

# *Nothacrobeles*, n. gen., with Descriptions of Four New Species (Nematoda: Cephalobidae)

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*Abstract:* A new nematode genus, *Nothacrobeles*, is proposed in the subfamily Acrobelinae. Four new species are described and one new combination made. The five species exhibit a progression from short-to-long, bifurcate, elaborately fringed labial probolae, the longest probolae resembling those of species of *Acrobeles*. *Key Words:* *Nothacrobeles* n. gen., *N. sheri* n. sp., *N. lepidus* n. sp., *N. maximus* n. sp., *N. subtilis* n. sp., *N. acrobeles* n. comb., Taxonomy, Morphology, Distribution.

In 1967 Andr ssy (1) described a new species, *Zeldia acrobeles*, from a single male collected in Mongolia in 1964. We have obtained similar nematodes from collections made in several countries. Dr. Andr ssy kindly allowed us to examine the type specimen of *Z. acrobeles* and we believe that this species and our specimens represent a new genus showing some affinities to the genus *Acrobeles* von Linstow, 1877.

## Genus *Nothacrobeles* n. gen.

*Diagnosis.*—Acrobelinae. Labial probolae bifurcate, of variable length, margins bordered by small membranous projections. Basal portion of labial probolae swollen, projecting toward cephalic probolae. Anterior margins of cephalic probolae bearing a row of small, triangular projections. Three cephalic axils, each axil guarded by two projecting, pointed structures arising from a small annule on the base of the cephalic probolae. Internal to each axil there are two cuticularized pointed structures. Cephalic areas between axils divided by an obscure longitudinal suture, making possible recognition of six cephalic probolae, each of these bearing one papilla.

Amphids pore-like, located on lateral cephalic probolae.

Cuticle with well developed transverse annules, sometimes with longitudinal striae. Rows of transverse punctations sometimes present in annules. Lateral fields with four incisures, the outer ones crenate, areolated in the esophageal region. Deirids present. Excretory pore and hemizonid near isthmus. Females and males with a pair of lateral pores located dorsal to the lateral field, slightly posterior to vulva in females and at 70 percent in males. Phasmids near middle of tail. Tails of both sexes conoid, terminus pointed, without annulation.

Stoma collapsed, consisting of discrete rhabdions, cheilorhabdions not forming a wide cheilostom. Esophagus with corpus, isthmus and valvate bulb. Esophageal-intestinal valve small. Nerve ring at anterior margin of isthmus. Female gonad single, uterus anteriorly directed, spermatheca present, ovary reflexed. Posterior uterine sac present. Male gonad single, anteriorly directed, sometimes with flexure near distal end. Spermatozoa round. Spicules and gubernaculum present. Three pairs of sub-lateral preanal papillae, 4 or 5 pairs on tail, the most anterior located in lateral field near the phasmid.

*Nothacrobeles* differs from *Acrobeles* in not having pointed flap-like cephalic probolae, the swollen bases of the labial probolae, and the structures guarding the cephalic axils.

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There is in the species of *Nothacrobeles* a progression from very short to long labial probolae, the latter resembling those of *Acrobeles*.

TYPE SPECIES: *Nothacrobeles sheri* n. sp.

*Nothacrobeles sheri* n. sp.

(Fig. 1, A-H; Fig. 3, F)

*Measurements* (19 ♀♀): L = 0.76 (0.67–0.90) mm; a = 20 (17–23); b = 4 (4–5); c = 12 (11–14); V = 64 (57–68); posterior uterine sac = 66 (54–78)  $\mu$ ; T/ABD = 2.4 (1.7–2.8); excretory pore = 127 (111–146)  $\mu$ .

(13 ♂♂): L = 0.76 (0.61–0.96) mm; a = 19 (16–25); b = 4.5 (3.7–6.1); c = 13 (11–15); T = 55 (47–66); T/ABD = 1.9–2.6; spicule = 34 (30–38)  $\mu$ ; gubernaculum = 17 (15–19)  $\mu$ ; excretory pore = 122 (100–142)  $\mu$ .

(Holotype ♀): L = 0.85 mm; a = 22.8; b = 4.4; c = 13.9; V = 64; posterior uterine sac = 78  $\mu$ ; T/ABD = 1.7; excretory pore = 146  $\mu$ .

