

## ***Lagochilascaris minor* (Nematoda: Ascarididae) from a Wild Cougar (*Puma concolor*) in Mexico**

**Jorge Falcón-Ordaz,<sup>1</sup> José Carlos Iturbe-Morgado,<sup>1</sup> Alberto Enrique Rojas-Martínez,<sup>2</sup> and Luis García-Prieto<sup>3,4</sup>**  
<sup>1</sup>Laboratorio de Morfología Animal, Universidad Autónoma del Estado de Hidalgo, Ciudad Universitaria, Carretera Pachuca Tulancingo s/n Km. 4.5, 42184 Mineral de la Reforma, Hidalgo, México; <sup>2</sup>Laboratorio de Ecología de Poblaciones, Universidad Autónoma del Estado de Hidalgo, Ciudad Universitaria, Carretera Pachuca Tulancingo s/n Km. 4.5, 42184 Mineral de la Reforma, Hidalgo, México; <sup>3</sup>Colección Nacional de Helmintos, Instituto de Biología, Universidad Nacional Autónoma de México, AP 70-153, CP 04360, Mexico City, Mexico; <sup>4</sup>Corresponding author (email: luis.garcia@ib.unam.mx)

**ABSTRACT:** We document parasitization of a wild cougar (*Puma concolor*) by the nematode *Lagochilascaris minor* in Hidalgo State, Mexico. This finding contributes to our understanding of the epidemiology of this zoonotic agent in Mexico.

The cougar, *Puma concolor*, is one of three large carnivore species in Mexico; its native distribution includes western Canada to southern Argentina and Chile (Chávez 2005; Ceballos and Arroyo-Cabrales 2012). Helminthologic studies related to cougars in Mexico are scarce. The recognized helminth fauna of the cougar is seven nominal species (*Aelurostrongylus abtrusus*, *Physaloptera praeputialis*, *Spirocerca lupi*, *Spirometra mansonoides*, *Toxascaris leonina*, *Toxocara cati*, and *Uncinaria stenocephala*) and nine unnamed taxa (*Ancylostoma* sp., *Capillaria* sp., *Physaloptera* sp., *Strongyloides* sp., *Strongylus* sp., *Taenia* sp., *Toxocara* sp., *Trichuris* sp., and *Uncinaria* sp.), identified mainly through egg morphology (García-Prieto et al. 2012). Here, we document an additional helminth species for the cougar, the nematode, *Lagochilascaris minor*, collected for the first time from an animal host in Mexico. Lagochilascariasis is an emerging zoonosis in Mexico, with at least five human cases reported (Vargas-Ocampo and Avarado-Aleman 1997; Román-López et al. 2003; Barrera-Pérez et al. 2012).

In December 2013, we collected 21 nematode specimens from an immature female cougar that had drowned in Laguna de Metztitlan, San Cristobal, Metztitlan, State of Hidalgo, Mexico (20°40'31.2"N, 98°51'14.3"W). Nematodes recovered were washed in 0.85% saline solution, fixed in 4%

hot formalin, and cleared with Amman's lactophenol for taxonomic study; voucher specimens of parasites were deposited at the Colección Nacional de Helmintos (CNHE), Instituto de Biología, Universidad Nacional Autónoma de México, México City, Mexico.

We identified two nematode species parasitizing *P. concolor*: *Lagochilascaris minor* (CNHE 9989, one male and two females found in the esophagus) and *Toxocara cati* (CNHE 9990, 19 specimens collected in the intestine). The latter is a well-known parasite of wild and domestic felids. Taxonomic identification of *L. minor* follows Sprent (1971). Although in poor condition, several traits characteristic of the species were identified. The male was 6.63 mm long×97 μm wide at midbody, and the spicules were simple and equal in length (184 μm). The females were 8.2–9.0 mm long and 302–306 μm wide at midbody; the esophagus was 1.0–1.2 μm long; the distance from the anterior end to nerve ring was 327 μm; the vulva opening was at 3.2–3.3 mm from the anterior end; the ovejector was 171 μm long; eggs were 50–59 μm long and 49 μm wide; the mean number of surface pits in the eggshell at the circumference of the egg was 20; and the distance from the caudal extremity to the anus was 187–209 μm.

