



Neotropical Helminthology



RESEACH NOTE / NOTA CIENTÍFICA

FIRST REPORT OF *PSEUDOTELOECHIS YACAREI* CATTO & AMATO, 1993 (TELOECHIIDAE) IN *CAIMAN LATIROSTRIS* (DAUDIN, 1802) (ALLIGATORIDAE) IN BRAZIL

PRIMER REPORTE DE *PSEUDOTELOECHIS YACAREI* CATTO & AMATO, 1993 (TELOECHIIDAE) EN *CAIMAN LATIROSTRIS* (DAUDIN, 1802) (ALLIGATORIDAE) EN BRASIL

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ABSTRACT

Caiman latirostris (Daudin, 1802) occurs in South America, where its geographic distribution extends down to Uruguay. Very little is known about helminths of *C. latirostris*; therefore, the present study reports the first occurrence of *Pseudoteloechis yacarei* Catto & Amato, 1993 in these animals. Six young and juvenile specimens of *C. Latirostris* were collected in Caravelas, Bahia, Brazil. The animals were necropsied and six animals had their digestive tracts evaluated for further analysis. In 5 of the 6 hosts analyzed, 16 specimens of *P. yacarei* were collected from the stomach and small intestine with a prevalence of 83%. Hence, this study presents the broad-snouted caiman as a new host of *P. yacarei*.

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RESUMEN

Caiman latirostris (Daudin, 1802) es encontrada en América del Sur, donde su distribución geográfica se extiende hasta Uruguay. Existe muy poca información en la literatura sobre los helmintos en *C. latirostris*; por lo tanto, el presente estudio reporta la primera aparición de *Pseudotelororchis yacarei* Catto & Amato, 1993 en estos animales. Fueron recolectados seis individuos jóvenes y juveniles de *C. latirostris* en Caravelas, Bahía, Brasil. Fue realizada la necropsia de los animales y siendo evaluados sus tractos digestivos para análisis posteriores. En el estómago e intestino delgado de cinco de los seis hospederos analizados fueron recolectados 16 ejemplares de *P. yacarei*, con una prevalencia de un 83 % para la muestra. Por lo tanto, este estudio presenta al Caimán de hocico ancho como un nuevo hospedero de *P. yacarei*.

Keywords: Alligatoridae – Caimán de hocico ancho – *Caiman latirostris* – crocodílicos – fauna helmíntica – *Pseudotelororchis yacarei* – Trematoda

INTRODUCTION

The broad-snouted caiman [*Caiman latirostris* (Daudin, 1802)] occurs in South America and its geographical distribution extends to Brazil, Argentina, Paraguay, Uruguay and Bolivia, in latitudes ranging from 5° S to 34° S and altitudes up to 800 m, with populations of low densities dependent on ecosystems with water and vegetation, such as rivers, swamps, lagoons, mangroves, among other environments of the Atlantic Forest, Cerrado, Caatinga and Pampas biomes, as well as in environments near cities, industries and rural areas (Coutinho *et al.*, 2013). This species is considered a top predator, so any loss of individuals can lead to an impact on the balance of the local ecosystem. In Brazil, much of the species' geographic distribution is in remnants of the Atlantic Forest (Coutinho *et al.*, 2013).

Very little is known about the helminths of *C. latirostris*. Only two trematodes are described in this host: *Cystodiplostomum hollyi* (Dubois, 1936) and *Herpetodiplostomum caimancola* (Dollfus, 1935) and one nematode: *Brevemulticaecum pinto* (formerly named *Multicaecum agile*) (see Werneck & Jerdy, 2020), all of these described in free-living animals. In addition, fecal analyses of *C. latirostris* in commercial farms revealed the presence of *Eimeria* and *Isopora* oocysts and eggs of *Acanthostomum* spp. and *Balantidium* spp., *Capillaria* spp., *Dujardinascaris* spp., and *Strongyloides* spp. (Batista *et al.*, 2011; Batista *et al.*, 2012).

In order to expand the knowledge about the helminth fauna of Brazilian crocodilians, the present work reports

the first occurrence of *Pseudotelororchis yacarei* (Catto & Amato, 1993) (Telorchiiidae) in specimens of broad-snouted caimans in Brazil.

MATERIALS AND METHODS

This study was conducted in the municipality of Caravelas, in the state of Bahia, northeastern coast of Brazil, located in the Atlantic Forest biome, in 2019. Six young specimens of *C. latirostris* were collected (Snout-vent length < 30 cm- sexing was not possible due to size). During the necropsies, the digestive tracts of six analyzed hosts were kept frozen for later analysis. In the laboratory the digestive tract was separated into esophagus, stomach, small intestine, and large intestine. The segments were opened individually using scissors and forceps and their contents were cleaned and concentrated with sieves (0.3 mm and 0.150 mm mesh size) and examined under a stereomicroscope. Trematode specimens were fixed in alcohol-formalin-acetic acid, stained with chlorhydric carmine, and cleared with eugenol and analyzed using a computerized system for image analyses (S-EYE image analysis Software).

