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Kelsall, John P.

Barren-ground caribou research program
October 1, 1957 to March 31, 1958. Ottawa,
1958.

20~~2~~ maps.

(Barren-ground caribou cooperative in-
vestigation 1957-58 Report 3).

1. Caribou. 1 Title.

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**THE
BARREN-GROUND
CARIBOU**

COOPERATIVE INVESTIGATION 1957-58

REPORT NO THREE

CANADA

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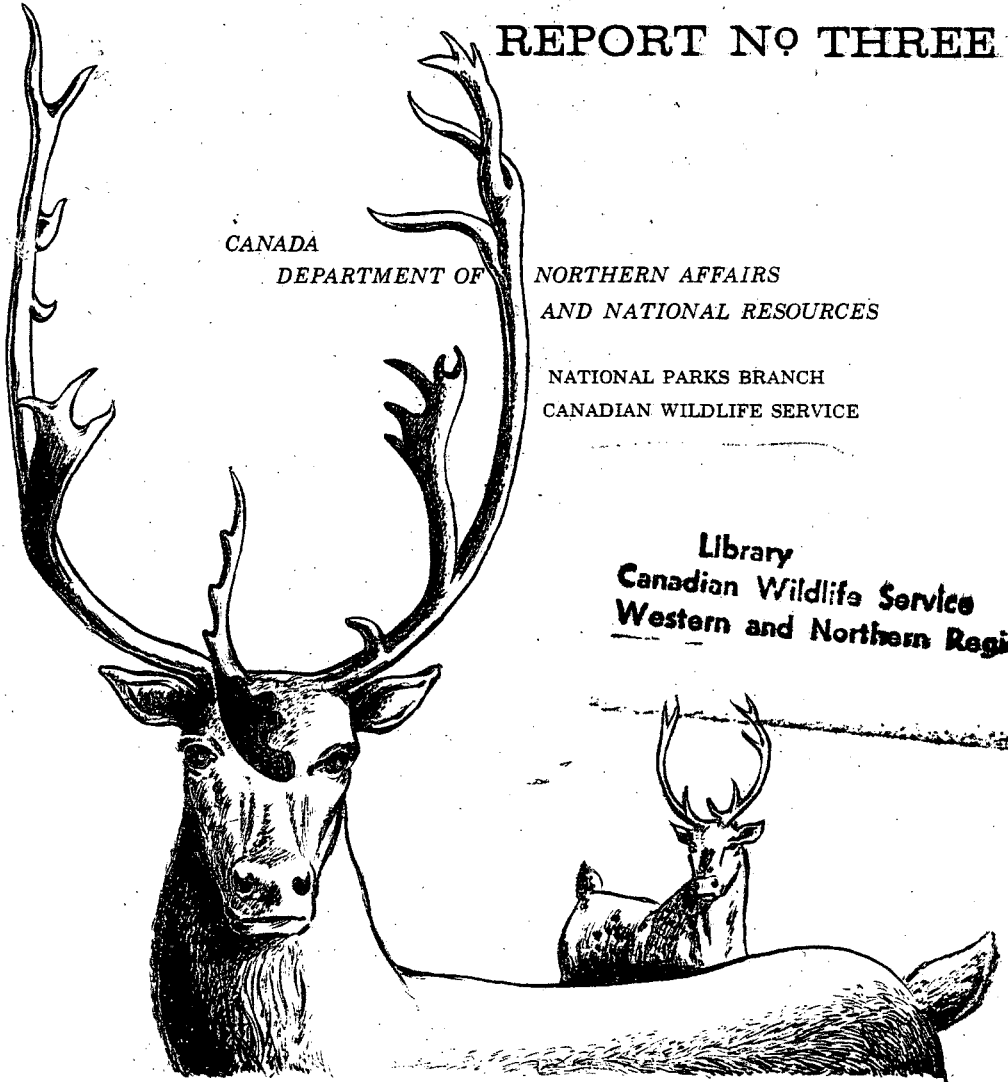


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4-58

BARREN-GROUND CARIBOU RESEARCH PROGRAM

October 1, 1957 to March 31, 1958

Report No. 3

by John P. Kelsall

Introduction

This report, the third on the barren-ground caribou research program, brings the information up to March 31, 1958. Some data which are lacking for the period after the middle of January, will be included in the next report.

From December to the end of March the field load was carried almost entirely by Dr. W.O. Pruitt and Messrs. Kuyt, Terry and Thomas. A great deal of credit is due these four men who have had to work harder, and for much longer periods in the field than originally planned. Though unfortunate, this has been unavoidable because of changes and transfers of personnel within the Canadian Wildlife Service.

