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A NEW SPECIES OF *MOENNIGIA* (TRICHOSTRONGYLINA: MOLINEIDAE) A PARASITE OF *CHAETOPHRACTUS* SPP. (XENARTHRA: DASYPODIDAE) FROM ARGENTINA

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ABSTRACT: *Moennigia celinae* n. sp. collected from the small intestine of *Chaetophractus vellerosus* and *Chaetophractus villosus* (Xenarthra, Dasypodidae) from Argentina is herein described. This new species belongs to the genus *Moennigia* because it possesses a short uterus with few eggs, atrophied distal branch of the ovejector, vulva near the anus, and a conical tail. The new species has a synlophe with 17 symmetrical ridges and slight ventro–dorsal orientation. The spicule length:body length ratio is similar to that of the other species parasitic of Dasypodidae; however, *Moennigia celinae* n. sp. differs from *Moennigia pintoi* and *Moennigia lutzi* because the latter lack a gubernaculum, and from *Moennigia complexus*, *Moennigia moennigi*, *Moennigia filamentosus*, *Moennigia intrusa*, *Moennigia littlei*, *Moennigia pulchra* and *Moennigia dessetae* by the latter having very complex spicules with 2 or 3 points at the distal extremity. Moreover, *Moennigia celinae* n. sp. differs from *Moennigia virilis* by the length and shape of its spicules. *Moennigia celinae* n. sp. can be distinguished from *Moennigia travassosi* by the shape of the dorsal ray of the caudal bursa. *Moennigia celinae* n. sp. resembles *Moennigia pseudopulchra* but the gubernaculum of the latter is V-shaped. This is the second report of a species of *Moennigia* in Argentina and the first for the genus *Chaetophractus*.

Although parasites of xenarthrans from Argentina have been studied for the last 30 yr, the identification of helminths in these hosts has increased markedly in the past few years (Ezquiaga et al., 2009; Navone et al., 2010; Ezquiaga et al., 2012; Ezquiaga, 2013; Ezquiaga and Navone, 2013). In this study, as part of a research project on the diversity of helminths in some species of Dasypodidae, we examined the parasitological fauna of the large hairy armadillo, *Chaetophractus villosus* (Desmarest) and the screaming hairy armadillo, *Chaetophractus vellerosus* (Gray) (Dasypodidae: Euphractinae) whose distributions partially overlap from Paraguay to central Argentina (Abba and Superina, 2010).

Chaetophractus villosus, the most abundant species in Argentina, is found in a wide range of habitats but seems to prefer grasslands (Abba et al., 2007; Abba and Superina, 2010). *Chaetophractus vellerosus* is found mainly in xeric environments as well as in pastures and agricultural areas (Abba and Superina, 2010; Abba et al., 2011). In Argentina, these species of armadillos share several species of nematodes belonging to the families Ancylostomatidae, Aspidoderidae, Onchocercidae, Rictulariidae, and Spirocercidae (Ezquiaga, 2013). These host species are also parasitized by nematodes belonging to Molineidae, *Macielia jorgei* Ezquiaga and Navone, 2013 and *Trichohelix tuberculata* (Parona and Stossich, 1901) (Ezquiaga and Navone, 2013), and recently we found some specimens of the genus *Moennigia* Travassos, 1935. The latter genus includes species that parasitize dasypodids, myrmecophagids, and marsupials. Twenty species are distributed in Brazil, Colombia, French Guiana, Trinidad, and Argentina; most known species are parasites of myrmecophagids and *Dasypus novemcinctus* from Brazil (Travassos, 1935; Durette-Desset, 1970; Durette-Desset et al., 1977), with up to 5 species of this genus coexisting in 1 host (e.g., *Tamandua tetradactyla*) (Durette-Desset et al., 1977). We compared the specimens found in *C. vellerosus* and *C. villosus* with the known species and observed that these represented an undescribed species. The aim of the present study is to describe this new species of *Moennigia* from Argentina.

