

Re-description of *Trichomycterus cubataonis* BIZERRIL, 1994 (Siluriformes: Trichomycteridae) from the Cubatão river basin, southern Brazil

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Abstract

Trichomycterus cubataonis, from the Cubatão river, southern Brazil, is re-described and revalidated. It is hypothesized as closely related to *T. diabolus*, *T. itatiayae*, *T. maculosus* and *T. nigroautarus* based on the presence of a broad metapterygoid, which is wider than deeper. *Trichomycterus cubataonis* differs from the above four species by the number of pectoral, dorsal, and anal-fins rays, origin of anal fin related to the dorsal-fin base, insertion of pelvic-fin related to the vertebrae, origin of dorsal- and anal fins related to the vertebrae, number of dorsal and ventral procurrent rays of caudal fin, number of odontodes of the opercular and interopercular patch, length, depth and width of the head, and eye size. Moreover, *T. cubataonis* differs from *T. zonatus* mainly by the insertion of pelvic-fin related to the vertebrae, origin of dorsal- and anal fins related to the vertebrae, number of anal fin rays, and the position of the anal fin related to the dorsal-fin base. Therefore, *T. cubataonis* should be considered a valid species.

Resumo

Trichomycterus cubataonis do rio Cubatão, sul do Brasil, é redescrita e revalidada. Ela é hipotetizada como proximamente relacionada à *T. diabolus*, *T. itatiayae*, *T. maculosus* e *T. nigroautarus* baseado na presença de um amplo metapterigóide, que é mais largo do que alto. *Trichomycterus cubataonis* difere das quatro espécies acima pelo número de raios das nadadeiras dorsal, peitoral e anal, pela origem da nadadeira anal em relação à base da nadadeira dorsal, pela inserção das nadadeiras pélvicas em relação às vértebras, origem das nadadeiras dorsal e anal em relação às vértebras, pelo número de raios procorrentes dorsais e ventrais da nadadeira caudal, pelo número de odontódeos operculares e interoperculares, comprimento, altura, largura da cabeça e tamanho do olho. Além disso, ela difere de *T. zonatus* principalmente pela inserção da nadadeira pélvica em relação às vértebras, origem das nadadeiras dorsal e anal em relação às vértebras, pelo número de raios da nadadeira anal e pela posição de origem dos raios da nadadeira anal em relação à base da nadadeira dorsal. Portanto, *T. cubataonis* deve ser considerada uma espécie válida.

Key words

Pencil catfish, Santa Catarina, Atlantic forest, Neotropical, trichomycterinae, taxonomy.

Introduction

Trichomycterus VALENCIENNES, 1832 is a genus of catfishes that are usually found in mountain rivers with highly oxygenated water. This is one of the most diversified gen-

era among the neotropical fishes, with over 140 species (COSTA, 1992; BARBOSA & COSTA, 2003, 2008; 2010a, b; 2011; 2012a, b; CASTELLANOS-MORALES, 2008; FERNANDEZ



Fig. 1. *Trichomycterus cubataonis*, MNRJ 12490, holotype, 45.5 mm SL; Brazil: Santa Catarina: Joinville.

& VARI, 2009; KATZ *et al.*, 2013; WOSIACKI & PINNA, 2008a, b). The most remarkable feature of its members is the ability to climb rocks in waterfalls, with the help of odontodes present in the operculum and interoperculum. Both the later structures have a special muscular ligament that helps the movement of these bones, assisting the odontodes fixation on the rock (PINNA, 1998). Often it is the only fish genus found in the majority of the rivers headwaters between Costa Rica and Patagonia, including high altitude rivers in the Andes altiplans. However, the highest concentration of species is found in southeastern Brazil (EIGENMANN 1918; COSTA 1992; BARBOSA & COSTA, 2010a), the number of species in southern part of the country has increased in the recent years. Nineteen species are known to southern Brazil, among them *Trichomycterus nigricans* VALENCIENNES, 1832, the type species of genus (FERRARIS, 2007; FERRER & MALABARBA, 2013). *Trichomycterus cubataonis* BIZERRIL, 1994 was described from the Cubatão river, a southern coastal basin (BIZERRIL, 1994). Later it was considered to be a junior synonym of *Trichomycterus zonatus* EIGENMANN, 1918 (DE PINNA & WOSIACKI, 2003). *Trichomycterus cubataonis* is herein re-described and revalidated.

