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Ecological Studies of Beavers, Wolves, and Moose
in Isle Royale National Park, Michigan

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ECOLOGICAL STUDIES OF BEAVERS, WOLVES, AND MOOSE
IN ISLE ROYALE NATIONAL PARK, MICHIGAN

by Philip C. Shelton

This is an interim report prepared in lieu of a thesis which was originally scheduled for completion during summer or fall, 1963. I took the opportunity to return to Isle Royale as an employee of the National Park Service for the summer of 1963, and continue beaver trapping for a third summer. Thus, preparation of the final thesis has been delayed, making this report necessary. Some of the data gathered in 1962 and most of that from 1963 are still incompletely analyzed, so this report is not to be considered final. Data analysis and thesis preparation are proceeding and hopefully will be completed in the spring of 1964.

Wolves, moose, and beavers are the dominant mammalian inhabitants of Isle Royale, a 210-square-mile National Park in northwestern Lake Superior. Since 1958 these species have been the subject of continuing ecological research by Purdue University graduate students, as part of a projected 10-year program under the direction of Durward L. Allen. Principal support has been by the National Science Foundation, the National Park Service, and the Wildlife Management Institute.

The first study in this series was an intensive investigation of the relationship between wolves and moose by L. David Mech, and a thesis covering this work was completed in 1962. The present project continues the wolf-moose work, but is concerned primarily with beavers, the secondary prey species of the wolf. Field work began in 1960 and was continued into 1963. Reports were prepared on the work through March, 1962; this report covers summer and fall work in 1962, and winter, spring, and a limited amount of summer work done in 1963.

Beaver Studies

Populations

Between 13 July and 2 December 1962, beavers were live-trapped at 20 different sites, including eight locations that were trapped in 1961. Ninety-five different beavers were caught, 18 of which were tagged in 1961. The number caught per colony ranged from 1 to 9, with the average 4.75.

During October 1962, an aerial survey of beaver sites was made in which 117 active colonies were identified. Twenty-one other active sites were known that were not seen from the air, making a total of 138 known active sites in the fall of 1962. Multiplying the number of beavers trapped per colony (4.75) by the total number of known colonies (138) gives a minimum population estimate of about 655 beavers.

The sex and age composition of the trapped animals was essentially the same as that reported for the 91 beavers trapped in 1961. The annual recruitment is approximately 30 per cent, which, assuming a stable population, would be offset by annual mortality of approximately the same amount. Final analysis is still to be made of the age composition of beavers trapped in all three years, including 1963, in which 20 of 37 trapped beavers had been marked previously, and most of which were of known age. This will provide a more accurate breakdown of age groups in the population.

Movements

Records of movements, obtained from recaptured animals, show that breeding adults and their offspring of the year move little. Yearlings usually stay with the parents at the home colony through their second year, but two or three cases of dispersal of these animals were noted. Two-year-old and small, non-breeding, adult animals were involved in most of the long-range movements. The maximum distance between captures of one animal was about 13 miles, all of which could have been traveled by water. The time interval was about 9 months. These wandering beavers probably are more vulnerable to wolf predation than the more sedentary ones.

Distribution

Beaver distribution is influenced by vegetation types and water resources. The growth of young trees, especially aspen, birch, and willow, in the central quarter of the island burned in 1936 is producing abundant beaver food for several colonies. But the most extensively used habitat is the forest created by regrowth of aspen-birch-conifer forests following fires that burned over the northeastern half of the island about a century ago. This area also has the most favorable water resources for beavers-- many small streams, lakes, and narrow swamps-- and by far most of the beavers are found in this half of the island.

Mature spruce-fir-birch forests, which make up most of the forests at lower elevations on the southwestern half of the island, have little food for beavers due to lack of aspen and young birch. Usually birches present are either large, overmature trees, which beavers seem not to favor, or heavily moose-browsed sprouts. This part of the island also has fewer streams and lakes, and the extensive swamps are commonly too wide for easy damming and surrounded by little if any good beaver foods.

