



INUIT KNOWLEDGE REGARDING CLIMATE CHANGE  
AND THE BAFFIN BAY POLAR BEAR POPULATION

Martha Dowsley<sup>1</sup>

<sup>1</sup>Department of Geography, 705 Burnside Hall, McGill University,  
805 Sherbrooke St. West, Montreal, QC H3A 2K6

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## **Abstract**

During spring, 2005, interviews were conducted with elders and senior hunters in the three Nunavut communities which harvest polar bears from the Baffin Bay population (Pond Inlet, Clyde River and Qikiqtarjuaq). Between 15 and 20 interviews were conducted in each community focusing on observations of changes in the polar bear population, observations on the climate during the last 10 to 15 years and views of bear management. The results were analyzed using both qualitative and quantitative methods.

The qualitative analysis revealed several general trends. Most respondents said that the population had increased based on their observations of bears, although some people noted that these observations could reflect a change in bear behaviour rather than an increase in population. The majority of respondents also said that bears are less fearful of humans, more bears are coming to town and that bears are causing more damage now than 10-15 years ago. Discussions about climate change showed that there is high variability in the environment. There were general trends indicating that the floe edge is closer to the shore now, the sea ice is thinner, there are fewer icebergs and glaciers have receded over the past 10-15 years. People were not sure whether climate change was affecting polar bears or what those effects might be. Respondents also held varying opinions about the quota system and whether or not it was responsible for the increase in the bear population since the 1960s. When asked about their views on the biologists' studies of bears, there was again a mixed response, with some participants feeling concern for the long-term effects on bear health and quality of meat. Many respondents also did not understand how the government is organized or how the scientific studies were carried out, and also expressed shyness about asking for more information or help from government employees.

The quantitative analysis revealed a north-south gradient among the three communities regarding polar bear population and behaviour. Respondents in Pond Inlet reported observing more bears while Qikiqtarjuaq gave mixed responses about polar bear population and behaviour. There were no significant differences between communities regarding climate change observations. Active hunters gave significantly different responses from non-active hunters for two questions. The first was regarding how respondents knew there were more bears. Most hunters (81.25%) stated that they had seen more evidence of bears on the land, whereas non-hunters were split in their observations between seeing evidence of bears on the land and seeing bears in town. Over 90% of active hunters also reported the floe edge is closer to land now compared to 10-15 years ago, while only 60% of non-hunters made the same observation.

The use of two methodologies for analyzing the data allowed both the details of individual comments as well as trends of differences to be expressed. In general the two methods supported each other and drew a more complete picture of the situation than either one did alone. The qualitative analysis allowed more latitude in interpretation and consideration of the context of the response and other associated responses. The quantitative analysis allowed a more objective perspective on whether community, hunter-experience, sex, or age, had an effect on what was held as Inuit knowledge. Identification of significant effects of covariates on the comments provided suggested

that Inuit knowledge is not always held as a uniform, non-variant quantity. Inuit knowledge is sometimes held as a range of perspectives that vary depending on the community and experiences of the respondent.

## **Introduction**

There is considerable scientific literature on the ecology and biology of the polar bear (for a broad overview, see Stirling 1998). There is also a significant anthropological literature on the spiritual (Keith 2005) and socioeconomic roles of polar bear in Inuit culture (Sandell and Sandell 1996; Wenzel 1983, 1991; Wenzel and Bourguin 2002). Neither of these two sets of literature, however, extensively addresses two important aspects critical to the Inuit-polar bear relationship. The first concerns Inuit Traditional Ecological Knowledge, or TEK, about contemporary polar bear population numbers, demographic structure, seasonal movements and the environmental factors that influence the species' behavior. The other is directed toward Inuit understanding of polar bears in relation to themselves and humans generally. This aspect provides some cultural context, in keeping with the broader meaning of *Inuit Qaujimajatuqangit*, between TEK experiential information and non-empirical explanations of polar bear behavior (see Usher 2000; Wenzel 1999, 2004).

In December of 2004 the Nunavut Wildlife Management Board and Minister of Environment confirmed Polar Bear Memoranda of Understanding (MOUs) which included the Baffin Bay polar bear population. The Baffin Bay polar bear MOU increased the polar bear total allowable harvest (TAH) from 64 to 105 for the communities that share this population (Qikiqtarjuaq, Clyde River and Pond Inlet) based on Inuit Knowledge (GN 2005). In February, 2005 the Federal/Provincial Polar Bear Technical Committee received information indicating that the Greenland harvest had increased from 68 per year (average harvest from 1993-1997) to 185 per year (last two years average) (Born 2005). This increased the total kill in Baffin Bay to an annual removal of approximately 290 animals.

Simulation modeling suggests the population has declined from 2074 bears in 1998 (Taylor et al. 2005) to 1700 in 2004, concurrently undocumented information from both Greenland and Nunavummiut hunters was to the effect that the population of bears was increasing. This paradox may be due to changes in the distribution and behaviour of polar bears caused by climate change. This appears to have affected Inuit perceptions of polar bear populations and trends in Western Hudson Bay, where recent scientific information documents a decline (Stirling et al. 1999) while Inuit knowledge suggests an increase.

This report summarizes Inuit knowledge from the three Baffin Bay communities collected during spring 2005. The purpose of the investigation was to collect information on changes in polar bear population, behaviour and health over the past 10-15 years, changes in climate over the same period and also to gather information on Inuit knowledge of government management of polar bears. A second purpose of the investigation was to compare qualitative and quantitative methods of data analysis. This combination of methods was used to both reveal statistically significant differences in

responses and to allow for the expression of observations as they were reported by Inuit. This duo approach was used to capture Inuit TEK and also to allow respondents to express a deeper *Inuit Qaujimajatuqangit*, or cultural, context for the “fact-based” (age, sex, locational) TEK data.

## **Methods**

The data were collected using an interview developed after consultation of the Igloolik Oral History Archive to give context to the questions.

Survey participants were recruited through two means: 1) consultation with HTO and/or Nunavut Department of Environment personnel; 2) recommendation by earlier interviewees. Those who chose to participate were compensated at the rate of \$35.00 per hour and the interviews were generally conducted in Inuktitut through an interpreter, who was compensated at the appropriate local rate. The identities of the participants are not associated with the data presented, as part of confidentiality agreements signed by participants before the interview began.

Forty-eight interviews were conducted from April to June 2005 in the Baffin Bay communities –Pond Inlet, Clyde River and Qikiqtarjuaq. Participants ranged in age from late 20s to early 80s, with most over age 50. Most participants were men and engaged in harvesting activities on either a part time or full time basis, or else were retired from harvesting.

Interviews lasted between one hour and one and a half hours. The interview format was semi-structured so that respondents could expand on topics that they knew a lot about or were more comfortable discussing (Agar 1996, Eyles and Smith 1988). People were also generally unprompted with regards to possible explanations of their observations. This was done to allow them to express their own views. Participants were asked three sections of questions. The first was regarding polar bear population, behaviour and health, the second was regarding climate change and the third was regarding understandings and views on the management of polar bears in Baffin Bay.

The results were analyzed two different ways. First, a qualitative approach was used to explore the responses to each of the questions as they were asked during the interviews (Part 1). This analysis was done by community and includes frequencies of responses to each question and quotes from participants expressing their views. The second analysis was quantitative and was completed using SPSS (SPSS© for Windows version 11.0.1). Responses to questions were broken down into their smallest units and coded into a data table. The data were then explored for significant differences based on four criteria regarding the respondents: community, age, sex and hunting status (Part 2). The frequencies of responses reported between the two analytical methods may not be equal due to the coding procedure employed in the quantitative analysis.

Due to the semi-structured design of the interviews, participants were often asked supplemental questions or they offered further explanation for their answers. Themes were revealed in these discussions and these themes were coded into new variables for

the quantitative analysis. These are phrased as questions in the analysis, but were not necessarily asked of the survey participants. The actual questions asked are affixed as Appendix 1. The breakdown of the survey questions into new variables used in the quantitative analysis is as follows:

Question 1a, 'Has the polar bear population increased, decreased or stayed the same over the past 10 to 15 years?', and the supplemental question, 1b) 'How do you know?', were not broken down. However, another supplemental question, 'Why are there more?', generated responses that were grouped into three categories. The categories were phrased as questions in the analysis: 1c) 'Are there more due to natural increase?', 1d) 'Are there more due to the quota system?' and 1e) 'Are there more due to changes in the environment?'.

Questions 2, 3, 8, 10, 12 and 13 were left as asked during the interviews.

Question 4 was broken into its parts: 4a) 'Are there more, fewer or the same number of bears in land in general?', 4b) 'Are there more, fewer or the same number on the land in spring?', 4c) 'in summer?', 4d) 'in fall', and 4e) 'in winter?'.

Question 5 'Is there more, less or the same damage to cabins, meat caches and other equipment?' was broken down into 5a) 'Is there more, the same or less damage caused by bears now compared to 10 or 15 years ago?' and 5b) 'Has the level of destruction of meat caches changed?'. Survey participants also often gave one or more reasons for any increase in destruction of property. These are coded as three yes or no questions: 5c) 'Is the reason for increased destruction that there are more bears?', 5d) 'Is the reason for increased destruction that there are more people and more things left out?' and 5e) 'Is the reason for increased destruction that there is a change in bear behaviour?'.

