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## DESCRIPTION OF THE MALES OF *ANDROLAELAPS MISIONALIS* AND *ANDROLAELAPS ULYSESPARDINASI* (ACARI: PARASITIFORMES: LAELAPIDAE) PARASITIC OF SIGMONDONTINE RODENTS FROM NORTHEASTERN ARGENTINA

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**ABSTRACT:** Laelapinae mites are common ectoparasites of small mammals, mainly sigmodontine rodents, but males are not frequent in natural populations. In this study, the morphology of the unknown males of *Androlaelaps misionalis* Lareschi, 2010 and *Androlaelaps ulysespardinasii* Lareschi, 2011 are described. The males of these species differ from the male of *Androlaelaps rotundus* (da Fonseca, 1936), a close species, because of the size and shape of their dorsal shield and the length of paranal and sternal *st1* and *st2* setae. The males of *A. misionalis* and *A. ulysespardinasii* differ in their size, in the distance of *j6* setae in the dorsal shield, length of hypostomal seta *hyp3*, number of accessory setae in holovenal shield, length of postanal and sternal *st3* setae, number of opisthogastric setae in unarmed integument lateral to level of coxae IV, and shape of tip of movable digit in the chelicera.

Laelapine mites (Parasitiformes, Laelapidae) are common parasites of small mammals, mainly sigmodontine rodents (Cricetidae). In natural populations females are predominant. Thus, most of the descriptions of the species include only the females while the knowledge of males and immatures is scarce (Furman, 1972). From Argentina, about 20 species of laelapine mites have been reported parasitizing rodents (Lareschi and Mauri, 1998). Among them, the complex *Androlaelaps rotundus* includes the following species parasitizing mostly sigmodontines of the Akodontini tribe (Lareschi and Gettinger, 2009; Lareschi, 2010, 2011; Lareschi and Galliari, 2014): *Androlaelaps rotundus* da Fonseca, 1936 sensu stricto (from a small undetermined sylvatic rodent species), *Androlaelaps maurii* Lareschi and Gettinger, 2009 (from *Deltamys kempi* Thomas, 1919), *Androlaelaps misionalis* Lareschi, 2010 (from *Akodon montensis* Thomas, 1913), *Androlaelaps ulysespardinasii* Lareschi, 2011 (from *Akodon philipmyersi* Pardiñas, D'Elia, Cirignoli, and Suarez, 2005), *Androlaelaps aerosus* Lareschi and Velazco, 2013 (from *Akodon aerosus* Thomas, 1913), *Androlaelaps navonae* Lareschi and Galliari, 2014 (from *Thaptomys nigrata* (Lichtenstein, 1830)), and *Androlaelaps wingei* Lareschi and Galliari, 2014 (from *Akodon cursor* Winge, 1887). Out of these species, only the morphology of the male of *A. rotundus* sensu stricto is known. Da Fonseca (1957/1958) described this male on the basis of a specimen (No. 37, Instituto Butantan Collection, São Paulo, Brazil) collected from an unidentified rodent captured in the type locality of the species, Butantan, São Paulo, Brazil.

Herein, we contribute to the knowledge regarding the diversity of laelapine mites parasitic on rodents from northeastern Argentina by describing the males of 2 species of *Androlaelaps* associated with rodents of the genus *Akodon*.

### MATERIALS AND METHODS

The study was carried out on the basis of 3 mites collected from rodents identified as *A. montensis* and *A. philipmyersi* by Ulyses Pardiñas (Instituto de Diversidad y Evolución Austral, CONICET, Argentina) and Carlos Galliari Centro de Estudios Para-

sitológicos y de Vectores (CEPAVE). Mites were cleared in lactophenol, mounted in Hoyer's medium, and studied by light microscopy equipped with a drawing tube. Measures were taken by using a stage-calibrated ocular micrometer. Taxonomic characters are presented in micrometers ( $\mu\text{m}$ ). Measurements are presented in the text as the mean value followed by range values in parentheses when available. Morphometric features of the dorsum, venter, gnathosoma, and legs of the mites were selected following Lareschi and Galliari (2014), and the main ones are shown illustrated in the figures herein. Evans and Till (1979) were followed for setal nomenclature. Patton et al. (2015) were followed for host taxonomy. At the moment, 2 of the rodents still maintain a field collection number, which is a temporary code until they are deposited in a biological collection (LTU). Mites also hold a field number, which consists of the same field number as the hosts but preceded by MLP (Museo de La Plata) in reference to the Colección de la División de Entomología, Museo de La Plata (MLP), La Plata, Argentina, where they are housed. Data about the type host and type locality of the species, as well as host, locality, and date of collection of the males, are provided.

