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A new species of *Cosmocercoides* (Nematoda; Cosmocercidae) and other helminths in *Leptodactylus latrans* (Anura; Leptodactylidae) from Argentina

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Abstract: *Cosmocercoides latrans* n. sp. (Cosmocercidae) from the small intestine of *Leptodactylus latrans* (Anura: Leptodactylidae) from Northeastern Province of Buenos Aires, Argentina is described. The new species can be distinguished from their congeners by a combination of the characters, among which stands out the number of rosette papillae, the lack of gubernaculum and the presence of lateral alae in both sexes. There are over 20 species in the genus *Cosmocercoides*, and *Cosmocercoides latrans* n. sp. represents the third species from the Neotropical realm and the second for Argentina. Additionally, seven previously known taxa are reported; *Pseudoacanthocephalus* cf. *lutzi*, *Catadiscus uruguayensis*, *Rauschiella palmipedis*, *Aplectana hylambatis*, *Cosmocerca parva*, *Schrankiana* sp. and *Rhabdias elegans*; providing literature records and information on distribution and host-parasite relationships.

Key words: helminths, *Leptodactylus latrans*, *Cosmocercoides latrans* n. sp., anura, Argentina.

INTRODUCTION

Previous reports of endoparasites in *Leptodactylus latrans* (Steffen, 1815) have been summarized in checklists from South America (Campião et al. 2014, Fernandes & Kohn 2014) and Argentina (González & Hamann 2015). These reports, mainly as isolated records of a taxonomic nature, include several species of acanthocephalans, digeneans, cestodes and nematodes parasitizing this large frog species. The criolla frog, as it is commonly known, inhabits flooded fields and temporary or permanent shallow ponds and is also common to find in periurban places and crops. It is widely distributed in South America, being present in Trinidad and Tobago, Colombia, southern

Venezuela, the savanna areas of Guyana, Brazil, northeastern Bolivia, eastern Paraguay, Argentina, and Uruguay (Heyer et al. 2010). Being an opportunistic feeder, its diet is generalist and determined by the availability of prey in the environment (Duellman & Trueb 1994).

Among nematodes, is frequent to find specimens belonging to Cosmocercidae. Members of this family are parasites of the digestive tract of amphibians and reptiles. It includes the Subfamily Cosmocercinae Railliet, 1916 that contains 9 genera: *Cosmocerca* Diesing, 1861, *Aplectana* Railliet & Henry, 1916, *Oxysomatium* Railliet & Henry, 1916, *Cosmocercella* Steiner, 1924, *Raillietnema* Travassos, 1927, *Oxyascaris* Travassos, 1920, *Cosmocercoides* Wilkie, 1930 *Paradollfusnema*

Baker, 1982 and *Neocosmocercella* Baker & Vaucher, 1983 (Burse et al. 2011).

The genus *Cosmocercoides* includes species that commonly parasitize amphibians and reptiles, but also occasionally occur in land snails and slugs (Chen et al. 2018). The aims of the present work are (1) to describe a new species of *Cosmocercoides* and (2) to increase the knowledge of the diversity of helminth parasites of the Criolla frog, *L. latrans*.

MATERIALS AND METHODS

Forty-eight *L. latrans* (15 females, 23 males, 10 sexually undifferentiated) were captured by active search at night using the visual encounter survey technique (REV) (Crump & Scott 1994) between 2011 and 2012 in the surroundings of La Plata city, Buenos Aires Province, Argentina with authorization of the Dirección de Flora y Fauna, M.A.A.BA (Exp n° 225500-11319/10). The frogs were transported alive to the laboratory, then euthanized with an overdose of 20% benzocaine, and all organs were examined using a Stemi 2000-C Zeiss stereoscope.

Helminths were fixed in 5% formalin and preserved in 70% ethyl alcohol. Trematodes were stained with a 1:6 dilution in 96% ethanol of hydrochloric carmine, dehydrated, cleared in xilol and mounted in Canada balsam. Acanthocephalans and nematodes were cleared in Aman's lactophenol and examined as temporary mounts. The systematic determination of the helminths was carried out following specific keys (Yamaguti 1961, 1963, Petrochenko 1971a, b, Anderson et al. 1974, Gibson et al. 2002, Jones et al. 2005, Bray et al. 2008) and drawings were made with the aid of a drawing tube. Measurements are given in micrometres (μm) unless otherwise stated, as the mean followed by the standard deviation,

and the range in parentheses. The values of prevalence, mean intensity and intensity of infection were calculated following the criteria given by Bush et al. (1997).

For scanning electron microscopy (SEM), helminths were dehydrated in a series of alcohols (70 °, 80 °, 90 °, 95 ° and 100 °), dried by the critical point method (Baltec CP-30), metallized with a gold-palladium bath (Metallizer: JEOL Finecoat ion sputter JFC1100) and then photographed with an Electronic Scanner Microscope Jeol® JSV 6063 LV from the La Plata Museum. Helminths were deposited in the Helminthological Collection of the Museo de La Plata (MLP-He).

