

# Nematodes of the order Dorylaimida from Andalucía Oriental, Spain. The genus *Prodorylaimus* Andrassy, 1959. II. Bisexual species

Joaquín Abolafia\*, Reyes Peña Santiago\* and Domingo Jiménez Guirado\*\*

\*Departamento de Biología Animal, Vegetal y Ecología, Universidad de Jaén, Paraje "Las Lagunillas" s/n, Edificio nº 5, 23071-Jaén, Spain,

\*\*Departamento de Biología Animal (Sección Zoológica), Facultad de Ciencias, Universidad de Córdoba, Avenida San Alberto Magno s/n, 14004-Córdoba, Spain.

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**Summary.** This paper deals with four previously known species of the genus *Prodorylaimus* Andrassy, 1959 collected mostly from natural areas in south-eastern Spain: *P. brigdammensis* (de Man, 1876) Goodey, 1963; *P. filiarum* Andrassy, 1964; *P. longicaudatoides* Altherr, 1968 and *P. mas* Loof, 1985. The species are described and illustrated, and tables of measurements are also given. *Prodorylaimus longicaudatoides* and *P. mas* are reported for the first time from the Iberian peninsula.

**Key words:** bisexual species, *Prodorylaimus* spp., taxonomy.

In this second paper on the occurrence of members of the genus *Prodorylaimus* Andrassy, 1959 recorded from soil samples collected in Spain we report four species in which both females and males are known. The methods used are these reported by Peña Santiago *et al.* (1998) in the first paper describing *Prodorylaimus* species from the Iberian peninsula.

## DESCRIPTIONS

### *Prodorylaimus brigdammensis* (de Man, 1876) Goodey, 1963 (Fig. 1 & Table 1)

**Female.** Slender nematodes of medium size, 1.1-1.5 mm long. Body cylindrical, tapering towards both extremities but more so towards the posterior end. Habitus curved ventrad to an open "C". Outer cuticle layer thin along the entire body and with fine but clear transverse striations. Inner cuticle layer wider than the outer one and somewhat thickened at the caudal region. Lateral chord occupying about one-third of the midbody width, granular. Lateral pores obscure. Lip region set off from the adjacent body by a slight to obvious depression and somewhat angular. Labial and cephalic papillae slightly prominent. Amphid fovea cup-shaped, opening at level of the cephalic depression and occupying about half the lip region width. Odontostyle 1.4 times the lip region width long; aperture about one-third of the total

length. Odontophore rod-like, the exact length not measured with accuracy. Guiding ring simple. Pharynx consisting of a slender but muscular anterior part which extends gradually into the basal bulb. Pharyngeal bulb cylindrical and occupying about two-fifths of the total neck length. Pharyngeal gland nuclei and outlets somewhat obscure in the specimens examined. Cardia relatively short, wider than long and enveloped by intestinal tissue. Nerve ring situated at one-third of the total neck length. Genital system didelphic-amphidelphic. Ovaries relatively small, not reaching the oviduct-uterus junction; oocytes initially as several rows and then as a single row. The oviduct joins subterminally the ovary and consists of a slender part with prismatic cells and a developed *pars dilatata*. A sphincter separates the oviduct and uterus; its inner part more refractive and encircled by a muscular ring. Uterus a tube about three times as long as the corresponding body width and without modifications. Vagina extending inwards but not reaching half the body diameter. *Pars proximalis vaginae* 11 x 13 µm, almost as long as wide, and with somewhat convergent or sigmoid walls; encircled by weakly developed musculature. *Pars refringens vaginae* consisting of two well developed and close drop-shaped sclerotizations measuring 5 x 3 µm and with a combined width of 8 µm. *Pars distalis vaginae* 2-3 µm long and with slightly angular walls. Vulva a transverse slit. One uterine egg obser-

ved, 82 x 28  $\mu\text{m}$ . Abundant sperm present within the genital tract, especially in the uterus. Prerectum 2.0–2.5 anal body widths long. Rectum little longer than the anal body diameter. Tail filiform, somewhat curved ventrad, and tapering gradually from anus to tip; the hyaline part rather long with the internal core almost reaching mid-tail. Three pairs of caudal pores: one subdorsal and two subventral.

**Male.** Similar in appearance to female but with the posterior region more curved ventrad. Genital system diorchic with opposite testes. Spicules curved ventrad, about 1.6 times as long as the anal body width. Lateral guiding pieces relatively long and stout, bifurcate at the end. In addition to the adanal pair there are seven well spaced ventromedian supplements which begin anteriorly of the anterior end of the spicules. Prerectum 2.5 anal body widths long. Tail filiform, similar to the female but more curved ventrad. Spermatozoa spindle-shaped to ovoid.

**Distribution.** The species has been found in three localities: i) "Acebeas", Sierra de Segura, province of Jaén, in association with *Corylus avellana* L., *Quercus faginea* Lam., *Rubus* sp., *Populus alba* L., *Pinus* sp. and *Primula* sp.; ii) road to "Río Madera", Sierra de Segura, province of Jaén, in the rhizosphere of *Quercus pyrenaica* Willd., *Pinus* sp. and ferns; and iii) road to Casares, province of Málaga, in association with *Pistacia lentiscus* L. and *Chamaerops humilis* L.

### ***Prodorylaimus filiarum* Andrassy, 1964 (Fig. 2, Table 2)**

#### **Sierra de Cazorla (Jaén province) population:**

**Female.** Relatively slender to very slender nematodes of medium to great size, 1.6–2.1 mm long. Body cylindrical, tapering to the posterior end and less so towards the anterior extreme. Habitus variable after fixation, straight or somewhat curved to well curved ventrad. Outer cuticle layer thin along the body and with very fine transverse striations which sometimes are only visible in the anterior region. Inner cuticle layer wider than the outer one, thickened at level of tail. The cuticle presents different types of small irregularities (short separations between outer and inner layers, punctuated elevations of the outer layer) which were observed throughout the body in almost all specimens examined. Lateral chord granular, occupying one-fourth to three-seventh of the mid-body diameter, granular. Lateral pores obscure in the specimens examined. Lip region truncate and angular, narrower than the adjacent body and set off by a depression; 1.7–2.0 times as wide as high or one-fourth of the body width at neck base. Lips amalga-

mated. Labial and cephalic papillae often visible but do not infringe the head contour. Amphids opening at level of the cephalic depression and occupying about half of the lip region width; fovea cup-shaped. Cheilostome cylindrical, about three times as long as wide, and with weakly sclerotized walls. Odontostyle straight or somewhat sigmoid, 8–9 times as long as wide and 1.4–1.5 times as long as the lip region diameter; dorsal side little (about 1  $\mu\text{m}$ ) longer than the ventral one; aperture one-third to two-fifths of the total length. Odontophore 1.5 times the odontostyle length, rod-like. Guiding ring double, clearly visible in some specimens. The pharynx consisting of a slender but muscular anterior part which extends gradually into the basal bulb. Pharyngeal bulb cylindrical, about six times as long as wide; occupying about half of the body diameter at neck base and 39–42% of the total neck length. Pharyngeal gland nuclei and outlets obvious observed only in some specimens: DO=59–62%; S<sub>1</sub>N=79–81%; S<sub>2</sub>N=88–89%; DO-S<sub>1</sub>N=19–21%; DO-S<sub>2</sub>N=28–29%; S<sub>1</sub>N-S<sub>2</sub>N=7–9%. Cardia conoid, almost as long as wide; separated from the bulb base by a disc-like structure not always visible, and enveloped by intestinal tissue forming a tongue-like or conical structure which projects into the intestinal lumen. Nerve ring situated at one-third (31–37%) of the total neck length. Reproductive system didelphic-amphidelphic. Ovaries relatively short, not reaching the oviduct-uterus junction: oocytes first as two or several rows, then as a single row. Oviduct joining the ovary subterminally and consisting of a slender part with prismatic cells and a developed *pars dilatata*. Sphincter between oviduct and uterus; its inner part more refractive and encircled by a clear muscular ring. Uterus a tube, narrower distally and wider in its intermediate and proximal portions; 3–3.5 times the corresponding body width long. Vagina extending inwards to half or little more of the body width. *Pars proximalis vaginae* 15–17.5 x 10–12  $\mu\text{m}$  or 1.3–1.7 times as long as wide, the walls varying from practically straight to clearly sigmoid; encircled by a weak musculature. *Pars refringens vaginae* consisting of two close rounded triangular sclerotizations with a combined width of 13  $\mu\text{m}$  and extending along the lumen to 5  $\mu\text{m}$ ; in several specimens the two sclerotizations are apparently subdivided in three or four "pieces", probably due to an optical effect of the sclerotized ring since in ventral view in one specimen it is obvious that this ring is not divided. *Pars distalis vaginae* very short, about 2  $\mu\text{m}$ . Vulva a transverse slit. One specimen presents two "vulval papillae" (appearing as cuticular holes), one anterior, the other posterior. Spindle-shaped spermatozoa present within the uterus. Prerectum 3–4 anal body widths long.

