



INUIT QAUJIMAJATUQANGIT OF M'CLINTOCK CHANNEL POLAR BEARS

FINAL REPORT

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Gjoa Haven Hunters and Trappers Organization, Gjoa Haven
Spence Bay Hunters and Trappers Organization, Taloyoak

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Tahapkuat pinahuaqni pinahuaqtauniat ihuaqhivalliqlugit, ilitquhiliqutitlu naamaknit,
ihuaqhihimanilu aulatyutai pitquhiit ikayuqtuiyut nunaliuyuni ilauyunit.

2. Introduction

Accurate and reliable information on polar bear population status and trends is necessary for informed decisions in polar bear management. In Nunavut, collaborative polar bear management among the Nunavut Wildlife Management Board, Government of Nunavut Department of Environment (GN DoE), Nunavut Tunngavik Inc., Regional Wildlife Organizations, and Hunters and Trappers Organizations partners, aims to ensure each subpopulation is sustainable for harvesting by Inuit (through Total Allowable Harvests [TAH] and non-quota limitations). Both conventional (scientific) and traditional knowledge forms of information are needed for this process.

Inuit traditional knowledge, or Inuit *Qaujimajatuqangit* (IQ), not only includes knowledge of wildlife trends but also Inuit values, opinions, concerns, traditional management practices, and perceived impacts on harvesting and livelihood (Wenzel, 2004). This differentiates IQ from conventional science, which tends to focus on wildlife data at the exclusion of human relationships and values. For this reason, including IQ in polar bear management also supports “Inuit harvesting rights and priorities, and recognizes Inuit systems of wildlife management that contribute to the conservation of wildlife and protection of wildlife habitat” (Nunavut Agreement, Article 5). Documenting IQ for management applications requires the direct inclusion and guidance of IQ holders in formulating research questions, analysing and validating results, and interpreting and presenting data (Wenzel, 2004). Research methods that are systematic yet informal and based on respectful communication, narrative discourses, subjective and personal engagement, and unhurried meeting styles are culturally appropriate (Ferrazzi et al., 2019).

The Government of Nunavut (GN) Department of Environment recently completed a biological survey of the M’Clintock Channel polar bear subpopulation (MC; Dyck et al., 2020). To complement this work, the GN contracted Trailmark Systems Inc. (Trailmark) Consultants to conduct an independent IQ study for Gulf of Boothia and M’Clintock Channel polar bear populations. The results from this work may contribute to recommendations to the Nunavut Wildlife Management Board—Nunavut’s main instrument of wildlife co-management—and potentially shape total allowable harvests and management objectives for the populations. Below we report on polar bear IQ documented from communities that harvest M’Clintock Channel polar bears.

3. Methods

We followed a grounded theory approach to guide this work, where hypotheses and patterns in information are allowed to emerge inductively, without any pre-existing theory (Strauss & Corbin, 1994). This contrasts with the deductive approach (Lewis, 1988) used in conventional wildlife science, where hypotheses are established and tested (Johnson, 2002).

A Trailmark consultant met remotely with Ekaluktutiak (Cambridge Bay), Gjoa Haven, and Spence Bay (Taloyoak) Hunters and Trappers Organizations (HTO) as well as Kitikmeot Regional Wildlife Board staff to discuss project objectives and seek advice on methods and approach to an IQ study. HTOs suggested public community meetings be held in each community in March and April 2020 to document IQ. Trailmark staff drafted a list of guiding interview questions focusing on hunting experience, perceived population changes, knowledge of polar bear ecology, and management perspectives. This interview guide was circulated to each HTO and the GN before being finalized.

In March 2020, travel was restricted due to COVID-19 and community meetings were not possible because of social distancing. HTO staff suggested remote interviews over telephone and videoconferencing so that IQ research could continue. Because interviews took place remotely and mostly over the telephone, participatory mapping and GIS data collection were not possible. We probed for place names to identify relevant geographic locations to the best of our ability. HTO staff recruited all participants (purposeful sampling; Marshall, 1996).

We interviewed four participants in a semi-directive manner (Huntington, 1998; Huntington, 2000) from Cambridge Bay over telephone individually from 11–20 May 2020; five participants from Taloyoak individually over Zoom conferencing on 21 May 2020; five participants from Gjoa Haven as a group over telephone on 3 June 2020; and one participant from Gjoa Haven on 16 June 2020. Because of the group discussion format in Gjoa Haven, most information from Gjoa Haven represented perspectives of the entire group, rather than individuals. It was not always possible to distinguish who was speaking over the telephone, so we identified individual interviewee's quotations where possible, and otherwise denoted quotations with "unidentifiable Elder." We replaced participant names with alphanumeric codes ("CB", "GH" and "T" to represent Cambridge Bay, Gjoa Haven, and Taloyoak home communities, respectively) to protect participant confidentiality.

Interviews took place in English except for four interviews in Taloyoak and the group interview in Gjoa Haven, where interpreters provided translation between English and

Inuktitut. Interviews were audio-recorded and auto-transcribed using Sonix transcription software (<http://sonix.ai>). We manually edited transcripts and analysed them using conventional content analysis, where common themes and categories are determined from the data (Hsieh & Shannon, 2005). We identified quotations that represented the common themes and reported them. Additional quotations are listed in Appendix 1.

Interview summaries were sent to each HTO, who reviewed and validated them for inclusion in this report. Because of travel restrictions and the limited time available for this work, HTO board members (rather than interview participants) validated the results for accuracy and representativeness for their community.

4. Results and discussion

4.1. Participant hunting experience

HTOs recommended all interview participants for their known experience, breadth of knowledge and familiarity with polar bears, bear hunting, and hunting areas. In Cambridge Bay, the four interview participants were active polar bear hunters (have visited polar bear areas [Appendix 2] within the last year and harvested an innumerable number of bears over their lifetime).

In Gjoa Haven, one interview participant was an active polar bear hunter, and the other four participants were no longer actively hunting due to age; however, these participants had harvested an innumerable number of bears over their lifetime prior to the implementation of quotas (since quotas were established, they were each only able to harvest up to five bears due to limited access). In Taloyoak, three interviewees were active polar bear hunters. Two interviewees were no longer active hunters due to age and had not visited designated polar bear hunting areas (Appendix 2) in the last 20 years but were still recommended by the HTO for their prior experience and continued knowledge of polar bears.

Because interviews took place remotely over telephone, it is likely some interview participants did not feel comfortable sharing information openly. Some interviewees expressed a preference for face-to-face interviews. Face-to-face engagement could enable additional information to be gathered, either directly from participants or through participant observation. Interviews were also validated by HTOs instead of individual participants due to logistical and project time constraints; the information reported below should be interpreted at the community level.

4.2. IQ of polar bear ecology

Interviewees indicated every individual polar bear is different. They have personalities and are considered intelligent, learning animals.

You can't guarantee how bears [are] gonna behave. It's based on what type of animal it is, whether it's aggressive bear or it's a bear that's shy and hasn't really encountered any of the bears and fighting or anything so I mean there's dominant, there's a bunch of different bears with their attitude out there and it's always different. It's never the same. (CB1, 11 May 2020)

Polar bears know that they are protected by something. They know. They are intelligent animals, no matter what animal you are. They, as if, know what people are doing. What guidelines, what policies and procedures, as if they know what's going on with the tagging system. (Interpreter translating for T1, 21 May 2020)

Interviewees reported bears generally prefer rough ice, especially areas that are difficult to access by hunters.

Today we have snowmobiles and it's usually in the wintertime that we hunt them, and that the motorized snowmobile, you can hear the motor and you can hear the sleds hitting the ice. And as soon as a bear hears something like that, they start to run off right away to the rough ice, to try and get away from you. And if you see the polar bear tracks, you can notice right away that it's running away from you and it's a fast track. And sometimes you won't even see the bear because they had a head start of many miles away. 'Cause he hearing the snowmobile that had a good head start to run away into the rough ice or to the hills, rocky hills or whatever it may be, where a snowmobile won't be able to make it. (Interpreter translating for T2, 21 May 2020)

These areas include pressure ridges and open water, where it is easier for them to access prey.

They love being around seals. Like bearded seals and ringed seals. Like pressure [ridges] and currents. Where the seals are. Breathing holes, they have a lot of breathing holes around the currents and the pressure ridges. That's their buffet, where the seals are. That's where the food is. (CB2, 16 May 2020)

Some interviewees reported bears are more active during the full or new moon.

In the areas where you have [food] or ice pressure ridges and there's a full moon or a new moon, that's where the bears are there, after the seals, they hunt the seals. Same thing with us hunters, we go out hunting, we like to hunt in the areas in the ocean where it's a smoother area. It's easier to find the seal holes. Pretty much the same way, that's where the bears go. Where the pressure ridges and the cracks are. That's where it's easier to see the bears in a very rough area. If you are trying to find a seal hole for the hunters, it's hard to find them. Same thing with the bears. So, where you have smoother ice you have a better chance of seeing a bear. (Interpreter translating for T2, 21 May 2020)

Knowledge of polar bear habitats, behaviour, and seasons is important for hunters to be able to locate and harvest bears. Hunters also use this information to locate and harvest prey that they share with polar bears.

4.3. Description of hunting

For Inuit, knowledge of polar bears is gathered within the context of human-bear relationships. A description of hunting practices can provide insight into why polar bear IQ is important, how it is learned, and how it evolves. Understanding these contexts can also point

to the observations and considerations a hunter makes to gather information at the population level.

Participants described their knowledge of management practices and harvesting regulations that are discussed in more detail in Appendix 3. Harvest regulations have protected females and cubs, which is also supported by male-biased harvesting for the sales of hides. In the past, any kind of bear could be harvested. Hunters would only take what they needed.

