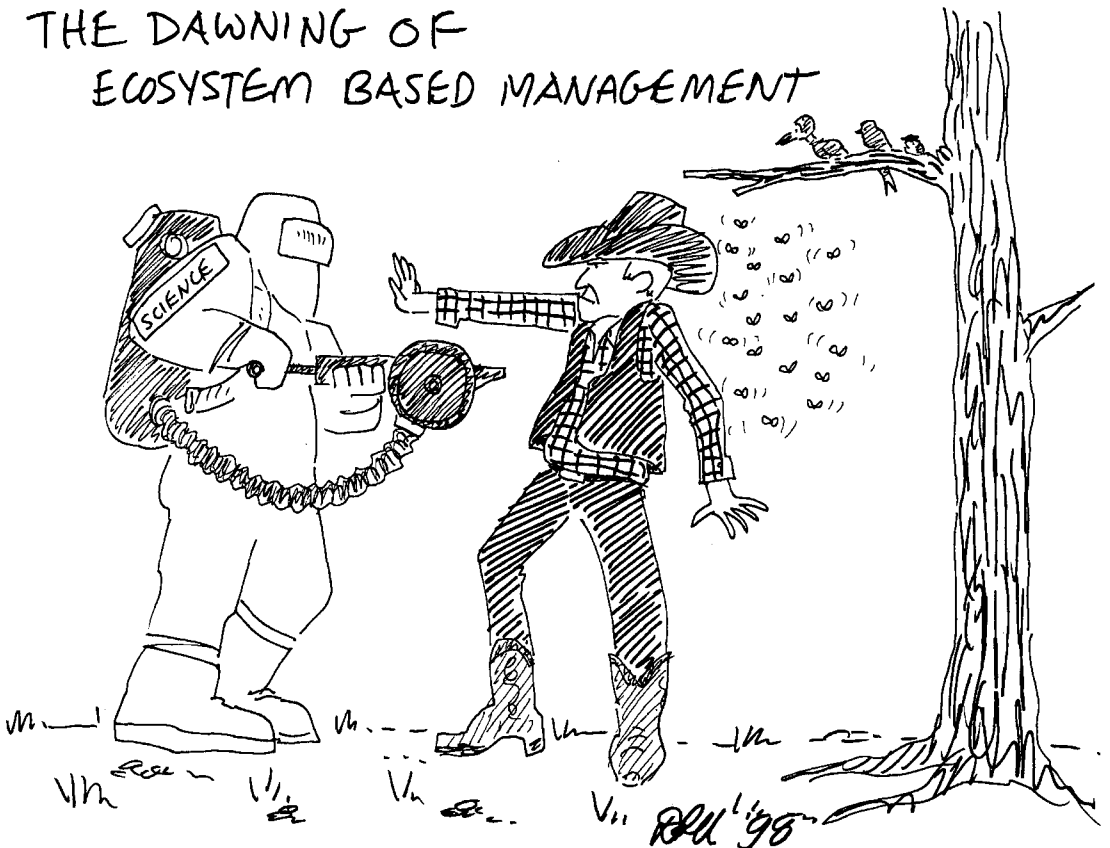


# Session four

## Panel Discussion on Lessons in Disturbance Research & Monitoring

THE DAWNING OF  
ECOSYSTEM BASED MANAGEMENT



## Panel Discussion: Human developments and their effects on caribou

Richard Farnell

Department of Renewable Resources, Box 2703, Whitehorse, Yukon Y1A 2C6, Canada.

**Rangifer**, Special Issue No. 12, 115–122

### Introduction

The First North American Caribou Workshop held in Whitehorse in September 1983 selected the theme “Caribou and Human Activity” to focus attention on this important and sometimes controversial subject. The purpose of the panel discussion during the 8th North American Caribou Workshop was to update our experience on human developments and their impacts on caribou and examine how we have progressed over the last 15 years. We organized these discussions to contrast the longer term exposure to human activity experienced in Norway to the more modest impacts experienced in North America.

