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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

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Proctocaecum dorsale *n. sp. is described and* Caimanicola marajoara *Freitas & Lent, 1938 is redescribed based on specimens collected from* Caiman crocodilus yacare *(Daudin) from the Pantanal Mato-grossense, State of Mato Grosso do Sul, Brazil. This report extends southward the known geographic distribution of* C. marajoara. *It is the first record of the genus* Proctocaecum *in South America, and in the caiman.* Proctocaecum dorsale *n. sp. differs from the other eight species in the genus by the dorsal location of the anal openings, instead of being lateral or in the posterior extremity of the body.*

Key words: *Proctocaecum dorsale* n. sp. – *Caimanicola marajoara* – *Caiman crocodilus yacare* – Criptogonimidae – Acanthostominae – digenetic trematodes – Pantanal Mato-grossense – Brazil

The Acanthostominae Poche, 1926 has 35 species distributed in six genera. Eighteen of these species are parasites of crocodilians around the world (Brooks, 1980). The only species in the subfamily which parasitizes crocodilians in Brazil, *Caimanicola marajoara,* was described by Freitas & Lent (1938) based on material collected from *Caiman sclerops* Gray (= *Caiman crocodilus crocodilus*) from the Amazon region. Travassos (1922, 1928) described two new species of digenetic trematodes *Odheneriotrema microcephala* and *Pachypsolus sclerops* from the esophagus and cloaca, respectively, of *Caiman crocodilus yacare* (Daudin), identified as *C. sclerops.* Later, Dubois (1988) collected *Proterodiplostomum longum* (Brandes, 1888) from *C. c. yacare,* in Paraguay, completing the list of digenetic trematodes recorded from this host. In this paper, we add two new species of digenetic trematodes to the list of parasites of *C. c. yacare,* one of them new to science, and a new key for species of the genus *Caimanicola.*

MATERIALS AND METHODS

The specimens studied are part of the material collected from 64 necropsies made from January 1985 and January 1989, in the Pantanal Mato-grossense region (Catto, 1991). The hosts were captured alive and killed in the Laboratório de Parasitologia do Centro de Pesquisa Agropecuária do Pantanal da Empresa Brasileira de Pesquisa Agropecuária, Corumbá, Estado de Mato Grosso do Sul, following the recommended procedures. The caimans were captured with written permission from IBAMA (Instituto Brasileiro do Meio Ambiente) given to the first author. The helminths were collected and processed according to Amato (1982, 1985). They were fixed in A. F. A. (ethyl alcohol 70 °GL (Gay Lussac) – 93 parts, formaldehyde solution 37% – 5 parts, and glacial acetic acid – 2 parts), or in glacial acetic acid for 2-3 min without pressure. After 24 hours in A. F. A., were transferred to the preservative ethyl alcohol 70 °GL. The helminths were stained with Delafield's hematoxilin, and were destained in ethyl alcohol 70 °GL with hydrocloric acid 0.5%, dehydrated in an ethyl alcohol series, cleared in beechwood creosote or methyl benzoate, and mounted in Canada balsam. The illustrations were prepared with a drawing tube and a Wild Leitz microscope. Measurements are in micrometers unless otherwise indicated. The range of measurements is followed by the average within parentheses. The terms preacetabular pit, postaceatabular pit, and gonotyl are used sensu Brooks & Overstreet (1977). The terms forebody and

