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NEMATODES OF THE ORDER DORYLAIMIDA FROM ANDALUCIA ORIENTAL, SPAIN. THE GENUS *FUNARIA* VAN DER LINDE, 1938, WITH DESCRIPTION OF TWO NEW SPECIES

by
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Summary. In several soil samples collected in Southeastern Spain (provinces of Granada and Jaén), two new species belonging to the genus *Funaria* were found. The species are named *F. millani* sp. n. and *F. barcinai* sp. n. They are closely related to three previously known species: *F. obtusa*, *F. ourasphaira* and *F. maryanneae*. Additional material of these latter species was studied. Morphological features related to the cuticle, lateral chords and lateral pores are described and their taxonomic importance discussed. *F. millani* sp. n. is characterized by its medium size, slender odontostyle with clear lumen, 25-34 lateral pores located in a single row, tail convex conoid and presence of male. *F. barcinai* sp. n. is medium size, has a somewhat attenuated odontostyle, 19-24 lateral pores located in a single row, tail convex conoid and male unknown. The differential diagnosis of the genera *Funaria* and *Leptonchus*, including some taxonomic changes, is discussed, and a key to the species of *Funaria* is given.

Although there is no previous record in the region, the genus *Funaria* van der Linde, 1938 is relatively common in natural mediterranean areas. In surveys carried out in the province of Granada during 1980-1981 and in the province of Jaén during 1982-1983 four different populations of *Funaria* species were collected.

Two of the populations represent new species, close to a group of three known species [*F. obtusa* (Thorne, 1939) Goseco *et al.*, 1974, *F. ourasphaira* Goseco *et al.*, 1974 and *F. maryanneae* Goseco *et Ferris*, 1976] and together form a species complex in which species boundaries are difficult to establish.

Materials and methods

Nematodes from Granada samples were extracted by centrifugation-flotation method (De Grisse, 1969) and from Jaén by a modified Baermann funnel technique. All specimens were fixed in FAA and processed to anhydrous glycerin according to Seinhorst (1959, 1962).

The four different populations collected are named as follows:

Population 1. Holm-oak forest near the site Cerro de Don Luis, Genes de la Vega, province of Granada.

Population 2. Holm-oak forest, Piedra del Aguila, Valdepeñas de Jaén, province of Jaén.

Population 3. Brushwood, Sierra de la Pandera, Valdepeñas de Jaén, province of Jaén.

Population 4. Holm-oak forest. Sierra de Jabalcuz, Jaén, province of Jaén.

Other material examined (from Purdue Nematode Collection, borrowed from V.R. Ferris):

F. obtusa: one female and two males from Sequoia National Park, California, USA.

F. ourasphaira: three female paratypes and two juveniles from Viento, Oregon, USA.

F. maryanneae: four female paratypes from Bad Sooden, West Germany.

Morphological notes

In the material examined the cuticle presents a uniform morphology. The outer cuticle has two layers with the same width and appearance under interference contrast microscope. In the case of *F. obtusa* and *F. maryanneae* there is a fine but conspicuous transverse striation, clearer near both extremities. In *F. ourasphaira* and the four Spanish populations the cuticle is apparently smooth and only in some specimens has it been possible to observe a fine but inconspicuous striation on the tail.

The inner cuticle (subcuticle?) is coarsely striated, with abundant irregularities in its outline and is often clearly separated from the outer cuticle. The existence of radial refractive elements in the outer and inner cuticles which apparently coalesce, without crossing them, is a constant feature in this genus. In lateral view these elements have the appearance of little rod-like structures and in frontal

