

# Polar Bear Monitoring and Research in Nunavut

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## Purpose of the presentation

*My goal is to describe **how** we collect scientific data to address the needs of decision makers*



## Purpose of the presentation

*My goal is not to explain **why** we monitor polar bear populations or **how** management decisions are made*



These issues have been covered by other people at this symposium.

The polar bear program provides scientific and some Inuit Knowledge information for the decision makers. However most Inuit Knowledge information is provided by our social science expert, Moshi Kotierk, who will be giving a presentation later.

## The use of science to monitor polar bear populations

- Questions asked by decision-makers
- Scientific process
- Scientific methods



I will review the questions asked by decision-makers and the methods that we used to answer these questions and why. I will briefly describe the scientific process as it relates to polar bear monitoring.

## Questions asked by decision-makers

- Are there separate populations of bears?
- How many bears are there?
- Are the populations growing or declining?
- How many can we hunt to meet the *target number*?
- Will climate change affect polar bears?
- Are the bears healthy?

These are the questions asked by decision-makers.

## Questions asked by decision-makers

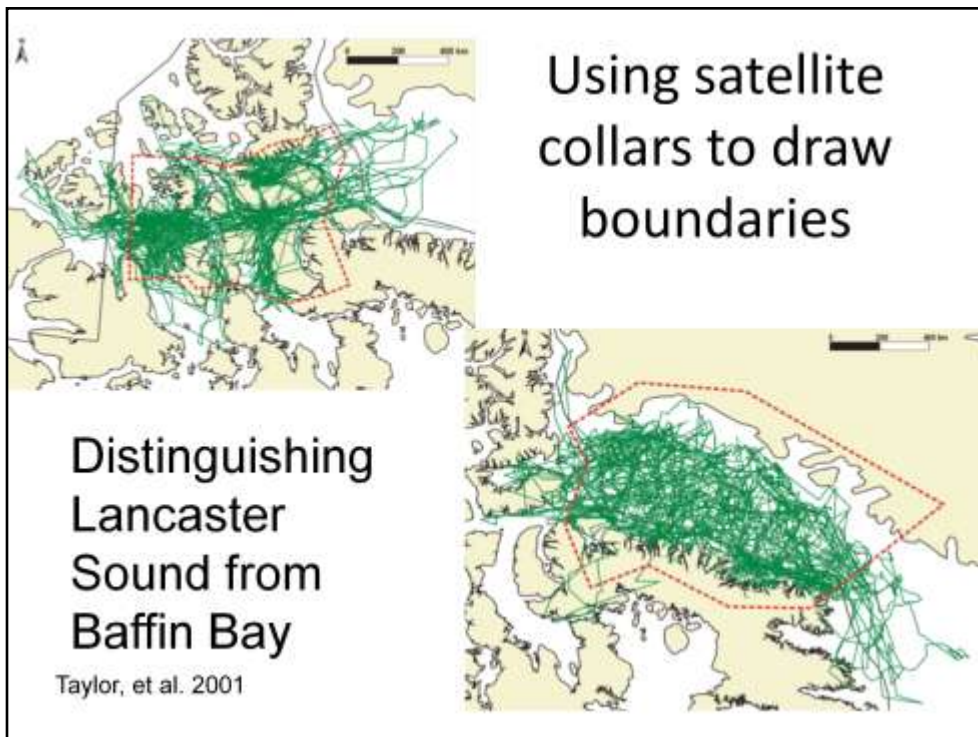
- Are there separate populations of bears?
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First, I'll explain how we determine if there are separate populations of bears.



These are the polar bear populations in Nunavut that we currently use as management zones.