Material and Methods

Measurements and counts follow BARBOSA & COSTA (2003b). Measurements are presented as percentages of standard length (SL), except for subunits of head, which are presented as percentage of head length (HL). Morphometric characters of the holotype were based on examined material (MNRJ 12490), and other measurements were made in topotypes (UFRJ 8736). Counts of procurrent caudal-fin rays, vertebrae, branchiostegal rays, teeth and odontodes were made in cleared and stained specimens (c&s) prepared according to TAYLOR & VAN DYKE (1985). Abbreviations for institution are: MNRJ, Museu Nacional, Universidade Federal do Rio de Janeiro; UFRJ, Instituto de Biologia, Universidade Federal do Rio de Janeiro. The method for species de-

limitation follows the methodology proposed by DAVIS & NIXON (1992) formally known as population aggregation analysis, which is based on the presence of unique combination of non-overlapping character states to delimit species. Comparative material is listed in BARBOSA & COSTA (2008), BARBOSA & COSTA (2010a), and KATZ *et al.* (2013).

Trichomycterus cubataonis BIZERRIL, 1994

Fig. 1

Trichomycterus cubataonis BIZERRIL, 1994: 29 (original description, Cubatão river, Santa Catarina, Brazil).

Material examined. MNRJ 12490, holotype, 45.5 mm SL; Brazil: Estado de Santa Catarina: Município de Joinville: Cubatão river basin; C.R.S.F BIZERRIL & P.M.C. ARAÚJO; 10 Nov 1991. – UFRJ 8736, 14, 24.3–52.3 mm SL; – UFRJ 8871, 5 (c&s), 32.8–38.1 mm SL; Brazil: Lindo river, on road SC-301, 2 km after the BR-101; 26° 11' 48.84" S 48° 55' 19.62" W, altitude 30 m; A.M. KATZ, F. PEREIRA & J.L. MATTOS; 29th May, 2012.

Diagnosis. *Trichomycterus cubataonis* is similar to *Trichomycterus diabolus* BOCKMANN, CASATTI & PINNA, 2004, *Trichomycterus itatiayae* MIRANDA-RIBEIRO, 1906, *Trichomycterus maculosus* BARBOSA & COSTA, 2010 and *Trichomycterus nigroauratus* BARBOSA & COSTA, 2008, and can be distinguished from all other known species of *Trichomycterus* from southeastern and southern Brazil by possessing a broad metapterygoid which is wider than long. It is distinguished from *T. diabolus*, *T. itatiayae*, *T. maculosus* and *T. nigroauratus* by having a deeper head (51.2–65.1% HL, vs. 34.9–50.8% in *T. itatiayae*, *T. maculosus* and *T. nigroauratus*, and 78.1–92.8% SL in *T. diabolus*), a wider head (90.1–115.8% HL, vs. 39.4–81.1) and a larger eye (12.0–16.3% HL, vs. 7.4–10.9); from *T. itatiayae* and *T. nigroauratus* by possessing 18–22 dorsal procurrent rays (vs. 13–17); anal-fin origin after of the dorsal-fin base (vs. 7–12 dorsal-fin ray), from *T. diabolus* and *T. itatiayae* by the smaller head (16.1–19.3% SL, vs. 19.8–25.8). Can be further distinguished from *T. itatiayae* by possessing 12 dorsal-fin rays (vs. 10–11),



Fig. 2. *Trichomycterus cubataonis*, UFRJ 8736, topotype, 36.4 mm SL; Brazil: Santa Catarina: Joinville.

