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Intermediate Hosts of *Elaeophora schneideri* Wehr and Dikmans, 1935 on South Island, South Carolina[1]

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Elaeophora schneideri Wehr and Dikmans, 1935, is a filarial nematode that inhabits the arterial system of certain ruminants in North America. Although mule deer (*Odocoileus hemionus*) are usual hosts for *E. schneideri*, other cervids including white-tailed deer (*O. virginianus*) also are susceptible to infection (Hibler and Prestwood, 1981, *In* Diseases and Parasites of White-tailed Deer, Davidson et al. (eds.), Tall Timbers Research Station, Tallahassee, Florida, Misc. Publ. #7, pp. 351–362; Pence and Gray, 1981, J. Wildl. Dis. 17: 49–56).

In contrast to the tolerance of mule deer to infection by *E. schneideri*, the host-parasite relationship between white-tailed deer and *E. schneideri* is tenuous (Titche et al., 1979, J. Wildl. Dis. 15: 273–280). This may partly account for the paucity of reports of infected white-tailed deer. In the western and southwestern United States, *E. schneideri* has been reported from white-tailed deer in Arizona, Oklahoma, and Texas and in areas along the Texas-Arkansas border (Hibler and Prestwood, 1981, op. cit.). In the southeastern United States, clinical elaeophorosis has been reported in white-tailed deer from Florida and South Carolina. Arterial worms have been found in apparently healthy white-tailed deer from the lower coastal plain physiographic province in Florida, Georgia, and South Carolina (Prestwood and Ridgeway, 1972, J. Wildl. Dis. 8: 233–236; Hibler and Prestwood, 1981, op. cit.).

The arterial worm utilizes horseflies (Diptera: Tabanidae) as intermediate hosts. The following tabanids have been identified as intermediate hosts of *E. schneideri*: *Hybomitra procyon* Osten Sacken and *Tabanus monoensis* Hine in California; *H. aatos* Philip, *H. laticornis* Hine, *H. phaenops* Osten Sacken, *H. sonomensis* Osten Sacken, *H. tetrica rubrilata* Philip, *Silvius quadrivittatus* Say, *T. abditis* Philip, *T. eurycerus* Philip, *T. gilanus* Townsend, *T. punctifer* Osten Sacken, and *T. subsimilis subsimilis* Bellardi in New Mexico (see Hibler et al., 1969, Bull. Wildl. Dis. Assoc. 5: 27–30; Hibler et al., 1971, J. Wildl. Dis. 7: 43–45; Anderson and Weinmann, 1972, 14th Int. Cong. Entomol. Abstracts, Canberra, Australia, p. 290; Clark and Hibler, 1973, J. Wildl. Dis. 9: 21–25; and Davies, 1979, Ph.D. Diss., Colorado State Univ., Fort Collins, Colorado, 216 pp.). Intermediate hosts of *E. schneideri* in the southeastern United States have not been reported. The purpose of this study was to examine tabanids for larval *E. schneideri* and to determine which species serve as intermediate hosts for the parasite in the area.

The study area, South Island, George-

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town County, South Carolina, is a barrier island on the Atlantic Coast. The island was selected as a study site because *E. schneideri* has been found in white-tailed deer on the area (Hibler and Prestwood, 1981, op. cit.) and because horseflies are particularly abundant on the island from spring to early fall.

Horseflies were collected from July through September 1981, and from April through mid-October 1982, using canopy and malaise traps baited with dry ice (Roberts, 1976, Mosq. News. 36: 530–535). Trapped flies were refrigerated in plastic bags for 48–72 hr pending shipment to the laboratory in Athens, Georgia, for processing. Horseflies were identified and their heads individually dissected in search of third-stage larvae as described by Titche et al. (1979, op. cit.). Horseflies were not examined for other larval stages largely because of time constraints.

Larvae were fixed in glycerine/alcohol, cleared in glycerine, and measured with the aid of a camera lucida. Third-stage larvae obtained from *Tabanus lineola hinellus* Philip were inoculated into white-tailed deer fawns to complete the biological cycle of *E. schneideri*. Five fawns were obtained from areas in Georgia where *E. schneideri* has never been reported. Fawns were raised artificially and held indoors where contact with hematophagous insects was negligible. Three fawns aged 10, 16, and 14 wk were inoculated via jugular venipuncture with 20, 48, and 72 third-stage larvae, respectively, as larvae became available. Two fawns were maintained as environmental controls.