Whenever he felt like polar bear hunting, he would go. Or whatever he needs of that polar bear, he would go and catch polar bear. And it's not only one polar bear but whatever, how many he needs, he's trying to catch. (Interpreter translating for GH3, 3 June 2020)

Today, each hunter can apply for a tag distributed through their local HTO via lottery with a time limit for use before it is passed on to another hunter. The importance of and interest in polar bear hunting is evidenced by the number of hunters who enter the lottery. The number of interested hunters usually exceeds the number of tags available.

For our community I guess it's a pretty important thing because there's a lot of people who put their names in for draws they do each year. (CB1, 11 May 2020)

Hunters are waiting in line to get a bear tag and other years—there is just never enough polar bear tags. There are a lot of people. These communities are growing. Especially today. We have a lot of people that like to have the opportunity to go out polar bear hunt and catch their first bear. But they're unable to do that because of the tagging system. (Interpreter translating for T2, 21 May 2020)

Participants described some areas that polar bears can be encountered in M'Clintock Channel: Dease Strait, Prince of Wales Island, Oscar Bay and Cape Alexander. Community members can also harvest other game in the M'Clintock Channel, such as caribou and wolves, in addition to polar bears. Harvested polar bears are usually shared among community members.

The first thing we do is we take a few pictures, give them out, take the meat, roll up the hide and call it a successful hunt and come home. Then usually what I do is usually sell the polar bear hides for income. And all the meat we use for eating, throughout the family. (CB1, 11 May 2020)

Polar bears are an important source of meat for consumption.

They're important 'cause they're our regular diet. And [Inuit] of course, we have polar bear meat, we [pray] for them when the season's over to have that dietary. They're

important to us too, they're part of our diet, so, regular diet, annually it's, we do [pray] for them...we also make the hide into our clothing as well so it's quite important to our community. (T5, 21 May 2020)

Polar bears also continue to be harvested for their hide.

Around April perhaps they have good hair. The hair is thick, and it's a good quality for selling. Seems like that's when is good time. Even though fall is a good time, but their hair is not as thick. (Interpreter translating for T4, 21 May 2020)

Today's kill for polar bear hide, I think you could only sell them at a certain height. If it's 10 feet you could sell it. Otherwise, you won't make any money out of the hide. So, the use for clothing or other useful tools. (GH1, 3 June 2020)

Unfortunately, the demand for hides has declined today, in part due to species-at-risk and international trade restrictions.

It depends on if there's people interested or the time they're not interested, so just hang on to the hide for a while and somebody decides that they want it later on and eventually sells. (CB1, 11 May 2020)

At this time today, it's pretty hard to sell a polar bear hide...we are not allowed to sell any hides anymore to the States. And to certain areas like the parts of the world, so that's why it's a lot harder to sell the hides. And if you can't sell the hides to the States, even the auction where we send it first down, they don't even be bought anymore. I send a hide two years ago, I have not seen nothing yet 'cause it hasn't been bought yet. (T5, 21 May 2020)

Polar bears are usually harvested on sea ice.

It's usually on the sea ice, ocean, that's where [polar bears are] doing the hunting from the seal [populations this] time of the year. Usually [hunters] don't really hunt the bears on land. (Interpreter translating for T1, 21 May 2020)

Timing and success of polar bear harvesting varies each year, depending on climate and population changes.

Pretty much every animal, even if it's a polar bear or not, they go through the weather cycle. You have a good year, good weather. It's a good year for pretty much all animals. If you have crappy weather, then it's harder for hunting, even though they're—it goes with the weather. You cannot really predict on how many years cycle. It just go with the weather pattern. (Interpreter translating for T3, 21 May 2020)

Depending on experience, hunters can usually spot and return home with their harvest within a few days.

Probably take about two, three or four days to shoot a bear. She knows that the younger generation today don't spend a lot of time out on the land so they can probably take about four days or so. (Interpreter translating for T4, 21 May 2020)

Today, he'll [wake] up 5:00 in the morning and within the next four hours or so, especially now that the seal pups are out now in the seal pup dens and the polar bears are up for hunting for seal pups, you're pretty much guaranteed within the four hours [to] see bears if there's plenty of bear tracks, fresh bear tracks. (Interpreter translating for T2, 21 May 2020)

It is common for young hunters or hunters with little to no experience to return home without a harvest.

A lot of names came up, a lot of them went out and tried and a lot of them came back and their [explanation] of their trip was there's no bears. They might see a track or two, but you know, they don't know where to look. They asked them and where to look but they say they go into that area and say they're just not going far enough; they're giving up after a couple hours. You know, at least we're spending a day at least in that area. So yeah, my family, all my family members, from my father's side, they're knowledgeable on polar bears and most of the prey species that they depend on just from our upbringing. [We go] on land dealing with them. Being out there all the time. (CB3, 12 May 2020)

Polar bear hunting requires dedication and work. In the past, hunters had to really understand and learn information about polar bears—how to think like them and outsmart them—in order to be able to harvest them.

The hunters many years ago were able to think and have a clear thinking of how to catch an animal. Because that was their only way of surviving without any rifles, or back then they were catching polar bears only with a harpoon. It's totally different today. That generation...he's heard stories that the polar bear actually run slower than a hunter. A hunter can catch a polar bear that he's chasing. For many years ago, it was a very different way of hunting polar bears than today's way of hunting polar bears. So that's something he knows from many years ago, as a youngster. (Interpreter translating for GH4, 3 June 2020)

Today, that knowledge and information is still needed, but modern hunting technology has made it easier to access animals, for example, by reducing travel time to and from hunting areas. However, success is still dependent on snow and sea ice conditions and the ability to travel safely through them.

Years ago, the hunters who been travelling by dog team, there can be obstacles like bad weather days. It would take days for them to be able to reach the polar bear area before they catch one and before they head home. And it can take days before they

make it home. But present day, snowmobile and devices like GPS, they can make it the same day. But sometimes it can be longer because of the ice conditions. Many years ago, the dog teams were able to go almost any direction, but presently it's a different way of hunting caribous and that, by snowmobile. (Interpreter translating for unidentifiable Gjoa Haven elder, 3 June 2020)

When the ice condition is very rough it's not easy to track down a polar bear because of the difficulty travelling through rough ice. On the other hand, when the ice is too smooth it can also be hard to track down because of the smooth hard snow or ice. So, it depends how the condition is like, whether it was too rough or too smooth. Also, can be different for other hunters...they try to find easy way to try and track down polar bears as well. It's always different environment, different ice condition. So, it depends on the condition of the snow and ice. (Interpreter translating for unidentifiable Gjoa Haven elder, 3 June 2020)

The time it takes to harvest is also dependent on the equipment and resources that a hunter has.

If you have good equipment, good weather, then you can have it in two days you know. Two or three days. But you know with poor equipment and poor weather that that's always the factor in life here. Up in the north. (CB2, 16 May 2020)

Elders described some of their traditional hunting practices on the land, that include knowledge of polar bear behaviour and tracks.

The Inuit people, the Netsilikmiut clan, and not just them, many years ago before the white people came, they used their seal harpoons and snow knives to harvest the polar bears. And she used an example with her hands, the polar bear. You know how they're run. They have [right] paw first step and the left paw following behind. And if it has [that way] there is a certain way to harpoon from the left or the right side of the bear. And this is very important to remember because the experienced polar bear hunters are taught from generation and generations. (Interpreter translating for T4, 21 May 2020)

That was shared from generations before, once we start to have more 24-hour daylight, longer daylights, that's when it seems like it's the easiest and to hunt the bears because you have more daylight. And they even know if they see a track, they can tell it was from yesterday or from a few hours before or from that early morning. They can tell the difference on how fresh the track is. If that track was from a day before, they might not track it down. But if it was from a few hours before they're polar bear hunting and they're track down the bear and that's the easiest time to hunt the bears, is once you start to have 24-hour daylight and because they're hunting for seal pups. (Interpreter translating for T2, 21 May 2020)

The best time to harvest animals is when they are most active, early in the morning and evening.

He knows this for a fact, and it was passed down from many generations. The earlier in the morning you take off, the easier you see bears. Even if it's for marine mammals, caribou, birds, whatever it may be. The earlier the morning, the better chance you get an animal. And throughout the day it's like calm, quieter. And in the evening, sometimes late in the evening, are one of the better times to see the bears. (Interpreter translating for T2, 21 May 2020)

Unfortunately, Gjoa Haven elders report young hunters do not know how to harvest polar bears, despite their interest in polar bear hunting.

There is a lot of young people that are signing up to try and get a quota to hunt bears. Part of the problem is that the young hunter that pulls a tag or is given a tag doesn't exactly know where to go because they are not sure which way to travel. That's Gulf of Boothia, they're not knowing that area. They never been there. Some could be not going because they're not able to [afford] groceries or rough day, and different reasons...although they want to go, but there's a number of reasons why they are not. (Interpreter translating for GH3, 3 June 2020)

Lack of knowledge is due in part to harvest restrictions and, as a result, few hunting and learning opportunities.

There's always been a huge interest in polar bear hunts. But these past couple years, the interest is slowly dwindling. And there's a lot of the people that are in their late 20s, early 30s, that are openly saying that they don't hunt polar bears because they don't know how. And this is a direct impact because of the moratorium. Some of these young men say they don't know how to skin a polar bear or how to hunt in rough ice. So, I believe it's a direct impact from the moratorium that was put in about 20 years, 25 years back now. (GH2, 16 June 2020)

Hunting practices are shaped by individual knowledge of polar bear behaviour and ecology, as well as hunting areas, weather, and travel conditions. Experience and practice require the ability to access polar bear hunting. Hunting practices have shifted over time with changes in technology, environmental conditions, and harvest regulations. Understanding these changes can also provide insight into the impacts that management decisions can have on access to harvesting and land-use practices.