Question 6, 'Has the condition of bears changed in the past 10 or 15 years? Are you seeing more, less or the same sick, injured or dead bears? More, less or the same amount of fighting/scars? Are twins more or less common than 10 or 15 years ago?', was broken into 7 questions: 6a) 'What is the health of the bears that come to town?', 6b) 'Is there more, less or no trend in skinniness of polar bears?', 6c) 'Is there anything different about the behaviour of skinny bears compared to other bears?', 6d) 'Is the reason for the skinniness that there are more bears?', 6e) 'Is the reason for the skinniness that there is a problem with the environment?' and 6f) 'Is the reason for the skinniness interactions with people?' and 6g) 'Any other health problems?'.

Question 7, regarding climate change, involved a variety of environmental conditions which were coded as 12 separate questions, starting with 7a) 'Have there been any changes in the ice over the past 10 to 15 years?'. The other eleven questions, all begin with: 'Is there any change in...', followed by an environmental factor. The factors were 7b) cracks, 7c) distance to the floe edge, 7d) amount of snow, 7e) thickness of sea ice, 7f) brittleness of sea ice, 7g) number of icebergs grounding here, 7h) wind, 7i) currents, 7j) rough ice, 7k) break up and 7l) freeze up.

Question 9a) ‘Could climate change contribute to what you have observed about polar bears?’, was followed with the supplemental question 9b) ‘How do you know?’.

Question 11, ‘Can you tell me about the quota system here? Do you agree with it?’ was interpreted in two ways, 11a) ‘Are you happy with the quota number?’ and 11b) ‘What are problems with the quota system?’.

Question 13a) ‘Were there more or fewer bears before the quota system began?’ is followed by the supplemental question 13b) ‘Did the quota system increase the bear population?’.

The results are provided as frequency tables. To analyze these results, respondents were categorized by 4 criteria: community, age, sex and hunting status. Hunting status was coded as ‘active’ (full time hunter or hunters that go about once a week due to other jobs) and ‘not active’ (retired hunters, occasional hunters, women and non-hunters). We used Fisher’s exact test (2-sided) (SPSS© for Windows version 11.0.1) to look for categorical differences in participant responses, except for age effects. We tested for age effects using an ANCOVA categorical regression approach entitled ‘optimal scaling’ (SPSS© for Windows version 11.0.1). We report the observed significance, and discuss possible causes and implications for responses with observed level of significance ( $p$ ) less than 0.15.

## **Results**

### **Part 1. Qualitative Method**

The responses to each question are explored by community. The number of participants and the breakdown of each answer is given. An effort has been made to include representative quotes for each question, as well as the more complicated responses that are best left as expressed by the survey participant.

## **Section 1 Observations on polar bear population and behaviour**

### **Q 1. Has the polar bear population increased, decreased or stayed the same over the past 10 to 15 years?**

#### Pond Inlet

All 14 respondents indicated that the bear population has increased. 13 people offered explanations. Seven said there were more bears around the community or cabins. Seven said there were more bears and bear signs on the land. One person said the bears were forced onto the land because there is less ice.

Some comments:

“There are too many polar bears now, most of them will be hungry and prone to attack people. Before there were never polar bears around here until recently.”

“There were not many bears around Pond Inlet when I was growing up. We used to have caches of muktuk and seal. The polar bears only bothered them once in a while. Now there are lots of polar bears! I never suspected there would be polar bears in the western

fiords and now there are. There are fewer seals there, but the bears are probably looking for food over there.”

#### Clyde River

16 people answered this question. 14 said the population had increased. One said the increase was only slight and the other said there was no change. Nine of the people who said the population has increased gave reasons. 5 said there were more bears nearby, that people didn’t have to go very far to hunt them anymore. 2 people said they were seeing lots of young bears and bears with no ear tags. Three other hunters gave different statements:

“When I was young at the Home Bay area, there was a lack of polar bears. But in April and May the big males come looking for females there now.”

“There are too many bears. Before, when we went dog teaming for hunting we didn’t come across many bears. We were getting 45 a year anyway. The government says that’s too many. We should be able to get more now since we were able to get that when they were scarce.”

“The population has increased. We aren’t allowed to get cubs so the population is growing. A lot of people think the population is not increasing but I think it is. We’re not allowed to get cubs so every 10 years they make another generation.”

#### Qikiqtarjuaq

15 people answered this question. Three people said they didn’t know if the population had changed. Nine people said the population had increased and 3 said the population was the same.

Ten people explained their answers further. For the people who said the population had increased, 4 said they knew the population had increased because they were seeing bears near the community. One person said he had seen more signs out on the land. Two people said they had seen bears or signs where there didn’t used to be any bears.

Three of the people that weren’t sure offered these observations:

“I don’t know. The polar bears are usually at the floe edge and the sea. But this year they are not really down at the sea. They are more by the land. Probably there is not enough to harvest there (not enough food at floe edge). And there are walruses by the floe edge so the seals are probably more close to land.”

“I can’t answer, but I think they increased, but it could be due to change of weather or the polar bears are following their prey. We say they have increased because the weather got warmer and probably the polar bears have come nearby the communities. They are coming more to the community.”

“I tend to believe the biologists. They are saying there are fewer bears. So I’m sticking with them. Even though I’ve seen a lot of bears and they look like they’re increasing.”

**Q 2 In open water season have you seen changes in polar bear behaviour such as when they come to shore or what they do once they are on shore?**

Pond Inlet

6 people responded to this question. All indicated there was no change in when bears come to shore. 5 respondents stated during their interviews that bears had lost their fear of people. One elder explained this:

“Long ago polar bears would go away fast. When there are more animals of any kind they are less afraid. We used to have lots of caribou around town, even right here, beside the house. It was the same thing. When there are fewer animals, when the hunter is trying to catch them, he has to be really quiet. But when there were lots of caribou, one was sleeping in front of the house. He didn’t get up or care about the noise.”

Clyde River

10 people answered this question at least in part. Three people said there was no change in behaviour of the bears when they come on shore. Five people said the bears are not scared of people anymore. One person noted that hungry bears do not scare easily, whereas well-fed bears do. Another said that when the big bears are skinny they will not be scared easily. The other respondents said there was no change in when the bears come on shore, though one person offered a more detailed answer:

“Usually they come after the break up season. They come to the fiords, some stay out swimming and come on land to sleep, some are more curious than others. They usually come after the land fast ice breaks up, when the multi-year ice washes in from the north. When you scare them away (from town) they get used to it and they learn you won’t hurt them.”

Qikiqtarjuaq

6 people answered this question. Two said more bears are coming to town. Two said bears are less afraid of people. The other two indicated no change had occurred in timing or behaviour.

**Q 3 Are there more, the same or fewer bears around town now than 10-15 years ago?**

Pond Inlet

8 people responded to this question all said more bears are coming now. Even though many people used the presence of bears in town during the fall as an indication that their population had increased, some respondents gave more textured answers:

“It seems to be that more are coming to the community. When the polar bears are hunting they are not so careful because of the noises they always hear. Even dogs’ barking damages their ears. So polar bears are not as successful at hunting so they come to the community to find food.” (see health question, #6, for more details on this explanation).



“They started coming to town in the 1960s, early 1970s. Polar bears can think like a person, they won’t forget things right away. If they come and find food around here, people chase them away and the polar bear will come again the next year. They will remember where they found food. If a bear is chased away from town, it will come back at night when things have quieted down.”

“Polar bears don’t like the smell of dogs and they used to stay away because we had dogs everywhere. Now there are fewer dogs so the bears come to the settlements. We used to cache meat and they didn’t bother it. Now there are more bears and they dig up the caches.”

#### Clyde River

15 people answered this question. One said it is the same number, and all the others agreed that more bears were coming to town in the fall.

“More are coming to town, because there are more bears, not because they are extra attracted to town. It’s a different bear almost every time, but skinny ones keep coming back.”

“In the fall they seem to be hungry, they’ve been lying around for a long time. The town bears are also more likely to be young ones.”

#### Oikiqtarjuaq

6 people responded to this question. Three said more bears come to the community in the fall. Three people said it is the same as at least 10 years ago.

“Back then we only saw them (around the community) when there was no ice. Now even in the winter they come around.”

**Q 4 Compared to 15-20 years ago, are there more, fewer or the same number of tracks, bear kills and bears seen when you go hunting in spring, summer, fall, winter?**

#### Pond Inlet

Six said there were more bears in all seasons, four said there were more just in winter, three said there were more in spring, four said summer and six said fall.

“Before we had a certain time to see polar bears –during March and April when the polar bears are looking for seal pups and during the full moon. Now any time we can see them.”

“Since 1990, even when you go out boating you can see more, for example sleeping on the shore.”