RESULTS

Of the 48 frogs examined, 34 (71 %) were infected with at least one parasite. Eight helminth taxa (one acanthocephalan, two digeneans and five nematodes) were found.

Cosmocercidae (Raillet, 1916) Travassos, 1925

Cosmocercoides latrans n. sp. (Figs. 1-2)

Type host: *Leptodactylus latrans* (Steffen, 1815), Criolla Frog (Leptodactylidae).

Site of infection: small intestine.

Type locality: Establecimiento Santa Ana (35°02'23, 2''S; 57°48'58, 2''W), Buenos Aires, Argentina.

Type material: Holotype MLP-He 7626; Allotype MLP-He 7627; Paratypes, MLP-He 7628, 7629.

Voucher specimens: MLP-He 76230.

Prevalence, mean intensity and intensity of infection: 4% (2 of 48), 79.5 \pm 35.7 (29-130), 159.

Etymology: The specific name refers to the specific name of the host where the specimens were found.

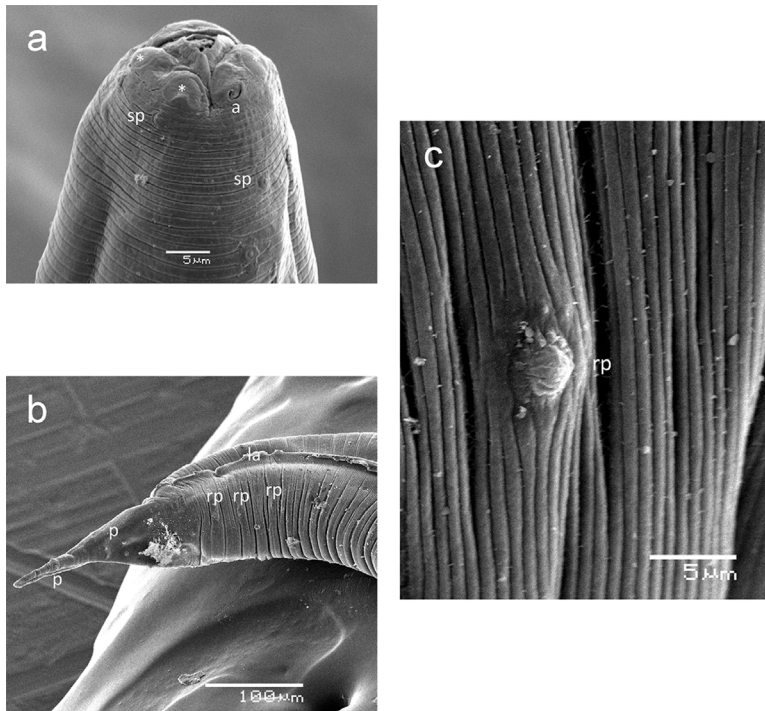


Figure 1. Scanning electron micrographs of *Cosmocercoides latrans* n. sp. a- Male anterior end. b- Male posterior end, ventrolateral view. c- Detail of the rosette papilla. Abbreviations: *= cephalic papilla; a= amphid; la= lateral alae; sp= somatic papilla; p= postcloacal papillae; rp= rosette papilla.

