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ORIGINAL ARTICLE / ARTÍCULO ORIGINAL

A NEW SPECIES OF *TEREANCISTRUM* (MONOGENEA, DACTYLOGYRIDAE) PARASITIC ON *PROCHILODUS LINEATUS* (VALENCIENNES, 1837) (CHARACIFORMES) FROM MOGIGUAÇU RIVER, BRAZIL

UNA NUEVA ESPECIE DE *TEREANCISTRUM* (MONOGENEA, DACTYLOGYRIDAE) PARÁSITO DE *PROCHILODUS LINEATUS* (VALENCIENNES, 1837) (CHARACIFORMES) DEL RIO MOGI GUAÇU, BRASIL

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Abstract

Species of *Prochilodus* Agassiz 1829 are among the most abundant fishes of South America basins and has good potential for pisciculture. During a study of the helminth parasites of *Prochilodus lineatus* (Valenciennes, 1837) (Characiformes) from Mogi Guaçu River, Brazil, a new species of *Tereancistrum* was collected. *Tereancistrum pirassununguensis* n. sp. can be distinguished from the other *Tereancistrium* species mainly by having a reduced accessory anchor sclerite with a little groove at the end; MCO as a sclerotized coiled tube forming two counterclockwise rings; an accessory piece as an inverted C, rod-like, not articulated at the base of the MCO; curved ventral bar; hooks similar with erect thumb and slightly curved shaft and point, slightly expanded shank proximally. This is the first record of a species of *Tereancistrum* in the southeastern of Brazil.

Keywords: Brazil - Characidae - Dactylogyridae - Monogenea - Mogi Guaçu River - *Prochilodus lineatus* - *Tereancistrum*.

Resumen

Las especies del género *Prochilodus* Agassiz 1829 son de las más abundantes en los ríos de América del Sur y presentan un buen potencial para la piscicultura. En investigaciones de monogeneos en *Prochilodus lineatus* (Valenciennes, 1837) (Characiformes) del río de Mogi Guaçu, Brasil, fue encontrada una nueva especie de *Tereancistrum pirassununguensis* n. sp. se distingue de las otras especies del género principalmente por presentar el esclerito accesorio de la áncora ventral con un pequeño surco en la extremidad. Además, presenta el órgano copulador masculino formando 2 anillos en sentido anti horario; una pieza accesoria como una C invertida, cilindrica, que sirve como guía la parte distal del órgano copulador masculino, no articulada en la base del OCM; barra ventral curva; ganchos similares, pulgar erecto, lamina y punta levemente curvas, hasta levemente expandida en la región proximal. Este es el primer registro de una especie de *Tereancistrum* en región sudeste de Brasil.

Palabras clave: Monogenea - Dactylogyridae - *Tereancistrum* - *Prochilodus lineatus* - Characidae - RioMogi Guaçu - Brasil.

INTRODUCTION

Prochilodus lineatus (Valenciennes, 1837) is a potamodromous and detritivorous fish species commonly known as Curimba or Curimbatá (Moraes *et al*., 1997). It is endemic from the basins of the Parana, Paraguay and Paraiba do Sul rivers, occurring in Argentina, Brazil, Paraguay and Uruguay (Froese & Pauly, 2012) and present a good potential for pisciculture and a rapid growth in intensive farming, being a species of greatest economic value (Bonfim *et al*., 2005). Specimens of *P. lineatus* were collected in the Mogi Guaçu River (Pirassununga, State of São Paulo), an important river in fishing activity which exhibiting a rich ichthyofauna (Peixer & Petrere, 2009; Gonçalves & Braga, 2010). Despite its great diversity fish fauna of Mogi Guaçu River, a few studies have been done about monogeneans. To date, the monogenean species recorded in this locality are *Annulotrematoides bryconi* Cuglianna, Cordeiro & Luque, 2003 (Characidae) and *Apendunculata discoidea* Cuglianna, Cordeiro & Luque, 2009, parasitizing gills of *Brycon cephalus* (Günther, 1869) (Characidae) and *P. lineatus* (Valenciennes, 1837) (Prochilodontidae), respectively, described in pisciculture ponds from Pirassununga, São Paulo (Cuglianna *et al*. 2003, 2009). More recently, three species of *Pavanelliella* were described from nasal cavities of pimelodid fishes (Aguiar *et al*., 2011).