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MATERIALS AND METHODS

Forty-one specimens of *C. vellerosus* were collected from the provinces of Buenos Aires, Córdoba, La Rioja, Mendoza, San Juan, and San Luis and 23 specimens of *C. villosus* from Buenos Aires, Chubut, and La Pampa (Argentina). The digestive tracts of the specimens were fixed in a 10% formaldehyde solution and dissected in the laboratory. The nematodes found were preserved in 70% ethanol, cleared in lactophenol, mounted on a slide under a cover slip, and studied using a compound microscope. A cross-section of the anterior end was made to obtain an en face view. The synlophe was studied following Durette-Desset (1985) and the caudal bursa was described following Durette-Desset and Digiani (2012). Drawings were made using an Olympus BX 51 microscope (Olympus Corporation, Tokyo, Japan) equipped with a drawing tube. Measurements are given in micrometers (μm), unless otherwise stated, with the types followed by the paratypes. Measurements are expressed as the mean ± SD followed by range values in parentheses. Nematode specimens were deposited in the Colección de Helmintos Museo de La Plata (CHMLP) and hosts in the Colección de Mastozoología Museo de La Plata (MLP), La Plata, Buenos Aires, Argentina.

DESCRIPTION

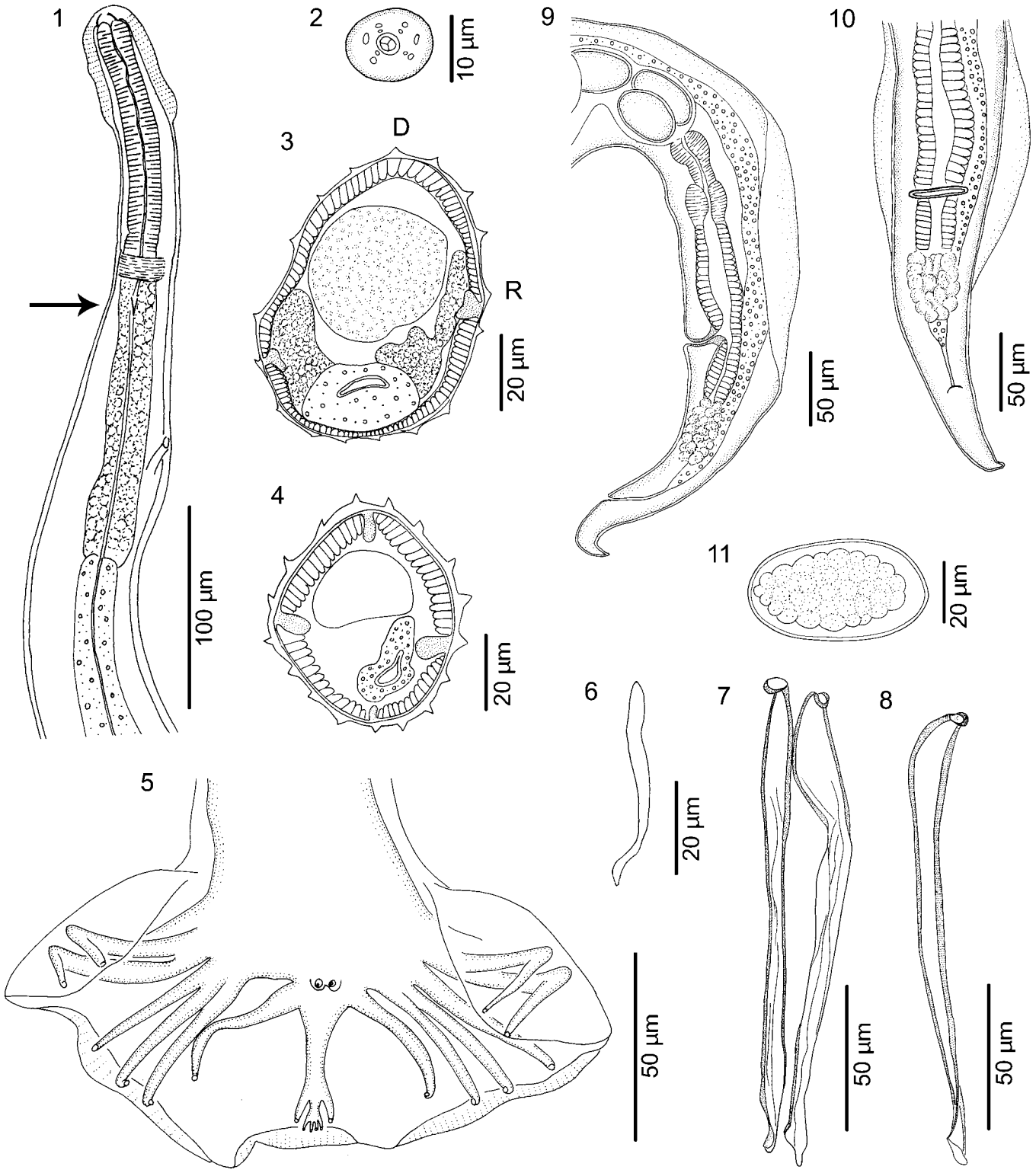
Moennigia celinae n. sp.

