ACROSS BORDERS, FOR THE FUTURE:

Torngat Mountains Caribou Herd Inuit Knowledge, Culture, and Values Study

Prepared for the Nunatsiavut Government and Makivik Corporation, Parks Canada, and the Torngat Wildlife and Plants Co-Management Board - June 2014

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Executive Summary

The Torngat Mountains Caribou Herd (TMCH), inhabiting the northern tip of the Québec-Labrador Peninsula, is not well documented in regard to science or Inuit Knowledge. Information on this herd suggests a recent population decrease. Given the importance of caribou for Inuit, precipitous declines in the neighbouring George River Herd, and the upcoming Committee on the Status of Endangered Wildlife in Canada assessment, increasing our understanding of these animals through documentation of IK is critical. This study drew together Inuit from Nunatsiavut and Nunavik and government agencies, from regional to federal levels and across provincial borders. Thirty-three semi-directed interviews were conducted, including participant mapping, with hunters and Elders in Nunavik and Nunatsiavut, representing over seven decades of IK. Thematic content analysis was performed on interview narratives, highlighting IK on this species including new information about topics like the changing role of predators and herd behaviour. Digitized spatial data visualized the long-standing Inuit-caribou relationship in the area, while augmenting the limited existing geographic information. Considerable depth and breadth of IK in Nunatsiavut and Nunavik regarding caribou and their ecology was evident, representing contributions to the overall understanding of TMCH ecology, particularly as it pertains to assessment and future Species At Risk Act designation for this herd. This project also represents a model for cross-border wildlife stewardship, essential for wide-ranging species.

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1 Introduction

> “I think the importance of having animals around should be number one for everybody.”

Caribou In Québec and Labrador

Caribou (Rangifer tarandus) are highly mobile herbivores that are distributed across much of northern Canada (Festa-Bianchet et al. 2011). In the wild caribou reach sexual maturity in their third year, and live to between 4.5 and 15 years of age, breeding once per year during the autumn months, and giving birth in the spring (Nowak 1999). Caribou mortality is highest at a young age and most herds require a 10-12% calf survival rate to 4 months of age for a stable population (Bergerud 1987). These ungulates play a key role in Arctic and boreal ecology as a prey species, in nutrient cycling, and in habitat modification through trampling and herbivory (Hummel and Ray 2008).

Caribou found on the Québec-Labrador Peninsula are of the woodland subspecies (R. t. caribou), of which there are there three ecotypes: migratory (e.g. the George River and Leaf River herds), sedentary (e.g. the Red Wine herd) and mountain (e.g. the Torngat Mountains herd). Ecotypic classification is largely based on differences in behavioural characteristics between herds of the same subspecies. Caribou of the mountain ecotype, such as the Torngat Mountains herd, generally maintain a relatively small range, rather than the extensive geographic distribution of the migratory type. Unlike the large scale migration undertaken by other herds, mountain caribou usually display a pattern of vertical migration, using elevation to mitigate the effects of harsh snow conditions, avoid predators, and take advantage of stratified vegetation growth and emergence (Hummel and Ray 2008).

The Torngat Mountains Caribou Herd (TMCH) inhabits the northernmost tip of the Québec-Labrador peninsula, with the population range overlapping considerably with that of the George River Caribou Herd (GRCH; Schaefer and Luttich 1998; Bergerud et al. 2008). Indeed, the two groups are not considered genetically distinct (Boulet et al. 2007). However, body size between these herds is significantly different (Couturier et al. 2010) and movement patterns throughout the year are also distinct (Schaefer and Luttich 1998). Mountain caribou, like the TMCH, generally have shorter migrations between seasonal ranges and are thought to use alpine habitat to escape predators during the critical calving period (Bergerud et al. 1984). As such, the TMCH is generally recognized in the science literature as a discrete population and is considered to be its own Designatable Unit by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2011).

Inuit Knowledge and Caribou

Caribou are an essential and highly nutritious country food that has been used for centuries by the Inuit of Nunavik and Nunatsiavut (Brice-Bennett 1977; Mason et al. 2006; Cuerrier and the Elders of Kangiqsualujjuaq 2012), as well as being central to Inuit culture (Williamson 1997; Cuerrier and the Elders of Kangiqsualujjuaq 2012). With this longstanding relationship comes intimate knowledge of

current and past behaviour and health as well as a broader understanding of the land caribou inhabit. Communities throughout Nunavik and Nunatsiavut continue to harvest caribou today, representing an opportunity for knowledge sharing between generations (Williamson 1997; Cuerrier and the Elders of Kangiqsualujjuaq 2012). Harvesting also plays an important role in the spiritual, social, cultural, and physical health of those who hunt and use country food (Pufall et al. 2011). Inuit represent a valuable source of knowledge to understand these animals given their close and continued contact with these animals since time immemorial. Those most affected by changes to caribou populations and caribou management will be Inuit who have depended upon and lived with these animals for centuries.

For the purposes of this report, the following definitions will be used to encompass different types of knowledge:

- Inuit Knowledge (IK): "Knowledge, understanding, and values held by Inuit based on personal observation, collective experience, and oral transmission over generations" (LILCA 2005).
- Traditional Ecological Knowledge (TEK): "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (Berkes 1999).
- Science-derived Knowledge (SK): Knowledge about the natural world derived primarily from systematic analysis built on the principles and process of the scientific method.

To date there has been very little documentation of IK regarding Torngat caribou. One project, undertaken in 2003, collected ecological knowledge of various local animals, including caribou, from Inuit in Kangiqsualujjuaq (Cuerrier and the Elders of Kangiqsualujjuaq 2012). The brief section on caribou did not differentiate between GRCH and TMCH, although participants were likely discussing both. The scope of the work was also limited to zoological information. There was some Nunatsiavummiut knowledge about caribou captured in the study Our Footprints are Everywhere, mainly regarding responses to humans, seasonality of movement, and population cycles (Brice-Bennett 1977). Caribou hunting area maps for the land between Nain and Saglek are included, as well as the extent of pre-settlement and recent (during the 1970s) caribou hunting from Nain to Kangalaksiorvik Fiord. Again, there is no discussion of Torngat Mountains versus George River caribou.

SK on Torngat Mountains caribou is also somewhat limited, particularly in terms of temporal scale. In the 1988 to 1997, telemetry collars were deployed on caribou from the Torngat Mountains to

assess movement and space use (Schaefer and Luttich 1998). Genetic work was completed to determine the relationship and lineage of Torngat Mountains caribou and other neighboring herds (Boulet et al. 2007) and comparisons of body size and movement rates have recently been explored, as well (Couturier et al. 2010).

Rationale and Context

The GRCH continues to be in a serious decline (Gunn et al. 2011) and preliminary data suggest that the TMCH may also be in a precarious state. For example, data from limited collaring initiatives in recent decades indicate very low survivorship among adult females (Torngat Wildlife, Plants & Fisheries Secretariat, unpublished data). Given the relationship between the two populations, their importance to Inuit, and the presence of numerous potential threats, understanding the poorly documented TMCH is imperative. In order to develop and implement an effective management strategy that is supported by Inuit and managers alike, basic population information and trends, like body condition and harvest levels, are required. It is also important that managers and Inuit harvesters agree on the information used to support management decisions.

The importance of the TMCH, both in social and ecological terms, emphasizes the critical need for a comprehensive, integrated examination of what information exists and where there are knowledge gaps in the Inuit Knowledge (IK) and the science-derived knowledge (SK). Furthermore, the transboundary and highly mobile nature of these animals emphasizes the need to facilitate cooperation among all levels of government involved in the stewardship of this herd, while encouraging the participation of local communities.

This study partnered with the Nunatsiavut Government, Makivik Corporation, Parks Canada and the Torngat Wildlife and Plants Co-Management Board to inform future management discussions by working with local Inuit hunters and Elders to synthesize qualitative and spatial IK regarding the TMCH.

Objectives:

- To gather and synthesize existing Inuit Knowledge on Torngat Mountains Caribou;

- To conduct an Inuit Knowledge, Culture and Value study (narrative documentation and mapping) among expert harvesters and Elders in Nunatsiavut and Nunavik to gather current IK on the Torngat Mountains Caribou;

- To represent that knowledge in a synthesized manner with supporting qualitative and spatial (map) illustrations for review by study participants and use by the Nunatsiavut Government, Makivik Corporation, Parks Canada and the Torngat Wildlife and Plants Co-Management Board to inform future management discussions.

2 Methods

> “Well, when we were kids, in those times Inuit kids they learned by watching.”

Study Area

Semi-directed interviews occurred in two communities between July and September of 2013: Nain, Labrador and Kangiqsualujjuaq, Québec (Figure 1). These communities represent the current-day settlements closest to the Torngat Mountains caribou herd range in each province (Schaefer and Luttich 1998). Nain is the northernmost community on the Labrador coast with a population of 1185 people, 90% of which identify as Inuit (Statistics Canada 2011). English is the primary spoken and written language. The Labrador dialect of Inuttitut is also commonly used, especially by Elders (Statistics Canada 2011). Of Kangiqsualujjuaq's 865 residents, 93% identify as Inuit. The primary language at home is Inuttitut, which is written in syllabics, while English and French are spoken less frequently (Statistics Canada 2011). Nain and Kangiqsualujjuaq are fly-in communities, with no road access. Country foods (plants and animals hunted or gathered from the land) continue to represent a considerable portion of the diets of Nunavik and Nunatsiavut residents (Allard and Lemay 2012). In addition to these two communities, several interviews were conducted at the Torngat Mountains Base Camp and Research Station in the Saglek Fiord, northern Labrador, where Inuit presence on the land dates back thousands of years (Brice-Bennett 1977). A number of Elders and hunters from Nunavik and Nunatsiavut visit the Base Camp and Research Station in various capacities (e.g. Parks Canada staff, bear monitor, guest, etc.) each summer. In August of 2013, the study was able to interview two Nunatsiavummiut and five Nunavimmiut at the Base Camp.

The study area spans two ecozones: the Arctic Cordillera and the Taiga Shield (Ecological Stratification Working Group 1995). Within the Taiga Shield ecozone, three ecoregions fall within the study area, including the George Plateau, the Kingurutik-Fraser Rivers, and the Coastal Barrens, while the Torngat Mountains ecoregion makes up the Arctic Cordillera portion of the study area. Seasonal temperatures range from an average of -16.5°C in the winter to an average of 7°C in the summer (Ecological Stratification Working Group 1995).

Landcover varies considerably depending on elevation and latitude. In the Taiga Shield, the plant communities range from bare rock, tundra, and alpine heath to open tree cover of black spruce (*Picea mariana*) and tamarack (*Larix laricina*), with areas of shrub, grass, lichen, and moss cover. Permafrost is extensive and discontinuous (Ecological Stratification Working Group 1995). Closer to the coast, the landscape is dominated by coastal heath and exposed bedrock. Wetland areas are also common. Lastly, the Torngat ecoregion is mountainous and glacially shaped with sparse lichen, moss, sedge, and grass cover dotted with patches of mixed evergreen and shrubs (Ecological Stratification Working Group 1995).

Figure 1. Study area of the Torngat Mountains Caribou Herd Inuit Knowledge Study.

Interview Guide and Map Development

The interview guide was developed in collaboration with the Nunatsiavut Government, Makivik Corporation, the Torngat Wildlife and Plants Co-Management Board, and Parks Canada. Key themes throughout the guide were drawn from established management criteria used for large ungulates (Wilson and Furgal 2013) including population dynamics, spatial behaviour, life history characteristics, interspecific interactions, health and disease, and hunting. Interview guides from previous traditional ecological knowledge studies were also used as a reference for content and flow (Thorpe et al. 2001;

Taylor 2005). The guide was translated into both Nunavik syllabics and the Labrador dialect of Inuttitut, along with the consent form and letter of information.

The base maps for the spatial component of the interview process were developed from several sources, including telemetry data from the 1980s and 1990s (Schaefer and Luttich 1998), caribou harvest data from a previous land use study (unpublished data, Makivik Corporation), and discussions with three respected harvesters in Nain. In total, four maps were created in ArcMap 10.2 (ESRI 2014): one "overview map" at a scale of 1:569,549 and three large-scale maps (two at a scale of 1:255,340 and one at 1:285,340, to capture the total study area). All maps were made using NAD83 and the UTM projected coordinate system (Zone 20). Maps were printed with tic marks around the perimeter to facilitate accuracy in the mylar digitization process.

Early in the interview process, it was clear that there were insufficient Inuttitut place names on the map, particularly in the Nunavik region; a community liaison and an Elder were able to supplement the limited coastal place names on the original map. The overview map was rarely used by participants during the interviews and served more as a point of reference, while the large-scale maps were the focus of the mapping exercise.

The Interview Process

Participant Selection

Following Davis and Wagner (2003), 'Inuit knowledge holders' or local experts were identified as individuals with recognized expertise and knowledge from experience gathered over a long period of time. These individuals were identified through discussions with the local Hunting, Fishing, and Trapping Association in Nunavik and with the Nunatsiavut Government Wildlife Stewardship Facilitator in Nunatsiavut. Several hunters interviewed for this study also made suggestions about other possible knowledge holders. In Nunavik, the community liaison and translator contacted potential participants and the Wildlife Stewardship Facilitator performed this role in Nunatsiavut.
While men were and continue to be the primary caribou hunters in both regions, some women do hunt and/or interact with caribou in other ways, for example, through cleaning skins and sharing stories. As such, women identified as knowledge holders in the communities were also invited to participate in the interview process whenever possible.

Semi-directed interviews

This study employed semi-directed interviews with a participatory mapping component for the documentation of associated spatial data (Huntington 1998; Chambers 2006). Interviews were

conducted one-on-one or, if preferred by participants, with small groups of 2-3 individuals who typically hunted the study animals together or often in the same locations because of familial or other connections. Before each interview, the project and its objectives were explained to the participant(s), along with the consent form (Consent Form: Appendix I). At this point, the participant was given the option of being recorded with a digital recorder or having the interview recorded solely through note taking. If he or she consented, the recorder was turned on and the interview began. Only one participant chose not to be recorded and to remain anonymous.

Hunter attributes were collected at the start of each interview. While the interview guide was used to focus each discussion, the semi-directed nature of the interviews allowed participants to speak about different topics related to caribou in the order that was most natural to them. This style of interview is preferred when there are key subjects that the interviewer would like to address, without limiting the conversation (Huntington 1998). Some interviews followed the guide quite closely, while others were less structured. Throughout the interview, participants were prompted to draw points, lines, and polygons on mylar overlaid on the base maps to illustrate spatial location and characteristics of features being discussed in narrative related to caribou and hunting. These features were labeled according to a predetermined coding structure (Table 4: Appendix II; Tobias 2010). The majority of participants added spatial data to the maps; however, some interviewees were uncomfortable drawing, at which point either the interviewer would assist with the drawing at the direction of the participant or the spatial information would be described orally for the digital recorder.

Participants were provided the option of conducting the interview in their preferred language. Eight of the interviews were conducted in Inuttitut, with the assistance of a local translator, wherein questions were asked in English and translated for the participant. Similarly, responses were given in Inuttitut and translated back to the interviewer. There were 33 interviews conducted in total (Table 1). The youngest participant was 25 and the oldest was 79 years old. In each community, the interview process continued until theoretical saturation was reached, at which point there was considerable overlap in the oral and geographic information shared by participants (Bowen 2008; Petheram et al. 2010). For example, after several interviews, the snowmobile and boat routes used to access hunting areas were repeated across maps and it was often noted by participants that there are limited routes that can be used due to the rugged terrain. Some participants also mentioned that there are only a small number of hunters that travel north for caribou, potentially because of the distance, cost of travel, and level of experience required.

Table 1. Interviewee demographics and number of years of experience hunting, traveling, and/or living in the study area.

		Nunavik	Nunatsiavut	Total
Number of Participants		15	18	33
Gender	*Male*	10	18	28
	Female	5	0	5
Age Class	*20-29*	1	1	2
	30-39	0	2	2
	40-49	2	1	3
	50-59	2	12	14
	60-69	7	2	9
	70-79	3	1	4
Range of Years of Experience		20 years to 70+ years	20 years to 70+ years	NA

Qualitative Analysis

Transcription and Translation

Interviews conducted in English were transcribed directly from the audio recordings and stored as electronic documents. The eight interviews conducted with an Inuttitut translator were fully translated and transcribed into an electronic copy for analysis. Place names were particularly difficult for English language translators and required the input of a local assistant from Nain. The accuracy of the transcription process was verified by listening to the audio recordings while reviewing the electronic transcripts and checking for inconsistencies. When inconsistencies were found, the electronic transcript was edited to match the audio recording.