### DESCRIPTION

#### *Androlaelaps misionalis* Lareschi, 2010

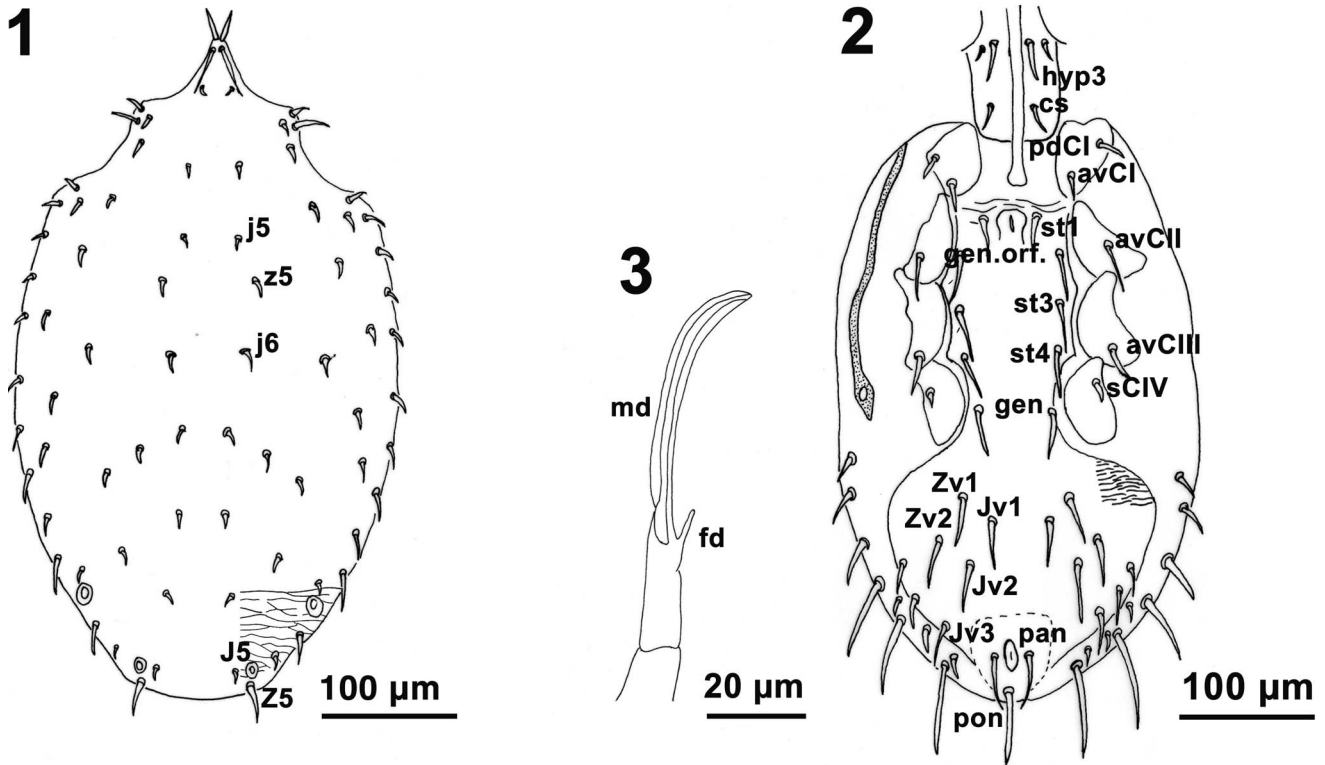
(Figs. 1–3)

*Description of the male (based on 2 specimens):* Dorsum (Fig. 1). Dorsal shield reticulate covering almost the total idiosoma. Thirty-seven pairs of setae simple; *j/J* and *z/Z* series complete; central setae about 15–16  $\mu\text{m}$ , with setae *j5* about 1/3 as long as distance from base of *j5* to *z5*. Distance between *j6* setae 1.5 greater than *j5-j5* distance, and similar to the distance between *z5* setae. Pairs of setae along posterolateral margin longer and stronger posteriorly; *Z5* longest. Gland pores and lyrifissures as illustrated. Idiosoma ovoid, rounded posteriorly, about 60% as long as wide.