Itinerary

Previous itineraries have given precise details regarding travel. As literally hundreds of flights are involved in the present itinerary, such detail does not seem justified or useful, and it is much condensed. Camps mentioned in the text are shown by number on Map 2.

At the end of September, E.H. McEwen and D. Thomas were at Camp 12. On October 7 they were joined by a Saskatchewan Information Service photographer, Alan Hill, who remained with the field men until early November. On October 9, E. Kuyt returned to the field and McEwen to Yellowknife, leaving shortly thereafter for Ottawa. F.W. Terry rejoined the field party on October 12.

In mid-October, with freeze-up imminent, the field party was moved to Camp 13 at Atkinson Lake. At that time ice was forming so rapidly that it had covered the area in front of the camp since the previous flight, and the aircraft had to break ice to land. Terry and Kuyt were left at Camp 13 for freeze-up.

In late October, Thomas undertook extensive survey flying from Uranium City in order to search out and segregate the southward-moving caribou during the rut.

On November 5, a wheel-equipped aircraft was able to land at Camp 13 and the men and equipment were moved to Stony Rapids. Camp 14 was established by canoe a few miles from the latter point on the Fond du Lac River. On November 9, the field men were visited by the author, and by Andrew Macpherson who remained at the camp to collect caribou specimens for the National Museum. In late November, with the assistance of Thomas and the author, all necessary field equipment, including the camp on the Fond du Lac River, was moved to Stony Rapids. During that period ice remained unsafe for aircraft landing south of Stony Rapids. By November 28 freeze-up was complete. On that date, Kuyt and his pilot, in searching for a new campsite, crashed in their aircraft some 50 miles south of Stony Rapids. The aircraft was a total loss, the second such occurrence during the present research program. The men were able to contact a passing aircraft by radio and were returned unharmed to Stony Rapids on November 29.

Camp No. 15 was established on December 1 by Kuyt, Thomas, and Dr. H.C. Gibbs who had joined the group for a brief period. In early December the field men were visited by the author and the newly-appointed Chief Mammalogist, W.E. Stevens. Gibbs returned to Ottawa at about that time and Pruitt, who had recently arrived at Stony Rapids, commenced field work in the west. Between early December and March 31, the basic field crew was made up of Pruitt, Kuyt, Terry, and Thomas. They were visited occasionally by Saskatchewan Conservation Officer, "Red" Taylor, who was cooperating in some phases of the work, by W. W. Mair, Chief, Canadian Wildlife Service, by J.A. Mills, Range Management Officer, and by the author. Camp 15 was maintained until near the end of January when a move was made to Camp 16 by dog team and aircraft. This camp in turn was occupied until February 16 when the field crew moved to Camp 17 for work on a group of caribou wintering south of Uranium City.

The field men were as active as weather permitted during the whole period to March 31. A large amount of flying was done from the field camps, particularly by Pruitt, during the course of snow studies, and by Kuyt during vegetation-mapping work. Two dog teams were kept at the field camp at all times and were in use almost

daily. Additional travelling was done for a number of purposes, including the gathering of camp supplies, securing fish for dog food, and periodic checking of the movements and distribution of the study herds. Kuyt visited Yellowknife briefly in February to plan a cover-mapping project, and in March Thomas came to Yellowknife to do segregation work on two caribou herds. Mills joined the field crews toward the end of March.

It must be mentioned that during the period September 26 to November 28, a second crew was gathering data in northern Manitoba. Their research camp at Duck Lake, was staffed by Pruitt and his assistant Jim Spence of Churchill. The camp was established by airlift from Churchill and a Cessna aircraft remained there until October 15 when freeze-up forced it to leave.

On November 4, the Cessna aircraft returned to the camp on skis; but adverse weather subsequently limited its value. On November 14, Spence and his dog team returned to Churchill, and on November 22 Pruitt flew to Churchill to arrange transportation to Stony Rapids. He returned to Duck Lake with a Norseman aircraft and on November 28 the entire camp was moved to Stony Rapids.

The Study Herd

Movements and Distribution

The dates of all caribou movements during the freeze-up period, which extended from October 15 to late November, are not known. However, the movement and distribution of the study herd until early January can be given with confidence. That movement is illustrated on Map 1.

In late September the animals were widely distributed north of tree-line between the Dubawnt River and Artillery Lake. Northwest of Artillery Lake a considerable part of the study herd was concentrated and among this group the research camps were maintained. By the first week in October migration was much in evidence at Camp 12 on the Lockhart River. The animals were coming from the northeast and following the west shore of Artillery Lake to the Lockhart River. Their movements were obstructed there by the swift water of the Lockhart, and although some caribou swam the river near the camp, many of them followed the river westward before crossing.