4.4. Changes in abundance

All interviewees reported an increase in numbers of bears compared to the distant past (1960s and 1970s) that has continued over the recent (last 10) years, evidenced by the shorter time it takes to encounter them.

Back in those days, there was way less bears. The sightings were very few. Very hard to find, very difficult to find, you were really lucky if a group of us went out and one person caught a bear. That was really, really special to have somebody find a bear back in the 1960s, 1970s. They're really hard to find, bears, back then. But having said that, today I see bears everywhere now. So, to me the population is really healthy, and it's really boomed big time...today just about anybody that goes out on the sea ice to the mainland they'll either see tracks or see signs. (CB3, 12 May 2020)

Interviewees can tell population sizes by distinguishing individual tracks during mating season.

When you travel to a place every year, the last 10 years, you see the amount of bears that you see while you're out there and continue to see it every year and more cubs being born and you see them while they're young. It's been a few years, you see them grown up now, with their pair or not with the mother anymore. So, I mean there's lots of tracks [that you see], more bears that are around, and can tell they're not the same bears...'cause of the size of the tracks and direction they're heading. (CB1, 11 May 2020)

It was easy to tell by a number of polar bears during mating season, there are polar bears tracks and the females building dens. The hunters come across those kind of signs of polar bears and in their feeding grounds. When there's enough meals for the polar bears, it's easy to track down the polar bear tracks. So that's one way that the polar bears or hunters are able to tell how much is in that area. By finding polar bear tracks. (Interpreter translating for unidentifiable Gjoa Haven elder, 3 June 2020)

Some interviewees suggested that the increasing population trend corresponds to prey abundance.

The harvest that they need to survive, the seals are just incredible, the numbers of bearded seals. The bigger bears prey only on bearded seals. (CB3, 12 May 2020)

There's more. Some years they are not always in the same spot. It's the ice conditions, what they really [opt to] where the seals are, where the seal breathing holes are and all that. Like the way the ice forms, it helps the seals have more breathing hole. So that's where the polar bears are going to be is where the seal breathing holes are. (CB2, 16 May 2020)

However, interviewees largely attributed the increasing population to harvest limitations.

Tagging, like they stop us from killing because, well now we have to have a tag in order to harvest the bear now. It's a rule that came from the government. It's not our rule. We live off of these animals and I think it helps us in our iron and in our health. We need to eat these because that's what we've been eating for thousands of years. (CB2, 16 May 2020)

Since the west side [M'Clintock Channel] was closed [2001 moratorium] they're starting to see more bears, summertime when they camp close by. They're starting to spot more bears on the west side, like summertime. Whereas years ago, they didn't really spot any too much bears at that time. (T5, 21 May 2020)

Changes were linked to harvest regulations protecting cubs.

They're so protected, you're unable to hunt the cubs or anything like that. And you're only to harvest so many a year. And that is the reason why he knows for a fact that there's many, many bears today. (Interpreter translating for T3, 21 May 2020)

Before the white people came around, before the tagging system, they were able to harvest whatever they want. Anything that you see, even the cubs because they're very good eating, like a delicacy. As now, starting sometime in the '70s, you get the tagging system and you're not allowed to hunt any of the cubs. And he knows for a fact that is how they know that there's a lot of polar bears now. (Interpreter translating for T1, 21 May 2020)

Interviewees reported encountering more young bears or mothers with cubs.

From many years ago, they would be able to go hunting for polar bears quite far away north of here, seems like the only way to get a bear is the further from town you go, the better chance you get. But now you're pretty much almost like guaranteed to get a polar bear once you go out and today when you go out polar bear hunting, you see a lot of mothers with cubs. And we know for a fact that the female bears are a lot more abundant than male bears. (Interpreter translating for T2, 21 May 2020)

Increasing numbers of cubs with mothers are also an indicator that the population is increasing.

You see more than one cub out there with a mother and sometimes the mother has one cub, sometimes the mother has two and [various]. (CB1, 11 May 2020)

So, there was more sows with cubs...They come across three, I mean one female sow with three cubs. That's a good indication that the polar bear population is increasing. That's a good sign. (CB4, 20 May 2020)

Even with male-biased harvesting, abundant males are also being encountered.

There's a lot of males around the M'Clintock. I noticed a lot of males around there and when we all harvested our bears, one season, we even still ran into a couple more males. Which are bigger than the ones we just shot. The three of us and we were like "oh, we could have waited and got a bigger one." (CB2, 16 May 2020)

Increasing harvest success is also an indicator of population increase.

The last 10 to 15 years in the M'Clintock Channel, between one to four days at the most to harvest two to three bears. And that's something in the early days that's just impossible to find them in that kind of numbers and that kind of health. (CB3, 12 May 2020)

There's been more of them now. What I think is their population is way up for polar bears, way more than when I was younger with my father, stepfather that when we went out guiding it was hard to find bears. But now you get even just do day trips now and get polar bears from Cambridge Bay. Such as before, we didn't do day trips to do it right? We had to be out at least a week or two. (CB2, 16 May 2020)

The abundance in polar bears today enables harvest selection because of the range in characteristics of bears encountered.

Now for the past 10 years, every time I go out, I bring home something. So, this time [assumption] that certainly numbers are increasing, the bears are huge. I only select the biggest males. And I would pass up the smaller males like the [rest we pass up] and then we got the big males. Now in the early days you couldn't do that. You couldn't find any bears, let alone the big...male, and today, so many of them that every time I go out after the bear on the ocean or anything but it's a fact that I see a lot of bears, see a lot of signs and I'll target the bear that I want, and I have. (CB3, 15 May 2020)

Harvest limitations and male-biased harvesting have supported polar bear population growth based on observations of indicators reported by hunters. The larger number of bears has made it easier to encounter bears and harvest them when hunters receive a tag.

4.5. Changes in distribution and behaviour

Interviewees reported polar bear distributions shift with feeding areas.

They know from the elders, from traditional knowledge it's a cycle. And they wait until the numbers start going down. The animals aren't dying off, they're moving, they deplete the feeding areas of where they are. And they have to go to new feeding areas to survive. It's just the fact of life. (CB3, 12 May 2020)

In the past, bears were rarely encountered near settlements. Today, bears often approach camps and communities, which is indicative of their abundance.

There was bears many years ago. They don't always see or hunt bears. But once in a great while bears will come into the camp or their outpost camp, and that's when they would harvest one, or they're on a route going from one location to another and they would get into a polar bear walking by or something and they would harvest it. Vice

versa for today, it's like you're most likely guaranteed to see a bear, or a polar bear get into a camp, outpost camp, or within the community. (Interpreter translating for T1, 21 May 2020)

Interviewees voiced concerns about bear aggression and being unable to cache their food.

Today there are too many bears. Especially in the summertime camping out, boating, when you're camping or at your outpost camp [you are] guaranteed for a bear to come into your camp. Because they are too plentiful and we Inuit like to do our hunting and we cache our meat, we bury it. We ferment it. And you're guaranteed if you try and pick it up in the fall time in the winter, it's gone. You're guaranteed you'll lose that fermented or buried seal that they're trying to save for the winter. It will never be there. The bears will get to it regardless. No matter where we cache our meat. (Interpreter translating for T3, 21 May 2020)

Seems like they're more aggressive towards humans. Many years ago, they, as if like see people they would run away right away. Today it seems like it's not that way anymore. (Interpreter translating for T3, 21 May 2020)

Since the M'Clintock Channel was closed and after that a lot more bears. So, they're more dangerous in the summertime when people are camping, because they could just if they're hungry they will attack people. That part is there seem to be a lot more bears today since the policy was in place. But before that, the bears were never around to disturb families or cabins or anything like that. But today, since there's a lot more bears and stuff like that, I guess that they are more dangerous, more aggressive. They could go into community or camp or community or break up camping gear like cabins and stuff like that. (Interpreter translating for T2, 21 May 2020)

Combined with harvest limitations, the increase in human-bear encounters is a safety concern.

He has a big concern in this area because starting in the 1980s with the tagging system, if you're out camping at your outpost camp, don't matter what time of the year, you don't have a tag and you're trying to follow the rules of the HTO as well as the government. And if a bear were to get into the camp or the outpost camp and you don't have a tag and you have children with you and you're out on your outing, enjoying your time out on a land camping, it's you know, what are you really to do? You don't have a tag and you're told not to hunt. That is a very big concern for him today. (Interpreter translating for T1, 21 May 2020)

Before there was a polar bear regulation, policy and procedure, they could catch the polar bear any time, even though it had cubs. Today there's so many polar bears and nobody like we cannot catch them unless, you know, they're [totally] attacking. Trying to camp in the summer, spring and summer with your family and polar bear policy in place. He's afraid for his family, especially children, because the polar bear can attack any time, he's got no law or anything. The polar bear can attack the children anytime

he wants, the family anytime he wants. But us, we've got a law that you know from that he's afraid the polar bears keep coming into the camps nowadays. Destroying cabins nowadays. There's so many that he knows that they will come into camps and all we have to do is try to scare them away. But if they're determined to come in, they will come in. (Interpreter translating for T1, 21 May 2020)

Interviewees indicated that increasing bear encounters are also due to sea ice changes and bears searching for food.

As everybody knows, the climate change [get] longer, longer fall seasons, faster melts in the spring. So that's a weather factor on its own...Polar bears, they move a lot from one zone to another. So they don't particularly stay unless they go back to where they came from....That could be another factor would be the polar bear being a predator, like you know, they're looking for food, all the time. (CB4, 20 May 2020)

Interviewees indicated that human-bear encounters became more frequent after the moratorium on hunting in 2001.