#### Clyde River

One person said it was the same as 15 years ago. Eight people said you could see more bear signs in all seasons. Six specified spring as having more bears, five said summer

and 11 specified fall as a time to see more bears than previously. Two people said you could see more bears in winter now and 2 said winter had variable numbers of bears.

#### Qikiqtarjuaq

11 people responded to this question. Four said there were more bears in general, while one person said there were the same number. One said there were fewer in the winter, while another person said there were more in winter. Three people said there are more in spring and one said there are the same number of bears in the spring. Two people said there are more in summer and another said there are the same number in summer. Four people said there are more bears in the fall and 2 said there are the same number in the fall as 10 or 15 years ago.

“They rotate. Some years they are in different places. In the last four years they have been further south, before that they were further north. 15 years ago in some places you could see more. A few weeks ago we saw more tracks to the north.”

A sport hunt guide said that they couldn’t find bears to the south of the community in spring 2005 and one of his clients was unsuccessful. He took the next client north and saw many bears.

#### **Q 5 Is there more, less or the same amount of damage to cabins, meat caches and other equipment? If there is more damage, why is that?**

##### Pond Inlet

The 11 respondents all agreed that bears cause more damage now than ten years ago. 5 people said it was nearly impossible to have a meat cache now. One person explained that people are building cabins out on the land more than before because tents are too vulnerable to bears. One respondent said that in the early 1960s it was also impossible to have a cache.

“They don’t run away when they hear something. They don’t care. They are causing more damage too, they even go up to tents and bother people.”

Six respondents elaborated on their observations about more damage. Two respondents said that it was because the bear population was too high. Four people stated that the noises caused by machines, dogs and the act of conducting research on bears causes the bears to lose their hearing. The bears then cannot hunt as well and are not as afraid of humans. This results in bears coming around people more.

##### Clyde

16 people answered this question. 15 people replied that bears are causing more damage now, in particular to cabins and meat caches. One respondent didn’t know if there was more now or not.

“There seems to be more damage, but you have to take into consideration that we’re leaving more stuff out on the land than 15 years ago. But if you leave meat caches they are pretty much guaranteed to be gone.”

“We used to cache 4 or 5 seals in a row, covered them just with gravel. Used to never be touched. But now it disappears even if we put rocks on it. Polar bears don’t like to use their claws and scratch them (wear them down), so they stayed away from the gravel. They wouldn’t dig it. Now they do.”

A total of ten people explained why they thought there was more damage. Three people only explained it was because there are more bears now. Two people said it was because there are more bears and more fighting and some can’t get food, so those bears come to where people are. Three respondents said the bears got used to people and the same ones kept coming back. Two respondents said there are more people and more food around, which was attracting bears.

#### Qikiqtarjuaq

Six people responded to this question. Five of them said there was more damage and one person said it was the same. All the people who said there was more damage elaborated on why. Three said it was because there are more human things around for bears to get into. One person said it was because there are more bears. One blamed the environment: “The bears are more hungry. There is a problem with the ice. The rough ice makes it hard for them to find seals, but there is the same number of seals.”

Two people also mentioned a lack of fear:

“The only change I’ve noticed is when I was growing up the polar bears would scare easily and run away. Even when they were around shacks they didn’t break windows or do damage but now they are not afraid. They used to avoid communities before and now they don’t.”

“More people are hunting them. In the past, using harpoons, only experienced hunters would go for bears, now with rifles, anyone can hunt, even women, so the bears are less afraid.”

#### **Q 6 What is the health of the bears that come to town?**

##### Pond Inlet

Seven people discussed this question. Four people said there is no pattern. Three said the bears that come to town are skinny. One of the people who reported skinny bears also stated that the town bears tend to be young.

##### Clyde River

For town bears there were three responses, one said skinny bears come to town, while another person said any kind come to town but skinny ones keep coming back. One person said there was nothing different in the health of town bears compared to other bears.

“Yes they are getting skinnier and sometimes they kill each other. I found a few killed by another bear.”

Q: “Where are you seeing the skinny ones?”

A: "They are more skinny and younger [the ones killed by other bears]. Fat polar bears just pass by [camp or town] but skinny ones keep coming back."

#### Qikiqtarjuaq

Only one person commented specifically on town bears. He said that the ones that are close to the community are fatter than ones further away.

### **Comments on the general health of bears**

#### Pond Inlet

There were 7 comments about the general health of bears. 4 said it was variable 2 said there were more skinny bears in general now. The seventh respondent stated: "I noticed since they started tagging bears, the ones with the tags were the skinniest. Even now when we look for bears, we go further to where they aren't so skinny and the meat is better."

Three elders talked about a loss of hearing in polar bears. One indicated that the bears no longer care about noises around people, one said that when an animal's population is high the animals lose their fear and don't mind loud sounds. Both of these could indicate that bears are getting used to noises, however, the third respondent was adamant that the reason was hearing loss:

A: "There are many more polar bears and I know exactly why. Right now their hearing is worse because of helicopters and airplanes that did research on them, gunshot sounds, these things make them deaf. That's why they can get close to town."

Q: "What about their sense of smell?"

A: "They got used to our smell....For the proof that polar bears are losing their hearing due to how research is done, their hearing is worse from the tranquilizer. Back then the polar bears could hear dogs coming from far away and if the polar bear got away his ears were already damaged."

#### Clyde River

15 respondents discussed general bear health. Seven respondents said polar bears are skinnier over all, while one respondent said only males were skinnier now. One person said it seems the big bears are skinnier now and maybe they are fighting over food, which happens when an animal's density gets high. Five people said there was more fighting among bears as evidenced by more scars, broken canines and the discovery of bears that had died from fighting. One person said cubs are leaving the dens earlier and one person mentioned that cubs leave their mothers earlier due to big males attacking them. Four people said there was no change in overall bear health.

One person mentioned hearing loss:

"Skidoos hurt their ears. IQ says when we used to hunt with dogs, if you missed a bear it would have damaged his hearing and he will be less lucky in hunting and get skinny. So hunters say 'it's too bad we missed that bear' not because they wanted to get it, but because they know that afterwards the bear will be damaged."

### Qikiqtarjuaq

Six people commented on general bear health. Two people said it was variable. Three said there are more skinny bears. Two gave other comments:

“Now people are finding more dead bears that climbed the mountains and fell down – they were looking for eggs.”

“The wolves are actually injuring and hunting the cubs and now the wolves are a problem by killing the cubs. We never used to see wolves so we were not aware of any killing of cubs. But for the past 3 or 4 years the number of wolves has increased. From IQ we know the caribou are coming, the wolves move before them, so probably the caribou are coming. A hunter has seen a cub that was killed by a wolf pack.”

### **Section 2 Observations on climate change**

The issue of climate change is very complicated, especially since there is high yearly variability in environmental conditions. Certain aspects of the environment certainly seem to be different in all three communities, but interviewees gave varying answers to the questions. The low number of responses may indicate that although the respondents thought about that aspect of the environment they had not noticed changes and therefore did not say anything because they were specifically asked about changes. Figure 1 illustrates the change in the floe edge as reported by participants.

### **Q 7 Have there been any changes in the ice? Floe edge, icebergs, rough ice, changes in amount of snow?**

#### Pond Inlet

14 people replied to this question, 13 said there had been changes while the other person replied that there had not been. People were asked to expand on the sorts of changes they had seen in the past 10 to 15 years and were sometimes prompted with examples of the sorts of changes I was interested in.

#### Quality of Ice

Eight people said that the general quality of the sea ice has changed. Four mentioned that the ice is thinner now. One said the land fast ice is often more slushy, another said there is less multi-year ice and there is less ice in spring. Comments about the hunting area around Button point included that the ice there is thinner now, that there is no ice there now, and that it is more smooth ice and one can drive a skidoo there in winter now whereas one could not in the past.

#### Cracks in Land Fast Ice

One said there were fewer cracks now because the ice is thin and one said that nothing about cracks had changed.

#### Break up

Three people mentioned break up as being during July and that it begins up to two weeks earlier, while one person said the time of break up had not changed.

### Freeze up

Three people mentioned that freeze up is later. In the past it was in October but now it takes place in November or December. During this time the ice is more brittle.

### Icebergs

Eleven people mentioned icebergs, nine of them said there were fewer icebergs now, while two said the number varies.

### Floe Edge

Seven people mentioned the floe edge. Of these, 6 said it was closer now and the other respondent said that it was a bit different. Two of the people who stated that the floe edge was closer gave the following explanations:

“The icebergs are like nails, they hold the ice in. Since there are fewer icebergs there (around Button Point) the ice edge is closer.”

“When I’m flying to and from Clyde River, there are not a lot of icebergs and the floe edge is closer to the land. In the Clyde River area, way back, when there were lots of icebergs, the floe edge was further out. Recently there are strong winds from the south so the icebergs left and the floe edge came in closer. The icebergs come from Greenland (between Greenland and Ellesmere) and they go into Clyde and the coast just north of it. The current is from the north and from Lancaster Sound coming east... The ice changes in Baffin Bay mean less ice patches so the bears come to land to hunt. Because polar bears can swim, but when they are tired they go to land. Probably Clyde people know more because when there is no ice on the ocean, the polar bears go to land, mostly by Clyde River.”

