

SHORT COMMUNICATION

The first report of *Cosmocerca parva* (Nematoda: Cosmocercidae) from *Colostethus* *fraterdanieli* (Anura: Dendrobatidae) in Colombia

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Palavras-chave: Anura, Dendrobatidae, *Colostethus fraterdanieli*, Nematoda, Cosmocercidae, *Cosmocerca parva*, Colômbia, helmintos.

Research on the nematode parasites of anurans in Colombia is scarce, with only three species of nematodes having been recorded from two Colombian anurans. Goldberg and Bursey (2003) reported *Cosmocerca podicipinus*, *Physocephalus* sp., and *Porrocaecum* sp. in the intestines, digestive tract musculature, and coelom, respectively, of the bufonid *Atelopus spurrelli* and the dendrobatid, *Oophaga histrionica* (*Dendrobates histrionicus* auctorum). *Cosmocerca parva* Travassos, 1925 (Ascaridida: Cosmocercidae), originally was described from the leptodactylid frog, *Hylodes nasus* (*Elosia nasus* auctorum) from Angra dos Reis, State of Rio de Janeiro, Brazil. Since this description, *C. parva* has been reported in 44 anuran species from eight countries in Central and South America (Table 1). Despite the

diversity of anurans in Colombia (~750 species, Frost 2010), there are no reports of this nematode in an anuran in this country.

Colostethus fraterdanieli Silverstone, 1971 is endemic to Colombia. This species occurs at elevations between 1000 and 2500 m along the western flanks of the Cordillera Central, as well as on both the western and eastern sides of the Cordillera Occidental in the departments of Antioquia, Caldas, Risaralda, Quindío, Valle del Cauca, and Nariño (Grant and Castro-Herrera 1998). *Colostethus fraterdanieli* is diurnal and inhabits the leaf litter near streams (Grant and Castro-Herrera 1998, Ramírez *et al.* 2009). The males guard developing eggs and, at hatching, transport the tadpoles to small, still pools and shallow, slow-flowing streams (Grant and Castro-Herrera 1998). We discovered the nematode parasite, *Cosmocerca parva*, in *C. fraterdanieli*; this is the first record of this nematode species in Colombia and *C. fraterdanieli* is a novel host of *C. parva*.

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Table 1. Anuran species (names as in Frost 2010) reported as host of *Cosmocerca parva* in Central and South America.

Anuran host (= original name reported)	Country	Site of infection	Reference
BRACHYCEPHALIDAE:			
<i>Hylodes nasus</i> (= <i>Elosia nasus</i>)	Brazil	Intestines	Travassos 1925, Vicente <i>et al.</i> 1990
BUFONIDAE:			
<i>Rhaebo glaberrimus</i> (= <i>Bufo glaberrimus</i>)	Peru	Intestines	Burseý <i>et al.</i> 2001
<i>Rhinella bergi</i> (= <i>Chaunus bergi</i>)	Argentina	Small and large intestines	González and Hamann 2007a, González 2009
<i>R. crucifer</i>	Paraguay	No indicated	McAllister <i>et al.</i> 2010a
<i>R. fernandezae</i> (= <i>Chaunus fernandezae</i>)	Argentina	Large intestine	González and Hamann 2007b
<i>R. granulosa</i> (= <i>Bufo granulosis major</i> ; <i>Chaunus granulosis major</i>)	Argentina	Small and large intestine	Mordegliá and Digiani 1998, González and Hamann 2006b
<i>R. schneideri</i> (= <i>Bufo paracnemis</i>)	Argentina, Paraguay	Large intestine	Baker and Vaucher 1984, González and Hamann 2008
<i>R. margaritifera</i>	Peru	Intestines	Burseý <i>et al.</i> 2001
<i>R. marina</i> (= <i>Bufo marinus</i>)	Peru	Intestines	Burseý <i>et al.</i> 2001
CRAUGASTORIDAE:			
<i>Craugastor crassidigitus</i>	Costa Rica	Large intestine	Goldberg and Bursey 2008
<i>Craugastor gollmeri</i>	Costa Rica	Large intestine	Goldberg and Bursey 2008
CYCLORAMPHIDAE:			
<i>Odontophrynus americanus</i>	Argentina	Large intestine	González and Hamann 2009
DENDROBATIDAE:			
<i>Ameerega picta</i> (= <i>Epipedobates pictus</i>)	Peru	Intestines	Burseý <i>et al.</i> 2001
<i>A. trivittata</i>	Peru, Guyana	Not indicated	McAllister <i>et al.</i> 2010b, c
HYLIDAE:			
<i>Hypsiboas boans</i>	Guyana	Intestines	McAllister <i>et al.</i> 2010c
<i>H. fasciatus</i> (= <i>Hyla fasciata</i>)	Peru	Intestines	Burseý <i>et al.</i> 2001

Table 1. Continued.

