

## Two new species of the genus *Amphimermis* Kaburaki & Imamura, 1932 (Nematoda : Mermithidae) from Argentine grasshoppers (Orthoptera : Acrididae)

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**Summary** – Two new mermithids, *Amphimermis ronderosi* n. sp. and *A. dichroplusi* n. sp., are described and illustrated; both are parasites of grasshoppers in Buenos Aires Province, Argentina. Diagnostic characters of the first species include : vagina long and S-shaped; spicules loosely twisted for proximal 41 % of their length, untwisted for 14 %, again twisted for 31 %, and untwisted for the last 14 %; three rows of genital papillae; the ventral row with 30 preanal and fifteen postanal papillae. The second species is characterized by having : S-shaped vagina; the spicules untwisted for 6 % of their length, then twisted for 24 %, untwisted for 12 %, twisted again for 44 %, and untwisted for the last 14 % of their length; three rows of genital papillae; the ventral row with 25 preanal and twelve postanal papillae.

**Résumé** – Deux nouvelles espèces du genre *Amphimermis* Kaburaki & Imamura, 1932 (Nematoda : Mermithidae) parasites de sauterelles d'Argentine (Orthoptera : Acrididae) – Deux nouveaux Mermithides, *Amphimermis ronderosi* n. sp. et *A. dichroplusi* n. sp., sont décrits et illustrés; l'un et l'autre sont parasites de sauterelles récoltées dans la Province de Buenos Aires, Argentine. La première espèce se caractérise par : vagin long et en forme de S; spicules enroulés de manière lâche sur les premiers 41 % de leur longueur, non enroulés sur les 14 % suivants, de nouveau enroulés sur les 31 % suivants et non enroulés sur les 14 % postérieurs; trois rangées de papilles génitales, la rangée ventrale comprenant 30 papilles préanales et 15 papilles postanales. *A. dichroplusi* n. sp. est caractérisée par le vagin en forme de S; les spicules non enroulés sur les premiers 6 % de leur longueur, enroulés sur les 24 % suivants, non enroulés sur les 12 % suivants, de nouveau enroulés sur les 44 % suivants et non enroulés sur les 14 % postérieurs; trois rangées de papilles génitales, la rangée ventrale comprenant 25 papilles préanales et 12 papilles postanales.

**Key-words** : *Amphimermis*, Argentina, grasshoppers, nematodes, new species.

While conducting field surveys on agricultural pests in Argentina in areas of Brandsen and Olavarria (North-east and center of Buenos Aires Province, respectively) we found nymphs of grasshoppers that were parasitized by two different *Amphimermis* species. Only one species of *Amphimermis*, *A. bonaerensis* Miralles & Camino, 1983 was previously known parasitizing Argentine grasshoppers, and its morphological characters markedly differ from the two species here described as new.

Parasitized grasshoppers were placed in aluminium cages with wire-screened walls. A shallow container with sterilized moistened sand was provided, where post-parasitic nematodes migrated to mature. Adults and post-parasitic juveniles were observed first alive and then killed in distilled water at 60 °C for 2 min, fixed in TAF and processed to glycerin by Seinhorst's method (Curran & Hominick, 1980). Living and fixed specimens were employed for drawings and measurements using a camera lucida microscope, and a micrometer in a Zeiss compound microscope.

### *Amphimermis ronderosi*\* n. sp. (Fig. 1)

#### MEASUREMENTS

*Female* (paratypes; n = 12) : L = 67.5-120 (99.38 ± 19.71) mm; head diam. at cephalic papillae level = 56-152 (123 ± 38.92) µm; body diam. at nerve ring level = 120-220 (187.5 ± 40.85) µm; max. body diam. = 234-282 (263.5 ± 19.46) µm; body diam. at post. end of trophosome level = 200-255 (226.25 ± 26.31); dist. ant. end to nerve ring = 300-350 (329 ± 21.75) µm; V = 48-59 (52.47 ± 4.11); vagina length = 100-350 (239.5 ± 95.29) µm; vagina width = 120-150 (134 ± 13.19) µm.

*Male* (paratypes; n = 10) : L = 18-72 (44.75 ± 23.97) mm; head diam. at cephalic papillae level = 50-

\* In honor of Dr. R. A. Ronderos, an Argentinian specialist in grasshoppers.

