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JUNEAU, ALASKA

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REPORT ON LYNX STUDIES

by

Peter M. Berrie

Volume XI
Project Segment Report
Federal Aid in Wildlife Restoration
Project W-17-2, Jobs 7.4R, 7.5R, 7.6R, and 7.7R

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JOB PROGRESS REPORT (RESEARCH)

State:	Alaska		
Cooperators:	Peter M. Berrie		
Project No.:	W-17-2	Project Title:	Small Game and Furbearer Investigations
Job No:	7.4R	Job Title:	Morphology, Productivity, and Physical Condition of Lynx
Job No:	7.5R	Job Title:	Harvest Analysis
Job No:	7.6R	Job Title:	Lynx Food Habits
Period Covered:	July 1, 1969 to November 31, 1970		

SUMMARY

The 1969-1970 lynx carcass collection contained 391 lynx; 231 males (56.4%) and 160 females (41.8%). Thirty percent were kits, an increase from 6.8% kits from the 1968-1969 collection. The average number of placental scars per female was 2.99, an increase from 2.16 for 1968-1969.

The average ages of lynx except kits for 1969-1970 was 4.88 years for males, and 3.93 years for females, as determined by cementum layers.

The average lynx harvest as indicated by questionnaire data for the 1969-1970 trapping season was 3.64 lynx per trapper, a slight increase from 3.50 for 1968-1969.

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BACKGROUND

The Alaska Department of Fish and Game began obtaining skinned lynx carcasses from commercial trappers in the late fall of 1961. Carcasses have been obtained continually since then, and will not be obtained on a mass basis after 30 June 1971.

Males and females were obtained, except for fiscal years 1965 and 1966, when only females were purchased from trappers.

Gross autopsy data were obtained from all specimens, and skulls, leg bones and the upper left canine tooth were stored for subsequent study. The Big Game section worked up the reproductive data for fiscal years 1961 through 1964, and a Master's Thesis concerned itself with the reproductive and age data for fiscal year 1965 (Nava, 1970). Reproductive data for fiscal years 1966 through 1971 are in the process of being worked up, and will hopefully be consolidated with the 3 year's previous data.

Data sheets were designed to enter data on computer tape, and FORTRAN programs for subsequent analysis of data were written, to incorporate morphometric and population data with gross autopsy and reproductive data.

Trapper questionnaire forms were designed in 1964 to obtain lynx, hare, and grouse population trends and were modified in 1965. The data obtained from these questionnaires have been analyzed yearly and the results obtained to the trapper continuously since 1965.

OBJECTIVES

To obtain information on morphology, productivity, and physical condition of lynx.

To determine age classes within the harvest of lynx.

To determine major prey items consumed and the relationship between lynx numbers and prey abundance.

PROCEDURES

Three hundred ninety-one skinned lynx carcasses were purchased from trappers throughout Interior Alaska during the legal trapping season from November 1, 1969 through March 31, 1970. The carcasses were processed as indicated by Berrie (1970).

One hundred fifty-four pairs of ovaries for 1969-1970 females were macroscopically examined for placental scars, and weighed. Data were entered on IBM Form 577 for further analysis.

Micro-sections of the upper left canine teeth of each specimen were examined for cementum layers for data years 1968-1969, and 1969-1970. Five hundred teeth for 1963-1964 were also processed, and all age data including data years 1964-1965, and 1965-1966 were entered on IBM Form 577 for further analysis. The results will be published in the project completion report, pending the addition of data years 1961-1962; 1962-1963; 1963-1964 and 1969-1970 for a detailed analysis.

Computer programs for data analysis and scanner sheet interpretation were designed by Alaskan Data Systems, 503 East Sixth Avenue, Anchorage, Alaska, to analyze reproductive, age, condition and morphological parameters for specimens from specific areas of the state. An update and sort program was also designed to further incorporate new raw data and make corrections in pre-programmed data, and to regress selected population and reproductive parameters in an effort to gain meaningful comparisons and insight concerning population trends in specific areas of the state.

Additional FORTRAN programs for the IBM system 360/40 computer were designed and written by lynx project personnel to compute life tables, means and T-values of parameters, and population trends for each cohort of a year's harvest analysis. All such data from 1961-1962 through 1970-1971 will be presented in the project completion report.

Two hundred thirty-five trapper questionnaire forms (after Burris, 1968) were mailed to trappers who had cooperated with us in the past. An effort was made to update the trapper cooperators list for future reference. The results were completed after Burris (1968).

Two publications concerning the effects of sernalyn on lynx and new limits for external and skeletal parameters of lynx were prepared and submitted to appropriate journals. Two additional publications concerning a zoological description of Lynx canadensis, and the ecology, behavior and status of the lynx in Alaska are in preparation. Six additional papers are in various stages of preparation.

FINDINGS

Age and Sex Breakdown of the Harvest

Fort Yukon (Table 1A) had the greatest numbers of subadults (50.42%) of all areas, indicating good breeding conditions during the summer of 1968, and a survival ratio of kits not indicated by the 1968-1969 data (7.2%). This bias is probably due to kits being more susceptible to traps from February through March of the trapping season as a result of more mobility due to the breeding behavior of the parent female and a family breakup. The next 3 cohorts, born in the summers of 1966, 1967, and 1968 are missing. Trapper questionnaire data indicate that these missing cohorts are indicative of the low lynx populations and trends (Burris, 1968; Berrie, 1970). The next largest cohort is that of 6 cementum layers, born in the summer of 1962 when the population was well on the upswing in the Fort Yukon area. The cohorts of 4, 5, and 6 cementum layers indicate that it is probably adults of 2 or more years of age that survive through the population low, and not subadults or young of the year.

