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Metazoan endoparasites of snakes from Argentina: Review and checklist with distributional notes and remarks

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Research Paper

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Abstract

This article presents a checklist of metazoan parasites of snakes from Argentina, along with a comprehensive review of the relevant literature published between 1922 and June 2023, covering various aspects of interest. We compiled 34 species of metazoan endoparasites from 28 studies. The subclass Digenea showed the highest number of species (n = 22 species), followed by the phylum Nematoda (n = 8 species), and the subclass Pentastomida (n = 3 species and 1 *taxa inquirenda*). Dipsadidae was the family of snakes with the most species examined for metazoan endoparasites (n = 20 species). In contrast, Viperidae had the largest number of specimens surveyed (n = 343). Of 23 provinces, 15 (65.2%) presented at least one report of metazoan endoparasites in snakes. The northeastern provinces showed the highest richness of metazoan endoparasites and host diversity. Many articles focused on taxonomy, but studies on parasite ecology were not found. Although taxonomic accuracy was high in most reports, some records were correctly deposited in zoological collections or geo-referenced. This is the first attempt to include all groups of metazoan endoparasites of snakes from Argentina in a single checklist in the last century.

Introduction

Parasitism is considered one of the most successful life forms in the animal kingdom due to the number of species that have evolved parasitic adaptations (Self 1961; Poulin & Morand 2000; Weinstein & Kuris 2016). Metazoan endoparasites represent the largest proportion of this biological diversity (Zhang 2011). However, the biodiversity in many host groups, including reptiles, is underestimated (Strona & Fattorini 2014; Carlson *et al.* 2020a).

Taxonomy is a constantly evolving science that relies on checklists as reference sources, regardless of the taxonomic group or geographic area of interest. The potential value of checklists in various disciplines, such as biogeography, ethology, ecology, or conservation biology, requires regular updates (Poulin *et al.* 2016; Dubois 2017).

A sequence of taxonomic checklists provides useful information on the acknowledged taxa over time. Identifying and categorizing the changes between these checklists can provide valuable insights regarding the rates of name, synonym, and circumscription alterations (Vaidya *et al.* 2018). The knowledge of endoparasite biodiversity in snakes from most countries in the Neotropical region is scarce, except for Brazil, which has studied helminth parasites of wildlife during the last century (Travassos *et al.* 1969; Vicente *et al.* 1993; Fernandes & Kohn 2014). Although some studies are available, publications are limited and dispersed, with significant time gaps. For example, the first report of a metazoan parasite in South America was made by Alexander von Humboldt, who described the pentastomid *Porocephalus crotali* Humboldt, 1812 (as *Echinorhynchus crotali*) from *Crotalus durissus terrificus* (Laurenti 1768) in north-eastern Venezuela (Humboldt 1812). More than a century later, a pentastome, *Cephalobaena tetrapoda* Sambon 1922 (Sambon 1922b *apud* Christoffersen & De Assis 2013), collected from an unidentified viperid in northeastern Argentina, was the first metazoan parasite of snakes reported in the country.

In recent decades, in Argentina, descriptions of new species, records of distribution or new hosts, and checklists of digeneans and nematodes have been produced (Caubisens Poumarau 1965 1968; Boero *et al.* 1972, Lunaschi & Sutton 1985, Lunaschi & Drago 2001 2007a 2010a; Martínez et al. 1996; Ramallo 1996 2005; Lamas *et al.* 2016; González *et al.* 2018; Castillo *et al.* 2020), showing the country's growing interest in parasites of reptiles. Nevertheless, reports of

other representative endoparasite groups of snakes, such as tongue worms (Arthropoda: Crustacea: Pentastomida), have not been included.

Williams & Vera (2023) reported 129 species of snakes in Argentina. This represents nearly 15% of the biodiversity of neotropical snakes (≈880 species, according to Guedes *et al.* 2018). Considering the diversity in terms of extension and thermal variations due to the latitudinal gradient, Argentina shows an interesting richness worthy of being explored in depth (Williams & Vera 2023).

Global climate change, habitat changes, and pollution are among the major drivers of parasite biodiversity loss (Marcogliese 2023); as shown through modeling, these drivers represent a constant threat to herpetofauna and associated parasites (e.g., amphibians, Campião *et al.* 2015). Moreover, they affect the human-wildlife interface and threaten the well-being encompassed in the One Health concept (MacKenzie & Jeggo 2019; Prata *et al.* 2022).

This research aimed to present a checklist and literature review of metazoan endoparasites of snakes from Argentina, emphasizing the development of this topic in the last century and presenting some interesting aspects and remarks on host and parasite taxonomy.

Materials and methods

A search was carried out using several online engines (PubMed, BioOne, JSTOR, SciELO, Google Scholar, Web of Science and ScienceDirect, researchgate.com, redalyc.com) to find all the available literature on metazoan endoparasite groups in snake species or snake families from 1922 to October 2023. The keywords used for the search were: "parasite", "metazoan", "endoparasites", "helminth", "nematode", "cestode", "trematode", "digenean", "acanthocephalan", "pentastomid", "tongue worm", "snake" and their equivalents in French, Spanish, German, and Portuguese.

We excluded reports of metazoan endoparasites not collected from their hosts by necropsies and reports of immature stages with uncertain taxonomic identification (such as eggs and some larvae).

The checklist includes metazoan endoparasite species from the phyla Acanthocephala, Arthropoda (subclass Pentastomida), Nematoda, and Platyhelminthes (subclass Digenea and class Cestoda) found in snakes throughout Argentina. Metazoan endoparasite systematics is based on Amin (1987 2013) for acanthocephalans, Christoffersen & De Assis (2013) for pentastomids, Anderson *et al.* (2009), and Gibbons (2010) for nematodes, Khalil *et al.* (1994) for cestodes, and Jones *et al.* (2005), Bray *et al.* (2008), and Fernandes & Kohn (2014) for digeneans. Host systematics is based on Williams *et al.* (2021) and Williams & Vera (2023).

Abbreviations used in the checklist:

Argentine provinces: Buenos Aires (BAS), Catamarca (CAT), Chaco (CHA), Córdoba (CBA), Corrientes (CTES), Entre Ríos (ENT), Formosa (FOR), Jujuy (JUY), La Rioja (LAR), Misiones (MIS), Salta (SAL), San Luis (SL), Santa Fe (SF), Santiago del Estero (SAN), Tucumán (TUC), undetermined locality (UND).

Museums and collections: The Helminthological Collection of Centro de Ecología Aplicada del Litoral (CECOAL), the Helminthological Collection of Museo de La Plata (MLP), the Helminthological Collection of Fundación Miguel Lillo (CH-FML), and the Zoologisches Museum Berlin (ZMB).

The type of material (holotype and paratype) records and the corresponding catalog numbers are included.

Parasitological descriptors: prevalence (P) as the number of hosts infected with one or more individuals of a particular parasite species (or taxonomic group) divided by the number of hosts examined for that parasite species, and mean intensity (MI) as the total number of parasites of a particular species found in a sample divided by the number of hosts infected with that parasite (*sensu* Bush *et al.* 1997). Data from reports that did not specify the location of the collection were excluded.

All maps were created using QGIS 3.22 software (QGIS Development Team 2021).

Results

History of reports

Studies on metazoan endoparasites of snakes from Argentina have increased in number and scope (taxonomic studies, new host or geographic records, veterinary reports) since the first report in 1922 (Fig. 1). However, between 1941 and 1960, no reports on snake infections were published. Chronologically, the first group of metazoan endoparasites reported was the subclass Pentastomida, followed by the subclass Digenea with 22 species. The phylum Nematoda is the second group in terms of richness (8 species) and the most recently studied (Fig. 2). Most of the studies were published from 1991 onwards, and included veterinary reports (Martínez *et al.* 1996; 2000; Peichoto *et al.* 2016; Bustos *et al.* 2023), taxonomic descriptions (Lunaschi & Drago 2001 2002), new geographic or host records (Ramallo 1996 2005; Lunaschi & Drago 2010a; González *et al.* 2018), and checklists (Lunaschi & Drago 2007a; Castillo *et al.* 2020). Notably, no ecological studies have been performed on metazoan endoparasites in these hosts in the last century.

General data, taxonomy, and diversity

Twenty-eight publications, including 20 taxonomic studies, 5 checklists, and 3 veterinarian reports, contributed 38 records (Fig. 1). Since the first description of a pentastomid in 1922, 34 metazoan endoparasites (and 1 *taxa inquirenda*) have been reported (Table 1) from five families of snakes in Argentina (Boidae Gray 1825, Colubridae Oppel 1811, Dipsadidae Bonaparte 1838, Elapidae Boie 1827, and Viperidae Oppel 1811) (Fig. 3). Digeneans have been found in all five families. The only family infected with parasites from all groups was Dipsadidae. No metazoan endoparasites have been reported in Anomalepididae Taylor 1939 (2 species), Leptotyphlopidae Stejneger 1892 (7 species), and Typhlopidae Merrem 1820 (1 species).

Of the 129 snake species recorded in Argentina (Williams & Vera 2023), only 40 (31%) have been examined for metazoan endoparasites. Specifically, 20 (22.2%) of the 90 species of the family Dipsadidae in Argentina have been examined for metazoan endoparasites. In contrast, the largest number of specimens examined (n = 343) belong to the family Viperidae (Fig. 4).

Geographic context

Of the 23 Argentine provinces, 15 have at least one report of a metazoan endoparasite species in one snake species (Fig. 5). The highest number of reports were from the northern provinces, with 3 – 32.5% of their snake species surveyed for metazoan endoparasites. Only one snake species was surveyed in the provinces of Catamarca, Jujuy, La Rioja, Salta, and San Luis (Fig. 6). On the other hand, the

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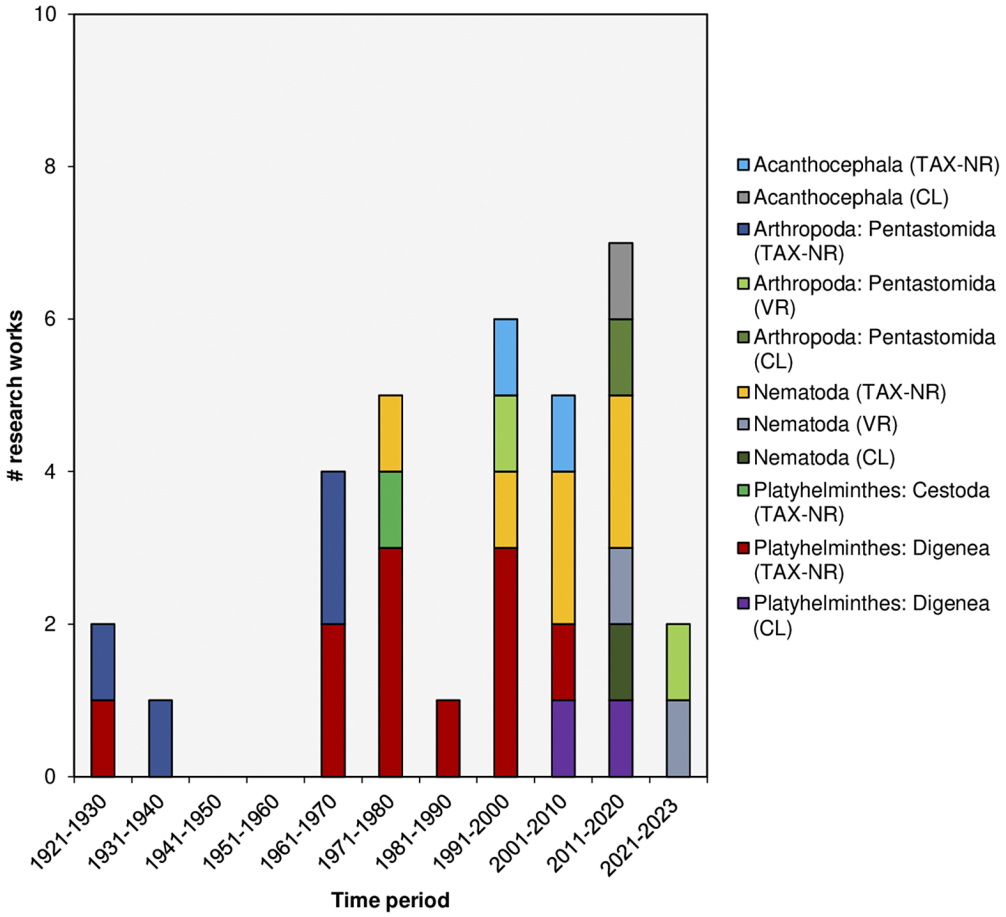

Figure 1. Types of research performed in groups of metazoan endoparasites of Argentine snakes from 1921 to 2023. TAX NR: Taxonomic article. New Record, CL: Checklist, VR: Veterinary Report.

highest number of metazoan endoparasite species (15 species) was found in Misiones (Fig. 5).

