Journal of Nematology 35(3):233–243. 2003.

Nematodes of the Order Rhabditida from Andalucía Oriental, Spain. The Genera *Nothacrobeles* Allen & Noffsinger, 1971 and *Zeldia* Thorne, 1937

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Abstract: A new species of the genus *Nothacrobeles* is described from natural areas (a salt lake) in the Southeast Iberian Peninsula. *Nothacrobeles lanceolatus* sp. n. is characterized by its body length, two rows of cuticular punctations per annulus, labial probolae bifurcate with divergent prongs, pharyngeal corpus 2.4 to 3.5 times isthmus length, spermatheca length, postuterine sac 0.5 to 1.1 times the corresponding body diameter ratio, female tail conical and bearing a spindle-shaped or conical mucro with acute terminus, phasmid at 8 to 17 µm posterior to the anus, male tail conical with acute mucro, spicules length, and gubernaculum length. In addition, *Nothacrobeles* cf. *lunensis* and *Zeldia punctata* are studied. *Cervidellus capricornis* is transferred to genus *Nothacrobeles*. A key to species of *Nothacrobeles* is also provided.

Key words: cephalobs, description, key, morphology, *Nothacrobeles,* SEM, Spain, taxonomy, *Zeldia.*

The genera *Zeldia* Thorne, 1937 and *Nothacrobeles* Allen & Noffsinger, 1971 are two relatively unusual taxa. The first genus could be phylogenetically between the genera *Chiloplacus* Thorne, 1937 (those species having amalgamated lips two by two) and *Nothacrobeles,* while the second genus seems to be more related to *Acrobeles* von Linstow, 1877. The two genera had not been previously recorded from the Iberian Peninsula (Abolafia and Peña-Santiago, 2001). The present paper, belonging to a series of papers (Abolafia et al., 2002) on cephalobs from Andalucía Oriental, deals with one new and one known species of *Nothacrobeles* and one species of *Zeldia* collected in natural areas.

Materials and Methods

Soil samples were collected from more than 400 localities of the provinces of Almería, Granada, Jaén, and Málaga (Spain). Extraction of nematodes was performed with a modification of Flegg's (1967) method. Animals were killed by heat, fixed in 4% formaldehyde, and processed to anhydrous glycerol according to Siddiqi (1964). Measurements and rawings were obtained from specimens mounted in anhydrous glycerol. For scanning electron microscopy (SEM) studies fixed specimens were dehydrated in a graded ethanol series, critical point dried, sputter-coated with gold, and observed with a JEOL JSM-5800 microscope.

The terminology used for the parts of the stoma and spicule follows that of De Ley et al. (1995) and Nguyen and Smart (1993), respectively.

Systematics

Nothacrobeles lanceolatus sp n.
(Table 1, Figs. 1–4)

Type population (11 ♀ ♀, 3 ♂ ♂)
Female: Body cylindrical, 0.45–0.61 mm long. Habitus after fixation ventrally curved. Cuticle annulated, tessellated. Annuli 3–4 µm wide at midbody, with two rows of more or less distinct cuticular punctations. Lateral field occupying 14–22%, of the body diameter at midbody, with four incisures and a central line less distinct with light microscopy; under SEM it consists of two bigger external wings, each with a shallow central protrusion, both of them separated by an area with a small protrusion at the middle. Lip region bearing labial probolae 7–10 µm long, bifurcate at two-thirds of their length, with a prominent dentate basal ridge protruding toward the lips. Prongs divergent and bifurcate, bearing inner prong longer than outer one; each prong having four triangular tines at its inner margin and five at outer margin. Lips paired, dentate, with two or three rounded tines directed toward primary axils, and one apical long and slender tine and six or seven rounded tines directed anteriorly. Primary axils deep, bearing two guard processes. Secondary axils demarcated by the existence of a narrow incisure. Each radial ridge having one tooth-like process. Amphid opening elliptical. Stoma cephaloboid. Cheilostom with almost triangular rhabdia. Gymnostom narrower than cheilostom, and as wide as stegostom. Pharyngeal corpus slightly fusiform, 2.4–3.5 times as long as the isthmus. Pharyngeal corpus-isthmus junction well marked. Basal bulb spheroid, with well-developed valves. Cardia conoid, surrounded by intestinal tissue. Intestine with sphincter at 45–54 µm from intestine–rectum junction. Rectum 0.9–1.0 anal body width long. Nerve ring at 45–69% of neck length, surrounding the posterior part of pharyngeal corpus, near or at the isthmus. Excretory pore at 45–71% of neck length, at level of the posterior part of pharyngeal corpus or at isthmus, 28–32 annuli from lip region. Deirid at isthmus level, at 57–86% of neck length, 34–37 annuli from lip region, at isthmus level or at the anterior part of the basal bulb. The positions of nerve ring, excretory pore, and deirid are more anterior when the contraction of the body increases. Reproductive system monodelphic-prodelphic. Ovary directed posteriorly, outstretched. Oviduct short. Spermatheca well developed, slightly longer than the corresponding body diameter. Uterus well developed,

Received for publication 17 September 2002.
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This paper was edited by R. T. Robbins.

TABLE 1. Measurements (in µm) of *Nothacrobeles lanceolatus* sp. n. and *N.* cf. *lunensis* Shahina & De Ley, 1997.