The Fairbanks area (Table 1B) had 25% kits as compared with 14% kits for last year. There was little or no survival as indicated by the missing subadult cohort of zero cementum layers. The dominant age class other than kits was 5 cementum layers (18%) indicating a year delay in the crash and upswing as compared with Fort Yukon. Tok (Table 1C), however, did show subadults of zero cementum layers (10.25%) indicating some kit survival from 1968-1969. This aspect of latitudinal as well as altitudinal passage will be discussed further (Berrie, in preparation). Again, kits from 1968-1969 (4.4%) do not reflect nor predict the 10.25% subadults due to a bias in the trapped sample.

Glennallen (Table 1D) data indicate kits, 31.78%, subadults, 10.5% (kits for 1968-1969 = 1.1%) with the dominant cohort being of 5 cementum layers (24.0%).

Other areas (Table 1E) and the combined total (Table 1F) indicate good lynx population recruitment (33.8% and 30.0%, respectively) that may not indicate true recruitment, as a result of a bias indicating a lesser proportional recruitment than actually may be taking place. The 1968-1969 data for other areas indicated 1.6% kits as compared with 15.0% subadults for 1969-1970.

The mean ages of the catch (Table 2) indicate males are older than females, with a difference of .95 years for all areas combined. The youngest average age was Fort Yukon (2.77 males and 2.09 females) indicating a population expansion starting in 1968. Fairbanks had the oldest average ages (5.75 males, 5.25 females) indicating a more mature, possible senile population, with no recruitment in 1968 (Table 1B) and kits just starting to show up in the harvest in]969-1970.

All areas except Fairbanks indicated a greater proportion of males than females, close to the 3:2 males-females ratio of 1968-1969 (Berrie, 1970). The most rapidly expanding population (Fort Yukon) had the greatest proportion of males to females (7.3) while population with the least amount of recruitment (Fairbanks) had a greater ratio of females (3.7). This is not as should be expected for maximal population growth for a promiscuous species.

Reproduction

Placental scar information seems to contradict the recruitment information. Of the 5 main sub-areas (Table 4), Fairbanks had the second largest number of placental scars per female (2.75) and Fort Yukon had the second lessor number of placental scars per female for the least and most rapidly expanding populations, respectively. These data indicate that either there was no kit survival for the Fairbanks area, or that kits were available but weren't caught. The relationship of placental scars per female and young of the year recruitment must depend on the following year's data of subadults. This is an area that must be approached cautiously, due to the bias in kit capture, and a possible bias in subadult vulnerability as a result of the increased mobility associated with emigration to new territorial areas.

Questionnaire Data

Questionnaire forms have been mailed to a selected group of trappers at the close of each trapping season since 1966, with variable responses (Table 5). The 31% response for 1969-1970 indicates a decrease from the 37% response from the 1968-1969 data.

Lynx Populations

The average number of lynx harvested per trapper (Table 6) in 1969-1970, was 3.64, a slight increase from the 3.5 from 1968-1969. Fort Yukon area trappers averaged 20 lynx per trapper, a decrease from 26.4 from last year. Glennallen and other areas averaged 2.17 and 2.91 lynx per trapper, an increase from 1.11 and 1.69 from 1968-1969, respectively. All other areas indicated slight decreases from 1968-1969 in lynx caught per trapper.

Fort Yukon was the only area that reported a medium lynx population, and an increase from the previous year. All other areas indicated low populations with slightly more than the previous year.

Hare Populations

Fort Yukon indicated a slightly high hare population, with a strong increase from last year (Table 8), all other areas indicated medium to low populations, with a strong increase from the previous year.

Both indexes show an increase for all areas combined for the population and trend index (4.16 and 7.71) from the population and trend index for 1968-1969 (2.52 and 5.44), respectively.

Grouse Populations

Fort Yukon indicated the lowest grouse population and lowest grouse population index of all other areas; 1.8 and 2.00 (Table 9). This is diametrically opposed to population and trend indexes for hares. This is a decrease from the 3.40 and 3.40 from 1968-1969. Tok area trappers indicated a medium and slightly increasing population. All other areas indicated low grouse populations with a slight increase from the previous year, except Glennallen which indicated a decreasing population trend.

Comparable data for the 1967-1968 and 1968-1969 surveys are contained in Volume VIII Annual roject Segment Report, Federal Aid in Wildlife Restoration, Project W-17-1, Work Plan A, 4 and 6, respectively.

Questionnaire form, letter to the trapper, and the report of the results of the survey which was sent to the trappers were the same as those used in the 1967 and 1968 Surveys and have not been presented in this report.

Table 1A. Fort Yukon. Age and sex ratios of the 1969-1970 lynx collection. Age = number of cementum layers.

