

Praecocilenchus raphidophorus n. gen., n. sp. (Nematoda: Aphelenchoidea)
parasitizing *Rhynchophorus bilineatus* (Montrouzier)
(Coleoptera: Curculionidae) in New Britain¹

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Abstract: *Praecocilenchus raphidophorus* n. gen., n. sp. is described as a new endoparasitic aphelenchoid nematode parasitizing adults of the palm weevil, *Rhynchophorus bilineatus* (Montrouzier). *P. raphidophorus* is unusual in that juveniles develop to maturity within the female uterus and thin, needle-shaped crystals form in the intestines of mature parasitic females. Hundreds of parasitic female nematodes were found in the body cavity of infected hosts. The role of this parasite as a biological control agent of *Rhynchophorus* weevils is discussed.

The palm weevils (genus *Rhynchophorus*) are major pests of coconut palms throughout the tropics. *Rhynchophorus bilineatus* (Montrouzier) is the species most often damaging to coconuts in Indonesia and the neighboring islands, including the Territory of Papua and New Guinea. Adult weevils deposit eggs in existing or newly made holes in the trunk or fronds of both healthy and damaged palms. After hatching, the weevil larvae bore into the center of the tree, and death of the palm frequently follows (8).

Living nematodes were first obtained from the hemocoels of parasitized adult *R. bilineatus* collected by Mr. Geoffrey Bedford, a co-worker of the author on the U.N. South Pacific Commission's Rhinoceros Beetle Project at the Lowlands Agricultural Experiment Station, Keravat, New Britain.

Qualitative observations of living nematodes supplemented by taxonomic measurements of specimens processed to glycerine

led to the decision to erect a new genus for this nematode. The description follows:

GENUS *Praecocilenchus* n. gen.

Tylenchida (Filipjev, 1934) Thorne, 1949. Aphelenchoidea (Fuchs, 1937) Thorne, 1949. Aphelenchoididae (Skarbilovich, 1947) Paramonov, 1953.

DESCRIPTION: Mature parasitic female.—Cuticle with faint transverse striations; lips fused; stylet faintly visible; strongly developed median bulb with functional valve plates; pharyngeal glands conspicuous; ovary outstretched, vulva posterior, protruding in older specimens; post-vulvar sac and perivaginal gland cells absent; ovoviviparous with the juveniles reaching sexual maturity within the uterus of the living mother worm.

Intrauterine or free-living female.—Cuticle with faint transverse striations; lips fused; stylet thin without basal knobs; well developed median bulb containing dorsal and subventral gland openings; pharyngeal glands extending back almost to the tip of the ovary, which is outstretched.

Intrauterine male.—Cuticle with faint transverse striations; lips fused; spicules 2, separate; gubernaculum and bursa lacking; gonad outstretched, caudal papillae not visible.