Species	*N. lanceolatus*						*N.* cf. *lunensis*
Locality Province Habitat	Salinas de Cabo de Gata Almería *Sarcocornia fruticosa*			Isleta del Moro Almería *Lygeum spartum*	Sierra de Almijara Granada *Rosmarinus officinalis*		Sierra de Huétor Granada *Cistus* sp.
n	Holotype ♀	Paratypes 10 ♀ ♀	Paratypes 3 ♂ ♂	♀	♀	♂	♀
Body length	504	560.0 ± 51.5 (447–603)	552.3 ± 30.4 (530–587)	457	480	334	524
a	17.4	18.1 ± 2.0 (14.4–21.3)	19.0 ± 0.2 (18.9–19.3)	18.3	17.8	14.2	17.5
b	3.9	4.0 ± 0.3 (3.2–4.4)	4.1 ± 0.1 (4.0–4.3)	4.4	4.0	2.8	4.1
c	10.3	10.9 ± 0.7 (9.5–11.8)	11.8 ± 0.5 (11.3–12.3)	10.9	9.8	8.6	13.1
c′	2.2	2.3 ± 0.1 (2.2–2.5)	2.2 ± 0.1 (2.0–2.2)	2.3	2.7	2.1	2.1
V/T	62	61.5 ± 2.6 (56–65)	52.1 ± 3.2 (50–56)	65	64	75	62
Labial probolae length	8	8.4 ± 0.8 (7–10)	8.0 ± 0.0 (8)	8	8	8	4
Lip region width	14	14.9 ± 0.8 (14–16)	13.0 ± 1.7 (11–14)	13	14	12	14
Stoma length	11	12.4 ± 1.4 (10–14)	12.0 ± 1.0 (11–13)	10	11	11	7
Pharyngeal corpus length	73	76.6 ± 4.4 (68–81)	72.3 ± 0.6 (72–73)	55	59	63	58
Isthmus length	23	26.9 ± 3.2 (22–32)	27.0 ± 2.6 (25–30)	21	21	25	36
Bulb length	22	23.7 ± 0.8 (22–25)	23.0 ± 1.0 (22–24)	20	21	20	24
Pharynx length	129	139.8 ± 5.2 (132–147)	134.3 ± 3.2 (132–138)	104	120	119	127
Nerve ring—anterior end	77	76.1 ± 12.9 (61–98)	88.3 ± 6.8 (83–96)	61	67	70	92
Excretory pore—anterior end	73	78.1 ± 14.6 (61–101)	87.5 ± 14.8 (77–98)	82	65	75	94
Deirid—anterior end	78	96.3 ± 16.5 (77–122)	98.3 ± 11.4 (89–111)	93	82	86	109
Annuli width	3	3.2 ± 0.4 (3–4)	3.0 ± 0.0 (3)	3	3	3	3
Cuticle thickness	2	2.0 ± 0.2 (2–2)	2.0 ± 0.0 (2)	2	2	3	3
Body width:							
Neck base	30	31.0 ± 3.9 (22–34)	28.7 ± 0.6 (28–29)	25	25	24	28
Midbody	29	31.0 ± 1.8 (28–34)	29.0 ± 1.7 (28–31)	25	27	24	30
Anus	22	22.0 ± 1.1 (21–24)	21.7 ± 2.1 (20–24)	18	18	19	19
Lateral field width	5	6.0 ± 0.9 (4–7)	6.0 ± 0.0 (6)	?	5	5	4
Vagina length	8	9.3 ± 1.3 (8–11)	—	?	8	—	10
Ovary/testis length	123	134.5 ± 26.8 (97–177)	62.7 ± 6.0 (57–69)	91	83	61	133
Spermatheca length	36	36.3 ± 8.7 (25–46)	—	?	20	—	48
Uterus/genital branch length	49	69.7 ± 8.1 (57–81)	296.7 ± 29.7 (264–322)	71	90	105	65
Postuterine sac length	27	27.1 ± 3.2 (23–32)	—	?	14	—	52
Rectum length	18	19.9 ± 1.5 (18–22)	—	16	18	—	19
Tail length	49	51.2 ± 3.2 (47–56)	46.7 ± 2.5 (44–49)	42	49	39	40
Vulva–anterior end	312	345.0 ± 40.1 (249–384)	287.3 ± 15.8 (270–301)	296	308	252	326
Phasmid–anus distance	9	13.6 ± 2.8 (8–17)	14.3 ± 1.5 (13–16)	?	14	18	16
Vulva–anus/tail length	2.9	3.2 ± 0.2 (2.9–3.6)	4.7 ± 0.3 (4.4–5.0)	2.8	2.5	1.1	4.0
Spicules length	—	—	28.3 ± 1.2 (27–29)	—	—	33	—
Gubernaculum length	—	—	16.3 ± 1.2 (15–17)	—	—	15	—

— = structure not present.
? = not observed.

about two times the body diameter long, differentiated in a tubular proximal part and a swollen distal one. Postuterine sac 0.7–1.1 times the corresponding body diameter long. Vaginal distal part very thick, almost quadrangular in longitudinal section (only one specimen with sunken vulva). Tail conical, with thicker cuticle anterior to the mucro, latter spindle-shaped or conical, with more or less acute terminus. Phasmid at 16–34% of tail length.

Male: General morphology similar to female but the habitus is more ventrally curved posteriorly. Body 0.53–0.59 µm long. Genital system monorchic, with testis reflexed ventrally anteriorly. Tail conical, ventrally curved terminating in an acute mucro. Phasmid at 28–33% of tail length. Caudal papillae five pairs, two anterior to phasmid (one lateral and one subventral) and three near the tail tip (one subdorsal, one lateral, and one subventral). Spicules ventrally curved; manubrium rounded; calamus cylindrical; lamina swollen near calamus. Gubernaculum ventrally bent anteriorly.

Other material examined (2 ♀ ♀, 1 ♂ from two localities, see Table 1)

Very similar to type population in their general morphology, though the male from Sierra de Almijara is smaller.

Type locality and habitat

Salinas de Cabo de Gata, Cabo de Gata Natural Park (province of Almería), in volcanic sandy soil, in association with *Sarcocornia fruticosa* (L.) Scott., *Urginea maritima* (L.) Baker, and *Lygeum spartum* L., near salt mine.

Other localities and habitats

This species has been collected in three additional localities in the region: two in Cabo de Gata-Níjar Natu-