Anuran host (= original name reported)	Country	Site of infection	Reference
<i>Phyllomedusa atelopoides</i>	Peru	Intestines	Burseley <i>et al.</i> 2001
<i>P. hypochondrialis</i>	Guyana	Intestines	McAllister <i>et al.</i> 2010c
<i>Scarthyla goinorum</i>	Peru	Intestines	Burseley <i>et al.</i> 2001
<i>Scinax acuminatus</i>	Argentina	Large intestine	González and Hamann 2008
<i>S. garbei</i>	Peru	Intestines	Burseley <i>et al.</i> 2001
<i>S. ictericus</i>	Peru	Intestines	Burseley <i>et al.</i> 2001
<i>S. nasicus</i>	Argentina	Large intestine	Hamann <i>et al.</i> 2009
LEIUPERIDAE:			
<i>Edalorhina perezii</i>	Peru	Intestines	Burseley <i>et al.</i> 2001
<i>Physalaemus soaresi</i>	Brazil	Intestines	Vicente <i>et al.</i> 1990
LEPTODACTYLIDAE:			
<i>Leptodactylus bufonius</i>	Argentina	Small and large intestines	González and Hamann 2006a
<i>L. chaquensis</i>	Paraguay	Small and large intestines	Baker and Vaucher 1984, Hamann <i>et al.</i> 2006b
<i>L. fuscus</i>	Brazil	Intestines	Vicente <i>et al.</i> 1990
<i>L. elenae</i>	Argentina	Large intestine	Baker and Vaucher 1984
<i>L. latinasus</i>	Argentina	Large intestine	Hamann <i>et al.</i> 2006a
<i>L. leptodactyloides</i>	Peru	Intestines	Burseley <i>et al.</i> 2001
<i>L. macrosternum</i>	Trinidad	Large intestine	Goldberg <i>et al.</i> 2002
<i>L. marmoratus</i> (= <i>Adenomera marmorata</i>)	Brazil	Intestines	Vicente <i>et al.</i> 1990
<i>L. mystaceus</i>	Brazil	Intestines	Vicente <i>et al.</i> 1990, Burseley <i>et al.</i> 2001
<i>L. nesiotus</i>	Trinidad	Large intestine	Goldberg <i>et al.</i> 2002
<i>L. ocellatus</i>	Brazil	Intestines	Vicente <i>et al.</i> 1990
<i>L. podicipinus</i>	Brazil	Large intestine	Vicente <i>et al.</i> 1990, Trombeta 2008

Table 1. Continued.

Anuran host (= original name reported)	Country	Site of infection	Reference
MICROHYLIDAE:			
<i>Elachistocleis ovalis</i>	Peru	Intestines	Burseley <i>et al.</i> 2001
<i>Hamptophryne boliviana</i>	Peru	Intestines	Burseley <i>et al.</i> 2001
STRABOMANTIDAE:			
<i>Oreobates quixensis</i>	Ecuador, Peru	Large intestine	Dyer and Altig 1977, McAllister <i>et al.</i> 2010b
<i>Pristimantis fenestratus</i> (= <i>Eleutherodactylus fenestratus</i>)	Peru	Intestines	Burseley <i>et al.</i> 2001
<i>P. peruvianus</i> (= <i>E. peruvianus</i>)	Peru	Intestines	Burseley <i>et al.</i> 2001
<i>P. toftae</i> (= <i>E. toftae</i>)	Peru	Intestines	Burseley <i>et al.</i> 2001
<i>P. turpinorum</i> (= <i>E. turpinorum</i>)	Tobago	Large intestine	Goldberg <i>et al.</i> 2002


