Southern Hudson Bay polar bears: overview of available science

February 4, 2025

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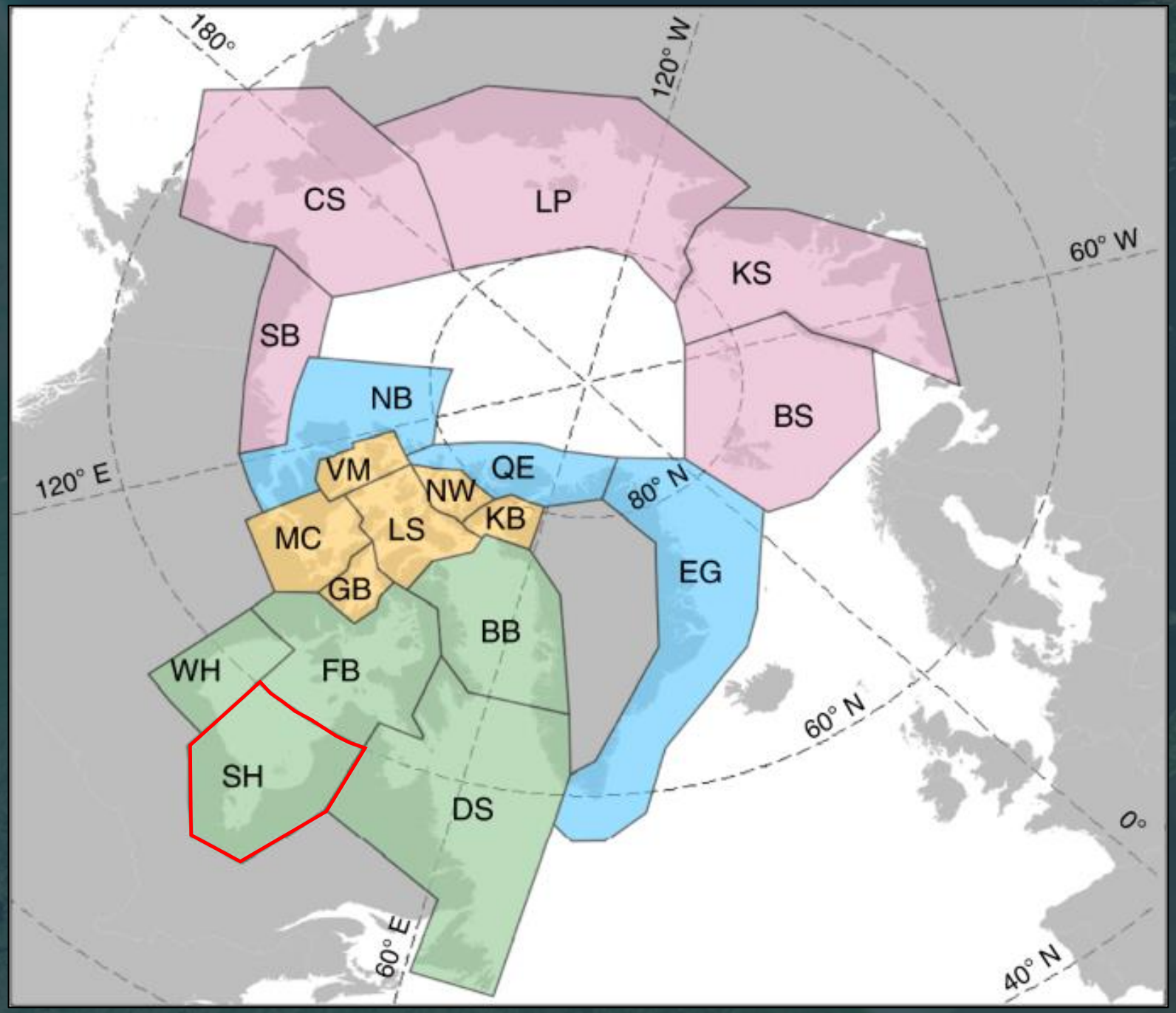
Outline

- General overview of the SH subpopulation

- Scientific information
  - Abundance
  - Survival and reproduction
  - Body condition
  - Movements
  - Genetics
  - Harvest and human-bear conflict

D. Mcgeachy


180°
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CS
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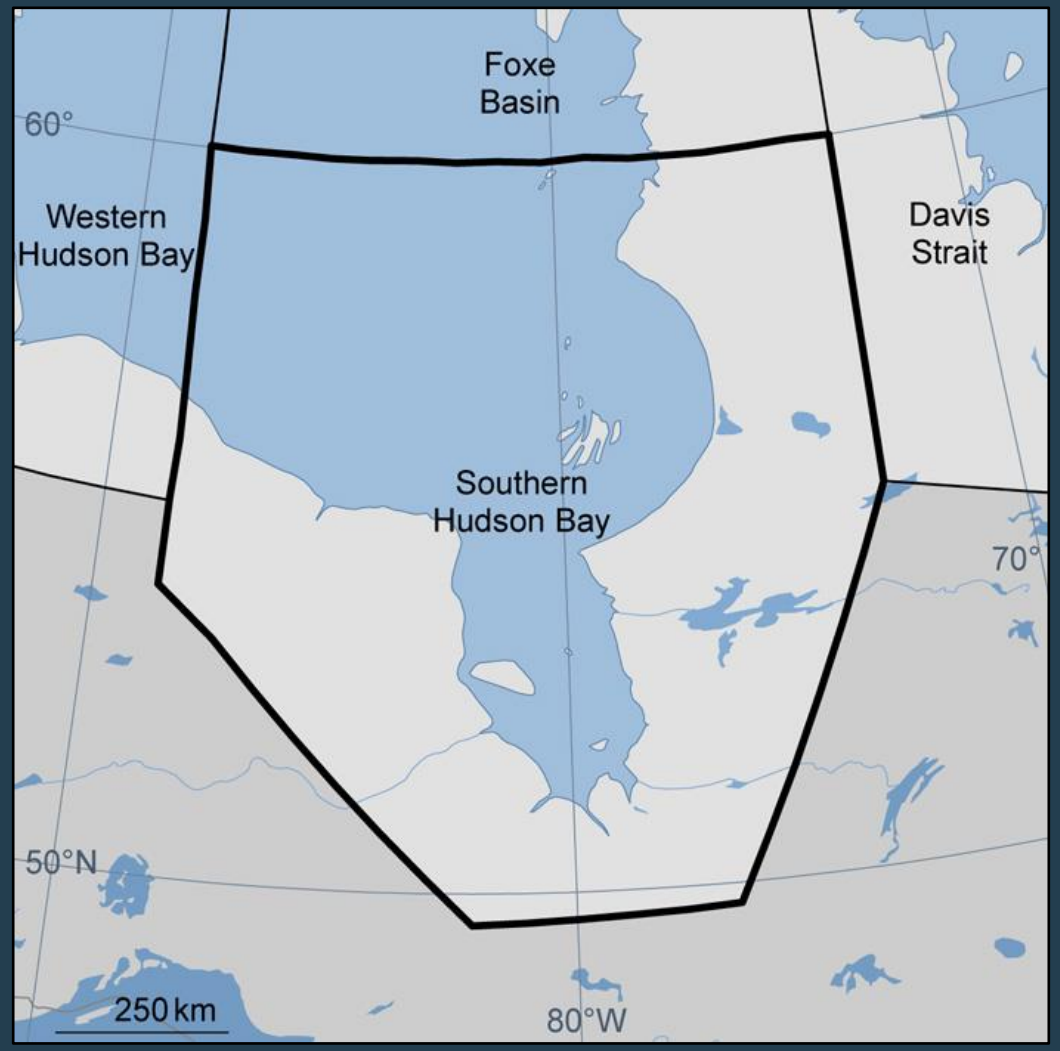
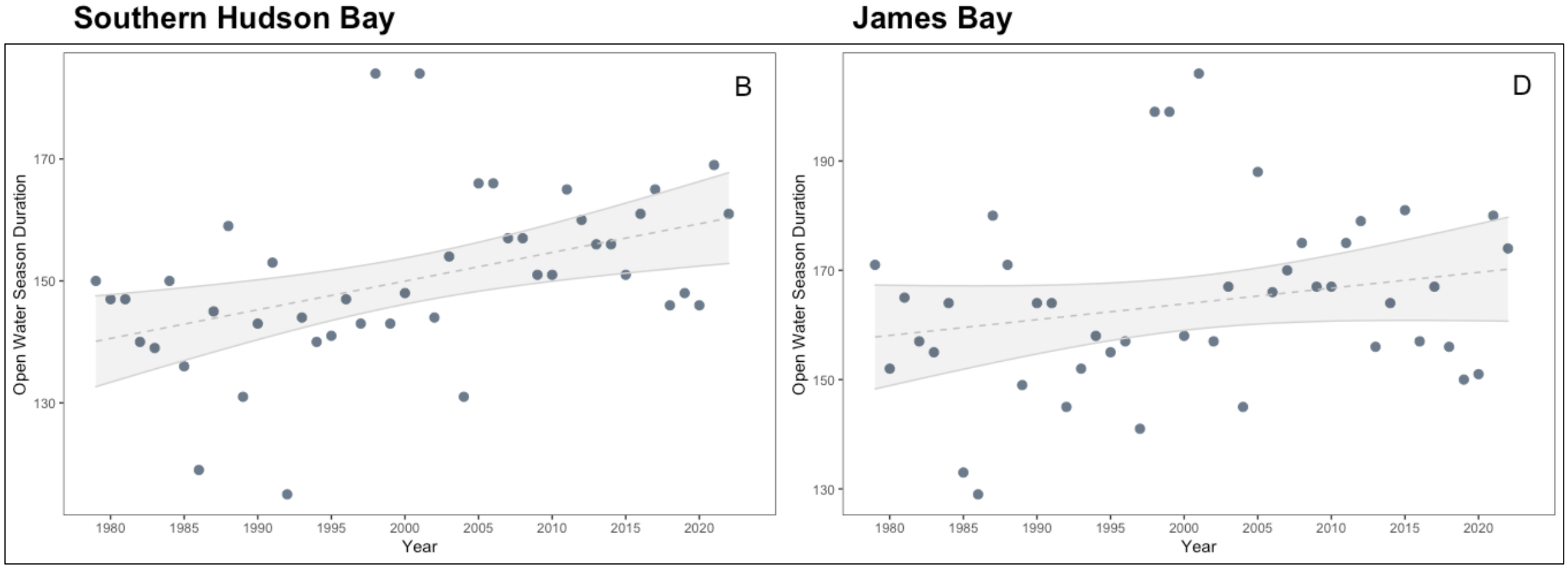
Southern Hudson Bay

