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***Shrankiana chacoensis* sp. nov. (Nematoda: Atractidae) from *Leptodactylus bufonius* Boulenger, 1894 (Anura: Leptodactylidae) from Argentina**

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Here we describe a new attractid nematode, *Shrankiana chacoensis* sp. nov., from the large intestine of *Leptodactylus bufonius* (Anura: Leptodactylidae), from Chaco Province, Argentina. This is the first attractid nematode described for *L. bufonius*. The new species is distinguished from the remaining species of the genus by its cephalic morphology: *S. chacoensis* sp. nov. possesses four large papillae on the lips (two on the dorsal lip and one on each subventral lip) without any other small papillae (present in the remaining *Shrankiana* species) and forked amphids; by having a shorter vagina; tips of the lateral alae located well anterior to the anus in both sexes, one additional pair of postcloacal papillae compared with other species, and a “fringe” in the posterior and anterior margins of the excretory pore. *Shrankiana chacoensis* sp. nov. represents the eighth species assigned to the genus. A key to the species of the genus is provided.

<http://www.zoobank.org/urn:lsid:zoobank.org:pub:D4B643AF-1F5D-4E36-83EE-C204AB2067B3>

Keywords: *Shrankiana* sp. nov.; Nematoda; Atractidae; *Leptodactylus bufonius*; Argentina

Introduction

In 1925, Travassos erected the genus *Shrankia* included in the family Cosmocercidae and described a single species, *Shrankia shranki*; in 1927, the same author described a new species, *Shrankia brasili*, both parasitizing *Leptodactylus pentadactylus* (Laurenti, 1768) from Brazil (Travassos 1925, 1927). Vaz (1933) described the third species of this genus, *Shrankia larvata*, from the same amphibian host. Strand (1942) noted that *Shrankia* was pre-occupied and renamed the genus *Shrankiana*. In 1949, Travassos inadvertently proposed the name *Shranknema* (Travassos 1949).

Chabaud (1957) included *Shranknema* Travassos, 1949 within Atractinae RAILLET, 1917. In 1959, Freitas described the specimens studied by Travassos (1927) as *Shrankianella brasili* (Freitas 1959); however, in 1988, Baker and Vaucher synonymized this genus with *Shrankiana* (Baker and Vaucher 1988).

Parasitic attractid nematodes are found in amphibians, reptiles, mammals and fishes. In the family Atractidae, eggs hatch and larvae develop to the third stage within the uterus; these larvae autoinfect the host. Autoinfection is generally accompanied by high intensities with few large larvae. Transmission is unknown (Anderson 2000).

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A total of seven species of the genus *Schrankiana* have been described from anurans from the Neotropics; here we describe the eighth species of this genus found in a leptodactylid from the Chacoan region, Argentina. Until now, no attractid nematode parasites had been found in this amphibian host.

Material and methods

Three adult *Leptodactylus bufonius* (one female, two males) were collected in October 2011 in Taco Pozo, Almirante Brown Department, Chaco Province, Argentina (25°36'54" S, 63°15'54" W). Frogs were transported live to the laboratory and killed using a chloroform solution. At necropsy, hosts were sexed and the alimentary canal, lungs, liver, kidneys, urinary bladder, musculature and integument were 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. Illustrations were made using a Zeiss microscope with the aid of a camera lucida. For examination by scanning electron microscopy, the nematodes were post-fixed in 1% osmium tetroxide, dehydrated through an ethanol series and an acetone series and then subjected to critical-point drying. The specimens were coated with gold and examined with a Jeol 5800LV scanning electron microscope. All measurements are given in micrometres unless otherwise indicated as the mean and standard deviation with range in parentheses. Amphibian taxonomy follows Frost (2011). Specimens have been deposited in the Helminthological Collection of the Museo de La Plata, La Plata, Argentina and the Helminthological Collection of the Centro de Ecología Aplicada del Litoral.

Results

Two (66.6%) of the toads were found to harbour 301 (191 males and 110 females) specimens of nematodes of the genus *Schrankiana*.

Species description

Order ASCARIDIDA Skrjabin et Schulz, 1940
Superfamily COSMOCERCOIDEA Railliet, 1916
Family ATRACTIDAE (Railliet, 1917 subfam.) Travassos, 1919
Genus *Schrankiana* Strand, 1942 (= *Schrankia* Travassos, 1925; = *Schranknema* Travassos, 1949)
Schrankiana chacoensis sp. nov.
(Figures 1, 2)

Description

General. Cylindrical nematodes with fine transversally striated cuticle, distance between striations 3–4 μm at level of excretory pore. Males and females of similar length, maximum width occurring at level of oesophageal–intestinal junction in males and at half of total body length in females (Figure 1A, B). Lateral alae present in both sexes. Oral opening triangular with three lips; dorsal lip with two large papillae,

