# ALASKA DEPARTMENT OF FISH AND GAME JUNEAU, ALASKA

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DIVISION OF GAME Joseph C. Greenley, Director

## CARIBOU REPORT

by

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Volume X Annual Project Segment Report Federal Aid in Wildlife Restoration Project W-15-R-3 W-17-1, Work Plan L

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#### WORK PLAN SEGMENT REPORT

#### FEDERAL AID IN WILDLIFE RESTORATION

STATE:	Alaska		
PROJECT NO:	<u>W-15-R-3</u> and <u>W-17-1</u>	TITLE:	Big Game Investigations
WORK PLAN:	L	TITLE:	Caribou
JOB NO:	1, 2, 3, 4, 6, 7, and	8	
PERIOD COVERED:	January 1, 1968 to Dec	ember 31	. 1968

#### ABSTRACT

#### Population Status of Alaska Caribou Herds

A census of the Alaska Peninsula Herd revealed a population of 14,000 caribou. The census of the Nelchina Herd was cancelled.

#### Distribution and Movements of Caribou in Alaska

The calving areas of the Alaska Peninsula, Mentasta and Mulchatna herds were delineated. Seasonal movement patterns were recorded for the Alaska Peninsula, Arctic, Mulchatna and Nelchina herds.

#### Productivity of Alaskan Caribou

Calf production and survival were excellent in the Alaska Peninsula and Nelchina herds but were fairly low in the Arctic. In the Arctic, low production was attributed to severe weather during the calving period and increased levels of placental retention among parturient cows.

#### Mortality Factors Affecting Alaskan Caribou

The crude estimated caribou harvest in 1968 is approximately 33,000. A quantitative measure of harvest is pending until April 1969 when the first annual summary of the caribou harvest ticket program will be completed.

#### Analysis of Caribou Range

A tentative score card was developed for measuring condition and trend of caribou range. Nelchina range exclosures were repaired as needed. Studies of forage preference, quality of forage and forage recovery are continuing.

#### Determination of Age in the Barren Ground Caribou

Techniques for determination of age have been developed and refined. Analysis of thin sections of the first incisor by fluoromicroscopy appears to be the best technique. The techniques are now being applied to samples from the Arctic and Nelchina herds.

#### Preparation of Research Data for Publication

Data are now being summarized for a paper on techniques for estimating the age of caribou and another on the distribution of caribou in Alaska.

#### RECOMMENDATIONS

Existing seasons and bag limits should remain the same. However, particular attention should be given to areas where caribou harvest levels may be approaching the annual increment.

New studies must be planned to measure the Statewide impact of the oil industry on caribou behavior and their habitat.

We need a better system of public education to gain increased hunter response and cooperation in our harvest ticket and specimen collecting programs.

Hunters should pay a nominal fee for harvest tickets to offset the cost of the program and increase its efficiency by reducing the number of individuals who obtain harvest tickets, but do not hunt. Holders of subsistence licenses should be exempt.

#### WORK PLAN SEGMENT REPORT

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#### OBJECTIVES

To evaluate annually Alaska's caribou population in terms of numbers, productivity, mortality and general condition of the animals and range. To determine, as time permits, the relative status of herds not yet inventoried.

To determine the seasonal distribution patterns of caribou throughout Alaska. To monitor population shifts and range use and to define summer, winter, and calving areas.

To obtain information concerning sexual cycles, fertility and natality rates and factors affecting intra and interherd productivity, in relation to population size, body condition and range quality.

To identify and evaluate the various mortality factors affecting caribou populations and to determine the magnitude and composition of the hunter-kill.

To measure the condition and trend of range forage as influenced by caribou utilization.

To determine the age structure of the various caribou herds in Alaska.

To review, compile, analyze, and prepare for publication the biological data obtained from studies of caribou in Alaska.

#### TECHNIQUES

#### Population Status of Alaskan Caribou Herds

All data from the various caribou studies and from other sources are synthesized and evaluated annually. The following census method is used: (1) Aerial reconnaissance in May to delineate calving grounds; (2) aerial photo counts (calving grounds) of total animals, cows, yearlings and calves; (3) ground composition counts during the rut to obtain bull-cow, yearlingcow, and calf-cow ratios; (4) ground composition counts just prior to calving to obtain calf (short-yearling)-cow ratios; (5) extrapolation of data by use of population statistics to determine herd size, calf crop, and annual increment of yearlings.

#### Distribution and Movements of Caribou in Alaska

Most information will be obtained from aerial reconnaissance. Alaska Department of Fish and Game personnel will record distribution data on special forms whenever the opportunity arises. U.S. Fish and Wildlife Service personnel, bush pilots, guides, and others will also be asked to cooperate. Additional information will be obtained from talks with local residents and hunters. All observations recorded will include the date, specific area involved, relative caribou numbers, presence or absence of calves, direction of movement, and length of time in the area.

#### Productivity of Alaskan Caribou

Examination of hunter-killed animals and animals collected for pathology and radiation studies, and the collection and examination of ovaries and uteri from these animals will provide information on minumum and maximum breeding ages, fertility rates, and growth of the fetus.

Aerial and ground counts will provide information on calf crops and survival and realtionship of antler condition to fertility.

#### Mortality Factors Affecting Alaskan Caribou

Information on disease-caused mortality will be obtained in connection with caribou pathology work (Work Plan P). Emphasis will be placed on the effects of brucellosis and foot rot.

Aerial and ground counts during the year will be used to evaluate calf mortality between the time of parturition and the yearling age-class.

Hunter harvest data will furnish known-kill figures which will be used as a base for estimating the total mortality. Hunter harvest data will be obtained as follows:

(1) Northern Alaska. Individuals from various Arctic villages will be employed to obtain specimens useful in evaluating harvest and caribou condition from hunter-killed caribou. Additional information will be obtained by hunter interviews in the spring and fall when forms and collecting supplies are delivered and picked up.

(2) <u>Southcentral</u> and <u>Central Alaska</u>. Mandatory Harvest Report forms will be issued to all caribou hunters and hunter check stations will provide supplemental information on harvest.

(3) Adak. An Alaska Department of Fish and Game representative will monitor the hunt.

#### Analysis of Caribou Range

Range use will be determined by periodic observations of caribou distribution (primarily in conjunction with other jobs, but some flights will be made for the specific purpose of assessing herd distribution).

Permanent range quadrat stations 6-10, plots A and B in the Nelchina area will be photographed using infrared color film, Kodachrome, and pan. Continue 10 quadrat analysis including a soil profile and detailed description of stations 16-39. These will be conducted as time permits.