Females			Males			Both		
Age	No.	%	Age	No.	%	Age	No.	%
Kits	10	26.32	Kits	26	32.75	Kits	36	30.77
0	24	63.16	0	35	45.00	0	59	50.42
1	0	0.0	1	0	0.0	1	0	0.0
2	0	0.0	2	0	0.0	2	0	0.0
3	0	0.0	3	0	0.0	3	0	0.0
4	1	2.63	4	2	2.52	4	3	2.55
5	1	2.63	5	3	3.79	5	4	3.40
6	1	2.63	6	8	10.15	6	9	7.65
7	0	0.0	7	2	2.52	7	2	1.70
8	1	2.63	8	1	1.25	8	2	1.70
9-15	0	0.0	9-15	2	2.52	9-52	2	1.70
Total	38	100.00	Total	79	100.00	Total	117	100.00

Table 1B. Fairbanks. Age and sex ratios of the 1969-1970 lynx collection. Age = number of cementum layers.

Females			Males			Both		
Age	No.	%	Age	No.	%	Age	No.	%
Kits	3	29.70	Kits	1	20.00	Kits	4	25.00
0	0	0.0	0	0	0.0	0	0	0.0
1	0	0.0	1	0	0.0	1	0	0.0
2	1	9.90	2	0	0.0	2	1	6.25
3	0	0.0	3	0	0.0	3	0	0.0
4	1	9.90	4	0	0.0	4	1	6.25
5	2	19.80	5	1	20.00	5	3	18.75
6	2	19.80	6	3	60.00	6	5	31.25
7	2	19.80	7	0	0.0	7	2	12.25
8	0	0.0	8	0	0.0	8	0	0.0
9-15	0	0.0	9-15	0	0.0	9-15	0	0.0
Total	11	100.00	Total	5	100.00	Total	16	100.00

Table 1C. Tok. Age and sex ratios of the 1969-70 lynx collection. Age = number of cementum layers.

Females			Males			Both		
Age	No.	%	Age	No.	%	Age	No.	%
Kits	5	41.66	Kits	3	11.10	Kits	8	20.51
0	0	0.0	0	4	14.80	0	4	10.25
1	0	0.0	1	0	0.0	1	0	0.0
2	0	0.0	2	0	0.0	2	0	0.0
3	0	0.0	3	0	0.0	3	0	0.0
4	0	0.0	4	3	11.10	4	3	7.69
5	4	33.33	5	11	40.70	5	15	38.46
6	2	16.70	6	4	14.80	6	6	15.38
7	0	0.0	7	1	3.69	7	1	2.56
8	1	8.33	8	1	3.69	8	2	5.12
9-15	0	0.0	9-15	0	0.0	9-15	0	0.0
Total	12	100.00	Total	27	100.00	Total	39	100.00

Table 1D. Glennallen. Age and sex ratios of the 1969-70 lynx collection. Age = number of cementum layers.

Females			Males			Both		
Age	No.	%	Age	No.	%	Age	No.	%
Kits	19	43.13	Kits	14	23.33	Kits	33	31.70
0	6	13.62	0	5	8.33	0	11	10.50
1	1	2.27	1	0	0.0	1	1	0.90
2	0	0.0	2	0	0.0	2	0	0.0
3	3	6.81	3	3	5.00	3	6	5.60
4	2	4.54	4	8	13.33	4	10	9.50
5	8	18.16	5	17	28.33	5	25	24.00
6	5	4.54	6	6	10.00	6	11	7.60
7	1	2.27	7	7	11.70	7	8	7.60
8	2	4.54	8	0	0.0	8	2	1.90
9-15	0	0.0	9-15	0	0.0	9-15	0	0.0
Total	44	100.00	Total	60	100.00	Total	104	100.00

Table 1E. Other Areas. Age and sex ratios of the 1969-70 lynx collection. Age = number of cementum layers.

Females			Males			Both		
Age	No.	%	Age	No.	%	Age	No.	%
Kits	22	48.90	Kits	14	23.24	Kits	36	33.80
0	8	18.00	0	8	13.28	0	16	15.04
1	1	2.13	1	1	1.66	1	2	1.87
2	1	2.13	2	3	4.98	2	4	3.76
3	3	6.38	3	5	8.30	3	8	7.52
4	3	6.38	4	3	4.98	4	6	5.61
5	7	15.90	5	12	19.92	5	19	19.71
6	7	15.90	6	6	9.96	6	13	12.19
7	0	0.0	7	5	8.30	7	5	4.67
8	0	0.0	8	3	4.98	8	3	2.80
9-15	0	0.0	9-15	0	0.0	9-15	0	0.0
Total	52	100.00	Total	60	100.00	Total	112	100.00

Table 1F. Total. Age and sex ratios of the 1969-70 lynx collection. Age = number of cementum layers.

Females			Males			Both		
Age	No.	%	Age	No.	%	Age	No.	%
Kits	59	37.00	Kits	58	25.60	Kits	117	30.00
0	38	23.56	0	52	22.36	0	90	23.04
1	2	1.24	1	1	0.43	1	3	0.77
2	2	1.24	2	3	1.29	2	5	1.28
3	6	3.72	3	8	3.44	3	14	3.58
4	7	4.34	4	16	6.89	4	23	5.89
5	22	13.64	5	44	18.92	5	66	16.89
6	17	10.54	6	27	11.61	6	44	11.26
7	3	1.86	7	15	6.46	7	18	4.60
8	4	2.50	8	5	2.15	8	9	2.30
9-15	0	0.0	9-15	2	0.86	9-15	2	0.51
Total	160	100.00	Total	231	100.00	Total	391	100.00

Table 2. Mean age of lynx in 1969-1970 collection, except kits.