Labial probolae bifurcate more than one-half their length, elaborately fringed. Bifurcations 10  $\mu$  long. Cephalic probolae fringed with forwardly directed triangular projections. At the base of the cephalic probolae an obscure broken annule with points guarding the cephalic axils (Fig. 1-C, 3-F). Margins of cephalic axils attenuated, pointed. Cuticle with transverse and longitudinal striae. In cross section behind lip region 32 longitudinal annules. Posterior to vulva about 106 longitudinal annules. Three rows of punctations on each transverse annule, the middle row larger than the outer. The intensity of the punctation variable in specimens from the same collection. Transverse annules 3.0  $\mu$  wide in esophageal region, 4.0

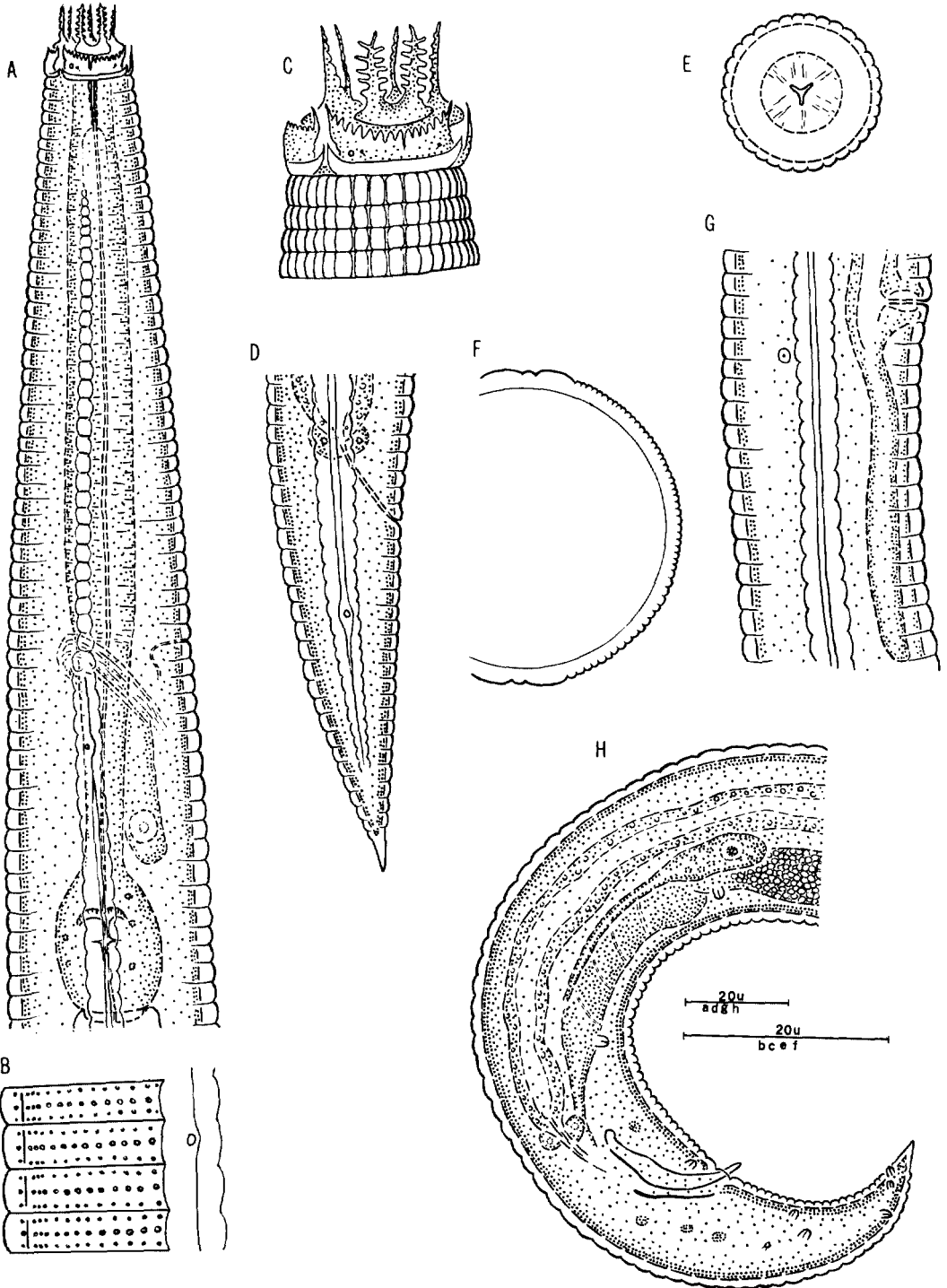
$\mu$  at middle of body. Excretory pore opening near anterior end of isthmus of esophagus. Deirids in lateral field near middle of isthmus. Vulva at 64 percent, gonad extending anteriorly 23 percent of body length, reflexed, ovary extending posteriorly to about midway between vulva and rectum, distally with a flexure. A pair of hypodermal pores dorsal to lateral field and just posterior to vulva. Posterior uterine sac two body diameters in length. Rectal glands present. Phasmids near middle of tail. Tail conoid-cylindrical, terminus pointed, without annulation.

