

Stanley, J.G., & J.B. Jones

1976. Feeding Algae to Fish. *Aquaculture*, 7: 219-223.

Venkataraman, L.V., & B.P. Nigam

1979. Mass culturing of fresh-water algae for utilization as a protein source. *Phykos*, 18: 83-95.

Watanabe, M.M., & T. Ichimura

1977. Fresh and salt-water forms of *Spirulina platensis* in axenic cultures. *Bull. Jap. Soc. Phycol.*, 25: 371-377.

**Bionomics of black flies
(Diptera: Simuliidae) in Costa Rica.
VIII. Observations on the natural infection of black fly
larvae by *Neomesomermis travisi* (Nematoda: Mermithidae)***

by

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Resumen: Se hizo un estudio en la corriente Parruás del cantón de Aserrí, Provincia de San José, Costa Rica, con el fin de obtener información sobre la infección natural de *Neomesomermis travisi* (Nematoda: Mermithidae) en larvas de simúlidos (Diptera: Simuliidae). Se encontró que este mermítido parasita preferentemente larvas de *Simulium metallicum*. En la muestra estudiada solo se encontró una larva de *Simulium panamense* parasitada y ninguna de *Simulium paynei*. Se presenta información sobre la distribución geográfica de *Neomesomermis travisi* en Costa Rica.

Host-parasite relationships are of utmost importance in biological control studies which may lead to a better understanding of the complex interactions among populations of both components.

A new species of a mermithid parasite of Simuliidae was described by Vargas *et al.* (1980) as part of a study on the bionomics of black flies in Costa Rica.

In this publication we provide observations on the natural infection of *Neomesomermis travisi* (Nematoda: Mermithidae) in two larval hosts, *Simulium metallicum* and *Simulium panamense* and present information about its geographical distribution in Costa Rica, so that further studies on the dynamics of the host-parasite relationship can be undertaken.

Black fly larvae were collected during 1980 following techniques described by Vargas and Travis (1973) in 100 representative streams in Costa Rica. The samples included all larval stages. Field observations were made to detect obviously parasitized larvae and collections were preserved in alcohol.

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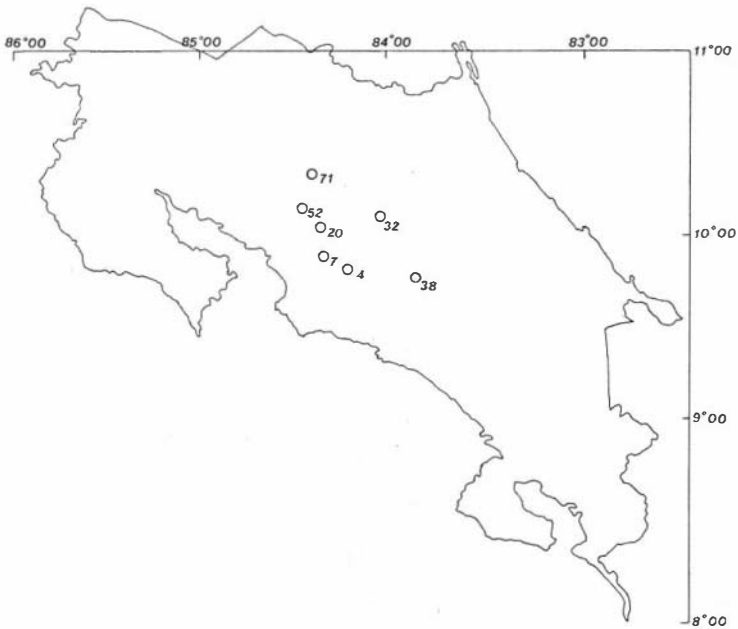


Fig. 1. Geographical localization of streams in Costa Rica where simuliid larvae parasitized by mermithids were found.

Stream No.4 (Quebrada Parruás) in Aserrí, San José Province was selected to study natural infection rates. In this stream larvae of three species of black flies were collected at random, the sample was partly fixed in 95% alcohol and partly brought live to the laboratory. The material collected was sorted by species and developmental stage and dissected under a stereoscopic microscope in search for mermithids. Black fly larvae parasitized by mermithids were collected in 7 of the 100 streams under study (Table and Figure 1). The general characteristics of these streams have been previously recorded in Vargas and Travis, 1973. Only one of these (No.71) is found outside the Central Valley, also, this stream belongs in category III, the rest of them fall in either category I or II and share similar stream beds, a factor which may be of importance for the development of the free living stages of the mermithids as well as for the larval hosts.

In Table 2 are summarized the results of the dissection of 587 larvae of three species of Simuliidae from Stream No.4 (Qda. Parruás). These data suggest that *Simulium metallicum* is the preferred host since only one larva of *Simulium panamense* and none of *Simulium paynei* were found parasitized. Usually, only one larval mermithid per host was found but two larvae of *S. metallicum* were parasitized by 3 mermithids and 2 parasites were recovered from each of 2 larvae of the same species.

The rather limited geographical distribution of *Neomesomermis trivisi* may be explained in part by the fact that it is apparently restricted to a few species of black flies. Its distribution in this country may coincide with that of *Simulium metallicum*. Failure to detect recently parasitized larvae in the field should also be taken into consideration.

We express our thanks to Mr. Roberto Gallardo for his field work.

TABLE I

*Streams in Costa Rica where mermithids parasitizing
black fly larvae were found*

Stream	No.	Category	Altitude	Locality
Qda. Parruás	4	II	1270 m	Aserri, San José
Qda. Honda	7	I	960 m	Mora, San José
Qda. Cajón	20	I	675 m	Atenas, Alajuela
Río Tambor	32	I	1550 m	Barva, Heredia
Qda. Quirí	38	II	1250 m	Tapantí, Cartago
Río Jesús	52	II	900 m	San Ramón, Alajuela
Qda. San Pedro	71	III	160 m	San Carlos, Alajuela

TABLE 2

*Parasitism by Neomesomeris travisi in black
fly larvae in Qda. Parruás, Costa Rica*

species	Total examined	Preserved larvae dissected				Total examined	larvae dissected <i>in vivo</i>			
		immature		mature			immature		mature	
		P	NP	P	NP		P	NP	P	NP
<i>Simulium paynei</i>	11	0	11	0	0	74	0	59	0	15
<i>Simulium panamense</i>	115	0	72	0	43	157	1	123	0	34
<i>Simulium metallicum</i>	68	12	31	1	24	160	35	93	0	32

Code: P: parasitized
NP: not parasitized

LITERATURE CITED

- Vargas M., & B.V. Travis
1973. Bionomía de los simúlidos (Diptera: Simuliidae) en Costa Rica. IV. Localización y descripción de los lugares de recolección. Rev. Biol. Trop. 21: 143-175.
- Vargas M., I.A. Rubtsov, & F. Fallas
1980. Bionomics of black flies (Diptera: Simuliidae) in Costa Rica. V. Description of *Neomesomeris travisi* sp. n. (Nematoda: Mermithidae). Rev. Biol. Trop. 28: 73-89.