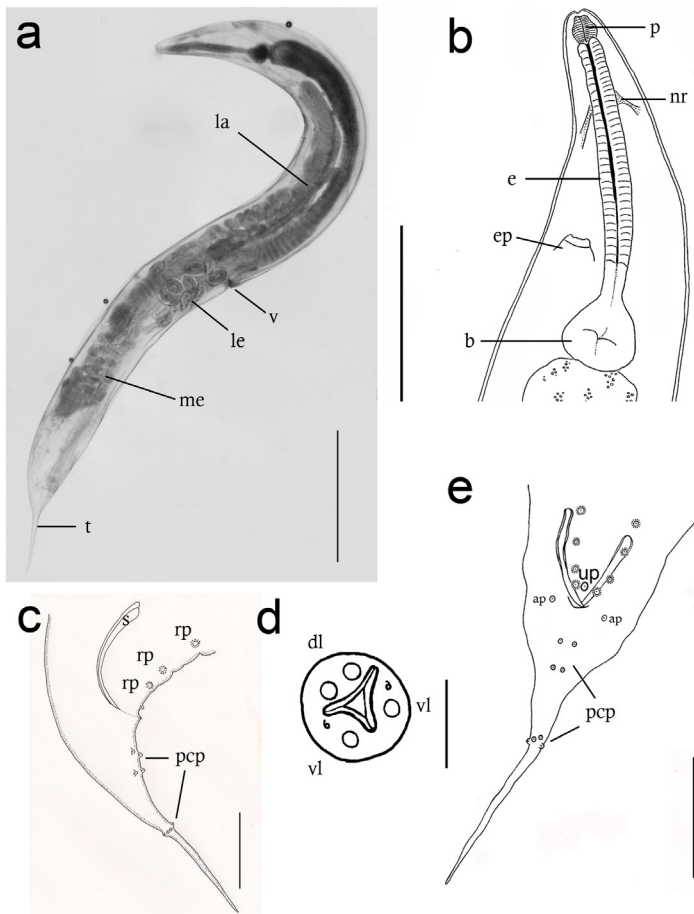


Figure 2. *Cosmocercoides latrans* n. sp. a- Female, general view. b- Female anterior end, lateral view. c- Male posterior end, lateral view. d- Male, in face view. e- Male, posterior end, ventral view. Abbreviations: ap= adcloacal papilla; b= bulb; dl= dorsal lip; e= esophagus; ep= excretory pore; la= lateral alae; le= larvated egg; nr= nerve ring; p= pharynx; me= morulated egg; pcp= postcloacal caudal papillae; rp= rosette papilla; s= spicule; t=tail; up= unpaired papilla; v= vulva; vl= ventral lip. Scale bars: A= 600 μm; B= 241.5 μm; C =100 μm; D= 40 μm; E= 500 μm.

Description

General morphology: Small, stout nematodes. Sexual dimorphism evident, males half-length of females. Lateral alae present in both males and females, extending from the anterior esophageal region to the tail. Cuticle transversely striated, somatic papillae present. Mouth with three prominent lips, dorsal lip with two sessile papillae, each ventrolateral lip with one ventral sessile papilla and one lateral amphid. Shallow mouth cavity, short pharynx, cylindrical corpus, short isthmus and valved bulb present. Excretory pore anterior to esophageal bulb.

Male (holotype and 14 paratypes, 6 specimens studied by SEM): Length 2.17 ± 0.37 (1.48-2.68 mm); width at midbody 0.26 ± 0.06 (0.19-0.37mm). Esophagus: pharynx 34.71 ± 3.82 (28.56-45.22) by 23.23 ± 6 (16.6-43), corpus 284.24 ± 26.6 (250-338), isthmus 43.6 ± 6.9 (35.7-59.5), bulb length 74.37 ± 6.17 (59.5-83.3), bulb width 81.78 ± 9.12 (66.64-102.34). Nerve ring 148.38 ± 17.87 (119-192.78) and excretory pore 290.35 ± 40.72 (230.86-347.76) from anterior end. Tail 284.93 ± 46.23 (178.5-364.14) long, tapering to sharp point. Spicules robust, equal (95.2-154.7) long. Gubernaculum absent. Caudal papillae in the following arrangement: 3-4 pairs of precloacal rosette papillae, ventral and arranged in two rows; 1 pair of simple adcloacal papillae and 1 unpaired papilla on the anterior border of the cloaca, 2 pairs of simple and ventral postcloacal papillae in the middle region of the tail and 2 pairs defining a long and acute tip-tale, ventrolateral in position (6-8:3:8). Each rosette papillae presented one circle of punctuations around the central papillae.

Female (allotype and 19 paratypes): Length 3.76 ± 0.5 (2.63-4.59 mm); width at vulva 0.35 ± 0.05 (0.24-0.45 mm). Esophagus: pharynx 37.24 ± 3.11 (33.32-47.6) by 31.78 ± 5.89 (19.04-45.22), corpus 319.34 ± 27.08 (252.59-362.25), isthmus 44.8 ± 4.4 (35.7-50), bulb length 98.65 ± 11.67 (76.16-131),

bulb width 106.5 ± 15.36 (78.54-142.8). Nerve ring 150.13 ± 32.65 (95.2-265.65) and excretory pore 331.13 ± 45.54 (217.35-406.14) from anterior end. Vulva 2 ± 0.35 (1.4-2.75 mm from anterior end; 50 % of body length from anterior end). Tail long and sharp 408.4 ± 61.26 (252.28-483) in length. Eggs, oval, thin-shelled and in different stages of development; eggs near vulva containing fully developed larvae 84.67 ± 6.66 (73.78-98.5) long and 48.67 ± 8.14 (33.08-73.78) wide.

***Aplectana hylambatis* (Baylis, 1927) Travassos, 1931 (Fig. 3a, b, c)**

Site of infection: Small and large intestine.

Prevalence, mean intensity and intensity of infection: 4.2% (2 of 48), 7.5 ± 4.6 (1-14), 23.

Voucher specimens: MLP-He 7631.

Other reported hosts and geographic range in South America: *Aplectana hylambatis* is a generalist species that parasitizes a wide range of amphibian hosts. In the Neotropical region, has been observed in different countries (Peru, Paraguay, Uruguay, Brazil) and anuran families, for example, Bufonidae, Ceratophrydae, Hylidae, Leptodactylidae, Leuperidae and Microhylidae (González et al. 2013, Campião et al. 2014, 2016, Aguiar et al. 2015). In Argentina, it is the species of parasitic nematodes of amphibians with the greatest geographical distribution and was found parasitizing Bufonidae, Leptodactylidae and Hylidae from Buenos Aires, Córdoba, Corrientes, Formosa, Salta and San Juan Provinces (González et al. 2013, González & Hamann 2015, Draghi et al. 2015).

Remarks: For the specific identification we consider the review of the genus *Aplectana* carried out by Baker (1980) and the subsequent synonyms and descriptions performed by Baker & Vaucher (1986), González et al. (2013) and Piñeiro Gomez et al. (2017).

