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THE NEMATODE FAUNA OF LONG-NOSED MICE *OXYMYCTERUS* SPP. FROM THE BOLIVIAN YUNGAS

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ABSTRACT: During a long-term survey of the parasites of mammals from all over Bolivia, 44 individuals of *Oxymycterus inca* and 6 of *Oxymycterus paramensis* were collected and examined for parasites from the foothills and Eastern Cordillera (Los Yungas) of the Andes of Bolivia. Three species of nematode were found including, from the cecum, a previously unknown genus and species of pinworm, *Caroloxyuris boliviensis* n. gen, n. sp., aspidoderids representing *Nematomystes rodentophilus*, and from the stomach, *Protospirura numidica criceticola*. These helminths occurred in prevalences of 25, 9, and 14%, respectively, in *O. paramensis*. *Caroloxyuris boliviensis* resembles species included in the genus *Syphacia* in the structure of the cephalic mask and copulatory organs, and the extension of lateral alae. However, males of this species possess only 2 mamelons on the ventral surface of the body. *Caroloxyuris* can be recognized as being distinct from both *Helminthoxys* and *Rauschtineria* in the ornamentation of the mamelons and the shape of cephalic mask. A redescription of *N. rodentophilus* is provided, and *Nematomystes scapteromi* is transferred from *Ansiruptodera* to *Nematomystes*.

Long-nosed mice of the genus *Oxymycterus* Waterhouse, 1837 (Muridae: Sigmodontinae) have a southern neotropical distribution and are represented by approximately 14 described species (Hershkovitz, 1994, 1998). These mice have a generally peripheral distribution in the Amazon basin but have not been recorded north of the main tributaries of the Amazon river (Hershkovitz, 1994); however, additional field work and collecting in the eastern foothills of the Andes in Peru and Ecuador will probably provide new distributional records for members of the genus. Three species have been reported from Bolivia (Anderson, 1997).

A literature review shows that the parasite fauna of species of long-nosed mice has not been studied extensively (Sutton et al., 1980; Sutton, 1994; Vicente et al., 1997; Notarnicola et al., 2000) and, as yet, no information exists on the parasites of *Oxymycterus* in Bolivia.

From 1984 to 2000, several joint research expeditions were sent from the Museum of Southwestern Biology (MSB), the Manter Laboratory of Parasitology, the American Museum of Natural History (United States) and the Colección Boliviana de Fauna (Bolivia) to conduct a survey of the parasites of mammals of Bolivia (Anderson, 1997). During this work, 2 species of *Oxymycterus* or long-nosed mice, also called ''Hocicudo,'' were collected from several mid- to low-elevation localities from throughout the Eastern Cordillera and lowlands of Bolivia (Fig. 1).

Individuals of both *O. paramensis* Thomas, 1902 and *O. inca* Thomas, 1900 were collected and examined for parasites from several areas of Bolivia east of the main Cordillera Occidental. These species have apparent wide geographic ranges in Bolivia, with *O. paramensis* having been recorded most commonly in the Yungas region of the Andean foothills and *O. inca* occurring mostly in the northern humid lowlands (Anderson, 1997).

In the present article, we describe a new genus and species of pinworm (Nemata: Oxyuridae) *Caroloxyuris boliviensis* n. gen., n. sp., redescribe a species of heterakoid nematode in Aspidoderidae, and provide new host and locality records for the stomach nematode, *Protospirura numidica crieticola* Quentin, Karimi, and Rodriguez de Almeida, 1968.

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MATERIALS AND METHODS

The Yungas is an ecological transition zone that includes habitats ranging from high-altitude puna to low-altitude tropical and temperate forests. The Yungas region stretches through Bolivia running north to south along the eastern front range of the Andes from Peru to Argentina (Unzueta, 1975). In this area, the altitude of the land decreases rapidly in a west to east direction, typically changing from a maximum of more than 5,000 to 1,500 m and lower over a distance of approximately 150 km. This unique geological–ecological zone is characterized by first-order streams that have cut deep gorges, with the lowest elevations along streams and rivers having temperate conditions, and ''puna'' or tundra-like habitat directly above (3,500–4,500 m).

Forty-four individuals of *O. paramensis* and 6 of *O. inca* were collected from 11 and 5 localities, respectively, from the biogeographic province known as the Yungas of Bolivia. The list of localities is presented below, and for each species of rodent collected, the general locality is given first, followed by latitude, longitude, and altitude (m). Number of individuals examined for parasites is given in parentheses. See Anderson (1997) for a gazetteer of all collecting localities given in this article. Collecting localities for *O. paramensis* are the following: Chuquisaca, 2 km SW of Monteagudo, 19°49′S, 63°58′W 1,130 m. (3); Río Limón, 19°33′S, 64°08′W, 1,300 m (1). Cochabamba, 17 km E of Totora 17°45′S, 65°02′W 2,950 m (2); 7.5 km SE of Rodeo 17°40′31″S, 65°36′04″W 4,000 m (10); 1.3 km W of Jamachuma 17°31′32″S, 66°07′29″W 2,800 m (1); 16.5 km NW of Colomi, 17°13′38″S, 65°57′26″W 3,500 m (17), and Poseidón, Laguna Corani, 12.5 km N of Colomi, 17°14′02″S, 65°53′26″W 3,200 m (3). Tarija, Tapecua, 21°26′13″S, 63°55′01″W 1,500 m (1); 4.5 km E of Iscayachi, Rio Tomayopo, 21°29′S, 64°55′W 3,750 m (1), 3 km SE of Cuyambuyo, 22°16′S, 64°33′W 900 m (4). La Paz, Río Aceromarca, 16°19′S, 67°53′W 2,990 m (1) (Fig. 1).

Individuals of *O. inca* were collected from 5 separate localities: Departamento de Santa Cruz, San Miguel Rincón, 17°23′S, 63°32′W 300 m (1); Estancia Cachuela Esperanza, 16°47′S, 63°14′W 300 m (1); 6 km by road W of Ascención, 15°43′S, 63°09′W 240 m (1). Cochabamba, 13 km N of Colomi 17°13′29″S, 65°53′30″W 3,152 m (2); La Paz, Chijchipa, 16°09′S, 67°45′W 1,114 m (1) (Fig. 1).

All rodents were collected using Sherman™ live traps baited with a mixture of oatmeal, vanilla, tuna, and sardines, or snap traps baited with peanut butter. Traps were placed in suitable habitat each evening and checked at first daylight the following morning. Details of each rodent collected (i.e., exact type of habitat from which each animal was taken) were recorded in the field-collection catalog book (the New Mexico cryovoucher number or ''NK'' book) and in the rodent-trapping data book, which are maintained in the MSB of the University of New Mexico, Albuquerque, New Mexico (http://www.unm.edu/~museum/). Additional details of trapping localities can be found in field notes of the expedition that refer to specimens of mammals maintained at the MSB, the American Museum of Natural History (AMNH), and specimens of parasites from those mammals in the Harold W. Manter Laboratory of Parasitology (HWML).

