FIRST REPORT OF NEMATODE PARASITES OF PHYSALAEMUS ALBONOTATUS (STEINDACHNER, 1864) (ANURA: LEIUPERIDAE) FROM CORRIENTES, ARGENTINA

Cynthya Elizabeth González & Monika Inés Hamann

Abstract

Thirty-four adults of Physalaemus albonotatus (20 males and 14 females) were collected near the city of Corrientes, Province of Corrientes, Argentina (27°28’S - 58°50’W) between January 2001 and September 2004. A total of four nematode species in adult stage, Strongyloides sp., Oswaldocruzia sp., Cosmocerca podicipinus, Cosmocerca parva and two species in larval stage, Spiroxys sp. and Physaloptera sp. were recovered from the digestive tract, lungs and gastric mucosa. We present morphologic characters (some of them with scanning electron microscopy), metric information and range extensions for these nematode species. This is the first report of nematode parasites of P. albonotatus from Argentina.

Key words: Amphibians - Argentina - Corrientes - nematode parasites - Physalaemus albonotatus.

Resumen

Treinta y cuatro adultos de Physalaemus albonotatus (20 machos y 14 hembras) fueron colectados en las proximidades de la ciudad de Corrientes, provincia de Corrientes, Argentina (27°28’S - 58°50’W) entre enero del 2001 y septiembre del 2004 para el estudio de su fauna nematológica. Un total de cuatro especies de nemátodos en estado adulto Strongyloides sp., Oswaldocruzia sp., Cosmocerca podicipinus, Cosmocerca parva y dos especies en estado larval, Spiroxys sp. y Physaloptera sp., fueron halladas en el tracto digestivo, pulmón y mucosa gástrica. En este estudio se presentan datos métricos y morfológicos de las especies halladas (algunos de ellos observados con microscopio electrónico de barrido). Éste es el primer reporte de nemátodos parásitos para P. albonotatus en Argentina.

Palabras clave: anfibios - Argentina - Corrientes - nemátodos parásitos, Physalaemus albonotatus.
INTRODUCTION

The nematode parasites of Argentinean amphibians were analyzed mainly for bufonids from northwestern (Ramallo et al., 2007a, b, 2008) and for leptodactylids and bufonids from northeastern (González & Hamann, 2006a, b, 2007a, b, 2008, 2009; Hamann et al., 2006a, b), while in the family Leiuperidae were made few studies of this topic. To our knowledge, in Argentina, the following leiuperids has been studied for nematode fauna: Physalaemus biligonigerus (Cope, 1861) from Cordoba province (Gutiérrez et al., 2005) and, Pseudopaludicola falcipes (Hensel, 1867), P. boliviana Parker, 1927 and Physalaemus santafecinus Barrio, 1965 from Corrientes province (Duré et al., 2004; González & Hamann, 2004, 2009, 2010a). About the species Physalaemus albonotatus (Steindachner, 1864) this study is absent. Thus, the purpose of the present study is to report for the first time nematode species that found in adults specimens of P. albonotatus from Corrientes, Argentina.

This amphibian is found in Mato Grosso and Mato Grosso do Sul (Brazil), Paraguay, and the Chacoan regions of Bolivia and Argentina (Frost, 2011). In Argentina is common in natural environments but it can also be found in agricultural areas (Duré et al., 2008). It can survive in both dry and moist substrata, i.e. near to the shore of temporary, semipermanent and permanent ponds, and also in the flooded grass. It has a diet dominated by formicids and isopterans and using an active foraging as strategy for prey capturing (Duré, 2004). There are no major threats to this species, is categorized as Least Concern by Aquino et al. (2004).

We described for the first time five genus of nematode parasites found in different organs of this amphibian host and presented new metrical and morphological data obtained with scanning electron microscopy.

