

CARIBOU AND THE TRANS-ALASKA PIPELINE:
A SUMMARY OF CURRENT KNOWLEDGE

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Since July 1974 the Alaska Department of Fish and Game has been studying the seasonal movements and behavior of caribou potentially affected by construction of the trans-Alaska oil pipeline. Approximate boundaries of the study area are the coast of the Beaufort Sea to the north, the crest of the Brooks Range to the south, and the Canning and Colville rivers to the east and west, respectively. The trans-Alaska pipeline and its associated haul road roughly bisect the study area (Fig. 1). Between Purdhoie Bay and Galbraith Lake Camp there are approximately 125 km of elevated pipe in four sections, representing 51% of the total pipe length on the arctic slope. Methods include regular aerial surveys of the region and systematic surveys along the pipeline haul road. This report summarizes the principal findings of Cameron and Whitten (1976) and those of Roby (unpublished).

The majority of caribou inhabiting the study area constitute the Central Arctic herd, estimated 5000 head, which is distinct from the larger Porcupine and Western Arctic herds to the east and west, respectively. Although there is some evidence for mixing of the three herds, calving areas and seasonal movements remain distinctly different. The summer range of the Central Arctic herd is primarily the arctic coastal plain which is dominated by wet sedge meadow. The majority of the herd winters on rolling terrain dominated by Eriophorum tussock tundra in the northern foothills of the Brooks Range. Thus, the herd spends its entire annual cycle on the arctic slope. Seasonal movements can be divided into four distinct phases. Northern spring movements commence in April and terminate on the coastal plain where calving takes place. Summer movements are mostly parallel to the arctic coast, initially to the east followed by a reversal to the west. Southward fall movements are in progress by late September and are nearly complete by rut in early October. During the winter, small groups wander throughout the foothills with no apparent directional trend.

In analyzing the movement behavior of caribou in the field, it is difficult to separate events which are under intrinsic control from those due to environmental stimuli. Thus, since rut occurs during or just subsequent to fall movements and calving occurs as the culmination of spring migration, it is likely that hormonal changes are in part responsible for these movements. By contrast, summer movements are regulated mostly by parasitic insects. During periods of severe mosquito attack, caribou on the coastal plain move northward into the prevailing

