

## Nematodes Found in the Opossum (*Didelphis virginiana*) and Four Other Species of Mammals in Central Kentucky in 1991

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### ABSTRACT

Opossums ( $n = 50$ ), striped skunks ( $n = 3$ ), eastern cottontail rabbits ( $n = 2$ ), muskrats ( $n = 2$ ), and a coyote, collected on horse farms ( $n = 14$ ) in central Kentucky in the fall of 1991, were examined for internal helminths. All parasites (nematodes, cestodes, and trematodes) recovered were counted. Only nematodes were identified. Species of nematodes recovered from opossums were *Capillaria* spp., *Physaloptera turgida*, *Strongyloides* spp., *Longistriata didelphis*, *Viannaia viannai*, and *Cruzia americana*; striped skunks were *Gongylonema* spp., *Physaloptera maxillaris*, *Baylisascaris columnaris*, and *Strongyloides* spp.; eastern cottontail rabbits were *Obeliscoides cuniculi*, *Trichostrongylus calcaratus*, and *Trichuris leporis*; muskrats were *Physaloptera* spp. and *Trichostrongylus* spp.; the coyote (only small intestine examined) were *Molineus barbatus*, and *Uncinaria stenocephala*.

### INTRODUCTION

Several species of wild mammals were collected in central Kentucky in 1991 on farms where leptospirosis had been found in horses. The purpose was to determine if they were carriers for this disease in horses. Collecting the mammals provided an opportunity to examine some of them for internal parasites. Mostly opossums, and lesser numbers of skunks, eastern cottontail rabbits, muskrats, and a coyote, were examined for helminths. Total counts were made for all parasites recovered, but only nematodes were identified.

### MATERIALS AND METHODS

A total of 50 opossums (*Didelphis virginiana*), 3 striped skunks (*Mephitis mephitis*), 2 eastern cottontail rabbits (*Sylvilagus floridanus*), 2 muskrats (*Ondatra zibethica*), and 1 coyote (*Canis latrans*) were collected from 14 horse farms in central Kentucky between November 8 and December 12, 1991 for parasitologic examination. They were trapped by personnel from the Southeastern Cooperative Wildlife Disease Study, University of Georgia. The age/sex categories were: opossums—38 adults and 12 juveniles/26 males and 24 females; skunks—2 adults and 1 juvenile/1 male,

1 female, and 1 sex not recorded; eastern cottontail rabbits—2 adults/1 male and 1 female; muskrats—1 adult and 1 juvenile/2 females; coyote—1 adult male.

Organs examined for parasites were: lungs (including the trachea), liver, esophagus, stomach, small intestine, and large intestine. Snips of the lungs, liver, and esophagus were removed for other researchers before a parasitologic examination was done. Therefore, some parasite specimens from these tissues, which were examined in fresh condition for parasites with a stereoscopic microscope (at about 30 $\times$ ), may have been "lost." The gastrointestinal tract was separated into stomach, small intestine, and large intestine, including cecum. Contents were emptied into separate containers and then each segment was washed several times with water. Rinses were added to the appropriate container of contents and this material was preserved with 5% formalin. The gastrointestinal tract was then opened with scissors and any parasites observed by gross examination were removed. Next, each portion of the gastrointestinal tract was placed in containers of artificial digestive juice (1% pepsin and 1% HC1 in an incubator at 37°C) for about 3 hours; then, the mucosal side was

TABLE 1. Data on internal parasites recovered from opossums in a survey in central Kentucky.