It is likely some did not cross but turned northward. On October 7 it was apparent that movement was widespread and, where not impeded by topography, was mostly in a southwesterly direction. On that date numerous caribou were seen moving southwest, and large numbers were piling up along the still open Taltson River between Rennie Lake and Gray Lake. Major elements of the study herd continued to move southwest on a narrowing front throughout October until by October 25 large numbers of them were only about 40 miles north of Uranium City. Camp 13 had been established in the expectation that it would lie directly on a major line of movement and that animals could be observed from that point through the freeze-up period. However, they by-passed the camp to the north and west and only minor numbers followed Atkinson Lake and the Dubawnt River.

By early November most of the herds moving southwest had split into two groups, possibly because the open water of Tazin Lake lay in their path. The larger of the two groups swung south to Lake Athabasca and then proceeded rapidly eastward following the shore of the unfrozen lake. By November 7 the leading elements of that herd had reached the Fond du Lac River a few miles west of Stony Rapids, and were crossing there on the new ice. By November 20 most of them were across and had proceeded southward to the general area where Camp 15 was established later.

Animals diverted to the west of Tazin Lake wandered during the next two months in the triangle formed by the Slave River, the north shore of Lake Athabasca and the Northwest Territories boundary. Some of them remained for the winter in the area south of Tazin Lake, but most followed the shore of Lake Athabasca nearly to Fort Chipewyan and then circled north, east, and south until they were once more on the lake shore not far west of Camsell Portage. From there many of them made repeated attempts to cross Lake Athabasca, which was still partly open. Several reports were received of caribou far out on the new ice near open water, or returning to shore. Shortly after the lake froze over in mid-December the animals succeeded in crossing to the vicinity of Jackfish River.

The winter ranges of the groups of caribou described above are shown on Map 2. A fourth group is shown separately to the north and east of the others. It is not known how it arrived there though it seems possible

that it either moved northward from the Cree River area or arrived from the north as a separate unit. In any event no more than a few thousand animals were involved. Other small herds remained north of Lake Athabasca and Black Lake.

While most units of the original study herd acted as above described, there was some additional splitting off from the main herd as shown on Map 1. It is assumed that less than half the caribou concentrated west of Artillery Lake in September ultimately moved southward into Saskatchewan. One group travelled north of Clinton-Golden and Aylmer Lakes and proceeded to Contwoyto Lake. Several thousand animals were involved in this movement and they wintered between Contwoyto and Yamba Lakes. A second very large group moved westward north of McKay Lake and spent November and half of December near Matthews Lake.

Subsequently this group travelled to the vicinity of Indian Mountain Lake and then split (as shown on Map 1), with the majority moving to the west.

The animals which moved eastward from Indian Mountain Lake have wandered little and, at the time of writing, are still wintering in thinly scattered groups north of the east arm of Great Slave Lake. The other animals, which moved in a westerly direction, continued to be remarkably mobile and their wintering area is nearly impossible to designate. They approached Yellowknife and Gros Cap briefly and then quickly withdrew. By mid-February all of them were moving northeasterly, and while many were still within tree-line, the majority had moved out to the barrens in the vicinity of Aylmer and McKay Lakes. By the end of March only a few thousand of them remained within tree-line. As discussed below, it is thought that that group was joined at some time during the winter by an entirely different group moving in from the north.

Another group, among the last to migrate in the autumn, followed the Snowdrift River and Nonacho Lake to the westward of the main body. By November 7 they were moving west in the vicinity of Gagnon Lake and by January they had passed Rutledge Lake and taken up winter quarters in the area shown on Map 2.

The movements described above resulted in a number of widely separated groups of caribou. There seems little possibility that they will return to a common rendezvous on the barrens in spring. The group south of Contwoyto Lake is over 500 miles from the group south of Stony Rapids. The northernmost animals are wintering on the barren-grounds and the southernmost are deep within the northern coniferous forest.

From survey flying and from other reports throughout the winter it was thought earlier that most of the study herd was wintering in northern Saskatchewan. Observations after mid-February, however, indicated that a very large herd is wintering north of Great Slave Lake.

It seems certain that portions of the study herd north of Great Slave Lake were increased in number during the winter by bands moving in from the north and west. It is known that during December caribou joined the study herd near Indian Mountain Lake, having arrived there via Matthews and McKay Lakes. There may now be as many as 60,000 animals north of Great Slave Lake, a number in excess of that known to have moved into the area from the study herd. North of Great Slave Lake it was possible late in March to see more than 1,000 caribou in a group, whereas in northern Saskatchewan individual groups of over 100 were rarely seen.

Recent investigations have thrown grave doubt on the concept once held that caribou are distributed in discrete herds which retain their identity over long periods. In the spring of 1957 the animals followed to the barrens by the research parties could have been considered a unit. For convenience we continue to use the term "study herd". However, during the autumn and early winter migration, the herd has so split up that it might now be considered eight or more separate wintering herds.