- Southern-most regular distribution of polar bears globally

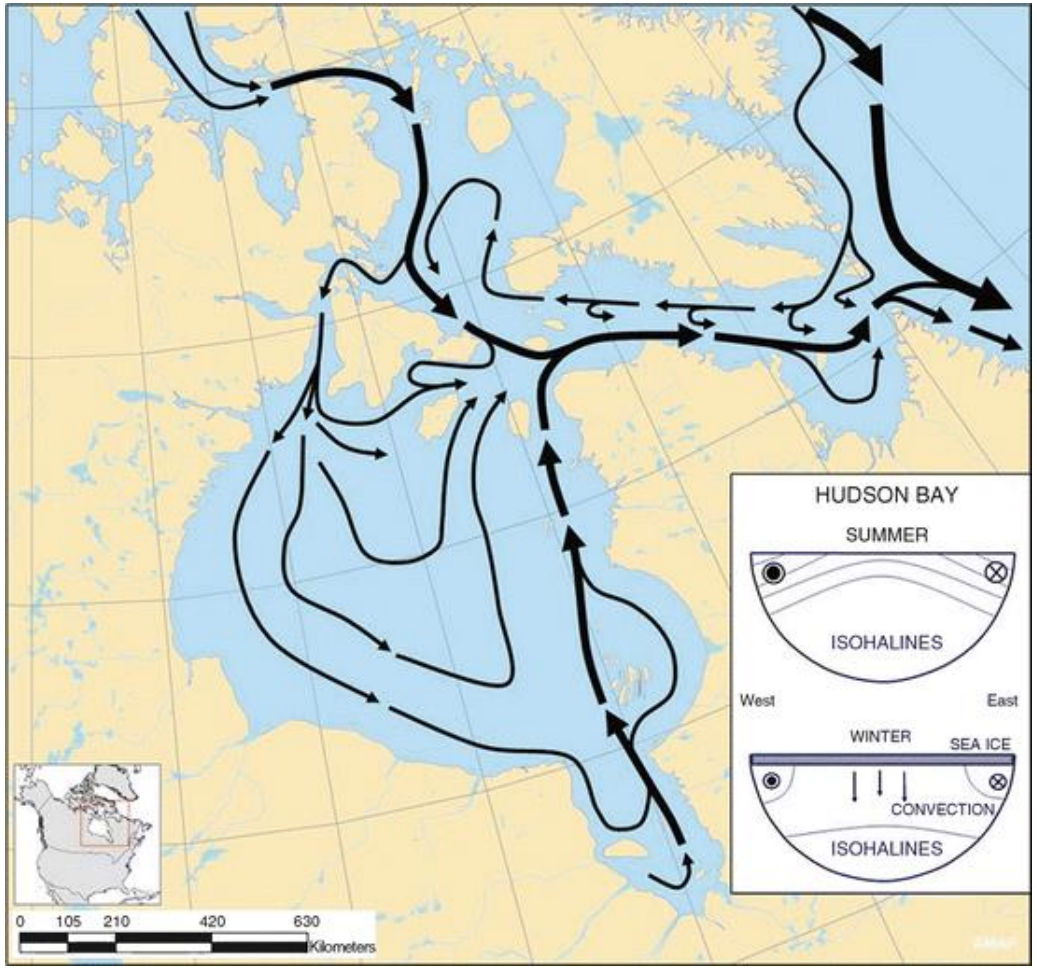


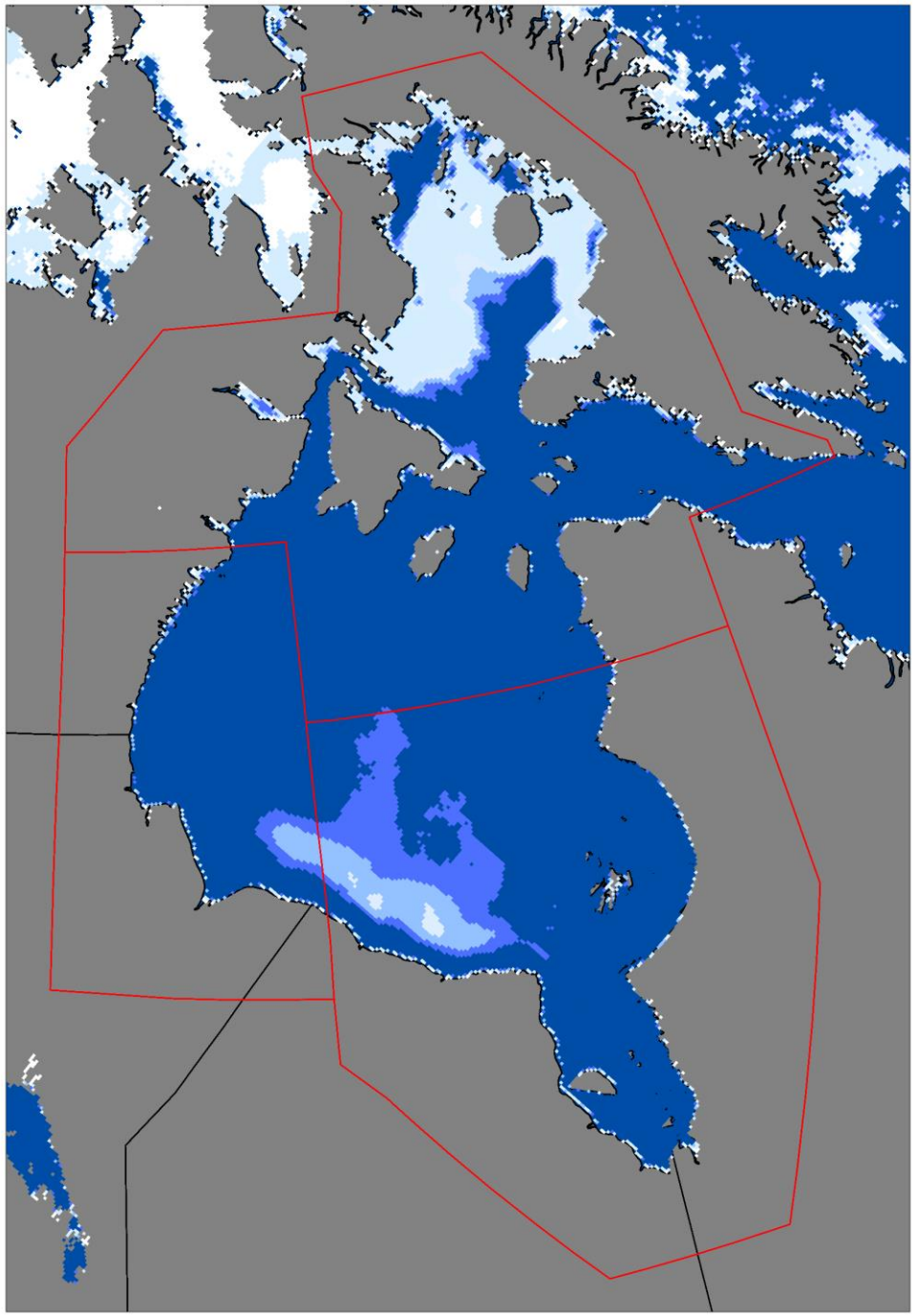
Open water season in SH and James Bay

- ~ 20 days longer now than in the 80s
- James Bay bears are on shore for ~ 6 months each year



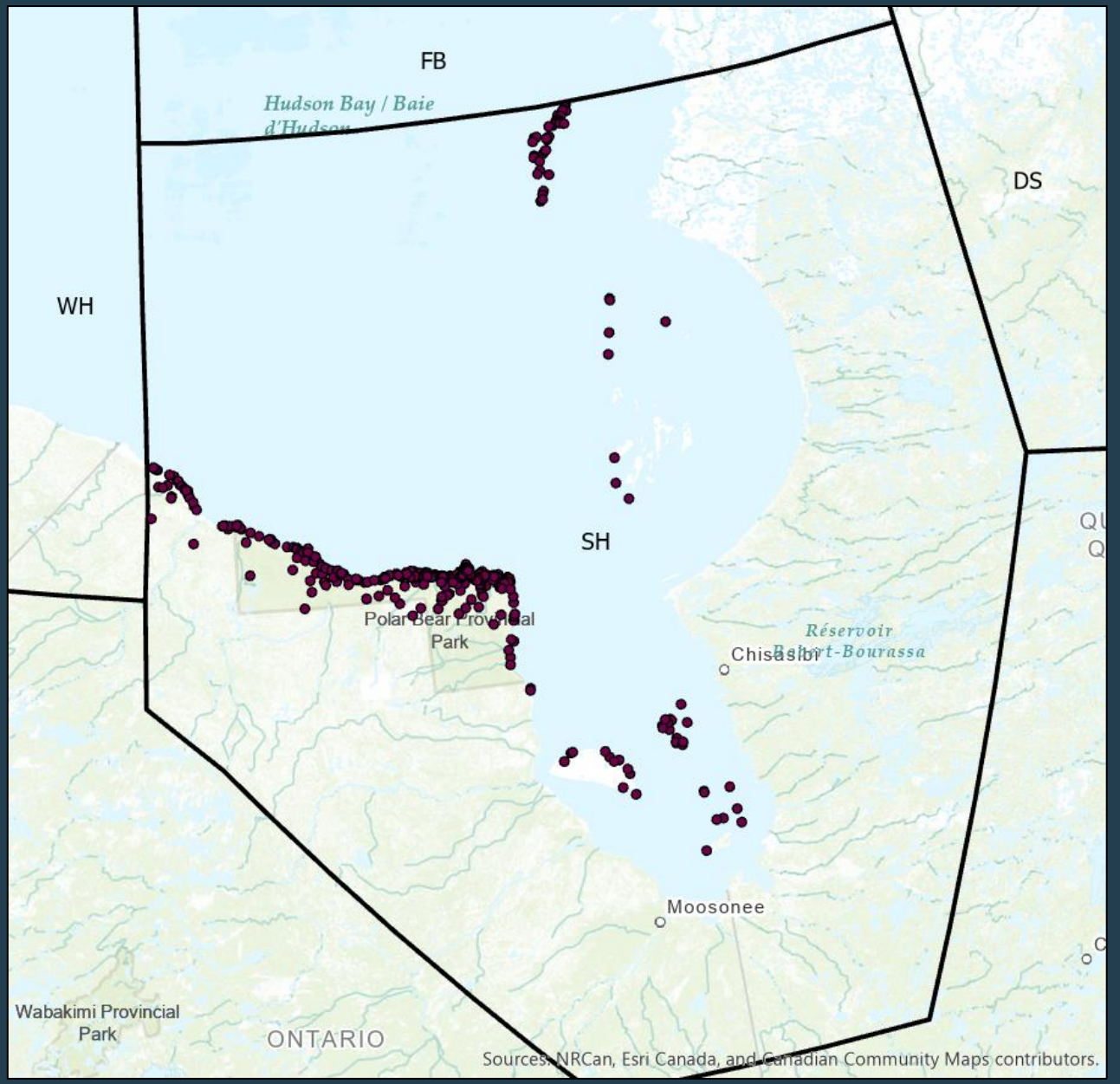
Average June-August ice concentration 2002 – 2017





Southern Hudson Bay

- Southern-most regular distribution of polar bears globally
- Most bears in the subpopulation summer along the Ontario coast



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D. Mcgeachy

Population inventories in SH

- Physical capture and recapture
  - 1984 – 1986
  - 2003 – 2005
  - 2007 – 2009
  - Showed stable population (~1000 bears)

Population inventories in SH

- Physical capture and recapture
  - 1984 – 1986
  - 2003 – 2005
  - 2007 – 2009
  - Never covered the entirety of the subpopulation in a robust manner: mark-recapture primarily of ON coast