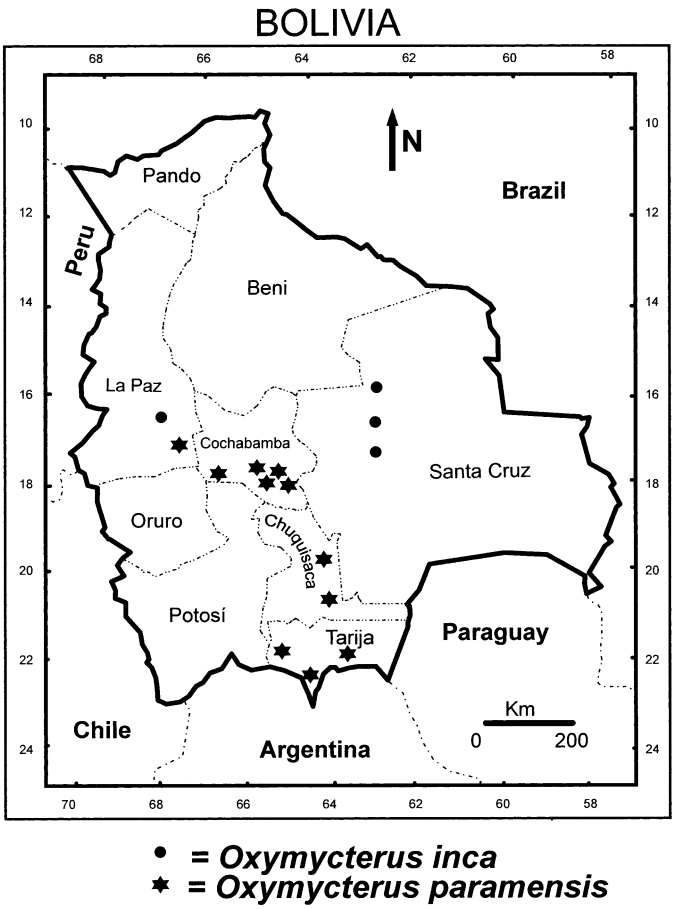


FIGURE 1. Approximate collection localities of *Oxymycterus paramensis* and *O. inca* in Bolivia.

Specimens were collected and studied under terms of a convention or agreement established between the National Museum of Natural History, La Paz, and the University of New Mexico, the University of California, Davis, or the HWML.

Some complete digestive tracts were fixed in the field at the time of collection, stored in 10% formalin, and examined in the laboratory using a dissecting microscope. In the field, each organ of the digestive system was examined separately with a dissecting microscope at ×5–20 or an optivisor at ×10. Nematodes found were killed in concentrated glacial acetic acid (GAA), 70% ethanol (EtOH), or hot or cold 10% formalin. All worms were stored in the same medium in which they were killed, except for those killed in GAA, which were transferred for storage and transport to cold 10% aqueous v/v formalin. Some specimens were preserved in vials filled with 95% aqueous v/v EtOH, or placed in cryotubes, frozen in liquid nitrogen, and stored at −85 C in an ultra low-freezer in the HWML. Abbreviations of museums from which specimens were borrowed or studied include Harold W. Manter Laboratory of Parasitology (HWML), Museum of Southwestern Biology (MSB), American Museum of Natural History (AMNH), United States National Parasite Collection (USNPC), Muséum National d'Histoire Naturelle, France (MNHN), Coleçaõ Helmintólogica do Instituto Oswaldo Cruz, Brazil (CHIOC), Colección Nacional de Helmintos, Mexico (CNHE), Parasite Collection of the School of Veterinary Medicine, Hokkaido University, Japan (PCSV), Museo de Historia Natural, Departamento de Zoología de Invertebrados, Argentina (CHLP).

Specimens used for comparative purposes included *Rauschtineria thompsoni*, 27793; *Rauschtineria eutamii* 4779, and *Syphacia arctica* 37151 (USNPC); *Syphacia venteli* 605M, 606M, *Syphacia alata* 158U, *Syphacia megadeiros* 5NE, 603M, and *Syphacia criceti*, 61U (MNHN); *Paraspidodera uncinata* 12492, 12698, 13521 and *Pseudaspidodera pavonis* 33019 (HWML); *Aspidodera ansirupta* 29934a–e (CHIOC); *Paraspidodera uncinata* 2190, 2287 (CNHE); *Nematomystes rodentiphilus* 180D, 2187D (CHLP), and *Ansiruptodera scapteromi* 2985 (PCSV).

Nematodes were cleared for study in lactophenol. Drawings were made with a Wild™ microscope equipped with a drawing tube. Measurements were made using a Zeiss Ultraphot™ microscope and digital measuring software (Jandel Sigma Scan Pro™, San Rafael, California; Albinger et al., 1995). Measurements are given in micrometers. For each character, the range is given first, followed by sample mean and coefficient of variation as a percentage (Sokal and Rohlf, 1981). If sample size for a character studied was different from number of specimens examined, this is also given.

Below, we present 3 sets of data. The first includes the description of a new genus and species of oxyurid nematode, the second contains a redescription of an aspidoderid nematode that had previously been found only in rodents in Argentina, and the third part is the first report of a spirurid from Bolivian rodents.

RESULTS

Caroloxyuris n. gen.

(Figs. 2–7)

Description

General: In both sexes, body with well-developed lateral alae. Cephalic plate or mask with 3 lips, dorsal lip smaller, and both lateral lips relatively large. Cephalic mask laterally elongated with amphids emerging on the lateral edges of the bilaterally symmetrical lateral lips (Figs. 2, 3). Stoma circular in cross section, provided with 3 teeth. Cuticle of body finely striated in transverse orientation.

Male: With single spicule and gubernaculum. Accessory piece of gubernaculum with several protuberances extending ventrad, giving the surface of the accessory piece a rough appearance. Two mamelons on ventral surface of body provided with many transverse bands of cement pores communicating with cement glands deep below the hypodermis of the cuticle (Figs. 4, 5).

Female: Cephalic mask symmetrical and enlarged laterally. Vagina with thick muscular walls (Fig. 6). Eggs operculate and oval, embryonated in the distal region of the ovijector relative to the uterus (Fig. 7).

Etymology: The genus is named in honor of the late Dr. Carola Sutton, a gifted teacher and pioneering parasitologist from the Museo de Historia Natural La Plata, Argentina.

