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Taxonomy and systematics

# Helminths of the common opossum *Didelphis marsupialis* (Didelphimorphia: Didelphidae), with a checklist of helminths parasitizing marsupials from Peru

## *Helmintos de la zarigüeya común* Didelphis marsupialis *(Didelphimorphia: Didelphidae), con una lista de los helmintos de marsupiales de Perú*

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**Abstract**

Between May and November 2015, 8 specimens of *Didelphis marsupialis* Linnaeus, 1758 (Didelphimorphia: Didelphidae) collected in San Martín, Peru were examined for the presence of helminths. A total of 582 helminths representing 11 taxa were identified (2 digeneans and 9 nematodes). Five new host records and 4 species of nematodes [*Gongylonemoides marsupialis* (Vaz & Pereira, 1934) Freitas & Lent, 1937, *Trichuris didelphis* Babero, 1960, *Viannaia hamata* Travassos, 1914 and *Viannaia viannaia* Travassos, 1914] are added to the composition of the helminth fauna of the marsupials in this country. Further, a checklist of all available published accounts of helminth parasites reported from Peru is provided. To date, a total of 38 helminth parasites have been recorded. Digeneans have the highest species richness in number and percentage (n = 19, 50%), followed by nematodes (n = 17, 45%) and acanthocephalans (n = 2, 5%). The parasites with the highest number of records were the digeneans *Plagiorchis didelphidis* (Parona, 1896) Stossich, 1904 (n = 4) and *Rhopalias coronatus* Kifune & Uyema, 1982 (n = 4) and the nematode *Aspidodera* sp. (n = 4). Additional sampling in this country will probably increase the richness of the helminthological inventory of this group of mammals.


*Keywords:* *Plagiorchis didelphidis*; *Rhopalias coronatus*; Mammals; *Philander opossum*; Neotropical; *Metachirus nudicaudatus*

**Resumen**

Entre mayo y noviembre del 2015, 8 ejemplares de *Didelphis marsupialis* Linnaeus, 1758 (Didelphimorphia: Didelphidae) recolectados en San Martín, Perú, fueron examinados en busca de helmintos. Un total de 582 helmintos representando 11 taxones fueron identificados (2 digéneos y 9 nemátodos). Cinco registros nuevos y 4 especies de nemátodos [*Gongylonemoides marsupialis* (Vaz y Pereira, 1934) Freitas y Lent, 1937, *Trichuris didelphis* Babero, 1960, *Viannaia hamata* Travassos, 1914 y *Viannaia viannaia* Travassos, 1914] se agregan a la composición de la fauna de helmintos de marsupiales de Perú. Además, se proporciona una lista de todos los registros publicados de este grupo de parásitos para marsupiales en dicho país. Hasta la fecha, se ha registrado un total de 38 helmintos; los digéneos tienen la mayor riqueza de especies en número

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y porcentaje (n = 19, 50%), seguido por los nemátodos (n = 17, 45%) y acantocéfalos (n = 2, 5%). Los parásitos con mayor número de registros fueron los digéneos *Plagiorchis didelphidis* (Parona, 1896) Stossich, 1904 (n = 4) y *Rhopalias coronatus* Kifune y Uyema, 1982 (n = 4) y el nemátodo *Aspidodera* sp. (n = 4). Nuevos muestreos en este país probablemente aumentarán la riqueza del inventario helmintológico de este grupo de mamíferos.


*Palabras clave:* *Plagiorchis didelphidis*; *Rhopalias coronatus*; Mamíferos; *Philander opossum*; Neotropical; *Metachirus nudicaudatus*

## Introduction

With 508 species of native mammals, Peru is the third most diverse country in the New World, after Brazil and Mexico, and the fifth most diverse for mammals in the world (Pacheco, Cadenillas, Salas, Tello, & Zeballos, 2009). In Peru, the order Didelphimorphia is represented by the family Didelphidae with 40 species in 13 recognized genera (Pacheco et al., 2009). However, despite this great diversity, the information on its helminth parasites is still very scarce (Tantaleán, Díaz, Sánchez, & Portocarrero, 2010).

