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Sightings of Moose, Deer, and Bears on Roads in Northern Ontario

D. Fraser

Ontario Ministry of Natural Resources

Road accidents involving moose (*Alces alces*) are a hazard to motorists and an unwanted source of moose mortality in several parts of Ontario. Most of these accidents occur in May, June, and July, and moose are generally thought to frequent roads most commonly at this time (Fig. 1).

It is not well understood why moose are attracted to roads during these months. It is often suggested that moose are forced into open areas by insects. However, Grenier (1974) noted that moose in Quebec seemed to be attracted to accumulations of highway salt in roadside ponds. In southern Sweden, moose-vehicle accidents in spring are blamed partly on the disoriented behavior of yearling moose newly abandoned by their mothers (Almqvist and Rosengarten 1978).

During 3 summers of fieldwork on moose, we noted that moose were particularly attracted to springs which were rich in sodium in May and early June, and to aquatic vegetation containing sodium between mid-June and mid-July (Cobus 1972, Fraser, unpubl. data, Jordan et al. 1973). We concluded that some animals must migrate to these special resources in a manner similar to that reported by Best et al. (1977) for animals attracted to mineral licks in Alberta. We often saw moose on roads and drinking from roadside puddles in the study area during the same period that the springs and aquatic vegetation were being used.

We felt that the behavior and presence of moose on the roads between May and July deserved special study because this activity coincides with the peak time of collisions between moose and vehicles in Ontario.

METHODS

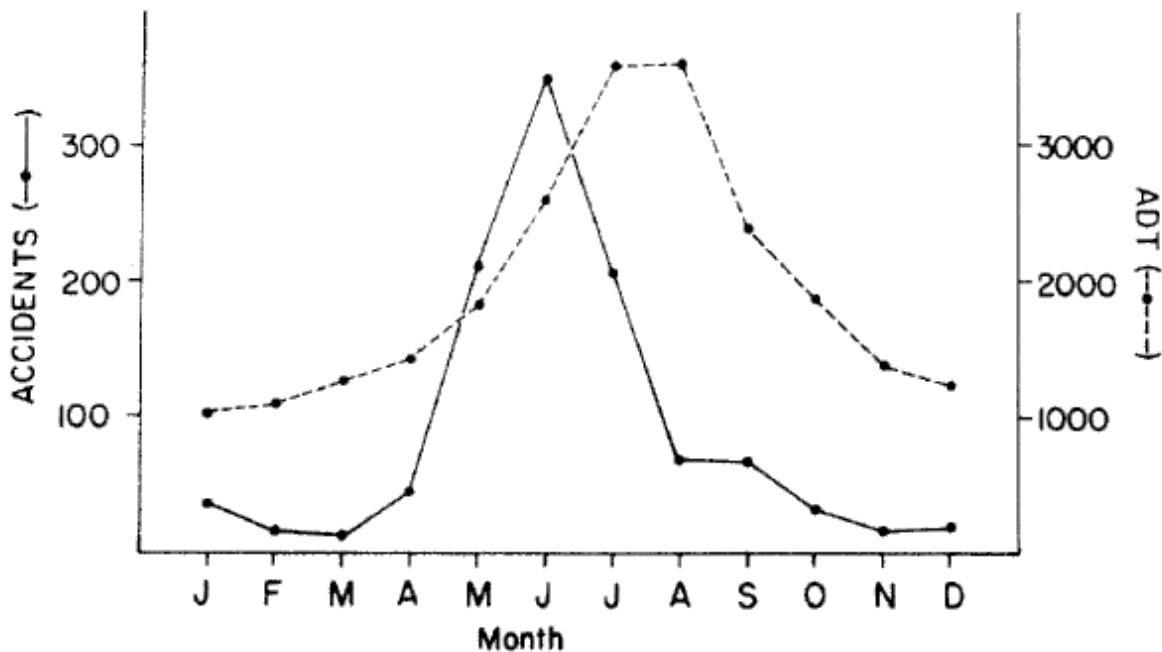
The study area was Sibley Provincial Park, a 243-km² area of principally boreal forest on a peninsula on the north shore of Lake Superior. The Park is closed to hunting, and is an excellent area for viewing moose, white-tailed deer (*Odocoileus virginianus*), black bears (*Ursus americanus*), and smaller species. About 45 km of oiled and unoled gravel roads within the park were chosen for the study because they were the most commonly travelled by the research staff. The oiled portions (about 24 km) remain snow-packed in winter, but are treated with a sand-salt mixture estimated to contain about 10 metric tons of salt, principally NaCl, for the total 24 km in 1977-78.

