Annals of Parasitology 2022, 68(3), 483–489
doi: 10.17420/ap6803.454

Original paper

Skrjabinodon castillensis n. sp. (Nematoda: Pharyngodonidae) from the *Homonota horrida* and *H. darwinii* (Squamata: Phyllodactylidae) from Argentina and key for the Neotropical species of the genus *Skrjabinodon*

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ABSTRACT. *Skrjabinodon castillensis* n. sp. is described and illustrated here, based on specimens found in the large intestines of *Homonota horrida* (province San Juan) and *Homonota darwinii* (province Neuquén) (Squamata: Phyllodactylidae) from Argentina. The new species is assigned to *Skrjabinodon* based lateral alae present in males, absent in females. Lateral alae beginning midway between lips and nerve ring and ending just posterior to first pair of caudal papillae. Females with vulva near esophageal bulb. In males, caudal alae absent, paired caudal papillae present. *Skrjabinodon castillensis* n. sp. represents the 9th species from the Neotropical realm. The new species differs from all other species assigned to *Skrjabinodon* by morphology of tail filament and number of tail filament spines. *Skrjabinodon castillensis* n. sp. is the only species of this genus known from Argentina. A key to the species of *Skrjabinodon* in the Neotropical realm is provided.

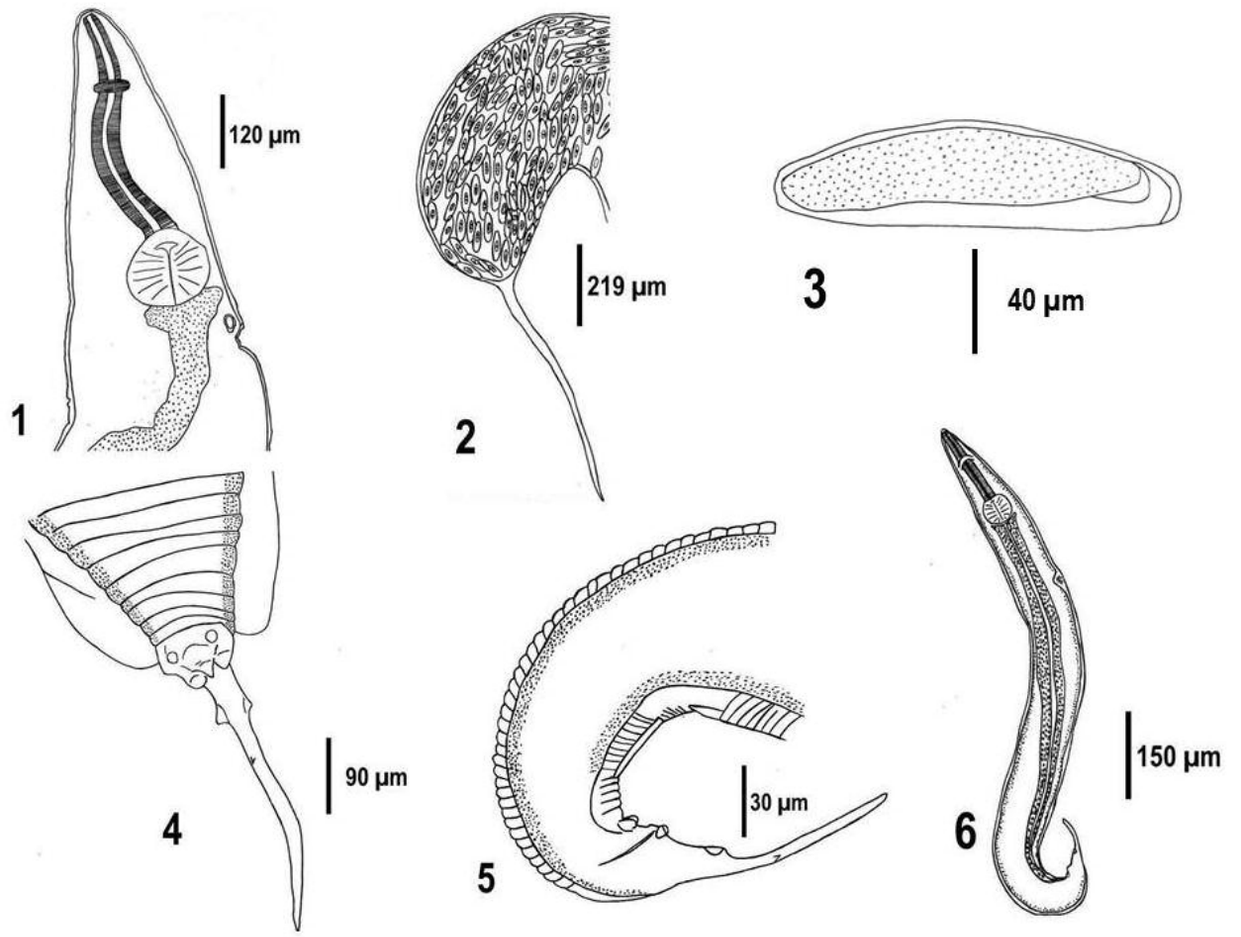
Keywords: nematodes, *Skrjabinodon castillensis*, *Homonota horrida*, *Homonota darwinii*, San Juan, Argentina