Specimen and geographic data availability

Of 38 records, 25 have not been deposited in curated biological collections, and 29 lack the corresponding location data. Regarding nematodes, only two reports (Ramallo 2005; González *et al.* 2018) presented the deposit number and geographic coordinates. For digeneans, Lunaschi & Sutton (1985) and Lunaschi & Drago (2001 2002, 2010a) deposited specimens in biological collections. Still, only Lunaschi & Drago (2010a) reported the geographic coordinates (Fig. 7). Regardless of the type of study, no associated molecular sequences have been described or deposited in GenBank.

Annotated check-list:

Phylum Acanthocephala Kohlreuther 1771.

Class Paleacanthocephala Meyer 1931.

Order Polymorphida Petrochenko 1956.

Family Centrorhynchidae Van Cleave 1916.

Centrorhynchus sp.

BAS: Villa Elisa (Partido de La Plata). *Paraphimophis rusticus* (Cope 1878) (= *Clelia rustica*) (Dipsadidae). Reference: Vizcaino (1993) *apud* Hernández-Orts *et al.* (2019).

CTES: Corrientes (Departamento Capital) (27°28'01"S, 58° 47'00'W). *Leptophis marginatus* (Cope 1862) (= *Leptophis ahaetulla marginatus*) (Colubridae). [P = 100% (1/1); MI = 600]. Material deposited: MLP N° 5874. Reference: Lamas & Lunaschi (2009).

Stage: cystacanth.

Site of infection: mesenteries.

Remarks: *Centrorhynchus* Van Cleave 1916 species are cosmopolitan parasites with a heteroxenous life cycle. They are found in the adult stage in birds of orders Strigiformes and Falconiformes, and occasionally in mammals, their definitive hosts (Amin 2013). Insects are usually the intermediate hosts; snakes and amphibians act as paratenic hosts and are parasitized by cystacanths (cystic larvae) (Kennedy 2006). Eight species in the adult stage have been reported in Neotropical regions. One has been described in Argentina parasitizing *Guira guira* (Cuculidae) from the province of Formosa (Lunaschi & Drago 2010b).

Phylum Arthropoda von Siebold 1848.

Subphylum Crustacea Brünnich 1772.

Subclass Pentastomida Diesing 1836.

Order Cephalobaenida Heymons 1935.

Family Cephalobaenidae Heymons 1922.

Cephalobaena tetrapoda Heymons 1922.

CTES: Corrientes (Departamento Capital). *Pseudablabes patagoniensis* (Girard 1858) (= *Philodryas patagoniensis*) (Dipsadidae). Reference: Bustos *et al.* (2023).

MIS: Santa Ana (Departamento Loreto). *Leptophis marginatus* (Cope 1862) (= *Leptophis ahaetulla liocercus*) (Colubridae). Material deposited: ZMB 48030, 48031, 48032, 48035. Reference: Heymons & Vitzthum (1935). *Pseudablabes patagoniensis* (Girard 1858) (Dipsadidae). Reference: Bustos *et al.* (2023).

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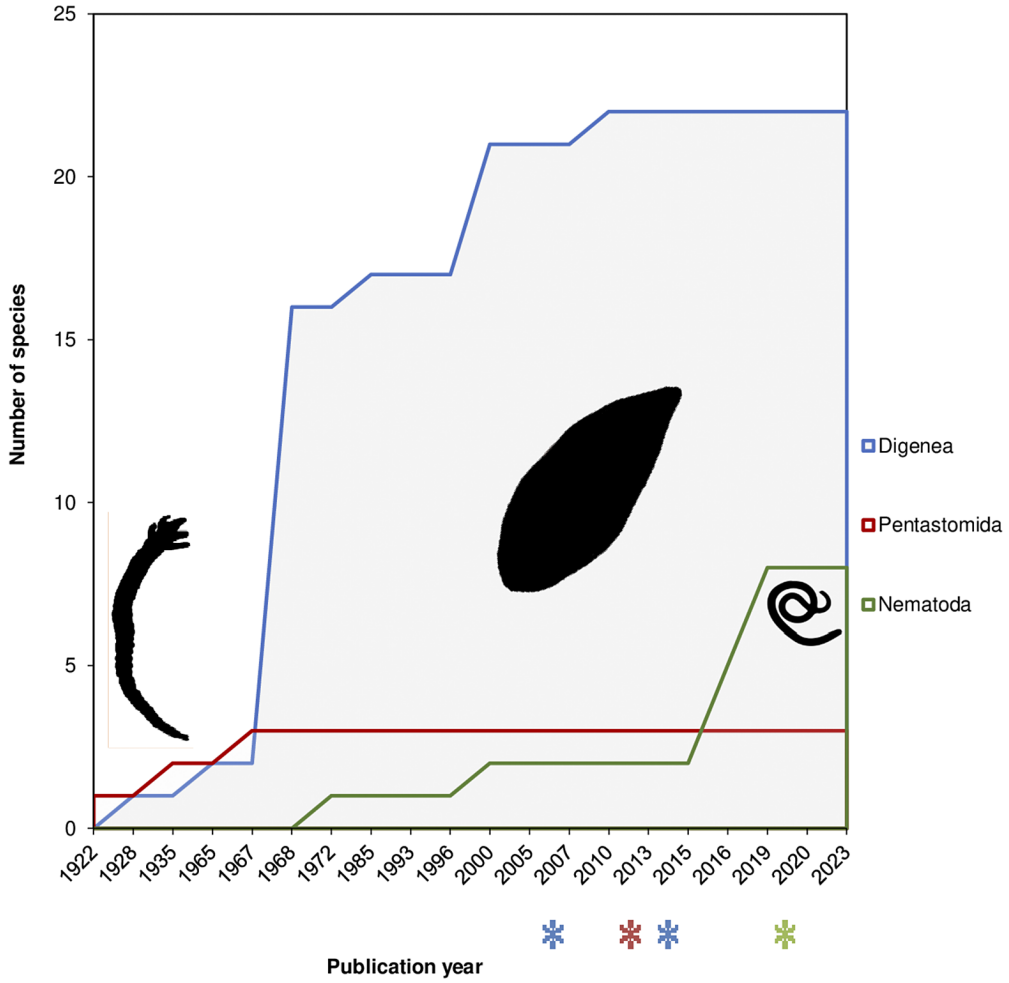

Figure 2. Cumulative number of species of representative groups of metazoan parasites in the last 100 years. Asterisk (*) indicates years of publication of checklists.

UND: *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Lachesis alternatus*) (Viperidae). Reference: Sambon (1922b) *apud* Christoffersen & De Assis (2013), Cavalieri (1970).

Stage: adult.

Site of infection: lungs.

Remarks: data on deposited material published in Heymons (1935) are included in Röhlig *et al.* (2010). This species is considered the most basal of the order Cephalobaenida and its life cycle is unknown (Fain 1966).

Order Porocephalida Sambon 1922.

Family Porocephalidae Heymons 1935.

Porocephalus crotali Humboldt 1812.

CHA: Resistencia (Departamento San Fernando). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae). Reference: Martínez *et al.* (2000).

Stage: nymphs.

Site of infection: lungs.

Remarks: the life cycle of *Porocephalus* Humboldt 1812 includes rodents and other mammal species as intermediate hosts. Nymphs and adults have been found in snakes, which serve as definitive hosts (Fain 1966). Martínez *et al.* (2000) mentioned the host as *Hydrodinastes* in captivity.

Order Raillietiellida Almeida & Christoffersen 1999.

Family Raillietiellidae Sambon 1922.

Railletiella furcocerca Sambon 1922.

CTES: Corrientes (Departamento Capital). *Pseudablabes patagoniensis* (Girard 1858). Reference: Bustos *et al.* (2023).

Stage: adult.

Site of infection: lungs.

Remarks: *Railletiella* Sambon 1910 adults have been reported in lizards and snakes (definitive hosts); while immature stages have been found in lizards and terrestrial arthropods (Fain 1966).

Species inquirenda

Family Cephalobaenidae Heymons 1922.

Bothropsiella bicornuta Cavalieri 1967.

UND: northeast of Argentina. *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae). Reference: Cavalieri (1967).

Site of infection: lungs.

Remarks: Rego (1984) *apud* Christoffersen & De Assis (2013) considered this species as "*taxa inquirenda*". Christoffersen & De Assis (2013) indicated that the holotype is deposited in Museo de La Plata, but the only female specimen studied is incomplete.

Phylum Nematoda Potts 1932.

Class Secernentea Chitwood 1950.

Order Rhabditida Chitwood 1933.

Family Rhabdiasidae Railliet 1916.

Acanthorhabdias acanthorhabdias Pereira 1927.

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Table 1. Number of taxonomic levels by group of metazoan endoparasite and available checklists for Argentina

Metazoan endoparasites group	# orders	# families	# genera	# species	# articles	Available checklists including snake parasites
Acanthocephala	1	1	1	1	2	Hernández–Orts *et al.* (2019)[a]
Arthropoda: Pentastomida	3	3	3	3	5	Christofersen & De Assis (2013)[b]
Nematoda	3	5	6	8	5	Castillo *et al.* (2020)[a]
Platyhelminthes: Cestoda	1	1	1	1	1	–
Platyhelminthes: Digenea	2	7	9	22	10	Lunaschi & Drago[a] (2007) Fernandes & Kohn (2014)[c]

[a]Including hosts of Argentina only.
[b]Including hosts worldwide.
[c]Including South America hosts.

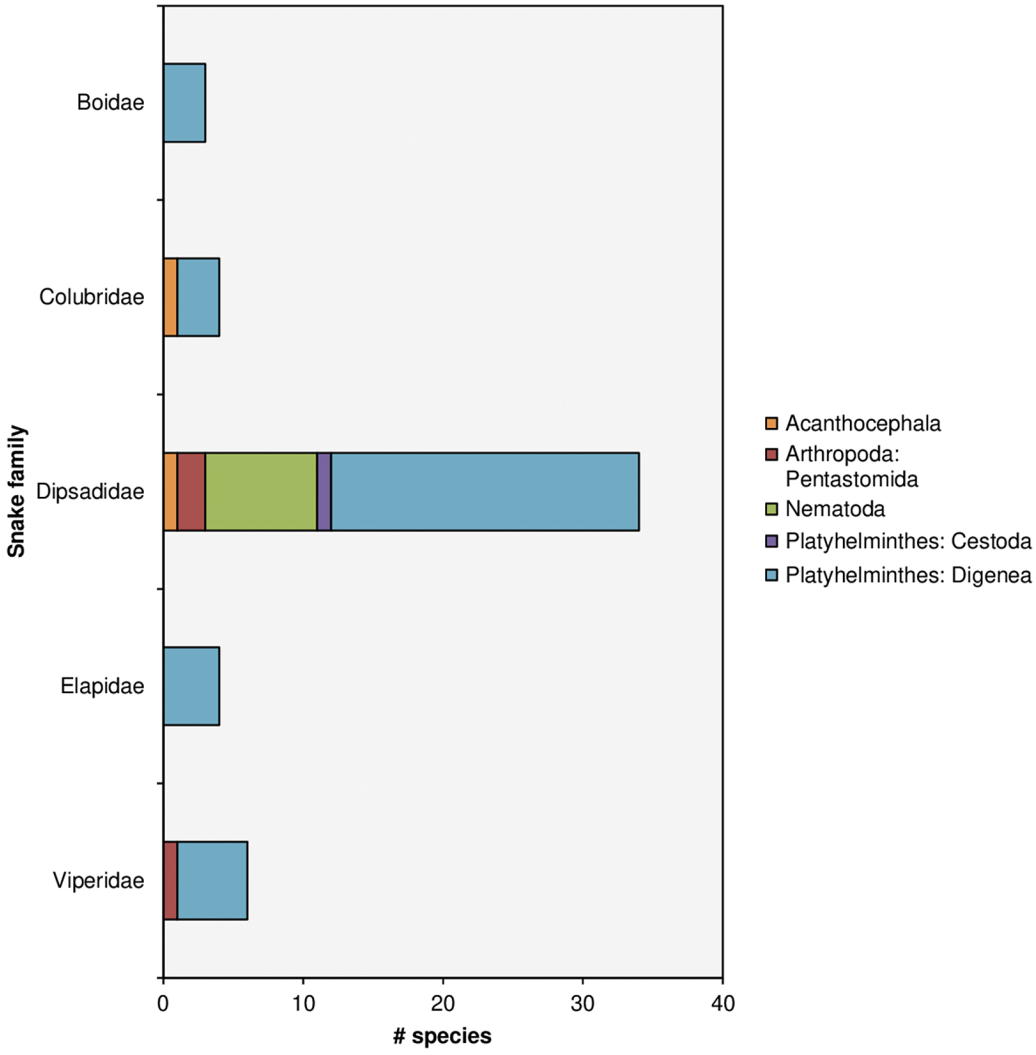

Figure 3. Number of species of metazoan endoparasites grouped by family of snake.

