Neotrop. Helminthol., 4(2), 2010
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ISSN: 2218-6425 impreso / ISSN: 1995-1043 on line

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ASOCIACIÓN PERUANA DE HELMINTOLOGÍA E INVERTEBRADOS AFINES

ORIGINAL ARTICLES / ARTÍCULOS ORIGINALES

MICROSOMACANTHUS HOPKINSI (EUCESTODA, HYMENOLEPIDIDAE) IN *NETTA PEPOSACA* (AVES, ANATIDAE) IN SOUTH AMERICA

MICROSOMACANTHUS HOPKINSI (EUCESTODA, HYMENOLEPIDIDAE) DE *NETTA PEPOSACA* (AVES, ANATIDAE) DE SUDAMERICA

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Suggested citation: Silveira, E.F. & Amato, S.B. 2010. *Microsomacanthus hopkinsi* (Eucestoda, Hymenolepididae) in *Netta peposaca* (Aves, Anatidae). Neotropical Helminthology, vol. 4, nº 2, pp. 105-111.

Abstract

The rosy-billed pochard, *Netta peposaca* (Vieillot, 1816), is a migratory bird that inhabits wetlands which have the surface covered by abundant vegetation, but also being found in lagoons or rice plantations. One hundred sixty-nine rosy-billed pochards, *N. peposaca,* were examined for helminths in the Municipalities of Santa Vitória do Palmar and Jaguarão, State of Rio Grande do Sul, Brazil (wintering site) and Alvear, Corrientes Province, northern Argentina (nesting site). Samples were obtained in 2002 and 2004. Birds were frozen in dry ice after collection. During necropsy they were categorized according to sex and maturity, either adult or juvenile. The cestode *Microsomacanthus hopkinsi* (Schiller, 1951) Spasskaia, 1966 was found in the anterior portion of caeca. Prevalence was 60.9% and mean infection 42.9, while the intensity of infection was 1 to 418 helminths/ host. The high prevalence and intensity of infection may be related to the reproductive strategy of the species that releases the eggs in the form of a single chain.

Key words: Argentina - Brazil - migratory-flyway - nesting site - rosy billed pochard - wintering site.

Resumen

Netta peposaca (Vieillot, 1816), marrecão, é um anatídeo silvestre, distribuí-se nos ambientes aquáticos como banhados, lavouras e várzeas. Com o objetivo de conhecer a helmintofauna do marrecão na América do Sul, 169 aves foram amostradas. Os locais de captura foram os municípios de Santa Vitória do Palmar e Jaguarão, no Estado do Rio Grande do Sul, sul do Brasil (pólo de invernia), e em Alvear, Província de Corrientes, região norte da Argentina (pólo de nidificação), entre 2002 e 2004. As aves foram congeladas em gelo seco logo após o abate. Durante o procedimento de necropsia tiveram o sexo identificado, e foram classificadas de acordo com estado de maturação sexual, em juvenil e adulto. A espécie *Microsomacanthus hopkinsi* (Schiller, 1951) Spasskaia, 1966 foi encontrada na porção anterior dos cecos. Prevalência de 60.9% e infecção média de 42.9, enquanto a intensidade de infecção foi de 1 to 418 helmintos/ hospedeiro. A alta prevalência e intensidade de infecção estão relacionadas com a estratégia reprodutiva da espécie que libera vários ovos na forma de uma corrente única.

Palabras claves: Argentina - Brasil - marrecão - pólo de invernia - pólo de nidificação - rota de migração.

