Predicting and Controlling Caribou: Historic Indigenous Groups and Their Knowledge of the Beverly and Qamanirjuaq Caribou Herds in Northern Canada

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Abstract

Caribou herds in northern Canada historically supported Indigenous populations inhabiting the area, including the Copper Inuit, Caribou Inuit, and Dene/Chipewyan Caribou-Eater peoples. The ability of Indigenous groups to use caribou depended on comprehensive knowledge of caribou biology and behaviour. This paper examines two historic traditions of caribou hunting in northern Canada: herd-following by the Dene/Chipewyan Caribou-Eaters, and herd-driving by the Caribou Inuit and Copper Inuit. Intergenerational knowledge of migration routes and caribou behaviour enabled a degree of predictability for these hunter groups, and herds were temporarily controlled through such strategies as caribou drives. Embedded within a broader ecological framework, this information may have provided enough data for these groups to have developed a conservation ethic that both met their physical needs and contributed to caribou herd sustainability.

Keywords: caribou; Nunavut; Beverly herd; Qamanirjuaq herd; Canadian Arctic; Indigenous; Copper Inuit; Caribou Inuit; Inuvialuit; Dene; Chipewyan; Caribou-Eaters; traditional ecological knowledge (TEK)

Introduction

The vast caribou herds ranging through northern Canada historically supported a number of Indigenous populations occupying the tundra and spruce forest treeline, including the Copper Inuit, Caribou Inuit, and the Dene/Chipewyan Caribou-Eater[1] peoples. Caribou provided immediate sustenance year-round for the Dene/Chipewyan, who practiced herd-following, and during the spring, summer, and fall seasons for the Copper and Caribou Inuit, who supplemented their winter food resources with caches of caribou meat (Berkes, 1999; Burch, 1991; Taylor, 1969). Caribou's utility as a material for clothing and shelter against the northern cold may have been even more important, a suggestion borne out by occasions on which Dene/Chipewyan Caribou-Eater peoples apparently disregarded the principle of using every part of an animal and not wasting; observational accounts depict caribou being over-hunted and sometimes skinned and left to rot, once nutritional needs were met (Berkes, 1999; Burch, 1991; Taylor, 1969).

The ability of Indigenous groups to utilize caribou depended on comprehensive knowledge of caribou biology and behaviour (Brink, 2005). Successful hunters had answers to the following questions: When will caribou be within their seasonal ranges? Where might subherds be located within a given seasonal range? How many? What routes will they take migrating between ranges? What motivates migration to begin, and when? What motivates herd aggregation, and, conversely, splinter into subherds? How can natural land and climate features be utilized in trapping caribou? How can caribou's behaviour be utilized in the process of trapping them? How can humans interact with caribou to manipulate their behaviour?

This paper examines historical and archaeological resources to describe two traditions of caribou hunting in northern Canada: herd-following by the Dene/Chipewyan Caribou-Eaters, and herd-driving by the Caribou Inuit and Copper Inuit.

Herd-following involves following herds throughout their entire annual range cycle, intersecting migration routes at different points

and exploiting subherd groups occupying fringe areas of seasonal ranges. Herd-driving involves manipulating caribou behaviour and the environment to draw the animals into traps.

A summary of historical, biological, and geographic data are included to describe the caribou hunted, and to provide context to the hunter-caribou relationship and the importance of caribou as a resource to these Indigenous populations. Instances of overhunting are explored within a broader ecological context, considering whether these instances breached a conservation ethic tied to these groups' traditional knowledge and cultural memory regarding caribou.

[1] The Chipewyan Caribou-Eaters refer to themselves as Dene.

