868). The stomach of six c&s specimens contained aquatic larvae of Diptera (Simuliidae) and Lepidoptera; and nymphs of the Ephemeroptera and Plecoptera.

Remarks. *Trichomycterus poikilos* demonstrates intraspecific ontogenetic color pattern variation. Although Bockmann & Sazima (2004) considered the body pigmentation pattern highly conserved in known species of *Trichomycterus*, a intraspecific variation in coloration is present in *T. caipora* Lima, Lazzarotto & Costa, 2008 (Lima *et al*., 2008), in *T. iheringi* (Eigenmann, 1917) associated to body size and microhabitat preference (da Silva *et al*., 2010), and in *T. santanderensis* Castellanos-Morales, 2007. The ontogenetic variation in *T. poikilos* is clear in lot UFRGS 14992 (six specimens with 40.5-92.5 mm SL), in which the smallest specimens have one obvious midlateral stripe on the body that gradually become indistinguishable in the largest specimens (Fig. 14). This ontogenetic variation is not observed in all samples. In other lots all specimens have a mottled pattern (UFRGS 14500, 11 specimens with 32.0-74.5 mm SL) regardless of body size. Besides coloration no additional differences were found between these populations that allow us to separate them and ontogenetic variation in the color pattern seems to appear only in some populations.

The color pattern of some specimens of *T. poikilos* – lateral surface of body with widened stripes – is very similar to *T. itatiayae* Miranda Ribeiro, 1906; *T. naipi*; *T. pauciradiatus* Alencar & Costa, 2006; *T. perkos*, and *T. reinhardti* (Eigenmann, 1917) (Barbosa & Costa, 2008; Wosiacki & Garavello, 2004; Alencar & Costa, 2006; Datovo *et al.*, 2012; Eigenmann, 1917), but differs from these by other characters (see diagnosis). The midlateral stripe is present in juveniles of other species of Trichomycteridae, but absent in adults (see Datovo *et al*., 2012).

Seven specimens from the rio do Sinos basin are poorly preserved and were not measured or counted (MCP 26148), however a mottled color pattern over a light yellow background is present in all specimens, and one c&s specimen possesses the lower jaw with blunt teeth which leads us to believe it to be *T. poikilos*.

Etymology. From the Greek *poikilos* meaning variegated, varicolored, in reference to the intraspecific color pattern variation of the new species. An adjective.

Trichomycterus brachykechenos, new species
Figs. 2d, 3d, 4d, 5d 6d, 15, 16

Holotype. MCN 18929, 61.1 mm SL, Brazil Rio Grande do Sul, State, municipality of Caraá, rio do Sinos, 29º45'44"S 50º19'39"W, 30 Jun 2006, B. B. Calegari, M. A. Azevedo & R. Hirano.

Paratypes. All from Brazil, Rio Grande do Sul State, rio do Sinos basin. MCP 46949, 3, 26.3-70.9 mm SL, Brazil, Rio Grande do Sul State, municipality of Caraá, rio do Sinos, 29º44'58"S 50º16'59"W, 30 Jun 2006, B. B. Calegari, M. A. Azevedo & R. Hirano. All the following lots from Brazil, Rio Grande do Sul State, municipality of Caraá, rio do Sinos, 29º43'32"S 50º16'56"W. MCN 18930, 2, 36.3-53.7 mm SL, 28 Nov 2007, M. A. Azevedo & T. Aguzzoli. MCN 18931, 2, 39.4-47.9 mm SL, 26 Jun 2007, M. A. Azevedo, T. Aguzzoli & M. Pairet. MCP 46950, 1, 51.6 mm SL, 14 Mar 2007, F. Becker, M. A. Azevedo & T. Aguzzoli. UFRGS 16244, 1 (c&s). 51.6 mm SL, 30 Jul 2007, M. A. Azevedo, T. Aguzzoli & M. Pairet. UFRGS 16245, 5 (1 c&s), 35.0-61.9 mm SL, 2 Feb 2007, M. A. Azevedo & T. Aguzzoli.

Diagnosis. *Trichomycterus brachykechenos* is distinguishable from all congeners except *T. megantoni* Fernández & Chuquihuamaní, 2007 by its elongate posterior cranial fontanel which is restricted to the parieto-supraoccipital (Fig. 2d *vs*. the posterior fontanel extending from the parieto-supraoccipital to the frontals or posterior fontanel separated in two openings not restricted to the parieto-supraoccipital). *Trichomycterus brachykechenos* is distinguished from *T. megantoni* by the modal possession of I+5 pectoral-fin rays (one among 15 specimens with I+6 *vs*. I+7-8 pectoral-fin rays), first ray of the pectoral fin not

Fig. 15. *Trichomycterus brachykechenos*, holotype, MCN 18929, 61.1 mm SL, Brazil, Rio Grande do Sul State, municipality of Caraá, rio do Sinos.

Table 4. Morphometric data for holotype and paratypes of *Trichomycterus brachykechenos*. SD = standard deviation; N = number of specimens.

	Holotype	Range	Mean	SD	N
Standard length (mm)	61.1	26.3-70.9	46.4	-	15
Percent of Standard Length					
Head length	20.4	19.9-24.0	21.6	1.10	15
Predorsal length	65.0	62.9-66.7	65.1	1.09	15
Prepelvic length	55.4	55.4-58.1	56.7	0.92	15
Preanal length	69.7	69.0-72.8	71.0	1.16	15
Scapular girdle width	13.6	13.6-15.6	14.7	0.67	14
Trunk length	35.6	34.2-37.8	36.3	1.21	15
Pectoral-fin length	13.7	12.9-15.6	14.3	0.72	15
Pelvic-fin length	9.7	9.1-10.8	9.9	0.41	15
Distance between pelvic-fin base and anus	11.5	9.8-11.7	10.6	0.66	15
Caudal peduncle length	19.6	18.3-21.8	20.1	0.81	15
Caudal peduncle depth	9.9	9.9-12.5	11.5	0.81	15
Body depth	12.8	12.6-19.6	14.8	1.86	15
Length of dorsal-fin base	12.6	10.5-12.7	11.6	0.69	15
Length of anal-fin base	8.0	7.3-10.4	9.0	0.89	15
Percent of Head Length					
Head width	85.5	79.5-89.6	83.9	3.17	15
Nasal barbel length	72.6	55.3-74.3	66.2	6.41	14
Maxillary barbel length	73.0	68.2-87.7	78.9	5.57	15
Rictal barbel length	71.8	56.5-79.3	69.7	6.36	15
Snout length	42.6	38.1-42.6	40.2	1.35	14
Interorbital	21.9	18.3-23.3	21.2	1.33	15
Mouth width	52.8	45.0-52.8	48.6	2.10	15
Eye diameter	10.0	7.9-11.2	9.5	0.84	15
Supra-orbital pore distance	10.6	10.2-16.1	12.7	2.11	15

