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DEVELOPMENT OF POPULATION ASSESSMENT TECHNIQUES FOR LYNX

by
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SUMMARY

A single lynx (Lynx canadensis) density estimate survey was conducted during this report period. Additional surveys were not conducted because of poor weather conditions. Four systematic samples, each consisting of three 2-mile transects, were walked, and the number of different lynx tracks encountered were recorded. This information, as well as movement data from radio-collared lynx, provided the basis for a density estimate. Lynx numbers were estimated to be 2.04 lynx/100 km^2 (80% confidence interval of 1.10-3.70 lynx/100 km^2). Because our observers were unavailable, aerial transects were not flown. Recommendations for improvement to the study design are included.

Key Words: census techniques, density estimate, lynx, Lynx canadensis.

CONTENTS

BACKGROUND

Research to develop techniques to estimate the density of lynx using on-systematic-line transects (Becker 1988) was initiated in the winter of 1986-87 (Schwartz and Becker 1988). Background information for this study and results of last years estimate have been presented (Schwartz and Becker 1988).

OBJECTIVES

To estimate lynx population density within 2 study areas on the Kenai Peninsula using line transect surveys.

To test the feasibility of aerial surveys to estimate lynx density based on track counts.

To test a lynx population density estimator using simulation modeling.

To prepare a final report.

METHODS

Density Estimates

Systematic lynx density estimates were made using a probability sampling design (Horvitz and Thompson 1952). Details of the mathematical and statistical calculations have been prepared for publication and are listed in Appendix A of Schwartz and Becker (1988). The design called for surveys to be conducted within 24 to 96 hrs after fresh snowfall to insure the elimination of old lynx tracks. The surveys were to be repeated 4 times within the study area at the Moose Research Center (MRC) to determine variability over time. Existing roads, trails, and lakes provided access to the study area. Two surveys will be conducted in the Tustumena Bench area using helicopter support.

The key to developing a population density estimator relies on verifying that all assumptions of the mathematical model are met. Since the distance travelled by each collared lynx is critical to the estimator, aerial flights to locate radio-collared lynx in the study area were conducted continuously over a 24- to 96-hr period after snowfall. Frequency of flights was dependent on weather conditions, ranging from a minimum of 1 time/day to 4 times/day. These flights enabled us to determine the distance traveled by each collared lynx. This information is required for the estimator and to pinpoint lynx locations just prior to the ground survey. Lynx tracks identified during the ground survey were classified as follows: (1) made by a known marked animal, based on location or (2) made by an unmarked animal. Radio-tracking surveys provided us with the information needed to determine the number of marked individuals within the area, and this coupled with the number of observed, unmarked individuals (tracks) provided a minimum estimate to compare with the line transect estimator.

Aerial Surveys

Because of the expense and limited usefulness of ground surveys in remote areas, we simultaneously evaluated aerial surveys using a Piper Supercub. We wanted to determine if a relationship existed between results of ground and aerial surveys. Because aerial tracking is difficult, particularly identification of lynx tracks, we used 1 pilot (Chuck Rogers, Fish and Wildlife Protection) and one observer (Ted Spraker, Alaska Dept. Fish and Game [ADF&G]) for all aerial surveys. This eliminated the potential for observer bias.

RESULTS AND DISCUSSION

Density estimates

Success of the density estimate survey was tied to snowfall and reliable weather conditions after each storm. During the fall of 1987 and winter of 1988, weather conditions were unsuitable for applying the technique. Early in the season, we had many snowfalls that provided good tracking conditions, but because most of the lakes within our study area were either not frozen or unsafe for aircraft landing, access to the area was precluded. Later in the winter when many of the lakes were frozen, heavy snowfall resulted in excessive overflow on most lake surfaces, precluding ski-plane landings and again restricting access to the study areas for surveys. These conditions limited us to one successful survey in March.

A snow storm hit the Kenai Peninsula during the week of 7 March 1988. On 14 March it stopped snowing; the radio-tracking flights of marked lynx began on 15 March and continued through 19 March, the day after the survey. On 18 March, personnel from the U. S. Fish and Wildlife Service and ADF&G assembled at the Kenai National Wildlife Refuge Headquarters for a briefing on the census technique and to receive maps of their transect (Fig. 1). Each person then went to the starting point of their transect and walked the designated 2 mi. Access to the 12 transects was provided as follows: 4 by auto, 1 by snowmachine, and the remaining 7 by ski plane. Observers walked their transects and counted each set of lynx tracks encountered. If more than one set of tracks was observed, recorders determined whether they were from the same lynx or a different one. If this determination could not be readily made, additional tracking was conducted the following day.

Seventeen lynx tracks were counted; backtracking indicated these tracks were made by 4 or 5 different lynx (Table 1). Transect C(1) was very close to a lynx bed, and 12 lynx tracks were observed. Through subsequent ground backtracking we determined that these tracks were made by either 1 or 2 lynx. The exact number could not be sorted out because the tracks were melted out and the high density of tracks on the transect precluded successful backtracking.