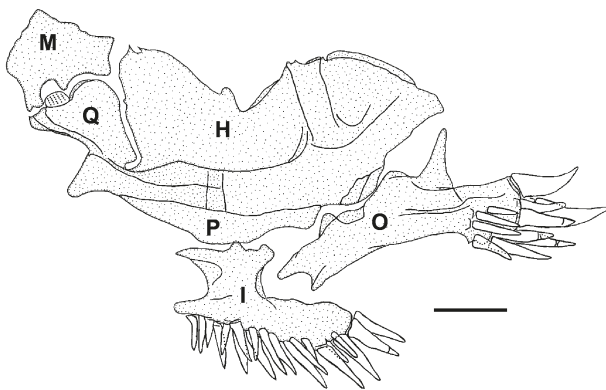


Fig. 3. Left jaw suspensorium and opercular series of *T. cubataonis*. UFRJ 8871, topotype, lateral view. Abbreviations: H, hyomandibula; I, interopercle; M, metapterygoid; O, opercle; P, pre-opercle; Q, quadrate. Scale bar 1mm.

the more slender caudal peduncle (10.0–12.4% SL, vs. 12.7–14.8), the longer pectoral fin (12.0–14.2% SL, vs. 10.1–11.5). Also can be distinguished from *T. nigroauratus* by possessing 9 anal-fin rays (vs. 10–11); 7 pectoral-fin rays (vs. 8); 7–11 opercular odontodes (vs. 16–18); 21–29 interopercular odontodes (vs. 38–40). It is distinguished from *Trichomycterus maculosus* by possessing 7 pectoral-fin rays (vs. 8); anal-fin origin after of the dorsal-fin base (vs. 10–11 dorsal-fin rays); 11–12 ventral procurrent rays (vs. 13–14); 7–11 opercular odontodes (vs. 17–18); 21–29 interopercular odontodes (vs. 45–52). Distinguished from *T. diabolus* by possessing pelvic-fin insertion in a vertical through centrum of 16th vertebra (vs. 21), origin of the dorsal-fin in a vertical through centrum of 18th vertebra (vs. 21–22), anal-fin origin in a vertical through centrum of 23th vertebra (vs. 25–26); 7–11 opercular odontodes (vs. 14–16), nasal barbel reaching anterior tip of opercular patch of odontodes (vs. eye), maxilar exciding posterior portion of patch of odontodes (vs. interopercular patch of odontodes), rictal barbel reaching middle portion of opercular patch of odontodes (vs. interopercular patch of odontodes), smaller interorbital width (25.7–33.3% HL, vs. 19.8–24.7). Furthermore, *T. cubataonis* distinguished from *T. zonatus* (EIGENMANN, 1918) by possessing pelvic-fin insertion in a vertical through centrum of 16th vertebra (vs. 17), dorsal-fin origin in a vertical through centrum of

18th vertebra (vs. 20), anal-fin origin in a vertical through centrum of 23th vertebra (vs. 22), 18–22 dorsal-procurrent rays (vs. 15), 9 anal-fin rays (vs. 10), anal-fin origin after the dorsal-fin base (vs. 7th dorsal-fin ray).

Description. Morphometric data for holotype and topotypes is given in Table 1. Body subcylindrical on anterior portion, compressed on caudal peduncle. Skin papillae minute. Dorsal profile slightly convex between snout and end of dorsal-fin base, straight to slightly convex on caudal peduncle. Ventral profile straight to slightly convex between lower jaw and end of anal-fin base, straight on caudal peduncle. Greatest body depth in vertical immediately in front of pelvic-fin origin. Skin papillae minute. Urogenital papilla spherical, in vertical through anterior third of dorsal-fin base.