We collected 37 *Colostethus fraterdanieli* (24 males, 13 females; SVL = 22.6 mm \pm 3.0 SD) from Vereda La Paloma, Municipio Santa Rosa de Cabal, Departamento Risaralda (4°49' N, 75°33' W), in the western versant of the Cordillera Central (Colombia, South America). The frogs were collected by hand and euthanized with topical xylocaine (5%); they were fixed in 10% buffered formalin and preserved in 70% ethanol. The body cavity of each frog was accessed by a longitudinal incision from throat to the cloaca and the digestive tract was removed. The entire digestive tract (esophagus, stomach, and small and large intestines) was slit open and examined under a dissecting microscope. The isolated nematode parasites were washed with saline solution (Iannacone 2003a, b) and mounted on glass slides; the parasites were cleared with

Amann's lactophenol (González and Hamann 2004). We used the keys of Anderson *et al.* (1974) and Yamaguti (1961) to identify the species of nematode. Prevalence (number of infected frogs \div number of frogs examined \times 100, expressed as percentage), mean intensity (mean number of nematodes \div infected host) and mean abundance (total number of nematodes \div number of examined hosts) were calculated according to Bush *et al.* (1997). We deposited some of the frogs examined in the herpetological collection of the Museo de Herpetología, Universidad de Antioquia (MHUA, Medellín, Colombia; voucher numbers MHUA 6587–6589 and MHUA 6618–6622); the nematodes were deposited in the helminthological collection of the Colección Colombiana de Helminthos (CCH, Medellín, Colombia; voucher numbers CCH 140).

Of the 37 frogs examined, each of three males (MHUA 6587–6589) harbored one adult *Cosmocerca parva*. The parasitic prevalence, mean intensity and mean abundance in *C. fraterdanieli* was 8.1%, 1.0 (\pm 0.0) and 0.09 (\pm 0.0), respectively. All *C. parva* found in the intestines of *C. fraterdanieli* are male, based on the presence of spicules on the nematode. The males have four or five pairs of plectanes arranged in rows; contralateral plectanes are independent of one another. Each plectane has four or five pairs of ventral papillae that are rosette in form. *Cosmocerca parva* has a pharynx and a long, muscular esophagus, with a light prebulbar area and a posterior sub-spherical bulb bearing a tri-radiate, stagnant valvular apparatus.

Cosmocerca parva is common in the intestines of anurans (Travassos 1931, Baker 1987, González and Hamann 2007b, 2009, McAllister *et al.* 2010a; Table 1). Like other cosmocercid species, this nematode is monoxenic and infects its hosts through larval integumentary penetration (Anderson 2000). Because of these characteristics, *C. parva* is a typical parasite of anuran species inhabiting terrestrial environments (McAlpine 1997, Burseý *et al.* 2001, Goldberg *et al.* 2002, Bolek and Coggins 2003, Luque *et al.* 2005, González and Hamann 2006b). Most anurans that are hosts of *C. parva* are denizens of the forest floor where they feed and reproduce, although some species, such as *C. fraterdanieli*, all *Leptodactylus*, the bufonid *Rhinella*, and many species of hylid frogs, use the lotic and lentic waters for egg and tadpole development.

The presence of *Cosmocerca parva* in only males of *Colostethus fraterdanieli* in this study may indicate that in this taxon, males are more prone to the infection by this parasite than the females. Because the larvae of *Cosmocerca* survive in thin films of water (Anderson 2000), male *C. fraterdanieli* may be infected in wet leaf litter as they attend their eggs or as they transport larvae on their backs to deposit them in creeks. However, this hypothesis must be investigated.

