

Two new species of mermithids (Nematoda: Mermithidae) parasites of insects in Argentina

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Summary - *Ditremamermis montana* n. sp., a parasite of larvae of *Simulium rubiginosum* (Diptera: Simuliidae) from Buenos Aires Province, is described and illustrated. This new species is characterized by having large amphids, vagina transversally oriented, barrel-shaped, located near the middle of the body, male with L-shaped spicules without sculpturing, and ventral row of genital papillae with eight preanal and seven postanal papillae. *Hexamermis australis* n. sp., a parasite of *Scarites anthracinus* Fabricius (Coleoptera: Carabidae) is described and illustrated. It is characterized by medium-sized, pocket-shaped amphids, J-shaped vagina, spicules paired without sculpturing, and genital papillae in six rows including ten preanal and seventeen postanal papillae.

Résumé - *Deux nouvelles espèces de Mermithides (Nematoda: Mermithidae) parasites d'insectes en Argentine* - *Ditremamermis montana* n. sp., parasite des larves de *Simulium rubiginosum* (Diptera: Simuliidae), provenant de la Province de Buenos Aires est décrit et illustré. Cette nouvelle espèce est caractérisée par de grandes amphides, le vagin en forme de tonneau situé transversalement au niveau de la partie médiane du corps, les mâles avec des spicules en forme de L, dépourvus d'ornementation, et les papilles génitales au nombre de huit préanales arrangées en une rangée ventrale et de huit postanales. *Hexamermis australis* n. sp., parasite de *Scarites anthracinus* Fabricius (Coleoptera: Carabidae), est décrit et illustré. Il est caractérisé par des amphides de taille moyenne en forme de poche, un vagin en forme de J, des spicules pairs sans ornementation, six rangées de papilles génitales dont dix préanales et dix sept postanales.

Key words: *Ditremamermis montana* n. sp., *Hexamermis australis* n. sp., Mermithidae, parasites, Simuliidae, Coleoptera.

Six genera of mermithids (Nematoda: Mermithidae) have been reported parasitizing blackflies in Argentina: *Mesomermis* von Daday, 1911 (Camino, 1985a), *Isomermis* Coman, 1953 (Camino, 1987), *Gastromermis* Micoletzky, 1923 (Camino, 1985b), *Octomyomermis* Johnson, 1963 (Camino, 1988), *Hydromermis* Corti, 1902 (Camino, 1993), and *Ditremamermis* (Camino & Poinar, 1988).

Only one species of *Ditremamermis* - *D. simuliae* Camino & Poinar, 1988 - had been found until now in Argentina. In this article, we report and describe another species of this genus, *D. montana* n. sp., parasitizing larvae of *Simulium rubiginosum* (Enderlein) (Diptera: Simuliidae) in Ventana Hills, Buenos Aires Province, Argentina.

Four species of *Hexamermis* Steiner, 1924 have been found in Argentina parasitizing different insects: *H. hortensis* Camino & Stock, 1989 found in lepidopterans; *H. cochlearius* Stock & Camino, 1992a and *H. ovistriata* Stock & Camino, 1992b in grasshoppers; and *H. macrostoma* Camino & Stock, 1994 in crickets.

Four species of this genus have been reported worldwide as parasites of coleoptera: *H. albicans* (von Siebold, 1848) in Carabidae, Cerambycidae, Chrysomelidae, and Curculionidae; *H. cornuta* Gleiss, 1955

in Chrysomelidae; and *H. brevis* (Hagmeier, 1912) and *H. arvalis* Poinar & Gyrisco, 1962 in Curculionidae. *Hexamermis australis* sp. n. is the first record from Argentinian Coleoptera, and is described parasitizing adults of *Scarites anthracinus* Fabricius.

Materials and methods

Parasitized blackflies were maintained in a bucket with dechlorinated tap water and an airpump, at 10°C, until nematodes emerged. Post-parasitic juvenile nematodes were placed in distilled water in Petri dishes with a layer of sand at the bottom and kept at 10 ± 2°C. Adults of *Scarites anthracinus* Fab. were collected with a sweepnet from the field at City Bell, Argentina. They were placed in cages with plastic containers filled with moist soil. The nematodes that emerged were collected from the moist soil and kept in moist soil until they matured.

