10.2478/s11687-011-0036-0

VERSITA

HELMINTHOLOGIA, 48, 4: 256 – 261, 2011

A new species of *Parastrigea* (Digenea, Strigeidae) endoparasite of *Buteogallus urubitinga* (Aves, Accipitridae) from Argentina

F. B. DRAGO, L. I. LUNASCHI

Laboratorio de Helmintología, División Zoología Invertebrados. Museo de La Plata, Facultad de Ciencias Naturales y Museo, UNLP, Paseo del Bosque S/Nº, 1900 La Plata, Buenos Aires, Argentina,
E-mail: *fdrago@fcnym.unlp.edu.ar*

Summary

A new strigeid digenean, *Parastrigea macrobursa* n. sp., is described from specimens recovered from the small intestine of the great black-hawk, *Buteogallus urubitinga* (Aves: Accipitridae), from Formosa Province, Argentina. The new species is characterized by having a tulip-shaped forebody, a hindbody without neck region, a large, well delimited copulatory bursa, and a very deep genital atrium. Three species of *Parastrigea* share the shape of the copulatory bursa namely *P. faini*, *P. astridae* and *P. tulipoides. Parastrigea faini* and *P. astridae* differ mainly from the new species by having the forebody strongly divided in two regions and very developed lateral expansions, and *Parastrigea tulipoides* by having a long neck region and a longer body size. This new species represents the first record of a member of the genus *Parastrigea* Szidat, 1928 parasitizing birds from Argentina. A key is presented for the species currently recognized as valid in the genus.

Keywords: Strigeidae; *Parastrigea macrobursa* n. sp.; *Buteogallus urubitinga*; Accipitridae; Argentina

Introduction

The great black-hawk, *Buteogallus urubitinga* (Gmelin) (Accipitridae), is a diurnal bird of prey found in the open savanna and swamp edges of the Neotropical Region, from Mexico through Central América to Bolivia, Uruguay and central Argentina (Thiollay, 1994). The helminth fauna of the great black-hawk is scarcely known, to date it was reported as host of four species of parasites in Brazil, *Thelazia* (*Thelaziella*) *aquilina* Baylis, 1934 (Nematoda-Thelaziidae), *Contracaecum caballeroi* Bravo-Hollis, 1939 (Nematoda- Anisakidae), *Neodiplostomum microcotyle* Dubois, 1937 (Digenea-Diplostomidae), and *Oligacanthorhynchus iheringi* Travassos, 1916 (Acanthocephala-Oligacanthorhynchidae) (Travassos, 1917; Dubois, 1937; Pinto *et al*., 1994).

Helminths collected recently from the intestine of the great black-hawk in Argentina included an undescribed species of *Parastrigea* Szidat 1928 (Strigeidae), which is described and illustrated in the present paper.

Materials and methods

Four specimens of *Buteogallus urubitinga* were collected between October 2004 and September 2009 from La Marcela farm (26°17'35"S, 59°06'67"W), Pirané, Formosa Province, Argentina. The birds were captured with a shotgun and dissected in the field, the viscera preserved in 10 % formalin and transported to the laboratory for examination. The digeneans found were stored in 70 % ethanol, stained with a 1:6 dilution in 96 % ethanol of hydrochloric carmine, dehydrated and mounted in Canada balsam between cover glasses in order to facilitate handling and observation. Transversal serial sections (5 μm thick) of forebody were stained with haematoxylin-eosin and mounted in Canada balsam. The drawings were made with the aid of a drawing tube. Measurements are given in micrometres (μm) unless otherwise stated, as the range followed by the mean in parentheses. Type and voucher specimens of parasites and hosts were deposited in the Helminthological and Ornithological Collections of the Museo de La Plata (MLP), La Plata, Argentina, respectively.