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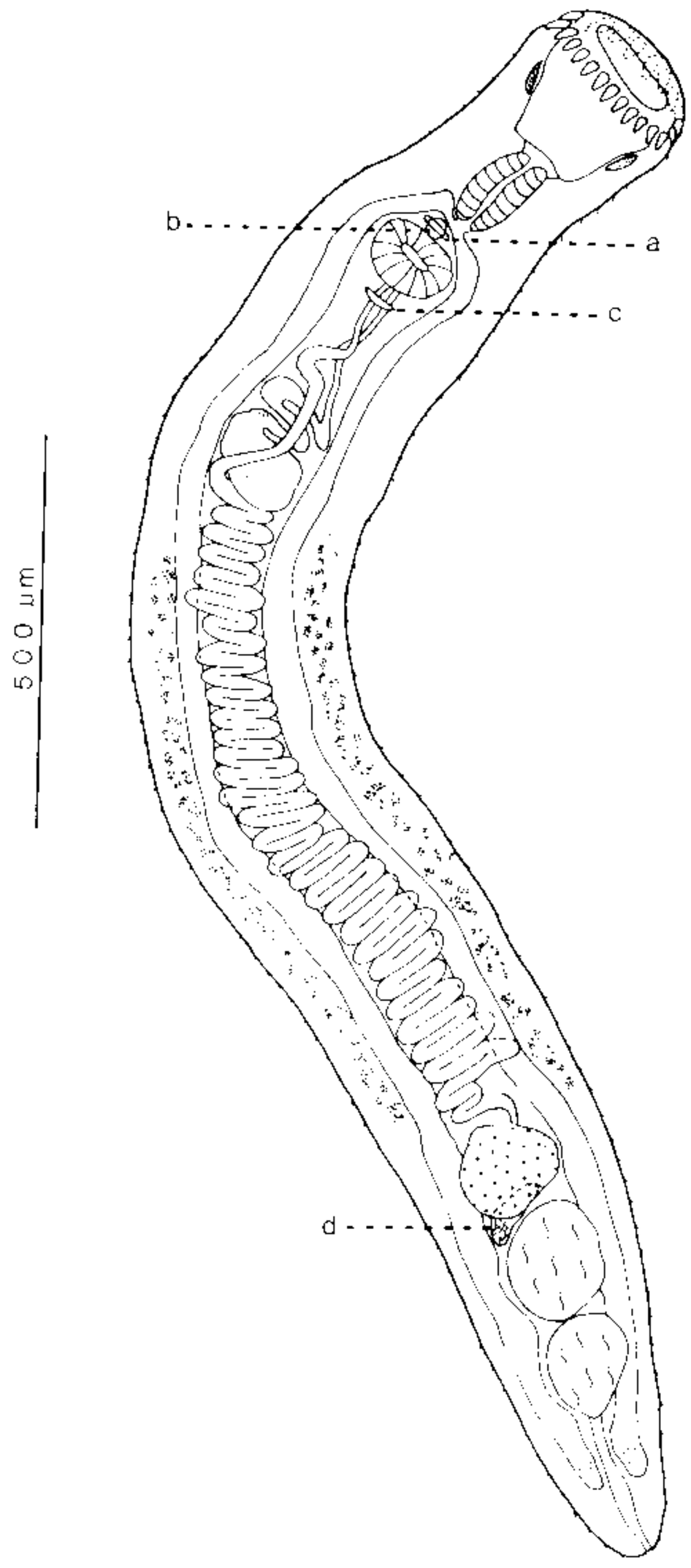
hindbody follow the proposition of Yamaguti (1971); TBL is the abbreviation for Total Body Length. Holotype, paratypes, and voucher specimens were deposited in the Coleção Helmintológica da Fundação Instituto Oswaldo Cruz (CHIOC), Rio de Janeiro, RJ, Brazil, while paratypes and voucher specimens were also deposited in the Helminthological Collection of the United States National Museum (USNM), Beltsville, Maryland, U.S.A.

