

Sección Especial



LOS MAMÍFEROS COMO HOSPEDADORES DE PARÁSITOS

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Artículo

SIGMODONTINAE RODENTS (MUROIDEA: CRICETIDAE) AS HOSTS OF CESTODA FROM ARGENTINA

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ABSTRACT. In Argentina, parasitological studies on Cricetidae rodents have been carried out mainly on nematodes. However, some research has shown that cestodes are also common components of their parasitic assemblages. In this study, Sigmodontinae rodents (Cricetidae-Muroidea) from the Cuenca del Plata, Argentina, are studied as hosts of cestodes. New host species, geographical areas, and parasitic infection parameters are provided. A total of 1675 specimens from 28 species of rodents from 67 localities were sampled for cestodes. Five taxa of cestodes belonging to three families were identified, including 20 new geographical records. In addition, nine new host-parasite associations are reported. These records help us to increase our understanding of the richness of cestodes in the region by providing a database to evaluate the effect of intrinsic and extrinsic factors on ecological indicators such as prevalence, abundance, and host specificity, among others.

RESUMEN. ROEDORES SIGMODONTINAE (MUROIDEA: CRICETIDAE) COMO HOSPEDADORES DE CESTODA DE ARGENTINA. En Argentina, los estudios parasitológicos en roedores Cricetidae han sido principalmente de nematodos. Sin embargo, algunas investigaciones han demostrado que los cestodos son componentes comunes de sus ensambles parasitarios. Los roedores Sigmodontinae (Cricetidae-Muroidea) de la región de la Cuenca del Plata, Argentina, son estudiados como hospedadores de cestodos. Se brindan nuevos registros hospedatorios y geográficos, y parámetros de infección parasitaria. Se examinaron 1675 especímenes pertenecientes a 28 especies de roedores de 67 localidades con el fin de hallar especímenes de cestodos. Se identificaron cinco taxones de cestodos pertenecientes a tres familias, entre los que se incluyen 20 nuevos registros geográficos. Además, se informan nueve nuevas asociaciones parásito-hospedador. Estos registros nos ayudan a aumentar nuestra comprensión de la riqueza de los cestodos en la región, y proporcionan una base de datos para evaluar el efecto de los factores intrínsecos y extrínsecos sobre los indicadores ecológicos, como prevalencia, abundancia, especificidad hospedatoria, entre otros.

Palabras clave: Argentina, Cricetidae, Datos ecológicos, Parásitos, Platyhelminthes.

Key words: Argentina, Cricetidae, Ecological data, Parasites, Platyhelminthes.

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INTRODUCTION

In Argentina, rodents of the subfamily Sigmodontinae Wagner, 1843, endemic to the Americas, include about 110 species grouped in 42 genera (Galliari et al. 1996; Pardiñas et al. 2006; Teta et al. 2018; Teta & Jayat 2021). These rodents constitute the most diverse group of the family Cricetidae Fischer, 1817 (Reig 1986; Pardiñas et al. 2017). Sigmodontinae rodents live in almost all types of habitats within their geographical range. Most are herbivores or omnivores, but some specialized forms are insectivorous (D'Elia & Pardiñas 2015; Pardiñas et al. 2017, 2020).

The Class Cestoda is the second most diverse group of flatworms, with at least 833 recognized genera belonging to 18 orders (Caira & Littlewood 2013), (Caira & Jensen, 2017). Cyclophyllidea is the order with the highest species richness and is sometimes recorded in reptiles and amphibians, but mainly in birds and mammals (Czaplinski & Vaucher 1994; Georgiev et al. 2006), (Caira & Jensen, 2017).

The fauna of cestodes from small mammals is relatively well studied in Europe, northern Asia, and North America. These studies showed that adult cestodes are widespread and abundant in small mammals (Georgiev et al. 2006). Members of five families of cestodes have been recorded with Rodentia as definitive hosts. Among these, Anoplocephalidae is distributed worldwide, parasitizing at least 20 families of rodents; Catenotaeniidae includes the whole world except Australia and South America, parasitizing at least six families of rodents; Hymenolepididae is distributed worldwide, parasitizing at least 11 families of rodents; Davaineidae is distributed worldwide, parasitizing mainly birds, but five families of rodents are parasitized by representants of this group; Dilepididae is distributed around the world, parasitizing at least three families of rodents (Khalil et al. 1994; Georgiev et al. 2006; Mariaux et al. 2017; Oliveira et al. 2017; Caira et al. 2022).

Eight species of the genera *Andrya*, *Hymenolepis*, *Rodentolepis*, and *Monoecocestus*, have been mainly recorded in sigmodontine rodents from South America (e.g., Rêgo 1967, 1970; Schmidt & Martin 1978; Haverkost & Gardner 2010a,b; Guerreiro Martins et al. 2022a). In Argentina, *Andrya octodonensis* (Babero & Cattán, 1975) has been

recorded in the province of Jujuy, *Hymenolepis ivanovae* Guerreiro Martins, Robles, Navone & Callejón, 2022 in the province of Buenos Aires, *Rodentolepis akodontis* Rego, 1967 (see taxonomy status in Guerreiro Martins et al. 2022b), *Rodentolepis* sp., and *Rodentolepis microstoma* (Dujardin 1845) in different localities of the provinces of Buenos Aires, Corrientes and Misiones (Navone et al. 2009; Haverkost & Gardner 2010b; Guerreiro Martins et al. 2014, 2022a,b; Panisse et al. 2017; Gómez-Muñoz et al. 2020). Also, Miño et al. (2012) and Gómez-Muñoz et al. (2020) recorded the presence of larvae of *Hydatigera taeniaeformis* (Batsch, 1786) (= *Strobilocercus fasciolaris*) from the provinces of Buenos Aires and Corrientes, respectively. In addition, other unidentified cestodes were reported from *Phyllotis xanthopygus* (Waterhouse, 1837) in the province of La Rioja (Chemisquy et al. 2021).

In this paper, Sigmodontinae rodents (Cricetidae-Muroidea) from the Cuenca del Plata, Argentina, are studied as hosts of Cestoda, including new records (host species and geographical areas) and parasitic infection parameters.

