ECOLOGY AND COACTIONS OF THE MOOSE ON ISLE ROYALE

First Annual Report

1963-64

NOT FOR PUBLICATION

by

Peter A. Jordan, Research Associate
Department of Forestry & Conservation
Purdue University
Lafayette, Indiana

30 May 1964

ECOLOGY AND COACTIONS OF THE MOOSE ON ISLE ROYALE

by Peter A. Jordan

The present program of ecological studies in Isle Royale National Park has been in progress since June 1958. It is directed by Durward L. Allen and is carried out in cooperation with the National Park Service. This study of the moose is the third phase in a projected 10-year program. The initial phase (1958-61) featured work on the timber wolf by L. David Mech; the second, on the ecology of the beaver (1961-63), was carried out by Philip C. Shelton. The current study was delayed a year, and hence this is the first report, covering research in the summer and winter of 1963-64, and in a few cases including data from early May. This year's work has had major support from the National Science Foundation, the Purdue Research Foundation, the Wildlife Management Institute, and the National Park Service.

My own intensive field work was in two periods, August through October, 1963, and February-March, 1964. Allen spent two weeks in the field in July 1963, and the month of February 1964. Contributions to the summer work were made by Erik Stauber and Larry J. Roop, participants in the department's undergraduate research program supported by the National Science Foundation. Chief Naturalist, William Dunmire, of Isle Royale National Park, aided the project in many ways, including assistance in setting up pellet-count plots in October and participating in the field work for two weeks in February. We are especially indebted to S. A. Gaafar, Purdue veterinary parasitologist, for generous help on autopsy procedures and for processing and examining materials collected.

Work of the summer and fall was largely concerned with collecting records on moose herd composition and studies of breeding behavior. The last week in October was devoted to a herd survey from the air, using a Piper Cub flown by William Martila. For the sixth winter, Donald E. Murray was with us for the entire seven weeks of the winter work as pilot (and skilled observer) of the Aeronca Champion used in observing moose and wolves.

Numbers, Dynamics, and Condition of Moose

On Isle Royale it is possible to study the moose in the absence of human interference and under an apparently normal regime of predation by timber wolves. Because of this exceptional circumstance, emphasis will continue to be placed on an appraisal of all aspects of moose habits and life history as related to the predation influence.

Production and survival of calves in 1963-64

Moose herd productivity has been calculated on the basis of observed sex and age ratios. Since these ratios may be biased by behavioral differences, conclusions are tentative. Moose calves are difficult to find early in the season, but they become increasingly active as the summer progresses. Counts in late summer and fall indicated 84 calves per 100 cows. When this figure is recalculated to exclude non-breeding yearlings, the ratio is 100 calves per 100 adult cows.

Since this ratio represents the herd more than two months after calf-drop, the number of calves born was greater. We have no measurement of the early calf loss, although two calves were known to be killed by wolves in June and July. No kills of cows were reported in the same period. In any event, this indication of natality suggests that the Isle Royale herd may be one of the most productive that has been studied in North America.

Further checks on calf survival were made in late October and in the winter studies (February-March). The fall aerial survey indicated 37 calves per 100 cows (yearlings not excluded), while in mid-winter the count was 42. Conditions for observation were more favorable on winter snow and that count probably was the more accurate. It is evident that a reduction of the calf component of the herd was in progress through the year--a logical expectation in a herd that is productive but probably near stable at present.

Mortality and physical condition

The best source of information on herd dynamics and health is the examination of moose remains found in the field or animals killed for autopsy. The refinement of aging techniques is particularly desirable, particularly for use on older animals, where the tooth-wear method has serious shortcomings. This method will continue to be used, but a fairly large collection of incisors has been preserved for the study of root annulations, and this technique will be fully utilized. A more accurate appraisal of bone-marrow condition also is needed. During the past winter marrow specimens were preserved for a laboratory determination of actual fat content. These methods have particular significance, since it is frequently the case that the jaw and large leg bones are about the only remains of a wolf-killed moose available for appraisal.

During this study period the remains of 37 moose were examined, 13 in summer and fall and 19 in winter. The summer-fall specimens included bones representing animals that had died in previous years, while the winter animals are all from the current year and season. Of the winter specimens, 19 (14 adults, 5 calves) were known or presumed to have been killed

by wolves, 2 (adults) probably represent other types of mortality, and 3 (adults) were collected for autopsy.

Of exceptional interest are the two moose which evidently died of non-predatory causes. One was an old cow in poor condition, which probably was injured in a fall. She wandered erratically on Chippewa Harbor, lay down, and after several days, died. The other animal was a prime bull of above-average size which was seen dead from the air. Unfortunately it could not be autopsied before the wolves found and consumed the carcass. Only the fact that its bone marrow showed a depletion of fat suggested that some systemic pathology was present.

