

Caribou response to human activity: research and management

Donald R. Miller

156 Concord Rd., Lee, NH 03824, USA (kittyndon@aol.com).

Abstract: This paper describes the need by researchers and managers of caribou (*Rangifer tarandus*) to carefully assess the impact of their study methods on animals and results. An error made during a study of barren-ground caribou is described. Assumptions made during preparation of study methods need to be tested during collection of data. Study plans should include communication with, and respect for, residents who depend on the caribou resource. During field observations of caribou behavior, feeding habits, rutting activity or sex and age composition, closer is not better. During capture, handling and marking activities, shorter processing time is better. During aerial surveys, photography, sex and age determinations, higher is better. When interpreting data collected from marked caribou, and generally applying to the unmarked population, caution is advised. The merits and drawbacks of helicopter use to capture and mark caribou for research and management need to be discussed.

Key words: behaviour, capture, helicopter use, mark monitor, population dynamics, *Rangifer tarandus*, survival, trauma.

Rangifer, Special Issue No. 14: 89-93

Introduction

Caribou response to research and management investigations is a difficult and perhaps unpopular topic for caribou biologists. I feel well qualified, however, to present this topic after 43 years conducting caribou research and management projects at Provincial and Federal levels, and after having been introduced to caribou in 1957 by the “Father of the George River Herd” - Dr. A. Tøm Bergerud. I have assisted Dr. Bergerud on caribou studies in Newfoundland, Labrador, Quebec, Ontario and in the British Columbia Provincial Parks, especially Spatzizi. I have also conducted studies on mountain caribou in Idaho and British Columbia (Selkirk Mountains), woodland caribou in Manitoba and Quebec (Parc de la Gaspésie) and Barren-ground caribou in Manitoba, Saskatchewan and the Northwest Territories. During 14 of the past 15 years (1985 to 2000) I have studied caribou during the rut on Mont Albert, Quebec.

In designing any research or management program, caribou biologists make assumptions regarding techniques to collect information. The errors we make, and I'm as guilty as anyone, are that once

methods of study are selected, we tend to accept them without further examination. In fact, we need to constantly re-examine our assumptions to test their validity. Invalid assumptions can produce erroneous conclusions no matter how great the statistical confidence limits. I will show how I fell into this trap and only recently realized my error.

In 1963 - 1965, as the Northern Wildlife Biologist of the Manitoba Wildlife Branch, I was in charge of the Duck Lake barren-ground caribou tagging project. We used numbered cattle ear tags with an attached 6 x 1.5 inch yellow herculite streamer. In late summer, usually August, when the insect season ended, the Kaminuriak (Qamanirjuaq) caribou population would migrate south from tundra summer range through the Duck Lake area in northern Manitoba. Migrating caribou could be captured and tagged while swimming across Duck Lake. This tagging operation was initiated in 1959, along with a similar operation in the adjacent Beverly barren-ground caribou population on the Thelon River in the Northwest Territories. Red streamers were used on the Beverly population. The objective of these operations was to determine if an interchange of cari-

bou occurred between the two populations (Kelsall, 1968). The basic assumptions of these two tagging operations was that there was very little trauma experienced by the tagged caribou and that they would be representative of the entire population. I thought the assumption was valid because each captured animal was processed and released in one to two minutes. However, in 1965, there was evidence to the contrary after we tagged over 500 caribou at Duck Lake (about 1% of the population). I didn't recognize it immediately but I should have. After most caribou had migrated through the Duck Lake area we observed single caribou on two separate islands in the lake. I chased each caribou into the water where they were intercepted by a tagging crew. Both caribou, which appeared to have no physical problem had been tagged earlier that year. I think these two caribou had been so traumatized by their tagging experience that they were afraid to enter the water to join their band as they normally would have done. How this particular observation affected the conclusions in our publication (Miller & Robertson, 1967) on the Duck Lake caribou tag returns is uncertain, but the basic assumption was certainly not valid for these two tagged caribou.

One aspect of caribou research and management that too often is not part of the study plan is to communicate with and respect the human residents within the study area. Our study plans, as well as the resulting management decisions need to be carefully explained to residents, especially those who are dependent on the caribou resource. We need to confer with them early on in the study plan stage to incorporate their knowledge and concerns into the final study. I found that the best way to communicate with these residents is to hire them as assistants and make them part of the study (Miller, 1974; 1976). We learn from them, they learn what we are doing and why, and they share this information in their communities. We are visitors in their environment and need to act and work accordingly - with respect.