It was stated in an earlier report that large numbers of caribou that wintered in Manitoba and Keewatin in 1955-56 were in northern Saskatchewan in 1956-57. From reports of few caribou wintering in Manitoba, and from the unusual failure of the autumn migration of the Duck Lake herd (see below), it is believed that a further shift in the population has occurred. Quite possibly the present "study herd" in Saskatchewan includes animals which were far eastward last year.

A field camp was maintained at Duck Lake, Manitoba, during the rutting period because past observations had indicated that that point offered possibilities for consistent ground observation. As a result of the excellence of caribou movements through Duck Lake in autumn and early winter there had for many years been a Chipewyan Indian settlement at that point. The former site of this settlement was thought to be an excellent site for our ground party but that did not prove to be the case.

Caribou movements through Duck Lake in 1956 were smaller in number than usual, and in 1957 reports indicated that the movements were almost negligible. Caribou migrated along the west shore of Duck Lake in scattered numbers between September 18 and 22; and small groups moved along the west side of Nejanilini Lake, just north of Duck Lake, on October 4 and 5. After late September the ground party might have lost contact with the caribou completely had they not had an aircraft based with them. Though extensive flying was done, the caribou seen numbered only in the hundreds, and the largest single group seen up to mid-October numbered only 60.

In November most caribou which passed through Duck Lake and adjacent areas were believed to have moved south and west. They wintered in considerable numbers in the vicinity of Egenolf Lake and toward spring moved still farther west to the vicinity of Misty Lake. Indications are that once more there are fewer caribou in Manitoba than previously, as has been the case each winter since 1955. There is every indication that mainland caribou populations in general are shifting westward in a reverse movement to that described by Kelsall in 1955.

The Rutting Period

Quantitative and qualitative observations during the rutting period were planned as an important part of the autumn and early winter activities of the field men. Because of the transportation limitations imposed by freeze-up, which coincides with the rut, we were not as fortunate as hoped. McEwen and Thomas were able to gather excellent material until October 9 but after that date the caribou were absent from the Lockhart River camp site and were not seen in the anticipated numbers at the subsequent Atkinson Lake camp site. Pruitt's party at Duck Lake in Manitoba also had very limited success.

It appears that the rut in 1957 was prolonged; manifestations of it were observed during more than a month. McEwen noted the first sparring between bulls as early as September 22 and Pruitt saw sparring at Duck Lake on September 27. At the other extreme, on November 9, during a flight between Fort Smith and Stony Rapids, three pairs of fully adult bulls were seen sparring aggressively, and one pair was so engrossed in that activity that neither animal was disturbed by the low-flying aircraft. At the same time in November some of the adult bulls already were shedding their antlers. In 1948 Lawrie first observed sparring between bulls after the first week in October with the peak in sexual activity occurring the last week in October.

Because there were no observations but Lawrie's, the latter part of October has been considered the height of the breeding season since then. McEwen's observations at the Lockhart River in 1957, however, indicate considerable sexual activity and almost certainly some breeding much earlier in the month. The following is an edited and abbreviated summation of McEwen's observations during the period in question.

McEwen considered the pre-rutting period to be between August 28 and September 24 because he saw no notable exhibition of sexual activity then. During the first week of that period adult bulls moved in small bands or singly and fed in marshes and at lake edges, while the adult cows and other age classes seemed to prefer upland tundra. All the animals were fat and tended to pant rapidly after exertion. During the second week the bands became more wary and adult bulls were frequently associated with bands of cows. When alarmed, the adult bulls fled with the bands and showed little independence. On September 5 an adult bull in a group of four expressed "annoyance" at the observers' presence in a canoe by rearing on its hind legs and by pawing the ground with its forelegs. By September 10 aggressiveness between individuals of a band increased and in two instances a cow accompanied by a calf chased a yearling bull. Calves became more independent, and wandered so far from the cows that sometimes it was difficult to tell whether a calf was accompanying a cow.

During the third week of September, the wariness of bands was even more pronounced and individual animals were more aggressive towards each other. Two yearlings were observed sparring and two adult cows were seen

bunting each other. On September 22, in a band of 79, the first encounter was seen between an adult bull and a young bull. They moved together slowly and carefully and after locking antlers pushed each other back and forth, twisting their heads sideways. Lawrie's first comparable observation in 1948 was not made until October 12.