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References

- Anderson, R. C. 2000. *Nematode parasites of vertebrates: their development and transmission*. 2nd. ed. Wallingford, UK: CABI Publishing, 650 pp.
- Anderson, R. C., A. G. Chabaud, and S. Willmont. 1974. *CIH Keys to the Nematode Parasites of Vertebrates*. Farnham Royal, Slough, England: Commonwealth Agricultural Bureaux, Central Sales Branch.
- Baker, M. 1987. Synopsis of the Nematoda parasitic in amphibians and reptiles. *Memorial University of Newfoundland, Occasional Papers in Biology 11*: 1–325.
- Baker, M. R. and C. Vaucher. 1984. Parasitic helminths from Paraguay VI: *Cosmocerca* Diesing, 1861 (Nematoda: Cosmocercoida) from frogs. *Revue Suisse de Zoologie 91*: 925–934.
- Bolek, M. G. and J. R. Coggins. 2003. Helminth community structure of sympatric eastern America toad, *Bufo americanus americanus*, northern leopard frog, *Rana pipiens*, and blue-spotted salamander, *Ambystoma laterale*, from southeastern Wisconsin. *Journal of Parasitology 89*: 673–680.
- Burseý, C. R., S. R. Goldberg, and J. R. Parmelee. 2001. Gastrointestinal helminths of 51 species of anuran from Reserva Cuzco Amazónico, Peru. *Comparative Parasitology 68*: 21–35.
- Bush, A. O., K. D. Lafferty, J. M. Lotz, and A. W. Shostak. 1997. Parasitology meets ecology on its own terms: Margolis *et al.* revisited. *Journal of Parasitology 83*: 575–583.
- Dyer, W. G. and R. Altig. 1977. Helminths of some Ecuadorian anurans. *Herpetologica 33*: 293–296.
- Frost, D. R. (ed.). 2010. *Amphibian Species of the World – an online reference*. Version 5.4 (8 April 2010). Electronic database accessible at <http://research.amnh>.

- org/vz/herpetology/amphibia/index.php. American Museum of Natural History, New York, USA. Captured on 18 June 2010.
- Goldberg, S. R. and C. R. Bursey. 2002. Helminth of the bullfrog, *Rana catesbeiana* (Ranidae), in California with revisions to the California anuran helminth list. *Bulletin, Southern California Academy of Sciences* 101: 118–130.
- Goldberg, S. R. and C. R. Bursey. 2003. Helminths of two anuran species, *Atelopus spurrelli* (Bufonidae) and *Dendrobates histrionicus* (Dendrobatidae), from Colombia, South America. *Parasitology International* 52: 251–253.
- Goldberg, S. R. and C. R. Bursey. 2008. Helminths from 10 species of brachycephalid frogs (Anura: Brachycephalidae) from Costa Rica. *Comparative Parasitology* 75: 255–262.
- Goldberg, S. R., C. R. Bursey, J. D. Trujillo, and H. Kaiser. 2002. Intestinal helminths of seven frog species from Trinidad and Tobago. *Caribbean Journal of Science* 38: 147–150.
- González, C. E. 2009. Aspectos cuali-cuantitativos de los nematodos parásitos en anfibios del nordeste argentino. Unpublished Ph. D. Thesis. Universidad Nacional de la Plata. Argentina.
- González, C. E. and M. I. Hamann. 2004. Primer registro de *Cosmocerca podicipinus* Baker y Vaucher, 1984 (Nematoda, Cosmocercidae) en *Pseudopaludicola falcipes* (Hensel, 1867) (Amphibia, Leptodactylidae) en Argentina. *Facena* 20: 65–72.
- González, C. E. and M. I. Hamann. 2006a. Helminths parásitos de *Leptodactylus bufonius* Boulenger, 1894 (Anura: Leptodactylidae) de Corrientes, Argentina. *Revista Española de Herpetología* 20: 39–46.
- González, C. E. and M. I. Hamann. 2006b. Nematodes parásitos de *Chaunus granulatus major* (Müller & Hellmich, 1936) (Anura: Bufonidae) en Corrientes, Argentina. *Cuadernos de Herpetología* 20: 43–49.
- González, C. E. and M. I. Hamann. 2007a. *Chaunus bergi* (NCN). Endoparasites. *Herpetological Review* 38: 181.
- González, C. E. and M. I. Hamann. 2007b. Nematode parasites of two species of *Chaunus* (Anura: Bufonidae) from Corrientes, Argentina. *Zootaxa* 1393: 27–34.
- González, C. E. and M. I. Hamann. 2008. Nematode parasites of two anuran species *Rhinella schneideri* (Bufonidae) and *Scinax acuminatus* (Hylidae) from Corrientes, Argentina. *Revista de Biología Tropical* 56: 2147–2161.
- González, C. E. and M. I. Hamann. 2009. First report of nematodes in the common lesser escurzo *Odontophrynus americanus* (Duméril and Bibron, 1841) (Amphibia: Cycloramphidae) from Corrientes, Argentina. *Comparative Parasitology* 76: 122–126.
- Grant, T. and F. Castro-Herrera. 1998. The cloud forest *Colostethus* (Anura, Dendrobatidae) of a region of the Cordillera Occidental of Colombia. *Journal of Herpetology* 32: 378–392.
- Hamann, M. I., A. I. Kerh, and C. E. González. 2006a. Helminth community structure of the oven frog *Leptodactylus latinasus* (Anura, Leptodactylidae) from Corrientes, Argentina. *Acta Parasitologica* 51: 294–299.
- Hamann, M. I., A. I. Kerh, and C. E. González. 2006b. Species affinity and infracommunity ordination of helminths of *Leptodactylus chaquensis* (Anura: Leptodactylidae) in two contrasting environments from northeastern Argentina. *Journal of Parasitology* 92: 1171–1179.
- Hamann, M. I., A. I. Kehr, C. E. González, M. I. Duré, and E. F. Schaefer. 2009. Parasite and reproductive features of *Scinax nasicus* (Anura: Hylidae) from a South American subtropical area. *Interciencia* 34: 214–218.
- Iannacone, J. 2003a. Helminths parásitos de *Atelopus bomolochus* Peters 1973 (Anura: Bufonidae) de Piura, Perú. *Gayana* 67: 9–15.
- Iannacone, J. 2003b. Helminths parásitos de *Telmatobius jelskii* (Peters) (Anura: Leptodactylidae) de Lima, Perú. *Revista Brasileira de Zoologia* 20: 131–134.
- Luque, J. L., N. A. Martins, and L. E. R. Tavares. 2005. Community structure of metazoan parasites of the yellow Cururu toad, *Bufo ictericus* (Anura, Bufonidae) from Rio de Janeiro, Brazil. *Acta Parasitologica* 50: 215–220.
- McAllister, C. T., C. R. Bursey, and P. S. Freed. 2010a. Helminth parasites (Cestoidea: Nematoda) of select herpetofauna from Paraguay. *Journal of Parasitology* 96: 222–224.
- McAllister, C. T., C. R. Bursey, and P. S. Freed. 2010b. Helminth parasites of amphibians and reptiles from the Ucayali region, Peru. *Journal of Parasitology* 96: 444–447.
- McAllister, C. T., C. R. Bursey, and P. S. Freed. 2010c. Helminth parasites of herpetofauna from the Rupununi District, southwestern Guyana. *Comparative Parasitology* 77: 184–201.