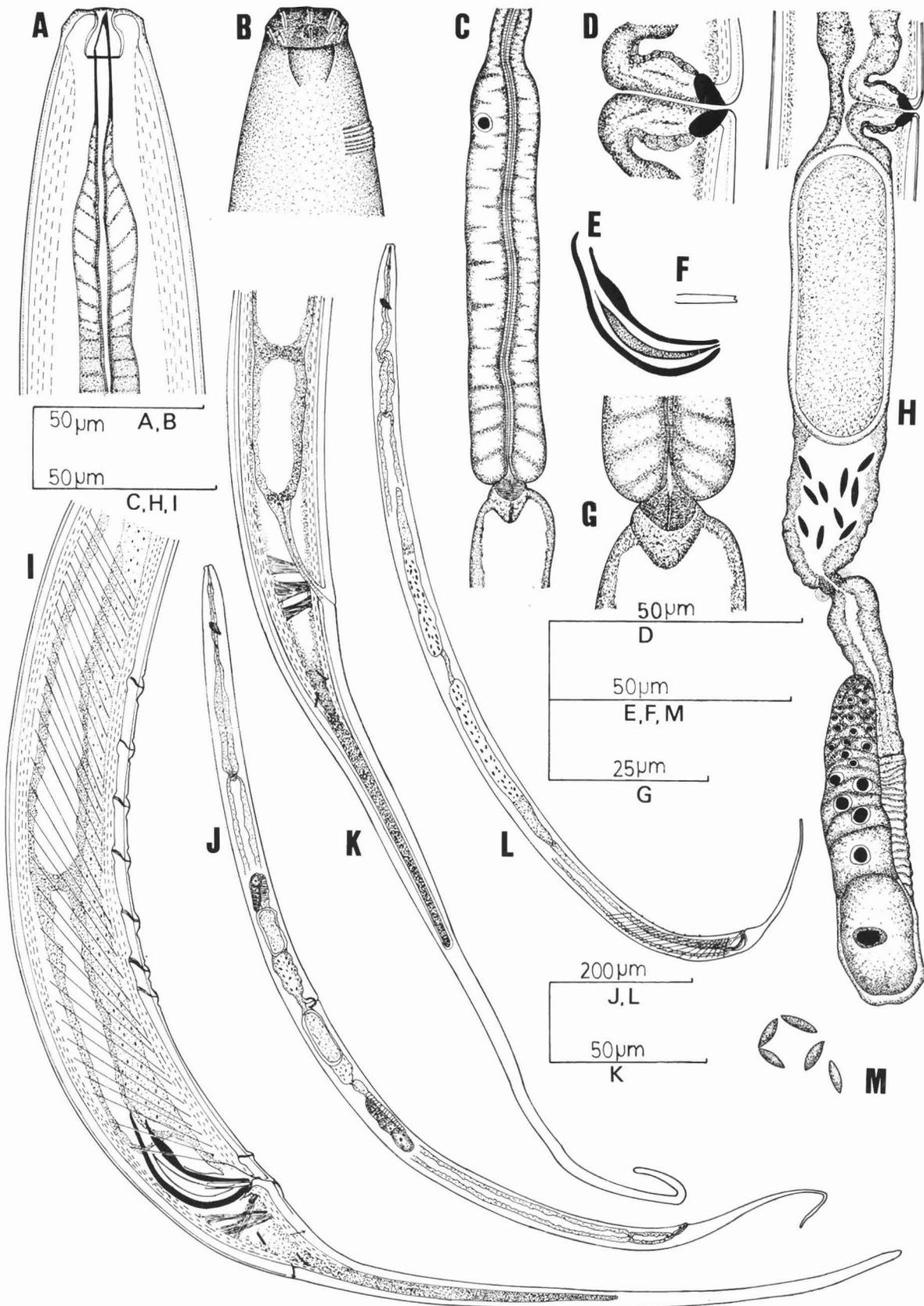
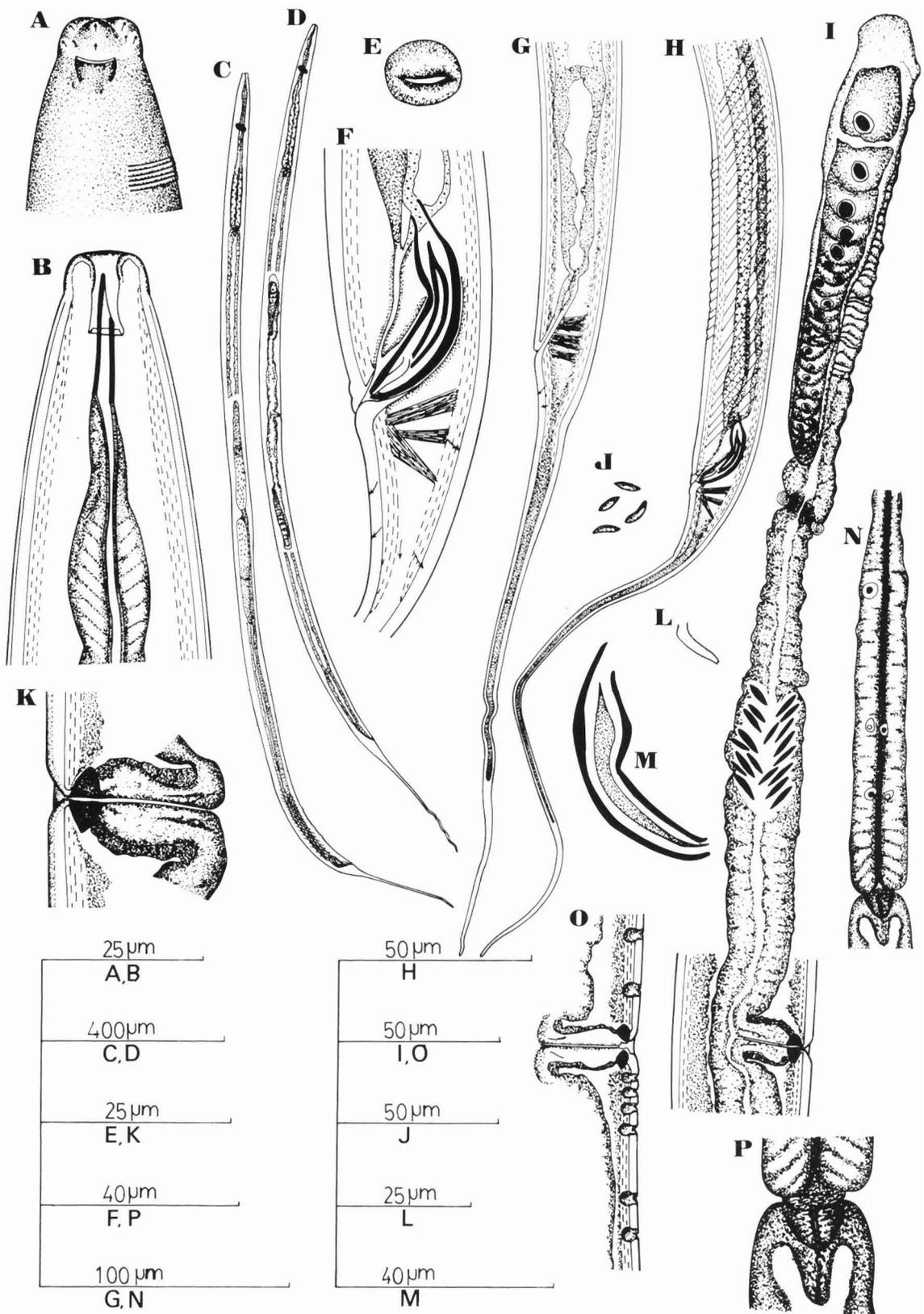


Fig. 1. *Prodorylaimus brigdammensis* (de Man, 1876) Goodey, 1963. A: Lip region in median view; B: Lip region in surface view; C: Pharyngeal bulb; D: Vagina; E Spicules; F: Lateral guiding piece; G: Cardia; H: Female posterior genital branch; I Male posterior region; J: Female entire; K: Female tail; L: Male entire; M: Spermatozoa.



