PREVALENCE OF PARASITISM OF ADULT *AEDES VEXANS* BY A MERMITHID (NEMATODA: MERMITHIDAE) IN OKLAHOMA

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During the past 20 years, considerable effort has been directed toward development of control of mosquitoes by using mermithid nematodes as biological agents (Petersen 1985). Still, little is known about the distribution of this parasite-host relationship. With the exception of studies with *Perutilimermis culicis* (Nickle), a parasite of adult *Aedes sollicitans* (Walker) along the Gulf and East Coast salt marshes (Petersen et al. 1967, Stiles 1903), and *Octomyomermis troglodytis* Poinar and Sanders, a parasite of immature and adult stages of the tree hole mosquito *Aedes sierrensis* (Ludlow) in California (Poinar and Sanders 1974), little is known about the occurrence of mermithids that mature in adult mosquitoes in the U.S. (Mermithids parasitize mosquitoes in the early larval stage, but some species do not mature until the host develops to the adult stage.)

During studies on the transmission of the dog heartworm, *Dirofilaria immitis* (Leidy) near Stillwater, Oklahoma (Afolabi 1985)[4] in 1983, a number of adult *Aedes vexans* (Meigen) captured in light traps and animal-baited traps were found to be parasitized by an unidentified species of mermithid. This is the first reported observation of adult *Ae. vexans* being parasitized by mermithids in the US.

Parasitism of adults of this species have been observed in British Columbia and Manitoba. Steiner (1924) reported that in 1920 ca. 80% of both sexes captured in a sweepnet collection near Vancouver were parasitized by a mermithid described as *Paramermis canadensis* Steiner (described from immature stages). Parasitism was not observed in other species in the same collection except for a single specimen of *Aedes sticticus* (Meigen). The following year, levels of parasitism did not exceed ca. 20%. Trpis et al. (1968) reported high levels of parasitism where all *Ae. vexans* females were parasitized, but *Ae. sticticus* collected in the same vicinity were free of mermithids. Galloway and Brust (1976) reported on a mermithid which parasitized predominantly adult *Ae. vexans*, but which was also found in low numbers in *Ae. dorsalis* (Meigen), *Ae. spencerii* Theobald and *Ae. sticticus* in the Winnipeg area. Parasitism of *Ae. vexans* was over 90% in most samples. The mermithids were determined to be an undescribed species of *Culicimermis*. Harlos et al. (1980) observed that the British Columbia and Manitoba mermithid species did not appear to be conspecific.

Stabler (1952) reported the parasitism of larval *Ae. vexans* in Delaware County, Pennsylvania. He found that 52% of the *Ae. vexans*, 56% of the *Culex pipiens* Linn. and 8% of the *Cx. salinarius* Coquillett were parasitized by an undetermined species of mermithid. Petersen et al. (1968) reported limited parasitism of larval *Ae. vexans* in Louisiana by *Romanomermis culicivorax* Ross and Smith, an extensively studied parasite of larval mosquitoes.

Since mermithids have not been reported from adult *Ae. vexans* in the U.S. or from mosquitoes in Oklahoma, these observations are being reported. During the summer (April–October) of 1983, adult mosquito populations in Stillwater, Oklahoma, were sampled using conventional light traps and a dog-baited live animal trap. Both trapping methods were augmented with dry ice. The predominant species of mosquitoes collected, the numbers examined and those parasitized by mermithids are summarized in Table 1. Of 23 species collected, only *Ae. vexans*, *Ae. trivittatus* (Coquillett) and *Psorophora ciliata* (Fabr.) were found to harbor mermithids. One parasitized *Ps. ciliata*, four parasitized *Ae. trivittatus* (all collected between June 11 and 16) and 151 parasitized *Ae. vexans* were collected from live animal traps. Eighty-three percent of the parasitized *Ae. vexans* were captured between May 30 and June 12, and the highest level of parasitism for a single day occurred on June 4. Levels of parasitism decreased rapidly shortly thereafter but persisted until mid-July (Table 2). Only five *Ae. vexans* and one *Ae. trivittatus* collected from light traps were found positive for mermithids; four of the five positive *Ae. vexans* were trapped between May 30 and June 12. The small numbers of parasitized mosquitoes in light traps compared with those collected in live animal traps may have resulted from some mermithids being overlooked from light-trapped mosquitoes. Light-trapped mosquitoes were killed the day they

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[4] Afolabi, J. S. 1985. Vectors of newly endemic canine dirofilariasis in Stillwater, Oklahoma. Ph.D. Thesis, Oklahoma State University, 116 pp.

Table 1. Incidence of an unidentified mermithid species in mosquitoes collected by two trapping systems in Stillwater, OK, during the summer of 1983.

Species	No. from light traps		No. from live animal trap	
	Examined	Parasitized	Examined	Parasitized
Ae. trivittatus	589	1	2,855	4
Ae. vexans	674	5	1,173	151
An. punctipennis	57	0	14	0
An. quadrimaculatus	85	0	274	0
Cx. erraticus	144	0	387	0
Cx. salinarius	358	0	989	0
Cx. tarsalis	28	0	23	0
Cs. inornata	17	0	8	0
Ps. ciliata	10	0	18	1
Ps. cyanescens	142	0	2	0
Ps. ferox	186	0	1	0
Ps. horrida	109	0	2	0
Ps. longipalpus	127	0	1	0
Ps. mathesoni	138	0	1	0

The following species each represented <1% of the captured mosquitoes: *Ae. canadensis*, *Ae. epactius*, *Ae. nigromaculis*, *Ae. zoosophus*, *Cq. perturbans*, *Cx. pipiens*, *Or. signifera*, *Ps. columbiae* and *Ur. sapphirina*; none was observed parasitized by mermithids.

Table 2. Incidence of parasitism by an unidentified mermithid parasite of *Aedes vexans* collected from a live animal trap in Oklahoma, summer of 1983.

Dates collected	No. examined	Parasitized	
		No.	Percent
May 16–22	2	0	0
May 23–29	195	0	0
May 30–June 5	353	97	27.5
June 6–12	61	28	45.9
June 13–19	125	12	9.6
June 20–26	194	8	4.1
June 27–July 3	21	0	0
July 4–10	23	2	8.7
July 11–17	81	4	4.9
July 18–Sept. 18	118	0	0
Totals	1,173	151	12.9

were captured when mermithids were not always readily apparent. In contrast, mosquitoes captured in the live animal trap were taken to the laboratory alive where many lived long enough to digest a blood meal taken while being trapped, thus permitting substantial growth of the mermithids.

The biology of this unidentified mermithid appears similar to that of *Perutilimermis culicis* (Petersen et al. 1967) and *Culicimermis* sp. (Harlos et al. 1980). Both are essentially host specific for a single species of mosquito, and both produce high levels of parasitism early in the mosquito season apparently resulting from a synchronous hatch of overwintering parasites. Harlos et al. (1980) determined that only the first generation of *Ae. vexans* was parasitized by *Culicimermis* sp. in Manitoba.

Mermithids preserved for taxonomic determination were generally in the advanced parasitic stage precluding a proper determination. It is highly probable this mermithid is the same as one of the species parasitizing *Ae. vexans* in southern Canada.

Although mermithids that develop in adult mosquitoes do not prevent their female hosts from blood feeding, they generally cause biological castration, preventing the mosquitoes from reproducing (Trpis et al. 1968, Petersen et al. 1967). The data suggest that certain larval habitats in the Stillwater area had high levels of parasitism that resulted in the extensive infection of adult mosquitoes. Apparently this mermithid could have a significant impact in regulating early season populations of *Ae. vexans*.

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