North American Caribou

Biologists differentiate three major caribou subspecies in Canada: Barren-ground (*Rangifer tarandus groenlandicus*), Woodland (*R. tarandus caribou*), and Peary (*R. tarandus pearyi*, classified as endangered) (Environment Canada, 2006; Northwest Territories Environment and Natural Resources, Wildlife Division, 2006). Neither Woodland nor Peary subspecies are migratory, and will be excluded from discussion.[2]

E. S. Burch (1991) identifies seven[3] migratory (Barren-ground) caribou herds ranging the latitudinal treeline from the west coast of Hudson Bay to Alaska: the Qamanirjuaq, Beverly, Bathurst, Bluenose, Porcupine, Central Arctic, and Western Arctic. Historically, the Beverly and Qamanirjuaq herds supported the Dene/Chipewyan Caribou-Eater peoples, the Copper Inuit, and the Caribou Inuit (Brink, 2005; Burch, 1991; Friesen & Stewart, 2004; Gordon, 1990, 1996; Taylor, 1969).

The Beverly and Qamanirjuaq caribou ranges encompass the eastern *Barrenlands* south of the Arctic Circle, on a plateau comprising the Eastern Mackenzie and Keewatin Districts and northern Manitoba, Saskatchewan, and Alberta (Gordon, 1996). Treeline transects both ranges, separating tundra from boreal forest to the south. Tundra experiences cold climate, with mean monthly temperatures not exceeding 4ºC except in July/August (Gordon, 1996). Forest climate is milder, with more frost-free days; the forest receives more annual precipitation and snowfall than the tundra but experiences milder blizzards, and forest trees reduce wind speeds to 8-to-16 km per hour (Gordon, 1996). Ranging throughout the tundra during spring, summer, and fall seasons, the Beverly and Qamanirjuaq herds retreat to the forest in winter for snow cover and insulation (Gordon, 1996). These herds have maintained the same ranges, migration routes, and annual cycles since at least the 1400s (Burch, 1991).[4]

Winter freeze-up begins in September, and by early December, lake ice is two metres thick; spring and early summer (April/May /June) bring ice break-up and more daylight (Gordon, 1996). This increased sunlight triggers hormonal changes in pregnant caribou cows (*photoperiodism*) that motivate herd migration to calving grounds (i.e., summer ranges) by May or early June (Gordon, 1996). Gordon (1996) suggests the caribou's habitual return to calving grounds involves a homing capacity and phylogenetic imprinting compelling a herd past familiar landmarks. However, Gordon (1996) also notes migration routes may alter somewhat over time, though specific calving grounds remain the constant destination, which may indicate homing capacity is more attuned to direction than to landmarks. During spring migration, herds splinter into subherds, some of which will come to occupy the southern edge of the summer range (Gordon, 1996). Herds regroup in August and head back towards the treeline and their winter range; near the treeline in September/October, they fragment into rutting subherds, which then proceed to the forest for winter (Gordon, 1996).

Summer ranges at one time extended north throughout Bathurst Inlet, north of Nunavut, which served as a major calving ground (Brink, 2005; Burch, 1991). Herds reached as far as Victoria Island, north of Bathurst Inlet, in the late spring, crossing Coronation Gulf, Dease Strait, and Dolphin and Union Strait, which are frozen nine months of the year (Brink, 2005; Burch, 1991). Today, caribou are scarce on Victoria Island and in Bathurst Inlet (Gordon, 1996).

[2] A fourth subspecies, the Dawson Caribou (*R. tarandus dawsoni*), is extinct. Traditionally they have been classified as Woodland Caribou; however, genetic research suggests they are more closely related to Barren-ground Caribou. Although Peary Caribou are sometimes found in the northwest of Victoria Island, and Copper Inuit may have hunted them, Peary Caribou are neither migratory nor do they form substantial herds (i.e., they are/were normally scattered through an area) (Environment Canada, 2006).

[3]Some evidence supports another discrete herd—the Ahiak—though its range overlaps with the Beverly, Bathurst, and Dolphin and Union (Peary) herds (Northwest Territories Environment and Natural Resources, Wildlife Division, 2006).