BAS: Los Talas (Partido de Berisso). *Erythrolamprus semiaureus* (Cope 1862) (= *Liophis miliaris semiaureus*) (Dipsadidae). Reference: Boero *et al.* (1972).

Stage: adult.

Site of infection: lungs.

Remarks: the life cycle of *Acanthorhabdias* Pereira 1927 is unknown. Nevertheless, Tkach *et al.* (2014) proposed that, like other parasites of the family Rhabdisidae, the cycle includes homogony and heterogony in parasitic and free-living phases.

Order Ascaridida Skrjabin & Schulz 1940.

Family Ascarididae Baird 1853.

Hexametra boddaerti (Baird 1860).

MIS: Parque Nacional Iguazú (Departamento Iguazú). *Oxyrhopus guibei* Hoge & Romano 1977 (Dipsadidae) [P = 100% (1/1);

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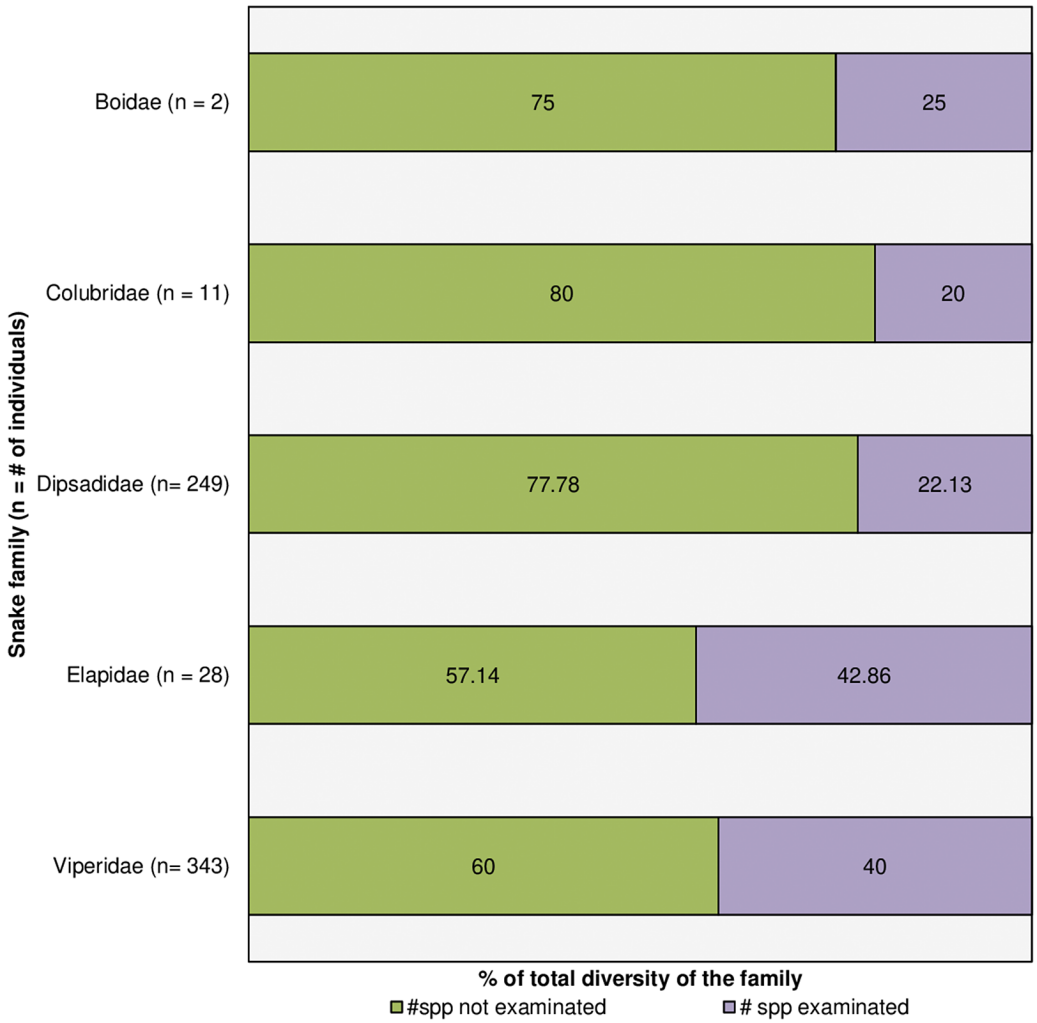

Figure 4. Percentage of species by snake family distributed in Argentina surveyed for parasites. The number of individuals by each one is presented with the names of the families of snakes (in parenthesis).

MI = 52]. Reference: Peichoto *et al.* (2016). *Erythrolamprus aesculapii* (Dipsadidae) [P = 100% (1/1); MI = 52]. Reference: Bustos *et al.* (2023).

Stage: adult.

Site of infection: small and large intestines.

Remarks: the life cycle of *Hexametra boddaerti* has not been determined. However, Bowman (1987) *apud* Peichoto *et al.* (2016) suggested that its life cycle could be heteroxenic, like that of *Toxocara* spp. Life history studies of Australian and Asian species of *Ophidascaris* (ascarids are closely related to the genus *Hexametra*) demonstrated that L2 or L3 larvae encyst in rodents preyed upon by pythons (Sprent 1963 1970).

Family Cosmocercidae (Railliet 1916 subfamily) Travassos 1925.

Aplectana travassosi (Gomes & Motta 1967) Baker 1980.

CHA: Colonia Las Mercedes (Departamento San Fernando). *Xenodon merremii* (Wagler 1824) (= *Waglerophis merremi*) (Dipsadidae) [P = 5% (1/20); MI = 11]. Material deposited: MLP-He 7250. Reference: Lamas *et al.* (2016).

Stage: adult.

Site of infection: small and large intestines.

Remarks: *Aplectana* Railliet & Henry 1916 has been frequently reported as a parasite of amphibians in Argentina (González & Hamann 2015). The life cycle of this genus is monoxenic; the host acquires the infection by ingesting larval stages (Anderson 2000). *Xenodon merremii* feeds exclusively on amphibians (Bellini *et al.* 2015).

Order Spirurida Chitwood 1933

Family Camallanidae Railliet & Henry 1915.

Camallanus sp.

CHA: *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (1/1); MI = 19]. Material deposited: CH-FML N° 1609. Reference: Ramallo (1996).

Stage: adult.

Site of infection: esophagus.

Remarks: *Camallanus* Railliet & Henry 1915 is a cosmopolitan genus with a broad host specificity and has been reported in fish, amphibians, and turtles. Immature stages have been found in copepods, which act as intermediate hosts, while fish or amphibians act as paratenic hosts (Anderson 2000). Fish are relevant trophic components in the diet of *Hydrodynastes gigas* in ecosystems of Argentina (López & Giraudo 2004; Giraudo *et al.* 2014).

Family Physalopteridae Railliet 1893.

Physaloptera liophis Vicente & Santos 1974.

CHA: Colonia Las Mercedes (Departamento San Fernando). *Xenodon merremii* (Wagler 1824) (= *Xenodon merremi*)

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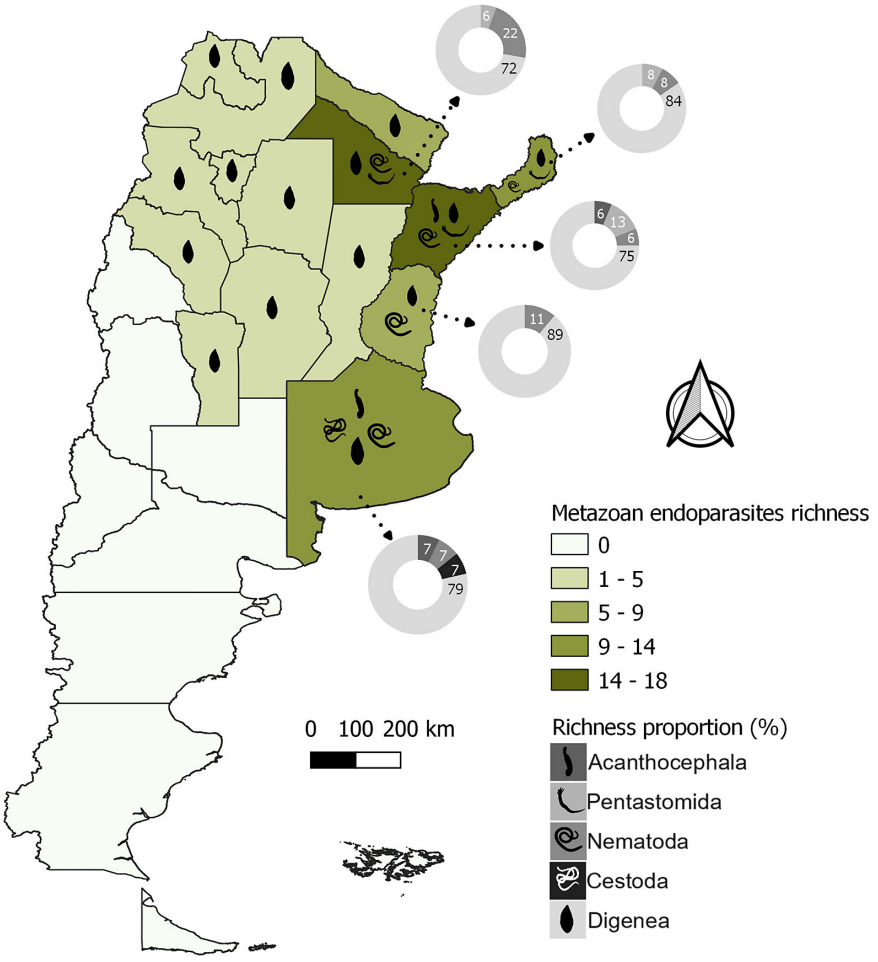

Figure 5. Number of metazoan endoparasite species by province.

(Dipsadidae) [P = 20% (4/20); MI = 23]. Material deposited: MLP-He 7251. Reference: Lamas *et al.* (2016).

Stage: adult.

Site of infection: stomach.

Remarks: *Physaloptera* Rudolphi 1819 is a genus with a broad host specificity and has been reported in amphibians, reptiles, and mammals. The life cycle of this genus is heteroxenic. Terrestrial insects are suitable intermediate hosts (Anderson 2000); the larval stage has been recorded in anurans, and the adult stage in lizards in the Chaco region (González *et al.* 2021a, b).

Order Strongylida Chitwood 1937.

Family Diaphanocephalidae Travassos 1920.

Kalicephalus costatus (Rudolphi 1819).

ENT: Ibicuy (Departamento Gualeguaychú) (33°44' S, 59°10' W). *Erythrolamprus semiaureus* (Cope 1862) (= *Liophis miliaris semiaureus*) (Dipsadidae) [P = 100% (1/1); MI = 115]. Material deposited: CH-FML N° 07428, 07429. Reference: Ramallo (2005).

Stage: adult.

Site of infection: small and large intestines.

Remarks: Schad (1962) proposed four subspecies for *K. costatus* based on geographic distribution: *K. costatus parvus* (North America), *K. costatus micrurus* (Africa), *K. costatus orientalis* (Asia and Oceania), and *K. c. costatus* (Central and South America). Schad (1956) conducted several experiments using experimental hosts and did not find a suitable host that could cause a successful infection in snakes; for this reason, he suggested that *Kalicephalus* has a direct life cycle. Ramallo (2005) suggested that some specimens found in Entre Rios could be *K. c. costatus.*

Kalicephalus subulatus Molin 1861.

CTES: Corrientes (Departamento Capital) (27°29'33.89" S, 58°45'33.63" W). *Xenodon merremii* (Wagler 1824) (= *Xenodon merremi*) (Dipsadidae) [P = 20% (1/5); MI = 18]. Material deposited: CECOAL 16061001. Reference: González *et al.* (2018).

Stage: adult.

Site of infection: small and large intestines.

Kalicephalus sp.

CHA: Colonia Las Mercedes (Departamento San Fernando). *Xenodon merremii* (Wagler 1824) (= *Xenodon merremi*) (Dipsadidae) [P = 10% (2/20); MI = 2]. Material deposited: MLP-He 7252. Reference: Lamas *et al.* (2016).

Stage: adult.

Site of infection: small and large intestines.

Phylum Platyhelminthes Gegenbaur 1859.

Class Cestoda Rudolphi 1808.

Order Onchoproteocephalida Caira, Jensen, Waeschenbach, Olson & Littlewood 2014.

Family Proteocephalidae La Rue 1911.

Ophiotaenia racemosa (Rudolphi 1819) La Rué 1911.