GENERIC DIAGNOSIS: *Peraphelenchus* Wachek, 1955 and *Entaphelenchus* Wachek,

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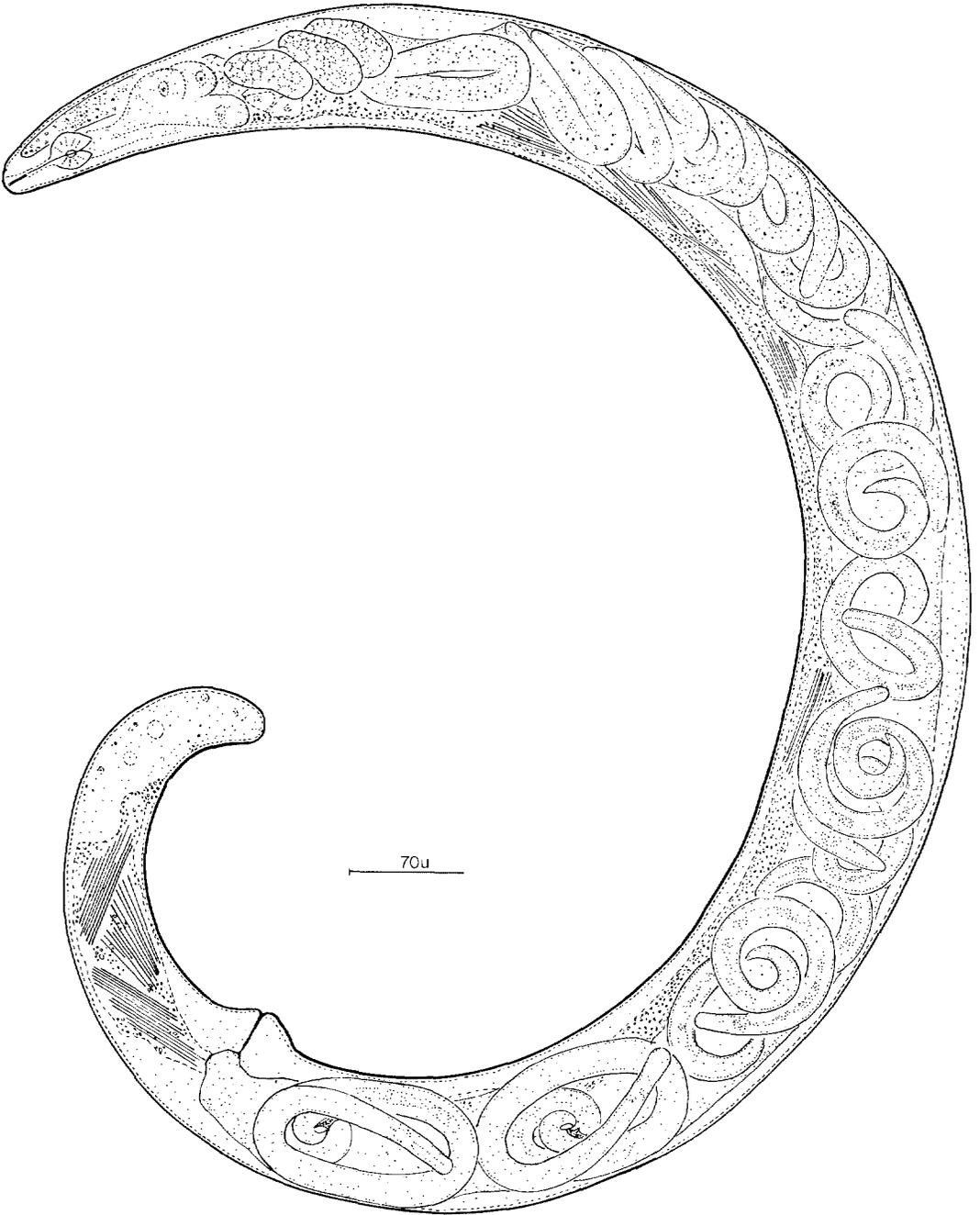


FIG. 1. Mature parasitic female of *Praecocilenchus rhapsidophorus* n. gen., n. sp. from the hemocoel of *Rhynchophorus bilineatus*.