Aerial surveys- 2011, 2016, 2021

- Comprehensive coverage of majority of subpopulation

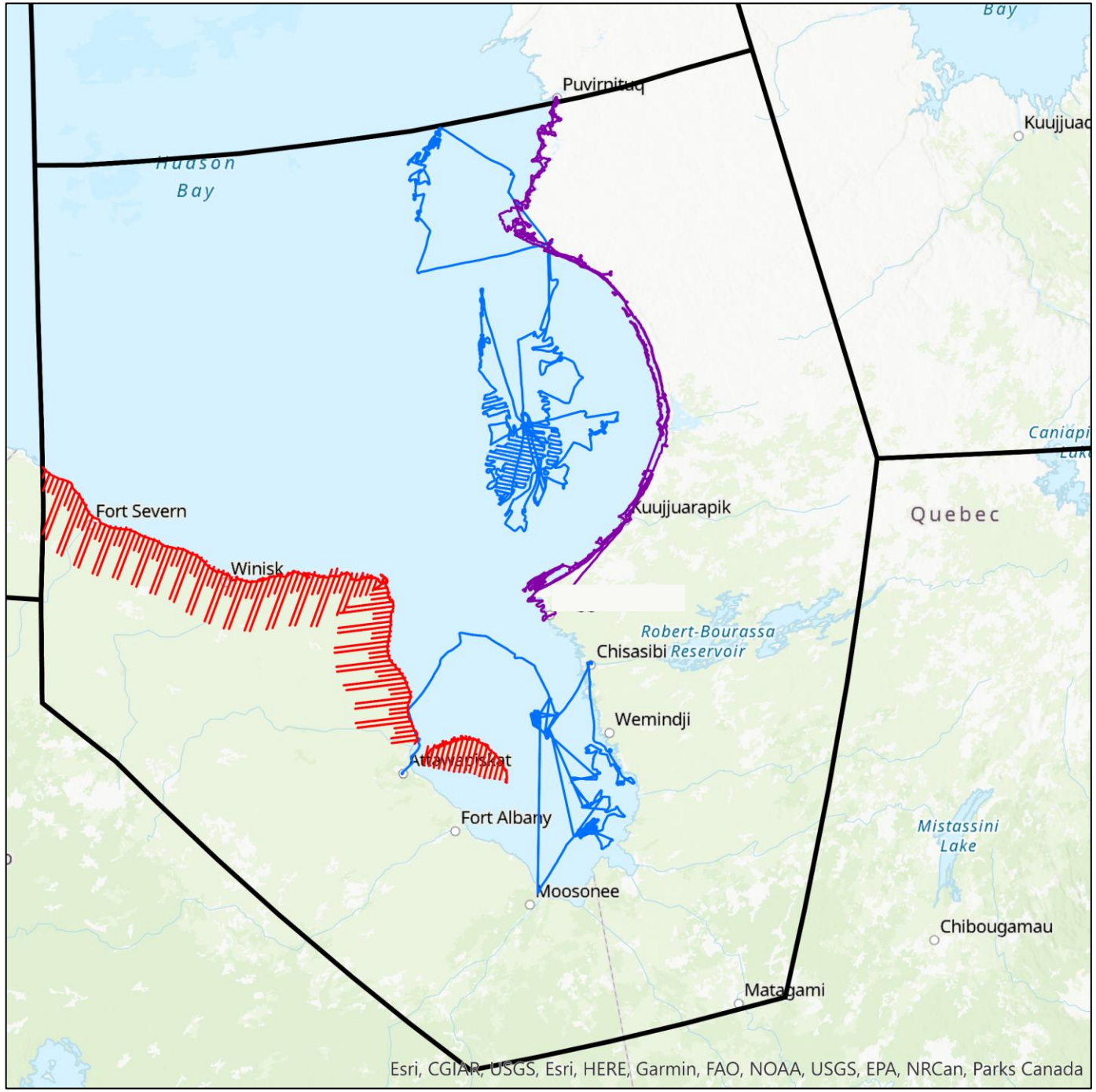
- Congruent surveys in WH

Aerial surveys- 2011, 2016, 2021

- Comprehensive coverage of majority of subpopulation
- Congruent surveys in WH
- No handling of bears
  - Snapshot of abundance
  - No information on survival or movement

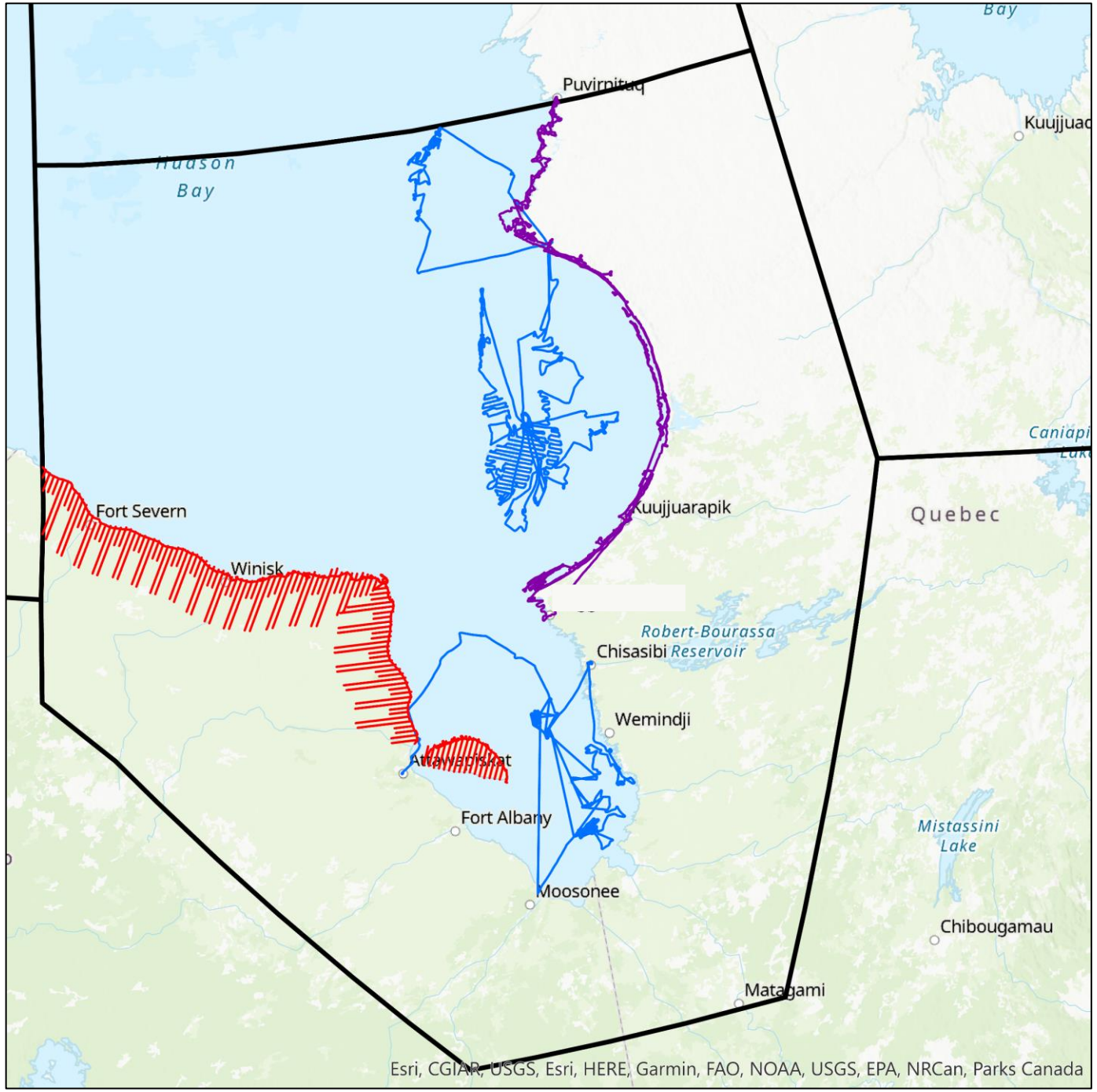
Aerial survey coverage

- Lots of complexity!