MATERIAL AND METHODS

Thirty-four adults of P. albonotatus (20 males and 14 females) were collected near the city of Corrientes, Province of Corrientes in Argentina (27°28'S - 58°50'W) between January 2001 and September 2004. Frogs were hand-captured, mainly at night, using the sampling technique defined as “visual encounters survey” (Crump & Scott, 1994). Amphibians were transported live to the laboratory, killed in a chloroform (CHCL₃) solution. At necropsy, hosts were sexed (determined by examination of gonads and external nuptial features), and the alimentary canal, lungs, liver, kidneys, urinary bladder, musculature and integument examined for parasites by dissection. Nematodes were observed in vivo, counted and killed in hot distilled water and preserved in 70% ethyl alcohol, cleared in glycerine or lactophenol and examined as temporary mounts. Cyst were counted and isolated from host tissues. Larvae were removed from cysts using preparation needles and studied either in vivo. Some specimens were studied by scanning electron microscopy (SEM); these specimens were dehydrated in ethanol series, dried using the critical point technique, coated with gold, and examined with a JSM-5800 scanning electron microscope. Measurements are presented in micrometers (µm) unless otherwise indicated as mean values and standard deviation followed by range values in parenthesis. The systematic determination of the nematodes was carried out following the guidelines given by Anderson et al. (2009) and Gibbons (2010). Prevalence and mean intensity were calculated according to Bush et al. (1997).

The nematode specimens studied were deposited in the Helminthological Collection of the Centro de Ecología Aplicada del Litoral (CECOAL), Corrientes, Argentina. The present study has complied with all the regulations and ethical and legal considerations for the capture and use of animals established by the National Council of Scientific Research and Technical of Argentina.
RESULTS

A total of 74 nematodes were collected from this leiuperid. These nematodes belonged to six species of the following families: Strongyloididae Chitwood and McIntosh, 1934: *Strongyloides* sp., Molineidae (Skrjabin and Schulz, 1937) Durette-Desset and Chabaud, 1977: *Oswaldocruzia* sp., Cosmocercidae Travassos, 1925: *Cosmocerca podicipinus* Baker and Vaucher, 1984 and *Cosmocerca parva* Travassos, 1925, Gnathostomoidea Railliet, 1985: *Spiroxys* sp. and, Physalopteridae Leiper, 1908: *Physaloptera* sp. Each larva was spirally coiled inside the brownish capsule.

*Strongyloides* sp. (Fig. 1A-B)

**Prevalence, number of parasites:** 2.9% (1 of 34 amphibians infected), 1.

**Site of infection:** large intestine.

**Accession number:** CECOAL 02113236 (1 gravid female).

**Description:** Based on 1 female specimen. Body slender, elongate, length 2.25mm, maximum width 55.0. Stoma simple, elongate, surrounded by six small lobes, each with one inconspicuous papilla. Esophagus filiform, 710.0 long. Nerve ring 170.0 from anterior end. Excretory pore not observed. Vulva with well developed lip situated at

---

**Figure 1A-E.** Fig. 1A. *Strongyloides* sp. Female, total view. Fig. 1B. *Strongyloides* sp. Posterior end, ventral view. Fig. 1C. *Oswaldocruzia* sp. Female, anterior end. Fig. 1D. *Oswaldocruzia* sp. Detail of anterior end. Fig. 1E. *Oswaldocruzia* sp. Posterior end, lateral view.
1.6mm from anterior end. Uteri opposed. Oval eggs, 50.0 in length x 34.0 wide. Anus 85.0 from posterior end; sharply pointed tail.

Remarks: The posterior end of these nematodes has been used as a diagnostic character for the species of this genus that parasitize anurans. Moravec and Kaiser (1995) have proposed two types: Type A: *Strongyloides* species that have a sharply pointed tail and, Type B: species that have a rounded tail. Specimen analyzed in this study might belong to the first type due to the morphology of the posterior end. In the present study, female nematode showed greater length (2.25mm) than female of *S. carinii* Pereira, 1935 (1.3-1.7mm) and *S. pereirai* Travassos, 1932 (1.56-1.91mm) and, the distance of anus to posterior end was greater (85.0) than were reported for these species (*S. carinii*: 60.0; *S. pereirai*: 64.0-72.0) analyzed by Pereira (1935) and Travassos (1932), respectively.