BAS: Los Talas (Partido de Berisso). *Erythrolamprus semiaureus* (Cope 1862) (= *Liophis miliaris semiaureus*) (Dipsadidae). Reference: Boero *et al.* (1972).

Stage: adult.

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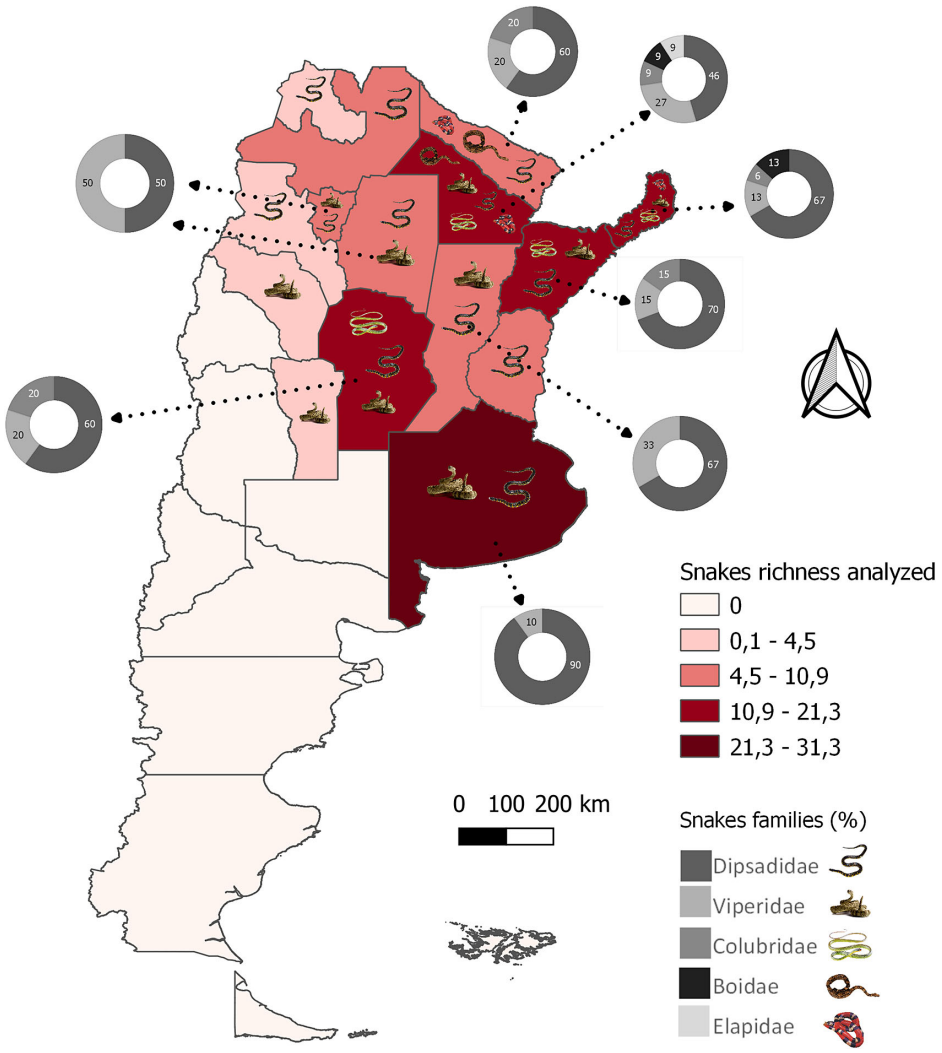

Figure 6. Percentage of host biodiversity evaluated for parasites by province. Number of snake species are cited by Williams & Vera (2023).

Site of infection: small intestine.

Remarks: the life cycle of this species is unknown, but Scholz & De Chambrier (2003) suggested it could be indirect, mediated by a copepod as an intermediate host.

Class Trematoda Rudolphi 1808.

Subclass Digenea Carus 1863.

Order Plagiorchiida La Rue 1957.

Family Diplodiscidae Cohn 1904

Catadiscus dolichocotyle (Cohn 1903) Cohn 1904

FOR: La Marcela farm (Departamento Pirané) (26°17'35"S, 59°06'67"W). *Philodryas* sp. (Dipsadidae) [P = 100% (1/1)]; MI = 4]. Material deposited: MLP N° 5515. Reference: Lunaschi & Drago (2010a).

Stage: adult.

Site of infection: large intestine.

Remarks: species belonging to the genus *Philodryas* Wagler 1830 have recently been relocated into various genera: *Chlorosoma* Wagler 1830, *Incaspis* Donoso Barros 1974, *Pseudablabes* Boulenger 1896, *Tropidodryas* (Fitzinger 1843), and *Xenoxybelis* Machado 1993 by Melo-Sampaio *et al.* (2020). Two genera, *Pseudablabes* and *Philodryas*, are present in Argentina (Williams & Vera 2023). In this context, the host identification provided by Lunaschi & Drago (2010b), *Philodryas* sp., does not allow us to know the actual taxonomic position of the host examined. The snail *Drepanotrema kermatoides* (D'Orbigny 1835) (Gastropoda: Planorbidae) has been mentioned by Lunaschi & Drago (2007) as a possible first intermediate host in the life cycle of *Catadiscus* species in natural systems in Argentina.

Catadiscus freitaslenti Ruiz 1943.

CBA: Chilibroste (Departamento Unión). *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 8]. Jesús María (Departamento Colón). *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 7]. Reference: Caubisens Poumarau (1968).

CHA: Las Palmas (Departamento Las Palmas). *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 3]. Reference: Caubisens Poumarau (1968).

CTES: Itá Ibaté (Departamento General Paz). *Erythrolamprus almadensis* (Wagler 1824) (= *Liophis almadensis*) (Dipsadidae) [P = 100% (1/1); MI = 6]. *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbignyi*) (Dipsadidae) [P = 100% (2/2); MI = 2.5]. Reference: Caubisens Poumarau (1968).

ENT: La Calandria (Departamento Federal). *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbignyi*) (Dipsadidae) [P = 100% (1/1); MI = 2]. Reference: Caubisens Poumarau (1968).

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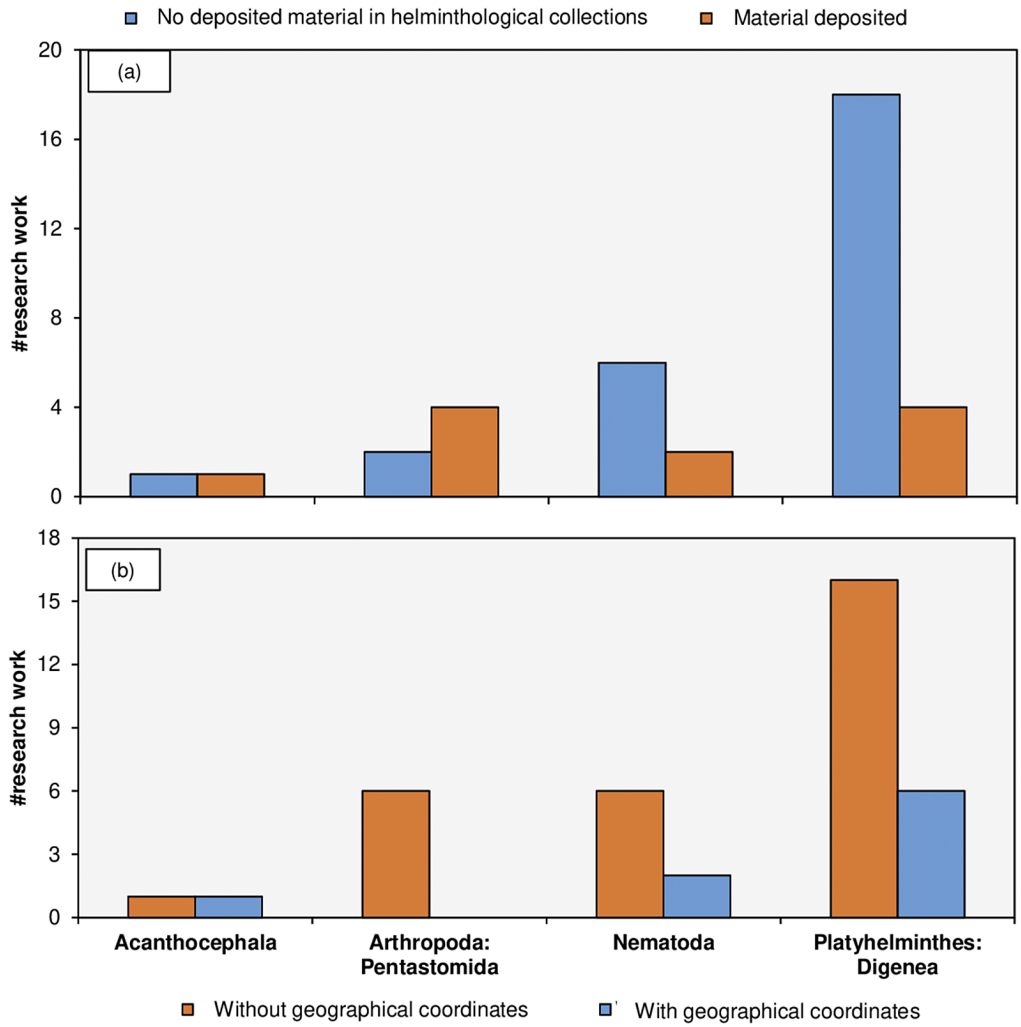

Figure 7. Number of studies by **(a):** Material deposited in helminthological collections. **(b):** Geo-referenced site of study. The label on the 'x' axis is shared by 7(a) and 7(b).

MIS: Posadas (Departamento Capital). *Bothrops diporus* Cope 1862 (= *Bothrops neuwiedi meridionalis*) (Viperidae) [P=100% (1/1); MI = 3]; *Lygophis flavifrenatus* Cope 1862 (Dipsadidae) [P = 100% (1/1); MI = 3]. Puerto Esperanza (Departamento Iguazú). *Erythrolamprus aesculapii* (Linnaeus 1758) (Dipsadidae) [P = 50% (1/2); MI = 6]. Reference: Caubisens Poumarau (1968).

SAN: Los Juries (Departamento General Taboada). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae) [P = 100% (1/1); MI = 1]. Reference: Caubisens Poumarau (1968).

SFE: Fortin Olmos (Departamento Vera). *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 6]. Reference: Caubisens Poumarau (1968).

Stage: adult.

Site of infection: small and large intestines.

Catadiscus longicoecalis Caubisens Poumarau 1965.

CHA: Las Palmas (Departamento Las Palmas). *Bothrops diporus* Cope 1862 (= *Bothrops neuwiedi meridionalis*) [P = 100% (1/1); MI = 4]. References: Caubisens Poumarau (1965 1968).

SAL: Padre Lozano (Departamento General José de San Martín). *Philodryas olfersii* (Lichenstein 1823) (Dipsadidae) [P = 100% (1/1); MI = 10]. Reference: Caubisens Poumarau (1968).

SFE: Lucita (?) (Departamento San Cristóbal). *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbignyi*) (Dipsadidae) [P = 100% (1/1); MI = 4]. Reference: Caubisens Poumarau (1968).

Stage: adult.

Site of infection: small and large intestines.

Remarks: in Caubisens Poumarau (1968), "Lucita" could be a misspelling of "La Lucila," a locality in the province of Santa Fe.

Catadiscus uruguayensis Freitas & Lent 1939.

BAS: Laguna Salada Grande (Partido de General Lavalle). *Erythrolamprus poecilogyrus* (Wied-Neuwied 1825) (= *Liophis poecilogyrus*) (Dipsadidae) [P = 100% (1/1)]. Reference: Lunaschi & Drago (2002).

Stage: adult.

Site of infection: small and large intestines.

Remarks: *Catadiscus uruguayensis* has been previously reported as a parasite of *Boana pulchella* (Duméril & Bibron 1841) (= *Hypsiboas pulchellus*) tadpoles, *Leptodactylus luctator* (Hudson 1892) (= *Leptodactylus ocellatus*), and *Pseudis minuta* Günther 1858 in Argentina (Lunaschi & Drago 2007a).

Family Plagiorchiidae Lühe 1901.

Glossidiella ornata Travassos 1927

BAS: Zoológico de La Plata (Partido de La Plata). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (1/1); MI = 2]. Material deposited: MLP N° 1044 D. Reference: Lunaschi & Sutton (1985).

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CHA: Las Palmas (Departamento Las Palmas). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% (1/1); MI = 79]. Reference: Caubisens Poumarau (1968). Juan José Castelli (Departamento General Güemes). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (25/25); MI = 80]. Reference: Martínez *et al.* (1996).