### Glaciers

4 respondents mentioned that the glaciers are receding.

### Snow

One person said there was more snow and one said there was less snow on the land.

### Clyde River

17 respondents answered this question. Three said there had been no significant changes. The others expanded on their observations about specific features.

### Ice quality

Five people mentioned that the ice is thinner now. One person explained that there is more snow on the ice and this insulates the ice and stops it from being so thick. Two people said ice quality was variable and there was no pattern of change.

“The ice is sharper now, not as hard as before. In the past the ice was really thick. The cracks were very narrow, deep and tapered down like a ‘V’. Now they have straight edges.”

“The salt water doesn’t freeze as hard as before. Every year we chip the ice at seal breathing holes, today it is not as hard, not as brittle. Now in June the bottom of puddles (on the ice) is not slippery, it’s not melting from the top, it’s melting from everywhere through the ice, like the inside of a bone. Today the ice is also thinner. People used to say when the leads opened they looked tapered going down in them because of the thickness. They no longer look tapered.”

#### Cracks in Land Fast Ice

Four people said there was no obvious trend regarding cracks. Three people said there were more cracks.

#### Ice Bergs

There were 14 responses about icebergs. 10 people reported that there are fewer icebergs. Four people reported no change in the number of icebergs.

#### Floe Edge

Four people said the floe edge was closer now while 2 people said it was the same.

#### Rough Ice

Nine people discussed rough ice. Five said there was no obvious trend. Five people said there was more rough ice. Two of these people explained the rough ice is caused by there being fewer icebergs to hold in the ice. One person said the rough ice occurs when the wind is from the south or east.

#### Break up

Six people gave responses about spring break up. One said it is about the same as in the past. Five said it was earlier now. One person specified a change of about 2 weeks earlier.

#### Freeze up

Four people said it was a couple of weeks later now. One person said it is highly variable.

#### Glaciers

Two people mentioned glaciers and said that they are melting more around Clyde River.

#### Wind

Four people mentioned wind. One said it is variable, and one said there was less wind. The other two gave these comments:

“We used to only have wind from the north. 3 or 4 years ago the wind started coming from the south too.”

“Seems like there is more wind. Seems to be more strong winds. It was soft snow in the south, less blowing snow. Now the snow is harder there (from being blown more).”

### Qikiqtarjuaq

13 people responded to this question. One of these people said there was no change because everything is highly variable. The others gave details about specific changes.

#### Ice quality

Three people said the ice is thinner now and getting more dangerous. One also said there is less pack ice.

“I went bear hunting all the way to the Dewline on Durban Island and the ice there was moving up and down. That was 4 years ago in March. It was not like that there when I was growing up. It was solid.”

#### Cracks in Land Fast Ice

One person said cracks appear earlier in the spring and there are more of them. Another person said there are usually leads open in winter off the north end of the island but lately there haven't been.

#### Icebergs

8 people commented that there are fewer icebergs now.

#### Floe Edge

Six people all answered that the edge is closer to land now.

“The floe edge is closer to the land and there are hardly any icebergs. That's why the floe edge is close by. The icebergs keep the ice from going anywhere. They are like plugs.”

#### Rough Ice

Two people mentioned there is more rough ice. One qualified that by explaining that the floe edge is closer and the rough ice is generally by that, so the rough ice is close to the land now.

#### Break up

Four people said break up is earlier now.

#### Freeze up

One person said freeze up is later and slower now.

#### Permanent Snow and Ice

Four people discussed a snowcap that used to stay all year on a mountain on Qikiqtarjuaq Island. There used to be bear dens in this snow, but now the snow doesn't stay all year and the bears no longer den there.

**Q 8 Have you heard of global climate change? Have you seen any evidence of it in your area?**



#### Pond Inlet

Seven people responded to this question. 5 said they believe the changes they have observed are caused by this. The other two respondents said they did not think they had observed any changes that could be attributed to climate change.

#### Clyde River

16 people responded to this question. Eight said there is evidence of climate change. Five people said there was not, and three people said they didn't know.

#### Oikiqtarjuaq

10 people answered this question. Eight said there is evidence of climate change. Two people said there was not. Two people made specific comments on changes:  
“Yes, it has affected our area. In the past we could hunt for different animals further. Now we can't go further, we have to hunt nearby on the ice.” This comment seemed to refer to the difficulty of traveling on the ice.

“I am experiencing it. In winter there are usually cracks from the points of land and I can put my net under water. But now there are hardly any cracks so I can't fish for char any more.”

One said there was no change

“I don't know anything about the environment. I don't think there is any global change. It is now May and there should be spots where it should have melted but there aren't and it is still frozen. So it doesn't appear to be warmer.”

### **Q 9 Could climate change contribute to what you have observed about polar bears?**

#### Pond Inlet

Three people responded to this question, one said no, and two said they didn't know.

#### Clyde River

Five people gave responses. Two said yes, two said no and one didn't know.

“No, because polar bears can go and follow the seals further, so they won't have trouble hunting. Also the snow covers the breathing holes but polar bears can still hunt, it's just for people.”

“Seems like yes because polar bears are getting skinnier. If it gets warmer it will affect polar bears. They like to be cold.”

“Yes, it could affect the polar bear's food, even with small amount of temperature change, the food will change. These days some livers (of seals) don't look good. Also the shedding of the seal fur: molting is this time of year usually. Now you sometimes find ones that are molting in other times of the year.”

“There is more rough ice, more thin ice. But it won't affect polar bears' hunting.”

#### Qikiqtarjuaq

Five people responded. Two said 'I don't know'. The other three gave comments: "It may be. There are not enough icebergs and the denning areas have less snow and it is melting in summer. The bears are more hungry. There is a problem with the ice. The rough ice makes it hard for them to find seals, but there are the same number of seals."

"Harp seals usually have breathing holes during the winter but because the weather is always changing, the ice freezes over quickly and so the seals are on the surface of the ice. They move around on the top of the ice, they can't get back in their holes because the holes froze. Then they are killed by polar bears."

"Maybe the ice in the sea is melting and the bear have no where to go. It is very noticeable, they will go to land. There are no icebergs for them to go to."

### **Section 3 Understandings of Management**

#### **Q 10 What do you know about polar bear hunting by Greenlanders?**

##### Pond Inlet

Three people discussed this question, One person claimed to know nothing, one stated Greenlanders use dog teams to catch bears. The third gave this comment:

"I've heard they are catching more. Sometimes polar bears go from here to Greenland and they don't have a quota system so it will affect our quota. They use polar bear skins for clothes so they are hunters too."

##### Clyde River

There were 6 responses to this question. Three said they didn't know anything. One said he heard they catch more polar bears there, while another only knew they use dog teams for hunting bears. The fifth person said:

"There is more hunting there because it's a part of their lives. More hunting there than here, it's like it was here 30 or 40 years ago."

#### Qikiqtarjuaq

Three people answered this question. Two said they didn't know much about it. The other said on television it shows they have polar bear clothes.

#### **Q 11 Can you tell me about the quota system here? Do you agree with it?**

##### Pond Inlet

10 people discussed the quota system. Five said they like the system while two specifically said they like the increase in the number of tags. Three people said they don't like the specific rules and three people want more tags. Most people gave comments:

"A few years ago I though the quotas were not useful, but then they increased the number of tags so I'm okay with it now. We wouldn't even need quotas now because people see

bears and don't even try to get them. If we stopped using quotas we could probably manage. The fur value is decreasing so people don't even try to catch them. Soon the only money from them will be from sport hunt guiding."

"We can't have all the bears that there are. So it has increased the population of bears, it's like that all around. Before people would get all the bears. The population will decrease since we can only catch males, so soon the population of males will be so little."

"I like the idea of the quota. If we don't have a quota and there are more hunters we'll have fewer polar bears. The population will go down."

"I don't like the idea of the quota system. It's only in winter and none in summer and we should be able to get bears in summer. They are dangerous when they are hungry."

#### Clyde River

14 people discussed the quota system. Seven said they like the quota going back to 45. Six said they wanted it higher. One said he liked the system in general and didn't care if the quota was high or low. Of the people who wanted the quota to be increased further, reasons for wanted more tags were to get more meat, that there are too many bears and that people are scared of bears. One person wanted the quota to allow the taking of any bear because males have tough meat. Three people expressed a desire to hunt cubs while three others said it is dangerous to have bears in town.

"I like it at 45. I'd be concerned if the polar bear quota dropped and we still had problems and also if we couldn't fill the quota, that would be a major concern. But lots of bears come into town and there were a lot around this spring."

#### Qikiqtarjuaq

Three people responded to this question. These are their comments:

"A sad part is that elders used to eat cubs but they are not able to do that now and they miss that. The quota system is not very efficient. If I had to shoot one (in defense) it is taken away from the quota. There are too many bears now."

"It's much better (to have quota system). If we don't have it more bears get shot."

"I'm happy they increased the quotas because there will be fewer bears in the community. Recently at A's outpost camp there were three bears."