Fort Yukon		
Males	n = 53	$\bar{y}$ cementum layers = 2.77
Females	n = 28	$\bar{y}$ cementum layers = 2.09
Fairbanks		
Males	n = 4	$\bar{y}$ cementum layers = 5.75
Females	n = 8	$\bar{y}$ cementum layers = 5.25
Tok		
Males	n = 24	$\bar{y}$ cementum layers = 5.71
Females	n = 7	$\bar{y}$ cementum layers = 5.71
Glennallen		
Males	n = 46	$\bar{y}$ cementum layers = 5.24
Females	n = 19	$\bar{y}$ cementum layers = 4.89
Other		
Males	n = 46	$\bar{y}$ cementum layers = 4.10
Female	n = 30	$\bar{y}$ cementum layers = 3.39
Total		
Males	n = 173	$\bar{y}$ cementum layers = 3.88
Females	n = 92	$\bar{y}$ cementum layers = 2.93

Table 3. Sex and age ratios of the 1969-1970 lynx collection, kits are separated and not included with subadults and adults.

Area	Males, n	%	Females, n	%	Kits, n	%	Total n
Fort Yukon	79	68.78	38	32.22	36	30.77	117
Fairbanks	5	31.25	11	68.75	4	25.00	16
Tok	27	70.00	12	30.00	8	20.51	39
Glennallen	60	58.72	44	43.38	33	31.73	104
Other	60	53.50	52	46.50	36	32.15	112
Total	22	56.4%	160	43.60%	117	30.00%	391

Table 4. Average number of placental scars per female lynx exclusive of kits from the 1969-1970 lynx collection.

Area	N	$\bar{y}$ Placental scars/female lynx
Fort Yukon	17	2.50
Fairbanks	8	2.75
Tok	7	1.00
Glennallen	25	2.80
Other	33	3.88
Total	90	2.99

Table 5. Responses to lynx trapper questionnaire, 1966-1970.

Year	Number Mailed	Number Answered	Percent Answered
1966	295	109	37
1967	295	63	21
1968	255	83	33
1969	227	85	37
1970	225	79	31

Table 6. Summary of replies to the 1969-1970 questionnaire of the lynx harvest.

Area	No. Responses*	No. Not Trapped	No. Returned Unanswered	No. Lynx Harvested	Average Catch Per Trapper
Fort Yukon	5	0	0	100	20.00
Fairbanks	17	0	4	13	1.00
Delta	8	1	1	1	.17
Tok	6	0	1	27	4.50
Glennallen	26	7	3	35	2.17
Other	17	3	2	35	2.91
Total	79	11	11	211	3.64

* Trappers not answering the question, "How many lynx did you take?" were considered to have trapped and not caught lynx.

Table 7. Summary of replies to the 1969-1970 questionnaire on lynx populations.

	Abundance in 1969-1970 Season				Comparison with 1968-1969 Season			
	High	Medium	Low	Index*	More	Same	Less	Index*
Fort Yukon	2	1	2	5.00	2	1	1	6.00
Fairbanks	0	1	12	1.30	4	4	5	4.69
Delta	0	1	6	1.60	0	4	3	3.30
Tok	0	0	6	1.00	0	0	6	1.00
Glennallen	0	1	20	1.20	5	7	8	4.45
Other	0	4	10	2.14	5	3	4	5.33
Total	2	8	56	1.72	16	19	27	4.31

* See section on procedure for explanation of index.

Table 8. Summary of replies to the 1969-1970 questionnaire on hare populations.

	Abundance in 1969-1970 Season				Comparison with 1968-1969 Season			
	High	Medium	Low	Index*	More	Same	Less	Index*
Fort Yukon	2	2	1	5.80	2	2	0	7.00
Fairbanks	2	6	5	4.07	10	3	0	8.08
Delta	1	1	5	2.71	5	2	0	7.85
Tok	1	3	2	4.33	4	2	0	7.66
Glennallen	2	10	10	3.71	12	6	2	7.00
Other	5	4	5	5.00	11	1	0	8.66
Total	13	36	28	4.16	44	16	2	7.71

* See section on procedure for explanation of index.

Table 9. Summary of replies to the 1969-1970 questionnaire on grouse populations.

	Abundance in 1969-1970 Season				Comparison with 1968-1969 Season			
	High	Medium	Low	Index*	More	Same	Less	Index*
Fort Yukon	0	1	4	1.80	0	1	3	2.00
Fairbanks	1	6	6	3.46	3	8	2	5.30
Delta	1	2	4	3.30	2	4	1	5.60
Tok	1	4	1	5.00	2	4	0	6.33
Glennallen	0	10	10	2.90	0	10	11	2.90
Other	2	7	5	4.87	4	6	2	5.67
Total	5	30	30	3.43	11	29	19	5.65

* See section on procedure for explanation of index.