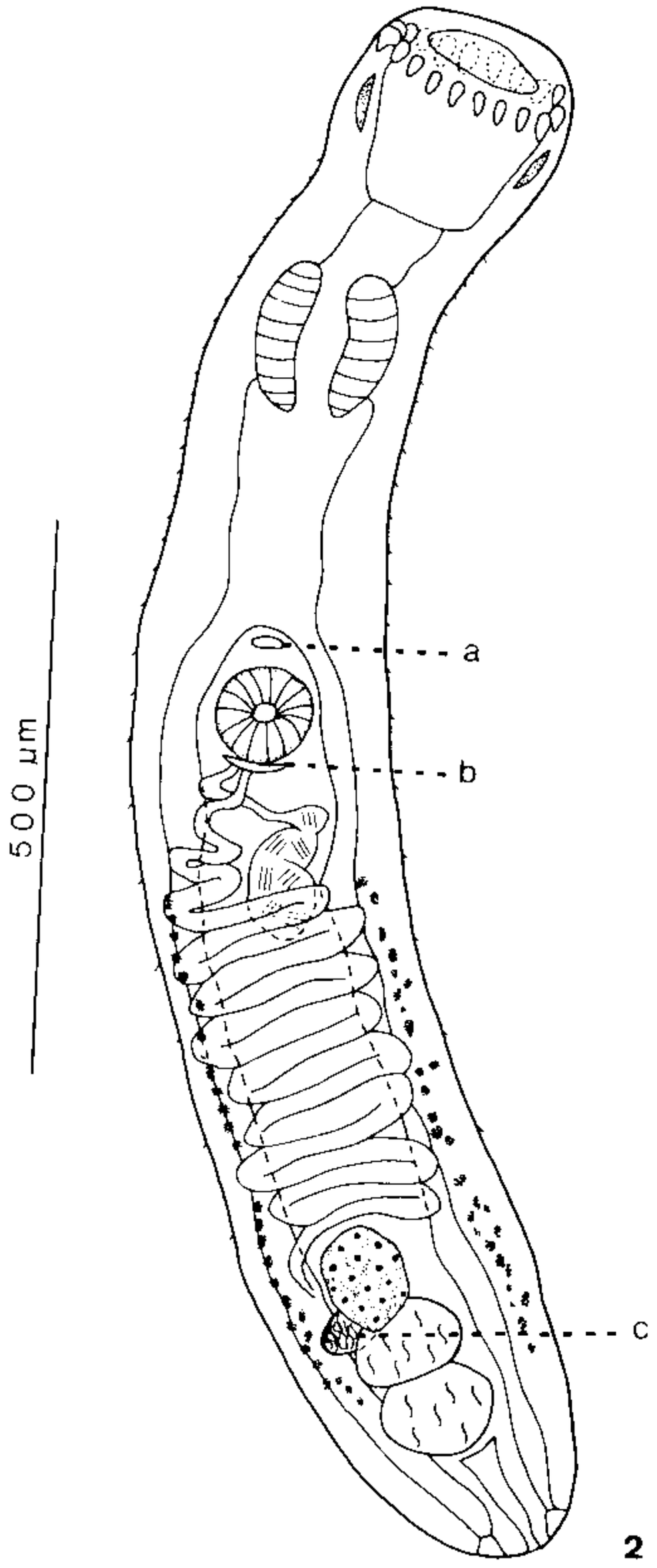
DESCRIPTIONS

Proctocaecum dorsale n. sp.
(Fig. 1)



1

Proctocaecum dorsale n. sp. – Fig. 1: holotype, ventral view. a. preacetabular pit. b. gonotyl. c. postacetabular pit. d. seminal receptacle.



2

Caimanicola marajoara – Fig. 2: adult, ventral view. a. preacetabular pit. b. postacetabular pit. c. seminal receptacle.

DESCRIPTION (based on 20 specimens, mounted *in toto*): Cryptogonimidae, Acanthostominae. Body elongate, 2.04-6.03 mm (3.22 mm) long, 16-43 (36) wide at level of acetabulum; length to width ratio 7.2-20:1 (12.3:1). Tegument with small spines, getting sparse toward posterior extremity. Acetabulum 94-153 (120) long, 94-175 (122) wide. Forebody 11-24% (17%) of TBL. Preacetabular pit 36-160