prolonged as a filament (Fig. 15; *vs*. the first ray of the pectoral fin prolonged as a filament), absence of the interopercle thickened ventrally (*vs*. presence). *Trichomycterus brachykechenos* is further distinguishable from all its congeners except *T. mboycy*, *T. naipi*, and *T. poikilos* by the modal possession of I+5 pectoral-fin rays (one among 15 specimens with I+6; *vs*. I+6 or more pectoral-fin rays) and the first ray of the pectoral fin not prolonged as a filament (Fig. 15; *vs*. first ray of the pectoral fin prolonged as a filament). *Trichomycterus brachykechenos* is further distinguishable from *T. mboycy* and *T. naipi* by the color pattern of the dorsal and lateral surface of body of a densely mottled dark brown over a light yellow background (Fig. 15; *vs*. the lateral surface of body with small spots in *T. mboycy*; the lateral surface of body with three dark longitudinal stripes in *T. naipi*); the maxillary barbel length (68.2-87.7% *vs*. 50.3-63% HL in *T. mboycy*; 34.1-68.2% HL in *T. naipi*). Additionally, *T. brachykechenos* is distinguished from the remaining congeners in the laguna dos Patos system by the number of odontodes on the opercular patch (8-11 *vs*. 13 or more in *T. balios*, *T. diatropoporos*, *T. poikilos*, and *T. tropeiro*) and the maxillary barbel length (68.2-87.7% *vs*. 37.8-66.6% HL in *T. balios*; 38.3-53.9% HL in *T. diatropoporos*; 33.2-60.4% HL in *T. poikilos*).

Description. Morphometric data for holotype and paratypes in Table 4. Body elongate, trunk roughly cylindrical and gradually compressed towards caudal fin. Dorsal profile of trunk convex along anterior half then straight to insertion of dorsal fin. Ventral profile of trunk straight. Dorsal and ventral profiles of caudal peduncle slightly concave to straight.

Head depressed, trapezoidal to square in larger specimens from dorsal view, wider posteriorly. Dorsal profile straight and ventral profile straight to slightly convex. Snout rounded from dorsal view. Eyes readily visible, rounded and dorsally oriented, orbital rim not free, eyes covered with skin thin and transparent. Each eye located over posterior termination of shallow and small longitudinal crest beginning at posterior nostril and making eyes visible from lateral view.

Nostrils of same size and smaller than diameter of eye. Anterior nostril surrounded by fleshy flap of integument posterolaterally continuous with nasal barbel. Posterior nostril surrounded anterolaterally by thin flap of integument. Gill opening not constricted but united with isthmus anteriorly forming a free fold. Mouth subterminal with corners posteriorly oriented. Lower lip with conspicuous fleshy lobes along lateral limits internal to origin of rictal barbels. Lips with small papillae; papillae largest on inner surface of upper lip.

Barbels with large bases and tapering gradually towards tips. Tip of nasal barbel usually reaching opercular patch of odontodes, always to middle of distance between pore i11 and pore po1. Origin of nasal barbels on posterolateral portion of integument flap around anterior nostril. Maxillary barbel usually reaching or extending beyond pectoral-fin insertion, always extending beyond posterior margin of interopercular patch of odontodes. Rictal barbel slightly shorter than maxillary barbel.

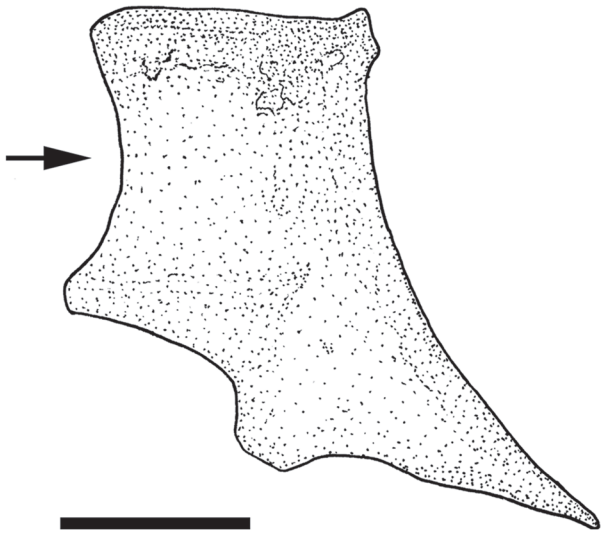

Fig. 16. Autopalatine of *Trichomycterus brachykechenos*, paratype, UFRGS 16245, 41.9 mm SL, dorsal view. Arrow indicates the concavity of mesial margin. Scale bar = 0.5 mm.

Mesethmoid with anterior margin slightly concave to straight, cornua short and thick, width of their bases similar to their length. Anterior cranial fontanel absent or restricted to very small opening situated between frontals (Fig. 2d). Epiphyseal bar absent. Posterior cranial fontanel elongate and restricted to parieto-supraoccipital. Antorbital short and anteriorly expanded. Tendon-bone supraorbital elongate and rod-like shaped. Anterior portion of sphenotic directed anteriorly from dorsal view. Sphenotic, prootic and pterosphenoid totally fused. Vomer arrow-shaped with long posterior process extending to parasphenoid. Parasphenoid with long and pointed process extending to basioccipital. Anterior portion of Weberian complex fused to basioccipital. Weberian capsule with lateral opening smaller than lateral profile of capsule.

Premaxilla rectangular with 78 conical, curved and pointed teeth (n = 1). Teeth of variable size and irregularly distributed in up to three rows. Maxilla large, boomerang-shaped and shorter than premaxilla. Lower jaw with 75 conical, curved and pointed teeth of variable size (n = 1). Few teeth at base of coronoid process and three discernible rows near dentary symphysis. Autopalatine with anterior margins straight, mesial and distal margins concave and small posterior process (Fig. 16) extending slightly over metapterygoid.

