

Group Cohesion and Leadership Response by Barren-Ground Caribou to Man-Made Barriers

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ABSTRACT. Barren-ground caribou *Rangifer tarandus groenlandicus* of the Kaminuriak population on the Canadian mainland west of Hudson Bay make annual migrations of several hundred kilometres to and from their calving ground. A man-made barrier to corral caribou for marking and release failed because caribou would not leave the frozen water course at the entrance to the corral, nor would they readily deviate from learned travel routes. Some caribou delayed their migration northward until they found ways to circumvent the barrier. Other caribou overcame the man-made obstacle and continued on their set course. Any disruption of caribou movement could be detrimental to cow and calf survival because of increased dangers along new routes chosen and the delay of pregnant cows in reaching the calving grounds.

RÉSUMÉ. Cohésion de groupe et réaction de leadership à des barrières artificielles chez le Caribou de la toundra. Sur la terre ferme à l'Ouest de la mer d'Hudson, les caribous de la toundra *Rangifer tarandus groenlandicus* du groupe de Kaminuriak effectuent des migrations annuelles de plusieurs centaines de kilomètres pour se rendre à leurs terrains de mise bas et pour en revenir. Une tentative de réunir les caribous au moyen d'une barrière artificielle pour les marquer et ensuite les relâcher, a échoué parce que les bêtes refusèrent de quitter leur trajectoire sur la rivière gelée à l'entrée du corral, comme elles refusent de dévier de leur route apprise. Certains caribous retardèrent leur migration vers le Nord jusqu'à ce qu'ils aient découvert des façons de contourner la barrière. D'autres surmontèrent l'obstacle et continuèrent leur route. Tout changement dans le mouvement du troupeau peut mettre en danger la survie des femelles et des veaux par les dangers accrus le long des nouvelles routes choisies et à cause du retard encouru par les femelles pleines à se rendre sur leurs terrains de mise bas.

РЕЗЮМЕ. Влияние искусственных преград на миграции карibu тундрового. Карibu тундровые (*Rangifer tarandus groenlandicus*) обитающие в Канаде к западу от Гудзонова залива, совершают ежегодные миграции в несколько сот, километров к местам отёла. Искусственные преграды, устроенные для клеймовки карibu, не имели успеха, так как карibu отказывались оставить замёрзшее русло реки при входе в загон и охотно изменить привычный путь следования. Некоторые карibu приостанавливают продвижение в северном направлении до тех пор, пока не находят возможности обойти преграду, в то время как другие преодолевают искусственные препятствия и продолжают свой путь. Любое нарушение передвижения карibu может принести вред коровам и повлиять на выживаемость телят, так как на новых путях следования увеличивается число опасностей и требуется большее время для достижения мест отёла.

INTRODUCTION

Migratory barren-ground caribou may be endangered by changing land practices which accompany economic development of natural resources on their ranges.

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The greatest current threat to their social behaviour and annual movement patterns is the construction of pipelines for transporting petroleum. Little is known of the external stimuli and social forces which influence caribou migrations or of how these forces might be altered by environmental disturbances. This report is offered, therefore, to provide preliminary insight into the possible impact of man-made barriers on migrating caribou.

In May 1967 we attempted to corral barren-ground caribou of the Kaminuriak population as they migrated northward to their calving ground. These animals winter in northwestern Manitoba and northeastern Saskatchewan and their traditional calving ground is about 500 km. to the northeast in the District of Keewatin, Northwest Territories. The spring migration to the calving ground consists of discrete movements along learned travel routes. The corral site was next to a traditional spring migration route. The work was part of the Canadian Wildlife Service's Manitoba-Keewatin (1966-68) barren-ground caribou study.

The live capture of a large number of caribou for recording physical variables and marking for subsequent recapture or observation was one of the project objectives. A successful technique had been developed for capturing Kaminuriak caribou on water crossings during open water months (Miller and Robertson 1967).

We needed to develop a winter time technique for the live capture of Kaminuriak caribou. The permanent corral method was tested, but abandoned for the mobile technique of live capture by the use of tangle nets (Miller *et al.* 1971).