Panel members, representing a variety of areas of background and perspectives, were asked to open discussions on particular issues within their experience. They were advised that an open discussion session would follow their presentations and involve all the participants at the Workshop as well as interested persons from the general public. Panel members were Jonathan Colman (Biology Institute, Department of General Physiology, University of Oslo, Norway), Colin Edey (Nova Gas Transmission Ltd. Calgary, Alberta, Canada), Stephen Murphy (ABR Environmental Research & Services, Fairbanks, Alaska, USA), Robert Florkiewicz (Yukon Department of Renewable Resources, Whitehorse, Yukon, Canada), Joe Tetlichich (Porcupine Caribou Management Board, Whitehorse, Yukon, Canada), and Robbie Keith (Canadian Arctic Resource Committee, Elora, Ontario, Canada).

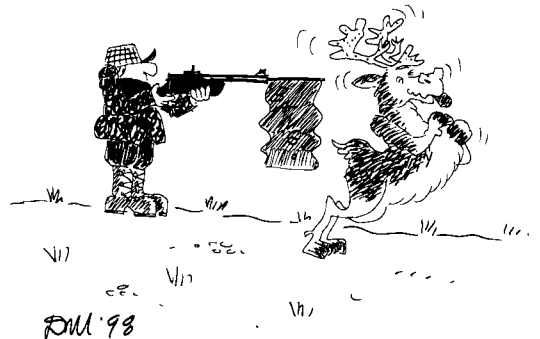
This paper summarizes the presentations and subsequent discussion, and attempts to identify the issues and explore some of the problems associated

with how humans are affecting caribou. A copy of the transcript from this session is available from the author.

### Panel Session

*Jonathan Colman*

HUNTING IN NORWAY CAN BE NON-NEGATIVE



Mr. Colman provided an overview of how wild reindeer distributions in Norway historically appeared before recent technology began to fragment them and cause habitat loss due to transportation corridors, hydroelectric developments, and other human made obstacles. This provided an opportunity to contrast the more acute European experience with that of North America.

Another topic presented by Mr. Colman was the belief that wild reindeer are very adaptable and hunting can be non-negative. Because of the absence of natural predators in Norway, population regulation is more dependent on hunting and when managed properly does not necessarily have to have a negative effect on how wild reindeer will react to

other forms of human activity. Stimuli do not have to be positive to promote habituation towards human activities. It can just be non-negative.

Mr. Colman presented background information on a novel research initiative in Norway that incorporates an advisory committee composed of scientists, users and other people interested in determining the effects of high voltage transmission lines on the behavioral ecology of wild reindeer. From this experience it was found that current knowledge in this area was inadequate. It was decided that information was needed on the sensory perceptions of wild reindeer. A study using domestic reindeer in experimental and control conditions has been designed to determine the hearing range and sensitivity to threshold levels of noise exposure from power lines, snowmobiles, aircraft, vehicular traffic and other human made noises. This information could be used in determining the effect of transmission line construction and maintenance on wild reindeer behavior, and to what extent its presence could create a physical barrier to movement.

In conclusion Mr. Colman thought that very little has been learned over the last 30 years in Norway, and that accessibility has to be contained to reduce disturbance activities like tourism, which may have a stronger negative affect on wild reindeer than visual, stationary obstacles.

#### *Colin Edey*

In 1991, the resource development sector in the province of Alberta was moving at a fairly rapid pace. There was concern for the general lack of knowledge about woodland caribou in the province and this resulted in a very conservative position by Government toward resource development and its

possible effects on caribou. Mr. Edey informed us how collaborative agreement with industry and government has integrated resource development with caribou conservation through the establishment of the Boreal Caribou Research Program (the amalgamated research subcommittees of the Northeast and Northwest Regional Standing Committees on Woodland Caribou).