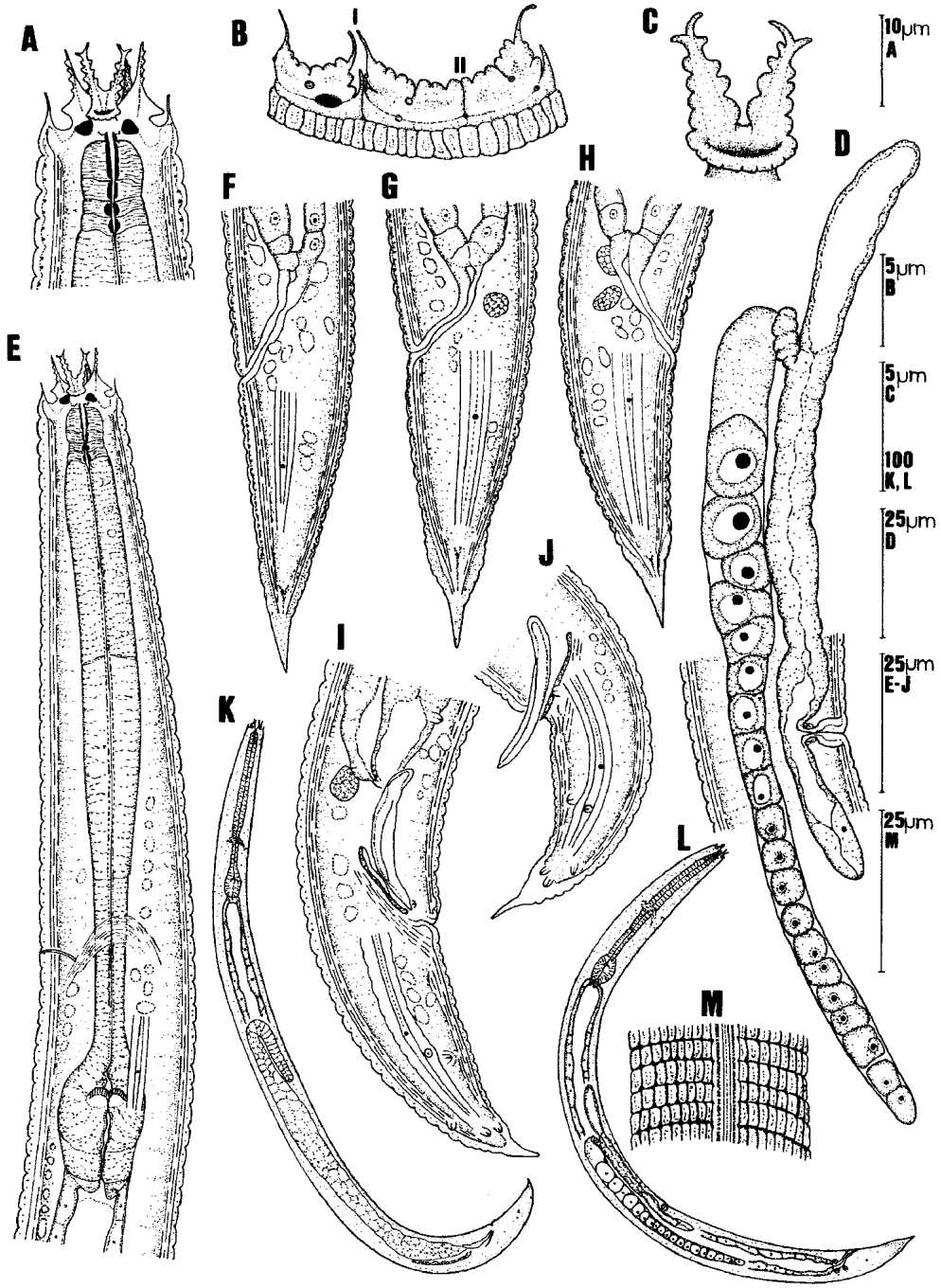

FIG. 1. *Nothacrobeles lanceolatus* sp. n. (Type population). A) Anterior end. B) Lips (I—Primary axil, II—Secondary axil). C) Labial probola. D) Female reproductive system. E) Neck. F–H) Female posterior end. I, J) Male posterior end. K) Entire male. L) Entire female. M) Cuticle at midbody.

ral Park (province of Almería), in soil with bank bush and in association with *Lygeum spartum* L., respectively; and near the road to Fornés, Sierra de Almijara (province of Granada) near Los Bermejales Dam, in association with *Rosmarinus officinalis* L.

Type specimens

Nine females (holotype and paratypes) and three males (paratypes) deposited in Departamento de Biología Animal, Universidad de Jaén, Spain; one paratype female deposited in the nematode collection of the Swedish Museum of Natural History, Stockholm (Sweden); and one paratype female deposited in the nematode collection of the Department of Nematology, University of California, Riverside.

Etymology

The specific epithet derives from the latin word *lanceolatus* (shaped like a spearhead) and refers to the female tail terminus shape.

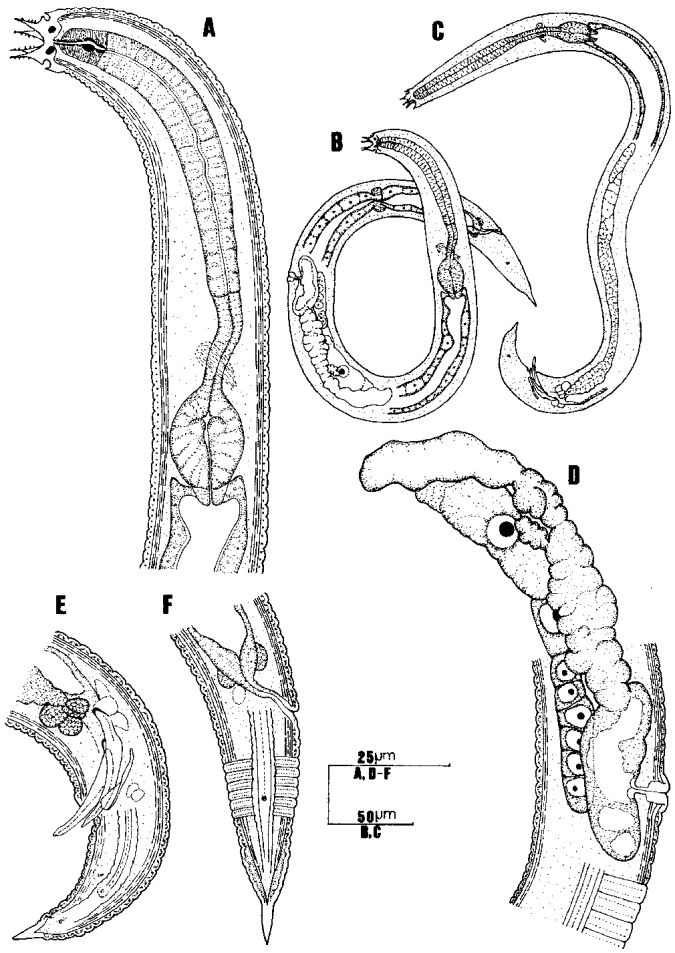

FIG. 2. *Nothacrobeles lanceolatus* sp. n.—Sierra de Almijara population. A) Neck region. B) Entire female. C) Entire male. D) Female reproductive system. E) Male posterior end. F) Female posterior end.

Diagnosis

Nothacrobeles lanceolatus sp. n. is characterized by its short body length (447–603 µm in females and 334–587 µm in males); two rows of cuticular punctations per annulus; bifurcate labial probolae (7–10 µm) and with divergent prongs; pharyngeal corpus 2.4–3.5 times isthmus length; spermatheca 20–46 µm long; postuterine sac length 0.5–1.1 times the corresponding body diameter; female tail conical (42–56 µm, c = 9.5–11.8, c′ = 2.2–2.7) and ending in a spindle-shaped or conical mucro with acute terminus; phasmid at 8–18% of tail length, male tail conical (39–49 µm, c = 8.6–12.3, c′ = 2.0–2.2) with acute mucro; spicules 27–33 µm long; and gubernaculum 15–17 µm long.

Relationships

The new species resembles *N. lepidus* Allen & Noffsinger, 1971; *N. maximus* Allen & Noffsinger, 1971; *N. prominens* (Andrássy, 1964) Andrássy, 1984; and *N. sheri* Allen & Noffsinger, 1971. From *N. lepidus* it is distinguished by having two rows of cuticular punctations (vs. without punctations), and female tail shape (vs. conical without distinct mucro). From *N. maximus* it differs by its smaller body (447–603 µm vs. 640–870 µm in females) and longer labial probolae (7–10 µm vs. 5 µm). From *N. prominens* in its smaller body (447–603 µm in females and 334–587 µm in males vs. 600–780 µm in females and 750 µm in males), tessellated cuticle (vs. undivided annuli), divergent prongs (vs. almost parallel), lateral field with four incisures (vs. three incisures), and female tail of different morphology. From *N. sheri* it can be distinguished by having a smaller body (447–603 µm vs. 670–900 µm in females), annuli with two rows of cuticular punctations (vs. three rows), shorter postuterine sac (14–32 µm vs. 54–78 µm), and female tail with conical or spindle-shaped distinct mucro (vs. tail conical as far as acute terminus).