http://zoobank.org/urn:lsid:zoobank.org:pub:3DD6FA81-9F4F-44EC-BBEE-2D54C29DF848

Introduction

Studies about parasite nematodes of the Argentina herpetofauna are scarce and incomplete. There are a total of 408 species of reptiles mentioned in Argentina, of which only 40 species of reptiles (4 snakes, 3 turtles, 1 anfisbaenian and 32 lizards) there are records of parasitic nematodes. Twenty-six nematodes species have been reported from reptiles, of which the genus *Skrjabinodon* was not mentioned in reptiles from Argentina [1].

Currently, 29 species of *Skrjabinodon* Inglis, 1968 are known [2–4], with only eight reported from the neotropical lizards: *Skrjabinodon cricosaurae* Barus and Coy-Otero, 1974 from the Cuban night lizard (*Cricosaura typical*); *Skrjabinodon heliocostai* Vicente, Vrcibradic, Muniz-Pereira and Pinto, 2000 from Cope's mabuya (*Mabuya frenata*), collected in Brazil; *Skrjabinodon spinosulus* Vicente, Vrcibradic, Rocha and Pinto, 2002 from the Paraguay mabuya (*Mabuya dorsivittata*), collected in Brazil; *Skrjabinodon scelopori* Caballero, 1938 from the crevice swift (*Sceloporus torquatus*), collected in Mexico;



Figures 1–6. *Skrjabinodon castillensis* n. sp. (1) Female, anterior end, lateral view; (2) Female, gravid, posterior end, lateral view; (3) Egg; (4) Male, posterior end, ventral view; (5) Male, posterior end, lateral view; (6) Male, entire, lateral view

Skrjabinodon cartagoensis Bursey and Goldberg, 2006 from *Mesaspis monticola*, collected in Costa Rica; *Skrjabinodon dixoni* Bursey and Goldberg, 2007 from the thornytail iguana (*Uracentron flaviceps*) collected in Ecuador; *Skrjabinodon aspercaudus* from *Pholidobolus montium* Bursey and Goldberg, 2011 collected in Ecuador and *Skrjabinodon campiaoae* De Sousa, Silva De Oliveira, Morais, Da Silva Pinheiro and Ávila, 2022 from *Vanzosaura multiscutata* collected in northeastern Brazil [2–9].

This paper describes the ninth species of *Skrjabinodon* from the Neotropical realm. A key for the identification of the members of *Skrjabinodon*, parasitic in lizards of the Neotropical realm, is provided.

Materials and Methods

One *Homonota horrida* Burmeister, 1861 collected in San Juan (1 male; SVL 40 mm) and two *Homonota darwinii* Boulenger, 1885 collected in Neuquén (2 males; SVL 35 mm) province, were dissected. Lizards were collected between February 2017 and November 2019 in the localities of El Encón (San Juan province), and Rincón de los Sauces (Neuquén province), Argentina. The stomach, intestines, cloaca, liver, lungs, gonads, and peritoneum of each specimen were searched for helminths using a stereoscopic binocular loupe. Nematodes were placed in lactophenol, allowed to clear and examined under a light microscope. Drawings were made using a camera lucida. Prevalence and mean intensity were calculated based on the definitions of Bush et al. [10].

Nematodes were deposited in the parasitological collection of the Department of Biology, National University of San Juan (UNSJPar 280, 281 and 282).