The establishment of this program has fostered a cooperation among industry in conducting research that otherwise could not be funded by one company or government. Information is shared by all partners and communication between industry and government has improved. This process has furthermore reduced duplication of research efforts across Alberta. The information base on woodland caribou will be used to establish appropriate guidelines for landscape management strategies that will be reviewed annually as knowledge advances.

Research is being carried out to address a number of issues. Studies are presently under way to address sensory disturbance to caribou during late winter when the energy sector is most active. They are examining the changing impacts of predation on moose and caribou caused by the creation of predator pathways through increased linear access in the forest. The use of gated security to limit the effects of legal and illegal hunting is being experimented with to mitigate the impact of improved access. Ways to prevent habitat fragmentation presents a challenge and is identified as one of the most serious issues to be addressed.

Clearly, Alberta's collaborative research program offers a new approach and is providing a much more enhanced view of caribou biology in the boreal forest.

#### *Stephen Murphy*

Mr. Murphy has considerable technical experience studying the effects of anthropogenic disturbance on caribou from oil field developments and military training missions. Major industrial development has been taking place in Alaska's arctic environment for the last 25 years. We learned that potential adverse impacts on caribou can occur directly from habitat loss or degradation, displacement to sub-optimal habitats, increased exposure to predators, disturbance, and exposure to contaminants. Indirect effects are numerous but typically stem from increase access and human activity, particularly hunting.

#### RESPONSES OF CARIBOU TO FIGHTER JET HARRASSMENT



Research that has attempted to quantitatively evaluate these effects has found that caribou respond to disturbance by spending less time lying, more time moving, and by faster rates than did undisturbed caribou. Time spent feeding, however, did not change significantly under different disturbance conditions. It was found that females with newborn calves are most sensitive to disturbance, and these responses generally lessen, as the calves become more independent. It has also been learned that caribou are more reactive to moving stimuli, such as vehicles, than they are to stationary objects, such as pipelines. Apparently the more a stimulus resembles a terrestrial predator (caribou do not appear to perceive low-flying aircraft as predators) the more difficult it is for them to habituate to the disturbance.

Knowing that there are statistically significant changes in behavior does not necessarily imply that they are biologically significant. For population level effects to occur adult natural mortality would have to increase and/or calf recruitment would have to decrease. A possible scenario for this effect would be increased predation, particularly on newborn calves, due to displacement of animals from preferred habitats such as calving areas. Another possibility is energetic stress due to disturbance to sub-optimal habitats or increased energy expenditure because of lack of full mobility. Lower fecundity would affect the population level rather than direct mortality.

In recent years Mr. Murphy has been working with colleagues to model the energetic costs that caribou incur when disturbed. While these efforts need refinement and field verification they have been useful in approximating exposure thresholds that can be tolerated by caribou before they become energetically stressed to the point where population level effects result.

In conclusion, the Alaska experience indicate that caribou are capable of habituating to many types of disturbance, however there are apparent intensity and frequency thresholds beyond which caribou can become energetically stressed or which will cause the animals to abandon the effected area.

*Robert Florkiewicz*

Mr. Florkiewicz presented a case history experience in Yukon for the Finlayson caribou herd in relation to recent mining exploration activity. The Finlayson herd remains the most studied woodland caribou population in Yukon with a 16 year detailed record

of its population dynamics. The range of the herd occurs in a heavily mineralized area that has been exposed to repeated rounds of claim staking over the last 30 years. Over a 2-year period from January 1994 to December 1996 there were 14 700 claims staked in the herd's range mostly during the spring through fall season. Claims covered about 3000 square kilometers in the southern portion of the herds 4500 square kilometer summer range. It is important to note that the distance between corner posts of adjacent claims is 1500 feet or about half a kilometer. Field crews have to visit each claim twice, once to set out corner post, and a second time to attach claim tags once the claim has been registered. It is furthermore necessary to access these sites by helicopter to avoid the impact of construction of new roads, which is a significant concern for residents in the area. It is quite likely that caribou were exposed to frequent and intense levels of disturbance from helicopter and ground level human activity traffic throughout this period.