Plants that have been grazed by caribou or reindeer at various intensities will be measured, tagged and reexamined at different seasons of the year and over a period of years.

Some of the most important forage lichen species will be chemically analyzed at regular intervals and the average annual linear growth rate will be determined for lichens growing in different locations and conditions.

Whenever possible caribou and reindeer will be observed and feeding craters examined to determine seasonal forage preferences.

The percent composition of different vegetation types will be estimated by an aircraft flying a survey line with estimates being taken at minute intervals from known size plots.

Several range sites will be examined and the salient features recorded to develop a reliable method of measuring condition and trend that can readily be applied in the field.

#### Determination of Age in the Caribou

Mandibles will be collected from hunter-killed caribou in the Arctic, Nelchina, and Fortymile herds. Tooth eruption and relative wear will furnish an index to the age structure of these populations.

After estimating the age by tooth wear and eruption, the age of the specimens will be determined using cementum techniques.

#### Preparation of Research Data for Publication

Standard data processing techniques and critical review of the literature.

#### ACKNOWLEDGEMENTS

We must express our appreciation to the skilled technical help of the field biologists and the laboratory technicians for their loyalty and dedication this past year. The U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, and U.S. Navy played a key role during various portions of our research. To members of our staff and others not individually named we express our sincere thanks.

#### FINDINGS

#### ALASKA PENINSULA HERD

#### Population

A direct count-extrapolation census of caribou on the Alaska Peninsula was conducted in spring and fall 1968. The details of this census method were described by Hemming and Glenn (1968). Budget limitations precluded the use of aerial photographs or helicopters for direct counting and composition counting. Fixed-wing aircraft were utilized as a substitute even though biases are inherent in their use, i.e., older age classes of both sexes are most conspicuous and fairly easy to identify; younger age classes are difficult to identify even from the ground; it is difficult to obtain accurate counts of any age class from fast-moving aircraft. It is imperative that these biases be considered when evaluating the following statements.

During the spring portion of the census, 3 Supercubs and one Cessna 180 were used to obtain a direct count of the adult female segment of the population and composition counts in the calving areas. The Alaska Peninsula was first divided into 4 census areas in order to simplify counting and to provide well defined units so that census effort could be conveniently shifted in the event of poor local weather conditions. The areas were defined as follows (Fig. 1):

Area 1\* - Naknek Lake to Dog Salmon River. Area 2 - Dog Salmon River to Meshik River. Area 3 - Meshik River to Port Moller. Area 4 - Port Moller to Cold bay.

\* Each area is bounded on the north by the Bering Sea and on the south by the Pacific Ocean.

Prior to counting, extensive flights were made in each area to locate the caribou. Census assignments were then issued to each pilot and observer. The crew of the Cessna 180 was assigned to peripheral areas where there were only scattered animals because the speed of the aircraft makes it difficult to obtain accurate counts of large groups of animals.

From 20-26 May, a total of 8,431 caribou were sampled of which 5,324 were adult females. Composition counts on a sample of 5,020 animals revealed a yearling-cow ratio of 39:100 and a bull-cow ratio of 10:100. The calfcow ratio was not recorded because calving had not been completed. It was interesting to note that very little segreation had occurred in the yearling age class. Small bands of yearlings were observed, but most were still with individual cows. Many solitary yearlings were seen with parturient cows and with cows which had new calves at their side. Most bulls were segregated from the calving segment as expected.

Fall composition counts of 4,183 caribou during the rut, revealed a calf-cow ratio of 50:100, and a bull-cow ratio of 47:100. It was impossible to obtain an accurate tally of fall yearlings. Since a large sample of spring animals was counted and little segregation of yearlings was observed at that time, the yearling-cow ratio (39:100) was used with other ratios for estimating the total population. Young bulls were difficult to tally from the air, so the estimated bull-cow ratio is probably low.

The total number of bulls, yearlings, and calves obtained by extrapolation from a base of 5,324 adult cows is 2,502, 2,076, and 2,662, respectively Therefore, the minimum fall population of caribou on the Alaska Peninsula proper is estimated to be 12,564.

Unimak Island, which lies just off the tip of the Alaska Peninsula, has an ephemeral caribou population. Caribou reach Unimak from the Alaska Peninsula by swimming approximately 1/2 mile across Isanotski Straight (False Pass). Movements back and forth across the Straight have been fairly well documented since the late 1800's (Skoog, 1968). We were not able to census Unimak Island in the spring of 1968 due to bad weather, but Robert Jones (Biologist, U.S.F.W.S.) reported seeing approximately 1,500 caribou on the island during the summer of 1968. The total estimated population for the Alaska Peninsula, including Unimak Island, is 14,000. Table 1 shows the population size since 1925.

#### Distribution and Movements

The Alaska Peninsula herd consists of 3 segments: one north of Port Moller; one south of Port Moller; and one ephemeral population on Unimak Island. Skoog (1968) indicated that only one calving area was found within the range of each segment. However, studies this year revealed two calving areas north of Port Moller (Fig. 1). Most cows, calves and yearlings remained near these areas from May through July, but the bulls scattered widely. In the first week of August, Nick Steen observed a measureable shift to the northeast and by mid-December the two northern "calving" segments appeared to be well mixed and occupied a common winter range, between Ugashik and Naknek Rivers.

#### Productivity

When we arrived on the Alaska Peninsula on 20 May 1968 parturient cows were on the calving grounds and individual females were starting to segregate. The progression of calving was fairly rapid e.g., on 20 May the calf-adult percentage was 0.3% (N=1,245), on 23 May it was 1.9% (N=2,891), and on 26 May it was 6.4% (N=1,857). Skoog (1968) found that the peak of calving occurs approximately 5 days after the calf-adult ratio reaches the 5% level. Therefore, the peak of calving for the Alaska Peninsula is estimated to be 31 May - 2 June. The peak of calving in the Fortymile and Nelchina herds is 24-26 May (Skoog, 1968) and the peak in the Arctic herd is about 5-7 June (McGowan, 1966).

Calf production and survival was good as indicated by a fall calfcow ratio of 50:100. Survival through the first year appears excellent as indicated by a spring yearling-cow ratio of 39:100.

#### Mortality

The 1967-68 caribou harvest on the Alaska Peninsuala, is estimated to be roughly 450 animals.

Data	Source	Estimated Po	Estimated Population					
Date	300100	Peninsula Proper	Unimak Island					
1925	Murie, 1959	5,000	7,000	12,000				
1949	Nelson, 1949	2,500	0	2,500				
1953	Skoog, 1968	4,000	0	4,000				
1960	Skoog, 1963	7,500	500	8,000				
1964	Skoog, 1968	10,300	1,400	11,700				
1968	This Study	12,500	1,500	14,000				

Table 1. Population size of the Alaska Peninsula caribou herd.