**Fig. 2.** *Prodorylaimus filiarum* Andrassy, 1964. A: Lip region in surface view; B: Lip region in median view; C: Male entire; D: Female entire; E: Vulva in frontal view; F: Cloacal region; G: Female posterior region; H: Male posterior region; I: Female anterior genital branch; J: Spermatozoa; K: Vagina; L: Lateral guiding piece; M: Spicule; N: Pharyngeal bulb; O: Vagina (Granada population); P: Cardia.

**Table 1.** Measurements and diagnostic features of *Prodorylaimus brigdammensis* (De Man 1876) Andrassy 1969, *P. longicaudatoides* Altherr, 1968 and *P. mas* Loof, 1985 (all measurements in  $\mu\text{m}$  except L in mm).

Species	<i>P. brigdammensis</i>		<i>P. longicaudatoides</i>				<i>P. mas</i>	
	Hazel coppice Sierra de Segura Jaén		Beechwood Tobía La Rioja		Moss-covered Redondo-Areños Palencia		Thicket Orgiva-Trevélez road Granada	
n	2 females	male	8 females	4 males	female	6 males	8 females	7 males
L	1.1, 1.5	1.4	2.6±0.1 (2.3-2.8)	2.3±0.1 (2.2-2.4)	2.4	2.2±0.1 (2.2-2.3)	2.2±0.1 (2.2-2.4)	2.1±0.1 (2.0-2.3)
a	29.1	38.5	36.6±2.3 (32.1-39.6)	34.7±2.1 (32.8-38.2)	31.5	29.6±2.9 (25.9-34.9)	45.2±3.6 (39.1-49.7)	44.7±3.2 (40.5-49.7)
b	3.8, 5.5	7.6	5.2±0.2 (4.8-5.6)	4.9±0.1 (4.8-5.0)	5.1	4.7±0.1 (4.7-4.9)	5.9±0.3 (5.5-6.0)	5.4±0.3 (5.2-6.0)
c	4.5	7.3	4.9±0.3 (4.4-5.4)	8.6±0.9 (7.5-9.9)	4.9	8.6±0.4 (7.9-9.1)	5.1±0.3 (4.9-5.5)	5.4±0.4 (4.5-5.9)
V%	38.8, 40.7	-	41.9±1.1 (40.2-43.6)		41.6		41.5±0.8 (40.6-42.8)	
G1/T1	12.8, 16.0	62.6	13.3±0.6 (12.6-14.7)	44.0±0.7 (43.4-45.0)	14.9	51.9±1.1 (50.2-53.1)	12.4±2.6 (5.9-15.8)	50.2±2.1 (47.2-52.5)
G2/T2	13.4, 20.4	21.9	13.9±1.2 (12.5-16.4)	34.8±0.8 (33.9-36.0)	16.3	29.3±1.9 (27.4-32.4)	14.1±0.8 (13.5-15.5)	24.7±6.3 (18.0-35.4)
c'	11.0, 11.3	7.5	13.7±1.8 (12.1-17.8)	7.2±0.9 (6.3-8.3)	13.2	6.9±0.4 (6.1-7.4)	17.5±1.5 (16.0-20.0)	15.7±1.7 (13.8-19.0)
Lip region: width height	10.5, 11.5 6.0, 7.5	11.5 4.5	20.5-23.5 7.5-9.0	20.3-21.9 8.0-8.6	20.5 7.0	21.0-23.0 8.0-10.5	12.0-13.0 6.0-7.5	12.0-13.0 6.0
Amphid aperture Odontostyle	4.5, 6.0 14.5, 16.0	7.5 16.0	10.5-11.5 35.6±1.9 (32.5-38.5)	11.0-11.5 36.7±0.9 (35.4-37.7)	11.0 33.5	10.5-12.0 34.4±1.5 (32.5-37.5)	5.0-7.5 22.5±0.6 (21.5-23.0)	6.0-7.0 22.0±0.4 (21.5-23.0)
Odontophore	?	?	49.2±1.1 (48.0-52.0)	48.9±2.6 (45.4-52.8)	51.5	48.8±0.7 (48.0-50.0)	21.5	?
Guide ring	6.0, 7.0	7.5	20.0-25.5	21.1-23.8	21.0	21.5-22.5	14.0-17.0	15.0-17.0
Nerve ring-ant. end	61.5	60.0	192±10.5 (180-212)	176±10.5 (165-193)	151	188±10.6 (175-206)	135±14.6 (114-153)	101±51.6 (123-138)
Neck length	300	187	470±22.6 (431-506)	438±23.9 (416-478)	470	436±15.1 (417-467)	377±21.5 (360-400)	371±4.9 (363-376)
Pharyngeal bulb length	112	97.0	226±4.6 (219-233)	207±10.6 (194-222)	225	208±9.4 (197-218)	166±7.5 (153-174)	165±11.5 (153-186)
Cardia: width length	7.5, 11.5 10.0, 10.5	? ?	19.0-22.0 30.0-34.5	19.0-23.5 23.5-35.5	23.5 29.0	18.0-23.5 19.0-28.5	10.5-23.0 10.0-17.0	10.0-21.5 14.0-17.0
Cuticle: head midbody anus	1.5 1.5 3.0	1.5 1.5 2.0	4.5-6.5 4.5-7.0 4.5-11.0	5.0-6.5 3.5-6.5 5.5-9.5	6.0 5.5 6.0	4.5-7.5 4.5-6.5 5.0-8.5	1.5 1.5 2.0-3.0	1.5-2.0 1.5-2.0 2.0-3.0
Body width: neck base midbody anus	38.5, 40.0 40.0, 42.0 23.0, 24.5	35.0 37.0 26.0	? ? ?	? ? ?	? ? ?	? ? ?	44.0-54.0 43.0-49.0 24.0-27.0	43.0-54.0 38.5-49.0 23.0-26.0
Lateral chord	12.0	9.0	16.5-32.5	16.0-19.4	21.0	19.0-22.0	14.0-15.0	11.5-12.0
Anterior ovary/testes	94.0, 105	245	115±23.9 (94.5-162)	95.6±3.9 (91.5-101)	178	256±13.6 (233-267)	144±44.1 (104-219)	303±45.4 (246-361)
Anterior genital branch	132, 199	893	325±26.9 (292-366)	1017±34.8 (986-1066)	349	1169±15.7 (1145-1186)	285±63.5 (126-380)	1051±73.3 (939-1137)
Posterior ovary/ testes	101, 123	261	120±21.2 (105-161)	113±13.6 (99.5-132)	260	246±16.4 (220-265)	152±29.8 (107-181)	286±56.7 (206-230)
Posterior genital branch	209, 242	313	344±66.6 (265-462)	804±21.8 (780-833)	398	661±43.5 (615-906)	325±15.6 (298-352)	456±42.5 (396-487)
Vagina length	18.5, 20.0	-	35.5-41.5	-	44.0	-	17.0-18.5	-
Vulva-ant. end	603, 633	-	1093±37.8 (1051-1150)	-	1035	-	936±34.6 (893-993)	-
Prerectum	54.0, 55.0	?	112±19.2 (67.0-132)	141±11.3 (123-154)	86.5	146±10.9 (137-168)	77.2±18.7 (50.5-107)	155±21.5 (130-183)
Rectum/cloaca	26.0, 30.5	?	62.8±7.1 (52.0-69.5)	13.8±1.2 (12.0-15.5)	58.5	16.5±1.0 (15.5-17.5)	33.4±2.5 (29.0-37.0)	?
Tail	260, 273	193	523±40.6 (479-605)	269±22.5 (245-296)	506	262±17.8 (240-287)	435±36.1 (380-493)	387±43.6 (333-466)
Spicules	-	43.0	-	71.0-76.5	-	75.5-84.0	-	42.0-50.0
Lateral guiding piece	-	12.0	-	20.0-22.0	-	21.5-25.5	-	7.5-13.0
Ventr. suppl.	-	7	-	22-25	-	20-27	-	16-18
Spermatozoa	-	9.0	-	11.5	-	8.0-10.0	-	10.0-12.0
Tail hyaline part	118, 140	80	143-160	85.0, 98.0	135	?	0	0

**Table 2.** Measurements and diagnostic features of *Prodorylaimus filiarum* Andrassy, 1964 (all measurements in  $\mu\text{m}$  except L in mm).