(Figs. 1–11)

General diagnosis: Small nematodes, coiled in 2 or 3 coils. Cephalic vesicle present (Fig. 1). Excretory pore situated posterior to deirids. Anterior end with an oral opening, 4 externo-labial papillae, 4 cephalic papillae, and 2 amphids (Fig. 2). Didelphic females with distal branch of uterus atrophied (Fig. 9). At vulva level, cuticle forming 2 lateral alae (Fig. 10).

Synlophe: In both sexes, body bearing cuticular ridges that appear posterior to cephalic vesicle and extend to caudal bursa in males and posterior end in females. Synlophe presenting bilateral symmetry determined by number, orientation, and size of ridges. Ridges with slight ventro–dorsal orientation. Seventeen cuticular ridges in both sexes, arranged as follows: 3 dorsal, 5 left-lateral, 5 right-lateral, and 4 ventral. Distribution and orientation of ridges remain constant along body (Figs. 3, 4).

Males (based on holotype and 10 paratypes unless otherwise indicated): Body length 2.45 (2.34 ± 0.3, 1.83–2.92) mm; width at mid-body 50 (62 ± 11, 46–80); cephalic vesicle 50 (62 ± 11, 46–80 long and 25 (26 ± 4, 20–33) wide; nerve ring, deirids, and excretory pore situated at 135 (115 ± 11, 103–135) (n = 8), 160 (145 ± 13, 130–155) (n = 3), and 255 (232 ± 16, 210–250) (n = 8) respectively, from apex. Esophagus 270 (277 ± 31, 210–308) long. Caudal bursa subsymmetrical, rays 2 and 3 with a common trunk, directed anteriorly, diverging at the base, and longer than rays 4–6; ray 4 diverging first from the common trunk of rays 4–6, not reaching bursal margin; rays 5 and 6 recurved and directed posteriorly; rays 8, arising from



FIGURES 1–11. *Moennigia celinae* n. sp. (**1**) Anterior end, right lateral view, female. Arrow shows the right deirid. (**2**) Apical view, female. (**3**) Transverse view at mid-body, female. (**4**) Transverse view at mid-body, male. (**5**) Caudal bursa, ventral view. (**6**) Gubernaculum. (**7**) Spicules: right, ventral view; left, ventral-lateral view. (**8**) Left spicule, lateral view. (**9**) Female: posterior end, ovejector in left lateral view, tail. (**10**) Posterior end, ventral view. (**11**) Egg. Abbreviations: D, dorsal; R, right.

base of dorsal ray and not reaching bursal margin. Dorsal ray bifurcated distally into 2 branches, and internal branches bifurcated (Fig. 5). Genital cone present and bearing papillae 7. Papilla zero not seen. Gubernaculum simple, poorly sclerotized, 60 (54 ± 6, 45–60) (n = 7) (Fig. 6). Spicules well sclerotized with distal part heel-shaped, 145 (147 ± 13, 130–168) (Figs. 7, 8). Spicule length:body length ratio 0.06 (0.06 ± 0, 0.05–0.07).

