

Caribou co-management: Realizing conceptual differences

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Abstract: The conditions allowing innovative collective learning of the unpredictable dynamics of caribou populations may be particularly apparent in co-management settings, especially those settings that foster diverse understandings of caribou ecology. This paper examines co-management, specifically caribou co-management in arctic and subarctic North America, for evidence of diverse conceptual constructs among co-management participants. It is suggested that the learning occurring in cross-cultural co-management settings may lead to the development of the humility necessary for the expression and adaptation of diverse understandings of caribou ecology.

Key words: epistemology, knowledge system, management.

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Introduction

While acknowledging the significance of the political power dynamics between 'state' and 'community' in caribou co-management, this discussion concentrates on learning and the accommodation of varied ways of knowing. The question of how humans learn to respect other ways of knowing is represented here as a question of humility, a respect for diverse realities. Humility is central to a needed dialectic or "new mode of conversation" allowing diverse and flexible human thought (Gregory Bateson in Mary Bateson, 1991: 306). This discussion sits within a larger global debate about learning that accepts the existence of uncertainty rather than the promotion of 'the myth of abstract certainty' or a belief that science can and will reveal all 'truths'.

Co-management is the sharing of natural resource management decision-making between 'local resource users' and 'state resource managers'. In this case, local resource users are traditional caribou-hunting communities who have had a high degree of cultural and/or economic dependence on caribou for many generations. The 'sharing' of decision-making authority is rarely, if ever, equal in co-management arrangements. Land claims processes have certainly

played a part in addressing this imbalance in decision-making authority in Canada (Campbell, 1996). However, recognition of the political power imbalance between aboriginal peoples and external state agencies is undeniably a part of understanding the learning that occurs in co-management scenarios. References to Aboriginal peoples in this paper include both First Nation/'Indian', Inuit and Métis peoples.

The often-mentioned 'user-manager' dichotomy has never represented a strict divide between aboriginal 'users' and state 'managers'. The seamlessness of resource use, observation, and interpretation of natural processes means that the management and harvest of resources is conceptually and practically inseparable in many northern communities (Usher, 1986: 2). Knowledge is derived from every aspect of caribou harvesting: from travelling, searching, hunting, skinning, butchering, and eating, and this knowledge modifies human-caribou relationships. Moreover, the 'user-manager' dichotomy is further blurred with the settlement of land claims; aboriginal 'users' may also be state 'managers' and policy-makers.

Co-management Tensions and Trust

While co-management broadens participation in resource management decision-making, it is not a panacea for the resolution of long-standing resource management conflicts, especially when there are considerable transaction costs endured by the indigenous societies who participate in these processes (Caulfield, 1997; Kofinas, 1998). These transaction costs are focused on the burden that lies with aboriginal peoples to 'prove land use or lose it' or to prove the legitimacy of their ecological knowledge (AFN and NAFA, 1995: 19). Aboriginal peoples may be 'information-rich, but data poor' and without the transformation of knowledge into shareable data, aboriginal rights and land use systems can be at risk because they are 'invisible,' although equally at risk when 'visible' and therefore easily co-opted (AFN and NAFA, 1995). However, the documentation of indigenous knowledge can be an expensive prospect. Perhaps fortuitously, aboriginal peoples' knowledge often represents knowledge that is prohibitively expensive to collect using conventional biological methods (AFN and NAFA, 1995: 8) and government and aboriginal peoples' needs and resources can be complemented in a kind of political tradeoff.

While not denying that power dynamics are central to co-management decision-making processes, this discussion is an attempt to expand upon the concept of "trust between actors," one of Berkes' (1997) posed conditions for successful co-management. Trust is at the centre of co-management processes, including: "Trust that the sensitivity of [aboriginal peoples] data will be respected. Trust, that the data won't be misused. Trust, that the data was collected in a credible way. And trust that the people or agencies interpreting the data have the skills, sensitivity and understanding to do so" (Olive & Carruthers, 1998: 132).

Trust is connected to *learning* and dependent on the mutual recognition of diverse belief systems or metaphors by the parties involved in co-management. It is suggested that co-management analyses have largely ignored the potential development of innovative learning processes within co-management institutions because of an almost complete focus on political power dynamics.

