

# ABNORMAL ANTLERS AND KIDNEY STONES IN MOOSE DISPLAYING SYMPTOMS OF PARELAPHOSTRONGYLOSIS

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ABSTRACT: Two wild 1 1/2 year old male moose (*Alces alces*), which displayed symptoms associated with parelaphostrongylosis, had abnormal antler development and numerous kidney stones. A 4 year old moose suspected of parelaphostrongylosis had cervicorn antler structure, but abnormalities were not apparent. No kidney stones were found during examination of kidneys from 56 additional moose, including 12 that displayed symptoms of parelaphostrongylosis.

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Abnormal antlers have been reported in several species and suggested causes include: injury to antlers or body, hypogonadism, parasites and diseases, and poor condition of molars (Clarke 1916, Penrose 1924, Moore 1931, Cowan 1956, Robinette and Jones 1959, Taylor *et al.* 1964, Bubenik and Pavlansky 1965, Marburger *et al.* 1972, Anon. 1978, Wishart 1980, A. B. Bubenik 1982, G. A. Bubenik 1982, Bubenik *et al.* 1982, Baber 1987).

No literature was found regarding kidney stones in cervids; however A. B. Bubenik (10 Stormoway Crescent, Thornhill, Ontario, pers. comm.) stated he was aware of references to kidney stones in other cervids and in bovids, but not in moose. Benson (1958a & b) reported examining kidneys in 5 cases of moose "sickness."

This paper reports the finding of both abnormal antlers and kidney stones in two moose that exhibited symptoms associated with parelaphostrongylosis.

## METHODS

Moose in Cook and southeastern Lake counties, Minnesota were routinely necropsied as suitable carcasses became available in order to obtain data for use in a variety of studies. Age was determined by tooth replacement and dental cementum annuli. Crystallographic examination of kidney stones was done by the College of Veterinary Medicine, University of Minnesota, St. Paul.

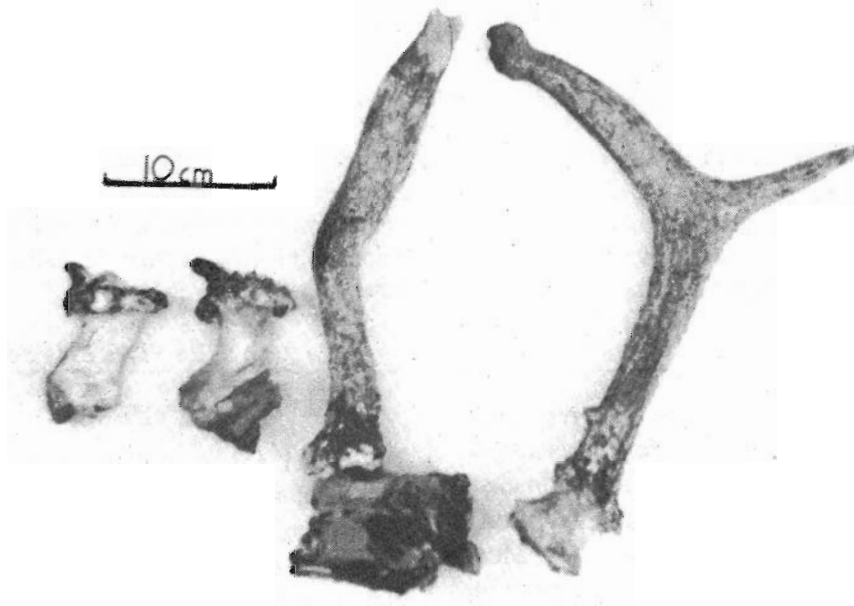
## RESULTS

Two 1 1/2 year old bull moose, which displayed symptoms associated with parelaphostrongylosis had abnormal antlers: one kidney of each moose contained numerous kidney stones. The heads were not examined for confirmation of *Parelaphostrongylus tenuis* infection due to gunshot damage. No other injuries or abnormalities were apparent.

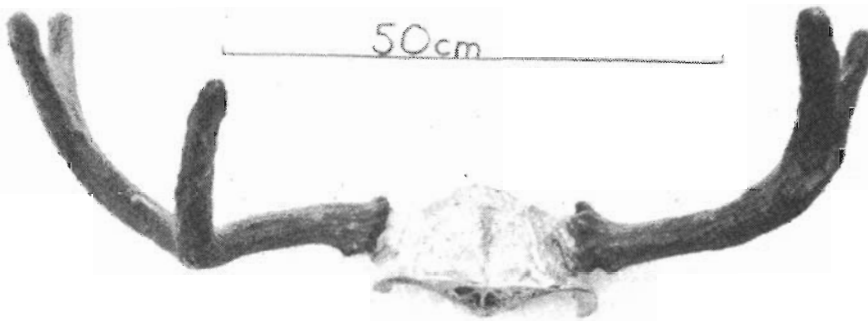
Moose 73-3 was killed 22 Oct. 1973. The antlers were 4 cm long and malformed (Fig. 1). Moose 74-3 was killed 3 Oct. 1974. One antler was 28 cm long, the distal half somewhat flattened and the tip chisel-shaped; the other was 34 cm long, forked, and enlarged at the tip (Fig. 1). Remnants of velvet were found near the bases of the antlers of this moose. Upon sectioning, the antlers of both animals were found to be well mineralized.