MATERIALS AND METHODS

A total of 1675 Sigmodontinae rodents from 67 localities in the region of Cuenca del Plata collected by several collaborators (see acknowledgments) between 1995 and 2018 in Argentina were examined (Table S1).

The research was conducted according to Argentinian laws. Sample collection was conducted during fieldwork under official permits granted by the corresponding Ministerios of the provinces of Buenos Aires, Chaco, Corrientes, Entre Ríos, Formosa, Misiones, and Santa Fe (see Navone et al. 2009; Panisse et al. 2017; Robles et al. 2018; Galliari & Pardiñas 2021). This study was performed in agreement with the recommendations of the Guidelines for the Capture, Handling, and Care of Mammals as approved by the American Society of Mammalogists (Sikes et al. 2016). The specimens obtained with methods for live capture were studied following the procedures and protocols approved by national laws and the Ethics Committee for Research on Laboratory and Farm and obtained from nature animals, National Council of Scientific and Technical Research (CONICET).

Cestodes found were removed from the small intestines of the rodents (unfixed or fixed in 10% formalin or 96% alcohol), subsequently fixed in 10% formalin, or preserved in 70% ethanol. Moreover, seven unidentified specimens from other five localities deposited in the Helminthological Collection of Museo de La Plata (MLP-He), La Plata, Argentina, were analyzed (MLP-He: 0253-2, 0802-2, 0840-1, 1235, 1919, 1949-2, 1989, 3265-1)

(see **Table 1**). Specimens were stained with hydrochloric carmine, dehydrated through an alcohol series, cleared in eugenol, and studied by light microscopy (Leica MZ6 and Olympus BX51[®]). Drawings were made with the aid of a drawing tube. Some specimens were dried using the critical point method, examined, and photographed by scanning electron microscopy (JEOL/JSMT 6360 LV[®]). Specimens were identified following the keys of Khalil et al. (1994) and specific references. Voucher specimens were deposited in the MLP-He, La Plata, Buenos Aires, Argentina.

Rodent specimens were identified by morphological studies and, when necessary, molecular techniques (see D'Elia & Pardiñas 2004; Pardiñas et al. 2005; D'Elia et al. 2008; Valdez & D'Elia 2013; Torres Monges 2019) and deposited in the Mastozoological Collection from Centro Nacional Patagónico (CNP), Puerto Madryn, Chubut, and in the Mammals Collection from Museo de La Plata (MLP), La Plata, Buenos Aires.

The ecological parameters prevalence (P), mean intensity (MI), and mean abundance (MA) were calculated according to Bush et al. (1997). Previous records of cestodes species on Sigmodontinae (Cricetidae) rodents were compiled from the available literature: scientific papers and book chapters. When necessary, the scientific names of mammal hosts were updated following D'Elia & Pardiñas (2015) and Pardiñas et al. (2017).

RESULTS

Among a total of 1675 specimens of sigmodontine rodents belonging to 28 species of 17 genera included in three tribes: Akodontini, Oryzomyini, and Phyllotini, 192 specimens were parasitized with cestodes.

A total of 11.5% (192/1675) of prevalence, 3.1 MI (587/192), and 0.4 MA (587/1675) were observed. Cestodes were found in 11 rodent species, showing a distribution as follows (P, MI, MA): *Akodon azarae* (Fischer, 1829) 12% (34/283), 2.8 (95/34), 0.3 (95/283); *Akodon dolores* Thomas, 1916 12.5% (2/16), 1.5 (3/2), 0.2 (3/16); *Akodon montensis* Thomas, 1913 17.2% (60/349), 3.1 (184/60), 0.5 (184/349); *Akodon philipmyersi* Pardiñas, D'Elia, Cirignoli & Suarez, 2005 13.3% (2/15), 4 (8/2), 0.5 (8/15); *Holochilus chacarius* Thomas, 1906 40.7% (11/27), 7.6 (84/11), 3.1 (84/27); *Holochilus vulpinus* (Brants, 1827) 18.2% (2/11), 1 (2/2), 0.2 (2/11); *Necromys lasiurus* (Lund, 1840) 12.1% (20/165), 3.6 (71/20), 0.4 (71/165); *Oxymycteris quaestor* Thomas, 1903 10% (1/10), 1 (1/1), 0.1 (1/10); *Oxymycteris rufus* (Fischer, 1814) 22% (35/159), 2.6 (91/35), 0.6 (91/159); *Scapteromys aquaticus* Thomas, 1920 12.2% (23/188), 1.8 (41/23), 0.2 (41/188), and *Thaptomys nigrata* (Lichtenstein, 1829) 6.1% (2/33), 1.5 (3/2), 0.1 (3/33) from 30 localities in the region of the Cuenca del Plata.

Five taxa of cestodes belonging to the families Anoplocephalidae, Davaineidae, and Hymenolepididae were identified. The information is presented in a taxonomic list for each cestode

species, which contains host records, locality records, collection numbers of parasite specimens deposited, and comments. Moreover, the infection parameters of each parasite species by host species and localities are shown in **Table 1**. Previous and new host and geographical records of cestodes in Sigmodontinae rodents (Cricetidae) from the region of the Cuenca del Plata in Argentina are summarized in **Tables 1**, and **2**, and **Fig. 1**.

In addition, unidentified cestodes deposited in the MLP-He is parasitizing *A. azarae*, *Deltamys kempfi* Thomas, 1917, and *O. rufus* from another five localities were studied.

The present study and the previous records in Argentina indicate that *A. azarae* and *N. lasiurus* are parasitized by four cestode species, followed by *O. rufus* with three species, *A. montensis*, *D. kempfi* and *T. nigrata* with two species, and *A. dolores*, *A. philipmyersi*, *H. chacarius*, *H. vulpinus*, *S. aquaticus* and *O. quaestor* with one cestode species (Table S2).

Phylum Platyhelminthes

Class: Cestoda Rudolphi, 1808

Order: Cyclophyllidea van Beneden in Braun, 1900

Family: Anoplocephalidae Cholodkowsky, 1902

Genus: *Mathevotaenia* Akhymyan, 1946

Mathevotaenia sp.

Host species: *Necromys lasiurus*.

Symbiotype: CNP 3038, 3050.

