



<http://dx.doi.org/10.11646/zootaxa.3980.4.1>

<http://zoobank.org/urn:lsid:zoobank.org:pub:F6823A76-8DE0-4C57-86E8-5A7564CB2A62>

Checklist of nematode parasites of amphibians from Argentina

CYNTHIA ELIZABETH GONZÁLEZ¹ & HAMANN MONIKA INÉS

Centro de Ecología Aplicada del Litoral (CECOAL), Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET). Ruta Provincial Número 5, Km 2,5. C. P. 3400. Corrientes, Argentina.

E-mail: cynthyaelizabethg@hotmail.com; monika_hamann@yahoo.com

¹Corresponding author

Abstract

This review includes information about 47 taxa of nematode parasites reported from 34 species of Argentinean amphibians, all belonging to order Anura (33 native species and 1 introduced species). Thirty four nematode species have been reported as adults and 13 species were reported as larvae (10 taxa) or juveniles (3 taxa). Two species, *Cosmocerca parva* and *C. podicipinus* (Cosmocercidae), collected as adults, are the most commonly occurring adult nematodes in Argentinean amphibians; each of them parasitize 14 amphibian species. The bufonid *Rhinella schneideri* and the leptodactylid *Leptodactylus bufonius* present the highest species richness of parasitic nematodes (9 species); followed by *Rhinella fernandezae*, *R. arenarum* and *Leptodactylus chaquensis*, each of which is parasitized by 8 nematode species. Mean species richness was highest for the family Bufonidae (4.5 ± 3.4 ; range: 1-9); followed by the Leptodactylidae (3.5 ± 2.8 ; range: 1-9). Data on hosts, geographical distribution, site of infection, location of deposited materials, and information about life cycles are provided. This is the first compilation of information on nematode parasites of amphibians in Argentina.

Key words: review, Nematoda, Argentinean Amphibians

Introduction

Nematode biodiversity has been estimated at 24,783 species included in 267 families, 31 orders and 3 classes (Hodda 2011). Global species richness of Nematoda in amphibian hosts was estimated at 2,631 by Poulin & Morand (2004). Specifically, in some South American countries, e.g. in Brazil, Peru and Paraguay, studies on nematode parasites of amphibians are numerous, whereas in others, e.g. in Guyana, Colombia, Uruguay and French Guiana, such research is scanty and sporadic, and yet in others, such as Bolivia and Suriname, to our knowledge, no research has been undertaken about nematode parasites in these hosts.

In Argentina, the first record of nematode parasites of amphibians was by Mazza & Franke (1927), who found microfilariae *Microfilaria tamborinii* Mazza and Franke, 1927 in the blood of the “criolla frog”, *Leptodactylus latrans* (Steffen, 1815) (syn. *L. ocellatus*) collected in Jujuy province; currently, this nematode is a *species inquirenda* (Baker 1987). The following year, a new species, *Aplectana fusiforme* Savazzini, 1928, was described from the digestive tract of the same host (Savazzini 1928).

Very few contributions were made in the following decades (30s 'and 40s); indeed, a gap of more than 20 years existed between the studies of Schuurmans Stekhoven (1952) and Sueldo & Ramírez (1976). Since then, there have been sporadic studies in different provinces, generally corresponding to descriptions of new species or new hosts or reports of new geographic records.

In the last decade, research about nematode parasites of anuran amphibians was done mainly in northwestern Argentina, with descriptions of new species (Ramallo *et al.* 2007a; 2007b; 2007c; 2008), and in the northeast of the country, where research was focused especially on systematic aspects (González 2009; González & Hamann 2004; 2005; 2006a; 2006b; 2007a; 2007b; 2007c; 2008; 2009a; 2010a; 2010b; 2011; 2012a; 2012b; 2013; 2014; González *et al.* 2012) and ecological traits such as population structure and seasonal occurrence of some species in natural and agricultural environments (González & Hamann 2009b; 2012c).

In this paper we summarize the knowledge about the diversity of nematode parasites in larval and adult stage found in Argentinean amphibians, and provide a host/parasite list.

Materials and methods

We compiled and reviewed all publications that referred to nematode parasites of Argentinean amphibians, from the first publication issued in 1927 until 2013.

The checklist contains the nematode family names organized alphabetically, genera and species included in each family (each one followed by author and publication year, and synonyms under which the original records appeared); in the case of nematodes recorded/described at larval stage, this is specified in parentheses. The list also includes host (s) and localities in which the nematode species was collected, site of infection and life cycle of the species; institution where the material is deposited and references in chronological order. For the geographical record, we used the following abbreviations for Argentinean provinces: Salta (Sa), Corrientes (Co), Chaco (Ch), Córdoba (Cb), Buenos Aires (Ba), San Juan (Sj), Jujuy (Ju), Formosa (Fo), Tucumán (Tu).

The taxonomy of nematodes follows Anderson *et al.* (2009) and Gibbons (2010). The taxonomy of amphibians follows Frost *et al.* (2014).

For specimens deposited in a collection, acronyms are as follows: **CECOAL**: Helminthological Collection of Centro de Ecología Aplicada del Litoral, Corrientes, Argentina; **CH-FML**: Helminthological Collection of Miguel Lillo Foundation, Tucumán, Argentina; **FBCBPC**: Parasite Collection of Faculty of Biochemistry and Biological Sciences Parasite, Universidad Nacional del Litoral, Santa Fe, Argentina; **MLP-He**: Helminthological Collection of Museo de La Plata, La Plata, Argentina; **MNHN**: National Museum of Natural History, Paris, France. The Collection of the Commonwealth Institute of Helminthology does not have an acronym.

Some publications lack information about despositions, as a result, in these cases, this data is missing. In those species of nematodes found in several hosts, each acronym for material deposited is followed, in parenthesis, by the corresponding host species. Type host, locality and original reference for new species described from Argentinean hosts are indicated in bold font; type material deposition in a collection is indicated with H (= Holotype), A (= Allotype), and P (= Paratype) after collection acronym.

Mean species richness for each amphibian family is the sum of nematode species per amphibian species, divided by the total number of species of amphibian in each family.

Results

Of the 34 species of amphibian anurans, belonging to six families (Bufonidae, Ceratophryidae, Hylidae, Leptodactylidae, Odontophrynidae, Ranidae), nematode parasites corresponding to 25 genera of 18 families (Anisakidae, Ascarididae, Atractidae, Camallanidae, Cosmocercidae, Dictyocaulidae, Gnathostomatidae, Hedruridae, Heterakidae, Heterocheilidae, Kathlaniidae, Molineidae, Onchocercidae, Pharyngodonidae, Physalopteridae, Rhabdiasidae, Rhabdochonidae, Strongyloididae) were identified; in one case, the nematode parasites were identified at superfamily level (Seuratoidea). The family with the largest number of species was Cosmocercidae (13 nematode parasites identified to species). Thirty four nematode species were reported as adults and 13 taxa were reported at larvae (10 taxa) or juveniles (3 taxa). Mean species richness was highest in family Bufonidae (4.5 ± 3.4 , range: 1-9); followed by the family Leptodactylidae (3.5 ± 2.8 , range: 1-9); Hylidae (2.62 ± 1.76 , range: 1-6), and Odontophrynidae (2.0 ± 1.41 , range: 1-3). Three reports were of parasites in tadpoles; the others were of adult anurans. The most parasitized organs in these hosts were the intestines, with 8 taxa found in the small and large intestine, followed by the lungs (6 species). Other sites of infection were liver, mesentery, gastric serous membrane, gastric mucosa, intestinal peritoneum, abdominal cavity, and blood.

Nematode parasites of Argentinean amphibians

Family Anisakidae (Railliet and Henry, 1912)

***Contracaecum* Railliet and Henry, 1912**

(= *Amphicaecum* Walton, 1927; = *Cerascaris* Cobb, 1929; *Contracaecum* (*Ornitocaecum*) Mozgovoi, 1951; = *Contracaecum* (*Synthetonema*) Kreis, 1952; = *Kathleena* Leiper and Atkinson, 1914)

***Contracaecum* sp.** (larvae)

Host and record: *Dendropsophus nanus* (Boulenger, 1889) (= *Hyla nana*) (Co), *Lithobates catesbeianus* (Shaw, 1802) (Sj).

Site of infection: Mesentery, gastric serous membrane.

Material deposited: CECOAL 13111101 (*L. catesbeianus*).

References: Hamann & Kehr (1998), González *et al.* (2014).

Life cycle: Species of the genus *Contracaecum* do not reach maturity in frogs. These species requires an intermediate host (aquatic invertebrates or fishes) to complete its cycle; the definitive hosts are piscivorous birds and aquatic mammals (Anderson 2000).

Family Ascarididae Baird, 1853

***Ophidascaris* Baylis, 1921**

***Ophidascaris* sp.** (juvenile)

Host and record: *Rhinella arenarum* (Hensel, 1867) (= *C. arenarum*) (Sa).

Site of infection: Stomach.

Material deposited: CH-FML 07445.

References: Ramallo *et al.* (2007a).

Life cycle: This genus parasitizes mainly snakes and lizards; in some species, vertebrates such as rodents and frogs are intermediate hosts (Anderson 2000).

***Ortleppascaris* Sprent, 1978**

***Ortleppascaris* sp.** (larvae)

Host and record: *Rhinella fernandezae* (Gallardo, 1957) (= *C. fernandezae*) (Co), *Leptodactylus bufonius* Boulenger, 1894 (Co).

Site of infection: Liver.

Material deposited: CECOAL 02103040, 09020604 (*R. fernandezae*), CECOAL 02093228, CECOAL 02113228 (*L. bufonius*).

References: González & Hamann (2006a; 2007a); Hamann *et al.* (2012; 2013).

Life cycle: Amphibians can act as paratenic hosts in the life cycle of this nematode. Adult nematodes parasitize the intestinal tract of crocodiles (Goldberg *et al.* 1991).

***Porrocaecum* Railliet and Henry, 1912**

(= *Belanisakis* Maplestone, 1932; = *Porrocaecum* (*Laymanicaecum*) Mozgovoi, 1951, in part)

***Porrocaecum* sp.** (larvae)

Host and record: *Rhinella schneideri* (Werner, 1894) (Co), *Leptodactylus chaquensis* Cei, 1950 (Co).

Site of infection: Liver, mesentery, gastric serous membrane.

Material deposited: CECOAL 03091901 (*R. schneideri*), CECOAL 03092418 (*L. chaquensis*).

References: Hamann *et al.* (2006b), Schaefer *et al.* (2006), González & Hamann (2008).

Life cycle: Amphibians serve as paratenic hosts that transfer the parasite to the carnivorous definitive hosts. The intermediate hosts of these nematodes are earthworms (Anderson 2000).

Family Atractidae (Railliet, 1917) Travassos, 1919

Schrankiana Strand, 1942

(= *Schrankia* Travassos, 1925; = *Schranknema* Travassos, 1949)

Schrankiana chacoensis González and Hamann, 2014.

Host and record: *Leptodactylus bufonius* Boulenger, 1894 (Ch).

Site of infection: Large intestine.

Material deposited: MLP-He 6650^(H), 6651^(A), 6652, CECOAL 11101910^(P)

References: González & Hamann (2014).

Life cycle: Nematodes of this family have been found in amphibians, reptiles, mammals and fishes; third-stage larvae autoinfect the host. Their transmission from host to host in the majority of species is not understood (Anderson 2000). Langford *et al.* (2013) confirmed with experimental infections in lizards that *Cyrtosomum penneri* Gambino, 1957 is transferred only during host copulation.

Schrankiana schranki (Travassos, 1925) Strand, 1942

Host and record: *Leptodactylus latinasus* Jiménez de la Espada, 1875 (Co).

Site of infection: Large intestine.

Material deposited: CECOAL 03023524.

References: Hamann *et al.* (2006a).

Family Camallanidae Railliet and Henry, 1915

Camallanus Railliet and Henry, 1915

(= *Zeylanema* Yeh, 1960)

Camallanus sp. (larvae)

Host and record: *Leptodactylus chaquensis* Ceí, 1950 (Co), *Lysapsus limellus* Cope, 1862 (Co).

Site of infection: Small intestine.

Material deposited: CECOAL 03042804 (*L. chaquensis*).

References: Kehr *et al.* (2000), Schaefer *et al.* (2006).

Life cycle: Species of this genus parasitize fishes that feed on aquatic invertebrates (principally copepods); their intermediate hosts (Anderson 2000). Amphibians are probably accidental hosts in the life cycle of these nematodes.

Serpinema Yeh, 1960

Serpinema cf. *trispinosum* (Leidy, 1852) (third larval stage)

Host and record: *Lysapsus limellum* Cope, 1862 (Co).

Site of infection: Intestine.

Material deposited: CECOAL 00112909, 00122104, 01013101.

References: González & Hamann (2007b).

Life cycle: The life cycle of this nematode is unknown. Apparently, freshwater turtles, their definitive hosts, may become infected by ingestion of copepods (intermediate hosts) or by feeding on paratenic hosts including aquatic snails, planktonophagous fishes and amphibians (Moravec 1998).

