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PROJECT CHARIOT--FINAL REPORT

(Final Progress Report)

MASTER

TERRESTRIAL MAMMALS INVESTIGATION,
OGOTORUK CREEK-CAPE THOMPSON AND VICINITY

PART C

CARIBOU INVESTIGATIONS, NORTHWEST ALASKA

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PROJECT CHARIOT--FINAL PROGRESS REPORT
TERRESTRIAL MAMMALS INVESTIGATION

PART C

CARIBOU INVESTIGATIONS, NORTHWEST ALASKA

by

Peter C. Lent and Odd Lønø

Odd Lønø joined the caribou investigation on May 29, 1961; he took over responsibilities for the field work when Lent left on September 16, 1961, to begin laboratory analyses of caribou materials at the University of Alberta. Lønø terminated the field work on March 20, 1962. The following Final Progress Report includes materials collected between May 5, 1961, and the termination date of March 20, 1962. It also contains a comparison of the 1960 and 1961 calving seasons and a summarization of the data collection program for the entire study. Lent has authored the spring and summer portions of this report, whereas Lønø has authored the fall and winter portions.

PRE-CALVING MOVEMENTS AND DISTRIBUTION

On the flight made on May 5, 1961, out of Point Barrow and reported in the June 1961 Caribou Progress Report, I determined that some caribou were already in the calving area and that smaller numbers were moving towards the Utukok River from the Meade River, Ikpiukuk River, and Umiat areas.

On May 9 Howard Kantner made a flight through the Brooks Range and into the upper Kokolik and Utukok drainages and noted several thousand caribou already in the upper Utukok River drainage and more large groups converging on that region from the east, moving along the north side of the De Long Mountains, and coming in from the south up the Kuguruk River. The greatest portion of the caribou appeared to have moved through the mountains up the Nimiuktuk River, then swinging west. However, heavy tracks in De Long Pass indicated a sizeable, but earlier, movement through there, presumably including the caribou observed heading north on March 27 (June 1961 Caribou Progress Report, p. 4). Lesser numbers of widely scattered caribou were observed moving west and north through the snow-covered country north and east of Howard Pass. Generally speaking, the pre-calving movements were composed of smaller bunches of caribou, more widely scattered than in 1960.

As in 1960, the location of pre-calving concentrations appeared to be controlled by snow-cover. The build-up of caribou was west of a line running north from Thunder Mountain to the head of Carbon Creek (Figure 1). East of this line the snow-cover ranged up to 80 per cent of the surface; west of the line the snow-cover dropped off rapidly to less than 20 per cent, and in the region from the mouth of Carbon Creek to the ridge north of Elusive Creek the amount of snow-cover was under 10 per cent. On May 8, Kantner noted Eriophorum buds on the tussocks on the north side of the De Long Range; and, as in 1960, the Eriophorum was fully out before the beginning of calving.

The main pathways of movement occurring in late April and early May and the snow conditions in the first week of May are shown in Figure 1.

Figure 1. Pre-calving movements, early May, 1961.

Per cents refer to approximate proportion of surface still covered with snow during second week of May.

THE CALVING PERIOD

Howard Kantner and I established camp at Elusive Creek on May 15. Odd Lønø and five tagging assistants arrived at the camp on various days during the last week of May. From May 25 to May 31, 26 calves were tagged. However, by the end of this period it definitely appeared that the Utukok River would be on the fringe of the calving area during the peak of the calving season.

To move camp eastward to the area of the calving concentration presented great difficulties. The area from the Utukok to the Meade River and between $69^{\circ}30'$ and $70^{\circ}00'N$.Lat. has few, if any, suitable locations for landing a wheel-equipped airplane in summer. The only means available for gaining access to the calving area in time to continue work was a Piper Super Cub equipped with floats. With this airplane, a camp was established on the Avalik River (Figure 4). However, because of the high cost and limited capacity of the "Cub" on floats, it was financially impossible to move the crew of calf-taggers to the new camp. In addition, a factor of uncertainty was introduced by the rapidly dropping water level in the Avalik River, which might have prevented the breaking up of camp at the end of calving. Thus, only Lent, Lønø, and Kantner established camp on June 1 on the Avalik River. Preceding the pre-arranged time to move camp, we were fortunate to have a rainy spell which brought the level of the river back up to a landable level by June 8.

Nineteen calves were tagged on the Avalik River from June 1 to June 7. Two additional calves were tagged later on the upper Utukok River. Data on all calves tagged this year are presented in Table 1. The number tagged this year was only about half that tagged in 1960. This decrease was primarily due to the lack of personnel during the peak of the calving season, but also because of the larger number of barren cows mixed in with the calving bands.

The difference in the timing of the calving in 1960 and 1961 was most striking. To illustrate this, compare the aerial flight made on May 27, 1960, when 33 per cent of the cows were accompanied by calves, with the aerial count made on the same date in 1961, when only 4 per cent of the cows had calves with them.

TABLE 1. Data on tagged caribou calves, Northwestern Alaska, May-June 1961.

Date	Tag No.	Sex	TL (mm.)	HF (mm.)	Wt. (lbs.)	Notes
Elusive Creek						
May 25	109	♀	584	279	-	In group with 7 cows
May 26	110	♀	787	343	-	
	120	♂	622	305	-	
	108	♂	813	330	-	
	106	♂	686	318	-	
	113	♂	699	318	-	
	101	♂	690	320	14	2 cows with calves alone
	102	♂	625	305	12	Calf followed for 10 min., calling
May 27	117	♂	760	330	-	Mother alone
	116	♀	760	290	-	In group of 40 incl. 1 other calf
	107	♂	762	324	-	
	133	♀	749	305	-	
	131	♂	686	318	-	
May 28	118	♀	660	298	-	
	115	♂	660	292	-	
	146	♀	-	-	-	
	149	♂	-	-	-	
	147	♂	-	-	-	
	121	♂	780	330	-	Cow antl. with 3 other cows
	122	♀	760	330	-	Cow antl. in group of 7, 1 other calf
	123	♀	680	305	-	Cow antl.
	142	♂	750	325	13.5	Just born. Cow antl.
	141	♀	750	335	16.5	Cow antl.
	143	♀	740	330	15	Cow unantl.
May 29	119	♂	787	343	-	
	132	♂	787	330	-	
May 30	134	♀	635	279	-	
May 31	136	♀	762	305	-	

TABLE 1. (CONTINUED)

Date	Tag No.	Sex	TL (mm.)	HF (mm.)	Wt. (lbs.)	Notes
Avalik River						
June 2	161	♂	720	330	15	Cow unantl.
	163	♂	700	305	11.75	Calf 1.5 hrs. old ran 100 yds. cow antl.
	103	-	730	330	-	
	104	♀	750	340	-	
	105	♀	620	320	-	
	145	♀	640	320	-	
June 3	166	♀	600	280	8.5	under 2 hrs. old, cow with 1 antl.
	164	♂	700	340	14	Cow antl., charged tagger
	165	♂	740	335	14.5	Cow antl.
	162	♀	680	300	10	Cow unantl., charged tagger
	135	♀	730	310	-	
June 4	167	♀	680	320	14	Cow with 1 antl.
	168	♂	720	340	14.5	Cow antl., calf 2 hrs., 5 min. old
	128	♀	640	320	-	
June 5	169	♂	710	330	12.5	Cow antl.
	170	♂	710	320	12	just born, cow antl.
	124	♂	720	310	-	
	130	♂	570	270	-	
June 7	153	♂	720	320	11.5	Cow antl.
Upper Utukok River						
June 15	127	♂	680	330	-	
June 24	148	♂	660	275	11.5	Cow unantl.

In Figure 2 I have compared the progression of calving for both years. Data used for plotting the progression was obtained from the central calving areas only, and not fringe areas of calving where group composition during calving is less stable. The data for 1961 are believed to be of greater accuracy than those for 1960, but the 1960 data are sufficient to demonstrate the wide difference in the two years.

