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The Moose in Northeastern Minnesota

PATRICK D. KARNS

ABSTRACT — The succession of dominant cervids in northeastern Minnesota since settlement has passed from moose and woodland caribou to white-tailed deer and is now returning to moose. Results of recent studies show high moose densities in some areas are leading to range deterioration and reduced net productivity. Pneumastongylus tenuis, a common parasite of white-tailed deer but fatal to moose, is the etiological agent of moose disease. With increases in deer density, such as occurred in the 1920's and 30's, the reports of this disease in moose became more prevalent. Presently, where moose occur on the high deer density areas of northern Minnesota, moose mortality due to this parasite is disproportionately high.

Interest in moose (Alces alces) has heightened in Minnesota in recent years as a result of increasing populations and range expansion.

Historically, moose range in Minnesota was restricted to the northern coniferous forest north of a line drawn from the southern end of Pine County to the extreme northwestern corner of the state. Woodland caribou (Rangifer tarandus) occupied these areas throughout this time and were particularly abundant north and east of the present-day town of Two Harbors on the north shore of Lake Superior. Another member of the deer family, the white-tailed deer (Odocoileus virginianus) occupied the “big timber” and stream valleys south of the coniferous forest (Surber, 1932).

Caribou all but disappeared by the turn of the century; moose filling this void. White-tailed deer were observed along the Minnesota-Ontario border country about the same time and shortly thereafter expanded their range to all of northeastern Minnesota. Deer populations reached a peak in the mid-1930's when populations of 30-50 deer per square mile were reported for some areas of northeastern Minnesota (CCC records on file at Winton Game and Fish Headquarters). A series of severe winters accompanied by deteriorating habitat has suppressed and maintained the deer population at a substantially lower level since then.

In Minnesota, a decline in moose numbers was evident in the late 20’s and early 30’s, corresponding with that experienced in other areas of eastern North America. Since this population low, moose numbers have increased to the point where in northeastern Minnesota some segments of the range are currently considered to be over-browsed.

Recent studies on moose were started in 1958 when a winter track count was conducted in Lake and Cook counties. Approximately 626 linear miles of section lines were flown by Game Wardens Robert Hodge and Robert Jacobsen to determine the moose distribution for this area. Tracks were observed in 303 (48 per cent) of the sections traversed. In the following years, an aerial moose survey on randomly selected plots has been conducted in cooperation with personnel of the Superior National Forest to determine the distribution, abundance, and composition of our moose population.

For our studies we have identified 169 townships as primary moose range in northeastern Minnesota. Sampling plots were selected for censusing each year from this series of townships. Seventeen of these plots were randomly chosen for the survey in 1959, 1960, and 1961. The survey was modified in 1962 to include two strata. Plot size was reduced from 25 to 15 square miles and the sample size was increased to 40 plots. The strata of high moose density consists of 31 townships in central Lake County and eastern Cook County. There are 138 townships in the low density area in St. Louis, Lake, and Cook counties.

Census plots are flown at an altitude of 600-800 feet in strips approximately one-half mile apart. This technique permits “blanket” coverage of the area. Circling at a lower altitude is done after moose are sighted to determine sex, age, and the presence of additional animals. All censusing is done in early winter after snow completely covers the ground and the lakes are frozen solidly enough to support the aircraft.

Population Trends

In calculating and interpreting the population estimates it is realized that there are a number of variables in the survey and estimates based solely on moose observed are conservative. The population trends from 1959 to 1960 represent census variables rather than actual population changes. Improved sampling methods and crew efficiency since 1962 has resulted in better population estimates. The results have shown that our moose densities are similar to those found in other parts of the moose range of eastern North America.

Productivity

The net productivity has been declining in northeastern Minnesota (Table 2). A similar trend is noted in the calves per cow with calf (Table 3). The number of twin calves observed in the winter has decreased from a high of 26 per cent in 1966 to a low of 5 per cent in 1966. The reduced productivity appears to be correlated with ground observations which indicate deterioration of the habitat due to the overpopulation of moose.

Data on calf survival obtained during 1961 and 1962 from intensive field observations indicates that calves make up 26 per cent of summer population and 15 per
TABLE 1. Calculated moose population for the high and low density range of northeastern Minnesota.

<table>
<thead>
<tr>
<th>Census Period</th>
<th>Moose/sq. mile</th>
<th>Calculated total population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>1959-60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960-61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1961-62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1962-63</td>
<td>1.3</td>
<td>.25</td>
</tr>
<tr>
<td>1963-64</td>
<td>1.5</td>
<td>.23</td>
</tr>
<tr>
<td>1964-65</td>
<td>1.7</td>
<td>.22</td>
</tr>
<tr>
<td>1965-66</td>
<td></td>
<td>.25</td>
</tr>
<tr>
<td>1966-67</td>
<td>1.7</td>
<td>.19</td>
</tr>
</tbody>
</table>

a First stratified census
b ± 80% C. I.
c Data collected but not applicable

TABLE 2. Net productivity of moose in northeastern Minnesota expressed in terms of percent of total sample comprised of calves.