Adults and post-parasitic juvenile nematodes were observed alive, then killed in distilled water at 60°C for 3 s, fixed in TAF, and processed to glycerol by Seinhorst's method for taxonomic studies (Curran & Hominick, 1980). To determine the arrangement of the longitudinal chords, histological cross sections

were made by fixing the nematodes in Bouin fluid, passing through alcohol series to paraplast, sectioning at 10 μm , and staining with hematoxylin-eosin. An apical view of the head was prepared in glycerine jelly (Hooper, 1970). Drawing and measurements were made from live and fixed specimens with a camera lucida microscope and micrometer.

***Ditremamermis montana* n. sp.**

(Fig. 1)

MEASUREMENTS

Female

Paratypes (n = 10): L = 8-11 (9.16 ± 1.34) mm; head diam. at cephalic level = 31.90-58 (43.33 ± 10.89) μm ; diam. at nerve ring level = 52.20-71.2 (61.33 ± 7.75) μm ; max. body diam. = 75.40-113.10 (92.50 ± 15.59) μm ; diam. at post. end of trophosome level = 52.20-74.10 (67.42 ± 7.93) μm ; dist. ant. end to nerve ring = 101.50-108 (104.66 ± 2.67) μm ; V = 48-53 (50.50 ± 1.61); vagina length = 30-32.80 (31.25 ± 1.28) μm ; vagina width = 28.50-31.40 (29.88 ± 1.16) μm ; length and width of amphids = 18-20.10 (19.63 ± 0.76) \times 14.3-14.8 (14.43 ± 0.17) μm .

Allotype: L = 9 mm; head diam. at cephalic papillae level = 37.7 μm ; diam. at nerve ring level = 68.3 μm ; max body diam. = 78 μm ; diam. at post. end of trophosome level = 63 μm ; dist. ant. end to nerve ring = 105 μm ; V = 50; vagina length = 31.9 μm ; vagina width = 29 μm .

Male

Paratypes (n = 12): L = 5-9 (6.50 ± 1.61) mm; head diam. at cephalic papillae level = 34.80-37.70 (35.87 ± 1.29) μm ; diam. at nerve ring level = 37.70-40.60 (38.67 ± 1.17) μm ; max. body diam. = 62.40-66.60 (64.50 ± 1.52) μm ; body diam. at anus level = 62.40-64 (63.23 ± 0.58) μm ; dist. ant. end to nerve ring = 121.80-124.60 (120.57 ± 5.68) μm ; dist. anus to tail = 102-110.20 (107.25 ± 2.71) μm ; spicules length = 153.70-159.50 (157.30 ± 2.07) μm ; spicules width = 3.80-5 (4.40 ± 0.46) μm ; length and width of amphids = 26-27.4 (26.76 ± 0.64) \times 20-20.3 (20.20 ± 0.17) μm .

Holotype: L = 5 mm; head diam. at cephalic papillae level = 37.7 μm ; diam. at nerve ring level = 40.6 μm ; max. body diam. = 62.4 μm ; body diam. at anus level = 63.8 μm ; dist. ant. end to nerve ring = 121.8 μm ; dist. anus to tail = 107.3 μm ; spicules length = 159.5 μm ; spicules width = 4.3 μm .

DESCRIPTION

Adults: Small, thin, white nematodes. Cuticle with no criss-cross fibres visible with the light microscope. Head homocephalic. Six cephalic papillae surround-

ing the mouth. Mouth terminal and central. Amphids large and wide, vessel-shaped. Eight hypodermal chords, lateral chords containing three rows of cells along the body, dorsal and ventral chords with two rows of cells, subventral and subdorsal chords with a single row of cells.