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INTRODUCTION

The genus *Microsomacanthus* (Eucestoda, Hymenolepididae) was proposed by López-Neyra (1942a) to accommodate species with distinct characters when compared to *Hymenolepis* Weiland, 1858. *Microsomacanthus* includes species with a long, thin rostellum armed with 10 hooks, and *Hymenolepis microsoma* Creplin, 1829 was designated as the type species. In this work, López-Neyra (1942a) also included a key for the genera of Hymenolepidae, in which the presence or absence of a rostellum separated the species of *Microsomacanthus* from *Hymenolepis*. The presence of a rostellum with hooks characterizes *Microsomacanthus*, while *Hymenolepis* lack or have only a rudimentary rostellum. Reviewing *Hymenolepis,* López-Neyra (1942b), considered the following species as new combinations: *Microsomacanthus abortiva* (Linstow, 1904), *Microsomacanthus collaris* (Batsh, 1786), *Microsomacanthus compressa* (Linton, 1892) *Microsomacanthus diorchis* (Fuhrmann, 1913), *Microsomacanthus fausti* (Tseng-Shen, 1932), *Microsomacanthus floreata* (Meggitt, 1930), *Microsomacanthus jaegerskioldi* (Fuhrmann, 1913), *Microsomacanthus microsoma* (Creplin, 1829), *Microsomacanthus pachycephala* (Linstow, 1872), *Microsomacanthus pauciannulata* (Meggitt, 1927), *Microsomacanthus pigmentata* (Linstow, 1872), *Microsomacanthus filirostris* (Wedl, 1855), *Microsomacanthus innominata* (Meggitt, 1927), *Microsomacanthus longirostris* (Rudolphi, 1819), *Microsomacanthus clerci* (Fuhrmann, 1923) and *Microsomacanthus falcata* (Meggitt, 1927).

Hymenolepis hopkinsi was described in 1951 by Schiller as a small, fragile cestode with a long and thin rostellum, labile rostellar hooks with distinct size and shape; with a 'U' shaped uterus and eggs released in a single chain like those found in the caeca of birds (Schiller, 1951). The shape of the uterus of *H. hopkinsi* was mentioned by Schiller (1951) as a rare characteristic among species of *Hymenolepis*.

Spassky & Spasskaia (1954) revised the species of *Microsomacanthus* and accepted the new combinations proposed by López-Neyra (1942b). These authors described four new species (*Microsomacanthus formosoides, Microsomacanthus hystrix, Microsomacanthus recurvata*, and *Microsomacanthus tuvensis*), and one unidentified species (*Microsomacanthus* sp.), but did not mention the species *H. hopkinsi*. Yamaguti (1959) made new combinations and transferred *M. clerci* and *H. hopkinsi* to the genus *Mayhewia* Yamaguti, 1956.

The species *H. hopkinsi* was transferred to *Microsomacanthus* only in 1966 by Spasskaia in a work about hymenolepididean carried out in Russia (McDonald, 1969).

McDonald (1969) cited 27 species for *Microsomacanthus* in their catalogue on helminth species parasitizing anatideans. According to these authors, *M. hopkinsi* is a common species in North America and is found as a parasite of wild ducks such as *Anas platyrhynchus* Linnaeus, 1758; *Anas acuta* Linnaeus, 1758; *Anas penelope* Linnaeus, 1758; *Anas rubripes* Brewster, 1902; *Anas strepera* Linnaeus, 1758 and *Aythya marila* (Linnaeus, 1758).

McLaughlin & Burt (1979) studied cestodes collected from the caeca of Canadian anatideans: *A. rubripes*, *A. platyrhynchos*, and *Aix sponsa* (Linnaeus, 1758). After comparing morphometric and morphological data, the cestodes found were identified as *H. hopkinsi*. According to the authors the specimens found were morphologically identical to the species *H. hopkinsi* described by Schiller in 1951 and, similar to the specimens found by Maksimova in 1967 which included the species of *Microsomacanthus*. However, McLaughlin & Burt (1979) did not discuss the synonymy of the species.

Czaplinski (1994) proposed a key for hymenolepididean cestodes found in birds. In relation to the genus diagnosis, the author considered only the presence or absence of a rostellum as had been proposed by López-Neyra (1942a).

New species were described for the genus *Microsomacanthus*: *Microsomacanthus polystictae* was found parasitizing the species *Polysticta stelleri* (Pallas, 1769) collected in Chukotka, Russia (Regel, 1988). *Microsomacanthus macrotesticulata* in three anatidean species: *Netta erythrophthalma* (Wied-Neuwied, 1833), *Anas undulata* Dubois, 1839, and

Anas erythrorhyncha Gmelin, 1789 collected in South Africa (Alexander & Mclaughlin, 1993). *Microsomacanthus paraparvula* was reported as a parasite of surface ducks in lakes of Chukotka, Russia (Regel, 1994). *Microsomacanthus parasobolevi* was recorded parasitizing several anatidean species in Chukotka, Russia (Regel, 2005). For South America, *Microsomacanthus kaulobatroni* was described by Deblock & Vaucher (1997) parasitizing birds of the species *Himantopus melanurus* Vieillot, 1811, collected in Paraguay.