#### **Q 12 Were there more or fewer bears before the quota system began?**

##### Pond Inlet

Eight people responded to this question, all agreed that the polar bear population has increased since the quota system began. Six people felt that the quota system was at least partially responsible for the increase in the bear population. One person didn't know if it was the quota that has caused the increase.

“The population has increased since we got quotas, because we can only kill so many. They shouldn’t have the quotas because the polar bears are dangerous. We should be able to get them year round.”

#### Clyde River

4 people discussed this question. Two people said the bear population was the same before the quota and now. One said there were more bears but didn’t know if the quota had caused this. The final respondent said this:

“We caught fewer bears before there was a quota. Now there are more bears. The quota allows more bears to be caught.”

#### Qikiqtarjuaq

Only one person responded to this question: “Before there was no law about hunting season, now there is a law, that’s why there are so many now.”

### **Q 13 What do you think about biologists catching bears?**

#### Pond Inlet

Eight people responded to this question. One person said he like biologists and liked working with Mitch Taylor. Another person was neutral. Two people said research hurts the bears’ hearing and makes them skinny. One person suggested studying them all year and another said he is now supportive of the research because the population did not move away. Some people were concerned about how research affects bears:

“The temper of the bears change and they become more dangerous.”

“Sometimes we don’t want to eat animals that have been researched. So when we get a polar bear with an ear tag, they way ‘that’s a government bear’ and it’s usually skinny. We really don’t want to eat those ones that are tranquilized. We feel it isn’t safe. Maybe it is, but that’s what we feel. When we see polar bears being put to sleep and measured, we see them as being abused by those people.”

#### Clyde River

Three people answered this question. Two people said they don’t believe the biologists and that the population has increased. They suggested biologists should study the population all year round. A third person said that research hurts the bears’ ears and makes them skinny.

#### Qikiqtarjuaq

Two people gave information about biologists:

“The NWMB appoints them to do research on bears.”

“I don’t go to meetings but we always hear about it. We hear that polar bear and caribou are decreasing and they tell us how many there are.”

Q: Did the biologist tell you why the polar bears are decreasing?

“Because maybe they are being controlled and it is similar to retaliation.”

### **Other Comments**

During the interviews some people who were particularly knowledgeable were asked questions related to this study but not part of the questionnaire.

#### Pond Inlet

Q: the Government thinks there are fewer bears, but hunters are seeing more, what should be done?

A: “We’re not really worried about that. It’s like this, in Alaska there is no quota for bowheads, but we are getting more bowheads. So maybe what others do doesn’t impact us.

Q: the Government thinks there are fewer bears, but hunters are seeing more, what should be done?

A: It’s the same as if someone told me the cows are less numerous down south, I might say to stop killing them. I lived here my whole life and so I believe what I see, not the researchers.

#### Qikiqtarjuaq

Q: Some people think the sea ice is melting and that is why the polar bears are coming to land more. Could that be true?

A: I believe that is actually happening because the snow banks have melted and the ice tends to melt more quickly and when there are no icebergs they need to get dry on land so they have to come to land.

Q: Do you think the population could actually be decreasing because of climate change?

A: I sort of believe that too, knowing the dens have melted. The ice on the mountains on Qikiqtarjuaq melted starting in 1968 gradually, but that is an estimate.

### **General Comments About the Government**

Several interviewees complained that government employees do not listen to their problems. Most relate to a lack of communication between government representatives and local people.

“Government should listen to Inuit, we should be able to hunt in summer. The quota should be open all year.”

“Last summer someone caught a harp seal with a square head from sickness. Inuit don’t want to eat sick or skinny seals. What should I do about these things?”

Interviewer: “Take a sample and give it to the wildlife officer.”

“We tried to go to the officer but we are always told to just throw it away because they don’t believe there is sickness or skinniness.”

“I was camping with my brother and I killed a bear that was wrecking my tent near Tasialuit, south of Canso Channel, last summer. The wildlife officer wanted to come and take a picture but he never came. Why? Doesn’t he care?

Interviewer: “Tell him again. Maybe he doesn’t have money to give to you.”

“I won’t go to him again. He won’t help if he didn’t help the first time.

## Part 2 –Quantitative Analysis

The responses to each question as used in the analysis are summarized in frequency tables. Questions that generated significantly different responses based on four criteria regarding the respondents: community, age, sex and hunting status are

### Section 1 Observation on polar bear population and health

Table 1. Forty-six participants gave responses to question 1a) ‘Has the bear population increased, decreased or stayed the same over the past 10 or 15 years?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
Increased	39	84.78
Same	4	8.70
Don't know	3	6.52
Total	46	100.00

Table 2. Twenty-eight participants gave responses to question 1b) ‘How do you know the polar bear population has increased?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
Bears are less afraid of people now	1	3.57
More in town	6	21.43
Elders say so	1	3.57
Fewer tagged bears and more signs	2	7.14
More tracks/signs	18	64.29
Total	28	100

Table 3. Twelve participants gave responses to question 1c) ‘Are there more due to natural increase?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
No	5	41.67
Yes	7	58.33
Total	12	100

Table 4. Twelve participants gave responses to question 1d) ‘Are there more due to the quota?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
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No	9	75.00
Yes	3	25.00
Total	12	100.00

Table 5. Twelve participants gave response to question 1e) ‘Are there more due to the environment?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
No	9	75.00
Yes	3	25.00
Total	12	100.00

Table 6. Twenty-two participants gave responses to question 2) ‘Have there any changes in polar bear behaviour during open-water season over the past 10-15 years?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
No change	5	22.73
Less afraid of people	13	59.09
Coming to town more	4	18.18
Total	22	100

Table 7. Thirty participants gave response to question 3) ‘Are there more, fewer or the same number of bears coming to town now compared to 10-15 years ago?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
More	26	86.67
Same	4	13.33
Total	30	100

Table 8. Twenty participants gave responses to question 4a) ‘Are there more, fewer or the same number of bears out on the land in general today compared to 10-15 years ago?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
More	18	90.00
Same	2	10.00
Total	20	100.00

Table 9. Thirteen participants responded to question 4b) ‘Are there more, fewer or the same number of bears out on the land in spring today compared to 10-15 years ago?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
More	12	92.31
Same	1	7.69
Total	13	100.00

Table 10. Twelve participants responded to question 4c) ‘Are there more, fewer or the same number of bears out on the land in summer today compared to 10-15 years ago?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
More	11	91.67
Same	1	8.33
Total	12	100

Table 11. Twenty-three participants responded to question 4d) ‘Are there more, fewer or the same number of bears on the land in fall today compared to 10-15 years ago?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
More	21	91.30
Same	2	8.70
Total	23	100.00

Table 12. Eight participants responded to question 4e) ‘Are there more, fewer or the same number of bears on the land in winter today compared to 10-15 years ago?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
More	7	87.50
Fewer	1	12.50
Total	8	100.00

Table 13. Twenty-nine participants responded to question ‘5a) ‘Is there more, less or the same amount of damage caused by bears now compared to 10-15 years ago?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
More	27	93.10
Same	1	3.45
Don't know	1	3.45
Total	29	100.00

Table 14. Twenty participants responded to question 5b) Is there more, less or the same amount of destruction of meat caches now compared to 10-15 years ago?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
More	20	100.00

Table 15. Twenty-six participants responded to question 5c) ‘Is the reason for increased damage that there are more bears?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
No	13	50.00
Yes	13	50.00
Total	26	100.00



Table 16. Twenty-six participants responded to question 5d) ‘Is this increased damage caused by the presence of more people and more human objects?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
No	18	69.23
Yes	8	30.77
Total	26	100.00

Table 17. Twenty-six participants responded to question 5e) ‘Is this increased damage caused by a change in bear behavior?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
No	15	57.69
Yes	11	42.31
Total	26	100.00

Table 18. Ten participants responded to question 6a) ‘What is the health of bears that come to town compared to other bears?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
Skinny	4	40.00
Fat	1	10.00
No pattern	4	40.00
Skinny ones keep coming back	1	10.00
Total	10	100.00

Table 19. Twenty-four participants responded to question 6b) ‘Is there more, less or no trend in skinniness of polar bears over the past 10-15 years?’ The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
More skinny	11	45.83
No trend	13	54.17
Total	24	100.00

Table 20. Ten participants responded to question 6c) ‘Is there any difference in the behaviour of skinny bears compared to other bears?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
Skinny bears are not afraid	1	10.00
Skinny bears are aggressive	3	30.00
Skinny bears keep coming back	6	60.00
Total	10	100.00

Table 21. Ten participants responded to question 6d) ‘Is the reason for skinniness in polar bears caused by an increasing bear population?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
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No	5	50.00
Yes	5	50.00
Total	10	100.00

Table 22. Ten participants responded to question 6e) ‘Is the reason for skinniness in polar bears that there is a problem with the environment?’ The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
No	6	60.00
Yes	4	40.00
Total	10	100.00

Table 23. Ten participants responded to question 6f) ‘Is the reason for skinniness in polar bears increased interactions with people?’ The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
No	6	60.00
Yes	4	40.00
Total	10	100.00