Thematic Code Development and Transcript Coding

Transcribed and translated interviews were imported into the qualitative analysis software program, NVIVO 9 (QSR International 2010). A hierarchical thematic code structure was developed as a basis for organizing qualitative data in the transcripts (Coding Structure: Appendix III). This allowed for the identification and association of participant responses into various common themes and provided the ability to search for patterns within responses across participants. Themes within the

coding structure were created using topics specifically discussed during interviews, as well as topics that emerged during the course of the interviews following a process of thematic content analysis (Creswell 2009). If important or common themes emerged during the coding process not currently included in the analytical structure, new codes were created and added to the existing structure.

Time Periods

Qualitative data garnered from interviews varied greatly temporally. In order to aid in the organization of data and to add a temporal element to analysis, temporal categories were created. Category definitions were not rigid, and data were categorized using researcher interpretation of the text when not explicitly stated by participants. Three categories were chosen and defined:

1. Present – category used when data referenced current situations or the very recent past. Usually these data referred to situations in the last 5 years.
2. Recent past – this category was used for data referring to situations in the past, usually based on the first hand memory of the participant from their own experiences, up until the 'Present' time period. Often this category included data from 5 to 40 years ago.
3. Distant past – this category refers to anything older than the 'Recent past' time period. Any information that was passed to the participant from a knowledge holder referring to something outside the participants' own memory was put in this category. Generally, it refers to situations greater than 50 years before present.

Seasons were defined as follows: Spring (March to May), Summer (June to August), Fall (September to November), and Winter (December to February).

Spatial Analysis

Vectorization of Map Features

All mylar maps were scanned and digitized, then georeferenced in ArcMap. Each interviewee and each mylar were given unique identification numbers; as some participants had multiple mylars these unique identifiers were essential for linking feature data in the map database. Scanned mylar TIFFS are raster images, meaning pixels are used to represent the features in the image. To create each of the point, line, and polygon map features, it was necessary to convert all raster images into vector files. First, all polygon map features on all mylars were vectorized using the 'Vectorization Trace' function in ArcMap. Vectorization Tool settings were adjusted so that the trace followed the centerline of the line feature being traced. As each polygon feature was created, the associated database

information pertinent to that feature was entered into the attribute table (e.g. community, mapping code information, temporal data regarding a feature, etc.). The point and line features were then vectorized in a similar fashion. The Snapping Toolbar was also used in ArcMap during line feature vectorization to ensure line features connected and did not become a 'floating' feature. After the vectorization process was complete, there were a total of 528 polygon features, 278 line features, and 240 point features.

Composite Map Creation

Composite maps were developed for the validation process (see below) and later updated to integrate any changes or additions from the community meetings (see 'Community Validation' below). For validation, composite maps were printed with the same format and scale as the original interview base maps to retain accuracy and consistency in the cartographic process. Two sets of maps were created: one for each region, where only features drawn by Nunavik or Nunatsiavut participants were represented. In this way, participants did not have to review parts of the study area and data with which they were not familiar. Hunting features and caribou features were mapped separately from travel routes and cabins to keep the maps clear and uncluttered, for greater simplicity in validation. A composite map of features in both regions was produced to illustrate the extensive Inuit caribou-related land use footprint to participants in both regions.

Community Validation

Community validation is an important step in the assembly, analysis, and presentation of project results, as it allows participants to review and validate how their knowledge has been summarized or interpreted before it is shared with others (Huntington 1998, Creswell 2009). This step is particularly important when interviews are bilingual, to ensure information was not lost or confused in translation. Validation also emphasizes ownership of the knowledge being shared by participants. In qualitative analysis this step constitutes an important component of verification of internal validity and is often referred to as "member checking".

Validation of results, including maps, with participants in Nain and Kangiqsualujjuaq occurred in February 2014. In advance of these visits, transcripts of individual interviews were prepared for participants to review. Ideally, these would have been shared with participants before arrival, but time constraints and difficulties in finding appropriate transcribers did not allow for this. Upon arriving, the research team met with several local contacts, depending on the appropriate points of contact in each community. These included the project translator (same contact as the interview process), the Mayor or AngajukKâk, the Inuit research advisor, and the hunter support coordinator. Participants were notified of validation meetings through the community contact and hunter support coordinator, by phone, and/or

over the community radio.

Two group meetings were planned, initially: one to address results flowing from the analysis of interview transcripts and another to review composite maps (Gagnon and Berteaux 2009). Prior to reviewing preliminary results, participants were given an update on the project and methods of data collection were re-explained since the interviews had taken place several months earlier. These meetings were always co-facilitated by the community contact, particularly in Kangiqsualujjuaq, where most participants speak Inuttitut as their first language.

The first meeting, to discuss qualitative analysis results, was tailored to each community to ensure that participants could review the data they shared and how it was represented in the results. This focus was especially important for certain themes where there was a notable difference in response between Nunavik and Nunatsiavut. As the intention was to confirm/improve accuracy of results through group discussion, participants were encouraged to comment on the interpretation of the qualitative data. Any comments, corrections, additional information, or changes in both qualitative results and the composite maps were noted and integrated into the final results. Participants were given a transcript of their own interview, for review. Some interviews required transcription into Nunavik syllabics and not all could be completed before the meetings. These were supplied to participants as quickly as possible after the community visits and they were encouraged to share concerns or comments regarding transcripts with the researcher via the community contact or hunter support coordinator.

During the second community meeting in both Nain and Kangiqsualujjuaq, paper copies of the composite maps were shared and explained. Participants reviewed and discussed the various features together (points, lines, polygons). In some cases, additional features were added and directional lines representing caribou movement were clarified for some seasons. No data were removed from the maps. In Kangiqsualujjuaq, eight of the fifteen participants attended at least one of the validation sessions and one participant reviewed preliminary results individually because of her schedule. Three participants were not in the community and three participants were not interested in reviewing results. In Nain, 10 of the eighteen participants attended at least one of the validation sessions. One participant (from Rigolet) was contacted while validation was conducted in Kangiqsualujjuaq.

Throughout the results section certain terminology is used consistently to refer to ranges in the number of participants that noted particular statements or made similar observations. ‘A couple’ refers to two participants, ‘a few’ refers to 3-5 participants, ‘some’ or ‘several’ refer to more than 4 participants, but less than 50%, ‘the majority’ or ‘most’ refers to more than 50% of participants.

3 Results

> “Caribou is our food, we as Inuit always had used it for our clothing, we used it in our lifestyle, if they go away, then what will we do?”

Hunter Attributes and Description of Dataset

Winter and spring are the most active seasons for caribou-related hunter travel. Currently, and in the recent past, travel during these seasons has been almost exclusively by snowmobile. In the distant past hunters traveled in the winter by dog team and on foot. There is some summer travel, by speedboat, freighter canoe, or longliner. Fall generally had the lowest level of travel; challenging weather conditions were commonly mentioned in relation to fall travel.

There has been a change from the distant past to the present in terms of length and frequency of hunts. In the distant past a hunting trip by dog team could last several weeks, often from a month to the entire winter. Currently, trips often only last a few days, but occur several times a year. Some participants talked about longer trips (lasting around a month) in the recent past or present time periods, but these were infrequent and usually only occurred once or a few times in the hunter's lifetime. It appears that less time in total is being spent on the land than in the distant past. However, it is possible that there is a similar geographic extent and intensity of hunting due to the increased effectiveness of snowmobiles over dog teams in covering land.

Hunters from Nain and Kangiqsualujjuaq tend to hunt the Torngat Mountains caribou in different areas. Hunters from Nunatsiavut hunt Torngat Mountains caribou north of Nain, along the eastern shore of Labrador and on the many islands along the coast. They also go inland where the terrain allows. Most hunters from Nunatsiavut do not go any further north than Saglek Fiord (Figure 5, Figure 6, Figure 7, Figure 8). Hunters from Kangiqsualujjuaq tend to hunt for caribou along the eastern shore of Ungava Bay, up to Killiniq, venturing inland where topography allows (Figure 9, Figure 10, Figure 11, Figure 12). Inland areas, which are generally less accessible, are used less than coastal areas in both regions

Estimates of the number of caribou harvested each year varied greatly depending on the time period. In both Nain and Kangiqsualujjuaq every participant that gave estimates of caribou harvest for both present and recent past time periods stated a greater number harvested in the recent past. Estimates of harvest numbers in the ancestral past time period were very unspecific and referred to hunters taking as many caribou as they could, which was not very many (none or just a few).

Present estimates of the number of total Torngat Mountains caribou harvested annually by all residents of Kangiqsualujjuaq ranged from 20 to over 100 with the majority of participants estimating 20-50 animals. In Nain, annual community harvest estimates varied from less than 10 animals to hundreds (likely combined with George River herd). Most participants gave unspecific responses (very few, not many, etc.) indicating the small number of animals harvested by the community on an annual basis.

Herd Identification

Since there was known spatial overlap between the TMCH and GRCH, as they are understood in the science literature, it was important to determine from participants if the communities that hunt and live with these caribou indeed consider them to be separate and if there were ways of determining herd association on the land and/or after a successful kill.

Key Distinguishing Features

The majority (84.8%, $n = 28$) of participants considered the TMCH to be distinct from the GRCH. The participants that were able to distinguish between the George River and the Torngat Mountains herds described several ways in which they could determine to which herd a specific caribou belonged (Figure 2).

"They're different animals. You can tell by their size, their fur colour, their habitat, their area where they live, too. Their tracks are different." – Nunatsiavut Participant

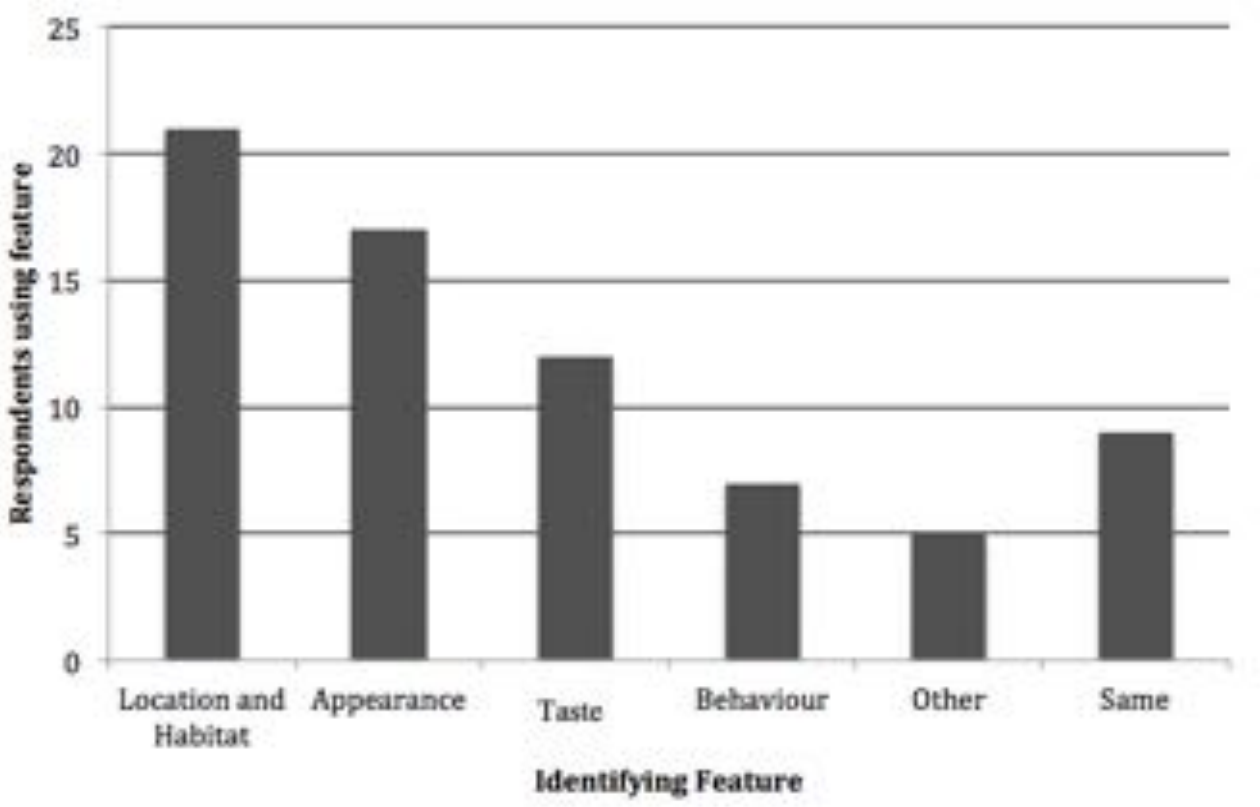

Figure 2. Identification of distinguishing features for the Torngat Mountains and George River caribou herds ($n = 33$).

The majority of respondents identified at least one feature they used to discern herd association, with location/habitat and appearance being the most commonly used identification traits. Examples of location and habitat included northern latitude (TMCH) versus southern latitudes (GRCH) and on hills/mountains (TMCH). Torngat caribou are also known to have larger bodies and shorter legs when compared with George River animals.

"Back in the day when I first started, the Torngat caribou up there had really big heads on them and shorter legs. They were a lot different than the George River caribou." – Nunatsiavut Participant

Other differentiating characteristic included how individuals or groups of caribou behaved and how the meat tasted after there was a successful kill. All the participants that mentioned a taste preference indicated they preferred the Torngat Mountains animals. The distinguishing of taste was often attributed to the differences in habitat and space use. Some participants suggested the more extensive migratory behavior of the George River animals made them leaner and gave them a less desirable taste. Some participants pointed to the different vegetation that the two herds have access to as a possible reason for the difference in taste.

"And they were just on the islands and on the mainland points so they were all stopped. There was a difference in watching the George River animals like they were moving through and there was steady movement." – Ron Webb (Nunatsiavut)

"The caribou up in around Hebron area, they taste a lot different than the George River caribou, maybe because there's no trees up there and it's a different taste." –Nunatsiavut Participant

Some participants (27.3%, n = 9) were either unable to tell the difference between the herds or considered them to all be part of the same herd.