Before the polar bear tag ban, it was rare that the polar bears come into town. There was hardly any coming into town. But animals do know, and after the ban was put in place, the polar bear started coming in every year. So, while all this in place they will still continue to come in every year. So, it's been happening for years now after the ban...Polar bears are still reproducing. So there's more polar bears coming into the community, and as long as this ban is in place it's still going to be a problem, always a threat to the community members. Any animals that reproduce, once they get to know that something is safe area, they will go to that area and if it's not a threat to them. And polar bear is one of them. (Interpreter translating for GH3, 3 June 2020)

Elders indicated that polar bears are no longer afraid of humans; polar bears are aware that hunting is no longer a threat to them.

Many years ago, even before he was born and after he was born...the polar bears approaching to the camp would start running away and the hunters would try everywhere to try and catch the polar bears whether regardless if they are running away, hunters would try and catch the polar bears. But presently, the quota and the ban of the polar bears see it that the polar bears knows that they won't be threatened or hurt when they come into the community, and even local people are starting to just watch them while they're in the community. The community members know that they're not supposed to kill the polar bear, regardless if it's in the community, and it seems that that's the difference. Like the polar bears nowadays knows that they're not going to be killed so they just even walk by without running away. Seems that that's a big difference from many years ago and from today's bear. (Interpreter translating for GH5, 3 June 2020)

Elders indicated handling or interacting with polar bears without hunting them also contributes to increased aggression toward humans.

The polar bears were not being killed by biologist or the person helping them. So, in that sense it changed that the polar bears are knowing that they're not being slaughtered so they are coming around more often and knowing that there is no danger to them. Once any animal knows that there's no danger to them, they tend to start coming around closer or start coming right into the community. (Interpreter translating for GH4, 3 June 2020)

Collecting information from the biologist by going into the polar bear country or area and the polar bears are not being slaughtered...it seems that the polar bears know that there's no trick to them. They tend to seem to be braver, not scared. Over there, over the years, anything that's happening like that, like just collecting information and not hurting them, they tend to seem to be getting tame. Able to come in close to the community or right into the community knowing that nobody is going to be threatening them or hurting them. He may be right, he may be wrong, but it seems that that's the way it's happening. Over the years, not killing them, they seem to be coming in more because they're not afraid, like nobody is hurting them so that they tend to come in more every year. (Interpreter translating for GH4, 3 June 2020)

Elders indicated that polar bears are aware of and responding behaviourally to how human relationships to them are changing. In the past, being able to harvest any bear, especially aggressive ones, ensured a balance where humans were able to safely coexist with bears. Today, bears are less shy because of harvest limitations and non-hunting interactions.

4.6. Polar bear health

Polar bears were considered generally healthy (in good body condition), except for individuals that had previously been handled in scientific (mark-recapture) surveys, which were considered unhealthy to eat.

Those are the ones that being tranquilized before, and they notice the taste, the difference in it, and they don't really, they wouldn't, they have a second thought of eating the bear, cooking it and eating it. And the colour of the bear doesn't look as good as another bear that never been tranquilized or doesn't have a lip tattoo. On any given day, they'd rather have a hunt a bear without a lip tattoo or anything. (Interpreter translating for T2, 21 May 2020)

Most of the ones that were caught were nice and fat and they seem healthy. But the ones that have tattoo and that, they tend to be skinnier. It's usually the older bears that have the tattoo and that, so could be because of age or that. But our elders that passed down were reluctant to have what was studied by scientists. They have tattoos and ear tags and that. And what, if they don't have tags or ear tags, or tattoos or ear tags; they

a lot happier and know that they're healthier and they're less reluctant to consume it. (T5, 21 May 2020)

When encountered, poor body condition and scarring was associated with male combat and considered normal.

Healthy bear is, I mean, you can see that they're fat and they're eating lots. The only time I seen a bear that was unhealthy was when I harvested a bear that got into a fight with a bigger bear, and he was wounded. Lost of all of his, scarred and he was almost ready to die. But it was really a big bear. Just from another bear that's bigger than him to injure him pretty bad. (CB1, 11 May 2020)

Skinny bears were also associated with poor hunting ability.

He did come across couple of times, many years ago, an unhealthy polar bear. Two polar bears, different times. Very, very skinny. Either because it's either having a hard time finding a meal to eat or if it's a sick polar bear, is very hard to tell because he's not able to determine which one's sick or starving. So, they did come across two polar bears that were very skinny...been sick or starving it was hard to tell. (Interpreter translating for GH6, 3 June 2020)

However, some interviewees reported meat quality has declined in comparison to the past, in part due to changes in diet.

He knows the meat is really different today. He think it's mostly from the like, the fast food or [all the] food [that] we're eating from the dumps and stuff like that. The quality of the meat is more different from a long time ago. And he knows like some meat are still good, a lot of polar bears are still good. But he notice some of them, they're not as good as they used to be. (Interpreter translating for T1, 21 May 2020)

Polar bears are shifting their diets to include food from the dumps, which may be contributing to lower meat quality for consumption. Interviewees were generally not concerned about health but noted on rare occasions where unhealthy bears were sighted, poor health is associated with having been handled in bear research, combat, and reduced access to prey.

4.7. Disturbances to polar bears

Interviewees described changes in sea ice conditions. Ice conditions vary every year, but interviewees reported a general reduction in sea ice season.

Ice conditions are different every year. Every year I've gone hunting, it's never the same. And the conditions of the ice will determine if the bears will be in the area or not.

I mean, bears are known to be around areas where they can get seals like a pressure ridge or by open water...where there's open water. I mean, seals will be in that areas and bears will be in that area. (CB1, 11 May 2020)

Major impact that I've witnessed in my lifetime is the ice is shrinking. You know, taking longer to freeze, thawing out earlier...The water temperature, oh my god, that's been really make a difference. That water temperature, one degree you're going to see that difference. Even in my travel routes, I see the difference in the lack of ice in some areas. Oh yeah, the ice is receding quickly with the waters, the ocean temperature rising. (CB3, 12 May 2020)

They know this fact because hunters hunt seals and they look at the ice on how thick it is, they look in the seal hole. And today for the past, starting later, like in the '90s up to today, seems like the ice is a lot thinner and we have less multi-year ice. The ice melts earlier in the springtime and in the fall time. And it's like a late freeze up. And in the wintertime, if you look through the seal hole, the ice is a lot thinner than it used to be. (Interpreter translating for T2, 21 May 2020)

Interviewees reported these changes are unlikely to affect polar bears, which are able to adapt.

Us hunters don't have a concern about the bears of this ice condition changing. Bears are known to be great swimmers, divers. They're known to be good on ice. They're known to be on the land in the wintertime. They go denning up on the land. They're able. It's really not a big concern because they're adaptable, they adapt to the climate, whatever it may be, in the ocean, water, on land, on ice or snow. It's not much of a concern. They're very adaptable, unique creatures. (Interpreter translating for T2, 21 May 2020)

Polar bears easy [to adapt to] environment. Whether there's lots of sea ice and whatnot, or if you don't have much sea ice, of course they go on the land. They just adapt to their environment. It's like a weather pattern they're following. (Interpreter translating for T3, 21 May 2020)

Interviewees indicated polar bears can also shift their diet. Sea ice changes may also improve access to prey.

They have no ice to hunt when it melts earlier and [they salvage] the fall too. You know they eat something, but they get to be long stretch of eating, they find other things to feed on, like seals or that whales' carcasses that end up on the beach. They find any way to survive. They eat a lot of seaweeds and vegetation on the little vegetation on the land. Just to get something in their bellies. (CB3, 12 May 2020)

It helps them just having that open water there. And there are a bit more seals there. That's where the bears usually are, is where the open water is. We'll find more of them

around open water. Because it's a lot easier for the seals to make breathing holes or to [breathe even] there. Yeah, that's their buffet. (CB2, 16 May 2020)

When asked about disturbances, interviewees reported bears are particularly sensitive to noises (e.g., snowmobiles and airplanes). In the past, they were more easily spooked.

My grandfather, he knows these animals and he said the most sensitive part of them is their hearing. They can hear. I mean they can hear anything that doesn't sound pleasant like a helicopter or plane. (CB3, 12 May 2020)

Due to machinery with the snowmobiles, jets flying over, planes and all this because polar bears have a very keen ear. They can hear from many miles, they hear machinery, and they get spooked and it's as if harder to find (them) in a way, because of the machinery, the sound and smell. (Interpreter translating for T4, 21 May 2020)

Today we have many planes flying over, jets, prospecting helicopters, planes flying over and hunters using snowmobiles with that sound of machinery. He thinks that they're a lot used to hearing that. Once, many years ago, once they hear something, they would run away right away. (Interpreter translating for T3, 21 May 2020)

Interviewees cautioned these sensitivities may affect the ability of helicopter surveys to detect polar bears, especially those that have been exposed to them.

You're not going to see them all. I mean, you can hear the chopper from 20 miles on a good day that's not windy. They're just loud, you can hear them for many, many miles and the bears have very sensitive ears and [maybe] when they hear every little sound...they know what's going on, they've experienced. Some of the older bears that were around and being handled by humans, by helicopter activity...hear the chopper they're going to vacate the area. A lot of them know that helicopter is danger to them. (CB3, 12 May 2020)

Polar bears are able to adapt to changing environmental conditions. Although polar bears may show sensitivities to disturbances, threats are more likely to impact their distribution and behaviour than population abundance.