Habitat	Ash grove		Several	Walnut tree forest		Several	
Locality Province	Valle Guadalquivir Jaén		Several Jaén	Archidona-Vnva.Trabuco Málaga		Capileira-Veleta Granada	
n	9 females	9 males	2 males	2 females	male	3 females	2 males
L	1.9±1.1 (1.8-2.1)	1.9±0.1 (1.7-2.1)	1.7, 2.0	1.9, 2.0	1.9	1.8±0.2 (1.6-2.0)	1.9, 2.0
a	42.8±2.1 (40.5-46.5)	44.2±2.6 (39.0-47.5)	35.1, 48.9	42.8, 47.5	46.1	36.9±3.0 (32.6-39.2)	37.4, 39.5
b	5.8±0.3 (5.3-6.3)	5.9±0.2 (5.5-6.2)	6.2	5.5, 5.8	5.8	5.3±0.4 (4.9-5.8)	5.1, 5.4
c	5.6±0.4 (5.2-6.1)	6.0±0.1 (5.9-6.5)	7.2, 8.1	7.5	?	5.5	?
V%	42.1±2.9 (39.4-48.7)	—	—	45.6, 46.9	—	42.6±2.2 (40.5-45.7)	—
G1/T1	14.1±1.4 (12.1-16.1)	51.7±5.7 (46.6-63.3)	50.6, 65.5	7.1, 14.3	57.4	14.5±0.6 (13.8-15.2)	65.4, 67.4
G2/T2	14.0±1.5 (12.6-17.5)	28.5±3.3 (25.0-34.1)	32.9, 40.3	13.6, 14.8	29.8	14.4±1.3 (12.6-15.7)	32.4, 37.9
c'	14.1±0.8 (13.1-15.5)	11.7±1.0 (10.2-12.8)	9.5	10.5	?	10.1, 16.2	?
Lip region: width	12	11.5-12.0	12.5	10.5, 12.5	11.5	14.0-14.5	14.0, 15.0
height	6.0-7.5	6.0-7.0	6.0	6.0	6.0	6.5-7.5	6.0, 7.0
Amphid aperture	5.0-7.0	5.0-7.0	7.5	5.0	5.0	6.5-7.5	6.5, 7.5
Odontostyle	17.2±0.5 (17.0-18.5)	16.8±0.8 (15.0-18.5)	17.5, 19.0	16.0	16.0	21.0±0.4 (20.5-21.5)	21.0
Odontophore	24.9±3.7 (18.5-27.5)	26.8±1.1 (26.0-29.0)	24.5	?	?	?	?
Guide ring	10.5-12.0	10.5	9.0	?	6.0	8.5, 13.5	14.0, 14.5
Nerve ring-ant. end	109±9.6 (92.0-119)	118±5.2 (110-126)	123	100, 157	54.0	127±16.4 (106-146)	123, 143
Neck length	333±14.7 (313-360)	329±8.2 (313-340)	326	333, 340	330	359±24.9 (353-393)	373, 393
Pharyngeal bulb length	138±8.5 (123-154)	133±10.8 (112-138)	134, 161	134, 152	134	161±6.0 (153-167)	149, 154
Cardia: width	12.0-28.5	10.0-18.5	12.0, 18.5	23.0, 32.0	20.0	12.0-17.5	17.0, 17.5
length	10.5-14.0	10.5-14.0	10.5, 15.0	12.0	13.0	10.0-17.5	15.0, 18.5
Cuticle: head	1.5-2.0	1.5-2.0	2.0	2.0	1.5	1.5	1.5, 2.0
midbody	1.5-2.0	1.5-2.0	1.5, 2.0	1.5	1.5	1.5	1.5, 2.0
anus	2.0-3.0	2.0-3.0	2.5	3.0	2.0	2.0-2.5	2.5, 3.0
Body width:							
neck base	43.0-49.0	41.5-46.0	41.5, 50.5	40.0, 46.0	41.5	50.0-53.0	50.0, 54.0
midbody	40.5-46.0	39.0-43.0	40.0, 45.0	40.0, 45.0	39.0	50.0-52.0	51.5, 54.0
anus	23.0-24.5	25.0-27.5	26.0	23.0, 24.5	25.0	22.0-25.0	25.0, 27.5
Lateral chord	12.0-18.5	9.0-14.0	16.0	12.0, 17.0	?	14.0-19.0	12.0, 16.0
Anterior ovary/ testes	91.9±22.1 (57.0-112)	218±62.7 (123-300)	237, 323	90.5, 131	295	166±58.3 (84.5-217)	274, 420
Anterior genital branch	285±35.2 (217-341)	997±125 (784-1203)	1030, 1163	136, 283	1101	279±39.0 (225-315)	1300, 1396
Posterior ovary/ testes	97.3±21.3 (75.0-127)	221±34.5 (157-255)	224, 247	97, 134	234	189±84.7 (91.5-215)	284, 295
Posterior genital branch	285±30.4 (244-320)	557±78.5 (429-648)	584, 820	269, 283	572	279±51.7 (207-325)	692, 731
Vagina: width	21.5-26.0	—	—	10.5, 12.0	—	12.5-15.0	—
length	11.5-13.0	—	—	23, 24.5	—	23.5-27.0	—
Vulva-ant.end	831±69.7 (703-926)	—	—	870, 926	—	817±108 (673-933)	—
Prerectum	92.2±12.3 (77.0-112)	173±18.8 (138-195)	195	75, 80	?	94.5, 110	225, 291
Rectum/Cloaca	39.1±3.6 (35.0-46.0)	10.3±3.1 (7.5-15.0)	15.0	32.0, 43.0	?	37.6±0.5 (37.0-38.0)	?
Tail	343±28.6 (293-380)	310±24.6 (266-340)	246, 250	166, 246	256	253, 373	196
Spicules	—	41.5-46.5	48.0, 50.0	—	41.5	—	55.0, 58.0
Lateral guiding piece	—	7.5-12.0	9.0, 10.0	—	12.0	—	12.0, 17.0
Vent. suppl.	—	16.0-21.0	18	—	20	—	19, 20
Spermatozoa	—	10.0-10.5	10.5	—	10.5	—	9.0, 10.5
Tail hyaline part	80.0-100	81.5-103	83	58	?	54.5-93.0	?

**Table 2 (continued).** Measurements and diagnostic features of *Prodorylaimus filiarum* Andr ssy, 1964 (all measurements in  $\mu\text{m}$  except L in mm).