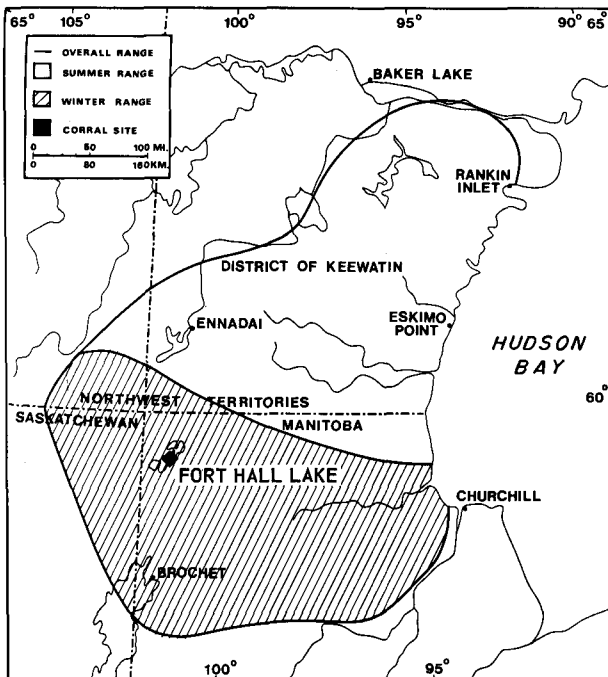


FIG. 1. Home range of the Kaminuriak population of barren-ground caribou and location of 1967 corral site in northwestern Manitoba.

STUDY AREA

The corral was on a spit of land that nearly cuts off the northern third of Fort Hall Lake (59°20'N., 101°18'W.) Figs. 1 and 2. Dominant tree species on the site are white spruce (*Picea glauca*) and black spruce (*P. mariana*) whereas the surrounding boreal forest is dominated by black spruce. The overstory is open, with scattered birches (*Betula* sp.), aspen and poplar (*Populus* sp.) mixed in the evergreen canopy. The understory is partly vegetated with *Ledum* sp. and *Vaccinium* sp.; the ground cover is composed mainly of mosses and lichens. The spit measures 330 m. on a north-south axis and protrudes 700 m. across the lake from the west shore. The narrows are only 110 m. wide at the head of the spit.

METHODS

The corral, 2.8 m. high, was made of horizontal spruce cross poles during April (Fig. 3). The lower 120 cm. of the corral was lined with 5-cm. welded square mesh wire. The entrance to the corral was about 5 m. wide. Barrier fences,

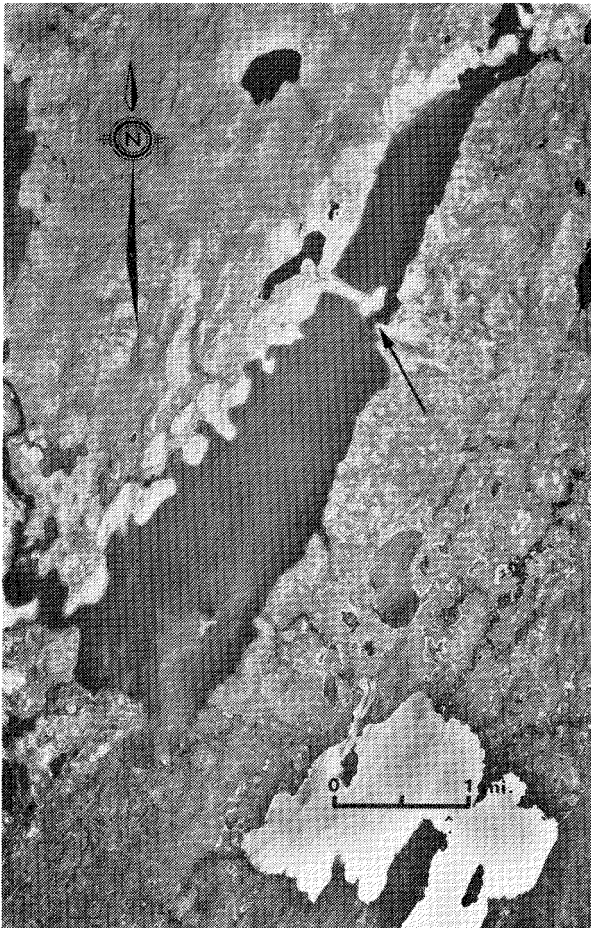


FIG. 2. Aerial photograph of Fort Hall Lake (59°20'N., 101°18'W.), northwestern Manitoba. Arrow indicates lake narrows and spit of land where corral was built.

2.2 m. high, of horizontal spruce cross poles (Fig. 3) were built across the narrows, along the east shore for 1.1 km. and along the west shore for 0.9 km. (Fig. 4). Wing-type drift fences (1 to 1.5 m. high) of cut spruce trees were extended end to end for several hundred metres on each side of the entrance to the corral to direct the caribou (Fig. 4). Snowmobile trails were laid down in a single line from the corral entrance 3 km. down the centre of the lake. Several lateral trails were constructed to guide caribou at any position on the lake to the hard packed main trail. A blind was built on the southeast point of the spit from where we could watch the migrating caribou and control the triggering device to close the corral gate.