Nothacrobeles cf. *lunensis* Shahina & De Ley, 1997
(Table 1, Fig. 5)

Female: Body length 0.52 µm. Habitus slightly ventrally curved after fixation. Cuticle double; annuli lacking punctations. Lateral field occupying 13% of the midbody diameter, with three incisures forming two areolated wings. Labial probolae short, 4 µm long, bifurcate, and bearing triangular tines. Primary and sec-

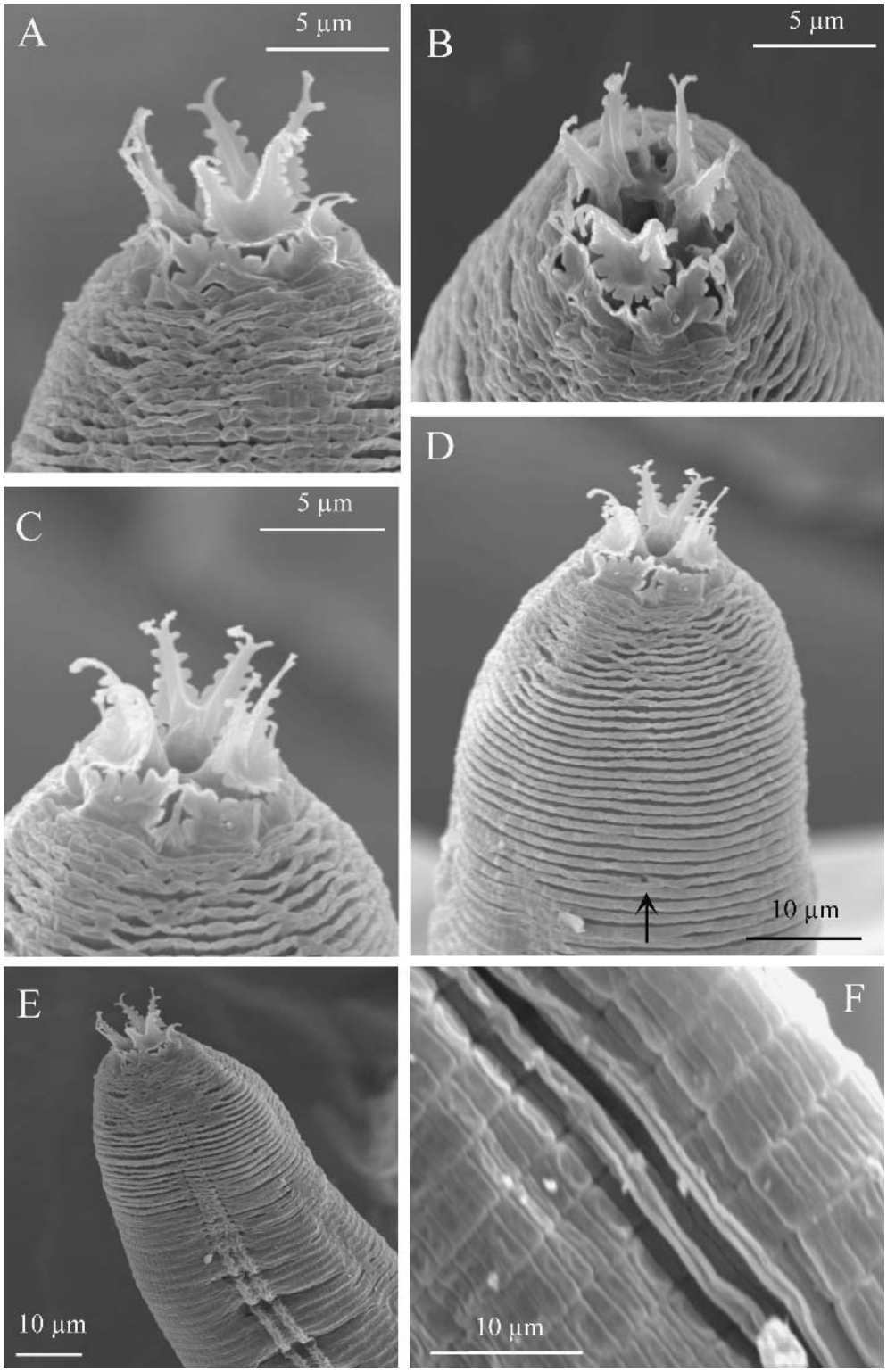

FIG. 3. *Nothacrobeles lanceolatus* sp. n. (SEM). A–C) Lip region: A) Lateral view; B) Dorsoventral view; C) Subdorsal view. D) Anterior end (arrow points at excretory pore). E) Anterior end. F) Lateral field.

ondary axils deep, with primary ones showing an open "U" shape and secondary ones a closed "U" shape. Stoma cephaloboid. Cheilostom with small spheroid rhabdia. Pharyngeal corpus cylindrical, 1.6 times as long as isthmus. Basal bulb ovoid, with strongly developed valves at its anterior part. Cardia conoid, surrounded by intestinal tissue. Intestine without specialization. Rectum as long as anal body width, with three rectal glands. Nerve ring at 72% of neck length, surrounding the distal part of isthmus. Excretory pore at

