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Community Relationships and Population Dynamics of Terrestrial Mammals of Isle Royale, Lake Superior, 1969-1970

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Rolf O. Peterson

COMMUNITY RELATIONSHIPS AND POPULATION DYNAMICS
OF TERRESTRIAL MAMMALS OF ISLE ROYALE, LAKE SUPERIOR*

Fourth Annual Report

(Covering the Twelfth year in the Isle Royale studies)

1969-70

Wolf nos.
approx. 18

by

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5 June 1970

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NOT FOR PUBLICATION

STUDIES OF ISLE ROYALE MAMMAL POPULATIONS

This report terminates the current four-year phase of the Isle Royale studies. Wendel Johnson completed his academic program on the campus in August and submitted his thesis, major findings of which will be summarized here, pending their publication. In September, Johnson assumed duties on the staff of the University of Wisconsin at Marinette.

Michael Wolfe left his post-doctoral position on this work in mid-February for a teaching-research appointment on the staff of Utah State University. Rolf O. Peterson, of the University of Minnesota, Duluth, will begin work on the wolf and its prey in June 1970. This is expected to be a three-year Ph. D. assignment.

The work schedule of 1969-70 was much like that of former years. Michael Wolfe and Michael N. Kochert arrived on the island on 20 May. Kochert, a January graduate of our wildlife curriculum, helped in the field until 12 July. Ronald L. Bell and Steven W. Ruckel finished their junior year in wildlife studies and reported to the island as summer assistants on 2 June. They left on 24 August. These men carried on the work during Wolfe's absence from 5 August to 29 September. From the latter date, the fall work continued until 26 October. During the last two weeks, Larry J. Roop went off the park summer payroll and assisted in our work.

From 3 to 23 October, Philip C. Shelton, on leave from the Smithsonian, made a fall survey of the beaver population. This was his first review of the situation since he finished his Ph.D. project in 1963. Results of the 1969 work are included in this report. A contribution also was made by Jim A. Bottorff, who carried out an undergraduate research project on moose aging.

Again this year, an attempt was made to open the winter camp a week early. Wolfe, accompanied by John C. Keeler as assistant, went north on 23 January, planning to fly to the island on the 24th. They were delayed by bad weather in Virginia, Minnesota, and finally were able to fly to Washington Harbor on the 29th. Pilot Donald E. Murray and park electronics technician William Dohrn made up the party of four. Transportation flights were made this winter, as usual, by William E. Martila in the Cessna 180. The first two weeks of the winter study were marred by the illness of Wolfe and Murray, with respiratory infections. Allen arrived on the Island 14 February and closed camp on 14 March. Wolfe left the island on 17 February and Keeler left for airforce training on 7 March. Our pilot and wolf observer Don Murray is the old-timer of this project, 1970 marking the 12th winter he has been on the island flying the Aeronca Champion in pursuit of the wolves.

Films taken in February 1969 by the MGI-Canadian Film Board team were included in the NBC television broadcast entitled "The wolf men," on 18 November. This program, assembled and directed by Irwin Rosten, of MGM Documentary Division, probably stimulated more continent-wide interest in the wolf than any other event in history. In our Purdue office more letters were received than could be handled individually, so a form letter was used, which is attached as an appendix to this report.

There was some hope that the increased publicity might turn up a financial sponsor for this research program, although that has not happened as yet. In December 1969 the remainder of our fourth National Science Foundation grant was expended. Currently we are receiving support from the National Park Service and the Wildlife Management Institute and are expecting to operate on a considerably restricted budget for the next three years.

The Winter Study, 1970

After two winters of extreme weather conditions-- the least snow we have experienced in 1968 and the heaviest in 1969-- things were back more nearly to normal in 1970. When the party first measured snow depth on 31 January, there were 23.2 inches in the woods. On 2 March the average depth was 21.8 inches. Approximately 10.75 inches of new snow fell in the 6-week period. Most of this was light and fluffy but created reasonably good tracking conditions on February 5, 10, and 27. On 3-4 March a day-long rain followed by icing created some of the worst conditions we have seen for this work. Subsequently, a hard crust formed and wolves could not be tracked for the last two weeks of the work.