One other antlered moose (84-3) that exhibited symptoms of parelaphostrongylosis was examined. This 4 year old animal was killed 5 Aug. 1984. Antlers were in velvet, 45 and 48 cm long and of cervicorn structure (Fig. 2). Unfortunately, the kidneys were not examined.

Kidney stones from moose 73-3 were 1.0 to 6.6 mm diameter (total weight 1592 mg, n=208) and those from moose 74-3 were 0.1 to 2.4 mm diameter (total weight 102 mg, n=861). Crystallographic examination of the stones found from moose 73-3 were composed of calcium carbonate (95%) and protein (5%); those of moose 74-3 were com-



1



2

Fig. 1. Abnormal antlers of moose 73-3 (left) and 74-3 (right).

Fig. 2. Cervicorn antlers of moose 84-3.

posed of calcium carbonate (94%), calcium phosphate (carbonate form) (4%), and protein (2%).

No kidney stones were found during examination of 56 additional moose from the study area, including 12 that exhibited symptoms of *parelaphostrongylosis*. No kidney stones were found in 898 white-tailed deer (*Odocoileus virginianus*), from the same area, examined between 1 Nov. 1974 and 20 Oct. 1981.

## DISCUSSION

The three antlered moose described in this paper displayed symptoms associated with *parelaphostrongylosis* (as described by Anderson 1964 and 1965) and were thus presumed to harbor the parasite. Although the cervicorn antlers of moose 84-3 were not malformed, this antler structure is of interest as it occurs in only about 1 % of 3 to 5 year old moose in Minnesota (Gasaway *et al.* 1987).

No literature was found linking abnormal

antlers in moose and parelaphostrongylosis. However in a study of moose in Maine, it was noted that all (about 10) antlered yearling moose examined that were positive for *P. tenuis*, had abnormal antlers (F. F. Gilbert, Natural Resources Sciences, Washington State University, pers. comm.). Since *P. tenuis* often result in abnormal actions and behaviors by moose (Anderson 1964 and 1965), the abnormalities were assumed to have been caused by damage to the growing antlers as has been reported by Clarke (1916), Cowan (1956), and Robinette and Jones (1959), Bubenik and Pavlansky (1965), Anon. (1978), A. B. Bubenik (1982), G. A. Bubenik (1982),.

*P. tenuis* also could also possibly affect antler development by other means. It has been found in many locations in the central nervous system (Anderson 1964 and 1965), which Bubenik and Pavlansky (1965) state controls antler development and growth. Therefore, the parasite could affect the "antler growing centers" hypothesized by Bubenik and Pavlansky (1965) and A. B. Bubenik (1982) as probably located in the hypothalamus. Also, symptoms of parelaphostrongylosis such as poorly coordinated movements, stumbling, and limb paralysis may appear similar to an animal's reaction to various limb injuries. Such injuries and foot amputations have been reported to result in abnormal antlers (Clarke 1916, Robinette and Jones 1959, Marburger *et al.* 1972, A. B. Bubenik 1982 ).

Hypogonadism has been linked to development of abnormal antlers which usually remain in velvet (Clarke 1916, Penrose 1924, Cowan 1956, Robinette and Jones 1959, Taylor *et al.* 1964, Anon. 1978, Wishart 1980, A. B. Bubenik 1982, G. A. Bubenik 1982, Baber 1987). Such antlers have been reported to be poorly mineralized (G.A. Bubenik 1982); however the antlers of moose 73-3 and 74-3 were well mineralized. It is conceivable that *P. tenuis* could cause hypogonadism in moose through effects on hy-

pothalamic reproductive centers or by reduced general condition retarding sexual development (G. A. Bubenik, College of Biological Science, Univ. of Guelph, pers. comm.).

Abnormal antlers have been found on cervids with serious parasite and disease infections (Anon. 1978), as well as on animals with missing or poor molars (Moore 1931). Perhaps kidney stones too could affect antler development if they caused debilitating conditions. However, kidneys of too few moose (58 in this study and 5 reported by Benson [1958a and b]) have been examined to state an overall frequency of occurrence of kidney stones, or to determine their cause and importance to the animal.

Managers taking the opportunity to examine carcasses, may obtain specimens of interest to others. Moose suspected of parelaphostrongylosis should be examined for confirmation of infection, location of worms and damaged nerve tissue, and presence of abnormalities.

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