NONGASTROINTESTINAL HELMINTHS IN MARTEN (MARTES AMERICANA) FROM ONTARIO, CANADA

Authors: Seville, Robert S., and Addison, Edward M.

Source: Journal of Wildlife Diseases, 31(4) : 529-533

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-31.4.529

Journal of Wildlife Diseases, 31(4), 1995, pp. 529–533

NONGASTROINTESTINAL HELMINTHS IN MARTEN (*MARTES AMERICANA*) FROM ONTARIO, CANADA

Robert S. Seville[1] and Edward M. Addison[2]

[1] Department of Zoology and Physiology, University of Wyoming/Casper Center, Casper, Wyoming 82601, USA

[2] Ontario Ministry of Natural Resources, Wildlife Branch, Maple, Ontario, Canada, L6A1S9

ABSTRACT: Six species of nongastrointestinal nematodes were recovered from 405 marten, (*Martes americana*), examined from six areas in Ontario, Canada in 1992 to 1993. Three species (*Crenosoma petrowi, Eucoleus aerophilus, Filaroides martis*) were found in the respiratory tract, one in the urinary bladder (*Pearsonema plica*), one in the kidney (*Dioctophyme renale*), and one in the musculature (*Trichinella* sp. larvae). This is the first report of *F. martis* and *P. plica* from this host. In addition a specimen of *Dracunculus insignis* collected from a marten pelt was received. Based on our results, martens are primary definitive hosts for few nongastrointestinal nematodes. Animals in more southern areas had greater species richness than those from higher latitudes.

Key words: Marten, *Martes americana*, helminths, nematoda, Ontario.

INTRODUCTION

Martens (*Martes americana*) are widely distributed throughout the boreal forests of North America (Clark et al., 1987). While parasite surveys based on complete necropsies of martens have been conducted (Holmes, 1963; Poole et al., 1983; Hoberg et al., 1990; Foreyt and Lagerquist, 1993) there are few reports of helminths occurring outside the gastrointestinal tract. While studying gastrointestinal helminth communities in martens we examined various other organs for helminths. Here we report the occurrence of internal helminths exclusive of the gastrointestinal tract; where possible we assess the relationships between host age and geographic location on helminth prevalence and abundance.

MATERIALS AND METHODS

Carcasses of 405 martens collected by trappers during the 1992 to 1993 trapping season were examined for helminths. These were collected from a variety of Ontario Ministry of Natural Resources districts located in distinct ecoregions (Wickware and Rubec, 1989) around Ontario, Canada. Locations sampled included Chapleau district (47°50′N, 83°24′W; Chapleau Plains ecoregion), Cochrane (49°0′N, 81°0′W; Lac Matagami), Ft. Frances (48°36′N, 93°24′W; Lake of the Woods Plains), Huntsville (45°20′N, 79°14′W; Nipissing), Nipigon (49°0′N, 88°17′W; Thunder Bay Plains), and Red Lake (51°3′N, 93°49′W; Berens Plains).

All carcasses were stored at −20 C until examination. At necropsy, the heart, lungs, trachea, liver, kidneys, and urinary bladder were examined for helminths. Nematodes were stored in 70% ethyl alcohol with glycerine and later cleared and mounted in glycerine for identification. The gastrointestinal tracts were opened, the esophagus lining was examined, and the stomach and intestines were scrapped and the contents stored in 10% formalin for later examination. Additionally 1 g of diaphragm was compressed between glass plates and examined for *Trichinella* sp. cysts. Heads were removed and placed in water to facilitate decomposition. Cleaned skulls were examined for lesions consistent with the presence of *Skryabingylus* spp. infection using the method of Addison et al. (1988). A premolar tooth was removed from each individual for age determination using cemental annuli (Strickland et al., 1982). Recovered nematodes were cleared in glycerol and identifications of each was based on comparisons with published descriptions for each species. Identification of *Filaroides martis* was based on the description of the lung nodules formed by this species (Anderson, 1962). Identifications of *Pearsonema plica* and *Eucoleus aerophilus* were based on the descriptions of Butterworth and Beverly-Burton (1980). Identification of *Trichinella* sp. infections was based on the presence of typical cysts containing coiled larval *Trichinella* in muscle. Identification of *Dioctophyme renale* was based on the presence of the large worm in the kidney capsule and the description of Soulsby (1982). Identification of *Crenosoma petrowi* was based on the description of Addison (1978) and *Dracunculus insignis* on the description of Crichton and Beverly-Burton (1973). Representative specimens of each have been deposited in the U.S. National Parasite Collection,

TABLE 1. Prevalences (%) of six species of helminths found infecting *Martes americana* from six locations in Ontario, Canada, 1992 to 1993.