Dorsal and anal fins approximately triangular. Dorsal-fin origin in vertical through centrum of 18th vertebra. Anal-fin origin in vertical after dorsal-fin base and through centrum of 23th vertebra. Pectoral fin about triangular. First pectoral-fin ray not prolonged as filament. Pelvic fin shorter than anal fin, not covering urogenital pore, tip not reaching anal fin, in vertical just anterior to dorsal-fin origin; pelvic-fin bases separated by interspace, pelvic-fin origin in vertical through centrum of 16th vertebra. Caudal fin truncate. Dorsal-fin rays 12; anal-fin rays 9; pectoral-fin rays 7; pelvic-fin rays 5; caudal-fin principal rays 13; dorsal procurrent rays 18–22, ventral procurrent rays 11–12. Total vertebrae 36–39; pleural ribs 11–12. Upper hypural plates separated, dorsal plate smaller than ventral plate.

Head trapezoidal in dorsal view. Snout blunt. Mouth subventral. Maxilla shorter than premaxilla. Teeth conic. Eye at middle of head. Barbels well developed. Tip of nasal, maxillary and rictal barbels reaching anterior edge of opercular patch of odontodes. Tip of maxillary barbel not reaching pectoral-fin base. Seven or eight branchiostegal rays. Interopercular odontodes 21–29; opercular patch of odontodes with 7–10; odontodes conical; some opercular odontodes about width to interopercular odontodes; opercular odontodes approximately arranged in circular line. Medial margin of autopalatine slightly to extremely concave; posterior process of autopalatine about equal in length to autopalatine without posterior process. Lacrimal about one third to one quarter supraorbital

Table 1. Morphometric data of *Trichomycterus cubataonis*. H = Holotype (MNRJ 12490), n = 10.

	H	Range	\bar{x}	SD
Standard length (mm)	45.5	24.3–52.3	34.7	
<i>Percentage of standard length</i>				
Body depth	13.0	12.0–15.0	14.0	0.9
Caudal peduncle depth	10.3	10.0–12.4	11.2	0.6
Body width	5.5	7.1–9.9	8.8	1.0
Caudal peduncle width	2.9	3.4–5.0	4.2	0.5
Dorsal–fin base length	9.7	8.6–12.4	10.7	1.0
Anal–fin base length	7.5	6.4–10.1	8.2	1.2
Pelvic–fin length	8.1	8.9–10.8	9.8	0.7
Distance between pelvic–fin bases	0.4	0.2–0.7	0.5	0.1
Pectoral–fin length	11.2	12.0–14.2	13.0	0.8
Predorsal length	61.1	57.4–65.4	61.4	2.4
Prepelvic length	49.9	50.7–56.1	53.5	1.4
Head length	17.8	16.1–19.3	17.2	1.0
<i>Percentage of head length</i>				
Head depth	45.7	51.2–65.1	59.2	4.8
Head width	84.0	90.1–115.8	104.7	8.2
Interorbital width	30.9	25.7–33.3	29.4	2.1
Preorbital length	40.7	36.3–47.1	42.8	3.2
Eye diameter	9.9	12.0–16.3	14.8	1.3

length; supraorbital rod-shaped. Metapterygoid moderate in length, broad, much wider than deep, without distinct processes; anterodorsal surface of hyomandibula with moderate concavity. Urohyal foramen rounded; distal portion of lateral arm of urohyal laterally pointed.

Supraorbital canal continuous, with three pores; first pore in transverse line through anterior nostril, second in transverse line just posterior to posterior nostril, third supraorbital pore paired, each pore nearer to orbit than to symmetrical pore, in transverse line just posterior to orbit. Infraorbital canal restricted to two pores: first and second pore absent, third and fourth present and posterior to orbit. Preopercular canal with one pore, in vertical through anterior margin of opercular patch of odontodes. Lateral line of body short, with three pores, posterior most pore in vertical just posterior to pectoral-fin base.