The principal feature of winter weather in 1970 was high winds. Many times on relatively clear days the air was too rough for the kind of low-level flying that is necessary for our observations. As a result, total flying time in 1970 was only 90 hours and 23 minutes, which is the least we have ever had in a winter period. The mean daily maximum temperature recorded was +22.27^oF, and the mean minimum was -1.34^oF. When the party flew over on 31 January, there was continuous ice from the island to Canada, the western edge describing an arc from Huginnin Cove to the islands off Pigeon Point. After the third week in February, open spots appeared and developed into extensive leads after the first of March.

The winter was a poor one for seed-eating birds. A few small groups of redpolls were seen, and they were feeding principally on the seed of upland alder (A. crispa). The large flocks of siskins and redpolls that appear in a year of abundant birch seed were missing. Likewise, there was no fruit on the mountain ash, and the grosbeaks were missing, although a few red crossbills were seen. Since mountain ash fruited heavily last summer, it may be assumed that this scarcity, perhaps of all tree fruits and seeds, was due to an early ice storm.

Woodpeckers were exceptionally plentiful, especially hairy and downy. Pileated woodpeckers were heard frequently, and one arctic three-toed was recorded. Horned owls were heard rarely, and one juvenile bald eagle was seen. A few ducks, evidently all mergansers and goldeneyes, were observed beyond the ice around the west and south shores.

A new major finding of the winter was the sighting by pilot Murray and ranger Zeb McKinney of a cat on the ice of Lake Richie on 8 March. Later Allen and Murray examined and measured the tracks and decided that it was a lynx. This confirms occasional summer reports of cat observations over the past several years.

The Wolf Population

A summary of wolf observations for the past winter indicates a total population of approximately 18, as compared with an estimate of 17 last winter. The largest pack was 8 (sometimes 7), and smaller groups of non-breeders numbered 4, 3, and 2. One loner was accounted for, and there may have been two.

Two years ago, a pack of 6 wolves containing two black individuals disappeared and has not been seen since. We hypothesize that these animals went back over the ice to Canada. A year later, in 1969, our large pack, which contained a breeding pair, was 8 most of the time, after an initial and perhaps questionable count of 9. This pack contained a black animal-- and another so dark it might have been the fourth of the original four blacks that came over from Canada in 1967. This is obviously the "big" pack of 8 we observed frequently in 1970.

Because of the exceptionally deep snow of 1969, an unusually large number of partially eaten moose carcasses remained on the range at the end of winter. It appeared that, with these available as a food supply, conditions were outstandingly favorable for the production of pups in spring. Actually, the expected increase in the island wolf population did not occur, although a litter appears to have been born. On 31 January, on the shore of Rock Harbor across from the Mott Island headquarters, Wolfe and Murray found the remains of a pup-- partly eaten by foxes but not yet completely frozen. It is possible that another young animal was in the pack of 8, but this is uncertain, and we can not confirm the existence of any living pups on the island at the end of the winter study.

The social structure of the big pack had several obvious features: The dominant wolf was a large gray male who, through late February and two weeks of March, was consistently attending an extremely small female. Closely associated with this pair was the large black male, who ran and rested with them, making it easily recognized trio. The black male obviously deferred to the gray breeder,

using all the postures of social inferiority, and was tolerated thereby as a close companion. The black male probably can be considered the beta male of the pack. The social status of 3 of the remaining 4 was not evident. However, the fourth animal was the low wolf in the social order. It usually maintained a distance of 30 to 50 yards from the others, and commonly it stood respectfully with its tail tucked. Although copulation was not observed this winter, there is little doubt that there will be a breeding den and a litter born somewhere on the island in the spring of 1970.

The large pack, containing the black wolf, was not located this winter until February 19, at which time only 6 animals were seen. Thus our largest group of wolves escaped discovery for three weeks, illustrating the fallibility of our observations relative to any complete count in a short time. It is true, however, that Wolfe and Murray spent most of their flying time in the first two weeks in the moose census, and we have no doubt that under normal conditions our pilot could have unraveled the track puzzle and located the big pack somewhat earlier in the period. The group of 8 wolves used the western half of the island, but restricted flying opportunities foreclosed a better estimate of their occupied area or the number of kills for which they were responsible in the total of 22 that were found.