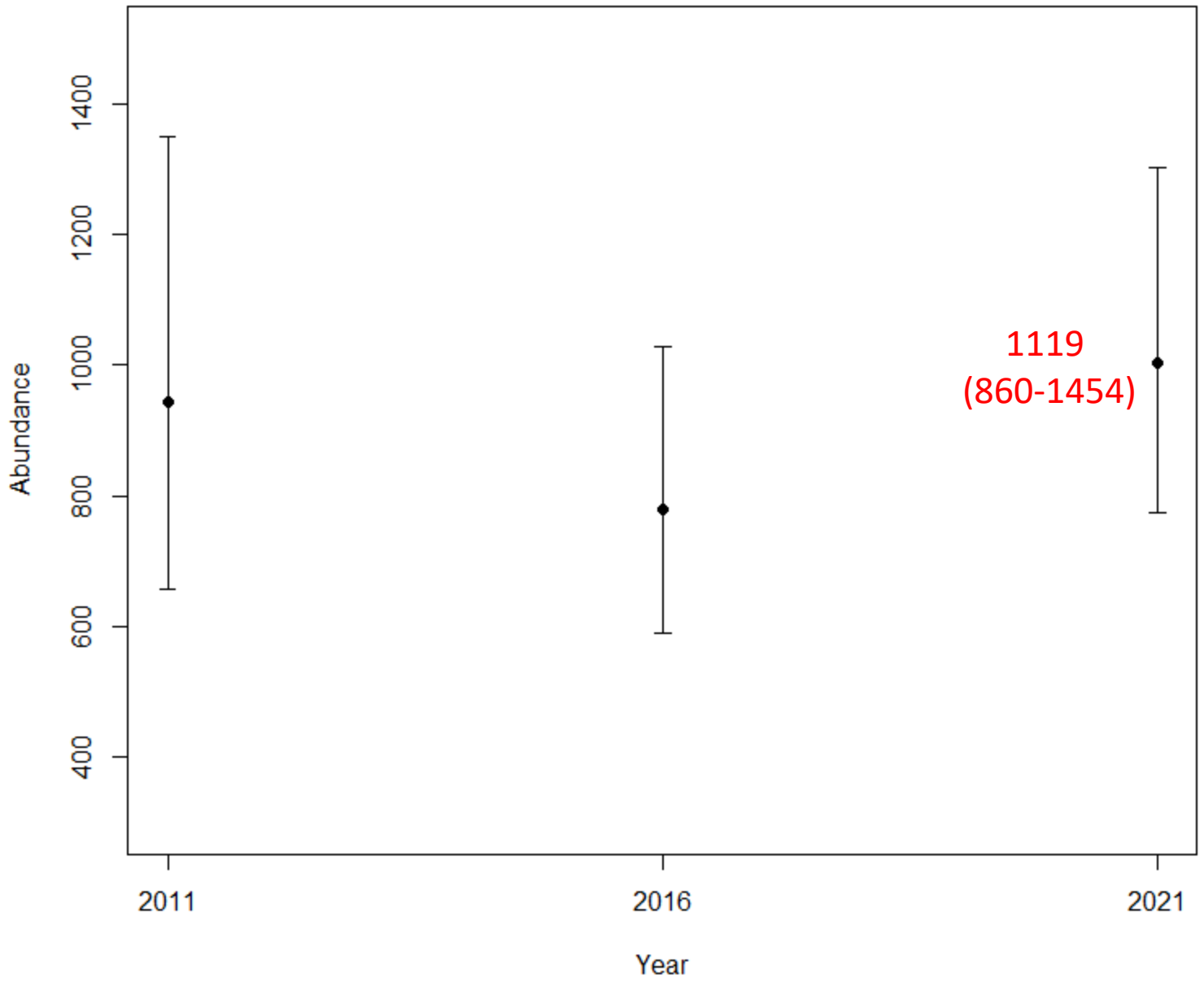
Aerial survey coverage

- Complicated subpopulation to survey
  - Very strong variation in bear density
  - Islands are challenging to survey



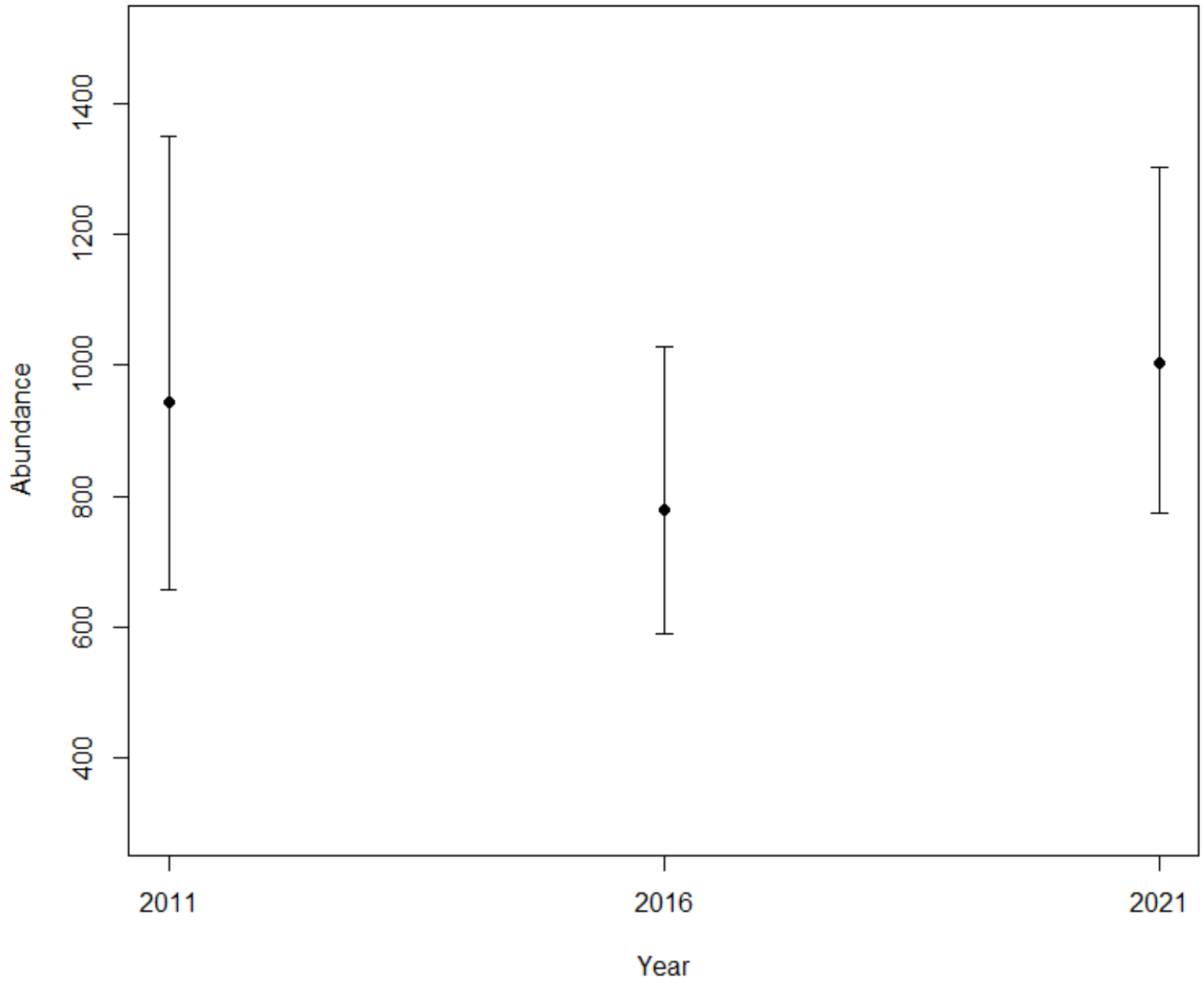
Aerial survey results 2011-2021

- 17% decline 2010-2016
- 29% increase 2016-2021



Why did the population go up?