A second contest was noted between two adult bulls. One bull singled out another and lowered its head as a threat to fight. A typical display of strength ensued, lasting for 15 minutes. One of the bulls was pushed backwards 15 to 20 feet and then appeared to lose interest and walked away. Nearby, adult cows remained unconcerned with this activity. It is curious that prolonged combat was scarcely ever noted by Lawrie. Younger age classes observed by him displayed aggressive behaviour by sparring or chasing. Adult cows with calves showed little aggressiveness except in defence of their calves. During the period from September 26 to October 3, no display of sexual activity was observed.

McEwen considered the rut to have commenced about October 4. Adult bulls were frequently in combat and at least a dozen combats were observed at one time. The duration of the encounters varied considerably, from a few minutes to 15 or 20 minutes. Some bulls held head and neck out parallel to the ground, turning the head through about 90 degrees. This display was exhibited before fighting or when an adult cow passed. On October 3, Pruitt observed exactly this same type of "display" in an adult bull at Duck Lake. Though some of the bulls were feeding and resting, many were rushing about, chasing the cows, and sniffing the external genitalia of cows. The snorting of these bulls was very pronounced. In 1948 Lawrie did not note sexual excitement of this sort until October 17.

On October 5, the sexual activity of the bulls increased, with frequent battles, chases, and rubbing of antlers on spruce trees. Cows retreating from the rush of bulls excited other bulls. It was noticed that after a cow urinated an adult bull would sniff the urine and eat some of the urine-soaked snow. Instances were observed of adult bulls mounting cows, though it appeared that most cows were not yet in oestrus.

Weather conditions appear to have an important effect on caribou sexual activity. On October 5 and 6, the weather was sunny with light winds, and the caribou moved in leisurely manner, stopping to rest for long periods. On October 7, the weather was overcast and windy, and they moved rapidly and showed little sign of sexual activity. On October 8, only scattered bands of caribou, stragglers of the migration, were observed. No sexual activity was noted, except in a band of 100 caribou when at 17:30 hours, adult bulls were observed fighting and chasing cows.

Rutting activities recorded above seem to lead to the conclusion that the rut started earlier this year than usual. However, the rubbing and shedding of the antler velvet seemed to proceed as usual. In 1948 Lawrie recorded the first rubbed antlers on September 7 and noted that most bulls had bloody or polished antlers by September 20. This coincides almost exactly with observations made by Kelsall in 1952. In 1957 the first adult bull with rubbed antlers was observed on September 15 and by September 24 most of the adult bulls had polished antlers. That there is considerable variation in the progress of antler development and shedding is supported by the observation that while some adult bulls were shedding their antlers on November 7, others were still sexually active and sparring.

It is interesting to note that the first cow with rubbed antlers was observed on September 21, slightly later than the adult bulls, and by September 24 most of the adult cows were shedding the velvet. In 1948 Lawrie saw the first cow with shed velvet on September 18, but noted that shedding among cows was not widespread until October 24.

Reports of rutting activity observed by McEwen and Lawrie are remarkably similar, even though separated in time by nine years. McEwen's observations were made a little earlier in the year, but the same sorts of activity were noted by both. Curiously, neither observer thought he saw copulation taking place. In retrospect Lawrie concluded that copulation among caribou is a very fleeting act, as it is among blacktail deer and some other species, and, that it must have been seen but not recognized because of its brevity.

Statistical data on the age and sex composition of the study herd during the rut, and at other seasons, will be presented in a later report.

Population Increment

In report No. 2 the results of herd segregations in the early post-calving period were given and the calf crop was estimated to be 16.5 per cent of total animals. The result of subsequent segregations are given in Table 1, where it may be noted that the figures given vary unusually. Since 1950 one of the most remarkable things about calf crops every year has been their similarity throughout the whole of their range. A spread of more than two or three per cent in the proportion of calves in different herds has been thought unusual. Yet Table 1 shows a spread of almost 12 per cent among herds which used a common calving ground in the spring.

It is now reasonably certain that the caribou studied August 28 to October 8 west of Artillery Lake were atypical of the rest of the "study herd". As discussed in Report No. 2, most of them calved west of the herds under observation at that time. There is every evidence that they experienced better weather and that their calf survival rate was proportionally higher. This would help account for the calf percentage of 20.8 determined among 7,000 animals. Additional evidence of superior calving success is supplied by the ratio of calves to adult cows. In the western area there were 1,559 calves to 3,179 adult cows, or approximately 49 calves to 100 cows. Among the herds studied in northern Saskatchewan there were only 35 calves to 100 cows and among other wintering groups, the ratio appeared to be less than 20 calves to 100 cows. A year ago 79.4 per cent of adult cows were found to be pregnant, therefore, calf loss has approximated 38 per cent among those animals showing highest calf ratios, and 56 to 75 per cent among the rest.