Parasites	Range	No. of parasites		Opossums (n = 50)		
		Mean*	Total	No. infected	(%) infected	
<b>Nematodes</b>						
<i>Capillaria</i> spp.**						
Lungs						
M	—	3.0	3	1	(2)	
F	0–7***	2.1	46	22	(44)	
M&F	0–7	2.2	49	22	(44)	
G.i. tract						
M	0–8	2.1	30	14	(28)	
F	0–11	3.1	68	22	(44)	
M&F	0–11	3.9	98	25	(50)	
<i>Physaloptera turgida</i> ****						
Imm	2–4,300	474.8	23,265	49	(100)	
M	3–53	18.4	899	49	(100)	
F	2–79	20.0	978	49	(100)	
M&F	6–131	38.3	1,877	49	(100)	
Total	10–4,314	518.4	25,918	50	(100)	
<i>Strongyloides</i> spp.	0–42	15.0	45	3	(6)	
<i>Longistriata didelphis</i>						
M	0–23	4.7	85	18	(36)	
<i>Longistriata/Viannai</i>						
F	0–21	7.3	198	27	(54)	
<i>Viannai viannai</i>						
M	0–2	1.7	5	3	(6)	
<i>Cruzia americana</i>						
Imm	0–1,800	63.1	2,271	36	(72)	
M	0–242	62.7	2,821	45	(90)	
F	0–305	75.9	3,568	47	(94)	
M&F	0–547	135.9	6,389	48	(96)	
Total	0–1,804	180.4	8,660	48	(96)	
Imm–Unidentified	0–39	6.8	129	19	(38)	
Total Nematodes	12–6,119	703.7	35,187	50	(100)	
Cestodes	0–510	114.4	1,487	13	(26)	
Trematodes	0–421	69.1	2,419	35	(70)	

\* Mean = value for infected opossums; \*\* *Capillaria* spp.—from lungs, probably *C. didelphis* and from gastrointestinal tract, probably *C. longicauda*; \*\*\* Sex of one specimen not determined, but included data with females; \*\*\*\* Includes 776 from one opossum for which only total number counted; M = male; F = female; Imm = Immature.

washed under running water while being rubbed by hand to remove loosened material. This material and the digest were preserved with 5% formalin; the remainder of the walls was discarded. Digestion was done to free parasites associated with the walls and mucus. For the single coyote collected, only the small intestine was examined for parasites.

The fixed contents, water rinses, and digests from the gastrointestinal tract were washed into a series of sieves (10, 20, 40, 60, and 100 mesh). Residue was examined for helminths with the aid of a stereoscopic microscope at about 30 $\times$ . Total counts of all helminths were done. Nematodes were identified by usage of

various reference publications (1–29). Cestodes and trematodes were not identified.

#### RESULTS AND DISCUSSION

For the opossums (Table 1), the 2 most prevalent species of nematodes were *Physaloptera turgida* (100%) and *Cruzia americana* (96%). The high prevalence of both of these species is similar to that reported by several other investigators (4, 11, 18, 30–32). Numbers of male versus female specimens per infected animal ranged (mean number/infected opossum) from 3 to 53 (18.4) and 2 to 79 (20), respectively, for *P. turgida* and from 0 to 242 (62.7) and 0 to 305 (75.9), respectively, for *C.*

TABLE 2. Data on number of opossums infected with internal parasites relative to farm where collected.

Farm no.	No. exam.	Internal parasites									
		Nematodes									
		<i>Capillaria</i> spp.		<i>Physaloptera</i>	<i>Stdes.</i> spp.	Im. Un-ID	<i>Longi-</i> <i>striata**</i>	<i>Viannaia</i>	<i>Cruzia</i>	Cestodes	Trematodes
No. of opossums infected											
1	3	1	2	3	0	1	3	0	3	0	2
2	3	2	2	3	0	0	2	1	2	1	2
3	2	0	0	2	0	0	1	0	2	0	0
4	5	2	2	5	0	3	0	0	5	1	2
5	1	0	0	1	0	1	0	0	1	0	1
6	6	2	5	6	1	4	6	0	6	5	6
7	1	1	0	1	0	1	0	0	1	0	1
8	3	1	0	3	0	3	1	0	2	1	2
9	4	3	1	4	0	3	1	0	4	0	4
10	4	2	1	4	0	3	1	0	4	0	0
11	1	0	0	1	0	0	1	0	1	0	1
12	3	2	0	3	0	0	0	0	3	0	3
13	8	2	7	8	1	0	6	2	8	1	6
14	6	4	5	6	1	0	6	0	6	4	5
Total	50	22	25	50	3	19	28	3	48	13	35
(T) inf.		(44)	(50)	(100)	(6)	(38)	(56)	(6)	(96)	(26)	(70)

