Hum Ecol (2010) 38:803–815
DOI 10.1007/s10745-010-9355-x

Wabusk of the Omushkegouk: Cree-Polar Bear (*Ursus maritimus*) Interactions in Northern Ontario

Raynald Harvey Lemelin · Martha Dowsley · Brian Walmark · Franz Siebel · Louis Bird · George Hunter · Tommy Myles · Maurice Mack · Matthew Gull · Matthew Kakekaspan · The Washaho First Nation at Fort Severn · The Weenusk First Nation at Peawanuck

Published online: 23 November 2010

Abstract In order to understand *wabusk* (polar bear, *Ursus maritimus*) behaviours and interactions with people in the Hudson Bay lowlands of northern Ontario we conducted this collaborative study of Cree *kiskayndamowin*/knowledge. Our findings reveal that Cree knowledge supports previously published information on polar bears, while adding further contextual findings: that male polar bears travel greater distances into the muskeg than previously recorded; that *wabusk* prey on *amisk* (beaver, *Castor canadensis*); that *wabusk* interact with *muskwa* (black bears, *Ursus americanus*); and that human-polar bear interactions occur in this region of northern Canada. Bearing in mind that Cree knowledge has been recognized in wildlife management strategies (i.e., for beaver, caribou and moose) elsewhere in Canada, this particular body of information is timely, especially since polar bears are considered threatened under the Ontario Endangered Species Act, and the province is developing a recovery strategy for the Southern Hudson Bay polar bear population. The federal government is also contemplating listing polar bears in Canada as a "species of special concern" under the Species at Risk Act (SARA). While it is unclear as to how these decisions will impact the Cree-polar interactions, the listing of polar bears by both governments, but especially the provincial government of Ontario, must recognize treaty and Aboriginal rights, acknowledge its duties to consult and properly accommodate Aboriginal people's views, incorporate Cree *kiskayndamowin*/knowledge of *wabusk*, and re-examine the proposed Wabusk Co-Management Agreement draft developed by the Ontario Ministry of Natural Resources (OMNR) and Coastal Cree First Nations of Northern Ontario in 1994. The article provides recommendations that highlight how the Northern Cree First Nations, through the development of the Recovery Strategy for Polar Bear in Ontario, can become engaged in the management of *wabusk* in Ontario and throughout Canada.

Keywords Cree · Collaborative research · Co-management · *Kiskayndamowin*/Cree Knowledge · Polar bears · *Wabusk* · *Ursus maritimus* · Canada

R. H. Lemelin (✉) · M. Dowsley
Centre for Northern Studies,
Lakehead University,
955 Oliver Rd.,
Thunder Bay, Ontario, Canada
e-mail: harvey.lemelin@lakeheadu.ca

B. Walmark · F. Siebel
Keewaytinook Okimakanak Research Institute (KORI),
216 South Algoma St.,
Thunder Bay, Ontario P7B 3C2, Canada

L. Bird · G. Hunter · M. Mack · M. Gull
Weenusk First Nation at Peawanuck,
P.O. Box 1, Peawanuck, Ontario P0L 2H0, Canada

T. Myles · M. Kakekaspan
Washaho First Nation at Fort Severn,
Fort Severn, ON P0V 1W0, Canada

The Washaho First Nation at Fort Severn
Fort Severn, ON P0V 1W0, Canada

The Weenusk First Nation at Peawanuck
Weenusk First Nation, P.O. Box 1,
Peawanuck, ON P0L 2H0, Canada

Introduction

The harvest of *wabusk* (*Ursus maritimus)* by the Muskekowuck *Athinuwick*, the original Cree people of the *Omushkegouk* (muskeg) of the Hudson Bay Lowlands of

northern Ontario, coastal central Quebec, and northern Manitoba, has been conducted for millennia (Bird 2005; Henri *et al.* 2010; Lytwyn 2002; McDonald *et al.* 1997). While Cree-*wabusk* relationships in Manitoba, Ontario, and Quebec were often founded upon mutual tolerance and respect (often through avoidance), these interactions were, and at times still are consumptive (i.e., sustenance from the meat and oils derived from the processing of the fat, medicinal by-products, and hides for clothing and other uses) (Beardy and Coutts 1996; Bird 2005, 2007; Lytwyn 2002; Mulrennan and Scott 2001; Peacock *et al.* 2010). Historical archaeological records (see Henri *et al.* 2010; McGhee 1990) from the Hudson's Bay Archives (Kakekaspan *et al.* 2010) and discussions with Elders from the Weenusk First Nation at Peawanuck (hereafter Weenusk) and the Washaho First Nation at Fort Severn (hereafter Washaho) (two First Nations located near the coast of *Winipekw* (Hudson Bay) in Northern Ontario, Fig. 1) indicate that increases in the polar bear harvest occurred during times when the caribou hunt was difficult, and were generally encouraged by Hudson's Bay Company employees who required meat for sustenance and desired the hides for trade (for additional information on the Cree harvest of polar bears during the Hudson's Bay Company era, see Lytwyn 2002). According to some Cree Elders, this may have resulted in the over-kill of polar bears in the region during the fur trade era. However, according to two Elders in Washaho, difficulties associated with the hunt (damage to property, dogs and individual hunters) and the relatively low price of the furs (compared to other types of furs) often discouraged the continuous harvesting of *wabusk*.

During the twentieth century Cree hunters harvested *wabusk* for personal consumption, to feed their dog teams, process the oils, for medicinal products, to trade the furs, and to create crafts. By the mid-twentieth century, due to the replacement of dog teams by snowmobiles and the decline of the fur industry in the region, the economic role of polar bears as a consumptive resource declined (Krech 1984). However, since, as one Washaho member explained, the hides could sell for up to $2,000, despite the decreased harvest, the polar bear *ayoowin* (fur/hide) is still cherished and widely used in both Weenusk and Washaho for mitts, hats, and mukluks that are used locally or sold (Royal Commission on the Northern Environment 1983). In addition, teeth, claws and even skulls, according to one Elder from Washaho, are often decorated and sold to visitors. *Wabusk* currently figures prominently on the Nishnawbe Aski Nation (NAN) (a political organization representing 49 First Nation communities within the James Bay Treaty) logo, and on the town logos of Washaho and Weenusk. The polar bear has also become an important socioeconomic (crafts, tourism) symbol, and an indicator of