Results and discussion

Parastrigea macrobursa n. sp. (Fig.1)

Description (based on 11 specimens): Body distinctly bipartite, 1.189 – 2.117 mm (1.764 mm) in total length. Forebody tulip-shaped, with large opening and lateral expansions poorly developed; 435 – 783 x 348 – 638 (568 x 455). Tegument smooth. Hindbody plump, without neck

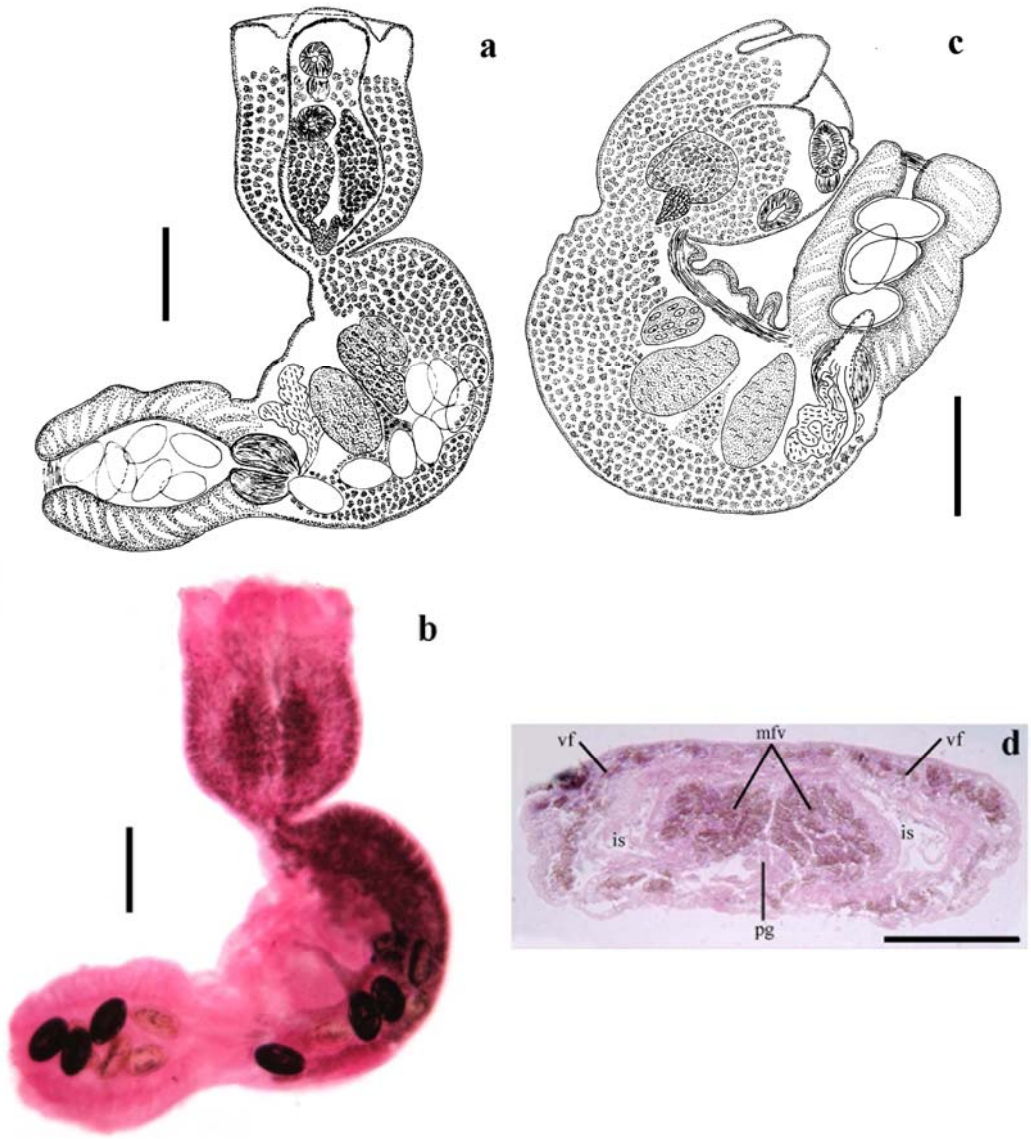

Fig. 1. *Parastrigea macrobursa* n. sp.