-72 ( $61 \pm 7.81$ )  $\mu\text{m}$ ; body diam. at nerve ring level = 100-180 ( $137.5 \pm 30.31$ )  $\mu\text{m}$ ; max. body diam. = 160-240 ( $197.5 \pm 28.61$ )  $\mu\text{m}$ ; body diam. at anus level = 140-200 ( $182.5 \pm 24.87$ )  $\mu\text{m}$ ; dist. ant. end to nerve ring = 190-210 ( $200 \pm 7.07$ )  $\mu\text{m}$ ; dist. anus to tail = 90-288 ( $229 \pm 81.74$ )  $\mu\text{m}$ ; spicule length = 800-2400 ( $1562.5 \pm 658.95$ )  $\mu\text{m}$ ; spicule width = 8-12 ( $10.25 \pm 1.48$ )  $\mu\text{m}$ .

**Holotype** (male) : L = 65 mm; head diam. at cephalic papillae level = 60  $\mu\text{m}$ ; body diam. at nerve ring level = 150  $\mu\text{m}$ ; max. body diam. = 200  $\mu\text{m}$ ; body diam. at anus level = 190  $\mu\text{m}$ ; dist. ant. end to nerve ring = 210  $\mu\text{m}$ ; dist. anus to tail = 250  $\mu\text{m}$ ; spicule length = 2000  $\mu\text{m}$ ; spicule width = 12  $\mu\text{m}$ .

**Allotype** (female) : L = 110 mm; head diam. at cephalic papillae level = 144  $\mu\text{m}$ ; body diam. at nerve ring level = 220  $\mu\text{m}$ ; max. body diam. = 280  $\mu\text{m}$ ; body diam. at post. end of trophosome level = 250  $\mu\text{m}$ ; dist. ant. end to nerve ring = 316  $\mu\text{m}$ ; V = 50; vagina length = 208  $\mu\text{m}$ ; vagina width = 144  $\mu\text{m}$ .

**DESCRIPTION**

**Adults** : Long white nematodes, male approximately 50 % of female length. Cuticle with crisscross fibres. Head homocephalic. Mouth terminal and central. Six cephalic papillae around the mouth, at same level. Amphids small, cup-shaped. Six hypodermal chords, lateral chords with three rows of cells along the body, dorsal

and ventral chords with one row of cells, and subventral chord with two rows of cells.

**Females** : Vulva a longitudinal slit. Vulval flap absent. Vulval cone present, base muscular. Vagina S-shaped, long, muscular, anterior loop 33 % shorter than posterior loop.

**Males** : Spicule long, paired, loosely twisted for the proximal 41 % of their length, then untwisted for 14 %, twisted for 31 %, and finally untwisted for 14 % of their length. Tips fused, attenuated to fine point. Three rows of genital papillae; the external rows with 30 papillae each, arranged in single line; ventral row with 30 preanal and 15 postanal papillae in a single line.

**TYPE HOST AND LOCALITY**

*Metaleptea brevicornis* (L.) (Orthoptera : Acrididae : Acridinae), Brandsen, Province of Buenos Aires, Argentina.

**TYPE MATERIAL**

Holotype and allotype deposited in the Helminthological collection at CEPAVE and paratypes deposited in the Invertebrate Division at Museo de La Plata, Argentina.

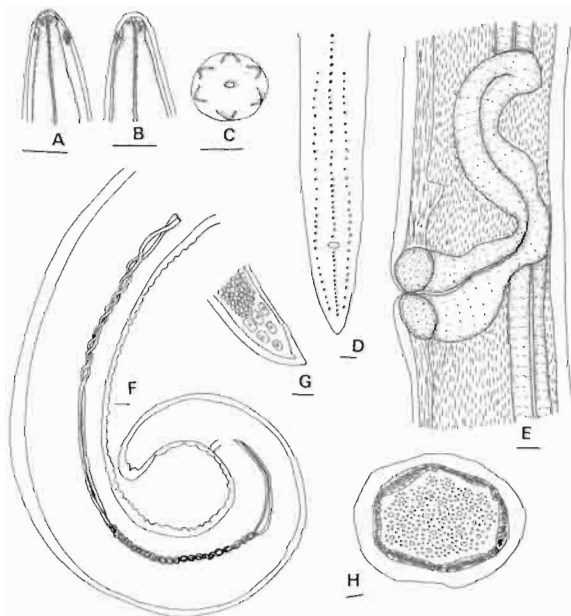
**DIAGNOSIS AND RELATIONSHIPS**

*A. ronderosi* n. sp. is characterized by the S-shaped type of vagina, the twisting length of the spicule and the arrangement of genital papillae in three single rows, the ventral row having 30 preanal and 15 postanal papillae.

Baker and Poinar (1994) divided the genus into four groups of species on the basis of the twisting of the spicules and the shape of the amphids. The new species belongs to the *bogongae* group, distinguished by having spicules loosely twisted at the distal and proximal halves and untwisted in the middle, and cup-shaped amphids.

