

Short note

Skrjabinodon castillensis (Nematoda: Pharyngodonidae) parasitizing *Liolaemus graciela* lizard (Squamata: Iguania: Liolaemidae) from Argentina

Gabriel N. CASTILLO^{1,2,3}, Cynthia GONZÁLEZ-RIVAS⁴, Juan C. ACOSTA^{1,3}

¹Departamento de Biología, Facultad de Ciencias Exactas, Físicas y Naturales, Universidad Nacional de San Juan. Av. Ignacio de la Roza 590, 5402, San Juan, Argentina

²CONICET (Consejo Nacional de Investigaciones Científicas y Técnicas), Av. Ignacio de la Roza 590, San Juan, Argentina

³Gabinete de Investigación DIBIOVA (Diversidad y Biología de Vertebrados del Árido), Universidad Nacional de San Juan, Av. Ignacio de la Roza 590, 5402, San Juan, Argentina

⁴Centro de Rehabilitación de Fauna Silvestre, Educación Ambiental y Recreación Responsable, San Juan, Argentina. Ruta Provincial N° 60 KM 14 5400 Rivadavia, San Juan, Argentina

Corresponding Autor: Gabriel N. Castillo; e-mail: nataliocastillo@gmail.com

ABSTRACT. *Skrjabinodon castillensis* is mentioned and illustrated here, based on specimens found in the large intestines of *Liolaemus graciela* (Squamata: Liolaemidae) collected in San Juan province, Argentina. The species found is assigned to *Skrjabinodon* based lateral alae present in males. Lateral alae beginning midway between lips and nerve ring and ending just posterior to first pair of caudal papillae. In males, caudal alae absent, paired caudal papillae present. The species recorded in this study differs from all other species assigned to *Skrjabinodon* by morphology and number of tail filament spines. *Skrjabinodon castillensis* is the ninth species from the Neotropical realm and the only species of this genus known from Argentina.

Keywords: Oxyuroidea, reptile, *Skrjabinodon castillensis*, nematodes, Neotropical

Introduction

The genus *Skrjabinodon* Inglis, 1968 consists of 37 species worldwide [1] all parasites of carnivorous reptiles [2,3]. In the Neotropical Region, nine species of *Skrjabinodon* were reported; *Skrjabinodon cricosaurae* Barus and Coy-Otero, 1974 from the Cuban night lizard *Cricosaura typical*; *Skrjabinodon heliocostai* Vicente, Vrcibradic, Muniz-Pereira and Pinto, 2000 from *Mabuya frenata*, collected in Brazil; *Skrjabinodon spinosulus* Vicente, Vrcibradic, Rocha and Pinto, 2002 from *Mabuya dorsivittata*, collected in Brazil; *Skrjabinodon scelopori* Caballero, 1938 from *Sceloporus torquatus* collected in Mexico; *Skrjabinodon cartagoensis* Bursey and Goldberg, 2006 from *Mesaspis monticola* collected in Costa Rica; *Skrjabinodon dixonii* Bursey and Goldberg, 2007 from the thornytail iguana *Uracentron flaviceps* collected in Ecuador; *Skrjabinodon asper-*

caudus Bursey and Goldberg, 2011 from *Pholidobolus montium* collected in Ecuador; *Skrjabinodon campiaoae* De Sousa, Silva De Oliveira, Morais, Da Silva Pinheiro and Avila, 2022 from *Vanzosaura multiscutata* collected in northeastern Brazil and *Skrjabinodon castillensis* González-Rivas, Castillo and Acosta, 2022 from *Homonota horrida* and *Homonota darwinii* collected in Argentina [3]. González-Rivas et al. [3] review the main characters that differs *Skrjabinodon* species in the Neotropical realm, being the size of the spike, morphology, number of spines on the tail and shape of the egg the main characteristics that differentiate them.

Liolaemus graciela Abdala, Acosta, Cabrera, Villavicencio and Marinero, 2009 is distributed in the provinces of San Juan and La Rioja, Argentina. This species inhabits altitudes above 4000 meters, areas located in the Andes mountains of Argentina.

It is a medium-sized lizard, 76 mm. Its diet is omnivorous, with a tendency to frugivory of *Lycium chanar* and flowers of *Ephedra* sp., with a unimodal pattern of daily activity. They bask during the still cold sunny hours of the morning, and seek shelter below *L. chanar* bushes during the warmer time of day. It is a viviparous species and no aspect of its biology is known [4,5].

Based on morphology and number of tail spines in males, this paper mentions the ninth species of *Skrjabinodon* from Neotropical and the second species of the genus parasitizing reptiles from Argentina.