"I don't think there is a difference, I think they are all the same." – Nunavik Participant

Distribution

Based on the cumulative knowledge of the participants of this study, the distribution of Torngat Mountains caribou was mapped using the greatest extent, as indicated by sites or areas where caribou were seen and/or hunted (Figure 3). The southern extent of the TMCH population may actually have receded northward of what is indicated in Figure 3. Several participants from Nunatsiavut noted that,

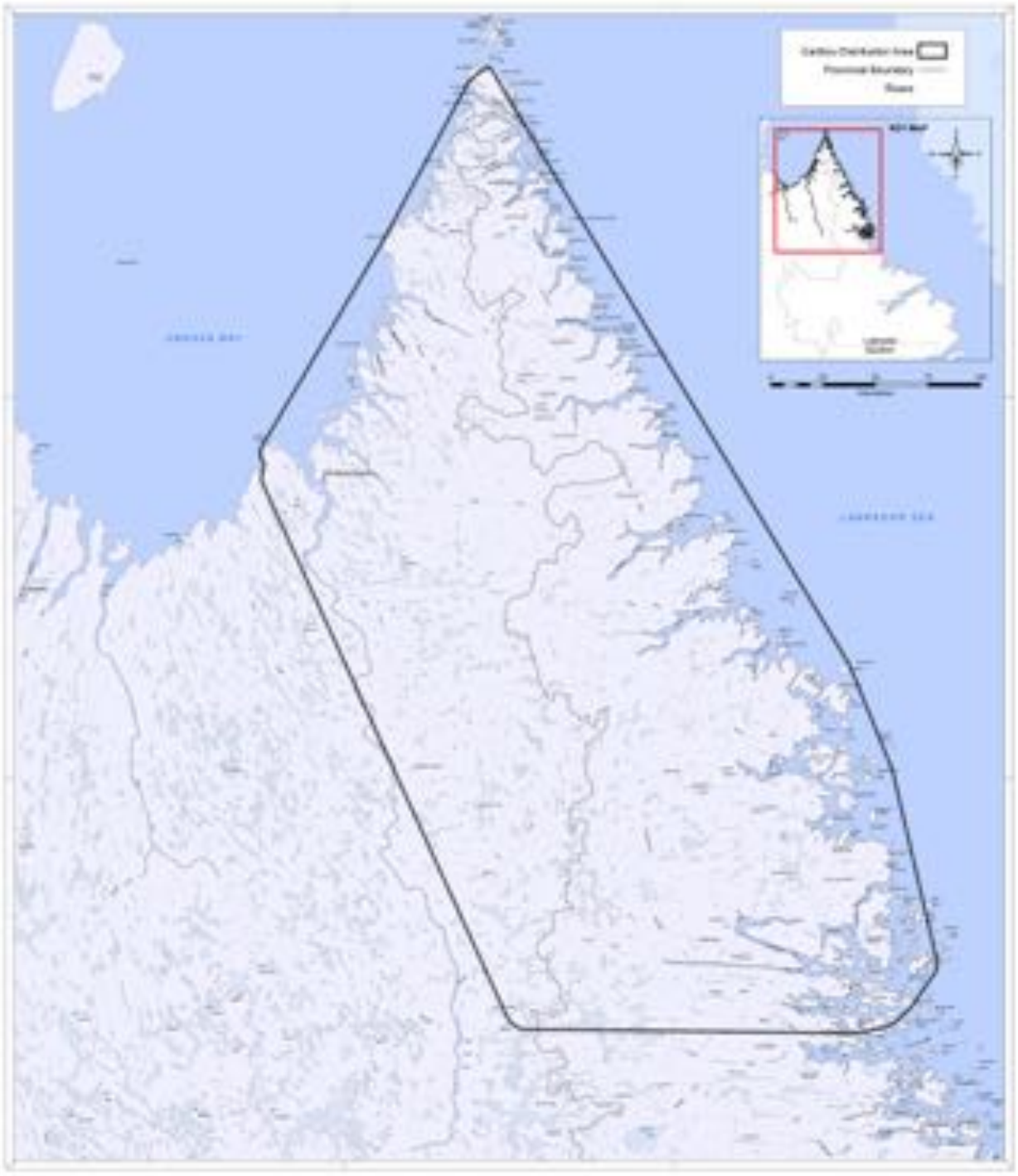

Figure 3. Known distribution of the Torngat Mountains Caribou Herd as determined by participant sightings and hunting places, delineated by a 100% minimum convex polygon.

while the Okak area was formerly an excellent hunting ground, caribou are rarely found in this location in recent years (past five to ten years) and hunters must now travel farther north in order to find caribou (See Overhunting). Several participants from Nunavik noted that in the recent past Torngat Mountains caribou could be found along the eastern shore of Ungava Bay close to Kangiqsualujjuaq, but were not

found at the northern extent of the Quebec-Labrador peninsula. Recently, Torngat Mountains caribou have become scarcer close to Kangiqsualujjuaq but are abundant at the northern extent of the Quebec-Labrador peninsula, especially on and around Killiniq Island.

Habitat

While the landscape of the Québec-Labrador Peninsula is highly variable, participants were asked to identify key characteristics of the land and environment that makes up TMCH habitat. Participants discussed many biotic and abiotic features as well as caribou behaviour associated with TMCH habitat. From these discussions several patterns emerged in the language and wording used to describe TMCH habitat features (Figure 4). Key habitat features were related to food in general, foraging activity, and types of food, such as moss (note: caribou moss is a local term for *Cladina sp*. lichen), hills and mountains, islands, trees, and movement. Interestingly, change was often mentioned in conversations about habitat.

Figure 4. Word cloud illustrating the most common word associations when participants discussed Torngat Mountains caribou habitat; word size indicated frequency of association throughout the interviews.

When asked why they see caribou in certain areas, participants often explained that caribou choose areas with accessible food (good quantities of lichen patches, for example) and protection from predators (generally, open areas that provide good visibility to spot predators or mountainous areas that provide some refuge from predators).

"I guess it's to do with the food available in the places and maybe they're with protection from wolves and stuff. I mean, this here man, it's just big old mountains and caribou can just jump right along up the hill and they don't even stop. And there's, they eats all the lichen and stuff off the rocks, right. There's a lot of it in these areas. I mean, there's no trees." – Andrew Andersen (Nunatsiavut)

"He said there was places, what they called stopping places when caribou were scarce you'd check out those. Some of the older people knew where to, where caribou would, I suppose they'd find a spot where the food, it was pretty good supply of food for them away from predators. And they'd find a little spot and they'd stay there in that area. So some of the older people knew where those were." – Henry Lyall (Nunatsiavut)

Figure 5. Spring (March to May) caribou-related information from Nunatsiavut participants.

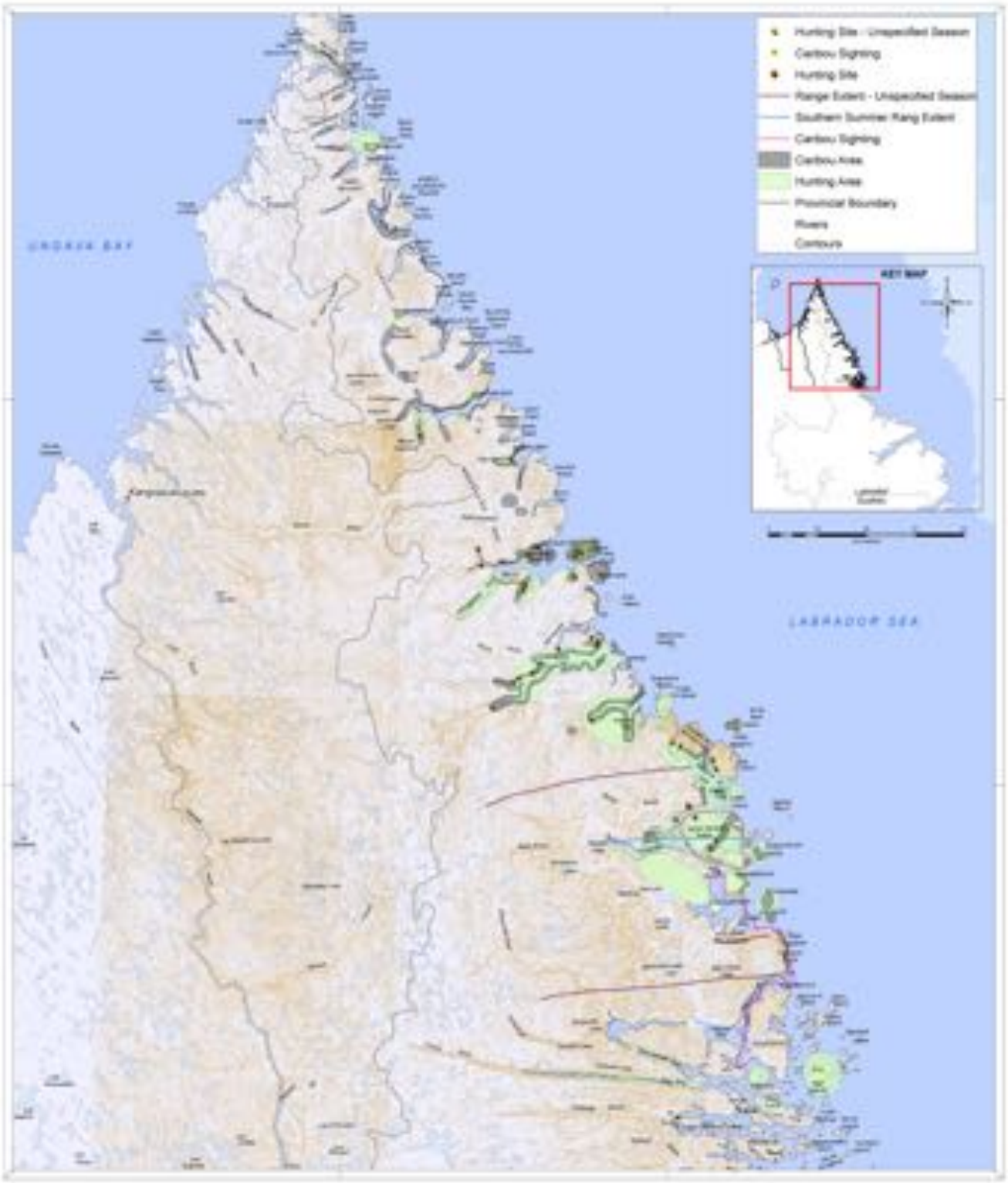

Figure 6. Summer (June to August) caribou-related information from Nunatsiavut participants.

Figure 7. Fall (September to November) caribou-related information from Nunatsiavut participants.

Figure 8. Winter (December to February) caribou-related information from Nunatsiavut participants.

Figure 9. Spring (March to May) caribou-related information from Nunavik participants.

Figure 10. Summer (June to August) caribou-related information from Nunavik participants.

Figure 11. Fall (September to November) caribou-related information from Nunavik participants.

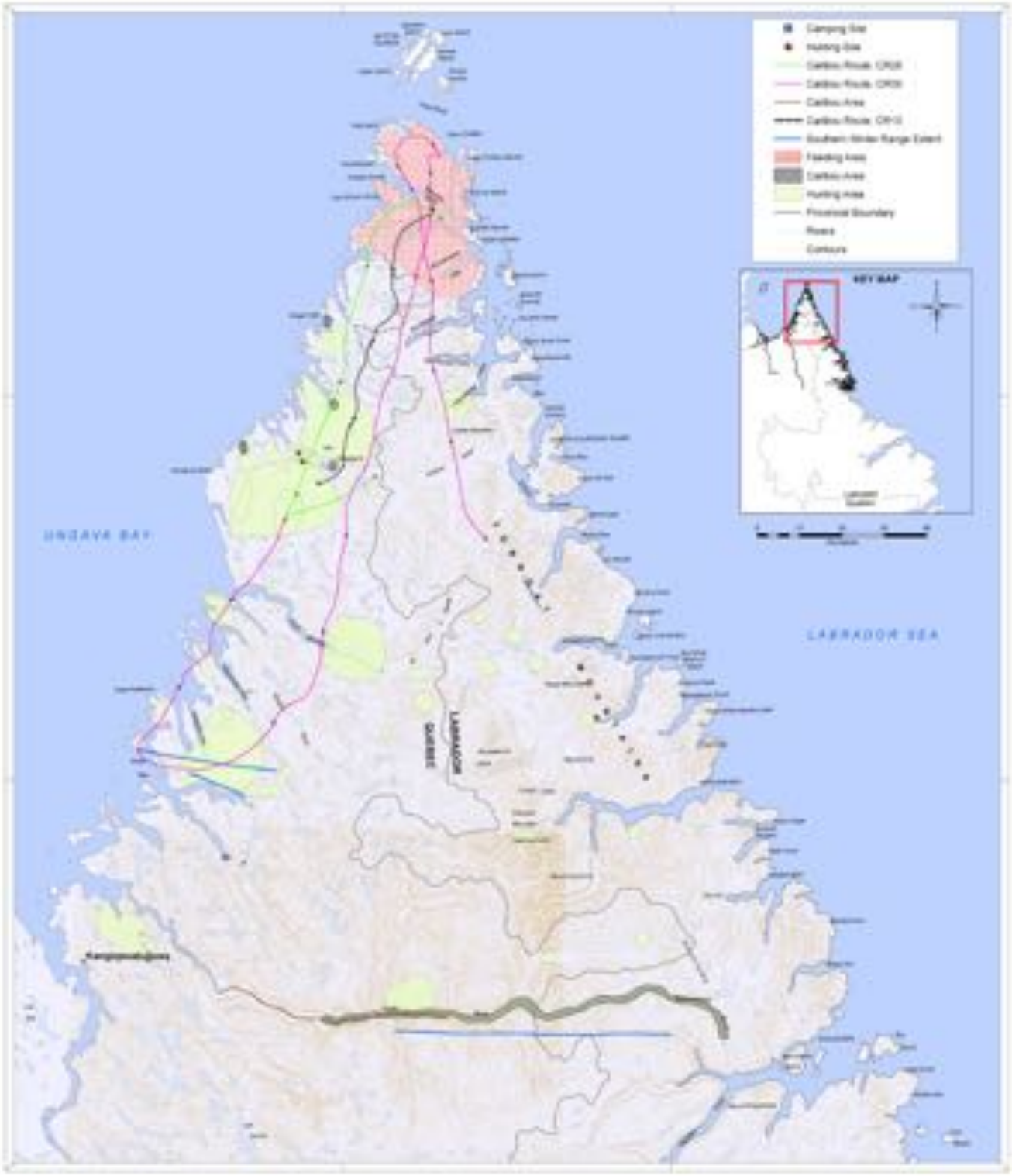

Figure 12. Winter (December to February) caribou-related information from Nunavik participants.

Biology

Forage

The most common food that caribou have been observed eating is fruticose lichen growing in mats on the ground (such as *Cladonia rangiferina*), although some participants also described times when their preferred forage was scarce and caribou ate the black foliose lichens growing on rocks. In addition to lichens, caribou are known to browse on new shrub growth in the spring (for example, dwarf birch, *Betula nana*). Torngat Mountains caribou will also travel to the coast to eat kelp/seaweed or to lick salt. They will occasionally eat spruce needles, too, when other preferred species are not available.

Movement and habitat selection were both explained by participants to be strongly related to forage. Calving places are thought to be areas with a good source of food. Winter food availability is also heavily affected by ice and snow conditions, which can cause caribou to move to different areas. Caribou are also known to fatten themselves throughout the fall.

"They eat off the ground up high on the mountains cause the mountains up high have a lot of food what they call moss that's the kind of food they eat from off the mountains; they don't go to the valleys." – David Etok (Nunavik)

"…obviously, they like the moss and in the fall there they're always down the beaches eating seaweed I guess." – Henry Lyall (Nunatsiavut)

"They are eating caribou lichen, but they are shorter and the things that are on the rocks the little black things on the rocks, they also eat them during the winters months." – Jacko Merkuratsuk Sr. (Nunatsiavut)

"As our elders said at that time, the caribou had been there but they also needed salt in their bodies after being on the land so they traveled to the sea to get their salt. Every few years they need salt in their bodies, that is what our elders would say." – Willie Etok (Nunavik)

Interspecific Interactions

Wolves (*Canis lupus*) were the most commonly discussed predator species (100% of participants, $n = 33$) as they are considered the main predator for Torngat Mountains caribou. Wolves

will follow caribou and their population trend can mirror that of the herd. Packs can also support themselves on other prey species, such as rodents or accessible pinniped species. Black bears (*Ursus americanus*) also represented a considerable threat to caribou; even though they were described as being less efficient at killing caribou compared to wolves, black bears are able to kill calves, yearlings, and sick or injured mature caribou. Polar bears (*Ursus maritimus*) were less of a concern, but still occasionally went after a caribou. Other predators participants mentioned include eagles (bald eagles, *Haliaeetus leucocephalus*, and golden eagles, *Aquila chrysaetos*), and foxes (*Vulpes sp.*), as well as wolverine (*Gulo gulo*) though only speculatively or speaking about the distant past.

Participants also discussed the various, often complex, ways in which predators can affect caribou. For example, even if a caribou escapes a hunting pack of wolves, it used a lot of energy to stay alive, making it vulnerable to other attacks and reducing its fat stores. Moreover, some animals, like foxes, might not kill a caribou, but by scavenging on a caribou killed by wolves, there is less food for the wolves, and, thus, the wolves must hunt more frequently to meet their energetic needs. Hunters frequently gave insight into these complicated ecosystem dynamics throughout their interviews. For further discussion of predator-related threats to caribou, see Limiting Factors and Threats.

"…we'd look down and there was two polar bears herding three caribou into the water, two big oh ones, eh one on the right and one on the left. And they were pushing the caribou down to the shore in front of them." – Andrew Andersen (Nunatsiavut)

Predators are not the only other animals that participants discussed. Interestingly, there have been northern range expansions in recent decades for several species according to some participants, including moose (*Alces alces*) and beaver (*Castor canadensis*). In general participants did not discuss the effects of the northern expansion of non-predator species such as moose and beaver on caribou, however a few participants discussed that these alternate prey species are taking the place of caribou in their hunting practices and diet.

"Oh yeah, [Torngat caribou are] really important, pretty hungry these days, no caribou. Eating moose, but it's not the same. We didn't grow up on moose, or there were no moose around here anyway when we were young. Now we gotta get moose instead of caribou." – Joe Webb (Nunatsiavut)

"And the beaver, they come up about 20 years ago. They moved up here." – Joe Webb (Nunatsiavut)

Insects were mentioned by the majority of participants (n = 20) as a driving factor behind some

caribou behaviour. This included erratic, high-energy behaviour in attempts to get away from nuisance insects. This included running, shaking, and swimming or going up to the hills, to the coast or islands for the breeze. Some participants (n = 10) specifically mentioned insects as a driving factor for broad scale habitat selection. These participants said that caribou choose to move to shorelines and islands where there is more wind, or to high hills where it is cooler for relief from insects.