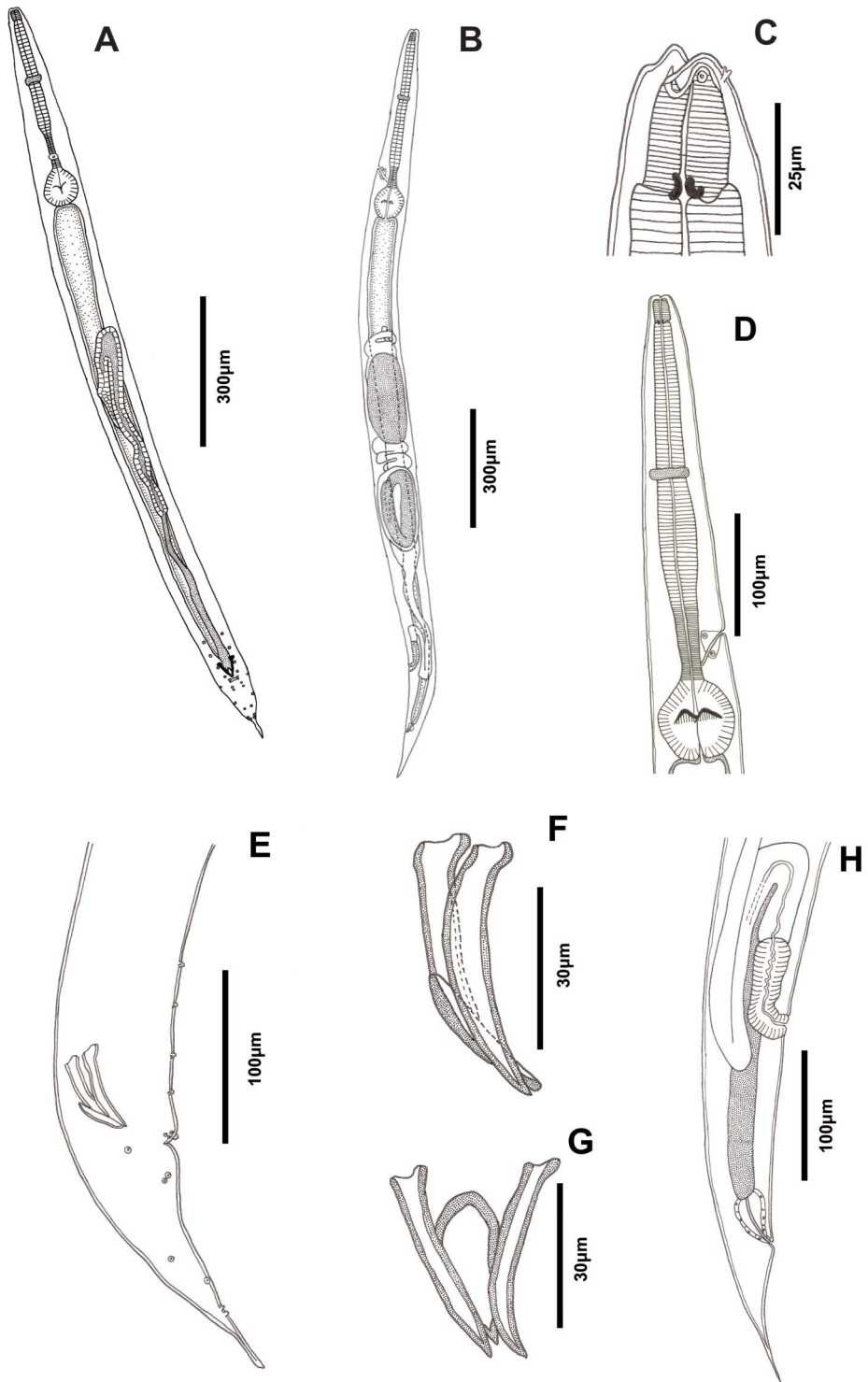


Figure 1. *Schrankiana chacoensis* sp. nov. (A) Male, ventral view; (B) female, lateral view; (C) cephalic end of female, lateral view; (D) anterior end of female, lateral view; (E) posterior end of male, lateral view; (F) spicules and gubernaculum, lateral view; (G) spicules and gubernaculum, ventral view; (H) posterior end of female, lateral view.