During a parasitological survey of *P. lineatus* from Mogi Guaçu River, a previously undescribed species of *Tereancistrum* was found in the gills. *Tereancistrum* was proposed by Kritsky *et al*. (1980) and currently is composed of six species: *T. kerri* Kritsky, Thatcher & Kayton, 1980 (type-species) from *Brycon melanopterus* (Cope, 1872) (Characidae) of Janauaca River, Amazonas (Brazil), *T. ornatus* Kritsky, Thatcher & Kayton, 1980 from *Prochilodus reticulatus* Steindachner, 1878 (Prochilodontidae) of Cauca River (Colômbia), *T. parvus* Kritsky, Thatcher & Kayton, 1980 from *Leporinus fasciatus* (Bloch, 1974) (Anostomidae) of Amazonas River basin (Brazil), *T. toksonum* Lizama, Takemoto & Pavanelli, 2004 and *T. curimba* Lizama, Takemoto & Pavanelli, 2004, both from *P. lineatus* of Paraná River basin (Brazil) and more recently *T. arcuatus* Cohen, Kohn and Boeger, 2012 from *Salminus brasiliensis* (Cuvier, 1817) (Characidae) of Paraná River (Brazil). Herein, a new species of this genus is described and illustrated.

MATERIALS AND METHODS

Specimens of *P. lineatus* were collected by using gill nets or baited hooks from Mogi Guaçu River (Southeastern State of São Paulo) (21°55'32.49"S; 47°22'13.76"W) in February 2010.

The gills were removed and placed in finger bowls containing 4% formalin solution to fix the ectoparasites. Some parasites were stained with Gomori's trichrome and mounted in Canada balsam and others monogeneans were mounted using Gray and Wess medium and a mixture of lactic acid (AL) and ammonium picrate-glycerin (Ergen's GAP solution) in order to study sclerotized structures. After, processed worms were remounted in Canada balsam (see Mendoza-Franco *et al.* 2009).

The illustrations were made with a drawing tube attached to a Olympus™ differential interference contrast (DIC) microscopy. Measurements, all in micrometers and were obtained using a calibrated ocular micrometer, represented straight-line distances between extreme points of the structures measured (body length includes the haptor) and were expressed as the mean followed by the range and number (n) in parentheses. Holotype and paratypes were deposited in the Helminthological Collection of the Institute Oswaldo Cruz (CHIOC), Rio de Janeiro, Brazil. Scientific and common names of hosts are consistent with Fishbase (Froese & Pauly, 2012).

RESULTS

Tereancistrum Kritsky, Thatcher & Kayton, 1980
Tereancistrum pirassununguensis n. sp. (Fig. 1-8)

Description (based on 4 stained specimens, on 7 in Grey and Wess medium and on 9 specimens mounted in GAP medium): Body fusiform and robust,193 (175-222; n=9) long, greatest width 82 (61-112; n=6). Cephalic margin broad, cephalic lobes poorly developed, 3 bilateral pairs of head organs, cephalic glands indistinct. Two pairs of

