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A new species of *Jainus* (Monogenea), gill parasite of *Schizodon borellii* (Characiformes, Anostomidae) from the upper Paraná river floodplain, Brazil

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ABSTRACT. *Jainus piava* n. sp. is described from the gills of *Schizodon borellii* (Boulenger, 1900) (Characiform), commonly named as piava from the upper Paraná River floodplain, Brazil. The new species differs from the other members of *Jainus* in the following features: ventral bar thin broadly V-shaped and male copulatory organ (MCO) a coil of about 1.5 rings. *Jainus piava* n. sp. is similar to species of *Jainus* by having a ventral anchor base with flattened superficial root and elongate rodlike deep root.

Keywords: Dactylogyridae, ectoparasite, fish, piava.

RESUMO. Uma nova espécie de *Jainus* (Monogenea), parasito de brânquias de *Schizodon borellii* (Characiformes, Anostomidae) da planície de inundação do alto rio Paraná, Brasil. *Jainus piava* sp. nov é descrito para brânquias de *Schizodon borellii* (Boulenger, 1900) (Chacariformes) comumente chamado de piava na planície de inundação do alto rio Paraná, Brasil. A nova espécie difere de outros membros de *Jainus* pelas seguintes características: barra ventral fina levemente em forma de V e órgão copulatório masculino (MCO) com cerca de uma volta e meia de diâmetro do anel. *Jainus piava* sp. nov é similar a outras espécies do gênero *Jainus* por ter a âncora ventral com uma raiz superficial com extensão alongada.

Palavras-chave: Dactylogyridae, ectoparasitos, peixe, piava.

Introduction

According to Pavanelli et al. (2004), in Brazil there have been few studies about the ecology of freshwater fish parasites. This occurs due to a scarcity of systematic works on fish parasites. The upper Paraná River floodplain has 153 fish species; of these, around 12 species belong to the family Anostomidae (AGOSTINHO et al., 2004).

The following species of monogeneans were described parasitizing Anostomidae from South America: *Tereancistrum parvus* Kritsky, Thatcher & Kayton, 1980 from *Leporinus fasciatus* (Bloch, 1794); *Rhinoxenus arietinus* (Kritsky, Boeger & Thatcher, 1988) from *Rhytiodus argenteofuscus* (Kner, 1858); *Urocleidoides paradoxus* (Kritsky, Thatcher & Boeger 1986) from *R. microlepis* (Kner, 1858); *Rhinoxenus arietinus* (Kritsky, Boeger & Thatcher, 1988), *R. nyttus* Kritsky, Boeger &Thatcher, 1988 from *Schizodon fasciatus* (Spix & Agassiz, 1829) and *Jainus* sp. from *Schizodon borellii* (Boulenger, 1900) (KOHN; PAIVA, 2000).

In the upper Paraná river floodplain, Guidelli et al. (2006) recorded the following taxa: Ancyrocephalinae sp.1; *Jainus* sp.1*; Jainus* sp.2*; Kritskyia eirasi* Guidelli, Takemoto & Pavanelli, 2003*; R. arietinus; Tereancistrum* sp.2; *Tereancistrum parvus; Urocleidoides* sp.1; *Urocleidoides* sp.2; and *U. paradoxus* from *Leporinus lacustris* Campos, 1945; and *L. friderici* (Bloch, 1794); Ancyrocephalinae sp.2 from *L. lacustris*; Ancyrocephalinae sp.3 from *L. friderici.*

During a helminthological study on the freshwater fish *Schizodon borellii* (Boulenger, 1900) in Brazil, locally known as piava (GRAÇA; PAVANELLI, 2007), a new species of *Jainus* was found and described from the gills.