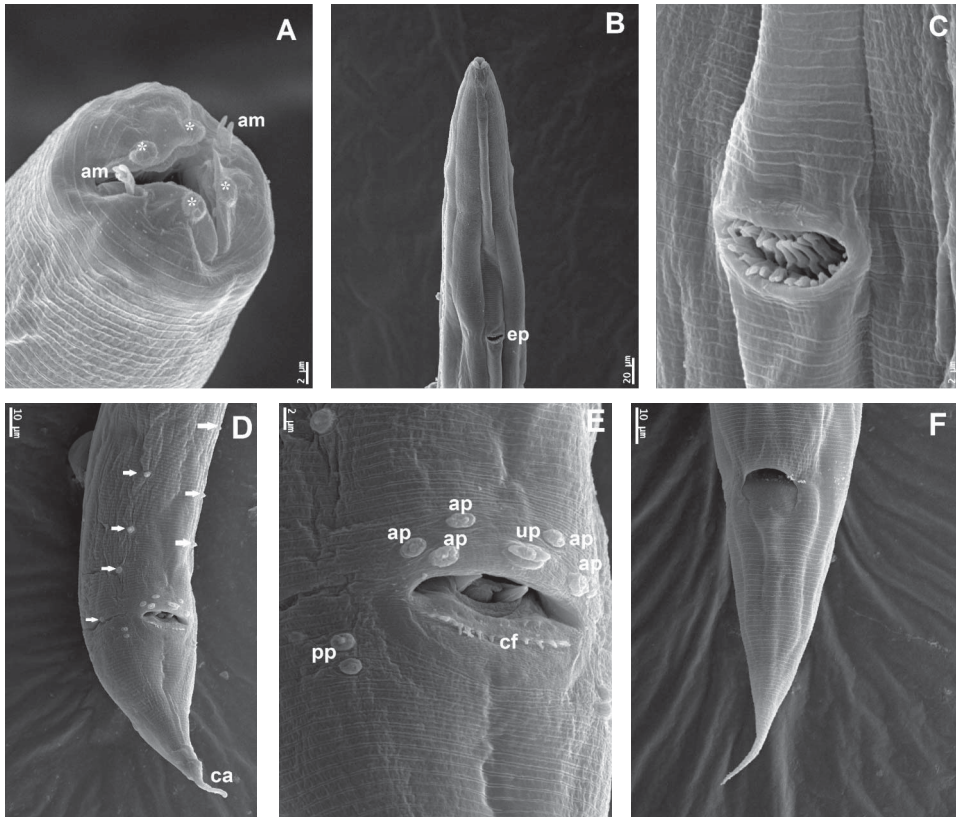


Figure 2. *Schrankiana chacoensis* sp. nov. (A) Cephalic end, apical view; (B) anterior end, ventral view; (C) detail of excretory pore; (D) posterior end of male, ventral view; (E) detail of cloaca and adcloacal papillae; (F) posterior end of female, ventral view. Abbreviations: am: amphid; asterisk: cephalic papillae; ep: excretory pore; arrows: precloacal papillae; up: unpaired papillae; ap: adcloacal papillae; pp: postcloacal papillae; cf: cuticular fringe.

subventral lips with one large papilla on each one. One forked amphid on each subventral lip. Each lip with cuticular flange overhanging mouth opening (Figures 1C, 2A). Pharynx relatively elongate and slender; oesophagus divided into three parts: muscular corpus, short isthmus and well-developed posterior bulb with valves (Figure 1D). Anterior extremity of oesophagus with three large and relatively elongate tooth-like projections. Excretory pore anterior to level of bulb; large, slit-like, with small comb-like fringe in the posterior and anterior edges (Figure 2B, C). Viviparous. Monodelphic and prodelphic; vulva located just anterior to anus. Tail conical and sharply pointed in both sexes (Figure 2D, F). Somatic papillae minute, distributed over body surface.

Male. (measurements of holotype and paratypes are given in Table 1). Lateral alae extending from anterior third of oesophagus to the level of first pair of precloacal papillae. Tail short, conical, with caudal appendage. Fourteen pairs of sessile caudal papillae and one unpaired papilla anteriorly to cloaca; these papillae present the following disposition (Figures 1E, 2D; Table 2): five pairs of precloacal papillae [distance

Table 1. Comparative morphometrics of *Schrankiana* spp. Measurements of males of *Schrankiana chacoensis* sp. nov. correspond to 18 specimens (holotype and 17 paratypes; mean \pm 1 SD and minimum and maximum; measurements of holotype in brackets), measurements of females of *Schrankiana chacoensis* sp. nov. correspond to 15 specimens (allotype and 14 paratypes; mean \pm 1 SD and minimum and maximum; measurements of allotype in brackets).

<i>Schrankiana</i> spp.	<i>S. chacoensis</i> sp. nov.	<i>S. fuscus</i>	<i>S. freitasi</i>	<i>S. formosula</i> ^d
References	Present study	Baker and Vaucher (1988)	Baker (1982)	Freitas (1959)
Type host	<i>L. bufonius</i>	<i>L. fuscus</i>	<i>L. pentadactylus</i>	<i>L. typhonius</i>
Males				
Total length	1.56 \pm 0.11 mm (1.45–1.89) [1.68 mm]	2.16 mm (2.08–2.11)	2.5 mm (2.3–2.6)	2.08 (1.81–2.08) [a: 1.97–2.30; b: 1.59–1.88]
Width	82.0 \pm 8.9 (70–105) [96]	–	–	100 (100–130)
Pharynx	25.1 \pm 4.34 (19–30) [22] \times 18.53 \pm 2.88 (15–24) [15]	–	40 (38–40)	25 (25–29 \times 13–17)
Oesophagus (total length)	371.0 \pm 23.96 (315–412) [358]	362 (346–358)	645 (610–630)	410 (370–410) [a: 404–428; b: 375–422]
Corpus	230.4 \pm 24.95 (180–260) [220] \times 30.0 \pm 2.66 (25–35) [29]	–	495 (470)	260–290 \times 27–38
Isthmus	69.94 \pm 8.50 (53–80) [70] \times 18.5 \pm 2.63 (15–23) [20]	–	35 (35–50)	38–63 \times 15–21
Bulb	70.7 \pm 5.63 (62–80) [68] \times 64.11 \pm 5.02 (55–75) [63]	–	75 (65–72)	71 \times 76 (63–80 \times 63–84)
Nerve ring	157.7 \pm 19.75 (120–205) [155]	140 (132–139)	230 (190–250)	190 (180–210) [a: 150–166; b: 132–178]
Excretory pore	289.87 \pm 27.68 (230–330) [290]	254 (247–256)	525 (470–485)	330 (310–340) [a: 305–336; b: 285–319]
Tail	114.52 \pm 14.44 (97–150) [115]	183 (163–171)	143 (129–156)	90 (90–140) [a: 143–173; b: 128–135]
Caudal appendage	26.52 \pm 5.35 (15–36) [30]	Absent	Absent	35 (26–43)
Spicule 1 and 2	47.64 \pm 5.98 (37–60) [58] and 47.0 \pm 3.46 (40–54) [50]	102 (103–114)	75	67–76 (63–80) [a: 80–86; b: 67–88]
Gubernaculum	31.5 \pm 4.51 (20–40) [36]	58 (57–61)	46	38 (29–40) [a: 42–52; b: 40–48]