Female: Head rounded. Large amphids not reaching the lumen of the oesophagus. Vulva not protruding, vulval lips not developed. Vagina pear-shaped and rounded, transversally oriented. Tail without appendage.

Male: Head structure similar to that of female. Large amphids reaching the lumen of the esophagus. Spicules paired, medium-sized, L-shaped. Spicules tip pointed, without sculpturing. Three rows of genital papillae; external rows each with eighteen papillae in a single line; ventral row with eight pre-anal and seven post-anal papillae in a single line. Tail without appendage.

Post-parasitic juveniles (n = 10): Dimensions similar to that of adults. Tail appendage long and thin, length = 290-340 (306.66 ± 16.99) μm ; width = 1-2 (1.66 ± 0.47) μm .

TYPE HOST AND LOCALITY

Larvae of *Simulium rubiginosum* (Enderlein) (Diptera: Simuliidae), det. Dr. Coscarón. Pantanoso stream, Ventana Hills, Buenos Aires Province, Argentina.

TYPE SPECIMENS

Holotype: deposited in the Helminthological Collection at CEPAVE. Allotype and paratypes: deposited in the Invertebrata Division, Facultad de Ciencias Naturales y Museo de La Plata, Buenos Aires, Argentina.

DIAGNOSIS AND RELATIONSHIPS

Ditremamermis montana n. sp. is characterized by : *i*) large amphids; *ii*) barrel-shaped vagina, transversally oriented and located near the middle of the body; *iii*) L-shaped spicules, without sculpturing; *iv*) ventral row of genital papillae with eight preanal and seven postanal papillae.

D. montana n. sp. differs from the only species in the genus, *D. simuliae*, by larger amphids (26.76 \times 20.20 *vs* 14.5 \times 8.7 μm), shorter spicules (157.30 *vs* 174 μm), spicule tip without *vs* with sculpturing, shorter vagina (31.25 *vs* 61 μm), and arrangement of the ventral genital papillae: eight *vs* nine preanal, and seven *vs* five postanal.