The end of the calving period shown on the graph for both years is the end of the period of measurable increase in the number of cows possessing calves. In both years some births were observed after these dates, but either the sample counts were not large enough to pick up the slight increase, or calf mortality was outweighing the increment of new births. Thus June 5, in 1960, and June 15 in 1961, are considered the ends of the two calving periods. The peak of the calving periods (based on estimates of the per cent of cows which gave birth on each day during the calving period) occurred on about May 26 in 1960 and June 5 in 1961. The period between the first observed births and the peak of calving was extended several days in 1961.

At the end of the measurable calving period, the per cent of cows two years old and older with calves was 80 in 1960 and 53 in 1961. Again, these per cents refer to the central calving concentrations. With respect to the total population, after peripheral and central groups had coalesced (late June and early July), final calf crops of 73 per cent in 1960, and 42 per cent in 1961, were determined. The figure of 42 per cent obtained in 1961 is based on counts totalling 17,000 cows, though the actual sample size is slightly less than 17,000 due to some duplication by observers on a few days.

There is no doubt that this wide difference in recruitment success between the two years was due mainly to a great increase in the number of barren cows in 1961 and not to any large increase in the post-natal mortality.

A further discussion of the natality and mortality in the population may be found under "Population Composition."

In 1961 we paid particular attention during the calving period to antler shedding by cows. Shaposhnikof (1955), working with the wild Altai reindeer of the U. S. S. R., and Skoog (1957) and De Vos (1960) working with caribou, have all suggested that pregnant females retain

Figure 2. Progression of calving, 1960 and 1961.

retention into the first three weeks of June by cows which give birth (Figure 3).

More specifically, we may be 95 per cent confident that between 5 and 33 per cent more cows with antlers will have calves with them than cows without antlers on any day between May 18 and June 20. The wide limits of confidence arise because of the small numbers of cows with antlers in the samples near the end of calving. The weighted daily means for the period May 28 to June 20 are as follows:

Per cent of cows with antlers, with calves = 35

Per cent of cows without antlers, with calves = 16

These means are based on a sample of 13,396 cows out of the entire population. On June 22, not included in the above compilation, 2,537 cows were tallied of which only five (0.2 per cent) were antlered. All five were accompanied by calves. Of an additional 1,600 cows tallied from June 24 to July 9, none were observed to have old antlers. The progression of antler shedding for the entire cow population is shown in Figure 2. Only daily samples exceeding 200 cows were used in plotting this progression and the ones shown in Figure 3, except where noted.

It was easiest to analyze the data in terms of the per cent of cows with antlers which had calves with them on any given date as compared to those without antlers but with calves. However, it is of greater biological significance to compare the percentage of cows accompanied by calves which retained their old antlers to the percentage of cows not with calves but with old antlers. In this way, we approach the biological picture; that is, it must be the birth which is influencing the antler retention, not the opposite.

The progression of antler loss among cows accompanied by calves and those not accompanied by calves is shown in Figure 3. It may be seen that the per cent of antlered cows with calves was higher on every day on which counts were made. If we average the three days at the end of the calving period (June 14-16) on which relatively large samples were obtained, the per cents are as follows:

Per cent of those with calves, retaining old antlers: 11

Per cent of those without calves, with old antlers: 2

Based on a total sample of 3,186 cows, this shows a significant difference at the 95 per cent confidence level.

Figure 3. Antler dropping in caribou cows. June 1961; Avalik and Utukok rivers, Alaska.

their old (hard) antlers until after the start of the calving season. Barren cows are assumed to drop their old antlers before the start of the calving season. However, none of the writers have presented much data in support of this theory. Obviously, if a correlation between old antler retention and pregnancy could be proved within certain confidence limits, it would be a valuable aid in the study and management of caribou. In particular, it would aid in estimating the post-natal calf mortality; that is, the per cent of cows observed with antlers at the start of calving, minus the per cent observed with calves at the end of calving, should equal the per cent of cows whose calves died.

Obviously, the best method of investigating this problem would be to kill and examine a large sample of cows before and during the calving. Such a large collection program was not desirable during the present study, however; nor is there any large scale Eskimo hunting done at this time of year from which specimens might have been gathered. The only feasible method of study was the observation of cows with antlers before the calving and during the calving period.

Out of 2,080 cows tallied between May 16 and May 24, 1961, 53 per cent (1,107) had old antlers. This per cent is identical with the proportion of cows accompanied by calves in the central calving area at the end of calving. However, this figure, in itself, cannot prove anything. Although the two percentages are identical, the comparison is not fully valid, since some calf mortality obviously occurred during the calving period. Thus, the actual per cent of cows which gave birth must be somewhat higher than 53.

Another difficulty is that we did not know the date on which an appreciable number of the cows began to shed their antlers. Ideally, counts should have been made continually from this date. This date has not been determined in any other studies, either, to my knowledge. Banfield (1954) suggests that the time of antler shedding is controlled by the age of the cow, the older cows shedding their antlers first. There is no evidence available to support this contention either.

It can be demonstrated on the basis of the data collected in 1961 that a higher per cent of cows with antlers are accompanied by calves than either the total cow population or the cows without old antlers. We can be 99 per cent confident that there is prolonged antler

In Figure 3, a third line is shown at the far left. This represents the percentage of cows with antlers and without calves, after the per cent of cows still pregnant is subtracted for each date (based on the data shown in Figure 2). Thus, this line represents only barren cows plus those which have lost calves. The high per cent (over 20) shown by this line after the beginning of calving shows clearly that not all barren cows had lost their antlers by the start of calving. The percentages for the first days of June are higher than the total per cent of calves born and, therefore, could not be explained by calf mortality. Thus, one conclusion to be reached is that we cannot definitely state that all barren cows will have lost their antlers by the start of the calving period. The barren cows do show a great increase in the rate of shedding in early June. The slight rise in the left hand line may be due to the accumulative effects of calf mortality. All antler shedding is rapidly accelerated at about the end of the calving period.

Counts of antlered cows made at Elusive Creek during the last week of May make an interesting comparison with those from the Avalik and Utukok rivers. The segment of cows moving by Elusive Creek during the last week of May was giving birth much earlier than the central cow population. It appeared that this segment had arrived on the calving grounds earlier, had crossed the Utukok River from the north, and were then recrossing it heading east.

It was noted that not only was the antler dropping among these early bearing cows occurring earlier, but so also was the antler dropping of the cows which we presumed to be barren, that were with them. At present, there is not sufficient information to explain this discrepancy. The relatively small samples obtained, and the uncertainties involved in considering fringe groups during calving do not permit any conclusions to be drawn from this phase.

Returning to consideration of the main calving area, it may be seen in Figure 3 that by the end of the calving period, June 15, the per cent of cows without calves, with antlers, was down to 7, and dropped to an insignificant figure by June 21. Further, approximately 7 per cent of the calves had been born in the six days between June 9 and June 15.

Thus, it would appear, at least at the end of calving, that the average period of antler retention after the birth of the calf might be about six days. Unfortunately, there are not sufficient data to apply this hypothesis to other periods earlier in the calving season. According to Flerov (1952), Semenov-Tyan-Shanskii (1948) determined that, among the wild reindeer of the Kola Peninsula, females retain their antlers for 3 to 7 days after giving birth.

The use of two additional observation techniques in the future may help clarify the problem of antler retention. First, close observation of the udders of cows without calves, particularly near the end of the calving season, may make possible an estimate of the neo-natal mortality. Skoog (1957) suggests that this is possible, but it may be difficult to obtain a large enough sample to be of value. Secondly, it would be useful if the cows with antlers, with calves, could be broken into classes based upon the age of the calf. This could be done with only dubious reliability at present, but additional data on the behavior of known age calves may permit at least limited use of this technique in the future. Of course, a complete understanding of antler retention will require large scale collecting and physiological studies.

POST-CALVING

The immediate post-calving movements in 1961 (Figure 4) resembled those of 1960. The timing of the movement was also quite similar in spite of the much later calving peak in 1961. In both years, the caribou population was concentrated in the area at the heads of the Kukpowruk, Kivalina, and Wulik rivers during the last few days of June. Again, in both years, the mass of caribou reversed direction and began moving eastward through the De Long Mountains.