CTES: Bella Vista (Departamento Bella Vista). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% (1/1); MI = 192]. Reference: Caubisens Poumarau (1968). Ituzaingó (Departamento Ituzaingó), Paso de los Libres (Departamento Paso de Los Libres), San Cayetano (Departamento Capital), San Cosme (Departamento San Cosme), San Luis del Palmar (Departamento San Luis del Palmar), Santa Ana (Departamento San Cosme). *Hydrodynastes gigas* (Dipsadidae) [P = 100% (25/25); MI = 80]. Reference: Martínez *et al.* (1996).

ENT: Estación Federal (Departamento Federal). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% (1/1); MI = 14]. La Paz (Departamento La Paz). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% (1/1); MI = 10]. Reference: Caubisens Poumarau (1968).

Stage: adult.

Site of infection: small and large intestines.

Remarks: Travassos (1927a) described "*Glassidiella*" as a new genus and established "*Glassidiella ornada*" as type species. In this work, the type of host was incorrectly named ("*Cunectes murinus*" instead of "*Eunectes murinus*"). Strikingly, in another work published the same year, Travassos described "*Glassidiella ornata*" (Travassos 1927b). The work included measurements but not drawings, which are fundamental for accurate identification. In a third publication the same year, the author changed the spelling of the genus to "*Glossidiella*" and the spelling of the type species to "*Glossidiella ornata*" (Travassos 1927c). In addition to the previous measurements (Travassos 1927a; Travassos 1927b), drawings were included. Finally, in 1928, Travassos emended the type of host to *Cyclagras gigas* (= *Hydrodynastes gigas*).

Two groups of authors argue the stability of the names "*Glassidiella*" for the genus and "*Glassidiella ornata*" for the type species by law of priority (Caubisens Poumarau 1968; Lunaschi & Sutton 1985; Lunaschi & Drago 2007a). Other authors support the validity of "*Glossidiella*" and "*Glossidiella ornata*", and recently described a new species of this genus and compared it with the type of material deposited in the Helminthological Collection of the Instituto Oswaldo Cruz (*Glossidiella peruensis* by Huancachoque *et al.* 2020).

Travassos first stated that the new genus was morphologically "very close to *Glassidium*" (Travassos 1927a 1927b) and later that it was like "*Glossidium*" (Travassos 1927c). In our opinion, Travassos made an unclear etymological reference based on *Glossidium* Looss 1899 (see Looss 1899), because he temporally placed *Glossidioides loosi* (Travassos 1927a 1927c) and *Glossidium ornatum* within that genus (*nomen in schedula* in the online catalog of the Helminthological Collection of the Fundaçao Oswaldo Cruz, 2023). In this regard, Travassos *et al.* (1969) and Fernandes & Kohn (2014) called it *Glossidella* based on a single source (Travassos 1927c). This nomenclature confusion should be resolved in an additional paper, where automatic corrections or justified emendations could be clarified, as appropriate in each case.

In Lunaschi & Sutton (1985), the host was cited as "*Hydrodinastes*". The data supplied by Martínez *et al.* (1996) appear to be general and did not differentiate among the seven locations where they reported the presence of this species in the host. The life cycle of this species is unknown.

Glossidioides loosi (Travassos 1927) Yamaguti 1958

BAS: Zoológico de La Plata (Partido de La Plata). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (1/1); MI = 37]. Material deposited: MLP N° 1044 D. Reference: Lunaschi & Sutton (1985).

CHA: Las Palmas (Departamento Las Palmas). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% (3/3); MI = 132]. Reference: Caubisens Poumarau (1968). Juan José Castelli (Departamento General Güemes). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (25/25); MI = 80]. Reference: Martínez *et al.* (1996).

CTES: Bella Vista (Departamento Bella Vista). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% (1/1); MI = 111]. Reference: Caubisens Poumarau (1968). Ituzaingó (Departamento Ituzaingó), Paso de Los Libres (Departamento Paso de Los Libres), San Cayetano (Departamento Capital), San Cosme (Departamento San Cosme), San Luis del Palmar (Departamento San Luis del Palmar), Santa Ana (Departamento San Cosme). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (25/25); MI = 80]. Reference: Martínez *et al.* (1996).

ENT: Estación Federal (Departamento Federal). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% (1/1); MI = 3]. La Paz (Departamento La Paz). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% (1/1); MI = 8]. Reference: Caubisens Poumarau (1968).

Stage: adults.

Site of infection: trachea, lungs.

Remarks: this species was originally described and named as "*Glassidium loosi*" (Travassos 1927a), and then as "*Glossidium loosi*" (Travassos 1927c). In both descriptions, the author stated the similarity of his material with "*Glassidium*" (Travassos 1927a) and "*Glossidium*" (Travassos 1927c). "*Glossidium*" was the spelling linked to a previously described taxon [*Glossidium*, described in Looss (1899)]. Later, Yamaguti (1958) created the genus *Glossidioides* and assigned *Glossidioides loosi* as type species.

Haplometroides buccicola Odhner 1910.

MIS: Arroyo Cuñá Pirú (Departamento Cainguás) (27°05'14'' S, 54°57'11'' W). *Micrurus corallinus* (Merrem 1820) (Elapidae) [P = 100% (1/1); MI = 1]. Material deposited: MLP N° 5505. Reference: Lunaschi & Drago (2010a). Puerto Esperanza (Departamento Iguazú). *Micrurus frontalis* Duméril, Bibron & Duméril 1854 (Elapidae) [P = 100% (1/1); MI = 2]. Reference: Caubisens Poumarau (1968).

Stage: adults.

Site of infection: esophagus, lungs.

Remarks: the life cycle of *Haplometroides buccicola* is unknown.

Plagiorchis luehei Travassos 1927

BAS: La Plata Zoo (Partido de La Plata). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (1/1); MI = 37]. Material deposited: MLP N° 1044 D. Reference: Lunaschi & Sutton (1985).

CHA: Las Palmas (Departamento Las Palmas). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% (3/3); MI = 15]. Reference: Caubisens Poumarau (1968). Juan José Castelli (Departamento General Güemes). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (25/25); MI = 80]. Reference: Martínez *et al.* (1996).

CTES: Bella Vista (Departamento Bella Vista). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% (1/1); MI = 81]. *Xenodon merremii* (Wagler

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1824) (Dipsadidae) [P = 100% (1/1); MI = 20]. Reference: Caubisens Poumarau (1968). Ituzaingó (Departamento Ituzaingó), Paso de Los Libres (Departamento Paso de Los Libres), San Cayetano (Departamento Capital), San Cosme (Departamento San Cosme), San Luis del Palmar (Departamento San Luís del Palmar), Santa Ana (Departamento San Cosme), *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (25/25); MI = 80]. Reference: Martínez *et al.* (1996).

FOR: El Colorado (Departamento Pirané) (26°18' S, 59° 22' W). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (1/1); MI = 13]. Material deposited: MLP N° 5501, 5502. Reference: Lunaschi & Drago (2010a).

Stage: adult.

Site of infection: esophagus, lungs.

Remarks: Caubisens Poumarau (1968), Lunaschi & Sutton (1985), and Martínez *et al.* (1996) have reported this species as *Microderma luhei*. In Lunaschi & Sutton (1985), the host is cited as *Hydrodinastes*, possibly due to a typographical error. The prevalence and mean intensity data presented by Martínez *et al.* (1996) include the sum of all hosts examined without distinction among localities and only the maximum value reached by the mean intensity of all species of helminths.

Styphlodora condita Faria 1911

CBA: Arroyito (Departamento San Justo). *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 30]. Modesto Pizarro (?) (Departamento General Roca). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae) [P = 100% (1/1); MI = 30]. Reference: Caubisens Poumarau (1968).

CHA: Juan José Castelli (Departamento General Güemes). *Micrurus pyrrhocryptus* (Cope 1862) (Elapidae) [P = 100% (1/1); MI = 6]. Corzuela (Departamento General Belgrano). *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 7]. Km 38, El Zapallar (Departamento Libertador General San Martín). *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 7]. Reference: Caubisens Poumarau (1968).

CTES: Bella Vista (Departamento Bella Vista). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% (2/2); MI = 12]. *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (2/2); MI = 20]. Itá Ibaté (Departamento General Paz). *Xenodon dorbyngyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbyngyi*) (Dipsadidae) [P = 100% (2/2); MI = 14]. Mercedes (Departamento Mercedes). *Palusophis bifossatus* (Raddi 1820) (= *Drymobius bifossatus*) (Colubridae) [P = 100% (1/1); MI = 7]. San Roque (Departamento San Roque). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) [P = 100% (1/1); MI = 20]. Santo Tomé (Departamento Santo Tomé). *Oxyrhopus rhombifer* Duméril, Bibron & Duméril 1854 (Dipsadidae) [P = 100% (1/1); MI = 16]. Yapeyú (Departamento San Martín). *Dryophylax hypoconia* (Cope 1860) (= *Thamnodynastes hypoconia*) [P = 100% (1/1); MI = 8]. Reference: Caubisens Poumarau (1968).

ENT: Gualeguaychú (Departamento Gualeguaychú). *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 4]. *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbignyi*) (Dipsadidae) [P = 1/1; MI = 10]. Reference: Caubisens Poumarau (1968).

FOR: Formosa (Departamento Formosa). *Micrurus pyrrhocryptus* (Cope 1862) (Elapidae) [P = 100% (1/1); MI = 15]. Reference: Caubisens Poumarau (1968). Clorinda (Departamento Pilcomayo). *Eunectes notaeus* Cope 1862 (Boidae). Reference: Boero *et al.* (1972).

SAL: Orán (Departamento Orán). *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 15]. Reference: Caubisens Poumarau (1968).

SFE: Malabrigo (Departamento General Obligado). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae) [P = 100% (1/1); MI = 15]. Campo Garay (Departamento Nueve de Julio). *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbignyi*) (Dipsadidae) [P = 100% (2/2); MI = 15]. Lucita (?) (Departamento San Cristóbal). *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbignyi*) (Dipsadidae) [P = 100% (1/1); MI = 17]. Huanqueras (Departamento San Cristóbal). *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbignyi*) (Dipsadidae) [P = 100% (1/1); MI = 15] Reference: Caubisens Poumarau (1968).

CAT: Las Lajas (Departamento Paclín). *Pseudablabes patagoniensis* (Girard 1858) (= *Philodryas schottii*) (Dipsadidae) [P = 100% (1/1); MI = 8]. Reference: Caubisens Poumarau (1968).

UND: *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae), *Bothrops diporus* Cope 1862 (= *Bothrops neuwiedii meridionalis*) (Viperidae), *Xenodon merremii* (Wagler 1824) (Dipsadidae). Reference: Caubisens Poumarau (1968).

Stage: adult.

Site of infection: ureters, renal canalicles, kidneys.

Remarks: metacercariae of *Styphlodora* Loos 1899 have been found in the liver and kidneys of *Odonthophrynus asper* (Philippi 1902) (= *O. americanus*) and *Elachistocleis bicolor* (Guérin-Méneville 1838) tadpoles in Argentina (Hamman & González 2009). Snails are obligate and first intermediate hosts, while tadpoles could be second intermediate hosts in the life cycle of this digenean (Hamman & González 2009). "Las Lajas" is a locality in the province of Catamarca, adjacent to the province of Tucumán; probably this is why Las Lajas has been indicated as being part of Tucumán by Caubisens Poumarau (1968). "Lucita" could be a misspelling of "La Lucila," a locality in the province of Santa Fe. In Caubisens Poumarau (1968). *Dryophylax hypoconia* (= *Thamnodynastes hypoconia*) has been originally cited as *Thamnodynastes pallidus* by Caubisens Poumarau (1968). *Thamnodynastes pallidus* is found in other South American countries (Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Perú, Suriname, and Venezuela), and does not reach Argentina in its southernmost distribution (Uetz *et al.* 2021).

Travtrema stenocotyle (Cohn 1902) Goodman 1951.

BAS: Buenos Aires. *Erythrolamprus poecilogyrus* (Wied-Neuwied 1825) (= *Liophis poecilogyrus*) (Dipsadidae). Reference: Ostrowski de Nuñez (1979) *apud* Fernandes & Kohn (2014). Las Talas (Partido de Berisso). *Erythrolamprus semiaureus* (Cope 1862) (= *Liophis miliaris semiaureus*) (Dipsadidae). Reference: Boero *et al.* (1972). Punta Lara (Partido de Ensenada), Villa Elisa, City Bell (Partido La Plata). *Erythrolamprus jaegeri* (Günther 1858) (= *Liophis jaegeri*) (Dipsadidae), *Paraphimophis rustica (= Clelia rustica)* (Dipsadidae), *Pseudablabes patagoniensis* (Girard 1858) (= *Philodryas patagoniensis*) (Dipsadidae) [P = 100% (3/3), MI = 18]. Material deposited: MLP N° 1101 C 1137 C 1142 C. Reference: Lunaschi & Sutton (1985).