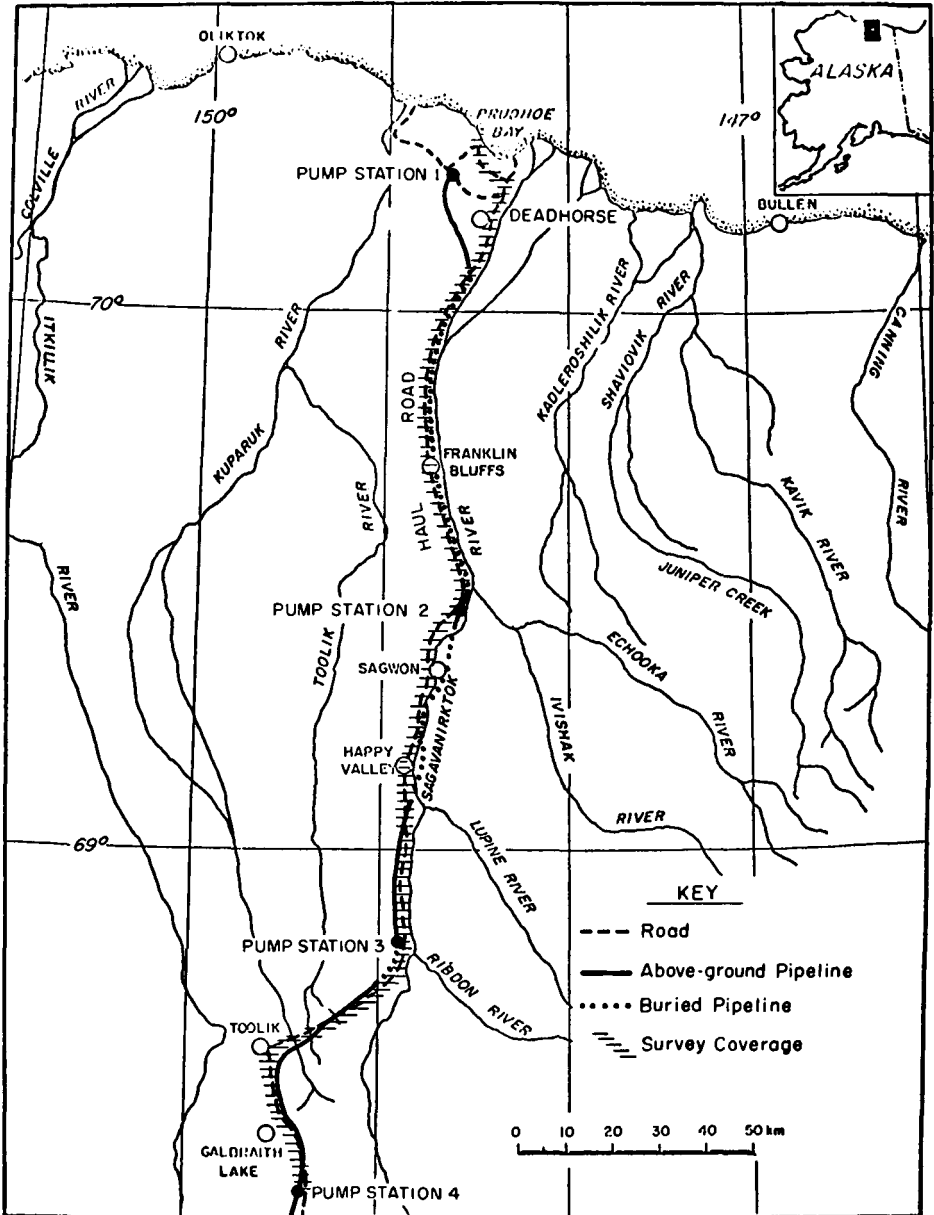


Figure 1. Study area on the Alaskan arctic slope.

winds; bulls, which were generally farther inland during calving, also move to the arctic coast. Local movements of caribou to insect relief habitat on coastal river deltas result in the formation of large post-calving aggregations in or near these areas, followed by east-west movements along the coast. Superimposed on this mass movement are short-lived oscillations to and from the coast in response to mosquitos, which continue their periodic harassment through July. During periods of cool or windy weather when mosquitos are relatively inactive, caribou move inland to feed; with a resumption of mosquito harassment, caribou return to insect relief areas along the coast. Emergence of warble flies and nose bots in August is associated with dispersal of small bands over the entire summer range, and many caribou are observed in the head-low posture characteristic of oestrid fly attack.

Selection of preferred, high quality forage is associated with considerable local movement of caribou. During spring, most bulls do not move north to the calving grounds with the parturient cows, but instead remain in the foothills feeding on new plant growth. When not harassed by mosquitos, bulls appear to follow the northward progression of plant phenology, thereby obtaining the highest quality forage available at a given time; during spring and summer bulls feed heavily on cottongrass (*Eriophorum*) flowers, willow (*Salix*) leaves and lousewort (*Pedicularis*) flowers. Similarly, the search for preferred plant species appears to be an important stimulus for southward fall movements, since snow depth and density on the coastal plain are not sufficient by that time to reduce forage availability. The quality of coastal vegetation decreases during September, and caribou turn more toward winter forage. Preferred lichens of the genera *Cladonia* and *Cetraria* are more abundant in the foothills than on the coastal plain, and local movements in winter are directed toward stands of these lichens or to valley bottoms where the evergreen horsetail *Equisetum variegatum* commonly occurs. The localized distribution and relatively low standing-crop of these forages is associated with small, widely dispersed groups during winter.

Heterogeneous snow cover is probably the most important factor regulating distribution of caribou during winter. With high wind velocities, hard-packed barchans of snow form on the coastal plain, feeding becomes very difficult and energetically wasteful under these conditions, consequently, few caribou remain on the coastal plain during the winter months. As snow accululates and is shifted by the wind, caribou select other feeding areas, such as river floodplains, where snow is less dense. With further snow acculation, caribou movements become progressively more restricted and sporadic due to the high energy cost of moving through deep snow. In late winter snow tends to be deeper and denser on the floodplains, and caribou select wind-blown ridges for feeding.

As patches of bare ground appear in spring, pregnant cows begin the northward migration to the calving grounds. Avoidance of wolf predation is probably the major stimulus for these movements. There are no known wolf dens on the coastal plain, and most wolves remain near den sites farther inland during caribou calving in early June. Thus, wolf predation on calves born near the coast is very low. The more northerly distribution of cow-calf groups is apparent shortly after calving and persists through the summer. Our aerial survey data show that groups with calves remain an average of 50 km farther north than groups without calves.

Studies of the effects of the trans-Alaska pipeline on caribou movements are in progress, but only a few generalizations are possible at this time. It is clear from our surveys along the haul road that most groups of caribou occupying the pipeline corridor are composed predominantly of adult bulls. During the summer of 1975, bulls represented 90 to 95% of all caribou observed from the haul road; by winter this figure decreased to about 60% bulls, which still exceeds our aggregate estimate of 35% bulls for the Central Arctic herd. This indicates a tendency for cows to avoid the pipeline and areas of human activity.