Materials and Methods

Five specimens of *Liolaemus graciellae* (one male and 4 females) were captured by the loop method, road to San Guillermo Provincial Reserve, Province of San Juan (Iglesia Department), during March 2022.

The body cavity was opened by a longitudinal incision from vent to throat, and the gastrointestinal tract was removed and opened longitudinally. 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. [6]. Measurements are in μm , with mean \pm 1 SD and range in parentheses, unless otherwise stated. Nematodes were deposited in the parasitological collection of the Department of Biology, National University of San Juan (UNSPar 288).

Results

Four nematodes males collected from *Liolaemus graciellae* assignable to *Skrjabinodon castillensis*.

Oxyuroidea Railliet

Pharyngodonidae Travassos, 1919

Skrjabinodon Inglis, 1968

Skrjabinodon castillensis González-Rivas, Castillo and Acosta, 2022 (Fig. 1)

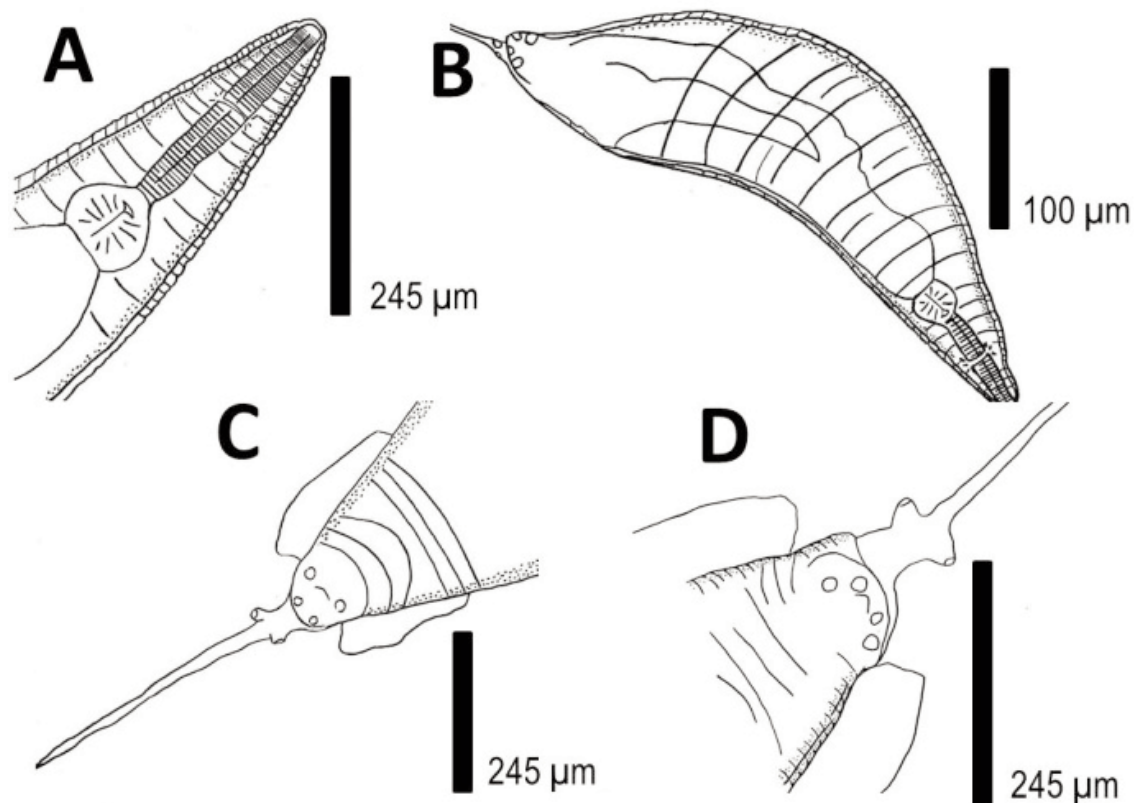


Figure 1. Male, *Skrjabinodon castillensis*. (A) anterior region, lateral view; (B) entire, lateral view, tail filament not visible; (C) posterior region, lateral view, tail filament without spines and caudal papillae can be seen; (D) posterior region, lateral view, with more detail

Table 1. Comparative measurements on males of nine Neotropical species of *Skrjabinodon* (µm)