[4]The Northwest Territories Department of Environment and Natural Resources provides a map showing the caribou herds and their ranges (http://www.enr.gov.nt.ca/programs/barren-ground-caribou), and the Beverly and Qamanirjuaq Caribou Management Board (BQCMB) provides detailed maps of these herds' ranges and movements (http://arctic-caribou.com/maps/map-atlas/). Providing additional context, Natural Resources Canada's map of Nunavut shows Hudson Bay, and Nunavut's geographic location in relation to the rest of Canada (http://ftp2.cits.rncan.gc.ca/pub/geott/atlas_tif/atlas6/Reference/Bilingual/nunavut.pdf). The University of Guelph's map of the Kitikmeot region (Nunavut) shows Victoria Island and the adjacent mainland, Dolphin and Union Strait, Coronation Gulf, Dease Strait, and Bathurst Inlet (http://www.arctic.uoguelph.ca/cpe/environments/maps/detailed/kitikmeotfr.htm).

Historic Herd-Dependent Populations

Victoria Island and the adjacent mainland proximal to Coronation Gulf form the region historically occupied by the Copper Inuit, the westernmost group of Central Inuit (Brink, 2005; Gordon, 1996). Brink (2005) identifies them as descendants of earlier Thule[5] culture, giving the Copper Inuit a relatively recent history in the region of approximately 800 years. Archaeological and ethnographic evidence supports caribou hunting on Victoria Island back to at least the Thule era (Brink, 2005). Copper found at archaeological sites north of the treeline, supported by historic accounts of Inuit camps in the interior, suggested to Gordon (1996) that some Copper Inuit people traveled south and transitioned into Caribou Inuit.[6]

Caribou Inuit first settled along the west coast of Hudson Bay above the forest, living in seasonal camps on lakes and rivers in the interior to hunt caribou during summer and fall (Friesen & Stewart, 2004). A caribou shortage on the coast in the late 18th century motivated resettlement further inland, to hunt caribou and to subsist on muskoxen which were present year-round (Friesen & Stewart, 2004).

The Dene/Chipewyan Caribou-Eater peoples[7]—traditional occupants of this region—retreated permanently to their winter forest grounds north of Manitoba due to the pressures of disease and the fur trade, as well as the Caribou Inuit's move inland, which encroached upon their summer ranges (Gordon, 1996, 2016). Archaeological evidence suggests this retreat did not conclude until the 20th century (Burch, 1991). For about 2,000 years prior, the Caribou-Eater peoples followed herds throughout their entire annual ranges, thus ensuring year-round access to this animal resource (Gordon, 1996). Gordon (1996) explains that the year-round presence of Caribou-Eater peoples in the forest meant the herds' winter ranges were inaccessible to the Caribou Inuit, preventing year-round herd-following, which hindered the Caribou Inuit from becoming fully Arctic-adapted.[8]

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[5]Thule people arrived in Alaska around 500 A.D. and reached Nunavut about 500 years later. A subgroup continued east to Greenland. In the 13th-14th centuries, some Thule people migrated south from Nunavut, to the area currently and historically occupied by the Central Inuit (Canadian Museum of History, n.d; Thule people, 2014).

[6]Gordon (1996) outlines several other theories put forth to explain the origin of the Caribou Inuit: The simplicity of their tools suggests they had occupied the Barrenlands for centuries; they may have had a northern link with the Netsilik Inuit (nomadic seal hunters) occupying Boothia Peninsula and King William Island; or, eastern proximity and contemporaneous surface dwellings shared in common with Hudson Bay coastal Inuit suggest a possible connection.

[7]The Chipewyan Caribou-Eaters comprised the most eastern segment of the general Chipewyan population (Burch, 1991).

[8]After moving inland from the Hudson Bay coast, the Caribou Inuit lost access to marine resources; since they did not have year-round access to the caribou herds, they had to rely on scarce muskox, which were present year-round on the tundra, and on caches of (rancid) caribou meat from previous seasonal kills (Gordon, 1996; Taylor, 1969). However, this strategy proved unsuccessful, eventually leading to adaptive failure, starvation, and eventual relocation back to coastal settlements in the 1950s (Gordon, 1996).