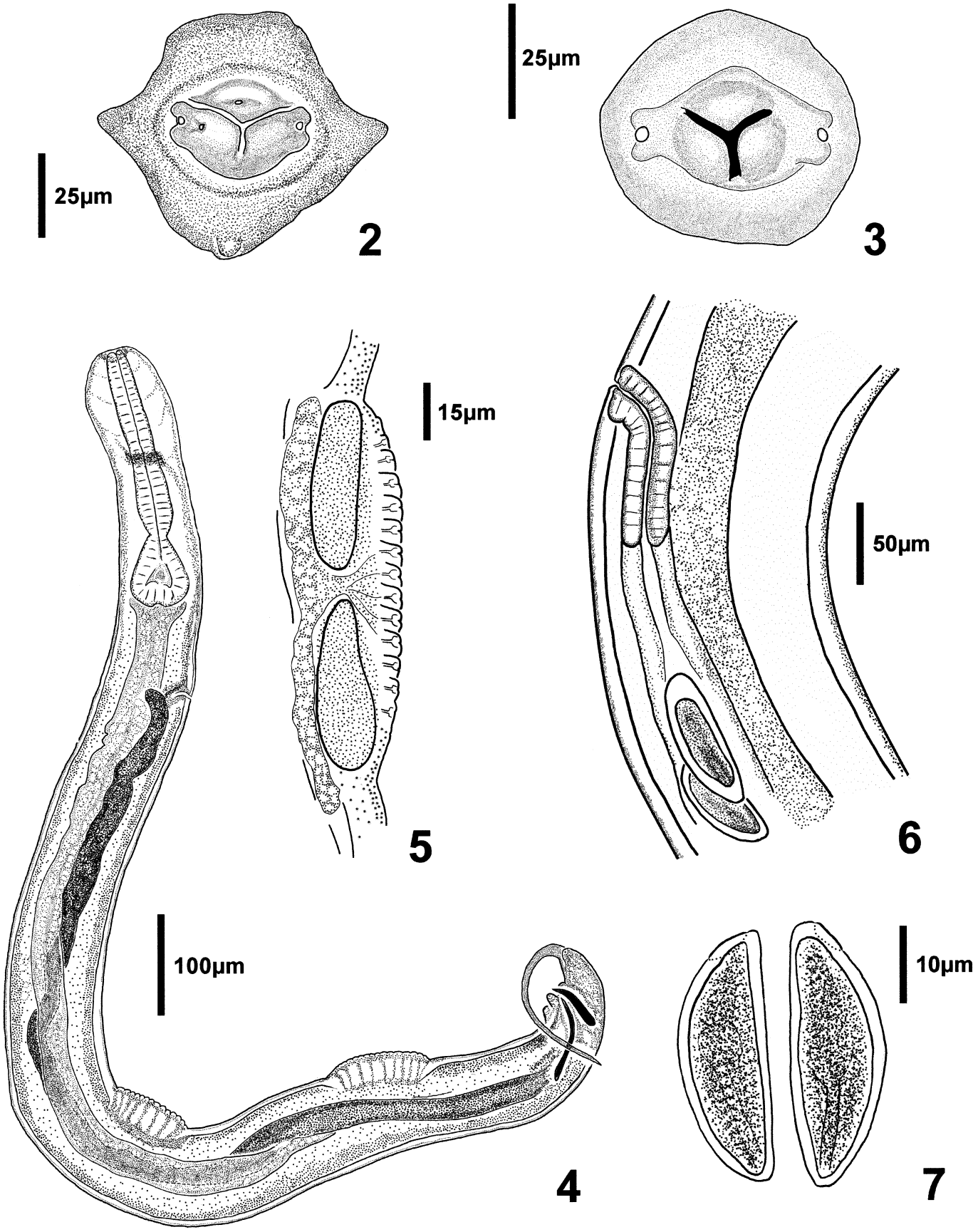
Type and only species: Caroloxyuris boliviensis n. sp.

Diagnosis: The species included in the genus *Caroloxyuris* is superficially similar to members of the genus *Syphacia* occurring in rodents in Nearctic and Neotropical regions in the shape of the cephalic mask, the lateral alae, and the accessory piece of the gubernaculum. However, species included in the genus *Caroloxyuris* can be distinguished from *Syphacia* by the presence of 2 rather than 3 mamelons in the male. Species of *Caroloxyuris* can be recognized as being distinct from those species of pinworms occurring in Neotropical rodents possessing only 2 mamelons in all other major morphological respects, including differences in the cephalic mask, the extent and shape of the lips, and the form and structure of both the spicule and gubernaculum (see Hugot, 1980; Hugot and Gardner, 2000).

Caroloxyuris boliviensis n. sp.

(Figs. 2–15)

The following description is based on 7 mature and 15 gravid females and 13 mature males. Oxyuridae: Syphacinae. Worms



FIGURES 2–7. *Caroloxyuris boliviensis* n. sp. **2.** En face view of a female. **3.** En face view of the cephalic mask of a male. **4.** Whole-mount lateral view of a male. **5.** Lateral view of the posterior mamelon of a male. **6.** Detail of vulva and ovijector. **7.** Embryonated eggs.

with no sexual dimorphism in head structures. Cephalic mask laterally elongated. A pair of papillae on each pseudolabium, amphids on lateroventral lips surrounded by a pair of papillae. Stoma circular when viewed in cross section. Three esophageal teeth. Cephalic cuticular expansion present and variable in width (Fig. 8). Lateral alae beginning at level of nerve ring extending to level of anus or cloaca. Alae with triangular shape when viewed anteroventrally in cross section, supported by central cuticular ridge (Fig. 9). Males with 2 ventral mamelons. Eggs embryonated and operculate in the distal section of the ovijector.

Male: Body length 1,393–1,940, 1,522 (9.89%), width at level of midbody 85–120, 100 (10%). Ventral surface with 2 mamelons, located 639–1,081, 739 (16%) and 801–1,399, 1,011 (14%) (measured from anterior end to middle of each) from anterior end. Tail 221–251, 237 (14%) long. Width of cephalic cuticular expansion 7–22, 12 (15%, n = 12). Nerve ring and excretory pore located 58–99, 79 (15%, n = 10), and 228–417, 307 (18%, n = 12), respectively, from anterior end. Stoma 4–14, 8 (42%, n = 11) deep, (Fig. 10) corpus of esophagus 158–190, 176 (5%, n = 12) long and 20–29, 24 (12%) wide at level of nerve ring. Bulb 53–69, 61 (8%) long and 44–61, 51 (9%) wide. Single spicule 80–102, 88 (7%) long by 3–5, 4 (13%) wide at level of manubrium. Gubernaculum 34–44, 38 (9%) long; accessory piece 14–22, 18 (11%) long, with a variable number of rounded outgrowths, protuberances, or tubercles on ventral surface (Fig. 11). Three pairs of papillae; 2 subventral perianal and 1 caudal. Anteriormost perianal pair pedunculate and covered by spherical cuticular expansion. Posterior perianal pair sessile and inconspicuous. Caudal pair formed by lateral and pedunculate papillae projecting outwards (Figs. 12, 13).