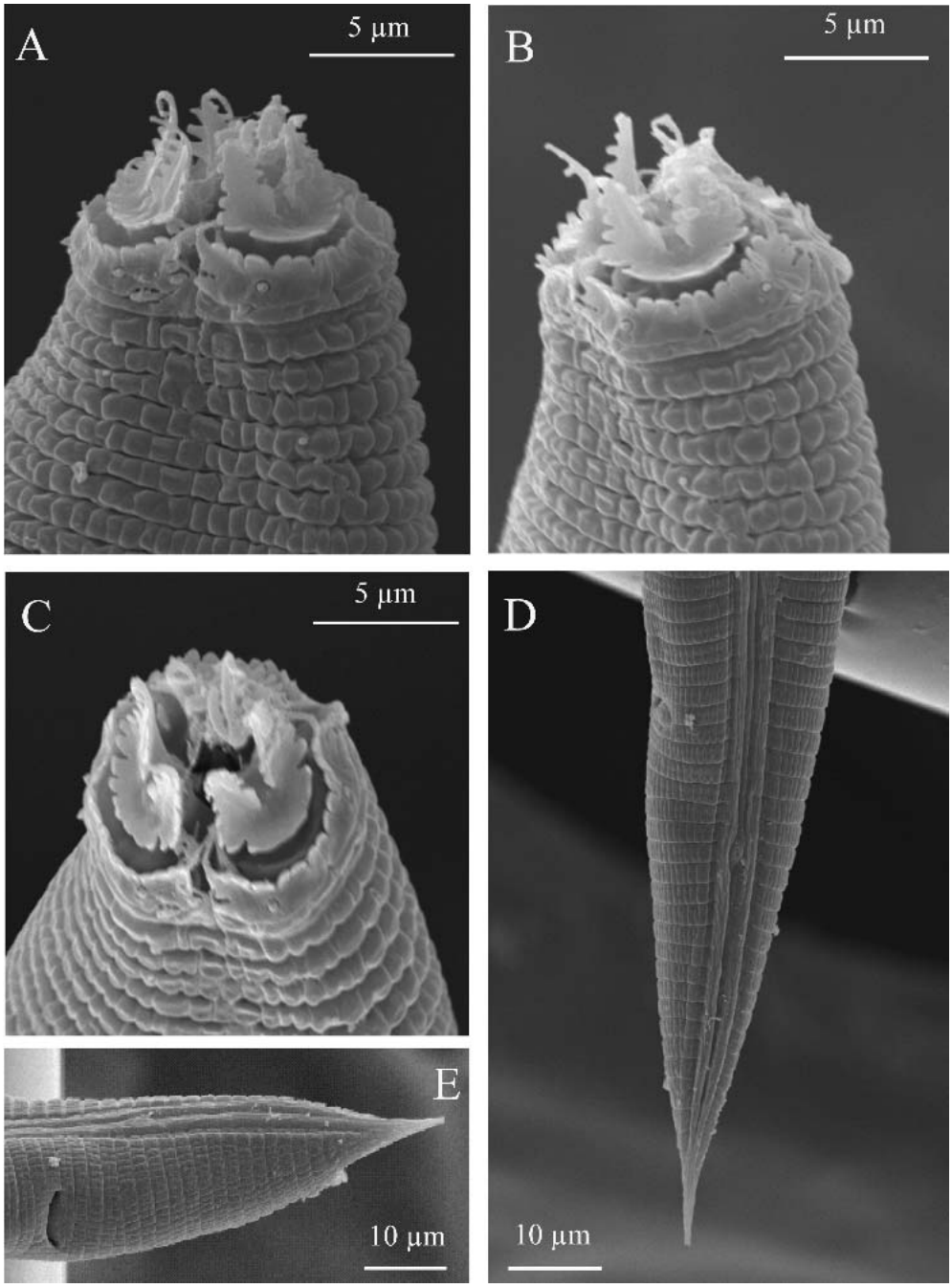

FIG. 4. *Nothacrobeles lanceolatus* sp. n. (SEM). A–C) Lip region: A) Subdorsal view; B) Dorsal view; C) Dorsoventral view. D, E) Female tail.

level of isthmus, at 74% of neck length, or 40 annuli from anterior end. Deirid at 86% of neck length, or 45 annuli from anterior end. Reproductive system monodelphic-prodelphic. Ovary short, with oocytes arranged in a single row. Oviduct short. Spermatheca swollen, length 1.5 times the corresponding body diameter long. Uterus tubular, distal part having thin walls. Post-uterine sac well developed, length 1.7 times the corresponding body diameter. Vaginal distal part slightly swollen. Tail conical, straight on ventral side, with 20 annuli and rounded tip. Phasmid at 40% of tail length.

Male: Unknown.

Distribution

The only specimen examined was collected near a rural road to Guarda-Lobos, Sierra de Huétor Natural Park (province of Granada), in the rhizosphere of *Pinus* sp. and *Cistus* sp.

Remarks

The female examined resembles *N. lunensis* Shahina & De Ley, 1997 but shows some remarkable differences

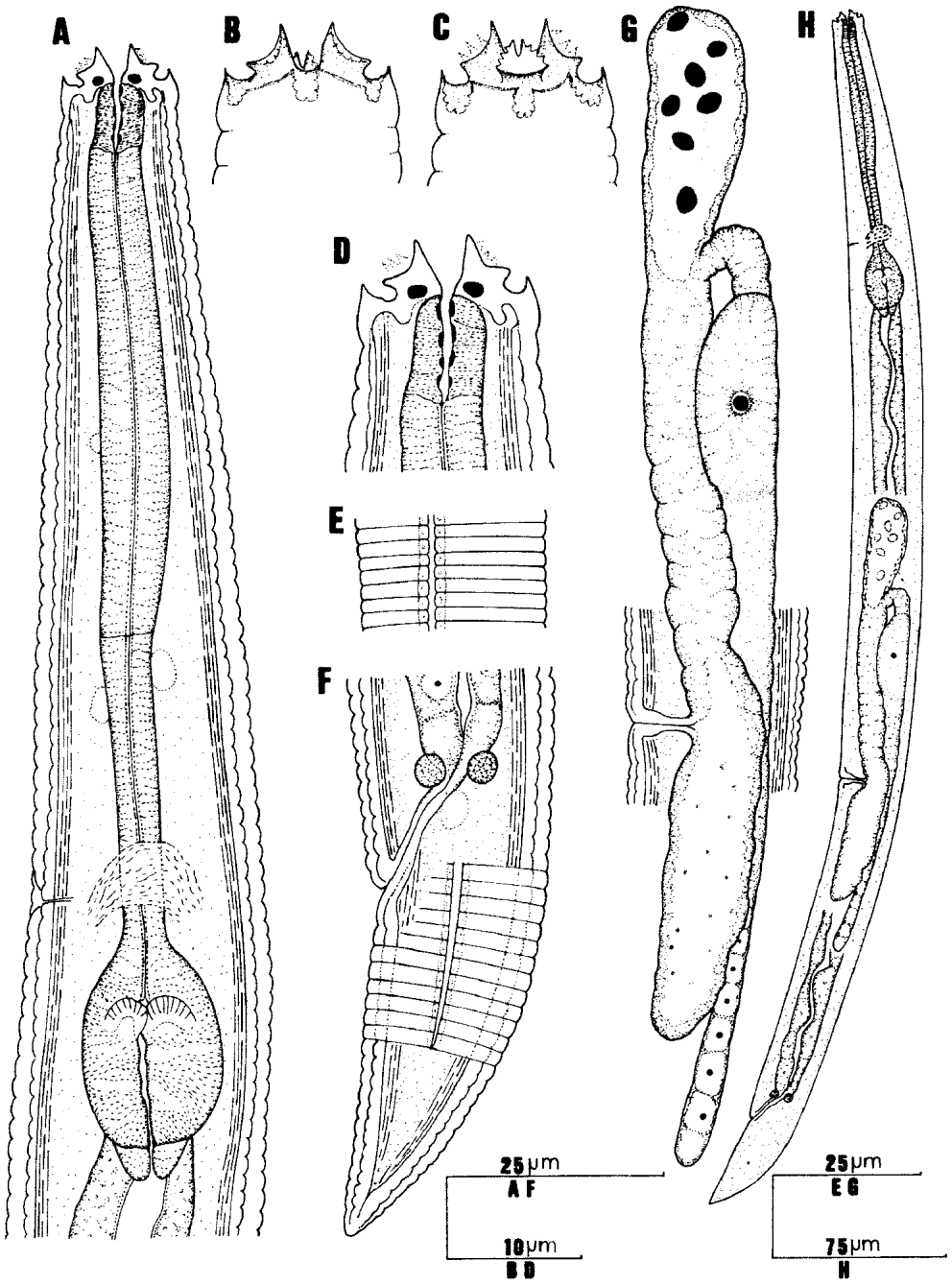

FIG. 5. *Nothacrobeles* cf. *lunensis* Shahina & De Ley, 1997 (female). A) Neck region. B, C) Lip region. D) Anterior end. E) Lateral field. F) Posterior end. G) Reproductive system. H) Entire female.

regarding labial probolae length (4.0 vs. 2.0–2.5 µm) and position of nerve ring, excretory pore, deirid, which are more posterior (72%, 74%, 86% vs. 44–57%, 50–66%, 61–76% of neck length, respectively). Thus, some doubts remain on the precise identity of this specimen.