Material and methods

Eleven specimens of *S. borellii* were collected from September 2006 to September 2007 with nets in the upper Paraná river floodplain (22º50' – 22º70'S and 53º15' – 53º40'W), southern Brazil. Monogeneans were removed from the gills under stereo-microscope, killed in a 1:4000 formalin solution and preserved in 5% formalin. Some

specimens were mounted unstained in Hoyer's medium to study sclerotized structures. Other specimens, stained with Gomori's trichrome, were used to visualize internal organs (EIRAS et al., 2006). Measurements are in micrometers, with means followed by the range and number of specimens or structures measured in parentheses. Illustrations were prepared with the aid of a drawing tube and a Nikon YS 2 microscope. Ecological terminology is based on Bush et al. (1997). Numbering (distribution) of haptoral hook pairs follows Mizelle (1936), and the description of coiled tube of the male copulatory organ followed the suggestions of Kritsky et al. (1985). Type specimens were deposited in the Instituto Oswaldo Cruz Collection (CHIOC), Rio de Janeiro State, Brazil.

Results

Dactylogyridae Bychowsky, 1933

Ancyrocephalinae Bychowsky, 1937

Jainus Mizelle, Kritsky & Crane, 1967

Emended diagnosis: Dactylogyridae, Ancyrocephalinae. Body usually robust, divided into cephalic region, trunk, peduncle and haptor. Tegument thin and smooth. Cephalic lobes poorly developed or absent: head organs and cephalic glands inconspicuous or absent, accessory granules sparse in cephalic area. Eyespots four or six, provided by aggregations of dark-brown granules. Pharynx muscular; esophagus bifurcated in two intestinal crura usually posteriorly confluented. One testis, one ovary tandem or overlapping. Seminal vesicle a dilated portion of the vas deferens; prostates reservoir one or two. Genital pore ventral between pharynx and copulatory complex. Male copulatory organ and accessory piece articulated or nonarticulated proximally. Base of male copulatory organ adorned or not. Male copulatory organ with coils or not. Vagina sinistral (KRITSKY et al., 1987). Haptor with one pair of ventral anchors. Dorsal anchor base bifurcate with well-developed superficial and deep roots. Ventral anchor base with flattened superficial root end elongate rodlike deep root. Ventral anchor shaft reduced or absent, apparently incorporated into point and/or base. Anchor filaments frequently absent. Two transverse nonarticulated bars, each connecting bases of an anchor pair. Ventral bar with or without median anterior and often presence of a delicate posterior projection. Hooks 14, similar in shape; distributed as described by Mizelle (1936) except the pair one which may lies posterior to ventral bar. Vitellaria distributed randomly in trunk or as two bilateral bands confluent near pharynx and in posterior trunk. Parasites of Neotropical Characiformes.

Remarks: The description of the genus was based in two other species: *Jainus jainus* Mizelle, Kritsky & Crane, 1967 and *J. robustus* Mizelle, Kritsky & Crane, 1967, subsequently other two species were described *J. hexops* Kritsky & Leiby, 1972 and *J. amazonensis* Kritsky, Thatcher and Kayton, 1980 both with absent some characteristics in the description of the genus, such as variation in the number of eyes and articulation of the base accessory piece of the MCO.

Jainus piava n. sp. (Figures 1-2)

Type-host: *Schizodon borellii* (Boulenger, 1900) Characiformes

Site: gill filaments

Type-locality: upper Paraná river floodplain; Brazil (22º50' – 22º70'S and 53º15' – 53º40'W)

Specimens deposited: holotype, CHIOC 37235 a; 4 paratypes, CHIOC 37235 b, CHIOC 37235 c, CHIOC 37236.

Other specimens examined: *Jainus hexops* Mizelle, Kritsky & Crane 1093-4/5 and *Jainus jainus* Mizelle, Kritsky & Crane 1174-1/2.

Prevalence: 92.3% (examined 13, infested 12)

Mean Intensity: 28.25 parasites per host

Specimens studied: 10 specimens in Hoyer's medium and 11 stained with Gomori's trichrome.

Etymology: the specific name refers to the popular host's name.