Among skeletal specimens picked up last summer, three males showed a striking pathology in certain joints. In the humerus-scapula joint of two and the femur-pelvis joint of the other, a severe degenerative osteo-arthritis was evident. According to H. J. Olander, of the School of Veterinary Medicine, the condition resulted from localized destructive infections. None of the three bulls was young, but they were also not at the upper age limit of specimens seen in this study. A moose encumbered in this way would be restricted in movement, and thus more vulnerable to predation, accidents, and possibly attacks by other moose.

In order to obtain better information on physical differences between predation-vulnerable and invulnerable moose, a small number of animals are being collected for autopsy. It is particularly desirable to get individuals that have withstood wolf attack and to examine specimens in the 1-to-5 age group that has seldom appeared in the kills. During the past winter three moose were collected, of which one was a wolf-tested animal. All three were in the "invulnerable" age range.

The male that had escaped wolf attack showed good fat reserves. It was heavily infested in places with winter ticks and had a fairly high load of tapeworm cysts in the lungs. Another male, chosen for autopsy because of the evident loss of hair, was moderately infested with ticks and had a negligible load of cysts. It carried little visceral fat.

The third autopsy was a female accompanied by twin calves. The logic in selecting this animal was that a cow which had brought twins through to late winter in an area frequented by at least a few wolves, very likely had warded off attacks. This animal had no fat reserves, but bone marrow was not depleted. It carried a moderate load of cysts. There were no signs of recent lactation, and she was not pregnant. This specimen raises the question whether cows having twins are unlikely to bear young the following summer.

A procedure now being followed is to measure certain bones in all remains examined. This may prove important when size in the current population is compared with specimens collected in earlier years or with those to be taken in the future.

Numbers of moose

Counting all the animals in a population is seldom feasible, although Mech made one complete inventory of Isle Royale moose in February 1960. Weather is an important limiting factor, and only partial censuses have been taken in other winters, including the past one. In aerial observations it is possible to miss more than half the animals under some conditions. There is no way to adjust for such an error. Our recent surveys were taken only in good light and with relatively fresh snow for tracking.

Counts made during the past winter on 10 sample areas comprising 12 percent of the island yielded 95 animals. It would not be valid to extrapolate directly and estimate total population because the plots were not a random sample. On the other hand it is reasonably valid to compare these figures with those plotted by Mech in his 1960 census.

On the identical area he counted 81 moose. There was a tendency for counts this year to show relatively higher numbers toward the southwest end of the island and lower toward the northeast end. If we were to assume that the difference between these two counts holds for the population as a whole, then an equivalent of Mech's estimate of 600 in 1960 would be 704 in 1964. The crudeness of the method precludes this assumption, and it is adequate to state that no change large enough to be clearly evident occurred.

As a year-to-year index of moose numbers, a system of pellet-group counting plots is being laid out in representative areas. The initial plots were marked and cleared of old pellets in October. The winter accumulation of pellet groups will be counted in May. This work is planned as a standardized annual procedure which can be carried on by park personnel if necessary. When plots were established, the percentage of ground cover occupied by major plant species and the degree of usage by moose and hares were recorded.

Food Habits and Behavior of Moose

Long-term work on moose browsing on Isle Royale has been done by L. W. Krefting of the Bureau of Sport Fisheries and Wildlife, and in the present project we have not made intensive studies of this kind. However, rumen samples are being taken from kills and autopsied animals, and these are to be analyzed by the percentage-volume method for recognizable forage species. During routine observational work, records are made of the species on which moose are foraging.

In late September, a canoe was used in shoreline patrols to observe the social and sexual behavior of moose. Good observations were possible on calm evenings in Washington Harbor. The animals did not react to the presence of the canoe, and some extended viewing of social interaction (but not copulation) was possible.

Wolf Studies

During the past winter, the usual emphasis was given to aerial observations on the habits and hunting of the island wolf population. Weather continues to be the most important limitation on this work, although contact was maintained with the large wolf pack on all but 8 days during the 7 weeks of field work. The longest periods of no contact were 70 and 64 hours. The large pack maintained its customary routine of killing approximately every three days, and all the major travels and kills were recorded. Although frequent efforts were made to locate and follow other wolves on the island, only meager success was achieved. Some fairly prolonged ground observations of the large pack were made at a bait station on Washington Creek.

Numbers of wolves in winter, 1964

From 1963 to 1964 there was a significant increase of wolves on Isle Royale. In the winter of 1963, Shelton was sure of a minimum of 20, and he suggested that there might have been 22 the year before. During the prior three winters, Mech was able to demonstrate a minimum of 20 with the possibility of one or two more than that. In 1964, in early February, there were at least 26.