Table 24. Fifteen people responded to question 6g) ‘Have there been any other changes in polar bear health over the past 10-15 years?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
Increased predation deaths	1	6.67
Increased accidental deaths	2	13.33
Loss of hearing	6	40.00
No change	5	33.33
More unhealthy bears	1	6.67
Total	15	100.00

## Section 2 Observation regarding climate change

Table 25. Thirty people responded to question 7a) ‘Have there been any changes in the sea ice over the past 10-15 years?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
No trend	4	13.33
Yes	25	83.33
Don't know	1	3.33
Total	30	100.00

Table 26. Twelve people responded to question 7b) ‘Are there any changes in the number of cracks in the land-fast ice over the last 10-15 years?’. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
More	4	33.33

No trend	5	41.67
Fewer	2	16.67
Don't know	1	8.33
Total	12	100.00

Table 27. Twenty-one participants responded to question 7c) 'Has the location of the floe edge changed over the last 10-15 years?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
Same	3	14.29
Closer to land	16	76.19
Don't know	2	9.52
Total	21	100.00

Table 28. Nine participants responded to question 7d) 'Has there been any change in the amount of snow over the past 10-15 years?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
More	2	22.22
No trend	5	55.56
Less	2	22.22
Total	9	100

Table 29. Fourteen participants responded to question 7e) 'Has there been any change in the thickness of the sea ice over the past 10-15 years?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
Thinner	12	85.71
Variable	2	14.29
Total	14	100.00

Table 30. Four people responded to question 7f) 'Has there been any change in the brittleness of the sea ice over the past 10-15 years?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
More brittle	3	50.00
Less brittle/softer	3	50.00
Total	6	100.00

Table 31. Thirty-three people responded to question 7g) 'Has there been any change in the number of icebergs grounding around here over the past 10-15 years?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
Fewer	27	81.82
No trend	6	18.18
Total	33	100.00

Table 32. Seven participants responded to question 7h) Has there been any change in the amount of wind over the past 10-15 years?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
More	3	42.86
No trend	3	42.86
Less	1	14.29
Total	7	100.00

Table 33. Seven participants responded to question 7i) Has there been any change in the ocean currents over the past 10-15 years?'. The frequency of specific responses and the percent of total responses are listed

Response	Frequency	Response Percent
No trend	4	57.14
Moving in different direction	2	28.57
Slower	1	14.29
Total	7	100.00

Table 34. Sixteen participants responded to question 7j) Has there been any change in the amount of rough ice over the past 10-15 years? '. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
More	10	62.50
No trend	5	31.25
Don't know	1	6.25
Total	16	100.00

Table 35. Thirteen participants responded to question 7k) Has there been any change in the timing of sea ice break up over the last 10-15 years?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
Earlier	12	92.31
Same time	1	7.69
Total	13	100.00

Table 36. Eight participants responded to question 7l) Has there been any change in the timing of sea ice freeze up over the last 10-15 years? '. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
No trend	2	25.00
Later	6	75.00
Total	8	100.00

Table 37. Thirty-three participants responded to question 8) Is there any evidence of climate change in this area?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
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Yes	21	63.64
No	9	27.27
Don't know	3	9.09
Total	33	100.00

Table 38. Twelve participants responded to question 9a) 'Could climate change contribute to what you have observed about polar bears?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
Yes	5	41.67
No	3	25.00
Don't know	4	33.33
Total	12	100.00

Table 39. Four participants responded to question 9b) 'How is climate change affecting polar bears?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
Makes them skinny	1	25.00
Changes food quality	1	25.00
Worse ice and permanent snow	2	50.00
Total	4	100.00

### Section 3 Understanding of Management

Table 40. Twelve participants responded to question 10) 'What do you know about Greenlanders hunting polar bears?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
They use dog teams	2	16.67
They wear polar bear clothes	1	8.33
They catch more bears than we do	2	16.67
Don't know	6	50.00
They have a more traditional hunting culture	1	8.33
Total	12	100.00

Table 41. Twenty-three participants responded to question 11a) 'Are you happy with the polar bear quota number for your community?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
Yes	12	52.17
Want more	11	47.83
Total	23	100.00

Table 42. Eleven participants responded to question 11b) Why do you want more polar bear hunting?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
More meat	1	9.09
Too many bears	7	63.64
Scared of bears	2	18.18
Hungry bears in summer are dangerous	1	9.09
Total	11	100.00

Table 43. Sixteen participants responded to question 11c) What is wrong with the quota system?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
Defense kills are taken off the quota and we can't kill cubs	1	6.25
We can't catch cubs	3	18.75
Too many bears in town	3	18.75
It's fine as it is	4	25.00
Bears get used to being scared away	2	12.50
We shouldn't take so many more males than females	2	12.50
Summer hunting is not allowed	1	6.25
Total	16	100.00

Table 44. Ten participants responded to question 12) What do you think of how biologists study polar bears (mark-recapture method)?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
Good	2	20.00
Techniques affect the bears	6	60.00
Neutral	1	10.00
Should listen more to Inuit	1	10.00
Total	10	100.00

Table 45. Twelve participants responded to question 13a) Have bears increased since the quota system began?'. The frequency of specific responses and the percent of total responses are listed.

Rspnse	Frequency	Response Percent
Yes	12	100.00
Total	12	100.00

Table 46. Twelve participants responded to question 13b) Did the quota system increase the polar bear population?'. The frequency of specific responses and the percent of total responses are listed.

Response	Frequency	Response Percent
Yes	9	75.00
No	1	8.33
Don't know	2	16.67
Total	12	100.00

There were no significant differences in responses between male and female participants (sex) and no significant differences in responses based on age. Table 47 lists the observed levels of significance ( $p$ ) associated with a 2-tailed Fisher's Exact Test (SPSS© for Windows, version 11.0.1) for community and hunter status. Tables 48-57 illustrate the observed differences

Table 47. The observed level of significance (Fisher's exact test, SPSS© for Windows, version 11.0.1) is listed by the categories of community (Pond Inlet, Clyde River and Qikiqtarjuaq) and hunter status (Active or Non-Active) for each question or topic discussed by participants during the survey that produced a significant result ( $p < .150$ ) in one of the two categories. In cases where significant results were found for only one of the two categories, the observed significance is given for both, for comparison. Differences which are significant ( $p < 0.150$ ) are boldfaced and these responses are summarized in more detail in subsequent cross tabulations.

Question	Category Comparison	
	Community $p$	Hunter Status $p$
1a ) Has the bear population increased, decreased or stayed the same over the past 10-15 years?	<b>0.010</b>	<b>0.149</b>
1b) How do you know the polar bear population has increased?	0.328	<b>0.002</b>
3) Are there more, fewer or the same number of bears coming to town now compared to 10-15 years ago?	<b>0.021</b>	0.598
4d) Are there more, fewer or the same number of bears out on the land in fall today compared to 10-15 years ago?	<b>0.119</b>	1.000
5c) Is the reason for increased damage that there are more bears?	<b>0.092</b>	0.695
5d) Is the reason for increased damage that there are more people and more things left out?	<b>0.043</b>	0.216
6e) Is the reason for skinniness in polar bears that there is a problem with the environment?	<b>0.119</b>	0.190
6g) Are there any other health problems in bears?	<b>0.101</b>	0.239
7c) Any changes in the distance to the floe edge now compared to 10-15 years ago?	0.246	<b>0.149</b>
11c) What are problems with the quota system?	<b>0.079</b>	0.901

### Community Differences

Table 48. Cross tabulation of question 1a) 'Has the bear population increased, decreased or stayed the same over the past 10-15 years' and Community ( $p = 0.01$ ).

			Community			Total
			Pond Inlet	Clyde River	Qikiqtarjuaq	
Has the	Increased	Count	14	16	9	39

bear population changed?		% within Has the bear population changed?	35.90	41.03	23.08	100.00
		% within Community	100.00	94.12	60.00	84.78
		% of Total	30.43	34.78	19.57	84.78
	Same size	Count		1	3	4
		% within Has the bear population changed?		25.00	75.00	100.00
		% within Community		5.88	20.00	8.70
		% of Total		2.17	6.52	8.70
	Don't know	Count			3	3
		% within Has the bear population changed?			100.00	100.00
		% within Community			20.00	6.52
		% of Total			6.52	6.52
	Total	Count	14	17	15	46
		% within Has the bear population changed?	30.43	36.96	32.61	100.00
		% within Community	100.00	100.00	100.00	100.00

Table 49. Cross tabulation of question 3) 'Are there more, fewer or the same number of bears coming to town now compared to 10-15 years ago?' and Community ( $p = 0.021$ ).

			Community			Total
			Pond Inlet	Clyde River	Qikiqtarjuaq	
Are more, fewer or the same number coming to town?	More	Count	8	15	3	26
		% within number coming to town?	30.77	57.69	11.54	100.00
		% within Community	100.00	93.75	50.00	86.67
		% of Total	26.67	50.00	10.00	86.67
	Same number	Count		1	3	4
		% within number coming to town?		25.00	75.00	100.00
		% within Community		6.25	50.00	13.33
		% of Total		3.33	10.00	13.33
Total		Count	8	16	6	30
		% within number coming to town?	26.67	53.33	20.00	100.00
		% within Community	100.00	100.00	100.00	100.00

Table 50. Cross tabulation of question 4d) 'Are there more, fewer or the same number of bears out on the land in fall today compared to 10-15 years ago?' and Community ( $p = 0.119$ ).

