This is a “preproof” accepted article for *Parasitology*.
This version may be subject to change during the production process.
10.1017/S0031182025000563

# Helminths assemblage in two opossum’s species, *Didelphis albiventris* and *Didelphis aurita* (Mammalia: Didelphimorphia) from the Atlantic Forest of Argentina

Bárbara Betina Hartmann[1,2]; Ezequiel Andres Vanderhoeven[1]; Dante Luis Di Nucci[3]; Agustín Solari[1] and Juliana Notarnicola[1,2]

[1] Universidad Nacional de Misiones - CONICET. Facultad de Ciencias Forestales. Instituto de Biología Subtropical (IBS) - Laboratorio de Biodiversidad Parasitaria de Animales Silvestres. Misiones Argentina. [2] Universidad Nacional de Misiones. Facultad de Ciencias Forestales. Laboratorio de Diagnostico Vegetal y Animal (LADEVA). Misiones Argentina; [3] Fundación de Historia Natural Félix de Azara, Centro de Rescate, Rehabilitación y Recría de Fauna Silvestre Güirá Oga, Misiones, Argentina.

**Corresponding author:** Hartmann Bárbara Betina, Email: barbarabetina94hartmann@gmail.com

**Abstract**

In the Argentinian Atlantic Forest (AAF) of Misiones, opossums comprise 13% of the wild mammalian diversity. The white-eared opossum, *Didelphis albiventris*, and the southern black-eared opossum, *D. aurita* are sympatric marsupials, and the most frequent mammals in the northern Misiones. In this study, we describe the helminth assemblages from both *D. albiventris* and *D. aurita* in the northern AAF. We found a total of 15 species of helminths: two trematodes, one cestode, 11 nematodes, and one acanthocephalan. The specific richness in *D. albiventris* was 12, while in *D. aurita* was 13. Both opossum's species share 10 helminth species; *D. albiventris* presented *Capillaria* sp. 2 and *Globocephalus marsupials*, absent in *D. aurita*; while *D. aurita* presented *Trichuris didelphis*, *Capillaria* sp. 1, and *Travassostrongylus orloffi*, absent in *D. albiventris*. *Cruzia tentaculata* registered the highest prevalence in both opossum species. Seven out of the 12 helminth species identified in *D. albiventris* have an indirect life cycle. Similarly, in *D. aurita*, five out of 13 helminth species exhibit an indirect life cycle. This suggests that nearly half of the assemblage of helminth in both opossum species need an intermediate host acquired through the diet. We also present new records for Argentina including *Trichuris minuta*, *G. marsupialis*, *Viannaia viannai*, *T. orloffi*, and *T. callis*. This is the first time the helminth assemblage has been described for *D. aurita* in Argentina.

**Keywords**: Helminth assemblage; Atlantic Forest; Misiones; opossums; *Didelphis*.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

## Introduction

The Atlantic Forest (AF) is widely recognized as one of the world's top five biodiversity hotspots (Myers *et al.*, 2000). The province of Misiones in Argentina, represents the largest continuous remnant, harbouring approximately 30% of the country's overall biodiversity (Placi and Di Bitetti 2006).

In Misiones, opossums comprise 13% of the wild mammalian diversity and they are represented by nine genera and 15 species: *Caluromys* Allen, 1900, *Chironectes* Illiger, 1811, *Didelphis* Linnaeus, 1758, *Gracilinanus* Gardner y Creighton, 1989, *Lutreolina* Thomas, 1910, *Metachirus* Burmeister,1854, *Micoureus* Lesson, 1842, *Monodelphis* Burnett, 1830, and *Philander* Tiedemann,1808 (Massoia *et al.*, 2012). The white-eared opossum (*Didelphis albiventris* Lund, 1840) and the southern black-eared opossum (*D. aurita* (Wied-Neuwied, 1826) are the so called medium sized opossums, frequently found in human dwellings and peripheral areas in north Misiones (Massoia *et al.*, 2012).

*Didelphis albiventris* is distributed in Brazil, Bolivia, Paraguay, Uruguay and Argentina (Wilson and Reeder, 2005). In Argentina, this species is distributed from north to the central part of the country (Chemisquy and Martin, 2019) with an expanding presence toward the south (Pastrán-López *et al.*, 2022). This opossum is found in diverse habitats like forests and grasslands often associated with human-altered landscapes (Massoia *et al.*, 2012). *Didelphis aurita* is distributed along the coast of Brazil, from Bahia to Rio Grande do Sul, east of the lower Paraguay river and the AAF (Wilson and Reeder, 2005). Unlike *D. albiventris*, it is associated in well-preserved native forests, both in continuous areas and remnants (Massoia *et al.*, 2012; Chemisquy and Martin, 2019). Both species are omnivorous and have opportunistic feeding behavior, with a diet consisting of small vertebrates, invertebrates, seeds, and fruits (Massoia *et al.*, 2012). Additionally, these opossums may consume garbage remnants of human consumption, as well as food available inside the forest (Bezerra-Santos



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

*et al.*, 2021).

In Argentina, studies on helminths in opossums are scarce and sporadic over time (Hartmann, 2023). At present, about 27 helminth species are known to be present in the most common species of opossums, mostly from central Argentina (Santa Cruz *et al.*, 1999; Lunaschi and Drago, 2007; Castaño Zubieta *et al.*, 2014; Montes de Oca *et al.*, 2024) and a few records from a rare species in the Northwest Argentina (Navone, 1989; Navone *et al.*, 1991; Navone and Suriano 1992). To our knowledge, in the AF there are several studies that report helminths in *D. aurita* and *D. albiventris* (see: Antunes, 2005; Ramos *et al.*, 2016; Costa-Neto *et al.*, 2018; Bezerra-Santos *et al.*, 2021). However, in Misiones there is only one record of Martínez (1986) mentioning the trematode *Duboisella proloba* Baer, 1938 in *D. albiventris*.

As opossums are frequent in urban and rural environments, live in close relationship with humans and domestic animals, they are considered potential reservoirs of many infectious agents (i.e.: *Trypanossoma cruzi*, *Leishmania infantum*, *Ancylostoma caninum*, *Angiostrongylus cantonensis*, among others) (Bezerra-Santos *et al.*, 2021). Several studies have proven that opossums are involved in the transmission of parasites of animal health concern, playing an underestimated role in the epidemiology of parasitic diseases affecting domestic animals (Bezerra-Santos *et al.*, 2021). In this study we proposed to work toward filling this knowledge gap providing new and updated records of helminth species from *D. albiventris* and *D. aurita* in the AAF.

## Materials and methods

### *Study site*

Our study was conducted between September 2021 and June 2023 in the Department of Puerto Iguazu in the north of Misiones province. Sampling was conducted at various sites,



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

including the routes through Iguazu National Park (National Routes (NR) 12 and 101), Colonia Wanda (NR 12 and Provincial Route (PR) 19), and Puerto Esperanza (NR 12), as well as the urban and rural areas surrounding these cities (Figure 1).

### *Sample collection*

We collected opportunistically opossum carcasses recently dead, including those from roadkill, dog attacks, or other causes. Specimens were collected in plastic bags and necropsied in the laboratory. The body cavity and viscera were thoroughly examined using a magnifying glass to facilitate observation. We collected and preserved all parasites found. Nematodes and acanthocephalans were fixed in 10% formalin and preserved in 70% ethanol. For morphological studies they were cleared in Amman's lactophenol and studied with a Leica DM500 microscope equipped with a drawing tube. Trematodes and cestodes were placed between two slides with 2% formalin until they were flattened; and preserved in 70% ethanol. For morphological studies specimens to be studied were stained with 1:6 dilutions in 96% ethanol of hydrochloric carmine, dehydrated in a series of alcohol ranging from 70%-85%-95%-100% ethanol, rinsed in eugenol, and mounted in Canada balsam. Measurements are given in millimetres (mm) unless other units it stated. Photographs were taken with a Zeiss Primo Star microscope with a compact digital camera.

Voucher specimens were deposited in the Colección de Helmintos Museo de La Plata, Argentina (CHMLP-he) (see Appendix), and IBS authors collection. Host acronyms correspond to the field numbers BH (Barbara Hartmann) and M (Dante Di Nucci), and to the Colección de Mastozoología del Laboratorio de Genética Evolutiva – Dr. Claudio Bidau (CM-LGE) from the Instituto de Biología Subtropical IBS (see Appendix).



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

### *Populations parameters*

We analysed parameters at the component population level. Quantitative parameters of prevalence (P), mean abundance (MA) and mean intensity (MI) were calculated following Bush *et al. (*1997). For the prevalence, a 95% confidence interval (CI) was estimated using Sterne's method; a bias-corrected and accelerated 95% bootstrap CI (Bca) with 2000 replicates was applied for calculation of mean intensity and mean abundance, according to Reiczigel *et al. (*2019). The Quantitative Parasitology web software (QPWeb) was used to calculate these descriptors (Reiczigel *et al.*, 2019).

## Results

Thirteen specimens of *D. albiventris* and 11 of *D. aurita* were collected. Three species of Platyhelminthes, ten species of nematodes and one species of Acanthocephala were identified. In Table 1 we detail the helminth species and the parameters (P, MI, and MA) recovered from both, *D. albiventris* and *D. aurita* in the present study. Below is listed the helminths species including a brief description with their measurements.

### ***Taxonomic aspects***

*Phylum Platyhelminthes Minot, 1876*

Class Trematoda Rudolphi. 1808

Superfamily Brachylaimoidea Joyeux and Foley, 1930

Family Brachylaimidae Joveux and Foley, 1930

*Brachylaima migrans* Dujardin, 1845 (Fig. A)

*Description* (n = 5): Trematode small, whitish, elongated subcylindrical body 3.15-4.31 long by 0.60-0.90 wide. Oral and ventral suckers globular, nearly equal, 0.40-0.50 by 0.30-0.60 and 0.30-0.45 by 0.30-0.43 respectively. Oesophagus 0.20-0.30 long by 0.15-0.20 wide.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

Testicles in tandem, located in the posterior third of the body, anterior testis 0.20-0.40 long by 0.20-0.35 wide, posterior testis 0.25-0.45 long by 0.20-0.30 wide. Ovary intertesticular, 0.15-0.25 long by 0.20-0.30 wide, the oviduct 0.2-0.6 long is continued by the uterus 1.75-2.5 long, which open into the genital pore. Eggs elliptical, with one side slightly flattened and the other convex, 0.02 long by 0.01 wide.

Taxonomic summary

*Host*: *Didelphis albiventris* (BH01, BH06, BH10, M177/22, M190/22, M211/23), *Didelphis aurita* (BH09, BH20, BH24, BH26, BH32, M220/23).