CBA: Arroyito (Departamento San Justo), *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 14]. Calamuchita (Departamento Calamuchita), *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 1/1; MI = 20]. Córdoba, *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 5]. Jesús María, *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 33]. Modesto Pizarro (?) (Departamento General Roca),

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Bothrops alternatus Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae) [P = 100% (2/2); MI = 43]. Reference: Caubisens Poumarau (1968).

CHA: Colonia Benítez (Departamento Primero de Mayo). *Bothrops diporus* Cope 1862 (= *Bothrops neuwiedii meridionalis*) (Viperidae) [P = 100% (1/1); MI = 14]. Corzuela (Departamento General Belgrano). *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 24]. Las Palmas (Departamento Las Palmas). *Bothrops diporus* Cope 1862 (= *Bothrops neuwiedii meridionalis*) (Viperidae) [P = 100% (1/1); MI = 21], *Xenodon merremii* (Wagler 1824) [P = 100% (1/1); MI = 46]. Km. 38 El Zapallar (Departamento Libertador General San Martín). *Bothrops diporus* Cope 1862 (= *Bothrops neuwiedii meridionalis*) (Viperidae) [P = 100% (1/1); MI = 18], *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 59]. Quitilipi (Departamento Quitilipi). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae) [P = 100% (1/1); MI = 2]. Río Muerto (Departamento Almirante Brown). *Bothrops diporus* Cope 1862 (= *Bothrops neuwiedii meridionalis*) (Viperidae) [P = 100% (1/1); MI = 15]. Reference: Caubisens Poumarau (1968).

CTES: Goya (Departamento Goya). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae) [P = 100% (1/1); MI = 38]. Paso de Los Libres (Departamento Paso de Los Libres). *Bothrops diporus* Cope 1862 (= *Bothrops neuwiedii diporus*) (Viperidae) [P = 66.7% (10/15), MI = 10]. Reference: Martínez *et al.* (1996). San Cosme (Departamento San Cosme), *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 33]. Santa Ana (Departamento San Cosme). *Bothrops diporus* (= *Bothrops neuwiedii diporus*) [P = 66.7% (10/15), MI = 10]. Reference: Martínez *et al.* (1996). San Roque (Departamento San Roque). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae) [P = 100% (1/1); MI = 6]. Sauce (Departamento Sauce). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae) [P = 100% (1/1); MI = 20]. Yapeyú. *Dryophylax hypoconia* (Cope 1860) (= *Thamnodynastes hypoconia*) [P = 100% (3/3); MI = 41]. Reference: Caubisens Poumarau (1968).

ENT: La Calandria (Departamento Federal). *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbignyi*) (Dipsadidae) [P = 100% (1/1); MI = 215]. La Paz (Departamento La Paz). *Xenodon merremii* (Wagler 1824) [P = 100% (1/1); MI = 43]. Nogoyá (Departamento Nogoyá). *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbignyi*) [P = 100% (1/1); MI = 13]. Reference: Caubisens Poumarau (1968).

LAR: Chilecito (Departamento Chilecito). *Bothrops diporus* Cope 1862 (= *Bothrops neuwiedii meridionalis*) (Viperidae) [P = 100% (1/1); MI = 20]. Reference: Caubisens Poumarau (1968).

MIS: Eldorado (Departamento Eldorado). *Dipsas ventrimaculatus* (= *Sibynomorphus ventrimaculatus*) (Dipsadidae) [P = 100% (1/1); MI = 260]. Posadas (Departamento Capital). *Lygophis flavifrenatus* (Dipsadidae) [P = 100% (1/1), MI = 23]. Santo Pipó (Departamento San Ignacio). *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 3]. Reference: Caubisens Poumarau (1968).

SAN: Los Jiries (Departamento General Taboada). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae) [P = 100% (1/1); MI = 24]. Reference: Caubisens Poumarau (1968).

SFE: Campo Garay (Departamento Nueve de Julio). *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbignyi*) (Dipsadidae) [P = 100% (1/1); MI = 20]. Fortin Olmos (Departamento Vera). *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1); MI = 126]. Huanqueras (Departamento San Cristóbal). *Xenodon dorbingyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbingyi*) (Dipsadidae) [P = 100% (1/1); MI = 20]. Lucita (?) (Departamento San Cristóbal). *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbignyi*) (Dipsadidae) [P = 100% (1/1); MI = 20]. Malabrigo (Departamento General Obligado). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae) [P = 100% (2/2); MI = 86]. Reference: Caubisens Poumarau (1968).

SL: El Trapiche (Departamento Coronel Pringles). *Bothrops diporus* Cope 1862 (= *Bothrops neuwiedii meridionalis*) (Viperidae) [P = 100% (1/1); MI = 90]. Reference: Caubisens Poumarau (1968).

TUC: La Cocha (Departamento La Cocha). *Bothrops diporus* Cope 1862 (= *Bothrops neuwiedii meridionalis*) (Viperidae) [P = 100% (1/1); MI = 10]. Reference: Caubisens Poumarau (1968).

UND: *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae), *Bothrops diporus* Cope 1862 (= *Bothrops neuwiedii meridionalis*) (Viperidae), *Xenodon merremii* (Wagler 1824) (Dipsadidae). Reference: Caubisens Poumarau (1968).

Stage: adult.

Site of infection: small and large intestines.

Remarks: the prevalence and mean intensity data in Martínez *et al.* (1996) are general and do not discriminate among the four localities where the helminth species has been reported to be present in the hosts. Metacercariae of *Travtrema* aff. *stenocotyle* have been found in the body cavity, mesentery, pharyngfal region, muscle, liver, and tegument of *Scinax nasicus* Wagler 1930, *Elachistocleis bicolor* (Guérin-Méneville 1838), *Leptodactylus latinasus* (Jiménez de la Espada 1875), *Odontophrynus asper* (Philippi 1902) (= *O. americanus*), *Physalaemus cristinae* Cardozo, Tomatis, Duport-Bru, Kolenc, Borteiro, Pansonato, Confalonieri, Lourenço, Haddad, & Baldo 2023 (= *P. albonotatus*), and *P. santafecinus* (Barrio 1965) tadpoles in Argentina (Hamman & González 2009). Tadpoles could be second intermediate hosts in the life cycle of this digenean (Hamman & González 2009). Adults of this species have been found in *Leptodactylus podicipinus* (Cope 1862), so anurans could act as definitive hosts too (Campião *et al.* 2009). The actual name of the locality mentioned above as "Modesto Pizarro" is "Modestino Pizarro." "Lucita" could be a misspelling of "La Lucila," a locality in the province of Santa Fe in Caubisens Poumarau (1968). *Dryophylax hypoconia* (= *Thamnodynastes hypoconia*) has been originally cited as *Thamnodynastes pallidus* by Caubisens Poumarau (1968), see comments on this species in the remarks on *Styphlodora condita.*

Family Dicrocoeliidae Odhner 1910

Infidum infidum (Faria 1910) Travassos 1916.

CHA: Colonia Benítez (Departamento Primero de Mayo). *Eunectes notaeus* (Boidae) [P = 100% (1/1); MI = 20]. Juan José Castelli (Departamento General Güemes). *Hydrodynastes gigas* [P = 100% (25/25); MI = 80]. Las Palmas (Departamento Las Palmas). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% (3/3); MI = 18]. Reference: Caubisens Poumarau (1968), Martínez *et al.* (1996).

CTES: Santa Ana (Departamento San Cosme), Paso de Los Libres (Departamento Paso de Los Libres). *Bothrops diporus* Cope 1862 (= *Bothrops neuwiedi diporus*) [P = 66.67% (10/15); MI = 10]. *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (25/25); MI = 80]. Ituzaingó (Departamento Ituzaingó), San Cayetano (Departamento Capital), San Cosme (Departamento San Cosme), San Luis del Palmar (Departamento San Luis del Palmar). *Hydrodynastes gigas* (Duméril, Bibron &

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Duméril 1854) (Dipsadidae) [P = 100% (25/25); MI = 80]. Reference: Martínez *et al.* (1996).

ENT: La Paz (Departamento La Paz). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% (1/1); MI = 20]. Reference: Caubisens Poumarau (1968).

FOR: Pozo del Tigre (Departamento Patiño). *Philodryas psammophidea* Günther 1872 (Dipsadidae) [P = 100% (1/1); MI = 10]. Reference: Caubisens Poumarau (1968).

Stage: adult.

Site of infection: gallbladder.

Remarks: the prevalence and mean intensity data in Martínez *et al.* (1996) are general and do not discriminate among the seven localities where the helminth species has been reported to be present in the hosts. The life cycle of this digenean is unknown, but adults of this species have been found in *Leptodactylus podicipinus* (Cope 1862) by Campião *et al.* (2009). Considering that only one sample of each of these species was found in *L. podicipinus*, these might be cases of accidental parasitism; thus, anurans could also act as definitive hosts.

Infidum similis Travassos 1916.

SAL: Padre Lozano (Departamento General José de San Martín). *Philodryas olfersii* (Lichenstein 1823) (Dipsadidae) [P = 100% (1/1); MI = 6]. Reference: Caubisens Poumarau (1968).

FOR: La Marcela farm (Departamento Pirané) (26°17'35" S, 59°06'67" W). *Philodryas* sp. (Dipsadidae) [P = 100% (1/1); MI = 2]. Material deposited: MLP N° 5516. Reference: Lunaschi & Drago (2010a).

Stage: adult.

Site of infection: gallbladder.

Family Mesocoeliidae Dollfus 1929.

Mesocoelium monas (Rudolphi 1819) Freitas 1958.

BAS: General Rodriguez (Partido de General Rodriguez). *Tomodon ocellatus* Duméril, Bibron & Duméril 1854 (Dipsadidae) [P = 100% (1/1); MI = 115]. San Miguel (Partido de San Miguel). *Tomodon ocellatus* Duméril, Bibron & Duméril 1854 (Dipsadidae) [P = 100% (2/2); MI = 89]. Reference: Caubisens Poumarau (1968). La Plata (Partido de La Plata). *Tomodon ocellatus* Duméril, Bibron & Duméril 1854 (Dipsadidae). Reference: Led & Boero (1973).

CHA: Gancedo (Departamento Doce de Octubre). *Dipsas ventrimaculatus* (Boulenger 1885) (= *Sibynomorphus ventrimaculatus*) (Dipsadidae) [P = 100% (1/1); MI = 10]. Reference: Caubisens Poumarau (1968).

CTES: Arroyo El Sombrerito (Departamento Capital) (27°38' S, 58°44' W). *Dipsas* sp. (= *Sibynomorphus* sp.) (Dipsadidae) [P = 100% (1/1); MI = 13]. Material deposited: MLP N° 5512. Reference: Lunaschi & Drago (2010a).

ENT: La Paz (Departamento La Paz). *Dipsas turgida* Cope 1868 (= *Sibynomorphus turgidus*) (Dipsadidae) [P = 100% (2/2); MI = 33]. Reference: Caubisens Poumarau (1968).

MIS: Eldorado (Departamento Eldorado). *Dipsas ventrimaculatus* (Boulenger 1885) (= *Sibynomorphus ventrimaculatus*) (Dipsadidae) [P = 100% (2/2); MI = 166]. Posadas (Departamento Capital). *Dipsas turgida* Cope 1868 (= *Sibynomorphus turgidus*) (Dipsadidae) [P = 100% (1/1); MI = 10]. Puerto Esperanza (Departamento Iguazú). *Dipsas ventrimaculatus* (Boulenger 1885) (= *Sibynomorphus ventrimaculatus*) (Dipsadidae) [P = 100% (2/2); MI = 38]. Puerto Leoni (Departamento Libertador General San Martín). *Dipsas turgida* Cope 1868 (= *Sibynomorphus turgidus*) (Dipsadidae) [P = 100% (2/2); MI = 110]. Reference: Caubisens Poumarau (1968).

Stage: adult.

Site of infection: small intestine.

Remarks: *Mesocoelium monas* has been reported as a parasite of *Rhinella diptycha* (Cope 1862) (= *Rhinella schneideri*) in Argentina (Lunaschi & Drago 2010a). Thomas (1965) described the life history of *Mesocoelium monodi*, determining that a terrestrial gastropod is the first intermediate host and metacercariae could be found encysted in two species of ants.

Mesocoelium sibynomorphi Ruiz & Leão 1949

MIS: Posadas (Departamento Capital). *Dipsas turgida* Cope 1868 (= *Sibynomorphus turgidus*) (Dipsadidae) [P = 100% (1/1); MI=19]. Reference: Caubisens Poumarau (1968).

Stage: adult.

Site of infection: small intestine.

Family Opisthogonimidae Travassos 1928.

