

Description of the Male of *Ogma cobbi* and Juveniles of *Bakernema inaequale* (Nematoda: Criconematidae)

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Abstract: Juveniles of *Bakernema inaequale* and the male of *Ogma cobbi* are described and illustrated for the first time. Juveniles of *Bakernema inaequale* lack the cuticular spines characteristic of the adults. The annules of first-stage and fourth-stage juveniles are smooth, whereas those of the second-stage and third-stage juveniles have faint, bead-like ornamentation either throughout the body or in the anterior or posterior part only. Detailed morphometric data of *O. cobbi* males and all juvenile stages and females of *B. inaequale* are given.

Key words: ring nematode, life stage, morphology, taxonomy, distribution, host.

This report includes for the first time a description, morphometric data, and illustrations of the male of *Ogma cobbi* (Micoletzky, 1925) Siddiqi, 1986 and all juvenile stages of *Bakernema inaequale* (Taylor, 1936) Mehta & Raski, 1971. Additional morphometric data of *B. inaequale* females also are given.

MATERIALS AND METHODS

Males of *Ogma cobbi*, including a molting one, were obtained from a greenhouse culture reared on *Betula nigra* (river birch) at Beltsville, Maryland. The nematodes originated from Fayetteville, Arkansas. An additional molting male was obtained from a soil sample sent by E. J. Wehunt in October 1985 from a *Quercus* sp. in Logan County, Arkansas. Specimens of *Bakernema inaequale* were collected by the authors in October 1982 and January 1987 from *Quercus* sp. in Beltsville, Maryland. Juveniles, males, and females were recovered from soil by sieving followed by Baermann funnel extraction. They were then heat relaxed in an oven at 43 C for 12 minutes and fixed in 3% formaldehyde. Procedures for preparing and measuring specimens are in Golden and Birchfield (2). Photomicrographs of juveniles, males, and females were made with an automatic 35-mm camera attached to a compound microscope having

an interference contrast system. All measurements are in micrometers.

SYSTEMATICS

Ogma cobbi (Micoletzky, 1925)
Siddiqi, 1986
(Figs. 1-6)

Male ($n = 29$): Length 345-390 (368.3, SD 12.7); width 21-25 (22.6, SD 0.83); a 14.1-17.5 (16.2, SD 0.78); c 8.8-11.7 (10.4, SD 0.68); excretory pore 112-118 (114.7, SD 2.5) from head end; spicule length 35.0-42.5 (39.7, SD 1.8); gubernaculum length 6.0-7.5 (6.6, SD 0.5); tail length 31-40 (35.4, SD 2.4); total body annules 104-118 (110, SD 3.9).