			Community			Total
			Pond Inlet	Clyde River	Qikiqtarjuaq	
number on land in fall?	More	Count	6	11	4	21
		% within number on land in fall	28.57	52.38	19.05	100.00
		% within Community	100.00	100.00	66.67	91.30
		% of Total	26.09	47.83	17.39	91.30



	Same	Count			2	2
		% within number on land in fall			100.00	100.00
		% within Community			33.33	8.70
		% of Total			8.70	8.70
Total		Count	6	11	6	23
		% within number on land in fall	26.09	47.83	26.09	100.00
		% within Community	100.00	100.00	100.00	100.00

Table 51. Cross tabulation of question 5c) 'Is the reason for increased damage that there are more bears?' and Community ( $p = 0.092$ ).

			Community			Total
			Pond Inlet	Clyde River	Qikiqtarjuaq	
Is the reason more bears?	No	Count	1	8	4	13
		% within Is the reason more bears?	7.69	61.54	30.77	100.00
		% within Community	14.29	61.54	66.67	50.00
		% of Total	3.85	30.77	15.38	50.00
	Yes	Count	6	5	2	13
		% within Is the reason more bears?	46.15	38.46	15.38	100.00
		% within Community	85.71	38.46	33.33	50.00
		% of Total	23.08	19.23	7.69	50.00
Total		Count	7	13	6	26
		% within Is the reason more bears?	26.92	50.00	23.08	100.00
		% within Community	100.00	100.00	100.00	100.00

Table 52. Cross tabulation of question 5d) 'Is the reason for increased damage that there are more people and more things left out?' and Community ( $p = 0.043$ ).

			Community			Total
			Pond Inlet	Clyde River	Qikiqtarjuaq	
Is the reason for increased damage more people and more things left out?	No	Count	7	9	2	18
		% within more people	38.89	50.00	11.11	100.00
		% within Community	100.00	69.23	33.33	69.23
		% of Total	26.92	34.62	7.69	69.23
	Yes	Count		4	4	8
		% within more people		50.00	50.00	100.00
		% within Community		30.77	66.67	30.77
		% of Total		15.38	15.38	30.77
Total		Count	7	13	6	26
		% within more people	26.92	50.00	23.08	100.00
		% within Community	100.00	100.00	100.00	100.00

Table 53. Cross tabulation of question 6e) 'Is the reason for skinniness in polar bears that there is a problem with the environment?' and Community ( $p = 0.119$ )

			Community			Total
			Pond Inlet	Clyde River	Qikiqtarjuaq	
Is skinniness caused by a problem with the	No	Count	3	3		6
		% within is skinniness caused by environment?	50.00	50.00		100.00
		% within Community	100.00	60.00		60.00

environment?	% of Total	30.00	30.00		60.00
Yes	Count		2	2	4
	% within is skinniness caused by environment?		50.00	50.00	100.00
	% within Community		40.00	100.00	40.00
	% of Total		20.00	20.00	40.00
Total	Count	3	5	2	10
	% within is skinniness caused by environment?	30.00	50.00	20.00	100.00
	% within Community	100.00	100.00	100.00	100.00

Table 54. Cross tabulation of question 6g) Are there any other health problems in bears?' and Community ( $p = 0.101$ ).

			Community			Total
			Pond Inlet	Clyde River	Qikiqtarjuaq	
Any other health problems in bears?	Increased predation deaths	Count			1	1
		% within other health			100.00	100.00
		% within Community			50.00	6.67
		% of Total			6.67	6.67
	Increased accidental deaths	Count		1	1	2
		% within other health		50.00	50.00	100.00
		% within Community		12.50	50.00	13.33
		% of Total		6.67	6.67	13.33
	Loss of hearing	Count	4	2		6
		% within other health	66.67	33.33		100.00
		% within Community	80.00	25.00		40.00
		% of Total	26.67	13.33		40.00
	No change	Count	1	4		5
		% within other health	20.00	80.00		100.00
		% within Community	20.00	50.00		33.33
		% of Total	6.67	26.67		33.33
	More unhealthy bears	Count		1		1
		% within other health		100.00		100.00
		% within Community		12.50		6.67
		% of Total		6.67		6.67
Total		Count	5	8	2	15
		% within other health	33.33	53.33	13.33	100.00
		% within Community	100.00	100.00	100.00	100.00

Table 55. Cross tabulation of question 11c) What are problems with the quota system?' and Community ( $p = 0.079$ ).

			Community			Total
			Pond Inlet	Clyde River	Qikiqtarjuaq	
What are problems with the	Defense kills taken off quota and can't kill cubs	Count			1	1

quota system?		% within problems with quota system			100	100
		% within Community			50.00	6.25
		% of Total			6.25	6.25
Not allowed to catch cubs	Count		3			3
		% within problems with quota system		100		100
		% within Community		37.50		18.75
Dangerous to have bears in town		% of Total		18.75		18.75
	Count		3			3
		% within problems with quota system		100		100
It's fine as it is		% within Community		37.50		18.75
		% of Total		18.75		18.75
	Count	2	1	1		4
Bear get used to being scared away		% within problems with quota system	50	25	25	100
		% within Community	33.33	12.50	50.00	25.00
		% of Total	12.5	6.25	6.25	25
Shouldn't take so many males	Count	1	1			2
		% within problems with quota system	50	50		100
		% within Community	16.67	12.50		12.50
Want summer hunting		% of Total	6.25	6.25		12.50
	Count	2				2
		% within problems with quota system	100			100
Total		% within Community	33.33			12.50
		% of Total	12.50			12.50
	Count	1				1
		% within problems with quota system	100			100
		% within Community	16.67			6.25
		% of Total	6.25			6.25
	Count	6	8	2		16
		% within problems with quota system	37.50	50.00	12.50	100
		% within Community	100	100	100	100

### Hunter-Status Differences

Cross tabulations of question responses and hunter status are shown for all cases where a significant difference ( $p < 0.150$ ) was observed.

Table 56. Cross tabulation for question 1b) ‘How do you know the polar bear population has increased?’ and Hunter status ( $p = 0.002$ ).

			Active hunter?		Total
			Yes	No	
How do you know?	Bears are less afraid of people now	Count	1		1
		% within how do you know?	100.00		100.00
		% within Active hunter?	6.25		3.57
		% of Total	3.57		3.57
	More in town	Count		6	6
		% within how do you know?		100.00	100.00
		% within Active hunter?		50.00	21.43
		% of Total		21.43	21.43
	Elders say so	Count	1		1
		% within how do you know?	100.00		100.00
		% within Active hunter?	6.25		3.57
		% of Total	3.57		3.57
	Fewer tagged bears and more signs	Count	1	1	2
		% within how do you know?	50.00	50.00	100.00
		% within Active hunter?	6.25	8.33	7.14
		% of Total	3.57	3.57	7.14
	More tracks/signs	Count	13	5	18
		% within how do you know?	72.22	27.78	100.00
		% within Active hunter?	81.25	41.67	64.29
		% of Total	46.43	17.86	64.29
Total		Count	16	12	28
		% within how do you know?	57.14	42.86	100.00
		% within Active hunter?	100.00	100.00	100.00

Table 57. Cross tabulation for question 7c) ‘Any change in the distance to the floe edge now compared to 10-15 years ago?’ and Hunter Status ( $p = 0.149$ ).

			Active hunter?		Total
			Yes	No	
Distance to floe edge	No change	Count	0	3	3
		% within Floe edge	0.00	100.00	100.00
		% within Active hunter?	0.00	30.00	14.29

		% of Total	0.00	14.29	14.29
	Closer to land now	Count	10	6	16
		% within Floe edge	62.50	37.50	100.00
		% within Active hunter?	90.91	60.00	76.19
		% of Total	47.62	28.57	76.19
	Don't know	Count	1	1	2
		% within Floe edge	50.00	50.00	100.00
		% within Active hunter?	9.09	10.00	9.52
		% of Total	4.76	4.76	9.52
Total		Count	11	10	21
		% within Floe edge	52.38	47.62	100.00
		% within Active hunter?	100.00	100.00	100.00

## Discussion

### Part 1. Quantitative Analysis

People generally think the bear population has increased, because they have seen more bears near human habitation and also bears have been appearing in places that did not used to have bears. Many respondents said that bear behaviour has changed to be more tolerant of people. In Clyde River people noticed more fighting among bears. People often reported that bears are skinnier now than in the past. No one mentioned any difference in the number of cubs seen per female bear, although this was specifically queried during the health section. Some elders in Pond Inlet and Clyde River are concerned about hearing loss in bears caused by noises from machines, dogs and research activities.