*Infection site*: Small intestine

*Localities*: Puerto Esperanza, Colonia Wanda, and Puerto Iguazú, Misiones, Argentina (see appendix).

*Deposited material*: MLP-He 8141 (1 specimen in a slide).

*Remarks*: The morphological characters are consistent with the description given by Boero and Boehringer (1967). *Brachylaima migrans* has been recorded across Argentina as a parasite of *D. albiventris* and *Lutreolina crassicaudata* Desmarest, 1804 (see: Boero and Boehringer, 1967; Martínez, 1986; Santa Cruz, 2006; Lunaschi y Drago, 2007). In Brazil, this species was reported for *D. albiventris* (see: Silva and Costa, 1999; Antunes, 2005) and *D. aurita* (see: Costa-Neto *et al.,* 2018; Gentile *et al.,* 2022). This is the first record for *D. aurita* in Argentina.

Superfamily Echinostomatoidea Looss, 1899

Family Rhopaliidae Looss, 1899

*Rhopalias coronatus* (Rudolphi, 1819) Stiles and Hassall, 1898 (Fig. B)

*Description* (n = 5): Trematodes with elongated, spiny body of 7.35-10.85 long by 1.20-1.50 wide. Specimens possess a pair of armed proboscides with spines, which can be invaginated into a muscular pouch. The pouches open to the exterior on each side of the oral sucker.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

Subterminal oral sucker. Acetabulum larger than the oral sucker, at 1.40-2.75 from the anterior end. Testis oval, in tandem located in the posterior half of the body, anterior testis 0.50-0.85 long by 0.30-0.60 wide and posterior testis 0.6-0.9 long by 0.3-0.4 wide. Ovary oval, pretesticular, 0.45-0.95 long by 0.4-0.85 wide. Genital pore median, pre-acetabular. Vitelline follicles in lateral fields in posterior third of the body. Eggs oval to elliptical, 0.09-0.1 long by 0.05-0.06.

Taxonomic summary

*Host*: *Didelphis albiventris* (M190/22, M211/23), *Didelphis aurita* (BH07, BH08, BH20).

*Infection site:* Small intestine

*Locality*: Puerto Iguazú, Misiones, Argentina.

*Deposited material*: MLP-He 8142 (1 specimen on a slide).

*Remarks*: Morphology of our specimens is consistent with the description given by Haverkost and Gardner (2008) and Chero *et al. (*2017). However, they are larger worms, the tentacle sacs extend far beyond the posterior margin of the pharynx, and the tentacle spines and oral spines are difficult to observe compared to those reported by Haverkost and Gardner (2008). Species of *Rhopalias* are parasites of the small intestine of marsupials from the Nearctic and Neotropical region (Haverkost and Gardner 2008). *Rhopalias coronatus* has been reported in *D. albiventris* and *L. crassicaudata* from Argentina (see: Boero and Boehringer, 1967; Lombardero and Moriena, 1973; Martinez *et al.*, 1973; Martinez, 1986; Haverkost and Gardner 2008; Jiménez *et al.*, 2024). It was also reported from *D. albiventris* from Brazil and Paraguay (see: Haverkost and Gardner 2008; Marinho de Quadros *et al.*, 2016; Zabott *et al.*, 2017; Teodoro *et al.*, 2019; Jiménez *et al.*, 2024); *D. aurita* (see: Costa-Neto *et al.*, 2018; Gentile *et al.*, 2022) from Brazil, and *Philander opossum* Linnaeus, 1758 from Bolivia (Haverkost and Gardner 2008; Jiménez *et al*., 2024). This is the first record for *D. aurita* Argentina.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

## Class Cestoda Rudolphi 1808

Orden Cyclophyllidea van Beneden in Braun, 1900

Family Anoplocephalidae Blanchard, 1891

*Mathevotaenia* sp. (Figs. D1-D3)

*Description* (n=5): Small cestodes, 4.95-5.60 in total length, consisting of 19-25 proglottids. Maximum width 0.35-0.45 attained in gravid segments. Scolex unarmed, poorly demarcated from strobila, 0.25-0.30 long by 0.40-0.50 wide. Oval suckers, with thin muscular walls, 0.15-0.2 long by 0.15-0.2 wide. In the specimens studied herein, segmentation begins immediately after scolex. Proglottids trapezoidal with laterally expanded posterior edges. Mature eggs concentrated along the lateral margin of the proglottids. Egg capsule 0.2 by 0.2.

Taxonomic summary

*Host*: *D. albiventris* (M211/23) and *D. aurita* (BH20).

*Infection site*: Small intestine.

*Locality*: Puerto Iguazú, Misiones, Argentina.

*Deposited material*: Specimens under study.

*Remarks*: The characteristics of these cestodes correspond to those mentioned by Campbell *et al. (*2003) for *Mathevotaenia* spp.: small cestodes, craspedote proglottids, scolex unarmed. However, the worms studied herein are smaller than those mentioned by Campbell *et al. (*2003). *Mathevotaenia argentinensis* Campbell, Gardner & Navone, 2003 and *M. sanmartini* Jimenez, Cambell & Gardner, 2008 present 135–163 proglottids and more than 200, respectively, while *M. bivittata* (Janicki, 1904) has 37–49 proglottids. Our specimens have fewer proglottids, and the position of the ovary and testes differs from *M. bivittata*, meaning that these specimens could be a new species. More specimens should be studied to confirm this.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

In Argentina, *M. bivittata* (Campbell *et al.*, 2003) and *M. sanmartini* were recorded for *Marmosa cinerea* and *M. argentinensis* was recorded for *Thylamys pallidior* (see: Jiménez *et al.*, 2008). In Brazil, *M. bivittata* was reported parasitizing *D. albiventris* (see: Justo *et al.*, 2017). Other species of the genus *Didelphis* have been mentioned as hosts for *Mathevotaenia* sp. in Mexico and French Guiana (Monet-Mendoza *et al.*, 2005; Jiménez *et al.*, 2011). This is the first report of *Mathevotaenia* sp. from *D. aurita*.

*Phylum Nemata Rudolphi, 1808*

Order Trichinellida Hall, 1916

Family Trichuridae Ramson, 1911

*Trichuris minuta* (Rudolphi, 1819) Babero, 1960 (Fig. C1, C2)

Description (6 males and 4 females): Mouth without lips; stichosome with one row of stichocytes. Bacillary band present. Spicule 0.82-1.14 long, spicule sheath 0.11-0.19 long, with spines less than 1 μm long, spicule tube 0.53-1.14 long, ejaculatory duct 0.95-1.65 long and testicle 3.60-5.95 long. Vulva located at the 9.70-14.41 from the anterior end, vagina 0.90-1.60 long, ovary located at the 1.02-1.20 from the posterior end, uterus monodelphic, terminal anus. Eggs 0.06-0.07 long by 0.03-0.04 wide.

Taxonomy summary

*Host*: *Didelphis albiventris* (BH05, BH06, BH10, BH35, M174/22, M177/22, M211/23), *Didelphis aurita* (BH07, BH08, BH09, BH19, BH20, BH24, BH32).

*Infection site:* Large intestine and caecum.

*Localities:* Puerto Esperanza, Colonia Wanda, and Puerto Iguazú; Misiones, Argentina.

*Deposited material:* MLP-He 8143 (5 males and 5 females).

*Remarks*: Our specimens are morphologically like those described by Babero (1960). *Trichuris minuta* was originally described by Rudolphi (1819) parasitizing *Caluromys*



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

*phylander* [originally mentioned as *Didelphis cayopollin* (Schreber, 1777)] in Brasilia, Brazil (Rudolphi, 1819). Later, Babero re-described the species from *D. virginiana* from Georgia, USA. More recently, this species was recorded in Brazil as a parasite of *D. albiventris* (Antunes, 2005) and *D. aurita* (see: Noronha *et al.*, 2002; Costa-Neto *et al.*, 2018). This is the first report of *T. minuta* for Argentina.

*Trichuris didelphis* Babero, 1960 (Fig. E)

*Description* (4 males): Anterior end very thin, mouth without lips. Stichosoma occupies approximately two thirds of the length of the body; the body widens at the level of esophago-intestine junction. Spicule 0.89-0.20 long. Spicule sheath extending 0.20-0.30 beyond rear end of body, globular, pear-shaped in outline, with small spines less than 1 µm long. Cloaca 0.25-0.43 long, thick and muscular. Spicule tube 0.15-0.20 long. Ejaculatory duct 1.50-1.80 long and vas deferens 2.40-3.8 long.

Taxonomic summary

*Host*: *Didelphis aurita* (BH26, BH32, M220/23).

*Infection site:* Caecum.

*Locality*: Puerto Iguazú, Misiones, Argentina.

*Deposited material:* Specimens under study.

*Remarks*: This species was originally described by Babero (1960) from *D. virginiana* in Georgia, USA. In Brazil, it was also recorded in *D. albiventris* (see: Silva and Costa, 1999; Antunes, 2005) and *D. aurita* (see: Costa Neto *et al.*, 2018; Gentile *et al.*, 2022). While in Argentina, it was recorded in *D. albiventris* (see: Santa Cruz, 2006). Lombardero & Moriena (1973) reported the presence of *Trichuris* sp. in *D. albiventris* from Corrientes province. The drawings provided by these authors closely resemble *T. didelphis*, indicating that it might be the same species. This species was also reported in Mexico (Acosta-Virgen *et al.*, 2015). This



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

is the first report of *T. didelphis* parasitizing *D. aurita* in Misiones.

Family Capillaridae Raillet, 1915

*Capillaria* sp. 1 (Fig F1, F2)

*Description* (5 females and 2 males): Small, slender-bodied nematodes, 11.2-16.50 total length; esophagus 5-5.3 long by 0.03-0.06 wide with well differentiated sticocytes and visible bacillary band; spicule 0.97-1 long and 0.01 wide, surrounded by a 0.67-0.9 spicule tube, covered by small cuticular spines; vulva located 4.45 from anterior region; eggs elongated barrel-shaped, colorless shell and operculum slightly projected outward, 0.05 by 0.03.

Taxonomic summary

*Host*: *Didelphis aurita* (BH08, BH32)

*Infection site:* Trachea, esophagus, stomach and small intestine.

*Locality:* Puerto Iguazú, Misiones, Argentina.

*Deposited material:* Specimens under study (retained by authors).