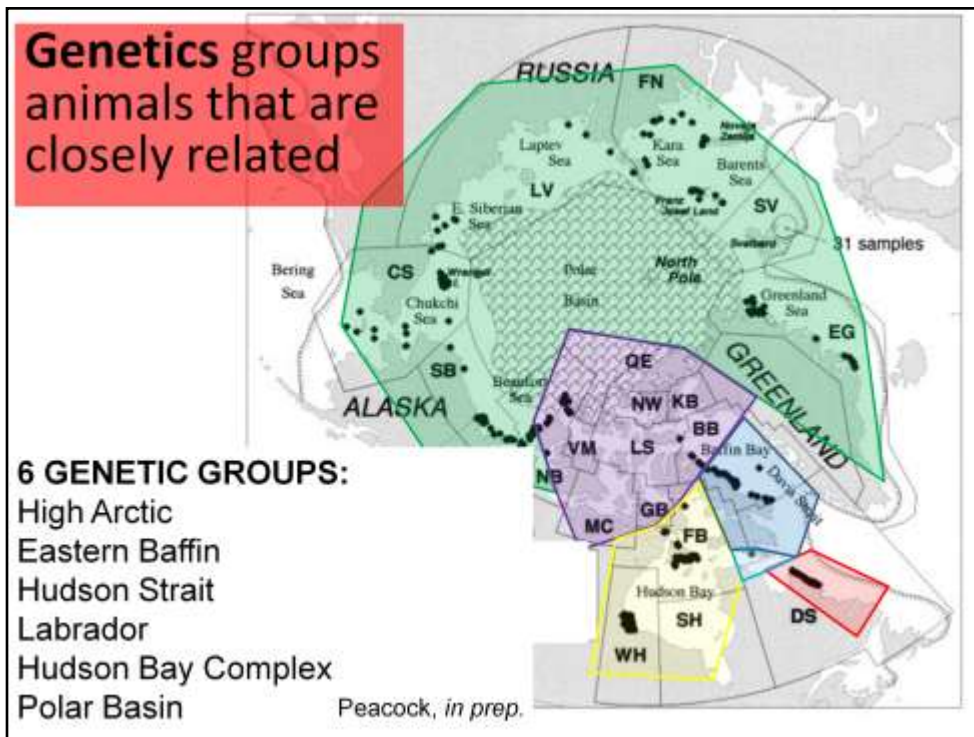
- 19 populations in the world
  - 13 in Canada
  - 12 in Nunavut
- Populations are 'management zones' defined by
  - Harvest & movement of tagged bears
  - Ice movement
  - Genetic relatedness



We put satellite collars on bears and map their movements. We draw boundaries based on the clusters of movements.

This example shows the movements of bears in Lancaster sound and Baffin Bay. These movements creates 2 clusters, which is why we divide these two populations.





We can also use genetics to distinguish groups of polar bears.

Genetic groups are groups of animals that are closely related – they are groups that keep together with mating.

Across the world we can recognize 6 groups of distinct genetic groups:

The High Arctic polar bears cluster together, as do those in eastern Baffin, those in the small area of Hudson Strait, The bears in Labrador are genetically distinct, the bears in Hudson Bay and Foxe Basin cluster together, and finally in green all the bears of the Polar Basin cluster together.

## Questions asked by decision-makers

- Are there separate populations of bears?
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The next question asked by decision makers are how many polar bears are there in the different management zones? Are the populations growing or declining and how many can we hunt to meet the target number or conservation goal.

*MOU 7.1 The intention of DOE is to conduct population inventory studies every 15 years to determine the numbers, and rates of birth and death... The results of these studies will guide future management of [this] population.*

The Memoranda of Understanding signed with the communities currently dictate how we answer these questions – How many bears are there?, and Are the populations growing or declining?

We conduct population inventory studies every 15 years to determine population size and the rates of birth and death.

We have just finished the Davis Strait population inventory, and in 2007 we started the Foxe Basin project.

The rates of birth and death allows us to understand how fast the population is growing. If we know how fast the population is growing we can determine the appropriate harvest to meet the management goal.

For example, if we determine that a population is growing at 4% a year, Inuit can - harvest the population at 4% a year – if the management goal is to maintain the current population size.

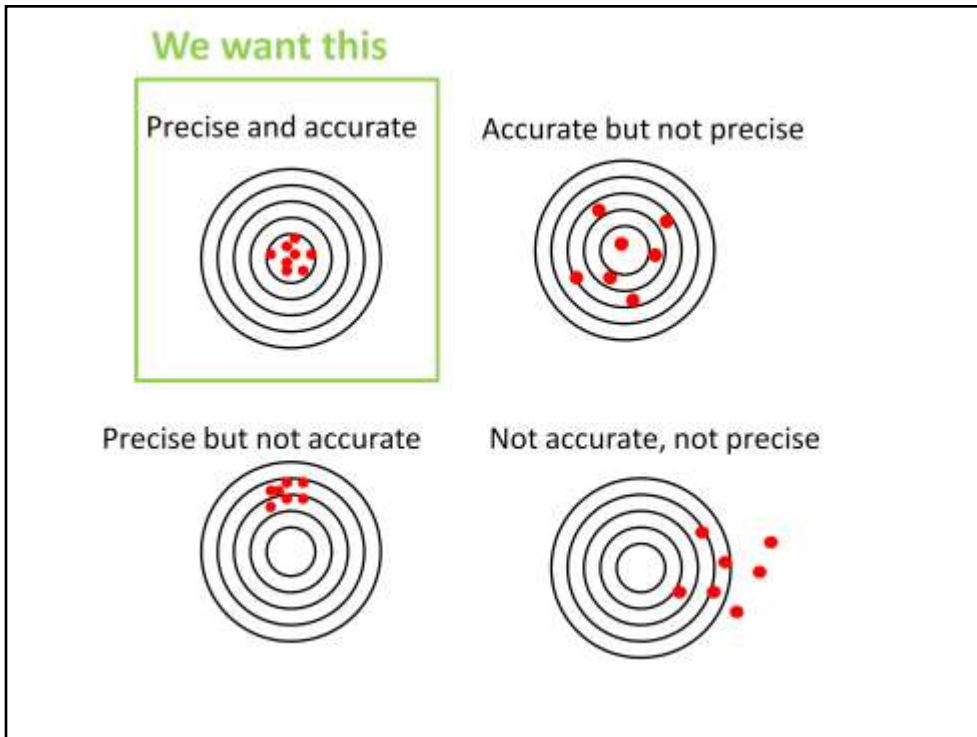
## How do we use science to determine population size and growth?