In 1960, more than half the caribou were observed to move back east on the south slope of the Brooks Range, at least as far as the area between Nimiuktuk River and Desperation Lake. In contrast, in 1961, the majority of caribou moved back east on the north side. Thus, as shown on Figure 4, most of the caribou retraced quite closely their recently completed movement, with the central pathway of the eastward movement passing only a few miles to the south of the earlier westward movement. The main mass re-crossed the upper Utukok River only two weeks after crossing it heading in the opposite direction. Ground observations of this post-calving movement were carried out near Thunder Mountain from July 5 to 8. After this, camp was moved to the south slope of the De Long Mountains on the Kugururok River from July 8 to 10 and on Sea Gull Creek from July 11 to 13.

Of the small segment of the population which started east on the south side of the range, representing about a fifth of the population, nearly all re-crossed the divide, east of the Nimiuktuk River, and returned to the north slope. All of these appeared headed for the Colville River drainage by July 13.

During the last week of June and the first week of July, the main mass of caribou never reached the degree of compactness observed in 1960. However, it may be that the mass which moved eastward along the north slope in 1960 was not so compact, either, as this northern group was never actually observed until after it started to break up. It is possible that the more rugged conditions on the south slope tend to cause a more compact movement: the smaller segment which passed this way in 1961 was just as compact as the main movement in 1960.

- = Camps
- *** = Main calving area
- = Location of aerial photography

Almost the entire small segment crossed the Kugururok River in one afternoon (July 8) with only a few stragglers in the two days which followed.

The 1961 post-calving movement also contained a much larger proportion of males than was observed in July of 1960. This composition is discussed under "Population Composition."

As the caribou passed the Nimiuktuk River and Thunder Mountain, a rapid process of herd disintegration and dispersal took place. This disintegration was striking in that it produced many compact, discrete segments of the population which fanned out in slightly different directions, but at the same time small bands or stray individuals outside of these segments were almost non-existent. Fewer lone cows and cow-calf pairs were observed moving along the trails than in 1960.

Figure 4 shows the pattern of dispersal during July. Almost all segments swung slowly north, towards and across the Colville River. A few thousand kept going east, crossing the Killik River and apparently moving into the Umiat area. Even smaller numbers, probably only a few hundred, never swung north, but moved into the mountains at the head of the Noatak River. W. Irving (personal communication) reported a movement of at least 1,000 animals moving by Etivluk Lake on July 19 and much smaller, scattered herds after that.

By July 26, only one large segment of the population could be located. This group, estimated at 20,000, was in the Kaolak River drainage. The group was in the process of further disintegration and by the afternoon of July 29 only about 5,000 could be found in one group.

It first appeared that these latter caribou would continue westward and move down the coast past Point Lay and Cape Sabine as had a similar large group in 1960 (December 1960 Caribou Progress Report, p. 32 and Map 4). However, only scattered small bands and many single individuals were observed west of the Utukok River. Warren Thompson of Kotzebue reported a couple of bands with approximately 200 individuals in each in the vicinity of Icy Cape. Most of the caribou from the segment first observed July 26 were headed southeast by the end of the month. The weather at this time was extremely stormy with temperatures in the 40's°F.

Thus, by August at least 95 per cent of the caribou population was dispersed over the coastal tundra from the Utukok River to Umiat.

FALL MOVEMENTS

Aerial observations, by Dr. W. O. Pruitt, Nelson Walker, the engineers at Liberator Survey Camp, and myself, show that the caribou in August and early September were to be found from Ipnarik River east to Anaktuvuk River, and from Colville River south to the divide of the Noatak Valley. Except for 200-400 caribou around Pitmegea and Ipwik rivers there were no caribou west of Ipnarik River. I have no observations during this period from north of the Colville Valley and east of Anaktuvuk River.

The movement south through Howard Pass started shortly after the middle of August. Between August 20 and 25, the weather was cold with snow-showers north of the Brooks Range. This cold weather was probably responsible for a southward movement, and several thousand caribou came through Howard Pass. When the weather was warm and fine during the last days of August, the movement stopped. On a flight August 31 I found just a few scattered groups, totalling 200 caribou altogether, south of Howard Pass. Probably most of the caribou which came first through the pass moved south along Cutler and Hunt rivers to the flats west of Jade Mountains. Here Nelson Walker saw about 60 animals during the first week of September and a few caribou were being hunted by local residents.

Nelson Walker saw a concentration of about 20,000-30,000 caribou at the heads of Killik, Alatna, and Nigu rivers on September 6-8. Between here and Anaktuvuk River he saw many groups of caribou, but fewer animals than at the head of Killik River. Shortly after September 8 the main movement from the north side of the divide started. The caribou passed south through Howard Pass and the Nigu Valley. The caribou which passed up the Nigu Valley, joined the caribou moving west from the Killik Valley (see Figure 5). (The width of the routes indicate on the map the relative numbers of caribou estimated in the movement.) Observations on September 14 showed that most of the caribou from the heads of Killik, Alatna, and Nigu rivers, had moved south of the divide and were to be found east of the confluence of Noatak and Aniuk rivers. The main route was along Aniuk River, but some animals moved from the head of Nigu River through Midas Creek into the valley of the Noatak, and then west along Noatak River.

Figure 5

Caribou movements

August, September, and October

1961

Scale 1:3,000,000

Moving westward along the Aniuk River, the caribou first moved into the Cutler River drainage and to the flats south of Feniak Lake. The first groups of caribou reached the Nimiuktuk River during the first week of September. Here they stopped, and during the last days of September the caribou concentrated in the Noatak Valley from Cutler River to Nimiuktuk River. On September 26 the concentration consisted of 20,000-30,000 caribou; most of them were at an altitude of 1,500 to 2,000 feet. Some of the caribou (400 to 500) were observed in the mountains between Cutler and Salmon rivers.

In October more caribou moved into the Cutler Valley from Howard Pass area, but in smaller groups than during September.

As described above, a few caribou moved south along Hunt River to the flats west of Jade Mountains during the first days of September. Tony Bernhardt of Kobuk tells me that a few caribou also moved down Redstone and Kogoluktuk rivers about the 10th of September. During the last days of September and the first week of October, most of the caribou from the Noatak Valley moved south along Hunt River and concentrated on the flats west and southwest of Jade Mountain. A few caribou crossed the Kobuk River near Ambler Village before the river froze, but the rest of the caribou at Jade Mountain did not cross the river until the last week of October, after there had been ice on the river for 14 days.

While the larger concentration was moving down to Jade Mountain, a smaller number of caribou in the valley of the Noatak were observed moving west on October 12. At the end of October these latter animals were to be found on the flats west of Noatak Village between Kelly and Agashashok rivers.

North of Cape Thompson, around Ipewik and Pitmegea rivers, 200-400 caribou stayed all summer. On a flight on September 22, more than a thousand caribou were seen between Thetis Creek and Kukpowruk River. These caribou had moved in from the north. In October they moved further south and spread out around the upper parts of the Ipewik, Kukpuk, and Kivalina rivers.

In October when the great movement took place along Hunt River, some caribou moved through the Baird Mountains into the Squirrel and Salmon valleys. On October 22 about 1,000 caribou were observed around Timber Creek and a few in the Salmon Valley. Some of these caribou had

crossed the Kobuk River late in October and moved into the Waring Mountains. Tommy Snider of Noorvik reports that a few groups of caribou were observed around Noorvik Village during the last week of October.

On October 30 and 31 I made an observation flight north to Umiat. There were no caribou in the Colville Valley. In the Noatak Valley 2,000-3,000 caribou were still east of Nimiuktuk River. Probably most of them moved west along the Noatak in November. Earl Boese, the radio operator at Umiat, on a flight on October 25 had seen 5,000 to 10,000 caribou west of Teshekpuk Lake. I have no information of the movement of this herd.

WINTER DISTRIBUTION AND MOVEMENTS

After crossing the Kobuk River, all the caribou from Jade Mountain moved during November south along Kugarak River and then spread out in the Selawik River drainage (see Figure 6). In November and December the caribou moved slowly back and forth, but the majority of them stayed along the Rabbit River. Ice fog prevented aerial observations east in the Kobuk Valley, but Tony Bernhardt reported some groups in there during the second half of November.