*Remarks*: Based on the morphological characters and the site of infection, we identified the specimen belonging to the genus *Capillaria*. In Brazil, several authors reported the presence of *Capillaria* sp. in the digestive tract of *D. albiventris* and other species of Didelphidae (Vicente *et al.*, 1997; Silva and Costa, 1999; Noronha *et al.*, 2002). Once again, these authors did not include good descriptions of the specimens. The genus *Capillaria* has a great diversity of species and many of them have been recorded from wild mammals (Butterworth & Beverley-Burton, 1977). Species identification of *Capillaria* is challenging due to the scarcity of males, the indistinct morphological traits of females and, in many cases, the limited availability of descriptions (López-Neyra, 1946). Moreover, Moravec (1982) argues that many of the descriptions of the genus *Capillaria* are erroneous. Herein, our specimens clearly correspond to *Capillaria* sp. because they were found in the digestive tract (Moravec,



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

1982). In Didelphidae previous studies have reported the presence of *C. longicauda* Freitas and Lent, 1935 in *P. opossum* and *D. marsupialis* (see: Lopez-Neyra, 1946; Jiménez *et al.*, 2011). The spicule of *C. longicauda* has been described as poorly chitinized, transparent, and difficult to observe (Lopez-Neyra, 1946). However, in this study the spicule was highly visible and well-chitinized, similarly to *Capillaria eberthi*. Further material and a revision of the specimens should be necessary to elucidate the identity of the species.

*Capillaria* sp. 2 (Fig. G)

*Description* (4 females): Nematodes small and slender; total length 7.75-10.05; oesophagus 3.15-4.25 long and 0.02-0.03 wide, with well-differentiated sticocytes, bacillary band absent; vulva at 3.85-4.3 from anterior end; eggs rounded, barrel-shaped, colorless shell with slightly outward projecting opercula, 0.06- 0.07 by 0.03-0.04.

Taxonomy summary

*Host*: *Didelphis albiventris* (M177/22; M190/22)

*Infection site:* Stomach and small intestine.

*Localities*: Puerto Iguazú, Misiones, Argentina.

*Deposited material:* Specimens under study (retained by authors).

*Remarks*: Based on the morphological characters and the site of infection, we identified the specimen belonging to the genus *Capillaria*. In this case, only female specimens were recovered. *Capillaria* sp. 2 differ from *Capillaria* sp. 1 in body size, as they are considerably smaller; by the absence of the bacillary band, which was clearly observed in *Capillaria* sp. 1, and by the shape and size of the eggs, which are more rounded and larger than those of *Capillaria* sp. 1.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

Order Strongylida Raillet y Henry, 1913

Family Ancylostomatidae Looss, 1905

*Globocephalus marsupialis* Freitas and Lent, 1936 (Fig. H1, H2)

*Description* (10 males and 10 females): White body with transversely striated cuticle. Subglobular stoma, with a pair of large sub-ventral teeth near the base of the capsule. Well-developed claviform muscular oesophagus. Spicules 0.32-0.45 long and gubernaculum 0,03-0.07 long. Female with amphidelphic uterus. Vulva at 4-5.25 from the anterior end. Eggs 0.084-0.11 long by 0.05-0.06 wide.

Taxonomy summary

*Host*: *Didelphis albiventris* (M190/22)

*Infection site:* Small intestine.

*Locality:* Puerto Iguazú, Misiones, Argentina.

*Deposited material:* MLP-He 8145 (5 males and 5 females).

*Remarks:* The specimens herein studied are consistent with the morphological characteristics given by Freitas and Lent (1936) parasitizing *Metachirus myosurus* Temminck, 1824 from Brazil. It was also recorded in *D. aurita* (see: Costa-Neto *et al.*, 2018; Gentile *et al.*, 2022). This is the first report of *G. marsupialis* parasitizing *D. albiventris* in Argentina.

Family Viannaiidae Neveu-Lemaire, 1944

*Viannaia viannai* Travassos, 1914 (Fig. I)

*Description* (8 males and 6 females): nematodes small and thin, body curled around its own axis. Synlophe without lateral or dorsal ridges. Cephalic extremity with a highly developed cuticular expansion. Males with highly developed caudal bursa, with two slightly asymmetrical lateral lobes and highly developed dorsal lobe. Bursa 2-1-2 type. Spicules 0.12-0.158 long. Females monodelphic. Vulva at 1.25-2.8 from posterior end. Eggs 0.05-0.07 long



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

by 0.04-0.05 wide.

Taxonomic summary

*Host*: *Didelphis albiventris* (BH35; M190/22, M211/23), *Didelphis aurita* (BH07, BH08, BH09, BH21, BH24, BH32, BH34, M220/23).

*Infection site:* Small intestine.

*Localities*: Puerto Iguazú, Misiones, Argentina.

*Deposited material:* MLP-He 8144 (5 males and 5 females).

*Remarks*: The specimens fit the description provided by Travassos, (1914). In Brazil, *V. viannai* was reported in *D. aurita* (see: Travassos, 1914) and *P. opossum* (see: Correa Gomes *et al.*, 2003); and in Bolivia it was mentioned parasitizing six species of Didelphidae (see: Jiménez *et al.*, 2024). It was also reported from Peru, Mexico, Venezuela, and French Guyana (Guerrero, 1985; Monet-Mendoza *et al.*, 2005; Jiménez *et al.*, 2011). This is the first report of *V. viannai* parasitizing *Didelphis* spp. in Argentina.

*Travassostrongylus orloffi* Travassos, 1935 (Fig. J1, J2).

*Description* (4 males and 5 females): Small nematodes. Cuticle with transverse striations and longitudinal lines; synlophe with 10 symmetric crests oriented from right to left. Cephalic cuticular dilatation of 0.09–0.13. Bursa 2-2-1 type. Spicules subequal, complex, 0.12–0.14 long by 0.02–0.04 wide, distal end bifid; gubernaculum 0.06–0.11 long; conical telamon 0.03–0.07 long. Vulva 1.05–1.2 from posterior end, anus 0.1–0.14 from posterior end. Eggs 0.05–0.06 long by 0.04–0.05 wide.

Taxonomic summary

*Host*: *Didelphis aurita* (BH32)

*Infection site:* Small intestine

*Localities*: Puerto Iguazú, Misiones, Argentina.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

*Deposited material:* Specimens under study (retained by authors).

*Remarks*: Our specimens are morphologically similar to those described by Diaw (1976). Descriptions for this species by Travassos (1937) and Diaw (1976) mention the presence of a subconical telamon. In this work, we also note that the telamon exhibits bilateral projections at one third of its height. In Brazil, *T. orloffi* was reported for *D. albiventris* (see: Silva and Costa, 1999; Antunes, 2004) and *D. aurita* (see: Costa Neto *et al.*, 2018; Gentile *et al.*, 2022). It was also found in French Guyana (Diaw, 1976) and Mexico (Scheibel *et al.*, 2014). This is the first record of *Travassostrongylus orloffi* for *D. aurita* in Argentina.

*Travassostrongylus callis* (Travassos, 1914) Orloff, 1933 (Fig. L1, L2)

*Description*: (7 males and 5 females): Nematodes small, cuticle with transverse and longitudinal striations, cephalic cuticular dilatation 0.1-0.11. Bursa 2-2-1 type. Spicules subequal, complex, 0.1-0.5 long and 0.01-0.02 wide, gubernaculum 0.04-0.05 long, conical telamon 0.03-0.05 long, with a left hook. Vulva located 1-1.4 from hind end, with a cuticular cap. Anus 0.1-0.13 from posterior end. Eggs 0.05 x 0.03.

Taxonomic summary

*Host*: *Didelphis albiventris* (M211/23), *Didelphis aurita* (BH32, M220/23)

*Infection site*: Small intestine

*Localities*: Puerto Iguazú, Misiones, Argentina.

*Deposited material*: Specimens under study (retained by authors).

*Remarks:* Our specimens are similar with those described by Travassos (1937) and Diaw (1976). *Travassostrongylus callis* was originally found in *D. aurita* from Brazil (Travassos, 1914). Later, it was mentioned from other localities from Brazil (Noronha *et al.*, 2002), and recently Jiménez *et al. (*2024) mentioned it for *Chironectes minimus* Zimmermann, 1780 in Bolivia. It was also found parasitizing *D. marsupialis* in French Guiana (Diaw, 1976), and



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

Panama (Scheibel *et al*., 2014). This is the first report in *D. albiventris* and *D. aurita* from Argentina.

## Order Ascaridida Chabaud, 1965

Superfamily Heterakoidea Railliet and Henry, 1912

Family Aspidoderidae Skrajabin y Schikhobalova, 1947

*Aspidodera raillieti* Travassos, 1913 (Fig. K1, K2)

*Description* (9 males and 9 females): Anterior end with a cap with six longitudinal loops or cords, three of them on the interlips and three on each lip. Oesophagus with a terminal bulb. Spicules similar in shape and size, 0.55-0.93 long. Gubernaculum 0.15-0.22 long. Cloaca at 0.28–0.38 from posterior end. Vulva at 1.90-2-65 from posterior end, amphidelphic uterus. Eggs 0.05-0,07 long by 0.04-0,05 wide.

Taxonomic summary

*Host*: *Didelphis albiventris* (BH35, M174/22), *Didelphis aurita* (BH07, BH08, BH09, BH20, BH21, BH32, M220/23).

*Infection site*: Large intestine and caecum

*Localities*: Puerto Iguazú, Misiones, Argentina.

*Deposited material*: MLP-He 8147 (5 males and 5 females).

*Remarks*: Nematodes similar in morphology to those described by Portes Santos *et al. (*1990) and (Chagas-Moutinho *et al.*, 2007). The specimens characterized by Chagas-Moutinho (2007) are relatively smaller and we consider that the differences are induced by the host and geographic distance. *Aspidodera raillieti* was also recorded in several species of marsupials from Brazil (Costa Neto *et al.*, 2018; Gentile *et al.*, 2022), Bolivia, Paraguay and Mexico (Jiménez *et al.*, 2024), French Guiana (Jiménez *et al.*, 2011), Peru (Polo-González *et al.*, 2019), and other localities. In Argentina, *A. raillieti* was only recorded in *D. albiventris* (see:



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

Lombardero and Moriena, 1973; Navone and Suriano, 1992). This is the first record for *D. aurita* in Argentina.

Family Kathlaniidae Lane, 1914

*Cruzia tentaculata* (Rudolphi, 1819) Travassos, 1922 (Fig. M)

*Description* (20 males and 20 females): Oral opening surrounded by three lips, one dorsal and two latero-ventral; inner margin of lips with small, serrated structures. Oesophagus ending in a bulb with an intestinal caecum projecting anteriad beyond the bulb. Spicules 0.80-1.20 long. Gubernaculum 0.18-0.40. Cloaca at 0.10-0.20 from posterior end. Vulva located at the middle of the body 4.35–9.40 from the anterior end. Anus at 0.55-1.90 from the posterior end. Eggs 0.10-0.15 long by 0.5-0.07 wide.

