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Dolichodorus miradvulvus n. sp. (Nematoda: Tylenchida) With a Key to Species[1]

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Abstract: Dolichodorus miradvulvus n. sp. from *Anubias nana* Engler in Florida is described and illustrated. The female is characterized by deep grooves in the cuticle on the ventral surface just anterior and posterior to the vulva, and by transversely elongate pouches anterior and posterior to the vulva. Both sexes have a constricted area of the stylet shaft just anterior to the knobs, and on the male the intersection of the lateral field and bursa appear sclerotized.

Key words: taxonomy, morphology, new species, *Anubias nana*, SEM.

In June 1982, soil and plant samples of *Anubias nana* Engler from a commercial aquarium plant nursery in Florida contained specimens of a new species of *Dolichodorus*. The nematode was highly pathogenic to *A. nana* (14). This report presents a description of the new species and a taxonomic key to the 13 species of the genus.

MATERIALS AND METHODS

Nematodes obtained from the original sample and from a population reared on corn (*Zea mays* L.) were killed and fixed in formalin : propionic acid (4:1), infiltrated with glycerine (13) and mounted in dehydrated glycerine. Measurements and illustrations were made from living, quiescent specimens in temporary water mounts. Living specimens were prepared for scanning electron microscopy (SEM) by the method of Stone and Green (15), coated with gold or gold-palladium, and examined in a Hitachi S450 SEM.

Dolichodorus miradvulvus n. sp. (Figs. 1–5)

Species name from Latin. Mira = unusual or extraordinary; ad = near; vulvus = vulva; hence, unusual or extraordinary near the vulva.

Females. Measurements of paratypes (20): L = 2,414 μm (2,088–2,699 μm); width = 39 μm (34–45 μm); a = 62 (54–71); b = 9.1 (7.8–10.7); c = 38 (34–45); v = 54 (50–57); stylet = 110 μm (105–120 μm) (conus = 67 μm [65–71 μm]; shaft = 42 μm [37–49 μm]); dorsal esophageal gland orifice (DGO) = 4.8 μm (3.4–6 μm); anterior end to center of median bulb = 167 μm (156–180 μm); to excretory pore = 173 μm (157–196 μm); hemizonid to excretory pore = 29 μm (21–37 μm); anal body width (ABW) = 31 μm (26–37 μm); tail = 63 μm (57–69 μm).

Holotype (female): L = 2,391 μm; width = 36 μm; a = 67; b = 10; c = 36; v = 54; stylet = 107 μm (conus 69, shaft 38); DGO = 4.7 μm; anterior end to center of median bulb = 158 μm, to excretory pore = 170 μm; excretory pore to hemizonid = 28 μm; ABW = 27 μm; tail = 66 μm.

Description: Body slightly curved after fixation. Lip region with 9–11 annules, offset by deep constriction (Figs. 1A, 3A). Cephalic framework with basal plate heavily sclerotized (Fig. 3A). Perioral disc prominent, distinctly raised (Figs. 1A, 3A). Lip region with four lobes, lateral divisions often not distinct (Fig. 3C). Amphid opening elongate laterally 3 × 1 μm (Fig. 3C). Stylet conus 60–66% of stylet length; stylet shaft with a short constricted area immediately anterior to stylet knobs (Fig. 1A). Stylet knobs rounded posteriorly, anterior surfaces inclined (Fig. 1A). Nerve ring near middle of isthmus. Excretory pore variable in position, from anterior end of median bulb to nerve ring, usually opposite or near median bulb. Hemizonid (Figs. 1A, 3E) about 29 μm (14–23 annules) posterior to excretory pore. Esophagus with short, swollen procorpus, distinctly constricted at median bulb (Figs. 1A, 3E). Basal bulb large, slightly overlapping intestine ventrally. Esophagointestinal valve large, sometimes obscure. DGO 4.8 μm from stylet. Esophageal lumen large, well cuticularized from stylet base to valve of median bulb, reduced in size posterior to valve. Vulva a transverse slit in a submerged oval