Records were kept on all moose, deer, and bears seen from a moving vehicle, and of all distances driven each day on the 45 km of road by the 3 research staff members between 5 May and 31 August 1978. The location, date, and time of each sighting were recorded, with notes on the animal's behavior. Normal duties accounted for most of the 9,457 km driven, and there was no attempt to standardize the length or route of the trips, but some special trips were made to help balance coverage throughout the season. Less complete records were also kept during the summers of 1976 and 1977.

ANALYSIS OF WILDLIFE SIGHTINGS

Deer were the animals most often seen on the roads in early May. Bears were also encountered early in spring, whereas moose were seen more frequently in late spring (Fig. 2). There was a significant seasonal difference in sightings between moose and deer ($P < 0.001$, χ^2), and between moose and bears ($P < 0.001$), but not between deer and bears ($P > 0.05$). A similar pattern was seen in 1976 and 1977.

Fig. 1. Moose reported killed by vehicles and the average daily traffic (ADT) recorded at 3 permanent traffic counting stations on northern Ontario high-ways from 1965 to 1975. The annual peak in moose-vehicle accidents (May-July), does not coincide with the annual peak in traffic (July and August).



These differences can be explained by reference to the animals' behavior (Table 1). Deer and bears often ate herbage in open roadside areas between early May and mid-June, but moose ignored this vegetation. Sometimes moose and deer drank from salty puddles or salty ditch water in early spring, but moose became most conspicuous in June when use of salty puddles, aquatic vegetation, and some roadside browse became common. Deer often licked dry gravel on the shoulder of the road in June and July. Snowshoe hares (*Lepus americanus*) and porcupines (*Erethizon dorsatum*) often appeared to do the same, but these animals' activities were not systematically recorded. Presumably the animals were obtaining residual salt from the roadside gravel, as other types of wildlife are known to do (Weeks and Kirkpatrick 1978). Except for 1 animal in 1978, moose were never seen licking dry gravel.

Many sightings of moose, deer, and bears could not be ascribed to any particular behavior. Often these animals were seen briefly as they moved away from the road. However, the seasonal pattern of these unclassified sightings approximated that of classified sightings for all 3 species (Table 1). In addition, many of the unclassified moose sightings were animals clustered around accumulations of road salt or aquatic feeding areas. There were 8 km of road that were within 0.5 km of known aquatic feeding areas or salt accumulations. These averaged 5.0 unclassified sightings of moose per km in 1978, as compared to 1.1 sightings per km in the other portions of road.

Fig. 2. Sightings of moose, deer, and bears per 100 km driven in the study area in 1978.

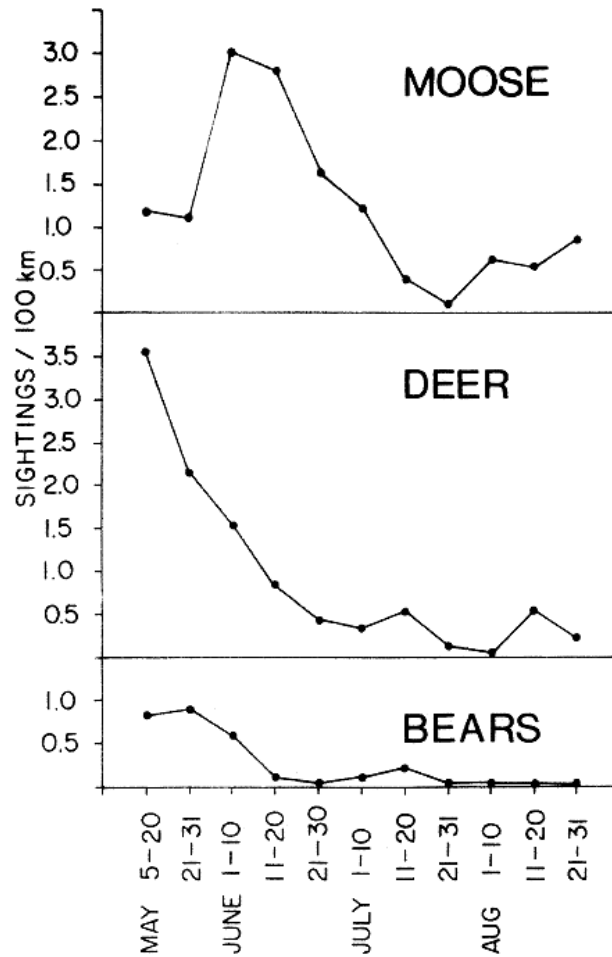


Table 1. Sightings of moose, deer, and bears in 1978 that fell into the principal behavioral categories for each species.