"So I was watching this one run back and forth all up and down this valley and he just come right up, right along next to me and like he was so close I could see his nose breathing out and everything. And he was running away from bugs, back and forth, and back and forth." – Andrew Andersen (Nunatsiavut)

Survival and Reproduction

Caribou start showing signs of rutting behaviour from August into the fall. Female caribou are thought to be a few years old before they start to breed, although there does not seem to be definite age when this happens.

"The caribou knew I think where to meet and that would be in August, there would be a lot of caribou, bull caribou that we'd see as a group they would be all bulls that is how it was for them back then… When we seen them they would just stay in one spot, the female caribou, although they wanted to move somewhere, they were made to stay in one area by the bull caribou that is how it was towards the end of August." – David Etok (Nunavik)

May is generally considered to be calving season for Torngat Mountains caribou. However, many people did not feel comfortable speaking about calving since it occurs at a time when travel conditions are often poor, restricting where people can hunt and see caribou. Those that did discuss calving locations noted that females often travel to hillsides/mountains or islands where there is some respite from predators and humans in advance of parturition.

"Back then they used to have their calves on the high hills, they would come from the south and go to the hills." – David Etok (Nunavik)

"They like to have their calves in places were there is no people around and would be on the hills. I have heard of these locations where the females then have their young, my father knew of this, that is why I also know this." – Kenny Angnatuk (Nunavik)

Movements and Dispersal

Torngat Mountains caribou are not migratory in the same way as animals from the GRCH; however, they are by no means stationary, using large areas of the landscape throughout the year and over the course of a lifetime to meet various life history requirements.

"I have heard from what the Inuit traditional knowledge hold, animals will not just stay in one area they will move to another area, that is what the traditional knowledge is, and that is what I was told." – David Etok (Nunavik)

"The words our elderly people had, I take them really seriously and I believe them, that when the food for the caribou is gone that they will move to find other food that is how the Inuit was and this is what we can feel and what we know." – Willie Etok (Nunavik)

"I heard the [Torngat Mountains] caribou that is in this area and very few in numbers and the [George River] caribou that are up south are very high in numbers and we were also told that the caribou that is in this area here would travel to the caribou that is in this area just to go and meet with each other, that is what we were told." – David Etok (Nunavik)

One participant also described how caribou movement often dictates human movement:

"We are alive because of the animals, we are similar to the animals but we use the harpoon and spear to survive, we move around like the animals for example if this area will be good in the summer we will go there and gets some animals and we will also move to where the char is that is also how the caribou is these are stories that be were taught and told." – David Etok (Nunavik)

Population trends

Past

Many participants referred to times in their own lives or the lives of their parents and grandparents when caribou were scarce. During these times hunters had to travel great distances on foot or by dog team to locate food for their families and people were often hungry. Participants also explained that these caribou have a cycle, where at times there are many animals and at others they are hard to find. One of these lows was during the 1940s to1960s. In general participants described caribou

as being scarce during the ancestral, past time period. Numbers peaked in the recent past but then began to decline again.

Current and Future

The majority of participants identified a decreasing population trend for the herd. Some people felt that this might be a low period in the caribou cycle. It is important to note that some participants associated a local decrease in caribou numbers with movement of caribou to a different area, which is different from an overall herd decrease. The perception of population trend also differed between regions (Figure 13). While many participants from Nunatsiavut expressed concern about decreasing caribou numbers throughout their interviews, this level of concern was not mirrored in Nunavik (Figure 13). However, it is important to note that fewer than half of the Nunavik participants believed that the Torngat Mountains caribou population was stable or increasing, and that more participants believed the population was decreasing than any other trend.

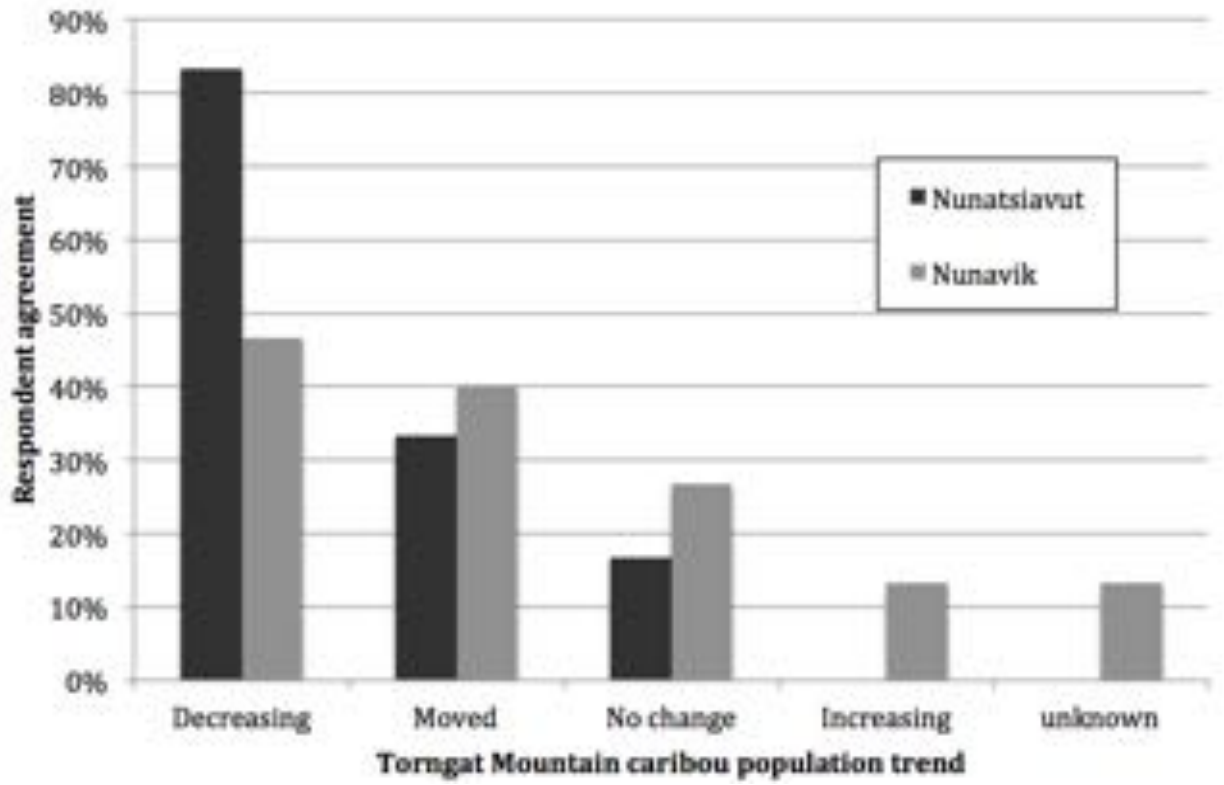

Figure 13. Nunavik (n = 15) and Nunatsiavut (n = 18) respondent perceptions of Torngat Mountains caribou population trends, compared across regions.

"It is very obvious that the caribou numbers are going down, if the numbers will totally go away, if our grandchildren know and understand, if they want the caribou around for when they grow up they have to be really aware of it…" – Willie Etok (Nunavik)

"…there were a lot of caribou trails and you can even see on the land where the trails were but a lot of the trails now are grown over with bushes and willows…" – Willie Etok (Nunavik)

For participants who discussed a caribou population cycle, some explained that, even if caribou are becoming scarce now, they will return eventually. There was a fairly strong belief that the Torngat Mountains, as well as the George River, population go through cycles of increase and decrease. However, this belief was not mutually exclusive from a concern over the long-term harm of some of the potential threats facing the herd, including over-hunting. Other participants expressed concern about the future of Torngat Mountains caribou, believing that the animals are decreasing solely due to some sort of external pressure.

"I'm always going back to what my mom used to say, that they would come back, go away, come back, go away. So that's probably... Hopefully they're just doing that." – Jessie Etok Stewart (Nunavik)

"They do cycle but if there's fewer animals, it takes them longer to recover." – Nunatsiavut Participant

"And they also used to tell stories, that if our land does not have anymore animals, you will know that the animals will come back again, we were told that if any species of animal is gone it will always come back. This is a story that was told to us, we were not just told, we were taught to know." – David Etok (Nunavik)

Limiting Factors and Threats

The majority of participants expressed some level of concern about potential threats to Torngat Mountains caribou for both the current population and into the future (Figure 14). While one participant did not believe over-hunting to be of concern, the majority of the participants (17, $n = 33$) expressed that overhunting is a concern for this herd. Other potential threats mentioned by several (7-10) participants included predators, disturbance from noise and recreation, development activity, and a changing environment. Only a couple of participants expressed concern about both herd health and insects as a threat to the TMCH. In particular, several participants stated that they specifically did not believe disease was an issue for this herd.

There was variation between regions in terms of concern over potential threats (Table 2). A higher percentage of participants from Nunatsiavut showed concern for all of the potential threats, with the exception of environmental change, ice conditions, and insects. In the case of insects, only one participant from each community expressed concern regarding insects threatening caribou populations. In the cases of environmental change and ice formation, a higher percentage of participants actually brought them up, but did not necessarily specify them as a specific threat to the TMCH population. It is also important to note that while only very few of the participants from Nunavik indicated predation as a threat, this was before validation. After some discussion validation attendees decided that wolves were indeed a threat, raising this percentage considerably.

	Potential threats[2]							
	OH	Pred	NR	Dev	Env	Ice	HH	Ins
Mentioned[1]								
Nunatsiavut	-	-	56%	39%	39%	61%	-	-
Nunavik	-	-	33%	13%	33%	33%	-	-
Concerned								
Nunatsiavut	72%	50%	70% (n=10)	100% (n=7)	57% (n=7)	36% (n=11)	11%	6%
Nunavik	27%	7%[3]	60% (n=5)	100% (n=2)	60% (n=5)	60% (n=5)	0%	7%
No Concern								
Nunatsiavut	6%	0%	0% (n=10)	0% (n=7)	0% (n=7)	0% (n=11)	39%	0%
Nunavik	0%	0%	0% (n=5)	0% (n=2)	0% (n=5)	0% (n=5)	33%	0%

Table 2. Percentage of participants concerned about potential threats, broken down by region, Nunatsiavut $n = 18$ and Nunavik $n = 15$ unless otherwise stated.

1 Records of mentions were only taken for potential threats that were not specifically asked about during the interview process. When calculating percent concern (or no concern), the number of participants that mentioned the potential threat was used as the denominator if the threat was not specifically asked about.

2 Potential threats are coded as follows: OH – Over hunting, Pred – Predation, NR – Noise and Recreation, Dev – Development, Env – Environmental change, Ice – changes in timing of ice formation/breakup, HH – Herd health, Ins – Insects.

3 Raised to 53% after validation.

Disturbance and Habitat Degradation

Disturbance of Torngat Mountains caribou comes from several sources. Participants explained how increased air traffic (both helicopters and planes), ship tracks through the ice, resource exploration and development, tourist activity, and recreation can change how caribou behave and move. Some participants noted that caribou are curious or 'tame' if they have never seen a human before, but once they have been bothered they are always skittish or shy after.

All participants that spoke on the subject agreed that development is a threat to Torngat Mountains caribou. Of those that addressed noise and recreation, 70% (n = 10) of Nunatsiavut interviewees and 60% (n = 5) of Nunavik interviewees felt that these are also threats to caribou. Several participants cited their observed effects of Voisey's Bay Nickel Mine south of Nain, where George River caribou have changed their movement patterns to avoid the activity in and around the mine site as well as the associated ship track through the ice in winter and spring. There is concern that increased development, like this mine, would cause more problems for caribou.

Predation

Participants discussed not only the importance of certain predators (see Interspecific Interactions), but also the changes they have witnessed in these populations. Hunters in both regions have noticed an increase in many predator species, particularly wolves and black bears (Figure 15). Some also commented that these populations were increasing at a rate that was much greater than the recruitment rate for caribou, which lead to concern around the amount of caribou being taken by non-human hunters.

"Wolf population is way up. Fox population is…it all goes in cycles. This is what we're saying, that the wolves may play a major role into the growth of some of these herds too. That's fairly sensitive, you know. So natural predators do play a role into it. I've seen as high as 20 wolves in one pack, so they can eat…they eat a lot of animals." – Nunatsiavut Participant

"I am not very optimistic about the future generation having caribou around, this is something that is really difficult to answer, but we have to think positive and say that there will always be some around, and we also have to think of the ones that also want to feed off of the same thing, and those are the animals, and we as parents have always fed our children so they are used to what we eat, when the animals are hungry they will try to get anything that they can get that is something that needs to be thought about as well." – David Etok (Nunavik)

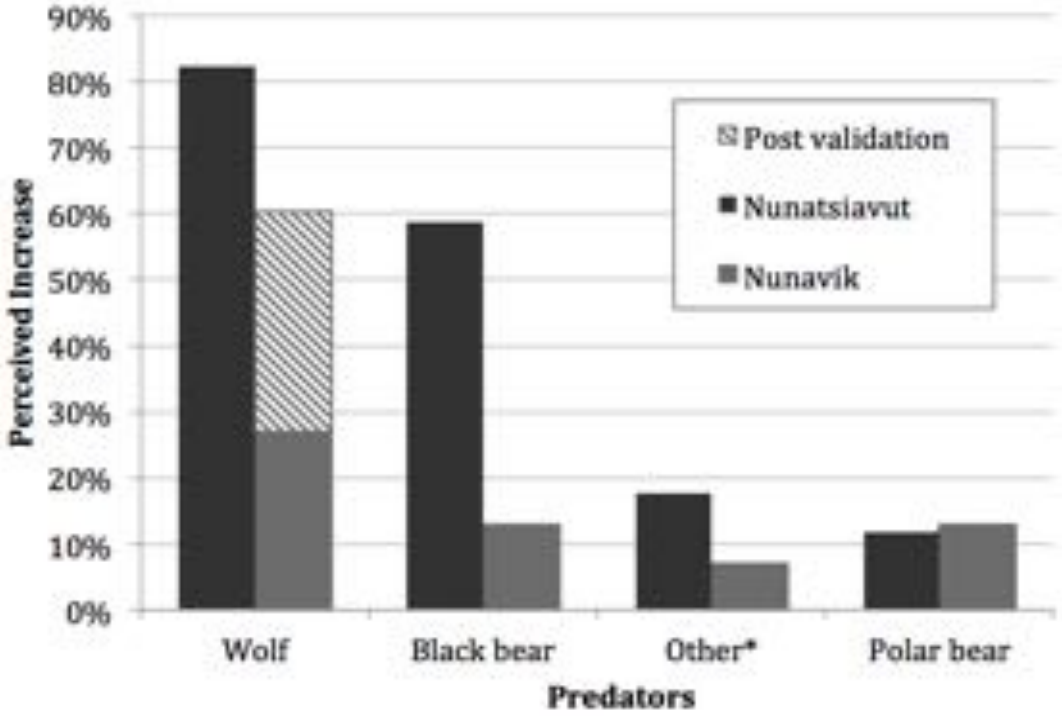

Figure 15. Perceived increase in various predators as a percentage of respondents who mentioned each predator, compared between regions. Nunatsiavut $n = 18$, Nunavik $n = 15$. *Other includes eagles, foxes, and any other scavengers.

While the initial interview process suggested that participants in Nunatsiavut are much more concerned about an increase in wolf numbers compared with participants from Nunavik, the validation meetings in Kangiqsualujjuaq revealed that many hunters are indeed concerned about the wolf population in that region as well. During the validation process Nunavik participants commented that the increase in wolf population has been very recent and was especially apparent in the current hunting season (winter 2013-2014). The participants reported seeing more wolves than usual in that year, and seeing wolf tracks regularly, and in abundance, when they were out on the land.

Black bears represented the largest distinction between Nunavik and Nunatsiavut participants in their perception of predator increase, after validation. Most of the Nunavik participants have not seen an increase in the number of black bears in the areas where they hunt. In contrast, the majority of participants from Nunatsiavut reported an increase in black bear abundance in the areas where they hunt. This contrast might be due to the geographical difference in hunting areas for people from the two regions, with Nunatsiavut participants hunting further south, in areas more suited to black bears.