(Continued)

Table 1. (Continued).

Females						
Length	1.93 ± 79.12 mm (1.8–2.07) [2.01 mm]	2.51 mm (2.33)	2.9 mm (2.9–3.2)	2.41 mm (2.14–2.41) [a: 2.70–2.81; b: 1.43–1.75] 170 (130–200) 42 (25–31 × 13–17)		
Width	100.8 ± 11.9 (85–135) [90]	–	–	–		
Pharynx	28 ± 3.29 (20–32) [27] × 19.06 ± 4.65 (15–30) [15]	–	52 (35–48)	–		
Oesophagus (total length)	423.15 ± 45.88 (310–476) [477]	392 (400)	737 (645–753)	400–480 [a: 483–513; b: 377–440] 270–340 × 31–42		
Corpus	287.69 ± 46.53 (190–350) [330] × 34.3 ± 3.9 (28–40) [34]	–	570 (510–585)	42–80 × 17–25		
Isthmus	52.28 ± 13.16 (38–80) [65] × 19.64 ± 2.13 (16–25) [20]	–	35 (25–40)	–		
Bulb	83.06 ± 8.41 (60–95) [82] × 76.2 ± 5.5 (66–87) [71]	–	80 (72–90)	84 × 84 (76–88 × 76–92)		
Nerve ring *	157.36 ± 18.48 (130–195) [180]	153 (151)	250 (245–280)	210 (180–220) [a: 186–219; b: 165–180]		
Excretory pore *	324.73 ± 48.3 (250–500) [380]	288 (279)	580 (495–615)	370 (330–380) [a: 378–408; b: 269–330]		
Tail	125.46 ± 19.10 (110–175) [120]	190 (204)	152 (149–170)	150 (110–160) [a: 164–179; b: 126–134]		
Vulva **	309.3 ± 55.49 (260–425) [285]	448 (471)	337 (325–367)	350 (320–390) [a: 356–390; b: 251–274] 140–220 [a: 120–200]		
Vagina	85.16 ± 6.20 (75–93) [85]	–	300	–		
Distance Vulva/Anus	172.45 ± 28.07 (145–225) [165]	–	–	–		
Eggs	216.26 ± 26.42 (181–300) [287] × 109.6 ± 13.53 (94–150) [117]	–	235–335 × 95–150	217 × 122 (165–235 × 104–174)		

(Continued)

Table 1. (Continued).

<i>Schrankiana</i> spp.	<i>S. incospicata</i> ‡	<i>S. schranki</i> §	<i>S. brasili</i> ¶	<i>S. larvata</i> ∞
References	Fahel (1952)	Freitas (1959)	Freitas (1959)	Freitas (1959)
Type host	<i>L. pentadactylus labyrinthicus</i>	<i>L. pentadactylus</i>	<i>L. labyrinthicus</i>	<i>L. pentadactylus</i>
Males				
Total length	1.85–2.07 mm [a: 2.21–2.44; b: 2.38–2.64]	1.88–2.48 (2.7)	3.92–4.69 mm [a: 4.6; b: 5.2–6.4]	2.41–2.68 mm [a: 1.6–2.4; b: 2.02–2.98; c: 2.5–3.0]
Width	80–90 [a: 90–120; b: –]	100–150 (160)	130–220 [a: 200; b: –]	130–170 [a: 90–130; b: 100–160; c: 120]
Pharynx	32–36[a: 38–42 × 17–21; b: –]	25–55 × 17–25	97–101 × 19–21 [a: 100–110; b: –]	25–34 × 29–38 [a: 33–40 × 33–40; b: 32; c: –]
Oesophagus (total length)	– [a: 490–570; b: 589–630]	580–610 (550–600)	880–950 [a: 1.02–1.2 mm; b: 1.23–1.47 mm]	400–460 [a: 410–430; b: –; c: 410]
Corpus	[a: 380–450 × 34–50; b: –]	300–480 × 25–42	Corpus divided	Corpus divided
Isthmus	[a: 34–59 × 21; b: –]	290–500 × 21–29	21–25 × 25 [a: –; b: –]	50–63 × 23–25 [a: –; b: 32–56; c: –]
Bulb	91–103 × 74–83 [a: 59–80 × 59–88; b: –]	71–84 × 63–92 (100–120 × 70–100)	71–84 × 63–84 [a: 80–100; b: –]	80–84 × 76–92 [a: –; b: 80–100 × 80; c: –]
Nerve ring*	200–240 [a: 210–213; b: 213–230]	210–250	330–360 [a: 340–370; b: 350–372]	160–180 [a: 140–160; b: 140–240; c: –]
Excretory pore*	– [a: 360–510; b: 421–482]	360–580	780–810 [a: 800–900; b: 820–938]	330–380 [a: 310–340; b: 260–380; c: –]
Tail	99–130 [a: 110–140; b: 157–181]	100–170 (170)	130–160 [a: 150; b: 247–329]	110–130 [a: 0.8–1.20; b: 80–110; c: 120]
Caudal appendage	– [a: 25–34; b: –]	36–46	34–38	21–29
Spicule 1 and 2	58–66 [a: 55–67; b: 58–72]	84–101 (120)	76–84 [a: 77; b: 76–83]	67–71 [a: 74–83; b: 66–79; c: 74]
Gubernaculum	41–45 [a: 29–42; b: 37–40]	46–55 (45)	50–63 [a: 60; b: 57–63]	46–55 [a: 49–53; b: 40–48; c: 53]