Opisthogonimus artigasi Ruiz & Leão 1942

CBA: Deán Funes (Departamento Ischilín). *Philodryas psammophidea* (Dipsadidae) [P = 100% (1/1); MI = 1]. Reference: Caubisens Poumarau (1968).

CHA: Las Palmas (Departamento Las Palmas). *Palusophis bifossatus* (Raddi 1820) (= *Drymobius bifossatus*) (Colubridae) [P = 100% (1/1); MI = 34]. Reference: Caubisens Poumarau (1968).

CTES: Yapeyú (Departamento General San Martín). *Dryophylax hypoconia* (Cope 1860) (= *Thamnodynastes hypoconia*) (Dipsadidae) [P = 100% (2/2); MI = 20]. Reference: Caubisens Poumarau (1968).

FOR: Pozo del Tigre (Departamento Patiño). *Philodryas psammophidea* (Dipsadidae) [P = 100% (1/1); MI = 4]. Reference: Caubisens Poumarau (1968).

MIS: Posadas (Departamento Capital). *Erythrolamprus poecilogyrus schotti* (Schlegel 1837) (= *Leimadophis typhlus*) [P = 100% (1/1); MI = 3]. Eldorado (Departamento Eldorado). *Dryophylax hypoconia* (Cope 1860) (=*Thamnodynastes hypoconia*) [P = 100% (1/1); MI = 17.] Puerto Esperanza (Departamento Iguazú). *Dryophylax hypoconia* (Cope 1860) (= *Thamnodynastes hypoconia*) [P = 100% (1/1); MI = 24]. Reference: Caubisens Poumarau (1968).

SAN: Santiago del Estero (Departamento Juan Francisco Borges). *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbinyi*) (Dipsadidae) [P = 1/1; MI = 8]. Reference: Caubisens Poumarau (1968).

UND: *Dryophylax hypoconia* (Cope 1860) (= *Thamnodynastes hypoconia*), *Bothrops jararaca* (Wied-Neuwied 1824) (Viperidae). Reference: Caubisens Poumarau (1968).

Stage: adult.

Site of infection: mouth.

Remarks: metacercariae of *Opisthogonimus* Lühe 1900 have been found parasitizing the body cavity, muscle, pharyngeal region, and tegument of *Odontophrynus asper* (Philippi 1902) (= *O. americanus*) and *Physalaemus santafecinus* (Barrio 1965) tadpoles (Hamman & González 2009), and adults of *Scinax nasicus* Wagler 1930 (Hamman *et al.* 2009). *Dryophylax hypoconia* (= *Thamnodynastes hypoconia*) has been originally cited as *Thamnodynastes pallidus* by Caubisens Poumarau (1968), see comments on this species in the remarks on *Styphlodora condita.* The life cycle of *Opisthogonimus* species is unknown.

Opisthogonimus fonsecai Ruiz & Leão 1942

BAS: Los Talas (Partido de Berisso). *Erythrolamprus semiaureus* (= *Liophis miliaris semiaureus*) (Dipsadidae). Reference: Boero *et al.* (1972).

MIS: Aristóbulo del Valle (Departamento Cainguás). *Xenodon merremii* (Wagler 1824) (Dipsadidae) (= *Waglerophis merremii*).

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[P = 100% (1/1); MI = 41]. Material deposited: MLP N° 4589. Reference: Lunaschi & Drago (2001).

Stage: adult.

Site of infection: esophagus, small and large intestines.

Opisthogonimus interrogativus (Nicoll) Pereira 1928

MIS: Aristóbulo del Valle (Departamento Cainguás). *Xenodon merremii* (Wagler 1824) (= *Waglerophis merremii*) (Dipsadidae) [P = 100% (1/1); MI = 2]. Material deposited: MLP N° 4589. Reference: Lunaschi & Drago (2001).

Stage: adult.

Site of infection: small and large intestines.

Opisthogonimus lecithonotus Lühe 1900

BAS: Coronel Pringles (Partido de General Pringles). *Bothrops alternatus* (= *Bothrops alternata*) Duméril, Bibron & Duméril 1854 [P = 100% (1/1), MI = 3]. Reference: Caubisens Poumarau (1968).

CBA: Arroyito (Departamento San Justo). *Xenodon merremii* (Wagler 1824) [P = 100% (1/1), MI = 14]. Córdoba (Departamento Capital). *Xenodon merremii* (Wagler 1824) [P = 100% (1/1), MI = 17]. Cruz del Eje (Departamento Cruz del Eje). *Lygophis anomalus* (Günther 1858) (= *Liophis anomalus*) [P = 100% (1/1), MI = 15]. Jesús María (Departamento Colón). *Xenodon merremii* (Wagler 1824) [P = 100% (1/1), MI = 15]. Yacasto de Calamuchita (Departamento Calamuchita). *Xenodon merremii* (Wagler 1824) [P = 100% (1/1), MI = 13]. Reference: Caubisens Poumarau (1968).

CHA: Colonia Benítez (Departamento Primero de Mayo). *Erytrhrolamprus poecilogyrus caesius* (Cope 1862) (= *Leimadophis typhlus*) [P = 100% (1/1), MI = 10]. Corzuela (Departamento General Belgrano). *Xenodon merremii* (Wagler 1824) [P = 100% (1/1), MI = 1]. El Zapallar (Departamento Libertador General San Martín). *Bothrops diporus* (= *Bothrops neuwiedii meridionalis*) [P = 100% (1/1), MI = 15]. Juan José Castelli (Departamento General Güemes). *Hydrodynastes gigas* [P = 100% (25/25), MI = 80]. Reference: Martínez *et al.* (1996). Las Palmas (Departamento Las Palmas). *Bothrops diporus* (= *Bothrops neuwiedii meridionalis*) [P = 100% (1/1), MI = 21]. *Xenodon merremii* (Wagler 1824) [P = 100% (1/1), MI = 61]. Machagai (Departamento Veinticinco de Mayo). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (Viperidae) [P = 50% (10/20), MI = 20]. *Bothrops moojeni* Hoge 1966 (Viperidae) [P = 100% (5/5), MI = 10]. Quitilipi (Departamento Quitilipi). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae) [P = 100% (1/1), MI = 6]. Resistencia (Departamento San Fernando). *Micrurus pyrrhocryptus* (Cope 1862) (Elapidae) [P = 100% (2/2), MI = 5]. Roque Saenz Peña (Departamento Comandante Fernández). *Bothrops moojeni* Hoge 1966 [P = 100% (5/5), MI = 10], *Erytrholamprus poecilogyrus caesius* (Cope 1862) (= *Leimadophis typhlus*) [P = 100% (1/1), MI = 4]. Reference: Caubisens Poumarau (1968).

CTES: Alvear (Departamento General Alvear). *Dryophylax hypoconia* (Cope 1860) (= *Thamnodynastes hypoconia*) [P = 100% (1/1), MI = 1]. Bella Vista (Departamento Bella Vista). *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1), MI = 1]. Corrientes (Departamento Capital). *Helicops leopardinus* (Schlegel 1837) (= *Helicops leopardina*) (Dipsadidae) [P = 100% (1/1), MI = 23]. Itá Ibaté (Departamento General Paz). *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbignyi*) (Dipsadidae) [P = 100% (1/1), MI = 10]. Reference: Caubisens Poumarau (1968). Ituzaingó (Departamento Ituzaingó). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (Viperidae) [P = 50% (10/20), MI = 20], *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (25/25), MI = 80]. *Mesotes strigatus* (Günther 1858) (= *Thamnodynastes strigatus*) [P = 100% (20/20), MI = 20]. Reference: Martínez *et al.* (1996). Mercedes (Departamento Mercedes). *Palusophis bifossatus* (Raddi 1820) (= *Drymobius bifossatus*) (Colubridae) [P = 100% (1/1), MI = 38]. Santa Ana (Departamento San Cosme). *Helicops infrataeniatus* Jan 1865 (= *Helicops carinicauda*) (Dipsadidae) [P = 100% (10/10), MI = 20]. *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) [P = 100% (25/25), MI = 80]. Reference: Martínez *et al.* (1996). San Cayetano (Departamento Capital). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (25/25), MI = 80]. Reference: Martínez *et al.* (1996). San Cosme (Departamento San Cosme). *Helicops infrataeniatus* Jan 1865 (= *Helicops carinicauda*) (Dipsadidae) [P = 100% (10/10), MI = 20]. Reference: Martínez *et al.* (1996). San Luis del Palmar (Departamento San Luis del Palmar). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (25/25), MI = 80]. Reference: Martínez *et al.* (1996). Paso de Los Libres (Departamento Paso de Los Libres). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (25/25), MI = 80]. Reference: Martínez *et al.* (1996), Yapeyú (Departamento General San Martín). *Dryophylax hypoconia* (Cope 1860) (= *Thamnodynastes hypoconia*) [P = 100% (1/1), MI = 1]. Reference: Caubisens Poumarau (1968).

ENT: Gualeguaychú (Departamento Gualeguaychú). *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1), MI = 8]. La Paz (Departamento La Paz). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% (1/1), MI = 4]. *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1), MI = 36]. Reference: Caubisens Poumarau (1968).

FOR: Formosa (Departamento Formosa). *Micrurus pyrrhocryptus* (Cope 1862) (Elapidae) [P = 100% (1/1), MI = 15]. Reference: Caubisens Poumarau (1968).

JUY: *Xenodon merremii* (Wagler 1824) (Dipsadidae). Reference: Cordero & Vogelsang (1928) *apud* Fernandes & Kohn (2014).

MIS: Posadas (Departamento Capital). *Bothrops jararaca* (Wied-Neuwied 1824) (Viperidae) [P = 100% (10/10), MI = 30], *Lygophis flavifrenatus* [P = 100% (1/1), MI = 25], *Mesotes strigatus* (Günther 1858) (= *Thamnodynastes strigatus*) (Dipsadidae) [P = 100% (20/20), MI = 20]. Santa Ana (Departamento Candelaria). *Palusophis bifossatus* (Raddi 1820) (= *Drymobius bifossatus*) (Colubridae) [P = 100% (1/1), MI = 5]. Reference: Caubisens Poumarau (1968).

SFE: Fortín Olmos (Departamento Vera). *Xenodon merremii* (Wagler 1824) (Dipsadidae) [P = 100% (1/1), MI = 23]. Lucita (?) (Departamento San Cristobal). *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbignyi*) (Dipsadidae) [P = 100% (1/1), MI = 5]. Malabrigo (Departamento General Obligado). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae) [P = 100% (1/1), MI = 14]. Reference: Caubisens Poumarau (1968).

SAL: Padre Lozano (Departamento General José de San Martín). *Clelia* (Daudin 1803) (= *Cloelia cloelia*) (Dipsadidae) [P = 100% (2/2), MI = 19]. Reference: Caubisens Poumarau (1968).

SAN: Santiago del Estero (Departamento Juan Francisco Borges). *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbignyi*) (Dipsadidae) [P = 100% (1/1), MI = 15]. Reference: Caubisens Poumarau (1968).

TUC: San Miguel de Tucumán (Departamento Capital). *Pseudablabes patagoniensis* (Girard 1858) (= *Philodryas schotti*) (Dipsadidae) [P = 100% (1/1), MI = 40]. Reference: Caubisens Poumarau (1968).

UND: *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae), *Bothrops diporus* Cope 1862 (= *Bothrops neuwiedii meridionalis*) (Viperidae), *Xenodon dorbignyi* (Duméril, Bibron & Duméril 1854) (= *Lystrophis dorbignyi*)

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(Dipsadidae), *Xenodon merremii* (Wagler 1824) (Dipsadidae). Reference: Caubisens Poumarau (1968).

Stage: adult.

Site of infection: mouth and esophagus.

Remarks: *Distomun xenodontis* (Cordero & Vogelsang 1928) has been synonymized with *Opisthogonimus lecithonotus* (Kohn & Fernándes 2014). The prevalence and mean intensity data in Martínez *et al.* (1996) are general and do not discriminate among the nine localities where the helminth species has been reported to be present in the hosts. "Lucita" could be a misspelling of "La Lucila," a locality in the province of Santa Fe in Caubisens Poumarau (1968). *Dryophylax hypoconia* (= *Thamnodynastes hypoconia*) was originally cited as *T. pallidus* by Caubisens Poumarau (1968); see comments on this species in the remarks on *Styphlodora condita*.

Opisthogonimus megabothrium Pereira 1928.

BAS: Punta Lara (Partido de Ensenada). *Erythrolamprus jaegeri* (= *Liophis jaegeri*) (Dipsadidae) [P = 100% (1/1); MI = 10]. Material deposited: MLP N° 1011. Reference: Lunaschi & Sutton (1985).

MIS: Aristóbulo del Valle (Departamento Cainguás). *Xenodon merremii* (Wagler 1824) (= *Waglerophis merremii*) (Dipsadidae) [P = 100% (1/1); MI = 2]. Material deposited: MLP N° 4587. Reference: Lunaschi & Drago (2001).