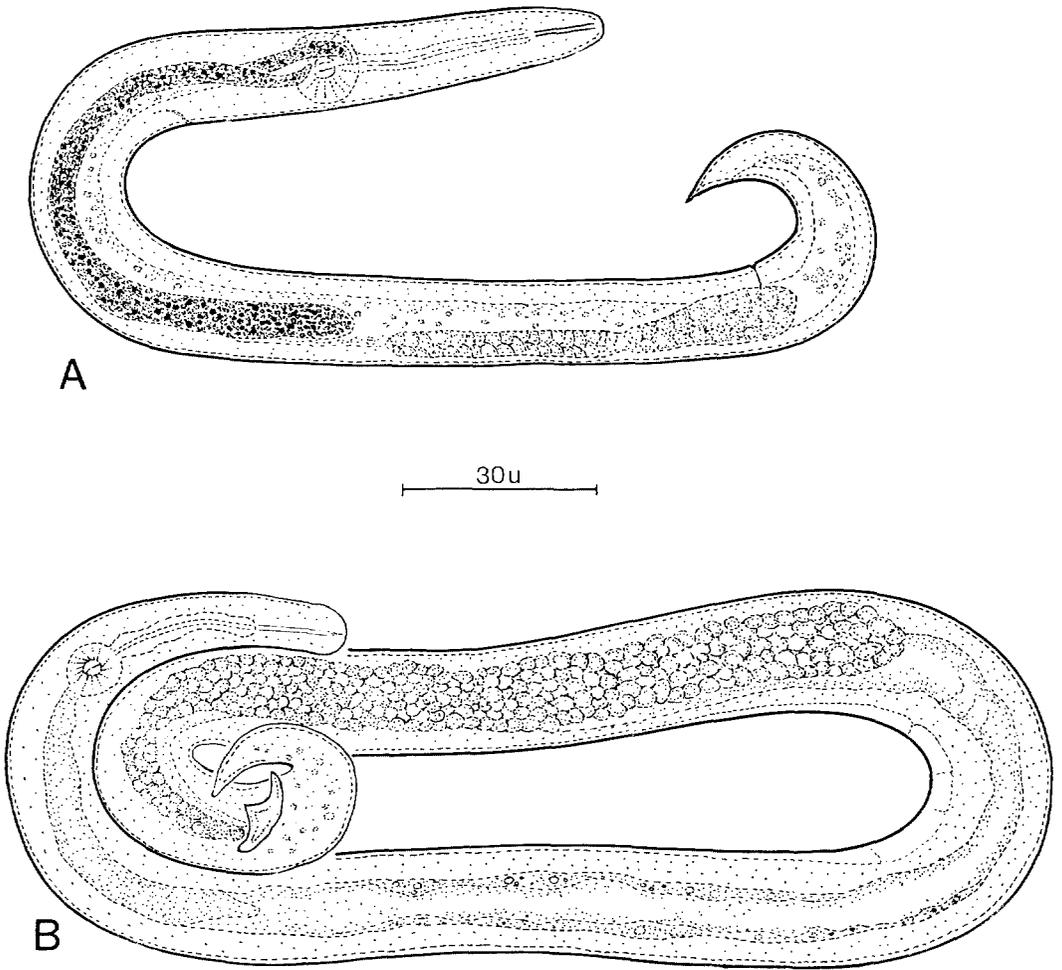


FIG. 2. A. Intrauterine female of *P. raphidophorus*. B. Intrauterine male of *P. raphidophorus*.

1955 are the only previously described genera of insect endoparasitic aphelenchoid nematodes (7). Mature parasitic females of *Peraphelenchus* differ from *Praecocilenchus* in possessing a trapezoid median bulb, a post-vulvar sac, and in being oviparous. The males are corkscrew shaped, possess a single spiculum, and have offset lips.

Mature females of *Entaphelenchus* differ from *Praecocilenchus* in possessing enlarged perivaginal gland cells and a convoluted ovary. Vulvar lips are not prominent and

all species in this genus are oviparous. The males have offset lips and possess distinct caudal papillae.

Praecocilenchus raphidophorus
n. gen., n. sp.

TYPE SPECIES: *Mature parasitic females* (20): (Fig. 1): Curved ventrally at rest; L = 1.72 mm. (.95–2.26); W at midbody 73 μ (46–100); W at vulva 61 μ (31–77); distance from head to base of bulb 52 μ (47–56); width of bulb 20 μ (16–25); %

vulva from head 82 (79–84). Prodelphic, ovary outstretched, vulva with lips protruding in older specimens; uterus and vagina thin walled; excretory pore and anus not visible; intestine containing needle-like crystals. Stylet same length as in free-living female; tail tip rounded.

Intrauterine or free-living females (15): (Fig 2A); very small; lip region constricted; $L = 292 \mu$ (259–334); W at midbody 15μ (13–17); distance from head to base of bulb 51μ (43–60); width of bulb 10μ (9–12); stylet flexible, length 9μ (8–10); excretory pore posterior to median bulb, at a distance of 67μ (62–78) from the head; tail stubby, pointed; anus faint.

Intrauterine males (15): (Fig. 2B); Larger than corresponding female; head slightly swollen; pharyngeal glands and intestine not as well developed as in the female; stylet same length as free-living female, but with thinner walls; $L = 484 \mu$ (409–564); W at midbody 20μ (17–23); bulb reduced, distance from head to base of bulb 49μ (46–54); width of bulb 8μ (7–12); testis single; tail curved, pointed, 25μ (17–33) long; spicules paired, equal, separate, with a pronounced rostrum and apex, length 17μ (13–20), greatest width at tip of rostrum 7μ (6–8); excretory pore not visible.