The caribou that at the end of October had stayed on the flats between the Kelly and Agashashok rivers, moved during November in two directions. One group moved west into the pass leading to Wulik River and spread out on the Mulgrave Hills and in the Wulik Valley. The other group moved towards Agashashok River and further into the Squirrel Valley. A very few caribou moved south along the Noatak River and Hotham Inlet.

During the second half of November many of the caribou which had moved west along the Noatak and into Mulgrave Hills, turned about, crossed the river and moved southward. These caribou joined the others that had moved south to Squirrel River. On a flight through the Wulik Valley on December 22, no caribou or tracks were seen there.

During January and February the caribou stayed in the same area as in December. As the snow-cover grew deeper, the caribou concentrated more and more where the snow-cover was thinnest. In the last week of February most of the caribou in the Squirrel Valley along Timber Creek spread out and moved into the Mountains north and south of the valley.

An intensive aerial survey, including more than 27 hours of flying, was carried out from January 31 to February 12, 1962. The area surveyed included the Buckland South Fork Valley, the Selawik River drainage, the Kobuk River drainage eastward to Selby Lake, the Noatak Valley eastward to Howard Pass, and the valleys of the Kukpuk, Kivalina, and Wulik rivers. The concentrations seen during this survey are tabulated in Table 2 and are plotted on the map in Figure 7. Apart from these concentrations, there were some caribou scattered throughout other sections of the study area. The numbers in these bands were difficult to enumerate, but I would estimate a total of 2,500 caribou.

Figure 6
 Caribou movements
 November and December, 1961
 Scale 1:3,000,000

Table 2. Caribou concentrations January 31 to February 12, 1962.

Mountains 10 miles north of Cape Seppings	1,000
Mulgrave Hills	2,500
Upper Wulik River	5,000
Anisak River - Upper Noatak	1,000
Mountains between Squirrel and Salmon valleys	8,000
Squirrel Valley	4,000
Mountains south of Squirrel River	1,500
Waring Mountains	1,500
Rabbit Mountain - Kugarak River	20,000
Pick River	2,000
Mountain west of Killiovilik Creek	2,500
Purcel Mountain - Ingruksukruk Creek	8,000
Mountains east of Tagagawik River	6,000
Estimated scattered caribou within the surveyed area	<u>2,500</u>
Total	65,500

During the winter of 1961-62 there apparently was more snow than usual; the people of Kotzebue commented about the unusual quantities of snow, as did Nelson Walker when he piloted the January-February aerial survey. No measurements of snow-depths were made, but as far as I could see from the air all the concentrations, except in the Squirrel Valley, were to be found where the snow-depths were lowest, i.e., where tussock vegetation or ridges were exposed.

According to pilot Howard N. Bowman, who has done much flying on the Seward Peninsula, and reindeer herder Charles Clark of Deering, caribou have not been seen this winter in the Buckland Valley or to the west of it. The southernmost limit of caribou seems to be the hills at the head of the Huslia River. A small section during the winter had moved east to the confluence of the Pah and Kobuk rivers where 60 caribou were observed. No observations were made in the Pah River flats or east of it, but according to pilot Fred I. Erikson, who made some flights between Bettles and Kobuk Village during the days the aerial survey was carried out, no caribou were spotted east of the Alatna River.

I made no observation flights north of the Brooks Range between January 31 and February 12, but Erikson reported that he saw many thousands of caribou between Umiat and Point Barrow. Pilot Jules Thibedeau of Barrow saw many caribou west of the Meade River. People from Barrow, Wainwright, and Point Lay hunted caribou in the vicinity of their villages all winter (see section on Human Utilization). On March 20 I flew north to 20 miles south of Point Lay and flew back along the Utukok River. There were no caribou except for 13 at Kukpowruk River. Earl Boese of Umiat on February 26 wrote that there had been only a few caribou around Umiat all winter. Therefore, the caribou on the North Slope apparently have stayed in the northernmost section of the Slope this winter. It is impossible to give any estimate of caribou numbers on the North Slope. The only estimate comes from Earl Boese in October when he saw 5,000-10,000 caribou west of Teshekpuk Lake, but this may be only a fraction of the caribou on the North Slope.

CARIBOU IN OGOTORUK VALLEY

Only a few stray caribou were seen in the Ogotoruk Valley from August, 1961, to March, 1962.

In August and September, 300 to 400 caribou stayed north of Kukpuk River, but only 4 caribou were observed in the Ogotoruk Valley during these months. On September 22 more than a thousand caribou were observed between Thetis Creek and Kukpowruk River (see Fall Movements). These caribou later moved south and spread out around the upper sections of Ipewik, Kukpuk, and Kivalina rivers, but none were observed moving into the Ogotoruk Valley.

During the winter, October to February, a few caribou groups were observed in the mountains east of the Ogotoruk Valley. Don Foote reports that the hunters from Point Hope shot about 80 caribou in the hills west of the Ogotoruk Valley.

~~Lono~~ made the following aerial observations in the Ogotoruk Valley:

August 28:	No caribou
September 22:	No caribou
October 5:	No caribou, first snow observed
November 19:	No caribou, no tracks or craters in the snow
December 22:	No caribou, no tracks or craters in the snow
February 10:	9 caribou, no other tracks or craters in the snow
March 20:	No caribou, no tracks or craters in the snow

Observations in the Ogotoruk Valley from other persons:

Dr. W. O. Pruitt, Jr.:

August 3 to 15:	No caribou
August 15:	No caribou seen during observation flight
August 20 to 26:	No caribou.

Bonita Neiland:

August 26:	Two caribou near Mad Mountain.
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Ernest Carl:

September 15 to	
October 5:	No caribou seen around camp or by people from camp working in the field.

Don Tucker:

October to March: No caribou observed from camp. Caribou hunter Amos Lane of Point Hope visited camp and reported that he had seen 14 caribou 500 yards east of Weather Station 6 in the Ogotoruk Valley on November 21. On February 19 two Point Hope hunters killed 5 caribou in the upper Ogotoruk. On February 28 Amos Lane killed 4 out of 5 caribou sighted near middle area of valley.

Howard Kantner:

February 16: Shot one caribou two miles up valley from camp; no other caribou observed.

POPULATION COMPOSITION, MORTALITY AND NATALITY--1961

The population data obtained during the summer of 1961 not only changes the overall picture of the population under study, but it clearly shows an unusually low natality, to a degree not previously described in a caribou population.

As stated earlier, the calf production after initial calf mortality was 27 per cent lower in 1961 than in 1960. It is quite certain that this large decrease in the recruitment to the population was the result of a decreased birth rate. The evidence in support of this contention is as follows:

1. Out of seven cows autopsied in the spring at Ogotoruk Creek by Lent and Kantner, only three were pregnant.
2. An average of only 53 per cent of the cows tallied in the ten days preceding the beginning of calving possessed antlers.
3. There was no evidence of excessive mortality and no evidence of unusual environmental factors which could have caused a high calf mortality.

Weather conditions were extremely mild throughout the 1961 calving. Weather observations are summarized in Table 3. Kelsall (1960) noted that high rates of calf mortality due directly or indirectly to weather occurred when daily chill factors exceeded 1,000. On no day during the 1961 calving did the chill factor exceed 900.

Numbers of predators were extremely low on the calving grounds. No wolves were seen on the Avalik or Ketik rivers and only three were seen in the area used near the end of calving, near Meat Mountain. The grizzly is quite rare on the Avalik and Ketik rivers. None was seen near the Avalik River ground camp. One adult and two subadults were seen from the air on the Ketik River. One of the subadults was feeding on a caribou carcass (not that of a calf). Several other grizzlies had been observed in late May and later in June along the Utukok River.