*Lagochilascaris minor* was described by Leiper in 1909, based on specimens removed from abscesses of two human patients from Port of Spain, Trinidad (Sprent 1971). In a review of the genus, Sprent (1971) recognized four species. *Lagochilascaris minor* is associated with humans, domestic cats (*Felis catus*;

Fraiha-Neto et al. 1989), and silvatic carnivores in the Caribbean Islands, Central America, and South America (Brenes-Madrigal et al. 1972; Volcan and Medrano 1991). *Lagochilascaris major* is associated with lions (*Panthera leo*) in Africa (Leiper 1910), *Lagochilascaris turgida* with opossums (*Lutreolina crassicaudata*, *Didelphis aurita*, and *Didelphis virginiana*), in the Americas (Stossich 1902; Travassos 1924; Canavan 1931), and *Lagochilascaris buckleyi* with the American cougar (*Puma concolor*; Sprent 1971). More recently, two additional species have been described: *Lagochilascaris sprenti* from the Virginia opossum (*Didelphis virginiana*) in Louisiana, US (Bowman et al. 1983), and *Lagochilascaris multipapillatum* from the brown spotted viper, *Trimeresurus mucrosquamatus*, in China (Wang and Wang 1991).

*Lagochilascaris minor* differs from the other species of the genus in that the spicules are the smallest among the species of the genus (230–700 µm vs. 1,300 µm in *L. buckleyi*; 475–925 µm in *L. major*; 3,680–3,840 µm in *L. multipapillatum*; 750–1190 µm in *L. sprenti*; and 1,850 µm in *L. turgida*). In addition, *L. sprenti* and *L. major* have more surface pits in the eggshell at the circumference of the egg than *L. minor* (24–31, 35–45, and 15–25, respectively), and surface pits in *L. buckleyi* and *L. turgida* are relatively larger (Sprent 1971; Bowman et al. 1983; Wang and Wang 1991). We identified our specimens as *L. minor* based on the size of its spicules (0.184 µm) and mean number of surface pits (20).

Human lagochilascariasis is a zoonotic disease with neotropical distribution. Adult worms of *L. minor* are present in subcutaneous abscesses within the esophagus, pharynx, trachea, cervical lymph nodes, and lungs of the definitive host (Bowman et al. 2002). The disease is considered an emerging zoonosis in the Americas, spreading from Mexico to Argentina and the Caribbean Islands. Most human cases are from Brazil (81.2%), mainly in the Amazon region near forests and rural areas (Faccio et al. 2013). The route of infection for humans is poorly understood (Barrera-Pérez et al. 2012). Ingestion of raw or undercooked rodent meat is normally how

humans become infected, but all patients denied consuming rodents. An alternative mode of infection may be from the ingestion of eliminated eggs from the definitive hosts. Five human cases of lagochilascariasis have been reported in Mexico, most from along the Atlantic coast (Yucatán and Veracruz; Vargas-Ocampo and Avarado-Aleman 1997; Barrera-Pérez et al. 2012), and one case from central Mexico (Estado de México; Román-López et al. 2003). This letter contributes to our understanding of the epidemiology of this zoonotic pathogen in Mexico.

We thank Georgina Ortega Leite for bibliographic support.