Of fundamental importance to this discussion is the finding, in a comparative study of Alaskan and Canadian caribou management systems, that neither the Canadian nor the Alaskan systems have found effective mechanisms for incorporating user and manager caribou observations (Kruse *et al.*, 1998). Managers comment that user observations are often difficult to interpret and a divergence in user and

manager views stifles efficient action. As a result, conventional management measures (*i.e.* limiting harvest rates) may be achieved only at the expense of significant short and long-term social costs and with minimal understanding of the natural processes regulating caribou numbers and the viability of caribou populations. A prime example of the social costs possible are early harvest data collection practices in northern Canada. These data were used to set quotas on community harvests, but allowed communities little input into the formulation of quotas (Usher & Wenzel, 1987). Widespread community mistrust of harvest data studies resulted, and negotiations to develop suitable protocols for harvest data collection were long and difficult.

Traditional Knowledge of Caribou

Traditional knowledge ... is encoded in story, song, and dance served to maintain the link between culture and land through all manner of adversity that accompanied colonisation (Duerden & Kuhn, 1998: 33).

The comparative study of Alaskan and Canadian caribou management systems revealed that not only do caribou users and managers have divergent perspectives on caribou ecology and management, but that they have difficulty interpreting each other's knowledge (Klein *et al.*, 1999: 495). It is worthwhile to take a closer look at the structure of traditional knowledge in order to appreciate the perceptual gap between caribou ecologists and traditional caribou hunters.

The notion that the act of harvesting caribou contributes to an understanding of the health and population dynamics of the animals underlies traditional caribou hunters' knowledge of these animals. Historically, hunting practices that allowed mass harvests of caribou occurred everywhere throughout the circumpolar north (Speiss, 1979). A discussion of mass harvests reveals the extent of local knowledge in both a temporal and spatial sense. Drift fences, impoundments and snares were employed (Kelsall, 1968: 213; Speiss, 1979: 105) to harvest large numbers of animals in the past and the use of these techniques was based on knowledge of the timing and location of high caribou population densities and migration paths.

The level of knowledge involved in the coordination of these large harvests is notable given that large numbers of people (800–1000) assembled *expressly* for these hunts (Smith, 1978). For example, the Chipewyan, located in northern Saskatchewan, Manitoba and the Northwest Territories in Canada

(one of several Dene or Athapaskan language speaking groups) had a high dependency on caribou. The Chipewyan needed to have a reasonable expectation and knowledge of the availability of moderate or large bands of caribou (Speiss, 1979: 135). Drift fences mimicked knowledge that caribou movements are mediated by geomorphological features like landscape contours such as ridges and eskers. Assembling large numbers of people specifically for such communal caribou hunts says something about the scale of the knowledge and the formidable communication involved. Drift fences at least a mile (American mile) round have been noted (Kelsall, 1968: 214). The interconnected and socially cohesive Chipewyan bands arcing from just west of the Hudson Bay coast northwest to the Arctic Circle still engaged in communal hunts using chute and pound techniques in the 1920s and 1930s.

It is possible that the hesitancy of communities to accept the methods and technology of caribou population surveys is also related to the ways that such research affects local knowledge exchange systems. "The sharing network, in addition to its functioning as a mechanism for distributing resources through the community, also functions as an information network" (Collings, 1997: 25). 'Local' sharing networks were historically distributed in some northern areas across broad regional areas. For instance, Chipewyan people did not live in isolated, individual camps, but moved between interconnected and shifting aggregations of family groupings. Intercommunity trade networks essentially extended the scale of a 'local' community. The Chipewyan 'information network' rethinks community as 'cultural isolate'. There are other examples of such 'information networks' including the Inupiat peoples who hunt the Western Arctic caribou herd in Alaska. Historically, 20 Inupiat societies were associated with 'home districts,' but identified themselves as part of a single Inupiat Eskimo culture.