Results

Seven nematodes (4 gravid females and 3 males) collected from *H. horrida* and six nematodes (4

Table 1. Current list and selected characters of species assigned to *Skrjabinodon* in the Neotropical realm

	Male		Female		
Species	Spicule	Tail filament	Egg shape	Tail filament	References
Skrjabinodon castillensis n. sp. González-Rivas, Castillo and Acosta, 2022	37	0–1 spines	Truncate ends	smooth	this paper
Skrjabinodon aspercaudus Bursey and Goldberg, 2011	53	smooth (surface ornamented with tiny bosses approximately 2 in diameter)	spindleform	smooth	[3]
Skrjabinodon cartagoensis Bursey and Goldberg, 2006	72–78	smooth	poles unadorned	stiff spike	[2]
Skrjabinodon dixoni Bursey and Goldberg, 2007	absent	1–3 spines	oval	3 spines	[9]
Skrjabinodon spinosulus Vicente, Vrcibradic, Rocha and Pinto, 2002	43–50	smooth	spindleform	spinous	[8,9]
Skrjabinodon heliocostai Vicente, Vrcibradic, Muniz-Pereira and Pinto, 2000	absent	smooth	oval	spinous	[7,9]
Skrjabinodon scelopori Caballero, 1938	57	smooth	spindleform	10–12 spines	[11]
Skrjabinodon cricosaurae Barus and Coy-Otero, 1974	37	smooth	truncate ends	3–7 spines	[6]
Skrjabinodon campiaoae De Sousa, Silva De Oliveira, Morais, Da Silva Pinheiro and Ávila, 2022	absent	3–9	fusiform	18–51	[4]

gravid females and 2 males) collected from *H. darwinii* assignable to *Skrjabinodon*, but dissimilar to any current species.

***Skrjabinodon castillensis* sp. n. (Figs. 1–6)**

General: Order Oxyuroidea Railliet. Family Pharyngodonidae Travassos, 1919, *Skrjabinodon* Inglis, 1968. Small cylindrical nematodes, evident sexual dimorphism, males smaller than females. Triangular oral opening surrounded by 3 bilobed lips. Lateral alae present in males, absent in females. Female excretory pore and vulva posterior to esophageal bulb. In males, caudal alae absent, paired caudal papillae present.

Male (based on 4 adult specimens): Length (lip to posterior pair of papillae; excludes tail filament) 1.4±0.23 mm (1.12–1.7); width at level of excretory pore 191.8±54.8 µm (117.6–249.9); esophageal corpus length (not including bulb) 157±26 µm (146–196); width esophageal 31.7±5.8 µm (25–39); bulb length 65.8±4.06 µm (60–68.6); bulb width 72.9±17.3 µm (58.8–98); nerve ring 108.8±27.6 µm (67.5–125); excretory pore 462±24.4 µm (431.2–490); spicule present 37.5±1 µm (37–39); tail filament 270.3±108 µm (125–386) in length with 0–1 small cuticular spines. Caudal alae absent, 3 pairs of sessile papillae; 1 pair precloacal, 1 pair postcloacal, third pair occurring at junction with tail filament.

Female (based on 4 gravid specimens): Length (to tail spike) 5.3±0.1 mm (5.2–5.4); width at level of excretory pore 478.7±8.5 µm (470–490); esophageal corpus length (not including bulb) 342±2.4 µm (340–345); width esophageal 38.3±1.01 µm (37–39); bulb long 121.9±9.8 µm (110–130); bulb width 133.3±3.3 µm (130–137); nerve ring 97.2±0.9 µm (96–98); excretory pore 483.7±4.7 µm (480–490); vulva 531±8.2 µm (520–539) from anterior end. Egg width 41.6±1.3 µm (40–43); egg length 149.7±0.5 µm (149–150);

Table 2. Comparative measurements on males of the nine Neotropical species of *Skrjabinodon* (µm)

	Males								
	Skrjabinodon cricosaurae	*Skrjabinodon dixoni*	*Skrjabinodon heliocostai*	*Skrjabinodon spinosulus*	*Skrjabinodon scelopori*	*Skrjabinodon aspercaudus*	*Skrjabinodon cartagoensis*	*Skrjabinodon campiaoae*	*Skrjabinodon castillensis* n. sp.
Length (mm)	0.89	1.92–2.80	1.02–1.26	1.47–1.72	1.96	1.15	1.2	0.8-1.1	1.12–1.7
Width	94	204–357	140–150	140–150	136	183	220	75−134	191
Esophageal	175	180–250	190–210	180–200	285	140	141	165−227	157
Bulb length	35	67–92	54–57	39–60	72	61	48	46−63	65.8
Bulb width	35	61–88	4–61	50–72	72	55	54	47−70	72.9
Nerve ring	10	92–134	79–90	43–50	132	92	123	54−64	108.8
Excretory pore	31	638–995	280	not observed	449	354	460	306	462
Spicule	37	absent	absent	43–50	57	53	72	absent	37.5
Tail filament	–	357–408	190	smooth, conical	81	275	smooth, filiform	117−275	270.3
Spines	absent	1–3	absent	absent	absent	absent	absent	3–9	0–1
Papillae pattern	2–2–2	2–2–2	2–2–2	2–2–2	2–4–2	2–2–2	2–2–2	2–4–2	2–2–2