Prevalence, mean infection intensity, and mean abundance values, determined according to Bush *et al.* (1997), were calculated in the Quantitative Parasitology Program QP 3.0, (Reiczigel *et al.*, 2019). The 95% confidence intervals (CI) of prevalence were calculated by Sterne's exact method and for mean intensity and mean abundance using bootstrapping with 2,000 replications.

The helminths collected during the study were deposited in the Coleção Helminológica do Instituto Oswaldo Cruz (CHIOC), Rio de Janeiro, Brazil (CHIOC 39628 a-b). All collections were authorized by federal licenses for activities with scientific purposes (Sistema de Autorização e Informação em Biodiversidade -SISBIO number 48573) of the Brazilian environmental agency (ICMBIO-IBAMA).

The original description of *P. yacarei* (Catto & Amato, 1993) was used for the morphological and morphometric comparison of the specimens found during the present work.

Ethic aspects: For this study formal consent is not required.

RESULTS

Sixteen specimens of *P. yacarei* were found from 5 of the 6 hosts analyzed [Prevalence = 83.3 % (41.1 - 99.2)], collected in the stomach and small intestine. The mean intensity was 3.2 (1.6 - 5.4) and the mean abundance was 2.67 (1.17 - 4.83).

Pseudotelorchis yacarei (Fig. 1) description: parasite with round anterior end and tapered posterior end; large, ventral, and terminal oral sucker; short and sinuous esophagus; prepharynx and pharynx present; thin ceca, running along the body in dorsal position to uterine loops and ending near the posterior end of body, with region ending asymmetrically; rounded acetabulum, in the initial third of the body; cirrus sac curved and anterior to the acetabulum; external seminal vesicle present; testis in tandem, oval, intracecal, occupying the final third of the body; post-acetabular oval ovary; uterine loops occupying almost the entire middle third of the body, ventral to the ceca, between the ovarian region and the anterior testis; vitellaria occupying the marginal region of the body, between the genital pore and the end of the anterior testis; genital pore lateral to the sinistral acetabulum; oval eggs.

DISCUSSION

Catto & Amato (1993) described *P. yacarei* based on specimens found in the intestines of *Caiman crocodilus yacare* (Daudin, 1802) from the Pantanal region, in the city of Corumbá, in the state of Mato Grosso do Sul,

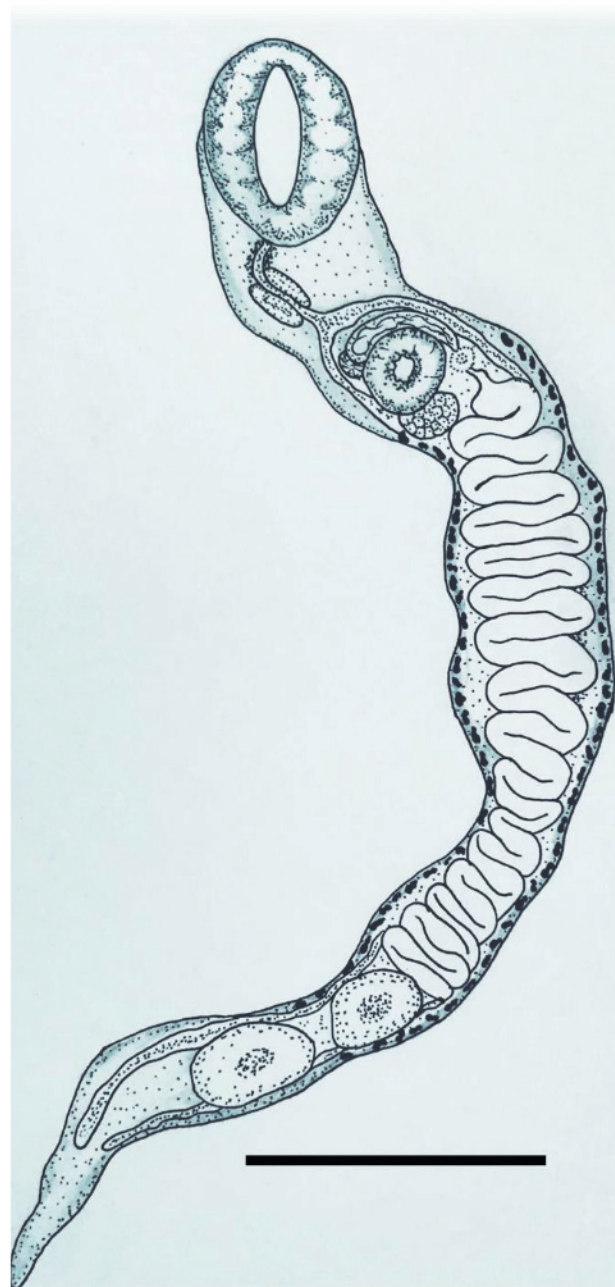


Figure 1. *Pseudotelorchis yacarei* Catto & Amato, 1993 (Digenea: Telorchhiidae) found in *Caiman latirostris* (Daudin, 1802) (Crocodylia: Alligatoridae) from Brazil. (scale bar= 0.5 mm).