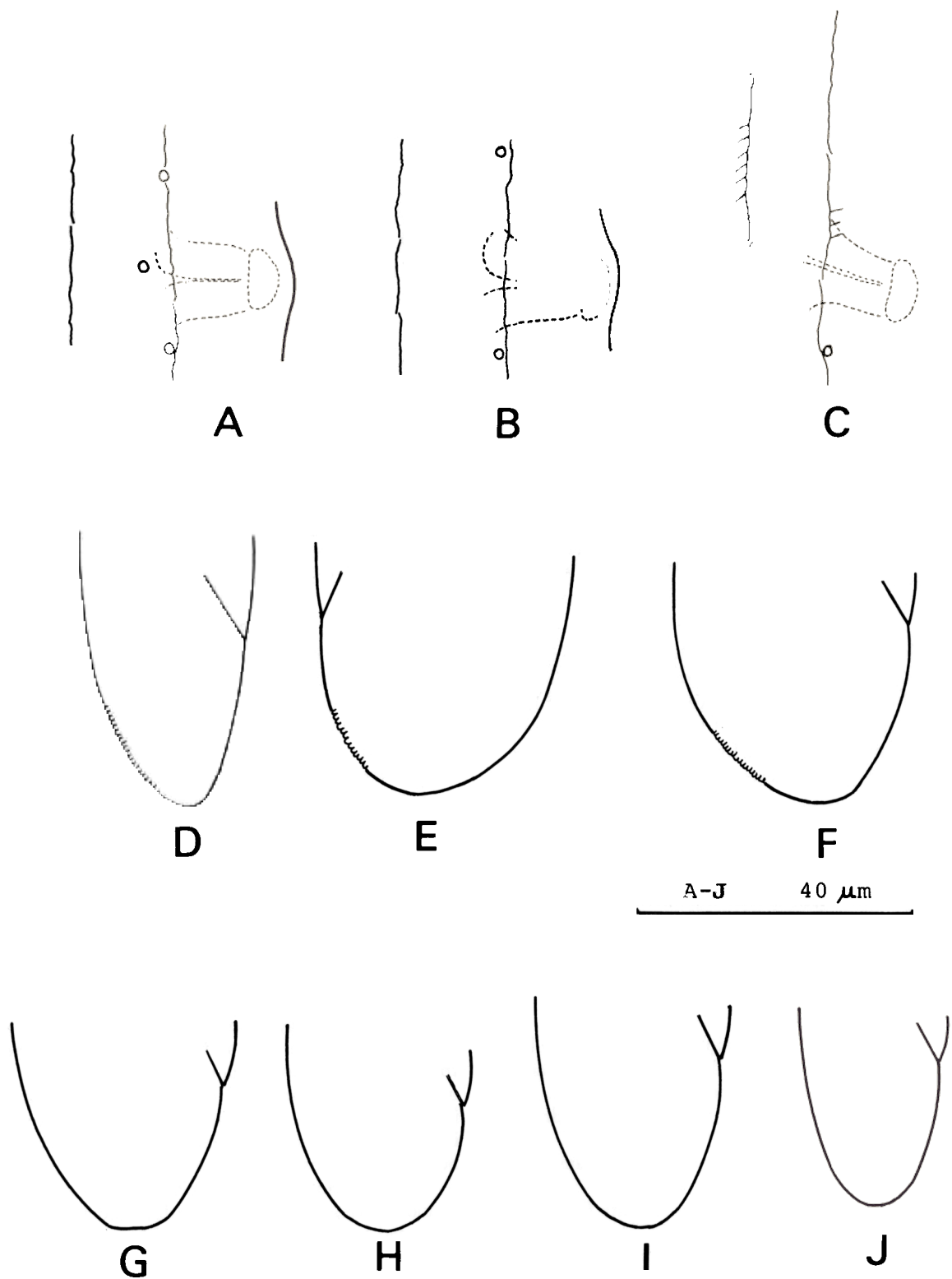


Fig. 1 - A-C, location of the lateral pores near the vulval area; D, *Funaria obtusa*, female tail; E and F, *F. maryanneae*, female tail; G-*ourasphaira*: G-I, female tail; J, juvenile tail.

view of a series of lined dots; they are seen most easily near the head and tail, but their abundance varies among individuals, populations and species.

The lateral chords are not always well delimited but they are easily perceptible because the striations of the inner cuticle and the series of lined dots, corresponding to the radial refractive elements in frontal view, do not cross their margins. As a consequence, the interior is almost smooth and the margins somewhat irregular due to crenations, punctations, etc. However, frequently there are rod-like structures without a regular arrangement. I agree with Goseco *et al.* (1974) that these structures represent broken fragments of the radial refractive elements which are beneath the cuticle.

The presence of coarse lateral pores, resembling little buttons, is another constant character of the genus. In *F. maryanneae* and the four Spanish populations the pores are located in a single row near the ventral margin of the lateral chord with a variable distance between them; on rare occasions a pore can be seen within the lateral chord. The number of lateral pores is somewhat variable in the different regions of the body (Table I). In the neck region five pores are present in all specimens and populations examined: two in the odontostyle-odontophore area, a third pore opposite the nerve ring and two more in or near the pharyngeal bulb area. Near the vulva level, one, two or three pores are present (Fig. 1, A-C). On the tail two pores are always present. Unfortunately the material of *F. obtusa* and *F. ourasphaira* examined was not in sufficiently good condition to observe these pores, but according to Goseco *et al.* (1974) and Loof (1963), the lateral pores are located in two rows. It was not possible to determine their number; however, Loof (1963) indicated that *F. obtusa* has about 40 pores, mostly located near the ventral margin of the lateral chord.

The study carried out shows cuticle and lateral pores can have taxonomic importance for species of *Funaria*. The transverse striation of the cuticle may be clear or inconspicuous and this seems to be a constant feature for indi-

viduals and populations of the same species. The abundance and distribution of radial refractive elements in the inner cuticle is variable between species. Arrangement in one or two rows and total number of lateral pores are apparently constant within a species.