eyespots, posterior pair of eyes greater than anterior pair, a few accessory granules dispersed in anterior body. Pharynx subovate, 13 (11-16; n=4) in diameter. Peduncle broad. Haptor armed with 14(7 pairs) hooks; subhexagonal, 57-60 (n=2) wide. Ventral anchor with not developed roots, elongate and evenly curved shaft and point, 21 (21-22; n=3) long, base 13 (12-13; n=3) wide. Accessory anchor sclerite, 9 (8-11; n=12) long, small, with a little groove at the end. Dorsal anchor with well-developed roots, straight shaft and curved point, 23 (21-24; n=8) long, 18 (15-22; n=8) wide. Ventral bar, 38 (33-44; n=9) long, curved; dorsal bar, 27 (22-30; n=8) long, Y-shaped. Hooks similar in size and shape, 13 (13-14; n=11) long, erect thumb, slightly curved shaft and point, shank slightly expanded proximally; FH loop about half of length shank. Male copulatory organ as a sclerotized coiled tube forming 2 counterclockwise rings, proximal ring, 8 (7-9; n=3) in diameter. Accessory piece,13 (11-14; n=3) long, as an inverted C, rod-like, serving as guide of the distal portion of the male copulatory organ, not articulated at the base of the MCO. Gonads overlapping. Testis dorsal to germarium, ovate, 25 (24-27; n=3) long, 20 (15-25; n=3) wide; vas deferens and seminal vesicle not observed; an oval prostatic reservoir. Germarium ovate, 39 (36-44; n=3) long, 17-16 (n=2) wide; a delicate vaginal duct, slightly sclerotized, opening into rounded seminal receptacle. A vaginal aperture opening in the left margin of the body. Vitellaria dense and scattered throughout trunk.

Taxonomic Summary
Type host: *Prochilodus lineatus* (Valenciennes, 1837) (Characiformes: Prochilodontidae)
Site of infection: gills
Type locality: Mogi Guaçu River, Pirassununga, SP (21°55'32.49"S; 47°22'13.76"W)
Specimens deposited: Holotype, CHIOC No 37816a and paratypes CHIOC No37816b-j.
Etymology: The specific name is a toponym that refers to the type locality: Pirassununga.

Remarks

The new species was included into *Tereancistrum* mainly by having ventral anchors with accessory anchor sclerite articulated to tip of superficial root. The new species resembles the species *T. parvus* by exhibit a sclerotized male copulatory organ as a coiled tube forming counterclockwise rings; hooks having an erect thumb with slightly curved shaft and point and a small proximal enlargement of shank; dorsal anchor with developed roots; and a sinistral vagina as simple sclerotized tube. However, the new species can be separated from *T. parvus* by showing a small accessory anchor sclerite with a little groove at the distal end (accessory anchor sclerite is longer presenting a small spathulate termination in *T. parvus*); a MCO forming 2 counterclockwise rings (MCO forming 1 ¼ counterclockwise rings in *T. parvus*); an accessory piece as an inverted C, rod-like, serving as guide of the distal portion of the male copulatory organ (flabellate, with a terminal blunt projection in *T. parvus*); dorsal anchor with straight shaft and curved point (slightly curved shaft and short point in *T. parvus*); ventral bar curved (with tapered ends in *T. parvus*); and dorsal bar Y-shaped (broadly V-shaped in *T. parvus*). *Tereancistrum pirassununguensis* n. sp also resembles *T. toksonum* and *T. curimba* by the morphology of the hooks, MCO, vagina and additionally, dorsal bar. The new species can be easily differentiated from *T. toksonum* and *T. curimba* by the shape of the MCO (forming 1 ¼ counterclockwise rings in *T. toksonum* and *T. curimba*); accessory piece (variable in *T. toksonum* and *T. curimba)*; ventral anchors (robust with well-developed roots, short shaft and recurved point in *T. toksonum* and *T. curimba*); accessory anchor sclerite (robust with spatulate end in *T. toksonum* and *T. curimba*); dorsal anchor (divergent roots in *T. toksonum* and *T. curimba*); and ventral bar (formed by thin sclerotized membrane with tick posterior margin and with reniform terminations, in *T. toksonum* and *T. curimba*, respectively). Other differences are in the shape of the ends of the dorsal bar (ends modified for attachment to dorsal anchors in *T. curimba*); and in the shape of the vaginal duct (sinuous in *T. toksonum*).The results presented here, contribute to expand the knowledge on the geographical distribution of species of *Tereancistrum* in Brazil.