(62) wide, with spines in anterior wall. Gonotyl opening into ventral surface of preacetabular pit, posterior portion globular, surrounded by groups of glandular cells, 20-45 (30) long, 25-64 (38) wide, 54-73 (63) deep; postacetabular pit without spines, frequently extroverted, immediately postacetabular, 36-64 (44) wide, surrounded by few glandular cells. Oral sucker terminal, 102-211 (147) long, 124-248 (160) wide, surrounded anteriorly by continuous row of 23 circumoral spines, 31-54 (36) long, 11-21 (15) wide; circular muscular thickening in the middle of oral sucker; prepharynx 43-182 (96) long; pharynx slightly anteriorly, 94-146 (113) long, 58-160 (101) wide; esophagus 7-51 (25) long; distance between cecal bifurcation and anterior margin of acetabulum 0.4-3.4% (2.2%) of TBL; two ani opening dorsally, 0.8-4.4% of TBL, from posterior extremity, occasionally opening at different levels. Oral sucker width ratio to acetabulum 1:0.6-1.0 (1:0.7); oral sucker width ratio of pharynx, 1:0.3-1.2 (1:0.6). Testes spheric to subspheric, smooth, same field, contiguous; anterior testis 73-197 (138) long, 80-248 (130) wide; posterior testis 94-240 (160) long, 73-226 (124) wide; posttesticular distance 2.3-8.2% (3.7%) of TBL; seminal vesicle bipartite, median, intercecal, anterior portion long, sinuous, posterior portion globular; distance between anterior margin of seminal vesicle and acetabulum less than two times its diameter; prostatic complex inconspicuous, with few free cells in parenchyma; genital pore between preacetabular pit and anterior margin of acetabulum. Ovary pretesticular, spheric to subspheric, smooth, occasionally contiguous to anterior testis, 80-219 (135) long, 65-175 (116) wide; seminal receptacle posterodorsal do ovary; Mehlis' gland dorsal to anterior portion of ovary; Laurer's canal present; uterus with ascendant loops, intercecal, between ovary and posterior portion of seminal vesicle, becoming straight; loops occupying 35-54% (43%) of TBL; metraterm joining male duct near genital pore forming tubular genital atrium; vitelline glands ventral, lateral to ceca, in groups, posteriorly reaching anterior margin of ovary, anteriorly reaching posterior portion of seminal vesicle; occasionally the anterior extension of vitelline glands ends at different levels; eggs numerous, yellowish to brown, 20-25 (23) long, 9-13 (10) wide. Excretory system "Y" shaped, bifurcating posterodorsally to acetabulum, anterior arms extending to base of oral sucker, excretory pore terminal.

Taxonomic summary

Type host: *Caiman c. yacare* (Daudim).

Site of infection: intestine.

Type locality: Nhumirim Farm, 18° 59'S, 56° 39'W, Corumbá, Mato Grosso do Sul, Brazil.

Other locality: Santana Farm, 18° 06'S, 56° 36'W, Corumbá, Mato Grosso do Sul, Brazil.

Prevalence: 20.3%.

Mean intensity of infection: 93.

Etymology: the specific epithet *dorsale* refers to the location, always dorsal, of the ani.

Specimens deposited: Holotype: CHIOC No. 32896a; paratypes: Nos 32896 b and c; 32897a and b; 32898; 32899a and b; 33000a and b. Paratypes: USNM Nos. 82629 (4 slides); 82630 (6 slides).

Remarks

Brooks (1980) in his revision of the Acanthostominae recognized eight species of *Proctocaecum;* three parasitizing *Crocodylus niloticus* Laurenti, in Africa; three parasitizing *C. porosus* Schneider, in the Pacific Ocean; one parasitizing *C. johnsoni* Kreff, in Australia, and one parasitizing *Alligator mississippiensis* (Daudin), in North America. This author has separated the species within this genus in two groups by the position of the anal apertures, whether lateral or in the posterior extremity of the body. This species differs from all others in the genus by having dorsal anal apertures. It is the first species of *Proctocaecum* parasitizing crocodilians of the genus *Caiman* and the first species of the genus, so far, recorded in South America.