Geographical distribution: In amphibians from Neotropical Realm, species of this genus were found in leptodactylids and bufonids from Brazil (Travassos, 1932, 1933; Pereira, 1935; Luque et al., 2005; Santos & Amato, 2010), in bufonids from Cuba (Pérez-Vigueras, 1942) and, in strabomantids from St. Vincent (Moravec & Kaiser, 1995). This is the first report of this genus for Argentinean amphianians.

**Oswaldocruzia** sp.
(Fig. 1C-E)

Prevalence, number of parasites: 2.9% (1 of 34 amphibians infected), 1.

Site of infection: small intestine.

Accession number: CECOAL 96040901 (1 immature female).

Description: Based on 1 female specimen. Body 9.0 mm x 150.0, with maximum width at level of midbody. Lateral alae undeveloped. Cephalic vesicle present with anterior swelling, total length of cephalic vesicle 87.4, rising approximately 6.9 above body wall in the widest first part. Claviform esophagus 540.0 length. Nerve ring, excretory pore and vulva 170.0, 282.0 and 6.37mm from anterior end, respectively. Amphidelphic. Tail 207.0 in length, terminating in flexible filament approximately 11.0 in length. Female without eggs.

Remarks: The identification of the species of this genus is done by analyzing the caudal bursa of males, the morphology of the spicules and the constitution of synlophe (Ben Slimane et al., 1996); because were not found males the specific identification was not possible.

Geographical distribution: *Oswaldocruzia* is a genus with a widely distribution in Neotropical Realm. Ben Slimane et al. (1996) reported species of this genus in leptodactylids from Chile, leptodactylids and bufonids from Brazil, leptodactylids from Paraguay, bufonids, hydrids and leptodactylids from Guyana, bufonids from Venezuela, leptodactylids, bufonids and hydrids from Ecuador and, in hydrids, leptodactylids and bufonids from Cuba and Puerto Rico. In Argentina, previous reports in amphibians hosts were: *Oswaldocruzia mazzai* Travassos, 1935 in bufonids from Jujuy province (Travassos, 1935, 1937), *Oswaldocruzia* sp. in leptodactylids from Corrientes province (González & Hamann, 2006b) and, *O. proencai* Ben Slimane and Durette-Desset, 1995 in bufonids from Corrientes (González & Hamann, 2008) and Salta provinces (Ramallo et al., 2007b). This is the first report of Argentinean leiuperid as host of genus *Oswaldocruzia*.

**Cosmocerca podicipinus** Baker and Vaucher, 1984 (Fig. 2A-B)

Prevalence, number of parasites: 73.5% (25 of 34 amphibians infected), 59.

Site of infection: lung, large intestine and small intestine.

Accession number: CECOAL 03074242 (1 male, 4 females); 02092915 (2 males, 4 females).

Description: Nematodes with conspicuous sexual dimorphism; body cuticle provided with transverse striations. Lateral alae present in both sexes. Mouth with 3 small v-shaped lips, dorsal lip with 2 sessile papillae, each ventrolateral lip with 1 ventral sessile papilla and 1 amphid; three
additional pairs of cephalic papillae. The anterior end of the esophagus presents three tooth-like projections covered with a thick cuticle, also called cuticular flap. Esophagus with short pharynx, cylindrical corpus, and posterior bulb containing valves. On the ventral surface of the preanal region of male there are two longitudinal rows of comb-like crests (plectanes). In this species there are 5 pairs of plectanes; the plectanes of each row are fusioned by sclerotized supports very marked (Fig. 2A-B). Somatic papillae numerous, in two ventral, two subventral, two dorsal and two subdorsal rows, extending from cervical region to posterior end. The metric characters of the males and females of these nematode species are present in Table 1.