Colouration. Side of body and head brown yellowish, with well-defined dark brown blotches along entire body, blotches forming irregular stripe along lateral midline of flank, between pectoral and caudal fins. Dorsal region brown yellowish with large blotches, sometimes fused in irregular and sinuous stripe between head and dorsal fin. Ventral region light brown, without blotches. Nasal, maxillar and rictal barbels light brown. Dorsal, pectoral and anal fins light brown yellowish hyaline on tip. Pelvic-fin transparent. Caudal fin transparent with some small brown dots. In live specimens, body and head golden yellowish with light brown blotches along entire body, well-defined light brown blotches along entire body, blotches forming irregular stripe along lateral midline of flank, between pectoral and caudal fins. Nasal, maxillar and rictal barbels golden yellowish. Dorsal, pectoral and

anal fins light orange, with a small diagonal white stripe in the middle.

Distribution. Known from the Cubatão river basin, southern Brazil.

Ecological notes. *Trichomycterus cubataonis* was found in a narrow stream (about 100 cm wide and 50 cm deep) under a bridge. The species was mainly collected along the stream banks, on gravel or litter substrate. Sympatrically were in the same habitat the Corydoradinae: *Corydoras ehrhardti* and *Scleromystax barbatus*, the Characidae: *Astyanax* sp., the Loricariidae: *Rhineloricaria* sp. and the Poeciliidae: *Phalloceros* sp.

Discussion

Trichomycterus has been the object of many field and taxonomic researches, thanks to that, a great diversity has been described until now. However, little is known about the relationships between the species. A few researchers have created hypotheses of relationships among species of *Trichomycterus* by grouping them in species complex (e.g. COSTA 1992; BARBOSA & COSTA, 2003; BARBOSA & COSTA, 2008; BARBOSA & COSTA, 2010a; BOCKMANN *et al.*, 2004), but this situation is far from been solved.

A recent checklist of freshwater fishes of South and Central America (PINNA & WOZIACK, 2003) listed *T. cu-*