Stage: adult.

Site of infection: small and large intestines.

Opisthogonimus misionensis Lunaschi & Drago 2001.

MIS: Aristóbulo del Valle (Departamento Cainguás). *Xenodon merremii* (Wagler 1824) (= *Waglerophis merremii*) [P = 100% (1/1); MI = 15]. Material deposited: MLP N° 4590/1 (holotype), 4590/2 (paratype). Reference: Lunaschi & Drago (2001).

Stage: adult.

Site of infection: small and large intestines.

Opisthogonimus serpentis Artigas, Ruiz & Leão 1943.

BAS: Punta Lara (Partido de Ensenada). *Helicops infrataeniatus* Jan 1865 (= *Helicops carinicaudus*) (Dipsadidae) [P = 100% (1/1); MI = 6]. Material deposited: MLP N° 1090. Reference: Lunaschi & Sutton (1985).

Stage: adult.

Site of infection: mouth.

Remarks: Lunaschi & Sutton (1985) cited this species as *Opisthogonimus* (*Westella*) *serpentis*.

Family Telorchiidae Looss 1899.

Telorchis clava (Diesing 1850)

CHA: Colonia Benítez (Departamento Primero de Mayo). *Eunectes notaeus* Cope 1862 (Boidae) [P = 100% (1/1); MI = 36]. Reference: Caubisens Poumarau (1968).

CTES: Ituzaingó (Departamento Ituzaingó), Paso de Los Libres (Departamento Paso de Los Libres), Ramada Paso (Departamento Itatí), San Cayetano (Departamento Capital), San Cosme (Departamento San Cosme), San Luis del Palmar (Departamento San Luis del Palmar), Santa Ana (Departamento San Cosme). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (Dipsadidae) [P = 100% (25/25); MI = 80]. Reference: Martínez *et al.* (1996).

FOR: La Marcela farm (Departamento Pirané) (26°17'35" S, 59° 06'67" W). *Eunectes notaeus* Cope 1862 (Boidae) [P = 100% (1/1); MI = 7]. Material deposited: MLP N° 5511. Reference: Lunaschi & Drago (2010a).

Stage: adult.

Site of infection: small intestine.

Remarks: *Telorchis* Lühe 1899 has been reported as a parasite of freshwater turtles such as *Phrynops hilarii* (Duméril & Bibron 1835) in Argentina (Lunaschi & Drago 2007a). The life cycle of *Telorchis* species is unknown.

Order Diplostomida Olson, Cribb, Tkach, Bray & Littlewood 2003

Family Proterodiplostomidae Dubois 1936.

Heterodiplostomum lanceolatum Dubois 1936

BAS: Punta Lara (Partido de Ensenada). *Helicops infrataeniatus* Jan 1865 (= *Helicops carinicaudus*) (Dipsadidae) [P = 100% (1/1), MI = 4]. Material deposited: MLP N° 1091 C. Reference: Lunaschi & Sutton (1985).

CHA: Las Palmas (Departamento Las Palmas). *Helicops leopardinus* (Schlegel 1837) (= *Helicops leopardina*) (Dipsadidae) [P = 100% (1/1); MI = 1]. Reference: Caubisens Poumarau (1968).

CTES: Bella Vista (Departamento Bella Vista). *Helicops leopardinus* (Schlegel 1837) (= *Helicops leopardina*) (Dipsadidae) [P = 100% (1/1); MI = 3]. *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% (2/2); MI = 18]. Goya (Departamento Goya). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae) [P = 100% (1/1); MI = 2]. Reference: Caubisens Poumarau (1968).

FOR: El Colorado (Departamento Pirané) (26°18' S, 59°22' W). *Hydrodynastes gigas* (Duméril, Bibron & Duméril 1854) (= *Cyclagras gigas*) (Dipsadidae) [P = 100% 1/1; MI = 2]. Material deposited: MLP N° 5504. Reference: Lunaschi & Drago (2010a).

SAN: Río Hondo (Departamento Río Hondo). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae) [P = 100% (1/1); MI = 2]. Reference: Caubisens Poumarau (1968).

SFE: Malabrigo (Departamento General Obligado). *Bothrops alternatus* Duméril, Bibron & Duméril 1854 (= *Bothrops alternata*) (Viperidae) [P = 100% (1/1); MI = 2]. Reference: Caubisens Poumarau (1968).

Stage: adult.

Site of infection: small and large intestines.

Remarks: larvae of this species have been reported in *Leptodactylus latinasus* (Jiménez de la Espada 1875) and *L. macrosternum* (Miranda-Ribeiro 1926) from agricultural and non-agricultural landscapes in the province of Corrientes (Hamman *et al.* 2020 2023) and in *Leptodactylus podicipinus* (Cope 1862) in Brazil (Queiroz *et al.* 2020). The life cycle of this species is unknown; however, it has been inferred that cercariae penetrate the skin of tadpoles and develop into metacercariae in the body cavity. Snakes become infected as definitive hosts when they ingest parasitized tadpoles or adult amphibians (Yamaguti 1975).

Discussion

This study compiles the largest number of published data on metazoan endoparasites of snakes in Argentina over the last century.

Despite the existence of parasite checklists of digeneans (Lunaschi & Drago 2007a 2010a), acanthocephalans (Hernández-Ortz *et al.* 2019), and nematodes (Castillo *et al.* 2020) in amphibians, reptiles, and other vertebrates, this work presents the only parasite checklist devoted exclusively to snakes as hosts in the country.

Several checklists of helminth parasites of different groups of vertebrates in Argentina have been published during the last 16 years, i.e., nematodes and digeneans of freshwater fishes (Ostrowski

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de Núñez *et al.* 2017; Ramallo & Ailán-Choke 2022); nematodes of amphibians (González & Hamann 2015); digeneans, nematodes and cestodes of wild birds (Lunaschi *et al.* 2007b; Drago *et al.* 2020 2021), and acanthocephalans, cestodes, digeneans, and nematodes of Patagonian wild mammals (Fugassa 2015; 2020). Due to the limited number of studies on parasites of snakes in Argentina, this host group has been included in checklists along with other hosts related to evolutionary history (Lunaschi & Drago 2007a; Castillo *et al.* 2020).

History of reports

The contribution to the knowledge of metazoan endoparasites of snakes from Argentina has been very irregular over time. Of all known metazoan endoparasite species included here, 58.8% were reported before 1968. The amount of studies increased between 1960 and 1999 and the first two decades of the 21st century, with a special focus on digenean biodiversity. Specifically, studies on nematode parasites of Argentine snakes have increased notably since the 1990s (Ramallo 1996 2005; González *et al.* 2018; Lamas *et al.* 2016; Peichoto *et al.* 2016; Castillo *et al.* 2020; Bustos *et al.* 2023).

According to Poulin & Jorge (2019), descriptions of new species of any helminth taxon reached the highest number of publications during different decades, regardless of the region in which the studies were conducted. The authors also stated that active researchers could disproportionately impact the survey of new species in their study regions, which would end with their retirement. The contributions of Dr. Emma Caubisens Poumarau to the field, which ended with her sudden death, are proof of this.

General data, taxonomy, and diversity

Caubisens Poumarau (1968) reported the largest number of records in this work and a previous publication listing digeneans of snakes in Argentina. Caubisens Poumarau also included the geographic distribution and abundance of *taxa*, covering most regions of the country. Along with the adult digeneans described, concomitant infections of numerous larval stages (metacercariae and mesocercariae) were observed in the mesentery of the hosts. Nevertheless, as a precise taxonomic identification of said stages was not achieved, the actual richness of this endoparasitic fauna was underestimated.

Larval stages of heteroxenous parasites (i.e., acanthocephalans, digeneans, nematodes, and pentastomids) could be important for understanding food webs in different environments and the position of the hosts in these webs (Marcogliese & Cone 1997; Lafferty *et al.* 2006 2008; Sukhdeo 2012; Michalska-Smith *et al.* 2018). Many larval forms are difficult to identify properly. Thus, molecular studies of metacercariae, mesocercariae, cystacanths, nymphs, and larvae of the parasitizing nematodes are essential.

Nematodes were the most frequently recorded species in checklists of metazoan parasites and helminths in reptiles in Peru and northeastern Brazil (Cuellar *et al.* 2022; Lacerda *et al.* 2023). In contrast, in this study, the subclass Digenea (phylum Platyhelminthes) was comparatively the group of metazoans with the highest richness. From an exhaustive analysis that used three approaches to evaluate the completeness of 25 checklists of parasites in vertebrate hosts from various geographic regions, Poulin *et al.* (2016) concluded that the checklists, although a useful synthesis of regional host–parasite associations, could not be used as reliable sources of data for comparative analyses. Therefore, caution should be taken when using this as a method of comparing parasite richness between host species or specificity.

Geographic context

Studies have focused on the northeastern provinces (Chaco, Corrientes, Formosa, Misiones, and Entre Rios) and have shown a high richness and abundance of metazoan groups.

The high diversity, phylogenetic composition, and functional groups of snake assemblages in northeastern Argentina could be driven by a latitudinal and thermal gradient, where tropical and temperate fauna from different biogeographic regions (e.g. Chaco, Pampa, The Espinal, and The Atlantic Rainforest) converge (Arzamendia & Giraudo 2009). Additionally, the large rivers of La Plata basin, with their dynamics of flood pulses and the complexity of the associated riparian forest vegetation, offer a spatio-temporal heterogeneity of conditions and resources that can be used by several snake species, providing them with numerous microhabitats and ecological niches to exploit (Junk *et al.* 2006; Arzamendia & Giraudo 2009 2012; Piatti *et al.* 2019; Rincón-Aranguri *et al.* 2023).

This is evinced by the higher number of snake species reported in the northern provinces compared to the southern ones (Williams & Vera 2023), consistent with the number of parasitological studies on this host group.

Specimen and geographic data availability

Most of the works produced in Argentina were descriptive, and the group that received the most attention and interest was the digenean. Although the digeneans described by Caubisens Poumarau (1968) are the most numerous, the current location of all the material collected by this author is unknown. Of 16 species reported by Caubisens Poumarau (1968), only two of them (Nos. 118 and 240 for *O. lecithonotus* and No. 190 for *G. loosi*) are available in the Helminthological Collection of Museo de La Plata. In addition, the formal deposit numbers in the collection catalog are unavailable (Brusa, F. pers. comm.). Since this was a pioneering work, with abundant material of the largest number of helminths and the widest coverage of the country's regions and host range, we consider it important to include these specimens in a helminthological collection formally.

Of all the metazoan endoparasites of snakes from Argentina compiled here, those available in zoological collections are deposited in only four collections (three in Argentina and one in Germany). In agreement with Tyler *et al.* (2023), we consider it essential to allocate type material to different natural history museums to avoid possible losses due to natural disasters or anthropogenic factors.

The geographic coordinates of the study site became mandatory for depositing in zoological collections only in the 21st century, so geographic data are not available for all the records in this study. These data are important to better understand the current biodiversity and elaborate a comprehensive parasite conservation plan (Carlson *et al.* 2020b; Lymbery & Smit 2023). In addition, this information could allow us to know the past state of parasitic fauna and evaluate its current state under conditions of anthropogenic intervention (Harmon *et al.* 2019; Thompson *et al.* 2021; Wood & Vanhove 2022; Wood *et al.* 2023).

It should be noted that the prevalence reported for nematodes is lower than that reported for digeneans. This may be because the studies on snake nematodes included more specimens per host species. Margolis *et al.* (1982) and Bush *et al.* (1997) made the first

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efforts to unify criteria on the terminology associated with the quantitative structure of parasite communities (prevalence, mean abundance, mean intensity); this is probably the reason why publications before 1960 do not include abundant data.

Poulin (2019) highlighted the relevance of presenting prevalence and abundance measurements (mean abundance or mean intensity) of each parasite population in studies of parasite community ecology. In taxonomic research, those values are not essential items, but data are often included in new species descriptions in sections such as "Taxonomy Summary" or "Comments" on new geographic/new host records or checklists with corresponding mean abundance and intensity values. These infection parameters are easy to calculate and could be useful in future studies to compare species collected from the same or different geographic areas or host species, which have not been previously evaluated for parasites. Therefore, it is desirable to include these descriptors in taxonomic studies whenever possible.

Finally, we consider that studies on metazoan parasites of reptiles in general, and of snakes in particular, should be carried out in Argentina to (a) expand knowledge of the existing parasite biodiversity in the vertebrates in the country, (b) diagnose the existing information gaps on the subject and the prospects for progress in this field, (c) describe the patterns and processes that allow the structuring of parasite communities in these hosts to measure the anthropogenic influence on their modification, and (d) determine which of these parasite species could cause pathologies in snakes and other hosts, including humans.

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