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Source: Journal of Wildlife Diseases, 22(4) : 579-582

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-22.4.579

whether they may have been acquired locally. However, a number of ducks harboring immature specimens of *Tetrameres* were found also suggesting that local transmission may be possible (McLaughlin, unpubl. data). A single ovigerous specimen of *Capillaria* was found in the caecum of one coot and, as this genus has a direct life cycle, local transmission is clearly possible.

I thank the late Dr. David Skead and his family for their generous hospitality during my stay at Barberspan and for his help in collecting coots. This work was supported by Natural Sciences and Engineering Research Council of Canada grant A6979.

Journal of Wildlife Diseases, 22(4), 1986, pp. 579–582

Helminth Fauna of Beaver from Central Texas

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The beaver, *Castor canadensis,* is distributed throughout most of North America, ranging from Canada and Alaska to northern Mexico (Hill, 1982, *In* Wild Mammals of North America, J. A. Chapman and G. A. Feldhamer (eds.), Johns Hopkins University Press, Baltimore, Maryland, pp. 256–281). While the helminth fauna of beaver is well documented in the northern latitudes by at least 16 studies from Canada, the northern United States (reviewed by Bush and Samuel, 1981, *In* Proc. First Worldwide Furbearer Conf., J. A. Chapman and D. Pursley (eds.), R. Donnelley and Sons Co., Falls Church, Virginia, pp. 678–689), and Alaska (Babero, 1953, J. Parasitol. 39: 674–675), there is little information on the helminth fauna of this host from the more southern regions of its range. The present study was initiated to examine the helminth community of a beaver population from central Texas.

Thirty-six beaver were collected with Conibear traps from five counties (Bell, Bosque, Freestone, Limestone, and Navarro) representing a 12,721-km^2 area in central Texas within a 120-km radius of Waco, Texas during 1981–1982. The area is characterized by hilly and broken topography interspersed with large numbers of small permanent to intermittent streams many of which have been modified to form small impoundments. The streams are the lesser tributaries of two major and nonconfluent drainage systems in the area, the Brazos River and Trinity River. These impoundments have created suitable habitat for beaver and the area now supports a sizable population derived from original endemic stock. This area is considered to have the highest density of beavers in the state of Texas and landowners often complain of damage to their reservoirs and adjacent croplands. Beaver examined in this study were collected from impoundments on both drainage systems and in response to damage complaints by landowners to the Texas Rodent and Predatory Animal Control Service.

Received for publication 25 October 1985.

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Beaver were sexed, aged by tooth development (Van Nostrand and Stephenson, 1964, J. Wildl. Manage. 28: 430–434), and classed as kits (<1 yr of age), yearlings (1–2 yr), and adults (>2 yr old). Animals were frozen and later necropsied. Intact carcasses were skinned and examined for filarids. Viscera were removed and examined for helminths. Trematodes were fixed in AFA solution, stored in 70% ethyl alcohol, stained in Semichon's acetocarmine, and mounted in Canada balsam. Nematodes were fixed in glacial acetic acid, stored in 70% ethyl alcohol, and examined in glycerine wet-mounts after evaporation of the alcohol.

Representative specimens of the helminth species recovered in this study are deposited in the U.S. National Parasite Collection, Beltsville, Maryland 20705, USA (Nos. 78982–78984).

The terms prevalence, intensity, and abundance follow the definitions of Margolis et al. (1982, J. Parasitol. 68: 131–133). Overdispersion is defined by Bliss and Fisher (1953, Biometrics 9: 176–200) and in the present study refers to frequency distributions of helminths where a few host individuals have many helminth individuals and many of the hosts have only a few or no individuals of a particular helminth species. Overdispersion was indicated when the variance was significantly greater than the mean (chi-square analysis) and was measured by the negative binomial parameter k (Bliss and Fisher, 1953, op. cit.).