Description: (based on 21 adult specimens) Body fusiform, length 309 (175–432; n = 6), greater width 124.7 (48–228; n = 10) in posterior half. Tegument thin and smooth. Cephalic region with apical three or four well-developed lateral lobes. Cephalic glands, lying in two bilateral groups dorsal-posteriorly to pharynx. Eyes 4; members of anterior pair smaller, usually closer together or nearly equidistant to members of posterior pair; a few accessory granules in some specimens in cephalic area. Pharynx subspherical, muscular, 10.2 (9.8– 10.7; n = 2) in diameter; esophagus reduced bifurcated in two intestinal crura usually confluented posteriorly. Peduncle short; haptor posteroventral, sub-square, 23.5 (n = 1) wide, 14.7 (n = 1) long. Hook distribution of ancyrocephaline arrangement (MIZELLE, 1936). Hooks 9.8 long and similar; each with erect thumb, slightly curved shaft and point; filamentous

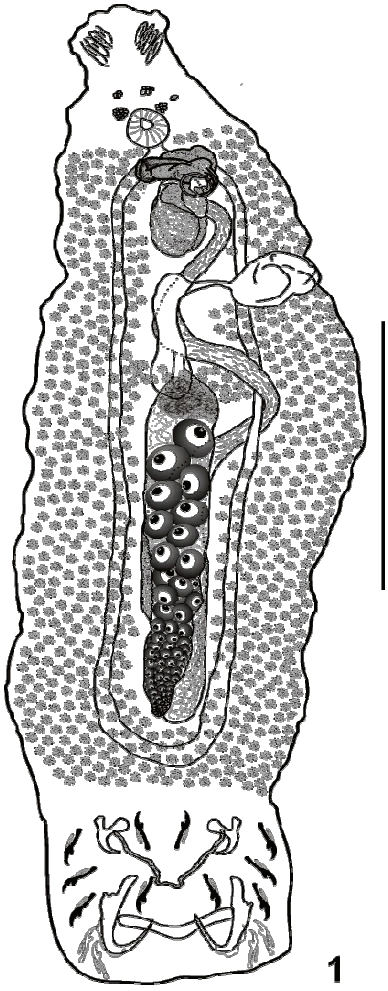

Figure 1. *Jainus piava* n. sp. from *Schizodon borellii*. Composite drawing of whole-mount (ventral view). Scale-bar: 75 μm.

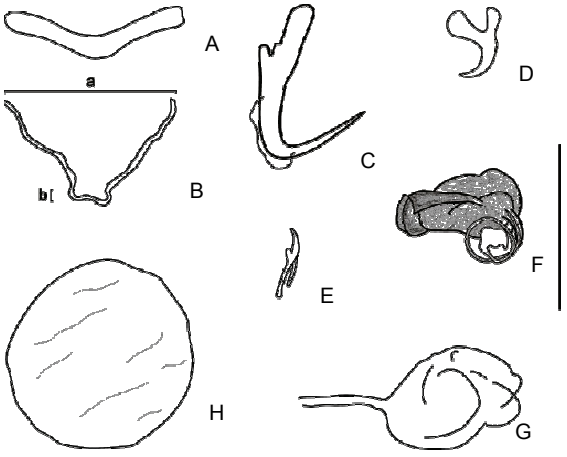

Figure 2. *Jainus piava* n. sp. from *Schizodon borellii*; A) dorsal bar; B) ventral bar; C) dorsal anchor; D) ventral anchor; E) hook; F) copulatory complex; G) vagina; H) egg. Measurements used: a) ventral bar wide, b) ventral bar long. Scale-bar: 25 μm.