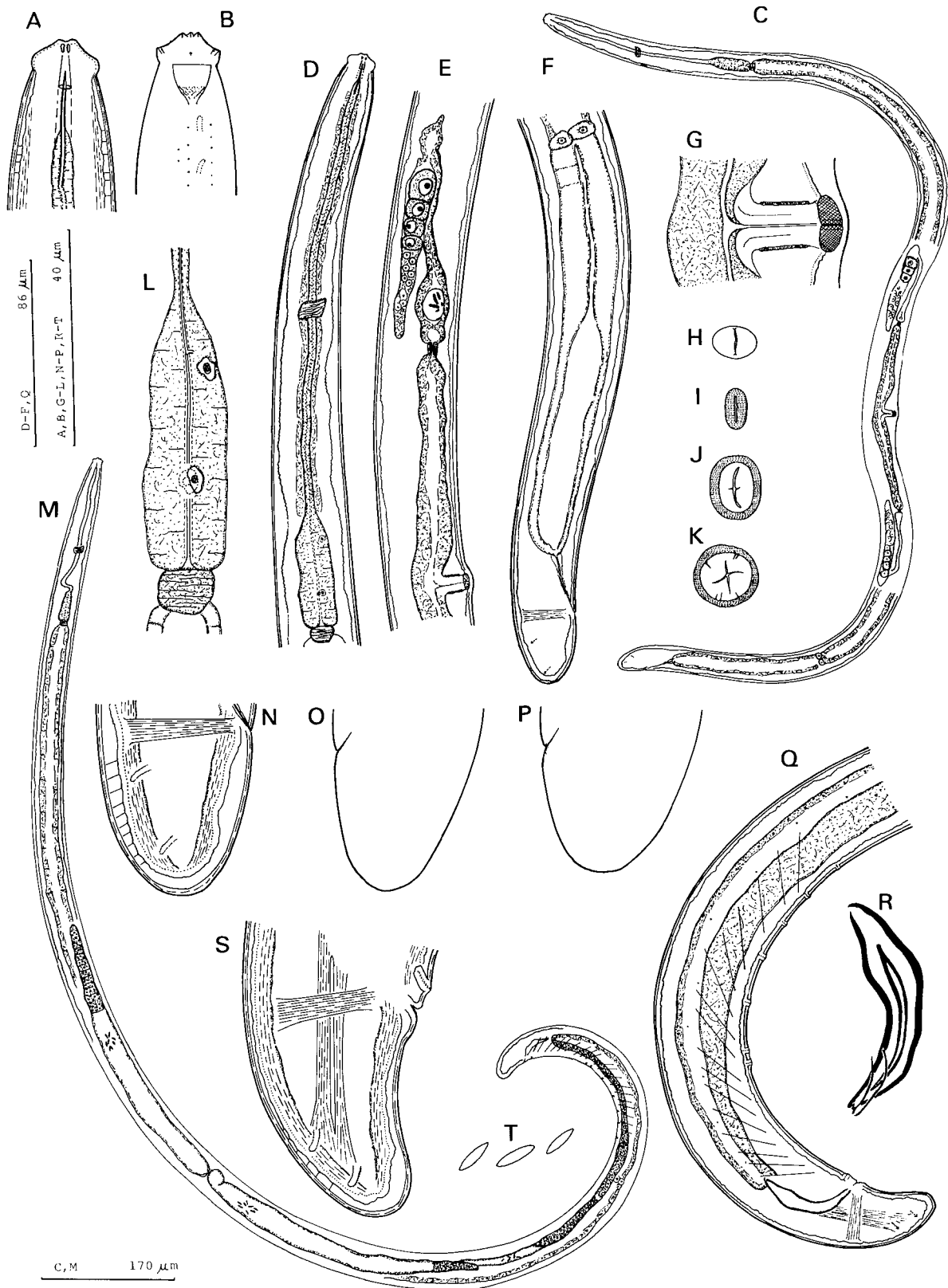
The four Spanish populations of *Funaria* together with *F. obtusa*, *F. ourasphaira* and *F. maryanneae* form a species complex with very similar morphometry (Tables II and III) and, as a consequence, with an intricate taxonomy. The characteristics of the complex are: medium size (body length 1-2 mm); body moderately slender, odontostyle length 9-13 μ m and delicate with very slender though visible lumen; vulva somewhat posterior ($V = 48.6-59.8$) and convex conoid to hemispherical tail.

F. obtusa is known only from North America. It was described originally by Thorne (1939) as *Leptonchus obtusus* from USA (Utah and Idaho). Loof (1963) studied abundant material from USA (Utah). Goseco *et al.* (1974) collected and studied several other populations, emended Thorne's description and transferred the species to the genus *Funaria*. Zullini (1973) described *Leptonchus parisi* from Mexico (Chiapas), but Goseco and Ferris (1976) considered it a synonym of *F. obtusa*. These populations show interesting variability in their morphology. The cuticle is fine but clearly striated in the populations studied by Thorne (1939) and Goseco *et al.* (1974) (my own observations confirm this); however, it is smooth according to Zullini (1973). The pharynx is significantly shorter in Zullini's material ($b = 7.0-7.4$ vs. $b = 3.9-6.5$ in USA populations). Males are present in populations studied by Goseco *et al.* (1974) and Zullini (1973) but not in those studied by Loof (1963), although he examined a large number of specimens. Unfortunately, there is no information about lateral pores in the populations. I doubt whether these populations are conspecific, but this needs further study.

F. ourasphaira was originally described by Goseco *et al.* (1974) from USA (Oregon) and no later record is known.

TABLE I - Number and distribution of lateral pores of different populations belonging to the genus *Funaria*.

	<i>F. barcinai</i> sp. n.		<i>F. millani</i> sp. n.		<i>F. maryanneae</i>
Population	Pop. 1	Pop. 2	Pop. 3	Pop. 4	
n	8	4	5	3	3
neck	5	5	5	5	5
neck base-vulva	5.6(5-8)	10.2(9-12)	9.6(8-11)	7.7(7-8)	8.7(7-11)
vulva-prerectum	5.5(4-7)	9(8-10)	7.4(6-8)	8.3(7-10)	7
prerectum	1.9(1-2)	4(3-5)	4.2(3-5)	3.3(3-4)	3.3(3-4)
tail	2	2	2	2	2
total	20(19-24)	31.2(28-34)	28.2(25-30)	26(25-28)	26.7(25-30)