Family Cosmocercidae (Railliet, 1916, subfam.) Travassos, 1925

Aplectana Railliet and Henry, 1916

(= *Neoraillietnema* Ballesteros-Márquez, 1945; = *Neyrapterectana* Ballesteros-Márquez, 1945; *Neoxysomatoides* Yamaguti, 1961)

***Aplectana* sp.**

Host and record: *Leptodactylus bufonius* Boulenger, 1894 (Co), *Leptodactylus chaquensis* Cei, 1950 (Co), *Adenomera diptyx* (Boettger, 1885) (= *Leptodactylus diptyx*) (Co, Fo).

Site of infection: Large intestine.

Material deposited: CECOAL 00012501, 02123272 (*L. bufonius*), CECOAL 02112902 (*L. chaquensis*), MLP 6528-6533 (*A. diptyx*).

References: González & Hamann (2006a), Hamann *et al.* (2012), Schaefer *et al.* (2006), Zaracho *et al.* (2012).

Life cycle: All species of genus *Aplectana* possess a monoxenous life cycle; infection occurs by ingestion of eggs (Anderson 2000).

***Aplectana adaechevarriae* Ramallo, Bursley and Goldberg, 2008**

Host and record: *Rhinella major* (Müller and Hellmich, 1936) (Sa), *Rhinella schneideri* (Werner, 1894) (Sa)

Site of infection: Large intestine.

Material deposited: CH-FML 07455^(H), 07456^(A), 07457^(P), 07461^(P).

References: Ramallo *et al.* (2008).

***Aplectana delirae* (Fabio, 1971) Baker, 1980**

Host and record: *Rhinella major* (Müller and Hellmich, 1936) (Co), *Leptodactylus chaquensis* Cei, 1950 (Co).

Site of infection: Large intestine.

Material deposited: CECOAL 02113232 (*R. major*), CECOAL 03092418 (*L. chaquensis*).

References: González & Hamann (2006b); Schaefer *et al.* (2006).

***Aplectana hylambatis* (Baylis, 1927) Travassos, 1931**

[= *Oxysomatium bonariensis* Gutierrez, 1945; = *Aplectana pudenda* Masi Pallares and Maciel, 1974 (see Baker and Vaucher, 1986)]

Host and record: *Rhinella achalensis* (Cei, 1972) (= *Bufo achalensis*) (Cb), *Rhinella arenarum* (Hensel, 1867) (= *B. arenarum*) (Sa, Sj, Ba), *Leptodactylus latinasus* Jiménez de la Espada, 1875 (Co), *Leptodactylus chaquensis* Cei, 1950 (Co), *Leptodactylus bufonius* Boulenger, 1894 (Co), *Physalaemus santafecinus* Barrio, 1965 (Co).

Site of infection: Small intestine, large intestine, intestinal peritoneum, liver.

Material deposited: MNHN 622 CA (*R. achalensis*), CECOAL 11072601, 11072602 (*R. arenarum*), CECOAL 0301333 (*L. latinasus*), CECOAL 00021701, CECOAL 10113010, CECOAL 10113010 (*L. bufonius*), CECOAL 02103022 (*P. santafecinus*).

References: Gutiérrez (1945), Sueldo & Ramírez (1976), Ramírez *et al.* (1979), Baker (1980a), González & Hamann (2006a; 2010a), Hamann *et al.* (2006a; 2006b; 2012), González *et al.* (2013a).

***Aplectana meridionalis* Lent and Freitas, 1948**

Host and record: *Pleurodema borellii* (Peracca, 1895) (Ju).

Site of infection: Not specified.

Material deposited: MNHN 75 HD.

References: Baker (1980a).

***Aplectana tarija* Ramallo, Bursley and Goldberg, 2007**

Host and record: *Rhinella arenarum* (Hensel, 1867) (= *C. arenarum*) (Sa).

Site of infection: Large intestine.

Material deposited: CH-FML 07442-A^(H), 07442-B^(A), 07442-C^(P).

References: Ramallo *et al.* (2007b).

***Aplectana fusiforme* Savazzini, 1928 (*species inquirenda*)**

Host and record: *Leptodactylus latrans* (Steffen, 1815) (= *L. ocellatus*).

Site of infection: Intestine.

Material deposited: Not specified.

References: Savazzini (1928).

Notes: Baker (1980a) considered that the description of this species was inadequate; the presence of a paired row of large preanal papillae possibly corresponds to the plectanes typical of *Cosmocerca*. This author considered this species as *species inquirenda*.

***Cosmocerca* Diesing, 1861**

(= *Paracosmocerca* Kung and Wu, 1945)

***Cosmocerca* sp.**

Host and record: *Pseudopaludicola boliviana* Parker, 1927 (Co), *Lysapsus limellus* Cope, 1862 (Co), *Adenomera diptyx* (Boettger, 1885) (= *Leptodactylus diptyx*) (Co).

Site of infection: Large intestine, lung.

Material deposited: MLP 6528-6533 (*A. diptyx*).

References: Kehr *et al.* (2000), Duré *et al.* (2004), Zaracho *et al.* (2012).

Life cycle: The life cycle of species of the genus *Cosmocerca* is monoxenous, the infection of hosts occurs by skin penetration (Anderson 2000).

***Cosmocerca cruzi* Rodrigues and Fabio, 1970**

Host and record: *Leptodactylus latinasus* Jiménez de la Espada, 1875 (Co).

Site of infection: Large intestine.

Material deposited: CECOAL 03092405.

References: Hamann *et al.* (2006a).

***Cosmocerca parva* Travassos, 1925**

[= *Cosmocerca freitasi* Silva, 1954 (see Fabio, 1981)]

Host and record: *Rhinella bergi* (Céspedes, 2000) (= *Chaunus bergi*) (Co), *Rhinella major* (Müller and Hellmich, 1936) (Co), *Rhinella fernandezae* (Gallardo, 1957) (= *C. fernandezae*) (Co), *Rhinella schneideri* (Werner, 1894) (Co), *Odontophrynus americanus* (Duméril and Bibron, 1841) (Co), *Scinax acuminatus* (Cope, 1862) (Co), *Scinax nasicus* (Cope, 1862) (Co), *Leptodactylus chaquensis* Ceí, 1950 (Co), *Leptodactylus latinasus* Jiménez de la Espada, 1875 (Co), *Leptodactylus bufonius* Boulenger, 1894 (Co), *Physalaemus santafecinus* Barrio, 1965 (Co), *Physalaemus albonotatus* (Steindachner, 1864) (Co), *Dendropsophus sanborni* (Schmidt, 1944) (Co), *Hypsiboas raniceps* Cope, 1862 (Co).

Site of infection: Small intestine, large intestine.

Material deposited: CECOAL 02092898 (*R. bergi*), CECOAL 02123298, 02123273 (*R. major*), MLP-He 3664C, 3669C, 3671C, 3672C, 3674C, 3675C, 3677C, 3751C, 3752C, 3753C, 3754C, 3755C (*R. major*), CECOAL 04062503, 09111002 (*R. fernandezae*), CECOAL 02042627 (*R. schneideri*), CECOAL 03064148 (*O. americanus*), CECOAL 04050462 (*S. acuminatus*), CECOAL 04121316 (*S. nasicus*), CECOAL 03031001 (*L. chaquensis*), CECOAL 03051609 (*L. latinasus*), CECOAL 03043825, CECOAL 10022310 (*L. bufonius*), CECOAL 02032573, 02032576, 02032577, 02103059 (*P. santafecinus*), CECOAL 02113235 (*P. albonotatus*), CECOAL 03074254 (*D. sanborni*), CECOAL 02103140 (*H. raniceps*).

References: Mordeglia & Digiani (1998), González & Hamann (2006a; 2006b; 2007a; 2007c; 2008; 2009a; 2010a; 2011; 2012b), Hamann *et al.* (2006a; 2006b; 2009b; 2010; 2012; 2013), Schaefer *et al.* (2006).

***Cosmocerca podicipinus* Baker and Vaucher, 1984**

Host and record: *Rhinella major* (Müller and Hellmich, 1936) (= *C. g. major*) (Co), *Rhinella fernandezae* (Gallardo, 1957) (= *C. fernandezae*) (Co), *Rhinella bergi* (Céspedes, 2000) (= *C. bergi*) (Co), *Rhinella schneideri* (Werner, 1894) (Co), *Odontophrynus americanus* (Duméril and Bibron, 1841) (Co), *Pseudopaludicola falcipes* (Hensel, 1867) (Co), *Pseudopaludicola boliviana* Parker, 1927 (Co), *Leptodactylus bufonius* Boulenger, 1894 (Co), *Leptodactylus latinasus* Jiménez de la Espada, 1875 (Co), *Leptodactylus chaquensis* Ceí, 1950 (Co), *Physalaemus santafecinus* Barrio, 1965 (Co), *Physalaemus albonotatus* (Steindachner, 1864) (Co), *Scinax nasicus* (Cope, 1862) (Co), *Dendropsophus nanus* (Boulenger, 1889) (Co).

Site of infection: Lung, small intestine, large intestine.

Material deposited: CECOAL 01082280, 0211323 (*R. major*), CECOAL 05022401, 08102212 (*R. fernandezae*), CECOAL 02092897 (*R. bergi*), CECOAL 02123280 (*R. schneideri*), CECOAL 02082806 (*O. americanus*), CECOAL 01052337-51, 01070901-11, 01083004-16 (*P. falcipes*), CECOAL 02073003, CECOAL 02072727 (*P. boliviana*), CECOAL 01102501, CECOAL 09102808 (*L. bufonius*), CECOAL 03052907 (*L. latinus*), CECOAL 03012903 (*L. chaquensis*), CECOAL 02112906, 02113219, 02113215, 02123263, 02123286 (*P. santafecinus*), CECOAL 02103078 (*P. albonotatus*), CECOAL 05072802 (*S. nasicus*), CECOAL 02022548, 03033623 (*D. nanus*).

References: González & Hamann (2004; 2006a; 2006b; 2007a; 2007c; 2008; 2009a; 2009b; 2010a; 2011; 2012b; 2012c), Hamann *et al.* (2006a; 2006b; 2010; 2012; 2013), Schaefer *et al.* (2006).

***Cosmocerca rara* Freitas and Vicente, 1966**

Host and record: *Leptodactylus latinus* Jiménez de la Espada, 1875 (Co).

Site of infection: Large intestine.

Material deposited: CECOAL 03092404.

References: Hamann *et al.* (2006a).

***Cosmocercella* Steiner, 1924**

***Cosmocercella minor* (Freitas and Dobbin, 1961) Baker and Adamson, 1977**

Host and record: *Phyllomedusa hypochondrialis* (Daudin, 1800) (Co)

Site of infection: Large intestine.

Material deposited: CECOAL 02123302.

References: González & Hamann (2012a).

***Cosmocercoides* Wilkie, 1930**

(= *Trionchonema* Kreis, 1932)

***Cosmocercoides liloi* Ramallo, Bursley and Goldberg, 2007.**

Host and record: *Rhinella arenarum* (Hensel, 1867) (= *C. arenarum*) (Sa).

Site of infection: Intestine.

Material deposited: CH-FML 07447-A^(H), 07447-B^(A), 07446^(P).

References: Ramallo *et al.* (2007b).

Life cycle: These nematodes present a monoxenous life cycle; third-stage larvae penetrate the skin of hosts (Anderson 2000).

***Oxyascaris* Travassos, 1920**

(= *Paraoxyascaris* Oliveira Rodrigues and Sodre Rodrigues, 1971)

***Oxyascaris caudacutus* (Freitas, 1958) Baker and Vaucher, 1984.**

Host and record: *Scinax acuminatus* (Cope, 1862) (Co), *Scinax nasicus* (Cope, 1862) (Co).

Site of infection: Small intestine, large intestine.

Material deposited: CECOAL 03061205 (*S. acuminatus*), CECOAL 03120202 (*S. nasicus*).

References: González & Hamann (2008), Hamann *et al.* (2009b).

Notes: Baker and Vaucher (1985) emended the diagnosis of this genus, synonymized *Pteroxyascaris* Freitas, 1958 with *Oxyascaris*, and transferred *Oxyascaris* to the *Cosmocercinae* (Gibbons 2010).

Family Dictyocaulidae (Skrjabin, 1933) Skrjabin, 1941

***Borrellostrongylus* Gutiérrez, 1945**

(= *Parabatrachostromylus* Tantalean and Naupay, 1974)

***Borrellostrongylus platensis* Gutierrez, 1945**

Host and record: *Rhinella arenarum* (Hensel, 1867) (= *Bufo arenarum*) (Ba).

Site of infection: Small intestine.

Material deposited: Not specified.

References: Gutiérrez (1945).

Notes: Durette-Desset & Chabaud (1981) synonymized this genus with *Parabatrachostromylus* Tantalean and Naupay, 1974.

