ALASKA DEPARTMENT OF FISH AND GAME

JUNEAU, ALASKA

DIVISION OF GAME

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CARIBOU REPORT

by

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Volume IV
Annual Project Segment Report
Federal Aid in Wildlife Restoration
Project W-6-R-4, Work Plan C

The subject matter contained within these reports is often fragmentary in nature and the findings may not be conclusive; consequently, permission to publish the contents is withheld pending permission of the Department of Fish and Game.

(Printed October 1963)

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FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-4 TITLE: Alaska Wildlife Investigations

WORK PLAN: C TITLE: Caribou Investigations

JOB NOS.: 1-a,b,c; 2-a,b,c,h; 3-a,b,d,e; 4; 5

PERIOD COVERED: May 1, 1962, to April 30, 1963.

ABSTRACT

At present, eleven distinct caribou herds have been recognized in Alaska. The names, approximate locations, and current population estimates (May 1, 1963) for these herds are as follows: Arctic (northwest Alaska)--200,000; Porcupine (northeast Alaska)--120,000; Steese-Fortymile (eastcentral Alaska)--50,000; Mentasta-Mt. Sanford (Wrangell Mountains northward)--4,000; Chisana-White River (Wrangell Mountains eastward)--3,000; Delta-Wood River (north slopes, central Alaska Range)--5,000; Nelchina (Talkeetna Mountains)--75,000; McKinley-Minchumina (Mt. McKinley National Park northward)--12,000; Beaver Mountains (McGrath area)--3,000; Mulchatna-Rainy Pass (western Alaska Range)--5,000; and Alaska Peninsula, (including Unimak Island)--8,000. In additon, there are about 1,000 caribou and/or feral reindeer at the base of the Seward Peninsula, and possibly several thousand other caribou scattered through the Kuskokwim Mountains. Alaska's total caribou population is estimated at 500,000 animals.

Work during the past year has concerned primarily the Arctic, Steese-Fortymile, and Nelchina herds. The results of this work can be summarized as follows:

Arctic--

1) The movement pattern resembled that recorded in previous years, although a lingering, heavy snow-cover during the spring of 1962 seemed to delay the northward movement to the calving grounds to the extent that many cows dropped their calves en route.

2) The calf:cow ratio for July 1962, was 53:100, indicating a good calf crop, even though much lower than the 73:100 ratio obtained in 1960; barren cows and stillbirths were common on the calving grounds.

3) A cooperative disease study between the Arctic Health Research Center and the Department of Fish and Game was initiated. Autopsies of caribou carcasses at Anuktuvuk Pass revealed that a high rate of morbidity is present in the Arctic herd. On the basis of serological tests made in 1961 and 1962, brucellosis seems to have increased (from 14 per cent positive titers to 24 per cent). Many abnormalities were noted in the animals examined, including a 12 per cent incidence of endometritis among cows. Of 58 cows older than two-years, however, 45 (78 per cent) were pregnant.

4) An enclosure was constructed in the Anchorage area to study the effects of brucellosis on penned reindeer. All three pregnant cows inoculated with Brucella bacteria aborted within two months; one adult bull so inoculated developed a general septicemia, with extensive lesions in the liver and spleen. Two control animals in the same enclosure, not inoculated with bacteria, developed positive titers for brucellosis within one month after the others had been infected.

Steese-Fortymile-- 1) The movement pattern resembled closely that of past years, except that most of the calving took place to the south of the often-used calving grounds in the White

Mountains. Presumedly the lingering, heavy snow-cover during the spring delayed the northward movement.

2) The age structure of the female segment of the herd was estimated as follows: for October 1962: calves, 21 per cent; yearlings, 17; two-year-olds, 16; prime (3-7 years), 26; mature (8-12 years),17; and old (13+ years), 3.

3) The calf-crop was relatively low in 1962; and estimated 5,000 survived the winter to the yearling age-class.

4) An estimated 3,750 adults (older than calves) succumbed during the year, including a 750 hunter kill; the other deaths were attributed to natural factors.

5) The annual herd increment in April 1963, was estimated at 1,000 animals; total herd size is estimated at 50,000.

Nelchina-- 1) A lingering, heavy snow-cover apparently disrupted the spring movement in this herd also. As a result, the calving was widely dispersed, although a major concentration of cows did reach the usual calving grounds in the Kosina Creek-Oshetna River area. The movement pattern for the rest of the year was similar to that expected, based upon past observations.

2) Ground composition counts revealed the sex-ratio of this herd to be 65 bulls:100 cows (calves excluded) in October 1962. The age-structure of the cow segment was determined

to be as follows: calves, 28 per cent; yearlings, 14; two-year-olds, 12; prime (3-7 years), 32; mature, (8-12 years), 10; and old (13 + years), 4.

3) The calf-crop was high, comparing favorably with past years, but only 47 per cent of the calves are estimated to have survived the first year of life. An estimated 11,000 yearlings were added to the herd in April 1963.

4) The total mortality on adults (older than calves was estimated at 7,500 animals--3,500 by hunters and 4,000 by natural factors. Brucellosis was detected for the first time in this herd, and 6 per cent of the animals tested had positive blood titers. In other respects, the herd seems healthy.

5) All range enclosures were repaired and the fences put in first-class shape. Weather prevented the successful completion of the project using aerial transects to determine the distribution of the major plant communities; the job was postponed to the following year.

6) The annual herd increment was estimated at 3,500 animals, and the population, at 75,000, for April 1963.

RECOMMENDATIONS

The known status of most caribou herds in Alaska is good, with most populations apparently increasing. Some populations may be relatively static, but, as far as known, none are decreasing. The present liberal hunting regulations are desirable, yet very few hunters are taking advantage of the long season and bag limit of three; a further liberalization probably would

contribute little. In view of the increasing prevalence of disease in the Arctic herd, however, and perhaps in the Nelchina herd, it is recommended that all aerial hunting of wolves for bounty be prohibited in those and all adjacent Game Management Units. Actually, it would be desirable to prohibit such hunting in all the Units of northern, central, and southcentral Alaska. The wolf is contributing to caribou management by helping to harvest the annual increment. As such, it should be protected from needless killing, and its value as a fur and trophy animal be emphasized.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-4 TITLE: Alaska Wildlife Investigations

WORK PLAN: C TITLE: Caribou Investigations

JOB NOS.: 1-a,b,c; 2-a,b,c,h; 3-a,b,d,e; 4; 5

PERIOD COVERED: May 1, 1962 to April 30, 1963

OBJECTIVES

To determine the distribution, relative abundance, and status of the various caribou herds in Alaska.