The common opossum, *Didelphis marsupialis* Linnaeus, 1758, is a marsupial species in the family Didelphidae, living in rainforest and subtropical forest, secondary forest, and near human settlements. This species is widely distributed from Mexico, south to Peru, Bolivia, Paraguay and northeastern Argentina, including Trinidad and the Lesser Antilles (Aponte, 2013; Emmons & Feer, 1997; Rueda, Ramírez, & Osorio, 2013). It is listed as presenting Least Concern status by the International Union for Conservation of Nature and Natural Resources (IUCN Red List). Information about parasite diversity of this species in different countries along its geographical distribution is scarce (Acosta-Virgen, López-Caballero, García-Prieto, & Mata-López, 2015; Fernandes, Justo, & Cárdenas, 2015; García-Prieto, Falcón-Ordaz, & Guzmán-Cornejo, 2012; Jiménez, Catzeflis, & Gardner, 2011; Rodríguez-Ortiz, García-Prieto, & Pérez-Ponce de León, 2004). Although there are some reports of digeneans (Kifune & Uyema, 1982; Miyazaki, Kifune, Habe, & Uyema, 1978; Tantaleán, Sarmiento, & Huiza, 1992), nematodes (Arrojo, 2002; Sarmiento, Tantaleán, & Huiza, 1999; Tantaleán et al., 2010) and acanthocephalans (Tantaleán, Sánchez, Gómez, & Huiza, 2005) from *D. marsupialis* in Peru, the knowledge of the helminth richness associated with this host species is still incomplete due to the wide distribution of this host in Peru.

In the present study, we report new records of helminth species parasitizing *D. marsupialis* in Peru. In addition, a checklist of helminth parasites of Peruvian marsupials is presented.

## Materials and methods

Between May and November 2015, 8 specimens of *D. marsupialis* (Didelphidae) were found dead in the jungle of San Martín, Peru (Fig. 1). The specimens were collected and transferred to the laboratory of Clinical Analysis Morales Lab. for the respective necropsy. During the necropsy of hosts, trematodes and nematodes were extracted from the gastrointestinal tract, placed in Petri dishes with tap water, fixed in 4% hot formaldehyde and preserved in 70% ethanol. For morphological study, trematodes were stained with Semichon's carmine, dehydrated in successive series of ethanol (up to absolute ethanol), cleared in Eugenol and mounted in Canada balsam. Nematodes were cleared in Amman's lactophenol and temporarily mounted for morphological study (Lamothe-Argumedo, 1997). The parasites were analyzed and measured using a Leica-DM500 microscope with LEICA-ICC50 HD camera and Software LAS (Leica Application Suite), EZ versión 1.80, 2009, Switzerland. Measurements are in millimeters (mm). The taxonomic determination of the parasites was in accordance with the diagnosis proposed by Gibson, Jones, and Bray (2002) and Haverkost and Gardner (2008) for trematodes, and Chagas-Moutinho, Oliveira-Menezes, Cárdenas, and Lanfredi (2007), Lent and Freitas (1937a,b), Santos, Lent, and Gomes (1990), Travassos (1922), Vicente (1966), and Vicente, Rodrigues, Gomes, and Pinto (1997) for nematodes. The terms prevalence and mean intensity were used according to Bush, Lafferty, Lotz, and Shostak (1997).

Vouchers of all helminth species were deposited in the Helminthological and Minor Invertebrates Collection of the Museum of Natural History at the San Marcos University (MUSM), Peru.

Furthermore, a checklist was compiled based on the new and previous reports of helminths parasites of marsupials from Peru. Undergraduate theses and scientific meetings do not constitute formal publications, and thus were not considered. Records published until April 2016 were included. The checklist consists of 2 sections: the first part is the list of helminth parasites of marsupials, indicating host, site of infection, locality and reference. The taxonomy of helminths follows Amin (2013) for Acanthocephala, Anderson, Chabaud, and Willmott (2009) for Nematoda, and Gibson et al. (2002) for Trematoda. The second part includes the list of hosts and their respective parasites. Marsupial species are in alphabetical order. The updated name of marsupials follows Pacheco et al. (2009).

In this work, all applicable institutional, national and international guidelines for the care and use of wild animals were followed. Furthermore, all individuals of the host *D. marsupialis* were found dead and are not considered as Critically Endangered by IUCN.

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