

MERMIS, *CHANGODUDUS* SP. N. (MERMITHIDAE) A NEMATODE  
PARASITE OF *HETERONYCHUS* BEETLES (SCARABAEIDAE)  
IN MADAGASCAR

BY

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The nematode, *Mermis changodudus* sp. n. (Mermithidae) is described as a new parasite of *Heteronychus* beetle larvae (Scarabaeidae) in Madagascar. The diagnostic characters of this species are 1) eggs without polar protuberances or filaments, 2) mouth shifted slightly ventrad and 3) embryo not fully developed at oviposition. This is the sixth species described in the genus *Mermis* (sensu stricto).

The genus *Mermis* Dujardin (1842) originally encompassed all species of the family Mermithidae, but became restricted as more diverse forms of mermithids became known. However, even today, authors may designate a mermithid nematode simply as *Mermis* sp., thus using the genus *Mermis* in the broad sense (simply implying a mermithid nematode). In the present study, the genus *Mermis* is discussed in the restricted sense (designating a genus of morphologically defined mermithid species).

Of the six described mermithids that fall into the restricted genus *Mermis*, five have been described on the basis of a single specimen. As a result, there is a tendency to equate the genus *Mermis* with the well known species *M. nigrescens* which has some very unique characters. The new species of *Mermis* described in the present paper illustrates some new variability in the genus, and an emended generic description is presented.

#### MATERIALS AND METHODS

The mermithids discussed in this study were removed from larvae of the beetle, *Heteronychus* sp. (Scarabaeidae: Coleoptera). These insects were collected in soil near Lake Tsimbazaza at Tananarive, Madagascar. After emerging from the insects as postparasitic juveniles, the nematodes were maintained in soil until they reached the adult stage. They were then heat-killed, and processed to glycerin for taxonomic studies.

#### RESULTS

The adult mermithids that developed from postparasitic juveniles emerging from *Heteronychus* beetles were determined as being new to science, and are

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described below. On the basis of the characters described in the present species, as well as the morphological variation shown in other members of the genus, an emended generic description is presented below. This description further expands the genus since the last complete diagnosis (Goodey, 1963).

*Mermis* Dujardin, 1842 (Mermithidae Braun, 1883). Diagnosis (emended). Head with four cephalic papillae, two lateral lip papillae and two amphids with small openings; mouth terminal or slightly ventrad in position; six hypodermal cords; cuticle with distinct cross fibers; vagina S-shaped; eggs may or may not have polar caps or appendages (byssi); spicules paired, straight, separate, approximately equal to anal body diameter; postparasitic juvenile normally lacking tail appendage.

In the following specific description, all measurements are given in micrometers unless otherwise specified. The first figure after the character is the average value. Numbers in parenthesis represent the range of the character.

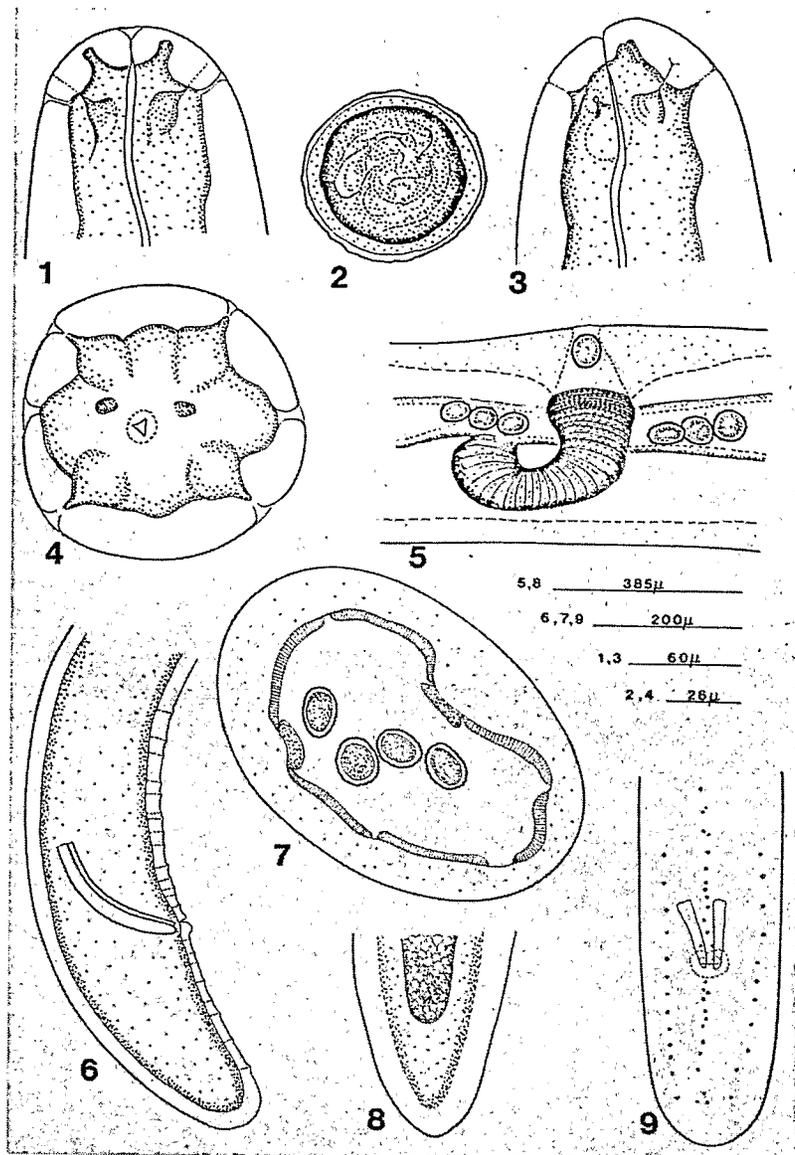
*Mermis changodudus* sp. n. (Figs. 1-9)