	Chapleau (n = 48)	Cochrane (n = 59)	Ft. Frances (n = 31)	Huntsville (n = 87)	Nipigon (n = 107)	Red Lake (n = 73)	Total prevalence (n = 405)
Filaroides martes[a]	0	0	0	37	0	0	8
Pearsonema plica	0	0	13	18	5	0	6
Eucoleus aerophilus	0	3	0	9	2	3	4
Trichinella sp.	0	0	0	5	2	0	2
Dioctophyme renale[b]	0	0	10	1	0	0	2
Crenosoma petrowi	0	0	0	0	1	0	<1

[a] Includes animals with nodules or larval *F. martis* present.
[b] Includes six animals with evidence of previous *D. renale* infection.

Biosystematics and National Parasite Collection Unit, U.S. Department of Agriculture, Building 1180 BARC-East, Beltsville, Maryland (USA). Accession numbers were: *Crenosoma petrowi* (84270), *Dioctophyme renale* (84266), *Dracunculus insignis* (84267), *Eucoleus aerophilus* (84269), *Filaroides martis* (84268), *Pearsonema plica* (84264), and *Trichinella* sp. larvae (84265). When possible, chi-square analyses were performed to identify significant differences ($P \leq 0.05$) in prevalence between ages (SAS Institute, 1992).

RESULTS

Of the 405 martens examined from six districts in Ontario, 69 (17%) were infected with at least one species of non-gastrointestinal helminth. Overall, six parasite species were identified; these were found infecting the respiratory tract (*Crenosoma petrowi, Eucoleus aerophilus, Filaroides martis*), urinary bladder (*Pearsonema plica*), kidney (*Dioctophyme renale*), and musculature (*Trichinella* sp. larvae) (Table 1). Of the 69 infected individuals, 53 (77%) harbored one species, 14 (20%) had two, and two (3%) had three species present at the time of necropsy. Multispecies infections were found only in animals from the Huntsville district sample.

DISCUSSION

Filaroides martis, a common parasite of mink (*Mustela vison*) in Ontario (Anderson, 1962), was the most prevalent species and is reported for the first time from marten. Nematodes were found tightly coiled together in nodules in lung tissue. *Filaroides martis* was found only in animals from the Huntsville district. Prevalence was significantly (chi-square = 4.00, $P \leq 0.05$) higher in young of the year (60%, n = 37) than all other age classes combined (20%, n = 50). Based on these data we propose that *F. martis* infection may have an adverse effect on host survival. Alternatively, perhaps young animals recovered from infections and were able to completely eliminate nodules from lung tissue. Intensity of infection using number of nodules as an index ranged from one to 11 ($\bar{X}$ = 2.8, SD = 2.34). In addition small thread-like larval nematodes which were likely *F. martis* also were found in seven individuals. These were embedded in the adventitia of the dorsal aorta near the heart. Stockdale and Anderson (1970) described the life cycle and route of migration of this species and reported that, in mink, larval *F. martis* were found in various locations throughout the thoracic cavity including the adventitia of the dorsal aorta. Terrestrial gastropods and aquatic snails are the intermediate hosts of *F. martis* (Anderson, 1992) and larvae can encyst in the livers of a variety of paratenic hosts (Lankester and Anderson, 1966).

Two capillarid helminths were the next most prevalent species. *Pearsonema plica* (synonym *Capillaria plica*; Anderson, 1992) was found in three of the districts, with the highest prevalence in Huntsville, followed by Ft. Frances and Nipigon. This is the first report of this species occurring

in marten. Intensity of infection ranged from one to two worms per host ($\bar{X}$ = 1.08, SD = 0.28). This helminth infects a variety of North American carnivores including raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), coyote (*Canis latrans*), fisher (*Martes pennanti*), and striped skunk (*Mephitis mephitis*) (Butterworth and Beverly-Burton, 1980). *Eucoleus aerophilus* (synonym *Capillaria aerophila*; Anderson, 1992) was found in all districts but Ft. Frances. In all cases only a single worm was recovered from the infected individual. This species previously has been found infecting red fox, marten, and badger (*Taxidea taxus*) in Ontario (Butterworth and Beverly-Burton, 1980). Both of these capillarid species probably use earthworms as intermediate hosts (Anderson, 1992). Their presence in martens is evidence that either marten occasionally use earthworms as prey or alternatively that paratensis occurs in the life cycles of these nematodes.