Full segregation data are not available at the time of writing for the animals that wintered in Saskatchewan. The 17.6 per cent arrived at for one herd as a result of ground counts is indicative, but may be high. On the other hand the 11.9 per cent calculated from aerial counts is from too small a sample to be considered representative. However, from an analysis of immediate post-calving counts, and of movements during the following six months, the calf crop in Saskatchewan should have been under 16 per cent of total animals.

Segregations among animals which wintered just south of Great Slave Lake are shown as air and ground

counts in Table 1. The difference between the two counts is not great enough to be significant and it is estimated that calves in those herds make up about 13 per cent of total animals.

North of Great Slave Lake an air count and a ground count showed calf percentages of 9.1 per cent to 10.5 per cent. The first figure, determined from the air, is thought to be the more accurate of the two because segregations were made over the whole winter range. Ground segregations were made at specific points where calf ratios might tend to be a little higher than elsewhere. Map 2 shows that in March the animals involved were concentrated at the extreme northeastern end of the wintering area and in the south-central part of it. Calf ratios among the latter were probably high because cows accompanied by calves would move slowly and would not become involved in the February movement which took most of the animals northeast to the barrens. As a matter of interest Table 2 also shows the result of segregation counts among the large northeastern herd. During three counts there by two different observers, results were obtained that varied by only 0.1 per cent and the calf percentage was about 8.8 per cent.

It was mentioned above that the wintering group north of Great Slave Lake might include animals besides those of the original study herd. To verify this, census and segregation work was done on the other major western herd, found north of Great Bear Lake. The results indicate that the Great Bear Lake herd is greatly reduced from a year ago and that its calf ratio is only 10.8 per cent. As the caribou herd north of Great Slave Lake is an aggregation of several small groups, its ratio of calves to total animals should reflect similar statistics from those groups. It was found, however, that the combined calf percentage of 9.0 per cent was lower than that of any individual group. It is suggested that any one of several factors may be involved:

1. The groups that made the long trek from Great Bear Lake may have included fewer calves than the ones that remained behind, and the loss of calves en route during such an early winter movement may have been substantial.
2. Elements of the "study herd" have been remarkably mobile during the winter and such continuous travel may have contributed to a substantial calf loss.

3. Far more wolves were found with the combined herd than with other wintering groups. (Well over 300 wolves have been taken by predator control officers working in the area and yet Thomas saw 18 wolves among the herd while flying in late March). It is assumed that wolves take more calves than yearlings or adults because it is easier to do so.

The above discussion shows that it is practically impossible to present any increment figure for the study herd this year. The herd is split into many wintering groups with varying calf percentages, and we do not have census figures for all the separate groups. However, the true figure may be between 9.0 per cent, and 17.6 per cent. The figure must have decreased progressively between autumn and spring because of selective mortality against the younger age group. It is suggested that 13 per cent might be close to the actual figure. This is a better increment figure than usual in recent years, but it cannot be considered satisfactory in any sense of the word.

Predation

No wolves were observed during the period August 28 to October 15 from the field camps in the west, although animals and tracks were seen during the course of flying operations. Few wolf kills were seen, although one yearling caribou with a bloody face and neck, seen October 5, had presumably been attacked by wolves. The absence of wolf observations during that period is unusual, as the field men were almost constantly within sight of caribou, and at times a great many were near by. It is all the more peculiar, considering the success in poisoning wolves during December, January, February and March by two predator control men operating only a few miles north of the camp sites. Wolves might be less readily observable because the camps were among scattered spruce during the period in question, but no wolf observations whatever is thought unusual.

Later, during the three weeks spent well inside coniferous forest at Atkinson Lake, wolf tracks were seen and a single wolf on one occasion. Wolves and their tracks were observed infrequently near the various field camps in northern Saskatchewan. It is not surprising that they might go unnoticed, because of the thickness of the forest cover, but a scarcity of tracks and an absence of dead wolves at poison baits set by Saskatchewan Conservation

Officers indicate a relatively light population. A few notes of interest have been submitted by the field crews.

On the night of November 18 at Camp 14, a wolf raided one of Macpherson's rabbit snares, taking out a snowshoe hare and leaving an abundance of tracks. On December 5 a freshly-killed caribou calf was discovered near Camp 15, and on December 12 Kuyt and Fruitt watched a wolf feeding on the remains of the same calf. During the period the wolf was watched (about 20 minutes) it was harassed by ravens while feeding and once interrupted its feeding to chase a raven. On a number of occasions wolves were heard howling near the camps in northern Saskatchewan.

A total of 12 wolves was seen during the period September 26 to November 28 from the Duck Lake camp, or while flying from there. On October 26 Spence and Fruitt found the remains of a female caribou partly eaten by wolves, foxes, and ravens. Careful examination of the carcass revealed it to be bullet-killed - presumably one that was wounded and escaped from the same men on October 20.