Family Gnathostomatidae Railliet, 1895

***Spiroxys* Schneider, 1866**

Spiroxys sp. (larvae)

Host and record: *Pseudis paradoxa* (Linnaeus, 1758) (Co), *Physalaemus albonotatus* (Steindachner, 1864) (Co).

Site of infection: Gastric serous membrane.

Material deposited: CECOAL 08112501 (*P. paradoxa*), CECOAL 10020901 (*P. albonotatus*).

References: González & Hamann (2010b; 2012b).

Life cycle: This genus parasitizes the stomach of freshwater turtles. Female nematodes expel eggs that pass out with the feces of the host and the first-stage larvae develop inside them. Larvae are ingested by copepods, the intermediate hosts. Infective larvae have been found in various potential paratenic hosts, such as snails, tadpoles and adults frogs, and larval and adult newts (Anderson 2000).

Family Hedruridae Railliet, 1916

***Hedruris* Nitzsch, 1821**

Hedruris mucronifer Schuurmans Stekhoven, 1952

Host and record: *Telmatobius schreiteri* Vellard, 1946 (Tu).

Site of infection: Stomach.

Material deposited: CH-FML not specified number.

References: Schuurmans Stekhoven (1952).

Life cycle: The species that parasitize anurans and salamanders exhibit extreme precocity, i.e. they develop into immature adults in isopod intermediate hosts and this probably accelerates the production of gametes in the final hosts (Anderson 2000).

Family Heterakidae Railliet and Henry, 1912

***Bufonerakis* Baker, 1980**

Bufonerakis andersoni Baker, 1980

Host and record: *Rhinella arenarum* (Hensel, 1867) (= *B. arenarum*) (not specified).

Site of infection: Unknown.

Material deposited: Commonwealth Institute of Helminthology Collection 1026A^(H), 1026B^(A), 1026C^(P).

References: Baker (1980b).

Life cycle: Heterakoids have monoxenous life cycles; eggs with infective larvae are ingested by the host. Members of the subfamily Spinicaudinae parasitize amphibians and reptiles (Anderson 2000).

Family Heterocheilidae Raillet and Henry, 1915

Brevimulticaecum Mozgovoi, in Skrjabin, Shikhobalova and Mozgovoi, 1951

Brevimulticaecum sp. (larvae)

Host and record: *Physalaemus albonotatus* (Steindachner, 1864) (Co), *Lepidobatrachus laevis* Budgett, 1899 (Fo), *Pseudis paradoxa* (Linnaeus, 1758) (Co).

Site of infection: Mesentery, abdominal cavity, gastric serous membrane, intestine.

Material deposited: CECOAL 10032304, 10032306 (*P. albonotatus*), CECOAL 11020901 (*L. laevis*); CECOAL 11020201, 11020202, 11020204, 11020205 (*P. paradoxa*).

References: González & Hamann (2013).

Life cycle: The occurrence of this larva in amphibian hosts indicates that they may play a role in transmitting this nematode, serving as either intermediate or paratenic hosts (Moravec & Kaiser 1994; Bursey *et al.* 2001).

Family Kathlaniidae (Lane, 1914 subfam.) Travassos, 1918

Falcaustra Lane, 1915

(= *Spironoura* Leidy, 1856; = *Florencioia* Travassos, 1920; = *Dibulbiger* Caballero, 1935; = *Zanclophorus* Baylis and Daubney, 1922; = *Nematoxynema* Skrjabin and Schikhobalova, 1951; = *Velariocephalus* Singh, 1958)

Falcaustra mascula (Rudolphi, 1819) Freitas and Lent, 1941

(= *Ascaris mascula* Rudolphi, 1819; = *Ascaris leptodactyla* Parodi in Savazzini, 1930; = *Florencioia mascula* (Rudolphi, 1819) Travassos, 1919; = *Florencioia nitida* Travassos, 1919).

Host and record: *Rhinella schneideri* (Werner, 1894) (Co), *Leptodactylus latrans* (Steffen, 1815) (= *L. ocellatus*).

Site of infection: Large intestine.

Material deposited: CECOAL 02052663 (*R. schneideri*).

References: Savazzini (1930), González & Hamann (2008).

Life cycle: The life cycle of this genus is unknown, but third-stage larvae have been found in snails and fishes, and it is also agreed that snails and fishes are paratenic hosts (Bartlett & Anderson 1985; Moravec *et al.* 1995). The adults parasitize mainly turtles, less frequently amphibians and fish, and even one species of bird (Baker 1987).

Falcaustra sanjuanensis González, Sanabria and Quiroga, 2013

Host and record: *Odontophrynus cf. barrioi* (Sj), *Lithobates catesbeianus* (Shaw, 1802) (Sj).

Site of infection: Large intestine.

Material deposited: MLP-He 6615^(H), 6616^(A), 6617^(P) (*O. cf. barrioi*), CECOAL 12100501^(P) (*O. cf. barrioi*), MLP-He 6705 (*L. catesbeianus*), CECOAL 13111102 (*L. catesbeianus*).

References: González *et al.* (2013b), González *et al.* (2014).

Family Molineidae (Skrjabin and Schulz, 1937, subfam.) Durette-Desset and Chabaud, 1977

Oswaldocruzia Travassos, 1917 [*Oswaldocruzia* (*Bialata*) Morishita, 1926]

Oswaldocruzia sp.

Host and record: *Leptodactylus bufonius* Boulenger, 1894 (Co), *Physalaemus albonotatus* (Steindachner, 1864) (Co).

Site of infection: Small intestine.

Material deposited: CECOAL 00101005 (*L. bufonius*), CECOAL 96040901 (*P. albonotatus*).

References: González & Hamann (2006a; 2012b).

Life cycle: The life cycle of these nematodes is monoxenous; the infective larvae penetrate through the skin of the hosts (Ben Slimane *et al.* 1996a; Anderson 2000).

Oswaldocruzia mazzai Travassos, 1935

Host and record: *Rhinella* sp. (Ju), *Rhinella marina* (Linnaeus, 1758) (= *B. marinus*) (Ju)

Site of infection: Small intestine.

Material deposited: Not specified.

References: Travassos (1935; 1937).

Notes: Durette-Desset *et al.* (2006) considered *O. mazzai sensu* Vicente (1981) *nec* Travassos (1935) as *species inquirenda*.

Oswaldocruzia proencai Ben Slimane and Durette-Desset, 1995 (= *Oswaldocruzia mazzai sensu* Lent *et al.*, 1939 *nec* Travassos, 1935)

Host and record: *Rhinella schneideri* (Werner, 1894) (Co, Sa), *Rhinella arenarum* (= *Ch. arenarum*) (Sa).

Site of infection: Small intestine, large intestine.

Material deposited: CECOAL 03091901 (*R. schneideri*, Co), CH-FML 07444 (*R. schneideri*, Sa), CH-FML 07448 (*R. arenarum*).

References: Ramallo *et al.* (2007a; 2007c), González & Hamann (2008).

Notes: Ben Slimane and Durette-Desset (1995) established this species from Paraguayan specimens reported as *O. mazzai* by Lent *et al.* (1946).

Oswaldocruzia subauricularis (Rudolphi, 1819)

Host and record: *Rhinella fernandezae* (Gallardo, 1957) (Co)

Site of infection: Small intestine.

Material deposited: CECOAL 08102211

References: Hamann *et al.* (2013).

Notes: Durette-Desset *et al.* (2006) established that the species reported as *O. subauricularis sensu* Freitas, 1955 *nec* Rudolphi, 1819 should be considered as a *species inquirenda*.

Family Onchocercidae (Leiper, 1911)

(= Dipetalonematidae Wehr, 1935; = Setariidae Yorke and Maplestone, 1926 subfam.)

Icosiella Seurat, 1917

Icosiella neglecta (Diesing, 1851) Seurat, 1917 (= *Foleyella helvetica* Kreis, 1934)

Host and record: *Leptodactylus* sp. (Fo)

Site of infection: Peritoneum.

Material deposited: CH-FML; not specified number.

References: Schuurmans Stekhoven (1952).

Notes: Baker (1987) considered this identification doubtful, even at genus level.

Microfilaria species inquirenda

Microfilaria tamborinii Mazza and Franke, 1927 (*species inquirenda*).

Host and record: *Leptodactylus latrans* (Steffen, 1815) (= *L. ocellatus*) (Ju)

Site of infection: Blood.

Material deposited: Not specified.

References: Mazza & Franke (1927).

Notes: This species has been described from juvenile specimens, adults were not found. Baker (1987) considers this species as a *species inquirenda*.

Family Pharyngodonidae Travassos, 1919

Gyrincola Yamaguti, 1938

Gyrincola sp.

Host and record: *Pseudis paradoxa* (Linnaeus, 1758) (tadpole) (Co).

Site of infection: Intestine.

Material deposited: Not specified.

References: Kehr & Hamann (2003).

Life cycle: Species of the genus *Gyrincola* infect the gastrointestinal tract of tadpoles of Holarctic and Neotropical anurans (Pryor & Greiner 2004). Tadpoles acquire initial infections by ingesting thick-shelled eggs that are distributed in the environment. Female worms possess two uteri; one uterine horn produces thick-shelled unembryonated eggs used as transmission from tadpole to tadpole and the second uterine horn produces thin-shelled eggs used for autoinfection. The development of monodelphic or didelphic condition in female worms, and the reproduction by parthenogenesis or haplodiploidy depends on the duration of the developmental period of the anuran hosts (Adamson 1981a; 1981b).

Gyrincola chabaudi Araujo and Artigas, 1981

Host and record: *Scinax nasicus* (Cope, 1862) (tadpole) (Co).

Site of infection: Intestine.

Material deposited: CECOAL 01052305-6, 01052354-56.

References: González & Hamann (2005).

Family Physalopteridae (Railliet, 1893 subfam.) Leiper, 1908

Physaloptera Rudolphi, 1819

Physaloptera sp. (larvae)

Host and record: *Rhinella fernandezae* (Gallardo, 1957) (= *C. fernandezae*) (Co), *Rhinella major* (Müller and Hellmich, 1936) (= *C. g. major*) (Co), *Rhinella schneideri* (Werner, 1894) (Co), *Scinax acuminatus* (Cope, 1862) (Co), *Leptodactylus bufonius* Boulenger, 1894 (Co), *Physalaemus biligonigerus* (Cope, 1861) (Cb), *Physalaemus santafecinus* Barrio, 1965 (Co), *Physalaemus albonotatus* (Steindachner, 1864) (Co), *Scinax nasicus* (Cope, 1862) (Co).

Site of infection: Gastric mucosa.

Material deposited: CECOAL 03023543, 08102210 (*R. fernandezae*), CECOAL 0303361 (*R. major*), CECOAL 03013425 (*R. schneideri*), CECOAL 05040701 (*S. acuminatus*), CECOAL 99012801 (*L. bufonius*), FBCBPC 1000-3 (*P. biligonigerus*), CECOAL 03074252 (*P. santafecinus*), CECOAL 06030612 (*P. albonotatus*), CECOAL 06073104 (*S. nasicus*).

References: Gutiérrez *et al.* (2005), González & Hamann (2006a; 2006b; 2007a; 2008; 2010a; 2012b), Hamann *et al.* (2009b; 2010; 2013).

Life cycle: Species of *Physaloptera* are parasites of mammals and reptiles, which acquire the infections from ingesting insects containing infective larvae. Larvae ingested by possible paratenic hosts (such as anurans) generally attach to the gastric mucosa and can persist for varying periods of time (Anderson 2000).

Family Rhabdiasidae Railliet, 1915

Rhabdias Stiles and Hassall, 1905

(= *Ophiorhabdias* Yamaguti, 1943; = *Shorttia* Singh and Ratnamala, 1977)

Rhabdias sp.

Host and record: *Physalaemus biligonigerus* (Cope, 1861) (Cb), *Leptodactylus chaquensis* Cei, 1950 (Co), *Rhinella bergi* (Céspedes, 2000) (= *C. bergi*) (Co).

Site of infection: Lung.

Material deposited: FBCBPC 1000-3 (*P. biligonigerus*), CECOAL 02103064 (*R. bergi*).

References: Gutiérrez *et al.* (2005), Hamann *et al.* (2006b), González & Hamann (2007c).

Life cycle: Species of the genus *Rhabdias* present alternation of generations: hermaphroditic generation in the host, and gonochoristic generation in the soil or feces. Adult worms parasitize the lungs of the hosts (Kuzmin 2013).

Rhabdias elegans Gutierrez, 1945

Host and record: *Rhinella arenarum* (Hensel, 1867) (= *Bufo arenarum*) (Ba, Sa), *Rhinella schneideri* (Werner, 1894) (Co), *Leptodactylus bufonius* Boulenger, 1894 (Co), *Odontophrynus americanus* (Duméril and Bibron, 1841) (Co).

Site of infection: Lung.

Material deposited: CECOAL 02111301 (*R. schneideri*), CECOAL 03120201, CECOAL 08022601 (*L. bufonius*), CECOAL 03064149 (*O. americanus*).

References: Gutiérrez (1945), Sueldo & Ramírez (1976), Ramírez *et al.* (1979), González & Hamann (2006a; 2008; 2009a), Hamann *et al.* (2012).