\* Complete names—*Physaloptera turgida*; *Strongyloides* spp.; Im. = Immature (Unidentified); *Longistriata didelphis*, *Viannaia viannai*, *Cruzia americana*.

\*\* *Longistriata didelphis* category includes *L. didelphis* males and *longistriata*/*Viannaia* females.

*americana*. Immature specimens (determined only by much smaller size than adults) varied in number (mean) from 2 to 4,300 (474.8) for *P. turgida* and 0 to 1,800 (63.1) for *C. americana*. The 2 next highest prevalent nematode species were *Longistriata/Viannaia* females (54%) and *Capillaria* spp. (probably *C. longicauda*) (50%) from the gastrointestinal tract. *Longistriata didelphis* males were found in 36% of the opossums. Two other reports indicated higher prevalence (18, 30) for *L. didelphis*. For *C. longicauda*, lower infection rates were found in 2 studies (4, 18) than for *Capillaria* spp. from the gastrointestinal tract in the present study. The number of male *L. didelphis* varied (mean) from 0 to 23 (4.7) and of female *Longistriata/Viannaia* from 0 to 21 (7.3). *Capillaria* spp. males vs. females were 0 to 8 (mean = 2.1) and 0 to 11 (3.1), respectively. Most of the *Longistriata/Viannaia* female specimens are probably *L. didelphis* because so few male *V. viannai* were found. The females were grouped together because of similarities in features. Other nematode species recovered (prevalence) were: from the lungs—*Capillaria* spp. (probably *C. didelphis*) (44%), and from the intestines—unidentified immatures (38%), *Strongyloides* spp. (6%), and *Viannaia viannai* (6%). Prevalency for

*Capillaria didelphis* was less in 1 study (32) and more in another (18) compared to that of *Capillaria* spp. in the lungs of opossums currently investigated. *Strongyloides* spp. (21) and *Viannaia viannai* (14) are apparently uncommon in opossums. The highest total number of nematodes in an individual opossum in the present study was 6,119; it had the greatest number of immature *P. turgida* and *C. americana*.

Cestodes (0 to 510; mean = 114.4) were recovered from 26% of the opossums; trematodes were highly prevalent (70%). The number of specimens of trematodes varied from 0 to 421 (mean = 69.1) per opossum. Data on the number of opossums infected with internal parasites on each farm are recorded (Table 2). Prevalences of the various species or types of parasites were highest on Farm No. 6.

The 3 skunks examined (Table 3) were all infected with the nematodes *Physaloptera maxillaris*, *Baylisascaris columnaris*, and *Strongyloides* spp.; *Gongylonema* spp. were found in 1 skunk. Cestodes were present in all 3 individuals, but trematodes in none. Prevalence of *P. maxillaris* in several other studies varied greatly (16, 33-35). *Baylisascaris columnaris* were much more prevalent in 2 other studies (34, 35). *Strongyloides* spp. were

TABLE 3. Internal parasites recovered from skunks, eastern cottontail rabbits, muskrats, and a coyote.