To compile and analyze all pertinent data resulting from field investigations of the Nelchina and Steese-Fortymile caribou herds relating to herd status, in accordance with the needs of management.

To determine the sex and relative age structure of the Nelchina herd by ground surveys made during the rut.

To determine the chronology, spatial distribution, magnitude, and composition of the caribou harvest in the Steese-Fortymile and Nelchina herds.

To determine quantitatively the distribution of the major vegetation types presently classified on the Nelchina range.

To repair the Nelchina range enclosures established in past years to first-class condition.

To review, compile, analyze, and prepare for publication the biological data obtained from management studies of the Nelchina caribou herd.

To determine the prevalence of brucellosis, foot rot, and other diseases among the caribou in northwestern Alaska.

To identify the variable environmental factors which stimulate and influence the patterns of movement and activity of arctic caribou during winter.

TECHNIQUES

Aerial observations and counts were the principal means used to determine major movements, seasonal distribution, range use, calf production, and calf survival. Information gathered from local residents and from various pilots supplemented these observations. The carcass examination of cows during the November-May period provided additional information on fertility.

A ground survey was made in late September and early October to ascertain the sex ratio and relative age structure of the Nelchina herd. The rutting period is the only time of the year when one can expect to find both sexes and all age classes represented in the groups of animals encountered. Calves and adult bulls are readily identified; young bulls (yearlings and two-year-olds) and cows are separated by recording the presence or absence of a vaginal opening or by observing the manner of urination; calves are sexed in a similar fashion; and the young bulls are separated into one- or two-year-olds by their relative antler size.

A concerted effort was made during the hunting season, August 20-December 31, to determine the characteristics of the caribou hunter-harvest in the Nelchina and Steese-Fortymile herds. Hunter check-stations provided the principal base for evaluating the hunter-take, supplemented by estimates and known-kill data obtained from local residents, guides and outfitters, transporters, and various Department personnel.

Aerial transects were to be flown in early September, after the autumnal color change in the vegetation, to determine the distribution of the major vegetation types on the Nelchina range. At that time the color differences between various key species of plants make the identification of the major types fairly definite. North-south and east-west transects were laid out upon maps of the area, at half-mile intervals, and grouped in blocks of twenty. Random numbers were used to pick which transect in each block was to be flown. As the plane flies along a transect line the observer records the vegetation types occurring at specific points on the ground at fifteen-second intervals, as determined by a reference point on the wing strut. These points are grouped

according to vegetation types and to the Range Units presently established. The final data will be analyzed using standard statistical methods.

A two-man crew spent a large portion of the summer checking the range enclosures that have been established on the Nelchina range. Repairs were made where necessary.

Biologists from the Arctic Health Research Center and the Alaska Department of Fish and Game combined forces to study the prevalence and effect of disease among the caribou of the Arctic herd in northwestern Alaska. Carcasses of hunter-killed caribou were examined at Anaktuvuk Pass in October 1962, and April 1963. A complete autopsy was made of each animal to determine what diseases and parasites were present. Blood samples were taken for serological tests, infected tissues were collected and injected into guinea pigs for culture, lower jaws were obtained for age determination, body weights and measurements were taken, and the general body condition of each animal was recorded. In addition, reindeer were obtained from Nunivak Island for a penned experiment to determine the effects of brucellosis.

During late winter an observer spent several weeks among wintering caribou of the Arctic herd, making quantitative measurements of climatological, topographic, and vegetative aspects of areas being utilized by the animals in their various activities. For comparison, similar measurements were made in areas not utilized, the areas being randomly selected. Measurements of snow conditions also were made at each site. The data gathered will be analyzed to determine the relationship of caribou movement and activity to environmental factors.

FINDINGS

The caribou herds in Alaska represent separate populations, and each should be managed as such. At present, eleven herds have been recognized: Arctic, Porcupine, Steese-Fortymile, Mentasta-Mr. Sanford, Chisana-White River, Delta-Wood River, Nelchina, McKinley-Minchumina, Beaver Mts., Alaska Peninsula, and Mulchatna-Rainy Pass. The last may include more than one herd. Other small herds may be present in the Kuskokwim River drainage also, and the animals now present at the base of the Seward Peninsula may constitute a distinct group. Caribou studies thus far have emphasized the Steese-Fortymile and Nelchina herds, but last year expanded to include the Arctic, plus limited work on the Seward Peninsula. The data obtained during the past year from

the above four areas are presented below according to the particular population involved.

Arctic Herd

Studies of this herd regarding population, movements, and productivity have been made prior to the past year by several biologists working for the Atomic Energy Commission's Cape Thompson project. This year the Department of Fish and Game began a study of the herd to ascertain the prevalence and effects of disease among the animals. In connection with that study, data concerning movements and productivity have been gathered; much of the information, however, was obtained from Peter C. Lent, biologist who had been working on the Cape Thompson project.

Movements and Distribution

A heavy snow-cover remained late in the spring in northwestern Alaska this year, similar to most other regions in the State inhabited by caribou. The northward spring movement from the wintering grounds in the Baird and Waring Mountains occurred much later than expected, and animals still were moving northward in early June. As a result, many cows did not reach the usual calving grounds in the Utukok River region until early or mid-June, and thus dropped their calves en route. Some cows calved as far south as the Kobuk River, probably the first such occurrence in this century, according to Lent.

By mid-June most of the calving segment had reached the Utukok River region, and the animals had started their post-calving movement southward and westward into the De Long Mountains. The main herd apparently dispersed to the eastward in late June and early July, as in previous years, with a large segment moving north of the Colville River during July.

Specific information regarding the 1962 fall movements is not available, but presumedly the caribou moved southward through the De Long and Baird Mountains along routes used in the past. Many animals were present along the upper Noatak River drainages during September. One segment of some 10,000 - 20,000 animals moved through Anaktuvuk Pass and vicinity in late August and September.

The main wintering grounds encompassed the lower drainages of the Kobuk River, notably the Waring Mountains. Another concentration of animals occurred in the western portion of the

Baird Mountains. Apparently these concentrations were present throughout most of the January - March period. In late April 1963, the spring movement to the north was in progress once again.

