

Howardula dominicki n. sp. Infesting the Tobacco Flea Beetle in North Carolina¹

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Abstract: *Howardula dominicki* n. sp. is described from specimens collected from the tobacco flea beetle, *Epitrix hirtipennis* (Melsheimer), at Oxford, North Carolina, and is distinguished from other members of the genus. Parasitism by *H. dominicki* sterilized female flea beetles and often led to the death of larvae. **Key Words:** Allantonematidae, entomogenous nematode, taxonomy.

In 1973, I found an undescribed allantonematid [=Sphaerulariidae (8)] parasitizing the tobacco flea beetle, *Epitrix hirtipennis* (Melsheimer), in North Carolina. This nematode was subsequently identified as a member of the genus *Howardula* which can be distinguished from other allantonematids by the apparent lack of a stylet in the male (10). Found to be an important natural enemy of the tobacco flea beetle, *Howardula dominicki* affects its host adversely in several ways. A description of this new species and a brief review of its biology follows.

MATERIALS AND METHODS

Adult parasitic females were obtained by dissecting adult flea beetles in a Ringer's solution. The nematodes were heat killed; fixed in triethanolamine, formalin, and water (TAF); and processed by the slow method to glycerin. Free-living males and females were obtained by placing juveniles removed from the beetle's hemocoel into a Syracuse dish of water. After 48-72 h, many of these nematodes molted to the adult form and mated. These adults were removed from the dish, heat killed, fixed in TAF, and processed to glycerin by Baker's rapid method (12). Freshly-killed nematodes in water mounts were also examined.

SPECIES DESCRIPTION

Howardula dominicki n. sp.

(Allantonematidae) (Neotylenchoidea)

Free-living female [(n = 12); Fig. 2-B, 3-A, E]: L = 525 μm (s = 36.4) (range =

479-591); W = 19.5 μm (s = 1.2) (range = 18-22); a = 27.0; V = 89%. Head to excretory pore 87.2 μm (s = 4.5); head to nerve ring, 75.6 μm (s = 3.6); stylet well developed, basal part slightly thickened, length 20.0 μm (s = 0.75), width 1.0 μm ; dorsal gland aperture 28.4 μm (s = 1.0) from tip of head; gonad single, prodelphic ventral; preuterine length 73.4 μm (s = 7.7); ovary consisting of ca. 12 distinct and several indistinct cells; uterus filled with sperm, length 66.3 μm (s = 7.6), width 11.2 μm (s = 2.6), no postuterine sac; vulva to tail tip 53 μm (s = 4.0); intestine indistinct; anus not seen; tail wedge-shaped, rounded at end.

Free-living male [(n = 10) Fig. 2-A, 3-B, C, D]: L = 491 μm (s = 25.3) (range = 467-531); W = 17.2 μm (s = 1.6) (range = 16-21); a = 28.7. Head to excretory pore 80 μm (s = 5.6) head to nerve ring 66 μm (s = 2.3); stylet absent, outline of esophageous vaguely visible; testis outstretched, length 323 μm (s = 13.6); length of peloderan bursa 31 μm (s = 1.5); spicules paired, equal length, length 13 μm (s = 1.0); gubernaculum present, small, length in lateral view 2-3 μm , width in ventral view 3 μm .

Adult parasitic female [(n = 10) Fig. 1]: L = 1750 μm (s = 300) (range = 1,402-2,294); W = 106 μm (s = 23.0) (range = 80-153); a = 17.0; V = 96.7%. White, sausage-like, full-grown specimens C-shaped when heat killed. Excretory pore on raised area, 140 μm (s = 26.8) from tip of head; stylet distinct, length 21 μm (s = 1.1); vulva 55 μm (s = 12.9) from tail tip; anus visible in some specimens, 13 μm from tail tip; ovoviviparous, eggs and juvenile nematodes present; gonad reflexed twice; ovary with small reflex in head.

The specific epithet honors Mr. C. B. Dominick, former entomologist with the Virginia Agricultural Experiment Station and now retired.