4.8. Management considerations and comparisons with science

Community members shared unique knowledge of polar bear ecology and described ongoing management practices in their communities that have focused on male-biased and tag-based harvesting. Community members also described their traditional hunting practices and indicators of changes in population abundance, behaviour, and relationships to humans. Communities reported increasing numbers of and encounters with polar bears, which is a concern for human safety. This increasing trend was attributed to reduced harvesting and improved access to prey, which is in agreement with recent scientific data (Dyck et al.,

2020). Communities also reported bears were generally healthy, which is also in alignment with reported increases in body condition (Dyck et al., 2020). In these contexts, we describe some considerations for research and management below.

Elders cautioned that polar bears should be respected; they respond to and are aware of humans. This consideration shapes how community members conceptualize, relate to, and speak about polar bears.

Even if we speak of polar bears, we have to speak respectful of them, even though they cannot hear us, we're not with any polar bears anywhere. It's as if they know what we are saying, what we're talking about. We cannot say hopefully a polar bear can come so we can hunt a bear, they know their well-being, they're as if they know true spirit that what we are saying. (Interpreter translating for T4, 21 May 2020)

From the elders' perspective, the inclusion of their concerns in polar bear management has been inadequate.

With polar bear information gathering like this one going on right now, before the meetings to be held in September, it doesn't really make sense to him. It doesn't really make sense to him if the government try and come up with another excuse to keep the ban in place after hearing all these concerns from the Elders and all the information put together for the meeting that's going to be held in September. So, there's always problems and excuses or something coming up every time he try and come up with solutions. (Interpreter translating for GH5, 3 June 2020)

Although they are not always supported by community members, management practices are always followed. Harvest regulations using tags were imposed on Inuit and not considered part of their traditional way of life. This needs to be acknowledged.

For this tagging system, before it was introduced, a hunter was able to hunt a polar bear and whether if it have one, two or three cubs and he can harvest all those, how many bears the cubs have. And it was a way of life. This who we are, we hunted. And introduce with the tagging system was really not their way of life. It was forced on us. And it's still forced on us, even up to today. We're allowed only one polar bear per person, and it's per household. And this area needs to be revisited and be fixed to a way where we can do what we used to be able to do, before the tagging system was introduced. (Interpreter translating for T2, 21 May 2020)

In the past, helicopter-based methods or surveys that involved tranquilization were also not supported by Inuit. These methods are still criticized today for having affected polar bear meat and behaviour.

After we got biologist, polar bear biologist coming up north, and the bears that have been tranquilized or that has been tranquilized before, they don't taste as good. The meat looks a little different. It's noticeable when they talk within other hunters and elders. They can taste the difference between the bear. And it's not as fat and as tasty as a bear that has never been tranquilized. That's a known fact. (Interpreter translating for T2, 21 May 2020)

The biggest concern for Inuit is people doing studies; scientists and that. We don't like them when they're being disturbed in that area. Other than that, choppers flying around for expedition or survey or whatever. But I think that those are the ones that mostly [disturb] within our area. (T5, 21 May 2020)

These past events have contributed to the ongoing lack of trust by community members in management and research. Community members are concerned that polar bears are being overprotected. A precautionary approach to management conflicts with harvesters' needs and their relationships to animals.

My concern is that they're being too overprotected right now when the population is really healthy. And I would like to see less activity on the range of the bears 'cause like there's, you know, when I mentioned that their senses are really keen, their hearing. Anytime you send a helicopter, that's the worst thing you could do, send a helicopter up there into polar bear country. (CB3, 12 May 2020)

The rules set by the government, the regulations, quotas put in place, it's a very awkward way of living. Because many years ago there was no quotas, no boundaries, no nothing like that, and they were able to hunt polar bears whenever the hunter needs to catch a polar bear. They did not have any regulations or rules to go by... If he wants to hunt an animal there is no way that he can be allowed to hunt animals because down south they have all these rules and regulations. (Interpreter translating for GH5, 3 June 2020)

An increase in polar bear abundance is a serious safety concern for community members.

We did a bowhead whale hunt in 2013 to the same area I was in as a child. We just about got attacked from a polar bear that just about ran into, walked into the tent. And daily polar bears would come into camp on a daily basis. And this I never ever saw as a child because back in the '70s. I used to see hunters just come into town, would find polar bears on their sleds, and this was before the tag system. But then again, the Inuit did that out of fear of the polar bear, way back in the day. To keep the population down and which is not happening anymore today. So, the population is booming now. (GH2, 17 June 2020)

More tags are needed to accommodate the increase in bear numbers and encounters. More tags can also improve access to polar bear hunting opportunities.

We can only harvest some of the polar bears, from my understanding, and it's not enough...My whole family's been hunting polar bears since, all their time, so when they grew up in this town there was no tags, so they were able to harvest polar bear when we want them 'cause they're delicacies to the community. Polar bear was harvested, and the food was used. The meat and the hides were used for clothing or whatever for family to sell the hide and make some income so that they can buy things in the community. 'Cause it brought income. So, if they can increase the amount of tags they get, or would be great for any locals to have an opportunity to harvest polar bears. Not very many are able to harvest due to the amount of tags that are available, there's not so many people that can harvest. (CB1, 11 May 2020)

My biggest concern is people trying to scare them off and try to sleep at night. You know, if the bear is hungry it's going to come back. There should be more tags. I know it that defence kill it's no issue towards that but there seem to be a lot more bears on the west side [M'Clintock Channel] today. So, when we go out camping when we see bears more often in the areas where we go out camping summertime. (T5, 21 May 2020)

He knows for a fact that there is a lot of bears getting into camps lately, no matter where you are. Even in Gjoa Haven and Kugaaruk they get into the community, or into people's camps. And, you know, like, what are you to do? And they're so protected by the government and you don't have a tag, well you're not able to shoot it. And, you know, what are you to do? It's almost senseless not to protect your campsite, yourself, and whatever it may be. Vice versa when he was a child, where in his parents' time, with the dog team, they haven't really seen much bears getting into their camps or their outpost camp. There is too many bears today. (Interpreter translating for T1, 21 May 2020)

Even without harvest limitations, community members have traditionally adjusted their harvest practices to prevent overharvesting, for example, shifting to a focus on other more abundant animals when polar bears are scarce.

The problem is a major concern to any communities help with each species of animals that they survive on, they rely on over the years and definitely a large part of it is how they manage them. You know, our people always had a way of managing what they harvested. And you know, gatherers, we gathered different types of meat with us [and from when] a certain time ago we harvest [basically] other times like spring and summer and the winter, the seasons, the four seasons, you know, there's times when you can't harvest fish, there's times when you can't harvest seals and so those times we always had something to fall back on, like fermented food is a lot of what I grew up on, stashing food, all our gathering and stashing and make sure that it's healthy enough to feed on. (CB3, 12 May 2020)

Harvest management should also accommodate differences in weather and population patterns year-to-year.

Every year is always different. We have some really good years where it's abundance of polar bears. And when it's a good year we should follow that and harvest more, be able to harvest more polar bears. For a lot of us have wife, we have children, we have daughters that would love to harvest their first polar bear. And this was shared for many, many generations. And it's our way, Inuit way of life, to try and get our family members and encourage them to harvest their first bear. And we're unable to do this because there is just never enough polar bear tags. (Interpreter translating for T2, 21 May 2020)

Some interviewees suggested removing a time limit to using tags, because of the resources and effort that are put into harvesting.

It's not an easy hunt and you do spend a lot of money to get fuel and food and all the supplies you need to go out there in minus 50. So, for them to give you 10 days it's something that could be adjust and give the hunter a lot more time or whoever's name drawn, you can have the tag 'cause as long as they have it, they harvest it and I mean that would be great. (CB1, 11 May 2020)

Just hopefully hoping that they're able to increase the amount of days that the hunter can receive them and there's...nowhere else or endangerment to polar bears and they're all throughout the [10] years I've been hunting, they've been in increasing. (CB1, 11 May 2020)

This adjustment can also accommodate hunters who are employed.

Everybody signs up, there's just, you know, it's just the everybody signs up. But it's always the same people getting bears almost all the time. Because there's most of them got jobs and the time that their time is on, it just doesn't match up with the time of their time off of work, so they don't have a choice of taking a tag or giving it up so they've got to give it up if they're not getting time off of work. So, there's a lot of working people out there that they'd like to shoot a polar bear, but it's their job is important, too, for them right. They just don't get time off at the right time...The way I've seen it here in Cambridge Bay is always most of the same people getting the bear because they're determined, and these guys are, most of them. There's not too many bear hunters here in Cambridge Bay. (CB2, 16 May 2020)

More time for hunting can also permit younger hunters to learn how to hunt.

I've met nobody there who know what to look for and a lot of them come back with nothing. They get screwed 'cause they come back, and they don't know what they're looking for or where to look. So, I guess it's somebody like myself that's done it all the time know where to look. I've never come home without a bear in the last 10, 15 years. Because I know the areas where they hang out, where they look for the bearded seals, where the very high density of bearded seals. I hunting [there and looking for] and I find them all the time [as opposed to] a young fellow that's never been out there and doesn't know where to look. I try and share information with my younger generation

[like] going out to look for the signs. If you see a sign about the polar bear that you want one, don't give up on it, just stay on it 'cause they spend hours and hours sitting on their seal hole, waiting. (CB3, 12 May 2020)

It's quite the change. I think a lot of more young people are now [they like it more] to sign up. So, we have a lot more experienced young hunters that are coming through the guardian programs that the HTO done over the years. So [definitely a lot of] young hunters. They signed up and I tell you it's a long wait if you are on the bottom of the list. (CB4, 20 May 2020)

However, community members still recognize the importance of having some regulations in place to prevent overharvesting.