According to these authors, the species is close to *F. obtusa* and differs by having a hemispherical tail and by the absence of males. The shape and size of the tail is somewhat variable in *F. obtusa*: rounded conoid (tail length 22.5 μm , ABW 28 μm and $c' = 0.8$) in Thorne's lectotype [see Fig. 16C and text in Goseco *et al.* (1974)] and conoid (tail length 27 μm , ABW 25 μm and $c' = 1.1$) in the female examined by the author (Fig. 1D). In *F. ourasphaira* the tail, said to be hemispherical, is (Fig. 1G-J) rounded conoid to hemispherical (tail length 18, 21, 26 μm ; ABW 26, 28, 31 μm and $c' = 0.7, 0.7, 0.9$) in three paratypes examined by me. The males, although present, are rare in *F. obtusa* and, on the other hand, the known population of *F. ourasphaira* is small ($n = 7$). As a consequence, one cannot exclude the possibility that these species are conspecific, but more information is required to ascertain this.

F. maryanneae is known from Europe (West Germany and Switzerland). This species is easily separated from *F. obtusa* and *F. ourasphaira* by the lateral pores located in a single row near the ventral margin of the lateral chords (two rows in other two species) and by a general larger body size.

Description of new species

FUNARIA MILLANI sp.n.

(Fig. 2; Table III)

Female: slender, of medium size. Body cylindrical, tapering towards anterior end. Habitus in general ventrally curved (Fig. 2C). Outer cuticle thin with two layers of the

TABLE II - Measurements of three known species of the genus *Funaria* (from the literature).

Species	<i>Funaria obtusa</i>								<i>F. ourasphaira</i>	<i>F. maryanneae</i>	
Reference	Thorne, 1939	Goseco, Ferris and Ferris, 1974				Loof, 1963	Zullini, 1973		Goseco <i>et al.</i> , 1974	Goseco and Ferris, 1976	
Population	Thorne's lectotype	Thorne's paratypes		USA populations		Utah (USA) popul.	Chiapas, Mexico		Oregon, USA	Bad Sooden, West Germany	
n	?	1 ♀	2 ♀ ♀	22 ♀ ♀	3 ♂ ♂	30 ♀ ♀	12 ♀ ♀	1 ♂	6 ♀ ♀	6 ♀ ♀	1 ♂
L	1.6	1.5	1.63 1.7	1.32(1.13-1.55)	1.3(1.05-1.50)	1.56(1.43-1.68)	1.23-1.40	1.36	1.1-1.4	1.6-1.95	1.88
a	30	37.5	35 39	31.6(22-36)	38(30-43)	34(29-39)	29-34	32	30-37	34.4-44.2	41.9
b	6.0	5.5	5.5 6.1	5.4(3.9-6.5)	5.8(5.6-6.1)	6.1(5.4-6.7)	7.0-7.4	6.3	4.2-5.6	6.4-7.6	7.6
c	50	66.9	54 68	49.1(40-58)	50.3(37-58)	58(49-72)	50-63	56	63-73	57.3-76.7	67.7
V	52	54	53 55	54.2(52-57)	—	55(51-59)	54-59	—	52-58	52.3-56	—
head width (μm)	11								11	13	
amph. apert (μm)	6.4								8	9	
odontostyle (μm)	11						9		10	13	
phar. bulb. length (μm)	50	48	53	46.3(37-56)	44.6(40-48)		19-43		48-56	58-62	
body width (μm)	40	43	46	41.7(31-46)	35				34-42	38.4-48	48
lateral fields (μm)	8								12	12	
prerectum (μm)	206	198	243	140(109-162)					109-176	186-224	
rectum (μm)	32								25	35	
ABW (μm)	28									30	
tail length (μm)	22.4	24	31	27(22-30)	26(24-28)				16-24	22.4-29	29
spicule (μm)	—	—	—	—	40.6(37.8-43)		—	36	—	—	55.5
Supplements	—	—	—	—	2 + [4-6]		—	1 + 4	—	—	1 + 7

Fig. 2 (Front page) - *Funaria millani* sp.n.: A, head in median view; B, head in surface view; C, entire female; D, neck region; E, anterior genital branch; F, posterior body region of the female; G, vagina in lateral view; H and I, vulva in ventral view; J and K, vagina in ventral view; L, pharyngeal bulb and cardia; M, entire male; N-P, female tail; Q, posterior body region of the male; R, spicule and lateral guiding piece; S, male tail; T, sperm.

same depth, smooth. Inner cuticle with irregular outline and often separated from the outer cuticle, coarsely striated. Radial refractive elements abundant, visible along the entire body but specially obvious near head and tail

(Fig. 2A,N). Lateral chord about 40% of the body width near midbody, with irregular crenated margins and numerous rodlike structures. Lateral pores (Table I) located in a single row near the ventral margin of the lateral chord. Lip

TABLE III - Measurements of two new species of the genus *Funaria*.