Caimanicola marajoara Freitas & Lent, 1938
(Fig. 2)

REDESCRIPTION (based on 58 specimens, 20 measured; and on the specimens examined listed bellow): Cryptogonimidae, Acanthostominae. Body elongate, posterior extremity slightly truncated, 1.42-2.23 mm (1.75) long, 21-53 (33) wide at level of acetabulum; length to width ratio 3.7-7.5:1 (5.4:1). Tegument with scale-like spines, up to 5 long, in anterior portion of body, 14.6 long, 9.5 wide at base, between oral sucker and acetabulum, progres-

sively smaller toward hindbody. Acetabulum 87-168 (120) long, 94-182 (125) wide. Forebody 42-61% (49%) of TBL. Preacetabular pit, 43-72 (55) wide, with spines in anterior wall; postacetabular pit, 65-131 (82) wide, 1.5 to 2 times deeper than preacetabular pit, immediately postacetabular, surrounded by groups of glandular cells. Oral sucker terminal, 131-219 (210) long, 153-299 (212) wide, surrounded anteriorly by single row of 19-21, generally 20 spines, 31-66 (42) long, 13-22 (17) wide at base; circular muscular thickening surrounding middle of oral sucker; prepharynx, 51-314 (124) long; pharynx doliiform, 124-190 (163) long, 124-197 (155) wide; esophagus occasionally wider than pharynx, 146-511 (280) long; distance between cecal bifurcation and anterior margin of acetabulum, 2.4-5.8% (3.7%) of TBL; ceca opening individualy forming two ani, in posterior portion of body. Oral sucker width ratio to acetabulum 1:0.53-0.71 (1:0.58); oral sucker width ratio to pharynx 1:0.67-0.84 (1:0.75). Testes in posterior region of body on dorsal surface, generally contiguous, spheric to subspheric, smooth; anterior testis 60-146 (88) long; 94-233 (133) wide; posterior testis 60-153 (100) long, 87-140 (105) wide; posttesticular space 1.6-9.2% (5.7%) of TBL; seminal vesicle bipartite, intercecal, postacetabular, anterior portion longer, sinuous, posterior portion globular; prostatic complex inconspicuous; genital pore between acetabulum and preacetabular pit. Ovary pretesticular, intercecal, spheric to subspheric, smooth, 87-182 (127) long, 73-146 (98) wide; seminal receptacle dorsal to posterior portion of ovary, 58-146 long, 29-80 wide; Mehlis' gland anterior to seminal receptacle; Laurer's canal not observed; uterine loops always preovarian, intercecal or cecal, extending to acetabulum, 30-40% (37%) of TBL; metraterm short, joining male duct at level of preacetabular pit forming tubular genital atrium; vitelline glands lateral, cecal, in groups, extending from the posterior margin of seminal vesicle to testicular zone, 25-37% (30%) of TBL; eggs yellowish to brown, 20-25 (23) long, 9-11 (10) wide. Excretory vesicle "Y" shaped, bifurcating dorsally to acetabulum, anterior arms extending to base of oral sucker; excretory pore terminal.

Taxonomic summary

Synonyms: *Acanthostomum acuti* Caballero & Brenes, 1958. *Atrophecoecum acuti* of Groschaft & Barus (1970). *Acanthostomum marajoarum* Carter & Etges, 1972.

Host: *Caiman c. yacare* (Daudin).

Site of infection: intestine.

Localities: Nhumirim Farm, 18° 59'S, 56° 39'W, and Santa Farm, 18° 06'S, 56° 36'W, Corumbá, Mato Grosso do Sul, Brazil.

Prevalence: 17.1%.

Mean intensity of infection: 27.

Specimens examined: CHIOC No. 9807 (holotype and paratype). *Caimanicola marajoara* Freitas & Lent, 1938. UNAM. No. 216-16. *Acanthostomum acuti* of Caballero & Brenes (1958), Nos. 23-27 (paratypes) *Caimanicola caballeroi* Peláez & Cruz-Lozano, 1953.

Specimens deposited: Voucher specimens – CHIOC No 32895a, b, and c. Voucher specimens – USNM No. 82617 (3 slides).