*Male*.—Similar to female. Three pairs of preanal papillae, five pairs on tail all posterior to phasmid, one subdorsal in position. Three rectal glands. Three large glands associated with the vas deferens (Fig. 1-H), one on the right and two on the left. Spicules slightly arcuate, gubernaculum linear.

*Holotype*.—Female collected March 6, 1964 by S. A. Sher. Catalogue No. UC Nematode Collection 1211, University of California, Davis.

*Paratypes*.—Fourteen females and 10 males, same data as holotype, distributed as follows: 7 females and 6 males, UCNC, Davis; 1 female and 1 male USDA Nematode Collection, Nematology Investigations, Beltsville, Maryland; 1 female and 1 male, Department of Nematology, University of California, Riverside, California; 1 male, CSIRO, Merbein, Victoria, Australia; 1 female and 1 male, Division of Nematology, Bet Dagan, Israel; 1 female, I. Andrassy, Budapest, Hungary; 1 female, Wageningen, The Netherlands; 1 female, Plant Protection Research Institute, Pretoria, Republic of South Africa; 1 female, Department of

FIG. 1. *Nothacrobeles sheri* n. sp. A. Adult female, esophageal region; B. Punctation of cuticle; C. Head of female; D. Tail of female; E. Cross-section behind cephalic region; F. Cross-section behind vulva; G. Posterior uterine sac; H. Male tail.



Nematology, Rothamsted, Harpenden, Herts, England.

*Type Habitat*.—Soil.

*Type Locality*.—Caesarea, Israel. This species has also been collected from Hadera and Tel-Aviv, Israel.

*Diagnosis*.—*N. sheri* is distinguished from other species in the genus by the labial and cephalic probolae, the presence of three transverse rows of punctations per annule and the longer posterior uterine sac. The species most closely resembles *N. lepidus* from which it differs in larger size and longer posterior uterine sac.

The species is named in honor of S. A. Sher.

*Nothacrobeles lepidus* n. sp.

(Fig. 2, A-D)

*Measurements* (4 ♀): L = 0.58 (0.52–0.64) mm; a = 19.7 (18.7–21.4); b = 4.5 (4.1–5.0); c = 12.1 (10.9–12.8); V = 64 (63–65); posterior uterine sac = 18 (13–21)  $\mu$ ; T/ABD = 2.2 (2.1–2.3); excretory pore = 91 (80–106)  $\mu$ .

(6 ♂♂): L = 0.57 (0.52–0.63) mm; a = 19.7 (18.0–21.9); b = 4.3 (3.8–4.8); c = 12.5 (11.0–14.6); T = 51 (48–56); spicule = 24 (22–25)  $\mu$ ; gubernaculum = 13 (12–14)  $\mu$ ; excretory pore = 93 (76–102)  $\mu$ .

(Holotype ♀): L = 0.64 mm; a = 19.5; b = 4.6; c = 12.4; V = 63; posterior uterine sac = 21  $\mu$ ; T/ABD = 2.3; excretory pore = 106  $\mu$ .

Labial probolae bifurcate about three-fourths their length, their borders with membranous projections. Bifurcations 6  $\mu$  long. Anterior margins of cephalic probolae fringed with forwardly directed triangular projections. Cephalic axils guarded by two pointed structures arising from an annule at the base

of the cephalic probolae. Anterior margins of cephalic axils attenuated, pointed. About 32 longitudinal striae posterior to lip region. Longitudinal striae about 106 at middle of body, these are not visible in totemounts. Excretory pore opening near middle of isthmus. Hemizonid three annules posterior to excretory pore. Deirids in lateral field near anterior margin of bulb. Lateral hypodermal pores about one body width posterior to vulva. Posterior uterine sac less than one body diameter in length. Phasmids about middle of tail.