A rank transformation procedure provided a useful technique for application in a unified manner of the usual parametric statistical methods by replacing abundance values in the contiguously distributed dataset with their ranks (RT-2 of Conover and Iman, 1981, Am. Stat. 35: 124–129; PROC RANK, Statistical Analysis Systems, 1982 Ed., SAS Institute, Raleigh, North Carolina 27511). The main and interactive effects (Box et al., 1978, Statistics for Experimenters, John Wiley and Sons, New York, 653 pp.) of the two independent variables of host age and sex were examined with a factorial ANOVA for the single common helminth species (PROC GLM; SAS). Three combinations of factors influencing the distribution of this helminth species were examined (sex, age, sex–age). The importance of specific factors was determined from the relative magnitude of the total variance accounted for in that factor by ranking the values of the F statistic (for significant relationships only) generated across all combinations of the two independent variables (Tabachnick and Fidell, 1983, Using Multivariate Statistics, Harper and Row, New York, 509 pp.). Statistical significance was determined at $P < 0.05$.

Three helminth species were recovered from 30 of 36 beaver in central Texas (Table 1). *Heterobilharzia americana* was observed in four beaver and two individuals of a *Dipetalonema* sp. were recovered from one host. The latter could not be identified to species level because only two adult females were recovered. However, they appeared to be morphologically different from *Dipetalonema sprenti* described from the beaver in Canada (Anderson, 1953, Parasitology 43: 215–221). The trematode *Stichorchis subtriquetrus* occurred in the small intestine, cecum, and large intestine. This was the only common and abundant helminth species recovered from beaver (30 of 36 infected) in central Texas.

It is difficult to compare prevalences of *S. subtriquetrus* across its host's geographic range based on previous surveys. Most of these studies did not distinguish between host age or sex classes and it is uncertain what effect these variables had on the distribution pattern of this helminth. However, Brenner (1970, J. Mammal. 51: 171–173) reported prevalences of *S. subtriquetrus* in yearling and adult beaver at 50% and 100%, respectively. It was suggested that infections might be age-dependent but this could not be confirmed

TABLE 1. Prevalence, intensity, and abundance of helminths in beaver from central Texas.

Helminth species	Prevalence (%)	Intensity[a]	Abundance[a]	Total recovered (*n*)
Stichorchis subtriquetrus	83	402.9 ± 149.4	335.7 ± 26.7	12,086
Heterobilharzia americana	11	1.3 ± 0.3	0.1 ± 0.1	5
Dipetalonema sp.	3	2.0	0.1 ± 0.1	2

[a] Mean ± standard error.

based on his small sample sizes. Alternatively, Bush and Samuel (1981, op. cit.) did not find a relationship between prevalence of *S. subtriquetrus* and age of the host. In the present study, only yearling and adult beaver had similar and high prevalences of *S. subtriquetrus* (Table 2). None of the four kits examined was infected.

Abundance of *S. subtriquetrus* from beaver in this study was higher than reported in the northern latitudes (Babero, 1953, op. cit.; Bush and Samuel, 1981, op. cit.; Choquette and Pimlott, 1956, Can. J. Zool. 34: 209; Erickson, 1944, op. cit.; Smith and Archibald, 1967, Can. J. Zool. 45: 659–661; Brenner, 1969, op. cit.). There were significant differences in rank abundances of this trematode across age classes, with the greatest abundance of *S. subtriquetrus* in yearlings (Table 2). Moreover, the distribution of *S. subtriquetrus* was highly overdispersed (mean/variance ratio = 1:1,722; k = 0.20). Based on extrapolation to equal sample sizes, yearlings could potentially harbor >90% of the *S. subtriquetrus* individuals. The main effect of age accounted for the variance generated by differences in magnitude of numbers of helminth individuals in this dataset (factorial ANOVA, $F = 12.95$, $P = 0.0001$). Sex as a main effect ($F = 1.00$, $P = 0.32$) and age–sex as an interactive effect ($F = 0.64$, $P = 0.54$) were not significant factors influencing the abundances of *S. subtriquetrus*.