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area with pouches anteriorly and posteriorly (Figs. 3G; 5A, D) which appear in lateral view as sclerotized accessory pieces (Fig. 3F). Tissue inside the pouches appears ridged (Fig. 5B) but may be the result of shrinkage when subjected to vacuum pressure. Interior of vagina with strengthening ridges (Fig. 5C, D) which appear serrate by light microscopy (Fig. 2C). Cuticle on ventral surface anterior and posterior to the vulva bearing up to 10 deep grooves separated by two or three annules (Figs. 2C; 3F, G; 5D). Gonads two, outstretched (Fig. 2A, B). Spermatheca prominent, oblong. Cuticle 2.1–2.6 μm thick at median bulb, 4–5 μm thick at mid body, and 3.5–4 μm thick in anal region. Annules 1.5–1.7 μm wide at level of median bulb, about 1 μm at mid body, and 1.3–1.5 μm immediately anterior to anus. Lateral field raised, areolated, with three incisures (Fig. 5F); occasionally five incisures were observed at mid body and more posteriorly (Fig. 3D). The central incisure terminates at the phasmid; the others terminate at about 55 μm anterior to anus. Anteriorly, the central incisure ends about 10 annules (9–10 μm) or more from the head constriction; the outer incisures end about 14 annules (21 μm) anterior to the center of the median bulb. Phasmids at end of central incisure about mid tail. Tail 63 μm, with a smooth terminal portion 8–10 μm long.

Males. Measurements of paratypes (12): L = 1,898 μm (1,831–2,017 μm); width = 30.5 μm (26–37 μm); a = 62 (49–73); b = 7.8 (7–9); c = 63 (52–70); stylet = 107 μm (100–112 μm); head end to excretory pore = 159 μm (146–176 μm), to center of median bulb = 154 μm (145–167 μm). Spicules = 49 μm (45–52 μm); gubernaculum = 27 μm (25–28 μm); ABW = 20 μm (18–22 μm); tail = 30 μm (28–33 μm).

Allotype (male): L = 2,011 μm; width = 30 μm; a = 67; b = 8.7; c = 69; stylet = 104 μm; head end to excretory pore = 152 μm, to center of median bulb = 153 μm; excretory pore to hemizonid = 27 μm; spicules = 45 μm; gubernaculum = 27 μm; ABW = 20 μm; tail = 29 μm.

Description: Body similar to female but slightly smaller. Lip region with 9–11 annules, well offset. Perioral disc prominent, raised and somewhat angular (Figs. 1B, 3B, 4A). Nerve ring, excretory pore, and hemizonid as for female. Posterior end of body curved ventrally, lateral field prominently raised (Fig. 4B). Tail terminus usually bifurcate (Fig. 4B, D, E). Two lateral lobes of bursa very large, usually rolled or curved inward with dentate margins (Fig. 4B, C, D). Raised lateral field is so thick that the intersection of lateral field with bursa appears heavily sclerotized and is seen easily in lateral, ventral, and dorsal views (Figs. 1E, 4F). Testis outstretched (Fig. 1C, D), more than half the body length. Spicules almost straight, distal ends pointed. Gubernaculum with distal end rounded (Fig. 4D) and curved dorsally (Fig. 1F).

Holotype: Tray 5, Slide 14, University of Florida Nematode Collection, Gainesville, Florida. From population increased on corn in a greenhouse.

Allotype: Tray 5, Slide 15, same data as holotype.