Spring and summer natural mortality appeared to be minimal. A few brown bears were observed in the calving areas and one was seen carrying off a new born calf. Two dead calves were reported during July and August. On 1 October, 6 caribou were collected near Becharof Lake for radiation analysis. Each animal was fat and in excellent condition. The largest bull weighed 499 lbs. and the largest calf weighed 118 lbs. In late October guides hunting near Black Lake reported seeing crippled and dead caribou. A short time later Department biologists collected 3 obviously crippled animals in an attempt to identify the causative organism. Personnel of the Arctic Health Research Laboratory identified the cultures as the common "foot rot" bacillus (Bacteroides fundiliformis). Fairly extensive aerial surveys in early November revealed a minor epidemic (12 limpers in a sample of 1,150 animals). The most obvious effect of the disease was that a significant number of animals dropped out or lagged behind the migrating herd. Since infected animals were lethargic and easily approached they must have been easy targets for brown bears, wolves and man. Subsistence hunters from Chignik were reported to have killed some sick animals. The "foot rot" epidemic appeared to be restricted to the area between King Salmon and Port Moller. An extensive aerial caribou survey south of Port Moller in early November revealed no sick animals.

#### ARCTIC HERD

#### Distribution and Movements

The distribution of the Arctic caribou herd during 1968 was recorded during aerial reconnaissance flights and supplemented by correspondence with residents of the region.

#### Winter 1968

The main caribou wintering areas (January - April), were south of the Brooks Range near the drainages of the Noatak, Kobuk, Selawik and John Rivers. The specific locations (Fig. 2) were: (1) Arctic coast from Cape Lisburne south to Cape Thompson; (2) Wulik River south to the Igichuk Hills and extending east into the lower Noatak Valley; (3) middle Kobuk River south to the headwaters of the Selawik River; (4) between the John and Detrich Rivers and from Anaktuvuk Pass south to the Middle Fork of the Koyukuk River; (5) ten to fifteen miles south of Wainwright.

#### Spring 1968

By mid April the spring movement to calving areas was in full swing. Caribou wintering in the southeastern portion of the range moved north through the Killik River, Chandler Lake and Anaktuvuk Pass areas. On 25 April these caribou were observed moving west on the north side of the Brooks Range from Anaktuvuk Pass to Howard Pass. From the Killik River most of the herd continued west along the north edge of the mountains, but many animals came south along the Killik River and turned west following Kakivilak and Itilyiargiok Creeks into the Nigu River then proceeding west into the Howard Hills.

By 15 April caribou that wintered in the Kobuk River Valley were seen moving toward the calving grounds. The 20,000+ caribou which wintered just west of Purcell Mountain crossed the Selawik River near Shinilikrok Creek, west of Shungnak, moved north across the Shungnak and Cosmo Mountains, then to the Ambler River. Most of the herds went north along the Ambler River, but several thousand animals proceeded north over the mountains between the Ambler and Redstone Rivers. Fresh trails indicated that the migrating herd had gone along the hills west of the Imelyak River and crossed the Noatak River about 10 miles east of the Cuttler River. At this point the herd split: some went north to Feniak Lake, but most continued north along the Noatak to the Aniuk River where they met the animals heading west from Howard Pass. The migration continued west to Feniak and Desperation Lakes where they were joined by other caribou (Fig. 3). On 17 May lead animals of the migration were observed crossing the DeLong Mountains between Nimiuktuk River and Desperation Lake, moving into the upper drainage of the Colville River. Calving grounds were located on the north side of the upper Colville River (Fig. 3).

#### Summer 1968

On 10 July 30,000-40,000 caribou were located in the extreme western portion of the DeLong Mountains. These animals were slowly moving south into the headwaters of the Kivalina River, further reconnaissance indicated these caribou had migrated west along the north side of the DeLong Mountains before they turned south in the vicinity of Igloo Mountain.

A combined sheep and caribou reconnaissance flight in the Brooks Range and Arctic North Slope was made between 20-29 August 1968. Ground fog prevented good observation on the North Slope, however detailed coverage was accomplished within the Brooks Range. No caribou were found between Wind River and Howard Pass, a straight line distance of over 300 miles. A large herd of caribou was located between Feniak Lake and the Nimuktuk River. Further reconnaissance revealed that numerous bunches of caribou were moving south through the mountain passes between Noluck and Liberator Lakes. With the exception of the DeLong Mountains and Feniak Lake-Nimuktuk River groups the Arctic herd until lake August was still scattered over the Arctic North Slope and Coastal Plain.

#### Fall 1968

Southward caribou migrations were noted in mid August. By 20 September caribou were scattered from Noatak Village north through the Wulik, Kivalina and Kelly River drainages. Residents of Ambler observed large numbers of caribou crossing the Kobuk River on 22 September. Widely scattered bands were also moving through the middle Noatak River Valley. Residents of Anaktuvuk Pass reported the arrival of caribou on 25 September. Animals were available to Kotzebue hunters until mid November. To the east, residents of Wiseman reported the arrival of animals on 5 November.





A Department biologist conducting a moose census along the Kobuk River on 9 December observed several small bands of caribou between the Squirrel River and Kiana with denser concentrations in the hills on the south side of the Kobuk River from Kiana to Shungnak. Scattered bands were present along Pick River and in the Pah and Noatak River Flats. The Arctic caribou migration is still in progress, therefore delineation of winter range boundaries will be completed later.

#### Productivity

Weather conditions were severe throughout the calving period. In early June there was almost continuous snow cover south of the Colville River, but north of the Colville River where most of the calving took place, snow cover was more patchy. Neiland (1968) reported an increase in the occurrence of placental retention and associated calf mortality. A number of apparently normal cows standing by dead calves was also observed.

Ground composition counts were conducted in July and October to determine calf survival. On 10 and 11 July, approximately four weeks after the peak of calving, a composition count was taken on a large group of caribou as they passed through the extreme western edge of the DeLong Mountains. During that count 1,767 cows older than one year were observed with 725 calves. The calf-cow ratio was 41:100. Peter Lent, as reported by Skoog (1963) made ground composition counts in the Arctic in June of 1960, 1961 and 1962. Results of these counts were as follows: 1960 calf-cow ratio 73:100; 1961 calf-cow ratio 42:100, 1962 calf-cow ratio 53:100. The ratio of 41:100 supports earlier reports of calf mortality for 1968. The second calf-cow count was conducted between 26-28 October at a point twenty miles east of the Noatak River mouth. During this count 1,010 cows older than one year were identified. The cows were accompanied by 345 calves, indicating a calf-cow ratio of 34:100. Calf mortality from July through October was 17%.