Gnathosoma (Fig. 2). Hypognathal groove with 6 rows of teeth; strong tritosternum with unornamented base and thick laciniae. Capitular (*cs*) and 3 pairs of hypostomal setae present; minute with exception of hypostomal seta *hyp3*, almost twice as long as the others, with its tip not reaching insertion of gnathosomal setae.

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FIGURES 1–3. The male of *Androlaelaps misionalis*. (1) Dorsal plate. (2) Venter. (3) Chelicera.

Venter (Fig. 2) with tritosternum and presternal sculpturing. Holoventral shield, bearing anterior genital orifice (*gen. orf.*), expanded laterally posterior to coxa IV, with 7 pairs of opisthogastric setae (*Jv1*, 2 and 3; *Zv1* and 2; and 2 pairs of accessory setae); with tip of sternal setae *st1* reaching insertion of sternal setae *st2*, tip of sternal setae *st2* reaching insertion of sternal setae *st3*, tip of sternal seta *st3* overpassing insertion of metasternal seta *st4*, metasternal seta *st4* and genital seta (*gen*) short; anal shield fused but easily distinguished by a diminution and difference in sculpturing, with postanal (*pon*) seta twice as long as paranal setae (*pan*); unarmed integument lateral to level of coxae bearing another 3 pairs of opisthogastric setae. Peritrematic shield well sclerotized, extending posterior to stigma. All legs thick and subequal in length; anterior ventral seta of coxa I (*avCI*) twice as long as posterior dorsal seta of coxa I (*pdCI*); posterior seta of coxa II (*pdCII*) and posterior seta coxa III (*psCIII*) almost as long as proximal seta of coxa I; seta of coxa IV (*sCIV*) minute.

Chelicera (Fig. 3) with long, tubular spermatodactyl. Movable digit (*md*) straight with tip sharply curved dorsally; fixed digit (*fd*) strongly reduced, with pilus dentilis absent.

**Measurements** (2 specimens): Spermatodactyl length, 54 (53–55); dorsal shield length, 423 (420–425); dorsal shield width, 260 (250–270); holoventral shield length, 330 (325–335); length of sternal seta *st1*, 34 (30–38); length of sternal seta *st3*, 52 (48–55); length of metasternal seta *st4*, 39 (36–41); length of genital seta *gen*, 36 (34–38); length of paranal seta (*pan*), 23 (22–23); length of postanal seta (*pon*), 47 (45–48); greatest width anal shield, 60; length of anterior ventral seta coxa I (*avCI*), 32 (30–33); length of posterior dorsal seta coxa I (*pdCI*), 30 (26–33); length of posterior dorsal seta coxa II (*pdCII*), 30 (26–33); length of posterior dorsal seta coxa III (*pdCIII*), 20 (19–20); length of seta *ad1* in femur I,

36; length of seta *ad3* in genu I, 18. Length of seta *j5*, 16 (15–17); length of seta *j6*, 15; length of seta *z5*, 16 (15–17); distance between seta *j5* and seta *z5*, 43; length of seta *J5*, 19 (18–20); length of seta *Z5*, 65 (61–68); distance between *j5* setae, 47 (46–48); distance between *z5* setae, 97 (96–97); distance between *j6* setae, 74 (72–75); distance between *J5* setae, 63; distance between *Z5* setae, 83; length of capitular seta (*cs*), 11; length of hypostomal seta *hyp3*, 18; distance between capitular and hypostomal seta *hyp3*, 26.