Habitat	Stream bank		River bank		River bank		Stream bank	
Locality Province	Barrios de la Colina Burgos		Carde�a C�rdoba		Redondo-Are�os Valencia		P�rtugos Granada	
n	4 females	3 males	7 females	9 males	4 females	7 males	5 females	10 males
L	1.9 $\pm$ 0.1 (1.8-2.0)	1.7 $\pm$ 0.1 (1.7-1.8)	2.0 $\pm$ 0.1 (1.9-2.1)	1.9 $\pm$ 0.1 (1.7-2.1)	2.0 $\pm$ 0.1 (1.9-2.1)	2.0 $\pm$ 0.1 (1.9-2.2)	2.0 $\pm$ 0.1 (1.8-2.2)	2.0 $\pm$ 0.6 (1.9-2.1)
a	42.6 $\pm$ 2.7 (39.3-46.3)	44.3, 43.9	?	?	43.2 $\pm$ 0.9 (42.4-44.6)	43.6 $\pm$ 2.9 (38.1-48.1)	30.6 $\pm$ 1.3 (28.8-32.9)	37.8 $\pm$ 4.1 (33.5-45.1)
b	5.8 $\pm$ 0.3 (5.4-6.2)	5.6 $\pm$ 0.1 (5.5-5.7)	5.6 $\pm$ 2.2 (5.4-6.2)	5.7 $\pm$ 0.3 (5.2-6.1)	5.8 $\pm$ 0.2 (5.6-6.1)	5.7 $\pm$ 0.2 (5.4-6.1)	5.3 $\pm$ 0.2 (5.0-5.6)	5.6 $\pm$ 0.3 (5.2-6.1)
c	4.8, 4.8	5.5 $\pm$ 0.5 (5.0-6.3)	4.9 $\pm$ 0.3 (4.5-5.2)	5.1 $\pm$ 0.4 (4.8-6.1)	5.7 $\pm$ 0.2 (5.5-6.0)	5.4 $\pm$ 0.3 (4.5-5.5)	5.6 $\pm$ 0.2 (5.2-5.8)	7.4 $\pm$ 0.8 (6.3-8.9)
V	41.3 $\pm$ 3.0 (37.8-44.6)	—	42.2 $\pm$ 1.9 (39.5-45.2)	—	42.1 $\pm$ 1.3 (40.2-43.1)	—	40.5 $\pm$ 0.6 (40.1-41.7)	—
G1/T1	10.9 $\pm$ 1.8 (9.8-12.8)	53.5 $\pm$ 5.8 (45.8-60.1)	16.7 $\pm$ 1.3 (15.5-19.4)	54.5 $\pm$ 5.3 (43.5-62.0)	15.4 $\pm$ 0.1 (15.4-15.6)	51.5 $\pm$ 3.2 (47.5-54.9)	16.2 $\pm$ 0.9 (15.0-17.4)	?
G2/T2	11.7 $\pm$ 3.1 (7.4-14.5)	23.7 $\pm$ 2.8 (21.5-27.7)	17.1 $\pm$ 1.4 (15.0-17.9)	24.5 $\pm$ 2.1 (20.2-28.2)	15.8 $\pm$ 0.5 (15.2-16.4)	27.2 $\pm$ 1.5 (25.5-29.6)	17.4 $\pm$ 1.3 (15.1-18.8)	?
c'	15.5, 15.7	12.5 $\pm$ 1.2 (10.8-13.8)	15.1 $\pm$ 2.3 (12.0-18.4)	11.4 $\pm$ 1.5 (9.9-14.5)	13.8 $\pm$ 0.7 (12.8-14.6)	13.4 $\pm$ 0.5 (12.8-14.0)	13.0 $\pm$ 0.4 (12.5-13.5)	8.8 $\pm$ 1.3 (6.7-10.6)
Lip region: width	12.5	12.0-12.5	12.5-13.5	11.5-13.5	12.5-13.5	12.5-14.0	14.5-16.5	14.0-17.0
height	6.0-8.0	6.0-7.5	6.0-8.0	6.0-8.0	6.0-7.5	6.0-7.5	6.0-7.0	5.5-7.5
Amphid aperture	6.0-6.5	6.0-7.0	6.0-8.0	6.0-8.0	6.0-6.5	6.0-8.0	6.0-9.5	5.5-8.5
Odontostyle	19.8 $\pm$ 0.2 (19.5-20.0)	20.0 $\pm$ 0.4 (19.5-20.5)	20.6 $\pm$ 0.4 (20.0-21.5)	21.0 $\pm$ 0.4 (20.5-21.5)	20.7 $\pm$ 0.4 (20.5-21.5)	20.1 $\pm$ 0.5 (19.0-20.5)	22.6 $\pm$ 0.7 (21.5-23.0)	21.8 $\pm$ 0.7 (21.0-23.0)
Odontophore	17.5, 18.0	18.5 $\pm$ 0.7 (17.5-19.0)	28.8 $\pm$ 5.9 (20.5-33.0)	30.0, 31.5	17.5	18.0	31.7 $\pm$ 1.6 (29.0-34.0)	32.8 $\pm$ 0.9 (31.0-34.0)
Guiding ring	12.5-21.5	9.5	12.5-14.0	13.0-15.0	13.0-14.0	12.5-14.0	14.5-15.0	13.0-16.0
Nerve ring- ant. end	122 $\pm$ 3.3 (120-127)	124 $\pm$ 3.7 (120-129)	132 $\pm$ 3.7 (126-137)	136 $\pm$ 5.8 (131-142)	134 $\pm$ 5.3 (126-140)	124 $\pm$ 10.0 (110-135)	150 $\pm$ 12.7 (133-171)	144 $\pm$ 12.3 (124-159)
Neck length	322 $\pm$ 13.9 (306-340)	324 $\pm$ 9.4 (313-336)	348 $\pm$ 18.0 (320-373)	334 $\pm$ 108 (333-376)	347 $\pm$ 3.0 (346-353)	342 $\pm$ 9.8 (333-366)	350 $\pm$ 7.9 (342-363)	325 $\pm$ 17.6 (292-353)
Pharyngeal bulb length	133 $\pm$ 6.7 (129-145)	131 $\pm$ 2.8 (125-135)	149 $\pm$ 9.1 (140-162)	146 $\pm$ 6.9 (134-158)	140 $\pm$ 4.9 (134-147)	139 $\pm$ 5.7 (129-148)	172 $\pm$ 7.3 (160-181)	152 $\pm$ 6.9 (140-161)
Cardia : width	11.0-12.5	11.0-15.0	12.5-17.0	10.0-20.5	12.5-15.5	11.0-14.0	?	?
length	12.0-15.5	14.0-17.0	6.0-18.0	6.0-14.0	14.0-20.5	12.5-19.0	?	?
Cuticle: head	1.5	1.5	1.5	1.5	1.5	1.5	1.5-3.0	1.5-3.0
midbody	1.5	1.5	1.5	1.5	1.5	1.5	1.5-3.0	1.5-3.0
anus	2.0-3.0	2.5	2.0-3.0	1.5-2.5	2.5	2.0-2.5	2.5-4.0	1.5-4.0
Width:neck base	38.0-47.5	39.5-53.5	57.5-71.0	57.0-64.5	45.5-47.5	41.0-53.5	?	?
midbody	39.5-45.5	38.5-52.0	58.5-63.0	52.0-68.0	45.5-47.5	39.5-50.5	61.0-66.5	43.5-62.5
anus	23.5-25.0	25.0-27.0	25.0-31.0	27.0-36.0	25.0-26.0	26.5-28.5	61.0-66.5	27.5-32.5
Lateral chord	11.0-13.5	9.5, 12.5	15.0-23.5	9.5-15.5	12.5-14.0	11.0-15.0	18.0-24.0	11.5-21.5
Anterior ovary/ testes	83.1 $\pm$ 4.8 (79.0-90.0)	281 $\pm$ 90.7 (162-382)	201 $\pm$ 41.2 (128-267)	286 $\pm$ 89.1 (113-458)	126 $\pm$ 24.2 (101-164)	241 $\pm$ 33.0 (194-290)	?	?
Anterior genital branch	221 $\pm$ 31.2 (173-260)	981 $\pm$ 133 (803-1122)	341 $\pm$ 22.8 (323-394)	1069 $\pm$ 141 (844-1298)	305 $\pm$ 18.8 (279-331)	1035 $\pm$ 74.5 (939-1132)	323 $\pm$ 22.1 (282-344)	?
Posterior ovary/ testes	98.6 $\pm$ 5.9 (94.5-107)	266 $\pm$ 79.7 (154-328)	216 $\pm$ 29.8 (192-273)	303 $\pm$ 78.4 (197-446)	148 $\pm$ 9.6 (139-164)	213 $\pm$ 27.1 (178-243)	?	?
Post. genital branch	238 $\pm$ 52.9 (151-282)	433 $\pm$ 37.9 (402-487)	342 $\pm$ 30.1 (293-364)	479 $\pm$ 34.7 (422-538)	319 $\pm$ 4.7 (320-324)	547 $\pm$ 39.6 (501-610)	345 $\pm$ 16.1 (330-374)	?
Vagina: width	12.5-15.0	—	15.0-22.0	—	11.0-13.5	—	?	—
length	21.5-23.5	—	20.5-33.0	—	22.0-26.0	—	30.5-36.5	—
Vulva-ant.end	771 $\pm$ 75.8 (693-893)	—	861 $\pm$ 45.5 (813-940)	—	871 $\pm$ 329 (840-926)	—	805 $\pm$ 46.7 (753-891)	—
Prerectum	85.7 $\pm$ 8.8 (74.0-98.0)	98.0	107 $\pm$ 26.7 (77.0-147)	177, 184	101 $\pm$ 9.3 (91.5-114)	158 $\pm$ 9.7 (137-165)	87.7 $\pm$ 3.7 (81.6-92.0)	204 $\pm$ 30.5 (161-243)
Rectum/Cloaca	30.3 $\pm$ 2.2 (27.0-33.0)	12.3 $\pm$ 1.0 (11.0-13.5)	36.5 $\pm$ 2.9 (31.5-39.5)	15.9 $\pm$ 2.0 (12.5-19.0)	35.8 $\pm$ 1.0 (34.5-37.0)	15.7 $\pm$ 2.6 (11.0-20.5)	40.6 $\pm$ 16.8 (36.8-45.3)	41.2-43.5
Tail	366, 393	326 $\pm$ 23.6 (293-346)	413 $\pm$ 31.7 (373-460)	380 $\pm$ 30.8 (353-440)	350 $\pm$ 13.5 (333-366)	369 $\pm$ 16.2 (343-380)	356 $\pm$ 20.1 (318-375)	269 $\pm$ 29.5 (225-313)
Spicules	—	44.0-47.0	—	44.0-50.5	—	44.0-52.0	—	50.7-55.5
Lat.guiding piece	—	12.5, 14.0	—	11.0-13.5	—	12.5-15.5	—	7.5-10.5
Ventr. suppl.	—	17-22	—	15-18	—	17-22	—	17-22
Spermatozoa	—	8-12	—	9.5-14	—	9.5-14	—	6.5-10.5
Tail hyaline part	74.0-151	72.0-96.0	85.0-101	56.0-110	78, 85	73.5-105	?	?