The fawn that received 20 third-stage larvae and the two control fawns were euthanatized at 28 wk post-inoculation. Complete necropsies including a thorough search of the arterial system for adult *E. schneideri* were performed on these animals. Baermann examinations of forehead skin for microfilariae were conducted as described by Hibler and Adcock (1968, J. Parasitol. 54: 1095–1098). The remaining two fawns that had received third-stage larvae were examined at 28 wk post-inoculation for evidence of *E. schneideri* infection using the Baermann technique on samples of forehead skin. Skin biopsies were obtained while fawns were under general anesthesia and fawns were allowed to recover.

Representative specimens of microilariae, third-stage larvae, and adult *E. schneideri* have been deposited in the U.S. National Parasite Collection, Beltsville, Maryland (Accession Nos. 77833, microfilariae; 77638, third-stage larvae; 77833, adult). Specimens of tabanids have been deposited in the B. P. Bishop Museum, Honolulu, Hawaii (Accession No. 1983.254).

During the 2-yr period, 25,521 horseflies of eight species were examined for larvae of *E. schneideri*. Overall, 430 larvae were obtained from 31 of 10,540 *T. l. hinellus*. Infected *T. l. hinellus* harbored one to 64 ($\bar{x} = 14$) third-stage larvae. Two larvae were obtained from one of 9,543 *T. nigrovittatus* Macquart. Larvae were not found in 907 *Chrysops atlanticus* Pechuman, 719 *C. fuliginosus* Wiedemann, 3,308 *Hybomitra* (*H. daeckei* Hine and *H. lasiophthalma* Macquart), 502 *T. atratus fulvopilosus* Johnson, and two *T. gladiator* Stone.

Specimens were identified as third-stage larvae of *E. schneideri* based on morphometric characteristics (Table 1). Morphology and measurements of larvae obtained from both intermediate hosts in this study conformed closely with data given by Hibler and Metzger (1974, J. Wildl. Dis. 10: 361–369) for third-stage larvae derived primarily from *H. laticornis* in New Mexico. Third-stage larvae from *T. l. hinellus*, however, were slightly shorter than third-stage larvae from *H. laticornis*.

One adult *E. schneideri* was recovered from a carotid artery of the fawn inoculated with 20 third-stage larvae; and intimal proliferation was noted in the con-

TABLE 1. Dimensions of third-stage larvae of *Elaeophora schneideri* from *Tabanus lineola hinellus* collected on South Island, Georgetown County, South Carolina. Except as noted, measurements of males and females are combined.[a]

Parameter	Number examined	Measurements (microns)	
		Average	Range
Body length	19	3,731	3,250–4,023
Body width	17	48	39–57
Esophagus length			
Muscular	13	253	221–277
Glandular	9	1,617	1,333–1,896
Nerve ring[b]	12	121	97–135
Genital primordium[b]			
Female	3	324	297–358
Male	4	1,983	1,814–2,053
Anus[c]	21	54	42–63

[a] Measurements were made on three female larvae, four male larvae, and 16 larvae of undetermined sex.
[b] Distance from anterior end of body.
[c] Distance from posterior end of body.

tralateral carotid artery. Forehead skin was negative for microfilariae. Microfilariae were obtained from forehead skin of two fawns inoculated with 48 and 72 third-stage larvae, respectively. Control animals were not infected with *E. schneideri*.

This is the first report of *E. schneideri* in tabanids in the southeastern United States. Recovery of adults and microfilariae of *E. schneideri* following inoculation of white-tailed deer fawns with third-stage larvae obtained from *T. l. hinellus* established this horsefly as a biological intermediate host of *Elaeophora* on South Island. Observations by two authors of this paper (CEC and VFN) of *T. l. hinellus* feeding on the dorso-facial region of captive white-tailed deer on South Island and a previous report of *T. l. hinellus* feeding on deer in coastal Louisiana (Wilson et al., 1969, Ann. Entomol. Soc. Am. 62: 1043–1046) further establish this horsefly as a pest of white-tailed deer. *Tabanus nigrovittatus* seems to be less important in the transmission of *Elaeophora*. Based on the literature and the findings of this study, *E. schneideri* will develop in a number of tabanids. Further research is indicated in enzootic areas, viz., Florida, Georgia, and South Carolina, to relate these findings to the epizootiology of elaeophorosis in the southeastern United States.

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Helminths of Striped Bass (*Morone saxatilis*) from the Kouchibouguac River, New Brunswick

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During an anadromous fish population survey in the Kouchibouguac River, New Brunswick, in September and October of 1979, 17 striped bass were examined for metazoan parasites. The fish (36.5–50.1 cm fork length; 2–6 yr old) were angled or

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