Food relationships

The food supplies of beaver colonies, both active and abandoned, were subjected to extensive observation, aimed at determining their role in the longevity of beaver colonies. As reported earlier, some

colonies appear to have been abandoned when readily accessible aspen supplies were exhausted; others have remained active where only birch or shrub growth was available. Epizootic disease (most likely tularemia) was also mentioned as a possible reason for abandonment of colonies where supplies of aspen, birch, or both, appeared to be adequate.

A phenomenon that became obvious from comparison of several colonies was increased efficiency in the use of foods with decreasing availability. Colonies recently established in good habitat-- on streams or lakes with aspen stands within 50 to 100 feet of water-- waste a great deal of the trees cut, while those living where trees are not so abundant or farther from water, cut fewer trees but make greater use of each tree. The amount of bark peeling from the trunk and large limbs and the size of limbs cut off are indicators of efficiency in use of food resources.

Competition for food with moose, and the natural trend of plant succession toward climax conditions in which beaver foods are scarce, probably will effect a lowering of the island's capacity to support beavers. However, this will be a slowly changing situation, rather than a dramatic decline as was reported in the beaver population in the early 1950's.

Predation

The presence of effective predators-- wolves-- probably helps stabilize the beaver population by removing excess animals and preventing any major population build-up. Beaver hair continues to appear in wolf scats at about the same rate as in previous years (6 per cent of occurrences in 274 scats in 1962; 14 per cent of occurrences in 59 scats in 1963). The significance of this to wolves is largely unknown, and effects on beavers can only be inferred from analysis of the dynamics of the beaver population.

Beavers are available to wolves only during the season of open water-- April to December-- and are most frequent in scats found in the northeast section of the island, where beavers are most plentiful.

This northeast section is, as far as is known, not heavily used by the main pack of about 16 wolves (see Winter Wolf Studies), and the presence of beavers may be of little consequence to them. But the remaining four or more individuals and small groups of wolves, who do use this area, and have much more difficulty killing moose than the big pack, may depend heavily upon beavers.

Moose Censuses

No complete census of moose has been attempted since the one made by Mech in 1961, so his figure of approximately 600 moose in late winter still stands as the only one available.

Ratios of calves in samples of the moose population have been obtained whenever practical, by both ground and aerial observations, as an index of recruitment and to determine whether there is differential mortality of calves and adults. The following tables summarizes results on 1962 and 1963.

Table 1. Summary of moose counts, 1963-63.

<u>Season or month, & year</u>	<u>Number of moose classified</u>	<u>Sex ratio of adults bulls: cows</u>	<u>Percent calves</u>	<u>Manner of observation</u>
May 1962	31	8:7	32.0	Ground
Summer 1962	79	28:27	17.7	Ground
Fall 1962	85	34:36	17.3	Ground
Fall 1962	123	68:40	12.2	Aerial
March 1963	128	-	17.2	Aerial
May 1963	46	12:18	24.0	Ground
Summer 1963	60	20:26	23.4	Ground

These figures show a slightly lower calf crop in 1962 than in 1961, but it was still within the range found in former years. No differential overwinter loss of calves was detectable.

Two figures require further explanation: (1) The fall aerial ratio was lower in calves than expected when expressed as a per cent of the total number of moose seen. But if the bulls, which are apparently more conspicuous at this time of year, are dropped out and the number of cows multiplied by 2 and added to the number of calves to get the total sample size (this assumes an even sex ratio, which is justified by figures obtained by other means), then the figure (15.8) compares more closely with the ground count.

(2) The ratio of calves (11 months old or more) in the May counts of both 1962 and 1963 was unrealistically high. The figures probably show the lack of wariness on the part of these almost yearling moose, who have just been abandoned by the cows, and give every impression of being lost and bewildered. These animals may be especially vulnerable to wolves at this time, but there are no observations to support this hypothesis.

Summer Wolf Observations

Ground observations of wolves are usually limited to a few glimpses by park personnel or visitors, and occasionally by researchers, but a few incidents that occurred in 1962 and 1963 are worth noting:

From 2 August to 24 August 1962, Gary Strodtz, Fire Control Aid for Feldtmann Tower, heard wolves howling in the Big Siskiwit Swamp area on eight different days, and saw wolves on two of those days. His minimum count, made on 24 August by binocular from the lookout, was seven wolves; on 19 August he counted "15 or 20" wolves, but was not certain of the extent of duplication. This was likely most, if not all of the big pack of about 16 wolves which has been seen and counted each winter (see Winter Wolf Studies).