At present, the *bogongae* group is represented by the species *A. bogongae* Welch, 1963, a parasite of Lepidoptera Noctuidae from Australia; *A. tiny* Nickle, 1972, found in damsel flies from the USA; *A. maritima* Rubzov, 1971, from an unknown host in Russia; *A. litoralis* Artyukhovski & Karchenko, 1971, also from an unknown Russian host; *A. bonaerensis* Miralles & Camino, 1983, a parasite of acridids from Argentina; and *A. mirabinda* Baker & Poinar, 1994 found in acridids from Australia.

The male of *A. ronderosi* n. sp. differs from all known species by the twisted length of the spicules and the number and arrangement of the genital papillae. Spicule length of *A. ronderosi* n. sp. is comparable to that of *A. mirabinda*, *A. bonaerensis* and *A. maritima*. However, *A. mirabinda* can be distinguished from the new species in having enormous amphids (width approximately half head diameter). *A. bonaerensis* is separated from the new species in the twisting and untwisting percentage of the spicule length (31, 14, and 41 % vs 28, 12, 28 %) and



**Fig. 1.** *Amphimermis ronderosi* n. sp. A : Head of the male, ventral view; B : Head of the female, ventral view; C : Head of the female, face view; D : Tail of the male, ventral view; E : Vagina; F : Tail of the male, lateral view; G : Post-parasitic juvenile tail; H : Cross section at midbody. (Scale bars = 50  $\mu\text{m}$ ).

*A. maritima* differs in male body length (18-72 vs 25-102 mm).

Female *A. ronderosi* n. sp. is distinguished from the other species of the group by the type of S-vagina (with anterior loop 33 % shorter than the posterior loop) and differs further from *A. bogongae* and *A. bonaerensis* in the length of the vagina (100-350 vs 160-205 and 51-113  $\mu\text{m}$ , respectively); the new species has shorter vagina length compared to that of *A. mirabinda* (100-350 vs. 380-850  $\mu\text{m}$  long).

***Amphimermis dichroplusi*\* n. sp.**

(Fig. 2)

MEASUREMENTS

*Female* (paratypes; n = 15) : L = 230-370 (292.5  $\pm$  51.17) mm; head diam. at cephalic papillae level = 61.1-66 (63.72  $\pm$  1.68)  $\mu\text{m}$ ; body diam. at nerve ring level = 129-156 (136.42  $\pm$  11.31)  $\mu\text{m}$ ; max. body diam. = 348-364 (355  $\pm$  5.74)  $\mu\text{m}$ ; body diam. at post. end of trophosome level = 244-300 (263.5  $\pm$  21.83)  $\mu\text{m}$ ; dist. ant. end to nerve ring = 300-340 (312  $\pm$  16.50)  $\mu\text{m}$ ; V = 49-54 (51  $\pm$  1.87); vagina length = 740-2980 (1668  $\pm$  895.18)  $\mu\text{m}$ ; vagina width = 104-268 (186.5  $\pm$  76.7)  $\mu\text{m}$ ; length and width of amphids = 21-24 (22.75  $\pm$  1.3)  $\times$  16-20 (18  $\pm$  1.41)  $\mu\text{m}$ .

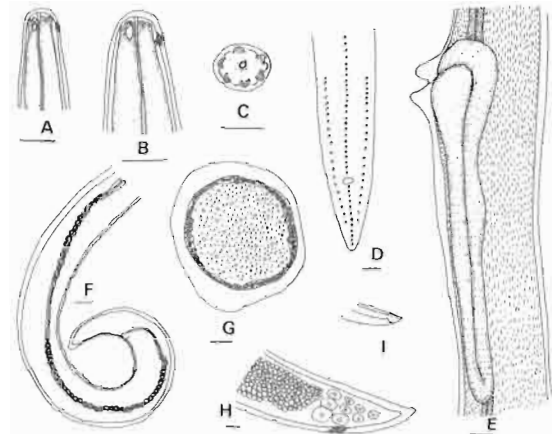
*Male* (paratypes; n = 12) : L = 46-65 (51.75  $\pm$  7.82) mm; head diam. at cephalic papillae level = 55-68 (60.35  $\pm$  5.13)  $\mu\text{m}$ ; body diam. at nerve ring level = 82-120 (94.44  $\pm$  15.02)  $\mu\text{m}$ ; max. body diam. = 150-200 (173.18  $\pm$  22.12)  $\mu\text{m}$ ; body diam. at anus level = 110.45-190 (147.61  $\pm$  28.47)  $\mu\text{m}$ ; dist. ant. end to nerve ring = 210-260 (240  $\pm$  18.71)  $\mu\text{m}$ ; dist. anus to tail = 190-220 (205  $\pm$  11.18)  $\mu\text{m}$ ; spicule length = 1600-2000 (1806  $\pm$  141.80)  $\mu\text{m}$ ; spicule width = 12-14 (13.05  $\pm$  1.05)  $\mu\text{m}$ ; length and width of amphids = 20-22 (20.84  $\pm$  0.84)  $\times$  7-9 (8  $\pm$  0.68)  $\mu\text{m}$ .