Productivity

Information regarding the 1962 calf crop comes entirely from observations made by Peter Lent. Ground counts made in mid-June after the main period of calving revealed a calf:cow ratio of 53:100. This figure is much lower that the 73:100 ratio obtained in 1960, yet appreciably higher than the 42:100 of 1961. Lent believes that there was a rather high proportion of barren cows during the past two years, coupled with a high pre- and postnatal mortality.

An indication of the fertility rate of this herd was obtained from examination of caribou carcasses in the Anaktuvuk area during April 1963. Of 58 cows two years old and older, 45 or 78 per cent were pregnant; two yearling cows examined were not pregnant. This fertility rate compares favorably with that obtained for the Nelchina herd.

Disease and Parasites

A study was initiated this past year to determine the prevalence of disease in the Arctic herd, notably in regard to brucellosis and foot rot. Two field trips were made to Anaktuvuk Pass to examine the carcasses of caribou killed by the people there. A complete autopsy was made of each animal; specimens were collected which included a blood sample, lower jaw, and reproductive tract, plus samples of infected tissue to be used in isolating the organisms involved; and detailed notes were made of all abnormalities. A total of 139 caribou was examined. Table 1 presents the results of these examinations.

It was apparent from the autopsies performed that a rather high rate of morbidity exists in the Arctic caribou herd. Brucellosis seems to be increasing, judging from serological tests made during the past two years: 1961, 14 per cent of 145 animals tested; 1962, 24 per cent of 117. The Brucella organism has been isolated from several specimens; the species has not been identified definitely yet, but it seems to resemble Brucella melitensis much more closely that it does B. abortus. Pleural adhesions and spleen edema were rather common in the animals examined, but their significance is not known at present. Helminth parasitism was common, but was not considered pathogenic; infestations of the larvae of the nose bot and warble flies were as expected and also not considered pathogenic. Foot rot was

Table 1. Prevalence of various abnormalities among Arctic caribou examined during 1962.

ABNORMALITY (Disease, Parasites, etc.)	TOTAL ANIMALS CHECKED	POSITIVE NO.	POSITIVE %
Adhesions:			
Liver	138	2	1
Lungs	138	12	9
Rumen	138	7	5
Anaplasmosis:			
Blood Test	25	0	0
Brucellosis:			
Blood Test	117	28	24
Fly-larvae:			
Nose bot	79	36	46
Warble	79	78	99
Endometritis	60	7	12
Foot rot	139	1	1
Leptospirosis:			
Blood Test	39	0	0
Lesions:			
Liver	139	3	2
Lung-worms	7	2	29
Spleen-edema	60	14	23
Tapeworm-larvae:			
Taenis (liver)	138	40	29
Echinococcus (lungs)	138	3	2

found in only one animal (male calf; also positive for brucellosis); the organism isolated from this infection proved to be Spherophorus necrophorus. Reports received in late summer, however, indicated that this disease was much more prevalent than the one per cent determined from the above autopsies. It is likely that many of the infected animals died prior to the October field trip. Examination of 60 cows in April 1963, revealed that 7 (12 per cent) had endometritis; 6 of these were pregnant, but the 1 non-pregnant cow could have aborted earlier. It was presumed that these 6 pregnant cows might have aborted also, or at least have abnormal problems at parturition. Of the 7 cows with endometritis, 2 had positive titers for brucellosis and 1 was a suspect (blood sample hemolized).

In July 1962 an enclosure was built in the Anchorage area for brucellosis experimentation with penned animals. Twenty-three reindeer were obtained from Nunivak Island and placed in the enclosure in mid-August. Sixteen of these died during the following four months, mostly, it seems, from "malignant edema", caused by a Clostridium organism; this disease was determined as the cause of death in one animal, and most of the others that died had similar symptoms. Five of the seven animals remaining (three pregnant adult cows, one female calf, and one adult bull) were inoculated on February 19, 1963, with brucella bacteria cultered from infections in caribou of the Arctic herd; two animals (one adult bull and one male calf) were used as controls. One month later, March 20, blood tests revealed that all animals had positive titers for brucellosis, although the two controls had titers of only 1:40 as compared with 1:1230 or greater in the other animals. During the first week of April, two of the pregnant cows aborted; three weeks later the other pregnant cow aborted. The bull that had been infected originally was sacrificed and autopsied in early April. The animal had a general septicemia of the viscera, with extensive lesions in the spleen and liver, and it doubtlessly would not have lived much longer. In May, two short-two-year-old heifers were placed in the enclosure to determine the effect of this particular species of brucella upon domestic stock. It is intended to continue the reindeer experiment during the next year, and more animals will be obtained from Nunivak Island in August 1963.

The results of the disease study are inconclusive at this point. Although valuable information has been obtained, certain aspects need further work. It is intended to emphasize this particular study again next year, especially regarding foot rot and also in evaluating the effect of brucellosis upon productivity.

Status

Peter C. Lent, who has been doing most of the recent work on

the Arctic herd, estimated the population in July 1962 to be between 175,000 and 200,000 animals. It has not been determined whether the herd is increasing, decreasing, or remaining static at present. In view of the high prevalence of brucellosis and, supposedly, foot rot, one would think that both productivity and survival would be low. The residents of Anaktuvuk, who derive much of their subsistence from caribou, generally agree that the animals killed by them are in poorer condition (i. e. less fat deposits) than those killed a few years ago. On the other hand there is no indication of serious range depletion, for extensive lichens are present along the Kobuk River, and farther south, and summer forage seems unlimited. The vast stands of the sedge Eriophorum vaginatum on the north slopes of the Brooks Range might also provide adequate winter forage. It is hoped that more specific information on mortality can be obtained during the coming year to determine the current population trend.

Steese-Fortymile Herd

Movements and Distribution

Little information was obtained regarding the 1962 spring movement of the Steese-Fortymile caribou from their wintering grounds in the Dawson-lower White River region of the Yukon Territory and adjacent portions of Alaska. Lingering deep snows during the spring, however, seemed to delay and retard the usual northwestward movement in April and early May to the calving grounds. As a result, only a few animals reached the often-used calving grounds in the White Mountains north of the Steese Highway. Most of the cows calved in the mountains encompassing the upper drainages of Birch Creek and the Chena, Salcha, Charley, Goodpaster, and Fortymile Rivers. The usual grouping after calving occurred and then the herd dispersed over the ancestral summering grounds, which essentially cover the same area used for this year's main calving. No major movements took place during the summer, except for the usual drift of animals to and from various areas.