Observers also recorded tracks of other carnivores and snowshoe hares (Table 1). Although individual tracks are not the most accurate method to determine animal abundance, a comparison of the mean number of snowshoe hare tracks encountered on the transects this year (i.e., 48.8) with those encountered last year (i.e., 63.3) corresponds with the estimated decline in total hare numbers in two grids within the study area (T. Bailey, pers. comm.).

In addition to completing the 12 transects, it was necessary to determine the distance moved by each radio-collared lynx during the survey period. Low ceilings on 14 March prevented radio-collared lynx from being located until 15 March. This distance was estimated by determining the average X-axis movement made by radio collared lynx from 15 March to 19 March. On 19 March, tracks from radio-collared lynx were backtracked from the ground and from the air to determine the average X-axis distance moved from the day after the end of the snowstorm to their radio location on 19 March (96-hr X-axis movements). By dividing the average distance moved by the lynx population during the 96-hr period, the number of lynx in our 285-km^2 study area was estimated. The best estimate of the mean distance moved on the X-axis (+ SE) by these 3 marked lynx was 3.06 ± 0.65 mi. The X-axis distance moved by the population for the 4 systematic samples was estimated at 18.33 ± 7.48 mi. Distances moved on the 4 systematic samples were 0.0, 18.33, 36.67, and 18.33 mi for samples A through D, respectively. This estimate assumed that there was only 1 lynx on transect C(1), not 2. Our best estimate of $\bar{N}$ was therefore 5.81 lynx for the 110-mi^2 study area, or 2.04 lynx/100 km^2. The 80% confidence interval was 1.10-3.70 lynx/100 km^2.

Overall, the technique worked well once snow conditions were suitable for a survey. The only problems encountered were determining if 1 or 2 lynx crossed transect C(1) and the total X-axis distance moved by the radio-collared lynx for the 96 hrs after the storm. When daytime temperature exceeded 0 C, tracks melted, and it was difficult to determine if tracks were from a single cat or from 2 cats. This pattern was compounded because transect C(1) crossed very close to a lynx bed where there was a high density of tracks. Our estimate of the 96-hr movements of the marked lynx was good, since the lynx appeared to be staying in small areas that had an abundance of hares.

During the course of the study, there were 3 lynx within the study area that had been previously radio-collared; an additional lynx was caught just prior to the census, and 2 uncollared lynx crossed the transects (i.e., one each on C[1] and D[1] during the census). Therefore, a minimum of 6 lynx were in the study area during the census. The population estimates of 5.81 (1 lynx counted on transect C[1]) and 7.27 (2 lynx counted on transect C[1]) were close to the known population number within the 80% confidence interval. As a point of interest, 10 additional lynx were captured in or adjacent to the study area 4 months after the census; all were caught near the perimeter of the study area and probably were not on the area during the census.

A comparison of lynx densities in the study area for the last 2 winters (i.e., 14.5 vs. 5.81 lynx/110 mi^2 in 1986-87 and 1987-88, respectively) suggested a decline in lynx numbers. This decline was supported by 2 other factors: (1) a lack of kitten production of the 2 marked females and (2) the dispersal of 4 kittens born in the study area in 1986 before the 1988 census (W. Staples, pers. commun.).

Stevenson (1984) advocated using all lynx tracks that crossed transects as an index of lynx abundance. Total tracks crossing the 12 transects in 1986-87 were 18, while in 1987-88 there were 17; our population estimates for those same years were 14.5 and 5.81 lynx/110 mi^2, respectively. Based on this limited data, it appears that total track counts may not reflect changes in population density, even when there is 60% decline in density.

Aerial Survey

Because our pilot and observer were involved in aerial wolf tracking, they were unavailable to conduct the aerial survey. No aerial survey was conducted.

RECOMMENDATIONS

We recommend that the study be continued for at least one more year. Because of weather, we only completed 1 census during this report period. The USFWS (T. Bailey, pers. commun.) has placed additional radio collars in the MRC study area, and as of 15 July 1988 there were 8 lynx with functioning transmitters. This is a substantial gain over the 3 marked individuals we had this past year. Likewise, there were 4 resident and as many as 4 dispersing radio-collared lynx in the Tustumena Bench area, so we also have an adequate sample of marked lynx to conduct a census there. We recommend that the aerial surveys be continued to evaluate the potential of the aerial lynx census and to aid ground observers in locating lynx and sorting out multiple tracks crossing a single transect. We further recommend that additional studies be initiated to determine when kitten production and recruitment occur. Last year, no marked lynx produced kittens. One female with 1 kitten was later captured on the perimeter of the study area.

