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Brief communication

Human impacts on George River Caribou: An Overview

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Human activities have had, historically, varying degrees of effect on caribou (*Rangifer tarandus*). In northern Europe, caribou have been moulded into the semi-domestic reindeer. In North America, many sedentary woodland populations have been eliminated or severely reduced in number. Migratory, barren-ground populations, on the other hand, have recently experienced population highs reminiscent of levels estimated to have occurred prior to the last century of increased exploitation (Bergerud, 1988). The George River population is no exception and, in fact, may serve as a model of this recent expansion. For much of this century, the population appeared to be of little consequence, compared to its importance in the late 1800s. Beginning in the 1950s, an increase from perhaps less than 10,000 individuals to over 600,000 by the mid-1980s propelled the population into a central position regarding human activities in northern Quebec and Labrador. Although there is as yet no clear evidence that human activity has had much to do with either the population's increase or the initiation of its current decline, the issue of potential impacts by humans is now a major concern. Decisions made now concerning these impacts may determine the ultimate level of the next population low, its duration, and the period to the next population peak.

The nature of human impacts varies along a number of dimensions. Influences can be direct or indirect. Hunting represents the most direct of influences; ultimately, its impact of the population may be either positive or negative. Global warming, on the other hand, may be among the most indirect, acting through effects on vegetation or snow conditions. Impacts may also be permanent or transient. Loss of habitat through development, whether for mining, hydroelectric power, or human habitation, may exert relatively long-term effects. Low-

level aircraft flights may cause relatively transient effects that may be easily reversible. Ultimately, it is the cumulative impact of these various influences that is of greatest concern. Below I will focus on three forms of human impact that are of most immediate concern.

Hunting is an activity with the potential for both positive and negative effects (Harrington, 1988, 1991). Over-hunting may send a population into an early decline; under-hunting may allow it to peak relatively early. Judicious hunting, on the other hand, may sustain a population peak. However, a sustained population high may not be beneficial in the long term, if other negative effects (over-grazing, disease) are enhanced during a prolonged period of high density. Three sources of hunting can be identified: a local, subsistence component; a broader, sport component; and a commercial component. Subsistence hunting is generally governed by economic principles; the availability and accessibility of caribou must allow a reasonable expectation of return for effort expended. Low caribou densities do not warrant sustained hunting effort, relaxing hunting pressure under these conditions. Sport hunting, on the other hand, is driven by outside market factors, namely the number of interested clients and the relative cost of hunting in Quebec and Labrador compared to elsewhere. In addition, a sustained level of hunting is required to keep the outfitter solvent. Thus sport hunting may continue at much lower caribou densities than would support a subsistence hunt. Finally, the development of a commercial hunt requires a relatively large initial financial investment, both for materials and marketing. To remain viable, it requires a stable and sustained supply of caribou. Thus exploitation may continue at low population densities. In the management of these hunts, coordination and cooperation is

required among each user sector and the various managers with jurisdiction within the population's range.

Hunting pressure is directly linked to accessibility to caribou habitat. Development which makes travel easier (road development, development of interior airstrips, etc.) opens up more country to hunting, thus increasing overall hunting pressure.

The potential impacts of low-level military jet fighter training has been another recent area of concern. Low-level flying does not likely exert a significant direct effect on caribou. Caribou may be startled by low-level overpasses and may run briefly, but these effects are short-lived and unlikely to have important population-wide effects except under rare circumstances (Harrington & Veitch, 1991). On the other hand, low-level jet overpasses may have important although largely indirect negative impacts on caribou population dynamics. Calves overflowed more often during the first two weeks postcalving survive for shorter periods of time (Harrington & Veitch, 1992). Females overflowed by jets during the post calving period move longer distances during the next 24-hours than they normally do (Murphy *et al.*, 1993), perhaps making their calves more accessible to predators. The vulnerability of caribou to negative impacts from low-level jet activity likely varies dramatically depending on season. In addition, although the high frequency of jet flights makes them an important concern, helicopters on a per flight basis have a greater potential for negative effects than either fixed-wing or jet aircraft.

Hydro-electric development is the third source of potential human impacts of caribou (Harrington, 1991). Habitat alteration and habitat loss are two of the potential effects of such development. Some of these impacts would be permanent, as in winter range flooded under reservoirs; others would be long term, such as return of vegetation following human-caused wildfires, and still others might be short-term, such as changes to river drainage patterns or lake ice conditions caused by lowering of reservoirs for power overwinter. In addition, the opening up of previously inaccessible areas will increase the vulnerability of caribou to hunting activity.

Habitat loss exerts its influence by lowering the carrying capacity of the habitat. Loss of critical habitat, therefore, is of most concern. The fact that calving range is the one "constant" in the caribou's migratory movements, and that summer range appears to be overgrazed at present and may be limiting the population, indicates that protection of habitat in or about calving and summer range is a priority.

No one factor is likely to be the key element. Rather, the effects of various factors will be additive, multiplicative, or compensatory. In the end, it may not be possible to construct a model that adequately characterizes the influence of these factors and the relationship among them. But it is important to monitor human influences of the population, so that changes in the relative magnitudes, at least, of these variables can be detected before their impacts become serious. Until a fuller understanding of the impacts of these various activities is acquired, it may be more appropriate to accept the alternative hypothesis that there is an impact, rather than the null hypothesis that there is none.

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