Partnerships were developed between Yukon government, the Ross River Dena First Nation, and mining companies to effectively address concern for disturbance to caribou. With this assistance biologists were able to increase survey monitoring of the herd during calving and post-calving periods. Findings from these surveys indicate that calf/female ratios in the southern portion of the herds range, where intensive mining exploration activity took place, was lower than ratios in the northern portion of the herds range, where little or no activity took place during the 95-96 'staking rush'. When compared to the long-term record of calf survival for the herd the pattern is reversed because the southern portion of the herd's range used to generally have higher calf/female ratios than the

STAKING ACTIVITY CAN AFFECT REPRODUCTIVE BEHAVIOUR OF FINLAYSON CARIBOU



north. After the 'staking rush' mining activity went into a developmental stage in areas of interest and the impact area was reduced to 6 square kilometers relative to the 3000 square kilometer potential area.

Several lessons were learned from this experience;

- 1) that a 'staking rush' could have a significant single short-term impact on caribou calf survival,
- 2) that access roads should continue to be kept at a minimum,
- 3) that by employing map notation as an alternative to physically registering claims disturbance associated with claim staking could be avoided,
- 4) that short-term monitoring has problems and it is important to establish long-term monitoring to provide an adequate information base for impact assessment.
- 5) that it is critical to look at the population level responses as opposed to individual mine development footprints, which tends to be the industry standard,
- 6) that partnerships between government, industry and stakeholders are effective means of assessing true and relative costs of this kind of activity.

#### *Joe Tetlich*

Mr. Tetlich is a Gwitchin First Nation person who opened his remarks by reminding everyone that his people reside in 15 user-communities and are the ones at risk if caribou are greatly affected by industrial development. As chair of the Porcupine Caribou Management Board he emphasized the Board's responsibility to protect the health, habitat and viability of the herd for future generations. The Board is aware of concerns expressed by people for the welfare of this herd because it is a primary source of food. The herd is threatened by oil and gas development. The Board believes it is essential to provide permanent protection of the herd's calving and is working to achieve this end. The calving grounds are a sacred place to the Gwitchin people and they respect it such that they do not even travel there themselves.

How the Dempster Highway, which bisects the herd's migration route in Canada, is managed is another potential threat to the herd's well being. The Board has made a number of recommendations on how activity is managed on the Highway including compliance by First Nation subsistence hunters as well as how industry is to use the road to access resources in the herds range.

Other First Nation concerns related to us by Mr. Tetlich include the fear that the herd may get too large and eventually collapse if they exceed the carrying capacity of their range. As many Gwitchin youth become more urban there is concern in maintaining traditional cultural values respecting the caribou. Many of the elders who stood for the conservation of the herd have passed on and their message to keep on fighting has to be remembered.

Mr. Tetlich closed his presentation with a very interesting story about his late brother-in-law:

*He was a very subsistent person. He kept his family well. He came over the mountain one day, and this mountain there was very dangerous, and if you got on one side, you had to make sure and read the clouds and see if there was no wind. If there was wind, you could never go over the mountain. So he got on the other side... to hunt. But when he got on the other side, the wind came. He shot about five caribou, and when he was cutting up the caribou, he found out that he forgot his teapot. But he wasn't worried, because he was a very subsistent person. He knew he had an overnight on the other side of the mountain. He had no blanket, nothing. He knew he was going to make an open camp, but he had no teapot. So after he skinned all his caribou, there was a little part of the stomach there that he took all of the stuff that the caribou eat out of it. He soaked it out, washed it with snow, and he filled it up with snow. Then he threw it on the fire, and he made tea out of that little bag, and he was okay. But after he drank all of his tea, he turned around, and he ate his teapot.*

*That's why our people are so strong, because you can never beat them, even if they don't have a teapot.*

YOU MISSED THE WHOLE POINT  
OF MY STORY DOUG!!