RECOMMENDATIONS

As ten years of lynx carcass data for a full population cycle have been acquired, massive collecting need no longer be continued. Small collections of up to 5 adult female lynx should be acquired from Fort Yukon, Fairbanks, Glennallen and Anchorage in an effort to monitor productivity from year to year, and to insure an ample sample size for parasitological investigations.

The large amount of data obtained from 7,900 lynx specimens should be computer analyzed and patterns of reproductive and population trends determined. Meaningful management policies may be formulated as a direct result thereof.

The Trapper Questionnaire form for relative population trends of lynx, hare, and grouse should be continued.

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JOB PROGRESS REPORT (RESEARCH)

State: Alaska

Cooperators: Peter M. Berrie

Project No.: W-17-2 Project Title: Small Game and Furbearer Investigations

Job No.: 7.7R Job Title: Lynx: Habits, Movements, and Mortality

Period Covered: July 1, 1969 to November 31, 1970

SUMMARY

Seven additional lynx were captured and radio-equipped in the lynx study area near Central, Alaska. A large male lynx was observed to travel a circumference of approximately 18 square miles of territory every ten days, which is a home range 2.2 times that previously reported. Young of the year lynx (3 females) were observed to have moved an average of 10 miles after the family breakup resulting from breeding behavior of the parent female. Effective maximum range for receiving equipment was 22 miles from aircraft and 9 miles on the ground.

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BACKGROUND

The Lynx Habits, Movements and Mortality Study was scheduled to start 1 July, 1967. A manpower shortage delayed the start of this phase of the lynx study until 4 July, 1968.

Techniques were developed for capturing, immobilizing and radio-equipping wild lynx, and a study area was set aside near Central, Alaska, specifically for lynx study.

Field techniques were developed for radio-tracking operations under arctic conditions, and design changes of transmitters and receivers were made by the Davidson Company Electronics Division, 2109 Glenwood Avenue, Minneapolis, Minnesota for low temperature operation.

Harnesses were designed for mounting antennas on pickup trucks, and use of aircraft for radio-tracking purposes was initiated during April 1969. Experimental use of aircraft indicated a need for additional magneto supressors to shield magneto leak through to tracking receivers.

OBJECTIVES

To determine lynx movement and life history information through the use of radio equipped animals and telemetry equipment.

PROCEDURES

Prey Animals

A census form was designed for use in censusing relative prey animal abundance along the road system throughout the lynx study area (Berrie, 1970; Lord, 1959). The form indicated time of day of observation, road, observers, weather conditions, number of adult and young hares, number of adult and young grouse, and number of ground squirrels.

During the month of May, 1970, adult snowshoe hares were live snared and pennants of engineer's tape attached to both ears with the use of numbered number one fingerling tags, red for females, green for males. It proved to be impossible to accurately predict hare numbers using the ratio of marked versus unmarked animals because of small sample sizes. This part of the Prey Animals census of the lynx project was turned over to the Survey and Inventory Section, Region III as of June, 1970, and the individuals involved will submit the data in a separate segment report.

Lynx Live Trapping

Eighteen "tomahawk" single door live traps, 20" x 26" x 6" were continually used at locations along Deadwood Canyon Road, Circle Hot Springs Road, and Ketchem Creek Road as indicated by Berrie (1970). Two of these traps from the upper Deadwood Creek area were removed during the early spring months as a result of the extreme difficulty and the loss of time involved in checking them due to the very bad road conditions associated with heavy rains throughout the entire spring and summer trapping effort. These traps (formerly Deadwood numbers 11 and 12) were removed from Tommy's Pup and Discovery Gulch and placed at Sawpit Creek and Mile 132 on the Steese Highway.

The 3 trap sites on the upper Steese Highway were not used this year as the amount of time involved in checking them on a daily basis proved to be prohibitive.

Traps were baited using combinations of animal "forms," scents, and whole carcasses of hares. The forms made of grouse feathers were not used from August, 1969 through June of 1970 as the Protection Division of the Alaska Department of Fish and Game felt it unnecessary (albeit legal) as local citizens and hunters who might have stumbled across the traps might take exception to the use of grouse feathers as bait. Grouse forms were again used in late August, 1970.

Three live snares were used along trails in the study area, but were discontinued as an adult male lynx was killed as a result of flipping up and over the drag. The male was accompanied by an adult female who was caught in Ketchum #1 and subsequently radio-equipped.

A total of 24 days was spent on the Porcupine River at Graphite Point (8 days) and Ward Camp (16 days) during July, 1969. Live snares were used along trail systems paralleling ridges and sloughs, and trails

were brushed out in lynx habitat and snares set. Twelve number three single spring traps were baited and set along the trail system. Traps were run on foot and with the use of a 24-foot Ouachita river boat.

All lynx trapped were handled and released as described by Berrie (1970).

Immobilization and Handling

Immobilization of live-trapped lynx was accomplished with Sernalyn (1-phenylcychohexyl)(piperidine monohydochloride) of 100 mg/ml concentration. (Parke, Davis and Company, Detroit, Michigan). The effects were recorded and, as last year, a difference in response between male and female lynx was noted. The results were submitted to the editor of the Journal of Wildlife Management.

Two additional adult male lynx were immobilized and injected intraperitoneally with 35 mg. of alizaren red S in an effort to obtain information on time of year cementum layers in the teeth are deposited, during September 1970. Both animals will be injected again in January, and again in May, and the upper left canine tooth from each will be pulled in July. The teeth will be microsectioned and examined.