	<i>Skrjabinodon cricosaurae</i>	<i>Skrjabinodon dixonii</i>	<i>Skrjabinodon heliocostai</i>	<i>Skrjabinodon spinosulus</i>	<i>Skrjabinodon scelopori</i>	<i>Skrjabinodon aspercaudus</i>	<i>Skrjabinodon cartagoensis</i>	<i>Skrjabinodon campiaoeae</i>	<i>Skrjabinodon castillensis</i>	<i>Skrjabinodon castillensis</i> present study
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	1.71–1.75
Width	94	204–357	140–150	140–150	136	183	220	75–134	191	107–112
Esophageal	175	180–250	190–210	180–200	285	140	141	165–227	157	235–255
Bulb length	35	67–92	54–57	39–60	72	61	48	46–63	65.8	98–107
Bulb width	35	61–88	4–61	50–72	72	55	54	47–70	72.9	107.8
Nerve ring	10	92–134	79–90	43–50	132	92	123	54–64	108.8	166–186
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	490–499
Spines	absent	1–3	absent	absent	absent	absent	absent	3–9	0–1	absent
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	2-2-2
Host	<i>Cricosaura typica</i>	<i>Uracentron flaviceps</i>	<i>Mabuya frenata</i>	<i>Mabuya dorsivittata</i>	<i>Phyllodactylus lanei</i>	<i>Pholidobolus monitum</i>	<i>Mesaspis monicola</i>	<i>Vanzosaura multiscutata</i>	<i>Homonota horrida</i> and <i>Homonota darwini</i>	<i>Liolaemus graciela</i>
Country	Cuba [9]	Perú and Ecuador [10]	Brazil [11]	Brazil [12]	Mexico [13]	Ecuador [14]	Costa Rica [15]	Brazil [16]	Argentina [3]	Argentina

General: Small cylindrical nematodes. Triangular oral opening surrounded by 3 bilobed lips. Lateral alae present in males. No excretory pore observed. In males, caudal alae absent, paired caudal papillae present. Three pairs of sessile papillae; 1 pair precloacal, 1 pair postcloacal, third pair occurring at junction with tail filament, papilla pattern 2:2:2.

Male (based on 2 adult specimens; μm): Length (lip to posterior pair of papillae; excludes tail filament) 1734 ± 27 (1715–1754); width at level of excretory pore 109 ± 3.5 (107–112); esophageal corpus length (not including bulb) 245 ± 14 (235–255); width esophageal 44 ± 6.9 (39–49); bulb length 102.9 ± 6.9 (98–107); bulb width 107.8 (107.8); nerve ring 176 ± 14 (166–186); tail filament 494 ± 6.36 (490–499). Caudal alae absent, 3 pairs of sessile papillae; 1 pair precloacal, 1 pair postcloacal, third pair occurring at junction with tail filament.

Taxonomic summary

Type host: *Liolaemus graciellae*

Type locality: Road to San Guillermo Provincial Reserve, Iglesias Department, San Juan Province, Argentina

Site of infection: Large intestine

Prevalence: 20%

Medium intensity: 4

Mean abundance: 0.8

[3,7,8]. Castillo et al. [8] carry out a review of parasitic nematodes in reptiles from Argentina, mentioning 26 species of nematodes in 40 species of reptiles (4 snakes, 3 turtles, 1 amphisbaena and 32 lizards). However, up to that moment, *Skrjabinodon* had not been recorded in Argentina. However, González-Rivas et al. [3] described *S. castillensis* in hosts *Homonota* from Neuquén and San Juan provinces, Argentina. We registered *S. castillensis* in lizard *L. graciellae* based on morphological characters of male nematode specimens. In nematodes, the absence of spines and geographic distribution of *S. castillensis* [3] are the main characters that allowed us to elucidate our species. Our record is the second of this genus of nematodes parasitizing reptiles in Argentina.

Our new mention helps to understand and learn more about diversity of parasitic nematodes of reptiles from Argentina, which until now are scarce.

References

- [1] Hodda M. 2022. Phylum Nematoda: a classification, catalogue and index of valid genera, with a census of valid species. *Zootaxa* 5114(1): 1–289. doi:10.11646/zootaxa.5114.1.1
- [2] Anderson R.C., Chabaud A.G., Willmott S. 1974. Keys to the nematode parasites of vertebrates. Wallingford, CAB International.
- [3] González-Rivas C.J., Castillo G.N., Acosta J.C. 2022. *Skrjabinodon castillensis* n. sp. (Nematoda:



Figure 2. *Liolaemus graciellae*, collected way San Guillermo Provincial Reserve, San Juan province, Argentina

Discussion

The genus *Skrjabinodon* are parasitic nematodes of carnivorous reptiles from worldwide, with very few studies and records in the Neotropical realm

Pharyngodonidae) from the *Homonota horrida* and *H. darwini* (Squamata: Phyllodactylidae) from Argentina and key for the Neotropical species of the genus *Skrjabinodon*. *Annals of Parasitology* 68(3): 483–489. doi:10.17420/ap6803.454