hook loop approximately ¾ shank length. Ventral anchor 8.64 (6.86–10.7; n = 6) long, evenly curved shaft and pointed, superficial root with elongated terminal extension; anchor base 6.86 (5.88–8.82; n = 6) wide. Dorsal anchor 22.5 (n = 6) long, with a superficial depression on root, sharply recurved and pointed, constriction of anchor shaft near union with point, base 8.28 (5.8–8.82; n = 6) wide. Ventral bar 33.8 (30–38.2; n = 4) wide and 1.1 (0.98–1.47; n = 4) long , broadly V-shaped. Dorsal bar 30.7 (28.4–34; n = 5) wide, 2.85 (2.45–2.94; n = 6) long simple, arched. Gonads intercecal, tandem or slightly overlapping. Testis intercecal, postovarian, fusiform, 41 (14.7–68; n = 2) long, 19.6 (n = 1) wide; vas deferens conspicuous looping left intestinal caecum; seminal vesicle usually large, lying in midline immediately posterior to copulatory complex; prostatic reservoir pyriform, lying ventral to seminal vesicle. Copulatory complex situated posterior to pharynx. Male copulatory organ has coils of about 1.5 rings, ring diameter 11.9 (n = 5), accessory piece well developed, variable, articulating to male copulatory organ base, enclosing distal portion of this structure. Gonads overlapping. Ovary fusiform, elongated, 78 (68–88; n = 2) long, 15.6 (n = 1) wide; vagina sclerotized, adorned and sinistral; irregular seminal receptacle. Uterus delicate. Vitelline follicles throughout trunk, but absent in regions of gonads and copulatory complex. Egg spherical 31 (n = 1) diameter.

Discussion

Jainus was proposed by Mizelle et al. (1968) for monogeneans of Neotropical Characiformes. Before this work, the genus of this parasite comprised four species distributed in Southeast Amazon river basin and Costa Rica. Three species of *Jainus* were described from Characiformes of Southern America as follows: *J. jainus* from *Chalceus macrolepidotus* Cuvier, 1818; *J. robustus* from *Creatochanes affinis* (Güinther, 1864); *J. amazonensis* from *Brycon melanopterus* (Cope, 1872); and one from Costa Rica, *J. hexops* from *Astyanax fasciatus* (Cuvier, 1819).

The genus *Jainus* resembles *Urocleidoides* Mizelle & Price, (1964), by the presences of a male copulatory organ and nonarticulated proximally accessory pieces (MIZELLE et al., 1968). *Jainus* differs in the morphology of the copulatory complex and especially the ventral anchors. The dorsal anchors in *Jainus* possess a base with conventional superficial and deep roots and can be considered the normal anchor type for most Ancyrocephalinae. However, the ventral anchor base is characterized by a rodlike deep root.

Considering *Jainus piava* n. sp., four species of *Jainus* have previously been described from South America. The new species closely resembles the other members of *Jainus* by presenting a ventral anchor base with flattened superficial root and elongate rodlike deep root. *Jainus piava* n. sp. can be distinguished from *J. robustus*, *J. amazonensis*, *J. jainus* and *J. hexops* by the ventral bar without median anterior and delicate posterior projection and the morphology of the copulatory complex.

Jainus jainus and *J. robustus* have an accessory piece nonarticulated to the base of male copulatory organ, dorsal bar arched posteriorly (MIZELLE et al., 1968). *Jainus piava* n. sp. differs from these species by having accessory piece articulated and is similar to the others species by dorsal bar arched. This last character can be observed also in *J. amazonensis* (KRITSKY et al., 1980). *Jainus amazonensis* is also similar to *J. piava* sp. nov. by the prostatic pyriform reservoir, lying ventral to seminal vesicle, male copulatory organ with counterclockwise ring coiled, ventral bar broadly V-shaped.

Kritsky et al. (1987) resurrected *Characidotrema* Paperna & Thurston, 1968, so far considered as synonymy of *Jainus* Mizelle, Kritsky & Crane, 1968 by Paperna (1973). Both genera possess several similar and somewhat unique characteristics such as robust bodies with poorly developed peduncles and haptors; modified ventral anchor-bar complexes; overlapping gonads; strongly developed vitellaria; and both taxa are restricted as parasites of characoid fishes. Species of *Characidotrema* has a relatively uniform morphology of the haptoral sclerites and dextral vagina, wich is fundamentally different from the Neotropical species of *Jainus* (KRITSKY et al., 1980). This is the first dactylogyrid monogenean described from *Schizodon borellii*.

Conclusion

Jainus piava n. sp. is similar to species of *Jainus* by having a ventral anchor base with flattened superficial root and elongate rodlike deep root but differs from the other members of *Jainus* in the following features: ventral bar thin broadly V-shaped and male copulatory organ (MCO) a coil of about 1.5 rings.

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