Of the smaller group of wolves, 2 (frequently only one) were in the Washington Harbor - McGinty Cove area, 4 were in the Richie-Chickenbone-Todd Harbor region, and 3 were found in the north-east sector around Duncan Bay and Amygdaloid Island.

During the winter period 18 kills or partial remains were examined on the ground, of which 6 were calves of the year. Two calves that must have been killed at about the same time were found on McGinty Cove and may have been a pair of twins. No previous record of this kind has been found in the Isle Royale studies. Of the four remaining kills, which were discovered from the air but not examined on the ground, one was on the ice of the south shore, and attempts will be made in June to find the other three.

Moose Numbers and Losses

In the years of this study several methods have been used in monitoring the size of the moose herd, the first being a winter count covering the entire island by David Liech in 1960. This is not feasible because the weather conditions under which it is possible occur so seldom as to be phenomenal. Peter Jordan developed a stratified sampling system for the winter count and a system of pellet plots to be used as an index of wintering populations-- work continued by Michael Wolfe. The results of pellet counts need to be converted to population figures in terms of the defecation rate of an average moose over 24 hours in winter under Isle Royale conditions, and this information has not been available. We have attempted to obtain a cow:calf index in summer as a comparative measurement of annual breeding productivity, and a fall "antler and calf" count has been taken after the leaf fall in late October. The great problem in applying any of these methods has been to obtain unbiased samples of sufficient size. In general, it may be stated that our inventories have been subject to disconcertingly large errors.

Since it is seldom possible to begin field work in the park before mid-May, and our student help is not ordinarily available before early June, the period for running pellet lines before the growth of new vegetation is relatively short. Wolfe and Michael Kochert began the work on 23 May 1969, with later assistance by Bell and Ruckel. The running of 83 percent of the transects for the season represented a reasonably good sample under the circumstances.

Pellet line figures since 1964 have been converted experimentally to population estimates by applying a moose defecation rate of 11.9 times per day, as reported by Pierre Des Meules at the Northeast Wildlife Conference in 1962. In the following table, these figures are compared with the results of the winter aerial census made by a stratified sampling-- because of unsatisfactory weather conditions, it is "normal" for this inventory also to fall somewhat short of the planned program.

Moose Population Estimates

<u>Year</u>	<u>Winter Census</u>	<u>Pellet Plots</u>	<u>Comparison Factor</u>
1964	704*	1638*	2.3
1965	848*	1808*	2.1
1966	721	1598	2.2
1967	530	2406	4.5
1968	1015	2224	2.2
1969	1150	2329	2.0
1970	944	----	---

* non-stratified

It has become evident that the moose-density habitat stratification pattern for the winter count should sometimes be modified according to snow-depth conditions. That Wolfe did this with some success is indicated by the relative consistency of his results in 1968 and 1969, which a difference in about 30 inches in snow depth greatly affected the distribution of moose.

The most significant feature in the above table is the consistency of the comparison factor. Our best estimate of the meaning of these figures is that the winter aerial count is coming fairly close to the actual population, indicating an average midwinter herd of around 900 moose. The pellet plot conversion is too high for our conditions and the method needs a more realistic calibration; however these surveys do indicate relative densities from year to year. The indications are that, if possible, this work should be continued.

We have become increasingly dissatisfied with the summer calf count as an index of moose reproduction, but lacking better methods we will continue to summarize our field observations in these terms. From late May through the end of August in 1969, field personnel recorded 230 sightings of moose which may be categorized as follows:

<u>Males</u>	<u>Females</u>	<u>Calves</u>	<u>Total</u>	<u>Cows w/calves</u>	<u>Cows w/twins</u>
102	97	31	230	^{assumed} 24 25	3

Of the females seen, 12 could be identified as yearlings. The ratio of calves to adult females was 36:100.