Metapterygoid large and laminar and connecting with quadrate through cartilage. Hyomandibula well-developed. Preopercle long and narrow and in contact with ventral margins of quadrate and hyomandibula. Opercular patch of odontodes rounded with 8-11 conical odontodes (n = 2). Interopercular patch of odontodes elongate with 22-30 conical odontodes (n = 2) more concentrated posteriorly. Odontodes of both opercular and interopercular patches gradually curved medially and increasing in size posteriorly.

Ventral hypohyal triangular (Fig. 4d). Anterior ceratohyal elongate widening at anterior and posterior limits. Posterior ceratohyal short and triangular. Eight branchiostegal rays (n = 2); five on anterior ceratohyal, one on posterior ceratohyal and two on interceratohyal cartilage. Last three branchiostegal rays widest. Dorsal hypohyal and interhyal absent. Urohyal with expanded anterior head, two elongate processes with wide bases narrowing distally and bearing pointed tips; and laminar, elongate, narrow posterior process (Fig. 5d).

Basibranchial 1 absent. Basibranchials 2 and 3 connected to each other, of approximately equal lengths with cartilage at tips (Fig. 3d). Ossified portion of basibranchial 2 distinctly wider than basibranchial 3. Basibranchial 4 completely cartilaginous. Hypobranchial 1 of similar size as but narrower than basibranchial 2 with cartilage at tips. Hypobranchials 2 and 3 with narrow ossified portion anterolaterally, larger on hypobranchial 2, and large area of cartilage distally; cartilage larger in hypobranchial 3. Hypobranchial 4 absent. Five elongate and narrow ceratobranchials with cartilage at tips. Ceratobranchials 2 and 3 with concavity along posterior margins; concavity larger in ceratobranchial 3. Ceratobranchial 5 expanded posteromedially with 21-22 conical, elongate and pointed teeth arranged in 3 rows (n = 1). Five epibranchials; first three elongate and narrow with cartilage at tips. Epibranchials 1 and 2 with triangular process along anterior margins; process slightly larger in epibranchials 1. Epibranchial 3 with robust uncinate process along posterior margin. Epibranchial 4 rectangular. Epibranchial 5 small and completely cartilaginous. Pharyngobranchials 1 and 2 absent. Pharyngobranchial 3 similar in form but shorter than hypobranchial 1 with cartilage at tips. Pharyngobranchial 4 curved and well ossified connected to plate with 22-25 conical, elongate and pointed teeth arranged in 3 rows; teeth growing in length posteriorly (n = 1).

Sensory canals on head with simple (non-dendritic) tubes ending in single pores. Supraorbital sensory canal complete with pores s1, s3 and s6. Pore s1 located between anterior nostrils, pore s3 located in same longitudinal row of pore s1 after posterior nostrils and pore s6 in interorbital space. Infraorbital sensory canal incomplete; pores i1 and i3 absent, pore i10 located behind the eye and pore i11 located lateral to posterior margin of eye. Postotic pore po1 located lateral to anterior margin of opercular patch of odontodes. Postotic pore po2 located lateral to middle of length of opercular patch of odontodes. Lateral-line very short with 2 pores and located above insertion of pectoral fins and just posterior of gill openings.

Pectoral fin with distal margin rounded to truncate, I+5* (1 of 15 specimens with I+6), first ray short and not prolonged as filament. Pelvic fin with distal margin rounded reaching at most anterior margin of urogenital papillae, I+4* (one specimen with I+3) (n = 15). Inner margin of pelvic fin very close basally. Pelvic girdle with two basipterygia united medially by cartilage with two elongate bifid processes (external process and

internal process) and medial process short. Pelvic splint thin, comma-shaped and parallel to first pelvic-fin ray. Urogenital papillae nearer tip of pelvic fin than origin of anal fin.

Dorsal fin with distal margin rounded, semicircular when fin expanded with two unsegmented rays (n = 2), II-III+6-8 rays (n = 15), usually II+7* (n = 15). Dorsal-fin origin located at vertical through last third of pelvic fin. Dorsal-fin basal radials 7-8 (n = 2); first inserting anterior to neural spine of 19th vertebrae.

Anal fin slightly smaller than dorsal fin with distal margin rounded, two unsegmented rays (n = 2), II+4*-5 rays (n = 15), usually II+5. Anal-fin origin located at vertical through middle of dorsal-fin base. Anal-fin basal radials 6 (n = 2); first inserting anterior to haemal spine of 21th or 22th vertebrae.

Caudal fin with distal margin rounded. Procurrent caudal-fin rays 15-16 (n = 2) and 10-13 ventrally (n = 2). Principal rays I+5+6+I (n = 15), branched rays splitting two times. Lower caudal plate with parhypural and hypurals 1 and 2 co-ossified and fused to compound caudal centrum (Fig. 6d). Upper caudal plate with uroneural and fused hypurals 3, 4, and 5.

Vertebrae 37-38 (n = 2); ribs 12 (n = 2) with first rib straight and thickest and last rib rudimentary.

Coloration in alcohol. Dorsal and lateral surfaces of head and body densely mottled dark brown over a light yellow background and progressively lighter ventrally (Fig. 15). Ventral surface of head and trunk yellow. Area between pelvic and anal fins and ventral surface of caudal peduncle light brown. Pectoral, dorsal, anal, and caudal fins weakly pigmented with small light brown spots and lighter along margins. Pelvic fin unpigmented. Barbels with dark pigmentation dorsally and lighter ventrally.

Distribution and ecological notes. *Trichomycterus brachykechenos* is apparently endemic to the rio do Sinos, in the laguna dos Patos system (Fig. 8). At the locality where most types (11 specimens) were collected, the rio do Sinos is narrow (ranging from 5 to 9 m a.s.l.) and shallow (depth less to 1 m) with fast current and rapids, a distinct slope, clear waters, a substrate consisting mainly of large rocks, and conserved riparian vegetation (Fig. 9d). The type locality is located at elevation of approximately 109 m a.s.l. and the two other type lots were from 169 m and 266 m a.s.l. The stomach contents of one c&s specimen contained larvae of the Chironomidae (Diptera) and pupa of the Diptera.