Taxonomic summary

*Host*: *Didelphis albiventris* (BH01, BH05, BH06, BH10, M128/22, BH35, M82/21, M129/22, M174/22, M177/22, M190/22, M211/23), *Didelphis aurita* (BH07, BH08, BH09, BH19, BH20, BH21, BH24, BH26, BH32, BH34, M220/23).

*Infection site*: Large intestine and caecum.

*Localities*: Puerto Esperanza, Colonia Wanda, Puerto Iguazú, Misiones, Argentina.

*Deposited material:* MLP-He 8146 (5 males and 5 females).

*Remarks*: *Cruzia tentaculata* was originally described parasitizing *D. aurita* from Brazil (Travassos, 1922). After that, it was recorded in several South American didelphids (see: Adnet *et al.*, 2009; Noronha *et al.*, 2002; Gomes *et al.*, 2003; Costa-Neto *et al.*, 2018; Jiménez *et al.*, 2024). In Argentina, it is mentioned parasitizing *D. albiventris* and *L. crassicaudata* (see: Boero and Boehringer, 1967; Santa Cruz, 2006). This is the first record for *D. aurita* in Argentina.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

Order Spirurida Railliet, 1915

Family Physalopteridae Railliet, 1893

*Turgida turgida* (Rudolphi 1819) Travassos, 1919

*Description* (5 males and 5 females): Large nematodes with a rigid whitish body, covered by a thick cuticle with fine transverse striations. Oral opening surrounded laterally by 2 symmetrical, semi-domed lips or pseudolabia, composed of 3 fused lips that are flattened on the inner part. A cephalic collarette, formed by a deep fold surrounds the pseudolabia. Male tail with caudal alae with 22 papillae: 4 pairs of pedunculated papillae are placed on the caudal alae; 3 papillae are located anteriorly to the cloaca; spicules 0.35-0.60 long; tail 0.3-0.9 length. Vulva is located below the end of the oesophagus at 4.84-9.10 from the anterior end; tail 0.3-0.7 length.

Taxonomic summary

*Host*: *Didelphis albiventris* (BH01, M129/22, M190/22, M211/23), *Didelphis aurita* (BH07, BH19, BH20, BH21, BH26).

*Infection site*: Stomach

*Localities:* Colonia Wanda, and Puerto Iguazú, Misiones, Argentina.

*Deposited material*: MLP-He 8148 (5 males and 5 females)

*Remarks*: *Turgida turgida* was recorded parasitizing *Didelphis* spp. from North and South America (Humberg *et al.*, 2011). Our specimens are morphologically like those described by Travassos (1920), Matey *et al. (*2001), and Humberg *et al. (*2011). In Brazil, *T. turgida* was recorded in *D. albiventris*, *D. aurita*, *C. minimus* and *P. quica* Temminck, 1824 (see: Noronha *et al.*, 2002; Costa-Neto *et al.*, 2018; Humberg *et al.*, 2011); from Bolivia in *D. albiventris* and *P. opossum* (see: Jiménez *et al.*, 2024), while in Argentina it was reported parasitizing *D. albiventris* and *L. crassicaudata* (see: Boero and Boehringer, 1967; Navone and Suriano, 1992; Santa Cruz, 2006). This is the first record for *D. aurita* in Argentina.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

*Phylum Acanthocephala Kohlreuther, 1771*

Clase Archiacanthocephala Meyer, 1931

Orden Oligacanthorhynchida Petrochenko, 1956

Familia Oligacanthorhynchidae Southwell et Macfie, 1925

*Oligacanthorhynchus microcephalus* (Rudolphi, 1819) Schmidt, 1972 (Fig. N)

*Description* (5 females): Individuals of large size, cuticle striated with transverse roughness. Proboscis small, ovoid with 5 to 6 semiluniform double-rooted hooks of 75–100 µm length. Distinct neck, its length and width depend on the degree of extension of the trunk and proboscis. Small, elliptical embryonated eggs surrounded by a thick outer membrane of 80–100 µm long by 40-50 µm wide.

Taxonomic summary

*Host*: *Didelphis albiventris* (BH10, M128/22, BH35, M129/22, M174/22, M177/22, M190/22, M211/23) and *Didelphis aurita* (BH20, BH21, BH24, M220/23)

*Infection site*: Small intestine.

*Localities*: Puerto Esperanza, Puerto Iguazú, Misiones, Argentina.

*Deposited material*: MLP-He 8149 (5 males and 5 females).

*Remarks*: The identification was based on Richardson *et al. (*2014). *Oligacanthorhynchus microcephalus* is distributed in North and South America and it parasitizes members of Didelphimorphia as its unique definitive hosts (Richardson *et al.*, 2014). In the serosa, white nodules were evident indicating the characteristic lesions affecting the mucosa, submucosa, and muscle layers of the marsupial's intestine (Richardson and Barnawell, 1995). In Argentina, this species has been mentioned as a parasite of *D. albiventris* (see: Boero and Boehringer, 1967; Navone and Suriano, 1992). In Brazil it was cited for *D. albiventris*, *D. aurita* and *M. myosurus* (see: Carneiro de Souza *et al.*, 2017; Zabott *et al.*, 2017; Costa-Neto



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

*et al.*, 2018; Cirino *et al.*, 2020) and from Bolivia in *M. opossum* and *P. opossum* (see: Jiménez *et al.*, 2024).

### *Ecological descriptors*

During our collections we found a total of 15 species of helminths. The specific richness in *D. albiventris* was 12, while in *D. aurita* was 13 (see Table 1). Both species of *Didelphis* share 10 species of helminths; *D. albiventris* presented *Capillaria* sp. 2 and *G. marsupials*, absent in *D. aurita*; while *D. aurita* presented *T. didelphis*, *Capillaria* sp. 1 and *T. orloffi*, absent in *D. albiventris*.

In *D. albiventris*, *C. tentaculata* registered the highest prevalence (P), followed by *O. microcephalus* and *T. minuta*; the lower P were registered for *G. marsupialis* and *Mathevotaenia* sp. (see Table 1). Related to the mean intensity (MI) and mean abundance (MA), *C. tentaculata*, *Mathevotaenia* sp. and *O. microcephalus* showed the highest values. In *D. aurita*, *C. tentaculata* registered the highest P, followed by *V. viannai*, *T. minuta*, *A. raillieti* and *B. migrans*; while the lower P were registered for *Mathevotaenia* sp. and *T. orlofi*. The highest values of MI and MA correspond to *C. tentaculata*, *V. viannai*, and *R. coronatus*.

Most of the helminths recovered display direct life cycles, except for *R. coronatus*, *B. migrans*, *Mathevotaenia* sp., *C. tentaculata*, *T. turgida* and *O. microcephalus* (see Table 1).

## Discussion

In this study we examined the parasite community of two sympatric species of opossums in northern Misiones. We present new records for Argentina including *T. minuta*, *G. marsupialis*, *V. viannai*, *T. orlofi*, and *T. callis*. In *D. aurita*, we identified three species of



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

Platyhelminthes, nine nematodes, and one acanthocephalan, all of which are new records for the country.

In *D. albiventris*, six out of the 12 helminth species identified have an indirect life cycle. Similarly, in *D. aurita*, six out of 13 helminth species exhibit an indirect life cycle (see Table 1). This suggests that nearly half of the helminth species in both opossum species need an intermediate host acquired through the diet. Metacercariae of *Brachylaima* sp. have been reported in the land slug *Phyllocaulis variegatus* from Misiones (Valente *et al.*, 2016), while those of *Rhopalias* sp. were found encysted in tadpoles of *Rhinella* sp. from the same stream where planorbid snails harboured cercariae (López-Hernández *et al.*, 2023), suggesting that slugs and amphibians respectively, serve as intermediate hosts from these trematodes. The genus *Mathevotaenia* includes several species that have been found parasitizing mammals worldwide (i.e.: rodents, insectivores, edentates, marsupials, bats), with isolated reports in reptiles and birds (Beveridge, 2008; Bursey *et al.*, 2010; Lunaschi *et al.*, 2012). Spasskii (1951) suggested that the life cycle of *Mathevotaenia* species involve insects, such as cockroaches and butterflies as intermediate hosts. Moreover, the nematode *T. turgida* uses insects of the orders Orthoptera and Coleoptera as intermediate hosts and is specific for certain species of opossums (Anderson, 2000). Furthermore, native snails of the genus *Thaumastus* and *Latipes*, plus the invasive snail *Achatina fulica* in Brazil, were found to be the intermediate host of *C. tentaculata* (Ramos de Souza *et al.*, 2021). Richardson *et al.* (2014) identified millipedes of the genus *Narceus* as natural intermediate hosts for the acanthocephalan *O. microcephalus*. This raises the possibility that millipedes in the study area could also serve as intermediate hosts for this species.

Although there are few studies on the feeding habits of opossums, existing research suggests they are primarily insectivorous (Kasparian *et al.*, 2002; Richardson, 2006). Sandidge (1953) analysed the stomach contents of *D. virginiana* and found not only insects



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

but also mammals, birds, reptiles, amphibians, and, to a lesser extent, centipedes, snails, and crayfish. Given this diversity in diet and the high prevalence of helminths with indirect life cycles found in the present study, plus the finding of legs and antenna of insects, birds and mouse hair in the digestive tracts of the studied host, we suggest that *D. aurita* and *D. albiventris* may consume slugs, snails, millipedes, and other vertebrates as part of their diet, indicating that these prey items act as intermediate hosts of the parasite species reported herein, constituting a significant portion of their prey in the study area.

The two host species studied herein share 10 helminth taxa. *Didelphis aurita* occurs both, in Rio de Janeiro and in Misiones, and in both localities share a substantial number of species (8 over 14 parasite taxa) (Costa-Neto *et al.,* 2018; Gentile *et al.,* 2022). This pattern aligns with findings from similar studies on sympatric opossum species in French Guiana and Mexico (Jiménez *et al.,* 2011). Research shows that parasite communities in the same locality often exhibit higher taxonomic similarity than those in conspecific species of marsupials living in different areas. This can be attributed to the generalist feeding habits and overlapping diets of sympatric opossums, which expose them to the same parasites or to ecological fitting where the parasites shift to a new host and adapt or survive to the new association (Combes, 1991; Agosta *et al.,* 2010). In the study area, *D. albiventris* and *D. aurita* have been observed living in sympatry (Cruz *et al.,* 2019). Moreover, closely related species often share physiological, immunological, and ecological traits, making them compatible hosts for the same parasites (Combes, 1991; Krasnov *et al.,* 2006; Poulin, 2014). Therefore, the sympatry, shared diet, and the conspecificity of these opossums likely explain the similarities observed in their helminth communities.