Rhabdias fülleborni Travassos, 1926

Host and record: *Rhinella schneideri* (Werner, 1894) (Co).

Site of infection: Lung.

Material deposited: CECOAL 03091901.

References: González & Hamann (2008).

Rhabdias aff. sphaerocephala Goodey, 1924

Host and record: *Rhinella fernandezae* (Gallardo, 1957) (Co).

Site of infection: Lung.

Material deposited: CECOAL 08102207.

References: Hamann *et al.* (2013).

Rhabdias truncata Schuurmans Stekhoven, 1952 (juvenile)

Host and record: *Telmatobius schreiteri* Vellard, 1946 (tadpole) (Tu)

Site of infection: "Near to the heart".

Material deposited: CH-FML; not specific number.

References: Schuurmans Stekhoven (1952).

Rhabdias mucronata Schuurmans Stekhoven, 1952 (juvenile)

Host and record: *Leptodactylus latrans* (Steffen, 1815) (= *L. ocellatus*) (Co).

Site of infection: Stomach and duodenum.

Material deposited: CH-FML; not specified number.

References: Schuurmans Stekhoven (1952).

Family Rhabdochonidae (Travassos, Artigas and Pereira, 1928 subfam.) Skrjabin, 1946

Rhabdochonidae gen. sp. (larvae)

Host and record: *Rhinella fernandezae* (Co), *Scinax nasicus* (Cope, 1862) (Co), *Scinax acuminatus* (Cope, 1862) (Co).

Site of infection: Gastric serous membrane.

Material deposited: CECOAL 09020606 (*R. fernandezae*), CECOAL 04101102, 05042115 (*S. nasicus*), CECOAL 04101101 (*S. acuminatus*).

References: Hamann *et al.* (2009b; 2010; 2013); González & Hamann (2010b).

Life cycle: Amphibians act as paratenic hosts; amphipods and, especially, ephemeropters, as intermediate hosts.

Adults are parasites of the digestive tract, the abdominal cavity and some internal organs especially of cold-blooded vertebrates; they are rare in mammals (Anderson 2000).

Superfamily Seuratoidea Hall, 1916

Seuratoidea gen. sp. (larvae)

Host and record: *Leptodactylus podicipinus* (Cope, 1862) (Co), *Rhinella fernandezae* (Gallardo, 1957) (Co).

Site of infection: Gastric serous membrane.

Material deposited: CECOAL 08100104, 08102206 (*R. fernandezae*).

References: González & Hamann (2010b), Hamann *et al.* (2013).

Life cycle: Unfortunately, knowledge of the transmission mechanisms and development of species of the superfamily Seuratoidea is very limited. The life cycle of most species involves an intermediate host (Anderson 2000).

Family Strongyloididae Chitwood and McIntosh, 1934

Strongyloides Grassi, 1879

Strongyloides sp.

Host and record: *Physalaemus albonotatus* (Steindachner, 1864) (Co).

Site of infection: Large intestine.

Material deposited: CECOAL 02113236.

References: González & Hamann (2012b).

Life cycle: This genus includes heterogonic forms with a hermaphroditic parasitic stage and free-living stages. Adults parasitize amphibians, reptiles, birds and mammals (Anderson 2000).

Host/parasite list

Class Amphibia

Order Anura

Adult anurans

Family Bufonidae

Rhinella schneideri (Werner, 1894)

Rhabdias fülleborni Travassos, 1926

Rhabdias elegans Gutierrez, 1945

Oswaldocruzia proencai Ben Slimane and Durette-Desset, 1995

Aplectana adaechevarriae Ramallo, Bursey and Goldberg, 2008

Cosmocerca podicipinus Baker and Vaucher, 1984

Cosmocerca parva Travassos, 1925

Falcaustra mascula (Rudolphi, 1819) Freitas and Lent, 1941

Porrocaecum sp. (larvae)

Physaloptera sp. (larvae)

Rhinella bergi (Céspedes, 2000)

Rhabdias sp.

Cosmocerca parva Travassos, 1925

Cosmocerca podicipinus Baker and Vaucher, 1984
Rhinella fernandezae (Gallardo, 1957)
Cosmocerca podicipinus Baker and Vaucher, 1984
Cosmocerca parva Travassos, 1925
Ortleppascaris sp. (larvae)
Oswaldocruzia subauricularis (Rudolphi, 1819)
Physaloptera sp. (larvae)
Rhabdias aff. *sphaerocephala* Goodey, 1924
Rhabdochonidae gen. sp. (larvae)
Seuratoidea gen. sp. (larvae)
Rhinella major (Müller and Hellmich, 1936)
Cosmocerca podicipinus Baker and Vaucher, 1984
Cosmocerca parva Travassos, 1925
Aplectana adaechevarriae Ramallo, Bursey and Goldberg, 2008
Aplectana delirae (Fabio, 1971) Baker, 1980
Physaloptera sp. (larvae)
Rhinella arenarum (Hensel, 1867)
Rhabdias elegans Gutiérrez, 1945
Oswaldocruzia proencai Ben Slimane and Durette-Desset, 1995
Ophidascaris sp. (juvenile)
Aplectana hylambatis (Baylis, 1927) Travassos, 1931
Aplectana tarija Ramallo, Bursey and Goldberg, 2007
Cosmocercoides lilloi Ramallo, Bursey and Goldberg, 2007
Borrellostrongylus platensis Gutierrez, 1945
Bufoerakis andersoni Baker, 1980
Rhinella achalensis Cei, 1972
Aplectana hylambatis (Baylis, 1927) Travassos, 1931
Rhinella marina (Linnaeus, 1758)
Oswaldocruzia mazzai Travassos, 1935
Rhinella sp.
Oswaldocruzia mazzai Travassos, 1935

Family Ceratophryidae

Lepidobatrachus laevis Budgett, 1899
Brevimulticaecum sp. (larvae)

Family Hylidae

Dendropsophus nanus (Boulenger, 1889)
Contraecum sp. (larvae)
Cosmocercoides gen. sp. (larvae)
Cosmocerca podicipinus Baker and Vaucher, 1984
Dendropsophus sanborni (Schmidt, 1944)
Cosmocerca parva Travassos, 1925
Hypsiboas raniceps Cope, 1862
Cosmocerca parva Travassos, 1925
Lysapsus limellum (Cope, 1862)
Serpinema cf. *trispinosum* (Leidy, 1852) (larvae)
Camallanus sp. (larvae)
Phyllomedusa hypochondrialis (Daudin, 1800)
Cosmocercella minor (Freitas and Dobbin Jr., 1961) Baker and Adamson, 1977
Pseudis paradoxa (Linnaeus 1758)
Brevimulticaecum sp. (larvae)

Gyrinicola sp.
Spiroxys sp. (larvae)
Scinax acuminatus (Cope, 1862)
 Cosmocerca parva Travassos, 1925
 Oxyascaris caudacutus (Freitas, 1958) Baker and Vaucher, 1984
 Physaloptera sp. (larvae)
 Rhabdochonidae gen. sp. (larvae)
Scinax nasicus (Cope, 1862)
 Gyrinicola chabaudi Araujo and Artigas, 1981
 Oxyascaris caudacutus (Freitas, 1958) Baker and Vaucher, 1984
 Cosmocerca parva Travassos, 1925
 Cosmocerca podicipinus Baker and Vaucher, 1984
 Physaloptera sp. (larvae)
 Rhabdochonidae gen. sp. (larvae)

Family Leptodactylidae

Adenomera diptyx (Boettger, 1885)
 Cosmocerca sp.
 Aplectana sp.
Leptodactylus bufonius Boulenger, 1894
 Rhabdias elegans Gutierrez, 1945
 Oswaldocruzia sp.
 Aplectana hylambatis (Baylis, 1927) Travassos, 1931
 Aplectana sp.
 Cosmocerca podicipinus Baker and Vaucher, 1984
 Cosmocerca parva Travassos, 1925
 Schrankiana chacoensis González and Hamann, 2014.
 Ortleppascaris sp. (larvae)
 Physaloptera sp. (larvae)
Leptodactylus chaquensis Cei, 1950
 Rhabdias sp.
 Cosmocerca parva Travassos, 1925
 Cosmocerca podicipinus Baker and Vaucher, 1984
 Aplectana hylambatis (Baylis, 1927) Travassos, 1931
 Aplectana delirae (Fabio, 1971) Baker, 1980
 Aplectana sp.
 Porrocaecum sp. (larvae)
 Camallanus sp. (larvae)
Leptodactylus latinasus Jiménez de la Espada, 1875
 Cosmocerca parva Travassos, 1925
 Cosmocerca podicipinus Baker and Vaucher, 1984
 Cosmocerca rara Freitas and Vicente, 1966
 Cosmocerca cruzi Rodrigues and Fabio, 1970
 Aplectana hylambatis (Baylis, 1927) Travassos, 1931
 Schrankiana schranki (Travassos, 1925) Strand, 1942
Leptodactylus latrans (Steffen, 1815)
 Rhabdias mucronata Schuurmans Stekhoven, 1952
 Aplectana fusiforme (Savazzini, 1928)
 Microfilaria tamborinii Mazza and Franke, 1927 (*species inquirenda*)
Leptodactylus podicipinus (Cope, 1862)
 Seuratoidea gen. sp. (larvae)
Leptodactylus sp.

Icosiella neglecta (Diesing, 1851) Seurat, 1917
Physalaemus albonotatus (Steindachner, 1864)
Strongyloides sp.
Oswaldocruzia sp.
Cosmocerca podicipinus Baker and Vaucher, 1984
Cosmocerca parva Travassos, 1925
Brevimulticaecum sp. (larvae)
Spiroxys sp. (larvae)
Physaloptera sp. (larvae)
Physalaemus biligonigerus (Cope, 1861)
Rhabdias sp.
Physaloptera sp. (larvae)
Physalaemus santafecinus Barrio, 1965
Cosmocerca podicipinus Baker and Vaucher, 1984
Cosmocerca parva Travassos, 1925
Aplectana hylambatis (Baylis, 1927) Travassos, 1931
Physaloptera sp. (larvae)
Pseudopaludicola boliviana Parker, 1927
Cosmocerca podicipinus Baker and Vaucher, 1984
Cosmocerca sp.
Pseudopaludicola falcipes (Hensel, 1867)
Cosmocerca podicipinus Baker and Vaucher, 1984
Pleurodema borellii (Peracca, 1895)
Aplectana meridionalis Lent and Freitas, 1948
Telmatobius schreiteri Vellard, 1946
Hedruris mucronifer Schuurmans Stekhoven, 1952
Rhabdias truncata Schuurmans Stekhoven, 1952

Family Odontophryniidae

Odontophrynus americanus (Duméril and Bibron, 1841)
Rhabdias elegans Gutiérrez, 1945
Cosmocerca parva Travassos, 1925
Cosmocerca podicipinus Baker and Vaucher, 1984
Odontophrynus cf. *barrioi*
Falcaustra sanjuanensis González, Sanabria and Quiroga, 2013

Family Ranidae

Lithobates catesbeianus (Shaw, 1802)
Contraecum sp. (larvae)
Falcaustra sanjuanensis González, Sanabria and Quiroga, 2013

Tadpoles

Family Hylidae

Pseudis paradoxa (Linnaeus 1758)
Gyrincola sp.
Scinax nasicus (Cope, 1862)
Gyrincola chabaudi Araujo and Artigas, 1981

Family Leptodactylidae

Telmatobius schreiteri Vellard, 1946
Rhabdias truncata Schuurmans Stekhoven, 1952

Discussion

All nematodes recorded in Argentinean amphibians belong to the Class Chromadorea. In total, 25 genera were identified; in two reports, nematodes were identified to family (Rhabdochonidae) and superfamily (Seuratoidea) level only. The family Cosmocercidae is represented with the highest richness, with 5 genera and 13 identified species, although one of them (*Aplectana fusiforme*) is *species inquirenda*. Two species of this family, *Cosmocerca parva* and *C. podicipinus*, are the most common adult nematodes found in Argentinean amphibians; each of them was found parasitizing 14 species of amphibians, followed by the species *Aplectana hylambatis* that parasitized 6 species of these hosts. With respect to species at the larval stage, the genus *Physaloptera* was found parasitizing 9 species of amphibians. Most parasitic nematode species infect a wide range of phylogenetically distantly related hosts (generalist species); in contrast, some species of nematodes are specific to certain amphibians species (specialist species) (e.g. *Cosmocercella minor* in *P. hypochondrialis*).

The finding of larval nematodes in anuran amphibians indicates the existence of different roles played by these hosts in the trophic web and in the transmission of larval stages to a number of vertebrate hosts (González & Hamann 2007b; 2010b; 2013b; Imasuen *et al.* 2012). In most cases, amphibians act as paratenic hosts, i.e. they transfer the parasite to the definitive host where the parasite continues its life cycle. In other cases, amphibians can act as accidental hosts (e.g. *Camallanus*), or even as intermediate hosts (e.g. *Ophidascaris*).

