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Digenean parasites of Ciconiiform birds from Argentina

Digéneos parásitos de aves Ciconiiformes de Argentina

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Abstract. The helminthological survey of 13 specimens of 5 ciconiiform species revealed the presence of 10 species of intestinal digeneans: *Sphincterodiplostomum musculosum* Dubois, 1936 in *Tigrisoma lineatum* and *Ardea alba*; *Tylodelphys elongata* (Lutz, 1928) in *T. lineatum*; *Apharyngostrigea ardearum* (Lutz, 1928) and *Dolichorchis lacombeensis* Lunaschi and Drago, 2006 in *Ardea cocoi* and *Ardea alba*; *Posthodiplostomum nanum* Dubois, 1937 in *A. alba* and *T. lineatum*; *Ascocotyle diminuta* (Stunkard and Haviland, 1924) in *A. alba*; *Petasiger* sp.1 in *A. cocoi* and *Paryphostomum segregatum* Dietz, 1909, *Strigea vaginata* (Brandes, 1888) and *Petasiger* sp. 2 in *Coragyps atratus*. *Syrigma sibilatrix* was free of digeneans. The reports of *A. ardearum*, *T. elongata*, *S. musculosum* and *D. lacombeensis* represent new host records; the other reports are new geographical records. Moreover, the specimens described as *Apharyngostrigea brasiliana* Szidat, 1929 by Labriola and Suriano (1998) were analyzed and transferred to *A. ardearum.*

Key words: Digenea, Ardeidae, Cathartidae, Strigeidae, Diplostomidae, Echinostomatidae, Heterophyidae.

Resumen. El estudio parasitológico de 13 ejemplares pertenecientes a 5 especies de aves Ciconiiformes reveló la presencia de 10 especies de digéneos intestinales: *Sphincterodiplostomum musculosum* Dubois, 1936 en *Tigrisoma lineatum* y *Ardea alba*; *Tylodelphys elongata* (Lutz, 1928) en *T. lineatum*; *Apharyngostrigea ardearum* (Lutz, 1928) y *Dolichorchis lacombeensis* Lunaschi y Drago, 2006 en *Ardea cocoi* y *A. alba*; *Posthodiplostomum nanum* Dubois, 1937 en *A. alba* y *T. lineatum*; *Ascocotyle diminuta* (Stunkard y Haviland, 1924) en *A. alba*; *Petasiger* sp.1 en *A. cocoi* y *Paryphostomum segregatum* Dietz, 1909, *Strigea vaginata* (Brandes, 1888) y *Petasiger* sp. 2 en *Coragyps atratus*. *Syrigma sibilatrix* no se encontró parasitada por digéneos. El presente estudio aporta nuevos registros de hospedadores para *A. ardearum*, *T. elongata*, *S. musculosum* y *D. lacombeensis* y nuevos registros geográficos para las restantes especies. Además, los organismos descritos como *Apharyngostrigea brasiliana* Szidat, 1929 por Labriola y Suriano (1998) fueron analizados y transferidos a *A. ardearum.*

Palabras clave: Digenea, Ardeidae, Cathartidae, Strigeidae, Diplostomidae, Echinostomatidae, Heterophyidae.

Introduction

Although 30 species of ciconiiform birds (14 Ardeidae, 8 Threskiornithidae, 3 Ciconiidae, 5 Cathartidae) are distributed Argentina, the information about its digenean fauna is scarce. At present, 8 ardeid species [*Tigrisoma lineatum* (Boddaert), *Bubulcus ibis* (L.), *Butorides striata* (L.), *Ardea alba* L., *Ardea cocoi* L., *Egretta thula* (Molina), *Ixobrychus involucris* (Vieillot), *Nycticorax nycticorax* (L.)], 4 threskiornithid species [*Ajaia ajaja* (L.), *Phimosus infuscatus* (Lichtenstein), *Plegadis chihi* (Vieillot), *Theristicus caudatus* (Boddaert)] and 2 ciconiid species [*Ciconia maguari* (Gm) and *Mycteria americana* L.] have been reported as hosts of digeneans (Lunaschi et al., 2007; Drago and Lunaschi, 2008; Lunaschi and Drago, 2009). Most of these records were made on the basis of hosts proceeding from the Humid Pampas ecoregion or under captivity in Zoological Gardens.