Locality: Estancia Santa Inés, province of Misiones.

Specimens deposited: MLP-He 7591.

Comments (based on four specimens): The specimens were classified under the genus *Mathevotaenia*, according to Beveridge (1994), based on the following morphological features: i.e., scolex generally globose, provided with four suckers; rostellum absent; genitalia single; genital pores alternate irregularly; internal and external seminal vesicles absent; and genital ducts open in the anterior third of each proglottid.

Of the 12 species of *Mathevotaenia* recorded in mammals, two parasitize Heteromyidae rodents –*Mathevotaenia deserti* (Millemann 1955) and *Mathevotaenia dipodomi* (Bienek & Grundmann 1973)– and one in Muridae –*Mathevotaenia symmetrica* (Baylis, 1927)– from North America (Beveridge 2008), with no reported records in Cricetidae rodents (Murai 1975; Millemann 1955; Bienek & Grundmann 1973). Our species differs from those three species above mentioned by the size of the scolex, number of testes, and size of the internal organs.

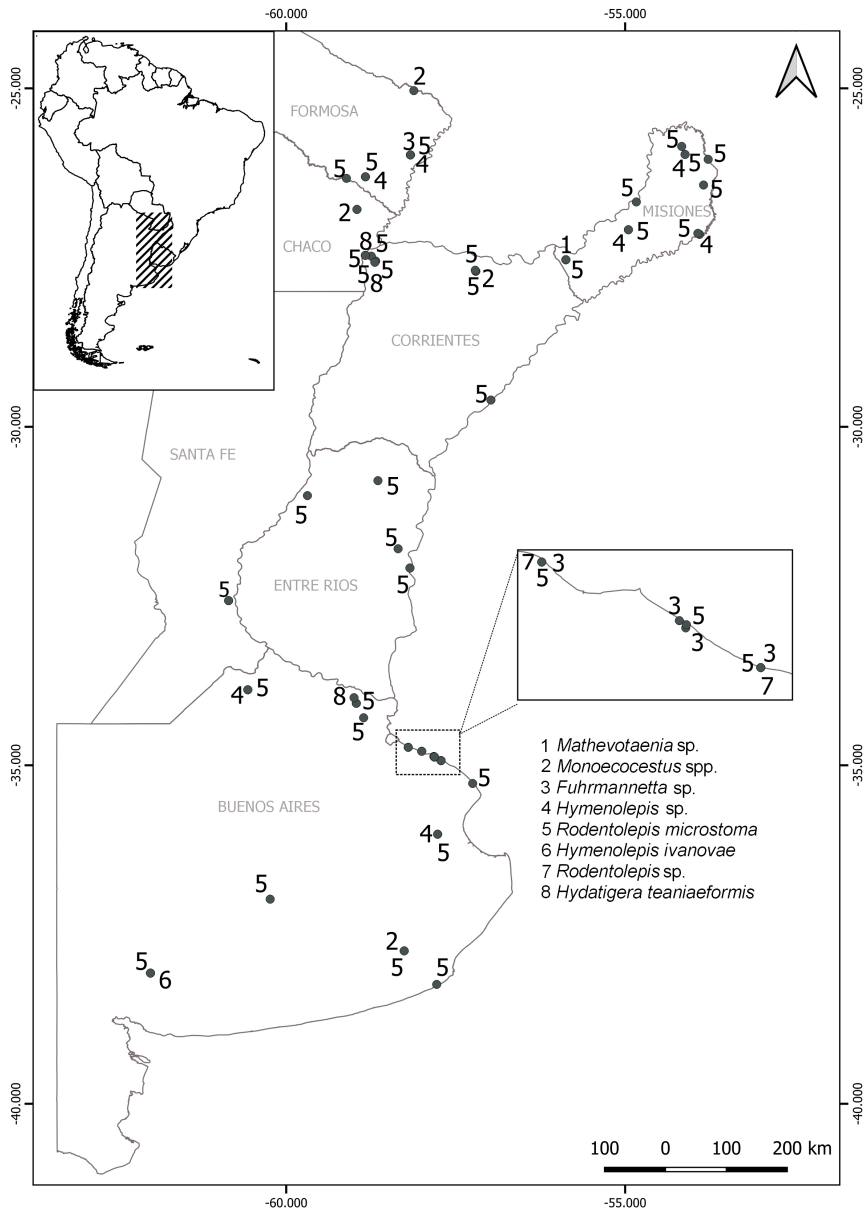


Fig. 1. Updated records of cestode species from Sigmodontinae rodents in the region of Cuenca del Plata, Argentina. See data of localities and hosts in Tables 1 and 2.

This is the first record of the genus *Mathevotaenia* from Cricetidae rodents and from Argentina (Table 1).

Monoecocestus Beddard, 1914
Monoecocestus spp.

Host species: *Akodon azarae*, *Holochilus chacarius*, *Holochilus vulpinus*.

Symbiotype: MLP 27.XII.01.5; CNP 1890, 3939. Other hosts with collection numbers in process, field numbers: CG 401, 402; RORO 12, 33, 58.

Localities: Balcarce, province of Buenos Aires. Selvas de Río de Oro, province of Chaco. Estancia

San Juan Poriahú, province of Corrientes. IPAF-NEA Laguna Blanca, province of Formosa.

Specimens deposited: MLP-He 840; 7587; 7588; 7589; 7590.

Comments (based on 12 specimens): morphological characteristics observed in these specimens agreed with those established for the genus *Monoecocestus* (Rêgo 1961; Beveridge 1994), i.e., scolex with prominent suckers; genitalia simple; genital pores alternate regularly and irregularly; testes numerous; cirrus pouch well developed; cirrus spined; eggs with pyriform apparatus.