(Continued)

Table 1. (Continued).

Females						
Length	2.05–3.07 mm [a: 2.61–2.78; b: 2.70–2.80]	2.08–2.51 mm (2.5)	4.62–6.53 mm [a: 5.0–6.2; b: 6.82–7.32]	2.68–3.05 [a: 2.5–3.6; b: 2.51–3.64; c: 3.5–4.15]		
Width	130–140 [a: 140–210; b: –]	120–180 (160)	230–350 [a: 300; b: –]	150–190 [a: 190–200; b: 170–250; c: 200–250]		
Pharynx	41–49 [a: 38–44 × 21–27; b: –]	34–42 × 21–25	96–113 × 26–29 [a: 100–110; b: –]	29–34 × 38–40 [a: 33–40 × 33–40; b: 32; c: –]		
Oesophagus (total length)	– [a: 560–710; b: 587–682]	540–680 (550–600)	1.02–1.35 mm [a: 1.02–1.2; b: 1.45–1.58]	440–460 [a: 450–490; b: –; c: –]		
Corpus	– [a: 450–560 × 38–50; b: –]	470–580 × 31–46	Corpus divided	Corpus divided		
Isthmus	[a: 38–63 × 21–25; b: –]	340–550 × 21–34	29–35 × 25–43 [a: –; b: –]	59–63 × 29–31 [a: –; b: 40–80; c: –]		
Bulb	99–107 × 83–107 [a: 67–105 × 76–113; b: –]	84–101 × 76–101 (100–120 × 70–100)	71–113 × 84–113 [a: 80–100; b: –]	84–92 × 84–97 [a: –; b: 69–110; c: –]		
Nerve ring*	200–210 [a: 220–270; b: 204–219]	210–250	330–340 [a: 340–370; b: 320–372]	180–190 [a: 150–160; b: 120–190; c: –]		
Excretory pore*	[a: 460–610; b: 398–547]	460–580	70–95 [a: 800–900; b: 845–980]	350–380 [a: 360–370; b: 280–360; c: –]		
Tail	132–157 [a: 130–150; b: 168–190]	160–220 (160–200)	280–330 [a: 370; b: 335–380]	150–200 [a: 174–249; b: 160–240; c: 220]		
Vulva**	260–290 [a: 300–370; b: 290–363]	290–430 (350–370)	480–600 [a: 550–620; b: 575–696]	550–800 [a: 590–770; b: 72–99; c: 350–400]		
Vagina	– [a: 100–160; b: –]	140–190	–	100–160 [a: –; b: –; c: –]		
Distance Vulva/Anus	–	–	–	–		
Eggs	207–282 × 99–124 [a: 200–287 × 130–200; b: –]	270–278 × 113–174 (250 × 100)	398–548 × 199–300 [a: 425–475 × 225–300; b: –]	261–299 × 130–149 [a: 373 × 199; b: 240–350 × 110–240; c: 360 × 320]		

Notes: *From anterior end.

**From posterior end.

†Measurements based on Freitas (1959) and in brackets based on Baker and Vaucher (1988) from *L. fuscus* (a) and from *L. elenae* (b).

‡Measurements based on Fahel (1952) and in brackets based on (a) Freitas (1959) and (b) based on Baker and Vaucher (1988).

§Measurements based on Freitas (1959) and in brackets based on Travassos (1925).

¶Measurements based on Freitas (1959) and in brackets based on (a) Travassos (1927) and (b) based on Baker and Vaucher (1988).

∞Measurements based on Freitas (1959) and in brackets based on (a) Fahel (1952), (b) based on Guimarães et al. (1976) and (c) based on Vaz (1933).

Table 2. Number and arrangement of caudal papillae in males of *Schrankiana* spp.

