SCIENTIFIC COMMUNICATION

Contracaecum rudolphii Hartwich (Nematoda, Anisakidae) from the Neotropical Cormorant, Phalacrocorax brasilianus (Gmelin) (Aves, Phalacrocoracidae) in southern Brazil 1

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ABSTRACT. The present report is part of a larger study on the helminth fauna of Neotropical Cormorants, Phalacrocorax brasilianus (Gmelin, 1789) in Brazil, particularly, in the southernmost State of Rio Grande do Sul. The nematodes which were found loose in the proventriculus/ventriculus or in groups of adults of different ages and of L₁ and L₂ larval stages, forming eosinophic granulomas had a prevalence of 100% in 47 Neotropical cormorants from Lago Guaíba, Municipality of Guaíba. The morphology of the labia/interlabia, the distribution pattern of the caudal papillae in males examined under scanning electron microscopy (SEM), and the tips of the spicules allowed determination of the species as Contracaecum rudolphii Hartwich, 1964 sensu lato (s. l.). This is the first record of C. rudolphii in southern Brazil.

KEY WORDS. Eosinophic granulomas; Lago Guaíba; Rio Grande do Sul; SEM; taxonomy.

RESUMO. Contracaecum rudolphii Hartwich (Nematoda, Anisakidae) parasita de biguás (cormorões Neotropicais, Phalacrocorax brasilianus (Gmelin) (Aves, Phalacrocoracidae) na região Sul do Brasil. O presente trabalho é parte de um estudo maior sobre a helmintofauna dos cormorões Neotropicais conhecidos no Brasil como biguás, Phalacrocorax brasilianus (Gmelin, 1789), particularmente, no Estado do Rio Grande do Sul. Os nematóides que foram encontrados soltos no proventrículo/ventrículo ou em grupos compostos por adultos de várias idades e larvas de vários estágios (L₁ e L₂), formando granulomas eosinofílicos tiveram prevalência de 100% em 47 biguás do Lago Guaíba, Município de Guaíba. A morfologia dos lábios e dos interlábios, o padrão de distribuição das papilas caudais em machos examinados com microscópio eletrônico de varredura (MEV) e as extremidades dos espículas permitiram a determinação da espécie como Contracaecum rudolphii Hartwich, 1964 sensu lato (s. l.). Este é o primeiro registro de C. rudolphii na região Sul do Brasil.

PALAVRAS-CHAVE. Granulomas eosinofílicos; Lago Guaíba; MEV; Rio Grande do Sul; taxonomy.
The final hosts of the species of Contracaecum are fish-eating birds (mostly Pelecaniformes) associated with fresh and marine waters and seas all over the world (Baruš et al. 2000). The main final hosts of C. rudolphii are birds of the genus Phalacrocorax (Linnaeus, 1761). Baylis, 1920 in the Doubled-crested Cormorant, Phalacrocorax auritus (Lesson, 1831) while Abollo et al. (2001) recorded concurrent infections by C. rudolphii and Contracaecum multipapilatum (Rudolphi, 1819) in saline solution 0.85%. Later were fixed in AFA and preserved in lactophenol; and 46 specimens mounted on stubs for SEM).

Contracaecum rudolphii Hartwich, 1964
Figs 1-9

Description: based on 105 adult specimens (30 males and 30 females mounted in lactophenol and measured; five specimens mounted en face as well as four male tails mounted in lactophenol; and 46 specimens mounted on stubs for SEM).

General: nematodes of different ages and larval stages were examined as temporary whole mounts in lactophenol (Humason 1972). For SEM, the nematodes with sectioned spicules were critical point dried, coated with carbon and gold, and examined with a Jeol (SM-6060) scanning electron microscope. Measurements are in millimeters (mm) unless otherwise indicated, ranges are followed (between parentheses) by the mean ± the standard deviation values, and the number of specimens measured for a given character (when different than the total number of specimens measured). Morphological parameters follow Hartwich (1964). Different developmental stages were identified according to Hartwich (1964) and Huizinga (1966). The fourth larval stage (L₄) and immature adults were identified according to Torres et al. (2000). The nomenclature for the pattern of male caudal papillae follows Fagerholm (1988). Ecological terms such as prevalence, intensity of infection, and mean intensity of infection follow Margolis et al. (1982). Voucher specimens were deposited (in ethanol 70ºGL) in the CHIOC, Rio de Janeiro, Rio de Janeiro, Brazil.

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ratio 91.3-145.5:1 (122.7 ± 14.6); esophagus length/intestinal cecum length ratio 0.9-1.6:1 (1.3 ± 0.1); esophagus length/ventricular appendix length ratio 2.8-3.6:1 (3.2 ± 0.2); body length/mean length of spicules ratio 3.1-5.4:1 (3.8 ± 0.4).

Figures 1-4. (1-2) Neotropical cormorant proventriculus infected with Contracaecum rudolphi: (1) general view of loose individuals of different sizes, showing continuous recruitment, bar = 10 mm; (2) nematodes of different sizes attached to proventriculus mucosa, showing that they ingest blood and that there is continuous recruitment, bar = 5 mm; (3-4) anterior region of Contracaecum rudolphi, viewed with light microscopy: (3) en face view of anterior end, bar = 20 µm; (4) ventral view, showing ventral interlabium, bar = 100 µm.