These figures suggest that recruitment in the moose herd in 1969 was somewhat lower than that observed in former years. However, it is doubtful if such a conclusion can be reached reliably because of sampling error and variables in moose behavior (e.g. the hiding of calves) which create biases we do not understand. Past experience indicates a higher degree of significance in the fall aerial count, which was taken 18-23 October, with William J. Martila piloting the Supercub on floats. Flying time in moose counting was approximately 24 hours. Sex and age distribution of the animals recorded were:

<u>Males</u>	<u>Females</u>	<u>Calves</u>	<u>Total</u>	<u>Cows w/calves</u>	<u>Cows w/twins</u>
112	78	37	227	29	3

If it is assumed that yearling females comprised the same segment of the population as indicated by the summer count, the corrected index of productivity as expressed by the calf:adult cow ratio is 54:100. Actual natality, of course, is higher than this, and we have no indication of the magnitude of early losses. However, in June two calves were known to have been lost by drowning and one evidently was killed by wolves.

calves/100 =
54
75

A summary of the winter aerial census of moose for 1970 indicates the marked differences in density that support the need for stratifying the sampling system. The high degree of mixture of vegetation types makes generalizing a necessity in setting up plots and brings about confusing variables in moose distribution from year to year.

Midwinter Aerial Moose Census, 1970

<u>Stratum</u>	<u>Area (Sq mi)</u>	<u>Moose (per sq mi)</u>	<u>Calculated total</u>
1	39.59	0.55	22
2	53.40	2.91	155
3	87.61	4.20	368
4	32.15	12.43	400
IR	212.75	5.8	945

Pop. est.: 945 ± 240

This census was taken in the first two weeks of February under what may be considered slightly less than average snow depth conditions for the island (about 2 feet). It was suboptimal in consideration of the physical condition of our pilot and observer much of the time and the prevalence of high wind that often reduced flying time on a given day.

A record of particular interest was the finding in August of the skeletons of two dead bulls in the shallow water of Mud Lake. These animals had locked antlers, and they had died during the 1968 rutting season. The younger animal (wear class VII) had the larger rack of the two (the older, wear class VIII). The skulls will be a part of the Park's museum collection and will be displayed at the Rock Harbor visitor information center.

Further information on moose aging

As reported last year, our entire collection of moose specimens, for which teeth are available, has now been aged by the sectioning of the first molar and examination for annulations. Wolfe's inspection of many teeth led him to believe that of the six cheek teeth this one (I₁) was most satisfactory. It is the first molar to erupt and its root should show a complete set of cementum layers.

It might be assumed, however, that other molars or premolars could be used if their time of eruption were taken into account. A systematic investigation of this idea was needed. Accordingly, Jim A. Bottorff undertook the problem as an undergraduate research project in the spring of 1970. Since it has been shown that maxillary teeth are more satisfactory for this purpose than mandibular teeth, the complete upper tooth rows of ten adult moose were used, five from the left and five from the right side.

Bottorff sectioned and examined all 6 teeth from the ten specimens, with the following results: In all cases, the M_1 produced the most easily read and reliable annual growth layer count. From this tooth, the cementum layers became less discernable and the count more erratic proceeding backward to M_2 or forward to P_2 (the second premolar is the first of the cheek teeth in the row and the first to erupt). A consistent correlation of the number of layers with the time of eruption was found in only 4 of the 10 specimens. Characteristically, M_2 is the lowest aged and least worn of the teeth, yet it is more³ difficult to read than M_1 . This work indicates strongly that the methods in use by Wolfe should not be changed, and they will continue to be employed in determining the age of our collected specimens.

Beaver Studies, October 1969

From 3 through 23 October 1969, Philip C. Shelton live-trapped beavers and made ground surveys of beaver colonies on the northeast third of the island. On 19 and 21 October, he spent about 3.5 hours flying with William Martila making a partial count of active beaver colonies over the entire island. Results of this work are here compared with similar data from the intensive studies made of Isle Royale beavers in 1961-1963, as reported in Shelton's doctoral thesis of 1966.

The most significant change detected since the earlier surveys was the increase of beavers by at least 25 percent. This increase was primarily in inland colonies. Rock Harbor, Tobin Harbor, and the outlying islands in the northeast section had almost exactly the same number of active colonies in 1969 as in 1963. But on streams in this section and also over most of the rest of the island, the density of colonies had significantly increased. For example, Tobin Creek had five active colonies with food piles in 1969, whereas the most found there during the early 1960's was three.