Brazil. In all, 64 necropsies were performed in 19 hosts (prevalence of 29.6%) and a total of 1,349 specimens of *P. yacarei* were identified, which represented an average intensity of 71.

The morphological comparison performed in this study was compatible with the data presented by Catto & Amato (1993) especially the shape of the body and oral

sucker, besides the position of the cirrus sac and the shape and distribution of the vitelline follicles.

The morphometric comparison of *P. yacarei* specimens (Table 1) revealed that the dimensions of the body, oral sucker, pharynx, testes, cirrus sac, and egg length are slightly larger than the previously published data for the

species (Catto & Amato, 1993). However, these data do not invalidate the identification of the species and are treated herein as just an individual variation within the species, which is not uncommon, since the present report offers the second report of morphometric data for *P. yacarei* in the literature.

Table 1. Morphometric data of *Pseudotolorchis yacarei* Catto & Amato 1993 (Digenea: Telorchhiidae) from *Caiman* sp. (Reptilia: Alligatoridae). Measurements in micrometers as Range (mean).

	Catto & Amato (1993)	Present Report
Host	<i>Caiman crocodilus yacare</i> (Daudin 1802)	<i>Caiman latirostris</i> (Daudin 1802)
Site	Intestine	Stomach and intestine
Locality	Corumbá, Mato Grosso do Sul, Brazil	Caravelas, Bahia, Brazil
N	20	16 (6 measurement)
Body length (mm)	1.44 – 3.07 (2.13)	2.85 – 3.60 (3.062)
Body width	256 – 530 (381)	290 – 330 (312)
Oral sucker length	204 – 394 (278)	350 – 440 (384)
Oral sucker width	190 – 423 (269)	260 – 300 (282)
Pharynx length	102 – 175 (141)	160 – 180 (169)
Pharynx width	102 – 153 (143)	119 – 150 (133)
Ventral sucker length	94 – 182 (132)	120 – 150 (133)
Ventral sucker width	87 – 182 (130)	150 – 193 (171)
Anterior Testes length	87 – 182 (138)	122 – 220 (174)
Anterior Testes width	65 – 189 (126)	74 – 140 (102)
Posterior Testes length	109 – 226 (156)	220 – 250 (238)
Posterior Testes width	58 – 189 (120)	120 – 150 (133)
Cirrus sac length	43 – 102 (67)	74 – 120 (95)
Cirrus sac width	106 – 233 (144)	129 – 172 (148)
Ovary length	73 – 211 (112)	70 – 137 (107)
Ovary width	5 – 182 (112)	80 – 120 (100)
Eggs length	23.7 – 31 (27)	23 – 32 (27)
Eggs width	11 – 14.6 (12)	11 – 14 (13)

The present work presents the broad-snouted caiman as a new host for *P. yacarei*, thus expanding the knowledge about this host in the Brazilian region.

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BIBLIOGRAPHIC REFERENCES

- Batista, A.M.B., Da Costa Pereira, M.A.V., Vita, G.F., Barros, S.C.W., & Barbosa, C.G. (2011). Coproparasitological diagnosis of oligators (*Caiman latirostris* Daudin, 1802) commercially raised in Rio de Janeiro. *ARS Veterinaria*, 27, 102-110.
- Batista, A.M.B., Da Costa Pereira, M.A.V., Vita, G.F., Barbosa, C.G., Silva, A., I.M., Barros, S.C.W., Magalhães, A.R., & Freitas, J.P. (2012). Levantamento qualitativo de gêneros de parasitas em amostras fecais de jacaré criados comercialmente em sistema fechado no Estado do Rio de Janeiro. *Revista Pesquisa Veterinária Brasileira*, 32, 1045-1049.
- Bush, A.O., Lafferty, K.D., Lotz, J.M., & Shostak, A.W. (1997). Parasitology meets ecology on its own terms: Margolis et al. revisited. *Journal of Parasitology*, 83, 575-583.
- Catto, J.B., & Amato, J.F.R. (1993). Digenetic trematodes (Cryptogonimidae, Acanthostominae) parasites of the caiman, *Caiman crocodilus yacare* (Reptilia, Crocodylia) from the Pantanal Mato-Grossense, Brazil, with the description of a new species. *Memorias do Instituto Oswaldo Cruz*, 88, 435-440.
- Coutinho, M.E., Marioni, B., Farias, I.P., Verdade, L.M., Bassetti, L., De Mendonça, S.H.S.T., Vieira, T.Q., Magnusson, W.E., & Campos, Z. (2013). Avaliação do risco de extinção do jacaré-de-papo-amarelo *Caiman latirostris* (Daudin, 1802) no Brasil. *Biodiversidade Brasileira*, 3, 13-20.
- Reiczigel, J., Marozzi, M., Fabian, I., & Rosza, L. (2019). Biostatistics for parasitologists – a primer to Quantitative Parasitology. *Trends in Parasitology*, 35, 277-281.
- Werneck, M.R., & Jerdy, H.L. (2020). Endoparasitas em crocodilianos brasileiros. In: Barreto-Lima, A., Santos, M.R.D., & Cardoso, Y.N. (eds). *Tratado de crocodilianos do Brasil*. Instituto Marcos Daniel.

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