In the present paper, we review the taxonomy and also analyze the biology and anatomy of the *M. hopkinsi* occurring in wild ducks.

MATERIAL AND METHODS

A total of 169 rosy-billed pochards [*Netta peposaca* (Vieillot, 1816)] were captured by shot gun, with permission from the "Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renováveis" (IBAMA n° 042/ 2004/RS) in: the municipality of Santa Vitória do Palmar (33°16'13"S, 53°26'28"W); in the locality of Fazenda Sossego (33°04'03"S, 53°19'20"W); in the municipality of Jaguarão (32°37'53"S, 53°09'3,6"W), all in the state of Rio Grande do Sul, southern Brazil; and in Alvear, province of Corrientes, northern Argentina (29°09'13"S, 56°54'34"W). The birds were collected between 2002 and 2004. After being killed, they were frozen in dry ice, taken to the laboratory, and separated by sex and maturation stage (juveniles or adults) based on presence/ absence of the cloacal pouch. Adult cestodes and hooks from the rostellum were fixed, stained and mounted according to Silveira & Amato (2008). All measurements are given in micrometers (µm), or otherwise indicated. Mean, standard deviation, and number of specimens measured for a determined character appear in parentheses when different from the established number. Ecological terms were used according to Bush *et al*. (1997). Drawings were made with a drawing tube using a Nikon E-200 microscope. The photographic images and scanned line drawings were prepared using Adobe's *Photoshop CS2*®. Representative specimens of the cestode were deposited in the "Coleção Helmintológica do Instituto Oswaldo Cruz" (CHIOC), Rio de Janeiro, RJ, Brazil. The remaining specimens are in the "Coleção Helmintológica do Laboratório de Helmintologia", Porto Alegre, RS, Brazil. Bird carcasses were deposited in the "Coleção Ornitológica do Museu de Ciências Naturais" (MCN), Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, RS, Brazil.