Geographically, the studies of nematodes in Argentinean amphibians have been focused in the northeastern part of the country, specifically in Corrientes province, where 40 reports of nematode parasites of different amphibian species have been made. Few reports have been made in other provinces: 6 in Salta; 3 in Córdoba, in Buenos Aires and in Formosa; 2 in Tucumán, San Juan and in Jujuy and 1 in Chaco. The southernmost record of nematode parasites in amphibians corresponds to La Plata city, Buenos Aires province (Gutiérrez 1945). *Aplectana hylambatis* is the nematode species with widest geographic distribution so far, having been found in five provinces, namely Córdoba, Salta, San Juan, Buenos Aires and Corrientes.

Of all the nematode species found so far, 11 were described from specimens collected in Argentinean hosts; of these, 5 were described from the bufonid *Rhinella arenarum* (*Bufo nerakisi andersoni*, *Aplectana tarija*, *Cosmocercoides lilloi*, *Borrellostrongylus platensis*, *Rhabdias elegans*), 2 from the leptodactylid *Telmatobius schreiteri* (*Hedrunis mucronifer* and *Rhabdias truncata*), 1 from *Rhinella major* and *R. schneideri* (*Aplectana adaechevarriae*), 1 from *Odontophrynus cf. barrioi* (*Falcaustra sanjuanensis*), 1 from *Leptodactylus bufonius* (*Schrankiana chacoensis*) and 1 from *Rhinella marina* (*Oswaldocruzia mazzai*).

Of the one hundred and seventy five amphibian species (Vaira *et al.* 2012) present in Argentina, only 18.9% of them have been studied for nematode parasites. All of these investigations have been carried out in members of order Anura. The most studied families have been Leptodactylidae (with 14 amphibian species studied) followed by Hylidae and Bufonidae (each with 8 species studied). In the family Odontophrynidae, two species of amphibians were analyzed for nematode parasites, and finally, only one species was studied in each of the families Ceratophryidae and Ranidae.

Leptodactylids and bufonids were the hosts that presented highest species richness of nematode parasites; *Rhinella schneideri* (Bufonidae) and *Leptodactylus bufonius* (Leptodactylidae) harbored 9 species of nematode each, while *R. fernandezae*, *R. arenarum* and *L. chaquensis* harbored 8 parasitic species each. Similarly, Brazilian leptodactylids and bufonids showed the highest number of nematodes species, *L. latrans* (= *L. ocellatus*) and *Rhinella crucifer* (Wied-Neuwied, 1821) (= *Bufo crucifer*) with 29 and 14 of nematode species, respectively (Vicente *et al.* 1990).

Of the total amphibians species analyzed in Argentina, one of them is an introduced species, the American bullfrog *Lithobates catesbeianus*. The nematode parasites of this amphibian were reported for San Juan province; however, this introduced species has also been found in six other Argentinean provinces (Sanabria *et al.* 2011). In this sense, many authors agree on the need for the comparative study of the parasites of native hosts vs. introduced hosts in order to understand the role of parasites during biological invasions and whether parasites can mediate invasion success (see Dunn 2009).

Two of the amphibian species, *Rhinella achalensis* and *Telmatobius schreiteri*, analyzed for nematode parasites are considered as threatened species (Vaira *et al.* 2012). The leptodactylid *T. schreiteri* is the host type of two species of nematodes that were found in this host and never reported again. In this respect, Muniz-Pereira *et al.* (2009) has demonstrated with examples how host extinction may be related to parasite extinction and suggested

that parasites should be included along with their hosts on every Red List. It is important to note that, in Argentina, 51 amphibian taxa are threatened to some degree and therefore of concern to conservation (Vaira *et al.* 2012).

In Table 1 we list the species of nematode parasites of Argentinean amphibians and indicate their presence or absence in other South American countries. The country that shares the largest number of nematode parasite species with Argentina is Brazil; followed by Peru, while Colombia and Guyana only share with Argentina 3 and 4 species of nematode parasites, respectively. In Chile, 6 species of nematode parasites have been reported in these hosts (Puga 1994; Olmos & Muñoz 2006), while the reports for French Guiana list 3 species (Ben Slimane *et al.* 1996b), and those for Venezuela, only one species (Ben Slimane *et al.* 1996c). However, since these countries do not share any species of nematode parasites of amphibians with those recorded in Argentina, they were not included in Table 1.

Finally, this list of nematode parasites of Argentinean amphibians is undoubtedly incomplete, both in terms of amphibian species analyzed (less than a fifth of all Argentinean amphibian species have been analyzed for nematode parasites) and of the geographic location of collection sites (only 9 of the 23 Argentinean provinces have been the focus of studies of this type). Thus, future studies can be expected to increase the list of nematode species in different hosts and other geographical areas.

TABLE 1. Species of nematode parasites (n= 40) of Argentinean amphibians and their presence or absence in other South America countries (excluding *species inquirendae* and adult stages that not determined at species level).

Nematode species	References of nematodes in other countries							
	Argentina	Brazil	Colombia	Ecuador	Guyana	Paraguay	Peru	Uruguay
<i>Aplectana adaechevarriae</i>								
<i>Aplectana delirae</i>		a, b, f, o						
<i>Aplectana hylambatis</i>				d	a	d, h, j	b, c, d, e, f	a
<i>Aplectana meridionalis</i>		l						a
<i>Aplectana tarija</i>								
<i>Borrellostrongylus platensis</i>								
<i>Bufoerakis andersoni</i>								
<i>Brevimulticaecum</i> sp.		j					c	
<i>Camallanus</i> sp.							b	
<i>Contraecum</i> sp.								
<i>Cosmocerca cruzi</i>		a, m						
<i>Cosmocerca parva</i>		a, l, m, o	a, b		a	d, f, j	c, f	
<i>Cosmocerca podicipinus</i>		c, g, h, i, j	a			f, j	c	
<i>Cosmocerca rara</i>		a, m, n						
<i>Cosmocercella minor</i>		a				e, j		
<i>Cosmocercoides lilloi</i>								
<i>Falcaustra mascula</i>		a, c, d, e				a, j	b	
<i>Falcaustra sanjuanensis</i>								
<i>Gyrinicola chabaudi</i>		a						
<i>Hedruris mucronifer</i>								
<i>Ophidascaaris</i> sp.							c	
<i>Ortleppascaris</i> sp.		q, r						
<i>Oswaldocruzia mazzai</i>		a, e		a, c	a	a*		
<i>Oswaldocruzia proencai</i>		j				i	f	
<i>Oswaldocruzia subauricularis</i>		a, e, k		c			b	
<i>Oxyascaris caudacutus</i>		a				g		

.....continued on the next page

TABLE 1. (Continued)

Nematode species	References of nematodes in other countries							
	Argentina	Brazil	Colombia	Ecuador	Guyana	Paraguay	Peru	Uruguay
<i>Physaloptera</i> sp.		a, b, j, k, o, p					a, b, c	
<i>Porrocaecum</i> sp.			a				c	
<i>Rhabdias elegans</i>		a, e		d	a	b, c		b, c
<i>Rhabdias fülleborni</i>		a, e, f, k, l, n, p				b, c, d		b, c
<i>Rhabdias</i> aff. <i>sphaerocephala</i>		a, e				b, c	b, e	
<i>Rhabdias truncata</i>								
<i>Rhabdias mucronata</i>								
Rhabdochonidae gen. sp.								
<i>Schrankiana chacoensis</i>								
<i>Schrankiana schranki</i>		a, c		a, b			c	
<i>Spiroxys</i> sp.								
<i>Serpinema</i> cf. <i>trispinosum</i>								
Seuratoidea gen. sp.								
<i>Strongyloides</i> sp.		a, b, e, f, h						
Species shared between Argentina/country		21	3	5	4	11	13	4
Species non-shared between Argentina/country		59	2	12	5	19	29	5
Total number of species		80	5	17	9	30	42	9

* reported as *O. proencai* by Ben Slimane & Durette-Desset (1995).

Brazil

^a Vicente *et al.* (1990); ^b Boquimpani-Freitas *et al.* (2001); ^c Goldberg *et al.* (2007); ^d Holmes *et al.* (2008); ^e Luque *et al.* (2008); ^f Lux Hoppe *et al.* (2008); ^g Campião *et al.* (2009); ^h Campião *et al.* (2010); ⁱ Campião *et al.* (2012); ^j Goldberg *et al.* (2009); ^k Pinhão *et al.* (2009); ^l dos Santos & Amato (2010); ^m dos Santos & Amato (2013); ⁿ dos Santos *et al.* (2013); ^o Klaion *et al.* (2011); ^p Madelaire *et al.* (2012); ^q Silva *et al.* (2013a); ^r Silva *et al.* (2013b).

Other reports with non-shared species: Martins & Fabio (2005); Van Sluys *et al.* (2006); Santos *et al.* (2008; 2011); Souza-Lima *et al.* (2012); Toledo *et al.* (2013); Nascimento *et al.* (2014).

Colombia

^a Goldberg & Bursey (2003); ^b Sánchez *et al.* (2010).

Other report with non-shared species: Esslinger (1989)

Ecuador

^a Dyer & Altig (1977); ^b Dyer (1990); ^c Ben Slimane & Durette-Desset (1995); ^d McAllister *et al.* (2010a).

Other reports with non-shared species: Dyer and Altig (1976); Ben Slimane & Durette-Desset (1993; 1996); Ben Slimane *et al.* (1996b).

Guyana

^a McAllister *et al.* (2010b).

Paraguay

^a Lent *et al.* (1946); ^b Kloss (1971); ^c Kloss (1974); ^d Masi Pallares & Maciel (1974); ^e Baker & Vaucher (1983); ^f Baker & Vaucher (1984); ^g Baker & Vaucher (1985); ^h Baker & Vaucher (1986); ⁱ Ben Slimane & Durette-Desset (1995); ^j McAllister *et al.* (2010c).

Other reports with non-shared species: Durette-Desett *et al.* (1985); Baker & Vaucher (1988).

Peru

^a Teixeira de Freitas & Ibañez (1965); ^b Sarmiento *et al.* (1999); ^c Burse *et al.* (2001), ^d Iannacone (2003a); ^e Iannacone (2003b); ^f McAllister *et al.* (2010d).

Other reports with non-shared species: Durette-Desset *et al.* (2000); Guerrero (2013).

Uruguay

^a Lent & Teixeira de Freitas (1948); ^b Kloss (1971); ^c Kloss (1974).

Other report with non-shared species: Teixeira de Freitas & Lent (1941).

Acknowledgments

This project was partially supported by Agencia Nacional de Promoción Científica y Tecnológica from Argentina, through grant PICT 2012-0661 to C. E. González.

References

- Adamson, M.L. (1981a) Development and transmission of *Gyrinicola batrachiensis* (Walton, 1929) Adamson, 1981 (Pharyngodonidae: Oxyuroidea). *Canadian Journal of Zoology*, 59, 1351–1367.
<http://dx.doi.org/10.1139/z81-188>
- Adamson, M.L. (1981b) Studies on gametogenesis in *Gyrinicola batrachiensis* (Walton, 1929) (Oxyuroidea: Nematoda). *Canadian Journal of Zoology*, 59, 1368–1376.
<http://dx.doi.org/10.1139/z81-189>
- Anderson, R.C. (2000) *Nematode Parasites of Vertebrates: Their Development and Transmission*. 2nd Edition. CAB International, Wallingford, Oxford, UK, 650 pp.
- Anderson, R.C., Chabaud, A.G. & Willmont, S. (2009) *Keys to the Nematode Parasites of Vertebrates. Archival Volumen*. CABI Publishing, Wallingford, UK, 463 pp.
- Baker, M.R. (1980a) Revision of Old World species of the genus *Aplectana* Railliet and Henry, 1916 (Nematoda, Cosmocercoidea). *Bulletin du Museum National d'Histoire Naturelle, Paris*, 2, 955–998.
- Baker, M.R. (1980b) *Bufo* *andersoni* n. gen. (Nematoda: Heterakoidea) from *Bufo arenarum* of South America. *Journal of Helminthology*, 54, 49–53.
<http://dx.doi.org/10.1017/s0022149x00006349>
- Baker, M.R. (1987) Synopsis of the Nematoda parasitic in amphibians and reptiles. *Memorial University of Newfoundland. Occasional Papers in Biology*, 11, 1–325.
- Baker, M.R. & Vaucher, C. (1983) Parasitic helminths from Paraguay IV: Cosmocercoid nematodes from *Phyllomedusa hypochondrialis* (Daudin) (Amphibia: Hylidae). *Revue suisse Zoologie*, 90, 325–334.
- Baker, M.R. & Vaucher, C. (1984) Parasitic helminths from Paraguay VI: *Cosmocerca* Diesing, 1861 (Nematoda: Cosmocercoidea) from frogs. *Revue suisse Zoologie*, 91, 925–934.
- Baker, M.R. & Vaucher, C. (1985) Parasitic helminths from Paraguay VII: Systematic position of *Oxyascaris* Travassos, 1920 (Nematoda: Cosmocercoidea). *Revue suisse Zoologie*, 92, 303–310.
- Baker, M.R. & Vaucher, C. (1986) Parasitic helminths from Paraguay XII: *Aplectana* Railliet y Henry, 1916 (Nematoda: Cosmocercoidea) from frogs. *Revue suisse Zoologie*, 93, 607–616.
- Baker, M.R. & Vaucher, C. (1988) Parasitic Helminths from Paraguay XV: Atractidae (Nematoda: Cosmocercoidea) from frogs. *Revue Suisse Zoologie*, 95, 421–431.
- Bartlett, C.M. & Anderson, R.C. (1985) Larval nematodes (Ascaridida and Spirurida) in the aquatic snail, *Lymnaea stagnalis*. *Journal of Invertebrate Pathology*, 46, 153–159.
[http://dx.doi.org/10.1016/0022-2011\(85\)90143-0](http://dx.doi.org/10.1016/0022-2011(85)90143-0)
- Ben Slimane, B. & Durette-Desset, M.C. (1993) Quatre nouvelles espèces du genre *Oswaldocruzia* Travassos, 1917 (Nematoda: Trichostrongyloidea) parasites d'Amphibiens d'Equateur. *Revue suisse Zoologie*, 100, 113–136.
- Ben Slimane, B. & Durette-Desset, M.C. (1995) *Oswaldocruzia* (Nematoda, Trichostrongylina, Molineoidea) parasites d'Amphibiens du Brésil et de l'Equateur, avec redéfinition de l'espèce-type *O. subauricularis* (Rudolphi, 1819) et d' *O. mazzai* Travassos, 1935. *Revue suisse Zoologie*, 102, 635–653.
- Ben Slimane, B. & Durette-Desset, M.C. (1996) Four new species of *Oswaldocruzia* (Nematoda: Trichostrongylina, Molineoidea) parasitizing amphibians and lizards from Ecuador. *Memorias do Instituto Oswaldo Cruz*, 91, 317–328.
<http://dx.doi.org/10.1590/S0074-02761996000300012>
- Ben Slimane, B., Chabaud, A. & Durette-Desset, M.C. (1996a) Les Nématodes Trichostrongylina parasites d'Amphibiens et de Reptiles: problèmes taxonomiques, phylétiques et biogéographiques. *Systematic Parasitology*, 35, 179–206.
<http://dx.doi.org/10.1007/bf00009639>