Species		<i>Funaria millani</i> sp. n.							<i>Funaria barcinai</i> sp. n.	
Population		Holm-oak forest, Sierra Pandera, Jaén			Holm-oak forest, Sierra Jabalcuz, Jaén			Brushwood, Sierra Pandera, Jaén	Holm-forest, Granada	
	Holo- type	Paratypes	Allo- type	Paratypes					Holo- type	Paratypes
n	♀	11 ♀ ♀	♂	5 ♂♂	7 ♀ ♀	♂	7 ♀ ♀	3 ♂	♀	16 ♀ ♀
L	1.53	1.58(1.29-1.91)	1.93	1.73(1.46-1.97)	1.37(1.26-1.73)	1.32	1.32(1.13-1.53)	1.28(1.22-1.32)	1.27	1.29(1.16-1.46)
a	34.9	33.8(30.0-38.1)	41.1	40.9(36.4-44.7)	32.6(29.8-36.7)	34.0	35.5(29.0-40.4)	37.4(32.1-38.4)	34.3	31.9(28.1-35.8)
b	5.6	5.9(4.5-6.9)	8.4	7.1(6.1-8.4)	5.5(5.1-6.0)	5.8	5.7(4.5-6.7)	5.7(5.4-6.0)	5.2	5.5(5.0-6.4)
c	46.5	53.3(41.6-68.3)	49.5	43.6(37.6-49.5)	52.1(49.3-59.9)	45.7	53.2(39.6-59.6)	39.5(34.9-43.6)	45.4	43.5(36.4-50.8)
V	57.7	54.8(48.6-59.8)	—	—	53.4(50.7-55.3)	—	55.5(53.5-57.1)	—	53.1	52.7(48.7-55.36)
G1 (T1)	16.0	16.1(12.0-20.4)	64.1	57.4(53.6-64.1)	16.6(14.4-19.9)	63.6	15.2(12.9-17.8)	51.4(49.8-53.06)	12.0	14.8(12.0-21.8)
G2 (T2)	16.4	15.9(11.0-18.8)	24.9	27.1(24.6-33.9)	16.5(15.0-18.7)	26.5	15.2(12.6-18.8)	25.4(24.6-26.2)	11.8	13.5(11.8-16.5)
c'	1.1	1.0(0.8-1.2)	1.1	1.26(1.0-1.56)	0.9(0.8-1.1)	1.0	1.0(0.8-1.2)	1.2	1.2	1.1(1.0-1.3)
head width (µm)	11	10-11	12	11-12	9-11	10	9-11	11	11	11
amph. apert. (µm)	7	6-7	8	7-8	6-7	7	6-7	6-7	7	7
odontostyle (µm)	9	9.8(9-11)	9	10.0(9-11)	9.5(9-10)	9	9.3(9-10)	9	9	9.2(9-10)
stoma (µm)	7	7-8	8	7-8	6-7	6	7	7	7	7-8
nerv. ring-ant. end (µm)	108	113(108-125)	119	114(106-125)	97(88-106)	97	99(97-100)	98(97-99)	96	93(88-100)
pha. bulb length (µm)	56	53(47-59)	47	50(47-56)	52(50-56)	45	51.5(48-55)	47(44-52)	53	51.5(45-56)
cardia (µm)	9	7-10	9	8-9	10-14	9	6-7	8-9	7	5-8
neck length (µm)	272	269(273-289)	230	245(231-287)	240(220-254)	228	232(202-254)	223(219-228)	246	237(218-260)
body width (neck base) (µm)	35	39(35-45)	37	35(33-37)	37(33-41)	35	33(29-36)	35(34-36)	32	36(32-39)
body width (midbody) (µm)	44	47(41-52)	47	42(40-47)	42(38-51)	39	37(33-41)	37(34-39)	37	40(37-44)
lateral fields (µm)	13	13-20	14	12-28	14-18	14	11-16	11-13	13	12-16
vagina (µm)	19	15-52	—	—	17-20	—	13-17	—	19	18-22
vulva-anterior end (µm)	886	864(702-982)	—	—	732(649-921)	—	753(605-876)	—	675	680(614-798)
prerectum (µm)	200	189(163-219)	247	220(209-247)	158(119-188)	206	181(131-225)	192(182-200)	129	166(94-200)
rectum (µm)	31	30(28-33)	42	42(41-44)	30(21-34)	41	28(22-33)	37.5(36-39)	31	29(25-33)
ABW (µm)	29	31(26-36)	34	32(30-34)	29(26-33)	28	26(24-28)	27(25-29)	24	27(24-30)
tail length (µm)	33	30(25-33)	39	40(31-47)	26(25-29)	29	25(19-29)	33(30-35)	28	30(26-34)
supplements	—	—	2 + 7	2 + [6-7]	—	2 + 6	—	2 + [6-9]	—	—
spicules (µm)	—	—	47	40(31-47)	—	29	—	40(36-43)	—	—
guiding pieces (µm)	—	—	14	12-14	—	11	—	11-12	—	—
copulatory muscles	—	—	17	14-21	—	16	—	15-18	—	—
sperm (µm)	—	—	9	8-9	—	8	—	6	—	—