**Taxonomic summary**

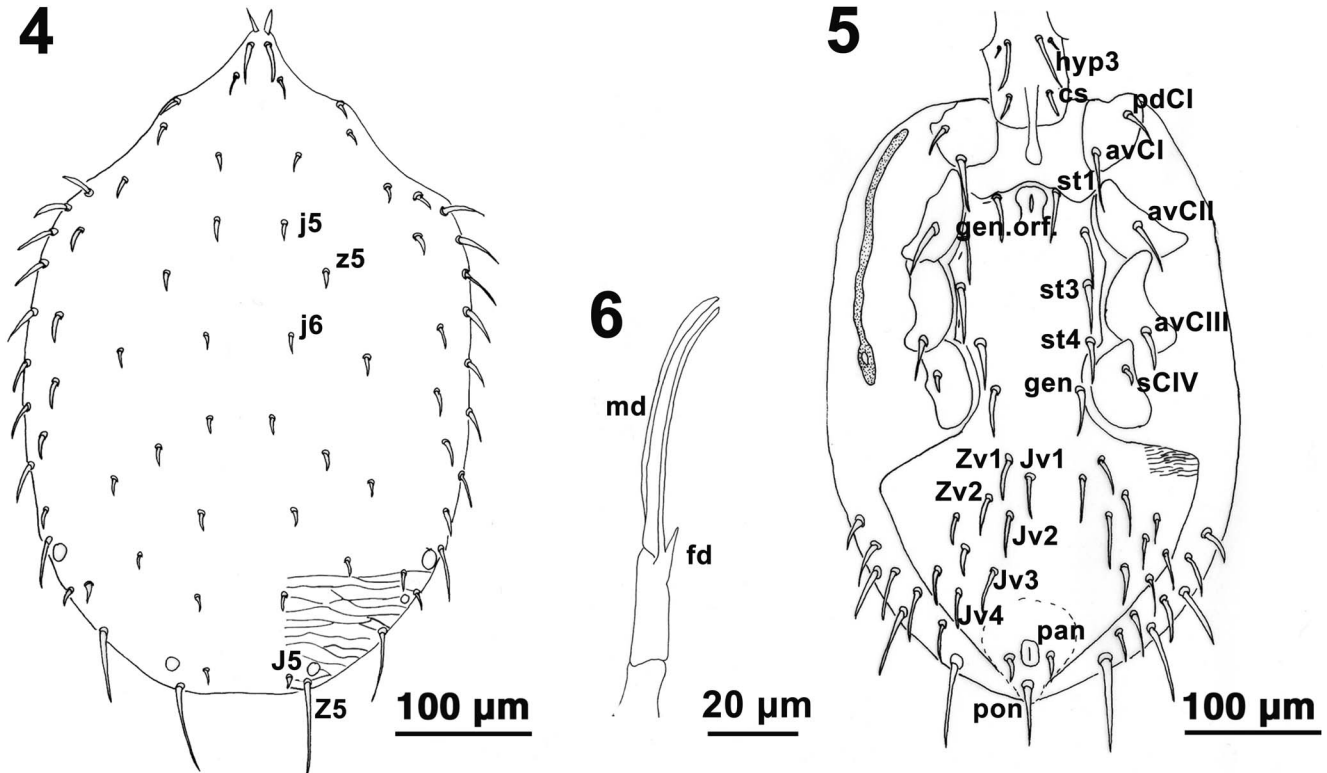
*Type host:* *Akodon montensis* Thomas, 1913.

*Type locality:* Salto El Paraíso, Misiones Province, Argentina (27°13'S, 54°02'W).

*Specimens studied:* MLP-LTU896. Ex *Akodon montensis* (LTU896), Refugio Moconá, A° Oveja Negra y Ruta 2, Reserva de la Biosfera Yabotí, Province of Misiones, Argentina. (26°37'S, 53°40'W). 9/IX/2009. MLP-LTU347. Ex *Akodon montensis* (CNP4007), Club de Pesca Parana-í Guazú, Misiones Province, Argentina (26°40'S, 54°48'W).

**Remarks**

The male of *A. misionalis* resembles the female because of its small size (dorsal shield length, 423 µm; dorsal shield width, 206 µm) and the distance between *j6* setae greater than distance between *j5* setae. Small size and the great distance between *j6* are not exclusive of *A. misionalis*. These characteristics allow differentiating 4 species out of the *A. rotundus* species group, *A. misionalis*, *A. maurii*, *A. navonae*, and *A. wingei*, which probably



FIGURES 4-6. The male of *Androlaelaps ulysespardinasi*. (4) Dorsal plate. (5) Venter. (6) Chelicera.

constitute a new genus (Lareschi and Galliari, 2014). Although morphologically very similar, using principle component analyses these 4 species were differentiated, each one host specific, independent of sympatry of the hosts and without geographical variation (Lareschi and Galliari, 2014). Moreover, the revision of about 100 individuals of *A. montensis* showed that about 95% of them were parasitized with females of *A. misionalis*, and no specimens of the 3 remainder *Androlaelaps* species were collected (M.L., pers. obs). Thus, we may assume that the mite herein described is the male of *A. misionalis*.