Clearly, cows with young calves are more sensitive to disturbance than are bulls, juveniles or barren cows. Cows with newborn calves were virtually absent from the pipeline corridor. In 1976, only one cow-calf pair was observed in the Prudhoe Bay oil field during calving, whereas coastal areas to the east and west were known to support numerous cows and calves. Later in the summer, those cow-calf groups observed in the corridor were usually under insect attack and seemed highly motivated to reach relief habitat.

Insect harassment alters the sensitivity of caribou to human activity, for only during periods of high mosquito density do large groups of caribou approach the Prudhoe Bay oil field. Flight distance (the distance at which caribou flee from an intruder) of cows with calves is reduced dramatically, from as great as 800 m to as little as 50 m. During oestrid fly attack, flight distances are similarly reduced, although cow-calf pairs are frequently alone in contrast to mosquito-induced aggregations. Caribou are attracted to unvegetated areas on river gravel bars, construction pads and gravel mounds, where light breezes offer some relief. On warm August days, when warble flies are most active, caribou frequently stand for hours and seem quite oblivious of nearby human activity. In fact, some adult bulls have been observed standing in the shade of elevated pipe during warble fly attack (Fig. 2).

Heavy traffic on a highway constructed on Norway repeatedly prevented access to important winter range by wild reindeer (Klein, 1971). Construction of the trans-Alaska pipeline haul road has stimulated concern over the possibility of similar problems in Alaska. Although caribou frequently appear alarmed and usually trot while approaching and leaving the road, even in the absence of traffic, it is only on rare occasions that the road itself has been an obvious obstruction to caribou movements. The reactions of caribou to road traffic are extremely variable, ranging from avoidance at distances of 1000 m to apparent undisturbed feeding or ruminating at distances of less than 40 m. Some caribou, particularly bulls, have apparently habituated and seem oblivious to traffic on the road. This response variability is ostensibly related to many factors, including insect density, time of year, group size and composition, previous experience of individuals, proximity of predators, distribution of preferred forage, human activity, and vehicular traffic.

At the present time, observations of caribou interactions with elevated pipe are too limited and the variables too numerous to permit any generalizations on the effect on caribou movements. Since August 1975, 37 group crossings of elevated pipe by 224 individuals have been recorded.



Figure 2. A bull caribou seeks temporary relief from insects on a construction pad of the trans-Alaska pipeline (photo by D. Roby).

Fifteen of the 37 groups were actually observed, and the other crossings were inferred from the tracks observed. Of the 90 caribou observed crossing beneath the pipe, all but 4 were adult bulls. Mean group size of recorded crossings was 5.6 (range, 1-29). Surface-to-pipe distance at crossing sites range from 1.1 to 5.1 m, with a mean of 2.1 m. Some selection for greater pipe heights or gaps in the pipe was evident, while other crossing sites were seemingly selected at random. Caribou cross elevated pipe more freely during periods of insect harassment, but the proximity of preferred forage has also been associated with an increased frequency of such crossing. For example in May 1976, groups of bulls fed on stands of horsetail (*Equisetum*) which were transected by elevated pipe, and crossings were frequent in this area as long as this forage was being preferentially selected.

Behavioral variability of caribou attempting to cross elevated pipe is attributable to many of the same factors which influence the reaction to the haul road. For example, vehicular traffic on the pipe pad or on the haul road nearby has thwarted some crossing attempts of elevated pipe. Mature bulls are least alarmed, and groups dominated by males are generally more successful in negotiating the pipeline; a few adult bulls have clearly habituated and cross regularly with little or no apparent concern. Some groups have been fragmented during attempted crossings and, while most individuals eventually reunite, some separations appear to persist. Due to the general avoidance of the pipeline corridor by cows and calves, no information has been obtained on the reactions of these cohorts to elevated pipe, and we anticipate that this segment of the herd will adapt more slowly.

In conclusion, we are most concerned with the ability of cow-calf pairs to cross the pipeline. The combined influence of the pipeline and the human activity associated with construction have effected a local avoidance by these cohorts, particularly during summer. Evaluation of the effects of the trans-Alaska pipeline on caribou movements must await further clarification of this problem and a long-term examination of the ability of cows with young calves to adjust to man-made changes in their environment. Of continuing concern is the regional expansion of oil development and its potential for adversely affecting the productivity, recruitment, and general well-being of the Central Arctic caribou herd.

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