Female: Measurements based on both mature and gravid specimens. Length 3,661–6,034, 5,277 (12%, n = 22) and maximum width at midbody 137–227, 179 (14%, n = 24) (Fig. 14). Cephalic cuticular expansion 8–33, 20 (14%) wide. Nerve ring and excretory pore located 92–152, 121 (25%, n = 21) and 325–495, 433 (10%, n = 22) from anterior end of body, respectively. Stoma 6–10, 8 (18%, n = 23) deep (Fig. 15). Corpus 208–283, 243 (8%, n = 24) long and 28–57, 47 (16%, n = 24) wide at level of nerve ring. Bulb 81–140, 101 (12%, n = 24) long and 56–96, 76 (10%, n = 24) wide. Tail 719–996, 825 (8%, n = 23) long. Vulva 541–827, 687 (11%, n = 22) from anterior end of body, ovijector 89–158, 124 (14%, n = 17) long. Eggs 70–90, 79 (8%, n = 36) long and 22–31, 27 (10%, n = 36) wide.

Taxonomic summary

Type host: Oxymycterus paramensis Thomas, 1902 (Hocicudo parameño)

Other host: Oxymycterus inca Thomas, 1900 (Hocicudo)

Prevalence: 25% in *O. paramensis*, 33% in *O. inca*.

Type locality: For holotype and allotype specimens with NK21372, Bolivia, Departamento de Chuquisaca, 2 km SW of Monteagudo, 19°49′S, 63°58′W, 1,130 m, 13 July 1990.

Other localities: Departamento de Cochabamba, 16.5 km NW of Colomi, 17°13′38″S, 65°57′26″W, 3,500 m, collected 28, 29 July 1993; 13 km N of Colomi, 17°13′29″S, 65°53′30″W, 3,152 m, 27 July 1993; 17 km E of Totora, 17°45′S, 65°02′W, 2,950 m, 29, 30 May 1991; 7.5 km SE of Rodeo, 17°40′31″S, 65°36′04″W, 4,000 m, 25 July 1993; Departamento de Tarija, 3 km SE of Cuyambuyo, 22°16′S, 64°33′W, 900 m, 3 August 1991; Departamento de Santa Cruz, 6 km W of Ascención by road 15°43′S, 63°09′W, 240 m, 12 August 1985.

Specimens deposited: Holotype (HWML 16928), allotype (HWML 16929), and paratypes (HWML 16930, 16939, 16955–16958; CNHE 3422, 3423, and CHIOC 34809). Voucher specimens: HWML 16931–16938.

Symbiotypes (see Frey et al., 1992)*: Holosymbiotype* and *allosymbiotype* same individual host: *Oxymycterus paramensis* Thomas 1902, male, AMNH Catalog Number (AM) AM263891; Division of Biological Materials, New Mexico, Kryovoucher no. NK21372.

Parasymbiotypes (from type locality)*: Oxymycterus paramensis*, female, MSB 67278, NK 22832.

Habitat: Cecum and large intestine.

Etymology: The species name refers to Bolivia, the country in which this species was discovered.

Diagnosis

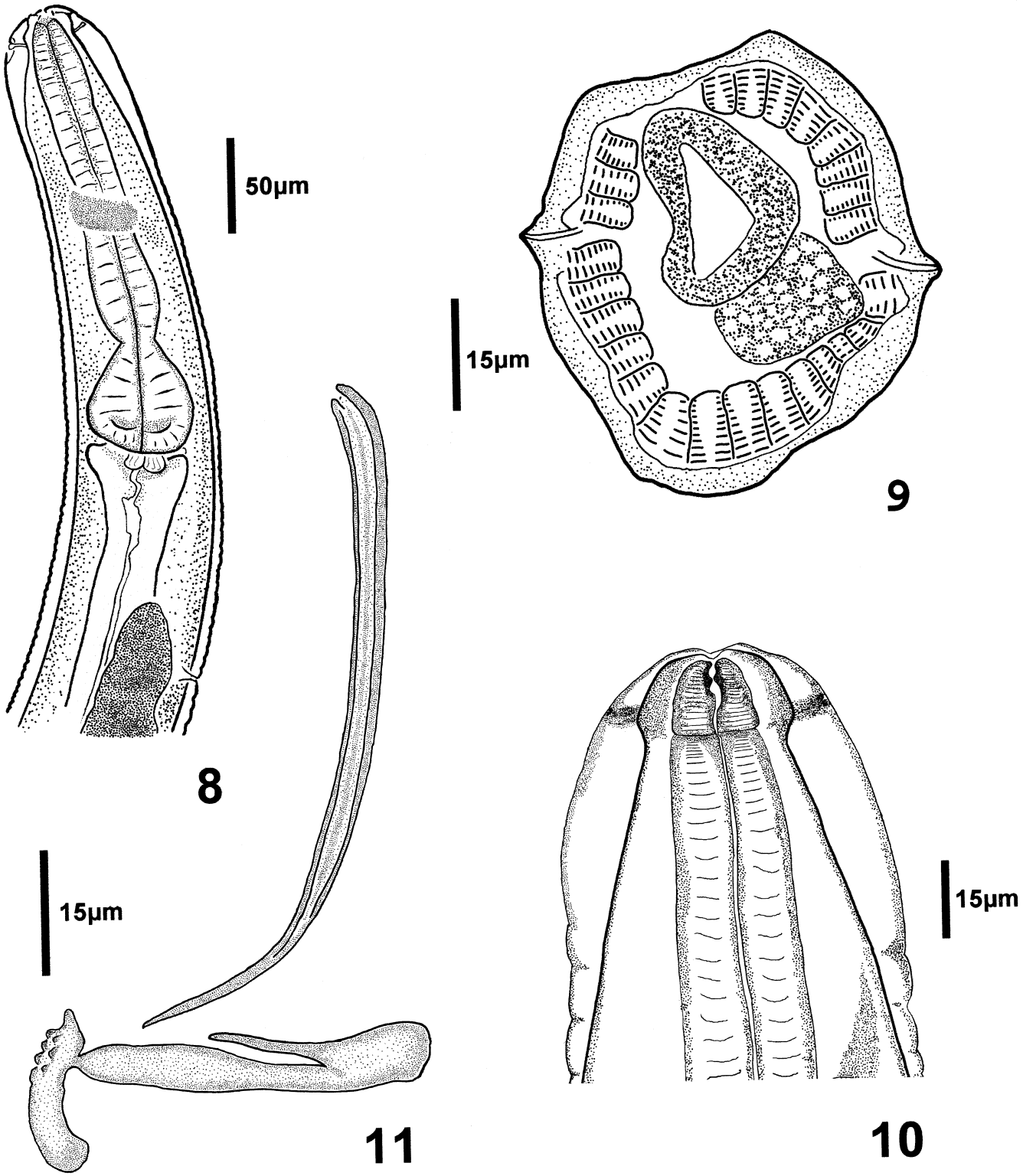
The taxonomy of members of the subfamily Syphacinae was extensively studied by Quentin (1973) and later by Hugot (1988). Hugot (1988) established the basis for further studies on morphology of the members of the group, and he also demonstrated the correlation that exists among pinworm parasites, their hosts, and the biogeographic regions in which they occur.