In comparison with the other known males of the group, *A. misionalis* is unique because the tips of sternal setae *st1* and *st2* reach insertion of setae *st2* and *st3*, respectively, while sternal seta *st3* overpass insertion of metasternal seta *st4*; holovenal shield, bearing 7 pairs of opisthogastric setae; venter with unarmed integument bearing 3 pairs of opisthogastric setae; anal shield with postanal seta twice as long as paranal seta; hypostomal seta *hyp3* not reaching insertion of capitular setae; movable digit of the chelicera with its tip sharply curved dorsally.

***Androlaelaps ulysespardinasi*** Lareschi, 2011  
(Figs. 4-6)

*Description of the male (based on 1 specimen):* Dorsum (Fig. 4). Dorsal shield reticulate covering almost the total idiosoma. Thirty-seven pairs of setae simple; *j/J* and *z/Z* series complete; central setae about 19-24 µm, with setae *j5* about 1/3 as long as distance from base of *j5* to *z5*. Distance between *j6* setae similar to *j5-j5* distance, and half the distance between *z5* setae. Pairs of setae along posterolateral margin longer and stronger posteriorly;

*Z5* longest. Gland pores and lyrifissures as illustrated. Idiosoma ovoid, about 70% as long as wide with posterior margin rounded.

Gnathosoma (Fig. 5). Hypognathal groove with 6 rows of teeth; strong tritosternum with unornamented base and thick laciniae. Capitular (*cs*) and 3 pairs of hypostomal setae present; minute with exception of hypostomal seta *hyp3*, almost 3 times as long as the others and with its tip reaching insertion of capitular setae.

Venter (Fig. 5) with tritosternum and presternal sculpturing as in female. Holovenal shield, bearing anterior genital orifice (*gen.orf.*), expanded laterally posterior to coxa IV, with 9 pairs of opisthogastric setae (*Jv1*, 2, 3, and 4; *Zv1* and 2; and 3 pairs of accessory setae); with the tips of sternal setae *st1*, *st2*, and *st3* reaching insertion of sternal setae *st2*, *st3*, and metasternal seta *st4*, respectively; metasternal seta *st4* and genital seta *gen* short; anal shield fused but easily distinguished by a diminution and difference in sculpturing with postanal seta (*pon*) more than twice as long as paranal setae (*pan*); unarmed integument lateral to level of coxae bearing another 5 pairs of opisthogastric setae. Peritrematic shield well sclerotized, extending posterior to stigma.

Chelicera (Fig. 6) with long, tubular spermatodactyl. Movable digit (*md*) straight with its tip scarcely curved dorsally; fixed digit (*fd*) strongly reduced, with pilus dentilis absent. Legs as in female, all legs thick and subequal in length; anterior ventral seta of coxa I (*avCI*) twice as long as posterior dorsal seta of coxa I (*pdCI*); anterior ventral seta of coxa II (*avCII*) and anterior ventral seta of coxa III (*avCIII*) almost as long as anterior ventral seta of coxa I; seta of coxa IV (*sCIV*) minute.

*Measurements:* Spermatodactyl length, 67; dorsal shield length, 510; dorsal shield width, 350; holovenal shield length, 420; length of sternal seta *st1*, 50; length of sternal seta *st3*, 65; length

of metasternal seta *st4*, 50; length of epigynal seta *st5*, 50; length of paranal seta (*pan*), 24; length of postanal seta (*pon*), 55; greatest width anal shield, 79; length of anterior ventral seta coxa I (*avCI*), 50; length of posterior dorsal seta coxa I (*pdCI*), 24; length of anterior ventral seta coxa II (*avCII*), 46; length of anterior ventral seta coxa III (*avCIII*), 26; length of seta coxa IV (*sCIV*), 23; length of seta *ad1* in femur I, 48; length of seta *ad3* in genu I, 29; length of seta *j5*, 19; distance between seta *j5* and seta *z5*, 53; length of seta *j6*, 24; length of seta *z5*, 22; length of seta *J5*, 22; length of seta *Z5*, 86; distance between *j5* setae, 53; distance between *z5* setae, 120; distance between *j6* setae, 65; distance between *J5* setae, 72; distance between *Z5* setae, 96; length of capitular seta (*cs*), 12; length of inner hypostomal seta (*hyp3*), 30; distance between capitular and inner hypostomal setae, 30.

### Taxonomic summary

*Type host*: *Akodon philipmyersi* Pardiñas, D'Elía, Cirignoli, and Suarez, 2005.