Remarks

Caimanicola marajoara was originally described based on specimens collected from *Caiman c. crocodilus* in the North of Brazil (Freitas & Lent, 1938). Carter & Etges (1972) redescribed this species from the same host, in Colombia. The present study increases the known geographic distribution to the Midwest region of Brazil and records *C. c. yacare* as new host for this species. The examination of the holotype and the paratype showed the ceca opening through two ani in the posterior extremity of the body; the longer and wider pharynx (130-143 long, 87-104 wide), located immediately behind the oral sucker, and the presence of a seminal receptacle postero-dorsal to ovary, differing from the illustrations included in original description. The specimens are not young as Carter & Etges (1972) suspected, but very contracted.

Brooks (1980), in his revision of the Acanthostominae, accepted four species in the genus *Caimanicola, C. pavida* (Brooks & Overstreet, 1977) from *A. mississippiensis,* in the USA; *C. brauni* (Mañé-Garzón & Gil, 1961) from *Phrynops hilarii* (Dumeril & Bibron), in Uruguay; *C. caballeroi* (Peláez & Cruz-Lozano, 1953), *C. marajoara* from *Crocodylus acutus, C. rhombifer, Caiman c. fuscus* and *C. c. crocodilus,* in South and Central Americas. For phylogenetic analysis, Brooks (1980) distinguished *C. marajoara* from *C. caballeroi* by the smaller body length, prepharynx smaller than the pharynx, and vitelline glands not ex-

tending anteriorly to posterior margin of the seminal vesicle. The literature shows that it is not possible to separate these species by the length of the prepharynx in relation to that of the pharynx (Caballero, 1955; Caballero & Brenes, 1958). In this paper, 40% of the specimens measured showed the distribution of the vitelline glands reaching the posterior margin of the seminal vesicle.

With the exception of Groschaft & Barus (1970), who collected *C. caballeroi* from *C. rhombifer*, in Cuba, with TBL equivalent to those values recorded for *C. marajoara*, the other authors recorded measurements of TBL superior to the maximum values for *C. marajoara*.

While *C. caballeroi* has been described with the constant number of 20 circumoral spines (Peláez & Cruz-Lozano, 1953; Groschaft & Barus, 1970; Caballero, 1955), *C. marajoara* was described with 20 (Freitas & Lent, 1938; Groschaft & Barus, 1970), with 18-21 (Carter & Etges, 1972), with 21-25, (Caballero & Brenes, 1958, but illustrated only 20), and with 19-21 spines in the present work.

The examination of the two paratypes of *C. caballeroi* showed the presence of a character illustrated and defined by Peláez & Cruz-Lozano (1953) as "copulatory bursa or gonotyl, similar to a third sucker located in the median line, ventral, preacetabular and with the diameter approximate to half of the acetabulum." As the pre- and postacetabular pits and the gonotyl, this sucker should function as an accessory organ in copulation. *Caimanicola caballeroi* is the only species in the Acanthostominae with this character. In the holotype, mounted laterally, the preacetabular pit has larger depth (146 μm) than the postacetabular pit (109 μm), and has the walls without spines. On the other hand, in *C. marajoara* the preacetabular pit is from 1.5 to 2 less deep than the postacetabular pit and has the anterior wall with spines. Books & Overstreet (1977) described the presence of spines in the anterior and posterior walls of *C. pavida* but Mañé-Garzón & Gil (1961) did not describe or illustrate a preacetabular pit in *C. brauni*.

Key to species of *Caimanicola*

1a. Number of circumoral spines less than 22 2
1b. Number of circumoral spines more than 22 3
2a. Presence of accessory sucker, preacetabular pit without spines..... ..... *C. caballeroi*
2b. Absence of accessory sucker, preacetabular pit with spines in anterior wall..... ..... *C. marajoara*
3a. Circumoral spines 26-28, preacetabular pit with spines in anterior and posterior walls ..... *C. pavida*
3b. Circumoral spines 23-24, preacetabular pit absent?..... *C. brauni*

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