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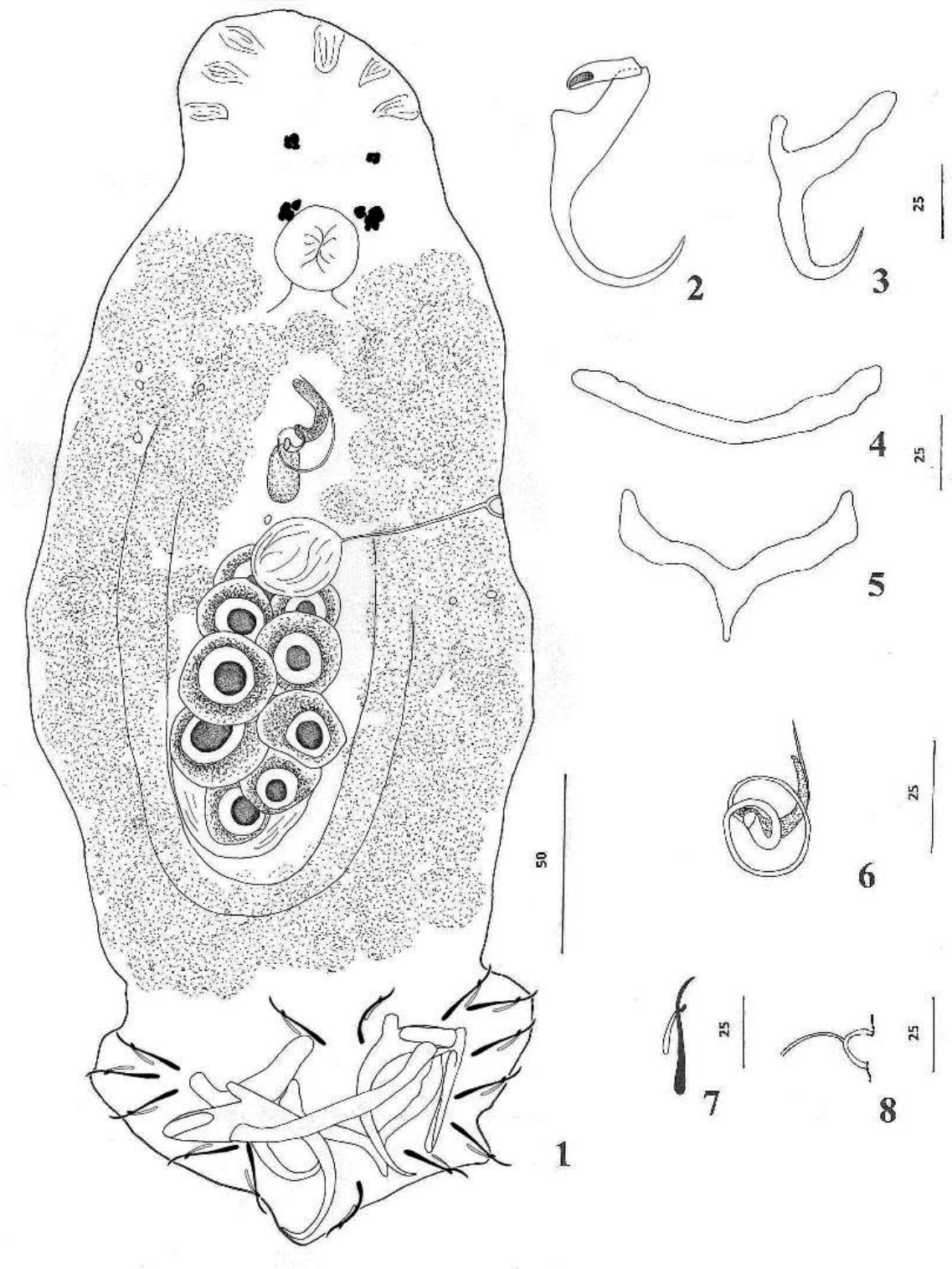

Figures 1–8. *Tereancistrum pirassununguensis* n.sp. Whole mount, ventral view. **2.** Ventral anchor. **3.** Dorsal anchor. **4.** Ventral bar. **5.** Dorsal bar. **6.** Sclerotized structures of Copulatory complex, ventral view. **7.** Hook. **8.** Vagina. Scale bars: 50 µm (Fig. 1), 25 µm (Figures. 2, 3, 4, 5, 6, 7, 8).

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