Answering this requires information on movement, survival and reproduction of individual animals



Biopsy darting

- Assess interannual movements, survival and reproduction through biopsy darting program in coordination with ECCC, Quebec, Manitoba and multiple Indigenous organizations

Biopsy darting

Individual id and sex

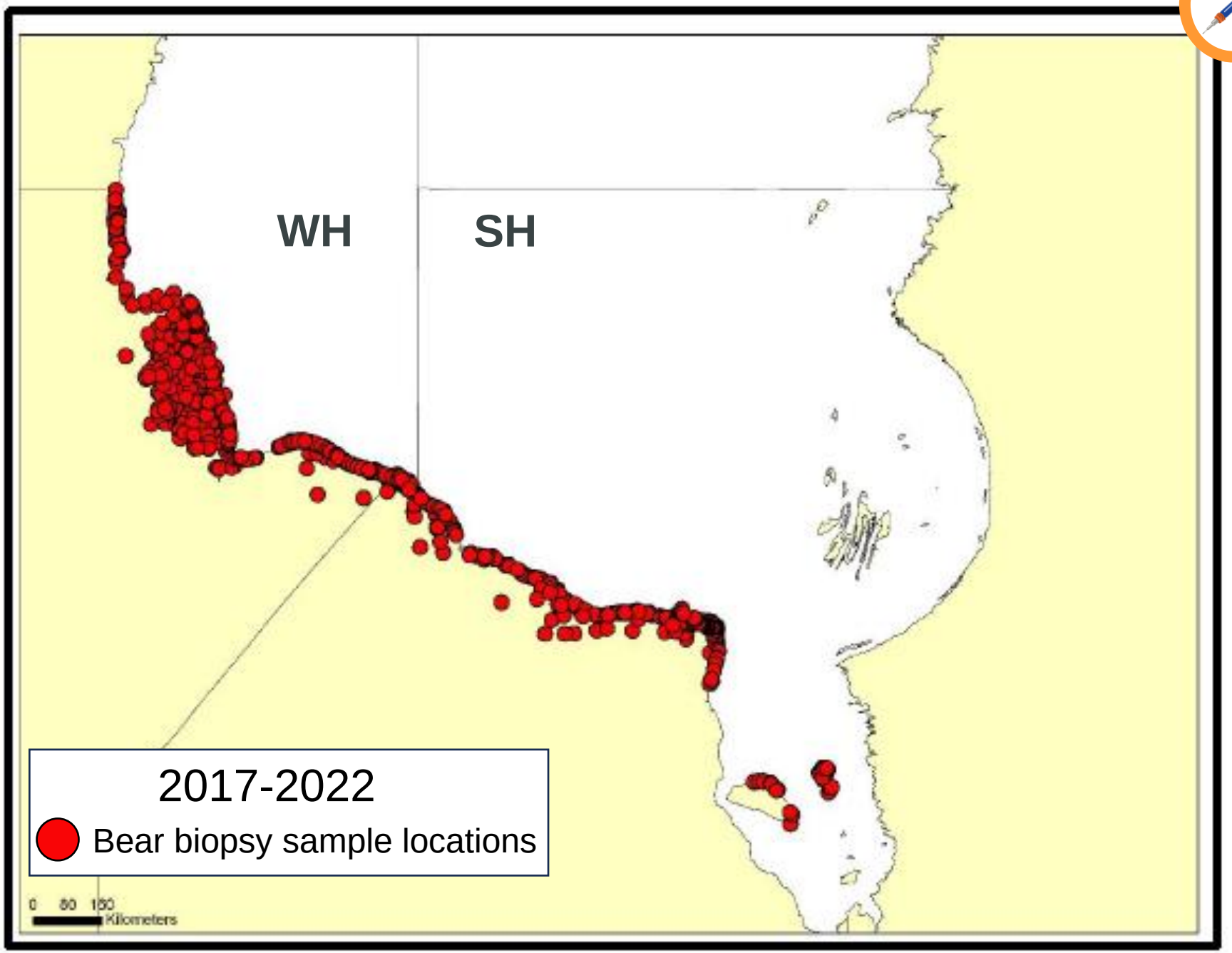
Movements

Abundance

Survival

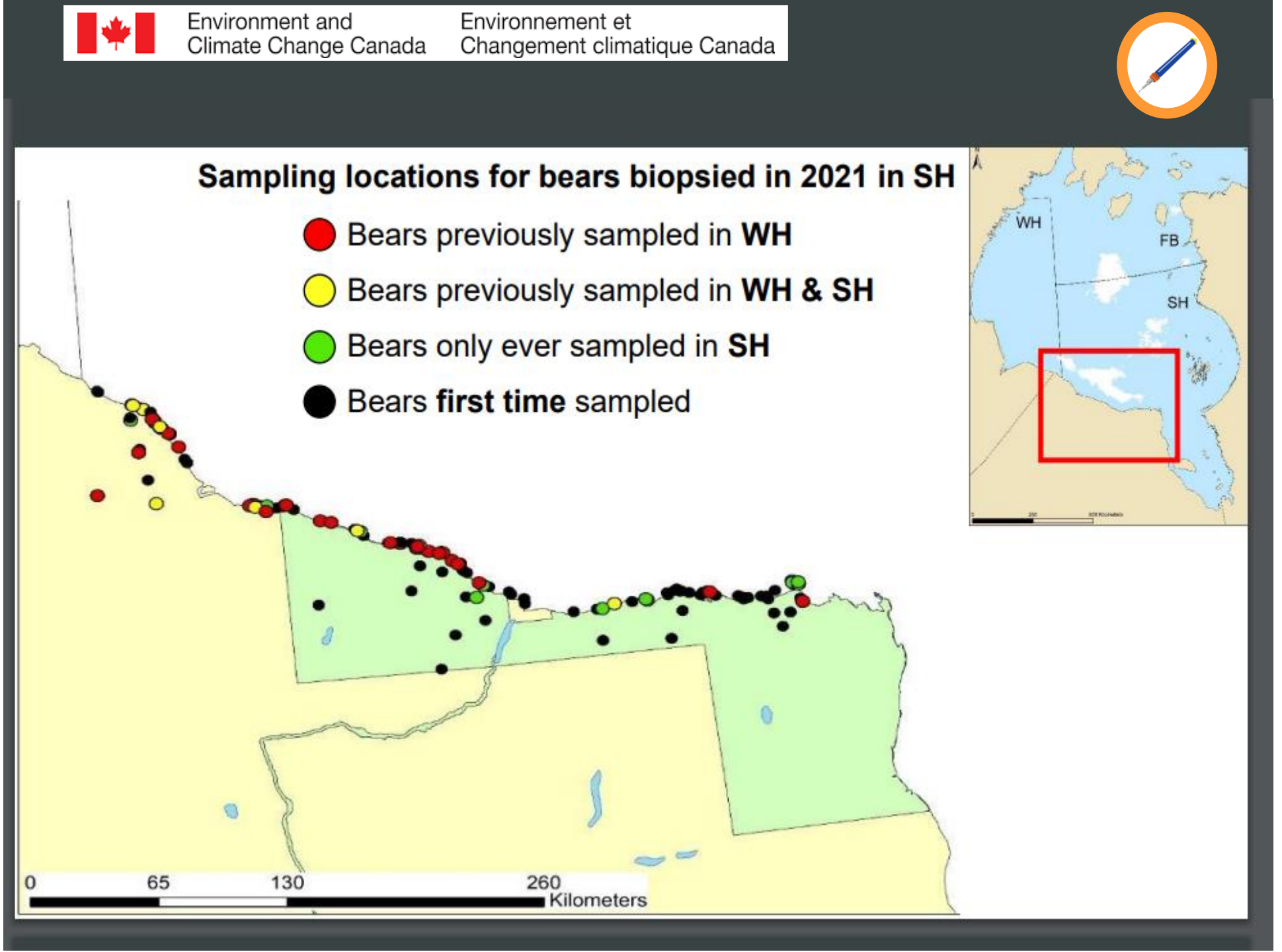
Reproduction

Environment and Climate Change Canada | Environnement et Changement climatique Canada