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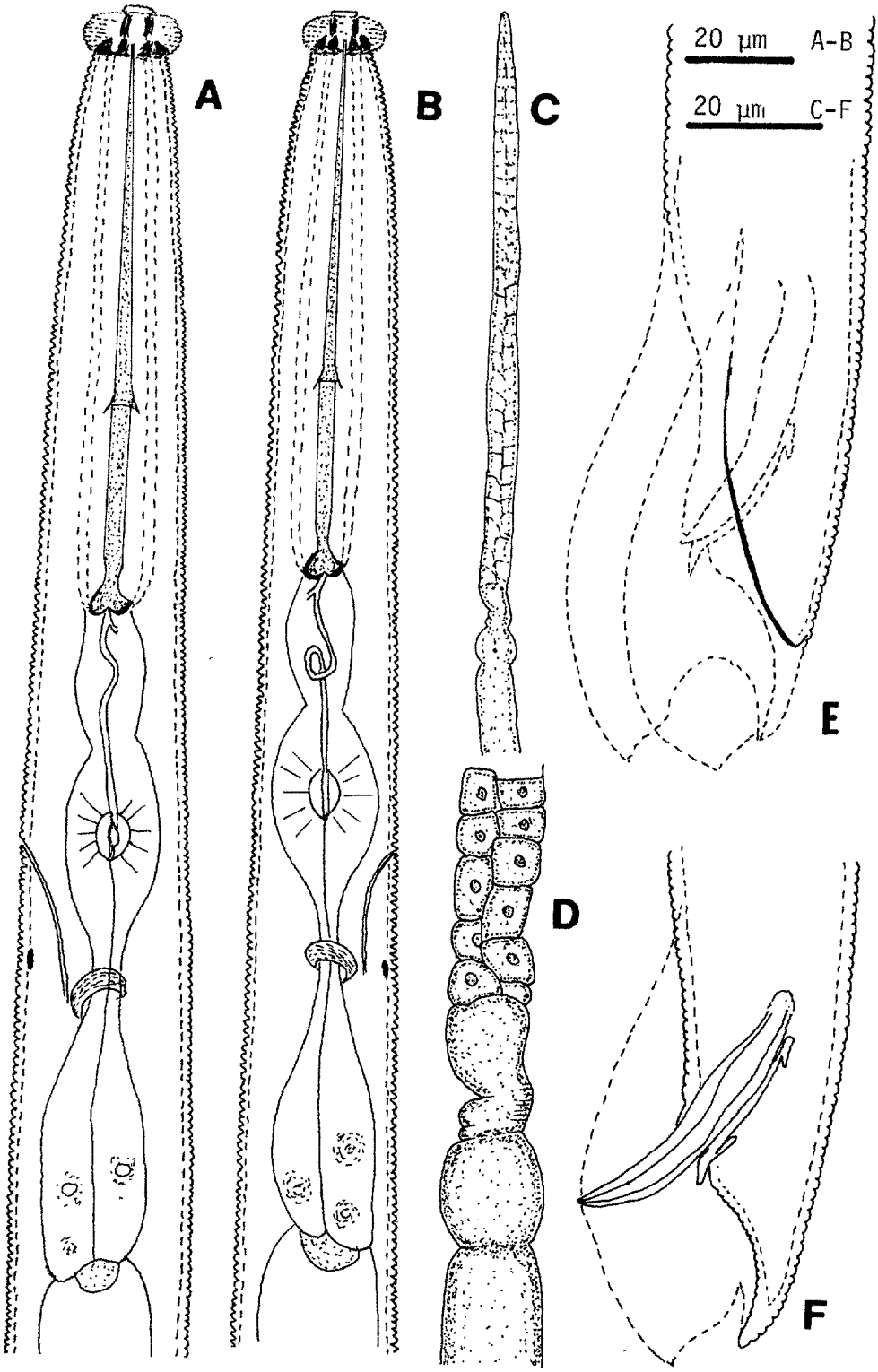
FIG. 1. *Dolichodorus miradvulvus* n. sp. A) Anterior portion of female. B) Anterior portion of male. C) End of male gonad. D) Enlargement of apparent seminal vesicle portion of male gonad. E) Male tail showing sclerotized-appearing junction of bursa and body. F) Male tail showing spicules and gubernaculum.

FIG. 2. *Dolichodorus miradvulvus* n. sp. A) Female gonad. B) Enlargement of spermatheca portion of female gonad. C) Vulval region showing deep grooves and pouches anterior and posterior to vulva, strengthening ridges (serrate appearance) in the vagina and muscles attached to the vaginal wall and body wall. D) Female tail, ventral view. E) Female tail, lateral view. Note differences in length of slender portion. F) Juvenile tail showing gradual tapering. G) Juvenile tail showing abrupt tapering.