The 1969 aerial survey of only 3.5 hours, plus three weeks of ground reconnaissance, brought the total number of known active colonies to 141, almost exactly the same as the 140 found in the more thorough survey of 1962, when 17 hours of flying time and some three months of ground surveys were employed in what was thought to be an almost complete count. It is estimated that a few more hours of aerial survey in 1969 would have brought the number of known active colonies to between 175 and 200, an increase of at least 25 percent over the 1962 figure.

That the increase was primarily in stream dwelling beavers is consistent with the hypothesis that the decline in beaver numbers in the late 1940's and early 1950's was caused by epizootic disease, probably tularemia. Harbor beavers would have been less susceptible to such a disease, and their numbers apparently did not drop as drastically as did those of stream and inland lake beavers. Consequently, they have continued to harvest their available foods, and

now have little left to sustain them, although they have demonstrated a remarkable tenacity and ability to thrive on birch and a variety of herbaceous and shrubby species growing close to shore.

During the 1960's beavers continued to reoccupy stream sites that were abandoned 10 to 20 years earlier. Although the most readily available stands of aspen were cut during this early occupancy, it appeared in the early 1960's that many abandoned sites had usable supplies of aspen and birch remaining and that food shortage was not the cause of the population decline. In 1969 old-growth aspen was still being used, and preliminary analysis of 1969 observations does not indicate that the beavers were traveling much greater distances for food than they were in the early 1960's. Many sites were found in 1969 where aspen was available within 50 to 100 feet of deep water, well within safe foraging range for the animals. The rate of cutting appeared to be similar to that found in the early part of the decade. This cutting rate was much less than that of the first occupancy of virgin stream sites during the 1930's and 1940's, when easily accessible trees especially aspens, were cut and wasted in large numbers. The trend toward greater efficiency of use with decreasing availability was previously described.

Five colonies, all of which were trapped in 1961-65, were trapped in October 1969. In 77 trap nights 23 different beavers were caught a total of 35 times. Colonies trapped and age classes of beavers caught were as follows:

<u>Colony</u>	<u>Adults</u>	<u>Two-year-olds</u>	<u>Yearlings</u>	<u>Kits</u>	<u>Total</u>	<u>No. trap nights</u>
Caribou-Rabbit Is.	2	0	0	5	7	23
Lorelei Lane	2	0	0	3	5	22
Mt. Franklin Trail ponds	1	1*	0	2	4	16
Baker Point	0	2**	0	0	2	7
Moskey Creek	2	0	2	1	5	9
Totals	7	3	2	11	23	77

* May have been three years old

** One may have been three years old.

The scarcity of yearlings may indicate an unproductive year in 1968. Otherwise the age structure of the sample appears normal.

Four of the 23 beavers had been tagged previously, but one, the adult female from the Caribou-Rabbit Islands colony, had lost her tags. (Beavers in this colony characteristically had tender ears and lost tags unusually often during the 1961-65 trapping period.) The three tagged beavers had all been tagged as kits, one each in 1962, 1963, and 1965, and all appeared to be breeding adults in 1969. The 1963 and 1965 animals were in the same colony (Lorelei Lane) and probably were mates. The 1965 animal, the female, was born in this colony but the 1963 beaver was born in the adjacent Caribou-Rabbit Islands colony, over a mile southwest in Rock Harbor. The 1962 animal, a female, was born in the Moskey Creek colony, where she was trapped in 1969.