*Robbie Keith*

Mr. Keith's presentation centered on public policy and whether it is helping or hindering the future of

caribou. His organization, the Canadian Arctic Resources Committee, has dealt with many issues concerning caribou over the last 27 years. Recent progress with the successful settlement and implementation of land claims and a growing focus on retaining benefits from development in the north are seen as positive steps. Agreements between communities and the mining industry, and the devolution of authority from the Government of Canada to the Territories are likewise progress toward co-management.

Mr. Keith identified a number of issues when he expressed concern for the erosion of government responsibilities, particularly the weaknesses that are endemic in the environmental assessment process, which has no framework in which the widespread movements of caribou are considered. There is also a sense of a disconnection between the information base and what sorts of decisions are eventually made, and this is further confounded by the general lack of long-term monitoring of the effects of development. The fact that scientific research and the documentation of traditional knowledge are driven by industrial development opposed to starting with the principal of people and sustainable communities as a basis for collecting information is another source of concern.

He also expressed concern with the rapid implementation of land claims and the establishment of boards having to deal with very significant issues while being challenged with agendas that are too full and financial resources too scarce. Traditional knowledge has to be blended with science and supported in such a way that it affects decision-making. For the present the people who hold this information are not those who make the decisions.

There is a demographic urgency that needs to be recognized as the north grows rapidly, and we have to find ways in which people are brought together into a national and international framework. In this regard the development of north-to-north relationships across Canada and with Greenland, Scandinavia, Russia, and Alaska is providing useful connections as we share the lessons we have learned together. There also needs to be some coherence to managing species like caribou that travel over great distances, use a variety of habitats, and range across many jurisdictions. The North American Waterfowl Management Plan provides an example that is flawed in many ways, but is a genuine effort to do this.

## Open Discussion Session

This discussion covered a range of topics related to human developments and their effects on caribou. It began by examining the experience in Norway. Here it seemed a paradox that populations have become fragmented and are isolated yet the total number of wild reindeer has increased. It was stated that the forces that cause fragmentation are also going to affect large predators more than caribou. Once a lot of predators are removed caribou populations will increase and have to be regulated with intensive hunting. Consequently, this often leads to extremely high densities of animals in moderately poor condition occurring within alienated ecosystems.

It was pointed out that the Norwegian experience illustrates the long-term insidious affect of "cumulative impacts" and points to the real danger in North America of focusing on one development at a time and forgetting the big picture. Participants attempted to come to terms with this concept because it is not well defined. The time-frames associated with projecting future developments are not clear and there is not a consistent framework for quantifying cumulative impacts. It was generally agreed however that for the present we have a piecemeal approach and an effective framework does not exist. One participant suggested that for jurisdictions like Yukon there is opportunity to learn from mistakes in other areas because development has not proceeded as far and landscape planning could be effective. Meanwhile the other jurisdictions, which have gone down the path of project by project planning, need to step back and reassess whether they want to keep making the same mistakes. It was generally agreed that land use planning be given a strong priority to deal with cumulative impacts.

Discussion quickly centred on the type of processes that will work to look more collectively at the landscape and hold the long view rather than a short view. Recognition was given to the non-government/public interest sector because they bring a different perspective, keep people accountable and add a lot of good information into the process. For the present, wildlife management planning has been reactive because of development pressures but has to become proactive. Alternatively the impacts will be there before we even have time to react to them. There furthermore has to be political will to protect lands by removing them from economic development. To do these things

will require forming alliances among people with shared goals. These people need to be skilled at lobbying and advocacy and be prepared to stay in for the long-term with a sustained effort. It was stated that piling up reports will not effect change, but good lobbyists will.

Several participants made comments regarding the role of co-management in decision making. It was stated that in Norway the communities that have the most hydroelectric developments are the richest communities in the country. At the time the benefits they got from development probably outweighed the aesthetic values of undisturbed wild reindeer populations. But today some question if it may not be the right thing to do and it might not be worth it. In Norway isolated populations are managed separately and each community is allowed to have their own rules. The question was raised whether local decision-making will work for North America.