Remarks: Some species of genus Cosmocerca have a fixed number of pairs of plectanes in the posterior end of males; C. chilensis Lent and Freitas, 1948 and C. rara Freitas and Vicente, 1966 have 6 pairs, C. cruzi Rodrigues and Fabio, 1970, C. travassosi Rodrigues and Fabio, 1970 and C. podicipinus have 5 pairs, C. longispicula Moravec and Kaiser, 1994 and C. vrcibradici Bursey and Goldberg, 1998 and C. uruguayensis Lent and Freitas, 1948 have 7 pairs. Other species have a variable number of pairs of these structures: C. brasiliensis Travassos, 1925 have 8-11 pairs, C. paraguayensis Moravec and Kaiser, 1994 have 4-5 pairs and C. parva Travassos, 1925 have 4-7 pairs (Goldberg et al., 2005). Thereon, specimens of C. podicipinus examined in this study show the same pattern as previous studies (5 pairs of plectanes); nevertheless, in some of immature specimens, the plectanes of each row do not fuse.

The metrical characteristic of C. podicipinus compared with original description realized by Baker and Vaucher (1984) with specimens collected in leptodactylids from Paraguay shows that males and females specimens analyzed from P. albonotatus are smaller than those studied by these authors (Baker & Vaucher, 1984: females: 2.86–7.33mm; males: 1.88–3.17mm vs. present study: females: 2.58–5.68mm; males: 1.35–2.95mm). In males, the length of spicules and gubernaculum are smaller than those found in Paraguayan specimens (Baker & Vaucher, 1984: spicules: 82-188; gubernaculum: 87-152 vs. present study: spicules: 57-97; gubernaculum: 62-141). Compared with specimens collected in a leiuperid sympatric host, P. santafecinus studied by González and Hamann (2010a), males analyzed in this study have total length of body, length of gubernaculum and length of spicules greater that males analyzed from P. santafecinus (P.
<table>
<thead>
<tr>
<th></th>
<th>Cosmocerca podicipinus</th>
<th>Cosmocerca parva</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Females (n=10)</td>
<td>Males (n=10)</td>
</tr>
<tr>
<td><strong>Total length</strong></td>
<td>4.13±0.87mm (2.58–5.68)</td>
<td>2.16±0.56mm (1.35–2.95)</td>
</tr>
<tr>
<td><strong>Width</strong></td>
<td>220.5±33.1 (185–300)</td>
<td>201.8±57.3 (100–280)</td>
</tr>
<tr>
<td><strong>Pharynx</strong></td>
<td>35.6±7.7 (28–51)</td>
<td>26.6±4.1 (20–33)</td>
</tr>
<tr>
<td><strong>Muscular</strong></td>
<td>276.5±25.0 (234–306)</td>
<td>204.2±27.9 (172–270)</td>
</tr>
<tr>
<td><strong>Bulb</strong></td>
<td>84.6±11.4 (69–103)</td>
<td>55.6±7.4 (46–70)</td>
</tr>
<tr>
<td><strong>Nerve ring</strong></td>
<td>209.5±27.0 (180–270)</td>
<td>173.0±33.6 (122–235)</td>
</tr>
<tr>
<td><strong>Excretory pore</strong></td>
<td>336.6±49.8 (230–410)</td>
<td>265.2±46.0 (198–350)</td>
</tr>
<tr>
<td><strong>Anus from</strong></td>
<td>413.7±45.1 (350–510)</td>
<td>153.1±74.4 (103–360)</td>
</tr>
<tr>
<td>posterior end</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gubernaculum</strong></td>
<td>- (62–141)</td>
<td>- (57–97)</td>
</tr>
<tr>
<td><strong>Spicules</strong></td>
<td>85.3±10.7 (57–97)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Plectanes</strong></td>
<td>- 5 pairs</td>
<td>-</td>
</tr>
<tr>
<td><strong>Adanal papillae</strong></td>
<td>- 3 pairs</td>
<td>-</td>
</tr>
<tr>
<td><strong>Vulva from</strong></td>
<td>2.13±0.44mm (1.32–2.91)</td>
<td>-</td>
</tr>
<tr>
<td>anterior end</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Eggs</strong></td>
<td>95.4±12.4 (78–122)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>61.0±7.7 (53–76)</td>
<td>-</td>
</tr>
</tbody>
</table>

* from anterior end.
Neotrop. Helminthol., 6(1), 2012

*santafecinus*: total length: 1.3–2.3mm; gubernaculum: 75-92; spicules: 69-89 vs. present study: total length: 1.35-2.95mm; gubernaculum: 62-141; spicules: 57-97); females, however, have a total length less than those studied in *P. santafecinus* (*P. santafecinus*: 4.27–7.8mm vs. present study: 2.58–5.68mm).