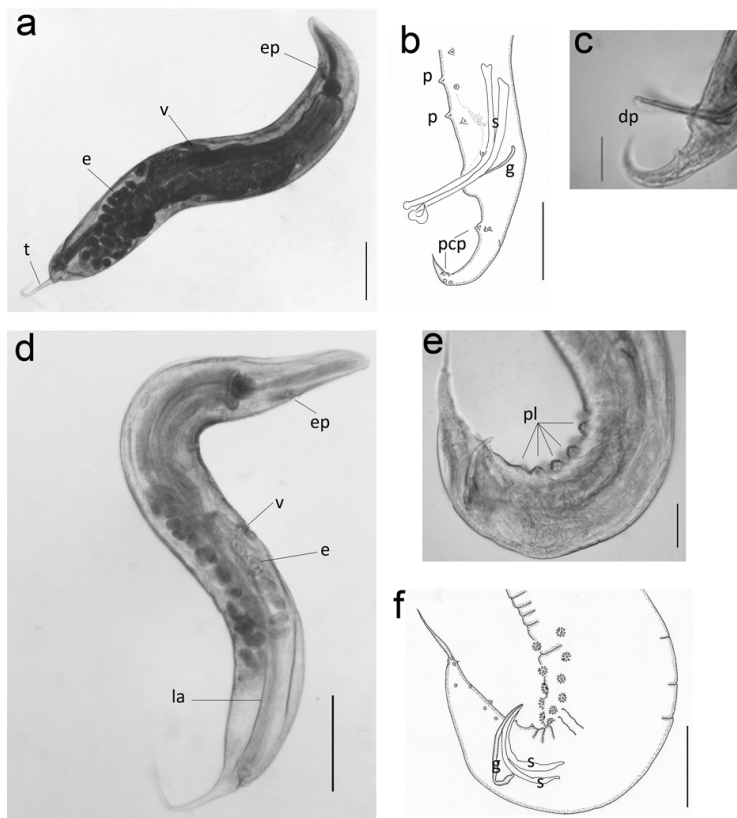


Figure 3. Microphotograph of a- *Aplectana hylambatis* female, general view. b, c- *A. hylambatis* male, posterior end lateral views. d- Microphotograph of *Cosmocerca parva* female, general view. e, f- *C. parva* male, posterior end lateral views. Abbreviations: dp= distal portion of the spicule; e= egg; ep= excretory pore; g= gubernaculum; la= lateral alae; p= papilla; pcp= postcloacal papillae; pl= plectanes; s= spicule; t= tail; v= vulva. Scale bars: A= 600 μ m; B, F=100 μ m; C= 70 μ m; D= 300 μ m; E= 50 μ m.

The arrangement of the caudal papillae in males (6-8: 4+1: 8) as well as the characteristic morphology of the spicules with a distal portion, the size of the spicules and gubernaculum (221.3 and 71.4, respectively) and the postecuatorial vulva with festooned edges allowed the identification. The finding of *A. hylambatis* parasitizing *L. latrans* represents a new host record for Argentine amphibians.

Cosmocerca parva Travassos, 1925 (Fig. 3d, e, f)

Site of infection: Small and large intestine.

Prevalence and intensity of infection: 2 % (1 of 48), 23.

Voucher specimens: MLP-He 7632.

Other reported hosts and geographic range in South America: *Cosmocerca parva* was originally described parasitizing *Hylodes nasus* (Lichtenstein, 1823) (Anura, Hylodidae) (cited as *Elosia nasus*) from Angra dos Reis, Rio de

Janeiro, Brazil. Since its original description, it has been found parasitizing several amphibian species from Argentina, Brazil, Colombia, Guyana, Paraguay, and Peru (see Campião et al. 2014). In our country, has been found parasitizing 14 amphibian species included in Bufonidae, Odontophrynidae, Hylidae and Leptodactylidae, constituting one of the most common nematode species found parasitizing amphibians (González & Hamann 2015). All reports were made in the Province of Corrientes (Mordeglia & Digiani 1998, González & Hamann 2006, 2009, 2011, 2016, Hamann et al. 2006b, 2010, Schaefer et al. 2006). **Remarks:** The presence of the lateral alae, the arrangement of the plectanes and papillae (5-6 pairs of precloacal papillae, 2-4 pairs of adcloacal plus 1 unpaired papilla on the anterior lip of the cloaca and 5 pairs of post-cloacal) and the size of the spicules and gubernaculum (104 and 63, respectively) allowed the allocation of our

specimens to the species *C. parva*. The rest of the morphometric characters are also consistent with those established for the species in other hosts (see Baker & Vaucher 1984, Vicente et al. 1991, Mordeglia & Digiani 1998, González & Hamann 2006, 2007), with some differences that are considered as intraspecific variations. For example, the variability in the number of plectanes (5-7) and cloacal papillae and the absence of the unpaired papilla anterior to the rows of plectanes reported by Mordeglia & Digiani (1998).