Height at the shoulder and girth were added to the standard mammal measurements taken of each live-trapped specimen.

Lynx Den Site

On July 4, 1970, a technician working on hunter access literally fell into a lynx den on the north bank of Crooked Creek, six miles south of Central, Alaska. The den was in an overflow jam of entangled Picea sp. roots and contained five kits with their eyes just opened. The kits were observed to be spotted in appearance and a buff-brown color. The den had two entrance-exits, and the parent female left the den and stayed in close proximity to the den, even when a warning shot was fired.

Six hours later, two technicians returned to the den site to obtain the kits and, if possible, to capture the female. The female had removed the kits from the original den and hidden them elsewhere, and 8 hours of intensive searching revealed no den. Two days later, 6 people returned to the den sight and established an overnight camp. Six hours of search revealed a second den 25 meters northeast of the original den that had been recently vacated. Sign in and around the den indicated that it was used for a very short period of time, perhaps until the female had located a more suitable, permanent den less prone to prying humans. Two additional days of searching in an area of 1 mile radius of the original den revealed no new den site.

Two caches were located within 15 and 25 meters of the original den. Each cache contained approximately one half a hare, both were pregnant females and were fresh kills. Each was covered with a loose pile of grass and leaf litter.

Radio-Tracking

Two 12-channel VHF radio-receivers manufactured by the Davidson Company, Electronics Division, Minneapolis, Minnesota were used for the radio-tracking phase of the study. Each was crystal controlled, and exhibited a marked improvement in quality of construction, clarity of signal, and volume of signal than experienced with the receivers of Markusen manufacture used the previous year. Thermal containers were not used with these receivers during the cold months, as they were compact enough to fit under a parka.

An adult male ("Tom") was equipped with a constant send leather mounted radio on July 1, 1969. Tom was recaptured on 11 April, 1970. The radio was hanging in shreds from the collar and an additional constant send reinforced leather collar mounted radio was used as a replacement. Two male kits were captured and equipped with leather collar mounted constant send transmitters on 5 November. It was felt that the 6 and 7 pound animals were not large enough to handle the heavier colrylic embedded pulse send transmitters. Tom was again recaptured on 28 April, and the reinforced leather collar and transmitter were again in shreds. At this point it was felt that Markusen manufacture transmitters were not of sufficient quality or strength to be used with lynx. Tom was equipped with a Davidson Colrylic mounted pulse send transmitter. Three additional subadult female lynx were also captured and radio-equipped with Davidson transmitters.

Two, six element DBH directional yagi antennas were used with a pickup truck, as described by Berrie (1970). A harness was redesigned to hold the antenna in a rigid, upright position and prevent swaying. The cross bars and masts on the antennas had to be reinforced by additional welding and bolting to prevent them from breaking off as a result of the vibration and shock of continual driving of the pickup over rough roads.

A new cat trail put into the Ketchum Creek area allowed access to a high vantage point, permitting scanning of over 100 square miles of the Birch Creek flats area on the north side of Circle Hot Springs Road. The towers were not used this year as a result of this, and also due to extremely wet conditions making trail bike use impossible in the study area.

Trails, ridges, canyons and creek beds were scanned on foot with hand-held 3 element yagi antennas. The areas scanned were the heads of Ketchum Creek Canyon, Deadwood Creek Canyon, Boulder Creek Canyon and Portage Creek Canyon. The procedure used was to walk overnite enroute in order to scan at 2-hour intervals for a 24-hour period.

Aircraft were used on 4 occasions for periods of 1-4 consecutive days. A 3-element yagi antenna was attached to each strut of a Super Cub or Champion Challenger and shielded from metal by packing Styrofoam between the center pole and the strut. Antenna leads were taped along the struts and into the rear seat through the windows on the starboard side and through the door on the port side. Test transmitters were

placed at the junction of the Circle Hot Springs Road and the Steese Highway and at 3.2 mile Ketchum Creek Road. Lynx were located and an azimuth determined. Flights were made along the azimuth until maximum signal strength was determined. A marked change in signal intensity indicated a "station passage" whenever a radio-collared lynx was overflown. Subsequent circling would pinpoint the animal within an approximate 200 foot radius.

FINDINGS

Live Trapping

A total of 4,154 trap nights produced 7 individual lynx captured 9 separate times (Table 1). Two kit males were captured simultaneously in the same trap. Sign indicated that they were part of a family of 1 parent female and 2 other kits. The relative trapping success of 1 lynx per 461.5 trap nights is approximately 3 times less than the 1 lynx per 167.1 trap nights experienced the previous year. Twelve "snare nights" produced 1 male adult lynx which died in the snare. No trapping occurred during the periods 4 July 1969 through 4 August 1969, and 14 December 1969 through 1 February 1970. Several traps were pulled at various times throughout the trapping period to be repaired as a result of freeze-ups, and bear and wolverine depredations. Trap dates and standard mammal measurements are summarized in Table 3.

The only recaptured animal (Tom) traveled an average distance of 1 mile between captures for 3 captures. The average time between recaptures was 136.5 days, which is greater than the 45.1 days reported for last year (Table 2).