#### Mortality

#### Hunter Harvest

The estimated 1968 Arctic caribou harvest is 27,000 caribou. As in previous years Arctic caribou hunting regulations provide no season or bag limit restriction on caribou. The current rate of harvest appears to have little effect on the expanding population. Information from the 1968 season indicates that caribou were available to most villages during the months of January, February, March and early April. Hunting during the summer months was good in the Point Barrow and Wainwright areas. The fall migration provided excellent hunting for the villages of Kivalina, Noatak, Kotzebue, Ambler and Anaktuvuk. During November and December caribou were once again available to most villages on the south side of the Brooks Range.

#### Composition of Harvest

A sample of 320 caribou jaws collected at Ambler (Table 2) during the fall of 1968 shows the sex composition of the harvest to be 61.0% male

and 39.0% female. However, in the juvenile age classes (calves, Yearlings and 2-year-olds), the female kill (22.1%) exceeded the kill of males (6.9%). The 1966-67 Ambler harvest contained 39% males and 61% females. Recent correspondence with Ambler hunters reveals that caribou hunters select fat bulls in September. Therefore, if mandibles are collected only in early fall, the sex composition may be biased toward males.

Hemming and Glenn (1968) reported on the Ambler caribou sex composition of harvest by month which graphically demonstrates a high bull harvest in October, changing to increased female harvest from February through May, and back to bulls in June.

#### Sex and Age Structure

Segregation counts were made from the ground between 26-28 October. The data presented in Table 3 are believed to constitute an accurate representation of herd structure because of the random distribution of sex and age classes and the large sample size. The July composition count given in Table 4 is presented only as a supplement to the fall count. During October bulls join the females; at this time distribution of the sex and age classes is essentially random.

The October tally revealed a sex ratio of 62 bulls:100 cows. Of 2,217 animals tallied, 1,010 (45.6 %) were cows; 627 (28.3 %) were bulls; 235 (10.6 %) were yearlings; 345 (15.6 %) were calves. No previous fall composition counts are known to have been conducted on the Arctic caribou herd, therefore changes in herd composition over the years cannot be determined.

The large jaw sample (2,000+) collected from seven Arctic villages in 1966-67 is still under study. The collection was first aged by tooth replacement and wear and findings were reported in the 1967 Caribou Segment Report. The age structure of this sample is now being checked by counting cementum annuli of the first incisor by fluoromicroscopy. When the study is completed, data derived from both techniques will be compared.

Mandibles from Arctic caribou were obtained only from the village of Ambler during the fall of 1968. The age structure of this sample is shown in Table 2. Collections were continued at Ambler because specimens were of superior quality and were accompanied by detailed kill information. The age structure of the Ambler harvest shows a significantly higher percentage of caribou in the calf (10.6%) and yearling (15.0%) age classes and a lower percentage in the prime (3-5 years) age class (12.2%) as compared to the composition of the previous year's kill (calf 0.8%, yearling 8.2%). Harvest of mature (6-9 years), and old (10+years) caribou increased 4.5% over the proceeding year. The percentage of two-year-old caribou, 3.4%, is the lowest we have recorded since collections were begun in 1963. When evaluating this data, consideration must be given to the fact that the kill composition is a reflection of the fall 1968 harvest only.

						Total
Age Class	ೆಂ	%	99	%	No.	%
Juvenile:						
Calf 1 yr. 2 yrs.	7 11 4	2.2 3.4 1.3	27 37 7	8.4 11.5 2.2	34 48 11	10.6 15.0 3.4
Total	22	6.9	71	22.1	93	29.0
Prime:						
3 yrs. 4 yrs.	28 66	8.8 20.6	12 16	3.8 5.0	40 82	12.5 25.6
5 yrs.	39	12.2	11	3.4	50	15.6
Total	133	41.6	39	12.2	172	53.7
Mature:						
6-9 yrs. 10+ yrs.	34 6	10.6 1.9	11 4	3.4 1.3	45 10	14.1 3.2
Total	40	12.5	15	4.7	55	17.3
TOTAL NUMBERS	195	61.0	125	39.0	320	100.0

Table 2. Sex and age structure of the Arctic caribou herd, fall, 1968.

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ੰ	%	ę	`%	Year	%	Calf	%	Total
627	(28.3)	1,010	(45.6)	235	(10.6)	345	(15.6)	2,217
Calf/co Yearlin Bull/co	ow ratio = ng/cow rati ow ratio =	34:100 o = 23:10 62:100	0					

Table 3. Arctic caribou composition count 26-28 October 1968, twenty miles east of the Noatak River mouth.

Table 4. Arctic caribou composition count 10, 11 July 1968 on headwaters of the Kivalina River.

ੰ	%	ę	%	Year	%	Calf	%	Total
1,085	(26.7)	1,767	(43.5)	485	(11.9)	725	(17.8)	4,066
Calf/co Yearlin Bull/co	w ratio = g/cow rati w ratio =	41:100 o = 27:10 61:100	0					

#### Range Analysis

#### REPORT ON CARIBOU-REINDEER RANGE STUDIES

IN THE NORTHWESTERN ARCTIC

By Robert E. Pegau, Alaska Department of Fish and Game, Nome

Grazing Pressure and Forage Recovery

Examination of reindeer feeding craters during late winter, 1968 revealed that the animals they utilize some dwarf shrubs. Browsing was almost always restricted to buds and upper portions of stems, seldom exceeding the current annual growth. No plants were observed that had been browsed extensively; usually only 3-5 stems on a plant were browsed. Only two browse species were utilized; these were bog blueberry (Vaccinium uliginosum) and dwarf birch (Betula <u>nana exilis</u>). Twelve plants of each species that had been browsed were marked with copper tags so that they could be reexamined in the summer to determine the effect of winter browsing. At low intensity browsing there was no apparent effect on the growth of the portion of the plant that had not been browsed. During the first summer following browsing, stems that had been browsed did not leaf out. These plants will be reexamined next summer to see if any resprouting occurs.

#### Nutritive Quality of Forage

Four areas were marked in July 1968 and lichens have been collected bimonthly since that time. The lichens have been sorted by species and location and have been frozen. The four locations represent four different habitats and periodic sampling should give us some indication whether the nutritive value is influenced by environmental conditions. The samples will be sent out in one large group to take advantage of a price reduction per sample so that a larger number of samples can be analyzed.