Environmental Change

Participants discussed several ways in which a changing climate may be affecting both Torngat Mountains caribou and the hunters themselves. The timing of ice formation and breakup was noted to have changed, with fewer days of good ice for travelling. In 2010 some participants from Nunatsiavut did not get out to hunt during one of their regular hunting periods due to a very warm year. The weather has also become more unpredictable and the high ground, where caribou often feed on lichen, ices over more in recent years. Further, participants have noticed changes in vegetation, with more shrubs and overgrown caribou trails. Many participants remarked on shifts in climate and of the 33 participants interviews, 44% in Nunatsiavut (n = 18) and 33% in Nunavik (n = 15) considered a changing climate to be a threat to the Torngat Mountains caribou. Several Nunatsiavut participants related the increase in predator populations to climate change, and a few mentioned changes in vegetation, with the land becoming more shrub covered.

"Today it's not as cold as it was in the past." – David Etok (Nunavik)

"I notice that it's later and later into the winter before the ice gets good enough to travel on and earlier and earlier in the spring when brooks are out." – Henry Lyall (Nunatsiavut)

"…one of the things we've seen now that you're talking about weather is that over the years that we didn't see a whole lot of way back was icing of the high ground because early in the fall you'd get wet snow and rain and all the higher hills would get glazed over with thick ice and the caribou couldn't get their food." – Ron Webb (Nunatsiavut)

"Not so much more rain, but more smog that is coming from the south you can notice, the clouds are carrying the smog and it wasn't like that in the past." – Norman Snowball (Nunavik)

"I notice when I was in Labrador this summer and last year and the year before that I've been going four years now since the parks opened, Parks Canada, and I've noticed the vegetation, it's the green, it's going way up into the mountains. Before there was nothing…There was never used to be, there was only used to be glaciers." – Sophie Keelan (Nunavik)

Harvest Levels

In Nunatsiavut, 72% (n = 18) of participants felt that overhunting was a threat to the herd, while that belief was only held by 27% (n = 15) of Nunavik participants (Table 2). Communities in

Nunavik and Nunatsiavut began transitioning from dog team to snowmobile in the 1960s and 1970s. Many families also have more powerful speedboats, as well. The increased mobility afforded by snow machines and faster watercraft was identified by some as a point of concern, as people can now travel farther, at much greater speeds, accessing areas that would have taken days or weeks to get to in the past, by dog team or kayak.

"People hunted in this area for years right up to Hebron. There was always lots of caribou. But, I guess, you know, taking too many can become a problem." – William Andersen (Nunatsiavut)

"There are people in this that are not – that doesn't have conservation in their minds whatsoever." – Joey Angnatok (Nunatsiavut)

"…you know some people are harvesting caribou and everybody knows they got caribou and the next thing you'll see is the skin or the rump or the head and the spine down to the dump, garbage dump you know. That's not respect and so the spirit of the caribou does not appreciate that." – Johannes Lampe (Nunatsiavut)

"My honest belief is that if this was part of Torngat herd, this part of Torngat herd which was primarily stationary in this area for years and years, it is hunted out." – William Andersen (Nunatsiavut)

Some participants also expressed concern about the negative effects of outfitter hunting and poaching.

"…it is a really good place for hunting, it has a lot of animals and because the caribou is not very high in numbers, Inuit don't want the white people to get their animals gone, because it is known that the white people do go to that area and hunt for caribou, and they go by plane there, even if they are not going there to go caribou hunting, they are just chasing the caribou away to a further place, to places were we cannot go…" – Kenny Angnatuk (Nunavik)

"I would like to add to that they don't do that anymore, they used to have guides take them caribou hunting in the past, they were like that in the past, and today they have calmed down we don't hear as much about these things anymore, there are more laws out there now they were like that in the past just leaving the meat but this has calmed down today, it seem they have stopped for now." – Sarah Pasha Annanack (Nunavik)

"Yes, yes. [Poachers are a] very big problem. Like we know there are poachers because every time we go they run to the plane and take off right away." – Sammy Unatweenuk (Nunavik)

Herd Health

Disease and parasites were not generally considered to be a threat to Torngat Mountains caribou population size or persistence. Only 11% of Nunatsiavut participants (n = 18) and 0% of Nunavik participants (n = 15) expressed concern about health as a threat to the herd.

"Disease. I don't think it would be disease [causing the decline]. I mean, I never, ever killed a sick caribou besides that one with the green leg…" – Andrew Anderson (Nunatsiavut)

That being said, many participants noted various signs of illness or injury (Table 3) and some noted the potential for herd health to be of concern in the future.

"Within the last say three years at the end of say three years ago, it's safe to say that 85 percent of what we killed had something wrong with them." – Joey Angnatok (Nunatsiavut)

"I think this needs to be taken into consideration today… some animals seem sickly more now, it doesn't matter what kind of animal it is… this is something that comes to mind that illness or something of some sort will wipe out the animals, doesn't matter what animals." – David Etok (Nunavik)

Some participants also observed that there were more indicators of poor health in the GRCH, when its numbers were at their peak, suggesting a link between density and health.

"...when the big herd of George River animals were out in this area we would see quite a lot of sick animals… the explanation for that was with more animals around there would be more sick animals. But with Torngat animals they seem to be always healthier than the George River herd."
– Ron Webb (Nunatsiavut)

While they have been seen to bother caribou a great deal, insects (biting flies) were not considered a threat to herd health by many (6% in Nunatsiavut, n = 18, and 7% in Nunavik, n = 15).

Table 3. Indicators of disease, parasites, injury, or general poor health in caribou as discussed by participants from both Nunatsiavut and Nunavik.

Number of Participants	Indicator of Disease or Parasites
7	Worms and maggots / parasites
7	Liver (colour, stuck etc.)
7	Leg Sand
5	Lungs stuck to ribs or other lung problems
5	White spots
3	Puss and lumps
1	Black spots
1	Green leg
1	Sores on internal organs or legs
1	Different colour meat
1	Other
1	Fluid
Number of Participants	**Indicator of Body Condition**
6	Injuries or wounds
6	Lazy or strange behaviour
4	Skinny
4	Limping
2	Low head
1	Deformed antlers

Perception of and Recommendations for Research and Management

Participants expressed an interest in learning more about Torngat Mountains caribou. More specifically, there was a high degree of interest in establishing a more accurate estimate of the number of caribou remaining as well as determining the population trend. These pieces of information were thought to be essential for making any decisions regarding management and harvest levels. Some participants suggested closing the hunt in advance of receiving this information to better protect the herd, while others felt that no management decisions should be made about harvesting until after population numbers and trend had been determined.

Other research suggestions included bringing IK and science together more often, documenting

IK for future generations, examining the effects of certain predators (especially black bears) on Torngat caribou, investigating the possibility of a wolf cull, keeping more accurate and accessible records of harvest numbers, establishing calf survivorship and recruitment, and exploring how Inuit health would be affected by a lack of caribou. While some participants supported the use of telemetry collars as they provide valuable information, there was also some concern about their negative effects on caribou health. Collars were thought to be heavy and cumbersome for animals and hunters have noticed them rubbing and wearing down the neck area on caribou. One participant noticed that the collars ice up in winter, likely causing discomfort or pain for the individual.

"I mean, it's good to track them and stuff, but them big old collars are some hard on the animals, man. I've seen a collared wolf pass by the house up in Okak. There's three of them, early morning walking by the house. Two of them was nice and strong looking, and that one in the back was skinny and straggling and had a big old collar on his neck. It got to be hard." – Andrew Andersen (Nunatsiavut)

"I'm kind of disappointed when they put collars on the caribou….What happened when they put collar on is that they're heavy and fall on the neck and in the winter they're iced up." – Jacko Merkuratsuk Jr. (Nunatsiavut)

Effect of a Hunting Ban

Participants expressed their concerns about the current and future effects of the implementation of a Total Allowable Harvest of zero:

"…now the younger ones are … they won't have any experience on stopping places or caribou crossings or what time of the year to go after them because they're not allowed to hunt them, which only makes sense for the numbers I think that we should stop, but it is scary for our traditional practices that we've always had." – Ron Webb (Nunatsiavut)

"They say saving it for our children but our children are not going to be able to eat them in five years' time. And if they're not tasting it, they're not – by the time the five years will be up they're not going to want to eat it. They're not used to eating it." – Nunatsiavut Participant

"Depends on how long the ban is. A lot of kids won't have the experience I had growing up. I mean, there's young kids not going to be able to kill their first caribou at five or anything, eh?...And kids around like the 8 to 15, whatever age, I mean, that's pretty vital age for learning stuff, eh? And if they

don't caribou hunt, I mean, there's always time to learn, but those years are really special when they're hunting with their family." – Andrew Andersen (Nunatsiavut)

"I mean, if we go through a five year moratorium now on caribou that may get extended, who knows. And say ten years from now a young fellow goes out hunting and he kills a caribou he's probably not even gonna know how to skin it." – Henry Lyall (Nunatsiavut)

"…other communities in Nunatsiavut do not know the hardship that we go through in Rigolet because of the ban that's on [Mealy Mountain] caribou. I don't want to see that happen in the rest, to my friends and my Inuit family. I don't want…that's not fair…to have people's rights being taken away, what they are in the Rigolet area, and that's basically what it is. Our rights are took away and, because of defiance, because of government…the government thinks that they're doing a wonderful job. They're protecting caribou…People will go out and they'll see animals in companies of 15 or 20, they'll kill every animal just out of defiance…." – Nunatsiavut Participant

The Importance of Caribou and Intergenerational Knowledge

It was very clear throughout the interview process just how important these caribou were and continue to be to Inuit who rely on them:

"I think the importance of having animals around should be number one for everybody." – Joey Angnatok (Nunatsiavut)

"…yes the caribou is very important they are our main diet, they are what we have, they are our lives and has been in our culture for many generations."
– Norman Snowball (Nunavik)

"Yes they are very important, we crave for them, when you are eating them you want more of it, because I cannot eat the store bought food, I can eat them but I can't eat them always, you can get tired of eating them, yes the caribou is really important." – Nunavik Participant

"They're very important to us because whenever we stop having our traditional food seems like our mind or our body's telling us that we miss traditional food." – Tooma Etok (Nunavik)

Traditions

Many of the participants in older age classes shared their knowledge of traditions regarding hunting and living with caribou. Learning through watching and following is how many people learned to hunt caribou and travel the land/waterways, as well as other skills like how to use sinew for sewing or how to prepare a hide for clothing. People also mentioned how Inuit can show respect for caribou and other people.

"Well, when we were kids in those times Inuit kids they learn by watching."
– Sophie Keelan (Nunavik)

"When I was just a child I learned just by watching I was never taught personally I learned on my own just by watching and trying it out, I just learned by watching my mother just from watching them."
– Nunavik Participant

"Well the only rule that I know that Inuit had to do was to you know take what you need and don't abuse any animal. Respect the animal, respect the breeding season and the hunting grounds or the habitat and the calving grounds and certainly share what you have that way you're not wasting it and I know that the older Inuit always said you know to conserve. You have to harvest any species because the species that are there and you're not harvesting it it's going to move away you know where it could be harvested and I believe that in order to conserve we have to use what's there." – Johannes Lampe (Nunatsiavut)

"When they are having their young we are not supposed to kill them when they are pregnant only when the calf is big enough." – Susie Morgan (Nunavik)

"…the elders in the past used to always say never fight for animal, about animals." – Sophie Keelan (Nunavik)

"If you don't use it, you lose it, like everything else. And that's a part of our culture, that we have a…there's a real possibility that we could lose it, you know. If you don't see it done and you don't participate into it, if you don't get your hands full of blood, if you don't go out as a hunter and be blessed and be able to take that animal, if you don't do that you can't fully appreciate it and you can't go full circle." – Nunatsiavut Participant

"Like, this is why, look at the map, when nothing, not just me, not at all. When other people, other Inuit travel these distances, you appreciate your meat when you get it home. And that's where you learn to respect it. You drag your butt over these areas for years and miles and hardship and you learn to respect, you appreciate how much and how valuable that meat is and every other part of it. I don't leave nothing on the land. You take it all home with you, all the edible parts." – Nunatsiavut Participant

"…we have always had caribou meat in our diet, we have the caribou for our meat, all parts of the caribou, the hooves, the head, it is our food, the bone marrow, the entire part of the caribou is our source of diet and the white man just take a piece of the caribou, they just take the head and the legs when they get a caribou, it is not important to the white man for their diet. It is very important for the Inuit, it is the Inuit diet and we also own the land, it is our ancestors land before time, even before the white man ever came, it was the Inuit land and this has to be known." – Kenny Angnatuk (Nunavik)

Future Generations

Many people spoke of past and future generations in regard to the importance of caribou.

"It was important to our ancestors now it is important to us and it will be important for our future generation." – David Etok (Nunavik)

"I'd like to see my kids, grandkids go up and see the caribou, live caribou, yeah. Something about seeing a caribou, it's like looking at a polar bear, first time I see something, never forget the day." – Alec Dicker (Nunatsiavut)

Participants in both regions raised concerns about caribou not being available for future generations as well as the Inuit traditions associated with caribou not being passed on to younger people. There were many reasons given, such as transitioning to a modern economy, settlement, and drugs and alcohol.

"They're not learning enough now. We're not teaching them enough." – Eli Merkuratsuk (Nunatsiavut)

"Caribou is our food, we as Inuit always had used it for our clothing, we used it in our lifestyle, if they go away, then what will we do? And we always want to have food for our next generation, because of that it is really important and it should be a priority to preserve them." – Willie Etok (Nunavik)

Despite the commonly held concern about lack of knowledge transmission to younger generations, there were suggestions about how this could be done and how it has been done traditionally, including taking youth out with experienced hunters and sharing stories with youth. Additionally, one participant emphasized that future generations need to know and understand caribou in order to help protect them. A few others discussed the importance of giving younger people a chance to practice caribou-related skills (hunting, dressing, sewing, etc.) and to develop a taste for caribou, even if the numbers are low or a hunting ban is implemented.

"I tell my grandchildren about them. About what we used to go through. What my father and my mother went through and what I saw. And hopefully they will take it like I did. Because I was... By talking about it it's passed down to generations. So, if you're going to be quiet about it, your grandchildren's not going to know about what is important in your life, or was important in your life. So the best way is to tell them the stories on it. Because that's what my parents used to tell us. Life stories, by telling stories on it. That's how we keep our traditional life." – Jessie Etok Stewart (Nunavik)

"I need to educate the kids like how to travel in the winter, how to make igloos, names and places. There's a lot of places where there's rattles that are open now, dangerous now." – Eli Merkuratsuk (Nunatsiavut)

"Because the caribou can have calves and they have calves yearly, the numbers can go up, that is why our future generation really need to be made aware of the animals, let them know what animals they are, mention it to them, make them aware of it, if the numbers are going down. Because that is what the Inuit done in past, they were always aware of the animals." – Willie Etok (Nunavik)

"One thing that we can use is education, we can keep telling stories about the caribou and hopefully in two years you know the caribou will come back but I think to school children you know would help a lot. But we have to come up with something where the school children and the elders you know can have a taste of what it is that we're talking about yeah and that would require harvesting caribou you know somehow too, to share the animal and I believe that as communities, Labrador Inuit, that we have to push the Nunatsiavut government to come up with ways of allowing you know harvesting of either George River herd or the Torngat herd." – Johannes Lampe (Nunatsiavut)

4 Discussion & Conclusion

> “It was important to our ancestors, now it is important to us and it will be important for our future generation.”

In Canada, the mountain ecotype of woodland caribou is mainly distributed throughout Yukon, British Columbia and Alberta (COSEWIC 2011); as such, the TMCH is unique from other mountain caribou in several ways. Many herds in the west of Canada inhabit ranges that occur in the boreal forest, whereas the TMCH is largely at or above the tree-line (Hummel and Ray 2008). This distinction is important for two reasons. Firstly, western mountain caribou rely heavily on arboreal lichens during the winter, which they are able to reach as snow accumulates through the season (Terry et al. 2000), while Torngat Mountains caribou dig for and eat mainly terrestrial lichens, in the absence of trees. As a result, snow conditions and inter-annual variability in these conditions as a result of climate change have the potential to affect herds of mountain caribou in different ways when it comes to forage. Secondly, faunal diversity, particularly diversity of ungulate prey species, is notably higher in many of the western ranges throughout the boreal forest, where mountain caribou can overlap with elk (Cervus canandensis), mule and white-tailed deer (Odocoileus hemionus and O. virginianus), bison (Bison bison), mountain goats (Oreamnos americanus), and mountain sheep (Ovis canadensis) (Hummel and Ray 2008). Until the influx of moose discussed by a few participants occurred in recent decades, Torngat Mountains caribou were observed to be the largest terrestrial prey species and the only ungulate species available on the Quebec-Labrador peninsula. Differences in prey base likely mean there are also differences in the density and behaviour of predators as they relate to caribou, but there is insufficient recent documented knowledge exploring predators in the study area to comment. Despite these disparities, Torngat Mountains caribou do have several characteristics in common with other herds of the mountain ecotype. By definition, this ecotype uses altitude and topography throughout the year, particularly to minimize predation risk (Bergerud et al. 1984). The TMCH is no exception. Participants in Nunavik and Nunatsiavut explained how caribou are often seen using mountains and hillslopes, where they are considerably more inaccessible to hunters of all species. Moreover, while there is still some uncertainty about the population number and trend for the TMCH, it is clear from other mountain caribou herds that the cumulative effects of several threats, particularly anthropogenic threats, can have serious and lasting consequences (Polfus et al. 2011); the same likely holds true for the TMCH.