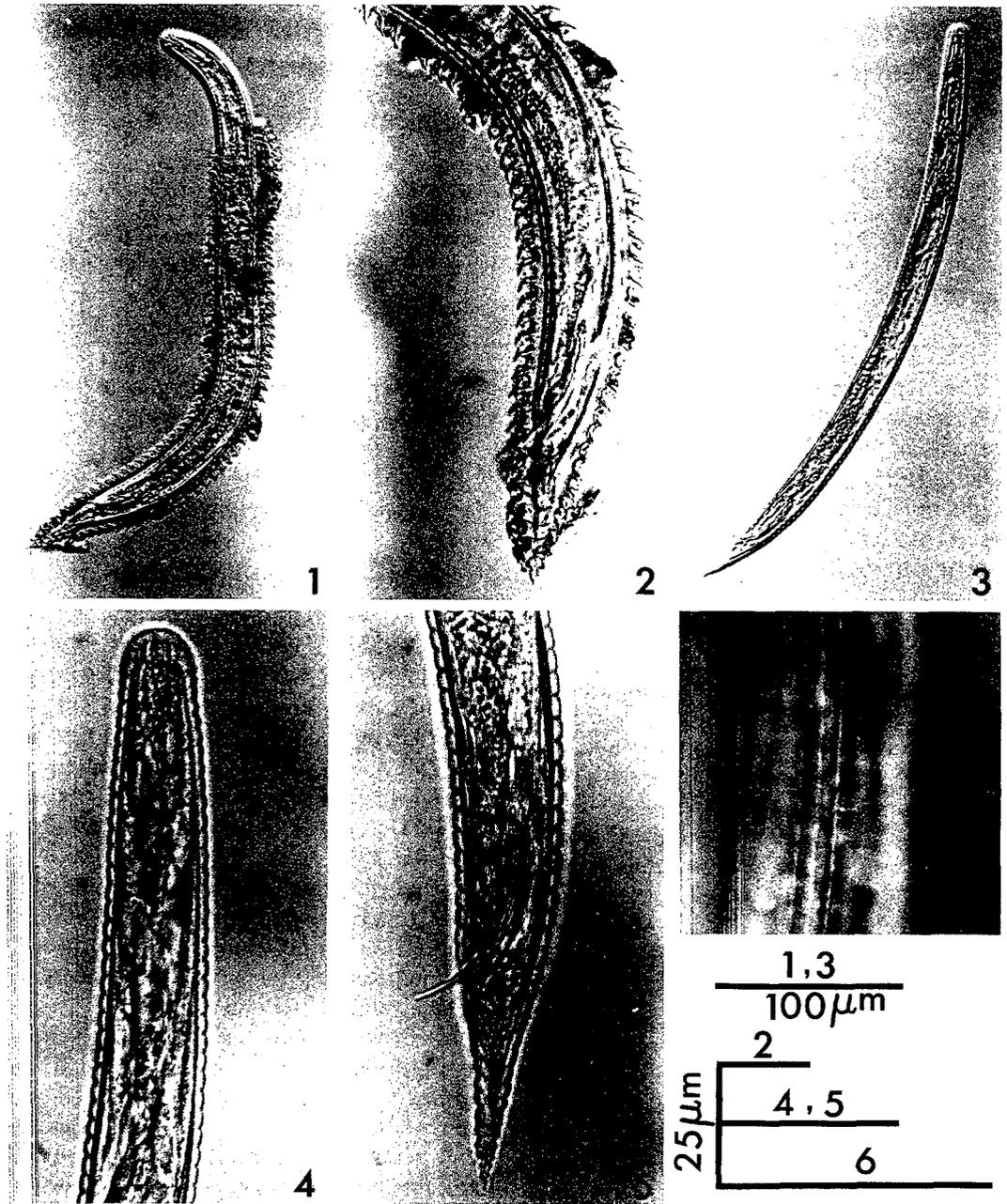
Body cylindrical, tapering slightly anteriorly, to a point posteriorly. Head bluntly rounded or almost hemispherical, set off, marked near base by two or three annules, slightly smaller than succeeding body annules. Stylet absent, esophagus degenerate. Lateral field with three incisures. Body annules 3.4-3.7 wide near midbody. Testis outstretched; sperm large, round. Spicule long, arched; gubernaculum simple, rod-like. Tail long, slender, conoid; narrowing immediately posterior to cloaca, terminus pointed.

Specimen designations: Females, males, and juveniles deposited in U.S. Department of Agriculture Nematode Collection (USD-ANC), Beltsville, Maryland; slide nos. G-8444, G-8447-G-8449, G-8478, and G-8479. Also females, one molting male, and juveniles collected by E. J. Wehunt from *Quercus* sp. from Logan County, Arkansas; slide no. G-8675.