These communication networks did not disappear with the advent of permanent settlements. Nakashima (1991: 339) writes of the Québec Inuit and how "... the informed network of communication which is a dynamic part of contemporary community life provides a system by which wildlife conditions, numbers, distribution, etc. can be monitored with unequal efficiency". Temporally and spatially the scales of local indigenous knowledge can be quite large. Local oral histories relate information about isostatic rebound, flooding events and the structure of local ecosystems (Duerden & Kuhn, 1998: 35).

Divergences in Perceptions

The continued differences between 'caribou users' and 'government managers' perceptions of caribou population dynamics (see Kruse et al., 1998) represents a significant epistemological issue; the co-existence of different ways of thinking. Epistemologically-speaking, co-management may contain clues about how to overcome human beings' deficit of what we are able to know and think (Mary Bateson, 1991) and an increasing tendency to homogenize how we are able to know and think. Understanding the assumptions that lie behind the concepts currently employed in caribou ecology is a large part of appreciating the contribution of community-based knowledge (including both traditional ecological knowledge and day-to-day local observations) to an understanding of caribou in circumpolar environments. This discussion uses the term 'traditional ecological knowledge' in the sense of the cumulative knowledge of people connected to place over generations (Berkes, 1999).

While it is important to recognize that human-caribou relationships have an enduring history, the values and behaviour underlying these relationships have always been dynamic. The circumpolar north 'pulsates in space and time' (Krupnik, 1993: 158). The 'cycle' is the basic unit of northern ecology, affecting virtually everything (Pruitt, 1978) and as a consequence, the adaptations of people to circumpolar environments are, and always have been, flexible.

Biologists have recognized the need to examine the historical basis of the differences and resultant conflicts between the environmental perceptions of boreal ecologists and northern indigenous communities for many years (Drolet *et al.*, 1987). The current 'co-production' of knowledge (Kofinas & Braund, 1998) between caribou-harvesting communities and academic researchers includes both the conceptual and empirical knowledge of communities. There has always been interplay between the knowledge of the state and communities about wildlife populations (Feit, 1998). However, the application of local knowledge by wildlife resource professionals increasingly reflects the 'needs and well-being of local resource users' and not just the 'interests and conditions of state institutions' (Feit, 1998: 123). The power dynamics involved in the recognition and expression of local knowledge is expressed by Foucault who has said that the "history and place of science in the larger context of power is needed ..." (quoted in Peet, 1998: 2), and this is as true for the study of caribou ecology as any other aspect of science.

A growing appreciation of the uncertainty involved in understanding fluctuations in caribou

populations is also playing a role in increasing academic interest in the contributions of local knowledge to understandings of caribou ecology (Klein *et al.*, 1999). Caribou population fluctuations are far more variable than biologists imagined 50 years ago (Klein, 1991). Fundamental concepts of caribou ecology in particular are still under negotiation. Even the question of defining 'a herd' is a matter of contention if the perceptions of caribou-using communities and caribou biologists are compared. In the Canadian arctic and subarctic there is an incomplete knowledge of almost all managed species and limited time depth of scientific knowledge (Ferguson, 1997). If fluctuations in caribou population dynamics range from 35-100 years then the observations of state management institutions are limited in the extent to which these cycles can be understood (the first Canadian Wildlife Service studies of caribou began in 1948).

The problems of generalizing to broader spatial and temporal scales, especially in fluctuating environments like boreal ecosystems, are especially problematic (Ferguson *et al.*, 1998). While indigenous knowledge is recognized as a source of empirical knowledge and ecological hypotheses, it has only recently been recognized by scholars as a source of alternative interpretation (Cruikshank, 1998; Ferguson *et al.*, 1998; Wenzel, 1999). Local knowledge is particularly critical to understandings of caribou dynamics precisely because of the wide circum-polar distribution and diverse habitats that caribou occupy. Gaining an understanding of caribou population dynamics and potentially predicting the responses of caribou populations to global warming, for instance, limits the value of generalizations (Gunn & Skogland, 1997). Moreover, it is predicted that global warming will add further variability to the inherent fluctuations in caribou population size and this effect will vary regionally (Gunn & Skogland, 1997).