Participants pointed out some of the advantages of co-management systems. Many of these comments centred on experiences in Northwest Territories and Yukon where management regimes are approved in a co-management process and communities are directly involved in the development of regulations, plans and policies. It was believed that community based decisions have the advantage because communities are always knowledgeable about wildlife in their region and locals will naturally abide by regulations that are developed from within. Moreover, local people and First Nations have strong animal and land ethics that will effect change to the benefit of caribou if they are involved. One participant reminded us that co-management was not an issue in 1983 when the First North American Caribou Workshop was held and now we find whole sections of these kind of symposia devoted to the topic. It was further pointed out that for a researcher, co-management bodies are a vessel that one can actually apply their research and be heard.

Along similar lines, the work of the Porcupine Caribou Management Board to integrate ideas from traditional knowledge into decision-making was discussed at length. The Board takes direction from user-communities and shares responsibility with them for management of the herd. A novel approach to harvest management taken by the Board illustrates how they have incorporated traditional knowledge into decision-making. To mitigate the impact of the Dempster Highway, which bisects the

herds winter range and migration routes, the Board will close the highway to hunting until the leaders pass to ensure that caribou will continue to make use of all the winter range available to them. The decision to do this was not based on scientific information but rather it was based on traditional knowledge. It was suggested that this represented a whole new way of making decisions. It was generally claimed that acceptance of traditional knowledge enables a variety of interests to be recognised.

Several participants expressed concern for caribou management in Quebec where the combined largest population of caribou in the world, the George River and Leaf River herd's, lack a comprehensive management plan. For 15 user-communities there is no co-management system for having an effective voice on how the herd is to be managed and there is a general concern that the population may decline in the near future. It was suggested that they learn from the Yukon/NW/T management experience and form an inter-jurisdictional board much on the same lines as the Porcupine Caribou Management Board. We were reminded that developing an effective co-management system takes a long time and can be very frustrating, but is well worth the effort. In later discussions it was hoped that by holding the 9<sup>th</sup> North American Caribou Workshop in Quebec it may help to bring communities, academics, and decision-makers together for herd management.

Another area of discussion examined the role of science in determining the consequences of disturbance. It was stated that information is not readily accessible unless one goes through a plethora of scientific papers and there is a need to pull this information together into a useable form that can be used in current environmental assessment processes. Apart from this problem another participant cautioned that science can be as a destructive force in trying to affect policy change, because it can be a tremendous smokescreen. For example massive amounts of science have been applied into the possible effects of oil and gas development in the Arctic Refuge issue, and yet we are always on the cusp of losing the Arctic Refuge. Not because there isn't enough science but because it can be made look like its never good enough. Another participant cautioned that as scientists we not only have to be ever-vigilant of not adding to the scientific smoke-screen, but additionally we have to be very cautious about applying the same standards to ourselves as

we do to industry. This comment served as reminder to participants that the caribou research and management studies we carry out is in itself a human activity that can greatly effect caribou. An additional concern was raised by a participant who used controlling mosquitoes negative effect on bird life as an example of how scientists should not "just look at one thing" when providing advise to decision-makers. Consequently it was acknowledged that our science system needs to become more entrenched in ecosystem management as a way of thinking.

Participants attempted to come to terms with what type of human activities can negatively affect caribou. It was generally agreed from a review of both Norwegian and North American research that caribou are not as reactive to stationary objects such as pipelines, as they are to moving stimuli associated with ground based activity. The example of population response of the Finlayson herd to exploration crews making repeated visits to sites for staking mining claims illustrated this impact and contrasted with findings from aircraft over flight research, which may require hundreds of overpasses to get a detectable response. It was further stated that the consequences of these disturbances are greater when they resemble predation risk as is the case with North American caribou. Improving access into caribou range was repeatedly identified as the single most detrimental human activity and the cause of fragmentation of wild reindeer in Norway.

