http://dx.doi.org/10.1590/1519-6984.12913 Original Article

First record of *Palombitrema triangulum* (Suriano, 1981) Suriano, 1997 (Monogenea: Dactylogyridae) from freshwater fishes in Brazil

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Received: July 16, 2013 – Accepted: August 30, 2013 – Distributed: March 31, 2015
(With 2 figures)

Abstract

This study reports for the first time the monogenean *Palombitrema triangulum* Suriano (1981) in freshwater fishes from Brazil, highlighting new sites of infection for this helminth and some morphological differences. Monogeneans were collected on the body surface, gills and nasal cavity of two native fish species from Brazil, *Cyphocharax modestus* (Fernández-Yépez, 1948) and *Cyphocharax nagelii* (Steindachner, 1881). A brief morphological characterization of this species is presented.

Keywords: Palombitrema Triangulum, *Cyphocharax modestus*, *Cyphocharax nagelii*, Peixe's River, Brazil.

Primeiro registro de *Palombitrema triangulum* (Suriano, 1981) Suriano, 1997 (Monogenea: Dactylogyridae) de peixes dulcícolas do Brasil

Resumo

Descreve-se a primeira ocorrência do monogenético *Palombitrema triangulum* Suriano (1981) em peixes dulcícolas do Brasil, destacando novos locais de infestação para este helminto e algumas diferenças morfológicas. Os monogenéticos foram coletados na superfície do corpo, brânquias e cavidade nasal de duas espécies de peixes nativos do Brasil, *Cyphocharax modestus* (Fernández-Yépez, 1948) e *Cyphocharax nagelii* (Steindachner, 1881). Uma breve caracterização morfológica desta espécie é apresentada.

Palavras-chave: Palombitrema triangulum, *Cyphocharax modestus*, *Cyphocharax nagelii*, rio do Peixe, Brasil.

1. Introduction

The monogenean *Androspira triangula* (Suriano, 1981) was described from gills of *Pseudocurimata gilberti* (=*Cyphocharax gilbert*) (Quoy and Gamard, 1824) in Laguna de Chascomús, Republica Argentina. Suriano (1997) considered *Androspira* (Suriano, 1981) a junior synonymy of *Palombitrema* Price and Bussing, 1968, and described the species *Palombitrema triangulum.* Currently, the genus *Palombitrema* includes three species*: P. heteroancistrium* Price and Bussing, 1968, *P. chascomusense* (Suriano, 1981) and *P. triangulum* reported in Argentina, Central America and southeastern Mexico (Mendoza-Franco et al., 2003).

Cyphocharax modestus (Fernández-Yépez, 1948) and *Cyphocharax nagelii* (Steindachner, 1881) are both benthopelagic and potamodromous species, zooplanktivorous (juveniles 40-50 days old) and detritivorous (larger individuals) distributed in South America: the first is found in upper Paraná River basin and Paraguay River above Sete Quedas Falls, and the other in upper Paraná River basin in Brazil (Froese and Pauly, 2011). The Peixe's River (48°06'38"W; 22° 49'53.1"S) is a tributary on the left bank of the middle Tiete River basin in Barra Bonita area, São Paulo State, Brazil, its headwaters are in the municipality of Torre de Pedra in the Basaltic Cuesta Botucatu Environmental Preservation Area and is a drainage basin corresponding to 584 km^2 running North to South (Caramaschi, 1986).

Cyphocharax modestus and *C. nagelii* are common species in Peixe's river, and studies on the occurrence of monogeneans in fishes from this river have not been performed yet. The aim of this study was to report for the first time the occurrence of *Palombitrema triangulum* Suriano in freshwater fishes from Brazil, highlighting new sites of infection for this helminth.

2. Material and Methods

During a helminthological survey carried out between March and August 2010, 58 specimens of *C. modestus* and 56 specimens of *C. nagelii* were collected from the Peixe's River to study their monogeneans. Fish were collected

using nylon monofilament gill nets with mesh sizes of 3-14 cm in three sites of Peixe's River. Nets were placed at 5 pm and removed the next day at 7 am, thus exposed for 14 h. The fish were removed from the nets and each specimen was separated in plastic bags. Some fish were maintained in coolers for one hour until necropsy, and others were frozen and analyzed posteriorly. The gills were removed and the gill arches were separated, placed in vials and filled with hot water (60 to 70° C). The vials were vigorously shaken to detach the parasites from the gill tissues. After 1 hour, absolute alcohol was added to the vials to fix the monogeneans. The body surface and nasal cavity were washed and sieved.