Only nine dead calves were found during the ground work in the period from May 26 to June 20. This number is about the same as was recorded in 1960 in spite of the many more man-hours in the field in 1961. An additional 11 dead calves were noted from the air on June 21, along the pathway of movement of at least 50,000 caribou, north of Meat Mountain. I believe this mortality was due primarily to desertion

Table 3. Weather Conditions - Northwest Alaska Calving Grounds
May 16 - June 27, 1961

Location & Date	Temperature Max. Min. (F.)		Wind (m.p.h.)	Sky*	Precipitation	Wind chill**
Elusive Cr.						
May 16	34	20	N 5-8	Cl.		900
17	27	18	N 7-10	Cl.		
18	50	20	N 5-12	low Cl.	lt. snow	1,000
19	30	24	N 3-6	low Cl.	drizzle-snow	850
20	32	16	N 0-6	Cl.	snow-flakes in AM	850
21	40	12	E-N under 2	0		700
22	39	22	NE 10-12	0		1,000
23	44	24	NE 8-12	0		1,000
24	45	22	NE 10-16	0		1,000
25	65	30	NE 5-9	0		800
26	52	38	SW under 3	Cl.	lt. rain	550
27	56	32	SW-NW under 3	Cl.	fog & rain	600
28	55	29	SW-NW under 3	Cl.	rain, early AM	650
29	44	30	NW-N 3-9	Cl.	rain	800
30	44	30	NE-E 10	Cl.	lt. rain	900
31	50	33	E-NE 4-10	Cl.	fog in evening	750
Avalik R.						
June 2	54	32	N-W 3	Cl.	lt. rain in PM	700
3	62	33	E-N 3-7	clearing		700
4	56	26	E-N 3-10	0		900
5	50	30	E-NE 8-16	Cl.	drizzle	900
6	43 at 0900		NE 10-16	Cl.	rain in PM	700
7	43 at 0830		S 7-9	fog	rain	650
8						
9	60		N under 10			
10						
11						
12	54	32	N 7			800
13	54	40	NE 5	Cl.		650
14	58	42	N under 3	Cl.	rain	450
15	52	43	S 3	Cl.		550
16	60	44	S 5-9	Cl.	rain	600
17	?	?	SE 26-40	Cl.		750(?)
18	70	40	SE 10-14	Cl.	rain	750
19	60	35	S under 5	Cl.	fog	650
20	44	32	S 5-8	Cl.	snow	800
21	38+	28	N 7	Cl.	snow	850
22	53	30	S-SE 5-10 PM	calm Cl.		800
23	60	35	S under 3	Cl.		550
24	56	48	S 10	0		600
25	54	35	N under 3	Cl.	drizzle	550
26	42	35(AM only)	"	fog	rain	550
27		30 at 0800	N 5			

*Cl = cloudy 0 = clear

**Based on minimum temperature and average wind velocity

by cows, because the post-calving movement was well under way before all births had taken place.

4. Percentage counts of cows with calves showed a steady increase throughout the calving period. This would not have been the case if mortality had been great enough to offset the increment due to births in any part of the period. The possible exception to this was mentioned earlier in the discussion of the end of the calving period.

At present I can offer no good explanation for the low birth rate experienced by the population in 1961. Although observations were carried out during the rutting season in 1960, our knowledge of the breeding biology and behavior of the barren-ground caribou is yet too incomplete to pinpoint any abnormalities which might have occurred.

One tentative hypothesis points towards a possible tie-in between both the lateness of the calving season and the low birth rate:

It is known that the reindeer cow is seasonally polyestrous. Schmitt (1936) in his work with the Siberian reindeer determined that cows which were not fertilized in their first heat usually came into a heat a second time. This second heat occurred from nine to ten days later. Gorbunov's work (1939) indicates that a third heat is possible, but rare.

As mentioned previously, both the peak and the end of the measurable calving period were approximately ten days later in 1961. There was, however, a measurable amount of calving occurring at the same time as the peak in 1960.

One possible explanation of all the above observations is that in 1961 very few of the cows were successfully fertilized during the first heat and the bulk of the 1961 calf production resulted from fertilization during a second heat.

The single new-born calf found and tagged on June 24 could have resulted from a cow fertilized during a third heat or it may have simply resulted from an unusually long gestation period.

Recent work by McEwen in Canada (Kelsall, 1960) has demonstrated that in a normal year a large number of the barren cows are actually members of the two-year-old class (cows which would be about 17 months old during the breeding). Successful births appear to be quite rare

for this age class. No attempt was made to segregate this age class in the field in 1961. However, on the basis of yearling counts made in 1960, the proportion of two-year-olds in the cow population could not have exceeded 15 per cent. Even if all these two-year-old cows were barren, this should still leave roughly 30 per cent of the mature cows which were barren in 1961.

On June 28 a flight to obtain aerial photographs was made in a Cessna 195 operated by the Arctic Research Laboratory and equipped with an electrically operated K-24 aerial camera. The areas where photos were taken are shown on Figure 4.

The results of this aerial photography were only partially satisfactory. For one thing, as noted above, the caribou were far more spread out than during the comparable movement of the previous year. However, of greater importance than that was the unfortunate fact that one entire roll of film produced no images; in addition all the photos tended to be overexposed.

In spite of all the above difficulties, some conclusive results were obtained. Fortunately, I attempted to estimate the number of individuals in the large masses photographed, in the same manner that I have used throughout the caribou investigation. Thus, I could make a close comparison between my estimates and the counts from those segments of the population for which I obtained usable photos. The counts were made directly from the negatives, using stereo magnifying glasses. The results showed that my estimates were consistently about 30 per cent higher than the actual counts from the photos.

By extending this comparison to the total estimated population and on the basis of ground counts carried out during the summer, a revised estimate of the total population of northwest Alaska is 130,000 caribou, excluding the current year's calf crop. This figure is considerably lower than my previous estimates and those of other recent observers. The possibility cannot be excluded, however, that there might have been a large shift in the population to the eastern Alaska-western Canada "Porcupine River Herd." Skoog's estimate of 100,000 individuals in this latter herd, made in the summer of 1961, certainly indicates a population calving in eastern Alaska far greater than was previously suspected.

The post-calving movement through the Baird Mountains in 1961 included a far larger percentage of bulls than was observed in the comparable movement in 1960. In fact, there was a greater percentage of bulls than had previously been observed in any large segment of the population at any time, including the rutting season.

The results of segregation counts carried out by Lent and ~~Lønp~~ at the Thunder Mountain camp from July 5 to 8 and at the Kugururok River camp from July 8 to 10 are shown below:

Class	Number <u>Segregated</u>	Per Cent <u>of Adults</u>	Per Cent <u>(excl. calves)</u>	Per Cent <u>(incl. calves)</u>
Cows	1,179	56	47	39
Bulls	959	44	36	30
Yearlings	440	-	17	14
Calves	<u>495</u>	<u>-</u>	<u>-</u>	<u>17</u>
Total	3,073			

If we apply the percentages shown to the total estimated population the following figures are obtained:

Females (24 months and older)	61,000
Males (24 months and older)	47,000
Yearlings (both sexes)	22,000
Calves (both sexes)	<u>26,000</u>
Total	156,000

HUMAN UTILIZATION

At the end of February, 1962, Lønø mailed a questionnaire to one person in every village in the study area to try to get information on the location and numbers of caribou killed by the people of the villages from August, 1961, until the end of February, 1962. The results are given in Table 4. In this table, the information under "Population," (except for Atkasuk[Meade River], Point Lay, Umiat and Kissimilouk Creek) is from United States Census of Population 1960; the population of Atkasuk and Point Lay is less than 25, so it is not recorded in this reference. During this period there were only three persons in Umiat and three at Kissimilouk Creek.

Some of the informants have given the following information in addition to that presented in Table 4:

Barrow: Mr. Horace of Barrow, who visited Kotzebue on March 4, reported that there had been caribou in the vicinity of the village this winter. He could not give any good estimate of the caribou killed by the hunters but he thought not more than 200.

Wainwright: The hunters have killed all the caribou they wanted.

Point Lay: During the winter the caribou have been shot near the village or miles away, and some caribou are still near the village right now (March 21).