Rectum length 1.5-2 times the anal body width. Tail filiform, tapering gradually from anus to the terminal tip; hyaline part one-fourth to one-third of the total length. Two pairs of caudal pores: one subdorsal, another ventral.

**Male.** General morphology similar to female but often with the posterior body region more curved ventrad. Reproductive system diorchic. Testes opposed. Spicules curved ventrad, 1.5-1.8 times as long as the anal body width. Lateral guiding pieces somewhat sigmoid and tapering at the end. In addition to the adanal pair, a series of 16-21 contiguous ventromedian supplements are present starting outside the spicules range. Prerectum 7-11 anal body widths long; its junction with the intestine always before the level of the most anterior supplement. Rectum short, joining the ejaculatory canal within the spicules range. Tail and caudal pores as in the female.

**Other specimens (two males) from the province of Jaén:**

A single male was collected in two localities. Their description and measurements correspond with the population from Sierra de Cazorla (see above).

**Population (two females and one male) from Archidona (province of Málaga):**

Specimens also conform with the population from Sierra de Cazorla.

**Population (seven females and nine males) from the province of Córdoba:**

Specimens closely resemble the preceding populations, although the odontostyle is somewhat longer (20.0-21.5 vs 16.0-19.0  $\mu\text{m}$ ), being 1.5-1.7 times the lip region width.

**Populations from the provinces of Burgos (four females and three males) and Palencia (four females and seven males):**

Similar to material from province of Córdoba.

**Two populations from Sierra Nevada (province of Granada): three females and two males from Capileira-Veleta; and five females and ten males from Pórtugos:**

In comparison with other populations they have a wider body (especially in females) at the neck base, midbody and anus. Lip region wider (14-17 vs 10.5-13.5  $\mu\text{m}$ ) and somewhat more angular and less setoff from the adjacent body. Longer odontostyle (21-23 vs 16-21.5  $\mu\text{m}$ ). Vulva probably longitudinal although it was not observed in frontal view. "Vulval papillae" present in all the females examined. Spicules longer (50.5-58.0 vs 44.0-52.0  $\mu\text{m}$ ), about twice

as long as the anal body width.

**Distribution.** The species has been found in several localities: i) near Tranco dam, Sierra de Cazorla, province of Jaén, in association with *Fraxinus angustifolia* Vahl. and *Populus alba* L.; ii) roadside Fuensanta to Valdepeñas de Jaén, near la Montesina, province of Jaén, in the rhizosphere of *Quercus rotundifolia* Lam.; iii) roadside Archidona to Villanueva del Trabuco, province of Málaga, in association with *Juglans regia* L., *Daphne gnidium* L., *Rubus* sp. and *Arundo donax* L.; iv) roadside Capileira to Veleta summit, Sierra Nevada, province of Granada, in the rhizosphere of *Scirpus holoschoenus* L. and unidentified moss; v) La Zubia, province of Granada, in association with *Salix* sp., *Hedera helix* L., ferns and moss; vi) Yeguas riverbank, Cardeña, province of Córdoba; vii) Valdefuentes streambank, Barrios de Colina, province of Burgos; and viii) Pisuerga riverbank, Sierra de Peña Labra, Redondo-Areños, province of Palencia.

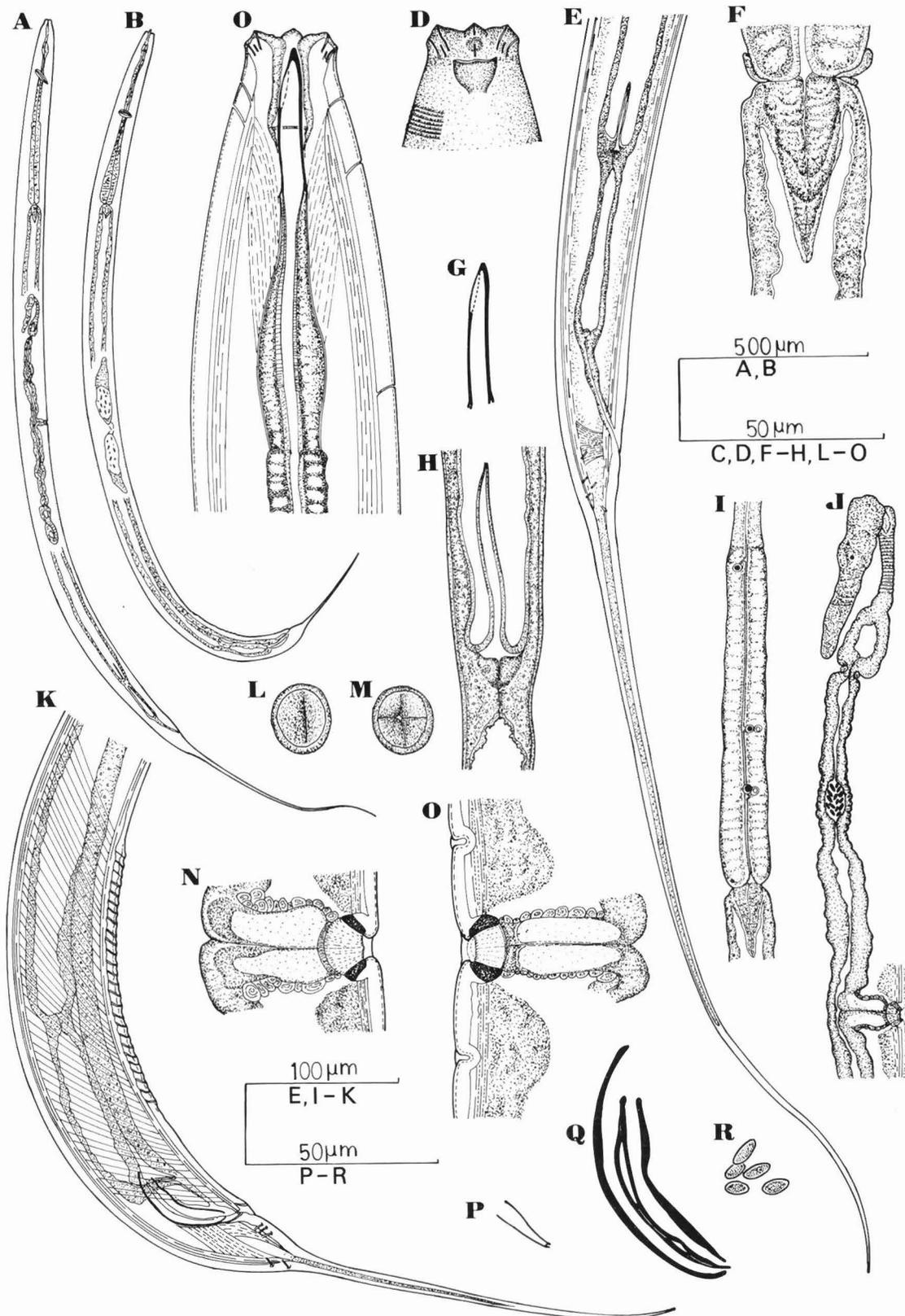
**Remarks.** *Prodorylaimus filiarum* presents an interesting intraspecific variability mainly affecting some important morphological features such as head width, odontostyle length, presence of "vulval papillae" and spicules length. It is possible that the two populations from the province of Granada are not conspecific with the others, but, in our opinion, the differences are not sufficient to propose a new taxon.

*Prodorylaimus longicaudatoides*

Altherr, 1968

(Figs. 3 & 4, Table 1)

**Female.** Relatively slender nematodes of large size, 2.4-2.9 mm long. Body cylindrical, tapering towards both extremities but more so towards the posterior end. Habitus after fixation somewhat curved ventrad, usually an open "C". Outer cuticle layer thin throughout the body. Inner cuticle layer wider than the outer layer and especially thickened at the level of the cervical and caudal regions. Dorsal and ventral pores clearly visible in the cervical region: two ventral and two dorsal pores within the range of the odontostyle but their position somewhat variable; 1-2 ventral and 1-2 dorsal pores are also usually present within the range of the odontophore. Lateral chord about one-third of the midbody width, of granular aspect. Lateral pores obscure. Lip region angular, set off by a depression, occasionally continuous; three times as wide as high and about one-third of the body width at neck base. Lips amalgamated, angular. Labial and cephalic papillae clearly visible, with obvious innervation. Amphid fovea cup-shaped, opening at the level of the cephalic depression and occupying half of the lip region width. Odontostyle