Wolverine depredations were increased over last year, with a "run" being made on the Deadwood trap line on an average of once every 2 1/2 weeks. A total of 5 such runs occurred, with an average of 6 traps being hit each time (5-8) for 30 depredations, an increase from the 14 for last year. Bears damaged traps in June, and continued to damage traps throughout the summer. A yearling bear was live-trapped on 14 July, and a cub was live-trapped on 24 July, which was accompanied by the female and another cub.

Hares (16), jays (12), martens (1), and squirrels (6) were also caught during the trapping period.

Radio-Tracking

Seven lynx were equipped with collar-mounted radio transmitters with whip antennas (Table 1). Two kit males were equipped with constant send six month duration transmitters, and only one subsequent fix was obtained. The remaining 5 lynx (1 adult male, 2 adult females, and 2 subadult females) were radio-equipped with pulse transmitters (Table 1) and the home ranges determined as a result of radio location fixes (Fig. 1), except for the 2 subadult females. Data for the subadult females will be published separately, and also will be included in a symposium on the Ecology, Conservation and Status of the World's Cats to be presented in March, 1971.

Adult male ADFG 7 ("Tom") was observed to cover an extensive circuit involving Deadwood and Ketchum Creek in the study area (Fig. 1), and involving another canyon outside the study area (Portage Creek). The circuit averaged 10 days in travel time, with only one day spent in Portage Creek Canyon. This range overlapped approximately 70% of an area used by another adult male (Igor) radio-tagged last year. Although Igor was not radio-equipped during the period covered by this report, he was visually fixed on 3 separate occasions along Deadwood Canyon Road.

Adult female ADFG 9 ("Bea") used Twenty-Two Pup and Twenty-Six Pup drainages into Deadwood Creek, and Louie Pup into Boulder Creek. Bea's transmitter worked continuously from 30 September 1969 to 24 August 1970, for an 11 month period before radio-tracking operations were terminated in the study area.

Male kits ADFG 10 and ADFG 11 were believed to have been part of Bea's litter of 4. Only one radio-fix of ADFG 10 was obtained on 11 March 1970, placing the kit 1/4 mile up canyon of where he had been caught.

Subadult female ADFG 15, captured near Ketchum Creek Road, was found to progressively spend more and more of her time down-canyon throughout the late spring. During the summer months, she was near Crooked Creek, 3-4 miles southeast of Central where she remained until the close of field activities.

Table 1. Lynx live trapping areas and relative success.*

Location	Number of Traps	Lynx Caught	Trap Nights	Success
Boulder Creek	1	0	94	0/94.0
Circle Springs Road	2-3**	1	410	1/410.0
Deadwood Canyon	1073**	7	3,107	1/442.8
Ketchum Creek	2-3**	1	480	1/480.0
Steese Highway	2	0	63	0/63.0
Total		9	4,154	1/461.5

* Does not include 12 snare trap nights.
** Traps were moved to other trap sites in different areas.

Table 2. Lynx captured in the lynx study area, Central, Alaska, 1 July 1969 - 28 August 1970.

Date	Sex	Milepost Location	Bait	Scent	Distance Traveled Between Captures	Tag No.
1 July 1969	M	4.5 D	Hare	Beaver	-	ADFG 7
30 Sept. 1969	F	5.0 D	Hare	Beaver	-	ADFG 9
5 Nov. 1969	M	1.5 D	Hare	Beaver	-	ADFG 10
5 Nov. 1969	M	1.5 D	Hare	Beaver	-	ADFG 11
16 Mar. 1970	F	1.0 K	Hare	Beaver	-	ADFG 15
22 Mar. 1970	F	9.0 D	Hare	Beaver	-	ADFG 17
2 April 1970	F	4.0 C	Grouse Wing	Beaver	-	ADFG 19
11 April 1970	M	3.5 D	Hare	Beaver	1.0	ADFG 13*
28 April 1970	M	4.5 D	Hare	Beaver	1.0	ADFG 13*

C = Circle Springs Road
D = Deadwood Creek Road
K = Ketchum Creek Road

* Replaces ADFG 7

Table 3. Measurements (cm) and weights (lbs) of live-trapped lynx, 1 July 1969 through 28 April 1970, from the lynx study area, Central, Alaska.