**Geographical distribution**: In Neotropical Realm, the genus *Cosmocerca* has a widely distribution in amphibians hosts. *Cosmocerca podicipinus* was found in families Bufonidae, Aromobatidae, Strabomantidae and Leptodactylidae from Peru (Bursey et al., 2001), in Leptodactylidae (Baker & Vaucher, 1984) and Hylidae from Paraguay (McAllister et al., 2010b), Bufonidae and Dendrobatidae from Colombia (Goldberg & Bursey, 2003), Hylidae (Campião et al., 2010; Goldberg et al., 2007) and Leptodactylidae from Brazil (Campião et al., 2009; Goldberg et al., 2009), Dendrobatidae from Panama (Martinez & Maggenti, 1989), Eleutherodactylidae, Leptodactylidae, Hylidae (Goldberg & Bursey, 2002; Goldberg et al., 2002a) and Ranidae (Goldberg & Bursey, 2002; Cabrera-Guzmán et al., 2007) from Mexico, Bufonidae, Leptodactylidae, Microhylidae, Strabomantidae, Craugastoridae (Bursey & Brooks, 2010), Ranidae (Bursey & Goldberg, 2005, 2006, 2007; Bursey & Brooks, 2010), Brachycephalidae (Goldberg & Bursey, 2008a), and Hylidae (Goldberg & Bursey, 2008b) from Costa Rica. In Argentina, it was found in families Leiuperidae (González & Hamann, 2004, 2009a, 2010a), Leptodactylidae (González & Hamann, 2006b; Hamann et al., 2006a, b; Schaefer et al., 2006), Bufonidae (González & Hamann, 2006a, 2007a, b, 2008), Cyclorhaphidae (González & Hamann, 2009b) and Hylidae (González & Hamann, 2008, 2011; Hamann et al., 2010). This is the first record of *C. podicipinus* in *P. albonotatus* from Argentina.

*Cosmocerca parva* Travassos, 1925 (Fig 3. A–B)

**Prevalence, number of parasites**: 8.8% (3 of 34 amphabians infected), 10.

**Site of infection**: large intestine.

**Figure 3A.** *Cosmocerca parva*. Posterior end of male, lateral view. rp: rosette papillae.

**Figure 3B.** *Cosmocerca parva*. Detail of anterior extremity of male. cp: cephalic papillae; a: amphid; cf: cuticular flap.
Accession number: CECOAL 02113235 (1 female), CECOAL02103078 (1 female, 1 male).

Description: The Table 1 shows the metric characters of the males and females of C. parva. In this study, the number of plectanes and rosette papillae in the posterior end of male varied between 4 and 6 pairs, each rosette papillae with two complete circles of punctations directed perpendicular to the body surface; the plectanes of each row are not fused to each other as in the previous species (Fig. 3A). The anterior extremity of this species presents the same number and arrangement of cephalic papillae than C. podicipinus (Fig. 3B).

Remarks: For C. parva some studies show, in the same host, a fixed number of pairs of plectanes, in other hosts, the number of pairs of plectanes for this species was variable (see González & Hamann, 2010a). In this study we found males with new pattern of number of plectanes (4-6 pairs). On the other hand, adanal papillae present the same number and arrangement to those found in P. santafecinus (1 preanal pair, 1 lateral pair and 1 postanal pair); in addition, 1 unpaired papillae on the anterior lip of anus.

Studies realized with SEM in males of C. parva showed rosette papillae surrounded by 12-16 punctations in specimens collected in R. granulosa (Mordeglia & Digiani, 1998); surrounded by 12-15 interior punctations and 12-15 exterior punctations in specimens collected in R. schneideri (González & Hamann, 2008) and, rosette papillae surrounded by 10-11 interior punctations and 12-14 exterior punctations in specimens collected in P. santafecinus (González & Hamann, 2010a). Males of C. parva of this study shows 11 interior punctations and 12 exterior punctations in each one of rosette papillae.