When choosing the methods of data collection in our caribou studies, we need to review Friend et al. (1996) to be sure we are considering the impacts our study may have on individual animals, members of the associated band and on the herd. These guidelines, in the Wildlife Society's Research and management techniques for wildlife and habitats manual, state (p. 96) that "professional scientists must consider the effects of their activities on the organisms under study, on the validity of study, results, and on the use of these organisms by other segments of society." We need to be aware of and minimize impacts of our data collection methods.

Closer is not better

It took me a very long time to learn to observe caribou from as far away as possible during rut. Even when down wind, in excellent cover and using binoculars an observer risks being observed by caribou traveling between rutting groups. I use 15 - 60X spotting scopes to observe rutting caribou 0.45 to 0.8 km or more on Mont Albert, Par de la Gaspesie. Even when caribou move near me and become alarmed they are so far from the rutting group that they rarely disturb the harem. As anyone knows who has observed caribou, even subtle behavior can alert other caribou in the vicinity. There appears to be an instinctive fear by most ungulates of unfamiliar objects up slope. A silhouette or reflection from equipment, let alone movement, above caribou will elicit immediate concern and quite likely a movement response. Often caribou aware of danger up slope, if not too disturbing, will gradually move around and above the perceived threat. Caribou respond less strongly to potential threats that are below them than to those from above. Danger from below or even on the same contour may elicit an initial response of movement closer, apparently more out of curiosity than fear. Yearling caribou seem to be most curious, while females, especially those with calves, are often first to detect danger and first to flee. If an observer is detected by a female, it is essential to freeze until she relaxes and lies down or begins to graze. Especially in rutting groups, caribou seem to be aware of the body language of each other although immature males seem less aware than others.

Shorter time is better

When capturing, handling and fitting caribou with marking devices, less trauma will generally be imposed on those individuals released most rapidly. The collection of additional data from the captive animal will obviously require more time than simply marking it. In any event, the captured caribou is not the same as it was prior to the capture and will likely respond with more fear to noises and people. More information may negatively impact the validity of a scientific study by causing trauma through additional processing time. In a study of greater Snow geese Menu et al. (2000, p. 550) suspected that "Because neck-banded birds were handled longer and received a larger marker, they could have experienced more stress than those marked with leg bands only, provoking a higher rate of emigration from the banding areas (trap shyness)." Paton et al. (1991) on spotted owls and Burger Jr. et al. (1991) on greater prairie-chickens also report on the influence of radio transmitters, and caution researchers who use them.

Higher is better

When surveying caribou from a fixed-wing aircraft or helicopter it is important not to disturb the caribou observed. Accurate counts or sex and age determinations are much easier to get with undisturbed caribou than with running, terrified animals. Caribou tend to bunch up and run when threatened by low flying aircraft, especially helicopters. Some biologists use helicopters and even fixed-wing airplanes to collect data on the productivity of adult females and the survival of calves by flying low enough to identify enlarged mammary glands. The terrain these caribou are frantically racing over is anything but a level field. If those kinds of data are required it would be less traumatic and dangerous for the caribou if the biologists conducted surveys on foot or, at least, landed the helicopter out of sight and walked to a viewing point where binoculars or a spotting scope could be used. Flying higher to reduce or eliminate caribou response below usually results in more accurate data.

Use of helicopters in caribou research and management

Very early in my experiences with caribou I learned that helicopters terrify caribou. In the fall of 1959, as Central District Biologist in Newfoundland I was given the task by my Director to use a helicopter to locate a prime male caribou for a visiting dignitary. I found a prime specimen southeast of Grand Falls and directed the helicopter pilot to hover low over the male caribou so I could count the points on its antlers. The male caribou seemed to become disoriented as I counted the points on its antlers and seemed to rear up and almost fall over backwards so I told the pilot to go up and leave. This experience revealed absolute fear by caribou for helicopters, hovering low overhead. Low flying helicopters and fixed-wing aircraft too, usually cause caribou to run.