The aim of this paper is to increase the knowledge of the diversity of digenean parasites from ciconiiform birds collected in the Humid Chaco and Humid Pampas ecoregions.

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Material and methods

Thirteen birds were hunted with guns between 1999 and 2006 from 3 localities of Formosa Province (Bellaco stream

[26º14'S; 58º07'W] and La Marcela farm [26°17'35"S; 59°06'67"W], Pirané department, and Clorinda [25°17´S, 57°43´W], Pilcomayo department), and 1 from Buenos Aires Province (Lacombe lagoon [35° 49'S; 57° 49'W], Lezama). The bird species analyzed were *A. alba*, *A. cocoi*, *T. lineatum*, *Syrigma sibilatrix* (Temminck) and *Coragyps atratus* (Bechstein). The viscera were fixed in 10% formalin and examined for parasites in laboratory. The digenean specimens were stained with hydrochloric carmine, dehydrated and mounted in Canada balsam. The taxonomy of digeneans is given in accordance to Gibson et al. (2002), Jones et al. (2005) and Bray et al. (2008); identification of birds follows Barnett and Pearman (2001), and the parasitic indexes used were based on Bush et al. (1997). All digeneans were deposited in the Helminthological Collections of the Museo de La Plata (MLP), La Plata, Argentina, and the hosts in the Ornithological Collections of the Museo de La Plata (MLP).

Results

Family Strigeidae
Strigea vaginata (Brandes, 1888) Szidat, 1928

Taxonomic summary

Host: *Coragyps atratus*, black vulture (Cathartidae).
Locality: La Marcela farm, Pirané, Formosa Province.
Site of infection: intestine.
Prevalence and mean intensity: 67% (2 of 3); 3 (1-5).
Voucher specimen deposited: MLP 5964.

Remarks

This species was briefly described as *Holostomum vaginatum* Brandes, 1888 from *Cathartes* sp. (Cathartidae) in Brazil, and transferred to *S. vaginata* by Szidat (1928). Later, it was reported parasitizing other Brazilian birds: *C. atratus*, *Sarcoramphus papa* (L.), *Cathartes burrovianus urubitinga* Pelzeln, (Cathartidae), *Cariama cristata* (L.) (Cariamidae), and *Spizaetus ornatus* (Daudin) (Accipitridae) (Szidat, 1929; Travassos et al., 1969). *Strigea vaginata* was also found parasitizing *C. atratus* and an indeterminate accipitrid (cited as "gavilán" and "gavião") in Venezuela (Lutz, 1928; Dubois, 1970a); *Cathartes aura aura* (L.) in Cuba (Dubois and Macko, 1972); *Theristicus caudatus*, *Cercibis oxycerca* (Spix) (Threskiornithidae), and *Caracara plancus* (Miller) (Falconidae) in Colombia (Dubois, 1978, 1981). According to Szidat (1929) and Dubois (1968), the specimens collected in the black vulture from Formosa Province were identified as *S. vaginata* mainly by the presence of an enormous copulatory bursa and genital cone, occupying almost half of the hindbody. This is the first report of *S. vaginata* in Argentina.

Apharyngostrigea ardearum (Lutz, 1928) Dubois, 1968

(Syn. *Apharyngostrigea brasiliana* Szidat, 1929 of Labriola and Suriano (1998): 3)

Taxonomic summary

Hosts and localities: *Ardea alba* from Lacombe lagoon, Lezama, Buenos Aires Province and Clorinda, Formosa Province; *Ardea cocoi* from Lacombe lagoon.
Site of infection: intestine.
Prevalence and mean intensity: *A. alba,* Lacombe lagoon: 50% (2 of 4); 10 (8-12); *A. alba*, Clorinda: 1 of 1; 33; *A. cocoi*: 50% (1 of 2); 3.
Voucher specimen deposited: *A. alba* MLP 5965 from Buenos Aires Province, MLP 5966 from Formosa Province; *A. cocoi* MLP 5967.
Other material: specimens from *A. alba* (MLP 5968) and *B. ibis* (MLP 5969) from Monte Lagoon, Buenos Aires Province [of Labriola and Suriano (1998)].