<i>Schrankiana</i> spp.	References	Precloacal papillae	Adcloacal papillae *	Postcloacal papillae
<i>S. chacoensis</i> sp. nov.	Present study	Total: 5 pairs.	Total: 3 pairs + 1 unpaired papilla.	Total: 6 pairs. Anterior half of tail: pairs I and II (ventral), near cloaca. Posterior half of tail: pair III (lateral), pair IV (ventral) and pairs V and VI (ventral and subventral).
Total pairs: 14 <i>S. fuscus</i>	Baker and Vaucher (1988)	Pairs I, II, III and IV ventral; pair V lateral, at level of cloaca. Total: 4–5 subventral pairs	Total: 3 pairs + 1 unpaired papilla.	Total: 5 pairs. Anterior half of tail: pairs I and II (subventral), near cloaca. Posterior half of tail: pair III (lateral), pairs IV (subventral) and V (subdorsal).
Total pairs: 12–13 <i>S. freitasi</i>	Baker (1982)	Total: 5 subventral pairs	Total: 3 pairs + 1 unpaired papilla.	Total: 5 pairs. Anterior half of tail: pairs I and II (subventral), near cloaca. Posterior half of tail: pairs III (subventral), IV (lateral) and V (subdorsal).
Total pairs: 13 pairs <i>S. formosula</i>	Baker and Vaucher (1988)	Total: 4–5 subventral pairs	Total: 3 pairs + 1 unpaired papilla.	Total: 5 pairs. Anterior half of tail: pairs I and II (subventral), near cloaca. Posterior half of tail: pair III (lateral), IV (subventral) and V (subdorsal).
Total pairs: 12–13 <i>S. formosula</i>	Freitas (1959)	Total: 3 sublateral pairs.	Total: 1 pair.	Total: 3 postcloacal pairs.

(Continued)

Table 2. (Continued).

Total pairs: 7					
<i>S. incospicata</i>	Baker and Vaucher (1988)	Total: 4 subventral pairs.	Total: 3 pairs + 1 unpaired papilla.	Total: 5 pairs.	Anterior half of tail: pairs I and II (subventral), near cloaca. Posterior half of tail: pair III (lateral), IV (subventral) and V (subdorsal).
Total pairs: 12					
<i>S. incospicata</i> [†]	Freitas (1959)	Total: 3 sublateral pairs	Total: 3 small papillae.	Total: 3 pairs	
Total pairs: 6 pairs + 3					
<i>S. schranki</i> [†]	Freitas (1959)	Total: 3 sublateral pairs.	Total: 3 small papillae.	Total: 3 pairs.	
Total pairs: 6 pairs + 3					
<i>S. brasili</i>	Baker and Vaucher (1988)	Total: 4-5 subventral pairs	Total: 3 pairs + 1 unpaired papilla.	Total: 5 pairs.	Anterior half of tail: pairs I and II (subventral), near cloaca. Posterior half of tail: pair III (lateral), IV (subventral) and V (subdorsal).
Total pairs: 12-13					
<i>S. brasili</i>	Freitas (1959)	Total: 3 sublateral pairs.	—	Total: 2 pairs.	
Total pairs: 5					
<i>S. larvata</i>	Fahel (1952) and Freitas (1959)	Total: 3 sublateral pairs	—	Total: 3 pairs.	
Total pairs: 6					
<i>S. larvata</i>	Baker and Vaucher (1988)	Total: 4-5 subventral pairs.	Total: 3 pairs + 1 unpaired papilla.	Total: 5 pairs.	Anterior half of tail: pairs I and II (subventral), near cloaca. Posterior half of tail: pair III (lateral), IV (subventral) and V (subdorsal).
Total pairs: 12-13					

Notes: * All adcloacal papillae on anterior margin of cloaca.

[†]Pairs of caudal papillae (precloacal and postcloacal) + papillae on anterior margin of cloaca.

first to second pair: 27.25 ± 4.49 (20–30) [29]; distance second to third pair: 23.41 ± 4.92 (17–30) [28]; distance third to fourth pair: 18.1 ± 3.0 (14–25) [25]; fifth pair at level of cloaca]; three pairs of adcloacal and one large unpaired papilla on anterior margin of cloaca (Figure 2E); six pairs of postcloacal papillae (first two ventral pairs immediately behind cloaca; third pair lateral, approximately at middle of tail length; fourth pair ventral in posterior third of tail; fifth and sixth pairs at beginning of caudal appendage, these last two pairs at the same level, one ventral and one sub-ventral). Posterior margin of cloaca with cuticular comb-like fringe. Spicules relatively short, curved ventrally, sharply pointed distally and with variably shaped capitulum; gubernaculum sclerotized, elongated, posterior end pointed (Figure 1F, G). Caudal alae absent.

Female. (measurements of allotype and paratypes are given in Table 1). Lateral alae extending from anterior third of oesophagus at level of vulva. Vulva, transverse slit, slightly prominent; vagina well developed, directed anteriorly (Figure 1H). Uteri with one to three oval eggs, thin shelled, some of them with larvae.

Site of infection

Large intestine.

Type locality

Taco Pozo, Almirante Brown Department, Chaco Province, Argentina ($25^{\circ}36'54''$ S, $63^{\circ}15'54''$ W).