Knowledge of wildlife parasitology is essential for understanding the complex relationships between parasites and their animal hosts in natural ecosystems. Our research aims to provide crucial data on two host species poorly studied and frequently observed in the



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

environment as well as in road-killed routes. Considering the habitat fragmentation in the region, the locally disturbances in the study area, and that both host species have been reported as reservoirs of zoonotic pathogens in other regions (Castaño Zubieta *et al.,* 2014; Bezerra-Santos *et al.,* 2021), this study provides important information in the southern distribution of both opossum's species for the AF. None of the helminths identified herein are zoonotic for humans or domestic animals. Complementary molecular studies from the different helminth species will be crucial in elucidating the identity of unclear taxa such as *Capillaria* or *Mathevotaenia.*

**Acknowledgements.** We extend our gratitude to Patricio Ramírez Llorenz from Administración de Parques Nacionales, Juliette Colman, Elena Furtado, and Hugo Hartmann for their valuable advice regarding the road-killed opossums; to Dr. Pablo Suarez, technician at IBS, CONICET for his assistance with the necropsies and curatorial management of the hosts; to Ing. Javier López from FCF, UNaM for helping with the map. Special thanks to the Ministerio de Ecología y Recursos Naturales, to the Instituto Misionero de Biodiversidad (IMiBio), and to the NEA regional delegation of the Parque Nacional Iguazú for the collection permissions (Permission Nro 4/2022 and Nº NEA 523). We sincerely thank Emanuel Grassi from IMiBio for kindly providing access to the microscope equipped with a camera, enabling us to capture high-quality photographs.

**Author's contribution.** This study was part of the Thesis for the Specialization in Conservation Biology from FCF, UNaM of B.B.H. J.N. and B.B.H. identified the specimens and wrote most of the manuscript. E.A.V contributed with the organization, review, discussion, and editing of the manuscript. D.D.L. contributed with the recollection, prospection, and reviewing the manuscript; and A.S. contributes with the recollection of the road-killed hosts.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

**Financial support.** The research was supported in the IBS, CONICET-UNaM by CONICET PIP 2022-2024 Nro 0590 to J.N and by FONCyT PICT 2019 Nro 3535 to J.N.

**Competing interests.** The authors declare there are no conflicts of interest.

**Ethical standards.** Collection of specimens was approved through permits issued by IMiBio, Ministerio de Ecología y Recursos Renovables, Misiones province, and by Administration de Parques Nacionales, Delegation NEA. and were in accordance with guidelines established for research on mammals by the American Society of Mammalogists (Sikes *et al.*, 2016) and by the Sociedad Argentina para el Estudio de Mamíferos SAREM.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

## References


**Acosta-Virgen K, López-caballero J, García-Prieto L and Mata-López R** (2015) Helminths of three species of opossums (Mammalia, Didelphidae) from Mexico. *ZooLeys* 511: 131–52. https://doi.org/10.3897/zookeys.511.9571.

**Adnet FAO, Anjos DHS, Menezes-Oliveira A and Lanfredi RM** (2009) Further description of *Cruzia tentaculata* (Rudolphi, 1819) Travassos, 1917 (Nematoda: Cruzidae) by light and scanning electron microscopy. *Parasitology Research* 104: 1207–11. https://doi.org/10.1007/s00436-008-1316-6.

**Agosta SJ, Janz N and Brooks DR** (2010) How Specialists Can Be Generalists: Resolving the "Parasite Paradox" and Implications for Emerging Infectious Disease. *Zoologia* 27: 151-162. DOI: 10.1590/S1984-46702010000200001.

**Anderson RC** (2000) Nematode parasites of vertebrates. Their development and transmission. 2nd edition, CABI Publishing. 672 pp.

**Antunes GM** (2005) Diversidade e potencial zoonotico de parasitos de *Didelphis albiventris*. PhD thesis, Universidade Federal do Rio Grande Do Sul, Brazil.

**Babero BB** (1960) Further studies on helminths of the opossum, *Didelphis virginiana* , with a description of a new species from this host. *Journal of Parasitology* 46: 455–63.

**Beveridge I** (2008) *Mathevotaenia niuguiniensis* n. sp. (Cestoda: Anoplocephalidae: Linstowiinae) from the Water-Rat *Parahydromys asper* (Thomas) in Papua New Guinea, with a list of species of *Mathevotaenia* Akumyan, 1946. *Systematic Parasitology* 71: 189–98. https://doi.org/10.1007/s11230-008-9155-5.

**Bezerra-Santos MA, Ramos RAN, Campos AK, Dantas-Torres F and Otranto D** (2021) *Didelphis* spp. opossums and their parasites in the Americas: A One Health perspective. *Parasitology Research* 120, 4091–4111. https://doi.org/10.1007/s00436-021-07072-4




https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

**Boero JJ and Boehringer IK** (1967) El Parasitismo de nuestra fauna autóctona. Los Parásitos de la Comadreja Picaza (*Didelphis azarae*) y de la Comadreja Colorada (*Lutrolina crassicaudata*). *Revista de La Facultad de Ciencias Veterinarias de La Plata* 21: 147–60.

**Bursey CR, Goldberg SR and Telford SR** (2010) A new species of *Mathevotaenia* (Cestoda, Anoplocephalidae, Linstowiinae) from the lizard *Sceloporus malachiticus* (Squamata, Phrynosomatidae) from Panama. *Acta Parasitologica* 55: 53–57. https://doi.org/10.2478/s11686-010-0001-y.

**Bush OA, Lafferty KD, Lotz JM and Shostak AW** (1997) Parasitology on its own terms: meets ecology margolis. *The Journal of Parasitology* 83: 575–83.

**Butterworth EW and Beverley-Burton M** (1977) *Capillaria didelphis n. sp.* (Nematoda: Trichuroides) from the Opossum, *Didelphis virginiana* L. in Georgia. *Canadian Journal of Zoology*. 30: 616–19.

**Campbell ML, Gardner SL and Navone GT** (2003) A new species of *Mathevotaenia* (Cestoda: Anoplocephalidae) and other tapeworms from Marsupials in Argentina. *Journal of Parasitology* 89: 1181–85.

**Carneiro de Souza A, Furtado Alvares E, Stutz Reis S, Santos Neves A, Martins Barino GT, da Silva ME*, et al*** (2017) First report of *Oligacanthorhynchus microcephalus* (Rudolphi, 1819) (Acanthocephala: Oligacanthorhynchidae) in *Didelphis albiventris* (Lund, 1841) (Marsupialia: Didelphidae) in Southeastern Brazil. *Journal of Dairy, Veterinary & Animal Research* 5: 3–6. https://doi.org/10.15406/jdvar.2017.05.00143.

**Castaño Zubieta R, Ruiz M, Morici G, Lovera R, Fernández MS, Caracostantogolo J and Cavia R** (2014) First report of *Trichinella spiralis* from the White-Eared (*Didelphis albiventris*) and the thick-tailed opossum (*Lutreolina crassicaudata*) in Central Argentina." *Helminthologia* 51: 198–202. https://doi.org/10.2478/s11687-014-0229-4.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

**Chagas-Moutinho VA, Oliveira-Menezes A, Cárdenas MQ and Lanfredi MR** (2007) Further description of *Aspidodera raillieti* (Nematoda: Aspidoderidae) from *Didelphis marsupialis* (Mammalia: Didelphidae) by light and scanning electron microscopy." *Parasitology Research* 101: 1331–1336. https://doi.org/10.1007/s00436-007-0641-5.

**Chemisquy MA and Gabriel MM** (2019) *Didelphis albiventris*. *SAyDS–SAREM (Eds.) Categorización 2019 de los mamíferos de Argentina según su riesgo de extinción. Lista Roja de Los Mamíferos de Argentina.* https://cma.sarem.org.ar/es/especie-nativa/didelphis-albiventris.

**Chero JD, Sáez G, Mendoza-Vidaurre C, Iannacone J and Cruces CL** (2017) Helminths of the common opossum *Didelphis marsupialis* (Didelphimorphia: Didelphidae), with a checklist of helminths parasitizing marsupials from Peru. *Revista Mexicana de Biodiversidad* 30: 1–12. https://doi.org/10.1016/j.rmb.2017.07.004.

**Cirino BS, Costa Neto SF, Maldonado Júnior A and Gentile R** (2020) First study on the helminth community structure of the neotropical marsupial *Metachirus myosuros* (Didelphimorphia, Didelphidae). *Revista Brasileira de Parasitologia Veterinaria* 29: 1–13. https://doi.org/10.1590/s1984-29612020064.

**Combes C** (1991) Evolution of parasite life cycles. In Parasite-host associations. Coexistence or conflict?, *C. A. Toft, A. Aeschlimann, and L. Bolis (Eds.)*. Oxford University Press.

**Corrêa Gomes D, Pereira da Cruz R, Vicente JJ and Magalhães Pinto R** (2003) Nematode parasites of marsupials and small rodents from the Brazilian Atlantic Forest in the State of Rio de Janeiro, Brazil. *Revista Brasileira de Zoologia* 20: 699–707. https://doi.org/10.1590/s0101-81752003000400024.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

**Costa-Neto SF, Cardoso TS, Boullosa RG, Maldonado A and Gentile R** (2018) Metacommunity structure of the helminths of the Black-Eared Opossum *Didelphis aurita* in peri-urban, sylvatic and rural environments in south-eastern Brazil. *Journal of Helminthology* 93: 720–31. https://doi.org/10.1017/S0022149X18000780.

**Cruz P, Iezzi ME, De Angelo C, Varela D and Di Bitetti MS** (2019) Landscape use by two opossums is shaped by habitat preferences rather than by competitive interactions. *Journal of Mammalogy* 100: 1966–78. https://doi.org/10.1093/jmammal/gyz133.

**Diaw OT** (1976) Contribution à l'étude de nématodes Trichostrongyloidea parasites de Xenarthre, Marsupiaux et Rongeurs Néotropicaux. *Bulletin Du Muséum National d'histoire Naturelle* 405: 1065–89. https://doi.org/10.5962/p.281416.

**Freitas de Teixeira JF and Lent H.** (1936). Estudo sobre o genero *Globocephalus* Molin, 1861 (Nematoda: Strongyloidea). *Memorias Do Instituto Oswaldo Cruz* 31: 69–83.