Date	Moose				Deer				Bears	
	Drinking salty puddles	Browsing	Aquatic feeding	Unclassified	Grazing	Drinking salty puddles	Licking gravel	Unclassified	Grazing	Unclassified
May 5-20	4	0	0	9	12	0	0	27	3	6
May 21-31	1	0	0	10	1	3	1	17	2	7
June 1-10	3	5	0	23	2	1	2	11	3	3
June 11-20	4	1	3	19	0	0	4	4	1	0
June 21-30	0	0	8	10	1	1	1	2	0	0
July 1-10	0	0	6	5	0	0	2	1	1	0
July 11-20	0	0	2	2	0	0	1	4	0	2
July 21-31	0	0	0	1	0	0	0	1	0	0
Aug 1-10	1	0	0	2	0	0	0	0	0	0
Aug 11-20	0	0	1	2	0	0	0	3	0	0
Aug 21-30	0	0	1	3	0	0	0	1	0	0
Total	13	6	21	86	16	5	11	71	10	18

Table 2. Chemical composition of water from 5 salty water locations compared with the mean of 4 samples of stream water from the study area. The 7 ions and total Kjeldahl nitrogen (TKN) are expressed in ppm, conductivity in $\mu\text{mhos/cm}$. The low TKN values indicate that samples were not substantially contaminated by animal urine (Fraser, unpubl. data).

Determination	Salty water	Stream water
	Mean \pm SE	Mean \pm SE
Na	88 \pm 12	3.2 \pm 0.4
K	7.3 \pm 2.7	0.7 \pm 0.1
Ca	72 \pm 18	18.0 \pm 4.6
Mg	24.6 \pm 4.7	6.6 \pm 1.8
Cl	194 \pm 57	5.9 \pm 1.5
HCO ₃	200 \pm 36	62 \pm 18
SO ₄	9.3 \pm 3.6	8.3 \pm 1.2
TKN	2.8 \pm 0.7	1.0 \pm 0.3
Conductivity	946 \pm 195	150 \pm 33

ATTRACTION TO SALTY WATER

Chemical composition was determined for water from the 5 locations where moose and deer were seen drinking from puddles, and for comparison samples, from 4 streams in the study area (Table 2). Compared to the stream water, the salty roadside water had very high levels of Na and Cl, with lesser differences for K, Ca, Mg, and HCO₃, corresponding roughly to the typical composition of road salt. The high conductivity of the water provides a simple field check for salt in roadside water. Even the highest concentrations shown in Table 2 are too low to be detected by human taste.

The 5 salty water locations were first discovered because animals were seen persistently drinking the water or because of abundant tracks. The salty sites were very localized. Other roadside puddles that were checked in the study area gave low conductivity readings and had no appreciable animal activity.

The 2 largest accumulations of salty water attracted animals in different years--one location was discovered in 1976, and the other in 1977. The conductivity at these sites was checked several times during the summers of 1977 and 1978, and showed high levels (mean \pm SE of 720 \pm 115 $\mu\text{mhos/cm}$) on all occasions except 1. The first location attracted moose in all 3 years since it was noticed, and the second in both years. These 2 locations were stretches of roadside ditch, 20-30 m long, which held standing water for most of the summer. The poor drainage at these sites probably accounted for the accumulation of salt. Most other stretches of roadside ditch in the study area had better drainage and were presumably flushed repeatedly by rainwater.

The other 3 saltwater locations were temporary, shallow puddles which were first noticed in 1978. Their accumulation of salt that year was probably due to local variation in how the salt had been applied to the road the previous winter.

Moose and deer were reluctant to leave when they were drinking salty water or licking gravel. They often continued drinking or licking for many minutes despite vehicles and pedestrians approaching within 30 or 40 m. Passing vehicles often caused the animals to bolt in an unpredictable manner, sometimes into a vehicle's path. In contrast, moose and deer that were not drinking salty water or licking gravel generally vanished from the road as soon as they were disturbed.

FURTHER DISCUSSION

Although little salt is used on the roads in Sibley Park, many of the moose sightings on the road were associated with areas of salt accumulation. On more heavily salted highways in Ontario, larger accumulations of salty water have been found, some with a history of moose-vehicle accidents nearby (cf. Grenier 1974, E. R. Thomas, pers. commun.). We are now exploring ways of reducing the springtime peak of moose-vehicle accidents by managing roadside accumulations of salt.

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