region, 2 – 3 times longer than forebody; 754 – 1451 x 391 – 658 (1196 x 539). Ratio of body length to forebody length 1 : 2.7 – 4.1 (1 : 3.1). Ratio hindbody length to forebody length 1 : 1.7 – 3.1 (1 : 2.1). Oral sucker subterminal, well developed, 76 – 87 x 64 – 99 (82 x 77). Ventral sucker spherical to oval, 82 – 107 x 60 – 150 (93 x 106) wide. Distance between suckers 26 – 97 (56). Sucker-width ratio 1 : 0.9 – 1.8 (1 : 1.4). Holdfast organ lobes reaching anterior end. Proteolytic gland at base of forebody 64 – 83 x 60 – 76 (71 x 69). Prepharynx absent; pharynx 44 – 60 x 39 – 60 (54 x 52); oesophagus not seen; intestinal caeca narrow, reaching copulatory bursa. Testes in tandem, large, oval or cuneiform, anterior testis 97 – 155 x 188 – 262 (124 x 213); posterior testis 102 – 213 x 193 – 304 (157 x 248). Seminal vesicle long, folded on itself, behind posterior testis. Ovary oval, pre-testicular or slightly overlapping anterior testis, at 133 – 299 (212) from intersegmental constriction (13 – 27 % of hindbody length), 69 – 131 x 109 – 190 (87 x 138). Laurer's canal short, opening dorsally between ovary and anterior testis. Mehlis' gland in intertesticular region. Vitelline follicles similar in size in both body segments; in forebody, extending from oral sucker in the dorsal wall of body, and from ventral sucker in the ventral wall; in the dorsal lip of holdfast organ forming two symmetrical masses situated between ventral sucker and intersegmental constriction; in hindbody strongly concentrated in preovarian region, extending ventrally to posterior testis or seminal vesicle. Uterus containing 3 – 45 (19) large eggs; 92 – 143 x 57 – 77 (117 x 69). Ratio of body length to egg length 1 : 10 – 20 (1 : 15). Copulatory bursa large, delimited by pronounced constriction, occupying 30 % – 45 % (40 %) of hindbody length; 290 – 648 x 280 – 532 (489 x 396). Muscular ring (*Ringnapf*) absent. Genital cone well delimited from body parenchyma, 117 – 179 x 107 – 176 (151 x 134); ejaculatory duct and uterus join at base of genital

Table 1. Records of the Neotropical species of *Parastrigea*, indicating their hosts and geographical distributions

Species	Host	Locality	References
P. brasiliana	*Cochlearius cochearius* (L.)	Brazil	Dubois (1968)
	Nyctanassa violacea (L.), *Butorides striatus* (L.)	Brazil	Arruda *et al*.(2001)*
	Ardea alba egretta Gmelin	Venezuela	Gomes & Oliveira Rodrigues (1981)
		Brazil	Noronha *et al*. (2009)
	Ardea alba L.	USA	Gibson *et al*. (2005)*
	Ardea herodias	USA	Gibson *et al*. (2005)
	Egretta thula (Molina)	Brazil	Gibson *et al*. (2005)
	Falconidae	Brazil	Noronha *et al*. (2009)
	Tigrisoma lineatum (Boddaert)	Brazil	Noronha *et al*. (2009)
P. caballeroi	*Jabiru mycteria* (Lichtenstein), *Mycteria americana* L.	Venezuela	Gomes & Oliveira Rodrigues (1981)
P. cincta	*Phimosus infuscatus berlepschi* Hellmayr	Colombia	Uribe-Piedrahita (1948)**; Dubois (1968)
	Ardea sp.	Brazil	Dubois (1968)
	Falco sparverius sparverius L., *Ajaia ajaja* (L.)	Cuba	Dubois & Macko (1972)
	Micrastur gilvicollis (Vieillot)	Brazil	Dubois (1970)
	J. mycteria	Venezuela	Lamothe-Argumedo *et al*. (1997)
P. mexicana	*Recurvirostra americana* Gmelin	Mexico	Coil (1957)
		USA, Canada	Gibson *et al*. (2005)
		Cuba	Gibson *et al*. (2005)
	Himantopus mexicanus (Müller)	USA	Dubois & Macko (1972)
		USA	Hinojos & Canaris (1988)
P. diovadena	*Eudocimus albus* (L.)	Cuba	Dubois & Macko (1972)
		USA	Bush & Forrester (1976)
	Eudocimus ruber (L.)	Colombia	Dubois (1978)

*Cited as *Apharyngostrigea brasiliana* (Szidat, 1928) Szidat, 1929
**Cited as Strigeidae

cone forming hermaphroditic duct. Genital atrium very deep; genital pore terminal. Excretory vesicle not observed. Excretory pore dorso-subterminal at level of copulatory bursa.