When the set line was pulled it released a 100-pound weight of logs that was attached to a white spruce tree and suspended about 6 m. above the ground. The falling weight pulled a wire attached to the far end of the gate and swung it closed. The impact of the closing gate dislodged a locking bar positioned on the fence so that it dropped into place and kept the gate closed.

RESULTS

Caribou did not arrive on Fort Hall Lake until 7 May, when 2 groups of 4 came on the lake at 0610 (Fig. 5A) and at 0905 (Fig. 5B). Both groups followed the hard-packed snowmobile trails to the corral entrance.

The first group — 2 adult cows, 1 yearling, and 1 calf — stopped some 20 m. short of the corral entrance. The lead cow moved to within 3 m. of the entrance to investigate, while the other animals watched. She then crossed the drift fence and moved about 40 m. closer to the blind where she possibly detected our scent.



FIG. 3. A section of the corral fence showing the type of construction used for the corral and barrier fences.

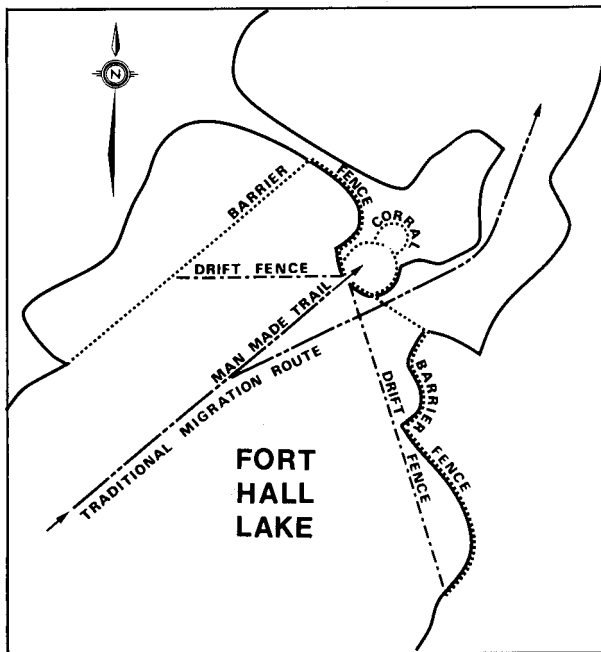


FIG. 4. A diagrammatic presentation of man-made obstacles to caribou migration at Fort Hall Lake, May 1967.

Turning abruptly, she rejoined the others, which were still in place, and then led them back the way they had come, and in the same order: lead cow, adult cow, calf and yearling.

The second group of 3 adult cows and 1 juvenile came on the main snowmobile trail to the corral entrance. They stopped for about 3 minutes some 3 m. in front of the entrance, seemingly testing their surroundings, then moved into the corral. At that point, we triggered the swinging gate, but the locking pole did not engage and the gate remained ajar. The caribou turned and left the corral at a brisk walk, continuing south until out-of-sight at the far end of the lake.

On 9 May, 8 caribou came onto the lake from the departure point of the 2 groups of 7 May (Fig. 5C). A hard surface on the lake snow, created by daytime thawing and nighttime freezing, supported the caribou and they did not appear to be attracted to the snowmobile trails. As the string of caribou travelled toward the narrows we saw that their composition was that of the 2 groups of 7 May. We assumed that they were the same animals that had approached 2 days before, as we had not seen any additional caribou in the area. The group stopped within 30 m. of the corral entrance. The lead cow walked to the west, made a tight circle around the group, then crossed the eastern drift fence and swung east paralleling the eastern barrier fence. Her group followed in a single file as they moved out of sight to the southwest whence they had come. This string of 8 either left the area by another route or were part of the group of 19 that traversed the lake on 11 May.

At 0800 on 11 May, a group of 11 adult cows and 8 juveniles came onto the lake from the south (Fig. 5D). At 0900 they were about 175 m. from the corral