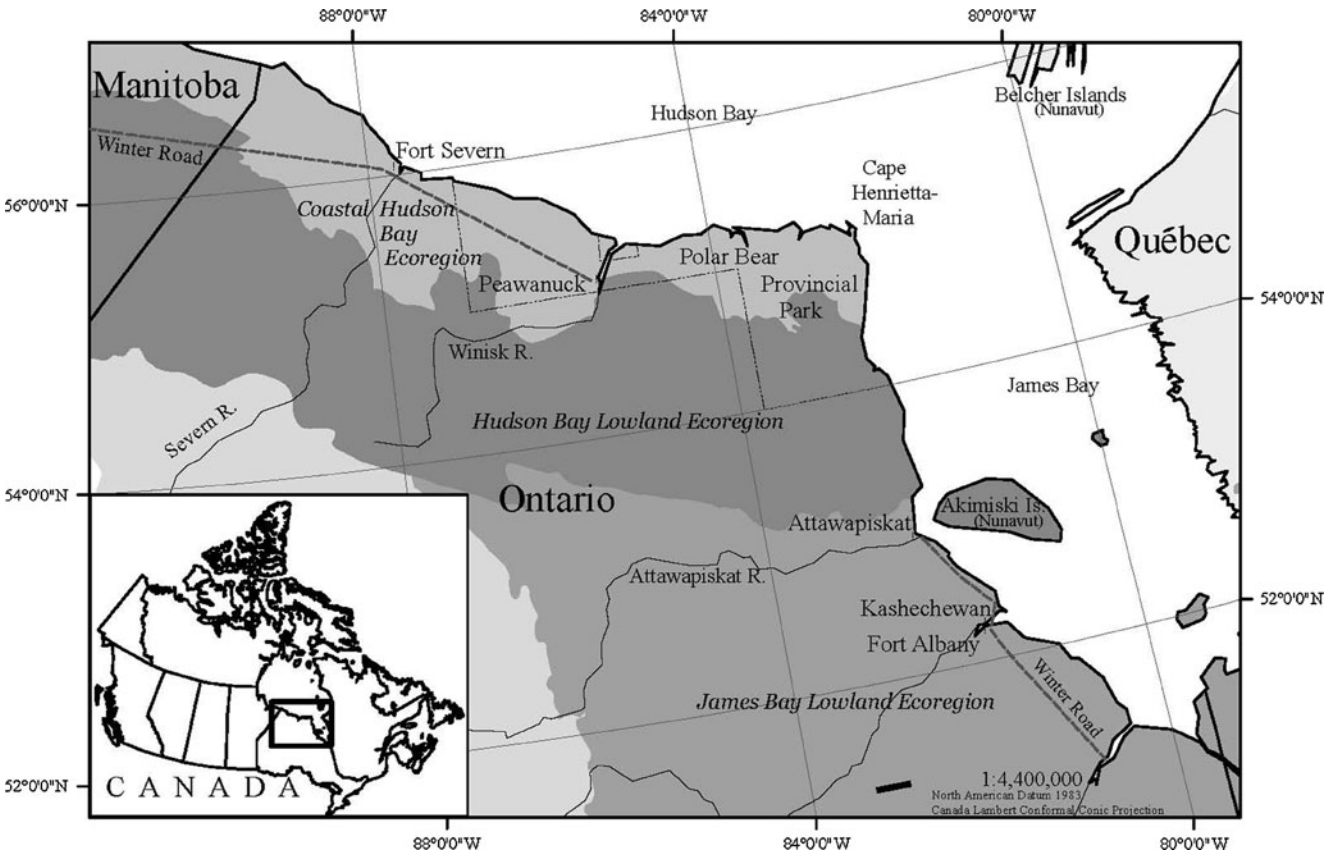

Fig. 1 The Coastal Hudson Bay Ecoregion of Ontario

ecosystem well-being for coastal Cree communities (Bird 2007; Lemelin *et al.* 2010a).

For the Cree of Weenusk and Washaho sustained contact with Europeans and Euro-Canadians occurred with the establishment of permanent trading posts and Christian missions. In 1905-1906, the federal and provincial government of Ontario negotiated Treaty 9, also known as the James Bay Treaty. Treaty 9 was subsequently ratified in 1929-1930 (Long 1995). The rights of coastal Cree communities such as Washaho and Weenusk to harvest various forms of wildlife, including polar bears, is implied in the James Bay Treaty (Lemelin *et al.* 2008) and has been recognized in other documents (see Polar Bear Provincial Park Management Plan, Ontario Ministry of Natural Resources (1994) Wabusk Co-Management Agreement-Draft).

Washaho and Weenusk First Nations

Washaho (the Cree designation for the Severn River) is the most northerly community in the province of Ontario. This small (40 km^2), remote Cree reserve of approximately 401 people (2001 estimates; 2006 population statistics from Statistics Canada, 2009a, were not available), is situated 9 km upriver from the mouth of the Severn River. Like many communities along the shores of Hudson Bay, Washaho was established by the Hudson's Bay Company in the seventeenth century originally about 5 km up river from the modern settlement (Pilon 1982). The community was relocated to its present site in 1973 (Pilon 1982).

The Weenusk ("ground hog" in Cree) Cree First Nation once traded with the Hudson's Bay Company along the length of the Hudson Bay and James Bay coastlines from York Factory in the west to Fort George in the east (Graham 1988). The establishment of the trading post on the Weenusk River in the late eighteenth century made some Cree families more sedentary and dependent on manufactured goods (Graham 1988). Members of the Weenusk First Nation formerly resided near the mouth of the Winisk River, but they were forced to move 30 km southwest to Peawanuck ("the land where the flint is found") in May of 1986 when spring floods swept away much of the original settlement (Feherty 2006). The present Weenusk First Nation at Peawanuck (1.51 km^2) is located on the site where the Asheweig River drains into the Winisk River, nearly 35 km from the coast. In 2006, the population of this isolated community was 221 (Statistics Canada, 2009b). The importance of traditional subsistence and the polar bear harvest in both communities has been documented by Berkes *et al.* (1994), Berkes *et al.* (1995), Lemelin and McIntyre (2010), Lemelin *et al.* (2010b), and Ohmagari and Berkes (1997).

Human-Polar Bear Interactions in Ontario

The Ontario Ministry of Natural Resources (OMNR), the agency responsible for wildlife management in the province, has conducted aerial censuses of polar bears along the Ontario coasts of Hudson and James Bays since 1963 (Jonkel *et al.* 1976; Kolenosky and Prevett 1983; Kolenosky *et al.* 1992; Prevett and Kolenosky 1982). The creation of Ontario's largest protected area, Polar Bear Provincial Park (PBPP) in 1970, provided additional protection of two critical terrestrial habitats for the Southern Hudson Bay (SHB) polar bear population: coastal staging habitat (e.g., Cape Henrietta-Maria) used by all types of polar bears, and inland maternity denning habitat used by pregnant females (e.g., along the Winisk River) (Lemelin *et al.* 2007; 2010a; b). It is estimated that over 70% of the maternity dens for the SHB are located within the park (Richardson *et al.* 2006). However, the most southerly known polar bear dens are still found outside of the park on Akimiski Island in Nunavut/Ontario (Prevett and Kolenosky 1982), and Twin Island Nunavut/Quebec (Dout 1967; Mulrennan *et al.* 2009).

Ontario hunting regulations do not permit the harvest of polar bears except for Treaty 9 Cree. The background document for PBPP (OMNR 1977) estimated that in the 1960s–1970s there were about 10 to 30 polar bears harvested annually by Cree hunters from Washaho, Weenusk and Attawapiskat (another coastal Cree nation located near Akimiski Island in James Bay) from a total estimated population of 300 bears. According to depositions provided in the Royal Commission on the Northern Environment (1983), the "allowable take" for Fort Severn alone was 12. Yet no official quota system has been developed and implemented to manage the Aboriginal harvest of polar bears in Ontario. The Omushkegouk were however, discouraged from exploiting the species in various ways, such as through OMNR pronouncements that polar bears should be taken in defense only (Stirling and MacPherson 1972), and that the "meat was 'unfit' for human consumption" (interview with Washaho Elder 2010). Cree hunters were also limited to annual sale of up to 30 hides per year at the provincial fur trade auction (Stirling and MacPherson 1972), although this number was not based on any regulation or agreements with the Cree. These numbers, termed 'permissible kills', were based on harvest records reported to the Federal/Provincial Polar Bear Administrative Committee (PBAC). Peacock *et al.* (2010) suggested that three-year mean reported harvest for the SHB polar bear population was 25 for Nunavut, 4 for Ontario, and 2.5 for Quebec. According to the Polar Bear Specialist Group, the five-year mean reported historical annual removal for this shared polar bear population between Nunavut, Quebec and Ontario was estimated at 35 or approximately 5 from Ontario (IUCN/SSC/PBSG Polar Bear Specialist Group 2010).

The low harvest numbers from Ontario counter the assumptions that 'unregulated harvest' by the Cree and other Aboriginal peoples was responsible for the decline in the animal numbers in the 1960s and 1970s (Peacock *et al.* 2010; Prestrud and Stirling 1994). Indeed, what these numbers appear to indicate is that self-regulation and cooperation of the Ontario Cree combined with the relatively low-worth and high processing cost of the

fur and meat have been significant factors in the SHB polar bear conservation for the past 40 years. The use of similar temporal and spatial regulations, along with personal and communal restrictions in wildlife management by the Cree, have also been reported by Berkes (2008) (i.e., fish); Ettenger *et al.* (2002) (i.e., harvesting practices on *Muskuuchii*-bear mountain), and Peloquin and Berkes (2009) (i.e., geese).

The current population of the Southern Hudson Bay polar bear population (shared between Ontario, Québec and Nunavut) for 2005 was 900–1000 (396–950 –ON; 70–100 in James Bay–95% CI). The current trend of the population is stable; however the estimated risk of future decline is very high (IUCN/SSC/PBSG Polar Bear Specialist Group 2010). Recent studies on the Southern Hudson Bay polar bear sub-population suggest that the health and distribution of these animals and their habitat (e.g., dens, staging areas) are being affected by climate warming, including declining sea ice (longer periods of open water), melting permafrost, and increasing precipitation such as springtime rains (Obbard *et al.* 2007; Scott *et al.* 2002; Stirling and Parkinson 2006; Stirling *et al*. 2004). These factors have prompted the move by Ontario to list polar bears as 'threatened' under the provincial Endangered Species Act (ESA). While it is unclear as to how this unilateral decision will impact the Cree harvest of polar bears, according to several Washaho and Weenusk members, it disregards treaty and Aboriginal rights, overlooks the province's duty to consult and properly accommodate, disregards Cree *kiskayndamowin*/knowledge (hereafter CK) of *wabusk*, and ignores the proposed Wabusk Co-Management Agreement of 1994. Furthermore, like Inuit Qaujimajatuqangit (IQ) in Nunavut (Dowsley 2007; Keith 2005; Tyrrell 2007; Usher 2000), CK does not support all of the recommendations regarding polar bear populations provided by government officials and researchers. Washaho and Weenusk members maintain that the studies conducted in Ontario are spatially and temporally limited. CK, on the other hand, provides both longer term and seasonal observations of all polar bears throughout the "land." It is therefore the key to understanding Cree perceptions of appropriate polar bear management in this region.