Kotzebue: In August and September, respectively, 5 and 25 caribou were killed at upper Noatak River by boat. In September, October, November, and February, 52 caribou were brought to Kotzebue by hunters who used airplanes. Two of these caribou were killed by two hunters with a guide, eight by an Eskimo who had chartered a plane. By questioning every household, Lønø found that 440 caribou had been killed this winter by the people in Kotzebue. Lønø received indirect information of a kill of 70 caribou taken by three families and a reindeerherder near Kotzebue.

Kiana: Caribou are not as plentiful this winter as they were last winter. There is no shortage, and the people and the dogs have plenty to eat.

Table 4. Reported caribou killed August 1961 - February 1962.

Village	Population	Informant		Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Total
Barrow	1,314			no information (but see comment, page 33)							
Wainwright	253	Steve Ungubruk	est.	0	-	-	-	-	-	-	1050
Atkasuk	>25			no information							
Point Lay	>25	Samuel Agnasagga	est.	18	9	7	0	0	6	14	54
Umiat	3	Earl Boese	count.	3	8	20	10	4	3	2	50
Point Hope	324	Don Foote	count.	0	0	150	0	0	35	25	210
Kissimilouk	3	Howard Kantner	count.	1	0	5	6	5	7	10	34
Kivalina	142	Milton Swan	est./ct.	4	6	35	50	40	30	50	215
Noatak	275	Julius Harkey	est.	10	20	80	100	300	300	500	1310
Kotzebue	1290	Odd Lønø	count.	5	38	44	88	104	115	116	510
Kiana	253	K.O. Fugleberg	est./ct.	0	0	few abt. 85		few abt. 235	abt. 265		600
Noorvik	384	Shield Downey	est.	0	40	50	150	200	175	225	840
Ambler	70	Tommy Douglas	est.	0	50	25	75	35	67	19	271
Shungnak	135	George Cleveland	est.	0	0	0	-	-	-	-	150
Kobuk	54			no information							
Selawik	350	Mrs. Harris	est.	0	0	-	-	-	-	-	450
Buckland	87	Mrs. Paullin	counted	0	0	0	0	0	0	0	0

CARIBOU COLLECTION PROGRAM

Weights of Caribou

Most of the caribou collected by Lønø were weighed. Because of field conditions, he usually had to dismember specimens in order to weigh them. As a result, 2-3 pounds of blood were usually lost. Weights of all specimens collected are given in Table 6; these weights are not compensated for the loss of blood.

In order to get information on weights of various parts of caribou, nine specimens were cut up in the same way, and the different parts were weighed. These weights are given in Table 5. In this table, "meat" designates the dressed carcass (including ribs); it excludes the heart, liver, tongue, and lower legs. For bulls and cows the percentage meat of the total weight varies from 54 to 58, and the percentage for the calves is lower, from 46 to 54.

During the first six months of life the caribou calves increase in weight, and usually weigh from 80 to 100 pounds in November. Then they appear to lose weight during the winter months. A curve of the weights of male calves from late May to March is drawn in Figure 8. The weights used to compile the curve in Figure 8 are from collections made in 1960 and 1961 (see collection data in December 1960 and June 1961 Caribou Progress Reports) as well as those made by Lønø in 1961-62 (see Table 6). No weights are available for July and August.

Generally speaking there are too few data to make a reliable curve, but there are enough data to show that the male fawns have no measurable increase in weight during the winter months.

Only four female calves were collected, insufficient to draw a curve as has been done for the males.

Specimens Collected April 1961 through February 1962

Table 6 lists the specimens collected since those reported in the June 1961 Caribou Progress Report; the list includes collections made by Howard Kantner, Lent, and Lønø, as well as specimens contributed by D. Douglass, W. O. Pruitt, Jr., and Nelson Walker; these latter specimens are listed under Lønø's field numbers (OL). Stomach contents from two caribou each month have been saved for food habit analyses. Skulls,

Table 5. Weight (in pounds) of caribou collected in northwest Alaska, winter 1961-62.

Specimen	Date	Skin	Meat	Lower Legs	Heart	Tongue	Stomach	Intestine	Liver	Head	Lungs	Total Weight	Meat/Tw. Per Cent
O.L.46 Bull w.antlers	Nov.19	12.5	117.0	7.5	1.75	0.75	46.5	10.5	2.75	9.25	6.75	215.25	54
O.L.53 Bull w.antlers	Jan.18	11.5	110.5	8.0	1.75	0.50	40.0	10.0	3.00	10.5	3.50	199.25	55
O.L.67 Bull no antlers	Feb.24	13.0	108.0	7.5	1.50	0.60	33.0	8.5	2.00	6.5	6.50	187.10	58
O.L.64 Cow	Feb.21	8.0	97.0	7.0	1.10	0.60	33.0	13.5	1.50	7.0	6.00	174.70	56
O.L.68 Cow	Feb.24	9.5	78.0	5.5	1.10	0.50	26.5	11.5	2.00	4.5	5.50	144.60	54
O.L.45 Calf,male	Nov.19	6.5	56.0	4.25	0.75	0.25	23.0	5.5	1.25	3.75	3.00	104.25	54
O.L.63 Calf,male	Feb.21	4.5	41.0	5.50	1.00	0.50	22.5	5.5	1.10	4.5	3.50	89.60	46
O.L.65 Calf,male	Feb.22	4.5	36.5	3.50	0.60	0.20	20.5	5.0	0.80	2.5	2.50	76.60	48
O.L.66 Calf,male	Feb.24	6.0	45.0	4.0	0.75	0.25	16.5	4.5	1.00	3.0	3.25	84.25	53

TABLE 6. Caribou specimens April 4, 1961, to February 14, 1962.

Number	Sex	Date	Location	Measurements in millimeters or pounds										Notes
				Total Length	Fore-leg	Tail	Hind-Ear	Eye-foot	Eye-Ear	Eye-Mouth	Hoof	Total Weight	Testes	
HK 16	♀	April 8	Ogotoruk Cr.	1305	810	-	110	485	-	-	-	-	-	-
HK 17	♀	April 8	Ogotoruk Cr.	1590	900	-	125	590	-	-	-	-	-	pregnant
HK 19	♀	April 21	Ogotoruk Cr.	1620	835	130	125	510	-	-	-	-	-	not pregnant
HK 24	♂	May 14	Howard Pass	1870	-	165	130	570	-	-	-	-	-	-
HK 29	♀	May 21	Elusive Cr.	1540	950	140	120	520	-	-	-	-	-	foetus: TL 585; Wt 10.5; HF 235.*
HK 30	♀	May 21	Elusive Cr.	1650	1200	150	120	540	-	-	-	-	-	-
HK 31	♀	May 21	Elusive Cr.	1600	970	160	125	510	-	-	-	-	-	-
HK 32	♀	May 26	Elusive Cr.	1620	1090	140	125	545	-	-	-	-	-	foetus: TL 680; Wt 13; HF 315.
HK 33	♀	May 26	Elusive Cr.	1670	1060	140	120	540	-	-	-	-	-	foetus: TL 710; HF 310; Wt 14.
HK 34	♀	May 26	Elusive Cr.	1640	1060	120	120	535	-	-	-	-	-	foetus: (wet) TL 720; HF 340; wet Wt 14.
HK 36	♀	June 1	Avalik R.	1700	1060	150	130	550	-	-	-	-	-	♂ foetus: TL 550; HF 210; Wt 6.
HK 42	♀	June 14	Utukok R. 69° lat.	1520	-	150	115	500	-	-	-	-	-	*
HK 43	♂	June 15	Utukok R. 69° lat.	-	-	-	-	-	-	-	-	-	54x29	*
HK 44	♀	June 16	Utukok R. 69° lat.	1600	1010	140	120	530	-	-	-	-	-	*
HK 45	♀	June 16	Utukok R. 69° lat.	1580	1100	-	125	540	-	-	-	-	-	milk sample collected *
HK 46	♀	June 16	Utukok R. 69° lat.	810	-	-	-	370	-	-	-	-	-	calf
HK 47	♂	June 17	Utukok R. 69° lat.	840	-	-	-	350	-	-	-	-	-	calf
HK 48	♂	June 19	Utukok R. 69° lat.	870	-	-	-	360	-	-	-	23	-	calf
HK 49	♀	June 19	Utukok R. 69° lat.	930	-	-	-	380	-	-	-	--	-	calf