Remarks. The cranial fontanel demonstrates several modifications in the Trichomycteridae. The basal subfamilies Copionodontinae and Trichogeninae possess a completely open anterior cranial fontanel extended as a long slit from the mesethmoid to the epiphyseal bar (de Pinna, 1992a). *Ituglanis* has only the posterior cranial fontanel which is reduced to a small round opening restricted to the parieto-supraoccipital (Costa & Bockmann, 1993) or is even absent in *I. macunaima* Datovo & Landim, 2005; *I. mambai* Bichuette & Trajano, 2008; and some *I. epikarsticus* Bichuette & Trajano, 2004 (Datovo & Landim, 2005; Bichuette & Trajano, 2008, 2004, respectively). A completely closure of cranial fontanels also occurs in the subfamilies Glanapteryginae, Stegophilinae, and Vandelliinae (Baskin, 1973). Bockmann *et al*. (2004) identified the anterior cranial fontanel partially or completely closed as a derived feature that corroborates the monophyly of clade 2 (*sensu* de Pinna 1992a, 1998).

In the *Trichomycterus* species the cranial fontanel is normally divided in two openings separated by epiphyseal bar: the anterior fontanel which is a small rounded opening situated between frontals, and the posterior fontanel which is long and narrow extending from posterior portion of frontals to parieto-supraoccipital. A reduced cranial fontanel is present in at least other three species of the genus: *T. cachiraensis* Ardila Rodríguez, 2008, *T. sketi* Castellanos-Morales, 2011 from Colombia, and *T. megantoni* from Peru.

Trichomycterus cachiraensis possess the posterior cranial fontanel reduced to a small round opening restricted to the parieto-supraoccipital – condition identical to that reported for *Ituglanis* (Costa & Bockmann, 1993) – and the anterior cranial fontanel variable (Ardila Rodríguez, 2008: fig. 4). *Trichomycterus sketi* has three openings with triangle shape: the anterior cranial fontanel between frontals, and the posterior cranial fontanel divided in one orifice between frontals and the other in the parieto-supraoccipital (Castellanos-Morales, 2010: fig. 3).

The cranial fontanel of *Trichomycterus megantoni* is illustrated and described as "reduced between frontals and supraoccipital" (Fernández & Chuquihuamaní, 2007: fig. 3), a shape very similar to *T. brachykechenos*, which is absent or restricted to a very small opening anteriorly and elongate and restricted to the parieto-supraoccipital posteriorly (Fig. 2d). Fernández & Chuquihuamaní (2007) stated that the peculiar cranial fontanel of *Trichomycterus megantoni* is probably an autopomorphy, but cannot be ascertained as unique in Trichomycterinae because some species are rare or do not have their anatomy examined. Indeed, the discovery of *T. brachykechenos* confirms that the condition is not unique in the subfamily Trichomycterinae.

Nevertheless, the several differences between the two species (see diagnosis) lead us to believe that they are not closely related and that this reduction is homoplastic among the two species. It reinforces the assumption of Fernández & Chuquihuamaní (2007) that cranial fontanel reduction must be interpreted as homoplastic among *Trichomycterus* species, *Ituglanis*, glanapterygines and stegophilines, according to the current understanding of the trichomycterid phylogeny.

Etymology. From the Greek *brachys* meaning short, and *kechenos* meaning gap, opening, in reference to the short posterior cranial fontanel of the new species. A name in apposition.

Key to the species of *Trichomycterus* from laguna dos Patos system

1. Pelvic fins absent ..... *Trichomycterus tropeiro*
1'. Pelvic fins present 2
2. Lateral surface of body with circular black blotches ..... *Trichomycterus balios*
2'. Lateral surface of body mottled, with stripes or blotches variable in shape and never circular 3
3. Maxillary barbel extending beyond posterior margin of interopercular patch of odontodes, usually reaching or extending beyond posterior margin of the pectoral-fin insertion ..... *Trichomycterus brachykechenos*
3'. Maxillary barbel not extending beyond posterior margin of interopercular patch of odontodes 4
4. Lateral surface of body with blotches, I+6 pectoral-fin rays ..... *Trichomycterus diatropoporos*
4'. Lateral surface of body mottled or with stripes, I+5 pectoral-fin rays ..... *Trichomycterus poikilos*

Discussion

The family Trichomycteridae is currently composed of eight subfamilies: Copionodontinae, Trichogeninae, Trichomycterinae, Tridentinae, Stegophilinae, Vandelliinae, Sarcoglanidinae, and Glanapteryginae. The phylogenetic relationships within the family Trichomycteridae have been well studied (*e.g.*, Baskin, 1973; de Pinna, 1989, 1992a; Arratia, 1990; Costa & Bockmann, 1993) based mainly in osteological characters and was summarized in de Pinna (1998). Posteriorly, other contributions were available (Wosiacki, 2002; Bockmann, *et al*., 2004) and recently, the relationships within the family Trichomycteridae were evaluated based on dorsolateral head muscles by Datovo & Bockmann (2010).

The four new species present 10 of 11 synapomorphies that support the clade 2 (*sensu* de Pinna, 1998 and updated in Bockmann, *et al*., 2004), which is formed by all trichomycterids except Copionodontinae and Trichogeninae: sphenotic, prootic, and pterosphenoid fused; incomplete infraorbital branch of laterosensory canal system; Weberian capsule with a small lateral opening, much smaller than its lateral profile; interhyal absent; five or fewer pelvic-fin rays; the anterior cranial fontanel partially or completely closed; a dorsal caudal-fin plate with six or fewer rays; a ventral caudal-fin plate with eight or fewer rays; a dorsal caudal-fin lobe with five or fewer branched rays; and a ventral caudal-fin lobe with six or fewer branched rays. Two other synapomorphies reported for this clade were not evaluated in the current study: the presence of the *protractor operculi* muscle (de Pinna, 1992a, 1998; Datovo & Bockmann, 2010) and the fibers of the *levator operculi* being posterodorsally directed towards its origin (Datovo & Bockmann, 2010).

The monophyly of Trichomycterinae was proposed by Arratia (1990) based on four putative synapomorphies, but these were demonstrated invalid by Datovo & Bockmann (2010), even with the exclusion of *Trichomycterus hasemani* (Eigenmann, 1914), and *T. johnsoni* (Fowler, 1932). These two species, along with *T. anhanga*, are more closely related to other subfamilies of Trichomycteridae (de Pinna, 1989; Wosiacki, 2002; Dutra *et al*., 2012). The new species, however, lack the diagnostic features of the subfamilies Tridentinae, Stegophilinae, Vandelliinae, Sarcoglanidinae, and Glanapteryginae (so-called TSVSG clade by Costa & Bockmann, 1993; de Pinna, 1998, Datovo & Bockmann, 2010) and the trichomycterine genera *Bullockia*, *Eremophilus*, *Hatcheria*, *Rhizosomichthys*, *Scleronema*, and *Silvinichthys* (*cf.* Eigenmann, 1918; Arratia *et al*., 1978; Arratia, 1990, 1998; Wosiacki, 2002). The new species also lack the three synapomorphies proposed by Costa & Bockmann (1993) for the genus *Ituglanis* – except *Trichomycterus brachykechenos* (discussed below) – which leads us to include them in the non-monophyletic genus *Trichomycterus* (de Pinna, 1989, 1998; Datovo & Bockmann, 2010).