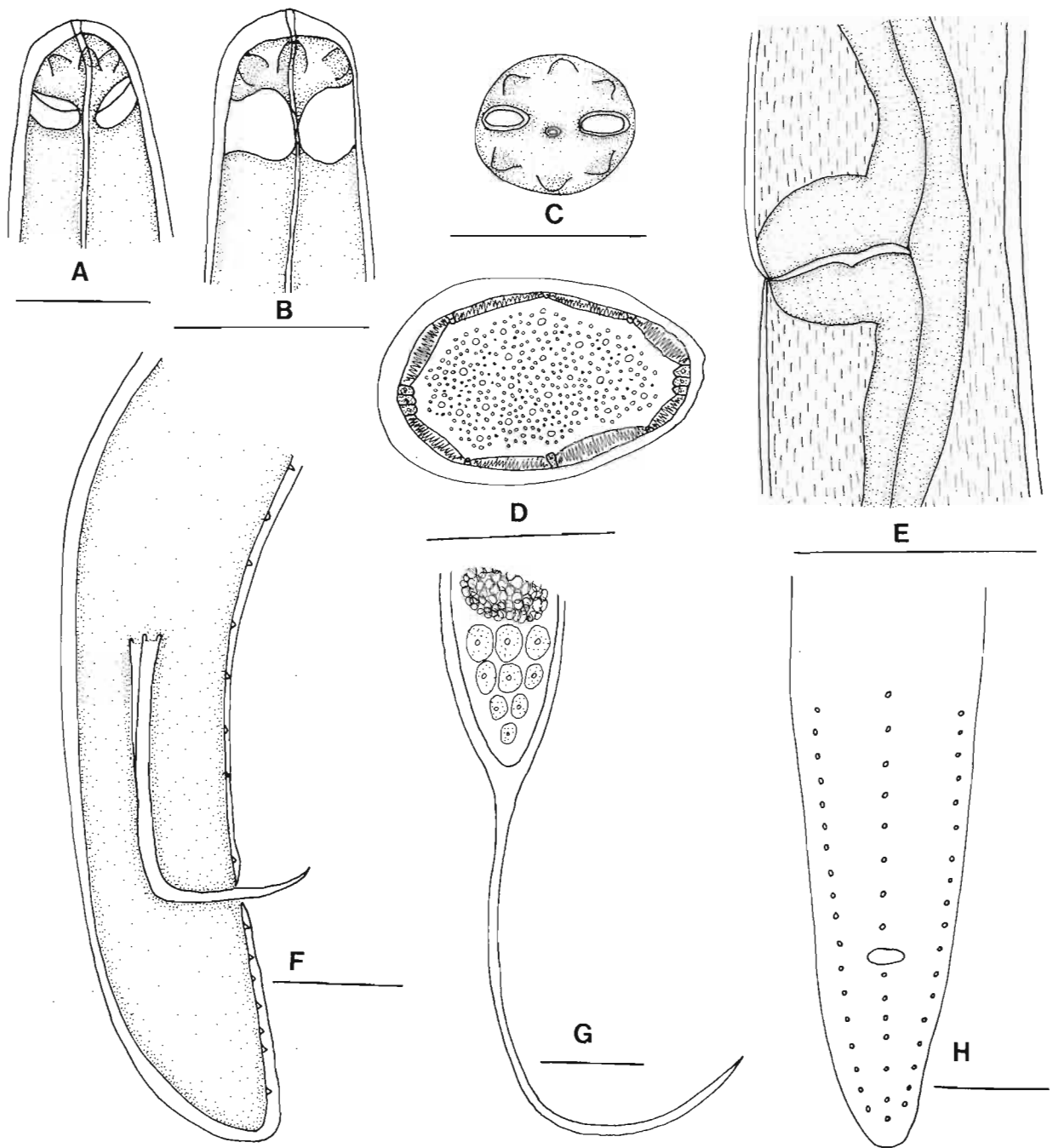


Fig. 1. *Ditremamermis montanus* n. sp. *A*: Head of female, ventral view; *B*: Head of male, ventral view; *C*: En face view of female head; *D*: Cross section at midbody; *E*: Vagina; *F*: Lateral view of male tail; *G*: Lateral view of post-parasitic juvenile tail; *H*: Ventral view of male tail. (Bars = 50 μ m).

***Hexameris australis** sp. n.**

(Fig. 2)

MEASUREMENTS

Female

Paratypes (n = 20). L = 52-81 (69.60 ± 11.84) mm; head diam. at cephalic papillae level = 68-74 (71.20 ± 2.03) µm; body diam. at nerve ring level = 144-164 (153.80 ± 7.80) µm; maximum body diam. = 248-364 (306.40 ± 50.58) µm; body diam. at vulva level =

284-412 (326.60 ± 45.63) µm; diam. at posterior end of trophosome level = 187-228 (200.60 ± 16.09) µm; dist. ant. end to nerve ring = 365-420 (390.80 ± 23.00) µm; vagina length = 260-348 (293.40 ± 36.07) µm; vagina width = 96-128 (106.60 ± 11.72) µm; V = 60-66 (63.20 ± 2.13).

Allotype. L = 81 mm; head diam. at cephalic papillae level = 72 µm; body diam. at nerve ring level = 164 µm; maximum body diam. = 364 µm; body diam. at post. end of trophosome = 412 µm; diam. at post. end of trophosome = 228 µm; dist. ant. end to nerve ring level = 164 µm; vagina length = 348 µm; vagina width = 128 µm; V = 66; length and width of amphids = 16 µm × 12 µm.

* The specific name refers to the distribution of the species in South America.