Females (based on allotype and 10 paratypes unless otherwise indicated): Body length 2.52 (2.63 ± 0.3, 2.26–3.07) (n = 9) mm; width at mid-body 80 (79 ± 10, 60–95); cephalic vesicle 55 (57 ± 6, 50–70) (n = 9) long and 25 (29 ± 4, 22–35) (n = 9) wide; nerve ring, deirids and excretory pore situated at 135 (120 ± 5, 115–130) (n = 7), (171 ± 30, 125–200) (n = 5), and 230 (249 ± 14, 230–265) (n = 6), respectively, from apex. Esophagus 287 (291 ± 10, 275–307) (n = 9) long. Vulva situated at 195 (180 ± 19, 145–207) from posterior end. Ovejector: vagina vera 25 (21 ± 6, 12–30) (n = 9); vestibule 70 (89 ± 20, 60–130) (n = 9) long; sphincter 30 (24 ± 4, 20–30) (n = 9) long, infundibulum 45 (46 ± 20, 30–90) (n = 7) long; uterus length 404 (418 ± 64, 362–560); number of eggs 8 (8 ± 3, 5–17); eggs 59 ± 8, 47–67 by 31 ± 8, 20–45 (n = 7) (Fig. 11). Cuticular expansions at vulva level 127 ± 17, 100–145 long, 17 ± 3, 13–20 (n = 6) wide. Tail 60 (52 ± 8, 45–66) (Fig. 9).

Measurements of specimens collected from *C. villosus*

Males (n = 11): Body length 2.54 ± 0.2, 2.03–2.80 mm; width at mid-body 66 ± 13, 50–90; cephalic vesicle 58 ± 7, 45–70 (n = 10) long and 27 ± 4, 19–32 (n = 10) wide; nerve ring, deirids, and excretory pore situated at 123 ± 20, 103–165 (n = 9); 131 ± 34, 105–185 (n = 5), and 247 ± 13, 230–265 (n = 8), respectively, from apex. Esophagus 281 ± 19, 250–310 (n = 10) long. Gubernaculum 56 ± 8, 50–67 (n = 8). Spicules 158 ± 8, 140–167. Spicule length:body length ratio 0.06 ± 0, 0.05–0.07.

Females (n = 11): Body length 2.73 ± 0.21, 2.37–3.05 mm; width at mid-body 83 ± 15, 57–105; cephalic vesicle 59 ± 4, 54–65 (n = 10) long and 28 ± 5, 23–35 (n = 10) wide; nerve ring, deirids, and excretory pore situated at 119 ± 11, 102–136 (n = 10), 123 ± 29, 100–165 (n = 4), and 243 ± 24, 210–285 (n = 9), respectively, from apex. Esophagus 283 ± 13, 260–300 (n = 10) long. Vulva at 198 ± 16, 175–220 (n = 10) from posterior end. Ovejector: vagina vera 20 ± 4, 10–25; vestibule 84 ± 9, 75–100 (n = 9) long; sphincter 27 ± 4, 19–35 long, infundibulum 44 ± 11, 35–60 (n = 8) long; uterus length 336 ± 51, 275–430; number of eggs 9 ± 2, 6–14; eggs 57 ± 6, 47–70 by 29 ± 5, 21–40 (n = 14). Cuticular expansions at vulva level 124 ± 13, 110–145 long, 16 ± 4, 10–21 (n = 6) width. Tail 54 ± 7, 45–67.

Taxonomic summary

Type host: Chaetophractus vellerosus Gray, 1865 (Xenarthra, Dasypodidae) deposited at the Colección de Mastozoología, Museo de La Plata, La Plata, Argentina.

Other host: Chaetophractus villosus (Desmarest, 1804).

Site of infection: Small intestine.

Type locality: Pellegrini (36°16′S, 63°22′W), Province of Buenos Aires, Argentina.

Specimens deposited: Holotype MLP-He 6706; allotype MLP-He 6707; paratypes MLP-He 6708.

Prevalence: 2% (*C. vellerosus*); 9% (*C. villosus*).

Mean intensity: 38 (*C. vellerosus*); 56.5 (*C. villosus*).