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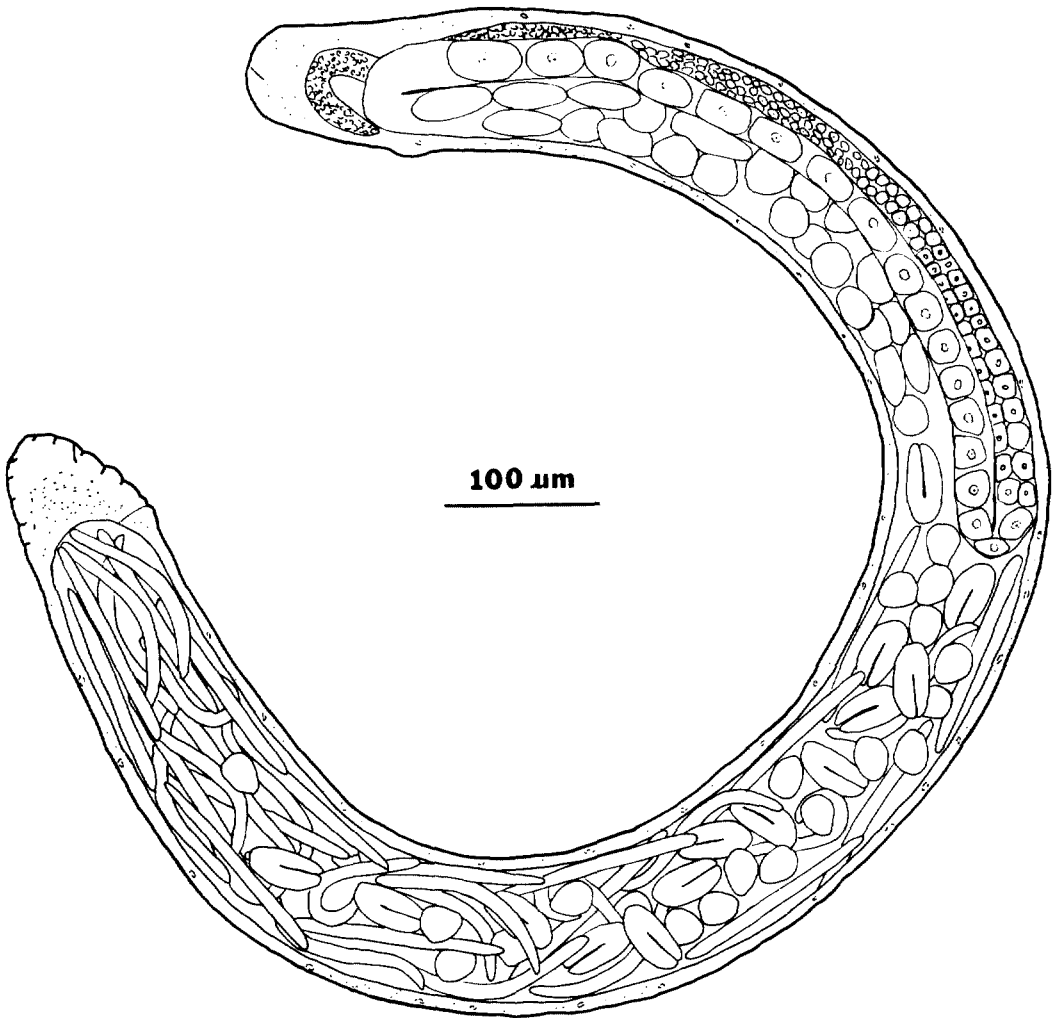


FIG. 1. *Howardula dominicki*, parasitic female with eggs and larvae.

Host range: *Epitrix hirtipennis* (type host), *E. fuscula* Crotch. A similar nematode has been taken from *E. cucumeris* (Harris) (7). *Type locality:* Oxford Tobacco Research Station, Oxford, North Carolina. *Type material:* Holotype-free-living female, allotype-free-living male, and paratype-free-living and parasitic females deposited at USDA Nematode Collection, Beltsville, Maryland.

Diagnosis: The free-living female stage of *H. dominicki* has a considerably longer stylet than is found in *H. benigna* (2), *H. aptini* (9), *H. aoronymphium* (15), *H. acarinatorum* (13), *H. phyllotretae* (Elsey, unpublished), and *H. dubium* (1). Free-living females of *H. dominicki* differ from

H. oscinellae in having a distinct dorsal gland (6), and from *H. madecassa* and *H. truncati* in having 11-13 ovarian cells compared with only 3 (11) in these nitidulid beetle parasites.

Howardula dominicki can be distinguished from four species of gamasid mite parasites (14) (*H. cunifer*, *H. claviger*, *H. terribilis*, and *H. hirsutus*) by the presence of a distinct vulva in the parasitic females.