**Gentile R, Costa-Neto SF, Cardoso T and Maldonado A** (2022) Helminths of small mammals in an atlantic forest biological station in Rio de Janeiro, Brazil. *Neotropical Helmintology* 16: 161–72. https://doi.org/http://dx.doi.org/10.24039/rnh20221621451.

**Guerrero R** (1985) Nematoda: Trichostorngyloidea parásitos de mamíferos silvestres de Venezuela. II Revisión del género *Viannaia* Travassos, 1914. *Memoria de La Sociedad de Ciencias Naturales La Salle* 45: 9–47.

**Hartmann BB** (2023). Helmintos de *Didelphis albiventris* y *Didelphis aurita* (Mammalia, Didelphimorphia) en ambientes selváticos y antrópicos en el Departamento Iguazú, Misiones, *Revista de Mastozoología Neotropical*, 30.

**Haverkost TR and Gardner SL** (2008) A review of species in the genus *Rhopalias* (Rudolphi, 1819). *Journal of Parasitology* 94: 716–26.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

**Humberg RMP, Tavares LER, Paiva F, Oshiro ET, Bonamigo RA, Júnior NT and Oliveira AG** (2011) *Turgida turgida* (Nematoda: Physalopteridae) parasitic in White-Bellied opossum, *Didelphis albiventris* (Marsupialia: Didelphidae), state of Mato Grosso Do Sul, Brazil. *Pesquisa Veterinária Brasileira* 31: 78–80. https://doi.org/10.1590/s0100-736x2011000100012.

**Jiménez FA, Braun JK, Campbell ML and Gardner SL** (2008) Endoparasites of fat-tailed mouse opossums (*Thylamys*: Didelphidae) from northwestern Argentina and southern Bolivia, with the description of a new species of tapeworm. *Journal of Parasitology* 94: 1098–1102. https://doi.org/10.1645/GE-1424.1.

**Jiménez FA, Catzeflis F and Gardner SL** (2011) Structure of parasite component communities of *Didelphis marsupials*: Insights from a comparative study. *Journal of Parasitology* 97: 779–87. https://doi.org/10.1645/GE-2711.1.

**Jiménez AF, Campbell ML, Byles B, Scheibel PG and Gardner SL** (2024) Gastrointestinal helminths of opossums (Mammalia : Didelphidae) from Bolivia. *Parasitology*, 1–53. https://doi.org/https://doi.org/10.1017/S0031182024000490.

**Justo MCN, Fernandes BMM, Knoff M, Cárdenas MQ and Cohen SC** (2017) Checklist of brazilian Cestoda. *Neotropical Helminthology* 11: 187–282. https://dialnet.unirioja.es/servlet/articulo?codigo=4765080.

**Kasparian M, Hellgren EC and Ginger SM** (2002) Food habits of the Virginia opossum during raccoon removal in the cross timbers ecoregion, Oklahoma. *Wildlife Research* 78: 73–78.

**Krasnov BR, Poulin R and Morand S** (2006) Patterns of macroparasite diversity in small mammals. In *Micromammals and Macroparasites: From Evolutionary Ecology to Management*, 197–231. https://doi.org/10.1007/978-4-431-36025-4_12.

**Lombardero OJ and Moriena RA** (1973) Nuevos helmintos de la comadreja overa (*Didelphis azarae*) para la Argentina. *Revista de Medicina Veterinaria* 53: 315–20.

**López-Hernández D, Caixeta Valadão M, Lane de Melo A, Tkach VV and Alves Pinto H** (2023) Elucidating the life cycle of opossum parasites: DNA sequences reveal the involvement of planorbid snails as intermediate hosts of *Rhopalias* spp. (Trematoda: Echinostomatidae) in Brazil. *PLoS ONE* 18: 1–18. https://doi.org/10.1371/journal.pone.0279268.

**López-Neyra** (1946) Tomo XII: Los Capilariinae. In *Memorias de La Real Academia de Ciencias Exactas, Físicas y Naturales*, 262.

**Lunaschi LI and Drago FB** (2007) Checklist of digenean parasites of wild mammals from Argentina. *Zootaxa* 50: 35–50. https://doi.org/10.11646/zootaxa.1580.1.3.

**Lunaschi LI, Lamas MF and Drago FB** (2012) A new species of *Mathevotaenia* (Cestoda, Anoplocephalidae) parasitizing *Tropidurus spinulosus* (Reptilia, Squamata) from northeastern Argentina. *Revista Mexicana de Biodiversidad* 83: 583–90. https://doi.org/10.7550/rmb.27660.

**Marinho de Quadros R, Müller G, Barbosa de Moura A, Rodríguez RB, Martins KH, Filippi DA, Mazzoni B** (2016) *Rhopalias coronatus* (Rudolphi, 1819) Stiles and Hassall 1898 in *Didelphis albiventris* from Santa Catarina, Brasil. *Parasitología Latinoamericana* 65: 38-41.

**Martínez AH, Brandetti E and Boero JJ** (1973) El parasitismo de nuestra fauna autóctona. Hallazgo de dos nuevas especies de trematodes, *Rhopalias baculifer* Braun, 1900 y *Rhopalias coronatus* Stiles y Hassal, en comadrejas colorada (*Lutreolina crassicaudata*) y picaza (*Didelphis azarae*). *Revista de Medicina Veterinaria* 54: 69–73.

**Martínez FA** (1986) Helmintofauna de los mamíferos terrestres. Trematodes. *Veterinaria Argentina* 3: 544–51.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

**Massoia E, Chebez JC and Bosso A** (2012) Mamíferos silvestres de la provincia de Misiones, Argentina. 1er Ed. Buenos Aires: *Fundación de Historia Natural Félix de Azara.* https://www.fundacionazara.org.ar/img/libros/los-mamiferos-silvestres-de-la-provincia-de-misiones.pdf.

**Matey VE, Kuperman BI and Kinsella JM** (2001) Scanning electron microscopy of *Turgida turgida* (Nematoda: Spiruroidea), parasite of the Virginia opossum, *Didelphis virginiana*, from southern California. *Journal of Parasitology* 87: 1199–1202. https://doi.org/10.2307/3285267.

**Monet-Mendoza A, Osorio-Sarabia D and Garcia-Prieto L** (2005) Helminths of the Virginia opossum *Didelphis virginiana* (Mammalia: Didelphidae) in Mexico. *Journal of Parasitology* 91: 213–19. https://doi.org/10.1645/GE-273R.

**Montes de Oca DP, Dominguez MG, Lammel MN and Cavia R** (2024) Natural Trichinella spiralis infection in wild and domestic vertebrates in a trichinellosis endemic area from Argentina. *Mastozoología Neotropical*, 31, Versión on-line ISSN 1666-0536. https://doi.org/10.31687/saremMN.24.31.01.22.e0993.

**Moravec F** (1982) Proposal of a new systematic arrangement of Nematodes of the Family Capillariidae. *Folia Parasitologica* 29: 119–32.

**Myers N, Mittermeier RA, Mittermeier CG, da Fonseca GAB and Kent J** (2000) Biodiversity hotspots for conservation priorities. *Nature* 403: 853–558.

**Navone GT** (1989) *Pterygodermatites* (Paucipectines) *kozeki* (Chabaud et Bain, 1981) n. comb., parásito de *Lestodelphys halli* Tate, 1934, *Didelphis albiventris* L. y *Thylamis pusilla* (Desmarest) de la República Argentina. Anatomía y posición sistemática. *Revista Ibérica de Parasitología* 49: 219-226.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

**Navone GT and Suriano DM** (1992) Species composition and seasonal dynamics of the helminth community parasitizing *Didelphis albiventris* (Marsupialia: Didelphidae) in savannas of the central Argentina. *Ecología Austral* 2: 95–100.

**Navone GT, Suriano DM and Pujol CA** (1991) *Travassostrongylus yungaensis* n. sp. and *Hoineffia simplicispicula* n. sp. (Nematoda: Trichostrongyloidea) from *Thylamys venustus cinderellus* and *Lutreolina crassicaudata* (Marsupialia: Didelphidae) in the northwest of Argentina. *Systematic Parasitology* 19: 187–93. https://doi.org/10.1007/BF00011886.

**Noronha D, Vicente JJ and Pinto EM** (2002) A survey of new host records for nematodes from mammals deposited in the Helminthological Collection of the Oswaldo Cruz Institute (CHIOC). *Revista Brasileira de Zoologia* 19: 945–49.

**Pastrán-López OGA, Rivero-Castro AG, Ruiz-Estebez EG Amoni-Sacchi HJ and Sánchez-Castro L** (2022) Ampliación de distribución de *Didelphis albiventris* (Didelphimorphia, Didelphidae) en su extremo austral, provincia de Rio Negro, Argentina. *Mammalogy Notes* 8: 230. https://doi.org/10.47603/mano.v8n1.230.

**Placi G and Di Bitetti M** (2006) Environmental situation in the ecoregion of Atlantic Forest of Alto Paraná (Atlantic Forest). [In Spanish.]. *The Environmental Situation in Argentina*, no. January 2006: 195–209.

**Polo-González A, Sánches L and Pacheco V** (2019) Helminths of genus *Didelphis* (Didelphimorphia: Didelphidae) or four regions in Perú. *Neotropical Helminthology* 13: 273–86.

**Portes Santos C, Lent H and Correa Gomes D** (1990) The genus *Aspidodera* Railliet and Henry, 1912 (Nematoda: Heterakoidea): Revision, new synonyms and key for species. *Revista Brasileira de Biologia* 50: 1017–31.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

**Poulin R** (2014) Parasite biodiversity revisited: Frontiers and constraints. *International Journal for Parasitology* 44: 581–89. https://doi.org/10.1016/j.ijpara.2014.02.003.

**Ramos de Souza J, Maldonado-Jr A, Vilela RV, AndradeSilva BE, Barbosa HE, Gomes SR and Thiengo SC** (2021) First report of the nematode *Cruzia tentaculata* using molluscs as natural intermediate hosts, based on morphology and genetic markers. *International Journal for Parasitology: Parasites and Wildlife* 15: 105–11. https://doi.org/10.1016/j.ijppaw.2021.02.013.

**Ramos DGS, Santos ARGLO, Freitas LC, Correa SHR, Kempe VG, Morgado TO, Aguiar MD, *et al*** (2016) Endoparasites of wild animals from three biomes in the state of Mato Grosso, Brazil. *Arquivo Brasileiro de Medicina Veterinaria e Zootecnia* 68: 571–78. https://doi.org/10.1590/1678-4162-8157.

**Reiczigel J, Marozzi M, Fábián I and Rózsa L** (2019) Biostatistics for parasitologists - A primer to quantitative parasitology. *Trends in Parasitology* 1835: 1–4.