Species of pinworms possessing 2 ventral mamelons and occurring in Nearctic and Neotropical rodents, include *Helminthoxys* Freitas, Lent and Almeida, 1937 (7 species in hystricognaths) and *Rauschtineria* Hugot, 1980 (2 species in sciurids). Species of *Syphatineria* Chabaud and Biocca, 1955 have a known distribution restricted to squirrels in Africa and southern Asia and species of *Acanthoxyuris* Sandground, 1928 and *Zenkoxyuris* Quentin, 1974 have been described only from flying squirrels in the Ethiopian region (Freitas et al., 1937; Chabaud and Biocca, 1955; Hugot, 1980, 1982, 1985).

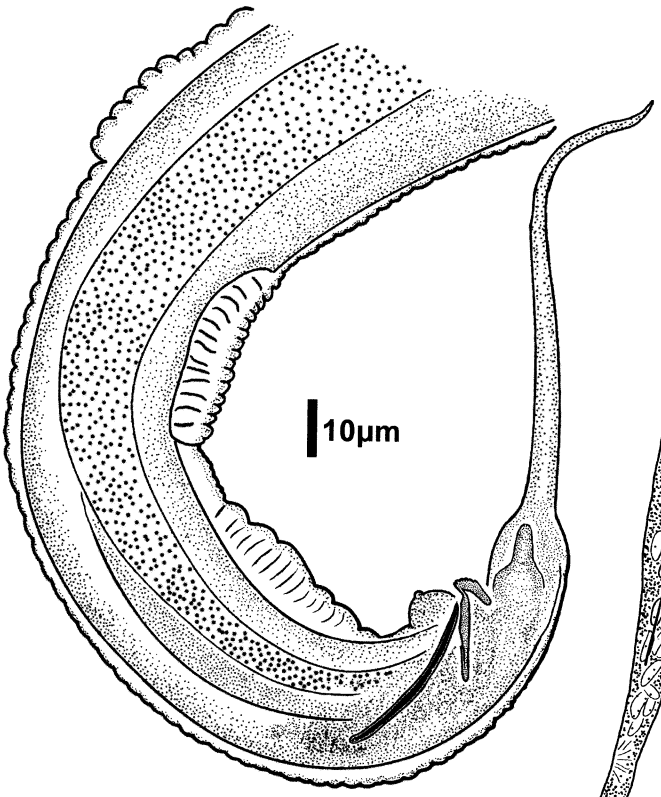
Since species of *Oxymycterus* have no fossil or historical record outside the Neotropical region, we make taxonomic comparisons only with those pinworms possessing 2 mamelons known to occur in rodents in the Neotropical and Nearctic regions. The 8 known species of *Helminthoxys* have a wide distribution in hystricognath rodents throughout South America, with the 2 northernmost species occurring in *Capromys pilorides* (Say, 1822) and *Mysateles prehensilis* (Poeppig) (see Hugot and Gardner, 2000).

Caroloxyuris boliviensis n. sp. can be distinguished from all described species of *Helminthoxys* by the shape and structure of the mamelons (Fig. 5), the shape and structure of the gubernaculum (Fig. 11), the extent and shape of the lateral alae (Fig. 9), and the shape and structure of the cephalic shield and lips (Figs. 2, 3). *Caroloxyuris boliviensis* n. sp. can be distinguished from known species of *Rauschtineria* in the structure of the cephalic mask (Figs. 2, 3), the shape and structure of the accessory piece of the gubernaculum, and the shape and structure of the spicule (Fig. 11).

The number and form of the mamelons in members of the Syphaciinae now appear to be variable. Conducting a detailed



FIGURES 8–11. *Caroloxyuris boliviensis* n. sp. **8.** Detail of the anterior end of male. **9.** Cross section of male showing both lateral alae. **10.** Lateral view of anterior end of male head showing inner structure of stoma. **11.** Spicule and gubernaculum lateral view.



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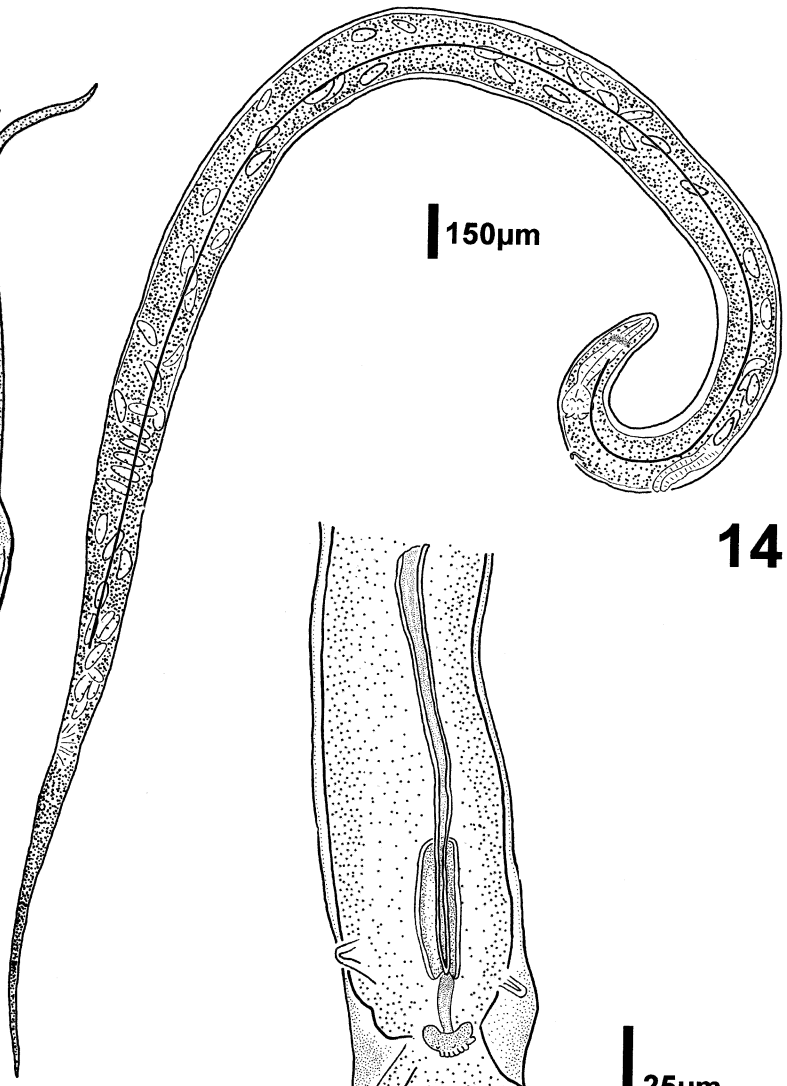