TABLE 6. (CONTINUED)

Number	Sex	Date	Location	Measurements in millimeters or pounds										Notes
				Total Length	Fore-leg	Tail	Hind-Ear	Eye-foot	Eye-Ear	Eye-Mouth	Hoof	Total Weight	Testes	
HK 50	♂	June 22	Utukok R. 68½°	760	-	-	-	320	-	-	-	14	-	calf
HK 51	♀	June 22	Utukok R. 68½°	1740	1100	140	125	540	-	-	-	-	-	milk sample coll.
HK 52	♂	June 22	Utukok R. 68½°	1650	1150	150	130	520	-	-	-	-	-	milk sample coll.*
HK 53	♀	June 22	Utukok R. 68½°	785	-	-	-	345	-	-	-	19	-	calf
HK 55	♂	June 23	Utukok R. 68½°	970	-	-	-	400	-	-	-	30.5	-	calf
HK 58	♂	June 24	Utukok R. 68½°	860	-	-	-	380	-	-	-	28	-	calf
HK 59	♀	June 24	Utukok R. 68½°	990	-	-	-	390	-	-	-	37	-	calf
HK 60	♂	June 24	Utukok R. 68½°	910	-	-	-	315	-	-	-	33	-	calf
PCL 82	♀	May 26	Elusive Cr.	1615	-	150	125	510	-	-	-	-	-	-
PCL 83	♂	May 30	Elusive Cr.	760	-	74	65	332	-	-	-	16	-	calf
PCL 84	♀	June 12	Utukok R. 69° N. lat.	-	-	-	-	-	-	-	-	-	-	-
PCL 85	♂	June 18	Utukok R. 69° "	680	-	-	-	340	-	-	-	11.5	-	calf
PCL 86	♂	June 19	Utukok R. 69° "	1870	1230	170	-	550	-	-	-	-	-	-
PCL 87	♂	July 5	Thunder Mtn.	1940	-	140	130	530	-	-	-	-	-	-
PCL 88	♂	July 5	Thunder Mtn.	1875	-	155	120	565	-	-	-	-	75x35	3/4" back fat
PCL 89	♂	July 7	Thunder Mtn.	1470	-	140	120	495	-	-	-	-	-	yearling
PCL 90	♀	July 11	Sea Gull Creek	1780	-	150	130	510	-	-	-	-	-	-
PCL 91	♀	July 12	Sea Gull Creek	1010	-	90	80	390	-	-	-	-	-	calf
OL 3		June 19	Utukok R.	660	-	-	-	330	-	-	-	-	-	calf, partly eaten
OL 4	♀	June 20	Utukok R.	1700	1040	140	120	510	-	-	-	-	-	found dead
OL 6	♂	July 9	Kugururok R.	1670	1080	150	130	560	-	-	-	-	50x28	-
OL 9	♀	Aug 13	Etivluk R.	1750	1100	170	120	540	-	-	-	171	-	milk in mammae
OL 10	♀	Aug 16	Colville R.	1690	1060	150	115	530	-	-	45x89	-	-	milk in mammae
OL 11	♀	Aug 16	Colville R.	1610	995	141	104	505	155	150	60x94	-	-	milk in mammae

TABLE 6. (CONTINUED)

Number	Sex	Date	Location	Measurements in millimeters or pounds										Notes	
				Total Length	Fore-leg	Tail	Hind-Ear	Eye-foot	Eye-Ear	Eye-Mouth	Hoof	Total Weight	Testes		
OL 12	♂	Aug 17	Colville R.	1450	945	110	115	495	145	135	65x83	-	43x22	-	*
OL 13	♀	Aug 17	Colville R.	1420	-	140	110	510	130	140	50x73	-	-	diseased lungs and heart	*
OL 15	♀	Aug 18	Colville R.	1520	1000	125	109	510	145	145	61x86	-	-	lame	
OL 17	♀	Aug 21	Colville R.	1530	960	110	120	500	130	140	60x74	125	-	-	
OL 18	♂	Aug 28	Cape Thompson	-	-	-	-	-	-	-	-	-	-	shot by D. Douglass	
OL 19	♀	Sept 14	Noatak R.	1750	1120	160	125	540	150	170	75x95	-	-		*
OL 20	♀	Sept 14	Noatak R.	1620	1020	140	110	510	120	155	65x95	-	-		*
OL 21	♂	Sept 14	Noatak R.	1570	1100	150	120	540	140	150	71x92	-	65x36	-	*
OL 22	♀	Sept 14	Noatak R.	1180	830	100	95	450	115	100	37x65	-	-	calf of OL 20	*
OL 23a	♂	Sept 17	Noatak R.	1250	830	103	100	450	120	120	60x60	73	25x13	calf	*
OL 23b	♀	Sept 25	Noatak R.	1630	1080	140	120	530	140	180	70x86	165	-	milk in mammae	*
OL 24	♂	Sept 25	Noatak R.	1350	870	140	95	450	120	110	60x65	92	-	-	*
OL 25	♂	Sept 27	Noatak R.	1910	1150	170	130	540	150	170	60x83	389	95x45	long antlers	
OL 26	♀	Oct 9	Onion Portage	1600	1070	140	115	560	140	150	70x90	151	-	milk in mammae	*
OL 27	♀	Oct 9	Onion Portage	1440	980	125	110	510	130	140	60x67	104	-	-	*
OL 28	♀	Oct 10	Onion Portage	1300	870	105	105	450	110	130	60x66	82	-	-	*
OL 29	♂	Oct 17	Akillik R.	1750	1150	135	120	520	160	165	-	163	60x31	-	*
OL 30	♀	Oct 18	Akillik R.	1600	950	135	105	510	125	140	63x75	118	-	-	*
OL 31	♂	Oct 18	Akillik R.	1950	1220	135	140	560	160	175	75x95	222	70x44	long antlers	*
OL 32	♀	Oct 20	Akillik R.	1690	1060	130	125	520	130	150	70x77	135	-	no antlers, no milk	*
OL 33	♂	Oct 21	Akillik R.	-	-	-	-	-	-	-	75x97	-	77x43	long antlers	39

TABLE 6. (CONTINUED)

Measurements in millimeters or pounds														
Number	Sex	Date	Location	Total Length	Fore-leg	Tail	Hind-Ear	Eye-foot	Eye-Ear	Eye-Mouth	Hoof	Total Weight	Testes	Notes
OL 35	♂	Oct 25	Eli River	1450	965	100	110	475	125	140	50x73	90	40x16	- *
OL 36	♂	Oct 26	Eli River	1385	950	115	95	470	130	125	61x67	84	32x17	calf of OL 37 *
OL 37	♀	Oct 26	Eli River	1725	1090	150	115	540	140	150	70x90	132	-	mother of OL 36 *
OL 38	♂	Oct 26	Eli River	1290	-	125	135	465	-	-	60x69	91	-	calf *
OL 39	♂	Oct 26	Eli River	1650	-	180	125	530	-	-	53x76	-	57x30	- *
OL 40	♀	Nov 5	Rabbit River	1300	850	80	100	440	120	130	35x75	102	-	dark, feral reindeer ? *
OL 41	♀	Nov 6	Rabbit River	1790	1100	110	120	525	140	165	67x92	190	-	milk in mammae *
OL 42	♀	Nov 6	Rabbit River	1580	990	120	120	520	130	140	58x72	130	-	calf (?) *
OL 43	♀	Nov 7	Rabbit River	1330	900	120	110	465	120	125	35x67	90	-	calf *
OL 44	♀	Nov 18	Rabbit River	1650	1110	130	120	540	140	160	60x90	-	-	milk in mammae *
OL 45	♂	Nov 19	Rabbit River	1400	940	115	115	495	120	140	55x67	105	35x19	calf *
OL 46	♂	Nov 19	Rabbit River	1810	1185	140	135	560	145	185	67x91	216	70x35	- *
OL 47	♀	Dec 7	Rabbit River	1670	1100	130	120	520	140	160	70x98	-	-	- *
OL 48	♂	Dec 13	Rabbit River	1400	980	105	90	485	125	130	62x70	88	35x20	calf *
OL 49	♀	Dec 13	Rabbit River	1720	1040	135	120	530	140	170	65x88	201	-	no antlers, mother of OL 48 *
OL 50	♂	Dec 13	Rabbit River	1380	940	135	100	465	125	130	55x75	87	40x19	calf *
OL 51	♀	Dec 16	Rabbit River	1660	1070	130	110	480	140	160	67x99	199	-	- *
OL 52	♀	Jan 18	Squirrel River	1270	870	110	100	460	115	120	54x70	77	-	calf *
OL 53	♂	Jan 18	Squirrel River	1730	1140	120	120	570	140	160	70x95	200	50x29	- *