Specific Diagnosis.—A relatively small species with characters as described for the genus. Besides being larger than the female, the male has a swollen head, possesses a reduced stylet, median bulb and intestine and lacks an excretory pore. All larger parasitic females from the host's hemocoel contained long, fine, needle-shaped crystals in their intestine. They are probably formed during development within the digestive system and may represent waste products stored in a non-toxic state.

Type locality.—Raulawat plantation, Keravat, New Britain.

Type habitat.—Hemocoel of adult *Rhyn-*

chophorus bilineatus (Montrouzier) (Curculionidae: Coleoptera).

Type species.—Holotype (T-131t) and paratypes (T-682p) deposited in the U.S.D.A. Nematode Collection, Beltsville, Maryland. Paratypes are also deposited with Dr. W. Nicholas, Department of Zoology, Australian National University, Canberra.

DISCUSSION

BIONOMICS: Brief mention has been made of a similar nematode found in the hemocoel of *Rhynchophorus* adults in Papua and New Guinea (5); however, the description is not complete enough to determine if it is identical with *P. raphidophorus*. An earlier report of nematodes associated with palm weevils was made by Leefmans (6), who found round worms in the intestine of dead *Rhynchophorus ferrugineus* in Indonesia. The nematodes were not identified and laboratory tests to infect healthy weevils were unsuccessful.

An interesting association occurs between the causal agent of red ring disease, *Rhadinaphelenchus cocophilus* (Cobb) Goodey and the palm weevil *Rhynchophorus palm-arum* (L.). The nematodes are carried about externally on various stages of the insect, and also occur in the trachea, intestine and fat body of beetle larvae and in the intestine and hemocoel of the adults (2, 3).

P. raphidophorus was found in the body cavity (hemocoel) of both sexes of adult weevils. Of 10 female and 13 male *R. bilineatus* adults examined, 5 and 3, respectively, were parasitized. No nematodes were recovered from the hemocoel of 35 various sized larvae of *R. bilineatus*. Hundreds of female nematodes ranging in size from intrauterine adults to the enlarged mature parasitic forms were found in each infected insect. This suggests that several life cycles of the nematode may be completed within one beetle. Males were not as common in

the insect hemocoel, but occurred regularly within the uterus of the mother nematode. The intrauterine adults were often surrounded by a membrane, possibly stretched egg shell or a previously cast skin. In some specimens, the cuticles from previous molts could be seen within this membrane. In older females, the newly formed adults were active and appeared to be mating within the uterus. It is not known if this is the typical location for mating in this species, but copulation probably occurs inside the host's hemocoel. Although it is a rare phenomenon in parasitic nematodes, Bovien (1) discovered that juveniles of *Scatonema wülkeri* Bovien could reach full maturity and even copulate inside the uterus of the female nematode parasite of the fly, *Scatopse fuscipes* Meig. Gupta and Swarup (4) observed mature males within the uterus of specimens of *Anguina tritici*; this, however, was considered atypical.

The ovipositor of infected weevils was packed with nematodes and it is possible that the latter leave the host via the reproductive system. However, free-living females were found in the feces of infected beetles and probably also exit through the gut wall. Viable male nematodes were rarely recovered outside the infected beetle, and since the uteri of many free-living females contained sperm, mating probably occurred inside the host.

The median bulb of the parasitic female of *Praecocilenchus* appeared to be functional, since the muscles contracted and the valve plates pulsated in living specimens. Host fluids are probably ingested into the thin walled intestine and then diffused throughout the body cavity of the nematode.

PATHOLOGY: Although viable eggs may still be deposited, the ovaries appeared smaller in parasitized beetles. The life span of infected beetles may be shortened, however more observations are needed to determine the pathogenicity of the nematode

upon the host weevil and its effectiveness as a biological control agent.

Since *Rhynchophorus* in New Britain breeds in the same palms as *Oryctes rhinoceros* (L.), it was initially hoped that the same nematode might be discovered parasitizing the latter pest as well. All observations thus far have been negative. It would be interesting to attempt laboratory infections.

If *P. raphidophorus* effectively controls *R. bilineatus*, the nematode could easily be distributed throughout the range of this pest. Even if the parasite proves to be innocuous to this host, it may be effective against other species of *Rhynchophorus*, and cross-infection studies might be worthwhile, since the habits of these weevils make them extremely difficult to control by conventional methods.

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