#### LITERATURE CITED

- Barrera-Pérez M, Manrique-Saide P, Reyes-Novelo E, Escobedo-Ortegón J, Sánchez-Moreno M, Sánchez C. 2012. *Lagochilascaris minor* Leiper, 1909 (Nematoda: Ascarididae) in Mexico: Three clinical cases from the península de Yucatan. *Rev Inst Med Trop São Paulo* 54:315–317.
- Bowman DD, Hendrix CM, Lindsay DS, Barr SC. 2002. *Feline clinical parasitology*. Iowa State University Press, Ames, Iowa, 450 pp.
- Bowman DD, Smith JL, Little MD. 1983. *Lagochilascaris sprenti* sp. n. (Nematoda: Ascarididae) from the opossum, *Didelphis virginiana* (Marsupialia: Didelphidae). *J Parasitol* 69:754–760.
- Brenes-Madrigal RR, Ruiz A, Frenkel JK. 1972. Discovery of *Lagochilascaris* sp. in the larynx of a Costa Rica ocelot (*Felis pardalis meamsi*). *J Parasitol* 58:978.
- Canavan, WPN. 1931. Nematode parasites of vertebrates in the Philadelphia Zoological Garden and vicinity. *Parasitology* 23:196–229.
- Ceballos G, Arroyo-Cabrales J. 2012. Lista actualizada de los mamíferos de México. *Rev Mex Mastozool* 1:27–80.
- Chávez TJC. 2005. *Puma concolor* (Linnaeus, 1771). In: *Los mamíferos silvestres de México*, Ceballos G, Oliva G, editors. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, Universidad Nacional Autónoma de México y Fondo de Cultura Económica, Mexico City, Mexico, pp. 364–367.
- Faccio L, Oliveira CB, Denardin CA, Tonin AA, Gressler LT, Dalla-Rosa L, Sampaio LC, Stainki DR, Monteiro SG. 2013. Case report: Feline infection by *Lagochilascaris* sp. in the State of Rio Grande do Sul, Brazil. *Vet Parasitol* 196:541–543.
- Fraiha-Neto H, Leão RNQ, Costa FSA. 1989. Lagochilascariase humana e dos animais domésticos. *Zoon Rev Int* 1:25–33.
- García-Prieto L, Falcón-Ordaz J, Guzmán-Cornejo C. 2012. Helminth parasites of Mexican mammals: List of species, hosts and geographical distribution. *Zootaxa* 3290:1–92.

- Leiper RT. 1910. Nematodes. *Wissenschaftliche ergebnisse der schwedischen zoologischen expedition nach dem Kilimandjaro, dem meru und den umgebenden massaisteppen Deutsch-Ostafrikas 1905–1906 unter letung von Prof. Dr. Yngve Sjöstedt*. Hrsq. mit unterstützung von der Konigl. Schwedischen Akademie der Wissenschaften, Stockholm, Sweden, 232 pp.
- Román-López E, Rosas-Carrasco O, Sánchez-Zúñiga MJ, Alexanderson EG, Soto-Abraham V, Santiago-Santiago R, Estrada-Garrido M, Aguilar-Sosa E. 2003. Lagochilascariosis en un paciente con diabetes tipo 2. Evolución aguda y mortal. Reporte del primer caso en la literatura. *Med Int Mex* 19:255–258.
- Sprent JFA. 1971. Speciation and development in the genus *Lagochilascaris*. *Parasitology* 62:71–112.
- Stossich M. 1902. Spora alcuni nematodi della collezione elmintologica del prof. dott. Corrado Parona. *Boll Mus Zool Anat Comp R Univ Genova* 116:1–16.
- Travassos L. 1924. Pesquisas scientificas realizadas em Angra dos Reis. *Folia Med* 5:152–153.
- Vargas-Ocampo, F, Alvarado-Aleman F. J. 1997. Infestation from *Lagochilascaris ninor* in Mexico. *Int J Dermatol* 36:37–58.
- Volcan GS, Medrano CE. 1991. Infection natural de *Speothos venaticus* (Carnivora: Canidae) por estadios adultos de *Lagochilascaris* sp. *Rev Inst Med Trop São Paulo* 33:451–458.
- Wang P, Wang Y. 1991. A study of nematode parasites of amphibians and reptiles from Fujian, China, with descriptions of one new family, one new genus and two new species. *Wuyi Sci J* 8:139–146.

Submitted for publication 10 September 2015.

Accepted 6 December 2015.