Near that carcass, on October 25, the men succeeded in stalking to within 100 feet of a grey wolf and a white wolf sleeping on a hillside. Fruitt's observations are quoted below.

"The wolves were on the east slope of a north-south ridge. The wind was west and we approached from the south. The wolves finally saw us, but because we were crouched low in the snow they could not identify us. They moved southeast at a walk, the white one in the lead, watching us all the while. When the white one arrived downwind from us and got our scent she recoiled and jumped as if stung, turned and ran east (downwind) for about 50 yards and then ran south. The grey one continued to walk southeast until he too reached our scent path, when he too jumped and recoiled and followed the white one. The interesting point of these observations is that the grey wolf did not respond to the white wolf's jump; or the white wolf's jump presented no unusual signs or characteristics. When the white wolf caught our scent and bolted I had anticipated the grey one's receiving some sort of sign stimulus from her actions, but apparently this was not the case".

Accidents

It has been described above how large numbers of caribou migrated south in October and early November and, splitting east and west, moved along the north shore of Lake Athabasca. At that time the lake was freezing. Shore-to-shore ice first formed eastward from Fond du Lac. The caribou, apparently determined to move south, commenced crossing the ice whenever it seemed sufficiently strong. Observations, largely from the air, indicated that many of them were crossing on ice only one inch thick, ice which certainly could not support the weight of a man. Crossing on such ice, they moved with unusual deliberation; even the presence of aircraft flying overhead seldom sped them beyond a slow walk.

On November 7, during a flight from Stony Rapids to Uranium City, four caribou were observed frozen into new ice, apparently having broken through and unable to climb back. Several other incidents of caribou breaking through the ice occurred while the field crew were camped on the Fond du Lac River.

On November 9 the author flew between Uranium City and Stony Rapids. On that date ice had newly formed in Pine Channel of the Fond du Lac River. Hundreds of caribou had crossed the channel, and more than two dozen holes were evident in the ice where animals had gone through. It was apparent that many of them had managed to save themselves, although 12 drowned ones were seen floating in holes in the ice. Two live animals were caught in the same hole; one was thrashing about wildly in an effort to save itself, and the second was standing belly deep in water while attempting to walk up the sloping ice to the firmer surface beyond the hole.

The above observations are the first field crews have made of caribou going through newly-formed ice, although reports of such incidents have been received in the past. Because the weather was very cold when the observations were made the ice probably remained unsafe only eight to twelve hours. Later, Indians and bush pilots reported that large numbers of caribou had attempted to cross the main part of Lake Athabasca before freeze-up was complete, and were seen standing on very thin ice at the edge of open water miles from land. The opportunities for accidents to occur must have been many, as even a light off-shore wind might break off sheets of newly-formed ice on which caribou were standing.

Parasites and Disease

No diseases that could be considered epizootic have so far been found in the caribou. In general they appear to be remarkably healthy. Up to April 15, 39 serum samples from 16 males and 23 females had been examined serologically for evidence of brucellosis and leptospirosis. One sample gave a questionable positive reaction for brucellosis but this might have been due to haemolysis. The others were uniformly negative.

Blood smears have been collected from all animals killed and examined for evidence of protozoa. The results have all been negative.

Autopsies and examinations for parasites have continued and a full report on the findings will be made at the end of the survey. A few of the findings are given below but none is considered sufficiently severe to cause concern:

Verminous bronchitis - a few light infections of lungworms have been seen.

Hydatid cysts in lungs - infrequent.

Cysticercosis in the muscles and liver - one of the most prevalent conditions but of little significance pathologically.

One case of a probable anaemia due to biting flies - that condition could be important during the height of the fly season.

A number of cases of foot rot resulting in lameness have been seen but it is difficult to assess the importance of that condition.

Human Utilization

Quantitative data concerning human utilization during the period October 1 to March 31 will take considerable time to compile, but should be available for the next report.

Until the caribou reached northern Saskatchewan in November, human utilization was very light. Perhaps 250 caribou were taken throughout the winter by four

barren-ground trappers operating as predator control officers and by Eskimos living with two of them. During the same period the kill elsewhere in the Northwest Territories has remained light because the caribou have kept far from settlements. At present it appears that not more than 500 from the "study herd" have been taken by Indians in the Northwest Territories.

It may be difficult to assess accurately the human utilization in Saskatchewan during the winter even though the Saskatchewan Government imposed legislation limiting the take to two caribou per person. Unquestionably the two-animal limit served to keep down the number of animals killed, but undoubtedly many persons exceeded their limit for one reason or another and will be loath to report the additional caribou taken. Effective enforcement of such a regulation calls for hunter co-operation on an unprecedented scale and it is far from certain that that co-operation will be received immediately. A full report on human utilization in Saskatchewan is expected later.