Zeldia punctata (Thorne, 1925) Thorne, 1937
(Table 2, Fig. 6)

Female: Body length 629–821 µm. Habitus almost straight after fixation. Cuticle clearly annulated; annuli 2 µm wide at midbody. Lateral field not observed. Lip margin dentated, bearing longer tines along primary axils. Primary axils deep, with a single long guarding process. Labial probolae 4–5 µm long, bifurcate, and with short prongs. Stoma cephaloboid. Cheilostom with rounded rhabdia. Stegostom with prorhabdia thicker than other rhabdia. Pharyngeal corpus cylindrical, 6.9–7.6 times isthmus length. Isthmus shorter than basal bulb. Basal bulb ovoid, with valves at its middle or slightly anterior. Cardia conoid, surrounded by intestinal tissue. Intestine without specializations. Rectum 1.4

TABLE 2. Measurements (in µm) of *Zeldia punctaa* (Thorne, 1925) Thorne, 1937.

Locality	Sierras de Andújar	Salinas de Cabo de Gata
Province	Jaén	Almería
Habitat	Bulrush	*Sarcocornia fruticosa*
n	2♀♀	2♀♀
Body length	764, 821	691, 629
a	20.1, ?	18.7, 18.5
b	3.7, 3.9	3.2, 3.1
c	20.1, 20.5	18.7, 17.5
c′	1.9, ?	1.6, 1.6
V	65, ?	65, 64
Labial probolae length	4, 5	4, 4
Lip region width	11, 12	12, 11
Stoma length	13, 13	15, 11
Pharyngeal corpus length	146, 144	152, 149
Isthmus length	20, 19	22, ?
Bulb length	28, 28	27, 26
Pharynx length	208, 213	216, 202
Nerve ring—anterior end	131, 116	110, ?
Excretory pore—anterior end	127, ?	86, ?
Deirid—anterior end	?	112, ?
Annuli width	2, 2	3, 2
Cuticle thickness	2, 2	2, 2
Body width:		
Neck base	35, ?	39, 30
Midbody	38, ?	37, 34
Anus	20, ?	23, 22
Lateral field width	12, ?	6, 6
Vagina length	?	8, ?
Ovary length	123, 97	144, ?
Spermatheca length	?	37, ?
Uterus length	?	103, ?
Postuterine sac length	?	10, ?
Rectum length	28, ?	25, 24
Tail length	38, 40	37, 36
Vulva–arterior end	499, ?	452, 405
Phasmid–anus distance	10, 10	12, 12
Vulva–anus/tail	6.0, ?	5.5, 5.2

? = not observed.

times anal body width long. Nerve ring at 51–63% of neck length, surrounding the distal part of pharyngeal corpus. Excretory pore at 40–61% of neck length, 52–56 annuli from anterior end, anterior to hemizonid. Deirid at 52% of neck length. Reproductive system monodelphic-prodelphic. Ovary without flexures posterior to vulva. Spermatheca scarcely developed. Uterus tubular. Postuterine sac short. Distal part of the vagina with thick walls. Tail conical, with 20–21 annuli, and acute terminus. Phasmid at 25, 26% of tail length.

Male: Unknown.

Distribution

This species has been found in two localities: (i) Sierras de Andújar Natural Park (province of Jaén), in the rhizosphere of bulrush near Jándula river; and (ii) Salinas de Cabo de Gata, Cabo de Gata-Níjar Natural Park (province of Almería), in volcanic sandy soil, in association with *Sarcocornia fruticosa* (L.) Scott.

Diagnosis

Zeldia punctata is characterized by its body length (629–821 µm long in females), labial probolae bifurcate (4–5 µm long), pharyngeal corpus 6.9–7.6 times isthmus length, nerve ring and excretory pore at level of anterior part of metacorpus, spermatheca 37 µm long ($n = 1$), postuterine sac 10 µm long ($n = 1$), and female tail conical (36–40 µm, c = 17.5–20.5, c′ = 1.6–1.9) with acute terminus.

Remarks

The material examined fits well with the description of Thorne, 1925, redescription of Allen and Noffsinger (1972), and other descriptions, but some differences have been observed. Andrássy (1967) studied one female (as *Z. paucipunctata* Andrássy, 1967) with a shorter body (629–821 µm vs. 520 µm). From the material described by De Bruin and Heyns (1993), it is separated by its longer body (629–821 µm vs. 570–690 µm) and less slender tail (c′ = 1.6–1.9 vs. c′ = 2.2–3.1). The specimens examined by De Ley et al. (1990) have a shorter body (629–821 µm vs. 598–743 µm), shorter pharyngeal corpus (144–152 µm vs. 153–171 µm), and longer rectum (24–28 µm vs. 21–23 µm). From the material examined by Rashid et al. (1985), it differs in the longer body (629–821 µm vs. 650–780 µm). Tahseen et al. (1999) described a population with a longer body (790–914 µm) but shorter stoma (11–15 µm vs. 16–18 µm), pharynx (202–213 µm vs. 213–238 µm), and tail (36–40 µm, c = 17.5–20.5, c′ = 1.6–1.9 vs. 48–63 µm, c = 13.0–17.0, c′ = 2.0–3.0).

This is the first record of the species in Spain. Previously, this species was recorded in Brazil (Rashid et al., 1985), Crete/Greece (Boström, 1992), Botswana (De Bruin and Heyns, 1993), Namibia (Rashid and Heyns, 1990), Senegal (De Ley et al., 1990), India (Tahseen et al., 1999), and Pakistan (Tabassum and Shahina, 2002). For previous findings see Andrássy (1984).