#### Seasonal Forage Preference

By observing where reindeer and caribou were feeding, some differences were observed in their feeding habits although these differences are most likely due to the types of forage available. Caribou utilize sedges and grasses adjacent to ponds more extensively than do reindeer, especially in the fall and winter.

In May as the caribou start to migrate from the wintering areas to the calving grounds, sedges are preferred forage, especially <u>Eriophorum vaginatum</u>. This sedge is one of the first to show green growth. On 7 May, 1968, at four different locations between Purcell Mtn. and the Kobuk River, the lower inch to inch and a half of this sedge was green. The caribou were also grazing sedges in large-snow-free areas near rivers; the plants were <u>Eriophorum</u> vaginatum and an unidentified carex. Lichens were scarce in the feeding areas that were examined.

Reindeer calve in the same vegetation type in which they winter, so there is little change in diet. The reindeer do utilize the green culms and leaves of <u>Eriophorum</u> vaginatum in late May. In one large sedge meadow north of Nome a herd was observed to graze almost exclusively on the green portions of <u>E. vaginatum</u> even though the green portion was only about an inch long. This meadow is composed principally of sedges (<u>Eriophorum</u> vaginatum, <u>E. angustifolium</u>, <u>Carex aquatilis</u>, <u>C. bigelowii</u>, <u>C. lungens</u>, <u>C.</u> rotundata and <u>Trichophorum</u> caespitosum) with interspersed dwarf shrubs (bog blueberry, dwarf birch, narrow leaved Labrador tea and crowberry). Sedges do not normally occur in single species stands, but usually all of the species are growing intermingled. When this sedge meadow was examined after the reindeer had grazed in it, almost all of the grazing had been restricted to <u>Eriophorum</u> vaginatum with some grazing of <u>Trichophorum</u> caespitosum also noted.

After calving the caribou moved south through the extreme western portion of the Brooks Range. Around 10 July, the caribou were observed utilizing various green vegetation. There were a few large snow patches which, due to the surrounding topography, were not exposed to direct sunlight for extensive periods of time. The grazing and movement of the caribou were influenced considerably by these snow patches, which were used by the animals in warm weather. Willow leaves (Salix pulchra mostly) were being used extensively. The caribou were also using some sedges and at this time they were avidly seeking out flowers, especially lupines and woly lousewort.

Reindeer utilized willow leaves (primarily <u>Salix pulchra</u> and <u>S. glauca</u>) from the time the leaves first started emerging in mid-June until late June when the local herd joined the Teller herd.

In late October the caribou were migrating scutheast of Selawik at a rapid pace. The animals across Hotham Inlet from Kotzebue would occasionally graze the predominate sedge (Eriophorum vaginatum). Caribou seldom used an area for over one-half hour before resuming their migration at a "caribou trot".

By early December the caribou were not moving extensively. Feeding craters were common on hillsides in which there was use on <u>Eriophorum</u> <u>vaginatum</u>, <u>Carex</u> and some lichens. Heavy use was noted on the edges of ponds and sloughs; some use was also made of bluejoint (<u>Calamagrostis</u> <u>canadensis</u>) in these areas.

Vegetative Type Mapping

A method of aerial delineation of vegetation types similar to that used in Sweden was tried in the Nome area and Noatak Valley. All flights were made in a Cessna 180. Plots 1/4 mile by 1/4 mile were studied from an altitude of 700 ft. The vegetation on the Noatak is fairly homogenous and delineation is relatively simple. The vegetation near Nome is much more complex and therefore more difficult to analyse from the air. It was hoped that the Bureau of Land Management would have a general type map prepared from aerial photographs so that the accuracy of the estimating technique could be determined. This map is in preparation and when it becomes available the aerial estimation method will be more thoroughly examined.

Range Condition and Trend

During the course of the field season several range sites in various conditions were examined to develop a relatively simple method of determining range condition.

The following is a tentative score card based on field observations and will be tested on different ranges next season. It should be emphasized that this is only a tentative arrangement because I have not had the opportunity to test it under varied field conditions.

Scoring is arranged so that the lower the score the better the range.

Caribou and Reindeer Winter Range Condition

#### I. Plant Indicators

1. Lichens

	a.	Reindeer lichens ( <u>Cladonia alpestris</u> , <u>C. rangiferina</u> , C. sylvatica) robust. living portion over 4 inches	
		long, in dense mats	0
	b.	Reindeer lichens robust, living portion over 2 inches	
		long, mats somewhat interrupted, other fruticose	
		lichens robust	1
	с.	All lichens scattered, few mats in open areas	3
	d.	Reindeer lichens only found in protected sites, other	
		lichens scattered	5
2.	Sed	ges and Grasses	
	a.	Robust, green, numerous seed heads, normally 3-5	
		plants arising from rhizomes of parent plant	0
	Ъ.	Robust, some yellowing of leaves, seed heads plenti-	
		ful, at least 2 plants arising from parent plant.	1
	с.	Dead leaves about as numerous as green leaves, few	
		seed heads, few rhizomes	3

d. Dead tussocks noticeable, rhizomes exposed . . . 5

3	Shr	ubs

		a. b. c. d.	All shrubs with numerous leaves, no evidence of morbid stems, young plants plentiful Shrubs leafy, few morbid stems apparent Shrubs with several dead branches	0 1 2 4
В.	Com	posi	tion	
	1.	Lic	hens	
		a. b. c.	At least 40% cover by reindeer lichens, other fruticose lichens in small aggregates At least 20% cover by reindeer lichens, other fruti- cose lichens abundant	0 1 3
		d.	Lichens, mostly small cup lichens and <u>Thammolia</u> vermicularis	6
	2.	Sed a. b. c.	ges and Grasses Mostly plants with some green shoots in winter, such as <u>Eriophorum vaginatum</u> and <u>Hierochloe alpina</u> Mostly single plants with rhizomes Mostly coarse plants with little or no green in winter, such as <u>Calamagrostis canadensis</u> , <u>Arcta-</u> <u>grostis latifolia</u>	0 1 3
	3.	Shr	ubs	
		a. b.	Bog blueberry, dwarf birch and green leaf willows (Salix pulchra) abundant and well distributed About equal amounts of Labrador tea and crowberry to bog blueberry and dwarf birch; willows in very dense	0
		c.	stands	3
		d.	often <u>Salix alaxensis</u>	4
	4.	Forl	as crowberry and arpine azarea	С
	-	a. b. c.	Few and scattered	0 2 4