<table>
<thead>
<tr>
<th>Census period</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-61</td>
<td>32</td>
</tr>
<tr>
<td>1961-62</td>
<td>26</td>
</tr>
<tr>
<td>1962-63</td>
<td>15</td>
</tr>
<tr>
<td>1963-64</td>
<td>18</td>
</tr>
<tr>
<td>1964-65</td>
<td>18</td>
</tr>
<tr>
<td>1966-67</td>
<td>11</td>
</tr>
</tbody>
</table>

TABLE 3. Observed cow-calf ratios of moose in northeastern Minnesota expressed in number of calves per cow with one or more calves.

<table>
<thead>
<tr>
<th>Year</th>
<th>Calves per cow with calf</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>1960</td>
<td></td>
<td>1.47</td>
</tr>
<tr>
<td>1961</td>
<td></td>
<td>1.13</td>
</tr>
<tr>
<td>1962</td>
<td>1.26</td>
<td>1.08</td>
</tr>
<tr>
<td>1963</td>
<td>1.13</td>
<td>1.14</td>
</tr>
<tr>
<td>1964</td>
<td>1.10</td>
<td>1.00</td>
</tr>
<tr>
<td>1965</td>
<td>no data</td>
<td></td>
</tr>
<tr>
<td>1966</td>
<td>1.05</td>
<td>1.00</td>
</tr>
</tbody>
</table>

cent of the winter population. The trend is from 57 per cent twin calves in the summer observations to 16 per cent in the winter.

Moose Disease

Moose disease is a problem that has aroused the interest of both laymen and wildlife scientists for many years. This malady is characterized by lack of fear, circling or aimless wandering, apparent blindness, canting of the head and ear to one side, and ataxia (Figure 1). It was first observed in Minnesota moose in 1912 (Fenstermacher and Jellison, 1933). Since about 1920 it has been studied intensively in Minnesota and elsewhere (Fenstermacher and Jellison, 1933; Fenstermacher, 1934, 1937; Fenstermacher and Olsen, 1942; Lamson, 1941; Benson, 1958). The etiological agent was revealed by Anderson (1963) who experimentally infected captive moose with third stage larvae of the roundworm *Pneumostrongylus tenuis*. This finding has since been verified by several workers under field conditions (Smith et al., 1964; Loken et al., 1965; Anderson, 1965).

In view of common occurrence of *P. tenuis* in deer, the effect it has on moose, and the recent history of big game in northeastern Minnesota, one can theorize with a certain amount of confidence concerning the moose decline in the 1920's and 30's. As previously mentioned, we know the deer populations reached their peak in northeastern Minnesota at this time. It was near or at this high peak in deer populations when the large decline in moose occurred and a number of animals were reported displaying what is now recognized as the "Pneumostrongylosis syndrome." With the decline and relatively level deer populations since the 1930's, the moose have increased.

References

ANDERSON, R. C. 1963. The incidence, development, and experimental transmission of *Pneumostrongylus tenuis* Dougherty (Metastrongyloidea: Protostrongyloidea) of the meninges of the white-tailed deer (*Odocoileus virginianus borealis*) in Ontario. Canadian J. Zool. 41:775-792.


Learned Societies Around the World

**U.S.S.R.**

The majority of scientific societies in the USSR is associated with the Academy of Sciences. In addition to these societies, there are others in the Union republics, many of which are affiliated with the republic Academies of Sciences. Each society puts out one or more publications of its own. The most important scientific societies in the USSR are:

- **Union Astronomical-Geodetic Society.**
- **Union Society of Soil Scientists.**
- **Union Botanical Society.**
- **Union D. Y. Mendeleev Chemical Society.**
- **Union I. I. Pirogov Surgical Society.**
- **Union Entomological Society.**
- **USSR Geographical Society.**
- **Union Society of Helminthologists.**
- **Union Hydrobiologic Society.**
- **Union Mineralogical Society.**
- **Union Palaeontological Society.**
- **Union Society of Physiologists, Biochemists, and Pharmacologists.**
- **Union Scientific and Technological Society.**
- **Moscow Mathematical Society.**
- **Moscow Society of Naturalists.**
- **Leningrad Society of Natural Historians.**
- **Union Society for the Propagation of Political and Scientific Knowledge.** The function of this body is to conduct political and ideological propaganda. It has a far-flung network of branches in all republics and regions of the USSR.