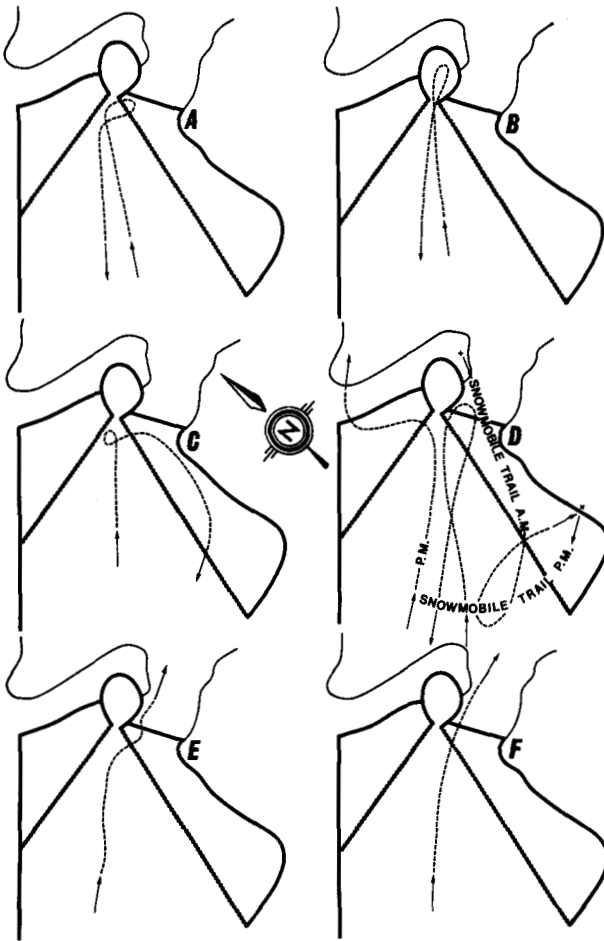


FIG. 5. Schematic presentation of caribou traversing Fort Hall Lake, May 1967: A) 4 caribou, 7 May; B) 4 caribou, 7 May; C) 8 caribou, 9 May; D) 19 caribou, 11 May; E) 5 caribou, 13 May; F) 7 caribou, 14 May.

entrance, not following the main snowmobile trail, but lined up with the west side of the narrows. The group stopped at the eastern drift fence. The lead cow advanced alone and crossed the fence. The entire group then followed her, one at a time. She approached the barrier fence in the narrows, at the point where the group of 8 had passed closest on 9 May. After sticking her nose between the poles, she crawled under the bottom cross piece (40 cm. gap) like a deer; the others followed suit. One observer snowshoed onto the lake. The lead cow saw him; she turned and, without hesitating, jumped between the top and second poles (38 cm. gap about 180 cm. above lake surface to top of lower bar), followed by the group. We attempted to overtake the caribou with our snowmobiles, but they outran us and returned to the south end of the lake. We positioned two snowmobiles in the bush on the east shore of the lake in case the group returned, or other caribou came onto the lake (Fig. 5D). About 1430, the caribou headed for the narrows (Fig. 5D). As they approached the eastern drift fence we outflanked them with the snowmobiles. The caribou bolted for the narrows, but the lead cow turned at the eastern drift fence, ran over the western drift fence, and jumped

the western barrier fence. In so doing, she broke the top pole (2.2 m. high) and the other animals leapt through the break that she had made. The group then crossed the isthmus to the spit and circled around the west side, before continuing north on the lake.

On 13 May, 5 caribou came onto the lake at about 0515 (Fig. 5E). The lead cow was followed by an antlerless cow and 3 bulls each with about 30 cm. of new antler growth. They came within 125 m. of the corral entrance, stopped and tested the surroundings, then veered east across the drift fence and stopped again. The lead cow turned and walked to the barrier fence in the narrows. After inspecting several metres of fence, she crawled under the bottom bar where the group of 19 had passed. The 4 other caribou walked directly to the crawl space and went under. The group then continued northward along the water course.

On 14 May, the last day of our operation, a group of 7 caribou, 5 adult cows and 2 juveniles, came onto the south end of the lake at 1035 (Fig. 5F). They were travelling slowly along the first trail taken by the 19 caribou on 11 May, the lead cow apparently lined up with the west side of the narrows. They unhesitatingly crossed the eastern drift fence. By 1150 they were within 30 m. of the barrier fence on the narrows. The lead cow walked directly to the crawl space, stopped and looked through the cross bars. She then crawled under, followed by the other 6. They then continued northward on the lake.

DISCUSSION

Several behavioural patterns were revealed during the week of caribou activity on Fort Hall Lake. The animals were persistent in their attempts to cross the Lake, even though man-made barriers and humans were present. This suggests that they were responding to learned behavioural patterns. All caribou groups made for the east of the spit through the narrows of Fort Hall Lake. Chipewyan Indians from Brochet, Manitoba, told us that this movement was traditional and that their people liked to wait at the narrows for caribou in spring.

The caribou were reluctant to enter the bush at the corral entrance, even though the main trail was laid down over an established autumn migration path. Although the caribou followed the snowmobile trails as if they were pre-established caribou trails, they apparently sensed danger when the main trail entered the bush at a point where caribou would normally continue along the water course.