*Type locality*: Estancia Santa Inés, Ruta No. 105 km 10 (27°31'S, 55°52'W), Department of Posadas, Misiones Province, Argentina.

*Specimen studied*: MLP-LTU896. Ex *Akodon philipmyersi* (LTU896), Estancia Santa Inés, Ruta No. 105 km 10 (27°31'S, 55°52'W), Department of Posadas, Misiones Province, Argentina.

### Remarks

The male of *A. ulysesparadinasi* presents with relative setal size and arrangement similar to the female, with distance between *j6* setae similar to distance *j5-j5*. The host, *A. philipmyersi*, is endemic to northern Campos in southern Misiones, where it is the most common prey item of the barn owl, *Tyto alba* (Gray, 1929) (Pardiñas et al., 2005). *Androlaelaps ulysesparadinasi* shows high prevalence (100%) and mean abundance (16), and it is specific to *A. philipmyersi* (Lareschi, 2011). Sympatric sigmodontine species were examined for mites and no specimens of *A. ulysesparadinasi* were collected. Moreover, no other mite belonging to *A. rotundus* species group was collected from *A. philipmyersi* (M.L., pers. obs.). Thus, we may assume that the mite studied is the male of *A. ulysesparadinasi*.

In comparison with other known males of the group, *A. ulysesparadinasi* is unique because the tips of the 3 sternal setae reach insertion of the next seta, but not overpass it; holovenral shield bearing 9 pairs of opisthogastric setae; anal shield with postanal seta more than twice as long as paranal seta; venter with unarmed integument bearing 5 pairs of opisthogastric setae; hypostomal seta *hyp3* long reaching insertion of capitular setae; movable digit of the chelicera with its tip scarcely curved dorsally.

### DISCUSSION

*Androlaelaps misionalis* and *A. ulysesparadinasi* are included in the *Androlaelaps rotundus* species group because of the presence of dorsal shield with 37 pairs of setae simple (*j/J* and *z/Z* series complete), central setae very short (<30 µm), setae *j5* about 1/3–1/4 as long as distance from base of *j5* to *z5*, and an enlarged *ad1* seta in femur I, with length subequal to width of femur at level of seta.

The males of *A. misionalis* and *A. ulysesparadinasi* differ from the male of *A. rotundus* sensu stricto because their dorsal shields

are ovoid (423 × 260 µm in *A. misionalis*; 510 × 350 µm in *A. ulysesparadinasi*) while rounded in *A. rotundus* (490 µm × 422 µm); postanal seta twice or more as long as paranal setae while shorter in *A. rotundus*; and the tips of sternal setae *st1* and *st2* not overpassing insertion of sternal setae *st2* and *st3*, respectively (fig. 40 in da Fonseca, 1957/1958).

In addition, the males of *A. misionalis* and *A. ulysesparadinasi* differ in their size, the distance between *j6* setae in dorsal shield (similar to distance between *j5* setae in *A. ulysesparadinasi* vs. greater in *A. misionalis*); length of hypostomal seta *hyp3* (almost 3 times as long as the others and reaching insertion of gnathosomal setae in *A. ulysesparadinasi* vs. shorter in *A. misionalis*); number of opisthogastric setae in holovenral shield (9 pairs in *A. ulysesparadinasi* vs. 7 in *A. misionalis*); length of sternal setae *st3* (reaching insertion of metasternal setae *st4* in *A. ulysesparadinasi* vs. overpassing its insertion in *A. misionalis*); length of postanal seta (more than twice as long as paranal setae in *A. ulysesparadinasi* vs. shorter in *A. misionalis*); number of opisthogastric setae in unarmed integument lateral to level of coxae IV (5 pairs of in *A. ulysesparadinasi* vs. 3 in *A. misionalis*); and dorsal curvature of the tip of movable digit in the chelicera (scarcely curved in *A. ulysesparadinasi* vs. strongly curved in *A. misionalis*).

Molecular, mating, and development information on parasitic laelapine mites is very scarce and unknown within the *A. rotundus* species group. Evidence on host specificity, including correct identification of the hosts as performed in this study, together with data on prevalence and abundance reinforce morphological characteristics and support that identification of the males is correct.

Laelapine parasitic species of Neotropical mammals are poorly known compared to other groups of ectoparasites (e.g., fleas and ticks). This article aims to contribute to its knowledge from the description of the males of 2 species. This information is useful to make inferences about the life cycle of these parasites.

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