Bush and Samuel (1981, op. cit.) listed 11 helminth species from beaver reported in 16 surveys across 15 different regions in North America. From these existing surveys only two species, *Travassosius americanus* and *S. subtriquetrus*, formed the principal helminth component of beaver in the Nearctic. *Castorstrongylus castoris* also was common and geographically widespread, but was a parasite of beaver from rivers. The remaining eight helminth species were considered rare or accidental parasites of beaver by Bush and Samuel (1981, op. cit.). Based on available data, *S. subtriquetrus* appears to be the only helminth species occurring across the entire range of beaver in North America. In addition to the present records from central Texas, *S. subtriquetrus* also was reported in a beaver from southern Louisiana (Bennett and Humes, 1939, J. Parasitol. 25: 223–231). Other common helminths of beaver in the northern latitudes were not recovered in central Texas.

At the community level, the general theory of Brown (1984, Am. Nat. 124: 255–279) may be applied to this host–parasite system. The common nematode parasites of this host in the northern latitudes, *T. americanus* and *C. castoris*, were not

TABLE 2. Prevalence and abundance of *Stichorchis subtriquetrus* in different age and sex categories of beaver from central Texas.

Age	Sex	*n*	Prevalence (%)	Abundance ($\bar{x}$)	Range
Kits	♂	1	0	0	0
	♀	3	0	0	0
Yearlings	♂	3	100	1,149.3	258–2,911
	♀	6	100	1,029.7	12–3,532
Adults	♂	9	100	174.9	32–414
	♀	14	86	63.3	0–327

found at the southern periphery of the beaver's range in central Texas. However, additional studies from other areas are necessary to verify the absence of these helminth species from beaver populations at the periphery of their native range. Alternatively, certain species such as *S. subtriquetrus* may conform to the exceptions outlined in Brown's (1984, op. cit.) concept of "a species' greatest density occurs at its epicenter with densities diminishing toward the periphery of its range." These exceptions include discontinuous changes in single environmental variables or multimodal patterns of abundance that are caused by environmental patchiness (Brown, 1984, op. cit.). Our study indicates that the primary (helminth) community component in this habitat (beaver host) consists of a single ubiquitously common helminth "indicator" species (Custer and Pence, 1981, J. Parasitol. 67: 289–307), *S. subtriquetrus,* across the entire geographical range where suitable habitat exists (range of the beaver host), with high abundances of that helminth species in at least one area at the periphery of that host's range.

The authors appreciate the technical assistance of Valerie E. Young. This study was supported in part by the Institute for Museum Research, The Museum of Texas Tech University, and in part by the Department of Pathology, Texas Tech University School of Medicine.

Journal of Wildlife Diseases, 22(4), 1986, pp. 582–585

Parelaphostrongylus tenuis in New Brunswick: The Parasite in Terrestrial Gastropods

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Parelaphostrongylus tenuis, the meningeal worm of deer and moose, utilizes terrestrial gastropods as intermediate hosts. A review of the biology of this parasite is provided by Anderson and Prestwood (1981, *In* Diseases and parasites of white-tailed deer, W. R. Davidson et al. (eds.), Misc. Pub. No. 7, Tall Timbers Res. Sta., Tallahassee, Florida, pp. 266–317). Parker (1966, M.Sc. Thesis, Acadia Univ., Wolfville, Nova Scotia, 126 pp.) found five species of terrestrial gastropods in Nova Scotia which contained the L_3 larvae of *P. tenuis,* i.e., *Discus cronkhitei, Deroceras reticulatum, Striatura exigua, Zonitoides arboreus,* and *Philomyeus carolinianus.* Lankester and Anderson (1968, Can. J. Zool. 46: 373–383) in a similar study in Ontario found the following seven species of gastropods infected with *P. tenuis*: *Deroceras laeve, D. reticulatum, Arion circumscriptus, Zonitoides nitidus, Anguispira alternata, Cionella lubrica,* and *Succinea ovalis.*

The present survey was made to determine which species of gastropods are most important in the transmission of *P. tenuis* in central New Brunswick and to determine the number of infected individuals with respect to habitat types and time of year.

The Acadia Forest Research Station is located about 22 km east of Fredericton. The area of the station is approximately 93 km². It is located in the Bantalor Dis-

Received for publication 12 February 1985.