Remarks

The morphological features of the specimens studied herein correspond to the description of *A. ardearum* given by Dubois (1981). This species was previously reported parasitizing herons from Venezuela by Lutz (1928) (as *Strigea ardearum* Lutz, 1928), *Ardea herodias herodias* L. and *Nycticorax n. hoactli* (Gmelin) from Cuba by Pérez Vigueras (1944) [as *Apharyngostrigea cornu* (Zeder, 1800)]. Moreover, *Ardea purpurea* L. was reported as experimental host in Guadalupe (Dubois, 1981). At present, in Argentina only 1 species of *Apharyngostrigea* Ciurea, 1927, *Apharyngostrigea simplex* (Johnston, 1904), has been reported by Ostrowski de Núñez (1989) parasitizing *E. thula* from Buenos Aires Province.

In addition, specimens described as *A. brasiliana* were reported parasitizing *A. alba*, *A. a. egretta* and *B. ibis* from Buenos Aires Province (Boero et al., 1972; Labriola and Suriano, 1998). Nevertheless, this species was previously transferred by Dubois (1964) to *Parastrigea* Szidat, 1928.

The specimens poorly described by Boero et al. (1972) do not show the main diagnostic characters of *Parastrigea* (e.i. vitelline follicles in forebody accumulated in 2 symmetrical masses localized in lateral expansions of dorsal lobe of holdfast organ). Unfortunately, their correct identification cannot be reviewed because no specimens were deposited at the appropriate time. The re-examination of the specimens studied by Labriola and Suriano (1998) revealed that they did not conform to the generic diagnosis of *Parastrigea* and their correct identification corresponds to *Apharyngostrigea*. Since the morphology and the metric characters of these specimens correspond to the description by Dubois (1981), we transfer these specimens to *A. ardearum*. The finding of this species in *A. cocoi*, *A. alba* and *B. ibis* represents new hosts and Argentina a new geographic distribution for this parasite species.

Family Diplostomidae
***Sphincterodiplostomum musculosum* Dubois, 1936**

Taxonomic summary

Host: *Tigrisoma lineatum*, rufescent tiger-heron (Ardeidae).
Locality: Bellaco stream, Pirané, Formosa Province.
Site of infection: intestine.
Prevalence and intensity of infection: 1 of 1; 8.
Voucher specimen deposited: MLP 5970.

Remarks

The monospecific genus *Sphincterodiplostomum* Dubois, 1936 is characterized by the presence of a dorsal invagination at the level of the posterior testis equipped with a sphincter. *Sphincterodiplostomum musculosum* was described based on immature specimens collected from the intestine of *Agamia agami* (Gmelin) (Ardeidae) from Brazil (Dubois, 1936, 1938). Later, unencysted metacercariae in the orbit of the eye of *Hoplias malabaricus* (Bloch) (Erythrinidae) and mature specimens parasitizing *A. alba* from northeastern Argentina were described by Szidat (1969) and Lunaschi and Drago (2006a), respectively. The finding of adult specimens of *S. musculosum* in *T. lineatum* represents a new host record.