The Importance of Caribou Meat and Hides

Caribou was the primary food source for both Dene/Chipewyan Caribou-Eater peoples and Caribou Inuit (Burch, 1991; Gordon, 1996). Caribou meat provides more calories than moose meat, for instance, and provides better quality nutrients because caribou eat lichen and grass, whereas moose feed on willows; some believe caribou tastes better, for the same reason (Gwich'in Elders, 1997). For Caribou Inuit, muskox were available year-round on the tundra, but caribou provided the larger part of their diet, even in the winter when only cached caribou meat was available (Friesen & Stewart, 2004).

For all groups discussed in this paper (particularly the Caribou Inuit and Copper Inuit), caribou was an essential source of material for clothing and shelter to protect from the northern cold. Hides are at their optimal condition in late summer and fall, when holes from spring and summer insect larvae have healed (Brink, 2005). Meeks and Cartwright (2005) analyzed samples of hair from caribou clothing in the British Museum. Electron microscopy scanning showed that the hair is round to oval in shape, with an outer surface of overlapping scales that allows for both rigidity and flexibility. Grooves and ridges formed by the scales trap air to provide insulation; transverse sectioning of the hair revealed a unique open cellular structure—which also provides insulation and is impervious to water—as well as ultra-thin cell walls that provide negligible heat conduction (Meeks & Cartwright, 2005). Caribou hair is lightweight and made from strong keratin, which retains its form when processed by humans (Meeks & Cartwright, 2005). Caribou hides are thus ideal for the Canadian North. Traditional Inuit winter outfits consist of inner and outer caribou hide parkas, with the inner layer turned inwards, and the outer layer turned outwards; air trapped between the layers and the body provides efficient insulation (Meeks & Cartwright, 2005).

The Herd-Following Tradition

Burch (1972) originally postulated that caribou herd-following was impossible for humans because, given the distances and speeds traveled by herds during migration, humans could not keep up (Burch, 1972, 1991). Burch (1991) highlighted that the Qamanirjuaq and Beverly herds travel 120 to 400 km during spring migration, at distances of 7-to-24 km per day. During summer migration, distances can reach 65 km per day. In comparison, Hearne (1795), who travelled with Chipewyan hunters throughout 1769-1772, and Gasté (1870), who traveled with Chipewyan hunters throughout 1870, estimated that the hunters traveled maximum distances of 13 km per day in summer and 11 km per day in winter (Burch, 1991).

Burch (1991) later clarified that his original postulation referred to *herd accompaniment* (i.e., following a specific set of animals throughout their migratory range), and redefined his use of the term *herd-following* as referring to a breeding population subset within the herd dispersed over the migratory range. Burch (1991) explains:

People who follow the herds do not attempt to keep up with a specific set of animals but move in a timely manner from the winter range of the breeding population in the [forest] to its summer range on the tundra (and vice versa)....The idea is to get to the animals' ranges, and locate bands of animals that roam. (p. 440)

Here, Burch (1991) was describing how hunters targeted caribou occupying the periphery of seasonal ranges and migration routes; for instance, those descending the plateau to seek relief from summer heat and insects. The Caribou-Eater peoples followed the annual cycle of herd movement, some following as far as Coronation Gulf (Burch, 1991). Knowledge of climatic and biological catalysts for caribou migration, as well as consistent herd migration routes and ranges, enabled herd-followers to predict where herds and subherds would be at a given time. Knowledge of herd fragmentation patterns and behaviour enabled hunters to predict where roaming subherds or individuals might appear at the edges of the seasonal range and migration routes (Burch, 1991; Gordon, 1996, 2016).

During summer migration, Caribou-Eater peoples were unable to keep the herds in sight, but rather followed their tracks; reaching the edge of the summer range, they spread out into smaller family groups to hunt (Burch, 1991; Gordon, 1996). During migration south to the herds' winter ranges, hunters waited ahead of the animals, above the treeline, and ambushed them en route (Burch, 1991; Gordon, 1996). No archaeological evidence exists suggesting Caribou-Eaters cached food; rather, they utilized forest resources to survive the harsh winters, and after permanent settlement in these winter ranges in the late 1800s, ambush-hunting replaced herd-following entirely (Gordon, 1996, 2016).