Etymology: The species is named after Dr. María Celina Digiani, a researcher who has made significant contributions to the knowledge of the Trichostrongylina in Argentina.

Remarks

The species herein described is included in *Moennigia* Travassos, 1935 on the basis of the following characters: uterus short with few eggs, distal branch of ovejector atrophied, vulva near the anus, tail conical ending in sharp point, male with caudal bursa subsymmetrical, dorsal lobe small, gubernaculum absent or rudimentary, synlophe with symmetrical ridges, oriented perpendicularly to the body or with ventro–dorsal orientation.

The only known species from Argentina is *M. virilis* Navone, 1987, found in the small intestine of *Tolypeutes matacus* (Desmarest, 1804) from Chaco and Santiago del Estero provinces (Navone, 1987; 1990). Only 1 species, *M. dessetae* Diaw, 1976 has been described parasitizing *Didelphis marsupialis* L. from French Guiana (Diaw, 1976). The spicule length:body length ratio has been used to distinguish the species of Trichostrongylina parasitizing myrmecophagids from those found in dasypodids. This ratio is lower in Dasypodidae and higher in Myrmecophagidae (Durette-Desset et al., 1977). The ratio in *M. celinae* n. sp. (0.06) is similar to that of dasypodid parasites (0.02–0.07) (Durette-Desset et al., 1977). However, *M. celinae* n. sp. differs from *M. pintoi* Travassos, 1935 and *M. lutzi* Travassos, 1935 because these latter species lack a gubernaculum. *Moennigia complexus* Travassos, 1935, *M. moennigi* Travassos, 1935, *M. filamentosus* Travassos, 1935, *M. intrusa* Travassos, 1935, *M. littlei* Durette-Desset, 1970, *M. pulchra* Travassos, 1935, and *M. dessetae* are different from the new species because they have very complex spicules with 2 or 3 distal points. The specimens studied here differ from *M. virilis* because the spicules of *M. virilis* are the longest found in this genus and are distally divided into 2 branches.

Moennigia celinae n. sp. is distinguished from *M. travassosi* Durette-Desset, 1970 because in the latter the dorsal ray of the caudal bursa is branched at the base, while this ray is branched distally in the species described herein. In *Moennigia intrusa*, both spicules and gubernaculum are much shorter than in the species described herein.

The new species resembles *M. pseudopulchra* Travassos, 1935 by shape and size of the spicules, but in the latter the gubernaculum is V-shaped. The description of *M. pseudopulchra* is based only on male specimens and other comparisons were not possible (Travassos, 1935).

DISCUSSION

The genus *Moennigia* parasitizes dasypodids and myrmecophagids, most of them from Brazil and Colombia. The parasites of both host families are related, but they differ by their spicule length:body length ratio (Durette-Desset et al., 1977). This suggests that this genus has diversified simultaneously in most xenarthrans, except in *M. dessetae*, a parasite of *Didelphis marsupialis* that is probably the result of host-switching. Also, the above-mentioned authors compared the species of the genus *Moennigia* parasitic of myrmecophagids on the basis of synlophe morphology and divided them into 3 types: synlophe with well marked lateral alae, synlophe without lateral or ventral alae, and synlophe without lateral alae but with a large ventral ridge (Durette-Desset et al., 1977). However, the synlophe of *Moennigia* from dasypodids is only known for the species here described and for *M. virilis*, which would belong to the second group together with *Moennigia levyi*, *Moennigia barbarae*, *Moennigia baeveri*, and *Moennigia obelsi*.

In the last 30 yr, over 500 specimens of dasypodids from different localities of Argentina have been examined and only 1 nematode species, *M. virilis*, was found in *Tolypeutes matacus* from Chaco province (Navone, 1987). Here we describe the second species of this genus from Argentina and expand its host distribution to *C. vellerosus* and *C. villosus*. In addition, the geographical distribution of the genus is extended 1,200 km southward from that of *M. virilis*. This finding confirms that dasypodids are appropriate hosts for these parasites, and further explorations may contribute to understanding the distribution of this genus in Argentina.

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