***Tylodelphys elongata* (Lutz, 1928) Dubois, 1937**

Taxonomic summary

Host: *Tigrisoma lineatum*, rufescent tiger-heron (Ardeidae).
Locality: Bellaco stream, Pirané, Formosa Province, Argentina.
Site of infection: intestine.
Prevalence and intensity of infection: 1 of 1; 1.
Voucher specimen deposited: MLP 5971

Remarks

Tylodelphys elongata originally described as *Alaria elongata* Lutz, 1928 in Venezuela (Lutz, 1928), was reported parasitizing podicipedids, *Tachybaptus dominicus* (L.) from Cuba, Brazil, Venezuela and USA and *Podilymbus podiceps* (L.) from Cuba and USA (Travassos et al., 1969; Dubois, 1970b; Dubois and Macko, 1972; Storer, 2000). It was also recovered in ciconiids, *Jabiru mycteria* (Lichtenstein) from Brazil and Venezuela, and *M. americana* from Venezuela (Travassos et al., 1969; Gomes and Oliveira Rodrigues, 1981). The finding of *T. elongata* in *T. lineatum* represents a new host record, the first record in ardeid birds and the first report of this species in Argentina.

***Dolichorchis lacombeensis* Lunaschi and Drago, 2006**

Taxonomic summary

Hosts: *Ardea cocoi*, *A. alba.*
Locality: Lacombe lagoon, Lezama, Buenos Aires Province.
Site of infection: intestine.
Prevalence and mean intensity: *A. cocoi*: 100% (2 of 2); 45 (14-76); *A. alba*: 50% (2 of 4); 2.
Voucher specimen deposited: *A. cocoi* MLP 5972; *A. alba* MLP 5973

Remarks

This species was described recently by Lunaschi and Drago (2006b) parasitizing *A. cocoi* from Buenos Aires Province. The finding of this diplostomid in *A. alba*

represents a new host record.

***Posthodiplostomum nanum* Dubois, 1937**

Taxonomic summary

Hosts and localities: *Ardea alba* from Lacombe lagoon, Lezama, Buenos Aires Province and Clorinda, Formosa Province; *Tigrisoma lineatum* from Bellaco stream, Formosa Province.
Site of infection: intestine.
Prevalence and mean intensity: *A. alba*, Lacombe lagoon: 50% (2 of 4); 9.5 (2-17); *A. alba*, Clorinda: 1 of 1; 66; *T. lineatum*: 1 of 1; 10.
Voucher specimen deposited: *A. alba* from Buenos Aires Province, MLP 5974; from Formosa Province, MLP 5977; *T. lineatum* MLP 5975.

Remarks

A wide range of birds has been reported as host of *P. nanum* in the Neotropical Region, *Butorides virescens* (L.) and *Butorides striata striata* (L.) (Ardeidae) from Brazil; *Butorides virescens maculata* (Boddaert) from Cuba and Colombia, *Pitangus sulphuratus* (L.) (Tyrannidae) and *Tigrisoma lineatum marmoratum* (Vieillot) (Ardeidae) from Venezuela, *Busarellus nigricollis* (Latham) (Accipitridae) and *B. striata* from Paraguay (Dubois, 1970a, 1970b, 1985, 1988; Gomes and Oliveira Rodrigues, 1981; Lamothe-Argumedo and Jaimes Cruz, 1982). In Argentina, it was reported in the Humid Pampas ecoregion parasitizing ardeid, *A. a. egretta*, *B. striata*, *I. involucris*, and threskiornithid, *P. chihi*, (Boero et al., 1972; Ostrowski de Núñez, 1973; Digiani, 2000). The finding of *P. nanum* parasitizing *T. lineatum* and *A. alba* in the Humid Chaco ecoregion represents a new geographical record.

***Posthodiplostomum* sp.**

Taxonomic summary

Hosts: *Ardea cocoi*.
Locality: Lacombe lagoon, Lezama, Buenos Aires Province.
Site of infection: intestine.
Prevalence and intensity of infection: 50% (1 of 2); 6.
Voucher specimen deposited: MLP 6013.

Remarks

The 6 specimens collected are immature and probably belong to *P. nanum.*

Family Echinostomatidae
***Paryphostomum segregatum* Dietz, 1909**

Taxonomic summary

Host: *Coragyps atratus*, black vulture (Cathartidae).
Locality: La Marcela farm, Pirané, Formosa Province.
Site of infection: intestine.
Prevalence and intensity of infection: 33% (1 of 3); 18.
Voucher specimen deposited: MLP 6010.