The Herd-Driving Tradition

Victoria Island's landscape consists of permafrost tundra and small ponds, lakes, and rivers which are frozen nine months of the year; vegetation consists of reindeer moss, grass, and flowers (Brink, 2005). Seal meat comprised the largest component of the Copper Inuit diet and was abundant year-round, supplemented by caribou, occasional muskox, and seasonal fishing (Brink, 2005). Hills create natural channels in various parts of the island, and these were a critical component in constructing caribou drive systems (Brink, 2005). At the time caribou drive systems were used, large numbers of caribou could be predicted to cross from the mainland each year, as Victoria Island was a calving ground (Brink, 2005). Herds remained on the island until fall, allowing Copper Inuit access in late summer and fall, while hides are at their optimal condition (Brink, 2005).

Brink (2005) reports on two archaeological sites—Eggington and POD—on the northwest side of Ferguson Lake, a 75-km-long inland lake 50 km north of Cambridge Bay.[9] Both sites contain evidence of caribou drive systems believed to have been used by the Copper Inuit, and which may date to the Thule era (Brink, 2005). Stone cairns—*Inuksuit*[10]—at these sites consist of one or two rocks placed on top of high points of local bedrock, or of large single boulders not usually found locally, suggesting they were imported (Brink, 2005). Some are topped with moss, emulating a human head; some have arm-like sticks that were draped with clothing, human hair, or strings of bones or stones (Brink, 2005). Sticks placed between Inuksuit were draped with seagull skins; draped clothing and skins fluttered in the wind, and strings of bones clattered against the stone. Poor eyesight[11] combined with innate curiosity would have drawn caribou closer to investigate these movements, sounds, and structures (Brink, 2005).

The Eggington and POD drives were constructed downwind in seasonal prevailing winds from open areas where caribou grazed, or hidden below ridges where caribou sought relief from insects and summer heat (Brink, 2005). Smell is caribou's main defense against predators, and so they tend to walk into prevailing winds. As such, locating drives downwind was advantageous as it concealed hunters and traps (Brink, 2005). Herd beaters (normally women, children, and the elderly) moved behind (upwind from) grazing herds or intercepted caribou travelling on ridges; the smell and loud noises they made started the caribou towards the drives (Brink, 2005).

Caribou coalesce when threatened by predators and in response to natural barriers. The Eggington drive incorporated a funnel between a hillside and a line of Inuksuit. Hunters directed caribou through the funnel, towards "spearing pits" at the end and along the sides of the funnel where the hunters could more easily spear the animals (Brink, 2005). The POD drive consisted of two converging lines of Inuksuit forming a funnel, similarly directing caribou towards spearing pits; the POD drive narrowed to an endpoint where closely placed Inuksuit formed a solid rock wall (Brink, 2005). Using Inuksuit meant fewer hunters were needed to contain the caribou as they were funneled through the drive, so that the number of hunters actually killing caribou could be maximized (Brink, 2005).

Both drives incorporated a lakeshore downslope, which functioned in two ways: firstly, caribou innately flee to lakes and rivers when threatened by predators; secondly, caribou are top-heavy animals and have difficulty turning or stopping when running, particularly when galloping downhill (Brink, 2005). Ferguson Lake would have served as a stimulus drawing frightened caribou towards the drive funnels. Once running they would have had great difficulty changing direction (Brink, 2005). Additionally, the fluttering clothing and clattering stones and bones on the Inuksuit would have deterred the caribou from breaking through the funnel (Brink, 2005).

Brink's (2005) article provides much greater detail, but the above description demonstrates how the Copper Inuit's comprehensive knowledge of caribou physiology, behaviour, and migration patterns, and their use of natural features of land and seasonal prevailing winds enabled them to predict, direct, and control caribou herds to contain and kill them in large numbers.