Threats to Torngat Mountains Caribou

Participants in this study described many current and potential threats to Torngat Mountains caribou, from increasing predator populations and hunting pressure to habitat degradation and climate change. While the level of concern regarding these threats varied between interviewees and between regions, it was clear that the future of Torngat Mountains caribou depends on many interconnected factors. Of course, the effects of these threats are cumulative in nature.

It is evident from both the interviews and the mapping exercises that caribou require a significant amount of space across a landscape to respond to changes in their environment, whether in the form of a depleted food supply or a new mine. The recurring theme of a caribou cycle and the observation that Torngat Mountains caribou have modified their space use in past decades speaks to the importance of managing this herd and the land it uses at a very large scale. For example, participants in Kangiqsualujjuaq noted that in the 1960s there were no caribou in the Killiniq area, but in present day, this is where most hunters travel to get caribou for their families and community. The phenomenon of range shift over time has been documented for other caribou herds, as well. The calving areas for the GRCH and the Leaf River Caribou Herd, both moved hundreds of kilometers in just a few decades (35 years and 15 years respectively), illustrating the dynamic space use required for caribou to meet life history requirements over multiple years and even multiple generations (Taillon et al. 2012). Without the necessary space, it is likely that this herd will face a similar range retraction and population decrease that has been documented for woodland herds in other parts of Canada where the landscape has been fragmented, degraded, or otherwise disturbed (Schaefer 2003).

Indeed, space is integral to all scales of Torngat Mountains caribou life history. Participants described this behaviour at the habitat selection scale, where females employ a spacing tactic during the critical calving time to minimize predation risk whereby parturient caribou move into the hills and mountains or onto islands. Again, inhibiting their use of space could have a negative effect on population size, by decreasing calf survival and recruitment.

Unlike some other ungulate species, caribou are highly sensitive to anthropogenic disturbance and local populations often show a negative response to human encroachment. Participants pointed to the Voisey's Bay Nickel Mine and how caribou from the GRCH have responded negatively to that particular disturbance as an example of how resource extraction might also affect behaviour and distribution of Torngat Mountains caribou. Similar responses have been documented in other woodland caribou herds throughout Canada. Northern mountain woodland caribou in British Columbia exhibited avoidance at a distance of several kilometers from mine sites, along with related infrastructure, particularly in the summer months when human activity is often increased (Polfus et al. 2011). Woodland caribou in Newfoundland avoided mine development at a similar scale, especially during the spring when females and calves are most vulnerable (Weir et al. 2007). Disturbance can lead to actual habitat loss (like a mine site) or effective habitat loss (like the avoidance radius around human development) (Vors et al. 2007). Both types of habitat loss can reduce the proportion of the landscape available to caribou to meet life history requirements and adapt to change, whether in the form of a warming climate or a stochastic event. In the case of Torngat Mountains caribou, which inhabit a

peninsula, there are geographic limits to the space available to adapt. Development could further limit this space.

Participants were also concerned about the effect of noise on caribou and mentioned different sources of this disturbance type, including air traffic and snowmobile travel. Several interviewees discussed how caribou are "tame" or naïve before encountering people on snowmobile or hunters with guns, but that caribou behave differently and are harder to hunt after these initial encounters. Caribou sensitivity to noise has also been researched in other woodland populations. In the Revelstoke area of British Columbia, snowmobiling noise has been shown to elicit a flight response from mountain caribou (Simpson 1987). Displacement from suitable winter habitat by snowmobiles has also been documented for mountain caribou (Seip et al. 2007). Human-related disturbance is likely perceived in a similar fashion as predation risk and, therefore, carries with it behaviours like increased vigilance and flight response, that can then effect energetics and herd health (Frid and Dill 2002). Recreational snowmobiling in the Québec-Labrador Peninsula does not occur at the elevated levels that exist in British Columbia; however, the recent creation of the Torngat Mountains National Park could bring more winter visitors to the region. Based on Inuit observations and existing literature, increases in recreational winter activity in prime Torngat Mountains caribou wintering areas should be avoided. The National Park, the Base Camp and Research Station, and ongoing resource exploration throughout the peninsula have also lead to an elevated level of air traffic, as noted by participants. Caribou are particularly sensitive to air traffic during calving (Harrington and Veitch 1992). High noise levels, such as those from aircraft, may decrease the likelihood of pregnancy, which is directly related to herd demographics and population trends (Luick et al. 1996).

Over-harvesting of caribou by multiple user groups can be, and has been in recent times, a cause of caribou population decline (Bergerud 1967, Hummel and Ray 2008). Eight participants from Nunavik (53%) and six from Nunatsiavut (33%) remarked on the relatively recent arrival of outfitter groups, non-Aboriginal hunters, and poachers in the TMCH range. Four participants from Nunavik and one from Nunatsiavut expressed concern about non-aboriginal hunting as a specific pressure on the TMCH, separate from general concerns about hunting or over-hunting. Aboriginal hunting of the TMCH has been happening for thousands of years, and caribou are an important component of Inuit culture, above and beyond being a source of food. Some participants spoke of traditional IK that explained how Inuit must hunt caribou to keep the caribou from disappearing. All participants agreed upon the importance (social, economic, and/or cultural) of the relationship between Inuit and caribou – a relationship that is diminished when Inuit are unable to hunt caribou. Traditional hunting practices were developed over thousands of years, without causing extirpation of caribou populations from Inuit

homelands. It is important to note that the effects of novel and external factors may now be modifying the environment in which these practices evolved. Several studies show that declines in caribou populations are strongly linked to factors such as climate change, and while hunting by humans can exacerbate decline or extirpation, it is not the ultimate cause (Cumming 1992, Vors and Boyce 2009). Unfortunately, climate change and other forms of disturbance have created an ecological scenario in the present that is different than in the past, and it is possible that traditional levels of hunting could add to the cumulative effects. Due to factors largely beyond their control, Inuit stand to lose significant cultural and socioeconomic security through reduction or loss of the ability to hunt, resulting from caribou decline (Vors and Boyce 2009).

Another factor to consider is the advances that have occurred in Aboriginal hunting in recent decades, which have the potential to increase harvest rates beyond that of Aboriginal hunting in the distant past. The rifle and snowmobile greatly improve the chances of a successful hunt, and the potential harvest rate for Inuit hunters is far beyond what it was in the past. While the importance of hunting caribou in Inuit culture must remain a priority, some guidelines rooted in traditional practices, such as those suggested by study participants, are likely needed to mitigate the effects of increased potential harvest, especially during a time of possible population decline. Several options were brought up during participant interviews, and are worth considering. Better documentation of harvest numbers would go a long way towards influencing individuals who may be tempted to harvest more than the herd could sustain. It would also provide important information for estimating population trends. Another option that was suggested was to put a limit on the number of caribou harvested per year. With the right knowledge, this limit could be adjusted across years, throughout the herd range, and among communities. Some participants suggested that with responsibly limited harvest in some years, in other years a limit might not be necessary. An even more cautious scenario would be to limit harvesting to cultural hunts only, where, as some participants suggested, hunting is only undertaken for the purpose of maintaining cultural practices, such as ceremonies, and intergenerational knowledge transmission. Many participants also discussed the implications of a total ban (see Effect of a Hunting Ban in Results). Interestingly, there was a notable difference between Nunavik and Nunatsiavut in responses regarding concerns about current harvest levels; there was considerably more emphasis on a decreasing population trend and concern about harvest levels from participants in Nunatsiavut. It is important to note that this does not mean that Nunavik participants give less weight to conservation or the potential for overharvest. More likely, this regional difference represents what community members are witnessing on the land. Many Nunavik hunters, while they must travel far, are still able to get caribou, while the traditional hunting grounds for Torngat Mountains caribou near Nain appear to be depleted.

Climate change is already shaping the Arctic landscape, affecting complex systems across the north, including how communities and individuals interact with these systems. Wide ranging species, like caribou and humans, will feel the effects of a changing environment in distinct ways (Wilcove and Wikelski 2008; Robinson et al. 2009): for example, new climatic regimes that affect movement corridors (e.g. an increase in snow could make a mountain trail impassible) and changes to seasonality, which is strongly tied to intra-annual movements (Post and Forchhammer 2008). Use of multiple ecosystems throughout the course of a year also means the intensity of effects could be variable and amplified (Robinson et al. 2009).

There is also a considerable growing body of work regarding the ecological effects of climate change in Canada's north. It is clear that northern regions, including sub-Arctic Québec and Labrador, are experiencing the earliest and most rapid changes (Allard and Lemay 2012). The study area, which straddles the treeline, will likely be a region of important change, as mean temperatures increase and southern species expand their ranges north. In fact, some participants reported observed changes in vegetation, with green growth being found at higher altitudes on mountainsides and shrubs overgrowing old trails. Current scientific research into changes in plant communities supports these observations (Sturm et al. 2001; Payette 2007; Trant and Hermanutz 2014).

Latitudinal and altitudinal shifts in plant communities are likely already affecting the ecological balance of the study area. A few participants commented on the arrival of new faunal species in recent decades, including moose and beaver, which may be related to observed shifts in vegetation distribution. Interestingly, it was mainly Nunatsiavut participants, who live farther south than the Nunavik participants, witnessing these new species. While these recently-arrived herbivores may not be in direct competition with Torngat Mountains caribou for food supplies, moose and beaver are a source of apparent competition, wherein their increased presence on the landscape supplies wolves and other predators with an additional food source, allowing their population to exist at higher densities (see Predators). One potentially positive change in regard to vegetation is the flush of high quality food earlier in the spring (Tveraa et al. 2013), although, depending on timing, this change could also produce a negative affect if a trophic mismatch develops between the critical calving period and spring green-up (Post and Forchhammer 2008).

Climate change was also discussed during interviews in the context of winter weather patterns. In addition to noted changes in travel/hunting conditions, generally warmer temperatures, and reduced seasonal duration of snow and ice, a couple of interviewees raised the issue of winter forage. More specifically, participants commented on the recent increase in icing events, which make cratering through the snow for food an increasingly energy-intensive process at best and impossible at worst. Winter is a critical time for caribou, especially pregnant females, and the reduced accessibility of

preferred forage as a result of new weather patterns could have negative implications for Torngat Mountains caribou (Heggberget et al. 2002). While the full repercussions of climate-related changes are still not wholly understood, it is clear that some of these changes are already underway in the TMCH range.

Predation was one of the most important potential threats to the TMCH population described by participants from both Nunatsiavut and Nunavik. The majority of participants believed that the numbers of at least one species of predator was increasing (Figure 15), and several participants also voiced concern over the effect predators could have on the sustainability of the herd (Figure 14). The scientific literature reports that mountain and boreal woodland caribou are consistently negatively affected by increases in predator abundance (Seip 1991, Kinley and Apps 2001). Wolves and black bears were the two predator species that the majority of participants believed were increasing in number. Often the increase in predators was described in conjunction with comments on climate change or increasing abundance of other prey species, or vegetation. This trend reported in the IK is similar to that appearing in the SK literature, showing that climate change can be a driving factor of ecosystem change (Walther et al. 2002), with many southern species of plants experiencing northward range expansion, and southern herbivores such as moose following the vegetation (Parmesan and Yohe 2003).
In a multi-prey system including moose and caribou, the moose tend to be the primary prey species for wolves. Caribou normally persists in this system by spatially separating from moose and wolves (James et al. 2004), but tend to experience population decline if they are unable to separate themselves from wolves and moose (Seip 1992). Therefore, it can be expected that caribou populations will decline in areas where moose, and consequently wolf, populations are increasing. This is likely the case in Nunatsiavut where an increase in wolf and moose populations in recent years has occurred in conjunction with fewer caribou sightings.

Indications of climate change in the TMCH ecosystem identified by IK (increased abundance of southern plants and animals), suggest that climate change may be the driving factor behind increased wolf populations. Some participants suggested that a wolf cull and/or bounty might be necessary to mitigate their negative affects on the caribou population. The effectiveness of such tactics is questionable (Krofel et al. 2011), and has the potential to become a controversial issue at national or international scale. However, there is strong indication that wolves are becoming more abundant throughout the TMCH range and investigations into effective forms of wolf control are likely merited to reduce their impact on the TMCH.

While the black bear population in the areas visited by Nunavik participants does not appear to be increasing, the majority of participants from Nunatsiavut have noticed greater numbers in recent

years. There is support in the literature for black bears taking a considerable number of calves in the early spring and summer (Bastille-Rousseau et al. 2011, Rayl 2014) and some participants also gave first or second hand accounts of black bears preying on young caribou calves. The majority of Nunatsiavut participants said that black bears only started inhabiting in the region in the recent past, similar to the period of time when caribou first began disappearing. Conversely, participants from Nunavik have much fewer accounts of seeing black bears in the area, almost no indication of their populations increasing, and have not noticed a drop in caribou abundance to the degree of Nunatsiavut. The regional contrast between Nunavik and Nunatsiavut in black bear and caribou abundance gives strong support to the hypothesis that an increased back bear population may be contributing to a decline in the TMCH population.

Another potential source of pressure on the population is herd health. One of the most common signs of poor health that participants had observed was a sandy texture in the leg (Table 3). This can be an indicator of Besnoitiosis (MDDEFP 2009). In the nearby Leaf River Caribou Herd, the occurrence of Besnoitiosis was recently recorded at 77% in males and 57% in females; occurrence was somewhat lower for the overlapping GRCH, in the range of 30-40% (Ducrocq et al. 2009; Gunn et al. 2010). Other indicators (white spots, puss, lumps) are common symptoms of Brucellosis (Brucella suis) (MDDEFP 2009). The observance of worms/maggots in the flesh suggests the presence of parasitic insects, such as bot flies (Cephenemyia tarandi) and warble flies (Hypoderma tarandi) and sores on internal organs could be parasite-induced, for example liver cysts (Cysticercus tenuicolis) and lungworms (Dictyocaulus viviparus), but it is impossible to determine the exact cause of these and several other symptoms without additional details (MDDEFP 2009).

Although disease and parasites were not generally thought to be causing herd decline, some participants did mention that herd health could be a problem in the future. Elevated levels of disease and parasites might not be enough to affect herd size on their own, but in combination with other pressures like increasing predator densities, anthropogenic disturbance, and climate change, they contribute to cumulative effects for the TMCH. Not only is this a concern for herd health and persistence, but it is also strongly related to community health. Caribou carrying zoonoses have the potential to pass these diseases on to humans using and ingesting caribou (McDonald et al. 1990, Lévesque et al. 2007). The diversity and prevalence of parasites and diseases is predicted to increase as a result of climate change in the Arctic (Kutz et al. 2004), making baseline knowledge essential for managing caribou and maintaining human health in affected communities.

Study Limitations

This study was not without its limitations. Changes to how, where, when, and why Inuit in Nunatsiavut and Nunavik hunt Torngat Mountains caribou affect observations of this herd over time. For example, there is a history of settlement and relocation throughout the Québec-Labrador Peninsula (Brice-Bennett 1977), which was often discussed in the interviews. Many participants were relocated by various authorities, so their memories and experiences span a sizeable area throughout both provinces and even into Nunavut. While this provides excellent geographic coverage of the TMCH range, it is somewhat problematic for creating local timelines of caribou population history. Further, certain times of the year are difficult or dangerous for travel, limiting hunters in their seasonal extent. This reality was particularly evident when discussing the calving period with participants. Many hesitated to draw calving areas or explain details of calving behaviour as parturition occurs during May when ice conditions can make snowmobile travel risky.