Traditional Ecological Knowledge (TEK) and Cree *Kiskayndamowin*/Knowledge (CK)

Most descriptions of traditional ecological knowledge (TEK), indigenous knowledge (IK), local ecological knowledge (LEK) and IQ emphasize the importance of practical skills and wisdom developed through experience in, and earning livelihoods from, the environment (Berkes 2008). This type of knowledge is largely orally and inter-generationally transmitted, and best summarized as the sum total of grass-root experiences, technical expertise, ecological proficiency, sociopolitical competence, and spiritual and ecological attunement (Lemelin and Lickers 2004). TEK can often provide information with a temporal depth exceeding scientific studies and is available for many areas and on specific topics that have not yet been examined through scientific inquiry (Dowsley 2007; Krupnik and Jolly 2002; Mallory *et al.* 2003). Critics contend that TEK is contextually and methodologically limited (see Gilchrist *et al.* 2005). Others have noted that the philosophical dimensions of TEK are misunderstood, neglected, and rejected by wildlife managers and researchers (Dowsley and Wenzel 2008; Lemelin 2009; Nadasdy 2003).

For the purposes of this paper and through a discussion with both communities involved we have decided to use Cree *kiskayndamowin*/knowledge as a more contextually relevant term than TEK or IK. CK fosters the sharing of observations among community members and throughout the Cree nations; through this sharing, Cree "hunters contribute to collective understanding that is flexible and that allows them to grapple with complexity. This collective understanding leads to either confirmation or revision of adaptive strategies, both at the scale of individual hunting territory as well as at the regional scale" (Peloquin and Berkes 2009: 534).

The key characteristics of CK are: (a) the holistic nature of Cree knowledge and worldview—encompassing the complex interrelationships between organisms and their environment, as well as the environmental, social and cultural dimensions of change; (b) a capacity to provide localized, long-term monitoring of environmental and social change (i.e., a community-based observing system); and (c) the willingness of the Cree to protect their traditional way of life and adapt to changes in a modern context (Henri *et al.* 2010; Peloquin and Berkes 2009; Saganash 2002).

Cree knowledge has been applied in the establishment of protected areas in Northern Quebec (e.g., the proposed Tawich Marine Conservation Area in Eastern James Bay would also protect the Twin Island denning site) (Dout 1967; Mulrennan *et al.* 2009), and for conducting environmental impact assessment reviews on proposed hydro-electric development projects in Northern Quebec (Saganash 2002). It has also been used in various wildlife management strategies including those for beaver (Feit 1986); caribou (Berkes 2008), snowshoe hare (Jacqumain *et al.* 2007), waterfowl (Mulrennan and Scott 2001; Peloquin and Berkes 2009; Scott 1987), fishing (Berkes 2008), and moose (Jacqmain *et al.* 2008). Most TEK polar bear studies have been conducted in Nunavut (Dowsley 2007; Freeman and Foote 2009; Keith 2005). Polar bear observations from Cree perspectives in the Hudson Bay have been reported by McDonald *et al.* (1997), and more recently by Fidler *et al.* (2008), Henri *et al.* (2010), Kakekaspan *et al.* (2010), and Lemelin *et al*. (2010a). This growing body of knowledge can, like other management strategies, complement and challenge existing approaches to polar bear management.

We present here the results of a collaborative research project between the First Nations of Washaho and Weenusk, the Keewaytinook Okimakanak Research Institute (KORI), and researchers from the Centre for Northern Studies at Lakehead University. The goal of the project was to acquire a greater understanding of CK regarding *wabusk* movement and behaviour, and document human-polar bear interactions in the territories of the Weenusk and Washaho Cree nations of Ontario. Since CK has become recognized in Canada and elsewhere as providing valid ecological data (Ferguson *et al.* 1998; Huntington *et al.* 1999; Peloquin and Berkes 2009; Tarkiasuk 1997), as well as providing a contextual knowledge system by which to manage our interactions with northern environments (Fienup-Riordan 1999; Moller *et al.* 2004; Nadasdy 1999), the incorporation of this particular body of information will be useful in the development of the strategies for polar bear recovery in Ontario, which is required under the Ontario Endangered Species Act by 2011.

Methods

A study on climate change, well-being, and wildlife management in Weenusk was initiated in 2006 by the lead author (Lemelin). During this process, discussions with community participants in Weenusk revealed a desire to study human-polar bear interactions. As a result of the examination of polar bear management in Ontario by the lead author, a partnership between Washaho, the Keewaytinook Okimakanak Research Institute (KORI), and researchers affiliated with the Centre for Northern Studies at Lakehead University was also established in the summer of 2008 to examine polar bear movement patterns and behaviours in Washaho's traditional territory and to begin community discussions on the management of the species. This became of even greater interest to Washaho when the decision to upgrade polar bears to threatened status in Ontario was announced in the summer of 2009. Weenusk was kept apprised of the research being conducted in Washaho by Lemelin. A visit by the research team in the winter of 2010 to Washaho and Weenusk provided an opportunity for community members to voice their concerns and to discuss the various aspects of current polar bear management in Northern Canada. This paper thus draws on data collected over the period 2006 to 2010.

Research Approach

The development of this research was guided by a collaborative approach, emphasizing the political aspects of knowledge production and dissemination in wildlife management in the jurisdictions of Ontario and Canada (Hart and Bond 1995; Reason 1994; Reason and Bradbury 2006). This approach had two aims—to produce knowledge and action locally, and to empower people through the sharing, ownership, and dissemination of the research findings. Both Washaho and Weenusk indicated that they wanted to be fully integrated in all the research processes, including future publications and presentations. The community partners also understand the importance of having methods and results peer-reviewed and reaching out to the research community. This paper, which highlights their knowledge and understanding of *wabusk,* attempts to further these aims.

Data Collection

Given the specific cultural context of the project, we decided to use in-depth informal ethnographic interviews where respondents could express their positions and beliefs (Fontana and Frey 2003; Hodgson and Firth 2006). The interview schedule was flexible, open-ended and theme-based. All the participants were asked to talk about their background, their family's history in the region and their present life situation in general. Questions also focused on various aspects of socio-environmental relations and on people's relationship to wildlife and resource use. The interview guide was flexible and questions were added in some interviews depending on the experiences narrated by the participants. The audiotaped interviews ranged from 45 min to 3 h in length.

Community research assistants were hired in both communities to act as cultural and language translators and to mitigate and limit cultural misunderstandings (Ryen 2002). Approximately half of the interviews were conducted in English, while those conducted in Cree were translated with the help of local field assistants. All interviews were transcribed shortly after they occurred. Feedback and further clarification regarding key points of selected interviews were encouraged throughout the research process. Sampling was conducted through a snowball technique, which started with initial contacts with gatekeepers and by the researchers who identified potential participants, who, in turn, recommended future participants (Hodgson and Firth 2006).

The research process in Weenusk began in the summer of 2006 with an introductory field trip and then involved various field seasons from 2007–2010. During the summers of 2008 and 2009, 22 semi-structured interviews were conducted with Cree harvesters, trappers and Elders in Weenusk. Twelve harvesters (8 men and 4 women), and 10 Elders (6 men, 4 women) participated in the interviews. A community presentation outlining some of the key findings and potential issues for discussions was conducted in the spring of 2010. One introductory field trip was conducted in Washaho in the summer of 2007, six interviews were conducted in the fall of 2008 and over 18 interviews were

conducted in the winter of 2010. Of the 24 participants in Washaho, 19 of the Elders were still active in *pimachiowin* (traditional Cree livelihood), while the rest of the participants defined themselves as somewhat active harvesters. A majority (14) of the participants from Washaho were women. Many of these interviewees in both communities belong to families that have worked local trap lines for decades, often for several generations, and passed on knowledge about wildlife in the area as part of oral traditions.