Trichinella sp. was limited geographically to the Huntsville and Nipigon districts. Prevalence in the Huntsville district was comparable to the findings of Dick et al. (1986) who found 99 (5%) of 1980 martens from the Algonquin region (including Huntsville district) infected with *Trichinella* sp. Finding similar prevalences several years after the work of Dick et al. (1986) supports their assertion that the parasite is well established in the region and that marten are one of the primary hosts. The low prevalence in Nipigon and the absence of *Trichinella* sp. in the more northern districts also is consistent with their finding of lower prevalences in the more northern reaches of the Algonquin region.

The two least common helminths were *Dioctophyme renale* and *Crenosoma petrowi*. The former was found only in the Huntsville and Ft. Frances districts. In the Huntsville district, a nematode was found in only one marten, while five marten had evidence of previous infection including loss of the entire right kidney with only the empty fibrous capsule remaining and hypertrophy of the left kidney. When both actual and suspect infections was considered, the prevalence of *D. renale* in Huntsville was similar to the 2.2% reported by Strickland and Douglas (1987) for the Algonquin region of Ontario. In Ft. Frances two animals harbored *D. renale* while one had evidence of prior infection. There are no prior reports of *D. renale* in marten from northwestern Ontario. E. M. Addison (unpubl.) found 37% of mink from Parry Sound (near Huntsville) and 17% from Ft. Francis infected with *D. renale*. These are the only two districts of the current study area for which *D. renale* is known in mink. These data are consistent with the notion that marten are atypical hosts for *D. renale* and infected only when sympatric with *D. renale* infected mink.

One marten from the Nipigon district was found infected with a single *C. petrowi*. This species previously was reported in marten by Strickland and Douglas (1987) but they gave no estimate of prevalence. Despite the absence of *C. petrowi* from marten in the Huntsville area, *C. petrowi* was present in 28 (15%) of 184 fishers (*Martes pennanti*) (Craig and Borecky, 1976) and in eight of 10 black bears (*Ursus americanus*) from which *Crenosoma* sp. specimens were identified to species (Addison et al., 1978) from that part of Ontario. Based on these results, we believe that martens play an insignificant role in the maintenance of this parasite in wild carnivore host populations in Ontario.

One specimen of *Dracunculus insignis* collected by a trapper from a marten in the Huntsville District also was received. Strickland and Douglas (1987) found *D. insignis* in 0.2% of marten from the Algonquin region. This nematode is common in raccoons in Ontario and also in mink where the mink are sympatric with raccoons (Crichton and Beverly-Burton, 1974). This species likely is much more common in marten and other furbearers, but animals examined often have the pelts with *D. insignis* embedded in connective tissue

removed, resulting in underestimation of prevalence (Crichton and Beverly-Burton, 1974).

Based on our results, we propose that few non-gastrointestinal helminths use martens as primary definitive hosts. Other than *Trichinella* sp, the helminths recovered are much more common in other carnivores. For those that do occur in marten, it appears that complex life cycles using intermediate hosts associated with riparian areas, paratensis, and wide definitive host ranges have served to maintain populations in wild carnivore populations. Finally, it should be noted that this type of life history strategy limits many of these helminths to lower latitude locations due to decreases in invertebrate and amphibian intermediate or paratenic hosts in more northern latitudes.

ACKNOWLEDGMENTS

The authors thank the Ontario Ministry of Natural Resources for support, and the Ontario Trappers Councils and various trappers who provided carcasses for this work. Damien Joachim determined ages of animals examined. This material is based upon work supported by the North Atlantic Treaty Organization under a Grant (NSF GER-9255292) awarded in 1992.

LITERATURE CITED

ADDISON, E. M. 1978. *Crenosoma* spp. (Nematoda: Metastrongyloidea) from black bears, *Ursus americanus*, of central Ontario. Canadian Journal of Zoology 56: 1993–1997.

———, M. J. PYBUS, AND H. J. RIETVELD. 1978. Helminth and arthropod parasites of black bear, *Ursus americanus*, in central Ontario. Canadian Journal of Zoology 56: 2122–2126.