Some specimens were stained with Gomori's trichrome and mounted in Canada balsam, and others were mounted in Gray and Wess' medium (Humason, 1979) to study the sclerotized structures. Differential interference contrast microscopy (Leica DMLB 5000) was used for morphological examination. Measurements were obtained using a computerized image analysis system (LAS, Leica Microsystems, Wetzlar, Germany). Measurements (in micrometers) were expressed as mean followed by the range in parentheses. The illustrations were made with the aid of a camera lucida mounted on a Leica DMLS microscope. Voucher specimens were deposited in the Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, AM, Brazil and Coleção Helmintológica do Instituto de Biociências de Botucatu (CHIBB), Botucatu, SP, Brazil.

3. Results

3.1. Morphological description (Figures 1 and 2)

Based on twenty specimens: Dactylogyridae, Ancyrocetahlinae. Body fusiforme. Tegument smooth. Cephalic lobes incipient or absent, cephalic glands at level of pharynx. Eyes absent and accessory granules in cephalic

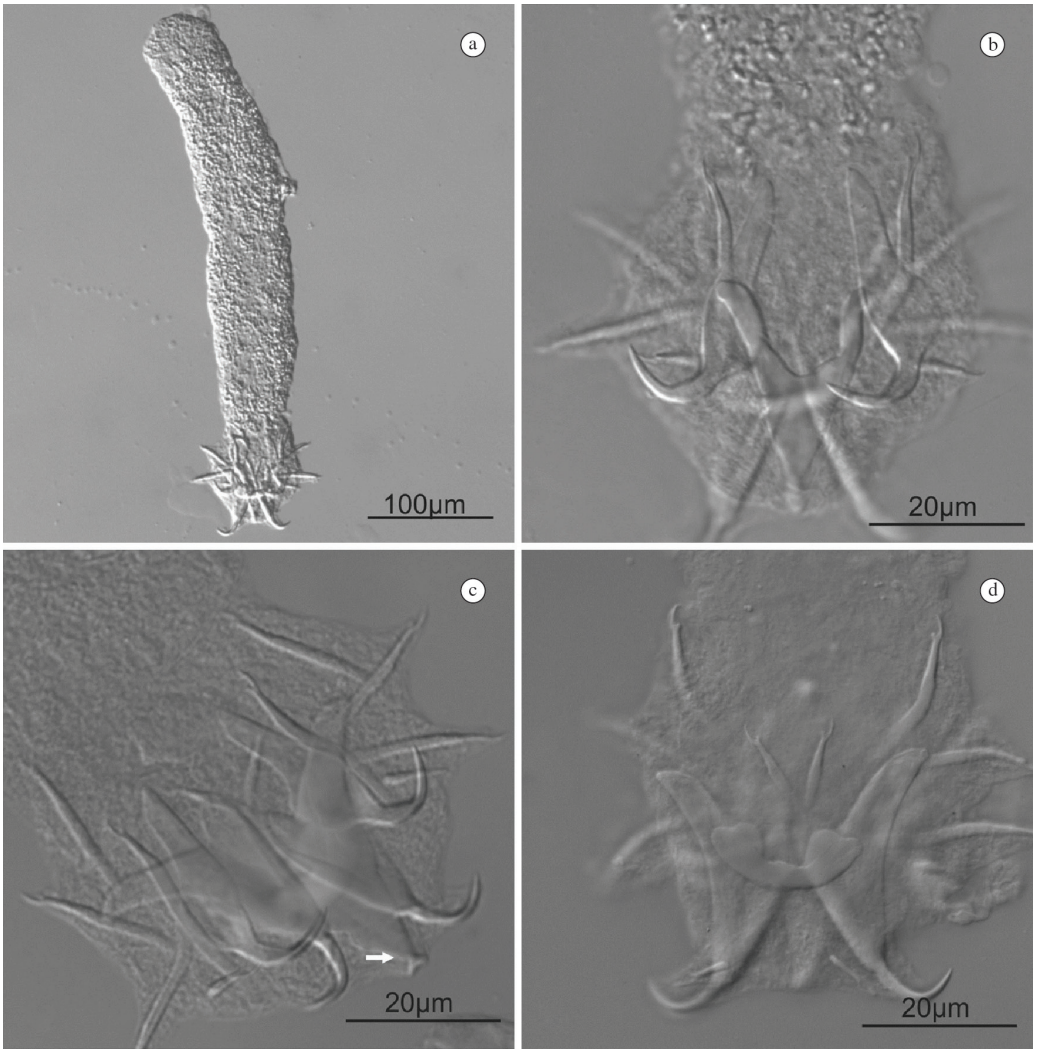

Figure 1. *Palombitrema triangulum* of *Cyphocharax nagelii* from Peixe's River, Brazil. (a) Whole worm, ventral view. (b) Haptor showing ventral anchor and bar. (c) Haptor showing hooks and detail of ventral anchor (arrow). (d) Haptor showing dorsal anchor and bar.