He's all right with the [tagging] the system on how it's being [dealt] today. Because you know, if we don't have those in place then they can be overharvest and then we can only hunt so many bears per year. The way this management system is, supports it...having this tagging system as well as policies, procedures, laws in place. They are there for a reason. Management, no matter what it may be, in life, we have to abide by the rules. Because if there weren't...you know, things can deteriorate right away if they [weren't] in place so he's happy that there is a loss and whatnot that we have to follow by. (Interpreter translating for T3, 21 May 2020)

Today we have stories. We have many animals that we can hunt. There are seasons, whether it be polar bear, caribou, whatever it may be. Times has changed and we have to go with these changing times and adapt to it and create policies, procedures or laws that help us in either way. (Interpreter translating for T3, 21 May 2020)

Some interviewees were not supportive of boundaries around polar bear populations. Polar bears are known to move between M'Clintock Channel and Gulf of Boothia.

He don't like the [tagging] system. He don't like the fact that there's boundaries. Like, for an example, we can only harvest so many in some certain area and we can only hunt in these certain boundaries with this tagging system. For us real experienced polar bear hunters it would be nice if we, you know, get a tag, and then, hunt where we want to hunt the bear and expand the territory or the boundary, you know. And you're told, okay this bear tag is only for Gulf of Boothia and that's the only area where you can hunt. We don't like that fact that, okay, to be told you can hunt this tag only this boundary. Because we know no matter the west [M'Clintock Channel] or the east side of Boothia Peninsula there is many bears. We should be able to hunt where we want. (Interpreter translating for T2, 21 May 2020)

The way I see that the biologists and the scientists seem to be doing everything wrong, according to our knowledge. And the west side [M'Clintock Channel] was closed after they thought it was declined, well it declined in that area. But the bears usually shift to areas where there's more plentiful of what they're prey, seal. So, we figured they went towards the east side of Boothia Peninsula. So, they were in Gulf of Boothia. And we

tried to explain that to the biologists, but [to no avail]. Of course, we don't go by paper and that, so Inuit doesn't go, they don't go through that. And they didn't have the on hand, the scripture or the writing. So, they didn't believe us for a while but then after that, they found out that our words were true, and they migrate here and to the east, to the west of Boothia Peninsula all the time. (T5, 21 May 2020)

The government boundaries and quotas, while the polar bears and animals don't have any boundaries. For example, on the map you set up a boundary or a line, and the hunters not supposed to pass that line. Well, the polar bear has no lines to cross. The polar bears are moving down south one place to another. They can either be inside the boundary and while the hunter is going after polar bears out of the boundaries, suddenly the hunter cannot catch that polar bear because of the boundary made by the government. That's something that's not very good with today's rules and regulations, is that the government sets boundaries and quotas while the polar bears and animals have no boundaries. And the number of them increases like it doesn't make sense. (Interpreter translating for unidentifiable Gjoa Haven elder, 3 June 2020)

Population mixing with Gulf of Boothia has also been scientifically suggested (Paetkau et al., 1999; Thiemann et al., 2008; Dyck et al., 2020). Gjoa Haven elders were particularly concerned for the safety of younger hunters travelling to Gulf of Boothia (due to few tags for M'Clintock Channel), which is not part of Gjoa Haven's traditional polar bear hunting area.

It's been years now that we've been concerned about the younger generations polar bear hunting over at Gulf of Boothia. And as part of the concern, even during the HTO meeting in the past, he raised the concern in Cambridge Bay during one of the wildlife or HTO meetings, that it is not safe for the younger generation to be heading to a totally different area, Gulf of Boothia, not knowing what to expect. As of today, he's still worried about that happening for the younger generation to be heading out that way for the polar bear hunts. (Interpreter translating for unidentifiable Gjoa Haven elder, 3 June 2020)

Gjoa Haven hunters need to travel further to Gulf of Boothia, which requires more time, safety risks, and resources.

The community is [really interested] in catching polar bears. But due to the fact that they have to go behind to Gulf of Boothia, a lot of people have hard time getting that far due to expense of gas, grub, and breaking down machines and whatnot. They have more comfortable going up to M'Clintock Channel because it's closer and they know the area. Whereas they don't know the area around Gulf of Boothia, they had different ice condition due to currents and there are some areas where it's thin, people [do] all that from here because that's not their hunting ground. (GH1, 3 June 2020)

Community members also criticized scientific methods for being inaccurate and unable to fully capture population abundance and seasonal or between-population bear movements.

Part of his concern is that the biologist doing data information on polar bears, they are never accurate, the area never right because the polar bears are moving from one place to another. And the other thing too that the polar bears are white, white like the ice and snow, so that can be sometimes that the biologist or the polar bear counters miss a polar bear. So, the number of polar bears being counted, he know that they will never be right because they either miss or moving from one place to another. So, it's been many years the area has polar bears from many years ago, and even as of today. (Interpreter translating for unidentifiable Gjoa Haven elder, 3 June 2020)

Inuit believe that the Boothia Channel or Boothia population and the M'Clintock polar bear populations are the same and we figured that they just moved, they just moved for more opportunity for seal and stuff. Or there's just too many big males. The smaller males tend to move away, they get bullied. There's a lot of speculation on actually why our population went down [as reported in 2001]. Another one was, we believe that researchers doing the surveys with helicopters from bad weather, we believe, and this is from experience, from watching [biologist] and them. They would do their surveys in May. And the whole month of May it's usually so white out that the helicopter is 75 percent of the time just grounded. And just weather-hampered surveys they get. And they don't take that into account. They don't do a 100 percent survey because of weather. And because I've seen this where helicopters just sit. A helicopter would sit at camp for a week and take a half a day run and then count 4 bears. And then that's what they got for the two weeks. So, I think if they change the season of when they're doing their surveys might help. (GH2, 16 June 2020)

These limitations are acknowledged in scientific reports (Dyck et al., 2020). Communities understand that there is a lack of capacity for frequent scientific surveys to collect data on and monitor polar bear population changes.

I understand that the GN doesn't have the capacity to work in all three regions, because you only have one polar bear biologist. Isn't that a factor as well?...Even the regional wildlife boards had each hire their own biologist and that would be something of a system, and expedite a lot of, you know projects on the go and whatnot. That's my thinking anyways. If only I had a million dollars. (CB4, 20 May 2020)

One interviewee recommended conducting surveys later in the year when bears are easier to spot and count.

I think June would be good because that's when most of the fogs lifted and it's not so white out, maybe end of June. They'd be much easier to spot on land and ocean, 'cause there's less snow out. And a helicopter can land on the ice north of the island easy right till end of July maybe. (GH2, 16 June 2020)

Traditional knowledge can be a source of invaluable and otherwise unavailable information, especially when frequent monitoring and data are needed (Dyck et al., 2020).

Here's always Elders' groups, meetings, and they're always talking about things from the past and that's one of the topics that's always brought up is, the prey species that we depend on and polar bears are really one of the major topics. And those are really nice to listen to. You know, you get a chance to go and listen to some Elders when they're gathering. Priceless information. I mean you don't get that anywhere. You know they understand, understand what the animals are doing. (CB3, 12 May 2020)

Oral history and I'd like to see training, more training of oral history or with IQ included. Not just, not really training but for young hunters to take that knowledge from more experienced hunters. What to expect and you know, and don't oral history is maybe vital. [It's so important] to have to carry that traditional knowledge. (CB4, 20 May 2020)

In general, an appreciation for and understanding of Inuit traditional knowledge is needed by scientists, decision-makers, and the public-at-large.

If they were here, if a scientist was here and do studies for, say, five years, they would understand what's going on up here. But they don't. So that's what frustrates us because we understand what's going on in our area, in the north here. Matter of fact, if you tell a southerner we still live in igloos and we have running water. They'll believe that...they become biologist and they're still learning as we're learning every day, as we go on. But that's what changes the dialogue or harvest of polar bears or the way we live up here because of misunderstanding or not enough knowledge for the people that make the rules and regulations of, that we have to follow. (T5, 21 May 2020)

We try a lot of times to make recommendations, but we were seen as people that have no knowledge because we can't keep a record. And we don't have written paper or any records of what we did and know. But what the way we do the things, the Inuit, is bring knowledge and information from generation to generation. Through our word, through our experience, with like, we go out on the land and we experience all this. That's how we keep our record up here in our head. (T5, 21 May 2020)

A lifetime over which IQ of polar bears evolves is much longer and broader than the shorter time scales of scientific studies. However, like science, IQ is continuously updated and revised as new information (experience) becomes available and comparisons with existing information are made. The knowledge of historical and cyclical changes that has been passed down from generation to generation occurs over longer time periods than most scientific studies and can guide interpretations of scientific models (e.g., extrapolating across time). Scientific models may also fail to take into account impacts to human safety and livelihood. Inuit knowledge of other ecological factors impacting polar bears (e.g., loud noises and human interactions) can also highlight variables and parameters for consideration in scientific sampling and analyses.

5. Summary

IQ offers unique insight into changes in polar bear population, behaviour, and relationships to humans. Community members who harvest from M'Clintock Channel reported increasing numbers of bears based on their observations and experience on the land, which has led to increasingly dangerous human-bear encounters. The trends reported here are in agreement with scientific data (Dyck et al., 2020). Community members recommended increasing total allowable harvests to reflect population changes, which would also encourage balance in how bears relate to humans. Communities criticized management for not adequately considering their perspectives, nor Inuit traditional hunting practices and relationships to animals. Collaborative bear research and management could improve with a better understanding and appreciation of IQ by non-IQ practitioners, and more resources and capacity to include IQ in knowledge production and decision-making processes.