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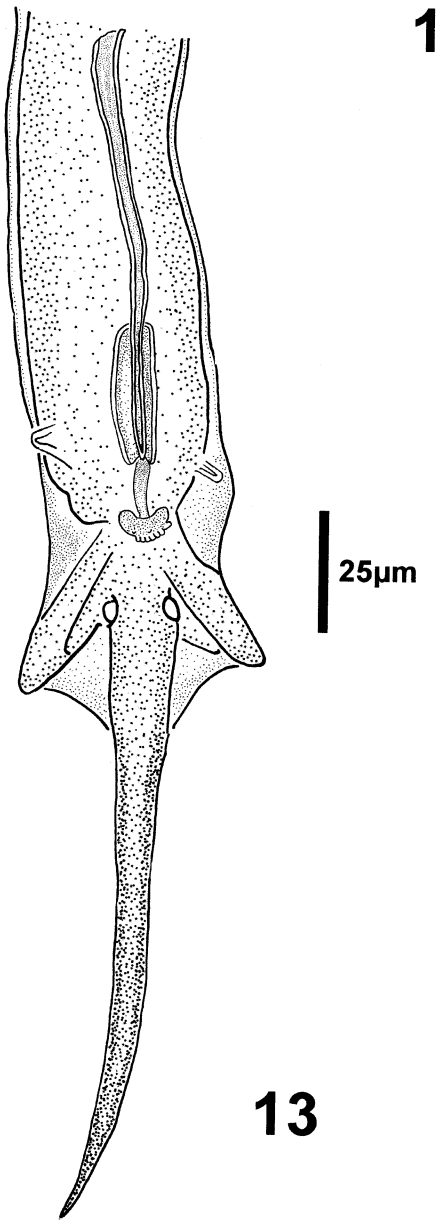

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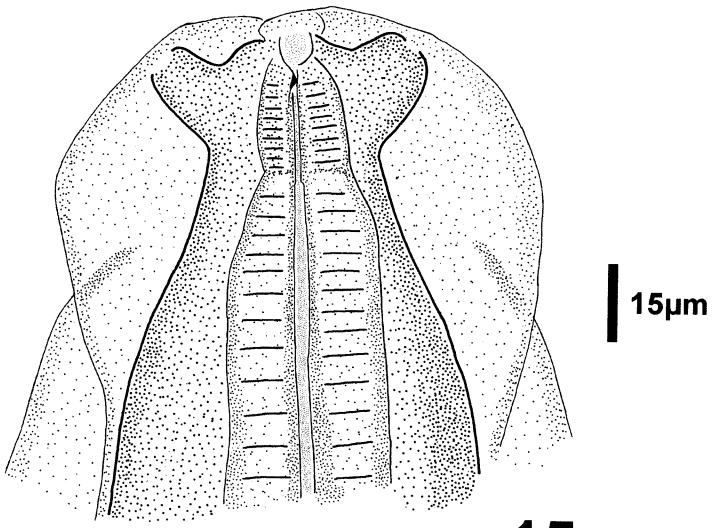

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phylogenetic analysis on all the species in the group would shed light on the problem by identifying species groups and geographic regions in which the numbers of mamelons may vary. Of interest here is the fact that all the characters of these nematodes, except the number of mamelons, match very well with the definition of the genus *Syphacia*. It appears that the switch from one host-group to another, i.e., from the oryzomyine lineage to species of the genus *Oxymycterus* occurred simultaneously with the loss of 1, or merging of 2, of the ventral mamelons. Definitive tests of these hypotheses await a complete phylogenetic analysis of the Neotropical and Nearctic forms of the Syphaciinae.

Redescription of *Nematomystes* Sutton, Chabaud and Durette-Desset, 1980

We include here an emended definition of the genus *Nematomystes* adding more details and reiterating important aspects of the original description. The characters used will serve to make cross comparisons with other species in the family.

Genus *Nematomystes* Sutton, Chabaud, and Durette-Desset, 1980

(Figs. 16–19)

Nematodes with slender bodies and tails ending in a sharp point. Cephalic cap composed of 3 somewhat trapezoidally shaped lips (Fig. 16), each lip with lateral extension or flap bearing a large projection directed posteriad and small lobe on anterior part (see Figs. 16, 17). Interlabium remaining separate from main part of lips by a space (Fig. 18). Interlabial spaces covered by v-shaped cuticular velum arising from sides of lips (Figs. 16, 17). Digestive tract consisting of stoma, pharynx, esophagus, esophageal bulb, intestine, and anus or cloaca. Lateral alae present (Fig. 19). In males, pre-cloacal sucker with thick rim-bearing small papillae on posterior margin. Two setaceous spicules, 1 gubernaculum. Uteri opisthodelphic. Eggs embryonated in ovijector and adjacent section of uterus.

Redescription of *Nematomystes rodentophilus* Sutton, Chabaud, and Durette-Desset, 1980

The following redescription is based on measurements of 8 gravid females and 8 mature males. Measurements were also taken from 4 syntypes. We note here that no holotype or allotype was designated at the time of description (''Lote tipo 180D'' in the CHLP; Sutton et al., 1980), so the series of specimens in the ''Lote tipo'' or type lot are considered as syntypes as defined in Article 72.1.1. of the International Code of Zoological Nomenclature (Anonymous, 1999).

Nemas with slender bodies and traits as described for the genus. Cephalic papillae arranged in pairs on each lip. Lateral alae triangular in outline when viewed in cross section. Each ala runs continuously from cephalic cap to second third of body; in females lateral alae disappear at level of vulva; in males lateral alae disappear at level of posterior portion of second third of body. Spicules equal in length and structure, surface of spicules ornamented with transverse ridges. Gubernaculum robust, typical of Aspidoderidae.