Fairly long nematodes with mouth shifted slightly ventrad in position; two lateral lip papillae and four submedian head papillae; paired amphids approximately on the same plane as the submedian papillae; amphidial openings small, six hypodermal cords; cuticle thick (30-40  $\mu\text{m}$ ), with distinct cross fibers; vagina S-shaped, bent in two planes; eggs small, disc-shaped and not fully embryonated at oviposition (worm form not recognizable); cuticular canal extends from vulvar opening to beginning of muscular vagina; eggs without byssi or polar knobs, shell with roughened surface; spicules paired, separate, straight, slightly curved throughout their length; equal to or slightly shorter than anal body diameter; male tail with three rows of anal papillae; middle row extending further anterior than two lateral rows; tails of both sexes rounded.

*Female* (N = 10) (Figs. 1, 3, 4, 5, 7, 8). Length: 91.5 (40-155) mm; greatest width: 354 (238-439); distance from head to nerve ring: 347 (284-385); V: 51 (47-59); length lip papillae: 9 (6-12); length S-shaped vagina: 368 (285-425); length cuticular canal between vulva and beginning of vagina: 99 (77-131); diameter of eggs: 59 (56-62)  $\times$  41 (37-46).

*Male* (N = 4) (Figs. 6, 9). Length: 33 (31-35) mm; greatest width: 219 (193-277); distance from head to nerve ring: 296 (277-316); length of lateral papillae: 7 (6-9); length of spicules: 182 (169-200); width of spicules: 16 (15-18); anal body diameter: 209 (193-216); length of tail: 275 (254-308).

Preparasitic and postparasitic juveniles were not observed.



*Mermis changodudus* sp. n. 1. Ventral view of female head. 2. Eggs from vagina of female. 3. Lateral view of female head. 4. En face view of female. 5. Lateral view of vulval area. 6. Lateral view of male tail. 7. Cross section of female at mid-body. 8. Lateral view of female tail. 9. Ventral view of male tail.

*Type species:* Holotype (female) and allotype (male) deposited in the Department of Nematology, University of California, Davis. (Nos. 1593 and 1594, respectively.).

*Type locality:* Tananarive, Madagascar.

*Type host:* *Heteronychus* sp. (Scarabaeidae: Coleoptera)

*Diagnosis:* The ventrally displaced mouth, undeveloped embryo at oviposition and shape and size of the eggs separates *M. changodudus* from previously described species in this genus. The following key separates the females of the presently known species of the genus *Mermis*.<sup>1)</sup>

1. Eggs containing polar protuberances (elevations, knobs) which may be adorned with filaments (byssi) — 2.
1. Eggs without polar protuberances or filaments (byssi); shell smooth or roughened — 3.
2. Eggs with thickened polar knobs and if present, unbranched polar filaments; no pigment zone in neck region of female; egg shell colorless — *M. mirabilis* von Linstow, 1903 (= *M. tabitiensis* Baylis, 1944).
2. Eggs with small polar knobs and branched polar filaments; brown pigment zone in neck region of female; egg shell brown — *M. nigrescens* Dujardin, 1842 (= *M. subnigrescens* Cobb, 1926) (= *M. meissneri* Cobb, 1926).
3. Mouth shifted slightly ventrad; embryo not fully developed at oviposition — *M. changodudus* n. sp.
3. Mouth terminal; embryo fully developed at oviposition — 4.
4. Eggs with a thin, smooth shell — *M. kenyensis* Baylis, 1944.
4. Eggs with a thick, roughened shell — *M. athysanota* Steiner, 1921.

#### DISCUSSION

Members of the genus *Mermis* have been recorded from both temperate and tropical areas, and are probably worldwide in distribution. This report represents a new host record for mermithid nematodes. However very little is known about the hosts of this genus of parasites. Aside from the present species, specific hosts are known only for *Mermis nigrescens*, and consist mainly of grasshoppers. Females of *M. nigrescens* ascend vegetation and deposit their eggs on the foliage. These eggs are pigmented to protect them from sunlight and embryonated when deposited. The latter character insures a quick hatch in the host's gut after ingestion. Females of *M. nigrescens* also contain a light sensitive pigmented area in their neck region, which has been correlated with their ovipositional habits (Cobb, 1929).

All of these specialized characters are lacking in *M. changodudus* since they are obviously not useful to a parasite of soil inhabiting insect larvae. It is now clear that nematodes in the genus *Mermis* show considerable variation in their behavioral and morphological characters.

<sup>1)</sup> *M. maroccana* Baylis, 1935 is not included here because the description is based on a single male specimen.

## RÉSUMÉ

*Mermis changodudus* n. sp. (Mermithidae), un nématode parasite d'*Heteronychus* (Scarabaeidae) à Madagascar

Les auteurs décrivent *Mermis changodudus* n. sp., parasite des larves d'*Heteronychus* à Madagascar. Les caractéristiques de cette espèce sont: 1) des oeufs sans filaments ou protubérances polaires, 2) un conduit buccal légèrement courbé ventralement, 3) un embryon non complètement développé au moment de la ponte. Cette nouvelle espèce est la sixième du genre *Mermis* (sensu stricto).

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