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Appendices

Appendix 1. Description of polar bear management

This year, Cambridge Bay community members received four tags for M'Clintock Channel, as well as three tags for the Viscount Melville Sound population (Hadley Bay). Interviewees indicated that it is more difficult to harvest polar bears at Hadley Bay and, as a result, M'Clintock Channel tags are often used up.

If you're going steady, about two days to get there. Because you got to carry a lot of gas, and you're so hard on your equipment if you're rushing. All that heavy gas and everything you just got to carry so much, for that run, that's too far. And it's a tough place to hunt. There's a lot of current there. A lot of these people don't know the currents over there. (CB2, 16 May)

Gjoa Haven community members traditionally harvested only from the M'Clintock Channel population. After a moratorium on hunting in 2001 and quota limitations were put in place, community members were given tags to harvest from the adjacent Gulf of Boothia population. This year, Gjoa Haven received four tags for the M'Clintock Channel.

When I go into the M.C. Channel, like M'Clintock Channel, a lot of the times I'd head up to the cabins at Cape Sydney. That's about 95 miles north of Gjoa Haven. And from there I'd either go out directly north towards Cape Alexander. Anywhere around the area there seems to be a lot of bears. And then when I go behind Taloyoak (Gulf of Boothia) I prefer it to go further up into the islands that are about 80, 90 miles north of Taloyoak. (GH2, 16 June)

Taloyoak community members received four tags for M'Clintock Channel, as well as 25 for Gulf of Boothia. Because of the limited number of tags, the community harvests fewer bears from M'Clintock Channel overall.

Now they're only allowed four tags each, at Cambridge [Bay] and Gjoa Haven. And we get four tags as well. So, we don't do very much hunting in that area anymore. (T5, 21 May)

One interviewee described differences between M'Clintock Channel and Gulf of Boothia polar bears, although they are known to travel across boundaries (see below).

The bears on M'Clintock Channel area seems to be more slender, less fat. And it's always been that way, they always heard of it. And it's still like that today. And for Gulf of Boothia, you have the open floe edge area behind Astronomical Islands. The ice would close up, freeze, and then through the cycle of the strong current following the moon, the ice would open up. And there's many seals. And wherever you have a floe edge or open water, there's known to be more seals and more bears in those areas.

And that is the difference and we've known it for a long, long time. (Interpreter translating for T2, 21 May)

Interviewees indicated that overharvesting results in a reduction in quotas in subsequent years.

We only get so much tags to, you know, harvest polar bears. That's what we try to go by; we try not to overharvest. When we overharvest, for defence kill or something, around the community, one tag is taken out from our quota. You know, if it's a female that's been caught in the community it might cost us two tags. So, we can't overharvest what is given to the community in terms of quotas. Today that's the only way we could hunt polar bears using quotas from the government. (GH1, 3 June)

To avoid overharvesting, HTOs distribute tags through a lottery and hunters are given a time limit to use the tag. If harvesting is not successful, the tag is returned and passed on to another hunter.

They give us 10 days to catch the bear and if it's not [used it] within the 10 days then they pass it on to the next person. (CB1, 11 May)

Usually, the HTO would give us about five days to pack up and get ready. But once you're actually hunting out there, there's really no time limit until you come back home with or without a bear. And then when you do get back, usually we pull another name from the draw. (GH2, 16 June)

There's usually more hunters than the tags that are open the first time. So, they draw all the names out like a lotto style. And then those first [hunters] who want to go out polar bear hunting. But they're allowed to keep their tags for three days or depending on the weather...as soon as they come back, they're asked to bring the tags back right away 'cause there's other hunters that want to go out, take a crack at catching a polar bear. (T5, 21 May)

Here in Taloyoak, he knows for a fact that it's been like policy or procedure for many years up to today. If you grab a tag at a local HTO office or Department of Environment, they have three days to hold on to the tag. It can be due to weather or waiting for some money to buy gasoline and grub...As long as they have a tag and they are out on the land, usually the hunter can stay out as long as they want. They could be out for a day, two days. They could be out for two weeks or even a month as long as you're out on the land with the tag. (Interpreter translating for T1, 21 May)

In addition to quotas, harvest regulations also protect females and cubs.

Can't shoot the younger bears that are with the mothers because they're still too young and so if there's a bear that by itself and no mother around then you know. You can harvest the bear cause it's shown that is the mature bear and that go out by himself, a bear that's worth harvesting. (CB1, 11 May)

They see bears right away, but if they have cubs, they (hunters) don't bother with them at all. 'Cause we're not allowed to catch polar bears with cubs. But if they are alone and if it's a male or a female full-grown, they'll catch. (T5, 21 May)

Hunters' selection for larger males for the sale of hides also further supports this bias in hunting.

Females out there and males, you'd see a bunch of young males growing up and you should try to stay away from the smaller ones and get the bigger ones because for some of the hides you could get a lot more income off of it. (CB1, 11 May)

The majority of hunters hunt big bears, the bigger, the better. More money (if you are going to) sell very high, as well as whether it's a male or female, as long as they don't have cubs. And it's mainly because the cubs are protected by the government. (Interpreter translating for T4, 21 May)

Appendix 2. Map of the M'Clintock Channel polar bear subpopulation

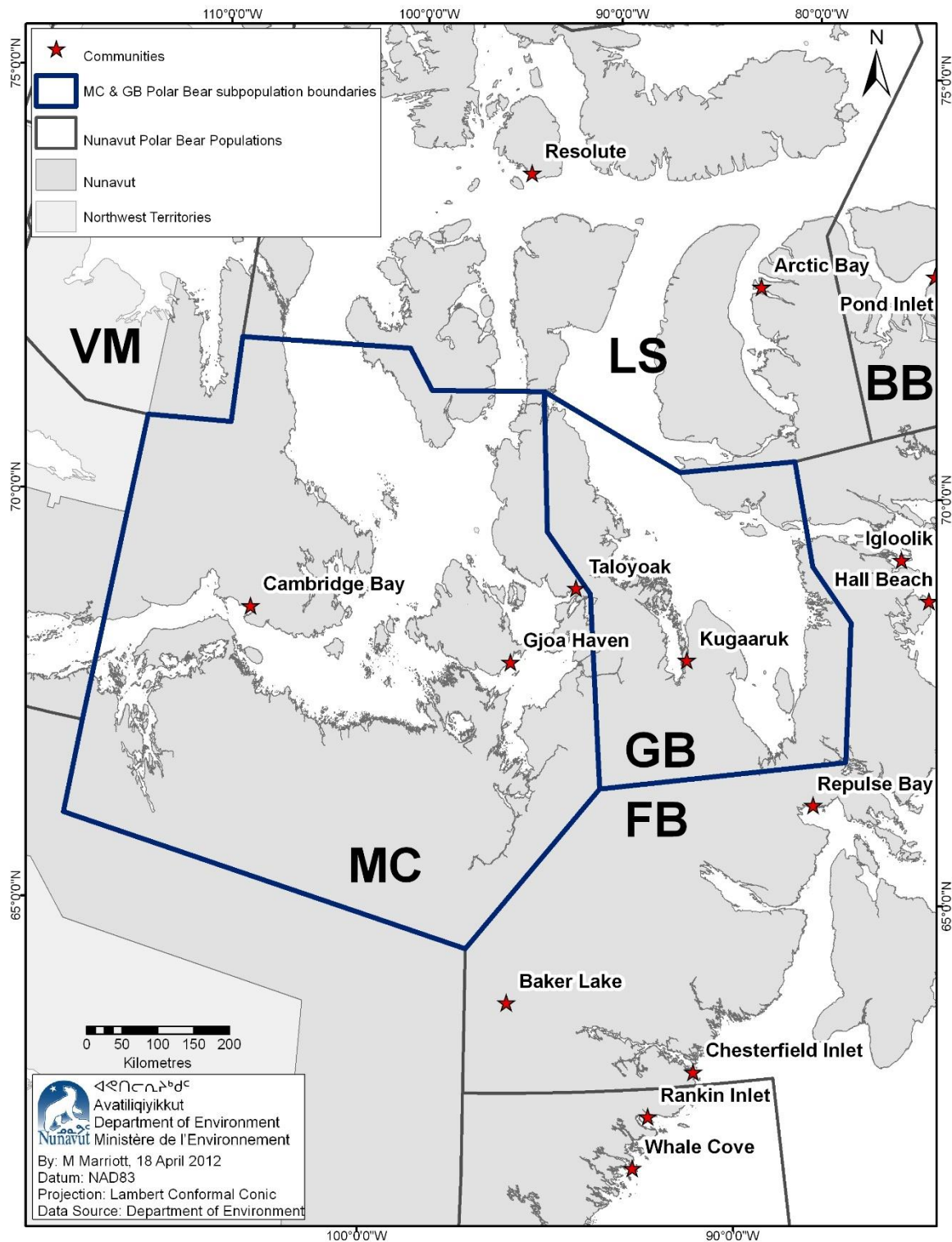


Fig. 1. M'Clintock Channel (MC) polar bear subpopulation in Nunavut, sharing a border with Gulf of Boothia (GB), Foxe Basin (FB), Viscount Melville Sound (VM), and Lancaster Sound (LS) subpopulations. The Baffin Bay (BB) subpopulation is also shown, as well as the communities in these areas.