Data Analysis

To acquire a greater understanding of the participants' comments, the first author read the transcripts several times and coded the transcripts twice (Patton 2002). After identifying the themes, we began to group them into more general concepts until saturation occurred (Boyatzis 1998; Taylor and Bogdan 1984). Several themes were coded and presented to the editorial team (consisting of community and tribal council members and university researchers). Some topics, such as aboriginal harvesting of polar bears and the death of polar bears caused by research, are not discussed at great length because the communities believe that this information would be dismissed or used against them. Other topics, such as male polar bears travelling greater distances into the muskeg than previously recorded, polar bear feeding patterns, including preying on beavers, and identifying human-polar bear interactions in this region of northern Canada (including defense kills of polar bears by Cree harvesters), are highlighted because many participants simply did not agree with the conclusions of previous research and wanted their voices heard. Another key finding was a discussion pertaining to the failed Wabusk Co-Management Draft Agreement of 1994. This document outlined how the OMNR and Weenusk, Washaho and Attawapiskat First Nations would co-manage polar bears in the PBPP and surrounding jurisdiction. The inability to ratify this document in the 1990s, to paraphrase one Elder from Weenusk, basically changed the province's approach to consultation and collaborative management, and essentially marginalized Northern First Nations in wildlife management in Ontario. That said, the document does provide the essential building blocks to re-examine collaborative approaches to polar bear management, especially in the light of their up-grade to threatened status in Ontario under the ESA.

Results

We use actual quotations from the participants to highlight the themes from our analysis reported in this section. To preserve their anonymity, participants are referred to by their association to stakeholder groups (such as hunters and fishers, and tourism operators).

Polar Bear Behavior and Interactions

Polar Bear Movement and Habitat Use

Similar to Russell's (1975) observations in Northern Ontario and Quebec, the Cree reported that *wabusk* typically move along the Hudson Bay shoreline through the Washaho area from east to west starting in late July or early August as part of their annual movement which maximizes their time on the sea ice. Summer retreat sites, populated by large males, can be found at East Pen Island and West Pen Island according to Washaho participants. Two interviewees from Washaho estimated that approximately 30 males congregate at East Pen Island each year. According to several Weenusk members who hunt and fish in their traditional territories near the Sutton Ridges, *wabusks* are also found at the estuaries of the Winisk and Sutton Rivers. Further down the coast, two individuals formerly employed as guides for the polar bear viewing operations offered in the PBPP estimated some aggregations near the Sutton River to be around three to four polar bears, while one individual spoke of extremely large aggregations averaging 15 large males at Cape Henrietta-Maria.

In Ontario most dens can be found within 40 km of the coast, yet some females have been known to wander as much has 120 km inland to find an appropriate denning site (Peacock *et al.* 2010). A majority of harvesters in both communities agreed that sub-adult females with cubs often travel inland into the muskeg and remain there until the ice is completely formed on the bay when the bears move out. In Washaho, a hunter reported seeing tracks of a female with two new cubs that had emerged from a den located 65 km inland in the spring of 2008. However, some harvesters noted that the polar bears were going much further inland than reported: "The tracks of a female and cubs of the year were found approximately 200 km inland in late March/early April" (interview with Washaho harvester 2010).

Although Cree observations supported scientific observations of inland travel patterns and denning habits by female polar bears, the Cree also provided a greater understanding of sub-adult and male travel patterns in the tundra and taiga of Northern Ontario Polar bears can be found "further up river, like a 150 km or so. And even the males do that" (interview with Weenusk harvester 2009). While such reports are typical in the fall, participants noted increasing observations of polar bears (both female and male) further inland during the

months of March and April (from 2006-2010), a time that is usually associated with hunting on the sea ice. Polar bear use of the inland muskeg and the *pipoonemaskunow* (winter road) through PBPP was also reported by half of the participants from Weenusk and Washaho. Another participant from Weenusk noted that "the polar bears come on shore earlier in the year and they hang around here, inland, like way inland." For example, in the summer of 2008, just a few days after sea ice break-up, a young sub-adult polar bear was observed swimming in the Winisk River only a few kilometers downriver from the community: "They never used to be up the river like that!" (interview with Weenusk harvester 2009). The Cree First Nation of Shamattawa was also recently visited (July 30, 2010) by a sub-adult polar bear (Winnipeg Free Press 2010). Many individuals argued that polar bears have always been going farther inland than had been previously reported by researchers. This is quite plausible since most of our data on polar bears in this region come from collared females, not males, which cannot be collared or monitored through radio-collars. In-order to understand if these are traditional patterns or new adaptive strategies, the Washaho citizens are now documenting these interactions and observations.

Polar Bear Feeding Behaviour

Scientists have long believed polar bears to be hyper-carnivores, feeding largely on marine mammals, and particularly on ringed seals when at sea. When on land during the open water months, polar bears in the Southern Hudson Bay feed opportunistically on a variety of terrestrial vegetation, most frequently berries (Derocher *et al.* 1993). Using scat analysis, field observations, and discussions with local harvesters, Russell (1975) reported that polar bears located in the Hudson and James Bays were eating fish, birds, eggs, animals, grasses and berries. Since then, Brook and Richarsdson (2002) and Derocher *et al.* (2000) have reported observations of polar bears preying and scavenging on *atik* (woodland caribou, *Rangifer tarandus-caribou)* near Churchill, Manitoba and reindeer (*Rangifer tarandus*) in the Svalbard Archipelago. Additional opportunistic feedings reported include *wapameg* (beluga whale, *Delphinapterus leucas*) and bowhead whale (*Balaena mysticetus*) carcasses (Miller *et al.* 2006; Rugh and Kew 1993), walrus (*Odobenus rosmarus*) (Thiemann *et al.* 2008), and *kichikameemasamaykoos* (arctic char, *Salvelinus alpinus*) (Dyck and Romberg 2007).

Supporting these observations are comments from Weenusk and Washaho that *wabusk* eat *penasew* (birds), *wawa* (eggs), *pisiskew* (animals), *uske* (moss), *usinne-wakoonuk* (lichens), *muskosea* (grasses) and *menisa* (berries); they also use "the tidal pools near river mouths in the bay to eat *kinoosa* (fish) and hunt *akikoos* (seals)" (interview with Weenusk Elder 2008). Nine interviewees from Weenusk familiar with the Sutton River and Holly Lake area provided similar observations of opportunistic feeding, including fishing for *masamaykoos (*brook trout, *Salvelinus fontinalis*), while individuals familiar with the Sutton and Winisk Rivers noted that polar bears often stole *kinoosa* (fish) from coastal tide nets, and preyed on *akikoos* (seals) in the Winisk and Severn Rivers. One harvester from Weenusk witnessed a polar bear trapping *akikoos* (seal) on land during the retreating tide, while others, including one Elder from Washaho, discussed how polar bears often predated on seals in the Severn River and along river banks. Unfortunately, the type of *akikoos* (seal) hunted by these bears on land was not identified. *Wabusk* predation on other species of *akikoos* is also corroborated by researchers who have noted similar patterns in the Hudson Bay: "Iverson *et al.* (2006) and McKinney *et al.* (2009) have indicated that there has been an increase of harbour seals and bearded seals and decrease in ringed seals in polar bear diets in Western Hudson Bay" (Peacock *et al.* 2010: 106) (Table 1).

Participants from both Weenusk and Washaho also highlighted how, after coming off the ice (late July/early August), polar bears will visit *niska* (Canada goose, *Branta canadensis*) and *waywayo* (snow goose, *Chen caerulescens*) colonies located along the Hudson Bay coastline and consume *wawa* (eggs) and *nishkishses* (goslings). These findings are similar to those reported by Russell (1975), Rockwell and Gormezano (2009) and Stempniewicz (1993). However, reported sightings of *wabusk* and *muskwa* (black bear, *Ursus americanus)* in close proximity to one another and sharing *niska* (Canada goose) and *waywayo* (snow goose) colonies were mentioned by one Elder in Washaho in the summer of 2008. Four participants in Washaho also reported seeing *wabusk* and *muskwa* in close proximity to one another along the coastline and near goose colonies throughout the summers of 2007, 2008 and 2009. None mentioned any aggressive encounters between the two types of bears. While the overlapping territory of polar bears and black bears is not unique to Northern Ontario, this is one of the first reports to document *wabusk* and *muskwa* interactions.