RESULTS

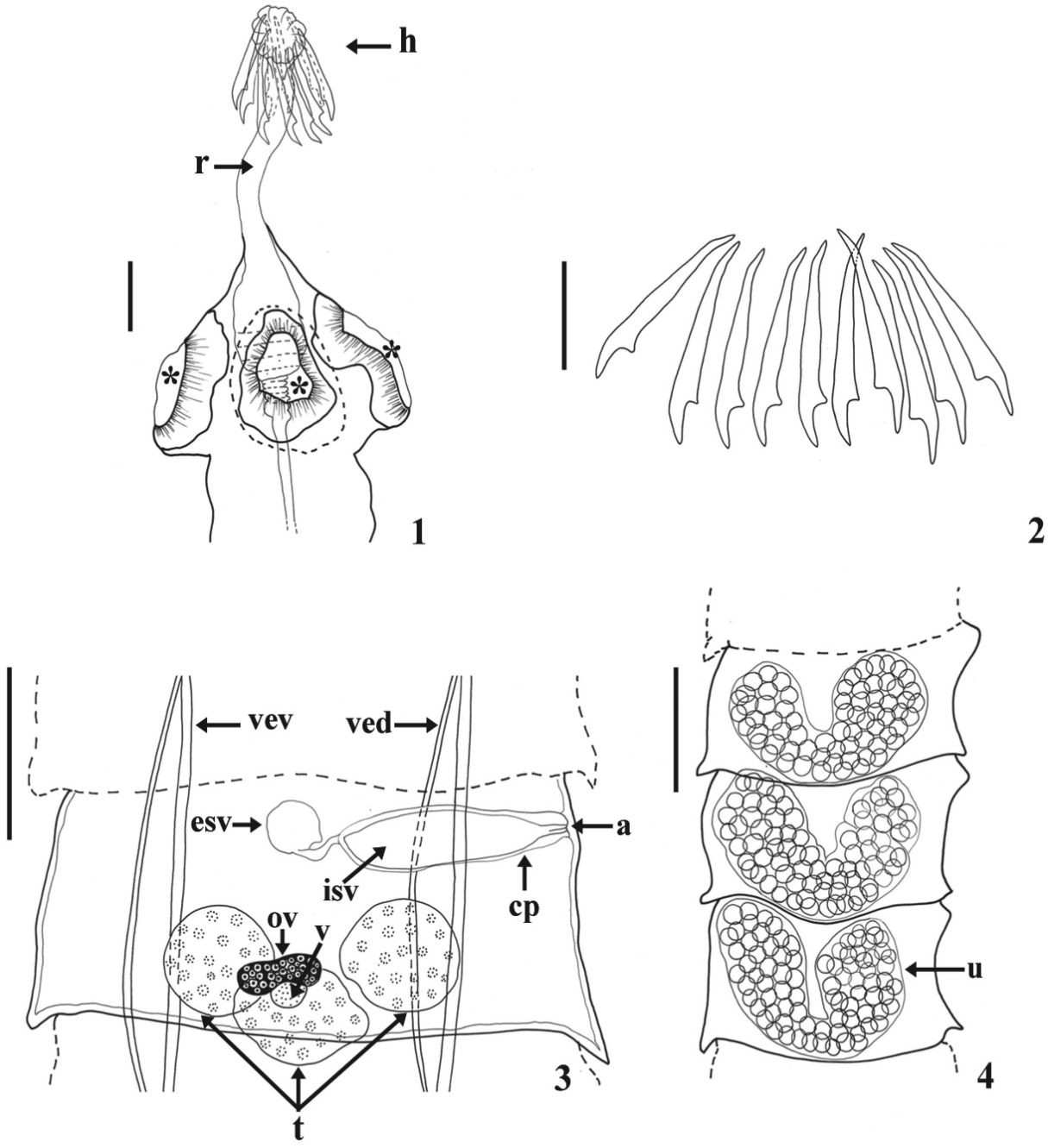
Microsomacanthus hopkinsi (Schiller, 1951) Spasskaia, 1966 (Figs 1-8)

Description. Based on 40 specimens mounted '*in toto*', 13 measured and 5 scolex mounted in Faure. Hymenolepididae, Hymenolepidinae. Scolex triangular, 140-198 (167, 50, n=12) in length, 128-160 wide at base (Fig. 1). Four unarmed suckers, 52-106 long, and 52-90 wide (Figs 1, 6, and 7). Rostellum long, thin (Figs 1, 6, and 7), 280-360 long (300, 68, n=12), 10 diorchoid hooks in one line, 24-32 long (Figs 2, 5, and 5a). Strobilum 12 mm long, 0.4 mm wide. Proglottids craspedot, rectangular when immature, square when mature, slightly longer than wide when gravid.

Male reproductive system with three testicles, circular to oval, forming an interverted triangle in anterior half portion of proglottid (Fig. 3). Cirrus pouch rounded 105-162 (160, 68, n = 10) long, 14-38 (28, 17, n = 10) in diameter, extending beyond excretory vessels to middle of proglottid or slightly, not reaching aporal excretory vessels (Fig. 3). Internal and external seminal vesicle present; external to antiporal middle of proglottid, slightly anterior to posterior end of cirrus pouch, 45-61 (52, 12, n = 10) long and 41-48 wide. Unilateral, non-alternating genital pores (Fig. 3). Cirrus spineless, 12-20 (18, 7, n = 10) long. Genital atrium at anterior end (Fig. 3). Ovary median, lobed, ventral to testicles; 60-81 (76, 20, n = 10) wide (Fig. 3). Vitelarium 15-28 long, and 10-22 wide. Vagina inconspicuous, uterus 'U' shaped with few eggs, 25-29 (27, 8, n = 10) in diameter (Fig. 4); eggs in packs forming single delicate chains (Figs 8, and 8a).