———, M. A. STRICKLAND, A. B. STEPHENSON, AND J. HOEVE. 1988. Cranial lesions possibly associated with *Skryabingylus* (Nematoda: Metastrongyloidea) infections in martens, fishers, and otters. Canadian Journal of Zoology 66: 2155–2159.

ANDERSON, R. C. 1962. The systematics and transmission of new and previously described metastrongyles (Nematoda: Metastrongylidae) from *Mustela vison*. Canadian Journal of Zoology 40: 893–920.

———. 1992. Nematode parasites of vertebrates: Their development and transmission. CAB International, Willingford, United Kingdom, 578 pp.

BUTTERWORTH, E. W., AND M. BEVERLY-BURTON. 1980. The taxonomy of *Capillaria* spp. (Nematoda: Trichuroidea) in carnivorous mammals from Ontario, Canada. Systematic Parasitology 1: 211–236.

CLARK, T. W., E. ANDERSON, C. DOUGLAS, AND M. STRICKLAND. 1987. *Martes americana*. Mammalian species No. 289. American Society of Mammalogists, Brigham Young University, Provo, Utah, 8 pp.

CRAIG, R. E., AND R. A. BORECKY. 1976. Metastrongyles (Nematoda: Metastrongyloidea) of fisher (*Martes pennanti*) from Ontario. Canadian Journal of Zoology 54: 806–807.

CRICHTON, V. F. J., AND M. BEVERLY-BURTON. 1973. *Dracunculus lutrae* n. sp. (Nematoda: Dracunculoidea) from the otter, *Lutra canadensis*, in Ontario, Canada. Canadian Journal of Zoology 51: 521–529.

———, AND ———. 1974. Distribution and prevalence of *Dracunculus* spp. (Nematoda: Dracunculoidea) in mammals in Ontario. Canadian Journal of Zoology 52: 163–167.

DICK, T. A., B. KINGSCOTE, M. A. STRICKLAND, AND C. W. DOUGLAS. 1986. Sylvatic trichinosis in Ontario, Canada. Journal of Wildlife Diseases 22: 42–47.

FOREYT, W. J., AND J. E. LAGERQUIST. 1993. Internal parasites from the marten (*Martes americana*) in eastern Washington. Journal of the Helminthological Society of Washington 60: 72–75.

HOBERG, E. P., K. B. AUBRY, AND J. D. BRITTELL. 1990. Helminth parasitism in martens (*Martes americana*) and ermines (*Mustela erminea*) from Washington, with comments on the distribution of *Trichinella spiralis*. Journal of Wildlife Diseases 26: 447–452.

HOLMES, J. C. 1963. Helminth parasites of pine marten, *Martes americana*, from the District of Mackenzie. Canadian Journal of Zoology 41: 333.

LANKESTER, M. W., AND R. C. ANDERSON. 1966. Small mammals as paratenic hosts of lungworms. Canadian Journal of Zoology 44: 341–342.

POOLE, B. C., K. CHADEE, AND T. A. DICK. 1983. Helminth parasites of pine marten, *Martes americana* (Turton), from Manitoba, Canada. Journal of Wildlife Diseases 19: 10–13.

SAS INSTITUTE. 1989. SAS/STAT user's guide, version 6, 4th ed., Vol. 1. SAS Institute, Inc., Cary, North Carolina, 943 pp.

SOULSBY, E. J. L. 1982. Helminths, arthropods, and protozoa of domesticated animals, 7th ed. Lea and Febiger, Philadelphia, Pennsylvania, 809 pp.

STOCKDALE, P. H. G., AND R. C. ANDERSON. 1970. The development, route of migration, and pathogenesis of *Filaroides martis* in mink. The Journal of Parasitology 56: 550–558.

STRICKLAND, M. A., AND C. W. DOUGLAS. 1987. Marten. *In* Wild furbearer management and conservation in North America, M. Novak, J. A.

Baker, M. E. Obbard, and B. Malloch (eds.). Ontario Ministry of Natural Resources, Toronto, Ontario, Canada, pp. 531–546.

———, C. W. DOUGLAS, M. K. BROWN, AND G. R. PARSONS. 1982. Determining the age of fisher from cementum annuli of the teeth. New York Fish and Game Journal 29: 90–94.

WICKWARE, G. M., AND C. D. A. RUBEC. 1989. Ecoregions of Ontario. Ecological Land Classification Series No. 26. Sustainable Development Branch, Environment Canada. Ottawa, Ontario, Canada, 37 pp.

Received for publication 24 October 1994.