region well offset, twice as wide as high and about 1/3-1/4th of the body width at neck base (Fig. 2A,D). Labial and cephalic papillae distinct, ten outer angular and six inner protruding (Fig. 2B). Amphids cup-shaped, opening at level of the cephalic constriction, and occupying about 2/3th of corresponding body width. Stoma a truncate cone to cylindrical, somewhat wider in the base and with thickened walls in the perioral area. Odontostyle delicate but with very clear lumen; its aperture about 1/3th of its total length; slightly bent and length equal to or somewhat less than head width. Odontophore also bent. Cervical pores two pairs, the first at the level of the odontostyle base and the second at the level of middle odontophore. Anterior part of the pharynx slender (Fig. 2D) and not muscular. Bulb cylindroid, about 18-25% of the pharynx total length; 3-4 times as long as wide (Fig. 2L). Pharyngeal gland nuclei and outlets clear: one dorsal and one pair ventrosublateral. Cardia rounded, somewhat wider than long. Nerve ring located at 38-47% of the neck length. At the level of the nerve ring or somewhat before it there is a lateral pore. Genital system didelphic-amphidelphic (Fig. 2E). With reflexed ovaries; oocytes at first in two rows, then in a single row. Oviduct with a slender part and a moderately developed *pars dilatata*. Oviduct and uterus are joined by a well developed sphincter. Uterus wider than oviduct, without specializations. Vagina cylindrical, its inner wall cuticularized surrounded by circular musculature; extending inward over 50% of the corresponding body width; and with a sclerotized area near the vulva (Fig. 2G,J,K). Vulva longitudinal (Fig. 2H,I). Genital tract often containing sperm, mostly in the *pars dilatata* of the oviduct. Prerectum 4.6-8.7 anal body widths long; intestine-prerectum junction guarded by three prominent cells (Fig. 2F). Rectum about one anal body width long. Tail convex-conoid with broadly rounded tip (Fig. 2N-P); about one anal body width long. Two pairs of caudal pores are present, one subdorsal, the other subterminal.

Male: general morphology similar to female (Fig. 2M). Genital system diorchic. Spermatozoa elliptical (Fig. 2T). Supplements an adanal pair and 6-9 well-spaced ventromedian ones (Fig. 2Q). Spicules stout, curved; 1-1.5 anal body widths long (Fig. 2R). Prerectum 6.3-7.8 anal body width long. Tail dorsally convex, ventrally concave conoid with rounded end (Fig. 2S). Two pairs of caudal pores in posterior half of tail.

Juveniles: resembling adults in general morphology.

Differential diagnosis: *F. millani* sp.n. is close to *F. obtusa*, *F. ourasphaira* and *F. maryanneae*. It differs from *F. obtusa* in having a single row of lateral pores (vs. two rows) and smooth cuticle (vs. finely but clearly striated). From *F. ourasphaira* in having a single row of lateral pores (vs. apparently two rows), tail convex-conoid and relatively longer (vs. hemispheroid and relatively shorter) and males

present (vs. males absent). From *F. maryanneae* in having convex-conoid tail (vs. hemispherical) and shorter odontostyle.

Type habitat and locality: alkaline soil around roots of *Paeonio-Quercetum rotundifoliae* Rivas Martínez (hol-oak forest) in Piedra del Aguila, Valdepeñas de Jaén, Province of Jaén, Spain.

Other habitats and localities: 1) soil around roots of *Santolino-Salvietum oxoydontis* Rivas Goday et Rivas Martínez (brushwood) and *Andryalium agardhii* Rivas Martínez (brushwood) in Sierra de la Pandera, Valdepeñas de Jaén, Province of Jaén, Spain. 2) soil around roots of *Paeonio-Quercetum rotundifoliae* Rivas Martínez (holm-oak forest) and 3) of *Ulici-Genistetum speciosae* Rivas Goday et Rivas Martínez in Sierra de Jabalcuz, Jaén, Province of Jaén, Spain. All alkaline soils.

Etymology: the specific epithet *millani* is a patronymic honoring F. Jiménez Millán, the eminent Spanish nematologist.

Type material: holotype female, two paratype females and allotype male deposited in the collection of Instituut voor Dierkunde, Rijksuniversiteit Gent, Belgium, slides n° 3291-3293. One paratype female and one paratype male in the following collections: Departamento de Biología Animal, Universidad de Granada, Granada, Spain, slide n° 0010; Istituto di Nematologia Agraria, Bari, Italy; Museum national d'Histoire naturelle, Paris, France; and Commonwealth Institute of Parasitology, St. Albans, UK.

***FUNARIA BARCINAI* sp.n.** (Fig. 3; Table III)

Female: medium size, generally less than 1.5 mm long. Body cylindrical and rather slender, tapering towards anterior end (Fig. 3A). Habitus slightly ventrally arcuate. Outer cuticle thin with two layers of similar width, smooth. Inner cuticle coarsely striated, with irregular outline and often separated from the outer cuticle. Radial refractive elements scarce, more visible in posterior region. Lateral chords about 1/3th of the body width near mid-body, with irregular crenated margins; rod-like structures not abundant. Lateral pores (Table I) located in a single row near the ventral margin of the lateral chord. Head offset by a constriction, cap-shaped (Fig. 3B,E), about twice as wide as high and about 1/3th of the body width at neck base. Labial and cephalic papillae rounded. Amphids cup-shaped, opening at level of cephalic constriction, and occupying almost 2/3th of the corresponding body width (Fig. 3F). Stoma a truncate cone, slightly wider at the base, about three times as long as wide; its walls somewhat sclerotized and thickened in the perioral area. Odontostyle delicate, attenuated with lumen not visible in its anterior part, slightly arched and its length somewhat less than