**Fig. 3.** *Prodorylaimus longicaudatoides* Altherr, 1968. A: Female entire; B: Male entire; C: Lip region in median view; D: Lip region in surface view; E: Female posterior body region. F: Cardia; G: Odontostyle; H: Intestine-prerectum junction; I: Pharyngeal bulb; J: Female anterior genital branch; K: Male posterior body region; L: Vulva in frontal view; M: Vagina in frontal view. N, O: Vagina; P: Lateral guiding piece; Q: Spicule; R: Spermatozoa.

rather robust, 6.5-9.0 times as long as wide; its length 1.4-1.8 lip region widths and its aperture about two-fifths (37-40%) of the total length. Odontophore rod-like, 1.2-1.5 times the odontostyle length. Guiding ring double. Pharynx consisting of a slender but clearly muscular anterior part which extends gradually into the basal bulb. Pharyngeal bulb cylindrical, sometimes somewhat thickened along its posterior third; about six times as long as wide, occupying almost half of the body diameter at the neck base and little more than two-fifths of the total neck length. Pharyngeal gland nuclei and outlets clearly visible in some specimens, as illustrated. Nerve ring located at 40-41% of the total neck length. Cardia conoid, as long as wide, and encompassed by intestinal tissue which forms a long conical projection into the intestinal lumen; it is apparently separated from the bulb base by a thin disc-like structure which extends and envelopes the end of the bulb base. Female genital system didelphic-amphidelphic. Ovaries rather short in the Tobía population, longer in the Pisuerga population; however, in both populations the ovaries usually reach the oviduct-uterus junction since the oviduct is also rather short, little less than twice the corresponding body width. The oviduct joins the ovary terminally and is comprised of a slender part with prismatic cells and a relatively long *pars dilatata* with visible lumen and containing encapsulated spermatozoa. Oviduct and uterus are separated by a marked narrowing whose inner part is slightly refractive being encircled by a weak muscular ring. Uterus a tube 2.5-3 times the corresponding body width; the section adjacent to the oviduct is narrower; about half way along its length a dilatation exists being surrounded by circular fibres, with the inner lining appearing somewhat refringent, and whose lumen is occupied by numerous and weakly refractive spindle-shaped structures; the section adjacent to the vagina appears as a wider tube with an obvious clear lumen. Vagina extending inwards to half or little more than the corresponding body width. *Pars proximalis vaginae* 22 x 14  $\mu\text{m}$ , about 1.5 times as wide; its walls almost straight with somewhat divergent proximal ends, and encircled by weak musculature. *Pars refringens vaginae* an apparently continuous sclerotization 16 (width) x 8 (length)  $\mu\text{m}$ , but it is possible to distinguish two small slender semicircular 6 x 2  $\mu\text{m}$  sclerotizations widely separated by a weaker sclerotized area. *Pars distalis vaginae* 7  $\mu\text{m}$  long. Vulva longitudinal. "Vulval papillae" present in several specimens: 0-2 anterior and 0-3 posterior. Prerectum 3-4.5 anal body widths long; its junction with intestine appears as a tongue-like projection which extends forwards, becoming visible only in some specimens. Rectum about 1.5 times the

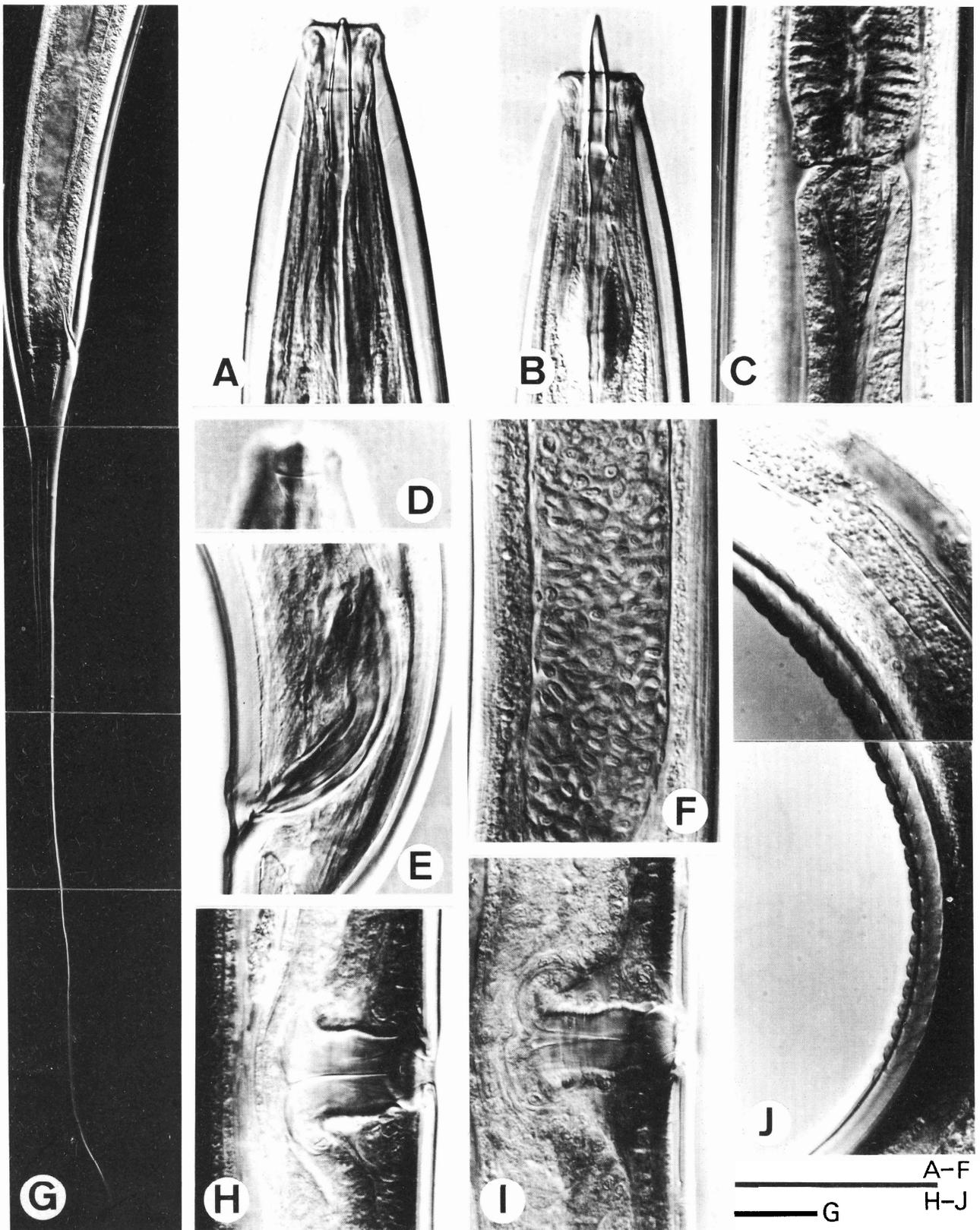
anal body width long. Tail very long, filiform, first tapering abruptly and then very gradually until the terminus; its hyaline part about one-third of the total length. Several pairs of caudal pores, as illustrated.

**Male.** General morphology similar to that of the female but the body is a little shorter and more curved ventrad in its posterior half. Genital system diorchic with opposite testes. Spicules relatively robust, somewhat curved ventrad and 1.6-1.7 times as long as the corresponding body width. Lateral guiding pieces tapering at the end, with bifurcated tip. In addition to the adanal pair a series of 20-27 ventromedian supplements is present beginning outside the spicules range. Prerectum 3-4 anal body widths long; its junction with the intestine at halfway of the ventromedian supplements range. Caudal pores as illustrated.