Four participants from Washaho and two harvesters from Weenusk also spoke of *wabusk* preying on *amisk* (beaver, *Castor canadensis*), *nékik* (otter, *Lontra canadensis*), and *sakwasew* (mink, *Mustela vison*), feeding behaviours not previously mentioned in the published literature. Three different hunting techniques of *amisk* by *wabusk* were reported. The first was ripping open *amisk-weste* (beaver lodges) to attack the inhabitants. The second was breaking apart *ooskwutim* (beaver dam) and preying on *amisk* that come to make repairs. The third, perhaps representing an adaptation from seal hunting, was for *wabusk* to make a hole in the ice of a *ooskuwutim* (pond) and wait for *amisk* to

Table 1 English-cree-latin lexicon of flora and fauna in Northern Ontario

English name	Cree name	Latin name
Arctic char	*Kichikameemasamaykoos*	*Salvelinus alpinus*
Animals	*Pisiskew*	
Bear cub	*maskosis*	
Bear claw	*maskasiy*	
Bear skin	*maskwayãn*	
Beaver	*Amisk*	*Castor canadensis*
Beaver dam	*Ooskwutim*	
Beaver lodge	*Amisk-weste*	
Beaver pond	*Ooskuwutim*	
Beluga whale	*Wapameg*	*Delphinapterus leucas*
Berries	*Menisa*	
Birds	*Penasew*	
Black bears	*Muskwa*	*Ursus americanus*
Brook trout	*Masamaykoos*	*Salvelinus fontinalis*
Canada goose	*Niska*	*Branta canadensis*
Cougar	*Misi-pisiw*	*Puma concolor*
Eggs	*Wawa*	
Fish	*Kinoosa*	
Goslings	*Nishkishses*	
Grasses	*Muskosea*	
Ground hog	Weenusk	*Marmota monax*
Hide	*Ayoowin*	
Lichen	*Usinne-wakoonuk*	
Mink	*Sakwasew*	*Mustela vison*
Moss	*Uske*	
Muskeg	*Omushkegouk*	
Otter	*Nékik*	*Lontra canadensis*
Pike	*Iýinito-kinosew*	*Esox lucius*
Pickerel (walleye)	*Okãw*	*Sander vitreus*
Polar bear	*Wabusk*	*Ursus maritimus*
Seal	*Ãhkikw*	
Seal (pup)	*Ãhkikosr*	
Snow goose	*Waywayo*	*Chen caerulescens*
Speckled Trout	*Mâsamêkos*	*Cynoscion nebulosus*
Sturgeon	*Namew*	*Acipenseridae*
Whitefish	*Atihkamêkw*	*Coregonus lavaretus*
Winter road	*Pipoonemaskunow*	
wolverine	*Keekawkayo*	*Gulo gulo*
Woodland caribou	*Atik*	*Rangifer tarandus-caribou*

surface there, which interview participants indicated was the method most preferred by polar bears. This method was observed in *tukwakin* (autumn), when ice was forming on lakes and the polar bears tended to become more active due to the cooler weather. Predation on *amisk* by bears, though rare, has traditionally been associated only with *muskwa* (black bears) (Bergerud and Miller 1977; Smith *et al*. 1994). However, it fits the behaviour pattern of these particular polar bears which are, according to the Cree and some researchers (Dyck and Romberg 2007), quite opportunistic in their feeding patterns.

Human-Polar Bear Interactions

Wabusk-Cree Interactions

In this section we discuss perceived changes in polar bear behaviour. Three participants from Weenusk reported that

like *keekawkayo* (wolverine, *Gulo gulo*) *wabusk* will follow a trapline and eat the trapped animals, or like *muskwa*, they will approach people's property and equipment in it in search of food. As one harvester explained:

> *Wabusk* never used to hang around communities before, it used to stay around the Bay, but nowadays if *wabusk* sees a stored snow machine all that, it will destroy it, looking for a source of food. Back in the day *wabusk* wouldn't do that, it would leave stuff alone. (Interview with Weenusk harvester 2009.)

Wabusk appear to be especially troublesome around seasonal camps and near the communities, for many of these interactions required the use of lethal deterrents. "Last year I shot two right in my parents' yard," asserted one harvester from Weenusk. In the spring of 2009, two polar bears were also shot on two separate occasions by Cree families camped along the coast of the Hudson Bay because the bears were not responding to deterrents and they were acting quite aggressively. As one harvester from Weenusk (2008) explained "We don't like to kill the animals, but when you have only a thin wall of fabric between you, your family and a polar bear, then we don't really have a choice but to kill them."

Increasing interactions between polar bears and humans have been reported in Arviat (Tyrrell 2007, Tyrrell 2009) and Nunavut (Dowsley and Wenzel 2008) and in the sub-Arctic (Kakekaspan *et al.* 2010). For example McDonald *et al.* (1997) noted that "community residents throughout the Hudson Bay reported that polar bears have recently lost their fear of humans and dogs and that they are becoming increasingly aggressive and more dependent on foraging dump-sites, camp sites and meat caches" (McDonald *et al.* 1997: 91). Future projections suggest that declining polar bear conditions due to changing sea ice conditions, and earlier ice break-up "are likely to increase polar bear interactions with humans even during the ice season. It directly follows that an increase in problem bears will result in increased kills, if proper deterrent programs are not put in place" (Peacock *et al.* 2010: 109). Since both researchers and most Aboriginal peoples in Northern Canada support the notion that in all likelihood human-polar bear conflicts will increase, it is surprising how little research and funding opportunities are actually being dedicated to implementing pro-active polar bear management strategies (i.e., data sharing, public campaigns, technological deterrents, and financial compensation for damaged property and injury) in the Canadian north (Kakekaspan *et al.* 2010; Peacock *et al.* 2010). By documenting these observations and interactions, and discussing preventative measures, the Cree Nation of Washaho is attempting to devise pro-active management strategies for polar bears. The incorporation of TEK, IQ and CK and scientific approaches into adaptive polar bear management strategies was identified and recommend at the problem-solving workshop on Aboriginal Peoples, Polar Bears and Human Dignity workshop held in the Yukon in the winter of 2009 (Clark *et al.* 2010).

Discussion

This collaborative study is one of the first to document Cree observations of polar bears in the transitional zone of the muskeg and tundra in Northern Canada. From this particular example, Cree *kiskayndamowin*/knowledge provides additional information regarding *wabusk* movements in the muskeg, and predation on *amisk* (beavers) and other *pisiskew* (animals). Of interest is the interactions of *muskwa* and *wabusk* in this area, and while they are not unique to Northern Ontario, very little documentation of these interactions exists. It is also evident that while *wabusk* historically created fewer disturbances than *muskwa*, raiding of traplines, destruction of property and the need for protection and defense kills of polar bears are increasing in this region of the country. According to recent climate change projections (Durner *et al.* 2009), the interactions between these two bear species and humans will increase, and the types of aggressive encounters described above may also increase. The fact that both First Nations have recognized these increasing interactions, and in the case of Washaho are documenting them, is indicative of a pro-active management approach that could be adopted by other Cree communities in the area.

The findings of this study are timely considering the recent re-classification of polar bears in Ontario from 'special concern' to 'threatened' under the Ontario Endangered Species Act (OMNR 2009). Under the act, a management plan (Recovery Strategy for Polar Bear in Ontario) must be produced by September 2011. The status upgrade in Ontario builds on the "State of resource reporting for polar bears in Ontario" document (OMNR 2008). Based entirely on scientific data, and a cursory recognition of the importance of CK in the management of polar bears, "The government will work in partnership with Aboriginal communities to ensure that Aboriginal and western knowledge are considered together in the future management actions" (OMNR 2008:6). The report asserts that the SHB polar bear population is currently stable, but that the potential impacts from climate change are an immediate concern (OMNR 2009). The report does not acknowledge that these perspectives are not accepted by all parties involved in the management of the SHB polar bear population, including the Inuit of Nunavut and the Cree of Ontario (see Kakekaspan *et al.* 2010), nor does it specify

how collaborative management strategies can facilitate the management of polar bears in this remote region of Ontario.

This collaborative study highlights the significant past and current information concerning polar behavior that is held by Cree harvesters, trappers, elders and community members that is not generally available to the public. Therefore, the findings of this study are a significant contribution to the current state of knowledge especially given the current trend to recognize the value of indigenous knowledge by external parties including provincial and federal governmental jurisdictions.