*Male*.—Similar to female. Three pairs of preanal sublateral papillae. Five pairs of papillae on tail, all posterior to phasmid, one subdorsal. Spicules slightly curved, gubernaculum linear.

*Holotype*.—Female collected February 14, 1963 by D. J. Raski and G. Swarup. Catalogue No. UCNC 1217, University of California, Davis.

*Paratypes*.—One female and 3 males. Same data as holotype, distributed as follows: 1 female and 2 males, UCNC, Davis; 1 male USDA Nematode Collection, Nematology Investigations, Beltsville, Maryland.

*Type Habitat*.—Sandy soil around roots of *Euphorbia* sp. in a stream bed.

*Type Locality*.—Fifty-four miles east of Jaipur, Rajasthan, India. Also collected at Govindgar, Rajasthan, India.

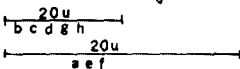
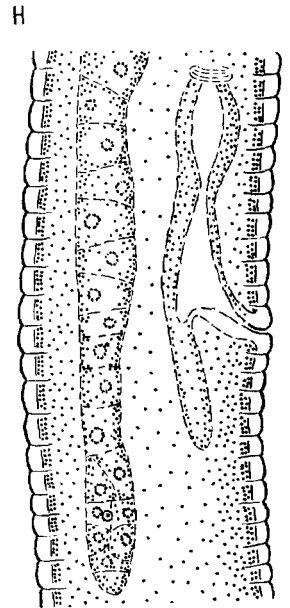
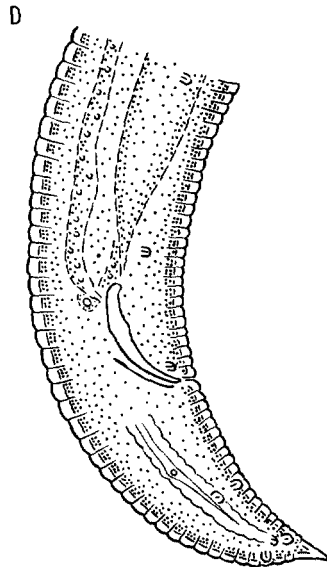
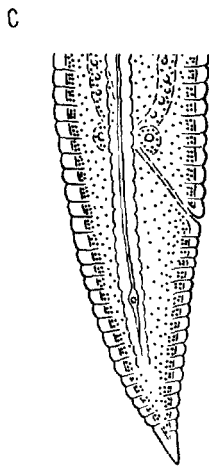
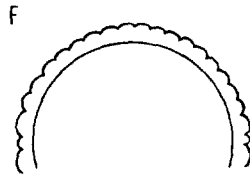
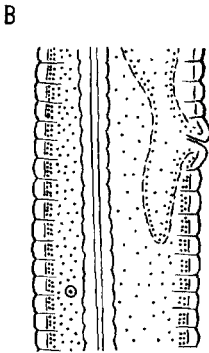
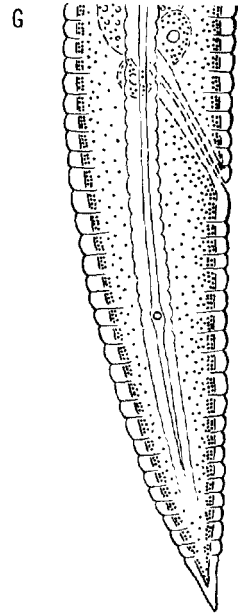
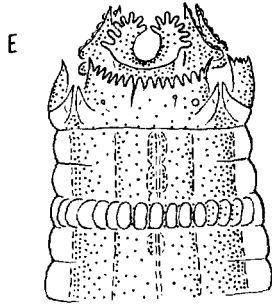
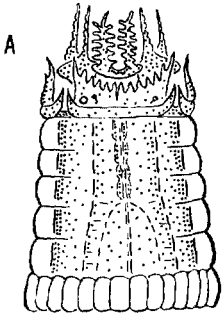
*Diagnosis*.—This species most closely resembles *N. sheri* from which it differs in smaller size, shorter labial probolae and shorter posterior uterine sac.

*Nothacrobeles maximus* n. sp.