Taxonomic summary

Synonyms: *Hymenolepis hopkinsi* Schiller, 1951; *Mayhewia hopkinsi* (Schiller, 1951) Yamaguti, 1959

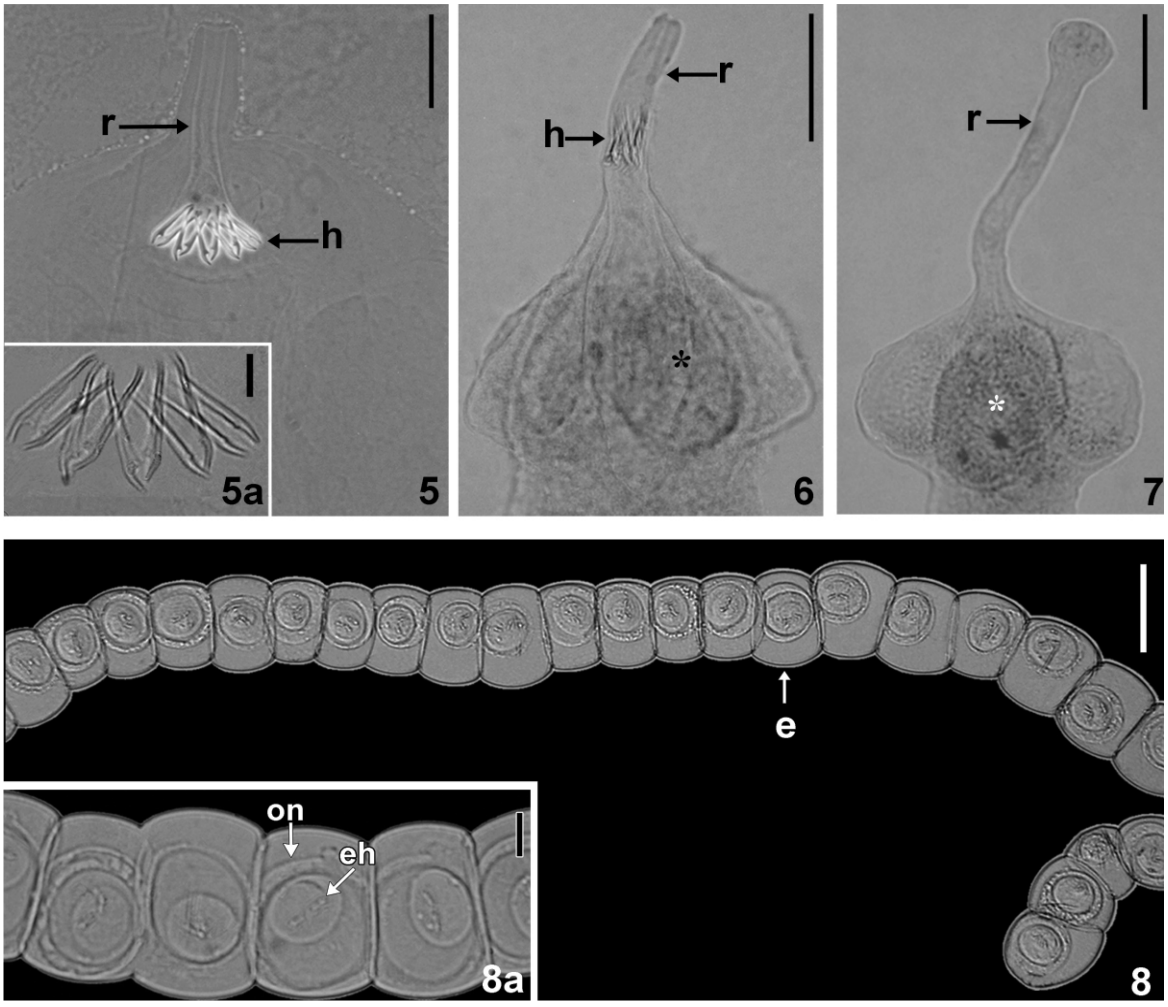


Figures 1-4. Incomplete diagrams of *Microsomacanthus hopkinsi* (Schiller, 1951). (**1**) Scolex showing the suckers (asterisk), rostellum (r), and rostellar diorchoid hooks (h). Bar = 50 µm. (**2**) Diarcuatoid rostellar hooks. Bar = 25 µm. (**3**) Mature proglottid. Ventral excretory vessels (vev), dorsal excretory vessels (dev), atrium (a), cirrus pouch (cp), internal seminal vesicle (isv), external seminal vesicle (esv), testicles (t), ovary (ov), and vitellarium (v). Bar = 50 µm. (**4**) Gravid proglottids showing the uterus (u) filled with eggs. Bar = 100 µm.