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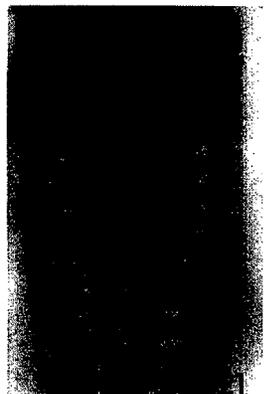
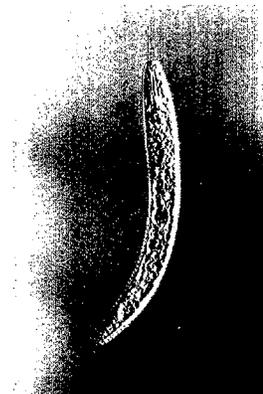
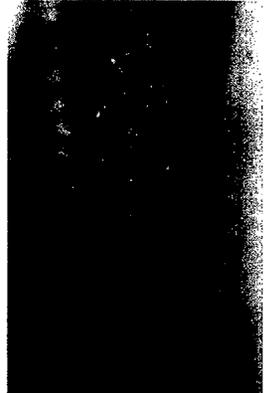
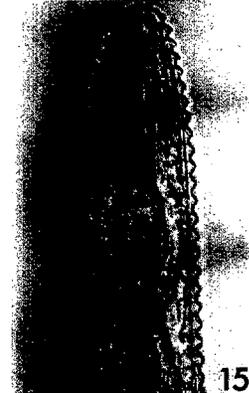
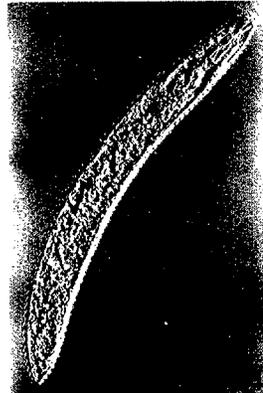
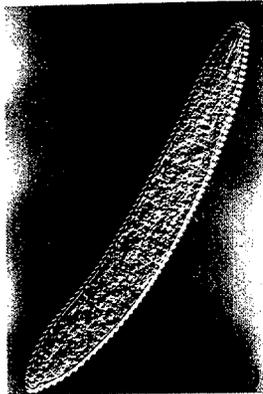
FIGS. 1-6. Male of *Ogma cobbi*. 1) Adult specimen molting from fourth-stage larval cuticle. 2) Enlarged posterior portion of Figure 1. 3) Whole male. 4, 5) Anterior and posterior regions. 6) Lateral field.

FIGS. 7-21. Female and life stages of *Bakernema inaequale*. 7-9) Female. 7) Whole female. 8, 9) Anterior and posterior regions. Note prominent spike-like spines. 10-13) Fourth-stage juvenile. 10) Whole specimen. 11, 12) Anterior and posterior regions. 13) Smooth body annules without cuticular markings or fringes. 14-17) Third-stage juvenile. 14) Whole specimen. 15, 16) Anterior and posterior regions. 17) Bead-like cuticular markings. 18-21) Second-stage juveniles. 18) Whole specimen. 19, 20) Anterior and posterior regions. 21) Bead-like cuticular markings or fringes.



50 μ m 7,10
14,18

25 μ m 8,9,11-13,15,16
17,19-21



Bakernema inaequale (Taylor, 1936)

Mehta & Raski, 1971

(Figs. 7-21)

Fourth-stage female ($n = 26$): Length 360-495 (432.8, SD 32.6); body width 44-70 (55.9, SD 5.4); a 6.4-10.0 (7.8, SD 0.7); b 3.5-4.4 (4, SD 0.2); stylet length 48-54 (50.5, SD 1.5); esophagus length 100-114 (107.2, SD 6) from anterior end; total body annules 64-72 (68, SD 2.3).

Body stout, slightly curved ventrad; tapering slightly toward both extremities. Body annules with smooth posterior margins, lacking cuticular markings or fringes. Head not offset, with two annules. Submedian lobes present, in two pairs. Stylet and esophagus typical for genus. Excretory pore indistinct, situated posterior to base of esophagus on 21st annule from anterior end. Tail terminus conoid-rounded, with a large terminal annule, occasionally bifid.