Six species of *Monoecocestus* have been recorded as parasitizing sigmodontine rodents: *Holochilus sciureus* Wagner, 1842 –*Monoecocestus threlkeldi* (Parra, 1952)– from Bolivia; *Graomys domorum* (Thomas, 1902) –*Monoecocestus andersoni* Haverkost & Gardner, 2010, and *Monoecocestus microcephalus* Haverkost & Gardner, 2010– from Bolivia; *Phyllotis caprinus* Pearson, 1958 –*Monoecocestus poralus* Haverkost & Gardner, 2010– from Bolivia; *Tapecomys wolffsohni* Thomas, 1902 –*Monoecocestus sininterus* Haverkost & Gardner, 2010– from Bolivia; and *Graomys chacoensis* (Waterhouse, 1837) –*Monoecocestus mackiewiczzi* Schmidt & Martin, 1978– from Paraguay (Haverkost 2009; Haverkost & Gardner 2009, 2010a).

Due to the inadequate preservation of the specimens and their low abundance, the determination at a specific level is incomplete and requires a greater number of specimens to complete the taxonomic study and advance in the nomenclatural process.

This is the first record of the genus for the host species *H. vulpinus*, *H. chacarius*, and *A. azarae* and for Argentina (**Table 1**).

Family Davaineidae Braun, 1900

Genus *Fuhrmannetta*, Stiles & Orleman, 1926

Fuhrmannetta sp.

Host species: *Scaptermys aquaticus*.

Symbiotype: with collection numbers in process, field numbers: B 2, 27, 30, 43; LB 287, 227, 226, 293, 295, 310; T 4, 10, 20, 31; PB 13, 14, 15, 17, 37; PL 306; CG 437, 443.

Localities: La Balandra; Los Talas; Palo Blanco; Reserva Selva Marginal de Punta Lara, province of Buenos Aires. El Bagual; Estación de Animales Silvestres Guaycolec, province of Formosa.

Specimens deposited: MLP-He 2184-2; 2194-2; 2230-1; 7581-7586.

Comments (based on 12 specimens): The mor-

phological characteristics observed in these specimens agreed with those established for the genus *Fuhrmannetta* with the presence of a rostellum armed with a double crown of hammer-shaped hooks, irregularly alternating genital pores, single reproductive organs, numerous testes, and multiple eggs in uterine capsules (Jones & Bray 1994).

Fuhrmannetta bandicotensis Olsen & Kuntz, 1979 and *Fuhrmannetta jurubatensis* Oliveira, Oliveira & Ederli, 2017 have been recorded as parasitizing rodents, and the last species as parasites of cricetid rodents in the Americas (Olsen & Kuntz 1979; Oliveira et al. 2017). Our specimens differ from *F. jurubatensis* by having unarmed suckers, the number of testes, and the number of eggs per uterine capsule. Since the fixation of material was not optimal, some diagnostic characters could not be observed in detail; therefore, a specific determination was not possible.

Specimens of cestodes from *S. aquaticus* identified as *Rodentolepis* sp. (Hymenolepididae) by Navone et al. (2009) were re-studied, and their taxonomic determination rectified, placing them within this genus.

This record is the first of the genus *Fuhrmannetta* in sigmodontine rodents and for Argentina (**Table 1**).

Family Hymenolepididae Ariola, 1899

Genus *Hymenolepis* Weinland, 1858

Hymenolepis sp.

Host species: *Akodon azarae*, *Akodon montensis*, *Necomys lasiurus*, *Thaptomys nigrita*.

Symbiotype: CNP 435, 3004, 4069; MLP 1.I.03.54. Other hosts with collection numbers in process, field numbers: C 117; RO 11; CG 73, 86, 92, 111, 112, 114, 116, 121, 128, 131; CG 40.

Localities: Cerro de la Gloria; Pergamino, province of Buenos Aires. Estación de Animales Silvestres Guaycolec; Reserva El Bagual, province of Formosa. Cuña Pirú; Reserva de Vida Silvestre Uruguay-í; PP Moconá-sendero de la Gruta, province of Misiones.

Specimens deposited: MLP-He 7574-7580.

Comments (based on 17 specimens): these specimens have been assigned to *Hymenolepis* sp. in agreement with the description given by Czaplinski & Vaucher (1994), i.e., strobila with numerous proglottids and progressive maturation, scolex with unarmed rostellum, testes three, separated into two groups by female gonads, cirrus sac short, cirrus smooth, genital pores unilateral.

Of the 27 species of *Hymenolepis* recorded in rodents, 11 parasitize rodents from North and South

America. Among these, only *H. ivanovae*, has been registered in *O. rufus* from Argentina (Guerreiro Martins et al. 2022a) (Table 2). The specimens studied here differ from species recorded in rodents from the Americas by the size of the scolex, suckers, cirrus sac, and eggs, among others.

This is the first record of the genus *Hymenolepis* in *A. azarae*, *A. montensis*, *N. lasiurus*, and *T. nigrita* from Argentina, enlarging the host and geographical range of the genus (Table 1).

Genus *Rodentolepis* Spasski, 1954

Rodentolepis microstoma (Dujardin, 1845) (Fig. 1)

Host species: *Akodon azarae*, *Deltamys kempi*, *Oxymycterus rufus*.

Localities: Balcarce; INTA Delta Canal 5, Campana; Ruta 12 km 100, Campana; Playa Bagliardi, Berisso; Sierra de La Ventana, province of Buenos Aires .

Specimens deposited: MLP-He 0802-2; 0253-2; 1949-2; 3265-1; 1235; 1919; 1989.

Comments (based on 6 specimens): these specimens were identified as *Rodentolepis microstoma* in agreement with Dujardin (1845), and the contributions of Guerreiro Martins et al. (2022b) based on the following morphological features, i.e. strobila long, craspedote, with proglottids wider than long, and in gradual maturation, scolex with rostellum armed with a single crown of hooks of the cricetoid type, testes three separated into two groups by female gonads, cirrus smooth, vitelline gland lobated, well-developed seminal receptacle, genital pores unilateral.

Rodentolepis microstoma was previously reported in eight species of Sigmodontinae rodents from six provinces in Argentina (Guerreiro Martins et al. 2022b) (Table 2). This finding adds a new host species (*D. kempi*) and new localities in the province of Buenos Aires (Table 1).