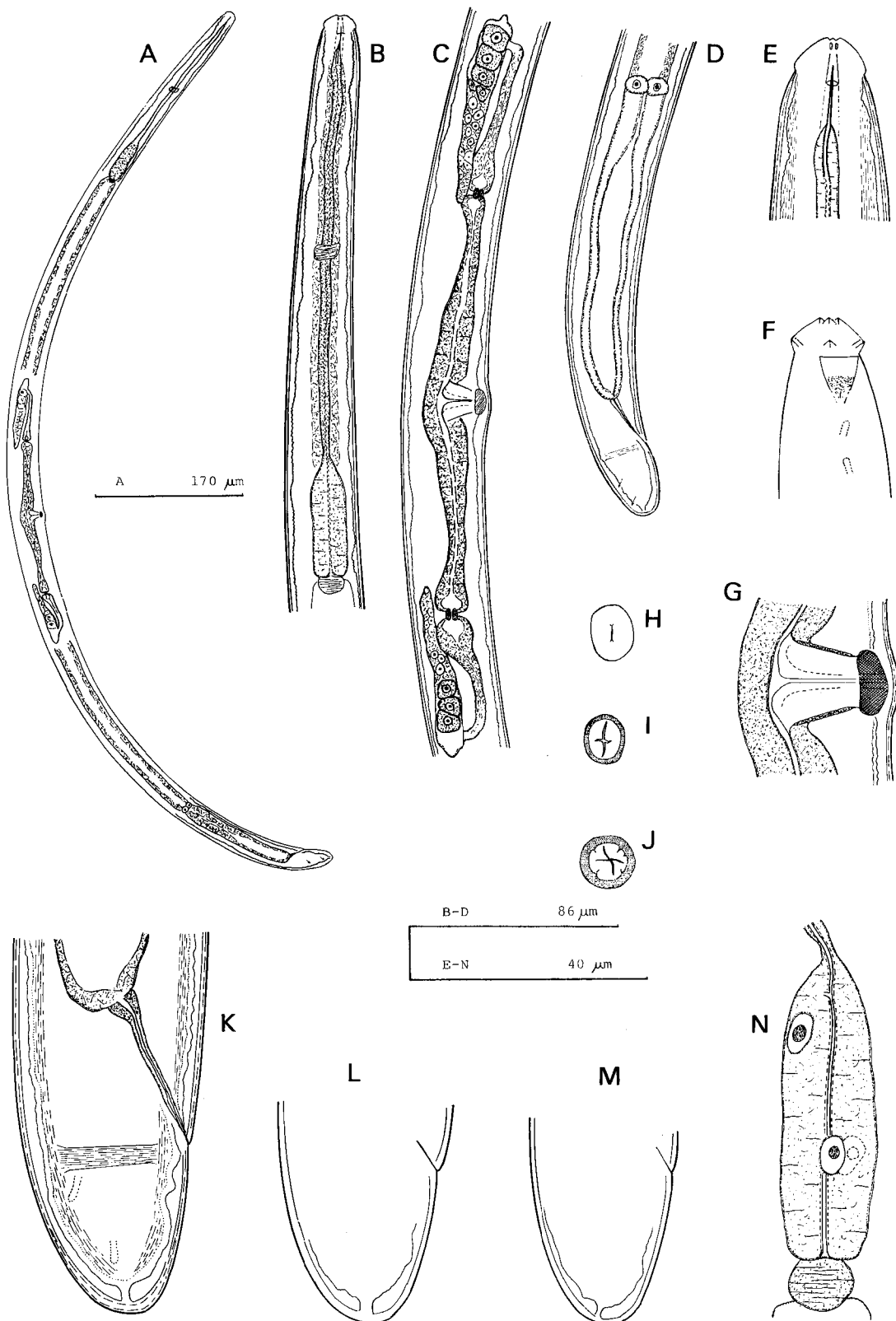


Fig. 3 - *Funaria barcinai* sp.n. (female): A, entire body; B, neck region; C, genital system; D, posterior body region; E, head in median view; F, head in surface view; G, vagina in lateral view; H, vulva in ventral view; I and J, vagina in ventral view; K-M, tail; N, pharyngeal bulb and cardia.

head width. Odontophore arched; its length similar to odontostyle. Guide ring simple. Cervical pores two, one at level of the odontostyle base and the other at level of the odontophore base. Pharynx (Fig. 3B) with a slender not muscular anterior part and a basal bulb. The latter about 20-25% of total neck length, 3-4 times as long as wide (Fig. 3O). Pharyngeal gland nuclei and outlets usually clear: one dorsal and a pair ventrosulateral ones. Cardia rounded. Nerve ring located at 37-43% of total neck. At the level of the nerve ring there is another lateral pore. Genital system didelphic-amphidelphic with ovaries re-flexed (Fig. 3C); oocytes initially in two rows, then in a single row. Oviduct with slender part and moderately developed *pars dilatata*. Sphincter present between oviduct and uterus. Uterus wider than oviduct without specializations. Vagina cylindrical to a truncate cone (Fig. 3G,I,K); its wall somewhat cuticularized and with circular muscles; extending inwards over half of the corresponding body width, with sclerotized area near the vulva. Vulva longitudinal (Fig. 3H). Genital tract without sperm. Prerectum 3.3-6.9 anal body widths long; intestine-prerectum junction guarded by three cells (Fig. 3D). Rectum about one anal body width long. Tail convex conoid (Fig. 3L-N); its length similar to or slightly greater than anal body width. In the internal part of tail end there is a terminal projection. Two pairs of caudal pores are present, one subdorsal and the other subterminal.

Male: unknown.

Juveniles: general morphology similar to females.