The Relationship between Human Purpose and Resource Management

The limitations of humankind's understanding of ecological processes is a systemic, epistemological problem (Gregory Bateson quoted in Mary Catherine Bateson, 1991). Mary Catherine Bateson (1991) summarizes this problem as:

... a destructive mismatch between human behavior and the characteristics of the biosphere within which human beings live and on which we depend [exist]. This is a mismatch rooted, not in the mistakes of particu-

lar chemists or the wastefulness of hunters or farmers, but in the human capacity to think about natural systems and act on that knowledge.

Co-management is potentially an arena where the human capacity to think about natural systems may be 'remembered' and expanded. This may be achieved not only by respecting the metaphors or beliefs of local communities which inform the technical aspects of traditional knowledge and practice, but learned in institutions displaying the ability to link thought about social and ecological systems. Fienup-Riordan's (1999) recent work with Yup'ik communities in Alaska confirms the importance of the social connections between state and community. Without the development of personal connections, collaborative work between communities and the state remains limited in scope. As expressed by one Yup'ik elder:

There are different kinds of biologists. Some stick with what they know, they don't try to expand their knowledge. There are the others who want to learn more and expand their knowledge to help us (Fienup-Riordan, 1999: 19).

Understandings of caribou population dynamics are limited by a lack of environmental history (Bergerud, 1996 in Anderson, 2000). Implicit in gaining a sense of this history is understanding the linked history of caribou and people. The seasonal shifts of micro/ macro-bands of Chipewyan and how these shifts matched the movements of caribou is an example of the communication exchange networks that marked human-caribou relationships in the past. However, understanding the collective actions and knowledge of today's settled caribou-hunting communities is equally important. In order to appreciate the contributions of community-based knowledge to current academic discussions of caribou health, population size and dynamics, the links between past and present knowledge are key.

Defining Caribou Population Dynamics: by whom and how

Terms such as herd 'health,' 'stability' and 'change' are descriptions bound in logic that may not be equivalent to indigenous concepts of cyclical processes like caribou population dynamics. Gunderson and his colleagues (1995) describe ecology's struggle to understand the 'soup' of processes represented by ecosystems often undermined by lin-

ear thinking (quoted in Kofinas & Braund, 1998). Community knowledge of population dynamics may shed light on this 'soup' if it is not masked by conventional understandings of ecological dynamics. Short-term swings in weather and plant biomass may explain longer-term (decades) fluctuations in caribou herd size. However, factors such as predation and human harvest may increase or decrease these swings and serve to dampen fluctuations.

If human harvests can play a role in dampening caribou fluctuations when population numbers are low, then the matter of how and who defines population 'crises' becomes all the more important. Disagreements between caribou users and managers about the existence of caribou population crises can be seen across the North American North, from Alaska to Québec (Meredith, 1983; Freeman, 1989; Collings, 1997; Kofinas, 1998; Anderson, 2000). It appears that the conclusion of caribou biologists that caribou populations were in a state of 'crisis' in the 1970s may have contradicted what communities knew about the sequencing and phenology of caribou movements and distributions.

We return again to the notion of defining 'a herd'. There are "major differences between the Inuit concept of caribou populations and that used commonly by caribou biologists" (Ferguson *et al.*, 1998: 216), and in the case of southern Baffin Island, "Inuit knowledge proved to be temporally and spatially more complete than the written record" (Ferguson *et al.*, 1998: 201). The herd discreteness issue can be looked at from behavioural and genetic points of view. The two are obviously related, but how do community perspectives of the behavioural aspects of herd dynamics advance understanding?

In parallel to Ferguson's work with Baffin Island Inuit, Soviet ethologists, adopting much of their thinking from local perspectives, describe *stado* (migratory aggregations) in relational and behavioural definitions of caribou groupings. 'Herdness' changes seasonally and by activity (Anderson, 2000), varying according to the microecological conditions of each season. "These relational models of migrations are supported by a rather less well known side of Soviet biology and ethology which stresses the voluntaristic and direct effects of people on natural phenomena" (Anderson, 2000). Inuit and Dene elders have also suggested that the relocation of people to certain regions (and away from others) dramatically impacted migratory behaviour (LIA, 1977; Smith, 1978; Bussidor & Bilgen-Reinart, 1997). The long-standing and mirrored relationship of people and caribou is well-recorded, but the effects of human movements and behaviour on caribou popu-

lations beyond speculation on the effects of harvesting levels is little understood.