- [4] Abdala C.S., Acosta J.C., Cabrera M.R., Villavicencio H.J., Marinero J. 2009. A new Andean *Liolaemus* of the *L. montanus* series (Squamata: Iguania: Liolaemidae) from western Argentina. *South American Journal of Herpetology* 4(2): 91–102. doi:10.2994/057.004.0201
- [5] Acosta J.C., Blanco G.M., Gómez-Alés R., Acosta R., Piaggio-Kokot L., Victorica A.E., Villavicencio, H.J., Fava G.A. 2017. Los reptiles de San Juan. Editorial Brujas, Córdoba (in Spanish).
- [6] Bush A.O., Lafferty K.D., Lots J.M., Shostak A.W. 1997. Parasitology meets ecology on its own terms: Margolis et al. revisited. *Journal for Parasitology* 83(4): 575–583. doi:10.2307/3284227
- [7] Ávila R.W., Silva R.J. 2010. Checklist of helminths from lizards and amphisbaenians (Reptilia, Squamata) of South America. *Journal of Venomous Animals and Toxins including Tropical Diseases* 16(4): 543–572. doi:10.1590/s1678-91992010000400005
- [8] Castillo G.N., Acosta J.C., Gonzales-Rivas C., Ramallo G. 2020. Checklist of nematode parasites of reptiles from Argentina. *Annals of Parasitology* 66(4): 425–432. doi:10.17420/ap6604.282
- [9] Barus V., Coy-Otero A. 1974. Nematodes of the genera *Spauligodon*, *Skrjabinodon*, and *Pharyngodon* (Oxyuridae) parasitizing Cuban lizards. *Vestnik Československe Spolecnosti Zoologické* 38(1): 1–12.
- [10] Bursey C.R., Goldberg S.R. 2007. New species of *Skrjabinodon* (Nematoda: Pharyngodonidae) in *Uracentron flaviceps* (Squamata: Iguanidae) from Ecuador and Peru. *Journal of Parasitology* 93(4): 866–869. doi:10.1645/ge-1136r.1
- [11] Vicente J.J., Vrcibradic D., Muniz-Pereira L.C., Pinto R.M. 2000. *Skrjabinodon heliocostai* sp. n. (Nematoda, Pharyngodonidae) parasitizing *Mabuya frenata* (Cope) (Lacertilia, Scincidae) in Brazil and the reallocation of *Skrjabinodon capacyupanqui* (Freitas, Vicente and Ibanez) in the genus *Thelandros* Wedl. *Revista Brasileira de Zoologia* 17(2): 361–367. doi:10.1590/s0101-81752000000200006
- [12] Vicente J.J., Vrcibradic D., Rocha C.F.D., Pinto R.M. 2002. Description of *Skrjabinodon spinosulus* sp. n. (Nematoda, Oxyuroidea, Pharyngodonidae) from the Brazilian lizard *Mabuya dorsivittata* Cope, 1862 (Scincidae). *Revista Brasileira de Zoologia* 19(1): 157–162. doi:10.1590/s0101-81752002000100014
- [13] Caballero E. 1938. Nematodes parasites des reptiles du Mexique. *Annales de Parasitologie Humaine et Comparee* 16(4): 327–333 (in French). doi:10.1051/parasite/1938164327
- [14] Bursey C.R., Goldberg S.R. 2011. Helminths of *Pholidobolus montium* (Sauria: Gymnophthalmidae) from Ecuador with description of a new species of *Skrjabinodon* (Nematoda: Oxyuroidea: Pharyngodonidae). *The Journal of Parasitology* 97(1): 94–96. doi:10.1645/ge-2591.1
- [15] Bursey C.R., Goldberg S.R. 2006. Helminths in *Mesaspis monticola* (Squamata: Anguillidae) from Costa Rica, with the description of a new species of *Entomelas* (Nematoda: Rhabdiasidae) and a new species of *Skrjabinodon* (Nematoda: Pharyngodonidae). *Parasite* 13(3): 183–191. doi:10.1051/parasite/2006133183
- [16] De Sousa C., Silva De Oliveira S., Morais D.H., Da Silva Pinheiro R.H., Ávila R.W. 2022. A new species of *Skrjabinodon* (Oxyuroidea: Pharyngodonidae) infecting *Vanzosaura multiscutata* (Squamata: Gymnophthalmidae) from Northeastern Brazil. *Journal of Natural History* 56(1–4): 35–48. doi:10.1080/00222933.2022.2046886

Received 30 January 2023

Accepted 15 March 2023