FIG. 3. *Dolichodorus miradvulvus* n. sp. (A–D, G = SEM; E, F = LM). A) Labial region of female with constriction and elevated oral disc. B) Labial region of male with constriction and elevated oral disc. C) En face view of female showing four lobes, oral disc, and prominent laterally elongate amphid openings (note secretions). D) Lateral field with five incisures in posterior region of female (fifth incisure around curvature not seen). E) Esophageal region of female. Note that esophagus overlaps intestine ventrally. F) Vulval region of female. Note deep grooves and pouches (which appear as sclerotized accessory pieces) anterior and posterior to vulva. G) Vulval region of female. Note submerged vulva, pouches anterior and posterior to vulva, and deep grooves anterior to vulva.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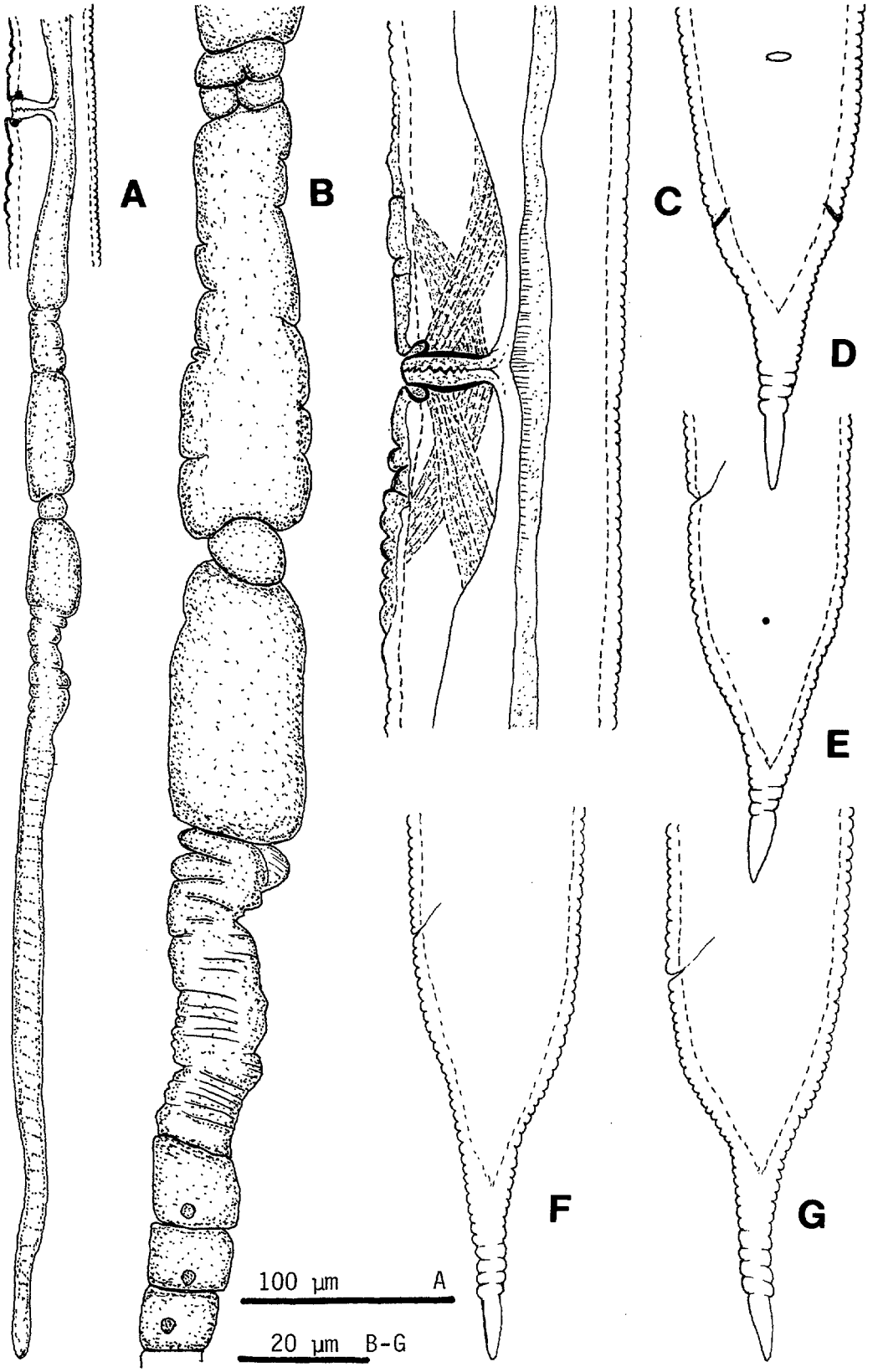
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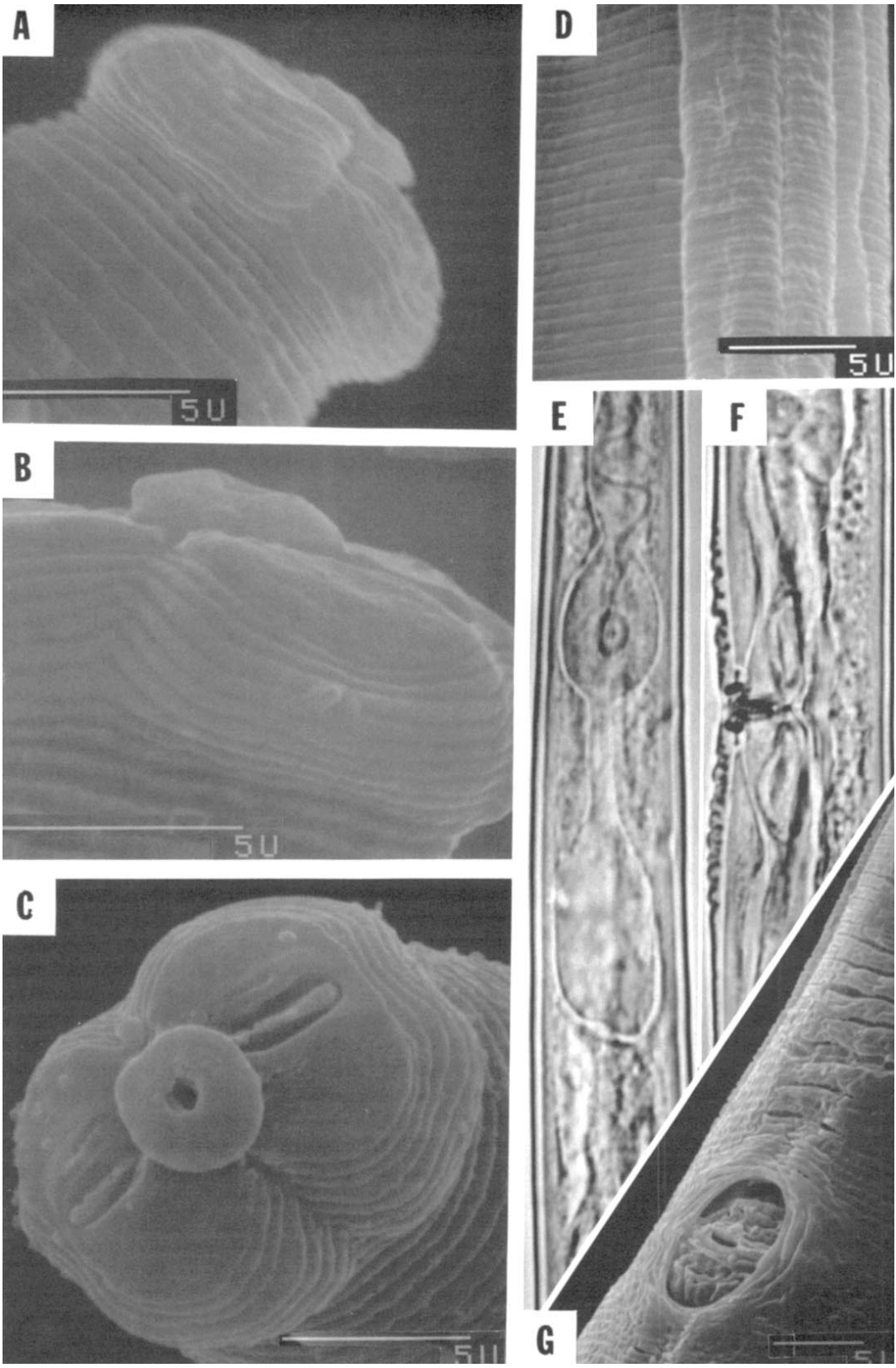
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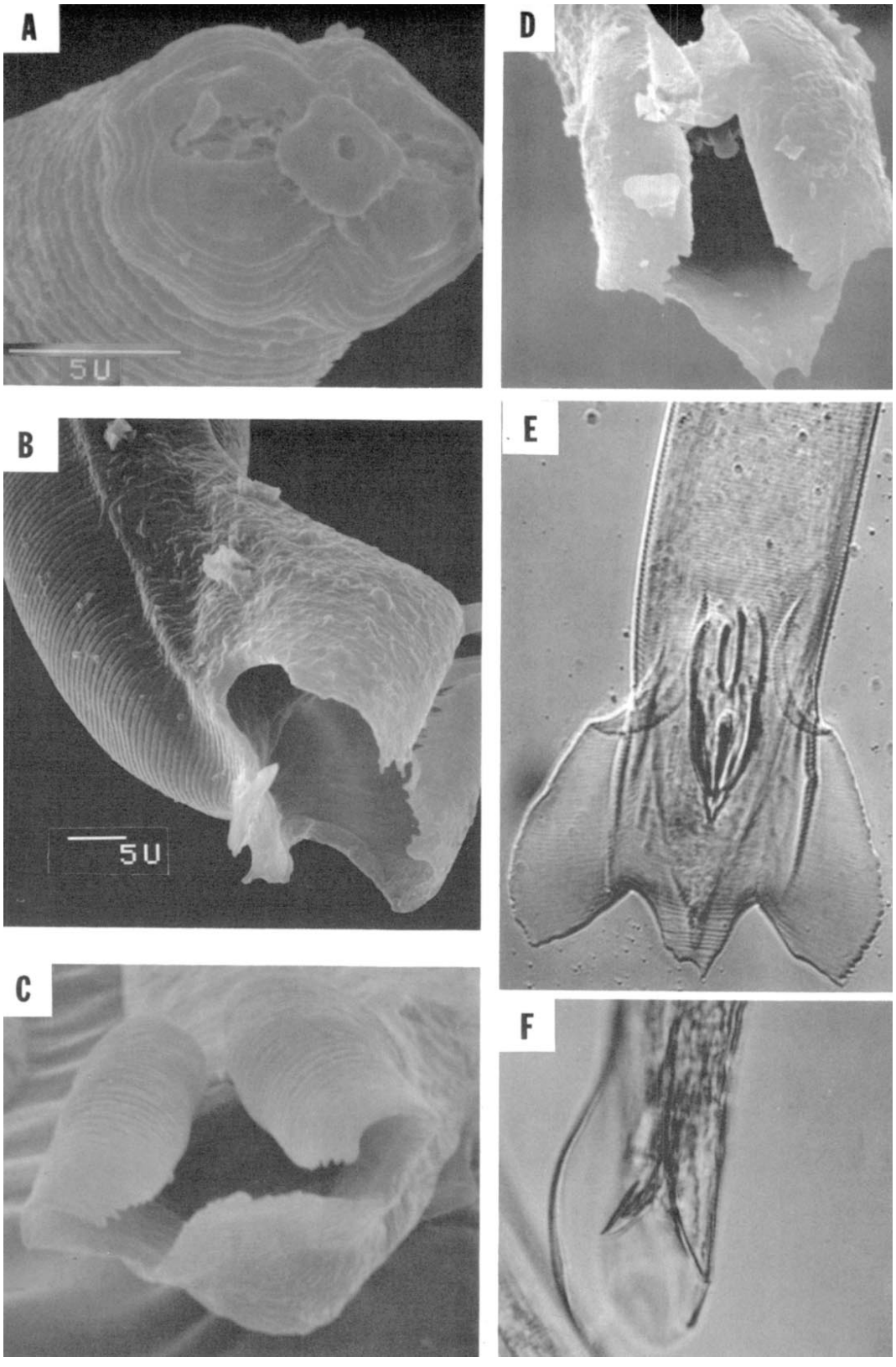
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Paratypes: Tray 5, Slides 16–20 containing four females and four males, University of Florida Nematode Collection, Gainesville, Florida; 17 slides containing eight females and nine males, and a vial containing many males, females, and juveniles in the authors' possession; USDA Nematode Collection, Beltsville, Maryland; Slide Nos. T-3231p, one female; T-3232p, one male; and Vial No. T-234p, five females, five males, and five juveniles; and Rothamsted Experimental Station, Harpenden, Hertfordshire, England; two slides containing three females and two males.