Deposition of types

Holotype (male), allotype (female) and paratypes (five males, five females) in Helminthological Collection of the Museum of La Plata (Holotype: MLP-He 6650; allotype: MLP-He 6651; paratypes: MLP-He 6652); paratypes (five males, five females) in Helminthological Collection of Centro de Ecología Aplicada del Litoral (CECOAL 11101910).

Host

Leptodactylus bufonius Boulenger, 1894 (Anura, Leptodactylidae), the Vizcacheras' White-lipped frog, Herpetology Collection of the Centro de Ecología Aplicada del Litoral (LHC 5062, LHC 5063).

Etymology

The new species is named in reference to its biogeographical region of collection.

Differential diagnosis

Species of the genus *Schrankiana* are distinguished by their oesophageal shape, cephalic morphology, extent of the lateral alae, location of the vulva, size of the vagina, and male caudal features (e.g. papillae and spicules) (Baker and Vaucher 1988).

The new species described here is distinguished from the remaining species of the genus by its cephalic morphology: *S. chacoensis* sp. nov. possesses four large papillae on the lips (two on the dorsal lip and one on each subventral lip) without any other small papillae (which are present in the remaining *Schrankiana* species) and the possession of amphids with forked shape; also by having a shorter vagina; the lateral alae ending well anterior to the anus in both sexes, an additional pair of postcloacal papillae compared with the other species, and a “fringe” in the posterior and anterior margins of the excretory pore.

Schrankiana chacoensis sp. nov. differs from *Schrankiana fuscus* Baker and Vaucher, 1988 mainly by the following characters: (1) smaller size of males and females; (2) smaller size of spicules and gubernaculum; (3) short posterior uterine pouch (absent in *S. chacoensis* sp. nov. versus present in *S. fuscus*); (4) shorter distance between vulva and posterior extremity; (5) presence of caudal appendage; (6) number and arrangement of precloacal and postcloacal papillae (see Tables 1 and 2).

Schrankiana chacoensis sp. nov. differs from *Schrankiana freitasi* Baker, 1982 by the following characteristics: (1) smaller size of males and females; (2) shorter total length of oesophagus in males and females; (3) smaller spicules and gubernaculum; (4) smaller vagina; (5) short posterior uterine pouch (absent in *S. chacoensis* sp. nov. versus present in *S. freitasi*); (6) presence of a caudal appendage; (7) number and arrangement of postcloacal papillae (see Tables 1 and 2).

The new species differs from *Schrankiana formosula* Freitas, 1959 by the following characteristics: (1) smaller spicules and gubernaculum; (2) smaller vagina; (3) absence of short posterior uterine pouch [present in Paraguayan specimens studied by Baker and Vaucher (1988)]; (4) number and arrangement of caudal papillae (Tables 1 and 2).

The new species differs from *Schrankiana incospicata* Freitas, 1959 by the following characters: (1) smaller size of males and females; (2) shorter total length of oesophagus in males and females; (3) smaller vagina compared with Brazilian specimens studied by Freitas (1959); in Paraguayan specimens the vagina is divided into *vagina uterina* and *vagina vera* (Baker and Vaucher 1988); (4) modification of anterior end of oesophageal corpus that includes cuticular rod-shaped structures in *S. incospicata* (Baker and Vaucher, 1988); (5) number and arrangement of caudal papillae (Tables 1 and 2).

Schrankiana chacoensis sp. nov. differs from *S. schranki* (Travassos, 1925) Strand, 1942 mainly by the following characters: (1) shorter total length of oesophagus in males and females; (2) smaller spicules; (3) smaller vagina; (4) number and arrangement of caudal papillae (Tables 1 and 2).

Schrankiana chacoensis sp. nov. differs from *S. brasili* (Travassos, 1927) Fahel, 1952 by the following characters: (1) shorter total length of males and females; (2) shorter total length of oesophagus in males and females; (3) morphology of the *corpus* [divided into procorpus and metacarpus in *S. brasili* (Freitas, 1959)]; (4) smaller spicules and gubernaculum; (5) morphology of the vagina [divided into *vagina uterina* and *vagina vera* in *S. brasili* (Baker and Vaucher, 1988)]; (6) shorter distance between vulva and posterior extremity; (7) number and arrangement of caudal papillae compared with Paraguayan and Brazilian specimens (Freitas 1959; Baker & Vaucher 1988) (Tables 1 and 2).

The new species described here differs from *S. larvata* (Vaz, 1933) Fahel, 1952 by the following characteristics: (1) shorter total length of males and females; (2) morphology of the *corpus* [divided into procorpus and metacarpus in *S. larvata* (Freitas, 1959)]; (3) smaller vagina; (4) shorter spicules and gubernaculum; (5) smaller

distance between vulva and posterior end compared with specimens studied by Freitas (1959) and Fahel (1952); (6) number and arrangement of caudal papillae (Tables 1 and 2).

Below we provide a key for the species of *Schrankiana*.