- Truth can't be known → we make **estimates**
- **Estimates** → Make inferences about nature from **samples**
- **Sampling** → **We don't need to mark all the bears**

How do we use science to determine population size and growth?

As scientists, we know that truth cannot be known. Therefore we use sampling methods to produce estimates that are close to truth.

The main method that we use is mark-recapture. Because mark-recapture is a sampling method, we do not need to mark all the bears.



Estimates of population size have two characteristics. These are accuracy and precision.

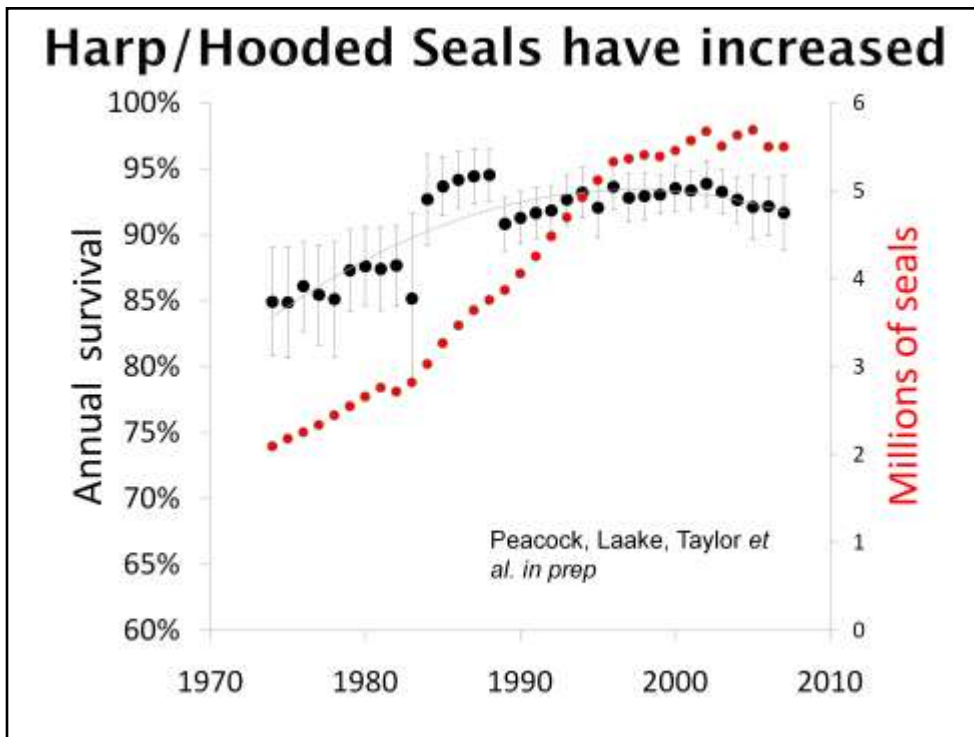
We choose methods to increase accuracy and increase precision.

## We used Mark-Recapture in Davis Strait ... and we have results!

- Davis Strait polar bear population  $2,200 \pm 72$
- This increase is in agreement with Inuit Knowledge
- We have determined the increase is due to:
  - Increase in survival
  - Decrease in harvest rate
  - Increase in seals



You can see that we have an estimate of precision – the estimate is plus or minus 72. We also think this is an accurate population estimate because we had a high sample size and studied all parts of the population.



Annual survival of polar bears in Davis Strait has increased since the 1970's

For example in the 1970's annual survival was only 85%. Now, an adult female has a 91% chance of surviving every year.

We think that survival of bears in Davis Strait has increased because of an increase in the number of seals.