The contributions of TEK have been recognized generally in the co-management of wildlife but there is a need for the increased acceptance of more contextual knowledge such as CK to be recognized as an effective means by which First Nations can participate in the management of their natural resources in particular contexts. A closer examination of past management approaches (i.e., the Ontario Ministry of Natural Resources (1994) Wabusk Co-Management Agreement-Draft) indicates that the provincial government of Ontario was willing to recognize Aboriginal treaty rights and CK. Therefore we would argue that revisiting the Wabusk Co-Management Agreement Draft, a document which recognized the importance of respect, transparency, and accountability in all aspects of wildlife management including regulation and policy change, economic development, training and education, the recognition of traditional rights and CK can be integrated in the development of the Recovery Strategy for Polar Bear in Ontario

Conclusion

This article illustrates the past and current state of Cree *kiskayndamowin*/knowledge as it relates specifically to *wabusk* in Northern Ontario. Previous publications on the human dimensions of polar bear management (see Clark *et al.* 2008; Dawson *et al.* 2007; Dowsley and Wenzel 2008; Lemelin and Dyck 2007) illustrate that the challenges and solutions associated with polar bear management are both social and ecological. We have argued that an understanding of CK complements and enhances our current understanding of polar bears. We thus encourage management agencies, other researchers and Aboriginal communities in Ontario and elsewhere to participate more fully in the social side of renewable resource management in order to build rapport among all parties and engage stakeholders in the management process to create more robust, resilient and long term management strategies. In Ontario, this starts by incorporating past solutions (i.e., the Wabusk Co-Management Agreement Draft) into new management strategies (i.e., Recovery Strategy for Polar Bear in Ontario).

Acknowledgments We would like to thank the Social Sciences and Humanities Research Council of Canada, the Climate Change and Health Adaptation in Northern First Nations and Inuit Communities Program provided through Health Canada, and the Aboriginal Funds for Species at Risk provided by Environment Canada for their funding support. We would also like to convey our appreciation to our research teams in Washaho (Kenny Thomas) and Weenusk (Jeanne Hunter), and at Lakehead University (Mitch Taylor, Michel Beaulieu, David Finch), and to the reviewers and the editors. Last, but not least we are extremely grateful to the citizens of Washaho and Weenusk, for the on-going support and dedication. Without this support, this research and publication would not have been possible.

References

Beardy, F., and Coutts, R. (eds.) (1996). Voices from Hudson Bay: Cree Stories from York Factory. McGill-Queen's University Press, Montreal, QC.

Bergerud, A. T., and Miller, D. R. (1977). Population dynamics of Newfoundland beaver. Canadian Journal of Zoology 55: 1480–92.

Berkes, F. (2008). Sacred Ecology: Traditional Ecological Knowledge and Managements Systems, 2nd ed. Routledge, London.

Berkes, F., George, P. J., Preston, R. J., Hughes, A., Turner, J., and Cummins, B. D. (1994). Wildlife harvesting and sustainable regional native economy in the Hudson and James Bay lowland, Ontario. Arctic 47: 350–360.

Berkes, F., Hughes, A., George, P. J., Preston, R. J., Cummins, B. D., and Turner, J. (1995). The persistence of Aboriginal land use: Fish and wildlife harvest areas in the Hudson and James Bay Lowland, Ontario. Arctic 48: 81–93.

Bird, L. (2005). Telling Our Stories: Omushkego legends and histories from Hudson Bay. Orchard Park, Peterborough, ON.

Bird, L. (2007). The Spirit Lives In The Mind: Omushkego Stories, Lives, and Dreams. McGill-Queen's University Press, Montreal, QC.

Boyatzis, R. (1998). Transforming Qualitative Information. Sage Publications, London, UK.

Brook, R. K., and Richarsdson, E. S. (2002). Observations of polar bear predatory behaviour toward caribou. Arctic 55: 193–196.

Clark, D. A., LEE, D. S., Freeman, M. M. R., and Clark, S. G. (2008). Polar bear conservation in Canada: Defining the policy problems. Arctic 61: 347–360.

Clark, D. A., Clark, S., Dowsley, M., Foote, L., Jung, T. S., and Lemelin, R. H. (2010). It's Not Just About Bears: A Problem-Solving Workshop on Aboriginal Peoples, Polar Bears, and Human Dignity. Arctic 63(1): 124127.

Dawson, J., Stewart, E., and Scott, D. (2007). Climate change vulnerability of the polar bear viewing industry in Churchill, Manitoba, Canada. Proceedings of the international conference on tourism and global change in polar regions, Oulu, Finland, 29 November–1December.Oulu: Oulu University Press, pp. 18–23.

Derocher, A. E., Andriashek, D., and Stirling, I. (1993). Terrestrial foraging by polar bears during the ice-free period in Western Hudson Bay. Arctic 46: 251–254.

Derocher, A. E., Wiig, O., and Bangjord, G. (2000). Predation of Svalbard reindeer by polar bears. Polar Biology 23: 675–678.

Dout, J. K. (1967). Polar bear dens on the Twin Islands, James Bay, Canada. Journal of Mammalogy 48: 468–471.

Dowsley, M. (2007). Inuit perspectives on polar bears (Ursus maritimus) and climate change in Baffin Bay, Nunavut, Canada. Research and Practice in Social Science 2: 53–74.

Dowsley, and Wenzel, G. (2008). The time of the most polar bears: A co-management conflict in Nunavut. Arctic 61: 77–89.

Durner, G. M., Douglas, D. C., Nielson, R. M., Amstrup, S. C., McDonald, T. L., Stirling, I., Mauritzen, M., Born, E. W., Wiig, O., De Weaver, E., Serreze, E. C., Belikov, S. E., Holland, M. M., Maslanik, J., Aars, J., Bailey, D. A., and Derocher, A. (2009). Predicting 21st-century polar bear habitat distribution from global climate models. Ecological Monographs 79: 25–58.

Dyck, M., and Romberg, S. (2007). Observations of a wild polar bear (Ursus maritimus) successfully fishing Arctic char (Salvelinus alpinus) and Fourhorn sculpin (Myoxocephalus quadricornis). Polar Biology 30: 1625–1628.

Ettenger, K. and Local Elders, Hunters & Tallymen, (2002). Muskuuchii (Bear mountain): Protecting a Traditional Iyiyuuch Wildlife Preserve and Sacred Site. Forestry Working Group of the Grand Council of the Crees (Eeyou Istchee), http://www.gcc.ca/pdf/ENV000000006.pdf (retrieved August 26, 2010.)

Feherty, B. (2006). Peawanuck The Promised Land. Book Surge, LLC.

Feit, H. A. (1986). James Bay Cree Indian management and moral consideration of fur-bearers. In *Native People, and Resource Management.* Alberta Society of Professional Zoologists, Edm, onton, AB, pp. 49–65.

Ferguson, M. A. D., Williamson, R. G., and Messier, F. (1998). Inuit knowledge of long-term changes in a population of Arctic tundra caribou. Arctic 51: 201–219.

Fidler, A., Lemelin, R. H., Peerla, D., & Walmark, B. (2008). "Hearing the voices of all parties" WWF Arctic Bulletin, No. 1.08, 15-16.

Fienup-Riordan, A. (1999). Yaqulget Qaillun Pilartat (what the birds do): Yup'ik Eskimo understanding of geese and those who study them. Arctic 52: 1–22.

Fontana, A., and Frey, J. H. (2003). Interviewing: The art of science. In Denzin, N. K., and Lincoln, Y. (eds.), Collecting and interpreting qualitative materials, 2nd ed. Sage Publications, Thousand Oaks, CA, pp. 47–78.

Freeman, M. M. R., and Foote, L. (eds.) (2009). Inuit, polar bears, and sustainable use: local national and international perspectives. CCI Press, University of Alberta, Edmonton, AB.

Gilchrist, G., Mallory, M., and Merkel, F. (2005). Can local ecological knowledge contribute to wildlife management? Case studies of migratory birds. Ecology and Society 10: 20. [online] URL: http://www.ecologyandsociety.org/vol10/iss1/art20/

Graham, J. E. (1988). The Weenusk Cree: A preliminary background report of locals, locations and relocations, for technology assessment in subarctic Ontario. TASO Research Report # 30. Hamilton, ON: McMaster University Research: Research Program for Technology Assessment in Subarctic Ontario.

Hart, E., and Bond, M. (1995). Action research for health and social care: A guide to practice. Open University Press, Philadelphia, PA.