This is the first record of this species from Buenos Aires Province, and constitutes the first time this species is found parasitizing *L. latrans* in Argentina, given that it was previously reported parasitizing this host species in Brazil (Santos & Amato 2013).

Atractidae (Railliet, 1917) Travassos, 1919

Schrankiana sp. (Fig. 4a, b, c)

Site of infection: Small and large intestine.

Prevalence and intensity of infection: 2 % (1 of 48), 25.

Voucher specimens: MLP-He 7633.

Other hosts and geographic range in South America: Members of the genus *Schrankiana* have been reported parasitizing almost exclusively South American leptodactylids. At present eight species are known, two of them in Argentina: *S. schranki* found parasitizing *Leptodactylus latinasus* Jiménez de la Espada, 1875, and *S. chacoensis* described from *Leptodactylus bufonius* Boulenger, 1894 (Hamann et al. 2006b, González & Hamann 2014).

Remarks: The specimens here studied were located in the genus *Schrankiana* owing to the monodelphic condition of the females, and the shape of spicules in the male (short and robust). Also, the esophagus is of cosmocercid type, with an entirely muscular corpus, a marked isthmus

and a bulb with chitinous valves. Species of the genus *Schrankiana* are very similar, and can only be distinguished by metric characters such as the esophagus total length, the size of the vagina, cephalic morphological characters, lateral wing extension, vulva location, and male caudal characteristics (papillae and spicules) (Baker & Vaucher 1988).

More studies are needed to properly describe the cephalic morphology and the pattern of caudal papillae of males of the specimens here found. The present record is the first one of this genus parasitizing amphibians in Buenos Aires Province, Argentina.

Rhabdiasidae Railliet, 1915

Rhabdias elegans Gutiérrez, 1945 (Fig. 5d)

Site of infection: Lungs.

Prevalence, mean intensity and intensity of infection: 10.4 % (5 of 48), 1.4 ± 0.18 (1-3), 7.

Voucher specimens: MLP-He 7634.

Other hosts and geographic range in South America: *Rhabdias elegans* was originally described by Gutiérrez (1945) from specimens collected from the lungs of *R. arenarum* from Buenos Aires Province, Argentina. It has subsequently been found in several amphibian hosts of the Neotropical realm (for a list of host species for *Rhabdias* spp. see Draghi et al. 2015). In Argentina, it has been also found parasitizing *R. arenarum* from Salta (Sueldo & Ramírez 1976), *Rhinella major* (Müller & Hellmich 1936) from Chaco and Formosa Provinces (Hamann & González 2015) and *Rhinella diptycha* (Cope, 1862), *L. bufonius* and *Odontophrynus americanus* (Duméril & Bibron, 1841) from Corrientes Province (González & Hamann 2006, 2008, 2009, Hamann et al. 2012).

Remarks: Three species of *Rhabdias* from the Neotropical region lack lip structures: *R. elegans*, *Rhabdias alabialis* Kuzmin, Tkach &