(Fig. 2, E-H)

*Measurements* (21 ♀♀): L = 0.79 (0.64–0.87) mm; a = 20.8 (17.1–31.5); b

FIG. 2. *Nothacrobeles lepidus* n. sp. A. Head, female; B. Posterior uterine sac; C. Female tail; D. Male tail; *Nothacrobeles maximus* n. sp. E. Head, female; F. Cross-section posterior to head; G. Female tail; H. Posterior uterine sac.



= 4.6 (3.3–5.0); c = 12.0 (10.7–14.4); V = 65 (63–69); posterior uterine sac = 20 (13–35)  $\mu$ ; T/ABD = 2.6 (2.3–3.0); excretory pore = 134 (112–152)  $\mu$ .

(Holotype ♀): L = 0.87 mm; a = 20.7; b = 4.6; c = 11.5; V = 65; posterior uterine sac = 19  $\mu$ ; T/ABD = 2.9; excretory pore = 151  $\mu$ .

Labial probolae bifurcate about one-half their length. The bifurcations short and broad 5  $\mu$  long with projecting membranes on their anterior and outer margins. Anterior margins of cephalic probolae fringed with triangular projections. Cephalic axils guarded by two pointed structures arising from an annule at base of cephalic probolae. Anterior margin of cephalic axils pointed. Transverse and longitudinal striae present (Fig. 2, E–F), easily visible throughout length of body. Punctations absent. Thirty-four longitudinal striae posterior to lip region, about 38 posterior to vulva. Transverse annules 3  $\mu$  wide in esophageal region, 5  $\mu$  near middle of body. Excretory pore near middle of isthmus. Hemizonid one annule posterior to excretory pore. Deirids opening in lateral field near anterior end of esophageal bulb. Lateral fields areolated in esophageal region. Outer incisures crenate behind deirids. Lateral hypodermal pores about one body width posterior to vulva. Length of posterior uterine sac less than body diameter. Phasmids near middle of tail.

*Males*.—Unknown.

*Holotype*.—Female collected September, 1968 by M. R. Sauer, Catalogue No. UCNC 1221, University of California, Davis.

*Paratypes*.—Fifteen females, same data as holotype, 7 deposited UCNC, Davis and one at each of the following: USDA Nematode Collection, Beltsville, Maryland; University of California, Riverside, California; CSIRO, Merbein, Victoria, Australia; Division of Nematology, Bet Dagan, Israel; I. Andrassy, Budapest, Hungary; Wageningen, The Neth-

erlands; Plant Protection Research Institute, Pretoria, South Africa; Department of Nematology, Rothamsted, Harpenden, Herts, England.

*Type Habitat*.—Soil around the roots of wheat.

*Type Locality*.—Cullulleraine, Victoria, Australia. This species has been collected also from soil at Merbein and Hattah, Victoria, Australia.

*Diagnosis*.—*N. maximus* most closely resembles *N. subtilus* from which it differs in being larger, having longer labial probolae and conspicuous longitudinal annulation.

*Nothacrobeles subtilus* n. sp.

(Fig. 3, A–C)

*Measurements* (38 ♀♀): L = 0.57 (0.48–0.70) mm; a = 17.2 (14.3–22.5); b = 4.5 (4.1–5.4); c = 11.2 (10.2–13.6); V = 66 (61–71); posterior uterine sac = 22 (11–30)  $\mu$ ; T/ABD = 2.5 (2.0–2.9); excretory pore = 91 (61–111)  $\mu$ .

(Eggs 8): = 22–30  $\mu$  × 68–88  $\mu$ .

(Holotype ♀): L = 0.50 mm; a = 17.3; b = 4.5; c = 10.9; V = 66; posterior uterine sac = 21  $\mu$ ; T/ABD = 2.2; excretory pore = 81  $\mu$ .