Henri, D., Gilchrist, H. G., and Peacock, E. (2010). Understanding and managing wildlife in Hudson Bay under a changing climate: Some recent contributions from Inuit and Cree ecological knowledge. In Ferguson, S. H., Loseto, L. L., and Mallory, M. L. (eds.), A little less Arctic: Top predators in the world's largest northern inland sea, Hudson Bay. Springer, New York, pp. 267–290.

Hodgson, R., and Firth, T. (2006). The methodological and practical issues of conducting tourism research into Indigenous communities: The Manyallaluk experience. Tourism Recreation Research 31: 11–22.

Huntington, H. P., and the Communities of Buckland, Elim, Koyuk, Point Lay, and Shaktoolik. (1999). Traditional knowledge of the ecology of beluga whales (Delphinapterus leucas) in the Eastern Chukchi and Northern Bering Seas, Alaska. Arctic 52: 49–61.

IUCN/SSC/PBSG Polar Bear Specialist Group (2010). Summary of polar bear population status per 2010, http://pbsg.npolar.no/en/status/status-table.html. Retrieved August 14, 2010.

Iverson, S. J., Stirling, I., and Lang, S. L. C. (2006). Spatial and temporal variation in the diets of polar bears across the Canadian arctic: indicators of changes in prey populations and environment. In Boyd, I. L., Wanless, S., and Camphuysen, C. J. (eds.), Top predators in marine ecosystems: their role in monitoring and management. Cambridge University Press, Cambridge, pp. 98–117.

Jacqmain, H., Dussault, C., Courtois, R., and Belanger, L. (2008). Moose-habitat relationships: integrating local Cree native knowledge and scientific findings in northern Quebec. Canadian Journal of Forestry Research 38: 3120–3132.

Jacqumain, H., Belanger, L., Hilton, S., and Bouthillier, L. (2007). Bridging native and scientific observations of snowshoe hare habitat restoration after clearcutting to set wildlife habitat management guidelines on Wasawnipi Cree land. Canadian Journal of Forestry Research 37: 530–539.

Jonkel, C., Smith, P., Stirling, I., and Kolenosky, G. B. (1976). The present status of the polar bear in the James Bay and Belcher Island area. Canadian Wildlife Service Occassional Paper 26: 42.

Kakekaspan, M., Miles, T., Lemelin, H., Dowsley, M., Beaulieu, M., Taylor, M., Siebel, F., & Walmark, M. (2010). Giving Voice to Bear: Cree Observations and Documentation of Wabusk in Ontario: Research Report. Centre for Northern Studies/KORI.

Keith, D. (2005). Inuit Qaujimaningit Nanurnut/Inuit Knowledge of Polar Bears. Canadian Circumpolar Institute, Edmonton, Alberta.

Kolenosky, G. B., and Prevett, J. P. (1983). Productivity and maternity denning of polar bears in Ontario. International Conference on Bear Research and Management 5: 238–245.

Kolenosky, G. B., Abraham, K. F., and Greenwood, C. J. (1992). Polar Bears of Southern Hudson Bay. Polar Bear Project, 1984–88. Ontario Ministry of Natural Resources, Maple, Canada. Final Unpublished Report.

Krech, S. I. I. I. (1984). The Subarctic Fur Trade. UBC Press, Vancouver, BC.

Krupnik, I., and Jolly, D. (eds.) (2002). The Earth is faster now: Indigenous observations of Arctic environmental change. Arctic Research Consortium of the United States, Fairbanks, Alaska, pp. 12–53.

Lemelin, R. H. (2009). Doubting Thomases and the Cougar: The Perceptions of Puma Management in Ontario. Sociologia Ruralis 49: 56–9.

Lemelin, R. H., and Lickers, F. H. (2004).. Implementing Capacity-Building, Respect, Equity, and Empowerment (CREE) In the Social Sciences. Proceedings of the Annual General Meeting from the Parks and Research Forum of Ontario: Parks and Protected Areas Research in Ontario 2004: Planning Northern Parks and Protected Areas. In: Rehbein, C., J.G. Nelson, T.J. Beechey and R.J. Paine. Parks Research Forum of Ontario (PRFO): Waterloo, Ontario.

Lemelin, R. H., and Dyck, M. (2007). New frontiers in marine wildlife tourism II: An international overview of polar bear tourism. In Higham, J., and Lück, M. (eds.), Marine wildlife and tourism management. CABI, Oxford, pp. 361–379.

Lemelin, R. H., & McIntyre, N. (2010 in-press). Chapter 11. Sub-Arctic Human Dimension. Resiliency and Tourism in Ontario's Far North: The Social Ecological System of the Weenusk First Nation at Peawanuck. In Maher, P., Stewart, E., and Lück, M. (eds.), Polar Tourism: Human, Environmental and Governance Dimensions. Cognizant Communication Corporation, Elmsford, NY, pp. 206–220.

Lemelin, R.H., McIntyre, N., Koster, R., and Johnston, M. (2007). Climate disruption and the changing dynamics of polar bear—Human interactions in Northern Ontario: a case study of polar bear management in Polar Bear Provincial Park, Ontario, Canada. (pp. 24–31). Tourism and Global Change in Polar Regions: An International Conference, An International Conference, November 29-December 1, 2007.Oulu, Finland.

Lemelin, R. H., Peerla, D., and Walmark, B. (2008). Voices from the Margins: The Muskekowuck Athinuwick/Cree People of Northern Ontario and the Management of Wapusk/Polar Bear. Arctic 61: 101–103.

Lemelin, R. H., Matthews, D., Mattina, C., McIntyre, N., Johnston, M., Koster, R., and and the Weenusk First Nation at Peawanuck (2010a). Climate Change, Well-Being and Resilience in the Weenusk First Nation at Peawanuck: The Moccasin Telegraph Goes Global. Special issue on "Human Health At The Ends of the Earth," Rural and Remote Health 10(1333): 1–18.

Lemelin, R. H., McIntyre, N., Koster, R., and Johnston, M. (2010b). Climate Disruption and the Changing Dynamics of Polar Bear—Human Interactions in Northern Ontario: A Case Study of Polar Bear Management in Polar Bear Provincial Park, Ontario, Canada. In Hall, M., and Saarinen, J. (eds.), Tourism and Change in Polar Regions: Climate, Environments and Experiences. Routledge, New York, NY, pp. 104–118.

Long, J. S. (1995). Who got what at Winisk? Beaver 75: 23–31.

Lytwyn, V. P. (2002). Muskekowuck Athinuwick : Original people of the great swampy land. Manitoba, Press, Winnipeg, MB.

Mallory, M. L., Gilchrist, H. G., Fontaine, A. J., and Akearok, J. A. (2003). Local ecological knowledge of ivory gull declines in Arctic Canada. Arctic 56: 293–298.

McDonald, M., Arragutainaq, L., and Novalinga, Z. (1997). Voices from the Bay: Traditional Ecological Knowledge of Inuit and Cree in the Hudson Bay Bioregion. Ottawa: Canadian Arctic Resources Committee.

McGhee, R. (1990). The Peopling of the Arctic Islands. In Harington, C. R. (ed.), Canada's missing dimensions. Science and history in the Canadian Arctic Islands, vol. 1-2. Canadian Museum of Nature, Ottawa, pp. 666–676.

McKinney, M. A., Peacock, E., and Letcher, R. J. (2009). Sea Ice-associated Diet Change Increases the Levels of Chlorinated and Brominated Contaminants in Polar Bears. Environmental Science and Technology 43: 4334–4339.

Miller, S., Schliebe, S., and PROFFIT, K. (2006). Final report: Demographics and behavior of polar bears feeding on Bowhead whale carcasses at Barter and Cross islands, Alaska, 2002–2004.

Moller, H., Berkes, F., Lyver, P., and Kislalioglu, M. (2004). Combining science and traditional ecological knowledge: Monitoring populations for co-management. Ecology and Society 9:2 URL: http://www.ecologyandsociety.org/vol9/iss3/art2.

Mulrennan, M. E., and Scott, C. H. (2001). Aboriginal rights and interests in Canadian northern seas. In Scott, C. H. (ed.), Aboriginal autonomy and development in Northern Quebec and Labrador. UBC Press, Vancouver, B.C, pp. 78–98.

Mulrennan, M. E., Boussieres, V., and Scott, C. H. (2009). Tawich (Marine) Conservation Area Eastern James Bay. Repor on the Wmindji-McGill Protected Area Project, January 20, 2009.

Nadasdy, P. (1999). The politics of TEK: Power and the "integration" of knowledge. Arctic Anthropology 36: 1–18.

Nadasdy, P. (2003). Reevaluating the co-management success story. Arctic 56: 367–380.