The fall movement to the southeast began in early September, and scattered groups of caribou were observed crossing the Taylor Highway between Jack Wade and Eagle during the latter half of the month. In early October "thousands" of caribou were observed moving southeastward across the Steese Highway between Miles 75 and 105; these animals evidently had moved northward undetected some time during the summer. The general southeastward movement continued throughout October, with the peak of the movement across the Taylor Highway occurring during the period October 20-23, mostly between Miles 85-102 and 121-138. Thereafter, only small scattered groups continued to cross, although another minor movement took place during November and early December with animals moving southward between Miles 3-65.

By late December the herd seemed to be established on the wintering grounds. One major and three minor areas of concentration occurred. The bulk of the herd wintered in the region south of Dawson and east of the Yukon and White Rivers, the result no doubt of the Taylor Highway crossing earlier. Laggards in the southeast movement apparently settled, thinly scattered, in the region encompassing both sides of the Taylor Highway, including the upper Dennison River country, Mt. Fairplay-Boundary area, and the upper Ladue and Sixtymile Rivers. The two other minor concentrations occurred north of the Taylor Highway, one along the upper drainages of the Goodpaster and Salcha Rivers and one along the upper drainages of the Chena and Chatanika Rivers; both of these probably resulted, in part at least, from the

southeastward movement across the Steese Highway in October. Scattered animals were present throughout much of the range, but generally the above winter concentration continued through March. In early April, caribou once again were moving to the northwest.

Population Structure

Significant data regarding the sex and age structure of the Steese-Fortymile caribou herd were not obtained this year. The scattered distribution and inaccessibility of the main portions of the herd precluded ground sex-ratio counts during the spring and fall movements, generally the only times when such counts are possible. Lower jaws collected from winter kills provided limited age data, as shown in Table 2.

Past work has indicated a hunter selectivity toward large bulls, as opposed to cows and small bulls. Calves are seldom represented fully in the kill. For this reason it is thought that age data derived from the bull segment of the harvest is biased, and therefore of little use for determining age structure. No bias is evident in the taking of cows, however, so that a jaw sample of these animals, exclusive of calves, should provide an accurate picture of the age structure of the cow segment of the herd; the "Juvenile" age-class of the cows probably applies to that of the bull segment as well. The jaws are aged by assessing tooth eruption and relative tooth wear and grouped into four age-classes: Juvenile (calf, yearling, and two-year-olds), Prime (approximately 3-7 years old), Mature (approximately 8-12 years old), and Old (over 12 years old). Table 2 indicates the proportions of these age-classes present. The calf segment has been adjusted by using aerial calf:adult counts taken during October, the final obtained being 26:100.

It appears that the calf and yearling age-classes are not as large as one might expect when compared with the two-year-old class. This deviation from the expected norm is consistent with past years' data concerning productivity. There was a high calf crop in June 1960, with a high survival to April 1961; those calves would constitute the two-year-old age class in October 1962. The two calf crops since that time have been relatively low, based upon the limited aerial counts made. Thus, the age structure of the cow segment, as revealed in Table 2, seems valid, and is indicative of a healthy population.

Table 2. Data regarding age-structure of Steese-Fortymile caribou herd, as obtained from hunter kills examined in October 1962.

AGE CLASS	TOTAL JAWS CHECKED		MALE		FEMALE	
	No.	%	No.	%	No.	%
*Juvenile (calf)	38(19)	21	21(7)	20	17(12)	21
Juvenile (1 yr.)	21	12	7	7	14	17
Juvenile (2 yrs.)	32	17	19	19	13	16
Juvenile (Total)	91	50	47	46	44	54
Prime (3-7 yrs.)	63	34	42	41	21	26
Mature (8-12 yrs.)	26	14	12	11	14	17
Old (13 + yrs.)	4	2	2	2	2	3
TOTAL	184	100	103	100	81	100

*Calf segment adjusted to correspond with calf:adult ratio of 26 per cent obtained from aerial counts: assumed calf sex ratio of 1:1; figures in parenthesis indicate number of animals actually checked.

Productivity

Aerial counts made June 8, 11, and 12, indicated a lower than usual calf production last year. Of 1,352 animals (excluding adult bulls) tallied, 369 were calves, for a calf: adult ratio of 38 per cent (369:983). Similar counts in previous years resulted in percentages of 50 to 78 per cent. A normal calf percentage for the entire (both sexes, all age-classes) herd at that time would approximate 30. The ratio obtained from aerial counts, however, would vary in accordance with the composition of the adult segment, i. e. the numbers of yearlings and bulls mixed with the cows.

The June calf data were substantiated to great extent, however, by aerial counts made during October and November. Of 1,462 animals (excluding adult bulls) tallied, 278 were calves, for a calf:adult ratio of 23 per cent. Past years' ratios at that time have varied from 30 per cent to 56.

Short-yearling counts taken during April 1963, were too few (112 total animals) to provide significant figures. One can assume a 75 per cent survival of the calves since the previous November, however, based upon previous years' data. Thus a comparable calf:adult ratio for April would be 17 per cent. This figure represents a 45 per cent survival of calves from mid-June to the following April. In a herd of 50,000 (1962 estimate, excluding calves), last year's productivity data would indicate an increment of yearlings approximating 5,000 animals.

Mortality

Hunter Kill: The inaccessibility of the Steese-Fortymile caribou herd during the August and September portion of the hunting season (Regular season--August 20 through December 31; 3 caribou) contributed to the relatively low hunter-kill for 1962. The Taylor Highway crossing by the herd in October was so scattered and so distant from the residence of most hunters that the light hunting pressure and low kill resulting was almost inevitable. During November and December the low densities of accessible caribou and the inhibiting influences of winter weather combined to further restrict hunting pressure and kill. A special season was enacted for the period January 18 through March 31, 1963, with an additional bag of two caribou permitted; few hunters took advantage of this season and the

take was small. The final estimate for the hunter kill, through March 31, was 850 animals; that figure includes a 5 per cent estimate for crippling losses. Table 3 gives the known and estimated kill for various areas and time periods.