In addition, while most participants (84.8%) felt comfortable distinguishing between the TMCH and the GRCH, there were some that either could not distinguish the herds or believed them to be of the same herd. As such, there was a degree of uncertainty introduced into the dataset. The most likely way in which this ambiguity could have affected the results is in the description of population trends and size, where the GRCH has shown drastic fluctuation, but also in other characteristics like habitat preferences or behaviour, where the majority of participants described several differences between the herds. Disagreement that arose when comparing participant comments on distinguishing Torngat Mountains caribou and George River caribou based on body size may be related to the changes in George River caribou appearance over time. Several characteristics of this migratory herd are strongly tied to population size, including body size, and determining herd association is likely density-dependent (Couturier 2007). For example, George River caribou are thought to exhibit smaller bodies than during the 1960s (Couturier 2007). The use of this trait by participants to identify a Torngat Mountains caribou was discussed further during the validation phase, particularly in Nunatsiavut.

The reality of conducting interviews through a translator is that there exists the potential for miscommunication. This concern was mitigated by using an interpreter who was familiar with the project, the participants, and the study area. Furthermore, analysis of transcripts was conducted using the participants' responses, not the response of the translator, in the event that some information was not translated back to the interviewer during the conversation. Lastly, the participant selection process intentionally focused on people with experience traveling and hunting in the study area. As a result, the participant demographic is skewed towards males, 50 to 70 years of age. While there were a couple of participants in their 20s, capturing a larger "youth" demographic could potentially have provided a better sampling of the younger generation's perspectives on topics like how best to encourage

knowledge transfer and what youth would like done in terms of management, since they will be the ones to deal with the outcomes of current herd management. These limitations illustrate the importance of collaborative, interdisciplinary research and management. Rarely does one methodology or one dataset provide answers to every question. Working with a wide-ranging species in a complex system requires such an approach, as a narrow focus to such a complex issue would surely be insufficient or even detrimental.

Current and Future Management of the Torngat Mountains Caribou Herd

The TMCH's relationship with the GRCH adds to the complexity of the management requirements for both herds, but especially for the TMCH, with it's comparatively small population size. For example, there was concern from some participants that the inability to harvest caribou from the George River herd was placing ever-increasing harvest pressure on Torngat animals.

"There's only not a big area and [hunter] have to find them, get what they want, a lot of pressure on the Torngat herd, now where the George River herd is closed." – Joe Webb (Nunatsiavut)

Results of this study and the current science literature speak to the spatial and genetic overlap that exists for these animals (Boulet et al. 2007; Couturier 2007). In addition, the observation by community members of higher levels of disease and general poor health when the GRCH was at its most recent peak highlights the capacity for disease transmission to the neighboring TMCH. It has been argued that overlapping and nearby herds cannot be managed as distinct populations, but rather, should be considered metapopulations where there is dispersal, contact, and genetic flow between herds (Hinkes et al. 2005). That argument holds true for the TMCH.

Further to this point, the main user groups, which span the provincial border, have traditionally hunted and lived alongside both herds. As such, hunting practices and traditional use of the species incorporates Torngat Mountains caribou and George River caribou.

"And the people from Québec, although people are called people from Québec and they say people from Labrador we are all Inuit and we are all trying to live like Inuit, all alike, we all tried to help each other out back then when it came to providing food." – Willie Etok (Nunavik)

A couple of participants, particularly in Nunavik, where caribou are still relatively accessible, spoke to the concern their community feels for friends, family members, and fellow Inuit in places, like Nain, where caribou are becoming increasingly difficult to hunt. Given the ecological relationship of

both herds, the longstanding connection between Inuit across regions and with the two herds, and the considerable decrease in George River caribou numbers, it is imperative that management solutions take a holistic approach. While this presents several challenges, the end result of two healthy caribou populations and a strong collaborative, and respectful relationship between all levels of government and Inuit communities is a worthwhile reward.

Every participant interviewed for this study expressed the importance of Torngat Mountains caribou. These caribou are a way of life, a connection to the past, and, many hope, an essential part of Nunavimmiut and Nunatsiavummiut futures. Changes to several factors in recent decades have had serious implications for how and when Inuit in Nunavik and Nunatsiavut hunt for caribou. Transitioning from dog teams to snowmobiles and faster boats means that hunters can travel farther, faster, covering more ground in search of caribou or other animals. It also means that there is a considerable and potentially prohibitive cost associated with these traditional activities, which was evidenced in the responses of many participants. In addition, travel has become more challenging in recent years as a result of increasingly unpredictable weather and ice conditions. Shoulder seasons are longer, meaning there is less time to get out on the land. Compounding the travel issue is the transition away from a traditional economy. More people in both regions are working regular full-time hours throughout the week, making it challenging to find time to go off hunting and to complete all the tasks associated with such a trip. With this recent lifestyle shift has come an increased dependence on store bought food, which some participants noted is more popular with younger generations. All of these changes, in the greater context of social changes in the regions, create a situation where passing along knowledge and engaging youth in hunting and other traditional practices associated with caribou hunting are increasingly a challenge. This type of challenge needs to be considered in future management strategies.

Management of wild populations requires informed decisions using data collected on the population of concern. There are still some weighty questions to be answered regarding the management of the Torngat Mountain caribou herd, many of which are major points of concern of Inuit in Nunavik and Nunatsiavut. With the TMCH being an under-studied herd, it is important that efficient and effective collection of data is employed in order to make effective and informed management decisions.

Both quantitative data, usually collected using scientific methods, and qualitative data, often in the form of traditional ecological knowledge (TEK), can be used to inform conservation and management decision-making processes. TEK can be an inexpensive way to collect data on the status

of a population, and allows researchers to work closely with the people who are most affected by the conservation of the species or ecosystem in question, and build relationships within communities (Kendrick and Manseau 2008). Scientific knowledge, alternatively, must be collected using techniques that often require a large financial investment, but provides quantifiable results over spatial and/or temporal scales chosen by the researcher.

Typically SK has been given preference over TEK when managers are making conservation-related decisions. While scientific methods and knowledge is often more successful at providing quantifiable results over large spatial scales, it is often very expensive to collect and can provide inconclusive results (Moller et al. 2003). Additionally, SK is sometimes mistrusted, unwanted, or disregarded by indigenous wildlife users for numerous reasons (Kendrick 2003, Kofinas 2005), largely as a result of the historically colonial relationship between researchers and aboriginal groups (Oshrenko and Young 1989). Communities were often subjects, as opposed to engaged developers, of science-related projects and the outcomes of these projects frequently had serious implications, like the imposition of harvest limits. However, despite the costs and sometimes-wary reception of SK, IK is rarely used to the same degree as SK in conservation and management decision-making. Many management decisions and monitoring techniques are developed purely using SK.

The importance of TEK in caribou management is increasingly being recognized across the north. In fact, recent work is demonstrating that TEK can be a highly practical source of management solutions and new research questions (Parlee and Manseau 2005). While not as expansive in scale as some scientific studies, it can provide useful and cost-effective information for informing management decisions (Kendrick and Manseau 2008). When collected with care, foresight, and purpose, qualitative data can be quantified into units of effort of collection for effective comparison across large geographic areas, and multiple spatial scales (Moller et al. 2003). Beyond this, the inclusion of IK in management decisions provides both managers and aboriginal stakeholders the opportunity to learn each other's unique concerns, both of which should be considered and included in decision-making processes. Very little SK is currently available regarding any aspect of the TMCH. What limited studies have been done have occurred irregularly and often only opportunistically (e.g. Schaefer and Luttich 1998, Boulet et al. 2007). This provides a unique opportunity (indeed, a necessity) for IK to be a highly utilized source of information for the monitoring and management of this herd, and work in cohesion and harmony with SK. The interest and participation of hunters in both Nunavik and Nunatsiavut, and the largely unblemished relationship between the communities and researchers could be an asset in making the conservation of the TMCH a flagship of successful co-management and utilization of multiple data sources based in multiple worldviews.

The concerns regarding the conservation of the TMCH provide an ideal opportunity to use IK

and SK in cohesion for efficient and effective conservation practices. In order to make opportunity a reality conservation priorities and practices need to be assessed and agreed upon by all stakeholders. Many participants expressed that some baseline knowledge of the number of animals in the TMCH population is the first step in developing an overall conservation strategy, and that this knowledge should be gained by scientific aerial survey(s). After this information has been obtained several participants mentioned the need for a system of monitoring, with some participants calling for the use of IK, some for the use of SK, and some for both. An effective system could involve IK in the monitoring of total harvest rates from each community, and catch per unit effort by participating hunters. Additionally, monitoring the geographical distribution of kill sites and sightings could help uncover spatial/temporal patterns in movement. The combination of these monitoring techniques can provide excellent data for an informed and inclusive decision-making process.

Conclusions

Future research on this herd should take its cue from the diverse lines of inquiry and concerns suggested by participants and presented throughout this report, while keeping in mind cumulative effects and the interconnected nature of this system. The results of this study represent a significant contribution to the greater understanding of Torngat Mountains caribou. Furthermore, this work makes available to various management bodies a considerable amount of critical knowledge from Nunatsiavummiut and Nunavimmiut regarding the herd, the landscape these animals occupy, as well as Inuit traditions and concerns. It is hoped that this knowledge will be respected and considered with equal weight alongside available SK in order to make the best possible decisions for the protection and preservation of the TMCH, but also for Inuit who live alongside these caribou. It is also the best opportunity to consider management options that are based on managing the herd rather than grounded in jurisdictions. Lastly, it is the most likely way to ensure that management options will be supported by Inuit – especially any decision that might affect harvesting rights.

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Appendix I - Interview Documents

Letter of Information and Consent Form:

Background:

This project is supported and directed by the Nunatsiavut Government, Makivik Corporation, Parks Canada and the Torngat Wildlife and Plants Co-Management Board, with research support from Trent University. Colin Webb (Nunatsiavut Government) and Kaitlin Wilson (Trent University) will be developing, executing, and reporting on the project, with continued input and guidance from the above partners.

There is not very much scientific knowledge available about Torngat Mountains Caribou Herd, nor has there been much documentation of Inuit Knowledge previously on this topic. The little information that does exist suggests a potential population decrease for this herd. Given the state of the neighboring George River Caribou Herd, proposed scientific studies of the Torngat Mountains herd, and the importance of caribou for Inuit in Nunatsiavut and Nunavik, it is important to document Inuit knowledge about Torngat Mountains caribou.

The focus of this study is to collect and document Inuit Knowledge about the Torngat Mountains Caribou Herd from Nunatsiavut and Nunavik experts in order to better understand their status and any changes in the herd over time, as well as to inform any future decisions about these caribou with Inuit knowledge from the people that know these animals and the land the best; the hunters and experts in the two regions.
Hunters and elders from the two regions are being interviewed to discuss these topics and document their knowledge. Your involvement in the study will include participating to an interview or focus group. Individuals will have the option to participate in either an interview (alone) or a focus group (with one or two other participants). Interviews/focus groups will be approximately 1 to 2 hours in length. They will include a series of questions focusing on Torngat Mountains caribou as well as participants' experiences hunting and traveling in the area. With the participants' consent, the interview will be recorded using a digital audio recorder. As well, there will also be a map available for drawing information shared about caribou movements, habitat etc.

Process for Informed Consent:

The researcher has explained to me the project and its intent and focus. I understand that my participation will consist of participating in an interview or focus group about my experiences in the study area and knowledge of the Torngat Mountains Caribou Herd.

It is intended that there is no personal risk in participating in this project and I should feel comfortable with its nature at all times. I understand that my participation in this project is voluntary and I am free to withdraw from the project at any time, before, during or after the interview and that I can refuse to participate or refuse to answer any questions. If I decide to withdraw from the project, any information I have given will be promptly destroyed and will not be included in the project in any way. I understand that my withdrawal will bear no consequences and no judgments or prejudice will be held against me.

I understand that information from this interview/focus group is being collected by digital audio recorder and on plastic (mylar) maps. I consent to the information from this interview being collected and recorded on a digital audio recorder and through my drawing on maps:
Yes o No o

I understand that the contents of the interview will be used in a research report and potentially other publications that will be based on this research. None of the interview content will be used for any commercial purposes.

Under the responsibility of the project lead, Chris Furgal, all information will be stored securely in encrypted digital form and under lock and key for a maximum of 5 years after publication at Trent University in Peterborough, Ontario. After this time, all materials will be destroyed. A copy of all information from Nunatsiavut participants will also be stored securely with the Nunatsiavut Government and a copy of all information from Nunavik participants will be stored securely with Makivik Corporation. I understand that any future use of the data by the Nunatsiavut Government or Makivik Corporation for reporting and publication beyond the scope of this study will require my additional consent prior to use.

I consent to the results of my individual interview/focus group also being stored in a secure fashion with the Nunatsiavut Government / Makivik Corporation:
Yes o No o

The Torngat Wildlife and Plants Co-Management Board may also wish to retain a copy of the results of this study. Similarly, any future use of the data for reporting and publication by the Torngat Wildlife and Plants Co-Management Board will require my additional consent prior to use.

I consent to the results of my individual interview/focus group also being stored in a secure fashion with the Torngat Wildlife and Plants Co-Management Board:
Yes o No o

Regarding my privacy and confidentiality, I choose one of the following options:

o I do not agree to direct quotes of mine being used in publications, and I prefer to stay anonymous and do not want my name to be listed or associated with any information that I provide

o I agree to have direct quotes of mine used in publications, but I prefer to stay anonymous and do not want my name to be listed or associated with any of the quotes or information that I provide

o I agree to have direct quotes of mine used in publications, and I agree to have my quotes associated with or attributed to my name

In any case where I provide authorization to use my name and quotes, I understand that I will have the opportunity to review the information, in its presented context before it is finalized and published.

I agree to have my name listed in the Acknowledgements section at the end of any report:
Yes o No o

I would like a copy of the transcript from this interview/focus group:
Yes o No o

I would like a copy of the final report:
Yes o No o

If I have any questions, I can contact my Inuit Community Government, the Department of Lands and Resources of Nunatsiavut Government, Chris Furgal, the regional contacts (Kaitlin Wilson or Colin Webb), or the appropriate Research Ethics Board representative (Karen Mauro, Trent University

Research Ethics Board, 705-748-1011 ext.7050) at the contact information provided above.

There are two copies of the consent form, one of which I may keep for my records.

By signing below, I _____agree that I have been fully informed and understand the nature of the project, and agree to participate as described to me by the researcher.

_____

Signature of Participant Date

_____

Signature of Researcher – Witness Date

Participant Contact Information:

Address: _____

Telephone: _____Email: _____

Torngat Mountains Caribou Herd Inuit Knowledge, Values, and Culture Study
Semi-directed Interview Questions:

1. Project Introduction

2. Consent Form

3. Explanation of Mapping Process

4. Hunter Attribute Questions:

For interviews with more than one participant, each participant can start by introducing themselves, where they're from and their general hunting behaviour

a. To start, can you please tell us a little bit about yourself? When and where were you born?
b. Where do you live now? How long have you lived in [current community]?
c. Where did you live before that?
d. When did you start hunting, in general? How long have you been hunting in the study area? (refer to map and indicate study area)
e. How often to you hunt in this area?
f. How long would you be out on a typical trip to this area?
g. Who do you normally go hunting with?
h. What equipment do you use?
i. Has anything changed about your hunting activities in the study area since you started hunting there? (Probe: how often you go, when you go, who you hunt with, how long you hunt for, how far you have to travel, equipment you use, species you hunt there)

5. Identification Questions:

a. Are Torngat Mountains caribou different from caribou in the George River herd? Do you consider them to be a separate population from George River caribou?
b. If yes, how are they different and what are some of the ways you can tell them apart? (Probe: body size, antler size/shape, behaviour, type of landscape they are found in, taste, etc.)
c. Do the two herds ever use the same areas or interact with each other?

d. If yes, when and where do they use the same areas? What are they doing when they are together? (refer to map)

Reminder: All questions from here on refer to Torngat Mountains Caribou only

6. Hunting Questions:

a. Can you tell me about the times of the year when you usually hunt (or have hunted) Torngat Mountains caribou?
b. Starting in [which ever time of year the participant identifies], where do you go or how do you typically find your caribou? Can you draw the route you take to get there? (refer to map)

Move through the following questions for each time of year that participants are out on the land with Torngat Mountains caribou, adjusting questions based on time of year. Ask what caribou do next or where they go to next to bridge between hunting seasons. Questions that can be asked for multiple seasons are noted.

c. When and where do you start looking for caribou or signs of caribou after you leave from [community]? (refer to map)
d. Can you circle the areas you hunt or have hunted Torngat Mountains caribou? (refer to map) How often do you go there? How long do you usually stay out for?
e. When you find caribou, do you ever decide to take some animals, but not others? If yes, how do you decide which caribou to take? (Probe: Sex, age/size, condition, posture of tail, condition of hide)
f. Once you kill a caribou, where and when do you skin/cut up/butcher it? (Probe: at kill site, boil-up/beach, inside or outside home or cabin)
g. How many Torngat Mountains caribou do you generally hunt in a year? Could you estimate how many Torngat caribou are hunted overall in a year by all hunters or even (i.e. total harvest)?
h. Have changes in weather/climate affected or stopped you from hunting caribou in areas you would traditionally hunt them? (Probe: timing of snow melt, more/less rain, number of biting insects, difficulty of travel on traditional routes used)
i. Have there been other changes in how, where, or how many caribou you hunt or in the overall amount of Torngat caribou hunted by all hunters? How might these things change in the future?