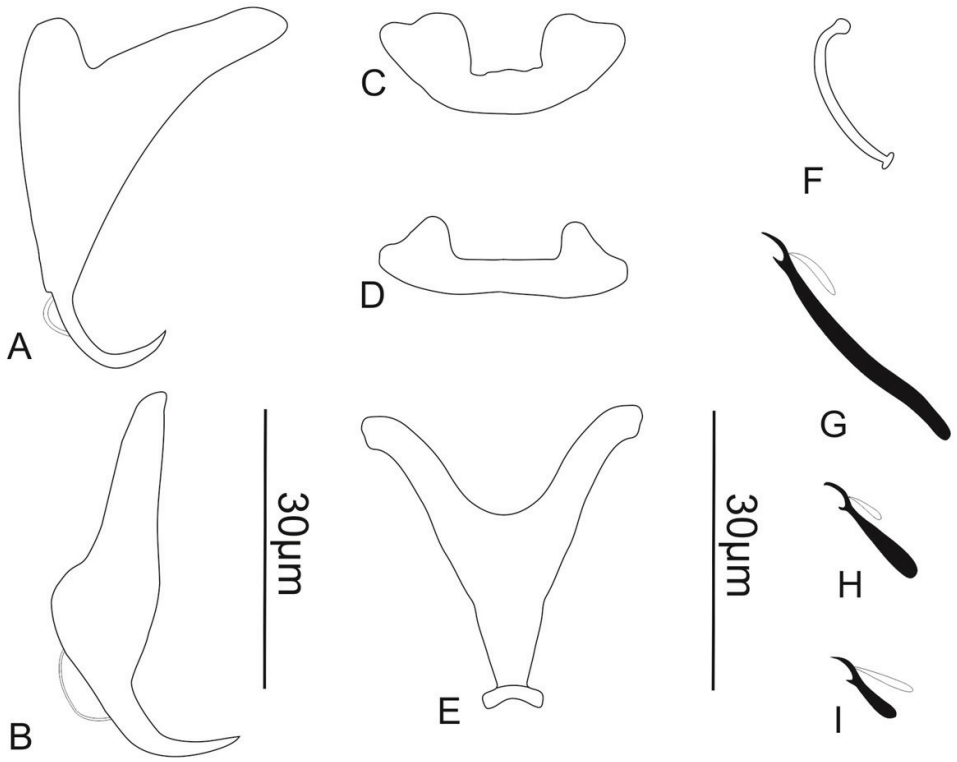

Figure 2. *Palombitrema triangulum* of *Cyphocharax nagelii* from Peixe's River, Brazil. (A) Dorsal anchor. (B) Ventral anchor. (C, D) Dorsal bars. (E) Ventral bar. (F) Vagina. (G) Hook Pairs 4-7. (H) Hook pairs 1 and 3. (I) Hook pair 2. Scale bar 30 µm.

area. Pharynx spherical. Peduncle short. Haptor subovate. Dorsal anchor with superficial root more developed than deep root, curved shaft and point. Ventral anchor with elongated superficial root and short deep root, curved shaft and point. Dorsal bar may present one of the two shapes: bowed with ends showing slight depression, or straight with rounded ends directed anteriorly. Ventral bar Y–shaped with a prominent projection. Hooks dissimilar. Ovary intercecal subovate; testis ovate postovarian. Cirrus tubular, spiral presenting three coils. Accessory piece composed by two pieces: one berry-shaped and other tweezers-shaped. One filament connects to the accessory piece with the base of cirrus. Seminal vesicle elongate; prostatic reservoir saccate. Vagina tubular dextral well sclerotized; seminal receptacle rounded. Vitellaria dense.