A hunter-check station was operated October 6-28, 1962 on the Taylor Highway during the late fall movement to the southeast. Table 4 gives a breakdown of the data obtained. Approximately 34 per cent of the 556 hunters checked were successful in bagging at least one caribou. Of these successful hunters, 60 per cent bagged one; 24 per cent, two; and 16 per cent, three. Two hundred and ninety caribou were checked through the station; fifty-nine per cent were males. Table 5 presents the sex and age structure of this kill, as obtained from the examination of carcasses. The 12 per cent calf proportion, if applied to the entire hunter kill, indicates an adult (older than calves) kill of about 750 animals.

Natural Deaths: No work was attempted to obtain data relative to evaluating the natural mortality occurring in the population. A gross estimate of 6 per cent was made for this mortality, excluding that of calves. That figure, applied to the 50,000 estimate for the herd in April 1962, indicated that some 3,000 animals died from natural causes during the year. That figure, of course, is merely a rough estimate in lieu of any data; such an "adult" mortality seems to be valid in the Nelchina herd, however, and therefore it might be equally valid in this population.

Total Mortality: The above data and estimates promise a mortality estimate for animals older than calves of 3,750, or 7 1/2 per cent of the total herd. This mortality is quite low for a population of this size. (Calf mortality is obtained by aerial counts, and is reflected in the final estimate for yearlings added to the herd.)

Status

Present information available concerning the Steese-Fortymile herd indicates a normal population that is increasing steadily. The productivity of the herd has fluctuated widely during the past eight years, presumedly due to differences in calf survival between years; nonrepresentative aerial counts could have biased the data, however. The mortality in the animals older than calves, consistently has been low, so that the herd has shown a steady increase, except for the suspected egress of several

Table 3. 1962 caribou harvest of Steese-Fortymile herd, as derived from known and estimated kills during regular and special hunting seasons.

AREA	KNOWN KILL	*ESTIMATED TOTAL KILL	
		No.	%
August 20-December 31, 1962:			
Steese Highway	22	35	4
Taylor Highway	378	425	50
Yukon Territory	-	325	38
January 18-March 31, 1963			
Tok - Northway	43	65	8
TOTAL	443	850	100

* Includes 5% estimated crippling loss.

Table 4. Summary of caribou-harvest data obtained at Taylor Highway checking station, October 6-28, 1962.

TOTAL CARIBOU HUNTERS	556	
Residents	534	(96%)
Nonresidents	22	(4%)
Civilian	449	(81%)
Military	107	(19%)
TOTAL CARIBOU KILL	290	
Males	170	(59%)
Females	120	(41%)
TOTAL MAN-DAYS	1,060	
Days/Hunter	1.9	
Days/Caribou	3.7	
SUCCESSFUL HUNTERS	187	(34%)
Hunter w/1 caribou	113	(60%)
Hunter w/2 caribou	45	(24%)
Hunter w/3 caribou	29	(16%)
Average Caribou/Hunter	1.6	

Table 5. Sex and age structure of the Steese-Fortymile hunters' kill, as determined by the examination of caribou carcasses, October 6-28, 1962.

AGE CLASS		MALE		FEMALE		TOTAL	
		No.	%	No.	%	No.	%
Juvenile:	Calf	7	8	12	16	19	12
	1 yr.	7	8	14	18	21	13
	2 yrs.	19	21	13	17	32	19
	Total	33	37	39	51	72	44
Prime:	3-7 yrs.	42	47	21	28	63	38
Mature:	8-12 yrs.	12	14	14	18	26	16
Old:	13 + yrs.	2	2	2	3	4	2
Total Jaws Checked		89	100	76	100	165	100
Total Animals Sexed		170	59	120	41	290	100

thousands of animals in 1957 to the Porcupine herd. There is no indication of a high prevalence of disease, nor of excessive wolf predation. The wintering grounds of the herd in Alaska are not considered to be in good condition, due to a general lack of lichens. The main wintering areas are located in Canada, however, and those have not been checked. There is no indication that the condition of the range is affecting the animals adversely.

Last year's estimate for the population in April 1962, was 50,000 animals. In April 1963, an estimated 5,000 yearlings were added to the herd. This was offset by an estimated mortality of 4,000 adults. Thus, the herd increment in April 1963, roughly approximates 1,000 animals.

Nelchina Herd

Movements and Distribution

The Nelchina caribou remained on their wintering grounds throughout most of April 1962 with major concentrations in the Cantwell, Paxson, and Mentasta areas and minor concentrations in the Talkeetna River and Eureka-Glennallen areas. The census in late February had determined the above concentrations to contain 29,000, 24,000, 13,000, 3,000, and 1,000 animals, respectively. There was some doubt however, as to whether or not these areas still contained the same numbers in April.

In mid-April a major movement started from the Mentasta region westward across the Richardson Highway and the Lake Louise Flat. In late April, a southwestward movement from the Paxson area took place. The Cantwell caribou started moving southeastward in early May. By mid-May the calving groups were funneling into the lower Kosina Creek-Oshetna River drainages from all directions, but keeping generally to snow-free areas at lower elevations. A deep, lingering snow-cover retarded the spring movement, as it apparently did in most areas of Alaska. The main calving area encompassed the lower reaches of Tyone Creek, Sanona Creek, Oshetna River, Black River, and Kosina Creek, but small groups of cows calved all along the spring movement routes from the various wintering areas.

The post-calving movements began in mid-June as expected, and by early July the main portion of the herd was concentrated in two areas: one at the upper reaches of the Black River, Oshetna River, and Tyone Creek, and the other in the Deadman-Nadiwen Lake region. These areas were the main summering grounds to mid-August. Other groups of caribou were scattered throughout the range.

The fall movements began in late August and continued through November. An eastward movement took place during August and September from the Deadman-Nadiwen Lake region across the Susitna River and Moraine Flat to Paxson Lake and the Alphabet Hills, swinging southward in October to the Lake Louise Flat. At the same time many of the animals in the upper Oshetna River area moved southward into the Nelchina-Eureka area. In late October and throughout November a general northward movement of animals occurred, the principal route being along the upper Susitna River valley, with most of the herd then moving westward past Nadiwen Lake, across Monahan Flat, into the Cantwell area, although many animals also remained to the south.