Compared with original description realized by Travassos (1925) with specimens collected in Pernambuco State, Brazil, males of C. parva from P. albonotatus present a total length and the length of gubernaculum smaller than Brazilian specimens, but length of spicules is greater (Travassos, 1925: total length: 3.5mm; gubernaculum: 120-140; spicules: 80 vs. present study: total length: 1.15-172mm; gubernaculum: 78-107; spicules: 92-130). Compared with specimens studied in a leiuperid sympatric host, P. santafecinus, by González and Hamann (2010a), the males of C. parva in this study are smaller and females are greater than those analyzed in P. santafecinus (P. santafecinus: males: 1.53–2.57mm; females: 3.43–5.92mm vs. present study: males: 1.15–1.72mm; females: 2.77–6.83mm). Also, the length of the spicules was higher in specimens collected from P. albonotatus (P. santafecinus: 57-98 vs. present study: 92-130).

Geographical distribution: In Neotropical Realm, C. parva was found in Brazil in the following families: Bufonidae (Santos & Amato, 2010), Leptodactylidae (Fabio, 1982), Leiuiperidae and Hylolidae (Travassos, 1925); in Mexico from Ranidae (Paredes-Calderón et al., 2004), in Guyana from Dendrobatidae and Hylidae (McAllister et al., 2010a), in Paraguay from Leptodactylidae, Bufonidae (Baker & Vaucher, 1984, McAllister et al., 2010b) and Hylidae (Masi Pallares & Maciel, 1974), in Peru from Bufonidae, Aromobatidae, Hylidae, Leiuiperidae, Leptodactylidae, Eleutherodactylidae, Microhylidae (Bursey et al., 2001), Strabomantidae and Dendrobatidae (McAllister et al., 2010c), in Trinidad and Tobago from Leptodactylidae and Eleutherodactylidae (Goldberg et al., 2002b), in Costa Rica from Brachycephalidae (Goldberg & Bursey, 2008a), Hylidae (Goldberg & Bursey, 2008b), Craugastoridae, Bufonidae, Eleutherodactylidae and Ranidae (Bursey & Brooks, 2010), in Colombia from Dendrobatidae (Sánchez et al., 2010). In Argentina, it was found in the families Bufonidae (Mordeglia & Digiani, 1998; González & Hamann, 2006a, 2007a, b, 2008), Leptodactylidae (González & Hamann, 2006b; Hamann et al., 2006a, b, Schaefer et al., 2006), Cycloramphphidae (González & Hamann, 2009b), Hylidae (González & Hamann, 2008, Hamann et al., 2009, 2010) and Leiuiperidae (González & Hamann, 2006b, 2010a). This is the first record of C. parva in P. albonotatus from Argentina.
Spiroxys sp. (Larvae)  
(Fig. 4A-B)  

Prevalence, number of parasites: 2.9% (1 of 34 amphibians infected), 1.  

Site of infection: serous of stomach.  
Accession number: CECOAL 10020901 (larvae).

Description: Based on 1 specimen. Small nematodes with fine cuticular transverse striations. Length of body 2.2 mm, maximum width 80.0. Cephalic end provided with two triangular lateral pseudolabia. Two cephalic papillae and one small amphid present on either side at level of base of pseudolabia. Walls of oral opening weakly sclerotized. Stoma weakly developed, very short. Esophagus starting at level of base of pseudolabia. Esophagus divided into narrow, anterior muscular part (length 330.0) and broader posterior glandular part (length 750.0). Excretory pore not observed. Intestine brownish, straight. Tail conical, 90.0 long, with rounded tip. Elongated cyst, measures were 850.0 x 370.0.

Remarks: The identification of this larva is based mainly on the characteristic large lateral triangular pseudolabia. The principal differences compared with it found in Pseudis paradoxa from Corrientes, Argentina studied by González and Hamann (2010b) are the form of cyst (almost spherical in P. paradoxa, 380-400 x 350-375) and the smaller metrics characteristics (e.g. length of body: 1.97 mm; length of muscular esophagus: 100.0; length of glandular esophagus: 620.0; length of tail: 82.0).