Remarks

Paryphostomum segregatum possesses a distribution restricted to the Neotropical Region, and was found in Brazil, Venezuela, Guyana and Paraguay parasitizing cathartid, *C. atratus*, *Coragyps atratus foetens* (Lichtenstein), *Cathartes aura* (L.), *Cathartes aura ruficollis* Spix, *C. b. urubitinga* and *S. papa* (Vevers, 1923; Lutz, 1928; Caballero and Díaz-Ungría, 1958; Travassos et al., 1969; Kostadinova et al., 2002). Particularly, in Argentina, it was reported in the Humid Pampas ecoregion parasitizing *Phalacrocorax brasilianus brasilianus* (Gmelin) by Ostrowski de Núñez (1968). The finding of *P. segregatum* parasitizing *C. atratus* in the Humid Chaco ecoregion represents a new geographical record.

***Petasiger* sp. 1.**

Taxonomic summary

Host: *Ardea cocoi*
Locality: Lacombe lagoon, Lezama.

Site of infection: intestine.
Prevalence and intensity of infection: 50% (1 of 2); 1.
Voucher specimen deposited: MLP 6012.

Remarks

A single adult was found in the small intestine of *A. cocoi*. This specimen was not in sufficiently good condition for species determination, but can be distinguished by having a well developed head collar with 19 spines.

***Petasiger* sp. 2.**

Taxonomic summary

Host: *Coragyps atratus*, black vulture (Cathartidae).
Locality: La Marcela farm, Pirané, Formosa Province.
Site of infection: intestine.
Prevalence and intensity of infection: 33% (1 of 3); 2.
Voucher specimen deposited: MLP 6011.

Remarks

Only 2 specimens of *Petasiger* sp. were found in the small intestine of *C. atratus*. These echinostomatids can be distinguished from specimens obtained from *A. cocoi* by having a well developed head collar with 27 spines. Further studies are needed to identify it to the species level.

Family Heterophyidae
***Ascocotyle diminuta* (Stunkard and Haviland, 1924)**

Taxonomic summary

Host: *Ardea alba*
Locality: Lacombe lagoon, Lezama, Buenos Aires Province.
Site of infection: intestine.
Prevalence and intensity of infection: 25% (1 of 4); 1.
Voucher specimen deposited: MLP 5976

Remarks

This species was previously found in ardeid birds, *A. alba* and *A. herodias* from Mexico and USA (Sepúlveda et al., 1999; Scholz et al., 2001). In Argentina, it was reported parasitizing to *E. thula* from a Zoological Garden in Buenos Aires Province by Ostrowski de Núñez (1993). This is the first record of *A. diminuta* parasitizing wild birds from Argentina.

Final comments

Host-parasite relationships. Among the 10 digenean species collected, the diplostomids were the group best represented (4 species), followed by the echinostomatids (3 species), strigeids (2 species), and heterophyids (1 species). In the Humid Pampas ecoregion, infected birds harbored a mean of 3 (2-4) digenean species; the most prevalent species were *A. ardearum* and *P. nanum* (67%); whereas, in the Humid Chaco ecoregion, the birds harbored a mean of 2.5 (2-3) digenean species, the most prevalent species were *P. nanum* and *S. musculosum* (33%).

The fish eating ardeids, *A. alba*, *A. cocoi* and *T. lineatum* harbored 7 digenean species whose life cycles include fishes, whereas *Syrigma sibilatrix* was found free of digeneans; this may be related to their terrestrial habitats and diet, which include predominantly arthropods, and occasionally amphibians and reptiles (Franz et al., 2007). Moreover, the great egrets from both ecoregions sampled were found parasitized by *A. ardearum* and *P. nanum*, whereas *A. diminuta* and *D. lacombeensis* were only recovered in the Humid Pampas ecoregion and *S. musculosum* was only found in the Humid Chaco. This suggests that this host species shows a little regional difference in feeding. Finally, the cathartid *C. atratus*, was found parasitized by species that were not found in the ardeids; these differences can be explained by their scavenging habits.

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