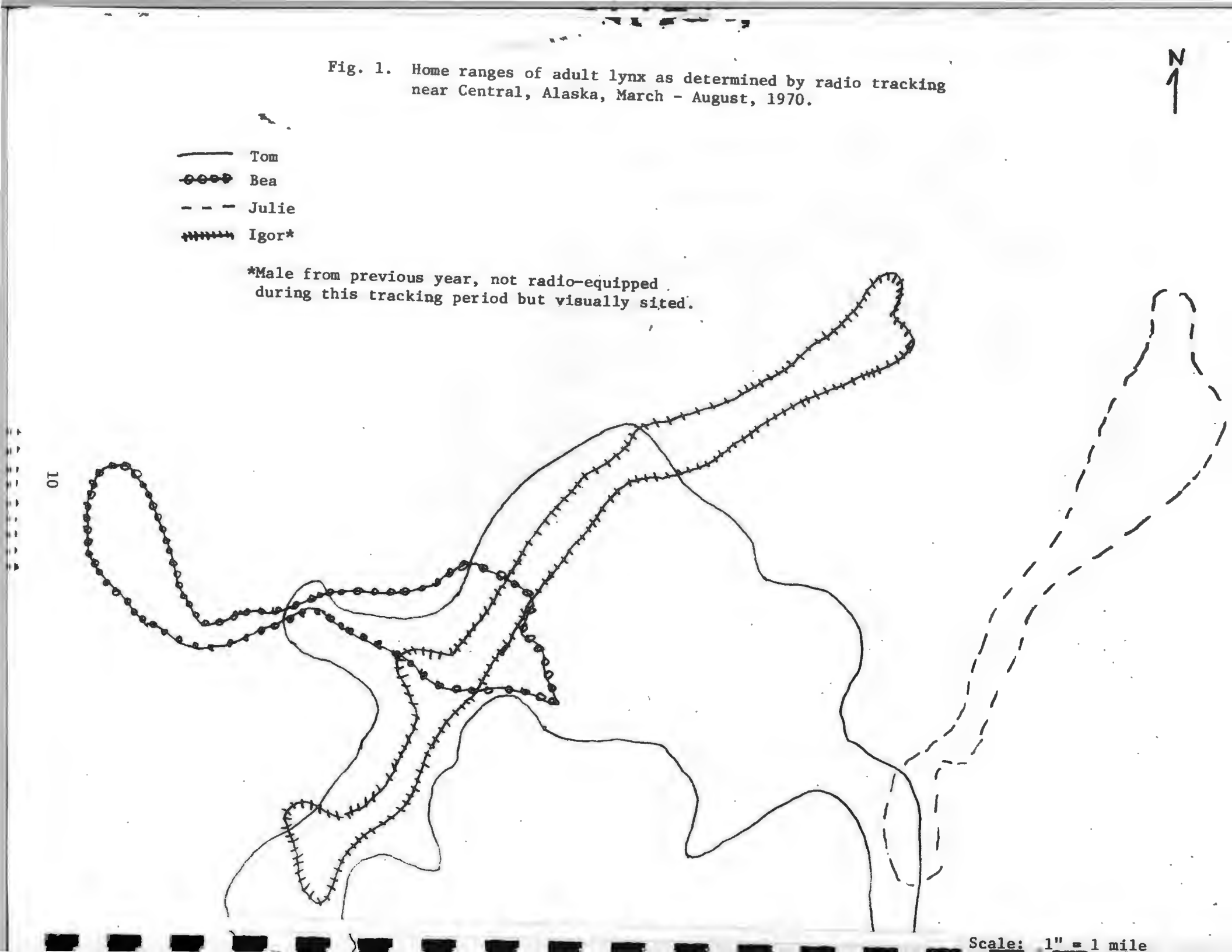
Tag No.	Date	Sex	Total Length	Tail	Ear	Hindfoot	Height at Shoulder	Girth	Weight
ADFG 7	1 Jul '69	M	112.5	12.0	7.3	25.5	59.5	41.5	27.5
ADFG 9	30 Sept '69	F	104.0	10.0	8.1	23.0	54.5	45.0	18.0
ADFG 10	5 Nov '70	M	73.6	11.5	10.2	20.2	42.0	38.2	6.0
ADFG 11	5 Nov '70	M	78.0	10.2	9.0	19.7	35.6	33.6	7.0
ADFG 15	16 Mar '70	F	100.5	12.6	11.5	24.0	47.0	40.6	16.5
ADFG 17	22 Mar '70	F	89.0	11.5	8.0	22.0	47.5	37.0	13.0
ADFG 19	2 Apr '70	F	84.0	14.0	9.5	23.0	39.0	45.0	13.0
ADFG 13*	11 Apr '70	M	112.5	12.0	7.3	25.5	59.5	36.5	26.0
ADFG 13*	28 Apr '70	M	112.0	12.0	7.3	25.5	59.5	36.0	19.0

Table 4. Transmitter types and frequencies of radio-tagged lynx from the Lynx Study Area, Central, Alaska, 1 July 1969 - 28 April 1970.

Tag No.	Sex	Relative Age	Signal	Frequency	Date Activated
ADFG 13	M	Adult	Constant	150.860	1 July 1969
ADFG 9	F	Adult	Pulse	151.010	30 Sept 1969
ADFG 10	M	Kit	Constant	150.825	5 Nov 1969
ADFG 11	M	Kit	Constant	150.010	5 Nov 1969
ADFG 15	F	Subadult	Constant	150.845	16 Mar 1970
ADFG 17	F	Subadult	Pulse	150.845	22 Mar 1970
ADFG 19	F	Subadult	Pulse	151.040	2 April 1970
ADFG 13	M	Adult	Constant	150.875*	11 April 1970
ADFG 13	M	Adult	Pulse	150.860**	28 April 1970

* Replaced 151.040
** Replaced 150.875

Fig. 1. Home ranges of adult lynx as determined by radio tracking near Central, Alaska, March - August, 1970.



RECOMMENDATIONS

Radio-tracking of lynx and any other boreal mammals during summer months should be conducted almost exclusively from an aircraft. The more vertical, as opposed to horizontal, directional reception assists in overcoming the interference caused by dense vegetation. A concentrated effort should be made to radio equip adult female lynx and kits during the early spring months of 1972. A concentrated effort should be made to locate active lynx dens via radio-tracking.

LITERATURE CITED

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