- Ben Slimane, B., Chabaud, A. & Durette-Desset, M.C. (1996b) New *Oswaldocruzia* (Nematoda, Trichostrongylinea, Molineoidea) parasites of Amphibians from French Guyana and Ecuador. *Miscellanea Zoológica*, 19, 55–66.
- Ben Slimane, B., Guerrero, R. & Durette-Desset, M.C. (1996c) *Oswaldocruzia venezuelensis* sp. n. (Nematoda: Trichostrongylinea, Molineoidea), a parasite of *Bufo marinus* from Venezuela. *Folia Parasitologica*, 43, 297–300.
- Boquimpani-Freitas, L., Vrcibradic, D., Vicente, J.J., Bursey, C.R., Rocha, C.F.D. & Van Sluys, M. (2001) Helminths of the horned leaf frog, *Proceratophrys appendiculata*, from southeastern Brazil. *Journal of Helminthology*, 75, 233–236.
- Bursey, C.R., Goldberg, S.R. & Pamarlee, J.R. (2001) Gastrointestinal helminths of 51 species of anurans from Reserva Cuzco Amazónico, Peru. *Comparative Parasitology*, 68, 21–35.
- Campião, K.M., da Silva, R.J. & Ferreira, V.L. (2009) Helminth parasites of *Leptodactylus podicipinus* (Anura: Leptodactylidae) from south-eastern Pantanal, State of Mato Grosso do Sul, Brazil. *Journal of Helminthology*, 83, 345–349.
<http://dx.doi.org/10.1017/S0022149X09289358>
- Campião, K.M., da Silva, R.J. & Ferreira, V.L. (2010) Helminth component community of the paradoxal frog *Pseudis platensis* Gallardo, 1961 (Anura: Hylidae) from south-eastern Pantanal, Brazil. *Parasitology Research*, 106, 747–751.
<http://dx.doi.org/10.1007/s00436-009-1718-0>
- Campião, K.M., Delatorre, M., Rodrigues, R.B., da Silva, R.J. & Ferreira, V.L. (2012) The effect of local environmental variables on the helminth parasite communities of the Pointedbelly Frog *Leptodactylus podicipinus* from ponds in the Pantanal Wetlands. *Journal of Parasitology*, 98, 229–235.
<http://dx.doi.org/10.1645/GE-2877.1>
- dos Santos, V.G.T. & Amato, S.B. (2010) Helminth fauna of *Rhinella fernandezae* (Anura: Bufonidae) from the Rio Grande do Sul Coastland, Brazil: analysis of the parasite community. *Journal of Parasitology*, 96, 823–826.
<http://dx.doi.org/10.1645/GE-2388.1>
- dos Santos, V.G.T. & Amato, S.B. (2013) Species of *Cosmocerca* (Nematoda, Cosmocercidae) in Anurans from Southern Santa Catarina State, Brazil. *Comparative Parasitology*, 80, 123–129.
<http://dx.doi.org/10.1654/4608.1>
- dos Santos, V.G.T., Amato, S.B. & Borges-Martins, M. (2013) Community structure of helminth parasites of the “Cururu” toad, *Rhinella icterica* (Anura: Bufonidae) from southern Brazil. *Parasitology Research*, 112, 1097–1103.
<http://dx.doi.org/10.1007/s00436-012-3236-8>
- Dunn, A.M. (2009) Parasites and Biological Invasions. *Advances in Parasitology*, 68, 161–184.
[http://dx.doi.org/10.1016/s0065-308x\(08\)00607-6](http://dx.doi.org/10.1016/s0065-308x(08)00607-6)
- Duré, M.I., Schaefer, E.F., Hamann, M.I. & Kehr, A.I. (2004) Consideraciones ecológicas sobre la dieta, la reproducción y el parasitismo de *Pseudopaludicola boliviana* (Anura, Leptodactylidae) de Corrientes, Argentina. *Phyllomedusa*, 3, 121–131.
<http://dx.doi.org/10.11606/issn.2316-9079.v3i2p121-131>
- Durette-Desset, M.C. & Chabaud, A.G. (1981) Nouvel essai de classification des nématodes Trichostrongyloidea. *Annales de Parasitologie Humaine et Comparée*, 56, 297–312.
- Durette-Desset, M.C., Baker, M.R. & Vaucher, C. (1985) Helminthes parasites du Paraguay IX. Remaniement et redefinition du genre *Schulzia* Travassos, 1937. *Revue Suisse de Zoologie*, 92, 811–821.
- Durette-Desset, M.C., Florindez, D.T. & Morales, E. (2000) *Schulzia chiribita* n. sp. (Nematoda, Trichostrongylinea, Mollineoidea) parasite of *Leptodactylus rhodonotus* (Amphibia) from Peru. *Parasite*, 7, 20–27.
<http://dx.doi.org/10.1051/parasite/2000071027>
- Durette-Desset, M.C., Anjos, L.A. & Vrcibradic, D. (2006) Three new species of the genus *Oswaldocruzia* Travassos, 1917 (Nematoda, Trichostrongylinea, Molineoidea) parasites of *Enyalios* spp. (Iguanidae) from Brazil. *Parasite*, 13, 115–125.
<http://dx.doi.org/10.1051/parasite/2006132115>
- Dyer, W.G. (1990) *Schrankiana schranki* (Travassos, 1925) Strand, 1942 (Nematoda: Atractidae) in *Leptodactylus mystaceus* (Spix, 1824) from Santa Cecilia, Napo Province, Ecuador. *Transactions of the Illinois State Academy of Science*, 83, 101–103.
- Dyer, W.G. & Altig, R. (1976) Redescription of *Cosmocerca brasiliensis* Travassos, 1925 (Nematoda: Cosmocercidae) from Ecuadorian frogs. *Journal of Parasitology*, 62, 262–264.
<http://dx.doi.org/10.2307/3279281>
- Dyer, W.G. & Altig, R. (1977) Helminths of some Ecuadorian anurans. *Herpetologica*, 33, 293–296.
- Esslinger, J.H. (1989) *Ochoterenella complicata* n. sp. (Nematoda: Filarioidea) from the toad *Bufo marinus* in Western Colombia. *Transactions of the American Microscopical Society*, 108, 197–203.
- Fabio, S.P. (1981) Considerações sobre *Cosmocerca parva* Travassos, 1925 e *C. freitasi* Silva, 1954 (Nematoda, Subuluroidea). *Revista Brasileira de Biologia*, 41, 25–27.
- Frost, D.R. (2014) Amphibian Species of the World: an Online Reference. Version 6.0. Available from: <http://research.amnh.org/herpetology/amphibia/index.html> accessed 15 January 2014)
- Gibbons, L.M. (2010) *Keys to the Nematode Parasite of Vertebrates. Supplementary Volume*. CABI Publishing, Wallingford, UK, 416 pp.
- Goldberg, S.R. & Bursey, C.R. (2003) Helminths of two anuran species; *Atelopus spurrelli* (Bufonidae) and *Dendrobates histrionicus* (Dendrobatidae), from Colombia, South America. *Parasitology International*, 52, 251–253.

[http://dx.doi.org/10.1016/S1383-5769\(03\)00013-8](http://dx.doi.org/10.1016/S1383-5769(03)00013-8)

- Goldberg, S.R., Bursey, C.R. & Aquino-Shuster, A.L. (1991) Gastric nematodes of the Paraguayan caiman, *Caiman yacare* (Alligatoridae). *Journal of Parasitology*, 77, 1009–1011.
<http://dx.doi.org/10.2307/3282758>
- Goldberg, S.R., Bursey, C.R., Caldwell, J.P., Vitt, L.J. & Costa, G.C. (2007) Gastrointestinal Helminths from Six Species of Frogs and Three Species of Lizards, Sympatric in Pará State, Brazil. *Comparative Parasitology*, 74, 327–342.
<http://dx.doi.org/10.1654/4268.1>
- Goldberg, S.R., Bursey, C.R., Caldwell, J.P. & Shepard, D.B. (2009) Gastrointestinal Helminths of Six Sympatric Species of *Leptodactylus* from Tocantins State, Brazil. *Comparative Parasitology*, 76, 258–266.
<http://dx.doi.org/10.1654/4368.1>
- González, C.E. (2009) Aspectos cuali-cuantitativos de los nematodos parásitos en anfibios del nordeste argentino. *Thesis*. Universidad Nacional de La Plata, Argentina, 241 pp.
- González, C.E. & Hamann, M.I. (2004) Primer registro de *Cosmocerca podicipinus* Baker y Vaucher, 1984 (Nematoda, Cosmocercidae) en *Pseudopaludicola falcipes* (Hensel, 1867) (Amphibia, Leptodactylidae) en Argentina. *Facena*, 20, 65–72.
- González, C.E. & Hamann, M.I. (2005) *Gyrinicola chabaudi* Araujo and Artigas, 1982 (Nematoda: Pharyngodonidae) in tadpoles of *Scinax nasicus* (Cope, 1862) (Anura: Hylidae) from Corrientes, Argentina. *Facena*, 21, 145–148.
- González, C.E. & Hamann, M.I. (2006a) Helminths parasites of *Leptodactylus bufonius* Boulenger, 1894 (Anura: Leptodactylidae) de Corrientes, Argentina. *Revista Española de Herpetología*, 20, 39–46.
- González, C.E. & Hamann, M.I. (2006b) Nematodes parásitos de *Chaunus granulatus major* (Müller y Hellmich, 1936) (Anura: Bufonidae) en Corrientes, Argentina. *Cuadernos de Herpetología*, 20, 43–49.
- González, C.E. & Hamann, M.I. (2007a) Nematode parasites of two species of *Chaunus* (Anura: Bufonidae) from Corrientes, Argentina. *Zootaxa*, 1393, 27–34.
- González, C.E. & Hamann, M.I. (2007b) The first record of amphibians as paratenic host of *Serpinema* larvae (Nematoda: Camallanidae). *Brazilian Journal of Biology*, 67, 579–580.
<http://dx.doi.org/10.1590/s1519-69842007000300026>
- González, C.E. & Hamann, M.I. (2007c) *Chaunus bergi* (NCN). Endoparasites. *Herpetological Review*, 38, 1–181.
- González, C.E. & Hamann, M.I. (2008) Nematode parasites of two anurans species, *Rhinella schneideri* (Bufonidae) and *Scinax acuminatus* (Hylidae), from Corrientes, Argentina. *Revista de Biología Tropical*, 56, 2147–2161.
<http://dx.doi.org/10.15517/rbt.v56i4.5785>
- González, C.E. & Hamann, M.I. (2009a) First Report of Nematodes in the Common Lesser Escuerzo *Odontophrynus americanus* (Duméril and Bibron, 1841) (Amphibia: Cycloramphidae) from Corrientes, Argentina. *Comparative Parasitology*, 76, 122–126.
<http://dx.doi.org/10.1654/4365.1>
- González, C.E. & Hamann, M.I. (2009b) Seasonal occurrence of *Cosmocerca podicipinus* (Nematoda: Cosmocercidae) in *Pseudopaludicola falcipes* (Anura: Leiuperidae) from the agricultural area in Corrientes, Argentina. *Revista Ibero-Latinoamericana de Parasitología*, 68, 173–179.
- González, C.E. & Hamann, M.I. (2010a) First Report of Nematode Parasites of *Physalaemus santafecinus* (Anura: Leiuperidae) from Corrientes, Argentina. *Revista Mexicana de Biodiversidad*, 81, 677–687.
- González, C.E. & Hamann, M.I. (2010b) Larval nematodes found in amphibians from northeastern Argentina. *Brazilian Journal of Biology*, 71, 1089–1092.
<http://dx.doi.org/10.1590/s1519-69842010000500026>
- González, C.E. & Hamann, M.I. (2011) Cosmocercid Nematodes of Three Species of Frogs (Anura: Hylidae) from Corrientes, Argentina. *Comparative Parasitology*, 78, 212–216.
<http://dx.doi.org/10.1654/4470.1>
- González, C.E. & Hamann, M.I. (2012a) First report of genus *Cosmocercella* Steiner, 1924 in amphibians from Argentina. *Comparative Parasitology*, 79, 155–159.
<http://dx.doi.org/10.1654/4535.1>
- González, C.E. & Hamann, M.I. (2012b) First report of nematode parasites of *Physalaemus albonotatus* (Steindachner, 1864) (Anura: Leiuperidae) from Corrientes, Argentina. *Neotropical Helminthology*, 6, 9–23.
<http://dx.doi.org/10.1007/s00436-012-3034-3>
- González, C.E. & Hamann, M.I. (2012c) Seasonal occurrence of *Cosmocerca podicipinus* (Nematoda: Cosmocercidae) in *Pseudopaludicola boliviana* (Anura: Leiuperidae) from natural environments in Corrientes, Argentina, and aspects of its population structure. *Parasitology Research*, 111, 1923–1928.
- González, C.E., Hamann, M.I. & Salgado, C. (2012) Study of helminth parasites of amphibians by Scanning Electron Microscopy. In: Kazmiruk, V. (Ed.), *The Scanning Electron Microscope*, InTech Open Acces, pp. 267–294.
- González, C.E. & Hamann, M.I. (2013) First record of larvae of *Brevimulticaecum* sp. (Nematoda: Heterocheilidae) in amphibians from Northern Argentina. *Brazilian Journal of Biology*, 73, 451–452.
<http://dx.doi.org/10.1590/S1519-69842013000200031>
- González, C.E., Quiroga, L.B., Moreno, D. & Sanabria, E.A. (2013a) Primer registro de *Aplectana hylambatis* (Nematoda, Cosmocercidae) para anfibios de la provincia de San Juan. *Cuadernos de Herpetología*, 27, 155–159.