In the few studies that attempted to elucidate the relationships among the species of *Trichomycterus* of south and southern of Brazil, Wosiacki & de Pinna (2008) recognized a monophyletic group formed by the species endemic to the rio Iguaçu basin [*T. crassicaudatus* Wosiacki & de Pinna, 2008; *T. igobi* Wosiacki & de Pinna, 2008, and *T. stawiarski* (Miranda Ribeiro, 1968)] based in three putative synapomorphies: the procurrent caudal-fin rays thickly ossified and rigid, the dorsal procurrent rays extend for a long portion of the caudal peduncle, stretching over the tips of at least ten neural spines, and 10-11 branchiostegal rays. Datovo *et al*. (2012) confirmed the validity of these characters and tentatively proposed another species from rio Paraná basin, *Trichomycterus perkos*, as the sister-group of the clade *T. crassicaudatus*, *T. igobi*, and *T. stawiarski* based on the share of the third character (10-11 branchiostegal rays). However, none of these three features are present in the species described herein from the laguna dos Patos system.

Another attempt to define a monophyletic group within Trichomycterinae is the case of *Trichomycterus brasiliensis* species-complex, proposed initially by Costa (1992) based in the proximity of the bases of pelvic fins, distal border of caudal fin rounded, and irregular confluent marks on lateral surface of body. This species-complex was redefined by Barbosa & Costa (2003) mentioning three morphometric synapomorphies, latter contested by Bockmann & Sazima (2004) due the lack of clear landmarks for precise comparisons. Thus, the *T. brasiliensis* species-complex was re-diagnosed based on the presence of four putatively derived traits: (1) the large, horizontally-elongate and well-defined blotches in four longitudinal rows of deeper-lying pigmentation on the trunk; (2) the pectoral fin with I+5-6 rays; (3) a separation of the anterior and posterior cranial fontanels by the primordial epiphyseal cartilaginous bar being present only in larger specimens; (4) and the pelvic-fin bases very close to each other, sometimes in contact (Bockmann & Sazima, 2004). More recently, Barbosa & Costa (2010) rejected three of these diagnostic features (characters 1, 2, and 4) from Bockmann & Sazima (2004) due to the presence of pelvic-fin bases very

close to each other and of I+5-6 pectoral-fin rays in other species of *Trichomycterus* not included in the group, as well as due to the impossibility to determine accurately the number of longitudinal rows of blotches that are greatly irregular in their arrangement. As a consequence, Barbosa & Costa (2010) redefined again the *T. brasiliensis* species-complex based on a single diagnostic feature: the oblique disposition of the opercular odontodes. The four species herein described present some diagnostic characters listed in these hypotheses (*e.g.*, pelvic-fin bases very close to each other and I+5-6 pectoral-fin rays), but the constant changes in the definition of *T. brasiliensis* species-complex and the unavailable osteological data from all species of *Trichomycterus* make these hypotheses questionable and to date not consistently demonstrated.

The species of *Trichomycterus* from laguna dos Patos system are clearly distinguishable from most congeners by the lower number of pectoral-fin rays (modally I+5 in *T. brachykechenos* and *T. poikilos*; modally I+6 in *T. balios*; and I+6 in *T. diatropoporos*, and *T. tropeiro*) and by the first pectoral-fin ray not prolonged as a filament. The combination of these two characters is uncommon in valid species of *Trichomycterus* from southern and southeastern Brazil, being present only in *T. davisi*, *T. mboycy*, *T. naipi*, *T. papilliferus*, *T. perkos*, *T. plumbeus* and *T. tropeiro*. All these species are restricted to the rio Iguaçu drainage, except for *T. davisi* that also occurs in the upper rio Paraná and rio Ribeira do Iguape drainages, *T. perkos* that is distributed in the rio Uruguay and rio Paranapanema drainages, and *T. tropeiro* which is restricted to the laguna dos Patos system. Two additional undescribed species (see comparative material) from rio Uruguay also possess the combination of these two characters.

Costa & Bockmann (1993) suggest that *Ituglanis* and *Scleronema* are closely related to TSVSG clade based in two synapomorphies (reduction of the interopercular patch of odontodes and urohyal thin and elongate), and de Pinna (1998) reinforced the monophyly of this clade based on shared three or fewer abdominal vertebrae by its members. However, Datovo & Bockmann (2010) listed a unique derived character shared by at least five genera of the subfamily Trichomycterinae (*Bullockia*, *Hatcheria*, *Ituglanis*, *Scleronema* and *Trichomycterus*), the posterior portion of the *levator internus* 4 originating from the dorsal face of the posttemporo-supracleithrum, and contested the utility of the characters that corroborated the monophyly of the clade *Scleronema* + *Ituglanis* + TSVSG (Costa & Bockmann, 1993; de Pinna, 1998). According to Datovo & Bockmann (2010), the reduction of the interopercular patch of odontodes and the thinness and elongation of urohyal lateral processes is present in many other trichomycterines (*e.g.*, *Trichomycterus stawiarski* and *Silvinichthys bortayro* Fernández & de Pinna, 2005) and seem to be developed to varying degrees with a continuum of intermediate states between the more extreme conditions. *Trichomycterus balios*, *T. diatropoporos*, and *T. poikilos* present the urohyal with lateral processes with wide bases and decreasing in width distally with rounded tips, but *T. brachykechenos* possesses the lateral processes of urohyal thin and elongate with pointed tips (Fig. 5), corroborating the statements of Datovo & Bockmann (2010).