## How do we mark bears?

*with ear tags and tattoos  
through physical  
capture*



To conduct mark-recapture, we have to mark polar bears with individual numbers. We must mark them so we can follow them through time, and know if they have survived.



## Incorporating Inuit Values: reducing handling & capture

- Our goal is to reduce handling time:
  - We do not take blood
  - We do not weigh bears
  - We do not take teeth from young
  - We will no longer take fat from live-captures
  - We keep handling time to 10 – 15 minutes/bear
- Use RFID tags to reduce recaptures
- Keep capture mortality low
  - Capture mortality rate 0.003  
(8 out of 2,300 capture events)



We understand that there is discomfort among Inuit that we handle animals. We have heard this at our community meetings.

However mark-recapture gives us the most accurate and precise information. The better the information – the more confidence in defending harvest rates.

We take great strides to decrease handling in Nunavut. Our handling procedures in Davis Strait were approved by the Quebec Animal Care & Use Committee, as in Nunavut we don't have an Animal Care & Use Committee (however hopefully in this symposium we will start the process to have our own). Our handling procedures are humane, and in order to incorporate Inuit Values – we choose NOT to do some procedures that are used in other jurisdictions.

## Foxe Basin Polar Bear Research



## **Objectives of the Foxe Basin Project**

- **Population delineation**

What are the boundaries?

- **Population size**

How many are there?

- **Population status**

How fast is it growing?



**WHAT IS THE SUSTAINABLE  
HARVEST RATE?**

We would also like to use mark-recapture to estimate population size and growth in the Foxe Basin management zone.

We came to all Foxe Basin communities in 2007 to consult on this project and discussed using mark-recapture to estimate the population size and determine the sustainable harvest rate.

The last population estimate for Foxe Basin was made in 1994.

## Objectives of the Foxe Basin Project

Develop less-intrusive  
methods that conform to

*Inuit Societal Values*  
(Pinasuaqtavut)



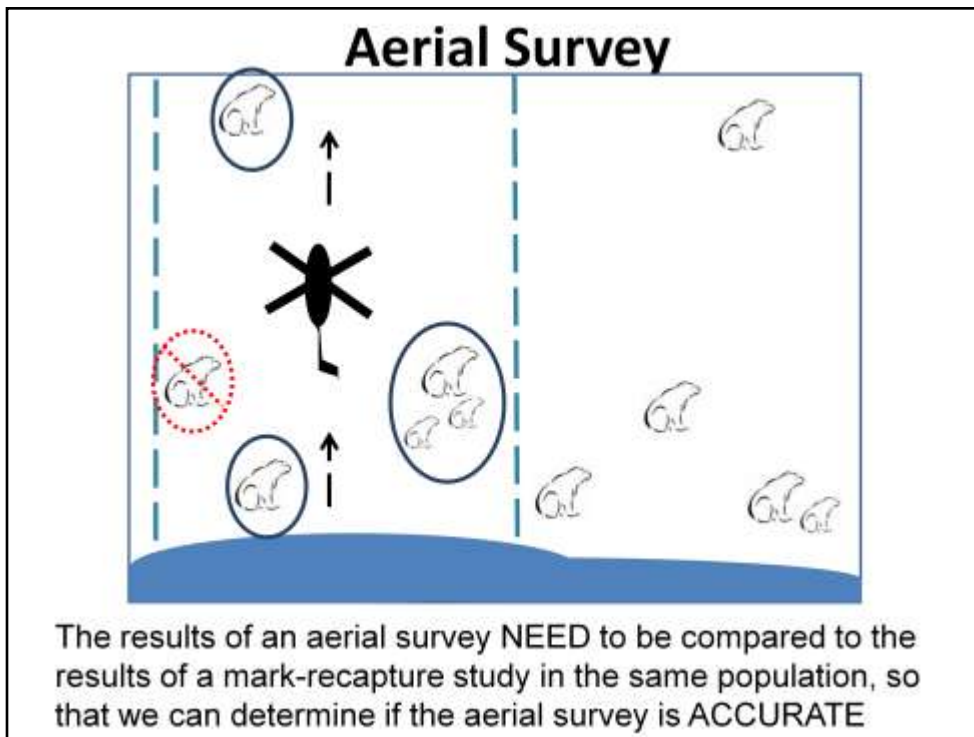
Can *aerial surveys* be used to accurately  
and precisely estimate bear populations?

During my visits to the Foxe Basin communities in 2007 and 2008, the hunters told me that they did not like that we captured polar bears.

In addition, Pinasuaqtavut – the long term vision of the Government of Nunavut - guides us to incorporate Inuit Societal Values in the working of government. Therefore, I have decided to develop a less-intrusive method of estimating population size for polar bears.