The discussion also broached the question of the usefulness of model building to approximate tolerance thresholds for caribou to disturbance and whether this should be looked at by other jurisdictions or is it an academic exercise. Some of the problems associated with the Porcupine herd energetic model were identified and included the need for field verification, determination of realistic exposure thresholds, and the general difficulty of trying to abstract the real world. There seemed to be consensus however that models can be very useful. Using the model helps to think about possible scenarios and helps to find out what factors are important. It helps people to think more clearly about the situation and make decisions by examining biological processes and possible outcomes.

One thread of discussion pursued the usefulness of a source book on the ecology of caribou. It was suggested that this could be a compendium of knowledge about caribou in North America and

would serve as an effective way of presenting information to the broader public. There was general agreement that a project of this kind be undertaken.

## Concluding Remarks

To the extent the group reached a conclusion it was generally agreed that management processes that include co-operative agreements between industry, governments, and stakeholders generate meaningful dialogue and could provide the right kind of research needed to identify and effectively mitigate potential impacts. As we interactively shared our experiences it became apparent that the establishment of co-management systems and the acceptance of traditional ecological knowledge enable a variety of interests to be recognized and contribute significantly to appropriate decisions about where and how developments should occur. Recent progress in these areas in Alberta, NWT, and Yukon represent substantial improvement over the last 15 years since the First North American Caribou Workshop was held.

The experiences shared with us by our Norwegian colleagues illustrate unequivocally that 'cumulative impacts' are a reality that can lead to alienation of whole large mammal ecosystems. It was furthermore made clear that there are weaknesses endemic in the current environmental review processes that cause a piecemeal approach to quantifying these effects. For an effective framework to exist will require proactive land use planning that for caribou in particular is not obstructed by inter-jurisdictional barriers. Designating protected areas for caribou that are withdrawn from development may be required to offset the long-term insidious effect of cumulative impacts.

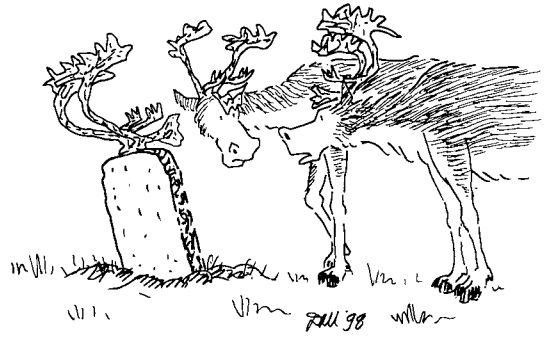
With respect to our state of knowledge about caribou responses to human activity it was concluded that the types of activity that most disturb caribou are those that resemble predation risk such as stimuli from ground based activity. North American caribou are furthermore less likely to habituate to this type of activity because they usually co-exist with a full complement of predators. It was further stated that the most detrimental result of human activity that can cause caribou population level responses is the development of improved human access and should be discouraged as a matter of policy. There was consensus that models provide a useful tool for



shaping our thinking about human effects on caribou and work should continue to determine realistic exposure thresholds and establish field verification.

The question of how best to incorporate scientific knowledge into environmental assessment infrastructure was repeatedly raised. We were warned that research could be used as a smoke screen to effecting policy change and that it should be used in a constructive way recognizing its limitations. It was repeatedly stated that no matter how much information is brought forward it will require formation of alliances and sustained lobbying on the political front to effect change. Concern was raised that scientific information is not readily accessible and should be put together into a useable form not only for current environmental assessment processes but also for the general public. It was recommended that a composite publication incorporating the great deal of information on caribou that has been generated over the last 2 decades be synthesized as a single and definitive source book.

HE COULDN'T DECIDE ON AN  
OPTIMAL FORAGING STRATEGY!



It seemed distressing to participants that the combined largest caribou populations in the world located in eastern Canada lacked comprehensive management planning. It was suggested that the contribution of these proceedings help to bring continuity to management of the George River and Leaf River herds. In that interest the transfer of the 9th North American Caribou Workshop to Québec may provide an instrument to that end.