The historical distribution of Chipewyan camps in the taiga-tundra ecotone directly mediated the migratory movements of the Qamanirjuaq, Beverly and Bathurst caribou herds. "The hunting groups may be viewed as strategically situated reconnaissance patrols for collecting information on caribou movements and intentions" (Smith, 1978: 83). The composition of regional and local bands and hunting ranges was extremely flexible to accommodate the variation of caribou movements (Smith, 1978: 84). The archaeological data of the spatial arrangement of bands along the forest-tundra transition zone has considerable time depth (Smith, 1978: 75), following the same annual cycles of movement from at least A.D. 1400-1900 and possibly much longer. This is particularly remarkable given that herd size fluctuated considerably during this period (Burch, 1991).

This knowledge of the historical links between Chipewyan and caribou has implications not only for the temporal and spatial depth of this knowledge, but for the understanding of the human-caribou interaction itself along caribou migratory routes. Although Chipewyan do not currently live in this spatial distribution, the experience and memory of living in a seasonal round in relationship to caribou movements still exists, and movements to re-create an information network that partially replicates such communication should not be discounted. The knowledge of the pattern or sequencing of movements may be linked to knowledge of changes in abundance or herd size.

Ferguson's work with the Inuit of south Baffin Island shows evidence of different patterns of thought about caribou dynamics. The processes of range expansion including range drift and shift in wintering areas (Ferguson *et al.*, 1998) are also observed by Gwich'in (like the Chipewyan the Gwich'in are Athapaskan language speakers) in the western Canadian Arctic (Kofinas & Braund, 1998). For example, during population decreases, winter range volatility is marked by frequent and unpredictable interannual range shifts. Inuit and Gwich'in observations describe changes in population dynamics useful in predicting future changes through knowledge of the sequence of changes in caribou movement and distribution.

Community harvesting practices essentially highlight the range not only of the local observations of caribou-hunting communities, but the geomorphological and phenological knowledge of traditional caribou hunting peoples. Archaeological data show the temporal depth of this knowledge; there is a cor-

relation between phytogeographic change, caribou behaviour and human adaptation (Speiss, 1979: 51).

Conclusions

Since the uncertainty of knowledge about caribou population fluctuations is high, science can't predict when significant changes in herd populations will occur (Kruse *et al.*, 1998). Caribou monitoring data is particularly subject to sampling and measurement errors. The traditional way of life of caribou hunting peoples such as the Chipewyan illustrates that it is possible to adapt to and live within the uncertainties of caribou population dynamics. Resource user knowledge can address the problem of persistent uncertainty with respect to the timing of changes in populations especially among people such as the Chipewyan who historically had a high dependency on caribou (Speiss, 1979).

Handling the uncertainty of current understandings of caribou population dynamics is critical to the manner caribou ecologists and caribou-hunting communities 'co-produce' knowledge to reflect the problem of uncertainty in a comprehensive manner (Kofinas, 1998). There is a possible resolution of the mixing of typologies of population structures to be found with reference to community-based knowledge of behavioural parameters (Anderson, 2000). However, formalized caribou management systems do not have a firm grasp of the flow of information between communities, native organizations, management agencies and industry (Kofinas & Braund, 1998).

A careful study of the environmental history of human-caribou relations, the manner in which landscape ecology affects herd discreteness, and how human behaviour affects caribou migratory behaviour, might expand models of caribou population dynamics. Current efforts to identify local propositions of caribou movements and distribution do exist. What this discussion hopes to have outlined, however, is that concepts like 'population health,' 'stability,' and 'crisis' are not neutral classifications. What is known and who is knowing are intimately connected. Community insights into herd discreteness, population shifts, and range expansions for instance, can shed light on the complexities of caribou ecology not commonly integrated into formal intellectual discourse. Real innovation in thought may be discovered in resource management approaches that concentrate on recognizing cultural differences in learning patterns.

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