7. Spatial and Habitat Questions:

a. In general, where do Torngat Mountains caribou live? Can you show me/draw this area for me on the map? (refer to map)

b. What is good caribou habitat? Can you describe the habitat/land where you see Torngat caribou during [time of year]? What is it that makes these places that make them good for caribou (refer to map)

c. What are they doing during [this time of year]? (Probe: calving, breeding, migrating, escaping insects, etc.)

d. Are there areas caribou use where you don't hunt them during this time? (refer to map) If yes, why is that?

e. Are there areas that caribou use during [time of year] that are sensitive to disturbance? (refer to map) If yes, why are these spots more sensitive?

f. Do these caribou migrate? If yes, can you show me on the map where they go? (refer to map) Are there types of areas that are good for traveling through? Or types of areas that are good for stopping? If yes, can you describe these areas? (refer to map)

g. Can you tell me about what caribou like to eat and the types of places you've seen them feeding? (refer to map)

h. What animals eat caribou at this time of year? Are certain caribou more likely to be eaten by other animals? (Probe: calves, cows with calves, sick animals)

i. Have you noticed any changes with the animals that eat caribou (i.e. wolves, bears, foxes, wolverine)? (Probe: number/abundance, change in behaviour/more or less bold/aggressive, change in group size, change in areas they use)

j. How do caribou protect themselves from animals that eat them (Probe: moving away to safe area, defending themselves etc.)?

k. What do caribou do when the weather gets bad (Probe: cold, stormy, heavy snowfall etc.)?

l. Do caribou use the ice (Probe: lakes, brooks, ocean)? Does the timing of breakup affect them? If yes, how? (refer to map)

m. Do Torngat Mountains caribou mix with each other throughout the whole area (refer to map)? If no, are there different, smaller groups within the herd (Probe: for example, different groups at Killinek compared to Saglek)? What areas do these smaller groups use?

n. Have you noticed any changes in how caribou move or in the areas they use? If yes, what kinds of changes have you noticed? Why do you think that is? Are there areas that they used to use, but don't use anymore? (Probe: Have there been any changes in caribou habitat/the land caribou use that you

have noticed while hunting in this area? Depending on season of discussion: plant height, types etc. for summer or snow depth, type, texture, duration of cover etc. for winter, predators, plants, insects, weather etc.)?

8. Demographics and Health Questions:

a. If you see caribou, are they usually in groups as opposed to alone during [time of year]? If yes, what size of group are they in and how many are male, female, or calves?

b. During [time of year], what are the stags/bulls doing? (Probe: are they separate from the cows/ calves? are they alone or in groups with other males? does a bull stay with a group of females/cows?) How many do you usually see compared to the size of the group they are with?

c. Can you tell how old a caribou is?

d. If yes, how old is a cow when she has her first calf? Do they have a calf each year?

e. Do they calve in groups or alone? Do calves stay with their mothers for very long?

f. Can you tell when a cow is pregnant? If yes, when you see a group of caribou in the late winter/ spring, roughly how many are pregnant?

g. Do Torngat caribou calve in big or small groups or by themselves?

h. When do you start seeing calves? How many calves do you usually see compared to the size of the group that they are with? (Probe: for example, does every female have a calf?)

i. Do flies bother caribou? If yes, what kind? How do caribou react to insects?

j. Can you tell if a caribou is sick or healthy? If yes, what are some signs? (Probe: body size, body condition, amount/location of fat, quality of meat, parasites in the hide/meat, cysts in liver or other organs, other body parts like marrow, inflammation of testicles or leg joints [brucellosis] ease of hunting/tame or wildness, etc.)

k. In general, what condition are the animals in at this time of year? (Probe: fat, coat, meat, taste, etc.).

l. Do disease or parasites affect the Torngat Mountains herd, as a whole? If yes, how do they affect the population/herd?

m. Do a caribou's antlers tell you anything about it? If yes, what? (Probe: shape, time of shed, male vs. female, health, change in appearance over time)

n. Can you tell me about how caribou behave when they see you? (Probe: tame, curious, wild, etc.)

o. Can you tell me about caribou trails? Have these changed in any way over the years (Probe: more/less trails? do caribou use new trails? are the old trails grown over? are trails deeper? etc.)?

p. Has there been any change in the number of Torngat Mountains caribou, while you have been hunting them? (Probe: more, less, same, and relative to what years, change in number of males/females/calves)

q. If yes, why do you think that is? What are the ways to tell if the herd is increasing or decreasing? Have you noticed a change in this herd in any other ways? (Probe: changes in how many pregnant cows you see, number of calves you see in the spring/summer, number of sick caribou you see etc.; ask for as specific a time as possible if changes are noted i.e. approximate year, or early versus late during a decade, if necessary)

r. Have you heard about past changes with the Torngat caribou, from older generations? If yes, what kinds of changes were happening to the herd before your time? (Probe: population cycles, times when caribou left or times when they came back, reasons for the return of caribou in the past?)

9. Importance, 'Management' and Future Generations Questions:

a. How are different caribou parts used? (Probe: hide, sinew, antlers, medicinal uses etc.)

b. Are there differences in how you use caribou now compared to how your parents or grandparents used Torngat Mountains caribou? If yes, how is it different now?

c. Are these caribou important to you? If yes, what about them or hunting them is important?

d. Is it important for future generations/your children and grandchildren to stay connected with these caribou? If yes, what is the best way to keep a strong Inuit-caribou relationship over the long term?

e. Do you have any old stories or memories about Torngat Mountains caribou you feel comfortable sharing today? (Probe: respecting caribou, relationship between humans and caribou etc.)

f. Do Torngat Mountains caribou play a role in your health or quality of life? If yes, how do they affect your health?

g. What does a healthy Torngat Mountains Caribou Herd mean to you? What is the best thing to do for the Torngat Mountains Caribou Herd right now? What should be done to make sure the herd is healthy for future generations? What has been done in the past? Did it work?

h. Do you think changes to the George River herd and how people use George River caribou will affect the Torngat Mountains herd? If yes, how?

i. Do you have any concerns about outfitters or poachers?

j. Can you share your thoughts on research about the Torngat Mountains caribou? What are some important things that should be looked at for these caribou? (Probe: what do think about what has been done?)

k. Do you have anything else you would like to share about Torngat Mountains caribou or anything else you would like to add to the map?

Nakummek!

Appendix II - Mapping Codes

Table 4. Mapping codes; an "*" after a code indicates a past event/item, where season is not implicit, the code will include a circled one letter suffix of S (Summer), F (Fall), W (Winter), or P (Spring).

Route Codes	Code	Notes
Snowmobile Route	SR	
Walking Route	WR	
Dogsled Route	DR	
Boat Route	BR	
Snowshoeing Route	NR	
Caribou Route	CR	Migration routes, direction of movement indicated by arrowhead
Caribou Trails	CT	Caribou trails
Hunter/Activity Codes	**Code**	**Notes**
Hunting Area	HA	Area for caribou hunting (general areas used for hunting)
Hunting Site	HS	Sites of successful and unsuccessful kills ('HSX' denotes successful kill site…include year if recalled by hunter as well)
Hunting Route	HR	
Cabin	CB	
Camping Site	MS	
Settlement Site	SS	Current or formal settlement location (e.g. Kilinig)
Animal Codes	**Code**	**Notes**
Calving Area	CV	Area where Torngat caribou calve
Feeding Area	FA	Noteworthy or common feeding areas/food sources
Caribou Area	CA	Area where caribou were seen but not hunted
Avoided Area	DA	Areas that caribou may avoid because of predators, disturbance, insects, etc.
Caribou Sighting	CS	Unique or remarkable sightings/kills that may need to be recorded
Caribou Sub-Group Area	GA	Area used by a sub-group of the Torngat herd
Range Extent	GT	Used to delimit southern boundary of Torngat herd (and occasionally to delimit northern boundary of George River herd)
Kill Site	KS	Site of a caribou kill by predator (not humans)

Appendix III - Qualitative Mapping Structure

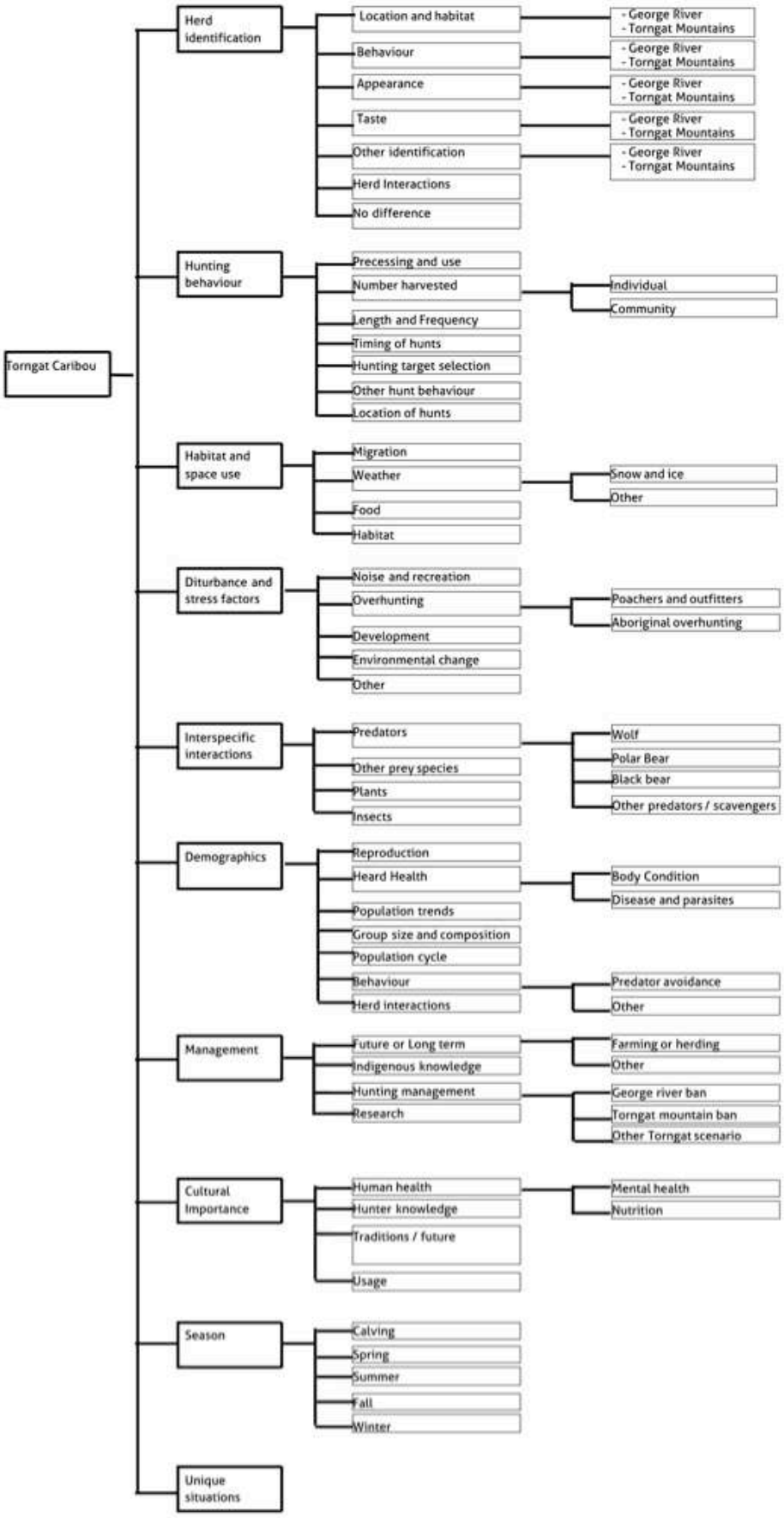

Figure 16. Hierarchical thematic coding structure applied to the qualitative dataset.

Figure 17. Spring travel routes for Nunatsiavut and Nunavik participants.

Figure 18. Summer travel routes for Nunatsiavut and Nunavik participants.

Figure 19. Fall travel routes for Nunatsiavut and Nunavik participants.

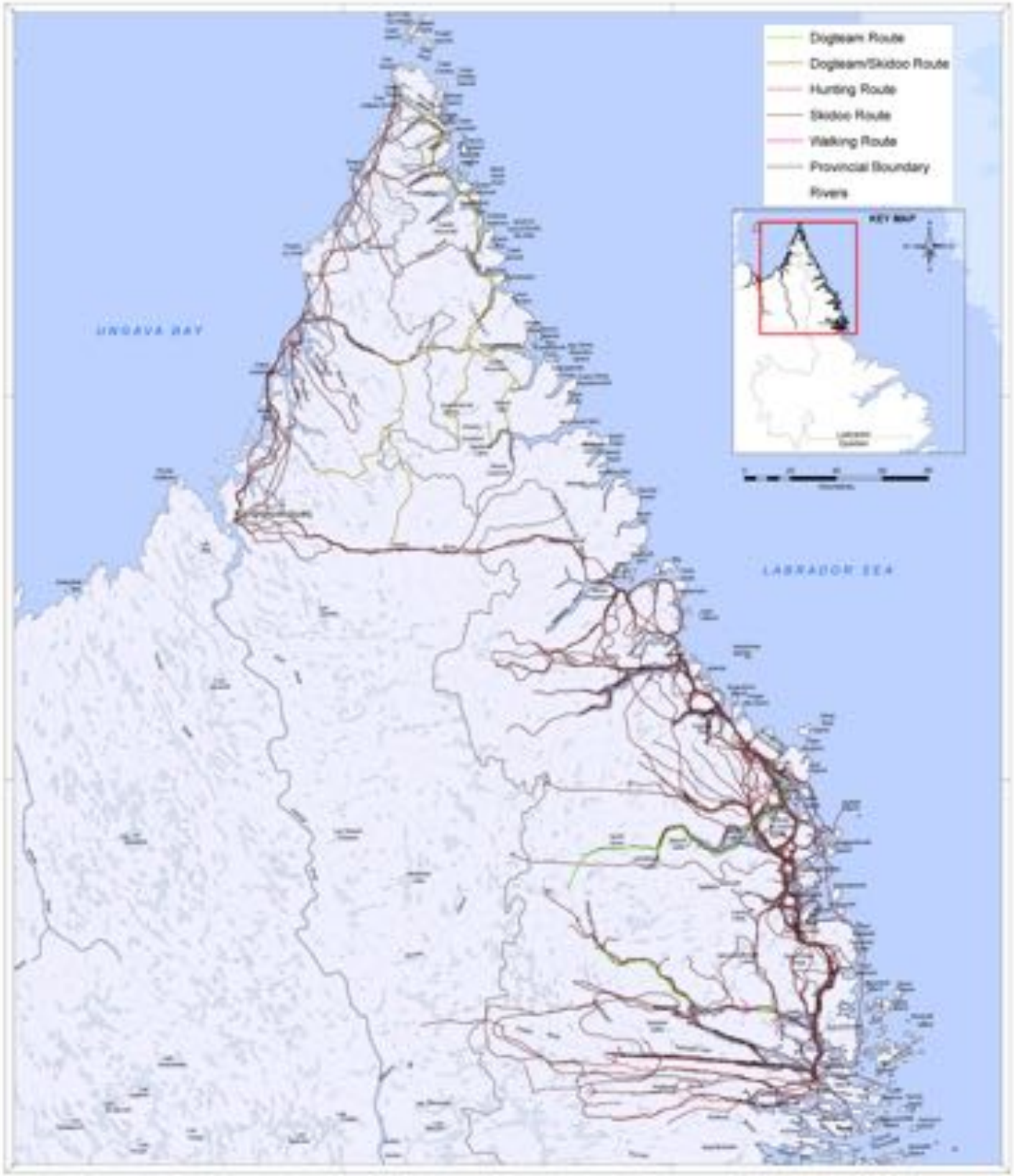

Figure 20. Winter travel routes for Nunatsiavut and Nunavik participants.