By January, the herd had settled on the wintering grounds for the most part, and little movement was noted until mid-April 1963. The main wintering grounds in evidence were as follows: Cantwell, extending northward to McKinley Park, Healy River, and upper Wood River--30,000+ animals; Talkeetna River-Fog Lakes--5,000+; Eureka-Lake Louise--10,000+; and Nadiwen Lake-Monahan Flat--5,000+. Other groups were scattered in many portions of the range. Once again the Cantwell area was a major wintering ground, and animals extended beyond the artificial boundaries of the range into the territory of the McKinley-Minchumina herd. As far as is known, however, no egress of animals took place, although such could happen easily without detection. The impression still exists that the Nelchina herd has lost some animals, but the wide dispersion of the herd throughout much of the past year precluded any definite conclusions regarding that impression.

Population Structure

During the rut at the end of September and early October, a major portion of the herd was present on Moraine Flat and along the Maclaren River valley. At this time the sexes and age classes are represented most randomly, and composition counts obtained then are most valid in depicting the population structure. Fortunately, unusually warm weather for that time of year prevented the lakes from freezing, and access to the caribou was possible via float-equipped airplane. Two observers spent October 1 and 2 on the ground making the counts in that area. Complete segregation counts can be made only from the ground because of the difficulty in separating cows and young bulls (yearlings and two-year-olds). Table 6 presents the results of these counts.

It is thought that the data presented in Table 6 are an accurate representation of the herd's structure, because of the large numbers (20,000+) of caribou in the area counted, the apparent randomness in distribution of the sexes and age classes, and the large sample-size of the count. Aerial flights and counts substantiated the uniformity of the groups in the area counted; another concentration (5,000+ animals) to the south contained fewer adult bulls and more young cows and bulls.

The data reveal a sex-ratio in the herd of 65 bulls:100 cows. Of 2,057 animals tallied, 391 (19 per cent) were calves; 1,009 (49 per cent), cows; and 657 (32 per cent), bulls. Of the last, separated on the basis of antler size, 199 (30 per cent) were yearlings; 161 (25 per cent), two-year-olds; 121 (18 per cent), three-year-olds; and 176 (27 per cent), four years or older. The various ratios shown in the Table will be used in evaluating aerial counts and computing calf productivity and survival.

Valid data regarding the relative proportions of the age classes in the total population are not available. A good jaw sample (595) was obtained from hunter kills, but obvious errors exist in the data (see Table 8) when compared with that presented in Table 6. There is a definite hunter bias toward the taking of adult bulls, and calves are poorly represented, as usual. For some reason both the yearling and two-year-old age-classes contain more animals than expected. It is not possible to reconcile the obvious discrepancies present. The best explanation is that hunters killed caribou throughout the season from the periphery of the main herd, and hence the sample is not representative.

Table 6. Composition of the Nelchina herd, as determined from ground counts made October 1-2, 1962.

TOTAL ANIMALS TALLIED	2,057			
CALVES	391	(19%)		
Sexed: Total			136	
Male			71	(52%)
Female			65	(48%)
COWS	1,009	(49%)		
*Yearlings			*199	(20%)
Antlerless			14	(1%)
BULLS	657	(32%)		
Yearlings			199	(30%)
2 yr. olds			161	(25%)
3 yr. olds			121	(18%)
4 yrs. +			176	(27%)

RATIOS:	
Bull:Cow	657:1,009 = 65%
Bull:Cow (minus yearlings)	458: 810 = 57%
Bulls 3 yrs+:Total Animals	297:2,057 = 14%
Bulls 3 yrs+:Adults (incl. yearlings)	297:1,666 = 18%
Bulls 3 yrs+:Adults (excl. yearlings)	297:1,268 = 23%
Calf:Cow	391:1,009 = 39%
Calf:Cow (minus yearlings)	391: 810 = 48%
Calf:Cow + 1 yr. Bulls	391:1,208 = 32%
Calf:Cow + 1 & 2 yr. Bulls	391:1,369 = 29%
Calf:Adults (incl. yearlings)	391:1,666 = 23%
Cow:Total Adults	1,009:1,666 = 61%
Cow:Cow + 1 & 2 yr. Bulls	1,009:1,309 = 73%
Cow:Cow + 1 yr. Bulls	1,009:1,208 = 84%
Yearlings:Cows	*398: 810 = 49%
Yearlings:Total Animals	*398:2,057 = 19%
Yearlings:Adults (incl. yearlings)	*398:1,666 = 24%

*Yearling Sex-Ratio assumed to be 1:1, based upon previous years' data.

Sufficient information exists, however, for determining the age structure of the cow segment of herd, using the composition count data of Table 6 and the age data of Table 8. In the latter, the relative proportion of animals in the three older age-classes, i. e. Prime, Mature, and Old, probably represents a true relationship, because no known bias would exist in the hunters' taking of those animals. The number of jaws in those age-classes were 58, 18, and 8 respectively. In Table 6, the number of male yearlings and two-year-olds is 199 and 161 respectively; those figures probably apply to the cow segment also, utilizing the apparent 1:1 sex ratio previously recorded for those age-classes. The ratio of yearlings:two-year-olds: adults in the cow segment thus is 199:161:649, or in percentages 20:16:64. Applying this relationship to the jaw-sample of Table 8 results in the following proportion: Yearlings, 26; two-year-olds, 21; Prime, 58; Mature 18; and Old, 8. The calf:cow ratio expressed in Table 6 is 39:100. Thus, the final computed age composition of the cow segment of the Nelchina herd, expressed as percentages, is Calf, 28: Yearling, 14; Two-year-old, 12; Prime, 32; Mature, 10; and Old, 4.

Productivity

Aerial counts were made on the calving grounds during late May and early June to assess the 1962 calf crop. The main calving grounds, in the Kosina Creek-Goose Creek-Oshetna River region contained an estimated 20,000 adults, very few of which were adult bulls (in fact, none were sighted). This estimate was considered minimal in view of the scattered distribution of the animals. On May 30, May 31, and June 1 a total of 5,664 animals was tallied, consisting of 1,510 calves and 4,154 adults (all others); of the last, 2,752 (66 per cent) were parturient cows, identified by their hard antlers and/or the presence of a calf. The calf: parturient cow ratio was 55 per cent (1,510:2,752), indicating the peak of calving had been passed. It has been found in previous years' work that approximately 70 per cent of the cows two years old and older are gravid in early May. The high percentage (66) of parturient cows on the calving grounds tends to substantiate the sparcity of bulls observed and indicates that the fertility rate among the cows was similar to other years. In addition, of 32 cows examined in April 1962, 25, or 78 per cent, were pregnant.