BIOLOGY

In North Carolina, *H. dominicki* overwinters as a parasitic female within diapausing adult flea beetles (3). When the beetles become active in the spring, the parasitic females release juveniles into the

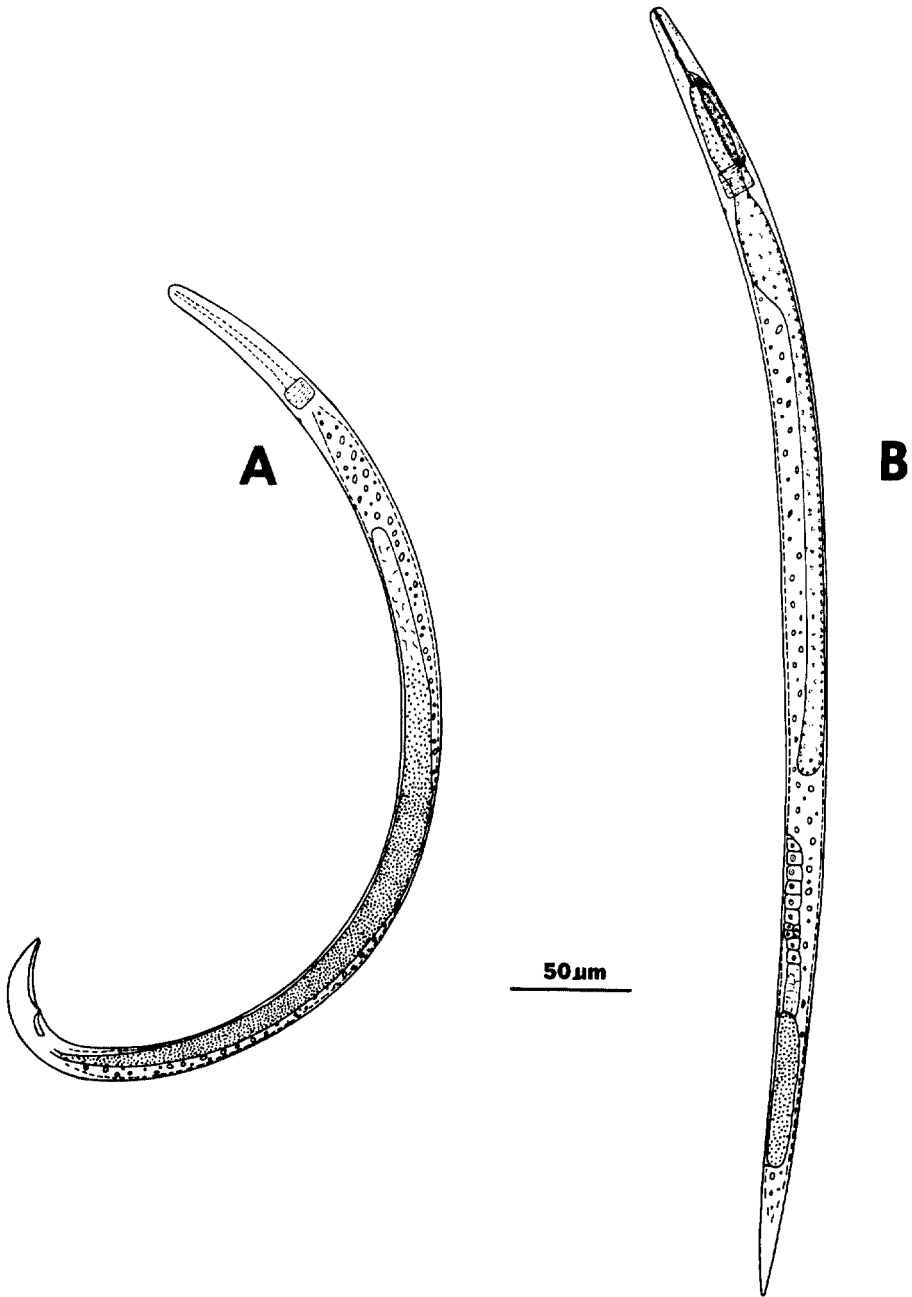


FIG. 2-(A-B). *Howardula dominicki*. A) Adult male. B) Free-living female.

hemocoel. The juveniles grow and eventually leave the beetle (via the reproductive tract of the female beetles and the digestive system of male beetles) and enter the soil (4). Up to 1,000 juveniles, about 80% of which were females (4), have been found to exit from individual beetles. The free-living forms molt twice within 48 h and then mate; at this time the females are

capable of invading flea beetle larvae. Free-living females can survive from 5 to 6 days in H₂O under laboratory conditions (4). After invading a host larva, the now parasitic female rapidly enlarges and becomes reproductive. At this point, some undetermined factors cause the nematode to follow either one of two reproductive strategies. The parasitic female may release