Trichomycterus brachykechenos has one of three synapomorphies proposed by Costa & Bockmann (1993) for the genus *Ituglanis*: the anterior portion of the sphenotic directed anteriorly (Fig. 2d). The other two, autopalatine with a deep concavity on the medial margin and the parieto-supraoccipital fontanel (= posterior cranial fontanel) reduced to a small round orifice, are not present in the new species (Fig. 16 and Fig. 2d, respectively). However, the shape of posterior cranial fontanel in *T. brachykechenos* is intermediary between the typical *Ituglanis* and the basal trichomycterids, which possess a tiny and wide posterior cranial fontanel, respectively (Fig. 2d, see remarks). Thus, according to the hypothesis of Datovo & Bockmann (2010) and the two characters present in *T. brachykechenos* – pattern of the posterior cranial fontanel added to anterior portion of the sphenotic directed anteriorly – may indicate a possible relationship with *Ituglanis*.

Color Pattern. *Trichomycterus balios*, *T. diatropoporos*, and *T. poikilos* shares the two distinct layers of pigmentation in the skin of large specimens as reported for *T. castroi* by de Pinna (1992b), *T. brasiliensis*, *T. iheringi*, *T. maracaya*, *T. mimonha*, *T. potschi*, and undescribed species of the *T. brasiliensis* complex by Bockmann & Sazima (2004), and *T. crassicaudatus*, *T. diabolus*, *T. giganteus*, *T. igobi*, *T. perkos*, *T. stawiarski*, and *T. tropeiro* by Datovo *et al*. (2012). Among the species from laguna dos Patos system, only *Trichomycterus brachykechenos* lacks the two distinct layers. The distribution of these patterns across *Trichomycterus* species, however, is mostly unknown because it is missing in most species descriptions or because it is difficult to recognize the two skin layers in specimens preserved for a long period of time (Datovo *et al*., 2012).

Several species of *Trichomycterus* have the deeper skin layer (= inner skin layer) usually composed of larger blotches and spots, formed by densely grouped chromatophores (Bockmann & Sazima, 2004). Among the species from laguna dos Patos system, *Trichomycterus balios*, *T. diatropoporos*, and *T. tropeiro* share this pattern of the inner skin layer. Both *T. balios* and *T. tropeiro* possess black circular blotches variable in size on the dorsal and lateral surface of body over a lighter background, while *T. diatropoporos* has black blotches variable in size and shape coalescent dorsally on a lighter background.

The other species from laguna dos Patos system with two distinct layers of pigmentation presents the inner skin layer formed by stripes in some specimens, condition similar to that of *T. perkos* from the La Plata drainage.

Bockmann & Sazima (2004) cited for *T. brasiliensis* species complex the superficial skin layer (= outer skin layer) formed by chromatophores gradually denser and organized in well-defined patches in progressively larger specimens, sometimes

covering so intensely that hides the deeper skin layer (Bockmann & Sazima, 2004: fig. 11b). This superficial pigmentation in the largest specimens is distinct from that observed in *Trichomycterus balios*, *T. diatropoporos*, and *T. poikilos*, which is composed by small spots and similar to the "freckled" pattern reported to *Trichomycterus perkos* in Datovo *et al.* (2012), as well as for *T. brasiliensis*, *T. castroi*, *T. crassicaudatus*, *T. diabolus*, *T. giganteus*, *T. igobi*, *T. maracaya*, *T. mimonha*, *T. stawiarski*, and *T. tropeiro*.

Geographic distribution. The review of a large number of lots of the Trichomycteridae collected in practically all portions of laguna dos Patos system revealed that *Trichomycterus* is restricted to the northern portion of that basin along the middle and upper stretches of the rio Jacuí and middle and upper stretches of its large tributaries, the rio do Sinos, rio Caí, rio Taquari-Antas, and rio Pardo (Fig. 8). The few lots of *Trichomycterus* listed in fish collections as having originated in the southern portion of the laguna dos Patos system proved to be *Ituglanis*, a genus which has an external morphology very similar to *Trichomycterus*.

The analysis of comparative material from adjacent drainages to the north and northeast of laguna dos Patos system (rio Uruguay, rio Tramandaí, and rio Mampituba basins) allow us to propose that three among the four new species are endemic to the laguna dos Patos system, excepting *T. balios*, which occurs also in the headwaters of rio Mampituba. However, their degree of endemism is variable. *Trichomycterus balios* is distributed in the upper courses of rio das Antas, rio Caí, and rio Mampituba basins; *T. poikilos* is widely distributed in the upper courses of the rio Jacuí basin and tributaries of the rio the Taquari-Antas; *T. brachykechenos* and *T. diatropoporos* are known only from few localities in the rio dos Sinos and the rio da Prata basin respectively. *Trichomycterus tropeiro* is also endemic to the laguna dos Patos drainage and has a very restricted range, occurring only in headwaters of rio das Antas (Ferrer & Malabarba, 2011). Endemism and restricted ranges seem typical among species of *Trichomycterus*, which is the dominant genus in the compilation of species with restricted-ranges in Nogueira *et al*. (2010), with 45 species.

The species of *Trichomycterus* from the laguna dos Patos system usually are distributed in headwaters or upper courses and may demonstrate disjoint distributions in the same basin. Both *T. tropeiro* and *T. balios* are found in the rio das Antas, but the first species is known only from localities above 1000 m a.s.l (Ferrer & Malabarba, 2011), while the second occurs in the lower portions between 681 m and 941 m a.s.l. The same distribution pattern is observed in two characid species of the genus *Astyanax* described from the rio das Antas basin, *A. brachypterygium* occurring above 1100 m a.s.l. and *A. cremnobates* restricted to altitudes ranging from 800 to 1000 m a.s.l. (Bertaco & Malabarba, 2001).

Besides both *T. balios* and *T. poikilos* occur in the rio Taquari-Antas drainage, they also show disjoint distributions. *Trichomycterus balios* occurs to the East, in the rio da Prata, a tributary in the right margin of the rio das Antas, and tributaries of the rio das Antas above the mouth of the rio da Prata in both right and left margins. *Trichomycterus poikilos* occurs to the West in the rio Carreiro, rio Guaporé and rio Forqueta, all right margin tributaries of the rio Taquari-Antas, below the rio da Prata, but is also widely distributed in the upper tributaries of the rio Jacuí basin that are geographically close to the rio Taquari-Antas tributaries (Fig. 8). The occurrence of *T. poikilos* in close proximity in the upper portions of the tributaries of two sub-drainages (rio Taquari-Antas and upper rio Jacuí) may indicate headwater capture events among these small tributaries.