Caution is advised Interpretation of data collected from marked caribou needs to be carefully assessed to avoid the potential pitfalls of abnormal movements caused by the method used to capture and mark the caribou and the time interval held in captivity. Since the late 1970s, when VHF radio collars were first used in caribou research, more and more caribou have been fitted with radio collars (including the satellite type, in the 1990s). In the sixth, seventh, and eighth North American Caribou Workshops (NACW), satellite radio collar results have been increasingly reported in workshop presentations. Not only have radio collars been used on caribou in every state and province that supports Rangifer populations, but most populations within each has radio

collared individuals. These collared caribou are being used to determine movements, range, mortality and most every aspect of the population. I propose extreme caution in the use of data from these collared caribou to represent different aspects of the population, and especially where calves are collared and used to determine calf mortality in the population (Fuller & Keith, 1981). Wildlife biologists need to share the problems experienced in their study and how they solved these problems in their talks, reports and publications to eliminate duplication in future studies (Boertje & Gardner, 2000). What part of the study plan didn't work as expected and how was the plan changed to make it better?

I've never tried to tranquilize or use the net gun method of capturing caribou from a helicopter, techniques commonly used to capture caribou for attaching radio collars today. My first exposure to the net gun method was at the 6th NACW in Prince George, British Columbia in 1994. The wildlife biologists in British Columbia had been using this method and had a video of the technique in use available for Workshop participants in the hotel lobby. My impression was that the technique worked to capture caribou, but how severe was the trauma to the captured caribou? Some netted caribou don't survive, one went over a cliff (I was told). No mention was made of injuries. The unknown was how the technique, when successful, influenced subsequent behavior and mortality. According to reports at the seventh and eighth NACWs, these radio-collared caribou in British Columbia (Heard & Vagt, 1998) as well as Alberta (Smith et al., 2000) and Yukon (Farnell et al., 1998) have provided them with the data needed to determine the location and range of their many separate caribou populations. This is very important for management decisions. We must use common sense, however, in the use of any caribou capture method that potentially causes injury or mortality and should rarely be employed with small, isolated populations.

Radio collars are providing valuable information on caribou populations across Canada and Alaska. However, there is little or no mention of injuries or fatalities during the capture process. In many cases the capture method is not described or a citation of a separate study is given. Shouldn't costs as well as benefits be presented so that other biologists can assess the suitability of the techniques for their needs? Even the distribution of radio-fixes from radio-collared caribou may be misleading if the traumatized, collared caribou avoids certain habitat features (alpine, for example) where they had been captured. It is possible that traumatized, radio-collared caribou (or marked by any method) may move to less

optimal habitat to avoid the habitat type where helicopter disturbance occurred. The biologists using the radio-fixes to collect data, need to determine the representation of the information on a population scale. There is a need to test findings from radio-marked caribou in the field with unmarked caribou to verify conclusions.

Finally, I would refer the reader to "Panel Discussion: Human Developments and their effects on Caribou" summarized by Farnell (2000). If one specifically inserts the subject of "Research and Management" into this summary, especially into the topic covered by Stephen Murphy (pp. 116 - 117), the reader will become aware of a more elegant use of words to communicate the emphasis of this paper. Farnell includes Murphy's conclusion as "caribou are capable of habituating to many types of disturbances, 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." Helicopter use is especially pertinent here, but fixed-wing aircraft can also cause caribou stress along with snow machines and overland vehicles. Timing of these mechanized disturbances is crucial and wildlife biologists need to use common sense when caribou are vulnerable (physically stressed). As Farnell (2000, p. 121) stated, "the caribou research and management studies we carry out is in itself a human activity that can greatly effect caribou."

Conclusions

1. We as wildlife biologists need to respect the animals and their environment we are researching and managing.
2. In our research and management projects we need to use methods that minimize trauma to caribou.
3. When conducting research and management projects on caribou we need to be especially considerate of the people who reside in the caribou range and especially those who depend on caribou.
4. Caribou captured by any method, handled and marked may not provide information representative of the entire herd.
5. It is very important that we periodically test our basic assumptions, made during the planning stages of our caribou research and management projects, for their validity.
6. When observing caribou behavior and natural movements from the ground it is more productive to remain far away than to move closer.
7. When capturing, handling and marking caribou,

the individuals released in the shortest amount of time will produce the most dependable data.