Host: *Netta peposaca* (Vieillot, 1816) – new host.
Host specimens deposited: *N. peposaca* – new host record (NHR). MCN Nºs 2775 (male); 2776 (female).
Locality: Fazenda Sossego and Ponta da Antena, Municipality of Santa Vitória do Palmar, RS, southern Brazil; Alvear, Province of Corrientes, northern Argentina.
Site of infection: anterior portion of caeca.
Prevalence: 60.9%.
Mean intensity of infection: 42.9 helminths/ host.
Mean abundance of infection: 26.1 helminths/ host.
Intensity of infection: 1 to 418 helminths/ host.
Deposited specimen: CHIOC 3745a-b – voucher specimens fixed in AFA and stained in Delafield's hematoxylin.

DISCUSSION

In the present study we followed a proposal made by Czaplinski (1994), who validated the genus *Microsomacanthus*, proposed by López-Neyra



Figures 5-8. Photomicrographs of the *Microsomacanthus hopkinsi* (Schiller, 1951). (**5**) Scolex with rostellum (r) and introverted hooks (h). Bar = 25 µm. (5a) Diorchoid rostellar hooks. Bar = 10 µm. (**6**) Scolex showing one of the four suckers (asterisk), rostellum (r), and hooks (h) partially everted. Bar = 50 µm. (**7**) Scolex showing one of the four suckers (asterisk) and rostellum (r) completely everted. Bar = 50 µm. (**8**) Egg chain showing one of the eggs (e). Bar = 100 µm. (**8a**) Oncosphere (on) and embryonic hooks (eh). Bar = 25 µm.

(1942a). Cestodes found in the caeca of rose-billed pochards were identified as *M. hopkinsi*, due to the presence of a thin, long rostellum armed with 10 diorchoid hooks (Figs 1, 6, and 7); three testicles forming an inverted triangle, bilobed ovary, and a 'U' shaped uterus. The eggs formed a single chain when released from the proglottid (Figs 8, and 8a). Measurements in the present study are similar to those given by Schiller (1951) in the species description, and those given by McLaughlin & Burt (1979) in their study on the hymenolepididean cestodes from anatideans in Canada.

According to Jarecka (1961) the eggs in *M. hopkinsi* differ in shape from those of *H. abortiva* and *H. microsoma*, which also infect anseriform birds. Eggs of *M. hopkinsi* are characterized by forming a single chain (Figs 8, and 8a) while in other related species they could form two or three lines. *M. hopkinsi* infected 60.9% out of 169 rose-billed pochards studied in the present study with a mean intensity of 42.9 specimens/ bird. The high prevalence and intensity of infection may be related to the reproductive strategy of the species that releases the eggs forming a single chain. The intermediate host will ingest several cysticercoids by consuming eggs released in a chain, and, consequently, the definitive host will receive a large number of larvae from a single amphipod. Considering that anatideans ingest a high number of amphipods throughout the day, the mean intensity of infection of *M. hopkinsi* will always be high in any host, as recorded in the present study. This relationship was also recorded by Jarecka (1961) and MacLauchlin & Burt (1970).

This is the first study documenting ecological data of this species, in addition to the discussion on taxonomy after the species description published by Schiller in 1951; the first record of *Microsomacanthus hopkinsi* to the South American continent, extending its known geographical distribution

ACKNOWLEDGEMENTS

The authors are grateful to IBAMA ("Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renováveis") for the license to capture the hosts; to Prof. João O. Meneghetti, for ornithological information; to Mr Jair Nunes and Mr Sidnei A. Bavaresco for the capture of the birds, and to Dr Philip J. Scholl for reviewing the English version of the manuscript.

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Received July 20, 2010.
Accepted October 27, 2010.

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