Male: Measurements based on 9 specimens unless otherwise noted. Body length 2,647–6,087, 4,556 (25%) by 93–178, 138 (22%) wide at midbody. Cephalic cap 41–60, 55 (11%) long by 44–70, 59 (16%) wide. Lateral alae 1,649–3,943, 2,697 (26%) long. Stoma 9–23, 18 (26%) deep; pharynx 30–38, 34 (8%) long by 17–29, 24 (16%, n = 8) wide. Esophagus 303–517, 444 (17%, n = 8) long, corpus 245–418, 365 (15%, n = 8) long by 21–35, 28 (16%, n = 8) wide at level of nerve ring. Bulb of esophagus 56–121, 89 (23%) long by 49–89, 71 (18%) wide. Excretory pore and nerve ring located at 263–361, 306 (12%, n = 7) and 129–234, 185 (21%, n = 7), respectively, from anterior end. Spicules equal in structure, left slightly longer than right; right spicule 293–571, 443 (23%) long by 8–30, 19 (36%) wide at manubrium; left spicule 369–534, 469 (14%, n = 7) long by 16–28, 21 (23%, n = 7) wide at manubrium. Gubernaculum 103–140, 117 (11%) long. Distance from posterior rim of sucker to cloaca 19–65, 43 (45%). Sucker 8–57, 27 (68%) in maximum length. Tail length 170–302, 253 (21%) and spinnerette (tip of tail) length 48–74, 61 (15%).

Female: Measurements based on 10 gravid and mature specimens unless otherwise indicated. Opisthodelphic. Body length 3,443–6,853, 5,348 (22%, n = 9) by 139–216, 181 (13%, n = 11) wide at level of vulva. Cephalic cap 48–69, 58 (11%) long by 54–76, 67 (10%) wide. Lateral alae 1,963–3,725, 2,823 (21%) long. Stoma 17–23, 20 (12%) deep; pharynx 26–51, 36 (21%) long by 23–38, 29 (16%) wide. Esophagus 470–620, 560 (9%, n = 9) long, corpus 355–428, 388 (6%, n = 8) long by 25–52, 37 (24%) wide at level of nerve ring. Bulb of esophagus 122–195, 147 (16%, n = 11) long by 56–88, 74 (16%, n = 11) wide. Excretory pore, nerve ring, and vulva located 279–354, 313 (9%, n = 7), 130–299, 236 (21%, n = 8), and 2,019–3,646, 2,870 (19%) from anterior end, respectively. Tail 244–475, 374 (19%) long. Eggs 62–96, 80 (9%, n = 164) by 41–61, 51 (7%, n = 164).

Taxonomic summary

Type host: Oxymycterus missionalis Sanborn, 1831.

Other host: Oxymycterus paramensis Thomas, 1902.

Type locality: Argentina, Provincia de Misiones, Arroyo Zaiman, 27°21′S, 55°53′W.

Other localities: Bolivia, Departamento de Tarija, 3 km SE of Cuyambuyo 22°16′S, 64°33′W; 900 m, 3 August 1991 and Departamento de Chuquisaca, Río Limón, 19°33′S, 64°08′W, 1,300 m, 4 August 1990.

Prevalence: In Bolivia 9%. No data on prevalence is available for specimens from Argentina.

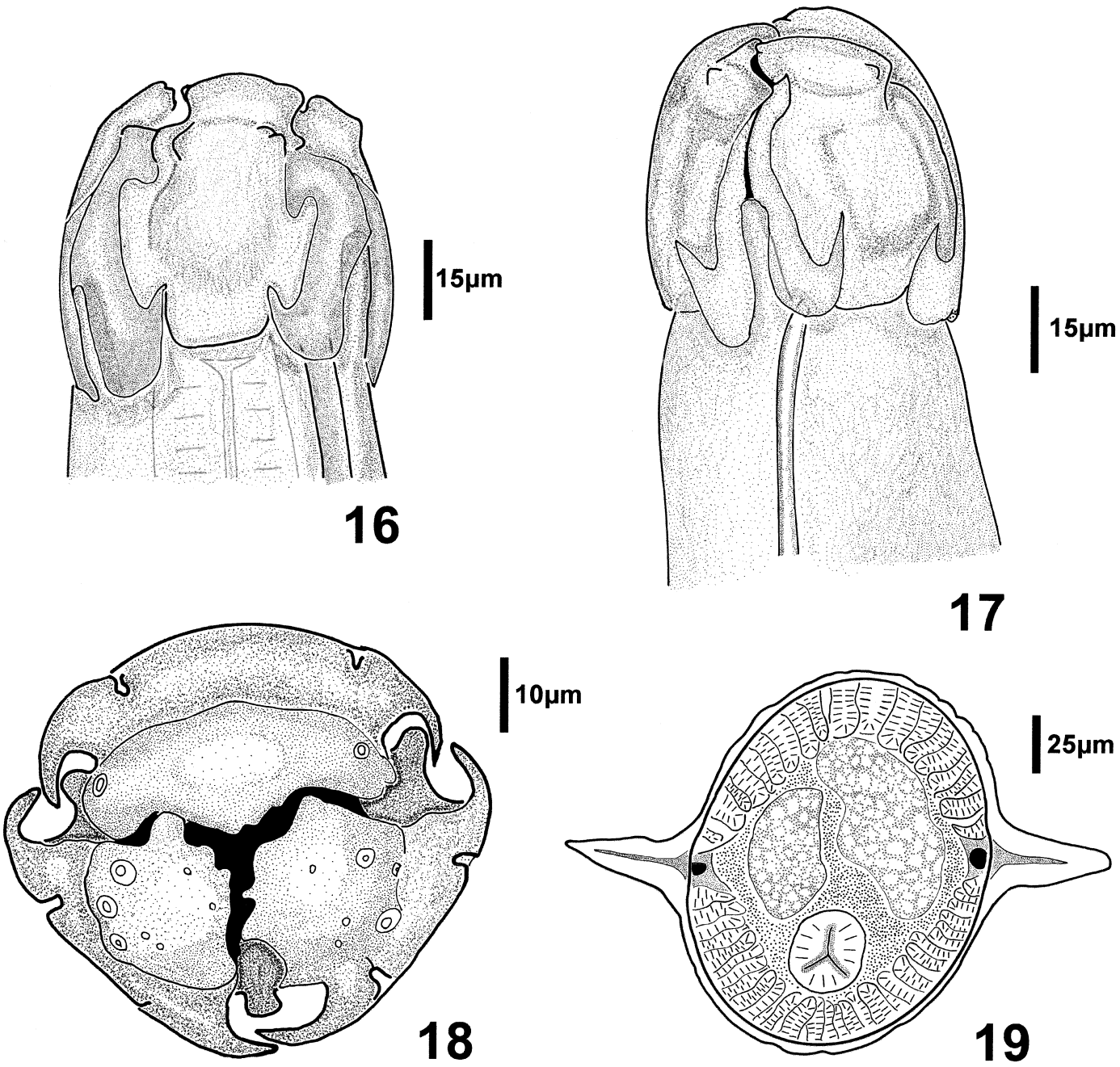
Accession numbers: HWML 16944–16947, 16959, 16960.