On the 15th of November, 1962, I spent about two hours within 100 yards of the same pack, as they slept and played on a series of open ridges with fairly thin second-growth (1936 burn) vegetation about a mile south of the head of Moskey Basin. The minimum count was 11 wolves, but there probably were at least 15.

These two observations are most significant in that they are the only sightings of this pack other than in the winter. Previously it had not been known if they stayed together other than when deep snow was present. In neither case was a kill found at the sites where the wolves were seen, but there was good evidence (abundant scats) that there had been at least one kill in the Siskiwit Swamp area sometime during the summer. Kills are frequent there in winter.

The November sighting was near a beaver colony that was being trapped at the time, and on the following evening a beaver caught in a Hancock live-trap was found by the wolves. The beaver, a 23-pound yearling female, was excited, but unhurt the next morning.

In June and July, 1963, four calf moose were found killed by wolves. Two of these kills were interrupted by National Park Service or Purdue University personnel; one calf was subsequently eaten by wolves, but the other was abandoned and left to decay. In one case it was clearly seen that only one wolf was involved, and evidence indicates that only one or a very few wolves were involved in the other three. These observations were all made in the northeastern section of the island, in the range of the smaller groups of wolves.

Winter Wolf Studies, 1963

The 1963 winter study took place from 29 January to 21 March, with headquarters at Windigo Ranger Station. The 90 horsepower Aeronca Champion aircraft was again piloted by Don Murray of Mountain Iron, Minnesota. The objectives of the study-- to observe wolves from the air as intensively as possible to determine their numbers, aggregations, hunting habits and effect on the island's moose population-- remained unchanged.

Populations

In 1962 the highest number of wolves accounted for was 21, with up to 17 in the large pack. This was an increase of one in this group over the previous year, and one of these wolves appeared to be a young animal. It was strongly suspected that there were at least 22 wolves on the island at that time.

In 1963, the highest number of wolves accounted for was 20, and there was little evidence that there may have been more, although the possibility could not be ruled out. The largest number seen in the big pack was 16, a decrease of one from 1962. It was not possible to determine if the animal lost were the young one seen in 1962 or an older wolf.

In 1962 there were thought to be two pairs (not necessarily mates) of wolves and one loner that ranged mostly over the northeast part of the island. In 1963 one pair and two loners were seen fairly often, but observations were not complete enough either year to be sure that all were accounted for.

Thus in 1963, the wolf population was smaller than in 1962 by at least one, and possibly two wolves.

Territories

The areas used by the different groups of wolves were essentially the same as in previous years: the big pack spent most of its time on the southwestern half of the island, travelling only as far northeast as Lake Whittlesey, while the smaller groups and individuals were most frequently seen in the northeast section.

Hunting

The pack of 16 was the subject of most observations. These wolves killed a minimum of 14 moose in 53 days, or one every 3.78 days. Four other kills by unidentified wolves were located during the winter period. Three of the 18 moose killed were young of the year, while the others were five years old or older.

One successful and three unsuccessful attacks on moose by the big pack were witnessed, but in no case was it possible to collect and autopsy a moose that had successfully withstood an attack by the wolves. By this means it has been hoped to get data on the age and physical condition of invulnerable moose to compare with what is known of those killed by wolves.

Miscellaneous Observations, 1962-63

Red fox-showshoe hare.

Red foxes and snowshoe hares were seen frequently during the winter of 1963, but no quantitative data were collected. Two red foxes became quite tame around settlements in the fall of 1962, and at least three were living in self-imposed semi-domestication in the summer of 1963.

Otter

Again in the winter of 1963, signs of otter were found. Tracks on Hatchet Lake led to an area nearly a half mile up the stream flowing into the southwest end of the lake where an otter spent several days, fishing in the creek. Scats found there smelled strongly of fish. The otter was seen from the air twice.