*Holotype* (male) : L = 50 mm; head diam. at cephalic papillae level = 68  $\mu\text{m}$ ; body diam. at nerve ring level = 90  $\mu\text{m}$ ; max. body diam. = 150  $\mu\text{m}$ ; body diam. at anus level = 150  $\mu\text{m}$ ; dist. ant. end to nerve ring = 260  $\mu\text{m}$ ; dist. anus to tail = 210  $\mu\text{m}$ ; spicule length = 1800  $\mu\text{m}$ ; spicule width = 12  $\mu\text{m}$ .

*Allotype* (female) : L = 270 mm; head diam. at cephalic papillae level = 64  $\mu\text{m}$ ; body diam. at nerve ring level = 130.5  $\mu\text{m}$ ; max. body diam. = 354  $\mu\text{m}$ ; body diam. at post. end of trophosome level = 260  $\mu\text{m}$ ; dist. ant. end to nerve ring = 308  $\mu\text{m}$ ; V = 50; vagina length = 2000  $\mu\text{m}$ ; vagina width = 258  $\mu\text{m}$ .

DESCRIPTION

*Adults* : Long, white nematodes, male 17 % of female length. Cuticle with crisscross fibres. Head homocephal-



**Fig. 2.** *Amphimermis dichroplusi* n. sp. A : Head of male, ventral view; B : Head of female, ventral view; C : Head of female, face view; D : Tail of male, ventral view; E : Vagina; F : Tail of male, lateral view; G : Cross section at midbody; H : Post-parasitic juvenile tail; I : Tip of the spicules. (Scale bars = 50  $\mu\text{m}$ ).

ic. Mouth terminal and central. Six cephalic papillae arranged in a circle around the mouth. Amphids medium-sized, cup-shaped. Six hypodermal chords; lateral chords containing four rows of cells at midbody and three rows of cells at the anterior and posterior ends of the body; dorsal chord with one row of cells; ventral and subventral chords each with two rows of cells.

*Females* : Opening of vulva a transverse slit. Vulval flap present resembling two large lips. Vulval cone absent. Vagina S-shaped, long, muscular, anterior loop approximately 10 % of the length of posterior loop.

*Males* : Spicules long, paired. Anterior end untwisted for 6 %, then loosely twisted for 24 %, untwisted for 12 %, twisted for distal 44 %, and finally untwisted in the posterior 14 %. Tips fused, wedge-shaped. Three rows of genital papillae; the external rows each with 21 papillae arranged in a single line; ventral row with 25 preanal and 12 postanal papillae in a single line.

TYPE HOST AND LOCALITY

*Dichroplus elongatus* Giglio-Tos, 1894 (Orthoptera : Acrididae : Melanoplinae). Olavarria, Province of Buenos Aires, Argentina.

TYPE MATERIAL

Holotype and allotype deposited in the helminthological collection at CEPAVE and paratypes deposited in the Invertebrate Division at Museo de La Plata, Argentina.

DIAGNOSIS AND RELATIONSHIPS

*A. dichroplusi* n. sp. is characterized by the configuration of the S-shaped vagina, the twisting length of the

\* From the generic name of the host, *Dichroplus elongatus*.

spicule and the arrangement of genital papillae in three rows, the ventral row having 25 preanal and 12 postanal papillae.

*A. dichroplusi* n. sp. belongs to the *bogongae* group (Baker & Poinar, 1994) because of the spicule loosely twisted at the distal and proximal halves and untwisted in the middle, and the cup-shaped amphids. The male of *A. dichroplusi* n. sp. is distinguished from all previously described species of the *bogongae* group (except *A. mirabinda*) by the length of the spicules, the new species having shorter spicules (1600–2000  $\mu\text{m}$ ). *A. mirabinda* differs from *A. dichroplusi* n. sp. in having enormous amphids, which are larger in both sexes. *A. dichroplusi* n. sp. can be distinguished from *A. bonaerensis* in the number of ventral genital papillae (25 preanal and twelve postanal *vs* 28–16). The new species also differs from *A. bogongae* in the percentage of the twisted and untwisted spicule length (24, 12, 44, and 14 % *vs* 24, 24, 16, and 36 %, respectively). The female of *A. dichroplusi* n. sp. can be separated from all the other species of the group *bogongae* by having a long (740–2980  $\mu\text{m}$ ) and S-shaped vagina, with a first loop 90 % shorter than the second loop.

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