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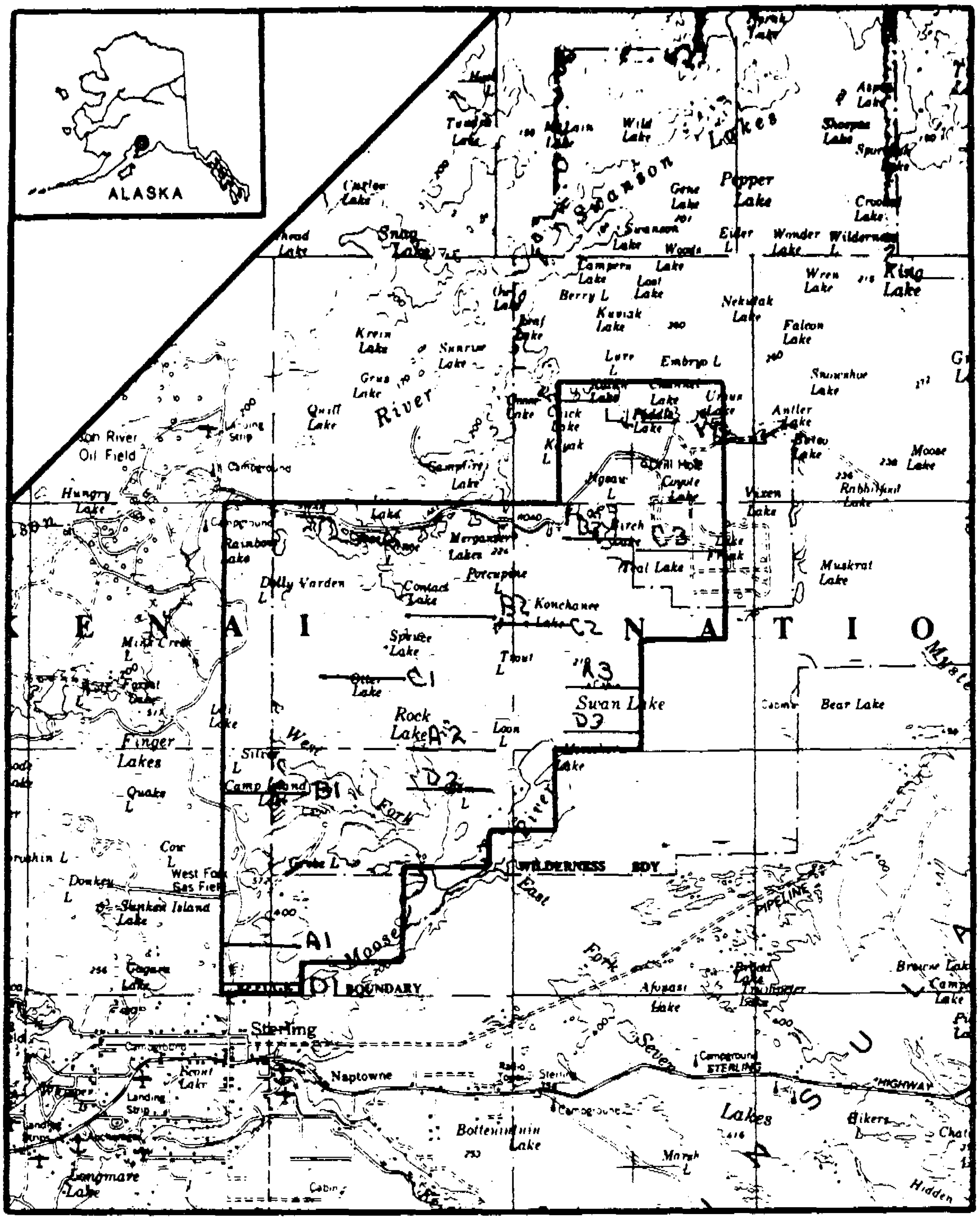

Figure 1. Moose Research Center study area located in the northcentral portion of the Kenai Peninsula lowlands. Study area boundaries and location of the 4 systematic samples (A-D) with the 3 transects per sample (1-3) are shown.

Table 1. Number of tracks encountered during 4 systematic samples with with 3 transects per sample (n = 4 or 5) during a lynx density estimate on 18 March, 1988, at the Moose Research Center study area, Kenai Peninsula, Alaska.

Systematic Sample (Transect)	Lynx Tracks Encountered		Total Tracks		
	Total	Individuals	Wolf	Coyote	Hare
A(1)	0	0	0	2	0
A(2)	0	0	0	5	25
A(3)	0	0	0	6	25
B(1)	0	0	0	6	2
B(2)	0	0	0	3	16
B(3)	3	1	0	5	173
C(1)	12	1 or 2	0	3	87
C(2)	1	1	0	23	125
C(3)	0	0	0	6	66
D(1)	1	1	0	0	4
D(2)	0	0	2	18	22
D(3)	0	0	0	12	40
Total	17	4 or 5	2	89	185

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