Labial probolae bifurcate about one-half their length. Length of branches about 3.5  $\mu$ ; their outer margins with small rounded projections. Cephalic probolae anteriorly fringed with small triangular projections. Cephalic axils guarded by two pointed structures arising from a small annule at the base of the probolae. Margins of cephalic axils pointed, not attenuated. Transverse annules about 2.0  $\mu$  in width behind lip region, about 2.6  $\mu$  at middle of body. Longitudinal annulation absent except immediately posterior to lip region, where they are obscure and visible only in cross-sections. No punctation. Excretory pore near middle of isthmus. Hemizonid four annules posterior to excretory pore. Deirids in lateral field at

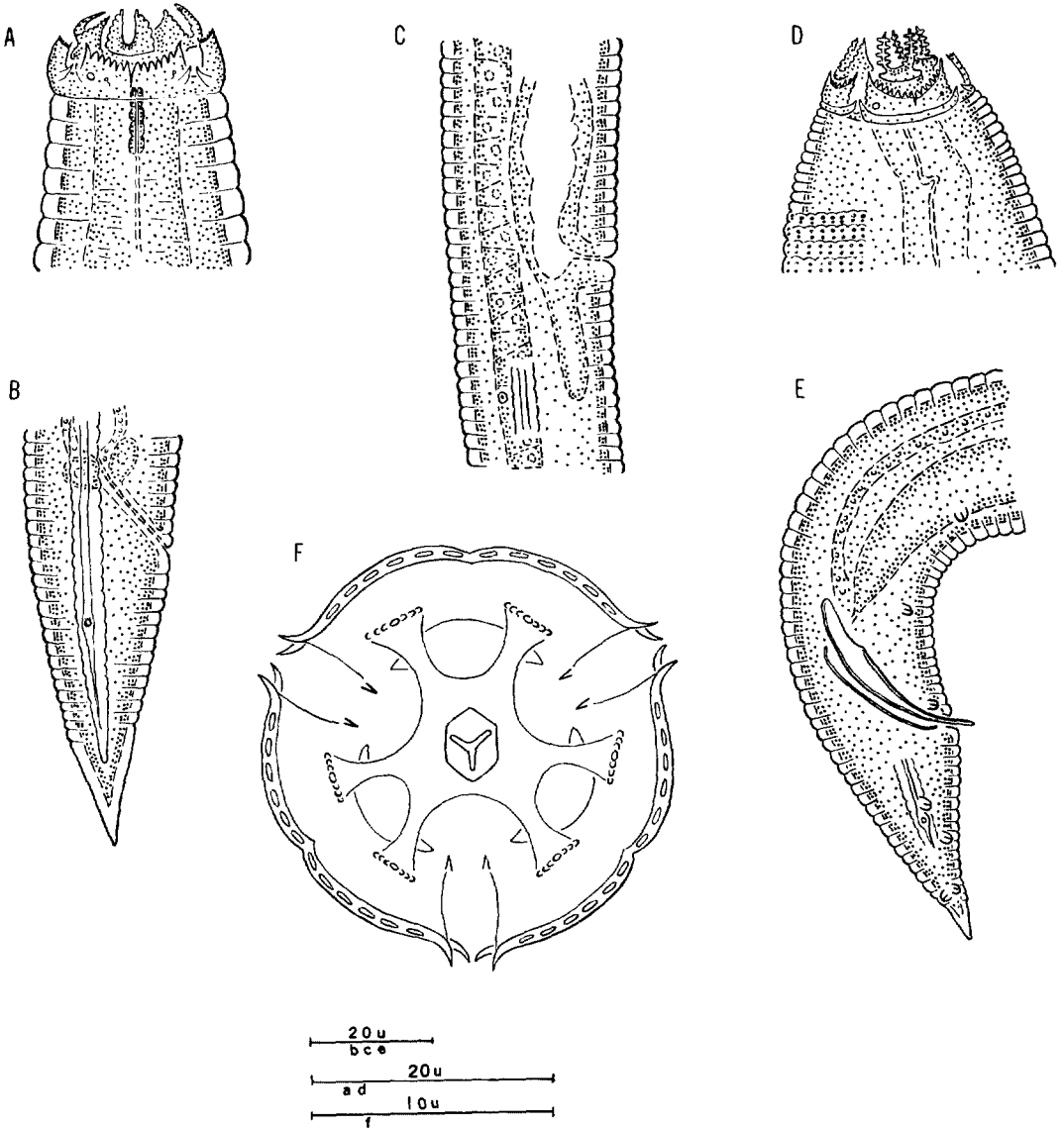


FIG. 3. *Nothacrobeles subtilis* n. sp. A. Head, female; B. Female tail; C. Posterior uterine sac: *Nothacrobeles acrobeles* (Andrássy) D. Male head; E. Male tail; *Nothacrobeles sheri* n. sp. F. Face view, female.

anterior end of esophageal bulb. Lateral fields areolated in esophageal region, outer lines crenate posterior to deirid. Lateral pores about one body width posterior to

vulva. Posterior uterine sac about one body width in length (Fig. 3-C). Phasmids near middle of tail.