TABLE 6. (CONTINUED)

Number	Sex	Date	Location	Measurements in millimeters or pounds										Notes	
				Total Length	Fore-leg	Tail	Hind-Ear	Eye-foot	Eye-Ear	Eye-Mouth	Hoof	Total Weight	Testes		
OL 54	♀	Jan 18	Squirrel R.	1640	1060	140	110	540	145	160	70x90	-	-	-	*
OL 55	♀	Jan 18	Squirrel R.	1300	870	110	100	470	110	120	50x63	81	-	calf, no antlers	*
OL 56	♀	Jan 18	Squirrel R.	1560	1040	135	115	520	130	140	65x82	-	-	-	*
OL 57	♂	Jan 20	Squirrel R.	1720	1140	130	130	570	140	170	75x90	-	55x33	-	*
OL 58	♂	Jan 20	Squirrel R.	1320	960	110	120	480	130	140	62x77	76	34x19	calf	*
OL 59	♀	Jan 20	Squirrel R.	1660	1120	140	115	530	145	180	80x107	-	-	-	*
OL 63	♂	Feb 21	Squirrel R.	1560	1020	140	110	520	145	155	78x80	90	35x25	calf	*
OL 64	♀	Feb 21	Squirrel R.	1700	1110	160	130	560	140	150	80x97	175	-	-	*
OL 65	♂	Feb 22	Squirrel R.	1320	930	130	100	470	110	130	50x68	77	33x15	calf	*
OL 66	♂	Feb 24	Squirrel R.	1400	870	120	95	480	115	130	50x75	85	33x19	calf	*
OL 67	♂	Feb 24	Squirrel R.	1840	1140	165	120	560	150	175	70x103	187	48x26	-	*
OL 68	♀	Feb 24	Squirrel R.	1560	1050	135	115	520	135	155	75x95	144	-	-	*
OL 69	♂	Feb 9	Squirrel R.	1295	740	115	115	480	110	140	64x70	-	32x16	calf	
HK 115	♀	Nov 9	Kissimilouk Cr.	1450	-	-	-	525	-	-	-	-	-	-	
HK 120	♀	Dec 14	Kissimilouk Cr.	1700	-	-	-	515	-	-	-	-	-	-	
HK 121	♀	Dec 14	Kissimilouk Cr.	1345	-	-	-	475	-	-	-	-	-	-	
HK 122	♀	Dec 16	Kissimilouk Cr.	1675	-	-	-	515	-	-	-	-	-	-	
HK 123	♀	Dec 16	Kissimilouk Cr.	1640	-	-	-	520	-	-	-	-	-	-	
HK 128	♀	Jan 13	Kissimilouk Cr.	1220	-	-	-	455	-	-	-	-	-	-	
HK 129	♀	Jan 13	Kissimilouk Cr.	1550	-	-	-	540	-	-	-	-	-	-	
HK 131	♀	Jan 27	Kissimilouk Cr.	1600	-	-	-	510	-	-	-	-	-	-	
HK 132	♂	Jan 27	Kissimilouk Cr.	1270	-	-	-	455	-	-	-	-	-	-	

TABLE 6. (CONTINUED)

Number	Sex	Date	Location	Measurements in millimeters or pounds										Notes
				Total Length	Fore-leg	Tail	Ear	Hind-foot	Eye-Ear	Eye-Mouth	Hoof	Total Weight	Testes	
HK 134	♀	Feb 14	Kissimilouk Cr.	1675	-	-	-	510	-	-	-	-	-	-
HK 136	♀	Feb 14	Kissimilouk Cr.	1550	-	-	-	520	-	-	-	-	-	-

*Materials from these specimens shipped to Hanford Laboratory for analysis.

Figure 8. The weight of male caribou calves from May to March in northwestern Alaska.

eyeballs, front hoofs, and reproductive organs have been saved from all specimens collected by ~~Lønø~~. Material from 60 caribou specimens have been shipped to General Electric's Hanford Laboratory for radioanalysis.

~~Lønø~~ added three measurements to those formerly taken: eye-ear, eye-mouth, and hoof. The eye-ear measurement is the distance from the notch of the ear to the front corner of the eye. The eye-mouth measurement is the distance from the front corner of the eye to the corner of the mouth. The hoof measurements are of the width and the length of the front hoof.

Except for the materials sent to the Hanford Laboratories and the hoofs which are currently in Dr. Pruitt's possession, all specimens are in the University of Alaska collections.

Summary and current status of collections

During the course of this investigation a total of 184 caribou were collected by the various field workers. Materials from 74 of these caribou have been shipped to General Electric's Hanford Laboratory, Richland Washington, for radioisotope analysis.

Standard measurements have been made on most of the specimens and these are recorded in this and previous progress reports. Total weights have been obtained for 59 of the specimens. Skulls of most of the specimens have been saved and are presently deposited at the University of Alaska Museum. There now appears to be adequate materials for a taxonomic investigation of the northwestern Alaska population. Such an investigation would be of particular interest in view of the recent taxonomic monograph on the species by Banfield (1961), whose conclusions regarding Alaskan populations are far from being decisive:

The identification of the caribou populations in Alaska and in the Yukon district has been the most difficult problem in the present investigation. . . . Since the only statistically valid Alaskan race is granti of the Alaskan peninsula, one is faced with the possible choice of referring to all central and northern Alaskan population as granti intergrades.

During the latter part of the field work eye lenses were collected and preserved in formalin for possible use as indicators of age. To date, lenses from 99 specimens have been dried and weighed using approximately the same techniques developed by Lord (1959), but the analysis of the data is not yet completed.

Approximately 2,000 caribou mandibles have been obtained by purchase and collection. Lent is presently examining these jaws, working on techniques for aging caribou.

First attempts to age the jaws by measurement of lingual crest of molars and premolars has led Lent to the conclusion that this method is not practical. The most promising means of aging is based upon the occurrence of concentric rings in the cementum of the teeth. It is believed that these rings are of an annual nature in the caribou, as has been demonstrated in other species of mammals. The annual nature of the rings is probably due to a change in the density of cement deposition occurring in the fall of the year. A small number of lower jaws from reindeer of known age have been received on loan from Dr. I. McT. Cowan of the University of British Columbia, and it is hoped that a study of these known-age specimens will confirm the annual ring hypothesis.

Lent spent much time this winter in developing a suitable technique for examining the cementum of the teeth. The best method appears to be the preparation of cross-sections through the root of the first incisor. Cross-sections are cut on a Nichlas bone and tooth cutting machine, the use of which has kindly been permitted by Dr. K. A. MacMurchy of the Department of Oral Pathology, University of Alberta. With this saw it is possible to make sections as thin as 6 microns without any additional grinding; staining with iron hematoxylin accentuates the rings in the cementum. To date, about 50 slides have been prepared and examined.

Dr. William A. Fuller of the Zoology Department, University of Alberta, will examine the caribou mandibles and attempt to age them according to tooth wear by a technique based upon the patterns on the upper surfaces of the molars.

Analyses of the content of caribou rumen samples collected during the study were interrupted in 1961-62. A continuation of these analyses in 1962, however, is planned. Approximately 60 rumen samples are available for analysis. To date, eighteen of these samples have been separated into 12 sub-samples each, based on particle sizes; and these samples and sub-samples are now ready for identification of contents.

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