

Trematodes and Cestodes from the Digestive Tracts of *Synaptomys cooperi* and Three Species of *Microtus* from Indiana

JOHN O. WHITAKER, JR.

Department of Life Sciences

Indiana State University, Terre Haute, Indiana 47809

and

DOROTHY ADALIS

Biology Department

Ball State University, Muncie, Indiana 47306

Abstract

The digestive tracts of 122 meadow voles, *Microtus pennsylvanicus*, 157 prairie voles, *Microtus ochrogaster*, 26 pine mice, *Microtus pinetorum*, and 13 bog lemmings, *Synaptomys cooperi*, were examined for internal parasites. Only one of the bog lemmings was found to be parasitized, and it harbored 31 specimens of the trematode, *Quinqueserialis hassalli*. Two of the pine mice harbored five cestodes, but unfortunately their poor condition precluded identification. Thirty cestodes were found in 18 of the meadow voles, or 0.24 per mouse, with 14.8% of the mice being parasitized. Among these cestodes were *Cladotania* sp., *Paranoplocephala troeschi*, *Paranoplocephala infrequens*, and *Andrya macrocephala*. Of the 157 prairie voles examined, 42 (28.6%) contained 227 cestodes (1.45 per mouse). Species identified were *A. macrocephala*, *P. troeschi*, *P. infrequens* and *Taenia taeniaeformis*. No seasonal changes in number of the cestode population was observed except that there were few cestodes in *M. ochrogaster* in the winter. There were very few cestodes in small *M. ochrogaster*. No differences in cestode populations related to size of the mice were observed, except that small *Microtus ochrogaster* harbored significantly less cestodes than did larger mice.

Introduction

Over the past several years numerous small mammals have been collected in Vigo County (25) as well as in other parts of Indiana. Those from Vigo County were collected in a series of random plots, while those from other areas were taken in long lines placed in various habitats. The purpose of the present paper is to present information on the cestodes and trematodes of *Synaptomys cooperi*, *Microtus ochrogaster*, *M. pennsylvanicus* and *M. pinetorum* as part of continued studies on the biology of the mammals of Indiana.

Materials and Methods

The stomachs and intestines of the mammals were opened with dissecting needles and the contents placed in watch glasses of normal saline solution. A 10 to 70 power zoom dissecting microscope was used to examine the material for internal parasites. Parasites were placed in a refrigerator overnight, then preserved in AFA (six parts commercial formalin, 1 part glacial acetic acid, 20 parts 95% alcohol, and 40 parts distilled water). Cestodes were stained with Semichon's Carmin or hemotoxylin and placed on slides in piccolyte; Trematodes were stained with Semichon's Carmin.

Results

Bog lemming. *Synaptomys cooperi*.

Thirteen bog lemmings were examined during the present study, seven from Vigo, and the remainder from other counties. The 31 trematodes recovered from the intestines of one of the lemmings from Vigo County were all *Quinqueserialis hassalli*. No other internal parasites were found.

The only previous records we have found of cestodes or trematodes in *S. cooperi* are of *Andrya* sp. (6) and *Paranoplocephala variabilis* (20).

Pine mouse. *Microtus pinetorum*.

Of the 26 pine mice examined during the present study, 21 were from Vigo and five from other Indiana counties. Two of the mice, both from Vigo County, harbored four and one cestodes, but because of their poor condition, none could be identified. Three cestodes have been previously reported in *M. pinetorum*, *Catenotaenia pusilla* (3), *Cladotaenia* sp. (16) and *Taenia* sp. (6).

Prairie vole. *Microtus ochrogaster*.

A total of 157 prairie voles was examined for internal parasites, of which 42 harbored 227 cestodes (mean of 1.45 per mouse overall, and a mean of 5.40 in those infested), and 3 harbored a total of 53 trematodes (0.34 per mouse, or 17.7 per mouse in those infested). The trematodes have not been identified.

Fifty-four of the cestodes from 22 of the prairie voles have been mounted and identified, including 4 species (Table 1). All these species have previously been reported from *M. ochrogaster* from other areas, *Andrya macrocephala* by (8, 9, 21, 23), *Paranoplocephala infrequens* by (8, 9, 22), *P. troeschi* by (8), and *Cladotaenia* sp. and *Taenia taeniaeformis* by (23).

One species of trematode, *Quinqueserialis hassalli*, has been reported from the prairie vole (20, 23).

Meadow vole. *Microtus pennsylvanicus*.

A total of 122 meadow voles were examined during this study, 54 of them from Vigo County. Six trematodes were found in one of the voles, but were lost. One unidentified cestode larva (bladderworm) was found in one and 30 adult cestodes were found in 18 of the mice. Twelve cestodes from seven mice were mounted and identified (Table 1).