Further south, Caribou Inuit utilized stone cairns in a similar manner, constructing single lines along slopes to lead caribou to lakes and rivers, where hunters waited in kayaks with spears; many drives were located at known river crossings along migratory paths (Environment Canada, 2006). Essential hunting activities involved spotting herds and signaling others so that kayaks could be in place; men carried out these tasks, while—as noted earlier—surrounding and driving the herd was the responsibility of women, children, and the elderly (Friesen & Stewart, 2004; Taylor, 1969).

Historically, fall was the most important hunting season as hides were at their best and meat could be cached for winter. However, as discussed earlier, caching was not a sustainable strategy; by late winter/early spring, caches were depleted and caribou had not yet returned (Friesen & Stewart, 2004). Although muskox were present year-round, archaeological representation of muskox at

sites suggests their availability was nonetheless limited (Friesen & Stewart, 2004).

[9]For diagrams of Eggington and POD, see Brink (2005), available from https://muse.jhu.edu/article/383092/pdf (figures 5 & 8).

[10]Inukshuk, singular; Inuksuit, plural. Similar stone cairns resembling humans have been used by Arctic hunters in Greenland and Alaska (Brink, 2005).

[11]Though caribou can see for great distances, they cannot clearly distinguish details or sense danger from sight (Brink, 2005).

A Conservation Ethic

Effective use of caribou for survival depended on having comprehensive knowledge of caribou biology and behaviour (Brink, 2005), and the Dene/Chipewyan Caribou-Eater peoples, Copper Inuit, and Caribou Inuit may have developed and operated with a conservation ethic stemming from this knowledge. A common assumption is that such an ethic entails prohibitions that foster resource sustainability, and that taking more than what is needed represents a breach. The Gwich'in of the Northwest Territories,[12] for instance, observed an ethic against overhunting and wasting (Gwich'in Elders, 1997). However, Berkes (1990) describes how the decline of caribou in the early 1900s has been attributed to the James Bay Chisasibi Cree's[13] overhunting in response to survival pressures. Similarly, Hearne (1795) and Gasté (1870) reported Caribou-Eaters killed and skinned hundreds of caribou and left them to rot when the sole objective was collecting hides (Burch, 1991). Turner's account (as cited in Taylor, 1969) of his 1780 journey with the Labrador "Eskimos"—who shared hunting and food caching practices in common with the Caribou Inuit—describes whole caribou carcasses being thrown into rivers, with only the skins preserved.

Nelson (1982) hypothesized that "a natural response is not to limit harvest intentionally, but the precise opposite—take as much as possible, whenever possible, and store the proceeds for later use" (p. 223). Does this suggest lack of a conservation ethic, or breach of a conservation ethic? This question must be explored by looking at the bigger ecological picture, rather than focusing on a single species (Collings, 1997), and considering the sociohistorical context of contemporary conservation frameworks. For instance, in the 1950s, Canadian Wildlife Service (CWS) biologists surveyed the caribou population of the Barrenlands and determined that numbers were declining, attributing this in part to "wanton slaughter" (i.e., overhunting) by Indigenous hunters (Campbell, 2004; Usher, 2004). The Canadian government responded by imposing restrictions on Dene and Inuit caribou hunters, accompanied by a public campaign to curb "wanton slaughter" (Campbell, 2004; Usher, 2004). The "wanton slaughter" campaign targeted two traditional practices of Dene and Inuit caribou hunters: feeding caribou meat to sled dogs and leaving whole caribou carcasses in the forest, in rivers, or on the tundra. Biologists and the government characterized these practices as wasting, which embodied the assumption that non-human consumption of caribou meat constitutes waste (Campbell, 2004). For the hunters, however, these were reasoned practices grounded in traditional ecological knowledge and cultural memory.

Firstly, hunters needed their dogs to have enough energy to pull sleds over long distances, and since caribou meat has a high energy value (higher than moose or muskox meat, for instance) (Gwich'in Elders, 1997), it was more efficient to feed sled dogs caribou meat than other types of meat or feed. Additionally, this practice meant excess meat was not wasted once peoples' nutritional needs had been met (Campbell, 2004).