On the basis of the above data, it is assumed that 70 per cent of the cows dropped calves. In this herd of 70,000 animals, the composition data shown in Table 6 indicates there would be approximately 13,000 yearlings (19 per cent); 23,000

bulls (33 per cent); and 34,000 cows (48 per cent). Thus about 24,000 calves were born in May and June, 1962. Future calf counts taken during the year necessarily include the female yearlings in the cow segment. The calf:cow ratio at parturition would be 24,000:40,500, or about 60:100. (The yearling sex-ratio is 1:1.)

The ground composition counts taken in early October revealed a calf:cow ratio of 39:100 (see Table 6). Aerial counts taken on November 6 resulted in a calf:adult ratio of 21:100 (370 calves:1,786 adults), the adult segment excluding bulls four-years-old and older, of which 159 were tallied. A calf:cow ratio of 31:100 was obtained by eliminating the bulls under four-years-old, included in the "adult" tally, using the data in Table 6. The October counts showed that 65 per cent of the calves had survived since parturition. If the November counts were representative of the herd, then the survival figure had dropped to 52 per cent one month later.

The spring counts were made on March 31, 1963, in the Lake Louise area. Unfortunately, the caribou present there represented a relatively small segment (10,000) of the entire herd, so perhaps the figures obtained are not representative of the whole. Nevertheless, 1,162 animals were tallied, of which 217 were calves, 912 were cows, plus one- and two-year-old bulls have dissociated from the cows. Without ground counts, it is difficult to determine the number of cows present in the cow-plus-young bulls segment, although it probably lies somewhere between the 73 and 84 per cent ratios expressed in Table 6. Use of the larger would indicate a calf:cow ratio of 28:100 (217 calves:766 cows).

In lieu of other data, it must be assumed that the spring counts were representative of the herd. The calf:cow ratio of 28:100 indicates that about 47 per cent of the calves had survived to April 1, 1963, from parturition of the previous year. Thus an estimated 11,000 yearlings were added to the (.47 x 24,000).

Mortality

Hunter Kill: The scattered distribution of the Nelchina caribou herd along the road system during the hunting season (August 20 - December 31) precluded a large harvest. The main herd concentrations remained inaccessible for the most part, except for airplane hunters. Nevertheless, hunters were able to get caribou throughout the season. Statistics pertaining to the caribou harvest were gathered at hunter-check stations

operated from August 20 through November 7. Supplementary information was gathered from field checks of hunters and from talks with guides, outfitters, transporters, and local residents. These statistics are presented in Table 7.

The total caribou harvest for 1962 was estimated at 3,500 animals, with a known kill of 2,796. Approximately 32 per cent of the hunters were successful in bagging at least one caribou, averaging 1.5 animals/hunter. Table 8 presents the sex and age structure of the kill, as determined from the examination of carcasses. The 8 per cent calf proportion, if applied to the entire hunter kill, indicates an adult (older than calf) kill of about 3,200 animals.

Natural Deaths: The Nelchina caribou seem to be in excellent condition, with relatively little evidence of disease or physical deformities. Parasites are common, notably warble, nose bot, and tapeworm larvae, but few animals have infestations that would be detrimental to their health. Only 2 cripples were noted among 7,869 caribou observed closely. Of 3 carcasses sighted from the air, 2 were known to be wolf kills and 1, a natural death, judging from the intact carcass. Blood samples of 284 caribou were tested for brucellosis and 16 (6 per cent) proved to have positive titers. The brucella organism was isolated from an infected testis of an adult bull. This is the first time the disease has been detected in this herd, and it will bear watching in the future. Table 9 presents the data obtained during the year from the examination of carcasses and blood samples. The significance of some of the abnormalities noted, i. e. adhesions and spleen edema, has not been determined yet.

Substantiated data are lacking at present for evaluating natural mortality. All evidence available, however, suggests a low mortality, similar to estimates in the past. An estimate of 4,000 (6 per cent) such deaths probably is liberal; calves are excluded in the estimate, because all calf mortality is evaluated in the productivity counts.

Total Mortality: The above data and estimates indicate that some 7,500 animals (calves excluded) succumbed during the year to hunters and natural causes. That figure represents about 11 per cent of the estimated herd population in April 1962.

Analysis of Range

The main work on this project during the year consisted

Table 7. Summary of Nelchina caribou-harvest data obtained at hunter-check stations, August 20 - November 7, 1962.

TOTAL CARIBOU HUNTERS	5,702		
Total Checked		5,685	
Residents		5,313	(93%)
Non-residents		372	(7%)
Total Checked		5,680	
Civilian		4,184	(74%)
Military		1,496	(26%)
TOTAL CARIBOU KILL	2,708		
Total Checked		2,703	
Residents		2,539	(96%)
Nonresidents		164	(6%)
Total Checked		2,695	
Civilian		2,107	(78%)
Military		588	(22%)
SUCCESSFUL HUNTERS	1,830 (32%)		
Residents		1,682	(32%)
Non-residents		145	(39%)
Civilian		1,393	(33%)
Military		428	(29%)
Hunters w/1 caribou		1,173	(64%)
Hunters w/2 caribou		436	(24%)
Hunters w/3 caribou		221	(12%)
AVERAGE CARIBOU/SUCCESSFUL HUNTER	1.5		
Residents		1.5	
Non-residents		1.1	
Civilian		1.5	
Military		1.4	

Table 8. Sex and age structure of the Nelchina hunters' kill, as determined by the examination of caribou carcasses, August 20 - November 7, 1962.

AGE CLASS		MALE No.	MALE %	FEMALE No.	FEMALE %	TOTAL No.	TOTAL %
Juvenile:	Calf	24	6	19	11	43	8
	1 yr.	64	17	47	27	111	20
	2 yrs.	42	11	26	14	68	12
	Total	130	34	92	52	222	40
Prime:	3-7 yrs.	176	47	58	33	234	43
Mature:	8-12 yrs.	55	15	18	10	73	13
Old:	13+ yrs.	15	4	8	5	23	4
Total Animals Aged		376	100	176	100	552	100
Total Animals Sexed		1,813	69	827	31	2,640	100

Table 9. Prevalence of various abnormalities among Nelchina caribou checked during 1962.