DISCUSSION

Four orders of small mammals (Chiroptera, Lagomorpha, Rodentia, and Soricomorpha) are parasitized as definitive hosts by six families of cestodes, Anoplocephalidae, Hymenolepididae, Davaineidae, Catenotaeniidae, Dilepididae, and Paruterinidae (Georgiev et al. 2006). Among these, the first three families have been recorded parasitizing Cricetidae rodents in the region of Cuenca del Plata, with Davaineidae recorded for the first time in this host group. In the Americas, the genera of Cestoda represented in sigmodontine

rodents are *Fuhrmannetta*, *Raillietina* (Davaineidae), *Andrya*, *Monoecocestus* (Anoplocephalidae), *Hymenolepis*, and *Rodentolepis* (Hymenolepididae) (e.g., Rêgo 1961, 1967; Haverkost & Gardner 2009, 2010a,b; Simões et al. 2012; Oliveira et al. 2017). Among these, *Fuhrmannetta*, *Monoecocestus*, *Hymenolepis*, and *Rodentolepis* were recorded in this paper, showing new reports from host species and geographical areas.

Previously to these reports, Guerreiro Martins et al. (2014) and Panisse et al. (2017) identified some specimens of cestodes as *Rodentolepis* cf. *akodontis* from *O. rufus* and *A. montensis*, and Gómez-Muñoz et al. (2020) as *Rodentolepis akodontis* from *N. lasiurus*. Later, Guerreiro Martins et al. (2022b) determined the same specimens from *O. rufus* and *A. montensis* as *R. microstoma*, and in this paper, the specimens from *N. lasiurus* were also assigned to *R. microstoma* since all morphological features agree with this species. In addition, the taxonomic status of *R. akodontis* should be considered doubtful as was suggested by Guerreiro Martins et al. (2022b).

The present study extends cestode records to the following hosts: *A. azarae*, *D. kempi*, *N. lasiurus*, *S. aquaticus*, *T. nigrita*, *H. chacarius*, *H. vulpinus*, and nine new parasite-host associations were identified (*Hymenolepis* sp.-*A. azarae*; *Monoecocestus* spp.-*A. azarae*; *R. microstoma*-*D. kempi*; *Mathevotaenia* sp.-*N. lasiurus*; *Hymenolepis* sp.-*N. lasiurus*; *Monoecocestus* spp.-*H. chacarius*; *Monoecocestus* spp.-*H. vulpinus*; *Fuhrmannetta* sp.-*S. aquaticus*; *Hymenolepis* sp.-*T. nigrita*). In addition, five cestode taxa from thirty-four localities are reported, 20 of which constitute new geographic records for the provinces of Buenos Aires, Chaco, Corrientes, Formosa, and Misiones (Table 1). Among the eight species recorded in this paper (Tables 1 and 2), three (*H. ivanovae*, *H. taeniaeformis*, *R. microstoma*) have a host range restricted to the Order Rodentia, while the rest enlarge their host distribution to birds and other mammals.

Cestode-host associations occur in a complex system of biotic and abiotic factors (Esch 1971; Bush et al. 1997). Cestodes species found in this study are acquired by definitive hosts through different food items. Among the studied hosts, different feeding preferences are observed, e.g., *O. rufus* is carnivorous, *Akodon* spp., *N. lasiurus*, and *T. nigrita* are omnivorous, and all these are terrestrial (D'Elia & Pardiñas 2015; Pardiñas et al. 2017, 2020). The present study and previous records in Argentina indicate that *A. azarae* and *N. lasiurus* are parasitized by four species of cestodes, *O. rufus* by three species, while *T.*

Table 1
Ecological data, new hosts, and geographical records of cestode species from Argentina by locality and host species.

Map (Fig. 1)	Family	Cestode species	Host	Locality	Coord S	Coord W	Province	Prevalence (%)	Mean intensity	Mean abundance	References or observations
1	Anoplocephalidae	<i>Mathevotaenia</i> sp.	<i>Necomys lastivus</i> *	Estancia Santa Inés**	27°31'53.69"	55°52'30.48"	Misiones	5.4 (2/37)	4 (8/2)	0.2 (8/37)	Present paper
2	<i>Monocestus</i> spp.	<i>Akodon azarae</i> *		Balcarce** (A)	37°44'23.36"	58°15'35.95"	Buenos Aires	-	-	-	Present paper, material from MLP-Hc
		<i>Holochilus chacarius</i> *		Selvas de Río de Oro**	26°47'23.35"	58°57'37.81"	Chaco	87.5 (7/8)	5 (35/7)	4.3 (35/8)	Present paper
				IPAF NEA, Laguna Blanca**	25°12'09.91"	58°07'13.71"	Formosa	7.7 (1/13)	46 (46/1)	3.5 (46/13)	Present paper
		<i>Holochilus vulpinus</i> *		Estancia San Juan Poriaht**	27°42'00.00"	57°12'14.00"	Corrientes	33.3 (1/3)	1 (1/1)	0.3 (1/3)	Present paper
		Total					44.4 (12/27)	7.1 (85/12)	3.1 (85/27)		
3	Davaineidae	<i>Fuhrmannetta</i> sp.	<i>Scapteromys aquaticus</i> *	Estación de Animales Silvestres Guaycolec** Reserva El Bagual** La Balandra**	25°58'49.53"	58°09'49.23"	Formosa	16.6 (1/6)	1 (1/1)	0.1 (1/6)	Present paper
				Los Talas**	25°58'51.60"	58°10'03.91"	Formosa	50 (1/2)	1 (1/1)	0.5 (1/2)	Present paper
				Palo Blanco**	34°55'45.47"	57°42'58.39"	Buenos Aires	15.4 (10/65)	1.1 (11/10)	0.1 (11/65)	Present paper
				Reserva Selva Marginal de Punta Lara**	34°52'05.00"	57°49'20.00"	Buenos Aires	10.5 (4/38)	3.2 (13/4)	0.3 (13/38)	Present paper
				La Balandra	34°53'00.00"	57°50'00.00"	Buenos Aires	14.3 (5/35)	2.6 (13/5)	0.4 (13/35)	Present paper
				Hudson**	34°47'30.00"	58°00'05.00"	Buenos Aires	12.5 (1/8)	1 (1/1)	0.1 (1/8)	Present paper
					34°56'00.00"	57°42'00.00"	Buenos Aires	-	-	-	Specimens re-studied from (Navone et al. 2009)
					34°45'00.00"	58°06'00.00"	Buenos Aires	-	-	-	Specimens re-studied from (Navone et al. 2009)
		Total					14.3(22/154)	1.8 (40/22)	0.3 (40/154)		

(A) Coordinate obtained from this location is very near the sampling site.