The physical characteristics of these animals provided no evidence for a deterioration of the food supply, even on outlying islands that have been occupied continuously for 15 years or more, during which time there has been no regeneration of the principle woody food species. Weights of adults and kits fell very close to the means or regression curve points for beavers of the same age and food habits in the 1961-63 sample:

	<u>Weight in Pounds</u>	
	<u>Aspen fed (Mt. Franklin Tr. & Moskey Creek)</u>	<u>Birch fed (Caribou-Rabbit Is. & Lorelei Lane)</u>
<u>Adults</u>		
1961-63 mean	42.0	36.4
1969 mean	44.5	36.5
1969 range	42-47.5	35-37
1969 number	3	4
<u>Kits (at 4.5 months)</u>		
1961-63 (from regression curves)	12.1	9.8
1969 mean	13.2	9.6
1969 range	10.5-15	9-12
1969 number	3	8

Smaller Mammal Populations

As noted previously, Wendel Johnson carried out a Ph.D. study of the smaller mammals of Isle Royale from June 1966 to October 1968. In August 1969 he submitted his thesis entitled, "Food habits of the Isle Royale red fox and population aspects of three of its principal prey species." Some of the highlights of his findings follow:

In winter the fox is a scavenger on moose remains in the wake of the wolf pack and a predator principally on snowshoe hares. With the disappearance of snow the percentage of other prey items increases and includes red squirrels, muskrats, deermice, and birds. Fox food habits were assayed by scat analysis, and the occurrence of hare remains from year to year was in accordance with hare numbers on the island. In August and September, as elsewhere, the fox becomes a fruit eater, and wild sarsaparilla is especially favored.

In 1966, at the beginning of this study, hares probably were at their lowest point in ten years. In all three years summer trapping records showed a low production and survival of young, accounting for the low population of this period. The breeding season of the hare was from late March to early August, and the mean litter size was found to be 3.33. The average adult female produced 2 litters in a season. The best large area of habitat on the island is the 1936 burn. Staple foods in winter were birch and cedar and a variety of herbaceous plants in summer.

It may be added that the general prevalence of hare tracks at the time of the 1970 winter study indicates that the snowshoe hare is now increasing on Isle Royale.

It does not appear that the red squirrel is heavily preyed upon by the fox or any other predator. The population appears to fluctuate with the production of cones, good crops occurring at intervals of from 2 to 6 years. In case of failure, the breeding stock of squirrels fails to function, and new litters are not conceived. This happened in marked degree in 1966. When young are produced, survival is high. The survival rate of adults from year to year also is high. This species evidently produces only one litter per year in this environment. The red squirrel appears to have saturated its habitat on the island, and further increases probably are inhibited by behavioral and periodically by food factors. The species is most dense in coniferous forest and least plentiful in the sugar maple-yellow birch forest. It is likely that the 1936 burn will begin to support a few squirrels as its growth continues.

A remarkable feature of the Isle Royale animal community is the presence of only one species of mouse-size animal, the Canadian deer mouse, Peromyscus m. maniculatus. Except for wet areas, it occupies all the woody-plant habitats on the island. It is not a staple food supply for the fox or for any other known predator. The breeding season lasts from late March to early October, and those females of the breeding stock that survive commonly produce 3 litters of 5 young each. First- and second-litter young females may have 1 or 2 litters by the end of the season. This production pattern did not vary markedly for the three years of the study.

The colonization of Isle Royale by other species of small mammals, especially the voles, is a logical expectation for the future. The occurrence of more fires probably will favor the increase of hares. If such an enemy as the marten were reintroduced to Isle Royale, it is likely that a greater annual turnover rate would be established in the squirrel population.

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December 11, 1969

To the many people who wrote to me as a result of the TV program "The wolf men" on November 18, 1969.

Dear fellow conservationist:

My apologies for replying to your recent letter in this manner. When I returned from a ten-day absence from the campus, the accumulation of mail relative to the wolf documentary was much more than I have facilities to handle. Since many of you requested the same information, this mimeo may be a reasonably good expedient.

Status of the wolf: In the 48 contiguous states, the wolf is indeed an endangered species, and is so listed by the Secretary of the Interior. There are races in Canada and Alaska that are not in immediate danger. Do not be confused by people who call the coyote a "wolf". That is the origin of many wolf reports in Arkansas and other states. Coyote-dog crosses are a problem too-- many being large and wolf-like. In recent years there have been no reports of breeding wolves in the states south of Canada other than in Minnesota (where there are several hundred) and the small population (averaging about two dozen) in Isle Royale National Park, which is a part of Michigan. A few surviving "loners" evidently are living out their days in northern Michigan and Wisconsin. Occasional animals cross the border from British Columbia or Mexico, and there are several wolves in Yellowstone. None of these is breeding, as far as anyone knows.