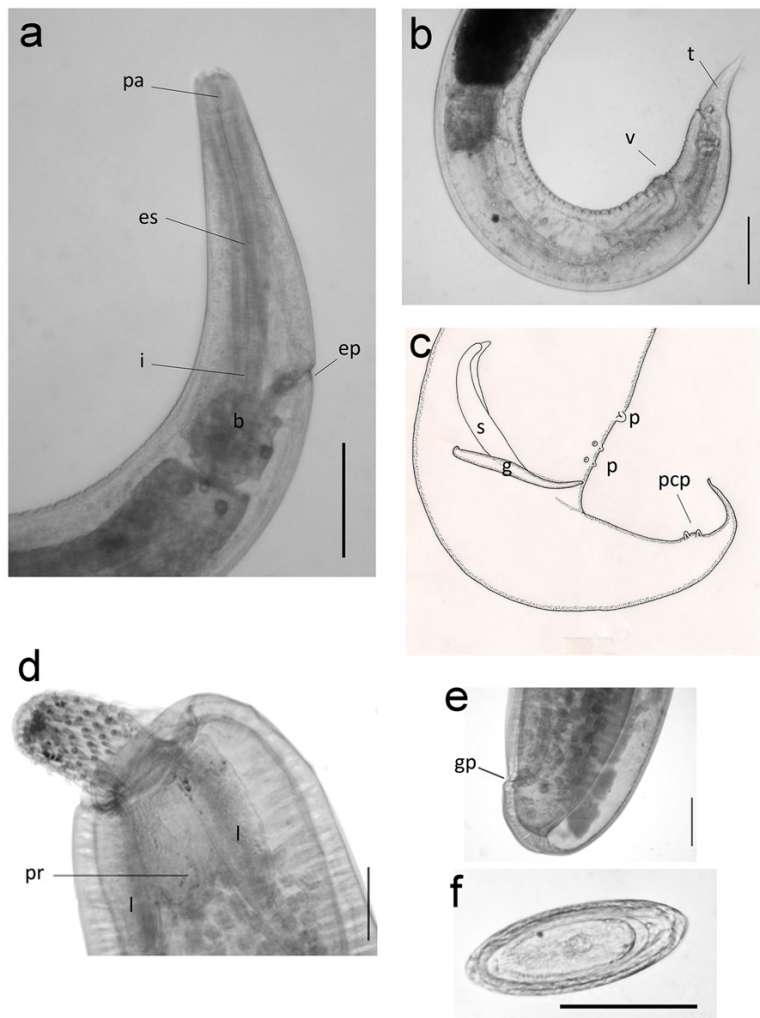


Figure 4. *Schrankiana* sp. a- Microphotograph of female anterior end, lateral view. b- Microphotograph of female posterior end, lateral view. c- Male posterior end, lateral view. *P. cf. lutzi* d- Microphotograph of female anterior end, lateral view. e- Microphotograph of female posterior end, lateral view. f- Egg. Abbreviations: b= bulb; ep= excretory pore; es= esophagus; g= gubernaculum; gp= genital pore; i= isthmus; l= lemnisci; s= spicule; p= papilla; pa= pharynx; pcp= postcloacal papillae; pr= proboscis receptacle; t= tail; v= vulva. Scale bars: A, B, C= 100 μ m; D=300 μ m; E= 300 μ m; F= 50 μ m.

Brooks, 2007 and *Rhabdias paraensis* Santos, Melo, Nascimento, Nascimento, Giese & Furtado, 2011. They are easily distinguished since *R. alabialis* presents a prominent dilatation in the middle portion of the muscular esophagus, a triangular buccal capsule in apical view and the vulva in equatorial position (Kuzmin et al. 2007), and *R. paraensis* presents conspicuous papillae in the cephalic region (Santos et al. 2011). The specimens here studied agree morphologically and morphometrically with those of *R. elegans* reported parasitizing Argentine amphibians because of the body length 3 (2.4-4) mm, absence of labial structures, cylindrical esophagus 440

(386-512), slightly post-equatorial position of the vulva and egg size (90-102 x 47-48).

The finding of *R. elegans* parasitizing *L. latrans* represents a new host record for this nematode species.

Echinorhynchidae Cobbold, 1876

Pseudoacanthocephalus cf. *lutzi* (Hamann, 1891) Arredondo & Gil de Pertierra, 2009 (Fig 4d, e, f)

Site of infection: Small and large intestine.

Prevalence, mean intensity and intensity of infection: 10.4 % (5 of 48), 4.2 ± 0.93 (1-12), 21

Voucher specimens: MLP-He 7635.

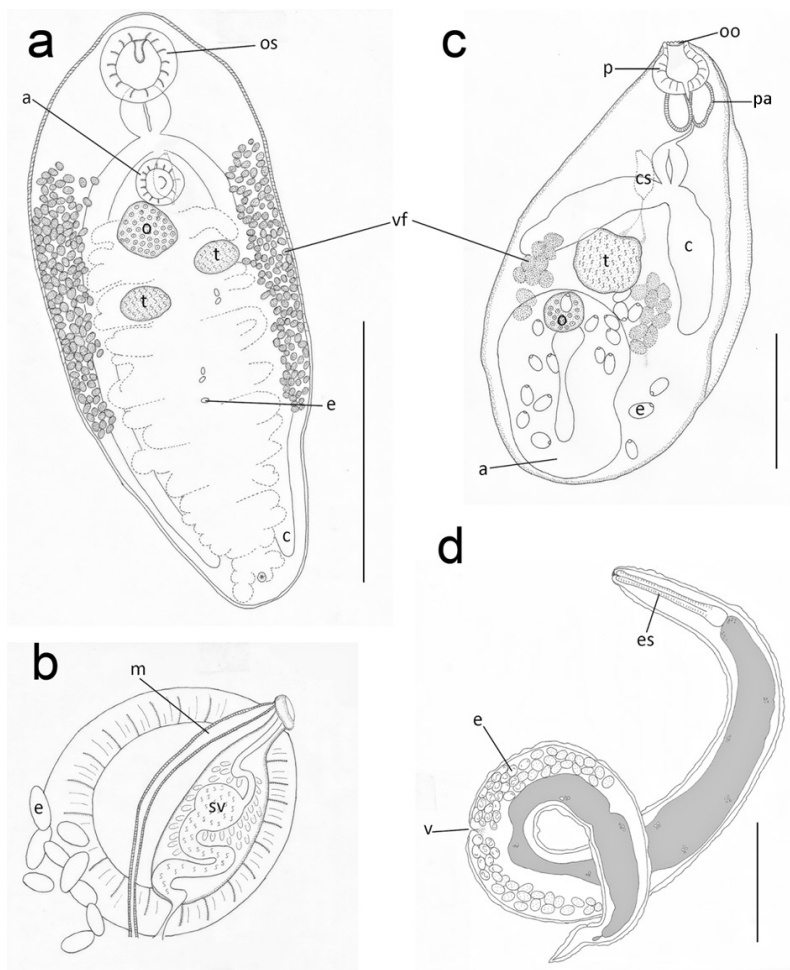


Figure 5. *Rauschiella palmipedis* a-ventral view. b- Detail of the cirrus sac. c- *Catadiscus uruguayensis*, ventral view. d- *Rhabdias elegans*, general view. Abbreviations: a= acetabulum; c= ceca; cs= cirrus sac; e= egg; es= esophagus; m= metraterm; o= ovary; oo= oral opening; os= oral sucker; p= pharynx; pa= pharynx appendages; sv= seminal vesicle; t= testis; v= vulva; vf= vitelline follicles. Scale bars: A-500 μ m; B= 50 μ m; C= 500 μ m; D=50 μ m.