Type host: *Buteogallus urubitinga* (Gmelin) (Falconiformes, Accipitridae).
Type locality: La Marcela farm (26°17'35"S; 59°06'67"W), Pirané, Formosa Province, Argentina.
Date of collection: October 2004, September 2009.
Site of infection: small intestine.
Type material: Holotype MLP 6272; paratypes MLP 6273, 6274 (8 specimens).
Voucher specimens: MLP 6275 in cross-sections, MLP 6276 (2 specimens)
Prevalence: 3 of 4 (75 %).
Mean intensity: 7.3 (3 – 13).
Etymology: The specific name refers to the large size of the copulatory bursa.

Remarks: *Parastrigea* is a genus that includes species characterized by having the forebody with two lateral and symmetrical expansions originated by the concentration of vitelline follicles in the dorsal lip of the holdfast organ. The main morphologic characteristics used to distinguish among its species are the shape of forebody, lateral expansions and testes, the presence or absence of neck region in hindbody and the conformation and size of the copulatory bursa, genital cone and genital atrium (Dubois, 1968). At present, this genus contains 17 species, 5 of them described in the Neotropical Region as parasites of ciconiiform, falconiform and charadriiform birds: *P. brasiliana* (Szidat, 1928) Dubois, 1964, *P. caballeroi* Dubois, 1952, *P. cincta* (Brandes, 1888) Szidat, 1928, *P. diovadena* Dubois et Macko, 1972, and *P. mexicana* Coil, 1957 (Table 1). Moreover, a sixth species, *P. robusta* Szidat, 1928, was listed in Brazil parasitizing *Jacana spinosa jacana* (L.) by Noronha *et al.*, (2009), although Dubois (1970) considered questionable this report for South America, given the poor condition of the specimens. In Argentina, *P. brasiliana* was listed parasitizing ardeid birds (Lunaschi *et al*., 2007), however, these specimens were transferred to *Apharyngostrigea ardearum* (Lutz, 1928) Dubois, 1968 (Drago & Lunaschi, 2011).
According to descriptions given by Dubois (1968), *P. macrobursa* n. sp. differs from other Neotropical species of the genus by a combination of characters, and principally by having a large well delimited copulatory bursa, with a well delimited genital cone from body parenchyma and a very deep genital atrium. *P. brasiliana* can be easily distinguished from the new species by having the forebody divided in a campaniform anterior region that includes both suckers, and a pyriform posterior region with lateral pronounced expansions. In addition, this species differs by possessing a long neck region in hindbody (1/3 of body length) occupied entirely by vitelline follicles, testes

Table 2. Comparative data for *Parastrigea macrobursa* n. sp. and related species

Species	*P. macrobursa* n. sp.	*P. astridae*	*P. faini*	*P. tulipoides*
References	Present study	Dubois (1968)	Dubois (1968)	Dubois (1968)
Distribution	Argentina	Rwanda	Rwanda, Madagascar	USA
Body length	1.189 – 2.117 mm	up to 10.6 mm	up to 3.8 mm	up to 5.1 mm
Forebody (Fo)	435 – 783 x 348 – 638	1.3 – 2.14 x 1.85 – 2.8 mm	0.8 – 1.22 x 0.7 – 1.28 mm	680 – 950 x 380 – 610
Hindbody (Hi)	754 – 1451 x 391 – 658	3.5 – 8.7 x 1.33 – 2.35 mm	1.52 – 2.66 x 0.77 – 1.15 mm	2.52 – 4.16 x 0.35 – 0.58 mm
Oral sucker	76 – 87 x 64 – 99	130 – 185 x 110 – 150	120 – 150 x 110 – 125	88 x 82
Ventral sucker	82 – 107 x 60 – 150	140 x 115	140 – 170 x 120 – 150	99 – 109 in diameter
Proteolytic gland	64 – 83 x 60 – 76	200 x 120	---	70 – 95 x 80 – 110
Pharynx	44 – 60 x 39 – 60	70 – 85 in diameter	85 – 105 x 85 – 100	59 – 66 in diameter
Ovary	69 – 131 x 109 – 190	225 – 300 x 550 – 650	135 – 220 x 300 – 400	136 – 245 x 231 – 313
Anterior testis	97 – 155 x 188 – 262	710 – 800 x 880 – 1430	300 – 470 x 760	272 – 435 x 312 – 503
Posterior testis	102 – 213 x 193 – 304	750 – 820 x 880 – 1470	420 – 580 x 680	231 – 490 x 312 – 503
Copulatory bursa	290 – 648 x 280 – 532	900 – 1400 x 1240 – 1440	730 – 1080 x 700 – 950	381 – 612 x 340 – 585
Genital cone	117 – 179 x 107 – 176	600 – 620 x 400 – 570	320 – 350 x 250 – 290	200 – 240 x 150 – 210
Eggs	92 – 143 x 57 – 77	125 – 139 x 70 – 84	106 – 125 x 63 – 64	99 – 129 x 69 – 82
Ratio Hi/Fo length	1.7 – 3.1	2.5 – 4.5	1.4 – 2.7	3 – 4
Hosts	*Buteogallus urubitinga*	*Bubo poensis* Fraser	*Accipiter hensti* (Schlegel)	*Buteo lineatus* (Gmelin)
		Tyto alba affinis (Blyth)	*Aquila rapax* (Temminck)	
		Tyto capensis (Smith)	*Buteo augur* (Rüppell)	
			Buteo oreophilus Hart. et Neum.	
			Lophaetus occipitalis (Daudin)	