Differential diagnosis: *F. barcinai* sp.n. resembles *F. obtusa*, *F. ourasphaira*, *F. maryanneae* and *F. millani* sp.n. From *F. obtusa* it differs in having a single row of lateral pores (vs. two rows) and smooth cuticle (vs. finely but clearly striated). From *F. ourasphaira* in having a single row of lateral pores (vs. apparently two rows) and tail convex conoid and relatively longer (vs. tail hemispheroid and relatively shorter). From *F. maryanneae* in being smaller, tail convex conoid (vs. hemispherical) and less lateral pores. Finally, it differs from *F. millani* sp.n. in having less lateral pores (Table I), absence of males (vs. males present and females with sperm in their genital tract) and differently shaped odontostyle.

Type habitat and locality: acid soil around roots of *Quercion fagineo-suberis* (Braun Blanquet, Silva et Rozeira) Rivas Martínez (holm-oak forest) in Cerro de Don Luis, Genes de la Vega, Province of Granada, Spain.

Etymology: the specific epithet *barcinai* is a patronymic honoring A. Gómez Barcina, the eminent Spanish nematologist.

Type material: holotype female and two female paratypes deposited in collection of Instituut voor Dierkunde,

Rijksuniversiteit Gent, Belgium, slide n° 3294 and 3295; one female paratype deposited in each of the collections as listed for *F. millani* sp.n.

Additional notes on the taxonomy of the genus *Funaria*.

Goseco *et al.* (1974) and Bajaj and Bhatti (1982) have indicated that the genus *Funaria* is morphologically close to *Leptonchus* Cobb, 1920). According to Goseco *et al.* (1974), *Funaria* differs from *Leptonchus* by having a longitudinal vulva (vs. transverse), a long and cylindrical pharyngeal bulb (vs. pyriform) and large distinct cardia (vs. small). I agree with Bajaj and Bhatti (1982) that the shape of the pharyngeal bulb is quite variable in some species of both genera; for example it is cylindrical in *Leptonchus patulibastus* Goseco, Ferris *et* Ferris, 1974. In the same paper, Bajaj and Bhatti (1982) described *Funaria indica* from India, as a species with transverse vulva (a feature of *Leptonchus*), large cardia (a feature of *Funaria*) and long prerectum with its junction with the intestine posterior to the vulva (a feature of *Funaria* but also present in *Leptonchus transvaalensis* Heyns, 1963). They stated that «only the length of prerectum is a good taxonomic character to separate the genera» (*Leptonchus* and *Funaria*) and transferred *Leptonchus microdens* Thorne, 1974 and *Leptonchus capitatus* Baqri *et* Jairajpuri, 1968 (two species with long prerectum and with the junction to intestine posterior to vulva) to the genus *Funaria*. I disagree with this action because, in my opinion, the shape of the vulva (by definition transverse in *Leptonchus* and longitudinal in *Funaria*) is a more consistent character for distinguishing the two genera. This character has also been used in the taxonomy of other dorylaimid genera such as *Paravulvus* Heyns, 1968.

As a consequence, the following taxonomic changes are proposed:

1. *Leptonchus indicus* (Bajaj *et* Bhatti, 1982) n. comb.
syn. *Funaria indica* Bajaj *et* Bhatti, 1982
2. *Leptonchus microdens* Thorne, 1974
syn. *Funaria microdens* (Thorne, 1974) Bajaj *et* Bhatti, 1982
3. *Leptonchus capitatus* Baqri *et* Jairajpuri, 1968
syn. *Funaria capitata* (Baqri *et* Jairajpuri, 1968) Bajaj *et* Bhatti, 1982

The genus *Funaria* thus contains twelve species which can be separated with the following key [modified after Goseco *et al.* (1974)]:

- 1 - Vulval opening surrounded by cuticular membrane 2
- Vulval opening not surrounded by cuticular membrane 3
- 2 - Tail mucronate *F. meridionalis* Popovici, 1990
- Tail not mucronate *F. fimbriata* (Thorne, 1939) Goseco *et al.*, 1974

- 3 - Tail mucronate or terminus acute 4
- Tail bluntly conoid to hemispherical 6
- 4 - Tail mucronate *F. thornei* van der Linde, 1938
- Tail acute 5
- 5 - Tail as long as anal body width, terminus less acute *F. acuta* (Zullini, 1973) Goseco et Ferris, 1976
- Tail twice as long as anal body width *F. apitica* (Thorne, 1964) Goseco et al., 1974
- 6 - Lateral pores located in two rows 7
- Lateral pores located in a single row 10
- 7 - Spear wider (1 μ m), with lumen distinct 8
- Spear narrower (0.5 μ m), lumen less distinct 9
- 8 - Spear robust; prerectum 6 anal body-widths long; tail relatively longer (one and a half anal body-width long); tail terminus blunt *F. cacti* Goseco et al., 1974
- Spear less robust; prerectum 7 times anal body width long; tail less than one anal body width long and ending in a rounded terminus *F. orientalis* Khan et Khan, 1987
- 9 - Tail bluntly conoid, male known *F. obtusa* (Thorne, 1939) Goseco et al., 1974
- Tail hemispherical, male unknown *F. ourasphaira* Goseco et al., 1974
- 10 - Lateral pores 20-24, male unknown *F. barcinai* sp.n.
- Lateral pores 25-34, male known 11
- 11 - Tail hemispherical, odontostyle 13 μ m long *F. maryanneae* Goseco et Ferris, 1976
- Tail rounded conoid, odontostyle 9-11 μ m long *F. millani* sp.n.

Acknowledgement

The author thanks V.R. Ferris for the loan of specimens of several *Funaria* species and A. Coomans for reviewing the manuscript.

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