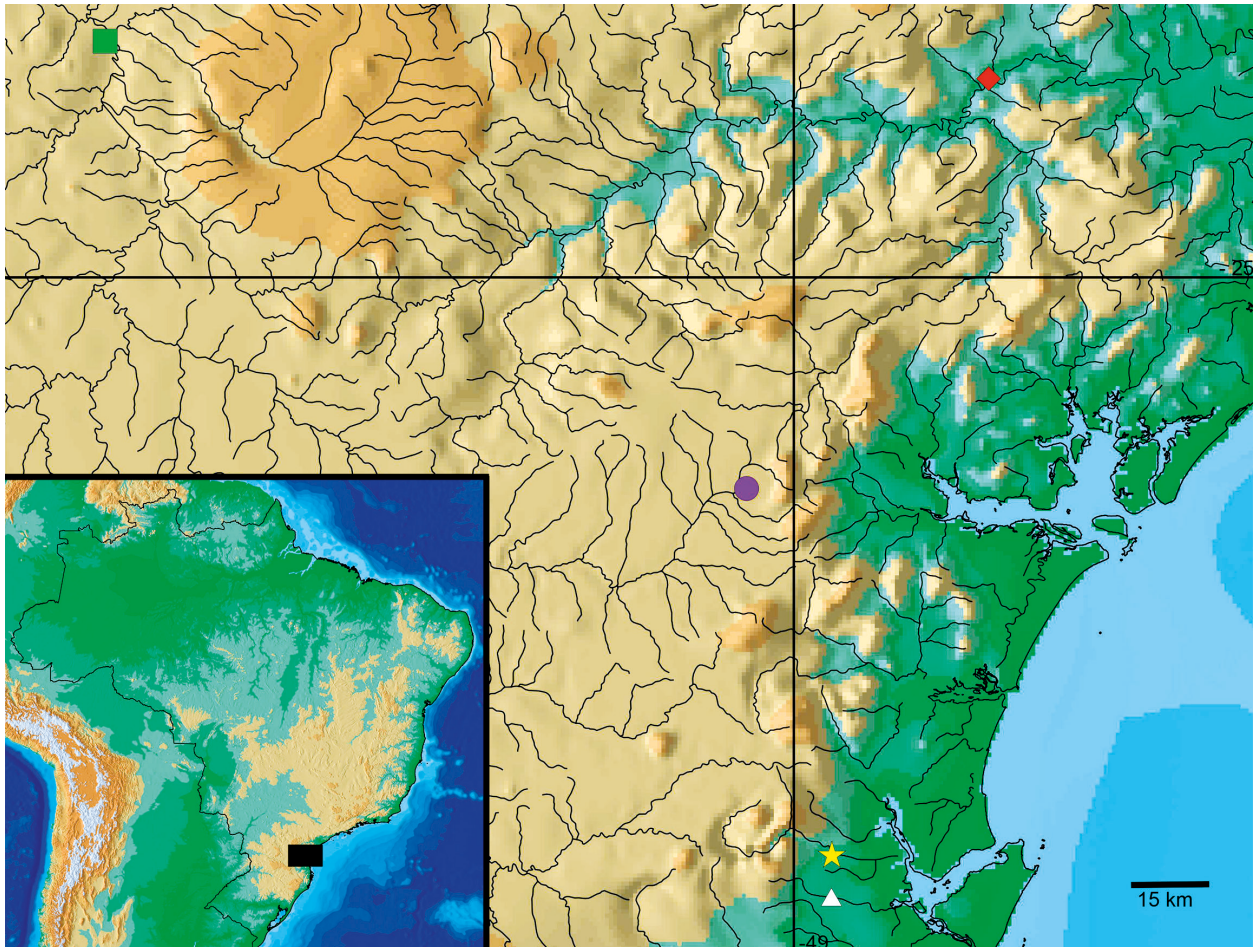


Fig. 4. Map showing the type locality of the holotype of *T. cubataonis* (yellow star), topotype of *T. cubataonis* (white triangle), *T. castroi* (purple circle), *T. diabolus* (green square), and *T. zonatus* (red diamond).

bataonis as a junior synonym of *T. zonatus*, however the evidences leading to the synonymization were not clearly showed. Comparing the morphological data of the topotypes and the holotype of *T. cubataonis* with the morphological data of the holotype of *T. zonatus*, it is possible to notice significant differences between the two species. The pelvic-fin insertion and the dorsal, and anal-fins origin in the *T. cubataonis* is 16th, 18th and 23th vertebrae centrum respectively (vs. 17th, 20th and 22th in *T. zonatus*). Moreover, *T. cubataonis* posses 9 anal-fin rays (vs. 10 in *T. zonatus*), 18–22 dorsal procurrent rays (vs. 15 in *T. zonatus*), and anal-fin origin after the dorsal-fin base (vs. 7th ray in *T. zonatus*). Furthermore, *T. zonatus* and *T. cubataonis* are known from two distinct coastal river basins, Ribeira do Iguape and Cubatão river basins respectively, separated by approximately 200 kilometers. These facts corroborate the hypothesis that *T. cubataonis* should be considered a valid species.

BARBOSA & COSTA (2008) described *Trichomycterus nigroauratus* and redescribed *T. itatiayae*, considering them closely related for exhibiting a broad metapterygoid, wider than deep. They also considered *T. diabolus* and *T. maculosus* to be closely related to the two species referred before for presenting the same kind of structure (BARBOSA & COSTA, 2010b). *Trichomycterus cubataonis*

also present this kind of metapterygoid, broad, wider than deep, thus should be considered closely related to the above four species. Also, the *T. cubataonis* shares with *T. castroi*, *T. diabolus*, *T. nigroauratus* and *T. maculosus* a colour pattern consisting in large blotches around the flank. Furthermore BOCKMANN *et al.* (2004) considered the *Trichomycterus castroi* DE PINNA, 1992 to be related to *T. diabolus* by both having a conspicuous unpigmented area on the basal region of the caudal fin. Unfortunately the original description of *T. castroi* do not provide osteological data, including about the metapterygoid.

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