Parasites	Range	No. of parasites		Animals infected		
		Mean*	Total	No.	(%)	
Skunks (n = 3)						
<b>Nematodes</b>						
<i>Gongylonema</i> spp.						
M	—	1	1	1	(33)	
F	—	1	1	1	(33)	
M&F	1-1	2	2	1	(33)	
<i>Physaloptera maxillaris</i>						
Imm	295-1,828	921.67	2,765	3	(100)	
M	30-53	39.00	117	3	(100)	
F	71-97	80.00	240	3	(100)	
M&F	102-150	119.00	357	3	(100)	
Total	400-1,978	1,040.67	3,122	3	(100)	
<i>Balisascaris columnaris</i>						
M	1-18	7.00	21	3	(100)	
F	3-9	6.67	20	3	(100)	
M&F	4-27	13.67	41	3	(100)	
<i>Strongyloides</i> spp.	1-93	38.33	115	3	(100)	
Cestodes	10-92	39.67	119	3	(100)	
Eastern cottontail rabbits (n = 2)						
<i>Obeliscooides cuniculi</i>						
M	3-4	3.50	7	2	(100)	
F	1-1	1.00	2	2	(100)	
M&F	4-5	4.50	9	2	(100)	
<i>Trichostrongylus calcaratus</i>						
M	2-2	2.00	4	2	(100)	
F	4-6	5.00	10	2	(100)	
M&F	6-8	7.00	14	2	(100)	
<i>Trichuris leporis</i>						
M	—	1.00	1	1	(50)	
Cestodes	—	3.00	3	1	(50)	
Trematodes	—	2,570	2,570	1	(50)	
Muskrats (n = 2)						
<b>Nematodes</b>						
<i>Physaloptera</i> spp. (Imm)	1-1	1.00	2	2	(100)	
<i>Trichostrongylus</i> spp.						
M	—	3.00	3	1	(50)	
F	—	4.00	4	1	(50)	
M&F	3-4	3.50	7	1	(50)	
Cestodes	—	2.00	2	1	(50)	
Trematodes	37-3,758	189.75	3,795	2	(100)	
Coyote (n = 1)						
<i>Molineus barbatus</i>						
M	—	3.00	3	1	(100)	
F	—	5.00	5	1	(100)	
M&F	3-5	8.00	8	1	(100)	
<i>Uncinaria stenocephala</i>						
M	—	6.00	6	1	(100)	
F	—	2.00	2	1	(100)	
M&F	2-6	8.00	8	1	(100)	
Cestodes	—	39.00	39	1	(100)	

\* Mean = value for infected animals.

Imm = Immature; M = male; F = female.

found to be less prevalent by 2 researchers (34, 36). *Gongylonema longispiculum* were of low prevalence in 1 study (36).

For both cottontail rabbits examined (Table 3), 2 nematode species, *Trichostrongylus calcaratus* and *Obeliscoides cuniculi*, were recovered. One rabbit was also infected with *Trichuris leporis*. Cestodes and trematodes were present in 1 rabbit. Four other reports (2, 17, 31, 37) indicated greatly variable prevalence of *O. cuniculi* and *T. calcaratus* in this species of rabbit. For *T. leporis*, 3 investigators reported (2, 17, 37) lower infection rates than in the current survey.

The 2 muskrats examined (Table 3) were infected with the nematodes, *Physaloptera* spp. (immature) and *Trichostrongylus* spp. In addition, cestodes were recovered from 1 muskrat and trematodes from both muskrats. *Physaloptera* spp. have been previously found (23). *Trichostrongylus calcaratus* were found in a few animals in 2 studies (5, 20).

In the small intestine of the coyote, the nematodes, *Molineus barbatus* and *Uncinaria stenocephala*, were present. Also, cestodes (not *Echinococcus* spp.), but no trematodes, were found. Both of the species of nematodes were evident previously in low numbers of coyotes (10, 24).

This survey of internal parasites gave an indication of species, prevalence, and numbers in some of the wild mammals in the central Kentucky area. Especially meaningful are data from opossums for which a much greater number were examined than for the other hosts. Also, further information was obtained for Kentucky, supplementing previous surveys for helminths in muskrats in Madison County (20) and in eastern cottontail rabbits in western Kentucky (37).

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