Rausch (19) first found *Andrya macrocephala* in *Microtus pennsylvanicus*, although Erickson (6) reported two unidentified species of *Andrya* in that host. There are several other records of *A. macrocephala* in *M. pennsylvanicus* (7, 12, 13, 14, 21, 23, 24). *Paranoplocephala troeschi* was originally described from *M. pennsylvanicus* (18), and this species was reported also by Rausch and Tiner (23), along with *Paranoplocephala* sp. *P. infrequens* has been reported by several work-

TABLE 1. *Cestodes and trematodes from Synaptomys cooperi and three species of Microtus from Indiana.*

	<i>Microtus ochrogaster</i>	<i>Microtus pennsylvanicus</i>	<i>Microtus pinetorum</i>	<i>Synaptomys cooperi</i>
Trematodes				
No. examined	157	122	26	13
No. infested	3	1	0	1
% infested	1.9	0.8	0	7.7
No. Trematodes	53	6	0	31
Ave. No. per host	0.34	0.05	0	2.4
Cestodes				
No. examined	157	122	26	0
No. infested	42	18	2	0
% infested	26.8	14.8	7.7	0
No. trematodes	227	30	5	0
Ave. No. per host	1.45	0.25	0.15	0
Cestodes identified				
<i>Andrya</i>				
<i>macrocephala</i>	22	4	0	0
<i>Paranoplocephala</i>				
<i>trotschi</i>	25	4	0	0
<i>P. infrequens</i>	5	3	0	0
<i>Taenia taeniaeformis</i>	2	0	0	0
(Cysts from liver)				
<i>Cladotaenia</i> sp.	0	1	0	0

ers (7, 11, 12, 14, 20, 22, 24). *Cladotaenia* sp. (23) and the liver cysts of *Taenia taeniaeformis* have also been reported (5, 6, 11, 23). The trematode, *Quinqueserialis hassalli* has been found in *M. pennsylvanicus* (10, 12, 15, 23) as has *Q. quinqueserialis* (10, 11, 12, 20, 24). Some other trematodes that have been reported from the meadow vole are *Schistosomatum douthitti* (17), *Plagiorchis muris* (11, 24), *Nudacotyle novica* (1, 2), *Entosiphonus thompsoni* (23), *Brachylaema rauschi* (20) and *Mediogonimus olivacus* (23, 26).

Host Size and Cestode Infestation

The individuals of *M. ochrogaster* and *M. pennsylvanicus* were separated into size groups by weight (Table 2). In *M. pennsylvanicus*, the degree of infestation was similar in the three size classes, as indicated by mean numbers of parasites per mouse of 0.23, 0.28 and 0.21, and the percentages of animals parasitized at 17.6, 16.4, and 15.8.

In *M. ochrogaster*, however, the animals under 20 g were parasitized at a significantly lower rate, at 0.09 cestodes per mouse (Chi-square = 36.10, 1 df), and less of the mice were infested, at 8.7%, than in the larger mice.

Seasonal Variation in Cestode Infestation

The cestode infestation data were grouped by season; spring (March through May), summer (June through Aug.), fall (Sept. through Nov.) and winter (Dec. through Feb.). The number of cestodes

TABLE 2. *Cestode infestations as related to weight classes of Microtus ochrogaster and M. pennsylvanicus.*

Weight classes	No. of Mice	No. of Cestodes	Mean	Infestation	
				No.	%
<i>Microtus ochrogaster</i>					
Under 20 g	23	2	0.09	2	8.7
20.0-39.9 g	99	153	1.54	32	32.3
40.0 g	29	72	1.79	8	15.4
Total	151	227		42	
<i>Microtus pennsylvanicus</i>					
Under 20 g	17	4	0.23	3	17.6
20.0-39.9 g	61	17	0.28	10	16.4
40.0 g	38	8	0.21	4	15.8
Total	116	29		17	

taken in the winter in *M. ochrogaster* (Table 3) at 0.13 per mouse, was significantly less than at other seasons (Chi-square = 33.97, 1 df). Also the incidence of mice parasitized was low in winter, with 12.5% being parasitized. The highest number of cestodes, and the highest incidence occurred in *M. pennsylvanicus* in winter, but unfortunately only four mice of this species were taken during that season. We see no strong evidence of seasonal differences of infestation in *M. pennsylvanicus*.

TABLE 3. *Seasonal variation in Cestode infestation in Microtus ochrogaster and M. pennsylvanicus.*

Seasons	No. of Mice	No. of Cestodes	Mean	Infestation	
				No.	%
<i>Microtus ochrogaster</i>					
Spring	29	63	2.17	11	37.9
Summer	51	32	0.63	14	27.5
Fall	53	129	2.43	14	26.4
Winter	24	3	0.13	3	12.5
Total	157	227		42	
<i>Microtus pennsylvanicus</i>					
Spring	29	5	0.17	3	10.3
Summer	25	5	0.20	2	8.0
Fall	64	18	0.28	11	17.1
Winter	4	3	0.50	2	50.0
Total	122	30		18	

Taxonomic Considerations

The major intestinal parasites of *M. ochrogaster* and *M. pennsylvanicus* in Indiana, as elsewhere, are cestodes of the genera *Andrya* and *Paranoplocephala* (Anoplocephalidae). *Andrya macrocephala* was described by Douthitt (6), but in 1947 Hansen (12) described *A.*

microti, as having a greater number of ovarian lobes and a smaller number of testes. Rausch and Schiller (28) state that *A. macrocephala*, common east of the Rocky Mountains especially in voles, is a variable species and these authors synonymized *A. microti* with *A. macrocephala*.

We found two morphologically separable forms of *Andrya* in both *M. ochrogaster* and *M. pennsylvanicus*, which, in view of the conclusions of Rausch and Schiller, we have called *A. macrocephala*. Seven of the cestodes from *M. ochrogaster*, and two from *M. pennsylvanicus* fit the description of *A. microti* Hansen. Further taxonomic work is needed.

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