С.	Dens	sity and Cover	
	1.	95% ground cover by lichens and vascular plants, moss mat complete and uniform	0
	2.	80% ground cover by lichens and vascular plants, moss	-
	з	mat interrupted only on frost boils, etc	1
	5.	mat broken, some moss pedestals present	3
	4.	Less than 60% ground cover by lichens and vascular	-
		plants, moss mat thin and spotty	/
D.	Use	· · · · · · · · · · · · · · · · · · ·	
	1.	No use	0
	2.	Light use of lichens and sedges	1
	3.	Moderate use of lichens and sedges, numerous trampled	4
	4.	Rodent burrows and nathways numerous, lichens mostly	4
	••	trampled, heavy use of sedges and shrubs	7
II. Sı	10W a	and Soil Indicators	
Α.	Snow	v Cover	
	1. 2.	Normally light, mostly windblown clear Snow depth normally less than 18", ice not over 1 1/2"	0
		thick	1
	3.	Snow over 18" deep, usually over 24" deep, ice crust	
	4.	Snow always deep during winter, or ice crust over 2 1/2"	4
		thick	tomatic r rating
В.	Soil	l	
	1.	Plant litter	
		a. Very abundant on soil surface between plants	0
		b. Common	1
		c. Scarce	3
		d. None	5
	2.	Soil erosion	
		a. All soil layers well covered with plant debris, no	0
		b. Some frost boils and active solifluction lobes	2
		c. Numerous frost scars, some shallow oullies	4
		d. Occasional deep gullies, some wind blown dunes .	7

## III. Animal Indicators

Α.	Caribou and Reindeer Condition
	<ol> <li>Animals in very good condition 0</li> <li>Animals sustaining themselves over winter, but not very</li> </ol>
	fat at end of winter 1
	3. Animals continually lose weight on this range, in poor condition at end of winter 4
	4. Animals continually dying during winter Panic button
В.	Other Herbivores (usually rodents and hares)
	1. Scarce
	2. Common
	3. Abundant
IV. I	ntrepretation of Total Score
Exc Goo Fai Poo	ellent Less than 12 d

#### NELCHINA HERD

#### Population

#### Census

An attempt was made in June 1968 to census the Nelchina caribou herd. Censuses were conducted in two consectutive years in order to evaluate the aerial photo census technique. The Bureau of Land Management, as in the preceeding year, cooperated with the Alaska Department of Fish and Game by providing men, aircraft and photographic equipment.

Prolonged inclement weather through late June delayed the census. On the morning of 26 June the BLM started the aerial photo portion of the census while Department personnel waited in the area to make direct peripherial counts with a helicopter (see Hemming and Glenn 1967 caribou segment report for details of census technique). Deteriorating weather caused the photographic mission to abort. Unfavorable weather continued in the area until 30 June. A second attempt to census the herd was not made because BLM funds for this purpose were not available past 30 June. Unfortunately, the project had to be abandoned even though the female segment of the herd remained ideally concentrated during the entire month of July.

#### Distribution and Movements

#### Winter 1968

From January to mid April 1968, the Nelchina herd remained on eight separate wintering areas (Fig. 4). Listed below are the locations of these areas with the approximate percentages of caribou in each:

1.	Nabesna-Wrangell Mountains	30%
2.	Lake Louise Flats	25%
3.	Broad Pass	15%
4.	Butte Lake	10%
5.	Upper Talkeetna River	3-8%
6.	Reindeer Hills-Yanert Fork	5%
7.	Chistochina-Slana	3-5%
8.	Sheep Mountain	2%

#### Spring 1968

The spring migration began in mid April. Caribou wintering in the Nabesna-Wrangell Mountains moved west and crossed the Copper River between Cobb Lakes and Glennallen. The spring migration differed from the preceding three years when caribou crossed the Copper River only in the vicinity of Chistochina Lodge. Residents living along the Richardson Highway reported that a majority of the caribou crossed the highway between 19 and 26 April. During this time caribou were seen on the Gulkana airstrip and large numbers moved west in the vicinity of the Slana-Tok Cutoff. Limited observations were made on other routes used by caribou to gain access to calving areas. Delineation of the trail patterns indicated that all segments of the Nelchina herd returned to their traditional calving grounds in the Talkeetna Mountains.

#### Summer 1968

The post calving concentration remained west of Kosina Creek, east of the Talkeetna River and south of Fog Lakes during the month of June. A northward shift was noted on reconnaisance flights conducted on 14, 18, 20 and 23 June. On 18 July the Nelchina caribou herd was located on Deadman and adjacent mountains. The caribou were of mixed composition and remained in mass congregations on all available snow patches. When the caribou hunting season opened 10 August, the caribou were still clumped but were located on high wind-swept ridges between Cole and Butte Creeks. A few caribou, mostly bulls, were scattered between Brushkana Creek and the lower Maclaren River.

#### Fall and Winter 1968

The Nelchina herd remained in the area between Deadman Lake and Cole Creek until early September when an easterly movement took place. Caribou moved across the Susitna River and proceeded east between the Denali Highway and the Alphabet Hills. On September 12, lead animals reached lower Paxson Lake. The migration then turned south and almost all of the animals passed through the Alphabet Hills in five days. The herd remained on the Lake Louise Flats until 5 October after which they again moved east following the West Fork of the Gulkana River to Fish Lake. Breeding activity appeared to take place during this time. By October 20 the herd was again located in the area north of the Alphabet Hills, south of the Denali Highway, west of the Richardson Highway and east of the Maclaren River. During late October and early November animals began to move east and south. Large numbers crossed the Richardson Highway between Summit Lake and Sourdough and were reported in the Chistochina-Slana area on 15 November. A second group moved south and spread out in the Lake Louise-Tyone River area. Reconnaissance flights on 13 and 14 January, 1969, located the caribou in the following places: 1) Upper Talkeetna-Chickaloon River; 2) North side of Stephan Lake; 3) Lake Susitna-Tyone River area; 4) Susitna Glacier; 5) Slana-Nabesna area.

#### Productivity

Aerial reconnaissance flights were made on 26 and 27 May to determine calving locations. Calving grounds were located on rolling bench land east of Kosina and south of Tsitsi Creeks (Fig. 4). No calving was observed near Fog Lakes or in the Black or Oshetna River drainages. Progression of calving appeared to be normal with an estimated 50% of the pregnant females having calved by 27 May.

Composition counts were made on 26 and 28 June. All counts were made from the ground with the aid of a 20X spotting scope. Caribou were classified as adult cows, adult bulls, yearlings and calves. The June 1968 calf-cow ratio of 61:00 (N=5,315) was higher than the 58:100 (N=3,083) reported in 1967. As expected the yearling age class was not fully represented (9 yearlings: 100 cows) in the post calving concentration due to precalving segregation.