Other reported hosts and geographic range in South America: In South America *P. lutzi* has been recorded on numerous occasions parasitizing amphibians and reptiles from Uruguay (Cordero 1933), Peru (Tantaleán 1976, Tantaleán et al. 2005, Chero et al. 2016), Brazil and Paraguay (Smales 2007, Santos & Amato 2010). In Argentina, it was found parasitizing *R. arenarum* in Buenos Aires and Entre Ríos Provinces (Lajmanovich & Martínez de Ferrato 1995, Arredondo & Gil de Pertierra 2009), and *Physalaemus biligonigerus* (Cope, 1861) from Córdoba Province (Gutiérrez et al. 2005).

Remarks: Although the totality of the specimens recovered from *L. latrans* were females, characteristics such as the cylindrical trunk without spines, widened in the anterior

region and rounded at its posterior end (6 x 1.05 mm); the cylindrical proboscis, with 16 longitudinal and alternating rows of 5-6 hooks each, progressively increasing in size towards the base; the cylindrical proboscis receptacle, with a double wall and cerebral ganglia near its base; digitiform to claviform lemnisci, not much longer than the receptacle; genital apparatus occupying an average of 9.9% of the total length of the trunk and composed of an uterine bell, uterus and vagina; ovoid eggs without polar extensions and the ventral and subterminal genital pore, allowed the identification.

The finding of *P. cf. lutzi* is the first record of this genus parasitizing *L. latrans*.

Diplodiscidae Cohn, 1904

Catadiscus uruguayensis Freitas & Lent, 1939 (Fig. 5c)

Site of infection: Small and large intestine.

Prevalence, mean intensity and intensity of infection: 18.8 % (9 of 48), 4.78 ± 0.43 (1-13), 43.

Voucher specimens: MLP-He 7636..

Other hosts and geographic range in South America:

C. uruguayensis was previously reported parasitizing amphibians from Uruguay (*L. latrans*) and Brazil (*L. latrans*, *Lysapsus limellum* Cope, 1862) (Freitas & Lent 1939, Freitas 1960 Travassos & Freitas 1964). In Argentina, was found parasitizing five host species: *Boana pulchella* (Duméril & Bibron, 1841) (cited as *Hypsiboas pulchellus*), *L. latrans* (cited as *Leptodactylus ocellatus*), *Pseudis minuta* Günther, 1858 (cited as *Lysapsus mantidactylus*) and *Erythrolamprus poecilogyrus* (Wied-Neuwied, 1825) (Squamata, Colubridae) from different locations in the Buenos Aires Province; and *Pithecopus azureus* (Cope, 1862) (cited as *Phyllomedusa azurea*) from the Province of Chaco (Suriano 1970, Ostrowski de Núñez 1978, Lunaschi & Drago 2002, 2010).

Remarks: The specimens found in the present study respond, morphologically and morphometrically, to the descriptions of *C. uruguayensis* from *L. latrans* in Uruguay (Freitas & Lent 1939) and *L. latrans*, *B. pulchella* and *P. minuta* from Buenos Aires, Argentina (Suriano 1970, Ostrowski de Núñez 1978).

Macroderoididae McMullen, 1937

Rauschiella palmipedis (Lutz, 1928) Sullivan, 1977 (Fig. 5a, b)

Site of infection: Large and small intestine.

Prevalence, mean intensity and intensity of infection: 35.4% (17 of 48), 2.88 ± 0.15 (1-10), 45.

Voucher specimens: MLP-He 7637.

Other hosts and geographic range in South America:

Rauschiella palmipedis has been found

parasitizing amphibians belonging to Bufonidae, Leptodactylidae, Hylidae and Ranidae from Brazil, Costa Rica, Venezuela, Paraguay, Uruguay and Argentina (Sullivan 1977, Fernandes & Kohn 2014). In Argentina it was found parasitizing *L. latrans* from Buenos Aires Province (Savazzini 1930, Suriano 1970), *Leptodactylus chaquensis* Cei, 1950 and *Rhinella fernandezae* (Gallardo, 1957) from Corrientes Province (Hamann et al. 2006a, 2013, Schaefer et al. 2006) and *Melanophryniscus klappenbachi* Prigioni & Langone, 2000 from Chaco Province (Hamann et al. 2014).

The specimens found in the present study agree morphologically and morphometrically with the descriptions of *R. palmipedis* made by Savazzini (1930) and Sullivan (1977) in *L. latrans*, and reports in other hosts (such as Suriano 1970).