The increase occurred in the large pack. On February 2, the second day of the winter field work, complete counts on this pack as it moved, hunted, and rested, clearly showed 22 animals. This was the largest aggregation ever seen on the island.

At the next opportunity for a complete count, February 10, there were 20 wolves in the pack, and in the meantime a lone wolf was observed using these same trails. During the remaining weeks, in which there were a number of good opportunities for total counts, the pack remained at 20. In previous years, the most wolves seen together had been 17 (1962). Therefore, it is a logical assumption that a litter of pups was reared successfully and accepted into the large pack. However, despite repeated observation, it was not possible to recognize any immature animals.

A wolf which died this winter was found near Little Boat Harbor. Nearby were many tracks indicating heavy use of the area by the big pack. The animal evidently died some time between February 15 and March 9. All that remained was the head,

vertebral column, and bones of the hind quarters-- well picked by ravens. Autopsy of the head by S. A. Gaafar revealed no lesions indicative of the cause of death. The wolf was old and probably a male; it will receive further examination by appropriate authorities. Possibly this animal was part of the large pack when 22 were counted on February 2, and its later absence may be one reason for the decline to 20.

Other wolves accounted for included the lone animal mentioned previously which used the territory of the big pack, a trio in the McCargo Cove area from which one tended to separare, and another lone animal frequently seen in the northeast portion of the island. The total minimum count was not made in a single day, but covered a two-day period. However, there is little chance that duplication occurred, considering the locations of the wolves and their movements. After discovery of the dead wolf, 25 were accounted for. One or more lone animals could easily be missed in such an inventory.

In September the skull of an immature wolf, probably about 6 months old, was picked up near Conglomerate Bay. It appears to have lain there for some years. This specimen and the carcass found during the winter are the first wolf remains collected since the animals arrived on the island some 16 years ago. Leaving out the aerial observations and photograph of a supposed pup in 1962, it is the first positive documentation of an immature wolf on Isle Royale.

Movements

During the February-March study period, the large pack confined its activities to the southwest end of the island, making 13 of its 16 kills within 3/4 mile of the shore. This is the most frequented area (including Siskiwit Swamp), and during the 52-day period the wolves traversed its central portion eight times. Activity patterns were similar to those of past years, except that more travel and hunting occurred after dark. Distance traveled between kills varied from 0.3 to 44.8 miles. Data of this nature were not obtained on the lesser groups of wolves.

All movements this year were markedly affected by an unusual lack of ice around the island's shores. The wolves had to detour around bays and inlets over whose ice they ordinarily travel. In one case the distance between two points on a major travel route was increased from 4 to 8 miles. Four offshore islands on which the large pack has hunted in past winters were inaccessible. Even more noticeable was the effect upon those few wolves frequenting the northeastern area including Amygdaloid Island. From their usual range of the islands and peninsulas there, they shifted well to the southwest.

Pack structure and social relationships

It might be expected that an increase in size might tend to reduce the strength of aggregation in the large pack. In other years there was a tendency for this pack, varying from 15 to 17, to split into two or more groups, sometimes for several days at a time. Surprisingly, the 20 wolves seen most of this winter displayed greater unity than the pack had shown in any of the previous five years. However, the tendency of one or two wolves to withdraw from the main body held as usual.

In 1962 and 1963, certain members of the large pack showed a striking fear of the plane, which greatly impeded the observation of day-to-day activities. This avoidance of the plane was not observed in 1964. Good observations were made on play, greeting and recognition gestures, dominance interactions, behavior of and reaction to the lead male, and on courtship and copulation. Since only the lead male is commonly individually recognizable, and a few others can sometimes be identified only by their roles, no definitive studies of behavior are possible here. Yet, as Mech demonstrated, valuable descriptions of activity in the wild can be achieved.

Wolf-Moose Relationships

During the six winters of study certain trends have appeared in the distribution and characteristics of moose killed by the wolves. For example, each succeeding year the large pack has covered a smaller portion of the island during the winter study period, with this year's being the smallest yet. There has been no corresponding reduction in the rate of kill. In fact, accompanying the increase in pack size this year, the rate was up slightly. A compression of hunting area might indicate a corresponding shift of moose toward the southwest, which is also suggested by the census data.

Of interest also are the trends in the age and quality of moose killed by the wolves. The proportion of calves taken (5 of 14) conforms to the usual heavy representation of this age group. However, during the past winter two yearling males were killed--our first indication of vulnerability in second-year moose. Necrosis of the jaw, "lumpjaw," was common among the older moose in the early years of the study, while in the past two winters no cases were found. It also appears that fat-depleted bone marrow is a less prevalent condition among kills. These trends will be watched closely, but at present any explanation would be purely speculative.

Certain of the field data and specimens taken during the period of this report have not been studied in detail, and more specific information concerning them will be included in the next report, which will be issued in the spring of 1965.

X X X