#### Mortality

#### Hunter Harvest

The crude estimated caribou harvest from 1 January through 31 March, 1968, is 600 animals. Although the harvest appears low during this time, hunters had fair success in the Eureka, Lake Louise and Chistochina-Slana areas. The projected crude harvest estimate for 10 August through 31 December, 1968, is 5,000 caribou. The accuracy of the 1968 estimate will be compared with the April harvest ticket summary which will yield a quantitative measure of the harvest.

Project personnel have long advocated the need for a caribou harvest ticket. Such a program was approved by the Alaska Board of Fish and Game in the fall of 1967 and implemented in August 1968. The first computerized harvest summary is expected to be available 30 days after the close of the 1968-69 season. This caribou harvest report will provide basic management information such as hunting pressure, number of caribou harvested, date and specific location of kill, sex composition of the harvest, and method of transportation utilized by the hunter.

#### Natural Mortality

The Nelchina caribou herd continues in good condition with no significant numbers of diseased animals. Complete autopsies were made on 14 caribou during the spring and fall radiation collection (Disease and Parasites Job P-4). These autopsies along with various carcass examinations conducted on hunter-harvested caribou revealed a low incidence of diseased animals.

Surveys of the post calving concentration indicate that calf production was high. Fall composition counts showed calf survival to be lower than the previous year: 49 calves per 100 cows in 1968 as compared to 57 calves per 100 cows in 1967. The calf-cow ratios for 1968 indicate a calf mortality of 19.7% between the June and October counts.

#### Hunter Success

The Denali Highway hunter check station opened on 10 August, 1968. During 55 days of check station operation, 3,238 hunters checked through with 1,019 caribou, indicating a 31.5% hunter success. Table 5 compares early season caribou hunting success during the last 9 years.

As indicated in Table 5, the average number of caribou per hunter declined from 1960 through 1964 and remained fairly constant from 1966 through 1968. No explanation can be given for low hunter success since caribou were available near the Denali Highway during the entire 1968 check station operation.

Check station personnel interviewed each hunting party that stopped at the station, and obtained the following statistics: Number of hunting parties, 1,409; average party size, 2.3; number of days hunted, 1.04; and range in party size, 1-15. As reported in the past, caribou and moose hunters could not be separated. Interviews, however, indicate that moose hunters harvest caribou if the opportunity arises. Peak hunting periods occurred on weekends as expected. The Denali check station personnel provided information on the caribou harvest along the Denali Highway. Table 9 lists the chronology of hunting pressure by week and success by location (milepost) on the Denali Highway. The large kill indicated between Milepost 81 and 100 is due to accessibility of caribou which remained in this area from July through September. It can be seen that the harvest increased each week along the Denali Highway and reached a peak the third week in September. This weekly build-up of hunter success was the result of increased accessibility of caribou near the road due to an easterly migration which eventually paralleled the Denali Highway from Mile 11 to Mile 130.

From mid-October to early November caribou hunting continued good in the Paxson area. Caribou were crossing the Richardson Highway from Summit Lake to Sourdough and from Mile 0 to Mile 50 on the Denali Highway. Hunter success during mid-November and December was generally poor with low densities of caribou available in the Paxson area.

#### Herd Structure

Fall composition counts (Table 6) were conducted on 20, 21 and 22 October, 1968. All counts were made from the ground with the aid of a 20X spotting scope. A Hiller-Fairchild turbo helicopter was used for transportation. During this time caribou were occupying that area south of the Denali Highway to and including the Alphabet Hills and from Paxson Lake west to the Maclaren River. Ideal weather conditions prevailed in this area during the three day period. Accuracy in sex identification depended on the closeness of animals to the observer. Counts were not taken if the animals were further than 600 yards.

The composition work was completed three days earlier than last year; however, both counts were made after the 1-15 October peak of breeding activity. Some segregation of adult bulls may have occurred prior to the counts and this possibility must be considered when evaluating the data. Bull segregation was not observed during the three days of counting. The low proportion of adult bulls, if correct, is a matter for concern and therefore earlier and more extensive composition counts will be made in 1969.

The last count (Table 6), involving a total of 285 animals, is considered to be 100% accurate. I had the opportunity to observe each animal in detail from close range. Individual animals were identified by body size, profile, genitalia and antler development. The resulting percentage calculation is comparable to the other three counts and thus appears to verify the sampling technique and animal classification. The composition of 3,242 caribou revealed a calf-cow ratio of 49:100, a yearling-cow ratio of 17:100 and a bull-cow ratio of 11:100.

For several years a small group of caribou have appeared to be resident between the headwaters of the Gakona and Chistochina Rivers. The composition counts in Table 7 were taken in this area and they revealed a calf-cow ratio of 29:100, a yearling-cow ratio of 12:100 and a bull-cow ratio of 42:100. It is interesting to compare the composition of this relatively isolated segment with the rest of the Nelchina herd.

Dates of Check Statio Operation	n	No. of Hunters	Caribou Harvest	Average Caribou per Hunter
8/20 - 10/3	1960	1,892	1,974	1.04
8/20 - 10/5	1961	3,694	2,612	.71
8/12 - 10/21	1962	5,271	2,459	•47
8/17 - 10/28	1963	4,814	2,240	- 47
8/12 - 10/12	1964	5,052	1,850	• 37
8/14 - 10/10	1965	3,088	1,223	.40
8/15 - 10/10	1966	2,799	857	.31
8/14 - 10/9	1967	2,977	857	.29
8/10 - 10/2	1968	3,238	1,019	.31

Table 5. Early season caribou hunting pressure and success Denali Highway, 1960-1968.

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Date	ੱ	%	ę	%	Year	%	Calf	%	Total
10/30	5	5.0	143	57.0	32	12.7	71	28.3	251
10/21	130	6.3	1158	55.8	210	10.1	578	27.4	2076
10/21	49	7.8	357	56.7	62	9.8	162	25.7	630
10/22	18	6.3	157	56.1	31	10.9	79	27.7	285
Grand Total	202	6.2	1815	56.0	335	10.7	890	27.5	3242
Calf, Year	/cow rati ling/cow	o = 49:1	00 18•100						

Table 6. Nelchina caribou composition counts 1968.

Bull/cow ratio = 11:100

Table 7. Upper Gakona, Chistochina River caribou composition counts 22 October 1968.