Climate change observations varied widely among participants. There is a general consensus that there are fewer icebergs now than in the past, and as a result the floe edge is closer to the land. Respondents did not have a clear idea of how, or if, this was affecting bears. In Qikiqtarjuaq the disappearance of year-round snow in denning areas on the island was mentioned often and given both as evidence of climate change and as evidence to how it might affect bears.

Respondents generally expressed that the problem was that too many bears were seen around people and that it was dangerous. Many people were ignorant of the management system or the reasons for it. They also expressed reluctance to seek better information from either their HTOs or the government. This behaviour may be cultural and should be addressed by wildlife managers.

### Part 2 Quantitative Analysis

In the group of questions from Section 1, regarding population size and bear behaviour, there were significant differences between communities for the responses to three questions, (questions 1a, 3, and 4d) (see tables 48-50). In all three cases, it was Qikiqtarjuaq that stood out from the other communities. Only 60% of respondents in Qikiqtarjuaq felt the bear population had increased over the past 10-15 years, compared

to over 90% of respondents in the other two communities. Likewise, only 50% of respondents in Qikiqtarjuaq felt more bears are coming to town today than 10-15 years ago whereas again, over 90% of respondents in the other communities thought more bears were coming. Qikiqtarjuaq also answered the related question, 4d), about the number of bears on the land in fall, differently from the other communities, with 2/3 of respondents in Qikiqtarjuaq saying there were more bears on the land in fall compared with 100% of the respondents in the other communities.

Most respondents (93.1%) in all communities responded that there is more damage caused by bears today than 10-15 years ago (Table 13, question 5a). During interviews, this topic elicited many responses about why bears were causing more damage. These responses were grouped into reasons, but each respondent could have given more than one reason, so they are not mutually exclusive. In the responses to question 5c) 'Is the reason for increased damage that there are more bears?' Clyde River and Qikiqtarjuaq had most of their answers (roughly 2/3) as no, whereas Pond Inlet respondents mainly said yes (85.71%). In 5d) 'is the reason for increased damage that there are more people and more things left out?' all respondents in Pond Inlet said no, Clyde River was split 69% no and 31% yes, while Qikiqtarjuaq was the opposite with 33% saying no and 67% saying yes.

Responses to questions about bear health (6e and 6g) also showed a significant difference between communities. The three Pond Inlet respondents to question 6e did not feel skinniness in bears is caused by a problem with the environment, while the 2 respondents from Qikiqtarjuaq did. Clyde River respondents were split. In question 6g, about other health problems in bears, Qikiqtarjuaq respondents only discussed natural problems – accidental and predation deaths. The only health problem mentioned in Pond Inlet was loss of hearing. Clyde River respondents had a wide variety of answers including both loss of hearing and natural deaths.

The final question with responses that were significantly different between communities was question 11c) which asked about problems with the quota system. Qikiqtarjuaq had only two respondents, one of which complained about the hunting rules. Pond Inlet respondents likewise complained about rules (shouldn't take so many males (33.33%), and want summer hunting (16.67%)) but one respondent also mentioned that bears get used to being scared away. This relates to the safety issue of having bears around that are used to people, a problem expressed by 50% of Clyde respondents (bears get used to being scared away and it's dangerous to have bears in town).

There seems to be a gradient from north to south in the communities, with Pond Inlet responding most strongly and Qikiqtarjuaq responding least strongly that there has been a bear population increase. Pond Inlet also attributes the increased bear damage they are experiencing with an increased polar bear population, while the other communities did not think this was the cause of the increased damage. Qikiqtarjuaq respondents had a much stronger view that the increased damage was caused by more people and more cabins, equipment and other objects being left out. This view was not shared by Pond Inlet at all and Clyde River was intermediate. The same sort of gradient can be seen in

the interpretive questions (5c, 5d and 6e). Pond Inlet respondents stated that behavioural changes were caused by the increased number of bears and they discussed a loss of hearing in bears. Qikiqtarjuaq gave other explanations for behavioural changes and did not mention hearing loss, while Clyde River expressing a mixture of opinions. This gradient of responses to interpretive questions may represent a gradient in communications between the communities, since people from Clyde River interact with both of the other communities more than Pond Inlet and Qikiqtarjuaq interact with each other. The final question that showed significant differences between the communities was question 11c) (Table 55). Clyde River respondents were more likely to express safety concerns about bears. Clyde River experiences high densities of bears near the community each fall, which explains their greater concern with human safety.

Hunting status was the other criteria used to group respondents that showed significant results between categories. These differences are not surprising given the areas in which each group spends most of their time. It verifies that respondents were answering questions based on their own observations rather than things they had heard from others.

The majority of hunters (81.25%) responded that they knew there were more bears (Question 1b, Table 56) because they had seen more tracks or signs of bears as well as live bears on the land. Half of non-hunters responded that they knew there were more bears because they had seen more in town, while 41.67% said they had seen more sign on the land. There was also a significant difference between hunters and non-hunters for question 7c (Table 57), regarding the distance to the floe edge. Nearly all hunters (90.91%) said the floe edge is closer to land now, whereas 60% of non-hunters said the same thing and 30% of non-hunters said there is no change in distance to the floe edge now compared to 10-15 years ago.

### **Discussion on Methodologies Applied in Analysis of Data**

Both qualitative and quantitative methodology yielded similar perspectives. The qualitative approach allowed a more integrated interpretation of participant responses because the response could be considered in the context of other related responses. The quantitative approach is more objective but may not capture some nuances of participants' responses. This approach worked best for questions where there were a limited number of responses, such as yes or no. The quantitative approach also illuminated relationships between questions and groups of respondents that were not apparent in the qualitative analysis.

### **Recommendations**

- More education on science-based polar bear management should be made available for all community members
- Communication between government employees and community members should be improved
- Safety issues should be dealt with, especially in Clyde River
- Further study of the effects of climate change on polar bears, particularly in Baffin Bay, would be beneficial for management

- The apparent decreasing gradient in polar bear numbers from north to south could be explored.

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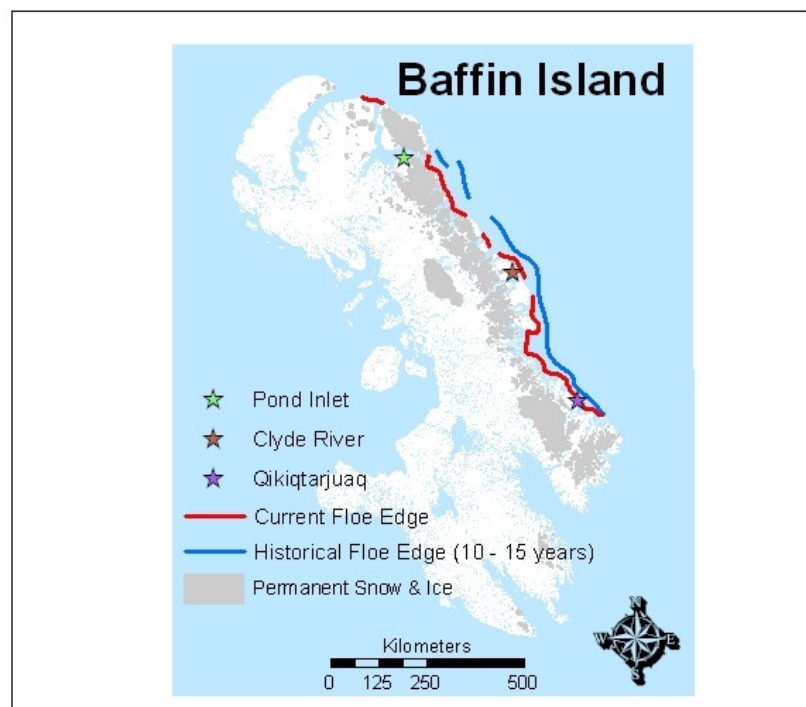


Figure 1. Map of Baffin Island showing present floe edge and past (10-15 years ago) floe edge as reported by participants in survey.

## **Appendix 1 Interview Questions**

Q 1. Has the polar bear population increased, decreased or stayed the same over the past 10 to 15 years?

Supplemental questions: How do you know? Why has the population increased?

Q 2. In open water season have you seen changes in polar bear behaviour such as when they come to shore or what they do once they are on shore?

Q 3. Are there more or fewer bears around town now than 10-15 years ago?

Q 4. Compared to 15-20 years ago are there more, fewer or the same number of tracks, bear kills and bears seen when you go hunting in spring, summer, fall, winter?

Q 5. Is there more, less or the same amount of damage to cabins, meat caches and other equipment? If there is more, why do you think that is happening?

Q 6. What is the health of the bears that come to town?

Q 7. Have there been any changes in the ice? Floe edge, icebergs, rough ice, changes in amount of snow?

Q 8. Have you heard of global climate change? Have you seen any evidence of it in your area?

Q 9. Could climate change contribute to what you have observed about polar bears?

Q 10. What do you know about polar bear hunting by Greenlanders?

Q 11. Can you tell me about the quota system here? Do you agree with it?

Q 12. What do you think about biologists catching bears?

Q 13. Were there more or fewer bears before the quota system began?