**Figure 4A-C.** Fig. 4A. Spiroxys sp. Anterior end, lateral view. Fig. 4B. Spiroxys sp. Posterior end, ventrolateral view. Fig. 4C. Physaloptera sp. Anterior end, ventral view.
Geographical distribution: In amphibian hosts of Neotropical Realm, the genus Spiroxys is previously reported in serous of stomach of hylid P. paradoxa from Argentina (González & Hamann, 2010b).

Physaloptera sp. (Larvae)
(Fig. 4C)
Prevalence, number of parasites: 2.9% (1 of 34 amphibians infected), 2.
Site of infection: gastric mucosa.
Accession number: CECOAL 06030612 (2 larvae).

Description: Based on 2 specimens. Larval body whitish, 2.56±0.14mm (2.55-2.57) long and 117.5±3.5 (115.0-120.0) wide, with transversely annulated cuticle. Terminus of head with two lateral lips and cephalic collar formed by inflated cuticle. On either lip a sclerotized support and one terminal tooth present at upper margin. Each lip bearing two cephalic papillae and one amphid. Muscular esophagus 167.5±3.5 (165.0-170.0) long by 32.0±4.2 (29.0-35.0) wide; length of glandular esophagus 0.87±0.03mm (0.87-0.88) by 51.0±1.4 (50.0-52.0) wide. Nerve ring encircling muscular esophagus at its posterior half, 115.0±7.1 (110.0-120.0) from anterior end. Excretory pore near anterior end of glandular esophagus, 145.0±7.1 (140.0-150.0) from anterior end of body. Tail conical, 110.0±7.1 (105.0-115.0) long.

Remarks: Compared with larvae that found in other hosts of the same area, specimens analyzed from P. albonotatus showed the same morphological characteristics, but in terms of size, were smaller [total length in P. santafecinus: 3.13-3.7mm (González & Hamann, 2010a); in R. fernandezae: 4.17mm (González & Hamann, 2007a); in R. granulosa: 4.6-5.6 (González & Hamann, 2006a); in R. schneideri: 5.9mm (González & Hamann, 2008)]. Also, the distance of the excretory pore and nerve ring from anterior end in specimens of this study are smaller that observed in P. santafecinus (nerve ring: 161.0-182.0, excretory pore: 168.0-204.0; González & Hamann, 2010a), in R. schneideri (nerve ring: 275.0, excretory pore: 360.0; González & Hamann, 2008), in R. granulosa (nerve ring: 210.0-250.0, excretory pore: 240.0-340.0; González & Hamann, 2006a), in R. fernandezae (nerve ring: 162.0, excretory pore: 212.0; González & Hamann, 2007a).

Geographical distribution: In amphibians of Neotropical Realm larvae of Physaloptera were found in families Cycloramphidae (Boquimpani-Freitas et al., 2001), Leptodactylidae (Goldberg et al., 2009), Hylidae, Bufonidae and Leiuperidae (Vicente et al., 1990) from Brazil; in Bufonidae, Aromobatidae, Hylidae, Leiuperidae, Eleutherodactylidae, Leptodactylidae and Microhylidae (Bursey et al., 2001) from Peru, in Leptodactylidae (Goldberg et al., 2002b) from Trinidad and Tobago, Bufonidae (Galicia-Guerrero et al., 2000; Bursey & Goldberg, 2001; Goldberg et al., 2002a; Espinoza-Jiménez et al., 2007), Hylidae (Bursey & Goldberg, 2001; Goldberg et al., 2002a) and Ranidae (Bursey & Goldberg, 2001) from Mexico and, in Brachycephalidae (Goldberg & Bursey, 2008a) and Hylidae (Goldberg & Bursey, 2008b) from Costa Rica. In Argentina it was found in families Leiuperidae (Gutiérrez et al., 2005; González & Hamann, 2010a), Leptodactylidae (González & Hamann, 2006b), Hylidae and Bufonidae (González & Hamann, 2007a, 2008).