- González, C.E., Sanabria, E.A. & Quiroga, L.B. (2013b) *Falcaustra sanjuanensis* sp. nov. (Nematoda: Kathlaniidae) from *Odontophrynus* cf. *barrioi* (Anura: Cycloramphidae) from Argentina. *Acta Parasitologica*, 58, 119–125. <http://dx.doi.org/10.2478/s11686-013-0105-2>
- González, C.E. & Hamann, M.I. (2014) *Schrankiana chacoensis* sp. nov. (Nematoda: Atractidae) from *Leptodactylus bufonius* Boulenger, 1894 (Anura: Leptodactylidae) from Argentina. *Journal of Natural History*, 48, 35–49. <http://dx.doi.org/10.1080/00222933.2013.800608>
- González, C.E., Quiroga, L.B. & Sanabria, E.A. (2014) First Survey of Nematode Parasites in Introduced American Bullfrog (*Lithobates catesbeianus*) in Argentina. *Comparative Parasitology*, 81, 284–287. <http://dx.doi.org/10.1654/4700.1>
- Guerrero, R. (2013) Two new species of *Oswaldocruzia* (Nematoda: Trychostrongylina: Molineoidea) parasites of the cane toad *Rhinella marina* (Amphibia: Anura) from Peru. *Acta Parasitologica*, 58, 30–36. <http://dx.doi.org/10.2478/s11686-013-0103-4>
- Gutiérrez, R.O. (1945) *Contribución al conocimiento de los nematodos, parásitos de anfibios argentinos*. Thesis. Universidad Nacional de La Plata, 37 pp.
- Gutiérrez, C., Attademo, A., Guerrero, S., Peltzer, P. & Lajmanovich, R. (2005) *Physalaemus biligonigerus* (False-eyed Frog). Endoparasites. *Herpetological Review*, 36, 161–162.
- Hamann, M.I. & Kehr, A.I. (1998) Variación espacio temporal en infrapoblaciones de helmintos y su relación con las fluctuaciones poblacionales de *Hyla nana* (Anura, Hylidae). *Cuadernos de Herpetología*, 12, 23–33.
- Hamann, M.I., González, C.E. & Kehr, A.I. (2006a) Helminth community structure of the oven frog *Leptodactylus latinasus* (Anura, Leptodactylidae) from Corrientes, Argentina. *Acta Parasitologica*, 51, 294–299. <http://dx.doi.org/10.2478/s11686-006-0045-1>
- Hamann, M.I., Kehr, A.I. & González, C.E. (2006b) Species affinity and infracommunity ordination of helminths of *Leptodactylus chaquensis* (Anura: Leptodactylidae) in two contrasting environments from Northeastern Argentina. *Journal of Parasitology*, 92, 1171–1179. <http://dx.doi.org/10.1645/ge-862r1.1>
- Hamann, M.I., Kehr, A.I. & González, C.E. (2009a) Niche specificity of two *Glypthelmins* (Trematoda) congeners infecting *Leptodactylus chaquensis* (Anura: Leptodactylidae) from Argentina. *Journal of Parasitology*, 95, 817–822. <http://dx.doi.org/10.1645/ge-1860.1>
- Hamann, M.I., Kehr, A.I., González, C.E., Duré, M.I. & Schaefer, E.F. (2009b) Parasite and reproductive features of *Scinax nasicus* (Anura: Hylidae) from a South American subtropical area. *Interiencia*, 34, 214–218.
- Hamann, M.I., Kehr, A.I. & González, C.E. (2010) Helminth community structure of *Scinax nasicus* (Anura: Hylidae) from a South American subtropical area. *Diseases of Aquatic Organisms*, 93, 71–82. <http://dx.doi.org/10.3354/dao02276>
- Hamann, M.I., Kehr, A.I. & González, C.E. (2012) Helminth community structure of *Leptodactylus bufonius* (Anura: Leptodactylidae) from a South American subtropical area. *Zoological Studies*, 51, 1454–1463.
- Hamann, M.I., Kehr, A.I. & González, C.E. (2013) Helminth Communities in the Burrowing Toad, *Rhinella fernandezae*, from Northeastern Argentina. *Biología, Section Zoology*, 68, 1155–1162. <http://dx.doi.org/10.2478/s11756-013-0272-5>
- Hodda, M. (2011) Phylum Nematoda Cobb 1932. In: Zhang, Z.-Q. (Ed.), Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness. *Zootaxa*, 3148, 63–95.
- Holmes, R., Bocchiglieri, A., de Araujo, F.R. & da Silva, R. (2008) New records of endoparasites infecting *Hypsiboas albopunctatus* (Anura: Hylidae) in a savanna area in Brasília, Brazil. *Parasitology Research*, 102, 621–623. <http://dx.doi.org/10.1007/s00436-007-0797-z>
- Iannacone, J. (2003a) Helmintos parásitos de *Telmatobius jelskii* (Peters) (Anura, Leptodactylidae) de Lima, Perú. *Revista Brasileira de Zoologia*, 20, 131–134.
- Iannacone, J. (2003b) Helmintos parásitos de *Atelopus bomolochus* Peters, 1973 (Anura: Bufonidae) de Piura, Perú. *Gayana (Concepción)*, 67, 9–15.
- Imasuen, A.A., Ozemoka, H.J. & Aisien, M.S.O. (2012) Anurans as intermediate and paratenic hosts of helminth infections in the rainforest and derived savanna biotopes of Southern Nigeria. *International Journal of Zoology*, 2012, 1–7. <http://dx.doi.org/10.1155/2012/823970>
- Kehr, A.I. & Hamann, M.I. (2003) Ecological Aspects of Parasitism in the Tadpole of *Pseudis paradoxa* from Argentina. *Herpetological Review*, 34, 336–341.
- Kehr, A.I., Manly, B.F.J. & Hamann, M.I. (2000) Coexistence of helminth species in *Lysapsus limellus* (Anura: Pseudidae) from an Argentinean subtropical area: influence of biotic and abiotic factors. *Oecologia*, 125, 549–558. <http://dx.doi.org/10.1007/s004420000480>
- Klaion, T., Almeida-Gomes, M., Tavares, L.E.R., Rocha, C.F.D. & Van Sluys, M. (2011) Diet and nematode infection in *Proceratophrys boiei* (Anura: Cycloramphidae) from two Atlantic rainforest remnants in Southeastern Brazil. *Anais da Academia Brasileira de Ciências*, 83, 1303–1312. <http://dx.doi.org/10.1590/S0001-37652011000400017>
- Kloss, G.R. (1971) Alguns *Rhabdias* (Nematoda) de *Bufo* no Brasil. *Papéis Avulsos de Zoologia de São Paulo*, 24, 1–52.
- Kloss, G.R. (1974) *Rhabdias* (Nematoda, Rhabditoidea) from the *marinus* group of *Bufo*. A study of sibling species. *Arquivos*