8. When conducting aerial surveys of caribou populations, classifying to sex and age or photographing from the air higher is better to collect data on animals that are stationary or moving naturally.
9. In the use of helicopters in caribou work be considerate of the caribou's fear, and its subsequent reaction to all helicopter exposure.
10. Published results of caribou investigations need to include the methods used and the problems experienced. It is not adequate to simply cite other studies or publications for methods used or problems incurred. A good discussion of problems experienced allows biologists who use the same methods to avoid similar pitfalls. We hope to seek truths not perpetuate errors.

Acknowledgments

I am dedicating this paper to the memory of an exceptional wildlife biologist and fine gentleman Pierre Desmeules, formerly with the Quebec Department of Tourism, Fish and Game. Pierre arranged for me to study caribou and their habitat on Mont Albert in 1967 and 1968. I am also very fortunate to have received permission and kind assistance from Francois Boulanger, Director of Parc de la Gaspesie to continue caribou studies on Mont Albert during the rut period. This paper was reviewed and improved with comments by Jim Dau and one anonymous reviewer.

References

- Boertje, R. D. & Gardner, C. L. 2000. The Fortymile caribou herd: novel proposed management and relevant biology. – *Rangifer* Special Issue No. 12: 17-37.
- Burger, L. W., Jr., Ryan, M. R., Jones, D. F. & Wijwialowski, A. P. 1991. Radio transmitters bias estimation of movements and survival. – *J. Wildl. Manage.* 55: 693-697.
- Farnell, R. 2000. Panel Discussion: Human developments and their effects on caribou. – In: Farnell, R, Russell, D. & van de Weetering, D. (eds.) *Proc. of the 8th North American Caribou Workshop*, Whitehorse, Yukon. – *Rangifer* Special Issue No. 12: 115-122.
- Farnell, R., Florkiewicz, R., Kusyik, G., & Egli, E. 1998. The status of *Rangifer tarandus caribou* in Yukon. – *Rangifer* Special Issue No. 10: 131-137.
- Friend, M., Towell, D. E., Brownell, Jr., Nettles, V. A., Davis, D. S., & Foreyt, W. J. 1996. Guidelines for proper care and use of wildlife in field research. – In: Bookout, T. A. (ed.). *Research and management techniques for wildlife and habitats* (Fifth ed.), pp. 96-124. The Wildlife Society, Bethesda, Maryland.

- Fuller, T. K. & Keith, L. B. 1981. Woodland caribou population dynamics in northeastern Alberta. – *J. Wildl. Manage.* 45: 197-213.
- Heard, D. C. & Vagt, K. L. 1998. Caribou in British Columbia. 1996 Status report. – *Rangifer Special Issue No. 10*: 117-123.
- Kelsall, J. P. 1968. The migratory barren-ground caribou. *Can. Wildl. Serv. Monogr.* 3 Queen's Printer, Ottawa. 339pp.
- Menu, S., Hestbeck, J. B. Gauthier, J. G. & Reed, A. 2000. Effect of neck bands on survival. – *J. Wildl. Manage.* 64: 544-552.
- Miller, D. R. 1974. Seasonal changes in the feeding behavior of barren-ground caribou on the taiga winter range – In: Geist, V. & Walther, A. (eds.). *Proc. The behavior of ungulates and its relation to management*, Vol. 2: 744-755.
- Miller, D. R. 1976. Biology of the Kaminuriak Population of barren-ground caribou Part 3: Taiga winter relationships and diet. – *Can. Wildl. Serv. Rep. Ser.* 36. 41pp.
- Miller, D. R. & Robertson, J. 1967. Results of tagging caribou at Little Duck Lake, Manitoba – *J. Wildl. Manage.* 31: 150-159.
- Paton, P. W. C., Zabel, C. J., Neal, D. L., Steger, G. N., Tilghman, N. G. & Noon, B. R. 1991. Effects of radio tags on spotted owls. – *J. Wildl. Manage.* 55: 617-622.
- Smith, K. G., Ficht, J. J., Hobson, D. & Hervieux, D. 2000. Woodland caribou distribution on winter range in relation to clear-cut logging in west central Alberta - preliminary analysis. – *Rangifer Special Issue No. 12*: 111-122.

