BIOLOGY AND REDESCRIPTION OF PHEROMERMIS PACHYSOMA
(V. LINSTOW) N. GEN., N. COMB. (NEMATODA: MERMITHIDAE), A
PARASITE OF YELLOWJACKETS (HYMENOPTERA: VESPIDAE)

BY

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Pheromermis pachysoma (von Linstow) n. gen., n. comb., a parasite of the yellowjacket, Vespula pensylvanica (Saussure), is described from California. The genus, Pheromermis, is characterized by the presence of four submedian cephalic papillae; large anteriorly placed cup-shaped amphids; an S-shaped vagina not bent in a transverse plane to the body; six hypodermal cords; paired, short, separate spicules; cuticle with cross fibers; and eggs lacking processes.

The development of P. pachysoma is unique because a paratenic or transport host is required for completion of the life cycle. The adult nematodes occur in water or saturated soil and the eggs are fully embryonated at oviposition. The eggs hatch in the gut of various insects and infective stage juveniles penetrate the gut wall and enter a quiescent state in the tissues of these paratenic hosts. Wasp larvae are probably infected when they are fed paratenic hosts captured by worker yellowjackets. Postparasitic juveniles of P. pachysoma emerge from adult wasps when the latter visit wet sites after their fall emergence from the nest.

The ant parasite, Mermis myrmecophilus Baylis, is transferred to the genus Pheromermis.

While studying insects associated with seepage areas in the California inter-coastal range, large mermithid nematodes were discovered. Although the nematodes were found in these localized habitats throughout the year, a detailed examination of the invertebrates in the immediate environment revealed no parasitized hosts. It was not until later that the hosts of these mermithids were discovered to be yellowjackets (Vespula pensylvanica [Saussure]).

Baird (1853) was apparently the first of several authors to report parasitic worms in yellowjackets. Baird's specimens, which he named Gordius vespae vulgaris, came from the abdomen of Paravespula vulgaris (L.) in England. Later Kristof (1879) observed a large worm leaving the abdomen of a living male of P. vulgaris. Von Linstow (1905) described Mermis pachysoma from four post-parasitic juveniles taken from Paravespula germanica (Fab.) in England and additional observations cited below indicate that this parasite is widely distributed in Great Britain. A most significant observation made by H. G. Filtness on the emergence of a mermithid nematode from a queen P. vulgaris was presented by Waterston & Baylis (1930). Workers and queens of P. vulgaris infected with mermithids were removed from a nest by Beck (1937) and Fox-Wilson (1946).

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collected what he called a *Gordius* from yellowjacket males. Blackith & Stevenson (1958) recovered similar parasites from workers, queens, and one male of *P. germanica* and from queens of *P. vulgaris* and *Dolichovespula sylvestris* (Scop.). In Germany, Kloft (1951) and Gauss (1970) found queens of *P. germanica* infected with what they called gordiid worms.

It is our contention that the above reports refer to the same parasite which is recorded here from the New World for the first time. This parasite is definitely a mermithid nematode that was occasionally confused with hairworms or Nematomorpha. Heinze (1953) was quick to show that Kloft’s specimens were probably mermithids and not gordiids. Welch (1958) redescribed the post-parasitic juveniles of this mermithid from material collected by Blackith & Stevenson and placed it in the collective genus of immature mermithids, *Agamomermis*.

Discovering the adults of this nematode now permits an examination of mature characters needed to correctly classify mermithids. The present paper describes the adult forms and investigates the life history of this most singular nematode. In so doing, it illustrates a pattern of development completely new to members of the Mermithidae.

**MATERIALS AND METHODS**

Field investigations were conducted on two study sites located on the University of California Field Station just outside Hopland, Mendocino County, California. Both sites were permanent spring seepages located on gradually sloping pastures surrounded by woodland. The first site was approximately 6.1 m long by 3.7 m wide and was covered with weeds, grasses, and moss. The former plants were closely cropped by domestic sheep maintained in the pasture throughout the year. Two dense patches of the rush, *Juncus bolanderi* Engelm., grew around the border of the seepage area. Other prominent invertebrates collected from soil at the site included earthworms, adult and larval Coleoptera, larvae of Trichoptera, and larvae of various Diptera (Ceratopogonidae, Dolichopodidae, Stratiomyidae, Tabanidae, and Tipulidae).

The second site consisted of two small streamlets (each up to 16 cm across) which ran from their spring source 12-15 m before disappearing into the earth. Grasses, mosses (*Bryum* sp., *Pohlia nutans* [Hedw.] Lindb.), and a rush (*Juncus* sp.) bordered the area and watercress (*Nasturtium officinale* R. Br.) was the dominant plant in the streamlets. The prominent invertebrates were similar to those from the first site. Cattle were present in this pasture only in spring.

Soil samples approximately 15 cm × 15 cm × 5 cm deep were removed periodically and placed in Berlese funnels for nematode extraction. Insects visiting or emerging from the sites were collected with nets or on boards coated with Tanglefoot (Stickem Special, Michel and Pelton & Co., Emeryville, California).

Nematodes collected from the study sites were maintained in tap water at 10° and 20°. For descriptive purposes, the nematodes were fixed in TAF and processed to glycerin.