*New host records; **new locality records.

Table 1 (cont.)

Map (Fig. 1)	Family	Cestode species	Host	Locality	Coord S	Coord W	Province	Prevalence (%)	Mean intensity	Mean abundance	References or observations
4	Hymenolepididae	<i>Hymenolepis</i> sp.	<i>Akodon azarae</i> *	Cerro de la Gloria** Estación de Animales Silvestres Guaycolec** Reserva El Bagial**	36°01'00.00" 25°58'49.53" 25°58'51.60" 27°09'23.52"	57°26'00.00" 58°09'49.23" 58°10'03.91" 53°54'10.26"	Buenos Aires Formosa	2.6 (1/38) 28.6 (8/28)	9 (9/1) 2.7 (2/28)	0.2 (9/38) 0.8 (22/28)	Present paper Present paper
			<i>Akodon montensis</i> *	Parque Provincial Moconá, sendero de la Gruta** Reserva de Vida Silvestre Uruguay-1** Pergamino**	25°58'32.29" 33°52'9'39.56" 27°05'17.00"	54°07'00.08" 60°46'07'4.6" 54°57'09.00"	Misiones Buenos Aires Misiones	4.1 (1/24) 6.2 (1/16) 8.3 (1/12)	3 (3/1) 1 (1/1) 2 (2/1)	0.1 (3/24) 0.06 (1/16) 0.1 (2/12)	Present paper Present paper Present paper
			<i>Necomys lasiurus</i> ** <i>Thaptomys nigrita</i> *	Cuña Pirí**	27°05'17.00"	54°57'09.00"	Misiones	8.3 (1/12)	2 (2/1)	0.1 (2/12)	Present paper
			Total					11 (16/146)	3.1 (49/16)	0.3(49/146)	
5		<i>Rodentolepis microstoma</i>	<i>Akodon azarae</i>	Balcarce** (λ)	37°44'23.36"	58°15'35.95"	Buenos Aires	-	-	-	Present paper, material from MLP-He
				INTA Delta, Canal 5, Campana** (λ)	34°17'47.68"	58°51'29.78"	Buenos Aires	-	-	-	Present paper, material from MLP-He
				Ruta 12 km 100, Campana** (λ)	34°05'00.00"	58°58'00.00"	Buenos Aires	-	-	-	Present paper, material from MLP-He
			<i>Deltamys kempi</i> *	Playa Bagliardi, Berisso** (λ)	34°52'00.00"	57°05'00.00"	Buenos Aires	-	-	-	Present paper, material from MLP-He
			<i>Oxymycterus rufus</i>	Sierra de La Ventana (λ)	38°04'44.55"	62°00'19.04"	Buenos Aires	-	-	-	Present paper, material from MLP-He
				Ruta 12 km 100, Campana** (λ)	34°05'00.00"	58°58'00.00"	Buenos Aires	-	-	-	Present paper, material from MLP-He
			<i>Akodon azarae</i>	Arroyo Caraballo	32°05'06.00"	58°10'30.00"	Entre Ríos	50 (2/4)	1.5 (3/2)	0.7 (3/4)	Present paper, (Guerreiro Martins et al. 2014)
				Arroyo Feliciano	30°58'21.00"	59°41'49.00"	Entre Ríos	50 (1/2)	0.5 (1/2)	1 (1/1)	Present paper, (Guerreiro Martins et al. 2014)

(λ) Coordinate obtained from this location is very near the sampling site.

*New host records; **new locality records.

Table 1 (cont.)

Map (Fig. 1)	Family	Cestode species	Host	Locality	Coord S	Coord W	Province	Prevalence (%)	Mean intensity	Mean abundance	References or observations
5	<i>Rodentolepis microstoma</i>	<i>Akodon azarae</i>	Cerro de la Gloria	36°01'00.00"	57°26'00.00"	Buenos Aires	13.2 (5/38)	5.6 (28/5)	0.7 (28/38)	Present paper, (Guerreiro, Martins et al. 2014)	
			Estación de Animales Silvestres Guaycolec Pergamino	25°58'49.53"	58°09'49.23"	Formosa	3.8 (1/26)	1 (1/1)	0.04 (1/26)	Present paper, (Guerreiro, Martins et al. 2014)	
			Punta Indio	33°52.9'39.56"	60°46.07'4.6"	Buenos Aires	20 (1/5)	3 (3/1)	0.6 (3/5)	Present paper, (Guerreiro, Martins et al. 2014)	
			Reserva Santo Domingo	35°16'00.00"	57°15'00.00"	Buenos Aires	14.3 (2/14)	1 (2/2)	0.1 (2/14)	Present paper, (Guerreiro, Martins et al. 2014)	
			Río Bermejo	29°36'14.27"	56°58'50.63"	Corrientes	33.3 (1/3)	9 (9/1)	3 (9/3)	Present paper, (Guerreiro, Martins et al. 2014)	
			Villa Elisa	26°19'45.00"	59°06'43.00"	Formosa	45.5 (5/11)	1 (5/5)	0.4 (5/11)	Present paper, (Guerreiro, Martins et al. 2014)	
			Parque Provincial Ernesto Tornquist	32°9'14.73"	58°20'10.40"	Entre Ríos	4.2 (1/24)	1 (1/1)	0.04 (1/24)	Present paper, (Guerreiro, Martins et al. 2014)	
			Campo Anexo M. Belgrano, INTA, San Antonio Cuiña Pirú	38°04'44.55"	62°00'19.04"	Buenos Aires	12.5 (2/16)	1.5 (3/2)	0.2 (3/16)	Present paper, (Guerreiro, Martins et al. 2014)	
			Refugio Moconá	26°02'54.21"	53°46'32.40"	Misiones	5 (4/80)	5 (20/4)	0.2 (20/80)	Present paper, (Guerreiro, Martins et al. 2014)	
			Estancia Santa Inés	27°05'17.00"	54°57'09.00"	Misiones	12 (6/50)	2.7 (16/6)	0.3 (16/50)	Present paper, (Guerreiro, Martins et al. 2014)	
			Oliveros	27°8'29.04"	53°55'40.40"	Misiones	30 (6/20)	3.7 (22/6)	1.1 (22/20)	Present paper, (Guerreiro, Martins et al. 2014)	
				27°31'53.69"	55°52'30.48"	Misiones	13.3 (2/15)	4 (8/2)	0.5 (8/15)	Present paper, (Guerreiro, Martins et al. 2014)	
				32°34'00"	60°51'00"	Santa Fe	66.7 (2/3)	1 (2/2)	0.7 (2/3)	Present paper, (Guerreiro, Martins et al. 2014)	

(A) Coordinate obtained from this location is very near the sampling site.