Trichomycterus diatropoporos is endemic to the rio da Prata basin and occurs sympatrically with *Hisonotus prata* and an undescribed species of *Eurycheilichthys*, also endemic to the upper course of the rio da Prata (Carvalho & Reis, 2011). The mountain relief on which the Taquari drainage flows was considered responsible for dividing species distribution in that drainage, as exemplified by *H. prata* and the undescribed species of *Eurycheilichthys* (Carvalho & Reis, 2011), and it seems to be also correlated to the restricted distribution range of *T. diatropoporos*.

Trichomycterus brachykechenos is apparently endemic to the upper course of the rio do Sinos. One sample tentatively identified as *T. poikilos* was found in other stretch of the upper basin of the rio dos Sinos, but not syntopic with *T. brachykechenos*.

This study revealed an astonishing undescribed diversity of *Trichomycterus* in a relatively small region with four undescribed species, along with one species recently described in 2011. We expect that the revision of other understudied basins in southern Brazil will reveal new and undescribed species of *Trichomycterus*.

Acknowledgments

For loan of specimens we thank to Carlos A. S. Lucena (MCP); Miriam Ghazzi (CIUSFC); Marco A. Azevedo and Vinicius A. Bertaco (MCN), Marcelo Britto (MNRJ). For analyzes of the stomach contents Ana Paula Dufech and Renato B. Dala-Corte (UFRGS). Thanks to Andréa T. Thomaz, Fernando R. Carvalho, Juliana M. Wingert, and Júlia Giora for help in field work. Special thanks to Juan Marcos Mirande, Gastón Aguilera and Luiz Fernández for receiving and support while visiting the Fundación Miguel Lillo (FML). We are grateful to Aléssio Datovo, Mário C. C. de Pinna, Richard Vari and Wolmar Wosiacki for valuable contributions in the manuscript. Thanks for financial support from CNPq (Proc. 300705/2010-7 and 477318/2012-6 to LRM).

Comparative material. Nematogenyidae: *Nematogenys inermis*: MZUSP 107490, 4, 53.5-49.2 mm SL, Chile, Copequén, río Cachantún drainage. Trichomycteridae: Copionodontinae: *Copionodon pecten*: MZUSP 42461, holotype, 60.5 mm SL, Brazil, Bahia, rio Mucujê (rio Paraguaçu drainage); *Glaphyropoma rodriguesi*: MZUSP 42465, holotype, 51.1 mm SL, Brazil, Bahia, rio Mucujê (rio Paraguaçu drainage); *G. spinosum*: MZUSP 99742, holotype, 58.1 mm SL,