Type host and locality: Anubias nana Engler growing in sand in an aquarium plant nursery at Stuart (Martin County), Florida, described as Township 38 South, Range 41 East. It is just east of the St. Lucie Canal and near the center of the Hanson Grant.

Diagnosis: Dolichodorus miradvulvus n. sp. resembles *D. heterocephalus* and *D. marylandicus* but differs from both in having a longer stylet and a more anteriorly located excretory pore. It differs from those two and all other species of *Dolichodorus* by having 1) deep grooves in the cuticle on the ventral surface anterior and posterior to the vulva of adult females, 2) pouches which appear as sclerotized accessory pieces by light microscopy, 3) a constricted area of the stylet shaft just anterior to the knobs, 4) somewhat angular stylet knobs, and 5) intersection of lateral field and bursa appearing sclerotized in males.

KEY TO *DOLICHODORUS* SPP.

1. Excretory pore anterior to median bulb, usually opposite base of stylet ..... *D. pulvinus* (6)
1. Excretory pore more posterior 2
2. Cuticle anterior and posterior to vulva with deep grooves ..... *D. miradvulvus* n. sp.
2. Cuticle anterior and posterior to vulva without deep grooves 3
3. Female tail tapering gradually from anus to tip; male with large hypoptygma ..... *D. longicaudatus* (3)
3. Female tail suddenly narrowing between anus and tip; male without large hypoptygma 4
4. Excretory pore opposite median bulb 5
4. Excretory pore posterior to median bulb 7
5. Female T/ABW ratio 3; body less than 2 mm long ..... *D. nigeriensis* (10)
5. Female T/ABW ratio 2 or less; body more than 2 mm long 6
6. Lip region cushion-shaped; anterior cuticle tessellate; stylet length less than 120 μm ..... *D. profundus* (11)
6. Lip region rounded; anterior cuticle not tessellate; stylet length more than 130 μm ..... *D. silvestris* (4)
7. Excretory pore usually opposite middle of basal bulb ..... *D. similis* (5)
7. Excretory pore opposite isthmus 8
8. Female tail average between 88–104 μm; tail-spike over ⅔ of tail length 9
8. Female tail average less than 75 μm, tail spike less than ⅔ of tail length 10
9. Female tail spike over ¾ of tail length, bursa extending one tail length beyond tail tip ..... *D. kishansinghi* (7)
9. Female tail spike not over ¾ tail length, bursa extending slightly beyond tail tip ..... *D. grandaspicatus* (12)
10. Body length less than 2 mm ..... *D. minor* (9)
10. Body length greater than 2 mm 11
11. Stylet length 62–76 μm ..... *D. aestuarius* (1)
11. Stylet length 83 μm or more 12