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Females (30 specimens): body 23-52 (41.8 ± 7.5) long, 0.5-1.1 (0.8 ± 0.1) wide. Muscular esophagus 2.4-5.4 (4.2 ± 0.8) long; intestinal cecum 1.6-3.6 (2.9 ± 0.6) long; ventricular appendix 0.6-1.5 (1.2 ± 0.2) long; anus 0.2-0.6 (0.4 ± 0.1) from posterior end. Vulva 9.7-21.3 (15.2 ± 2.5) from anterior end. Eggs 99-106 µm (105 ± 7 µm) long, 83-92 µm (91 ± 8 µm) wide. Phasmid apertures lateral. Body length/body maximum width ratio 36.6-66.5:1 (53.2 ± 6.1); body length/esophagus length ratio 8.7-13.2:1 (9.9 ± 0.8); body length/caudal length ratio 74.9-168.3:1 (101.8 ± 21.0); esophagus length/intestinal cecum length ratio 1.3-1.6:1 (1.5 ± 0.1); esophagus length/ventricular appendix length ratio 3.2-4.3:1 (3.7 ± 0.3). Vulva from anterior extremity x 100/body length ratio 29.7-46.5:1 (36.7 ± 3.6).

Host. Neotropical cormorant ("biguá"), Phalacrocorax brasilianus (Gmelin, 1789).

Site of infection. Proventriculus/ventriculus.

Locality. Lago Guaíba, Municipality of Guaíba, Rio Grande do Sul, Brazil (30°00'S, 51°15'W).

Prevalence. 100%.

Mean intensity of infection. 97.7 helminths/host.

Range of infection. 25-403 helminths/host.

Figures 5-9. Contracaecum rudolphii. (5-8) Viewed with SEM: (5) en face view of anterior end, showing amphidial pores (arrows), bar = 30 µm; (6) dorsal labium with two auriculae (head arrows), bar = 10 µm; (7) interlabium with bifid tip, bar = 10 µm; (8) male tail, showing cloacal opening with sectioned spicules, caudal papillae, and phasmidial pores on top of papillae (arrows), bar = 50 µm; (9) diagram showing the tip of a spicule, according to Hartwich (1964), bar = 20 µm.
Voucher specimens deposited. CHIOC numbers 35.488 and 35.489 (in ethanol 70º GL).

Remarks. Generally, measurements and morphometrical ratios in our specimens were larger than those given by Hartwich (1964), although these differences might be related to the fact that we only measured adult specimens, while Hartwich did not say if the measurements presented referred only to adult specimens. The distal end of the spicules (Fig. 9) and the number and position of caudal papillae (Fig. 8) when compared with the original description, confirm the identification of this species.

Hartwich (1964) indicated the holotype, paratypes, type host, and type locality for C. rudolphii, stating (pg. 32): “Der Holotypus befindet sich in der Helminthensammlung des Instituts für Spezielle Zoologie und Zoologischen Museums der Humboldt-Universität zu Berlin unter der Katalog-Nr. 441a, die Paratypen unter Nr. 441b” [sic].

Vicente et al. (1996) published morphometrical data and illustrations of specific diagnostic characters of C. spiculigerum (= C. rudolphii) allowing comparison with the specimens of the present report, which are larger. The illustrations provided by these authors of the face anterior end cannot be accepted as representative of the species, as well as the indication of the presence of two labial papillae in each labium. Hartwich (1964), in the original description of the species, and anteriorly Hartwich (1957), when proposing the genus, mentioned the presence of two pairs of papillae in the dorsal labium, resulting from the fusion of the two original papillae. Vicente et al. (1996) have also indicated the presence of five pairs of distal papillae, when the generic diagnosis indicates the presence of seven pairs.

Another discrepancy between Hartwich’s description and that of Vicente et al. (1996) are the egg sizes: 59-73 µm long by 41-59 µm wide and 50 µm long by 40 µm wide, respectively. The size of eggs in the specimens of C. rudolphii in the present work is larger than what has been indicated by these authors, and also have the phasmidial openings on top of the penultimate pair of distal papillae (Fig. 8 - arrows), as has been indicated by Fagerholm (1988) and Abollo et al. (2001). The shape of the labia and interlabia, as well as the papillae distribution on the male tail and the bifurcation of the interlabial extremities, agree with the illustrations provided by Barus et al. (2000).

Hartwich (1964) listed the ardeid “Casmerodius albus egretta” (Linnaeus, 1758) (Syn.: Ardea leucce Bryant). Brasilien (Rio Grande do Sul)” [sic], as one of the hosts for C. microcephalum, giving no additional information (author, collecting date, exact locality of capture, etc.), but indicating the deposit number in the collection: “Zoolog. Museum Berlin (Nº 1071)” [sic]. This is the only previous record of any species of Contracaeum in southern Brazil, but cannot be confirmed at the present time.

Li et al. (2005) presented genetic evidence for the existence of sibling species within the C. rudolphii complex (formed by C. rudolphii A and C. rudolphii B) collected from the Large Black Cormorant, Phalacrocorax carbo sinensis Blumenbach, 1798, in northeastern and central Italy, based on the first (ITS-1) and the second (ITS-2) internal transcribed spacers of ribosomal DNA (rDNA). As specimens of C. rudolphii from the proventriculus/ventriculus of P. brasilianus from Lago Guailba still have to undergo examination at the molecular level to detect the eventual existence of sibling species the present work is the first to document the presence of C. rudolphii (s. l.) in P. brasilianus in southern Brazil.

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