Appendix 3. Additional quotations

IQ of polar bear ecology

Mostly bears seem more personality than other animals. We know, we know other animals have different personalities. But the polar bears seem to have more, almost like in tune with human. (Interpreter translating for T1, 21 May)

Because they know that they're being hunted by humans. Whatever the humans cannot go through, the rough ice that's where the bear likes to be, it's their environment. That's their livelihood. They're run away to those areas. If it were to be [smooth] ice and, you know, it seems like harder to see because they're out in a rough ice and trying to be away from being hunted. (Interpreter translating for T3, 21 May)

When it's really cold, say March I mean, January and February they usually be in their dens, even if it's a full-grown bear, even if it's a male bear. 'Cause it's cold and bad but they, from my experience and what's passed down to me from my dad and relatives, is when there's moonlight and the [rutting] season starts around March area, that's when they start, the big bears start roaming more. And it's a lot easier to catch bears that time. And they usually go close to the floe edge, where there's open water, where the ice is thin. But they don't go far from the land. (T5, 21 May)

Description of hunting

Many years ago, they were able to hunt whatever they see. They see a mother and a cub there, they harvest food. They see a big boar [male bear] then they harvest that. Whatever they may, whatever they see polar bears back and then, they will harvest it. Today is totally different. You're unable to hunt whatever you want. And you have to go through the tagging system. You got to hold on to a tag in order to harvest a polar bear nowadays. (Interpreter translating for T3, 21 May)

Some elders prefer to catch younger ones because they're more tender, smaller bears. Some people prefer—possibly more people prefer the large male bears. Of course, it's hard to find work up here and they do have some price in them, to sell them. (T5, 21 May)

Depending on the condition of the ice, it's too thin, our community is usually opening or postponing the tags to be open...Sometimes they finish them before the hunting season is over by the 31st [of May]. But sometimes they have some more tags that we never use. They always have some leftover. Depending on the year, I guess, if there's good bear hunting. Like every season is different. Every year is different. (T5, 21 May)

Most of the guys that go out polar bear hunting, depending on how much daylight there is at the time they go polar bear hunting, most of the guy that go out polar bear hunting go out in the morning and come back with a bear. And sometimes some guys go out for three to four days. (T5, 21 May)

Changes in abundance

From the '60s and '70s, from those early time, few bears, very few sightings to sightings every time I go out on the east side of the island [M'Clintock Channel], I'll either spot them or see first signs of them. So, compared to way back, 50 years ago, the population just boomed. It exploded in this region. I hear people say otherwise. (CB3, 12 May)

They used to use dog team, once in a while they see the bear out in the outpost camp or out on the sea and they'd get a polar bear every so often. But it seems like there is a lot more polar bears within the last years, like starting around '90s up to today, even though we have snowmobiles. Seems like they're easier to see. (Interpreter translating for T1, 21 May)

I believe this moratorium has made a population boom of polar bears and the Inuit are scared now because there's too many polar bears. 'Cause way back in history as a kid growing up, even in the Boothia peninsula I used to go out polar bear hunting and you wouldn't see polar bears at all. (GH2, 17 June)

When I first moved here in 1981, there was never any polar bears when you travel between here and Taloyoak, never see any polar bear tracks. You get the occasional polar bear that would wander into town. But it was very rare. But now today you go north of the (King William) island, the polar bear population is booming. (GH2, 17 June)

There's much more, much more polar bear tracks. Like for example, polar bears like to use pressure ridges and cracks in the sea ice where seals may keep their blowholes open or breathing holes open. But I noticed, because I went on two trips, the first trip I went on was in April, and I noticed a lot of polar bear activity. But we didn't get any polar bear on the first trip. So, the second trip I went down I knew exactly where to go because of what I seen on a trip before. But I noticed there's a lot of polar bear tracks out there now. And the bears are very healthy. (GH2, 17 June)

The population's grown. Just lots of polar bears out there and the government or I guess it's controlled. For our area anyways, we don't get very much tags now. When I go out hunting we usually see between 16 and 24 polar bears trying to tag along. (CB1, 11 May)

Population's growing. I mean, the bears that are coming around, there's some that go into the ones that are coming really close to town are just young, mature bears that just left their mothers and looking for food. (CB1, 11 May)

Mainly the six footers are the ones I have always had trouble with, like even the one with you (was) that size, they're all that size. The bigger ones never seem to bother. Yeah, but then there's the sows and the cubs. They come in and they try to go in the camp too. When the mother's hungry. (CB2, 16 May).

The number of polar bears have increased dramatically. Especially seems like the smaller, younger bears are very many and easy to see. (Interpreter translating for T3, 21 May)

For the hunters that are going out, they always seem to have a success every year with the polar bears since the total allowable harvest increased to four tags. Once the HTO does their job for the tags and the hunters are gone in February, before end of February anyway. So, the four tags are always used. (CB4, 20 May)

Changes in distribution and behaviour

There was signs of them. It was four years ago, there was two bears into town. But every year since, there's polar bear tracks close by town every spring that they're walking just on the outside of town, going north or east. And last year, every year now, there's bears just in close to the town and I mean people go out there with their vehicles just to take pictures of them. (CB1, 11 May)

It was just last month that there was a polar bear coming into the communities, and it was not only once for that same polar bear coming in, right into the community. Less than a mile from here. Just uphill from this HTO. So, every year they are coming in and the last one was just last month. (Interpreter translating for unidentifiable Gjoa Haven elder, 3 June 2020)

After the ban, the polar bears are coming in every year, and even during summertime, they will come around, as opposed to the community or the town during the summertime. Most likely even through the camping grounds, where people are camping. And so, every year the polar bears are coming into the community. Even during summertime. (Interpreter translating for unidentifiable Gjoa Haven elder, 3 June)

Many years ago, the polar bear hunting, catching the polar bear there was never any problem because of no quotas in place. But after the government first started taking quotas on polar bears [he said] they have become a problem. And it became a problem with the hunters [shooting in the] community because whenever the polar bear comes into town or gets too close, and if it's killed, it's like illegal to try and kill polar bear without quota so it's a problem in today's way. Compared to many years ago 'cause many years ago there, polar bears are, show [up in the camp, because of] the campers or the community are happy to be getting meals to eat. But it's totally different today. After the quotas were put in place. (Interpreter translating for GH5, 3 June)

Many years ago, the polar bears were harder to get. But after many years of biologists collecting information, polar bears not being threatened, or not being slaughtered or killed by biologists and with limits on polar bears and requiring tags to hunt them. It's the number of polar bears being killed are way less than years ago, so it seems that the polar bears are learning that they aren't going to be killed. And it's different from many years ago. But years ago, it was not coming to town, but presently they're more

of them coming into town because they're not being in danger or like not being killed locally. (Interpreter translating for unidentifiable Gjoa Haven elder, 3 June)

Polar bear health

I've always noticed the M'Clintock Channel's bears are not as aggressive as the bears in Boothia. But that may be due to the size of the populations because the bears I get from the M'Clintock Channel have a lot less scars. They don't look as beat up and they're healthier. They have much more fat, whereas the bears in Boothia, they tend to have a lot more scars. I guess there's too much competition for food or they seem to be a beat up a bit more in Boothia...The bears in the M.C. Channel have always been much healthier for me anyway compared to the bears in Boothia. But again, like I said, it may just be from the population size. (CB2, 17 June)

He don't know if it's because he's in his old age. But he notice a difference in polar bear fat many years ago [vice versa] for today. Seems like the fat of the polar bear looks more like seal fat in a way. And seems like the taste is different, a little. The quality of the meat is different from many years ago. (Interpreter translating for T3, 21 May)

Interactions with other animals

Big polar bear and a very big muskox were fighting each other. And this fight, they could see the tracks, the prints in the snow. And they tracked them down and they tracked down the bear was dead. It got killed by the big muskox and the muskox walked away. So clearly the muskox won this fight, even though they are both very big, a very big polar bear and a very big muskox. And that's pretty much the only thing he heard of. He hasn't seen it before, but he heard of it. And that's what happened before. And he doesn't know of any polar bears interacting with other animals. (Interpreter translating for T2, 21 May)

Sometimes the wolves are killing the cubs. And they're always looking to take their catch away. You know how a bear catches a seal. The pack of wolves are always looking to steal that from the bear. It's always food, right... Seen a pack of wolves attacking a bear for its kill, for its seal. Yeah, they don't like wolves and they don't like humans. (CB2, 16 May)

Management recommendations

That area where having the tagging system and having follow rules is not a good thing for us in a way, because that is the reason why there's too many polar bears. And then if we have less restrictions then we'll be able to hunt like we used to. And they would be the polar bear management of having too many bears coming into camps. And that would solve a lot of problems as well. (Interpreter translating for T3, 21 May)

We have rules and regulations to follow. And it is okay to follow these today. Because there are many people that would go out and do whatever they want. It is okay to have

this in place and practice these. Where many years ago, we didn't have these laws. Sometimes they would be hungry for a few days, their father is a hunter, they would go out hunting and they don't always harvest the animal they're hunting. Whether it be caribou, seal, polar bear or whatever it may be, and they would go days without eating. (Interpreter translating for T3, 21 May)

The government sets boundaries right. Polar bears don't have boundaries. They go anywhere. (GH1, 3 June)

You ran out of time your amount of days and when you spend so much money to try to harvest it and when you run out of days you're forced to give up the tag and someone else has to go. (CB1, 11 May)

Hunting to Gulf of Boothia. His main concern is the younger generation not knowing exactly what to expect because it's different from this area where they usually used to go polar bear hunting. That's one of his big concerns that something may happen to them because it's a different area, different scenery and it's different...Different ice conditions, not knowing what to expect, and this is for the younger generation, that's his main concern. (Interpreter translating for unidentifiable Gjoa Haven elder, 3 June)

My preference would be to go to the M'Clintock channel, as travelling to another community, going on the polar bear hunts not very traditional to start with...not everyone does that but going to the Boothia usually causes delays because we have to travel to another community. (CB2, 16 June)