However, aerial surveys for polar bears have not been very successful. This method is often not precise and inaccurate.

However, we want to try and improve this method.



## Aerial Survey

In an aerial survey, observers count the animals seen, measure how far the animals are from the aircraft, and record which person saw the bears. By comparing who sees which bears, we can determine the probability of **not** seeing a bear. By combining the number of bears seen and the probability of not seeing a bear we can estimate how many bears there are.

Because the aerial survey is new, we must test it. This means we want to compare the population estimate from the aerial survey, with a population estimate from our traditional method.

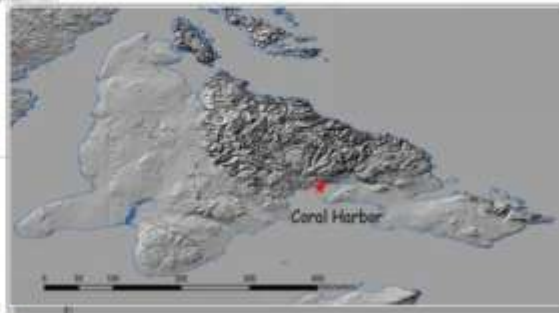
The results of an aerial survey **NEED** to be compared to the results of a mark-recapture study in the same population, so that we can determine if the aerial survey is **ACCURATE**

If we can prove that the aerial survey works in Foxe Basin – our goal is to use aerial surveys to estimate population size of all Nunavut polar bear populations, instead of capturing bears.

Our goal is to capture fewer bears, but it will take some time to test the new method.

## Aerial Survey: Results, 2008

- ~3885 km flown over 5 days
- 170 independent bears and 94 cubs and yearlings  
(Average group size: 1.55)
- ~240 independent bears



Stapleton, Peacock et al. in prep

## Questions asked by decision-makers

- Are there separate populations of bears?
- How many bears are there?
- Are the populations growing or declining?
- How many can we hunt to meet the *target number*?
- Will climate change affect polar bears?
- Are the bears healthy?

The next question asked by decision makers are whether climate change will affect polar bears

## Objectives of the Foxe Basin Project

- How do polar bears use habitat?

– *Inuit*

*Qaujimajaiugangit*

- Interviews by Vicki Sahanatein

– Satellite collars



**If habitat changes as predicted, how will this affect bear habitat use and the bears?**

Our third objective of the Foxe Basin project is to determine how polar bears use habitat, and when ice habitat changes in Foxe Basin, how will this affect the distribution of polar bears.

To do this project we are using two methods.

We are using interviews of hunters to collect information about habitat use of polar bears. Some of you have already been interviewed by Vicki Sahanatein. We are also using the satellite collars that we deployed to understand polar bear habitat use.



# Will climate change affect polar bears?

Use of Inuit Knowledge Interviews in Foxe Basin with questions on:

- Polar Bear Habitat and Movements
- Sea Ice and Polynya
- Polar Bear Denning
- Polar Bear Behavior
- Polar Bear Condition



Will climate change affect polar bears?

These are the questions that we are asking hunters in the Foxe Basin Communities.

# Will climate change affect polar bears?

Use of satellite telemetry in Foxe Basin to study:

- Polar Bear Habitat and Movements
- Use of Sea Ice and Polynyas

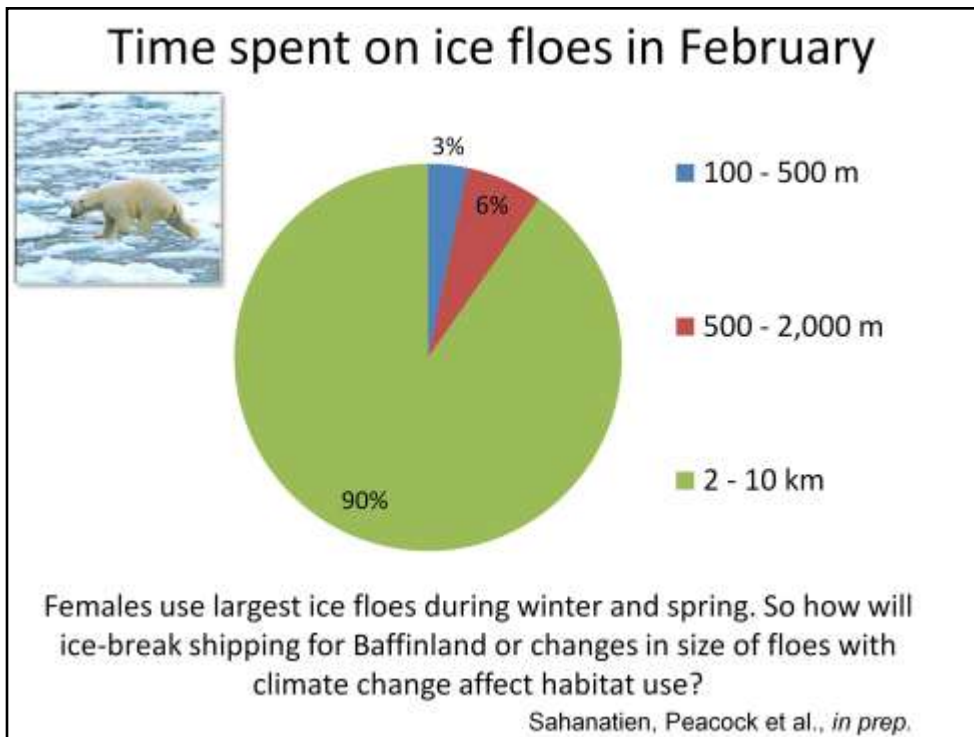
Satellite tag on adult male



Satellite collar on adult female



We will ask the same questions using scientific methods by using satellite tags on adult males and satellite collars on adult females.



Here are some results to date.

Female polar bears use largest ice floes during winter and spring. So how will ice-break shipping for Baffinland or changes in size of floes with climate change affect habitat use?

## Questions asked by decision-makers

- Are there separate populations of bears?
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- Will climate change affect polar bears?
- **Are the bears healthy?**

The next question asked by decision makers are how many polar bears are there in the different management zones?

# Are the bears healthy?

Contaminant monitoring using samples of fat turned in from hunters



In terms of bear health, one aspect that we monitor is the level of contaminants in polar bear meat.

This is important to both bear health and Inuit health.

This is also part of our community-based research. Fat samples have been turned in by hunters from their harvested bears.

## Change in Diet effects contaminant exposure



We have found that in western Hudson Bay, there has been a shift in diet.

Bears are eating fewer bearded seals, and more harbour and harp seals.

This has resulted in increased exposure to some contaminants.

# Community-based monitoring

The image is a composite graphic illustrating community-based monitoring for polar bears. It features three main components:

- Condition Index Scale:** A horizontal scale at the top left shows five polar bears of increasing body condition, labeled 1 through 5. Above each bear is a small diagram of its internal organs. Below the bears are five corresponding condition index cards.
- Wildlife Sighting Report Form:** A blue form titled "WILDLIFE SIGHTING REPORT" is on the right. It includes fields for Species, Community, Officer Name, Date (Day, Month, Year), Time of Day (AM/PM), Observer Name, and Observer Contact. It also has sections for "LOCATION INFORMATION" (Latitude, Longitude, Activity of Prey, Mode of Travel, Temperature (°C), Distance to Bear (m), Habitat, Additional Location Information) and "BEAR INFORMATION" (Activity of bear at first sighting, Activity of bear at end of observation, Number of Bears, Number of Adults, Sex of Adult, Number of Subadults, Sex of Subadult, Number of Independent Offspring, Condition of the bear, Distinguishing Marks or Scars, Radio Collar, Additional Bear Information).
- Girth Measurement Illustration:** A black and white illustration of a polar bear is shown with a girth being measured around its chest.

Text labels in red italics are placed around the components: "Condition index as assessed by hunters" is below the scale; "Sighting reports by hunters" is above the form; and "Girth measured by hunters" is below the bear illustration.

We also use community based monitoring to collect other samples and measures from polar bears.

For a long time we have been collecting tissues to study genetic relationships, teeth to study age structure of populations and measurements to study body size changes.

We now want to add two additional items that can also be measured at the community level. We have created these condition index cards for hunters to evaluate the body condition of the harvested bear on a scale of 1 to 5. We are also including ropes in the hunter kits for hunters to measure the girth of polar bears. By asking hunters to collect information on body condition of polar bears, it is a way to reduce the need to capture live animals for research.

A final initiative that our Department is starting is to send Wildlife Sighting Reports to the HTOs and Conservation Officers. Our new wildlife Deterrent specialist, Sarah Medill, in Igloodik is organizing this effort. Hunters can fill out these forms every time they view a polar bear. We will use your knowledge and information to update our information on polar bear distribution

# Community based monitoring

Tooth aging – to determine changes in selectivity of harvest and health of population



Hunters have been submitting teeth of their harvested bears for a long time.

We age these teeth to determine changes in selectivity of the harvest and health of a population. The age-structure of the population can tell us a lot about the productivity and health of the population.