ABNORMALITY (Disease, Parasites, etc.)	TOTAL ANIMALS CHECKED	POSITIVE No.	POSITIVE %
Adhesions:			
Liver	47	2	4
Lungs	47	4	8
Rumen	47	2	4
Spleen	47	2	4
Anaplasmosis:			
Blood Test	55	0	0
Brucellosis:			
Blood Test	284	16	6
Testes	*	5	-
Cripples	7,869	2	-
Leptospirosis:			
Blood Test	106	0	0
Spleen Edema	47	9	19
Tapeworms:			
Taenia (liver)	83	36	43
Echinococcus (liver and lungs)	119	8	7

* No figure available to provide base for infection rate.

of repairing the enclosures established in previous years. Frost action and moose seem to be the greatest problems in keeping the fences intact. The enclosures undoubtedly will need annual repairs.

Aerial transects were scheduled to be flown in early September 1962, to determine the distribution of the major vegetation types on the Nelchina range. Unfortunately, the weather interfered with this plan. The technique to be used depends upon the autumnal color change in the vegetation to identify the various types. Unusually cold weather in late August and early September apparently was responsible for preventing this change in color. The vegetation for the most part remained green, presumably from the cold, and then died and turned brown. This phenomonon was not 100 per cent distributed over the range, but enough so, together with early snows in some sections, to require the cancellation of the project. It has been rescheduled for 1963.

Status

No evidence exists indicating an egress of animals from the Nelchina range, yet there is a strong suspicion that such a movement might have taken place undetected. The herd has been so widely scattered throughout the year that a determination was not possible. In lieu of other information, it can only be assumed for the present that the herd has remained intact. The animals appear to be in excellent condition; natural mortality is low; the productivity of the herd remains high; and the range remains in good condition, except for certain heavily used areas.

In April 1963, an estimated 11,000 yearlings were added to the herd. During the year some 7,500 adults (older than calves) died, including those taken by hunters. The herd increment thus approximates 3,500 animals; last year's estimate for the total population was 70,000.

Other Herds

Little data were obtained regarding the other caribou herds in Alaska. At present, the population sizes of these herds are estimated as follows: Porcupine (northeast Alaska)--120,000; Mentasta-Mt. Sanford (Wrangell Mountains northward)--4,000; Chisana-White River (Wrangell Mountains eastward)--3,000; Delta-Wood River (north slopes, central Alaska Range)--5,000; McKinley-Minchumina (Mt. McKinley National Park northward)--12,000; Beaver Mountains (McGrath area)--3,000; Alaska Peninsula--7,000 north Port Moller, 1,000 south (including Unimak Island); and Mulchatna-Rainy Pass (western Alaska Range)--5,000. The last group might be more than one herd. In addition, it is not known what the relationship of various small groups of caribou scattered through the Kuskokwim Mountains may be to other nearby herds--whether they are entities in themselves or merely portions of other groups. Most of the estimates expressed above are based upon reconnaissance surveys and talks with long-time residents, with the exception of the Alaska Peninsula and McKinley-Minchumina herds, for which accurate populations data are available. As time and money permit, all caribou herds in Alaska eventually will be censused. Present studies concentrate effort upon those of most importance to human utilization.

Seward Peninsula Group

One segment of the caribou studies was designed to determine the number and distribution of caribou (including feral reindeer) at the base of the Seward Peninsula. The main area concerned encompasses the upper drainages of the Buckland, Tagagawik, Huslia, Kateel, Gisasa, Nulato, Shaktolik, Ungalik, and Inglutalik Rivers. The terrain is relatively low, ranging in elevation from 1,000 to 4,000 feet: rugged mountains of 3,000-4,000 feet to the south and gentle, rolling hills of 1,000-2,000 feet to the north. Fingers of spruce extend up most of the drainages to about 1,500-2,000 feet in elevation, being most dense on the east and south along the drainages into the Koyukuk and Yukon Rivers; lichens seem to be quite abundant in the Spruce type. Above timberline the principal vegetation appears to be a Sedge type, with scattered stands of Heath (very possibly Dryas is a common constituent). As viewed from the air, the region seems to be ideal caribou habitat, and probably could support at least 5,000 caribou in the 6,000 square-miles (or more) of habitat available.

Reindeer have been in the area since the early 1900's. Some 20,000 animals were near Shaktolik at the end of the Lomen operation about 1937, and many of these supposedly wandered into the mountains. Wild caribou were present in this region at the time of the first reindeer introductions, according to long-time residents. In recent years portions of the Arctic herd have come at least as far south as the Huslia and Kateel Rivers during the winter. Some of these might have remained.

Two survey flights were made by Burns--February 11 and April 10, 1963--to determine the relative size of the population. Only three groups were encountered, all near the headwaters of the Kateel and Gisasa Rivers, and these totaled 75-80 animals. Information from local hunters, however, indicated a population of 800-1,200. The principal hunting pressure stems from Shaktolik, but the hunter kill probably is less than 20 animals. Presumedly, this population contains more reindeer blood than it does caribou. The continued southward movement of Arctic caribou during the winter, however, might well result in the future establishment of a large herd in this region.

Miscellaneous Jobs

Caribou Publications

Little progress was made in analyzing and synthesizing the data accumulated from past years' studies into publications. Current studies and other duties monopolized most of the available time. Two papers, however, were presented at the Alaska Science Conference: 1) "Method for Estimating Caribou Herds" by Ronald O. Skoog, and 2) "Aerial Censusing of Caribou Using Stratified Random Sampling" by Donald B. Siniff and Ronald O. Skoog. The first has been distributed since as Informational Leaflet #20 by the Alaska Department of Fish and Game. The second has been revised and submitted to the Journal of Wildlife Management for publication. Preliminary work has been started on two other publications, one dealing with the progression of calving and the other, with population dynamics, both utilizing data from the Nelchina caribou herd studies. It is hoped that more time for writing will be available during the coming year.

Caribou Winter Activity

This study of the environmental factors influencing winter caribou behaviour was initiated by the Alaska Cooperative Wildlife Research Unit at the University of Alaska. The results of this research will be included in next year's report.

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