*New host records; **new locality records.

Table 1 (cont.)

Map (Fig. 1)	Family	Cestode species	Host	Locality	Coord S	Coord W	Province	Prevalence (%)	Mean intensity	Mean abundance	References or observations
5	<i>Rodentolepis microstoma</i>	<i>Necromys lasiurus</i>	Estación de Animales Silvestres Guaycolec	25°58'49.53"	58°09'49.23"	Formosa	33.3 (2/6)	1 (2/2)	0.3 (2/6)	Present paper, (Guerreiro Martins et al. 2014)	
			Finca La Adelta, Laguna Paiva	27°28'41.76"	58°44'41.14"	Corrientes	27.3 (3/11)	2.3 (7/3)	0.6 (7/11)	Present paper, (Guerreiro Martins et al. 2014)	
			Reserva El Bagual	25°58'51.60"	58°10'03.91"	Formosa	50 (1/2)	1 (1/1)	0.5 (1/2)	Present paper, (Guerreiro Martins et al. 2014)	
			Estancia Santa Inés	27°31'59.00"	55°52'22.3"	Misiones	24.3 (9/37)	5.6 (50/9)	1.4 (50/37)	Present paper, (Guerreiro Martins et al. 2014)	
		<i>Oxymycterus quaestor</i>	Parque Provincial Pñalito	26°25'40.07"	53°50'38.26"	Misiones	50 (1/2)	1 (1/1)	0.5 (1/2)	Present paper, (Guerreiro Martins et al. 2014)	
		<i>Oxymycterus rufus</i>	La Balandra	34°55'45.47"	57°42'58.39"	Buenos Aires	16.7 (7/42)	1 (7/7)	0.2 (7/42)	Present paper, (Guerreiro Martins et al. 2014)	
			Reserva Natural de Hudson	34°44'00.00'	58°12'00.00"	Buenos Aires	14.8 (4/27)	2.5 (10/4)	0.4 (10/27)	Present paper, (Guerreiro Martins et al. 2014)	
			Reserva Selva Marginal de Punta Lara	34°47'00.00"	58°01'00.00"	Buenos Aires	18.8 (3/16)	3.7 (11/3)	0.7 (11/16)	Present paper, (Guerreiro Martins et al. 2014)	
			Reserva Santo Domingo	29°36'14.27"	56°58'50.63"	Corrientes	40 (2/5)	1 (2/2)	0.4 (2/5)	Present paper, (Guerreiro Martins et al. 2014)	
			Estancia El Cimarrón, RP 118, km 169	27°41'10.73"	57°12'41.91"	Corrientes	50 (1/2)	1 (1/1)	0.5 (1/2)	Present paper, (Guerreiro Martins et al. 2014)	
			Villa Elisa	32°9'14.73"	58°20'10.40"	Entre Ríos	7.7 (1/13)	8 (8/1)	0.6 (8/13)	Present paper, (Guerreiro Martins et al. 2014)	
		<i>Thaptomys nigrita</i>	2 km aguas abajo desembocadura Arroyo Parana-í Guazú	26°40'39.30"	54°50'08.20"	Misiones	33.3 (1/3)	1 (1/1)	0.3 (1/3)	Present paper, (Guerreiro Martins et al. 2014)	
			Total				15.9 (76/477)	2.9 (221/76)	0.5 (221/477)		

(λ) Coordinate obtained from this location is very near the sampling site.

*New host records; **new locality records.

nigrita is parasitized by two species. In this context, cestode species richness would not be associated with different feeding preferences. However, these exploratory results are not conclusive, but for *A. azarae*, *N. lasiurus*, and *O. rufus*, the highest cestode species richness observed is probably due to their wider geographic distribution and use of habitat when compared with the other host species, as mentioned by Poulin & Morand (2004), which showed that wider geographic distributions favor more host-parasite encounters.

In the study area, previous and new records indicate that, among Hymenolepididae, *R. microstoma* is the species with the widest distribution in the region of Cuenca del Plata, including the provinces of Buenos Aires, Corrientes, Entre Ríos, Formosa, Misiones, and Santa Fe. With respect to Anoplocephalidae, *Monoecocestus* spp. present distribution in the provinces of Formosa, Chaco, Corrientes, and Buenos Aires, while *Mathevotaenia* sp. is only recorded in the province of Misiones. *Fuhrmannetta* sp. also presents a discontinuous distribution, only recorded in the provinces of Formosa and Buenos Aires. This could be due to sampling errors included in this study or to the ecological and taxonomic characteristics of the hosts and the environment. New studies are needed to explain the behavior of the hosts and the geographical-environment distribution of cestodes. However, this paper summarizes all the knowledge gained so far.