## How we monitor polar bear populations

- Genetics
- Mark-recapture
- Aerial Survey
- Inuit Knowledge
- Satellite telemetry
- Community-based monitoring



In summary – these are the kinds of methods that we use to monitor polar bear populations in Nunavut.

## How do we use IQ?

- To design surveys (where should we go?) and help interpret movements of bears
- We conduct interviews on traditional knowledge of habitat use of polar bears
- We use Inuit Values to guide our methods
- We use community-based sampling to answer questions about polar bears



I also want to reiterate how my program uses Inuit Knowledge in research.

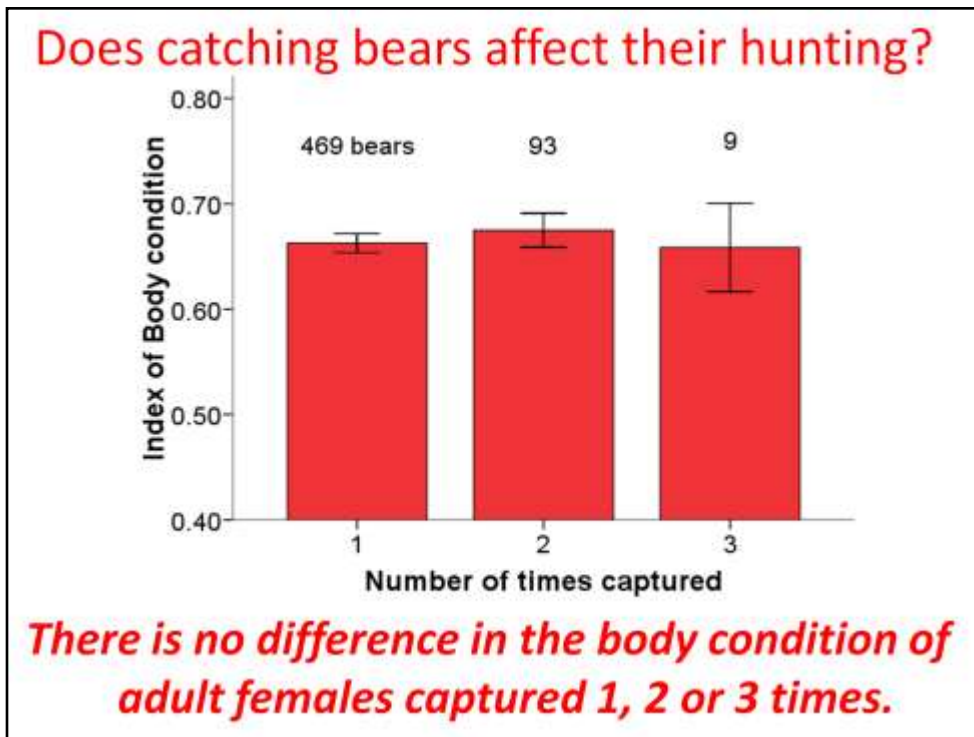
We ask hunters and conservation officers where we should go to find bears. We show maps of movements from satellite collars to people and ask for their interpretation. This is an informal communication/integration of IQ and science, which is difficult to advertise. But be sure that this happens very frequently.

As I have talked about we conduct interviews on traditional knowledge of habitat use of polar bears. We will be integrating these data directly with our scientific data.

We use Inuit Values to guide our methods. This is why we reduce our handling time, choose not to take some of the more invasive samples, look for new technology that can help reduce capture, and finally why we are trying to develop an aerial survey method.

Lastly, we use community-based sampling to answer questions about all aspects of polar bear ecology.