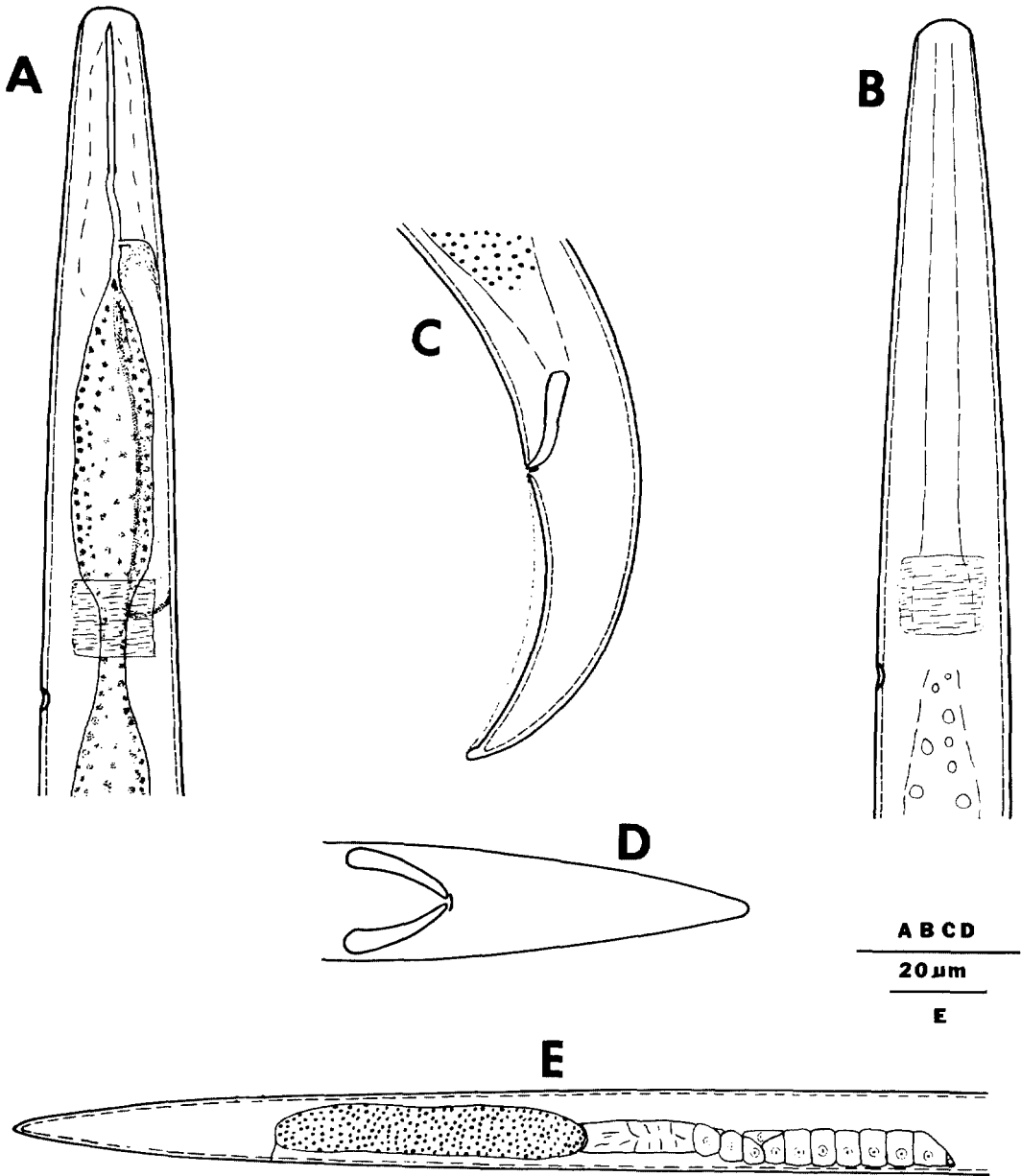


FIG. 3-(A-E). *Howardula dominicki*. A) Anterior, free-living female. B) Anterior, adult male. C) Adult male tail in lateral view. D) Adult male tail in ventral view (diagrammatic). E) Posterior, free-living female.

juveniles while the host is still a larva; in this case, the juveniles exit via the anus of the larva, which eventually dies (5). Or, the nematode may postpone release of juveniles until the host reaches the adult stage, whereupon the female beetle is castrated and also feeds less than unparasitized beetles (3). Male beetles show no obvious infirmity when parasitized.

The parasitic cycle continues until late summer when fewer and fewer parasitic

females release juveniles. By early October, almost all flea beetles are in diapause, and all the overwintering parasitic females have ceased to release juveniles (3).

In collections of *E. hirtipennis* taken over a 3-year period from tobacco fields in several North Carolina locations, I found that parasitization by *H. dominicki* ranged from 0 to 56% for adults and from 0 to over 60% for larvae (3, 5).

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