Brazil, Bahia, riacho at Gruna dos Torras (rio Paraguaçu drainage). Trichogeninae: *Trichogenes claviger*: MZUSP 105372, 4, paratypes, 39.7-40.1 mm SL, Brazil, Espírito Santo, córrego Picada Comprida (rio Itapemerim drainage); *T. longipinnis*: MZUSP 16099, holotype, 64.4 mm SL, Brazil, São Paulo, cachoeira do Amor. Trichomycterinae: *Bullockia maldonadoi*: IBA 78, 2, 31.2-30.7 mm SL, Argentina, río Andalion; *Eremophilus mutisii*: FML uncatalogued, 2, 190.0-200.8 mm SL, Colombia; *Hatcheria macraei*: FML 1139, 1, 78.2 mm SL, Argentina, Neuquén, arroyo Picún Leufú; *Ituglanis bambui*: MZUSP 79860, holotype, 41.7 mm SL, Brazil, Goiás, stream at Angelica Cave; *I. macunaima*: MZUSP 88452, holotype, 30.7 mm SL, Brazil, Mato Grosso, Corixo da Saudade (rio Araguaia drainage); *I. ramiroi* Bichuette & Trajano, 2004: MZUSP 79865, holotype, 28.1 mm SL, Brazil, Goiás, side pool fed by small water inlet at São Bernardo Cave; *Silvinichthys bortayro*: MZUSP 83359, 1, paratype, 27.7 mm SL, Argentina, Salta, artificial well near río Arenales at San Luis; *S. mendozensis*: MZUSP 75189, 1, 44,5 mm SL, Argentina, Lujan de Cuyo, río Salto; *Trichomycterus albinotatus*: MZUSP 42312, holotype, 45.3 mm SL, Brazil, Rio de Janeiro, rio Preto (rio Paraíba do Sul drainage); *T. alternatus*: MZUSP 54166, 4, 39.9-59.8 mm SL, Brazil, São Paulo, rio Boissucanga; *T. alterus*: FML 2085, 1, 49.4 mm SL, Argentina, La Rioja, Andalucas; *T. areolatus*: UFRGS 10792, 4, 33.1-54.4 mm SL, Chile, Província de Cautín, río Allipen; *T. auroguttatus*: MZUSP 43341, holotype, 49.7 mm SL, Brazil, Rio de Janeiro, rio Marimbondo (rio Paraíba do Sul drainage); MZUSP 43342, 4, paratypes, 33.6-47.3 mm SL, collected with holotype; *T. bahianus*: MZUSP 43340, holotype, 68.0 mm SL, Brazil, Bahia, riacho tributary to ribeirão Caveira (rio Una drainage); MZUSP 38636, 4, paratypes, 44.9-87.3 mm SL, collected with holotype; *T. barbouri*: FML 4742, 63.6-75.6 mm SL, Argentina, Salta, río Calchaqui (río Juramento drainage); *T. belensis*: FML 2530, holotype, 63.7 mm SL, Argentina, Catamarca, stream tributary to Laguna Blanca; FML 2531, 3, paratypes, 40.8-59.6 mm SL, collected with holotype; *T. borellii*: MZUSP 2208, 1, 57.8 mm SL, Argentina, rio Mendoza; *T. boylei*: MCNI 1563, 3, 38.0-53.3 mm SL, Argentina, Jujuy, arroyo near Tres Cruces; *T. castroi*: MZUSP 36964, holotype, 118.3 mm SL, Brazil, Paraná, branch of rio Iguaçu (rio Paraná drainage); *T. catamarcensis*: FML 2507, holotype, 36.5 mm SL, Argentina, Catamarca, stream tributary to Laguna Blanca; FML 2508: 4, paratypes, 32.5-35.2 mm SL, collected with holotype; *T. concolor*: MZUSP 43347, holotype, 62.8 mm SL, Brazil, Minas Gerais, stream 20 km south of Garapuava (rio São Francisco drainage); *T. corduvensis*: FML 2463, 2, 57.7-79.5 mm SL, Argentina, Catamarca, río Protero; *T. crassicaudatus*: MZUSP 88518, holotype, 109.2 mm SL, Brazil, Paraná, rio Jordão (rio Paraná drainage); *T. diabolus*: MZUSP 78860, holotype, 53.7 mm SL, Brazil, São Paulo, córrego São Carlos (rio Paranapanema drainage); *T. guianense* (Eigenmann 1909): MZUSP 109099, 4, 62.7-85.0 mm SL, Guiana, Kuribrong River (Essequibo River drainage); *T. hasemani*: MZUSP 93953, 2, 13.7-13.8 mm SL, Brazil, Amazonas, igarapé Boiboi (rio Negro drainage); *T. hualco*: FML 2601, holotype, 68.3 mm SL, Argentina, La Rioja, río Hualco; *T. igobi*: MZUSP 94843, 3, paratypes, 82.3-88.9 mm SL, Brazil, Paraná, rio Jordão (rio Paraná drainage); *T. itacambirussu*: MZUSP 58493, holotype, 70.9 mm SL, Brazil, Minas Gerais, córrego do Cabral (rio Jequitinhonha drainage); *T. itacarambiensis*: MZUSP 42649, holotype, 47.2 mm SL, Brazil, Minas Gerais, Olhos d'Água cave (rio São Francisco drainage); *T. jequitinhonhae*: MZUSP 58497, holotype, 70.5 mm SL, Brazil, Minas Gerais, córrego Laranjeiras (rio Jequitinhonha drainage); *T. johnsoni*: MZUSP 95013, 2, 13.1-14.5 mm SL, Brazil, Mato Grosso, rio Mutum (rio Paraguay drainage); *T. landinga*: MZUSP 58496, holotype, 43.3 mm SL, Brazil, Minas Gerais, córrego Moquém (rio Jequitinhonha drainage); *T. longibarbatus*: MZUSP 43339, holotype, 57.9 mm SL, Brazil, Espírito Santo, near village Santa Tereza; *T. mboycy*: MZUSP 94956, 1, 68.6 mm SL, Brazil, Paraná, rio Jordão (rio Paraná drainage); *T. mimonha*: MZUSP 43343, holotype, 56.2 mm SL, Brazil, São Paulo, rio Benfica (rio Paraiba do Sul drainage); *T. mirissumba*: MZUSP 43345, holotype, 57.7 mm SL, Brazil, Rio de Janeiro, rio Preto (rio Paraiba do Sul drainage); *T. naipi*: UFRGS 11405, 4, 55.6-65.6 mm SL, Brazil, Paraná, arroio Passo do Pano (rio Paraná drainage); *T. paolence*: MZUSP 108930, 3, 51.8-83.9 mm SL, Brazil, São Paulo, riacho tributary to Guarapiranga reservoir (Paraná drainage); *T. paquequerense*: MZUSP 53755, 4, 25.2-61.5 mm SL, Brazil, Rio de Janeiro, ribeirão dos Andradas tributary to rio Paquequerensis; *T. perkos*: MCP 46701, 1, paratype, 48.9 mm SL, Brazil, Rio Grande do Sul, unnamed stream tributary to Erechim River (rio Uruguay drainage); MCP 46711, 1, paratype, 69.1 mm SL, Brazil, Rio Grande do Sul, unnamed stream tributary to Sepultura Stream, an affluent of reservoir of Passo Fundo Hydroelectric Power Plant (rio Uruguay drainage); *T. plumbeus*: UFRGS 13947, 1, 62.5 mm SL, unnamed stream, rio Negro basin (rio Paraná drainage); *T. pseudosilvinichthys*: FML 2588, holotype, 60.6 mm SL, Argentina, La Rioja, río Amarillo; *T. ramosus*: FML 2070, holotype, 59.0 mm SL, Argentina, Catamarca, Laguna Blanca; FML 2071, 5, paratypes, 60.2-64.3 mm SL, collected with holotype; *T. reinhardti*: MZUSP 94511, 4, 47.7-70.14 mm SL, Brazil, Minas Gerais, rio Itabira (rio São Francisco drainage); *T. roigi*: FML 1503, 2, 51.1-61.4 mm SL, Argentina, Jujuy, arroyo 4 km north of Orosmayo; *T. spegazzinii*: FML 4747, 3, 35.8-89.1 mm SL, Argentina, Salta, río Calchaquí (Juramento drainage); *T. taczanowskii*: MZUSP 26031, 1, 100.6 mm SL, Peru, rio Chiriaco; *T. tupinamba*: MZUSP 61686, 2, 50.3-54.8 mm SL, Brazil, São Paulo, rio Betari (rio Ribeira do Iguape drainage); *T. variegatus*: MZUSP 42316, holotype, 39.8 mm SL, Brazil, Minas Gerais, rio do Peixe (rio São Francisco drainage); *T. vermiculatus*: MZUSP 87189, 4, 36.1-99.1 mm SL, Brazil, Minas Gerais, córrego Içara (rio Paraná drainage); *T. yuska* Fernández & Schaefer, 2003: FML 2535, holotype, 88.6 mm SL, Argentina, Catamarca, arroyo Aguas Calientes; *Trichomycterus* sp.: MZUSP 25022, 7 (c&s), Brazil, Santa Catarina, rio Roseira (rio Uruguay drainage); UFRGS 11312, 9 (1 c&s), 63.0-86.5 mm SL, Brazil, Rio Grande do Sul, rio Ijuí (rio Uruguay drainage); UFRGS 9492, 5 (1 c&s), 48.0-73.7 mm SL, Brazil, Rio Grande do Sul, arroio Lajeadinho (rio Uruguay drainage); MCP 17440, 5 (1 c&s), 30.2-61.5 mm SL, Brazil, Rio Grande do Sul, stream tributary to rio dos Touros (rio Uruguay drainage); UFRGS 10651, 1 (c&s), 66.5 mm SL, Brazil, Rio Grande do Sul, rio Cerrito (rio Tramandaí drainage); MCN 18587, 1, 63.0 mm SL, Brazil, Rio Grande do Sul, arroio Carvalho tributary to rio Maquiné (rio Tramandaí drainage). Additional comparative material cited in Ferrer & Malabarba (2011).

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Submitted July 4, 2012
Accepted May 1, 2013 by Francisco Langeani
Published June 28, 2013