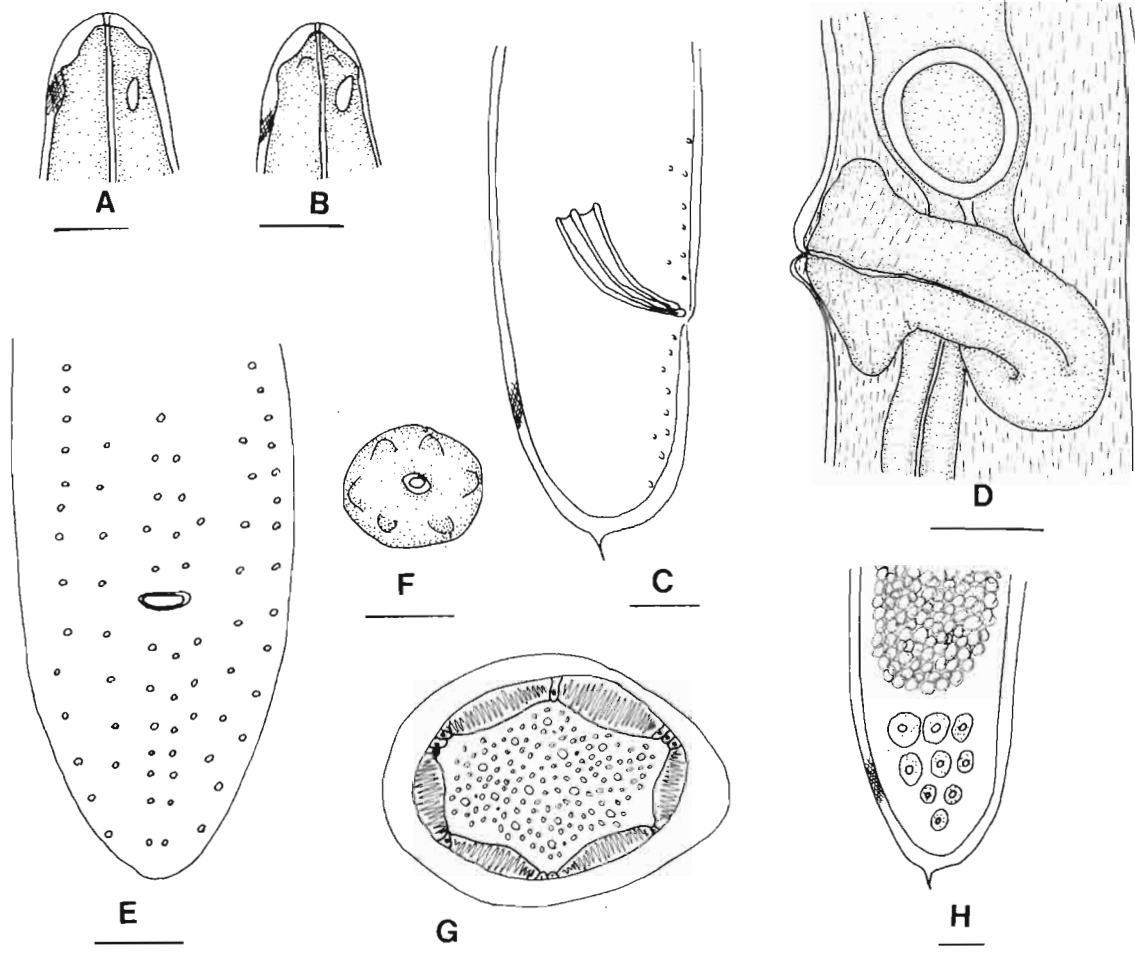


Fig. 2. *Hexameris australis* n. sp. A: Lateral view of female head; B: Lateral view of male head; C: Lateral view of male tail; D: Vagina; E: Ventral view of male tail; F: En face view of female head; G: Cross section at midbody; H: Lateral view of post-parasitic juvenile tail. (Bars = 50 µm).

Male

Paratypes (n = 18). L = 30-33 (31.80 ± 1.16) mm; head diam. at cephalic papillae level = 48-52 (50 ± 1.78) μm ; body diam. at nerve ring level = 110-120 (115.60 ± 3.20) μm ; maximum body diam. = 160-174 (167.20 ± 6.01) μm ; body diam. at anus level = 150-158 (154 ± 2.82) μm ; dist. ant. end to nerve ring = 349-370 (357 ± 8.43) μm ; dist. anus to post. end = 152-180 (164.20 ± 10.59) μm ; spicules length = 115-140 (124.80 ± 9.32) μm , width of spicules in the middle = 14-16 (15 ± 0.89) μm .