- de *Zoologia*, 25, 61–120.
<http://dx.doi.org/10.11606/issn.2176-7793.v25i2p61-120>
- Kuzmin, Y. (2013) Review of Rhabdiasidae (Nematoda) from the Holartic. *Zootaxa*, 3639, 1–76.
<http://dx.doi.org/10.11646/zootaxa.3639.1.1>
- Langford, G.J., Willobee, B.A. & Isidoro, L.F. (2013) Transmission, host specificity, and seasonal occurrence of *Cyrtosomum penneri* (Nematoda: Atractidae) in lizards from Florida. *Journal of Parasitology*, 99, 241–246.
<http://dx.doi.org/10.1645/12-30.1>
- Lent, H. & Teixeira de Freitas, J.F. (1948) Uma coleção de nematodeos, parasitos de vertebrados, do Museu de Historia Natural de Montevideo. *Memorias do Instituto Oswaldo Cruz*, 46, 1–71.
<http://dx.doi.org/10.1590/S0074-02761948000100001>
- Lent, H., Teixeira de Freitas, J.F. & Proença, M. (1946) Alguns helmintos de batraquios colecionados no Paraguai. *Memorias do Instituto Oswaldo Cruz*, 44, 195–214.
<http://dx.doi.org/10.1590/S0074-02761946000100007>
- Luque, J.L., Martins, A.N. & Tavares, L.E.R. (2008) Community structure of metazoan parasites of the yellow Cururu toad, *Bufo ictericus* (Anura, Bufonidae) from Rio de Janeiro, Brazil. *Acta Parasitologica*, 50, 215–220.
- Lux Hoppe, E.G., Pedrassani, D., Hoffmann-Inocente, A.C., Tebaldi, J.H., Storti, L.F., Zanuzzo, F.S., Avancini, N. & Do Nascimento, A.A. (2008) Estudos ecológicos em taxocenoses helmínticas de *Chaumus ictericus* (Spix, 1824) e *C. schneideri* (Werner, 1894) (Anura: Bufonidae) simpátricos, capturados no distrito de São Cristóvão, Município de Três Barras, Santa Catarina. *Revista Brasileira de Parasitologia Veterinária*, 17, 166–169.
- Madelaire, C.B., Ribeiro Gomes, F. & da Silva, R.J. (2012) Helminth Parasites of *Hypsiboas prasinus* (Anura: Hylidae) from two Atlantic Forest Fragments, São Paulo State, Brazil. *Journal of Parasitology*, 98, 560–564.
<http://dx.doi.org/10.1645/JP-GE-2665.1>
- Martins, A.N. & Fabio, S.P. (2005) Parasitismo por nematóides em populações simpátricas de *Eleutherodactylus parvus* (Girard, 1853) e *Eleutherodactylus guentheri* (Steindachner, 1864) - (Anura: Leptodactylidae). *Acta Biologica Leopoldensia*, 27, 47–50.
- Masi Pallares, R. & Maciel, S. (1974) Helminthes en batracios del Paraguay (Ira. Parte), con descripción de una nueva especie *Aplectana pudenda* (Oxyuridae: Cosmocercinae). *Revista Paraguaya de Microbiología*, 9, 55–60.
- Mazza, S. & Franke, I. (1927) Microfilarias de ranas (*Leptodactylus ocellatus* L.) del norte Argentino. *Revista de la Universidad de Buenos Aires, IV, (Sección 5)*, 899–901.
- McAllister, C.T., Bursey, C.R. & Freed, P.S. (2010a) Helminth Parasites of Selected Amphibians and Reptiles from the Republic of Ecuador. *Comparative Parasitology*, 77, 52–66.
<http://dx.doi.org/10.1654/4402.1>
- McAllister, C.T., Bursey, C.R. & Freed, P.S. (2010b) Helminth Parasites of Herpetofauna from the Rupunini District, Southwestern Guyana. *Comparative Parasitology*, 77, 184–201.
<http://dx.doi.org/10.1654/4420.1>
- McAllister, C.T., Bursey, C.R. & Freed, P.S. (2010c) Helminth parasites (Cestoidea: Nematoda) of Select Herpetofauna from Paraguay. *Journal of Parasitology*, 96, 222–224.
<http://dx.doi.org/10.1645/ge-2191.1>
- McAllister, C.T., Bursey, C.R. & Freed, P.S. (2010d) Helminth Parasites of Amphibians and Reptiles from the Ucayali Region, Peru. *Journal of Parasitology*, 96, 444–447.
<http://dx.doi.org/10.1645/ge-2206.1>
- Mordegli, C. & Digiani, M.C. (1998) *Cosmocerca parva* Travassos, 1925 (Nematoda: Cosmocercidae) in Toads from Argentina. *Memorias do Instituto Oswaldo Cruz*, 93, 737–738.
<http://dx.doi.org/10.1590/S0074-02761998000600007>
- Moravec, F. (1998) *Nematodes of freshwater fishes of the Neotropical Region*. Academia Praha, Czech Republic, 464 pp.
- Moravec, F. & Kaiser, H. (1994) *Brevimulticaecum* sp. (Nematoda: Anisakidae) from the frog *Hyla minuta* Peters in Trinidad. *Journal of Parasitology*, 80, 154–156.
<http://dx.doi.org/10.2307/3283361>
- Moravec, F., Huffman D.G. & Swim, D.J. (1995) The first record of fish as paratenic hosts of *Falcaustra* spp. (Nematoda: Kathlaniidae). *Journal of Parasitology*, 81, 809–812.
<http://dx.doi.org/10.2307/3283986>
- Muniz-Pereira, L.C., Vieira, F.M. & Luque, J.L. (2009) Checklist of helminth parasites of threatened vertebrate species from Brazil. *Zootaxa*, 2123, 1–45.
- Nascimento, L.C.S., Gonçalves, E.C., Melo, F.T.V., Giese, E.G., Furtado, A.P. & Santos, J.N. (2014) Description of *Rhabdias breviensis* n. sp. (Rhabditoidea: Rhabdiasidae) in two Neotropical frog species. *Systematic Parasitology*, 86, 69–75.
<http://dx.doi.org/10.1007/s11230-013-9432-9>
- Olmos, V. & Muñoz, G. (2006) Current State of Knowledge of Eumetazoan Parasites of Chilean Freshwater Ecosystems. *Gayana*, 70, 122–139.
- Pinhão, R., Wunderlich, A.C., Anjos, L.A. & Silva, R.J. (2009) Helminths of toad *Rhinella icterica* (Bufonidae), from the municipality of Botucatu, São Paulo State, Brazil. *Neotropical Helminthology*, 3, 35–40.
- Poulin, R. & Morand, S. (2004) *Parasite Biodiversity*. Smithsonian, Washington, DC., 216 pp.

- Pryor, G.S. & Greiner, E.C. (2004) Expanded geographical range, new host accounts, and observations of the nematode *Gyrinicola batrachiensis* (Oxyuroidea: Pharyngodonidae) in tadpoles. *Journal of Parasitology*, 90, 189–191.
<http://dx.doi.org/10.1645/GE-3136RN>
- Puga, S. (1994) Fauna helmintológica en anuros chilenos. *Boletín Chileno de Parasitología*, 49, 81–84.
- Ramallo, G., Bursey, C.R. & Goldberg, S.R. (2007a) *Chaunus arenarum* (Argentine Toad). Endoparasites. *Herpetological Review*, 38, 319–320.
- Ramallo, G., Bursey, C.R. & Goldberg, S.R. (2007b) Two new species of Cosmocercids (Ascaridida) in the toad *Chaunus arenarum* (Anura: Bufonidae) from Argentina. *Journal of Parasitology*, 93, 910–916.
<http://dx.doi.org/10.1645/ge-1131r.1>
- Ramallo, G., Bursey, C.R. & Goldberg, S.R. (2007c) Primer registro de *Oswaldocruzia proencai* (Nematoda: Molineoidea), parásito de *Rhinella schneideri* (Anura: Bufonidae) en Salta, Argentina. *Acta zoológica lilloana*, 51, 91–92.
- Ramallo, G., Bursey, C.R. & Goldberg, S.R. (2008) New species of *Aplectana* (Ascaridida: Cosmocercidae) in the toads, *Rhinella granulosa* and *Rhinella schneideri* (Anura: Bufonidae) from Northern Argentina. *Journal of Parasitology*, 94, 1357–1360.
<http://dx.doi.org/10.1645/GE-1422.1>
- Ramírez, V.G., Sueldo, C. & Mesones, R. (1979) Aportes sobre parásitos de *Bufo arenarum* de la Provincia de Salta. II. (Nematoda). *Neotropica*, 25, 1–90.
- Sanabria, E., Debandi, G., Quiroga, L., Martínez, F. & Corbalán, V. (2011) First record of the American Bullfrog *Lithobates catesbeianus* (Shaw, 1802) in Mendoza Province, Argentina. *Cuadernos de Herpetología*, 25, 55–58.
- Sánchez, S.M., Araque, G.A. & Gutiérrez-Cárdenas, P.D.A. (2010) The first report of *Cosmocerca parva* (Nematoda: Cosmocercidae) from *Colostethus fraterdanieli* (Anura: Dendrobatidae) in Colombia. *Phyllomedusa*, 9, 133–139.
<http://dx.doi.org/10.11606/issn.2316-9079.v9i2p133-139>
- Santos, J.N., Giese, E.G., Maldonado, A. & Lanfredi, R.M. (2008) A new species of *Oswaldocruzia* (Molineoidea: Nematoda) in *Chaunus marinus* (Amphibian: Bufonidae) (Linnaeus, 1758) from Brazil. *Journal of Parasitology*, 94, 264–268.
<http://dx.doi.org/10.1645/GE-1336.1>
- Santos, J.N., de Vasconcelos Melo, F.T., Silva do Nascimento, L.C., Batista do Nascimento, D.E., Guerreiro Giese, E. & Penha Furtado, A. (2011) *Rhabdias paraensis* sp. nov.: a parasite of the lungs of *Rhinella marina* (Amphibia: Bufonidae) from Brazilian Amazonia. *Memorias do Instituto Oswaldo Cruz*, 106, 433–440.
<http://dx.doi.org/10.1590/S0074-02762011000400008>
- Sarmiento, L., Tantaleán, M. & Huiza, A. (1999) Nemátodos parásitos del hombre y de los animales en el Perú. *Revista Peruana de Parasitología*, 14, 9–65.
- Savazzini, L.A. (1928) Nuevas especies de nematodos-cestodes y trematodes hallados en nuestro *Leptodactylus*. *Semana Médica*, 35, 24–28.
- Savazzini, L.A. (1930) Contribución al estudio de parásitos de los aparatos circulatorio y digestivo de nuestro *Leptodactylus ocellatus* (L.). Nuevas especies de nematodos, cestodes y trematodes. *Thesis*. Escuela Farmacia. Universidad del Litoral. Argentina, 43 pp.
- Schaefer, E.F., Hamann, M.I., Kehr, A.I., González, C.E. & Duré, M.I. (2006) Trophic, reproductive and parasitological aspects of the ecology of *Leptodactylus chaquensis* (Anura: Leptodactylidae) in Argentina. *Herpetological Journal*, 16, 387–394.
- Schuurmans Stekhoven, J.H. (1950) Nemátodos parasitarios del Chaco Paraguayo y de Argentina del Museo de Estocolmo. *Acta zoológica lilloana*, 9, 325–345.
- Schuurmans Stekhoven, J.H. (1952) Nemátodos parasitarios de anfibios, pájaros y mamíferos de la República Argentina. *Acta zoológica lilloana*, 10, 315–400.
- Silva, J.P., Melo, F.Y.V., Silva, D.C.B., Gonçalves, E.C., Giese, E.G., Furtado, A.P. & Santos, N.J. (2013a) Morphological and molecular characterization of *Ortleppascaris* sp. larvae parasite of cane toad *Rhinella marina* from eastern Amazonia. *Journal of Parasitology*, 99, 118–123.
<http://dx.doi.org/10.1645/ge-3203.1>
- Silva, J.P.E., da Silva, D.C.B., Melo, F.T.V., Giese, E.G., Furtado, A.P. & Santos, J.N. (2013b) Liver histopathology in the Cane Toad, *Rhinella marina* (Amphibia: Bufonidae), induced by *Ortleppascaris* sp. larvae (Nematoda: Ascarididae). *Journal of Parasitology*, 99, 250–256.
<http://dx.doi.org/10.1645/ge-3215.1>
- Souza-Lima, S., Marun, B., Alves, P.V. & Bain, O. (2012) *Ochoterenella esslingerii* n. sp. (Nematoda: Onchocercidae: Waltonellinae) from *Bokermannohyla luctuosa* (Anura: Hylidae) in Minas Gerais, Brazil, with notes on *Paraochoterenella Purnomo & Bangs, 1999*. *Parasite*, 19, 341–350.
<http://dx.doi.org/10.1051/parasite/2012194341>
- Sueldo, C. & Ramírez, V.G. (1976) Aportes sobre parásitos de *Bufo arenarum* en la provincia de Salta (Nematoda). *Neotropica*, 22, 105–106.
- Teixeira de Freitas, J.F. & Ibañez, N. (1965) Fauna Helmintológica do Peru: Alguns Nematodes Parásitos de *Bufo spinulosus limensis* (Werner). *Papéis Avulsos do Departamento de Zoologia, Secretaria da Agricultura, São Paulo, Brasil*, 17, 228–242.
- Teixeira de Freitas, J.F. & Lent, H. (1941) Contribuição ao estudo do gênero *Hedruris* Nitzsch, 1821 (Nematoda). *Papéis Avulsos do Departamento de Zoologia, Secretaria da Agricultura, Sao Paulo, Brasil*, 1, 121–142.

- Toledo, G.M., Fiorillo, B.F., Silva, R.J., Anjos, L.A. & Prado, C.P.A. (2013) Occurrence of *Ochoterenella digiticauda* (Nematoda: Onchocercidae) infecting the gladiator frog *Hypsiboas lundii* (Anura: Hylidae) in Brazil. *Herpetology Notes*, 6, 47–50.
- Travassos, L. (1935) Alguns novos gêneros e especies de Trichostrongylidae. *Revista Medicina Cirurgia Brasil*, 43, 345–361.
- Travassos, L. (1937) Revisão da Família Trichostrongylidae Leiper, 1912. Monografias. *Memorias do Instituto Oswaldo Cruz*, 1, 1–512.
- Vaira, M., Akmentis, M., Attademo, M., Baldo, D., Barrasso, D., Barrionuevo, S., Basoo, N., Blotto, B., Cairo, S., Cajade, R., Céspedes, J., Corbalán, V., Chilote, P., Duré, M., Falcione, C., Ferraro, D., Gutierrez, R., Ingaramo, M., Junges, C., Lajmanovich, R., Lescano, J., Marangoni, F., Martinazzo, L., Marti, R., Moreno, L., Natale, G., Pérez Iglesias, J., Peltzer, P., Quiroga, L., Rosset, S., Sanabria, E., Sanchez, L., Schaefer, E., Úbeda, C. & Zaracho, V. (2012) Categorización del estado de conservación de los anfibios de la República Argentina. *Cuadernos de Herpetología*, 26, 131–159.
- Van Sluys, M., Schittini, G.M., Marra, R.V., Azevedo, A.R.M., Vicente, J.J. & Vrcibradic, D. (2006) Body size, diet and endoparasites of the microhylid frog *Chiasmocleis capixaba* in an Atlantic Forest area of southern Bahia state, Brazil. *Brazilian Journal of Biology*, 66, 167–173.
<http://dx.doi.org/10.1590/s1519-69842006000100021>
- Vicente, J.J., Rodrigues, H.O., Gomes, D. & Pinto, R.M. (1990) Nematóides do Brasil. Parte II: Nematóides de Anfíbios. *Revista Brasileira de Zoologia*, 7, 549–626.
<http://dx.doi.org/10.1590/S0101-81751990000400015>
- Zaracho, V.H., Acosta, J.L. & Lamas, M.F. (2012) Dieta y parasitismo de *Leptodactylus diptyx* (Anura: Leptodactylidae) del nordeste argentino. *Revista Mexicana de Biodiversidad*, 83, 1180–1183.