Occurrence of *Protospirura numidica* from Bolivian long-nosed mice

Protospirura numidica criceticola Quentin, Karimi and Rodriguez de Almeida, 1968

←

FIGURES 12–15. *Caroloxyuris boliviensis* n. sp. **12.** Lateral view of the tail of male displaying spicule, gubernaculum, papillae, and the posterior mamelon. See Figure 4 for comparison. **13.** Tail of male in ventral view showing ornamentation of accessory piece. **14.** Whole mount of female in lateral view. **15.** Anterior end of female, ventral view.



FIGURES 16–19. *Nematomystes rodentophilus*. **16.** Anterior end showing the hood and outgrowth on the sides of the lips and extensions of the velum. **17.** Anterior end, left lateral view, showing development of lips and beginning of left lateral ala of male. **18.** En face view, showing single large dorsal lip on the top and the 2 lateroventral lips below. **19.** Cross section of a male, note well-extended lateral alae and their triangular outline.

Host: Oxymycterus paramensis Thomas, 1902.

Localities: Cochabamba, Poseidón, Laguna de Corani 12.5 km N of Colomi, 17°14′02″S, 65°53′26″W, 3,200 m, collected 15 June 1993 and 16.5 km NW of Colomi 17°13′38″S, 65°57′26″W, 3,500 m, collected 27–29 July 1993. La Paz, 0.5 km E of Saynani 16°07′07″S, 68°04′46″W, 2,163 m, collected 2 June 1993.

Accession numbers: HWML 16940–16943.

Prevalence: 14%.

DISCUSSION

The known helminth fauna of species of *Oxymycterus* thus far consists of 1 digenetic trematode and 8 nematodes. From *Oxymycterus rufus* (Fischer, 1814) in Argentina was described the digene *Zonorchis oxymycterae* Sutton, 1983, the aspidoderid nematode *N. rodentophilus*, and the filaroid nematode *Litomosoides oxymycteri* Notarnicola and Navone, 1999. Additionally, the filaroid nematodes *Litomosoides legerae* Bain, Petit and

Berteaux, 1980 and *Litomosoides carinii* Travassos, 1919 occur in *O. hispidus* Pictet, 1843, and *Oxymycterus* sp., respectively, in Brazil (Vicente et al., 1997). Finally, *N. rodentophilus* has also been recorded from *Oxymycterus misionalis* Sanborn, 1931 (see Sutton et al., 1980) and in the current article, we give the first record of *P. numidica criceticola* from *Oxymycterus paramensis*.

The redescription of both *Nematomystes* and *N. rodentophilus* was necessary to provide a standardized set of characters that can be used for both diagnosing and comparing nematodes of the family Aspidoderidae. Species allocated to the genus *Nematomystes* have been placed in the subfamily Lauroiinae because of the characteristic lips, spicules, gubernaculum, precloacal sucker, and arrangement of the cloacal papillae (Sutton et al., 1980). The diagnostic characters for *Nematomystes* are the presence of a flap on each side of the lip and a cuticular expansion or membrane that arises from the flap and covers the interlabial space (Fig. 17). As part of the cephalic cap, there also is an interlabium, which is separated from the lips by a groove. This interlabium does not bear a cuticular expansion, so the cuticular expansion that arises from the lip covers the groove (Fig. 17). Because of this unique arrangement of the cuticle, the interlabial structures of *Nematomystes* match the description that Inglis (1957) provided for the cordons of Aspidoderidae. The interlabia are structures common to both *Aspidodera* and *Ansiruptodera* (Aspidoderinae) and have not been reported from any other species of Lauroiinae. For instance, *Nematomystes* may be confused with *Ansiruptodera* because of the overall similarity of the cordons in both genera.

This is the case for *A. scapteromi* Ganzorig, Oku, Okamoto, Malgor and Kamiya, 1999. The cephalic cap of specimens of *A. scapteromi* that we studied features the typical lateral flaps on the sides of the lips and they lack any interlabial cuticular projection. In contrast, specimens of *Ansiruptodera ansirupta* (Proença, 1937) that we studied display a cuticular expansion arising from the interlabium, deeper grooves, and no flap. Additionally, the esophageal bulb of *Nematomystes* is claviform and weakly differentiated from the rest of the esophagus, whereas the same structure is pyriform and well differentiated from the rest of the esophagus in *Ansiruptodera*. For these reasons, we transfer *A. scapteromi* to *Nematomystes*.

To understand the nature of variation in these nematodes, we compared the measurements of types of *N. scapteromi* with the type specimens of *N. rodentophilus* and found differences in the extension of the lateral alae, the relative distance of the vulva from the anterior end, and the sizes of the spicules.

Thus, at the present time, the genus contains both *N. rodentophilus* and *N. scapteromi*, which are distinguished from each other by the size of the cephalic cap, distance of the vulva from anterior end, and alae extension.

We also had an opportunity to examine specimens described as *N. rodentiphilus* collected from *Scapteromys aquaticus* near the Río de La Plata, Argentina (Sutton, 1994). We found those worms to be the same as *N. scapteromi*, based on size of spicules, extension of lateral alae, distance of vulva from anterior end, and size of cephalic hood, all of which fall into the range given by Ganzorig et al. (1999). Sutton (1994) noticed the difference in measurements among specimens of *N. rodentophilus* from Misiones and specimens from La Plata, but she did not consider them to be sufficient to warrant species-level status.

In summary, the monotypic *Ansiruptodera* is composed of *A. ansirupta*, whereas *Nematomystes* is composed of *N. rodentiphilus* and *N. scapteromi*. The latter is distributed in the basin of Rio de La Plata in Argentina and Uruguay, whereas the former is present in the Bolivian Yungas and in the southern part of the province of Misiones, Argentina.

Finally, most surveys of helminths from *Oxymycterus* and in fact, most of the work done on the parasites of the mammalian fauna of South America have been conducted in either Brazil or Argentina, and very little is known in the rest of the continent, especially in Paraguay, Bolivia, and Ecuador. The potential number of species to be described may not be estimated with certainty, but additional field work in these relatively unknown (faunally) areas will most likely dramatically increase the number of species known.

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