Wolf-prey relations: Wolves are big-game predators. The large grazing and browsing animals of the world depend on their natural enemies for population control. When this control is ineffective, they build up and damage their ranges. The wolf exerts a strong and realistic culling effect because it takes mainly the old and weak animals (or the young when mothers are not healthy and capable of defending them). By protecting the range from over concentrations and by thinning the population, wolves are a long-term benefit to the animals that support them. The gun does not do the same kind of job.

The move for protection: Large predators have been persecuted by man because in some situations they damage livestock, because people have misunderstood their ecological effect on prey, and simply because of unreasoning prejudice. The latter two factors are operating in Minnesota where a limited wolf bounty is being paid (as a result of a strong political campaign last year). In Alaska a bounty is paid, and wolves are hunted from aircraft. I see from a news report that the Governor of Alaska has received some 2500 letters in protest of this situation since the documentary appeared in the 48 states. I am told that the program did not appear in Alaska because an injunction had been secured against it. Many of you have asked, "What can I do?" The most immediate thing that any of us can do is to see that his view points are known to the people who control the legal process. I learned yesterday that a bill is being introduced in both houses of Congress to make it illegal to kill any animal from an aircraft. Protection came to the wolf in Michigan and Wisconsin too late to do any good. If more citizens had been active, this might not have happened.

Our Isle Royale study: The study of the wolf and moose that we have carried out in Isle Royale National Park (Lake Superior) for the past 10 years has made use of the only area in the world where these two species are living together undisturbed by either hunting or predator control. Midwinter populations of wolves have averaged about 24. At that season there probably are 900-1000 moose on the 210-square-mile island. Both figures represent high populations. This study was described in National Geographic for February, 1963. You can get David Mech's "The wolves of Isle Royale" from the Superintendent of Documents, Washington, D. C. for \$1.00. It is the Seventh National Parks Fauna (1966) and is Dave's doctoral thesis-- he was my first student on this project. My present colleague in this work is Dr. Michael L. Wolfe, Jr., who will be finishing his 3-year post-doctoral assignment (full-time) on this study next June. Much that we have accomplished has depended on our bush-pilot and observer Donald E. Murray of Mountain Iron, Minnesota. Don is the best wolf tracker with an aircraft in the world. Both of these men appeared with me in the TV program, and I am sorry the other two were not identified.

Maybe I should mention that universities do not have funds for studies like this, as some people assume. I have personally raised more than \$200,000 for this work in 10 years. We hope to stick it out for two or three more years, since some wonderful new problems have developed and need answers.

Last winter the filming team from MGM Documentary Division (Culver City, California) and the Canadian Film Board was with us on the island for two weeks. This was our only major exception to a long-standing and necessary rule that we can not make our winter camp available to visitors. We are the only inhabitants of Isle Royale at that season, and all transport is by ski-plane.

Question: Where can I get a wolf to raise? I don't really know. Some people have obtained them from zoos. Raising a wolf is a job! You might like to read about Lois Crisler's experiences in "Artic Wild".

Personal comment: It is wonderful to witness how many people are concerned with the preservation of wildlife and natural areas, and how they reveal themselves after something like Irwin Rosten's (NIGI) program on the wolves. It is obvious that the presentation of factual material without preaching or comment allowed people to reach their own conclusions about the need for protecting this great animal. Some of you have asked my opinion on how wolves should be handled under modern conditions. Here are a few ideas:

For now, I think wolves could hold their own and probably would not be a nuisance if both Minnesota and Alaska put them on the game list, required a license, set a limit of one per hunter, and set the open season to coincide with big-game hunting. This is being done by some states with the mountain lion in the West. It is the bounty, poisoning, aircraft hunting, and snaring that have been unreasonably destructive of the wolf. It is entirely possible that wolves will need greater protection later, but for now, the above would represent real progress.

Thank you for letting me hear from you, and I hope you are not offended by this mass-production reply. Our world is getting too much that way, isn't it?

Sincerely,

Durward L. Allen,
Professor of Wildlife Ecology

DLA/cif