*cited as *Buteo rufofuscus augur* (Rüppell)

Key to the species of *Parastrigea*

1 - Body indistinctly bipartite. In African reptiles ..... *P. arcuata* Dubois, 1955
1' - Body distinctly bipartite. In birds 2
2 - Forebody divided in an anterior cephalic region and a posterior collar region 3
2' - Forebody not divided 10
3 - Neck region in hindbody, present 4
3' - Neck region in hindbody, absent 7
4 - Pharynx absent or not discernible 5
4' - Pharynx well developed 6
5 - Testes multilobed. In Ardeidae and Falconidae from Brazil, Venezuela and USA
..... *P. brasiliana* (Szidat, 1928) Dubois, 1964
5' - Testes bilobed. In Accipitridae and Laridae from Palearctic region
..... *P. flexilis* (Dubois, 1934) Dubois, 1955
6 - Copulatory bursa with *Ringnapf*; genital atrium campaniform. In Accipitridae from USA
..... *P. campanula* Dubois et Rausch, 1950
6' - Copulatory bursa without *Ringnapf*; genital atrium not campaniform. In Ciconiidae from Rwanda and India
..... *P. thienponti* Dubois et Fain, 1956
7 - Copulatory bursa with *Ringnapf*; genital atrium shallow 8
7' - Copulatory bursa without *Ringnapf*; genital atrium very deep 9
8 - Genital cone small. In Ardeidae, Ciconiidae, Threskiornithidae, Falconidae and Recurvirostridae from the Neotropical region
..... *P. cincta* (Brandes, 1888) Szidat, 1928
8' - Genital cone enormeous. In Accipitridae from Alaska. ..... *P. ogchnocephala* Dubois et Rausch, 1950
9 - Hindbody <3 mm; ratio hindbody/forebody length 1.4 – 2.7; copulatory bursa occupying 35 % – 50 % of hindbody. In Accipitridae from Rwanda and Madagascar. (in *Rattus rattus* L. as accidental host) ..... *P. faini* Dubois, 1955
9' - Hindbody >3 mm; ratio hindbody/forebody length 2.5 – 4.5; copulatory bursa occupying 25 % – 33 % of hindbody. In Tytonidae and Strigidae from Africa ..... *P. astridae* Dubois, 1955
10 - Neck region in hindbody, present 11
10' - Neck region in hindbody, absent 14
11 - Pharynx absent. In Accipitridae and Ardeidae from Australia ..... *P. repens* (Chase, 1921) Dubois, 1961
11' - Pharynx present 12
12 - Neck region occupying 50 % of hindbody In Accipitridae from Philippines and Europe ..... *P. intermedia* Tubangui, 1932
12' - Neck region occupying 60 – 75 % of hindbody 13
13 - Forebody ovoid; copulatory bursa small; testes entire. In Accipitridae from Europe
..... *P. tenuicollis* (Westrumb, 1823) Dubois, 1966
13' - Forebody tulip-shaped; copulatory bursa large, testes bilobed. In Accipitridae from USA
..... *P. tulipoides* Miller et Harkema, 1965
14 - Proteolytic gland similar in size to ovary. In Threskiornithidae from Cuba, USA and Colombia
..... *P. diovadena* Dubois et Macko, 1972
14' - Proteolytic gland smaller than ovary 15
15 - Forebody with lateral expansions poorly developed. Genital atrium very deep. In Accipitridae from Argentina
..... *P. macrobursa* n. sp.
15' - Forebody with lateral expansions well developed. genital atrium slightly deep 16
16 - Body >5 mm; hindbody cylindrical. In Ciconiidae from Venezuela ..... *P. caballeroi* Dubois, 1952
16' - Body <5 mm; hindbody ovoid or sacciform 17
17 - Copulatory bursa with *Ringnapf*. In Falconidae, Podicipedidae and Anatidae from Holarctic region
..... *P. robusta* Szidat, 1928
17' - Copulatory bursa without *Ringnapf.* In Recurvirostridae from Cuba and North America ..... *P. mexicana* Coil, 1957