**Richardson DJ** (2006) Life cycle of *Oligacanthorhynchus tortuosa* (Oligacanthorhynchidae), an acanthocephalan of the Virginia opossum (*Didelphis virginiana*). *Comparative Parasitology* 73: 1–6. https://doi.org/10.1654/4207.1.

**Richardson DJ, Gardner SL and Allen Jr JW (2014)**Redescription of *Oligacanthorhynchus microcephalus* (Rudolphi, 1819) Schmidt 1972 (syn. Oligacanthorynchus tortuosa (Leidy, 1850) Schmidt 1972) (Acanthocephala : Oligacanthorhynchidae). *Comparative Parasitology* 81: 53–60.

**Richardson DJ and Barnawell EB** (1995) Histopatology of *Oligacanthorhynchus tortuosa* (Oligacanthorhynchidae) infection in the virginia opossum (*Didelphis virginiana*). *Journal of Helminthology* 62: 253–56.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

**Sandidge LL** (1953) Food and dens of the opossum (*Didelphis virginiana*) in northeastern Kansas. *Transactions of the Kansas Academy of Science* 56: 97. https://doi.org/10.2307/3626198.

**Santa Cruz ACM** (2006) Ecto y endoparasitosis de *Didelphis albiventris* Temminck, del NEA (Marsupialia, Didelphidae). PhD thesis, Universidad Nacional de la Plata, Argentina.

**Santa Cruz AMC, Borda JT, Montenegro MA, Gómez LG, Prieto OH and Schebler N** (1999) Estudio de ecto y endoparásitos en *Didelphis albiventris* (Comadreja Overa), Marsupialia, Didelphidae. *Comunicaciones Científicas y Tecnológicas*, UNNE. Available from: www. unne. edu. ar/cyt/veterinarias/v-025.pdf (accessed 25 July 2015).

**Scheibel RP, Catzeflis F and Jimenez FA** (2014) The relationships of marsupial-dwelling Viannaiidae and description of *Travassostrongylus scheibelorum* sp. n. (Trichostrongylina: Heligmosomoidea) from mouse opossums (Didelphidae) from French Guiana. *Folia Parasitologica* 61: 242–54. https://doi.org/10.14411/fp.2014.032.

**Silva, MGQ and Costa HMA** (1999) Helminths of white-bellied opossum from Brazil. *Journal of Wildlife Diseases* 35: 371–75.

**Spasskii AA** (1951) Anoplocephalate tapeworms of domestic and wild animals. In Essentials of cestodology. *The Academy of Sciences of the USSR*, Moscow.

**Teodoro AKM, Cutolo AA, Motoie G, da Silva Meira-Strejevitch C, Pereira-Chioccola VL, Fernandes Mendes TM and Marques Allegretti S** (2019) Gastrointestinal, skin and blood parasites in *Didelphis* spp. from urban and sylvatic areas in São Paulo State, Brazil. *Veterinary Parasitology: Regional Studies and Reports* 16: 100286. https://doi.org/10.1016/j.vprsr.2019.100286.

**Travassos L** (1914) Trichostrongylideos Brazileiros (III Nota Previa). *Brazil. Med.* 28: 325–27.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

**Travassos L** (1920) Contribuições para o conhecimento da fauna helmintolojica brasileira X. Sobre as especies do gênero *Turgida*. *Memorias do Instituto Oswaldo Cruz* 12: 73–77.

**Travassos L** (1922) Contribuições para o conhecimento da fauna helmintolojica brasileira XVI: *Cruzia tentaculata* (RUD.,1819). *Memorias do Instituto Oswaldo Cruz* 14: 88–94. https://doi.org/10.1590/s0074-02761922000100004.

**Travassos L** (1937) *Revisao da Familia Trichostrongylidae Leiper, 1912*. Monographias do Instituto Oswaldo Cruz.

**Valente R, Diaz JI, Salomón OD and Navone GT** (2016) The role of *Phyllocaulis variegatus* (Mollusca: Veronicellidae) in the transmission of digenean parasites. *Revista Mexicana de Biodiversidad* 87: 255–57.

**Vicente JJ, Oliveira Rodrigues H, Correa Gomes D and Magalhaes Pinto R** (1997) Nematóides do Brasil. Parte V: Nematóides do Mamíferos. *Revista Brasileira de Biologia* 14, Supl 1, 1–452.

**Wilson DE and Reeder DM** (2005) (Eds.) *Mammal species of the world: A taxonomic and geographic reference*. 3rd edition. Johns Hopkins University Press, 2,142 pp.

**Zabott MV, Pinto SB, Viott ADM, Gruchouskei L and de Barros Bittencourt LHF** (2017) Helmintofauna de *Didelphis albiventris* (Lund, 1841) no município de Palotina, Paraná, Brasil. *Arquivos de Ciências Veterinárias e Zoologia Da UNIPAR* 20: 19–22. https://doi.org/10.25110/arqvet.v20i1.2017.6315.

**Table 1.** Population parameters of the helminths parasitizing *Didelphis albiventris* and *D. aurita* from Northern Misiones.

| Helminthes | Infection site | *Didelphis albiventris* | | | *Didelphis aurita* | | |
|---|---|---|---|---|---|---|---|
| | | P (%) | MI | MA | P (%) | MI | MA |
| *Brachylaima migrans*† | SI | 46.2 (22.4-74) | 15 (3-46) | 6.9 (1.3-25.8) | 54.5 (26.5-80) | 25.2 (7.5-57) | 13.7 (3.7-40.9) |
| *Rhopalias coronatus*† | SI | 15.4 (2.8-43.3) | 1* | 0.15 (0-0.3) | 27.3 (7.9-59.6) | 90 (20-142) | 24.5 (3.64-74.6) |
| *Mathevotaenia* sp.† | SI | 7.7 (0.4-34.2) | 438 | 33.7 (0-101) | 9.1 (0.5-40.5) | 29* | 2.6 (0-7.9) |
| *Trichuris minuta* | C, LI | 53.8 (26-77.6) | 14 (1-89) | 14.7 (4-37.3) | 63.6 (33.3-86.5) | 27.1 (12.4-48.6) | 17.3 (6.8-37.8) |
| *Trichuris didelphis* | C | - | - | - | 27.3 (7.9-59.6) | 4.7 (3-6) | 1.3 (0.3-3.2) |
| *Capillaria* sp.1 | S, SI | - | - | - | 27.3 (7.9-59.6) | 36 (2-68.3) | 9.82 (0.5-45.8) |
| *Capillaria* sp.2 | S, SI | 15.4 (2.8-43.4) | 22 (14-22) | 3.4 (0-10.3) | - | - | - |
| *Globocelphalus marsupialis* | SI | 7.7 (0.4-34.2) | 26* | 2 (0-6) | - | - | - |
| *Viannaia viannai* | SI | 23.1 (6.6-52) | 15.7 (2-27) | 3.62 (0.308-14.6) | 72.7 (40.5-92.1) | 74.1 (19.6-233) | 53.9 (13-205) |
| *Travassostrongylus orloffi* | SI | - | - | - | 9.1 (0.5-40.5) | 63* | 5.7 (0-17.2) |
| *Travassostrongylus callis* | SI | 15.4 (2.8-43.4) | 10.5 (2-19) | 1.6 (0-6.2) | 18.2 (3.3-50) | 49.5 (35-49.5) | 9 (0-23.8) |
| *Aspidodera raillieti* | C, LI | 15.4 (2.8-43.4) | 5 (4-6) | 0.8 (0-2.15) | 63.6 (33.3-86.5) | 35.6 (9.7-107) | 22.6 (5.6-91.3) |
| *Cruzia tentaculata*† | C, LI | 92.3 (65.8-99.6) | 355 (142-1090) | 328 (124-922) | 100 (73.6-100) | 251 (157-419) | 251 (160-413) |
| *Turgida turgida*† | S | 30.8 (11.3-58.7) | 12 (3-18) | 3.7 (0.8-9.4) | 45.5 (20-73.6) | 5.2 (1.6-9.8) | 2.4 (0.6-6.5) |
| *Oligacanthorhynchus* | SI | 61.5 (34.2-83.4) | 53.9 (20-123) | 33.2 (10.5-83.3) | 36.4 (13.5-66.7) | 8 (2.8-10.9) | 2.9 (0.8-6.3) |



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

*microcephalus*†

†Helminthes with heteroxenous life cycle. SI: Small intestine; LI: Large intestine; C: Caecum; S: Stomach; T: Trachea; S: Stomach.
*Only one infected host in the sample, thus CI cannot be calculated.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

**Figure 1.** Map of the Iguazú Department. In red is marked the route of National Routes 12 and 101 and Provincial Route 19. Individuals of *Didephis albiventris* collected are marked with green dots and those of *D. aurita* with purple dots.