Table 3. Comparative measurements on females of the nine Neotropical species of *Skrjabinodon* (μm)

	Females								
	Skrjabinodon cricosaurae	*Skrjabinodon dixoni*	*Skrjabinodon heliocostai*	*Skrjabinodon spinosulus*	*Skrjabinodon scelopori*	*Skrjabinodon aspercaudus*	*Skrjabinodon cartagoensis*	*Skrjabinodon campiaoae*	*Skrjabinodon castillensis* n. sp.
Length (mm)	3.41–4.62	5.44–7.87	2.190–8.400	7.44–8.96	3.81–5.73	3.9–5.3	3.8	0.6–3.6	5.2–5.4
Width	28–38	638–969	140–160	140–150	381–598	255–332	255	76–167	478.7
Esophageal	31–34	372–512	300–510	410–430	490–517	299–317	270	373–531	342
Bulb length	63–84	110–159	57–90	75–100	105–108	79–92	75	64–124	121.9
Bulb width	77–98	92–171	55–100	90–130	120–129	85–104	82	74–142	133.3
Nerve ring	84–100	92–140	93–150	100–130	109–120	79–110	120	63–130	97.2
Excretory pore	23–35	40	190–280	30–560	571–653	250–275	510	168	483.7
Vulva	25–44	816–1.148	200–300	370–600	625–721	281–317	555	61–206	531
Vulva location	bulb front	post bulb	prebulbar	post bulb	post bulb	prebulbar	post bulb	prebulbar	post bulb
Tail filament	–	204–306	140–390	450–630	857–1.156	740–842	120	291–731	876
Spines	3–7	3	spined	70–80	10–12	absent	absent	18–51	absent
Egg length	124–135	88–95	140	160–180	162–171	116–134	152	102–124	149
Egg width	3–42	40–43	54	36–50	36–48	30–34	36	19–49	41.6
Egg form	truncate ending	oval, slightly flattened on one side	oval	spindleform	spindleform	spindleform	poles unadorned	fusiform	truncate ending
Author	Barus and Coy-Otero, 1974	Bursey and Goldberg, 2007	Vicente, Vrcibradic, Muniz-Pereira and Pinto, 2000	Vicente, Vrcibradic, Rocha and Pinto, 2002	Caballero, 1938	Bursey and Goldberg, 2011	Bursey and Goldberg, 2006	De Sousa, Silva De Oliveira, Morais, Da Silva Pinheiro and Ávila, 2022	González-Rivas, Castillo, Acosta, 2022
Country	Cuba	Perú y Ecuador	Brazil	Brazil	Mexico	Ecuador	Costa Rica	Brazil	Argentina
Locality	Cabo Cruz, province Orionte	Moropon, on Río Nanay, Oreto Department	Sao Pablo	Prateleiras, Parque Nacional do Itatiaia. Estacao Ecologica de Itirapina	Aguamilpa, Nayarit	El Quinche, Pinchincha Province	Volcán Irazú (9°58'N, 83° 52'W), Cartago	Ecological Station Aiuaba (ESA-Aiuaba), Ceará State,Northeastern Brazil	El Encón, San Juan Province and Rincón de los Sauces, Neuquén province
Host	*Cricosaura typica Xanthusiidae*	*Uracentron flaviceps*	*Mabuya frenata*	*Mabuya dorsivittata*	*Phyllodactylus lanei*	*Pholidobolus montium*	*Mesaspis monticola*	*Vanzosaura multiscutata*	*Homonota horrida and Homonota darwinii*

tail length 876±5.8 µm (870–882).

Type host: *Homonota horrida* Burmeister, 1861, Phyllodactylidae, Symbiotype: collection date: 18 February 2017

Type locality: El Encón, San Juan Province (32º12'56"S 67º47'43"W), Argentina

Site of infection: Large intestine

Type specimen: Holotype male, UNSJpar 280, holotype female UNSJpar 281

Etymology: The specific epithet is given in honor of biologist-parasitologist-herpetologist Gabriel Natalio Castillo, member of Gabinete de Investigación DIBIOVA (Diversidad y Biología de Vertebrados del Árido). Universidad Nacional de San Juan, Argentina, for her significant contribution to the knowledge of parasitism of Argentina reptiles.

Additional host: *Homonota darwinii* Boulenger, 1885, Phyllodactylidae, collection date: 20 December 2019

Additional localities: Rincón de los Sauces, Neuquén province (37º23'25"S 68º55'31"W), Argentina

Site of infection: Large intestine

Remarks

Skrjabinodon castillensis n. sp. is the only species of this genus known from Argentina. *Skrjabinodon castillensis* is characterized and differentiated from the rest of the species of the genus in which the females do not have spines and males have between 0–1 spines.