*Male*.—Not known.

*Holotype*.—Female collected March 22, 1966, by M. R. Sauer. Catalogue No. UCNC 1226, University of California, Davis.

*Paratypes*.—Eleven females, same data as holotype, distributed 5 UCNC Davis and 1 to each of the following: USDA Nematode Collection, Beltsville, Maryland; Department of Nematology, University of California, Riverside, California; CSIRO, Merbein, Victoria, Australia; Division of Nematology, Bet Dagan, Israel; I. Andrassy, Budapest, Hungary; Plant Protection Research Institute, Pretoria, South Africa.

*Type Habitat*.—Soil around the roots of *Heterodendron* sp.

*Type Locality*.—Merbein, Victoria, Australia. (Residence at 19th Street, Merbein South, Merbein.)

*Diagnosis*.—*N. subtilus* resembles *N. maximus* but differs in smaller size, shorter labial probolae, and the absence of conspicuous longitudinal annulation. It differs from *N. acrobeles* in having shorter and broader labial probolae and in the absence of punctation in the cuticle.

*Nothacrobeles acrobeles* (Andrassy, 1967)

n. comb.  
(Fig. 3, D-E)

syn: *Zeldia acrobeles* Andrassy, 1967

*Measurements* (Holotype ♀): L = 0.40; a = 13.7; b = 3.7; c = 9.9; T = 55; spicule = 36 μ; gubernaculum = 26 μ; T/ABD = 1.9; excretory pore 85 μ.

Labial probolae bifurcate three-fourths their length. Bifurcations 3.3 μ long, inner and outer margins bordered by membranous projections. Anterior margins of cephalic probolae fringed with forwardly directed triangular projections. Cephalic axils guarded by two pointed projections arising from an annule at the base of the cephalic probolae. Cuticle in the anterior esophageal region appearing to have faint longitudinal annules. Transverse annules each with two rows of

punctations. Excretory pore appears to be opposite the anterior end of the isthmus. Deirids in lateral field about opposite the isthmus. Spicules curved, gubernaculum linear, slightly curved. Three pairs of preanal papillae; papillae on tail appear similar to those of *N. sheri* and *N. lepidus*.

*Diagnosis*.—*N. acrobeles* is known only from the holotype and differs from other species in length and shape of the labial probolae. The long gubernaculum distinguishes this species from males of *N. sheri* and *N. lepidus*.

The holotype of *N. acrobeles* is shrunken and distorted making it impossible to determine accurately the position of the excretory pore and deirids with reference to the esophagus. The peculiar expansions of the lateral field illustrated by Andrassy in the original description might be due to shrinkage during fixation. Andrassy assigned this species to the genus *Zeldia* on the basis of its having dentate cephalic axils. Examination of the type shows the cephalic axils to be without dentation, additionally the labial and cephalic probolae are not characteristic of species of *Zeldia*.

In addition to the species described we have examined two specimens (1 female, 1 male) from South Africa, collected by J. Heyns and 1 male from California that clearly belong to the genus, *Nothacrobeles*. These specimens are in poor condition and not suitable for description. They are recorded since they add to the known distribution of species in the genus.

KEY TO SPECIES OF *NOTHACROBELES*

1. Bifurcations of labial probolae more than 4.5 μ in length ..... 2
- Bifurcations of labial probolae less than 4.5 μ in length ..... 4
2. Posterior uterine sac more than 1.5 × body width at vulva, gubernaculum 15–19 μ long ..... *sheri* n. sp.



- Posterior uterine sac less than  $1.5 \times$   
body width at vulva ..... 3
3. Bifurcations of labial probolae, broad  
and palmate (males unknown) .....  
..... *maximus* n. sp.
- Bifurcations of labial probolae slender,  
elongate, gubernaculum  $12-14 \mu$  long  
..... *lepidus* n. sp.
4. Bifurcations of labial probolae broad  
and palmate, cuticle without puncta-

tion (males unknown) ..... *subtilus* n. sp.

Bifurcations of labial probolae slender,  
cuticle punctate, gubernaculum  $26 \mu$   
long ..... *acrobeles* (Andrássy).

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