Secondly, killing caribou and leaving whole carcasses behind was a practice that provided food to other animals, such as foxes, wolves, and weasels, which the Dene and Inuit would need as resources at a later time (Campbell, 2004; Usher, 2004). This practice of sharing caribou meat with other animals was additionally embedded within Dene and Inuit cosmology, serving as an expression of respect in the interdependent relationships between humans and animals (Brightman, 1993; Campbell, 2004).

Considered within this broader ecological context, the knowledge and practices of the Dene/Chipewyan Caribou-Eater peoples, Copper Inuit, and Caribou Inuit relating to caribou suggest these groups did develop and operate with a conservation ethic that has survived in intergenerational cultural memory, and that apparent infringements may actually represent rational articulations of this ethic.

Resource co-management strategies today demonstrate the strength and value of Indigenous ecological knowledge, especially

when integrated to supplement incomplete scientific data or to reframe data collection strategies. The Indigenous-led Beverly and Qamanirjuaq Caribou Management Board (BQCMB) is a good example. In response to biologists' predictions of population declines amongst the Beverly and Qamanirjuaq herds in the early 1980s, the BQCMB undertook a census employing scientific strategies, but from an Indigenous starting point: aerial photography; studies of herd recruitment, distribution, overlap, and mixing; and harvest studies were conducted by Indigenous communities (Beverly and Qamanirjuaq Caribou Management Board, n.d.; Osherenko, 1988). This strategy enabled the BQCMB to utilize Indigenous groups' data that herd populations were sustainable sizes and increasing (Osherenko, 1988). Integration of scientific methodology enabled the BQCMB to collect scientific data that supported Indigenous claims that low populations at the southern end of winter ranges were not indicative of total herd size (Osherenko, 1988). Most importantly, these data allowed governments to make evidence-based decisions to refrain from imposing hunting restrictions (Osherenko, 1988). The Porcupine Caribou Management Board similarly integrates scientific and Indigenous perspectives and methodology in its management strategies (Porcupine Caribou Management Board, 2010).

[12]The Gwich'in were not herd-followers, but did have access to the Porcupine Caribou herd (Porcupine Caribou Management Board, 2010). Long ago, the Gwich'in hunted in similar fashion to the Caribou Inuit, intercepting migratory herds at river crossings; today and in the past, the Gwich'in hunted using caribou "surrounds" similar to corrals used by the Chisasibi Cree (Gwich'in Elders, 1997).

[13]Berkes (1999) notes the Chisasibi Cree, though not caribou specialists, engaged in communal caribou hunting in the winter, targeted at individual caribou rather than at migratory herds. The Chisasibi Cree utilized fenced corrals constructed in a similar fashion to the drives used by the Dene/Chipewyan Caribou-Eaters and the Inuit; trees with human-like appearance in the landscape near the corral served a similar function to surrounding caribou (i.e., to direct them towards the corral) (Berkes, 1999).

Conclusion

Berkes (1999) describes caribou numbers as being unpredictable, and notes that they are not under the local control of Indigenous groups, factors which would hinder the development of a conservation ethic. However, this hypothesis reminds us that scientific knowledge is lacking, since science has not yet obtained a complete dataset on caribou population cycles (Berkes, 1999). Population density studies of migratory animals are notoriously unreliable, and this has been a major impetus for conservation strategies that incorporate co-management. This paper incorporates all evidence the author was able to access at the time of writing.

Knowledge of habitual migration routes and consistent caribou behaviour enabled a degree of predictability for Caribou-Eaters and Copper and Caribou Inuit, and herds were temporarily controlled through such strategies as caribou drives. Embedded within a broader ecological context, this information may have provided enough data for these groups to have developed a conservation ethic that both met their physical needs and contributed to herd sustainability. Such an ethic may similarly inform contemporary practices, including caribou co-management initiatives that combine both traditional knowledge and scientific data, as these Indigenous groups transition to new economies.

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