multilobed, muscular ring "*ringnpf*" in the copulatory bursa, no discernible pharynx, longer specimens (body up to 7.6 mm vs. 1.2 – 2.1 mm), and a greater ratio of hindbody length to forebody length (1 : 3.1 – 4.8 vs. 1.7 – 3.1). *Parastrigea caballeroi* can be differentiated from *P. macrobursa* n. sp. by having a sacciform forebody, strongly arched dorsally with reniform lateral expansions, multilobed testes, longer specimens (body up to 6.4 mm), and smaller eggs (87 – 91 x 41 – 53 vs. 92 – 143 x 57 – 77). *Parastrigea cincta* differs from the new species by having a pyriform forebody with a small opening, divided in two regions, of which the posterior region has very protuberant lateral expansions, multilobed testes, greater length of body (body up to 15 mm), and smaller eggs (80 x 50 vs. 92 – 143 x 57 – 77).

P. mexicana is similar in size to *P. macrobursa* n. sp. (body up to 2.3 mm vs. 1.2 – 2.1 mm), but differs by the shape of forebody, which is piriform with a small opening and very developed lateral expansions, by the location of the proteolytic gland, which is situated in the middle of the holdfast organ and by having the posterior end of hindbody rounded, where the copulatory bursa is not delimited externally. *Parastrigea diovadena* differs mainly by having a larger bilobed proteolytic gland, a small copulatory bursa slightly delimited externally and a well developed muscular ring "*ringnpf*", a shallow genital atrium and strongly lobed testes. Other species of the genus, i.e. *Parastrigea faini* Dubois, 1955 and *Parastrigea astridae* Dubois, 1955 from the Ethiopian Region, and *Parastrigea tulipoides* Miller et Harkema, 1965 from the Nearctic Region, are similar to the new species by having a large copulatory bursa, well delimited externally, and with a very deep genital atrium, but differ in most metrical characters (Table 2). Moreover, *P. faini* can be easily distinguished from *P. macrobursa* n. sp. by possessing the forebody strongly divided in an anterior cephalic region, bulbiform or cylindrical, and a posterior region with very pronounced lateral expansions. *Parastrigea astridae* can be differentiated by having the forebody divided in two regions, a bulbiform anterior region and a posterior region strongly dilated bearing very protuberant lateral expansions and multilobed testes. Finally, *P. tulipoides* is similar to *P. macrobursa* n. sp. in the shape of forebody and copulatory bursa, but differs by having a long neck in the hindbody and bilobed testes.
Based on all these differences, a new species *Parastrigea macrobursa* n. sp. is proposed.

Acknowledgements

To Luis Pagano and Ignacio Roesler for assistance in collecting the hosts. The authors, Lía Lunaschi and Fabiana Drago, are members of the Comisión de Investigaciones Científicas de la provincia de Buenos Aires (CIC) and Universidad Nacional de La Plata (UNLP), respectively. The present study was funded by CIC (Res. Nº 1150/09) and UNLP (11/N541).

References

ARRUDA, V. S., PINTO, R. M., MUNIZ-PEREIRA, L. C. (2001): New host and geographical records for helminths parasites of Ardeidae (Aves, Ciconiiformes) in Brazil. *Rev. Bras. Zool.*, 18(Supl. 1): 225 – 232. DOI: 10.1590/S0101-81752001000500018.

BUSH, A. O., FORRESTER, D. J. (1976): Helminths of the white ibis in Florida. *P. Helm. Soc. Wash.*, 43(1): 17 – 23.