Some surveys on ecological data of helminths have been carried out in different hosts of sigmodontine rodents in the Neotropical region (e.g., Maldonado et al. 2006; Haverkost & Gardner 2010a,b; Simões et al. 2011, 2012; Kuhnen et al. 2012; Oliveira et al. 2017; Costa et al. 2019). In Argentina, parasitological studies on sigmodontine rodents have been limited mainly to the study of the diversity, taxonomy, and ecology of nematodes (e.g., Digiani et al. 2012, 2013; Navone et al. 2009; Robles 2011; Robles et al. 2012, 2018). However, some research has revealed that cestodes are frequent components of their parasitic assemblages. Among these some authors studied the helminth communities from different sigmodontine species, Navone et al. (2009) from *A. azarae*, *D. kempi*, *O. rufus*, *Oligoryzomys flavescens* (Waterhouse 1837), *Oligoryzomys nigripes* Olfers, 1818, and *S. aquaticus* in a strip of the Río de la Plata wetlands; Panisse et al. (2017) from *A. montensis*, *Brucepattersonius* sp., *T. nigrita*, *Euryoryzomys russatus* (Wagner 1848), *Nectomys squamipes* (Brants, 1827), *O. nigripes*, and *Soretamys angouya* (Fischer, 1814) from the interior Atlantic Forest of Argentina;

and Gómez-Muñoz et al. (2020) from *A. azarae*, *N. lasiurus*, *O. rufus*, *H. chacarius*, *O. flavescens*, and *O. nigripes* in different localities on Humid Chaco ecoregion. The results of these papers show low prevalence and mean abundances of Cestoda, compared to Nematoda (e.g., values between 13-44%, and mean abundances of 0.3-1.2) (Navone et al. 2009; Panisse et al. 2017; Gómez-Muñoz et al. 2020).

Of all specimens examined (1675), only 192 harbored cestodes, *H. chacarius* recorded the highest $P = 40.7\%$ (11/27) and $MA = 0.4$, followed by *O. rufus* with a $P = 22\%$ (35/159) and $MA = 0.6$, indicating similar values to those previously reported. Moreover, cestodes were more frequent in the tribe Akodontini and lower in the tribe Oryzomyini (only in the genus *Holochilus*); but were not recorded in the tribe Phyllotini (Table S2).

The distribution of *R. microstoma* among the sigmodontine rodent species in the sampled localities showed a prevalence range between 3.8% (1/26)-66.7% (2/3); *Hymenolepis* sp. A range between 2.6% (1/38)-28.6% (8/28); *Fuhrmannetta* sp. between 10.5% (4/38)-50% (1/2); *Monoecocestus* spp. between 7.7% (1/13)-87.5% (7/8); and *Mathevotaenia* sp. a prevalence of 5.4% (2/37). Although the prevalence values for some localities may be questionable due to the low number of host specimens examined, these data provide a general description of the occurrence of cestodes in the Cuenca del Plata. Likewise, infection parameters observed for each host population also indicated low abundance and intensity. Possibly, fluctuations observed in prevalences and mean abundances of these parasitic taxa among host species may be a reflection of colonization patterns of parasites and of changes in the availability of intermediate hosts due to the effect of environmental factors.

In conclusion, these results expand the taxonomic knowledge of cestodes from Sigmodontinae rodents in the region of Cuenca del Plata and provide new records of geographic distribution and host species range. These records help us to increase our understanding of cestodes in the region, providing a database to evaluate in the future the effect of intrinsic and extrinsic factors on such ecological indicators as prevalence, abundance, and host specificity, among others.

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Table 2
 Host and geographical data of previously recorded cestode species of Sigmodontinae rodents from the region of Cuenca del Plata, Argentina.

Map (Fig. 1)	Family	Cestode species	Host	Locality	Coord S	Coord W	Province	References
5	Hymenolepididae	<i>Rodentolepis microstoma</i> (N)	<i>Akodon montensis</i>	Parque Provincial Uruguá-i	25°51'25.58"	54°09'59.87"	Misiones	(Pannisse et al. 2017)
				Reserva de Vida Silvestre Uruguá-i	25°38'32.29"	54°07'00.08"	Misiones	(Pannisse et al. 2017)
			<i>Necromys lasiurus</i>	Ciudad de Corrientes	27°28'00.00"	58°50'00.00"	Corrientes	(Gómez-Muñoz et al. 2020)
				San Cayetano	27°34'15.00"	58°41'41.00"	Corrientes	(Gómez-Muñoz et al. 2020)
				Arroyo de las Brusquitas	38°13'59.04"	57°46'44.40"	Buenos Aires	(Guerreiro Martins et al. 2014)
6	<i>Hymenolepis ivanovae</i>	<i>Oxymycterus rufus</i>	Olavarría (Cementos Avellaneda)	36°58'34.00"	60°14'13.00"	Buenos Aires	(Guerreiro Martins et al. 2014)	
			Estación Biológica Corrientes (ex Caprim)	27°33'08.69"	58°40'46.14"	Corrientes	(Guerreiro Martins et al. 2014)	
			Estancia San Juan Potrahuí	27°42'00.00"	57°12'14.00"	Corrientes	(Guerreiro Martins et al. 2014)	
			Estancia Santa Ana de Carpinchofi	30°47'39.25"	58°38'51.10"	Entre Ríos	(Guerreiro Martins et al. 2014)	
			Parque Provincial Ernesto Tornquist	38°04'44.55"	62°00'19.04"	Buenos Aires	(Guerreiro Martins et al. 2014)	
			Parque Provincial Ernesto Tornquist	38°04'44.55"	62°00'19.04"	Buenos Aires	(Guerreiro Martins et al. 2022a)	
			La Balandra Hudson	34°56'00.00"	57°42'00.00"	Buenos Aires	(Navone et al. 2009)	
			Hudson	34°45'00.00"	58°06'00.00"	Buenos Aires	(Navone et al. 2009)	
			La Balandra	34°56'00.00"	57°42'00.00"	Buenos Aires	(Navone et al. 2009)	
			Hudson	34°45'00.00"	58°06'00.00"	Buenos Aires	(Navone et al. 2009)	
8	Taeniidae	<i>Hydatigera teaniaformis</i> (strobilocercus)	Exaltación de la Cruz	34°00'00.00"	59°00'00.00"	Buenos Aires	(Miño et al. 2012)	
			Ciudad de Corrientes	27°28'00.00"	58°50'00.00"	Corrientes	(Gómez-Muñoz et al. 2020)	
				San Cayetano	27°34'15.00"	58°41'41.00"	Corrientes	(Gómez-Muñoz et al. 2020)

(N) Cited as *Rodentolepis* cf. *akodontis* by Guerreiro Martins et al. (2014), and Pannisse et al. (2017); and as *R. akodontis* by Gómez-Muñoz et al. (2020).

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**ONLINE SUPPLEMENTARY
MATERIAL**

Table [S1](#) - Table [S2](#)