1. Lateral alae ending at end of oesophagus in both sexes; 17–19 pairs of subventral precloacal muscle cells; total length of oesophagus 800 μm or longer ... *S. brasili*
 Lateral alae extending beyond end of oesophagus in both sexes; four to six pairs of subventral precloacal muscle cells; total length of oesophagus less than 800 μm 2
2. Four large labial papillae; six pairs of postcloacal papillae; forked amphids .. *S. chacoensis*
 Ten labial papillae; fewer than six pairs of postcloacal papillae; flat amphids 3
3. Eleven or more pairs of precloacal muscle cells; lateral alae not reaching level of anus 4
 Fewer than 11 pairs of precloacal muscle cells; lateral alae reaching level of anus 5
4. Pharynx elongate and slender; corpus not divided into *procorpus* and *metacarpus*; vagina divided into *vagina vera* and *vagina uterina* *S. incospicata*
 Pharynx as wide as it is long; corpus divided into *procorpus* and *metacarpus*; vagina not divided into *vagina vera* and *vagina uterina* *S. larvata*
5. Pharynx as wide as it is long; total length of oesophagus more than 500 μm 6
 Pharynx as wide as it is long or elongate and slender; total length of oesophagus less than 500 μm 7
6. Posterior uterine pouch present; vagina 300 μm long; spicules 75 μm long .. *S. freitasi*
 Posterior uterine pouch absent; vagina less than 200 μm long; spicules longer than 84 μm *S. schranki*
7. Pharynx as wide as it is long; spicules longer than 100 μm ; gubernaculum longer than 55 μm *S. fuscus*
 Pharynx elongate and slender; spicules less than 100 μm long; gubernaculum less than 55 μm long *S. formosula*

Discussion

Seven species of the genus *Schrankiana* have been described up to the present; all of them were found in diverse South American leptodactylid frog hosts of the genus *Leptodactylus* Fitzinger, 1826 except for *S. brasili*, which was also found in *Rhinella schneideri* (Werner, 1894) from Paraguay by Baker and Vaucher (1988); these authors considered this infection as “an accidental infection in an unusual host”.

Previous reports of *Schrankiana* spp. collected in Brazil include *S. formosula* found in *Leptodactylus fuscus* (Schneider, 1799) (syn. *L. typhonius*); *S. fuscus* found in *L. fuscus*; *S. freitasi* found in *L. pentadactylus* (Laurenti, 1768) and *L. mystaceus* (Spix, 1864); *S. larvata* found in *L. fuscus*, *L. mystaceus*, *L. labyrinthicus* (Spix, 1824), *L. pentadactylus*, *L. latrans* (Steffen, 1815) (syn. *L. ocellatus*); *S. brasili* found in *L. labyrinthicus* and *L. pentadactylus*; *S. schranki* found in *L. pentadactylus*, *L. labyrinthicus* and *L. rhodomystax* Boulenger, 1884; and *S. incospicata* found in *L. pentadactylus labyrinthicus* and *L. pentadactylus* (Travassos 1925, 1927; Vaz 1933; Fahel 1952; Freitas 1959; Guimaraes et al. 1976; Baker 1982; Goldberg et al. 2007, 2009). *Schrankiana* spp. collected in Paraguay include *S. formosula* found in *L. fuscus* and *L. elenae* Heyer, 1978; *S. fuscus* found in *L. fuscus*; *S. larvata* found in *L. labyrinthicus*; *S. brasili* found in *L. labyrinthicus* and in *Rhinella schneideri* (syn. *Bufo paracnemis*); and *S. incospicata* found in *L. labyrinthicus* (Baker and Vaucher, 1988). *Schrankiana* spp. collected in Peru include *S. larvata* found in *L. mystaceus* and *L. pentadactylus*; *S. brasili* found in *L. pentadactylus*; *S. schranki* found in *L. mystaceus*; and *S. incospicata* found in *L. rhodonotus* (Günther, 1869) (Bursey et al. 2001). In Ecuador, species of genus *Schrankiana* found in amphibians include *S. schranki* found in *L. mystaceus* and *L. pentadactylus* (Dyer and Altig, 1977; Dyer, 1990). On the other hand, *Schrankiana* spp. collected in Costa Rica include *S. incospicata* found in *L. fragilis* (Brocchi, 1877), *L. pentadactylus* and *L. pecilochilus* (Cope, 1862) (Bursey and Brooks 2010). Finally, in Argentina, *S. schranki* has been found in *L. latinasus* Jimenez de la Espada, 1875 (Hamann et al. 2006).

To our knowledge, the nematode parasites reported from *Leptodactylus bufonius* comprise the species *Rhabdias elegans* Gutierrez, 1945, *Oswaldocruzia* sp., *Aplectana* sp., *Aplectana hylambatis* (Baylis, 1927) Travassos, 1931, *Cosmocerca podicipinus* Baker and Vaucher, 1984, *Cosmocerca parva* Travassos, 1925, *Ortleppascaris* sp. and *Physaloptera* sp. found in Corrientes province, Argentina (González and Hamann 2006; Hamann et al. 2012) and *Aplectana hylambatis*, *Oswaldocruzia proencai* Ben Slimane and Durette-Desset, 1995 and *Schulzia travassosi* Durette-Desset, Baker and Vaucher, 1986 from Paraguay (Lent et al. 1946; Durette-Desset et al. 1985). With this study, we incorporate a new nematode parasite as part of the helminthological fauna of *L. bufonius*.

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