- McAlpine, D. F. 1997. Helminths communities in bullfrogs (*Rana catesbeiana*), green frogs (*Rana clamitans*), and leopard frogs (*Rana pipiens*) from New Brunswick, Canada. *Canadian Journal of Zoology* 75: 1883–1890.
- Mordeglia, C. and M. C. Digiani. 1998. *Cosmocerca parva* Travassos, 1925 (Nematoda: Cosmocercidae) in toads from Argentina. *Memórias do Instituto Oswaldo Cruz* 93: 737–738.
- Ramírez M. P., M. Osorno-Muñoz, J. V. Rueda, A. Amézquita, and M. C. Ardila-Robayo. 2009. *Colostethus fraterdanieli*. URL: <http://www.iucnredlist.org/>. Captured on 09 June 2009.
- Travassos, L. 1925. Contribuições para o conhecimento da fauna helmintológica dos batráchios do Brasil. Nematódeos intestinais. *Science and Medicine* 3: 673–687.
- Travassos, L. P. 1931. Pesquisas helmintológicas realizadas em Hamburgo. IX. Ensaio monographico da familia Cosmocercidae Trav., 1925 (Nematoda). *Memórias do Instituto Oswaldo Cruz* 25: 237–298.
- Trombeta, A. M. 2008. Estudo da helmintofauna de anfíbios das famílias Ceratophryidae, Leptodactylidae e Leiuperidae do Pantanal Sul, Mato Grosso do Sul. Unpublished M. Sc. Dissertation. 48 pp.
- Vicente, J. J., H. O. Rodrigues, D. Gomes, and R. M. Pinto. 1990. Nematóides do Brasil. Parte II: nematóides de anfíbios. *Revista Brasileira de Zoologia* 7: 549–626.
- Yamaguti, S. 1961. *Systema Helminthum*. Vol. 3. The nematodes of vertebrates. Interscience New York. 679 pp.