3.2. Taxonomic summary

Hosts: *Cyphocharax modestus* and *Cyphocharax nagelii*

Locality: Peixe's River (48°06'38"W; 22° 49'53.1"S), Anhembi, SP, Brazil

Site of infection: Body surface, gills and nasal cavity

Deposited specimens: INPA 597

4. Discussion

Morphometrical and morphological features of the studied specimens (Table 1) matches the description of *P. triangulum* by Suriano (1981). However, our specimens showed a ventral and dorsal anchor with superficial root more developed than the specimens described by the former authors and with filament present; in our specimens the dorsal bar can present two formats and the ventral bar present a prominent projection that is absent in specimens described by Suriano (1981). This may be related to intra-species variations that are common in Monogenea or to an adaptive process (Kritsky et al., 1995). These same authors studied the morphometric variability of specimens of *Scleroductus* Jara and Cone, 1989 reported from the external surface of four Siluriformes from the Guandu River and questioned whether the observed variations in morphology and size are of specific value or result from influences of host and/or environmental factors.

Although there are evidences of monogeneans with a broad host species spectrum, most of them show high host specificity, occurring on a single species or on closely related fishes. The monogeneans of the family Dactylogyridae are usually found in the gills, but they can inhabit the nasal cavities and, in rare cases, other body parts of hosts (Zanolo and Yamamura, 2006). The species found in this study were described only in the gills of their host (Suriano, 1981), however we recorded it in other sites with high infestation prevalence, intensity and abundance (Table 2). This data represent important information about the biology of this parasite, increasing the knowledge of the monogenean host-parasite interaction.

Table 1. Comparative measurements (in µm) of *Palombitrema triangulum* from *Pseudocurimata gilberti* from Argentina (Suriano, 19981) and *Cyphocharax modestus* (n=58) and *Cyphocharax nagelii* (n=56) from the municipality of Anhembi, São Paulo State, Brazil.

	Laguna de Chascomus, Republica Argentina (Suriano, 1981)	Peixe's River, municipality of Anhembi, São Paulo State, Brazil (current study)
Number of analyzed specimens	50	20
Ventral anchor a	38 (33-40)	37 (35-39)
Ventral anchor b	23 (20-30)	20 (18-23)
Ventral anchor c	0	0
Ventral anchor d	16 (15-20)	19 (17-21)
Ventral anchor e	10 (8-11)	10 (7-12)
Dorsal anchor a	36 (32-42)	41 (38-45)
Dorsal anchor b	25 (23-50)	30 (25-35)
Dorsal anchor c	4 (3-5)	6 (5-8)
Dorsal anchor d	17 (15-18)	17 (15-20)
Dorsal anchor e	9 (8-10)	11 (7-14)
Ventral bar x	27 (25-30)	29 (25-30)
Ventral bar w	20 (17-23)	24 (20-34)
Dorsal bar x	22.5 (20-25)	23 (21-27)
Dorsal bar w	4 (2.5-5)	4 (3-5.5)
Hook pairs I and III	17 (15-20)	15 (14-16)
Hook pair II	9.5 (8-10)	10 (7-13)
Hook pairs IV-VII	28 (25-30)	29.5 (24-33)
Accessory piece length	37.5 (35-40)	30.9 (26-33)
Cirrus length	205 (180-215)	205 (195-210)
Vagina	40 (35-50)	19 (14-21)
Body length	270 (245-280)	297 (243-433)
Body width	50 (45-60)	47 (33-65)

Table 2. Prevalence, mean intensity and mean abundance of *Palombitrema triangulum* in different sites of infestation from *Cyphocharax modestus* and *Cyphocharax nagelii* collected in Peixe's River, municipality of Anhembi, São Paulo State, Brazil.

Host	N	Prevalence (%)	Mean intensity	Mean abundance	Site of infestation
Cyphocharax modestus	58	47	3.6±0.10	2.9±0.07	Body surface
		73	6.8±0.30	4.2±0.18	Gills
		35	3.7±0.11	1.5±0.08	Nasal cavity
Cyphocharax nagelii	56	72	4.5±0.14	3.2±0.10	Body surface
		67	5.9±0.25	3.3±0.15	Gills
		41	4.8±0.14	1.9±0.10	Nasal cavity

This is the first record of *P. triangulum* in freshwater fishes from Brazil, and also the first report for the hosts *C. modestus* and *C. nagelii*.

Acknowledgements

Vanessa D. Abdallah was supported by a student fellowship from FAPESP (2009/51726-6), Rodney K. de Azevedo was supported by a student fellowship from FAPESP (2010/06564-5) and Reinaldo José da Silva was supported by a Research fellowship from CNPq (312590/2009-1) and FAPESP (2009/53316-0).

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