DISCUSSION

The genus *Cosmocercoides* can be distinguished from other genera of Cosmocercinae by the morphology of the male's caudal papillae, described as rosette papillae without plectanas. In contrast, in the genus *Cosmocerca* the rosette papillae arise prominently of the cuticular surface, and are accompanied by plectanes. Males of the genera *Cosmocercella* and *Neocosmocercella* present vesiculated papillae; and those of *Paradollfusnema*, *Raillietnema*, *Aplectana*, *Oxyascaris* and *Oxysomatium* have short and mamiliform papillae (Anderson et al. 1974, Bursey et al. 2011). The rosette papillae present in males of *Cosmocercoides* are formed by circles of punctuations which do not protrude from the cuticular surface (González et al. 2012). In the specimens described in this study, this feature was confirmed by scanning electron microscope study.

At present, there are 25 nominal species of *Cosmocercoides* worldwide (Burseley et al. 2015, Chen et al. 2018, Tran et al. 2015). These species can be distinguished by combinations of male characters, among which that stand out the pattern of caudal papillae, the presence/absence of lateral alae (in both sexes), somatic papillae and gubernaculum, and the length of spicules, gubernaculum and tail (Burseley et al. 2015).

Among *Cosmocercoides* species, only three shares with *C. latrans* n. sp. the absence of gubernaculum. These species are *Cosmocercoides lilloi* Ramallo, Bursey & Goldberg, 2007 found parasitizing *Rhinella arenarum* (Hensel, 1867) from Salta Province, Argentina; *Cosmocercoides kumaoni* Arya, 1991 found parasitizing *Euphlyctis cyanophlyctis* (Schneider, 1799) (cited as *Rana cyanophlyctis*) from India and *Cosmocercoides microhylae* (Wan, Zhao & Chen, 1978) Baker, 1987 found parasitizing *Microhyla ornata* (Duméril & Bibron, 1841) from China. *Cosmocercoides lilloi* differs from the new species by lacking lateral alae and because its males possess a different pattern of caudal rosette papillae of 18-19:0:10 (precloacal: adcloacal: postcloacal). Also, the unpaired papilla on the anterior lip of the cloaca is not present (Ramallo et al. 2007). The specimens of *C. kumaoni* and *C. microhylae* present lateral alae but can be easily distinguished from *C. latrans* n. sp. by their shorter tail (130-150 and 157) and rosette papillae pattern, 24:2:10 and 20:0:0, respectively (Wang et al. 1978, Arya 1991).

Eleven *Cosmocercoides* spp. were reported in the Oriental Region, seven in the Sino-Japanese Region, three in the Nearctic Region, two in the Palaearctic Region and two in the Neotropical Region (Burseley et al. 2015, Chen et al. 2018, Tran et al. 2015). Of those in the Neotropical region *Cosmocercoides sauria* Ávila, Strussmann & da Silva, 2010 was found parasitizing the

gymnophthalmid lizard *Iphisa elegans* Gray, 1851 in Brazil. *Cosmocercoides sauria* has 4 pairs of precloacal rosette papillae, but unlike the species here described, the males of *C. sauria* possesses gubernaculum and compared with the species here described are smaller (1.3 vs. 1.48-2.68) and have a shorter tail (54 vs. 178.5-364.14) (Ávila et al. 2010). The second species from this region, *C. lilloi*, was compared above.

The species here described present a pattern of caudal papillae of 6-8:3:8, which is not known for any species of the genus previously reported. This pattern allows us to conclude that it is a new species for science. *Cosmocercoides latrans* n. sp. represents the third species of the genus to be reported from Neotropical hosts, and the second one for Argentina.

The current identification of *Cosmocercoides* species remains mainly based on traditional methods, but, due to the similarity in their morphological characters, it is not easy to identify and distinguish some of them. To accomplish, recently authors as Tran et al. (2015) and Chen et al. (2018) have proposed the use of molecular techniques to sequence and analyze DNA. Unfortunately, it was not possible to apply these techniques in our material due to the specimens were originally fixed in formalin.

The life cycle of the new species is unknown, although according to studies carried out with *Cosmocercoides varibilis* (Harwood, 1930), the female lay eggs which develop into first stage larvae in the external environment, and molt twice to the infective third stage larvae, before they infect the host via skin penetration (Anderson 2000). Regarding other helminth species found parasitizing the criolla frog in our study, they are generalist species with an aquatic and indirect life cycle (*P. cf. lutzi*, *C. uruguayensis*, *R. palmipedis*), as well as nematodes species with direct life cycle (*C. latrans* n. sp., *A. hylambatis*, *C. parva*, *R. elegans*

and *Schrankiana* sp.). Habitat and mobility (water-ground) of the host, associated with the search for prey and parental care of the foam nest, could favor the penetration of the infective stages of the helminths, resulting in a richer and diverse parasitic community (Hamann et al. 2013).

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RD collected the data, made the figures, and led the writing of the manuscript. All authors participated in the description of the specimens and the revision of the manuscript critically content, approving the final version submitted for publication.