ୖ	%	ę	%	Year	%	Calf	%	Total
90	23.3	212	54.6	25	6.4	61	15.2	388
Calf/ Yearl Bull/	cow ratio = ing/cow rat cow ratio =	29:100 io = 12:1 42:100	00					

Date	No. of total Caribou checked through	% ď	% Ç
1959	531	70.0	30.0
1960	1,974	66.0	34.0
1961	2,612	65.0	35.0
1962	2,459	68.1	39.9
1963	2,240	64.4	35.6
1964	1,850	65.9	34.1
1965	1,223	67.4	32.6
1966	857	71.0	29.0
1967	857	56.1	43.9
1968	1,019	59.9	40.1

Table 8. Sex composition of caribou checked through the Denali Highway Check Station August - September, 1959 - 1968.

Table 9. Chronological distribution of caribou harvest by mileposts on the Denali Highway.

DENALI HIGHWAY MILEPOST	10-11 Aug.	12-18 Aug.	19-25 Aug.	26 Aug. 1 Sept.	2-8 Sept.	9-15 Sept.	16-22 Sept.	23-29 Sept.	30 Sept. 2 Oct.	TOTALS
1-10	2	7		L						
11-20					12	δ	37	-		63
21-30				(11)	27	10	10			58
31-40			Ŷ	Q	(32)	(63)	(6†)	ω		161
1+1-50			ŝ	t1	80	7	36	9		64
51-60			2	2	10	28	29	თ	ŝ	83
61-70		l		7	7	16	16		6	67
71-80			ŝ	(13)	2	14	m	10	6	51
81-90		Ś	15	11	(30)	16	18	15	_	112
91-100	(12)	(8)	(18)	6	10	(18)	(22)	((143)	(01)	153
101-110			2	part	2	ŝ	7	თ	4	28
111-120	2	7	17	ω	ω	2	ιΛ	2	2	53
121-130	2		80	(12)	rt	ц	2	ŝ	9	45
131-	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1 1 1 1	1 1 1 1	1 1 3 1 1	1 1 1 1 1	1 1 1 1	1 1 1 1 1	1 1 1 1 1
TOTAL HARVEST	22	23	۲۱	88	152	161	234	117	1 +7	939

( ) Optimum Harvest Areas

In the future we must compare composition of herds receiving little or no hunting pressure with those having heavy sport hunting and/or subsistence hunting pressure.

#### Composition of Harvest

Of 1,019 caribou checked through the Denali Highway hunter check station 59.9% were males and 40.1% were females. As shown in Table 8 the number of females in the harvest increased significantly in 1967 and 1968.

Recent changes in composition of kill suggest that the herd may contain a lower percentage of bulls than in previous years. It is also possible that bulls were not fully represented adjacent to the road system in early August and September.

#### MULCHATNA HERD

#### Distribution and Movements

Regular survey flights were made in the Mulchatna area from January through June and from October through December, 1968 in order to delineate calving and wintering areas.

In winter the animals were scattered from the headwaters of Chilikadrotna River on the south to the headwaters of Swift River on the north. The largest concentration of caribou occurred between upper Chilikadrotna River and the Whitefish-Telaquana Lakes Area (Fig. 5). A small scattered group, mainly bulls, was observed in December, February, and May along the drainages of Kaskanak River and Pecks Creek. Both streams join the Kvichak River just west of Igiugig. This is the first time we have found caribou along the south shore of Iliamna Lake. Skoog (1968) reported that caribou have not moved south across the Kvichak River since the 1800's. In recent years, however, local residents have reported occasional animals south of the Kvichak near Igiugig.

The calving area of the Mulchatna herd lies between the Bonanza Hills and Twin Lakes (Fig. 5). About 3,000-4,000 caribou excluding new calves, were observed in this area from mid April to the end of May.

After calving there appears to be a shift to the south and southeast. In summer and fall, caribou may be found from Telaquana Lake to Illiamna Lake and throughout the Nushagak and Shotgun Hills.

#### Productivity

Calves were first observed on 14 May 1968. At this time 29% of the cows (N=254) had calves at their side, indicating that calving was well underway. The next survey on 20 May revealed that 60% of the cows (N=82) had new calves. These limited observations suggest that the peak of calving occurred from 16-19 May. It is interesting to note that the Mulchatna herd calved approximately 2 weeks earlier than the Alaska Peninsula herd.



#### DELTA HERD

#### Distribution and Movements

On 5 June, the area occupied by the Delta herd was surveyed via Cessna 180. Bulls and yearlings were in small scattered groups from Yanert Fork to Delta Creek at the 3,000-4,000 ft. level. Cows and calves were concentrated in a small area between the headwaters of Delta Creek and the most easterly fork of Delta Creek (Fig. 6). Several caribou, marked with plastic ear streamers, were observed with the cow-calf group. These animals are part of 205 caribou marked by the University of Oklahoma-Department of the Army Project 1577, between October, 1966 and March, 1968. Table 10 lists all sightings made by, or reported to, ADF&G. The small dots on Fig. 6 indicate places where tagged caribou were observed.

#### OTHER HERDS

Four major areas remain to be investigated to complete studies of basic distribution patterns: Mulchatna-Rainy Pass, Mentasta-White River, Upper Kuskokwim River and northeastern Arctic. In all but the latter, the animals seem to be widely scattered during much of the year and it is difficult to state how many separate herds are involved. Calving ground studies are needed in each of these to complete the inventory of Alaska's caribou populations.



Date	Sex	Location	Type of Mark
14 Jan 1967	Ŷ	West Fork Little Delta River	Red ear streamer
6 Mar 1967	?	West Fork Little Delta River	Red ear streamer
5 Jun 1968	ç	Upper Buchanan Creek	Red streamer, left ear
5 Jun 1968	ç	Upper Delta Creek	Orange streamer, right ear
5 Jun 1968	ę	Upper Delta Creek	Orange streamer, right ear
5 Jun 1968	Ŷ	East Fork Delta Creek	Red streamer, left ear
5 Jun 1968	Ŷ	East Fork Delta Creek	Red streamer, right ear
5 Jun 1968	ç	East Fork Delta Creek	Orange streamer, right ear
9 Jun 1968	്	West Fork Dry Creek	Red streamer, left ear
25-29 Aug 1968	്	Big Grizzly Cr on Wood River	Ear streamer
11-14 Sep 1968	്	Foothills, Wood RGold King Cr	Ear streamer
11-14 Sep 1968	Ŷ	Foothills, Wood RGold King cr	Ear streamer
20-22 Sep 1968	Ŷ	Dick Cr. on Yanert Fork	Ear streamer

Table 10. Observations of marked caribou in the Delta herd.

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