COIL, W. H. (1957): *Parastrigea mexicanus* sp. nov., a strigeid trematode from the avocet. *T. Am. Microsc. Soc.*, 76: 70 – 72

DRAGO, F., LUNASCHI, L. (2011): Digenean parasites of Ciconiiform birds from Argentina. *Rev. Mex. Biodiv.*, 82: 77 – 83

DUBOIS, G. (1937): Sur quelques Strigéidés (Notes préliminaires). *Rev. Suisse Zool.,* 44(25): 391 – 396

DUBOIS, G. (1968): Synopsis des Strigeidae et des Diplostomatidae (Trematoda). *Mém. Soc. Neuchâtel. Sci. Nat.*, 10: 1 – 258

DUBOIS, G. (1970): Les Strigeata (Trematoda) de la collection A. Lutz. *Mem. I. Oswaldo Cruz*, 68(1): 169 – 196. DOI: 10.1590/S0074-02761970000100006.

DUBOIS, G. (1978): Notes Helminthologiques IV: Strigeidae Railliet, Diplostomidae Poirier, Proterodiplostomidae Dubois et Cyathocotylidae Poche (Trematoda). *Rev. Suisse Zool*., 85(3): 607 – 615

DUBOIS, G., MACKO, J. (1972): Contribution a l'étude de Strigeata La Rue, 1926 (Trematoda: Strigeida) de Cuba. *Ann. Parasit. Hum. Comp*., 47(1): 51 – 75

GIBSON, D. I., BRAY, R. A., HARRIS, E. A. (2005): *Host-Parasite Database of the Natural History Museum, London*. Retrieved August 21, 2010 from http://www.nhm.ac.uk/research-curation/research/projects/host-parasites

GOMES, D. C., DE OLIVEIRA RODRIGUES, H. (1981): Trematoda. In: HURLBERT, S. H., VILLALOBOS FIGUEROA, A. (Eds). *Aquatic Biota of Mexico, Central America and the West Indies*, California, USA, San Diego State University, pp. 116 – 128

HINOJOS, J. G., CANARIS, A. G. (1988): Metazoan Parasites of *Himantopus mexicanus* Müller (Aves) from Southwestern Texas, with a Checklist of Helminth Parasites from North America. *J. Parasitol*., 74(2): 326 – 331

LAMOTHE-ARGUMEDO, R., GARCÍA-PRIETO, L., OSORIO-SARABIA, D., PÉREZ-PONCE DE LEÓN, G. (1997): Catálogo de la Colección Nacional de Helmintos. México D. F, México, UNAM-CONABIO, 211 pp.

LUNASCHI, L. I., CREMONTE, F., DRAGO, F. B. (2007): Checklist of digenean parasites of birds from Argentina. *Zootaxa*, 1403: 1 – 36

NORONHA, D., SÁ, M. R., KNOFF, M., MUNIZ-PEREIRA, L. C., PINTO, R. M. (2009): *Adolpho Lutz e a Coleção Helmintológica do Instituto Oswaldo Cruz, Rio de Janeiro*. Rio de Janeiro, Brazil, Museu Nacional, Série Livros 37, 154 pp.

PINTO, R. M., VICENTE, J. J., NORONHA, D. (1994): Nematode parasites of Brazilian accipitrid and falconid birds (Falconiformes). *Mem. I. Oswaldo Cruz*, 89(3): 359 – 362. DOI: 10.1590/S0074-02761994000300010.

THIOLLAY, J. M. (1994): FAMILY ACCIPITRIDAE. IN: DEL HOYO, J., ELLIOTT, A., SARGATAL, J. (Eds) *Handbook of the Birds of the World.* Vol. 2. Barcelona, Spain: Lynx Edicions, pp. 52 – 205

TRAVASSOS, L. (1917): Contribuições para o conhecimento da fauna helmintolojica brazileira. *Mem. I. Oswaldo Cruz*, 9(1): 5 – 62. DOI: 10.1590/S0074-02761917000100001.

URIBE-PIEDRAHITA, C. (1948): Contribuciones al estudio de la parasitología en Colombia, II. *Caldasia*, 5(21): 211 – 219

RECEIVED NOVEMBER 30, 2010 ACCEPTED AUGUST 26, 2011