Discussion

Eight species of *Skrjabinodon* Inglis, 1968 are currently known from the Neotropical realm [3,9]: *S. cricosaurae*, *S. heliocostai*, *S. spinosulus*, *S. scelopori*, *S. cartagoensis*, *S. dixoni*, *S. aspercaudus* and *Skrjabinodon campiaoae*. Of these, all females have spiny tails, except *S. aspercaudus* and *Skrjabinodon castillensis* n. sp. that has smooth tail. However, *S. aspercaudus* female differ from *S. castillensis* n. sp. in that *S. aspercaudus* presents surface ornamented with tiny bosses approximately 2 in diameter. Our species *S. castillensis* n. sp. presents eggs truncate ends, this is similar to *S. cricosaurae*, because *S. dixoni* and *S. heliocostai* present eggs oval and *S. spinosulus*, *S. scelopori*, *S. aspercaudus* and *S. campiaoae* have spindle-form eggs.

According to the presence or absence of spicules [6] the species belonging to the genus *Skrjabinodon* in the Neotropical realm can be divided in two groups: the spicule is absent in the species; *S. dixoni*, *S. heliocostai* and *S. campiaoae* [8,9]), the spicule is present in the species; *S. cricosaurae*, *S. spinosulus*, *S. scelopori* and *S. aspercaudus* [3,7,9,11]. The species *S. castillensis* n. sp. described by us belongs to the group possessing the spicule. Due to this, male *S. castillensis* are similar to *S. cricosaurae*, *S. spinosulus*, *S. scelopori* and *S. aspercaudus* by the presence of spicule, although they differ in size. Of the 8 species mentioned for the Neotropical realm, all have no spines on the tail, except for *S. dixoni*, *S. campiaoae* and *S. castillensis*. The tail in males of *S. castillensis* has 0 to 1 spine, this differentiates it from *S. dixoni* and *S. campiaoae* that has 1 to 3 spines and 3 to 9 spines.

In the present study, the Phyllodactylidae lizard represents a new parasite-host interaction for nematodes of the genus *Skrjabinodon*. Moreover, a new species of this parasite is described for the first time for the from Argentina, contributing to the knowledge of the diversity of nematodes in Argentina.

Acknowledgements

We thank the Sub-Secretary of the Environment, Rodrigo Acosta (UNSJ), for the permits granted (Nº 1300-3097-16), and the rangers (Mariano Hidalgo, Jorge Cayuela, Jesús Quiroga and José Castro) for their help in field samplings. We thank two anonymous reviewers for improving the manuscript.

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Key to the Neotropical species of the genus *Skrjabinodon* Inglis, 1968

1a. Presence of spines in males 2
1b. Absence of spines in males 3
2a. Spines from 0 to 1 in males . . . . . .*Skrjabinodon castillensis* n. sp. González- Rivas, Castillo and Acosta, 2022
2b. Spines from 1 to 3 in males . . . . . .*Skrjabinodon dixoni* Bursey and Goldberg, 2007
2c. Spines from 3 to 9 in males . . . . . *Skrjabinodon campiaoae* De Sousa, Silva De Oliveira, Morais, ...Da Silva Pinheiro and Ávila, 2022
3a. Tail surface on male with ornamentation . . . . . .*Skrjabinodon aspercaudus* Bursey and Goldberg, 2011
3b. Tail surface in male without ornamentation 4
4a. Female with short tail filament . . . . . .*Skrjabinodon cartagoensis* Bursey and Goldberg, 2006
4b. Female with long tail filament 5
5a. Males with absence of spicule and females with oval shaped eggs . . . . . *Skrjabinodon heliocostai* Vicente, ...Vrcibradic, Muniz-Pereira and Pinto, 2000
5b. Males with presence of spicule and females with non-oval shaped eggs 6
6a. Females with eggs with truncated endings, tails with 3 to 7 spines and males with spicule size 37 µm . . . . . .*Skrjabinodon cricosaurae* Barus and Coy-Otero, 1974
6b. Female tail with more than 7 spines and spindleform eggs 7
7a. Females with 10-12 spines on tail filament . . . . . .*Skrjabinodon scelopori* Moravec, Salgado-Maldonado . . . . . .and Mayen-Pena,1997
7b. Females with more than 12 spines on the tail filament . . . . . .*Skrjabinodon spinosulus* Vicente, Vrcibradic, ...Rocha and Pinto, 2002

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Received 09 May 2022
Accepted 24 July 2022