Obbard, M. E., Mcdonald, T. L., Howe, E. J., Regehr, E. V., and Richardson, E. S. (2007). Polar bear population status in Southern Hudson Bay. Canada. U.S. Department of the Interior, U.S., Geological Survey, Reston, Virginia.

Ohmagari, K., and Berkes, F. (1997). Transmission of indigenous knowledge and bush skills among the Western James Bay Cree Women of subarctic Canada. Human Ecology 25: 197–222.

Ontario Ministry of Natural Resources (1977). Background Information: Polar Bear Provincial Park. Ministry of Natural Resources, Toronto, ON.

Ontario Ministry of Natural Resources. (1994). Wabusk Co-Management Agreement (Draft): An Agreement Between the Minister of Natural Resources and the Chiefs of the First Nations of Attawapiskat, Fort Severn, and Peawanuck, for the Conservation and Protection of Polar Bear Provincial and Adjacent Area. Revised November 16, 1994 in Peawanuck, Ontario.

Ontario Ministry of Natural Resources. (2008). State of resources reporting: polar bears in Ontario. PDF document available online: http://www.mnr.gov.on.ca/263710.pdf. (accessed 21 March 2009).

Ontario Ministry of Natural Resources. (2009). Polar bear get more protection in Ontario McGuinty government implements scientific committee's findings. On-line document. Available HTTP: http://www.mnr.gov.on.ca/en/Newsroom/LatestNews/275969.html (accessed 12 August 2009).

Patton, M. Q. (2002). Qualitative Research & Evaluation Methods, 3rd ed. Sage Publications, Thousand Oaks, CA.

Peacock, E., Derocher, A. E., Lunn, N. J., and Obbard, M. E. (2010). Polar bear ecology and management in Hudson Bay in the face of climate change. In Ferguson, S. H., Loseto, L. L., and Mallory, M. L. (eds.), A little less Arctic: Top predators in the world's largest northern inland sea, Hudson Bay. Springer, New York, pp. 93–116.

Peloquin, C., and Berkes, F. (2009). Local Knowledge, Subsistence Harvests and Social-Ecological Complexity in James Bay. Human Ecology 375: 533–545.

Pilon, J. L. (1982). Fort Severn land use and occupancy study, unpublished thesis. University of Toronto, Toronto, ON.

Prestrud, P., and Stirling, I. (1994). The international polar bear agreement and the current status of polar bear conservation. Aquatic Mammals 20: 113–124.

Prevett, J. P., and Kolenosky, G. B. (1982). The status of polar bears in Ontario. Le Naturaliste Canadien 109: 933–939.

Reason, P. (1994). Three approaches to participative inquiry. In Denzin, N. K., and Lincoln, Y. S. (eds.), The handbook of qualitative research. Sage Publications, Thousand Oaks, CA, pp. 324–339.

Reason, P., and Bradbury, H. (eds.) (2006). Handbook of Action Research. Sage Publications, Thousand Oaks, CA.

Richardson, E. M., Branigan, W., Calvert, M., Cattet, M., Derocher, A. E., Doidge, W., Hedman, D., Lunn, N. J., McLoughlin, P., Obbard, M. E., Stirling, I. and Taylor, M. (2006). 'Polar Bear Management in Canada 2001–2004' in Aars, J., Lunn, N.J., Derocher, A.E., (eds.) *Polar Bears: Proceedings of the 14th Working Meeting of the IUCN/SSC Polar Bear Specialist Group, 20–24 June 2005, Seattle, Washington, USA*, 117–132, Gland, SW: Occasional Paper of the IUCN, 32, Species Survival Commission.

Rockwell, R., and Gormezano, L. J. (2009). The early bear gets the goose: climate change, polar bears and lesser snow geese in western Hudson Bay. Polar Biology 32: 517–671.

Royal Commission on the Northern Environment. (1983). Hearings: Fort Severn, June 2, 1983.

Rugh, D. J., and Kew, S. (1993). Polar Bears, Ursus maritimus, feeding on beluga whales, Delphinapterus leucas. Canadian field-naturalist 107: 235–237.

Russell, R. H. (1975). The food habits of polar bears of James Bay and Southwest Hudson Bay in summer and autumn. Arctic 28: 117–129.

Ryen, A. (2002). Cross-cultural interviewing. In Gubrium, J. F., and Holstein, J. A. (eds.), Handbook of interview research: Context and method. Sage Publications, Thousand Oaks, CA, pp. 335–354.

Saganash, R. (2002). Cree Knowledge for Comprehensive Environmental, Social And Cultural Impact Assessment in James Bay (Quebec). Presentation at the Parallel Event: "Liking Traditional and Scientific Knowledge for Sustainable Development." World Summit on Sustainable Development 29 August 2002, Ubuntu Village, Johannesburg.

Scott, C. H. (1987). The socio-economic significance of waterfowl among Canada's Aboriginal Cree: Native Use and Local Management." The Value of Birds, ed., A.W. Diamond and F.L. Fillion, 49–62, ICBP Technical Publication No. 6 Cambridge: International council for Bird Preservation.

Scott, D., Malcolm, J. R., and Lemieux, C. (2002) Climate change and modeled biome representation in Canada's National park system: implications for system planning and park mandates. Global Ecology and Biogeography 11: 475–485.

Smith, D. W., Trauba, D. R., Anderson, R. K., and Peterson, R. O. (1994). Black bear predation on beavers on an island in Lake Superior. American Midland Naturalist 132: 248–255.

Statistics Canada (2009). 2006 Aboriginal Population Profile—All Data—Peawanuck. http://www12.statcan.ca/census-recensement/2006/dp-pd/prof/92-594/details/page.cfm?Lang=E&Geo1=CSD&Code1=3560078&Geo2=PR&Code2=35&Data=Count&SearchText=Fort%20Severn&SearchType=Begins&SearchPR=01&B1=All&Custom= (retrieved August 14, 2010)

Statistics Canada (2009). 2006 Aboriginal Population Profile—All Data—Fort Severn. http://www12.statcan.ca/census-recensement/2006/dp-pd/prof/92-594/details/page.cfm?Lang=E&Geo1=CSD&Code1=3560078&Geo2=PR&Code2=35&Data=Count&SearchText=FortSevern&SearchType=Begins&SearchPR=01&B1=All&Custom= (retrieved August 14, 2010).

Stempniewicz, L. (1993). The polar bear Ursus maritimus feeding in a seabird colony in Frans Josef Land. Polar Research 12: 33–36.

Stirling, I. and Macpherson, A. (1972). Polar bear management changes in Canada. Paper presented at the Third Working Meeting of Polar Bear Specialists, Morges, Switzerland.

Stirling, I., and Parkinson, C. L. (2006). Possible effects of climate warming on selected populations of polar bears (Ursus maritimus) in the Canadian arctic. Arctic 59: 261–275.

Stirling, I., Lunn, N. J., Iacozza, J., Elliott, C., and Obbard, M. (2004). Polar bear distribution and abundance on the southwestern Hudson Bay coast during open water season, in relation to population trends and annual ice patterns. Arctic 57: 15–26.

Tarkiasuk, Q. (1997). Voices from the Bay: Traditional Ecological Knowledge of Inuit and Cree in the Hudson Bay Bioregion. Northern Perspectives 25(1).

Taylor, S. J., and Bogdan, R. (1984). Introduction to qualitative research methods: The search for meanings. John Wiley & Sons, New York, NY.

Thiemann, G. W., Iverson, S. J., and Stirling, I. (2008). Polar bear diets adn arctic marine food webs: insights from fatty acid analysis. Ecological Monographs 78: 591–613.

Tyrrell, M. (2007). More bears, less bears: Inuit and scientific perceptions of polar bear populations on the west coast of Hudson Bay. Études/Inuit/Studies 30(2): 191–208.

Tyrrell, M. (2009). West Hudson Bay Polar Bears: The Inuit Perspective. In Freeman, M. M. R., and Foote, L. (eds.), Inuit, Polar Bears and Sustainable Use: Local, National and International Perspectives. CCI Press, Edmonton AB, pp. 95–110.

Usher, P. J. (2000). Traditional Ecological Knowledge in Environmental Assessment and Management. Arctic 53: 183–193.

Winnipeg Free Press On-Line Edition (2010). Polar bear takes dip in river at Shamattawa. Posted 30/08/2010. http://www.winnipegfreepress.com/breakingnews/Polar-bear-takes-dip-in-river-at–101798988.html (accessed September 15, 2010).