DISCUSSION

Of a total of nine species of the genus Physalaemus from Argentina, P. albonotatus, P. biligonigerus, P. cuqui Lobo, 1993, P. cuvieri Fitzinger, 1826, P. fernandezae (Müller, 1872), P. gracilis (Boulenger, 1883), P. henselii (Peters, 1872), P. riograndensis Milstead, 1960, P. santafecinus (Lavilla et al., 2000), the study of P. albonotatus represents the third report to the knowledge of the nematode fauna of this genus of amphibians (Gutiérrez et al., 2005; González & Hamann, 2010a).

Nematode parasites in the genus Physalaemus from Argentina include Rhabdias sp. and Physaloptera sp. in P. biligonigerus (Gutiérrez et
al., 2005), C. podicipinus, C. parva, Aplectana hylambatis (Baylis, 1927) Travassos, 1931 and Physaloptera sp. in P. santafecinus (González & Hamann, 2010a). Also, reports from Brazil (Vicente et al., 1990) included Aplectana sp., A. lopesi Silva, 1954, A. membranosa (Schneider, 1866) Miranda, 1924, C. parva, Oxyascaris oxyascaris Travassos, 1920 and Physaloptera sp. in P. signifer (Girard, 1853) and, Aplectana sp., C. parva, O. oxyascaris and Physaloptera sp. in P. soaresi Izecksohn, 1965. In the present study five genera of nematode parasites (Strongyloides, Oswaldocruzia, Cosmocerca, Spiroxys and Physaloptera) are reported for the first time in P. albonotatus. Additionally, the genus Strongyloides is reported for the first time in Argentinean amphibians.

The genera Strongyloides, Oswaldocruzia and Cosmocerca have a direct life cycle. The definitive host becomes infected by skin penetration of infective stage. Female nematodes expelled eggs that develop in the external environment into first-stage larvae and moult twice to the infective third stage. Migration to the lungs is apparently a necessary part of the development in species of genus Cosmocerca (Anderson, 2000). Nematodes of genera Spiroxys and Physaloptera have an indirect life cycle. They need to complete the cycle in an intermediate host (arthropod) which is then consumed by the predaceous final host (Anderson, 2000). Adults stage of genus Spiroxys parasite stomach of different species of freshwater turtles.

Female nematodes expelled eggs with the turtle’s faeces and the first-stage larvae develop in them. Then, it is ingested by a copepod and, in the haemocoel of this invertebrate, attains its third stage (Anderson, 2000). On the other hand, physalopterines are usually found firmly attached to the gastric mucosa with the aid of large dentate pseudalabia and a collarette which presses into the mucosa. In this way the larval parasite may persist for varying periods of time and be available to the predaceous final hosts (reptiles, birds, mammals) (Anderson, 2000). The presence of these larvae indicates that the amphibians could play a role in the transmission of these nematodes, serving as paratenic host.

This study is the first report of nematode parasites of P. albonotatus from Argentina and some new morphological data are presented for all the species recorded, however due to the wide distribution of the host, future research should include references to nematode parasites of P. albonotatus collected in other localities.

BIBLIOGRAPHICS REFERENCES


Bursey, CR & Brooks, DR. 2010. Nematode Parasites of 41 Anuran Species from the


Gibbons, L.M. 2010. *Keys to the Nematode*


González, CE & Hamann, MI. 2009b. First report of Nematodes in the Common Lesser Escue rzo Odontophrynus americanus (Duméril and Bibron, 1841) (Amphibia: Cyclor amphidae) from Corrientes,
Nematode parasites of Physalaemus albonotatus

González & Hamann


Asociación Herpetologica Argentina. Argentina.


Paredes-Calderón, L, León-Régagnon, V &


Received November 9, 2011.
Accepted January 27, 2012.

*Author for correspondence / Autor para correspondencia:

Cynthia Elizabeth González
Centro de Ecología Aplicada del Litoral; Consejo Nacional de Investigaciones Científicas y Técnicas, Ruta Provincial Número 5, km 2.5 (3400), Corrientes, Argentina.

E-mail / correo electrónico: cynthyaelizabethg@hotmail.com