Work in Progress or Planned

Reproductive Study

An important aspect of the current study is that dealing with caribou behaviour and activity during the rutting and calving periods. Field observations are being correlated with a laboratory study of caribou reproduction. Male and female reproductive organs are being collected for histological examination, and to that end 16 males and 24 females have been taken since mid-September. The material is being supplemented to some extent by organs collected from hunters' kills and from caribou killed for use in predator control programs. Every opportunity is being taken to examine female caribou to determine whether or not they are pregnant. Up to the time of writing, 17 examinations have been reported and 10 of the animals examined were pregnant. This pregnancy ratio is lower than found during any previous winter, but is derived from too small a sample to be reliable.

Marking Program

Our program of marking caribou has been plagued with misfortune of one type or another. Field work to test drugging techniques was suspended during the winter

months because of the difficulty of handling liquid drugs and delivering missiles accurately in extremely cold weather.

Early in the winter an alternative scheme for capturing and marking animals was attempted. It was planned, if suitable concentrations of caribou were found, to construct corrals of snow fencing and burlap, and, to employ drift fences of spruce trees to guide animals into the corrals. With that in mind, necessary materials were gathered at the field camps in northern Saskatchewan. Caribou were not present in good concentrations, but nevertheless sections of corral and drift fences were constructed for test purposes. To date these have not been successful. It has been found that the caribou avoid the corrals simply by escaping through the spruce drift fencing. The idea is still believed to have real promise and to be practical during migration in the spring of the year when caribou are less wary and are travelling in compact bands. Because the staff is small and no suitable movements of caribou may be found, it is doubtful whether we shall be able to mount a full-scale capturing operation.

Range Studies

The winter range occupied by caribou in northern Saskatchewan has been surveyed intensively from aircraft by Kuyt, who has plotted large recent forest fires on maps and aged the burns by counting tree rings.

Some qualitative observations have been made on the winter feeding habits of the caribou under study. Feeding craters in certain types of forest have been examined and marked with coloured dyes, to be studied in detail after the snow melts. The feeding craters so marked will be incorporated into study plots for long-term grazing study. Samples of vegetation consumed by caribou during the winter have been collected for identification and chemical analysis.

Future work planned for the winter range area includes the establishment of permanent exclosure plots on areas grazed by caribou during the winter of 1957-58. Permanent line transects will be established inside and outside the exclosures to measure the effect of grazing and the rate of growth of the ground vegetation.

Other exclosure plots and line transects will be set out in various areas of post-fire vegetation to determine the ecological development following fire. This will include exact counts of all lichens, herbs, shrubs, and trees appearing from spores, seed, or rhizome origin, and measurement of the height and aerial density of each species.

Investigations of the effect of fires on forest soil will be undertaken at the same time. Burned and unburned soil from each tree-association soil type will be chemically analyzed, and the results compared for possible changes following burning.

The range studies outlined must necessarily be long-term projects and continue after the present caribou research program has ended. Only through such a continuing research will the effects of fire on the caribou winter range be fully understood.

Snow Studies

Preliminary studies of snow conditions in areas occupied by caribou have been interesting though the results cannot be considered conclusive as yet. Generally, these areas are characterized by shallower and softer snow. Evidently, wintering caribou avoid deep or hard snow or areas where there are ice layers within the snow cover. Measurements of snow conditions and their effect on caribou distribution are being continued and a final report will be prepared in due course.

TABLE 1

Calf Percentages August 28, 1957, to April 1, 1958.

Date	Group	Type Segregation	Total Calves Segre- gated	Seg- regated	Per Cent Calves
Aug.28-Oct.8	Artillery L.	Ground	7,482	1,559	20.8
Nov. 6-Dec.20	Saskatchewan	Ground	2,706	475	17.6
Dec. 1-Jan.3	Saskatchewan	Air	193	23	11.9
Feb. 6-Apr.1	N.Great Slave	Air	3,881	352	9.1
Mar.16-Apr.1	N.Great Slave	Ground	2,390	251	10.5
Feb. 6-Mar.21	S.Great Slave	Air	884	115	13.0
March 21	S.Great Slave	Ground	116	15	12.8
March 28	Great Bear L.	Air	697	75	10.8

TABLE 2

Results of Three Segregations by Two Observers
Among the Northeasternmost Animals North
of Great Slave Lake.

Date	Type Segregation	Total Segregated	Calves Segregated	Percent Calves
Feb.6-Mar.6	Air	1,090	95	8.7
Mar. 16-19	Air	2,029	178	8.8
Mar. 16-19	Ground	1,631	143	8.8

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