List and Key to Species of Genus *Nothacrobeles*

Allen and Noffsinger (1971) erected the new genus *Nothacrobeles* including four new species and one previously known. Practically speaking, the taxonomy of this taxon did not change for more than two decades, but at the end of the 1990s Shahina and De Ley (1997) and De Ley et al. (1999) described new species and emended its diagnosis. Recently, Holovachov et al. (2001) described the new species *Cervidellus capricornis* Holovachov, Boström, Susulovsky & Nevo, 2001 that have features intermediate between the genera *Cervidellus* and *Nothacrobeles* but with some features more similar to species of *Nothacrobeles* (labial probolae with more or less-developed basal wing, prongs with or without tines, low [not acute] lips with dentate margin bearing short or long tines, primary axils with two guard pro-

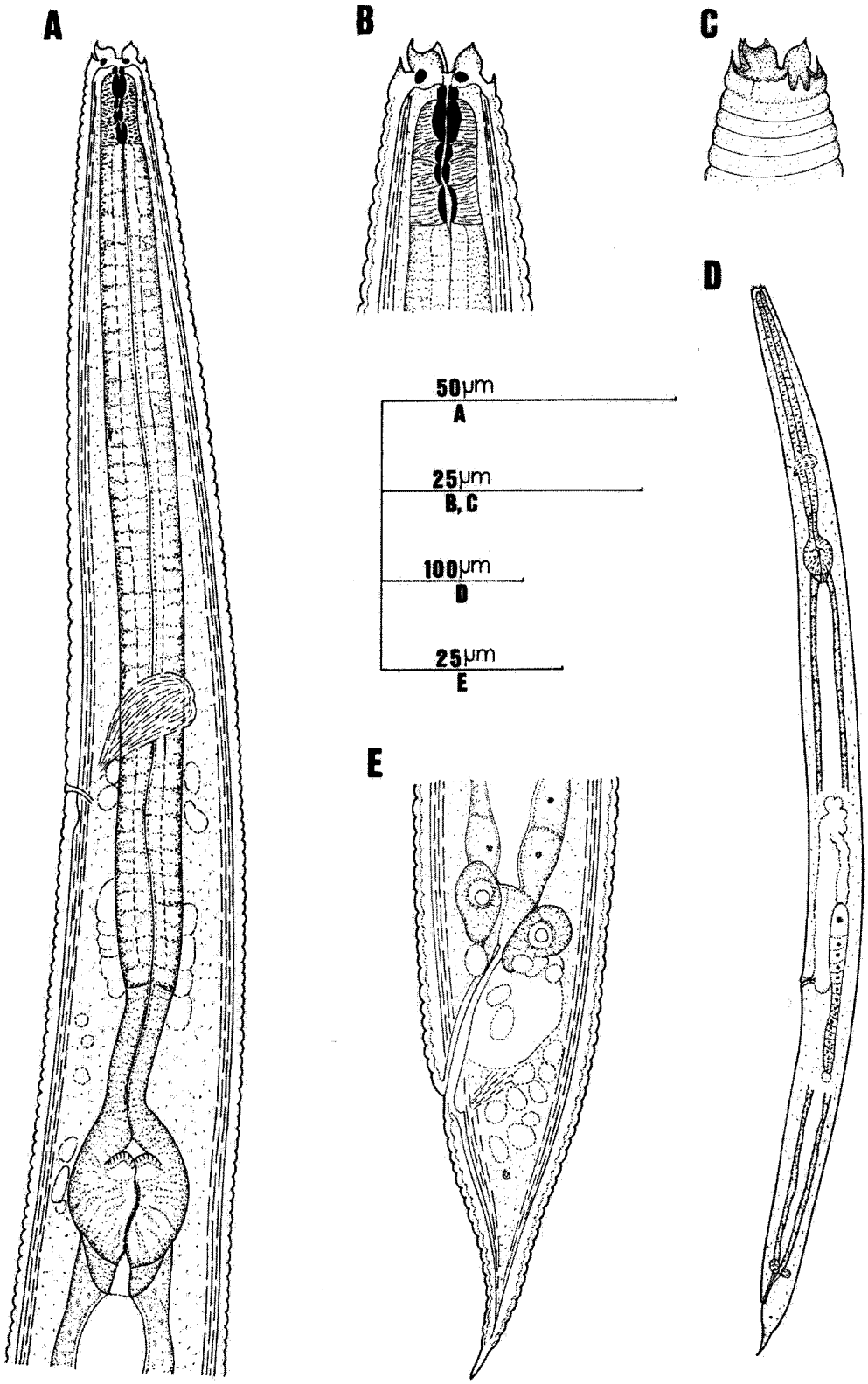

FIG. 6. *Zeldia punctata* (Thorne, 1925) Thorne, 1937 (female). A) Neck region. B) Anterior end. C) Lip region. D) Entire female. E) Posterior end.

cesses, secondary axils without guard processes, and lateral field with two wings; therefore, we transfer this species to *Nothacrobeles*. On the other hand, Poiras et al. (2002) have described a new species from California (*N. borregi*) and have transferred *Cervidellus laticollaris* (De Ley & Vandebroek, 1992) Boström & De Ley, 1996

to *Nothacrobeles*. Fifteen valid species plus one *incertae sedis* currently belong to *Nothacrobeles:*

Genus *Nothacrobeles* Allen & Noffsinger, 1971
syn. *Namibinema* Rashid & Heyns, 1990 *op* Shahina & De Ley, 1997
Type species:
Nothacrobeles sheri Allen & Noffsinger, 1971

Other species:
N. acrobeles (Andrássy, 1967) Allen & Noffsinger, 1971
syn. *Zeldia acrobeles* Andrássy, 1967
N. borregi Poiras, Baldwin, Mundo-Ocampo & Bumbarger, 2002
N. capricornis (Holovachov, Boström, Susulovsky & Nevo, 2001) comb. n.
syn: *Cervidellus capricornis* Holovachov, Boström, Susulovsky & Nevo, 2001
N. lanceolatus sp. n.
N. laticollaris (De Ley & Vandebroek, 1992) Poiras, Baldwin, Mundo-Ocampo & Bumbarger, 2002
syn. *Stegelletina laticollaris* De Ley & Vandebroek, 1992
Cervidellus laticollaris (De Ley & Vandebroek, 1992) Boström & De Ley, 1996
N. lepidus Allen & Noffsinger, 1971
N. lunensis Shahina & De Ley, 1997
N. maximus Allen & Noffsinger, 1971
N. nanocorpus De Ley, De Ley, Baldwin, Mundo-Ocampo & Nadler, 1999
N. prominens (Andrássy, 1964) Andrássy, 1984
syn. *Acrobeles prominens* Andrássy, 1964
N. scaphovulva (Rashid & Heyns, 1990) Shahina & De Ley, 1997
syn. *Namibinema scaphovulva* Rashid & Heyns, 1990
N. spatulatus De Ley, De Ley, Baldwin, Mundo-Ocampo & Nadler, 1999
N. subtilis Allen & Noffsinger, 1971
syn. *N. subtilus* Allen & Noffsinger, 1971
N. triniglarus De Ley, De Ley, Baldwin, Mundo-Ocampo & Nadler, 1999

Species incertae sedis:
N. distinctus (Kirjanova, 1951) Shahina & De Ley, 1997
syn. *Acrobeles distinctus* Kirjanova, 1951
Cervidellus distinctus (Kirjanova, 1951) Andrássy, 1959
Chiloplacus distinctus (Kirjanova, 1951) Goodey, 1963
Acrobelophis distinctus (Kirjanova, 1951) Andrássy, 1984
Acrobeles innoxius Kirjanova, 1951
Cervidellus innoxius (Kirjanova, 1951) Meyl, 1961
Acrobelophis innoxius (Kirjanova, 1951) Andrássy, 1984

Key to species identification:

1. Labial probolae without bifurcations ---- 2
   Labial probolae bifurcate with short or long prongs ---- 3
2. Body length less than 300 µm; labial probolae more or less rounded ---- *nanocorpus*
   Body length more than 300 µm; labial probolae heart-shaped ---- *spatulatus*
3. Labial probolae lacking tines ---- 4
   Labial probolae bearing tines ---- 6
4. Labial probolae with well-developed basal wing ---- *capricornis*
   Labial probolae with two minute lateral basal wings and a knob-like ledge ---- 5
5. Prongs with secondary branches ---- *laticollaris*
   Prongs lacking secondary branches ---- *borregi*
6. Labial probolae having short prongs ---- 7
   Labial probolae having long prongs ---- 12
7. Vulva sunken ---- *scaphovulva*
   Vulva not sunken ---- 8
8. Cuticle tessellated ---- *maximus*
   Cuticle not tessellated ---- 9
9. Cuticle double ---- *lunensis*
   Cuticle simple ---- 10
10. Annuli with two rows of cuticular punctations; labial probolae with low but acute prongs, lateral field with four incisures ---- *acrobeles*
    Annuli without rows of cuticular punctations; labial probolae with low prongs or without prongs; lateral field with four (or three) incisures ---- 11
11. Female tail conical with acute terminus ---- *subtilis*
    Female tail conical with mucro ---- *triniglarus*
12. Cuticle not tessellated; annuli with two rows of cuticular punctations; lateral field with three incisures ---- *prominens*
    Cuticle tessellated; annuli with two or three rows of cuticular punctations or without punctations; lateral field with two wings or four incisures ---- 13
13. Cuticle with two rows of cuticular punctations ---- *lanceolatus*
    Cuticle with three rows of cuticular punctations or without punctations ---- 14
14. Body length more than 650 µm; annuli with three rows of cuticular punctations; postuterine sac two times the corresponding body diameter long; spicules 30–38 µm long ---- *sheri*
    Body length less than 650 µm; annuli without rows of cuticular punctations; postuterine sac less than the corresponding body diameter long; spicules 22–25 µm long ---- *lepidus*

Literature Cited

Abolafia, J., G. Liébanas, and R. Peña-Santiago. 2002. Nematodes of the order Rhabditida from Andalucía Oriental, Spain. The subgenus

Pseudacrobeles Steiner, 1938, with description of a new species. Journal of Nematode Morphology and Systematics 4:137–154.

Abolafia, J., and R. Peña-Santiago. 2001. Rhabditid species (Nematoda, Rhabditida) recorded in peninsular Spain and Balearic Islands. Graellsia 57:113–131.

Allen, M. W., and E. M. Noffsinger. 1971. *Nothacrobeles* n. gen., with descriptions of four new species (Nematoda: Cephalobidae). Journal of Nematology 3:145–153.

Allen, M. W., and E. M. Noffsinger. 1972. A review of the genus *Zeldia* Thorne, 1937 (Nematoda: Cephalobidae) with descriptions of seven new species. Proceedings of the Helminthological Society of Washington 39:206–223.

Andrássy, I. 1967. Ergebnisse der zoologischen Forschungen von Dr. Z. Kaszab in der Mongolei. 92. Weitere Bodennematoden aus den Jahren 1964 and 1965. Opuscula Zoologica Budapest 6:203–233.

Andrássy, I. 1984. Masse Nematoda (Ordnungen Monhysterida, Desmoscolecida, Araeolaimida, Chromadorida, Rhabditida). Berlin, Deutschland, Akademie Verlag.

Boström, S. 1992. Some Cephalobidae (Nematoda: Rhabditida) from Crete, Greece. Fundamental and Applied Nematology 15:289–295.

De Bruin, S., and J. Heyns. 1993. Cephalobidae (Nematoda: Rhabditida) from Botswana. Phytophylactica 25:1–10.

De Ley, I. T., P. De Ley, J. G. Baldwin, M. Mundo-Ocampo, and S. A. Nadler. 1999. Three new species of *Nothacrobeles* (Nemata: Cephalobidae) from the Mojave Desert, California. Journal of Nematology 31:482–497.

De Ley, P., E. Geraert, and A. Coomans. 1990. Seven cephalobids from Senegal (Nematoda: Rhabditida). Journal of African Zoology 104:287–304.

De Ley, P., M. C. Van de Velde, D. Mounport, P. Baujard, and A. Coomans. 1995. Ultrastructure of the stoma in Cephalobidae, Panagrolaimidae, and Rhaditidae, with a proposal for a revised stoma terminology in Rhabditida (Nematoda). Nematologica 41:153–182.

Flegg, J. J. M. 1967. Extraction of *Xiphinema* and *Longidorus* species from soil by a modification of Cobb's decanting and sieving technique. Annals of Applied Biology 60:429–437.

Holovachov, O., S. Boström, A. Susulovsky, and E. Nevo. 2001. Description of *Cervidellus capricornis* sp. n. (Nematoda: Cephalobidae) from Israel. Nematologia Mediterranea 29:223–230.

Nguyen, K. B., and G. C. Smart. 1993. Scanning electron microscope studies of *Steinernema anomali* Kozodoi, 1984. Journal of Nematology 25:486–492.

Poiras, L., J. G. Baldwin, M. Mundo-Ocampo, and D. J. Bumbarger. 2002. *Nothacrobeles borregi* sp. n. (Nematoda: Cephalobidae) from Anza Borrego, California, and *N. laticollaris* (De Ley & Vandebroek, 1992) n. comb. Nematology 4:865–874.

Rashid, F., E. Geraert, and R. D. Sharma. 1985. Morphology, taxonomy, and morphometry of some Cephalobidae (Nematoda: Rhabditida) from Brazil, with descriptions of two new genera and four new species. Nematologica 30:251–299.

Rashid, F., and J. Heyns. 1990. Description of *Namibinema scaphovulva* n. gen., n. sp. and *Zeldia punctata* (Thorne, 1925) from Namibia (Nematoda: Cephalobidae). Phytophylactica 22:397–403.

Shahina, F., and P. De Ley. 1997. Two new species of Cephalobidae from Valle de la Luna, Argentina, and observations on the genera *Acrobeles* and *Nothacrobeles* (Nematoda: Rhabditida). Fundamental and Applied Nematology 20:329–347.

Siddiqi, M. R. 1964. Studies on *Discolaimus* spp. (Nematoda: Dorylaimidae) from India. Zeitschrift für Zoologische Systematik und Evolutionsforschung 2:174–184.

Tabassum, K. A., and F. Shahina. 2002. Re-description of four known cephalobids (Nemata: Cephalobidae) from Pakistan. Pakistan Journal of Nematology 20:25–37.

Tahseen, Q., I. Ahmad, and M. S. Jairajpuri. 1999. Observations on three species of the subfamily Acrobelinae (Nematoda: Cephalobidae) from India. Nematology 1:527–537.

Thorne, G. 1925. The genus *Acrobeles* von Linstow, 1887. Transactions of the American Microscopical Society 44:171–210.