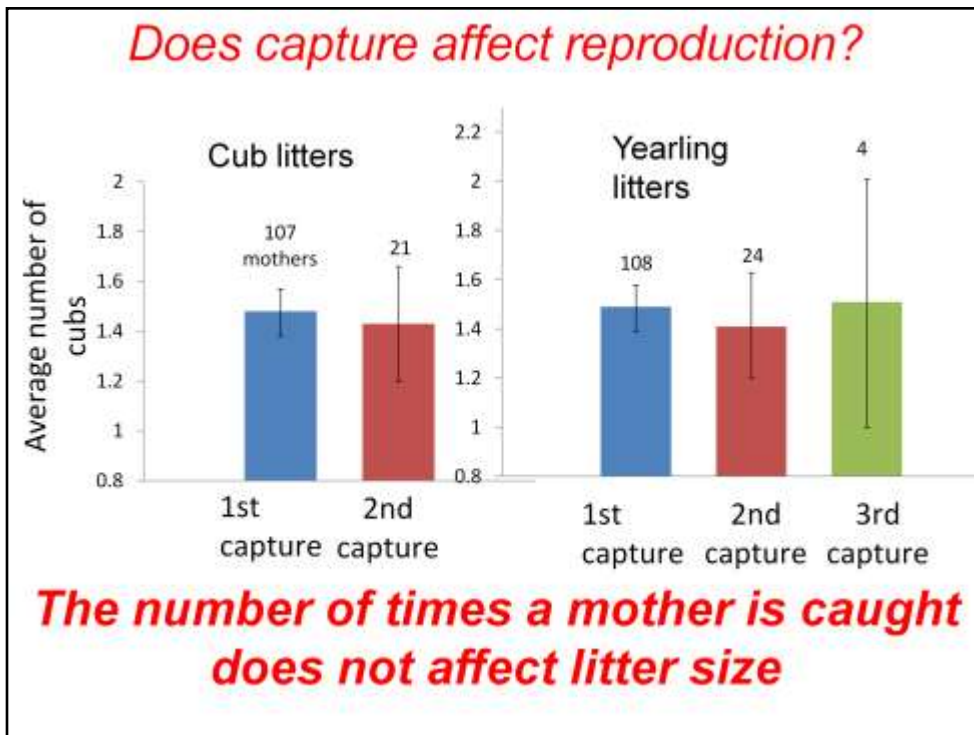


I get many questions at community meetings about the effect of handling on polar bears.

Often people ask if catching bears affect their hunting ability.

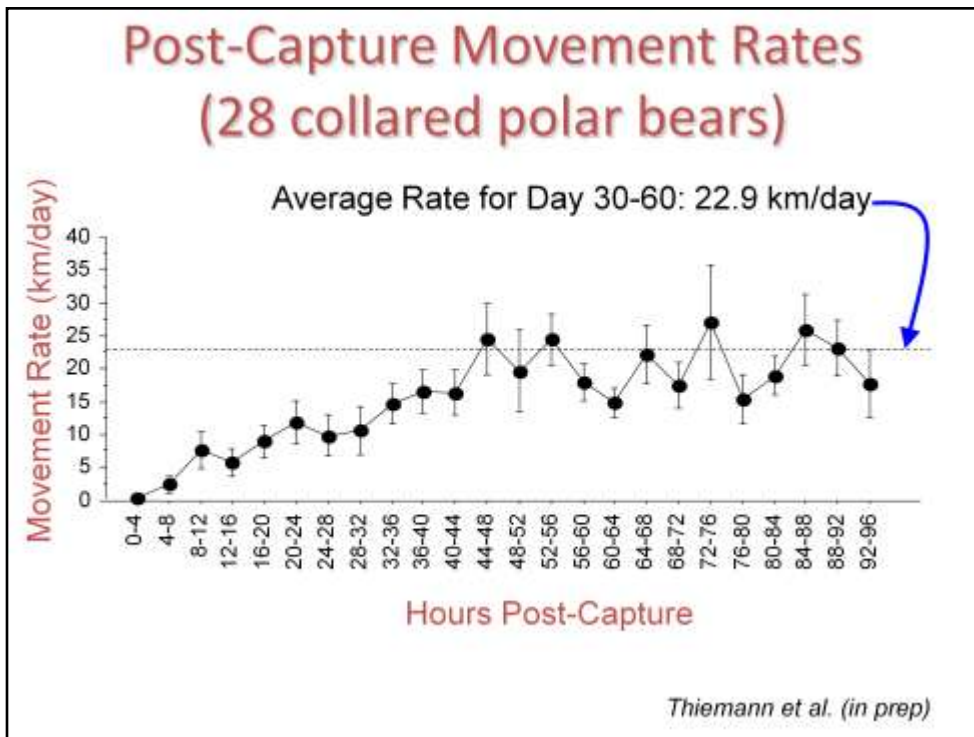
Using the information that we have from Davis Strait – our scientific knowledge suggests that catching bears does not affect their hunting ability.

For example, 571 adult female bears were caught in Davis Strait. 469 one time, 93 two times, and 9 three times. There was no difference in the body condition of females that were caught 1, 2 or 3 times. This means that an animal caught 2 times is in no worse condition than an animal caught 1 time. This suggests that their hunting ability is not hurt.



I also am asked if capturing mother bears makes them less able to have cubs in the future.

Our knowledge from Davis Strait is that the number of times a mother is caught does not affect her litter size. For example a mother that has been captured once has the same number of yearlings as a mother that has been caught two times.



From data from the southern Beaufort Sea, our information from 28 collar bears is that immobilized bears resume their average rate of movement by 48 hours after immobilization