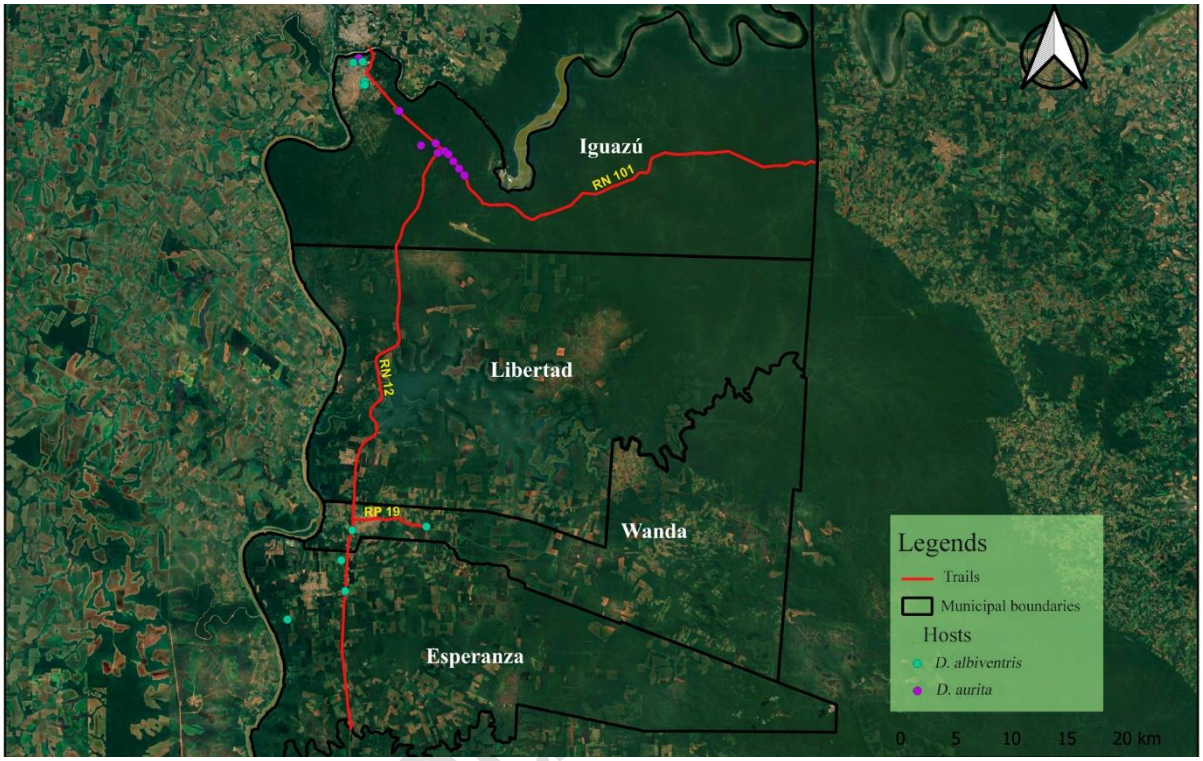
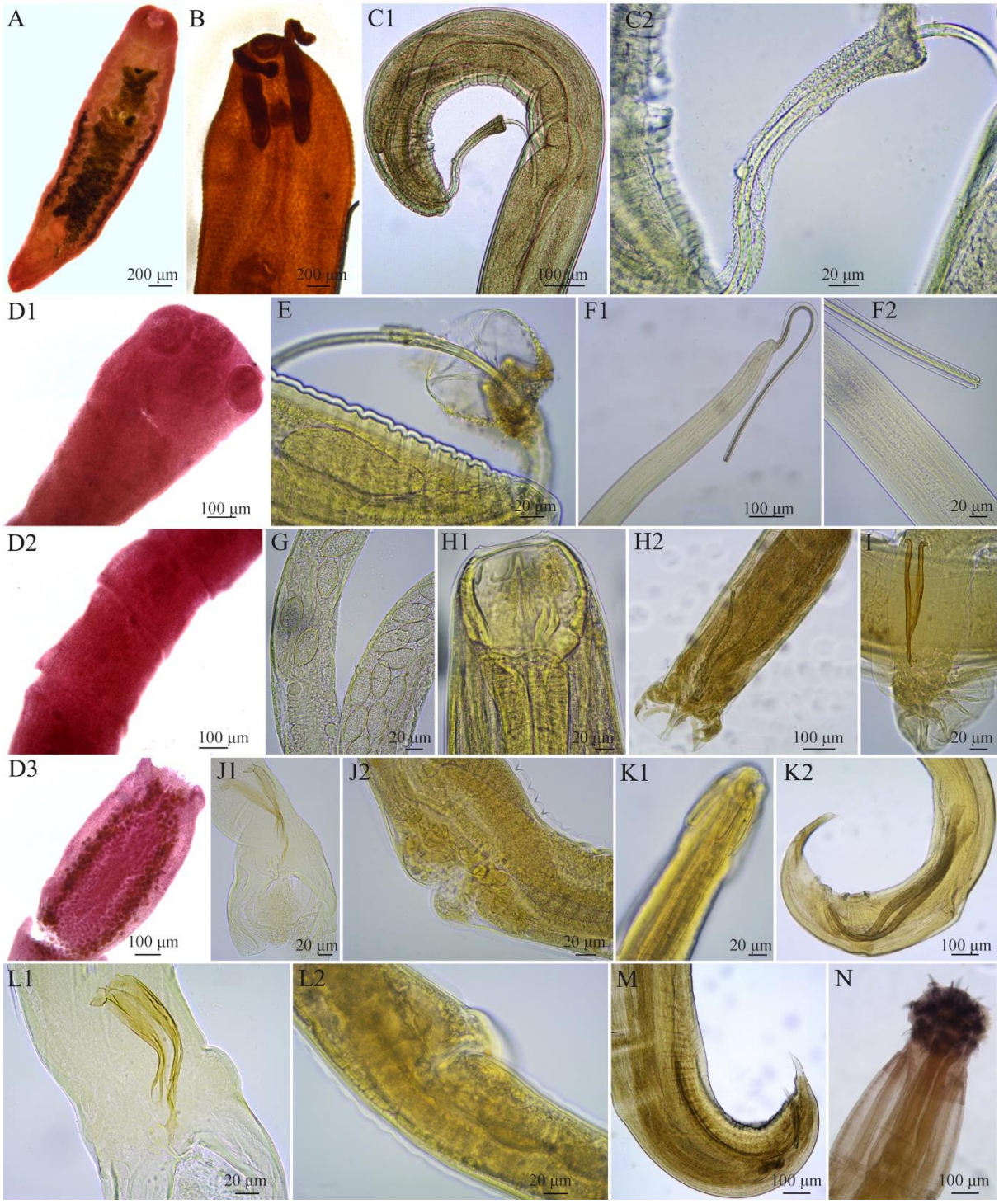



**Figure 2.** Photographs of helminths: **A.** *Brachylaima migrans*. **B.** Anterior end of *Rhopalias coronatus*. **C.** *Trichuris minuta*: 1. Posterior end. 2. Detail of the spicular sheath. **D.** *Mathevotaenia* sp: 1. Scolex. 2. Immature proglotids. 3. Mature gravid proglotids. **E.** Detail of spicular sheath of *Trichuris didelphis*. **F.** *Capillaria* sp. 1: 1. Posterior end. 2. Detail of spicular sheath and spicule. **G.** Detail of the vulva and eggs of *Capillaria* sp. 2. **H.** *Globocephalus marsupialis*: 1. Detail of the anterior region. 2. Tail, detail of bursa and spicule. **I.** Tail of *Viannaia viannai*. **J.** *Travassostrongylus orloffi*: 1. Male tail, detail of spicules, gubernaculum, and telamon. 2. Female, detail of the vulva. **K.** *Aspidodera raillieti*: 1. Anterior region. 2. Tail, detail of spicules, gubernaculum, and sucker. **L.** *Travassostrongylus callis*: 1. Male tail, detail of spicules, gubernaculum, and telamon. 2.



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

Female vulva with cuticular cap. **M.** *Cruzia tentaculata*, male tail, detail of spicules and gubernaculum. **N.** *Oligacanthorhynchus microcephala* probocis.




https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

Graphical Abstract:




https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

## Appendix

Data on locality and host species studied. Acronyms: BH: Barbara Hartmann field number; M: Dante Di Nucci catalogue. CM-LGE: Colección de Mastozoología del Laboratorio de Genética Evolutiva – Dr. Claudio Bidau from Instituto de Biología Subtropical. MLP-He: Colección de Helmintología from Museo de La Plata.

| | Locality | Zone | Lat (S) | Long (W) | Host colection no. | Host field no. | Sex | Helminths colection no. |
|---|---|---|---|---|---|---|---|---|
| *Didelphis albiventris* | Puerto Iguazú | Villa Florida Neighbourhood | 25º35´55´´ | 54º34´38´´ | M82/21 | | Male | |
| | | | | | M128/22 | | Female | |
| | | | | | M190/22 | | Female | MLP-He 8145 |
| | | | | | | | | MLP-He 8145 |
| | | | | | M211/23 | | Female | MLP-He 8149 |
| | | | | | | | | MLP-He 8149 |
| | | 300 viviendas Neighbourhood | 25º36´50´´ | 54º34´02´´ | M129/22 | | Female | |
| | | Villa 14 Neighbourhood | 25º35´53´´ | 54º34´08´´ | M177/22 | | Male | |
| | | Zona de Granjas Neighbourhood | 25º37´02´´ | 54º34´01´´ | BH35 | | Female | |
| | Colonia Wanda | NR 12, Km 1592 | 25º58´44´´ | 54º34´49´´ | BH01 | | Female | |
| | | PR 19, Km 13 | 25º58´34´´ | 54º30´49´´ | BH06 | | Female | |
| | Puerto Esperanza | Paraje Puerto Helvecia | 26º03´04´´ | 54º38´20´´ | BH05 | | Female | |
| | | Alegre neighborhood | 26º01´42´´ | 54º35´12´´ | BH10 | | Female | |



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press

**Continuation of the appendix.** Data on locality and host species studied. Acronyms: BH: Barbara Hartmann field number; M: Dante Di Nucci catalogue. CM-LGE: Colección de Mastozoología del Laboratorio de Genética Evolutiva – Dr. Claudio Bidau from Instituto de Biología Subtropical. MLP-He: Colección de Helmintología from Museo de La Plata.

| | Locality | Zone | Lat (S) | Long (W) | Host colection no. | Host field no. | Sex | Helminths colection no. |
|---|---|---|---|---|---|---|---|---|
| *Didelphis aurita* | Puerto Iguazú | San Martin Avenue | 25º35´ 44´´ | 54º34´ 21´´ | BH26 | | Female | |
| | Iguazú National Park | NR 12 | 25º39´ 60´´ | 54º30´ 06´´ | BH07 | | Female | |
| | | NR12, Km 1931 | 25°39' 54´´ | 54º30´ 14´´ | BH09 | | Male | |
| | | NR 12 | 25°40' 22´´ | 54°30' 07´´ | BH19 | | Female | |
| | | NR 12, Km 1633 | 25°38' 19´´ | 54º32´ 11´´ | BH21 | | Female | MLP-He 8148 |
| | | | | | | | | MLP-He 8148 |
| | | NR 101 | 25°38' 19´´ | 54°28' 42´´ | BH08 | | Male | |
| | | | 25°40' 46´´ | 54°29' 17´´ | BH24 | | Male | |
| | | | 25°40' 17´´ | 54° 29' 44´´ | BH32 | | Male | MLP-He 8144 |
| | | | | | | | | MLP-He 8146 |
| | | | | | | | | MLP-He 8146 |
| | | | | | | | | MLP-He 8147 |
| | | | | | | | | MLP-He 8147 |
| | | | | | | | | MLP-He 8144 |
| | | | 25°40' 26´´ | 54°29' 32´´ | BH34 | | Male | |
| | | | 25°41' 08´´ | 54°28' 58´´ | M220/23 | | Male | |
| | | | 25°41' 28´´ | 54°28' 41´´ | BH20 | CM-LGE 898 | Female | MLP-He 8141 |
| | | | | | | | | MLP-He 8142 |
| | | | | | | | | MLP-He 8143 |
| | | | | | | | | MLP-He 8143 |



https://doi.org/10.1017/S0031182025000563 Published online by Cambridge University Press