Third-stage female ($n = 18$): Length 220-330 (283.4, SD 31.5); body width 29-42 (35.7, SD 4.3); a 7.1-9.4 (8, SD 0.7); b 2.9-3.6 (3.1, SD 0.2); stylet length 39-41 (40.2, SD 0.6); esophagus length 75-100 (87.5, SD 7) from anterior end; total body annules 68-84 (73.6, SD 4.2).

Similar to fourth-stage juveniles except for smaller size and shorter stylet. Also total number of body annules is greater, and faint to heavy bead-like cuticular markings or fringes present on anterior or posterior part of body.

Second-stage female ($n = 4$): Length 202-295 (236.7, SD 40.5); body width 22-38 (29, SD 6.6); a 7.7-9.1 (8.2, SD 0.6); b 2.8-3.2 (3.0, SD 0.1); stylet length 30; esophagus length 67-94 (75.7, SD 12.3) from anterior end; total body annules 67-81 (75.7, SD 6.3).

Similar to third-stage juveniles except for the shorter stylet and more rounded head. Bead-like cuticular markings or fringes are very heavy to sometimes faint throughout the body.

Adult female ($n = 25$): Length 500-610 (545.8, SD 27); body width 56-64 (60.2, SD 2.4); a 8.0-10.1 (9, SD 0.5); b 3.9-4.6 (4.2, SD 0.1); V 90.9-94.7 (92.3, SD 0.7);

stylet length 60-70 (64, SD 2.2); esophagus length 120-136 (127.5, SD 3.9) from anterior end; excretory pore 130-152 (139.4, SD 1.6) from anterior end, situated from 18th to 22nd annule from anterior end; R 61-72 (66, SD 2.9); Rv 5-7 (5.5, SD 0.5); Ra 3-5 (3.4, SD 0.5). Posterior edge of annules with prominent cuticular spines.

Male: Not observed in this collection.

Specimen designations: Juveniles and adult females deposited in the U.S. Department of Agriculture Nematode Collection (USDANC), Beltsville, Maryland; slide nos. G-9289-G-9293.

Remarks: More data and details on the morphology of juveniles of ring nematodes might provide a better understanding of the relationships among genera and species of this complex group of nematodes and improve identification. For example, as described herein, the cuticular surface of juveniles of *Bakernema inaequale* is markedly different from that of the adult female; and the juvenile stylet length clearly delineates the various stages.

In another species of the genus, *B. yukonense* Ebsary, 1982 (1), juveniles have a cuticle strongly crenate and with an extra cuticular layer present but not elaborated into spines. On the other hand, *B. variabile* Raski & Golden, 1966 (3) has juveniles with short numerous cuticular ornamentations, crenate near anterior end but short, triangular in outline on the body. Though cuticular surfaces of juveniles of ring nematodes were characterized at the generic level in two recent revisions (4,5), the morphology of the juveniles of most species is lacking or incomplete.

LITERATURE CITED

1. Ebsary, B. A. 1982. *Bakernema yukonense* n. sp. (Nematoda: Criconeematidae) with keys to the species of *Criconeemella* and *Discoicriconeemella*. Canadian Journal of Zoology 60:3033-3047.
2. Golden, A. M., and W. Birchfield. 1972. *Heterodera graminophila* n. sp. (Nematoda: Heteroderidae) from grass with a key to closely related species. Journal of Nematology 4:147-154.
3. Raski, D. J., and A. M. Golden. 1966. Studies on the genus *Criconeemoides* Taylor, 1936 with descrip-

tions of eleven new species and *Bakernema variabile* n. sp. (Criconematidae: Nematoda). *Nematologica* 11: 501-565.

4. Raski, D. J., and M. Luc. 1987. A reappraisal of Tylenchina (Nemata) 10. The superfamily Crico-

nematoidea Taylor, 1936. *Revue de Nematologie* 10: 409-444.

5. Siddiqi, M. R. 1986. Tylenchida parasites of plants and insects. Farnham Royal, Commonwealth Agriculture Bureaux, UK.