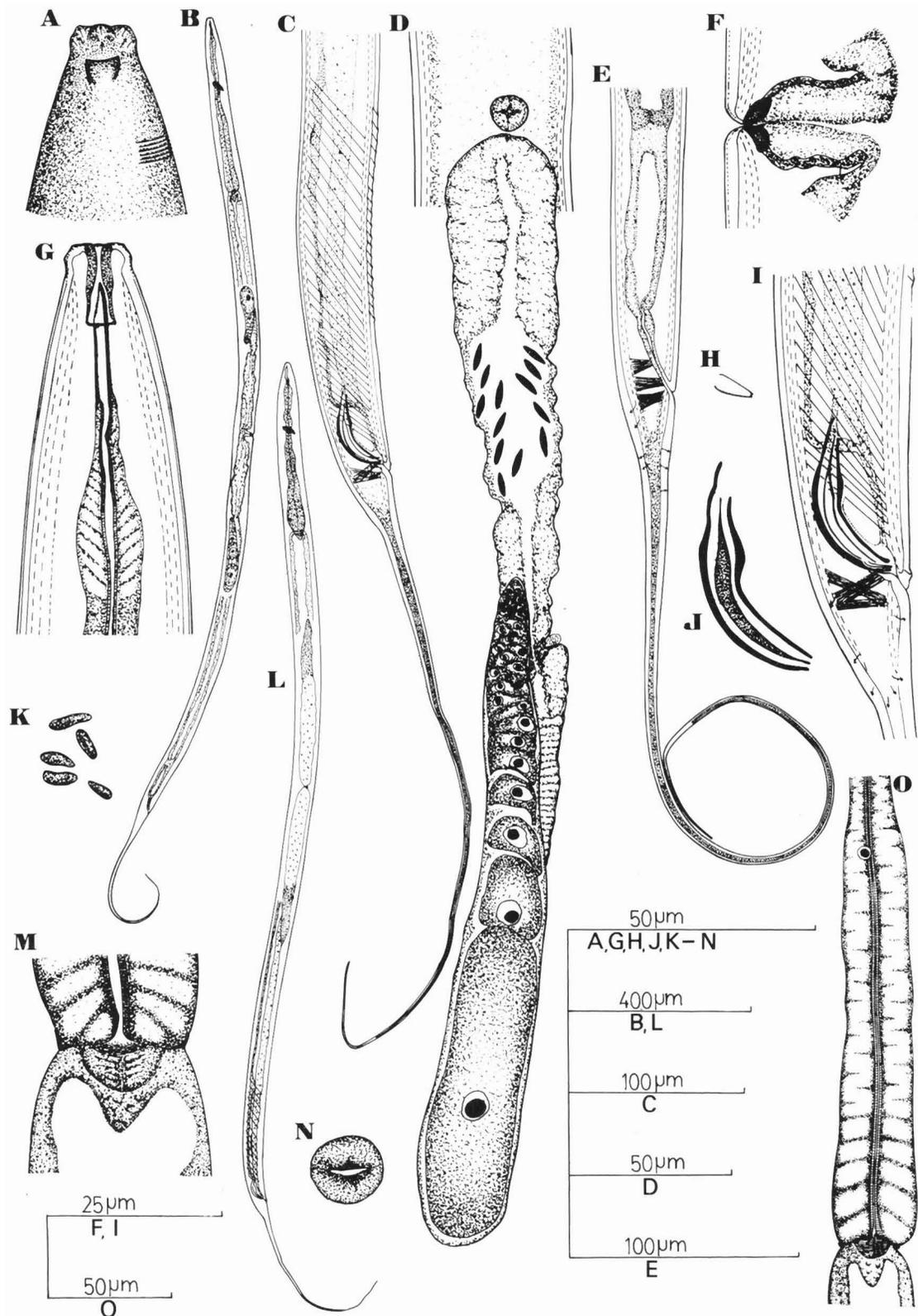
**Distribution.** *Prodorylaimus longicaudatoides* has been collected from two localities in Northern Spain: the rhizosphere of beech forest (*Fagus sylvatica* L.) with unidentified grass on the Tobía riverbank, Tobía, province of La Rioja; and associated with unidentified moss on the Pisuerga riverbank, Sierra de Peña Labra, Redondo-Areños, province of Palencia.

### *Prodorylaimus mas* Loof, 1985 (Fig. 5 & Table 1)

**Female.** Very slender nematodes of large size, 2.2-2.4 mm long. Body cylindrical, tapering towards both ends but more so towards the posterior extreme. Habitus after fixation practically straight or somewhat curved ventrad; tail very long and with different grade of curvature. Outer cuticle layer relatively thin along the body and with fine, obvious clear transverse striations. Inner cuticle layer wider than the outer one and thickened at the tail. Lateral chord occupying one-fourth to one-third of the midbody diameter, granular. Lateral pores obscure. Lip region truncate and slightly angular, practically continuous with the adjacent body or offset by a weak depression; 1.6-2.2 times as wide as high or two-ninth to two-seventh of the body width at neck base. Lips amalgamated. Labial and cephalic papillae visible, not prominent. Amphid fovea an elongated cup, opening at level of the cephalic depression and occupying half or little less than the lip region width. Cheilostome cylindrical, with rather thickened walls. Odontostyle 8-9 times as long as width, and 1.8-2.0 times the lip region width long; its aperture one-third to two-fifths of the total length. Odontophore rod-like, longer than the odontostyle. Guiding ring apparently double but often obscure. The pharynx consisting of a slender but muscular anterior part which extends very gradually into the pharyngeal bulb. Pharyngeal bulb



**Fig. 4.** Photomicrographs of *Prodorylaimus longicaudatoides* Altherr, 1968. A, B: Lip region in median view; C: Cardia; D: Lip region in surface view; E: Cloacal region; F: Testes; G: Female posterior body region; H, I: Vagina; J: Ventro-medial supplements.



**Fig. 5.** *Prodorylaimus mas* Loof, 1985. A: Lip region in surface view; B: Female entire; C: Male posterior body region; D: Female posterior genital branch; E: Female posterior body region. F: Vagina; G: Lip region in median view; H: Lateral guiding piece; I: Cloacal region; J: Spicule; K: Spermatozoa; L: Male entire; M: Cardia; N: Vulva in frontal view; O: Pharyngeal bulb.

cylindrical, slightly thickened at the basal portion where it occupies about three-fifths of the body width; it is about six times as long as wide, occupying 42-47% of the total neck length. Pharyngeal gland nuclei and outlets obscure in the specimens examined. Cardia conoid, wider than long and enveloped by intestinal tissue forming a conical projection which extends into the intestine lumen. Nerve ring located at 35-38% of the total neck length. Intestinal wall with a developed bacillary inner layer which is especially clear in its anterior portion. Genital system didelphic-amphidelphic. Ovaries rather big, often reaching and surpassing the oviduct-uterus junction; oocytes abundant, first located as two or more rows, then as a single row. The oviduct joins the ovary subterminally and consists of a slender part and a well developed *pars dilatata*. Sphincter present between oviduct and uterus. Uterus a simple tube about three times the corresponding body width long. Vagina extending inwards little less than half of the body diameter. *Pars proximalis vaginae* almost as long as wide, 13.5 x 12  $\mu\text{m}$  and with sigmoid walls, i. e., divergent at its proximal end and convergent at its distal end; surrounded by weak musculature. *Pars refringens vaginae* consisting of two moderately developed triangular and somewhat separated sclerotizations, measuring 4 x 2  $\mu\text{m}$ , and with a combined width of 9  $\mu\text{m}$ . *Pars distalis vaginae* very short, about 3  $\mu\text{m}$  long. Vulva a transverse slit. Prerectum 2-4 anal body widths long. Rectum little longer than the anal body width. Tail filiform and with variable curvature: from almost straight to clearly curved ventrad; tapering gradually to the terminal portion which is very fine, hair-like; hyaline part of the tail rather short, about one-seventh of the total length. Several pairs of caudal pores, as illustrated.

**Male.** General morphology is similar to that of the female. Genital system diorchic. Testes opposite. Spicules curved ventrad, 1.9-2.1 times the anal body width long. Lateral guiding pieces relatively short and stout, tapering at the end. Supplements as an adanal pair and a series of 16-18 contiguous ventromedian beginning outside the spicules range. Rectum short, joining the ejaculatory canal within the spicules range. Prerectum 5.0-7.5 anal body widths long. Tail filiform as in the female. Spermatozoa ovoid to

spindle-shaped. Caudal pores as illustrated.

**Distribution.** *Prodorylaimus mas* has only been collected from soil near the Poqueira riverbank, next to the road from Órgiva to Trevélez, province of Granada, associated with *Castanea sativa* Miller, *Ficus carica* L., *Rubus* sp., *Hedera helix* L. and ferns.

**Remarks.** Our description and measurements agree closely with those of the original population, except for the longer female tail (vs 292-366  $\mu\text{m}$ ,  $c=5.8-7.7$ ,  $c'=12.2-14.8$ ), shorter spicules (vs 55-58  $\mu\text{m}$ ) and fewer ventromedian supplements (vs 19-25). These differences are probably the result of intraspecific variability as the two populations, now known each to comprise only a relatively few specimens. This is only the second record of the species worldwide and represents the first occurrence of *P. mas* in Spain.

## ACKNOWLEDGEMENTS

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**Резюме.** В работе приводятся данные о представителях четырех ранее описанных видов рода, собранных главным образом в естественных ценозах юго-восточной Испании: *P. brigdammensis* (de Man, 1876) Goodey, 1963; *P. filiarum* Andrásy, 1964; *P. longicaudatoides* Altherr, 1968 и *P. mas* Loof, 1985. Даны описания видов, иллюстрации и таблицы измерений. *Prodorylaimus longicaudatoides* и *P. mas* отмечены на Иберийском полуострове впервые.