Pruitt (1959) has discussed the importance of snow in regulating caribou distribution and movements. He has placed snow as the paramount environmental stimulus controlling the migrations of caribou and has even suggested that snow conditions are responsible for the discreteness of several "herds". We believe, however, that even though snow influences caribou movements, the principal migrational paths remain the most favourable routes of travel year after year due to existing physiographic features.

Regardless of where Kaminuriak caribou wintered between 1966 and 1968 they returned to their same calving ground (Parker in press). In 1970, 24 Kaminuriak caribou equipped with radio transmitters on their winter range all returned to their traditional calving ground (F. L. Miller, unpublished data). This strong

affinity for their calving ground suggests that the migrational paths are not only traditional but also learned.

Baskin (1970 p. 33) stated that it is doubtful that the structuring of the herds within populations is the result of adaptation to the environment. He believes that reindeer migrate along migratory paths that are familiar to the herds and that experience plays an important role in all migratory movements. The role of leadership and the need for only the relatively few caribou that are leaders knowing where to travel has been reported for U.S.S.R. *Rangifer* by Naumov and Baskin (1969) and Baskin (1970 pp. 64-75).

Disruption of behavioural patterns could cause serious physiological changes and upset the relationship of a species to its environment. As reviewed by Geist (1971), Zhigunov (1961) in his compilation of data on reindeer husbandry reported many detrimental effects to reindeer caused by harassment and disturbances. The best example of the value of socialization to the genus *Rangifer* has been reported by Espmark (1970). In recent years, Swedish reindeer ranchers have moved their reindeer from the summer to the winter ranges by truck, instead of walking them. This has resulted in abnormal numbers of reindeer staying on the winter range and not migrating in the spring. Espmark (1970) believes that the following is the most likely explanation: "When reindeer are gathered in autumn the herd is split into small groups which are loaded on trucks and transported to the winter range where they are released. When the whole herd is moved and released in a new area the previous social structure and organization is destroyed: mothers are separated from their calves, individuals belonging to different sub-groups are pushed together and so on. The reindeer will find themselves in social chaos."

Klein (1970) has summarized the influence of man-made obstructions and disturbances on reindeer in Scandinavia. He reported that highways, railroads, fences, hydro-electric developments, forestry, snow machines, and lichens affected by air pollution all have an impact on *Rangifer*. Geist (1971) has pointed out that little is known about the effects of disturbance on the biology of wild ungulates. But he concluded that available evidence supports the need for much more investigation of the subject.

When confronted with impassable barriers on their spring migrations caribou have two alternatives: 1) they can wait until environmental conditions allow them to bypass the barrier and resume on their course, and thus face a delay of up to several weeks; 2) they can deviate from their traditional course and attempt to navigate by an unknown route. Either choice may prove unfavourable for the individuals concerned. If the caribou linger until the packed snow in the surrounding bush will support them and allow them to pass around the barrier, they must accelerate their pace and use up more energy to arrive on the calving ground before the onset of parturition. If the barrier is extensive, they will have to seek a new route and probably will not reach the calving ground on time.

If the caribou immediately seek a new route that takes them into unfamiliar country, they may not arrive on the calving ground before parturition. Excitation may also cause deleterious effects (Geist 1971).

Caribou annually return to the same areas for calving. Selective forces favour

pregnant caribou reaching their calving area before parturition. We suggest that if parturient cows do not reach their desired calving areas they may suffer psychological stress. This stress may result in a greater rate of desertion of young at birth, especially if the animals continue to migrate rapidly. It may also cause a weak bond between cow and calf which could subsequently contribute to greater loss of calves. Furthermore, if the Kaminuriak caribou are forced to calve south of their traditional calving ground, they will be within the heartland of denning wolves on the west side of Hudson Bay. This could lead to a much greater loss of calves to wolves at a time when usually only non-breeding wolves prey on newborn caribou. Further behavioural studies are necessary to resolve such problems.

The migrational paths of caribou are traditional, and apparently learned by the animals when they associate with older members of their populations. For their well-being, animals require a high degree of familiarity with their surroundings. Caribou are therefore most vulnerable to unknown dangers while in migration.

Indians and Eskimos no longer hunt at the caribou water crossings; the hunters are being replaced by a true menace. Modern man is able and willing to alter the movements of caribou in his search for minerals, oil and water. His exploitation of the North unless rigidly controlled will almost certainly disrupt the orderly migration of the herds and could indirectly lead to excessive mortality of the species.

If we are to maintain caribou numbers, as a game resource or as a tourist attraction, we must better understand the behavioural forces behind caribou migrations. We must know how changes in their behaviour or environment affect survival and reproductive rates, and how these data relate to established principles of game management.

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