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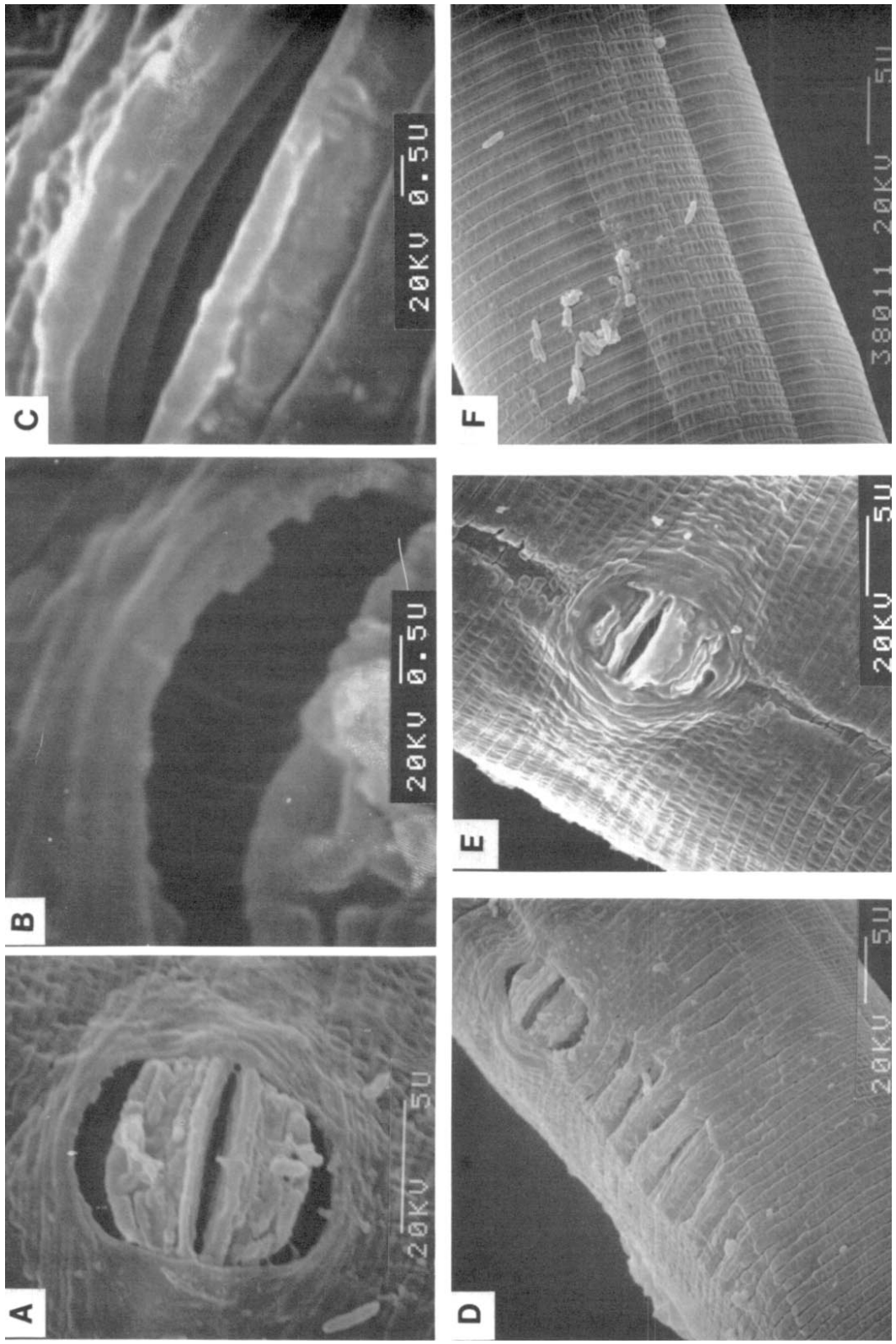
FIG. 4. *Dolichodorus miradvulvus* n. sp. males (A–D = SEM; E, F = LM). A) En face showing angular oral disc, four lobes, and prominent amphids (note secretions). B) Tail with raised lateral field, large dentate bursa, and bifurcate tip. C) Tail with large infolding, dentate bursa. D) Tail with protruding spicules and gubernaculum with rounded tip enclosed by bursa and bifurcate tail tip. E) Tail (ventral view) showing prominent intersection of lateral field and bursa; spicules; gubernaculum; bifurcate tail tip with one portion missing. F) Tail (lateral view) showing prominent intersection (appears sclerotized) of lateral field and bursa and protruding spicules.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12. Stylet length 83–92 μm; tail short, abruptly reduced in diameter, acuminate terminus often spicate ..... *D. marylandicus* (8)

12. Stylet length 99 μm or more; tail smoothly tapering or irregularly conoid, acute terminus ..... *D. heterocephalus* (2)

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Fig. 5. *Dolichodorus miradvulvus* n. sp. (A–D, F) and *D. heterocephalus* (E). A) Vulva showing pouches posteriorly and anteriorly. B) Enlargement of a pouch showing either supporting ribs or fixation artifacts. C) Strengthening ridges in walls of vagina. D) Vulval region with deep grooves and pouches, anterior and posterior to vulva. E) Vulval region of *D. heterocephalus*. Region anterior and posterior to vulva with no pouches and a pattern unlike that of *D. miradvulvus*. F) Lateral field with three incisures of *D. miradvulvus*.