Holotype. L = 31 mm; head diam. at cephalic papillae level = 48 μm ; body diam. at nerve ring level = 116 μm ; maximum body diam. = 160 μm ; body diam. at anus level = 156 μm ; dist. end to nerve ring = 352 μm ; dist. anus to post. end = 180 μm ; spicules length = 140 μm ; width of spicules in the middle = 14 μm ; length and width of amphids = 8.3 $\mu\text{m} \times 8$ μm .

DESCRIPTION

Adults : Medium-sized white nematodes. Cuticle with criss-cross fibres, visible with light microscope. Head homocephalic. Six cephalic papillae surrounding the mouth. Amphids medium-sized, pocket-shaped. Amphidial pore opening small. Six hypodermal chords; lateral chords with three rows of cells at anterior and posterior ends of body and two rows of cells in the middle of the body, ventral chord with two rows of cells, dorsal and subventral chords with one row of cells. Mouth terminal and central.

Females : Vulva protruding, vulval lips developed. Vagina J-shaped, transversally oriented. Anterior portion of vagina well muscularized. Head rounded, with slight neck constriction. Amphids larger in females than in males. Tail with appendage.

Male : Head structure similar to that of the female. Amphids smaller in males than in females. Spicules paired, separated, medium-sized, without sculpturing, their length never larger than the width of body at anal level. Tip of spicules rounded and simple. Six rows of

genital papillae: ventrolateral papillae in two rows on each side, each with an external row of fourteen papillae and an internal row of eight papillae, regularly arranged; ventral papillae with ten preanal papillae arranged as: a single papilla at the beginning of the spicules, then two pairs, one triplets, and one pair of papillae; seventeen postanal papillae arranged as: three triplets of papillae and four pairs of papillae. Tail with appendage.

Eggs : Rounded, not embryonated in uterus; shell smooth and without byssi. Eggs = 106-110 (108.30 ± 1.63) \times 104-106 (105.60 ± 0.81) μm .

Post-parasitic juveniles (n = 8) : Dimensions similar to that of adults. Tail appendage short and pointed, L = 20-22 (20.83 ± 0.89) μm .

TYPE HOST AND LOCALITY

Adults of *Scarites anthracinus* Fabricius (Coleoptera: Carabidae), City Bell, Buenos Aires, Argentina.

TYPE SPECIMENS

Holotype : deposited in the Helminthological Collection at CEPAVE. Allotype and paratypes : deposited in the Invertebrata Division, Facultad de Ciencias Naturales y Museo de La Plata, Buenos Aires, Argentina.

DIAGNOSIS AND RELATIONSHIPS

Hexameris australis n. sp. is characterized by *i*) amphids medium-sized, pocket-shaped; *ii*) vagina J-shaped, transversally oriented, with anterior portion well muscularized; *iii*) spicules paired, separated, medium-sized, without sculpture; *iv*) six rows of genital papillae (ten preanal and seventeen postanal); *v*) eggs with shell smooth and without byssi.

H. australis n. sp. has the same J-shaped vagina as the four previously described argentinian *Hexameris* species: *H. hortensis*, *H. ovistriata*, *H. cochlearius*, and *H. macrostoma*. Differences between these four species are listed in Table 1.

Table 1. Comparison of argentinian species of *Hexameris*.

Species	Amphids size (μm)	Length spicules (μm)	Genital papillae	
			preanal	postanal
<i>H. hortensis</i>	9.4 \times 7.0	180.0	12	16
<i>H. ovistriata</i>	23.5 \times 6.0	167.5	14	18
<i>H. cochlearius</i>	12.0 \times 10.0	115.5	1	7
<i>H. macrostoma</i>	very small, inconspicuous	140.3	30	24

The data are averages of ten specimens.

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