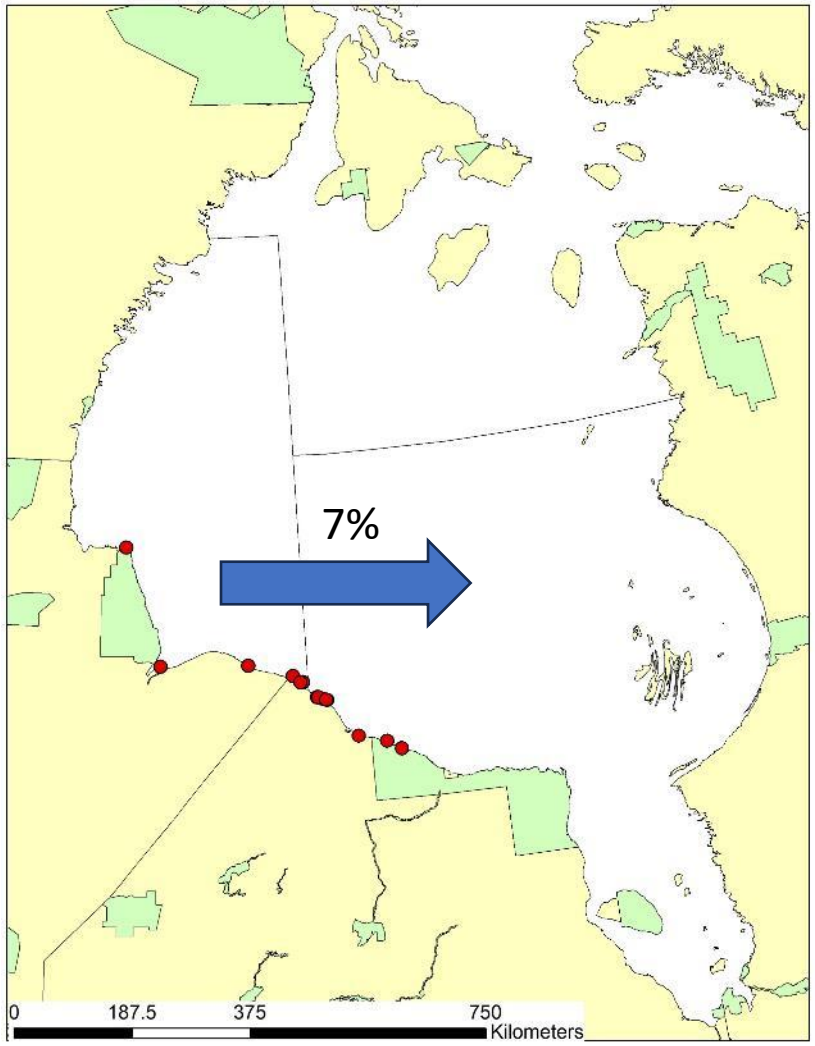


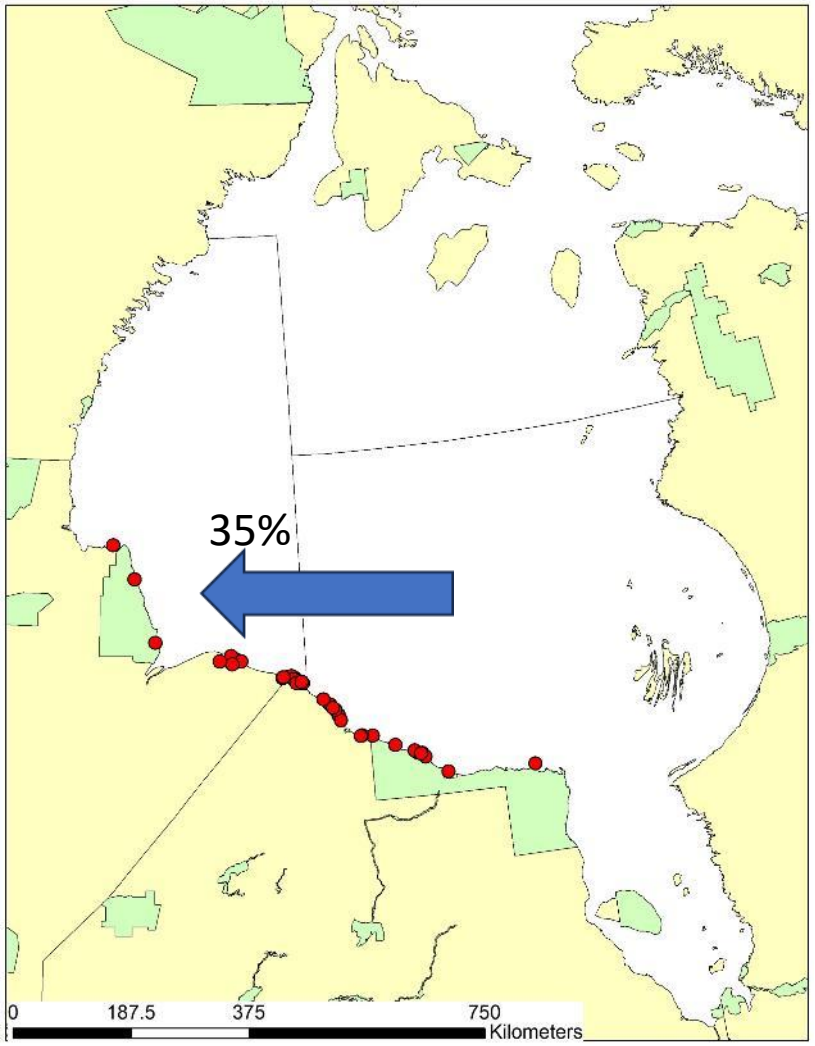
2021 biopsy results

- Lots of bears that were previously sampled in WH were in SH



2022 recaptures of 2021 sampled bears





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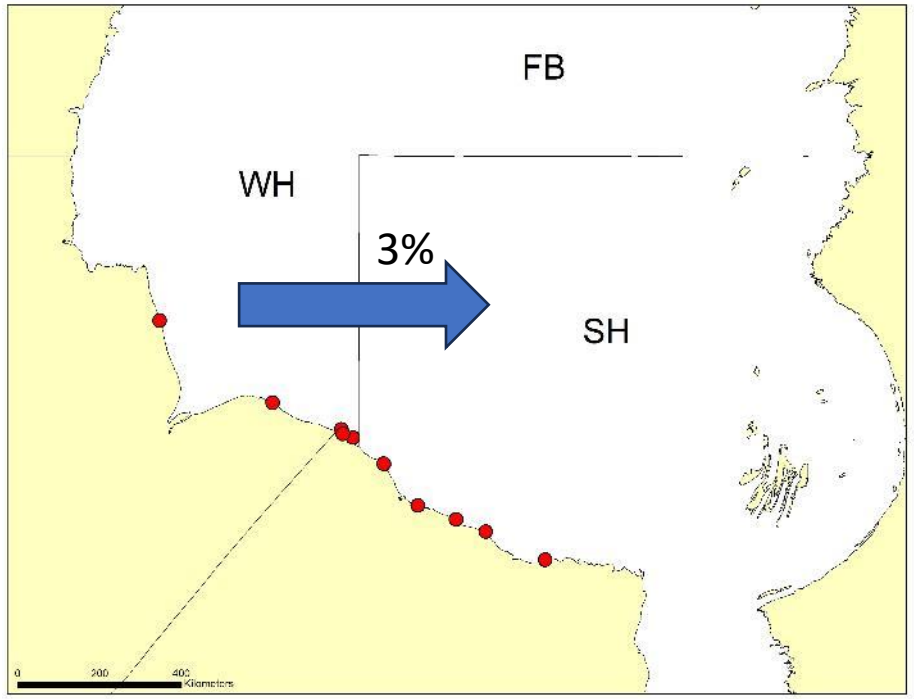
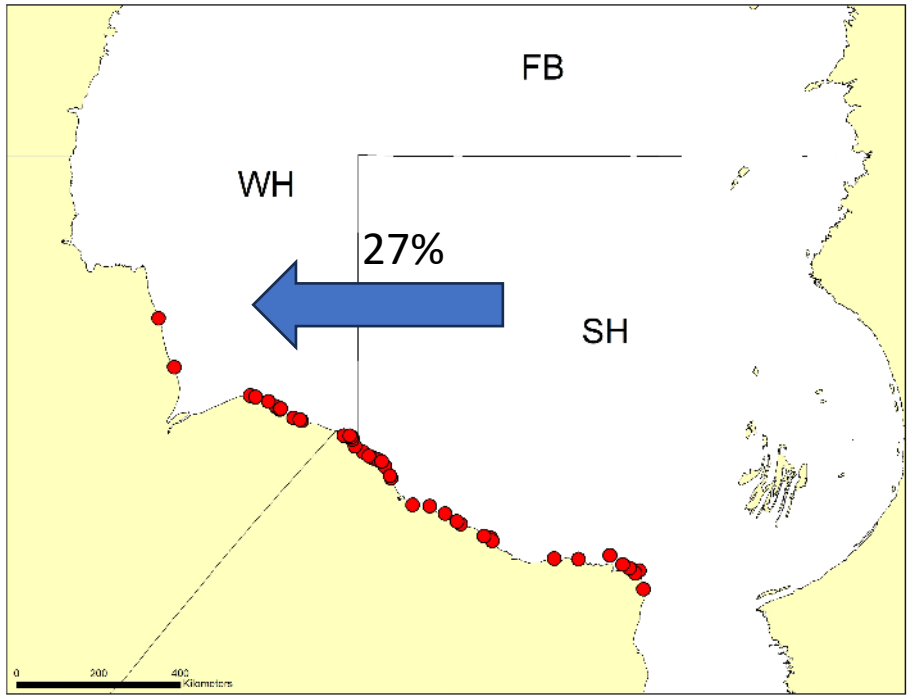




SH abundance estimate

- Significant uncertainty in the number of bears in the subpopulation and the number of bears available for harvest

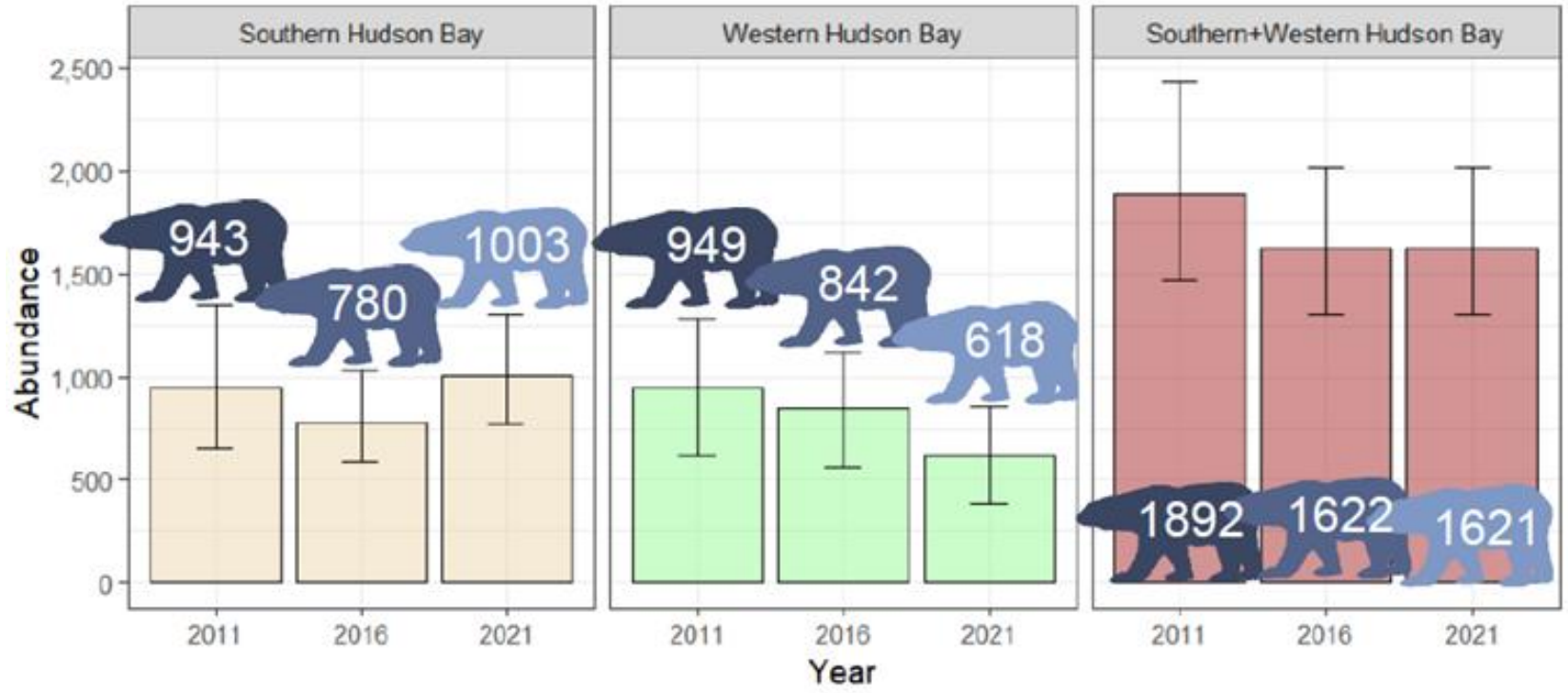
>30% of bears are COY and yearling

Year	% COY	%Yearling	% sub	% Ad female
2011	19	15	8	36
2016	30	5	6	34
2021	18	18	7	38

SH abundance estimate

- Significant uncertainty in the number of bears in the subpopulation and the number of bears available for harvest

- The combined WH-SH subpopulation declined 2010-2016 and has stayed constant 2016-2021. So, much of increase in SH may be due to movement



SH abundance estimate

- Significant uncertainty in the number of bears in the subpopulation and the number of bears available for harvest
- The combined WH-SH subpopulation declined 2010-2016 and has stayed constant 2016-2021. So, much of increase in SH may be due to movement
- BUT, are the bears that moved WH or SH bears?

So, how many bears do we think are in SH?

- Considering this information, the 2016 and 2021 aerial surveys offer reasonable bounds for the scientific estimate of abundance in SH: 780 – 1119

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- The population is likely somewhere in that range. Developing a TAT off of the higher end will lead to greater risk to the population and future harvest opportunities.
- Developing a TAT off of the lower end will lead to greater risk of lost harvest opportunities now.

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- Considering this information, the 2016 and 2021 aerial surveys offer reasonable bounds for the scientific estimate of abundance in SH: 780 – 1119
- The population is likely somewhere in that range. Developing a TAT off of the higher end will lead to greater risk to the population and future harvest opportunities.
- Developing a TAT off of the lower end will lead to greater risk of lost harvest opportunities now.
- BUT, this subpopulation clearly does not exist in isolation. The harvest in WH and the harvest in Sanikiluaq will influence what is a sustainable harvest in the NMR and EMR.

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Reproduction in SH is high

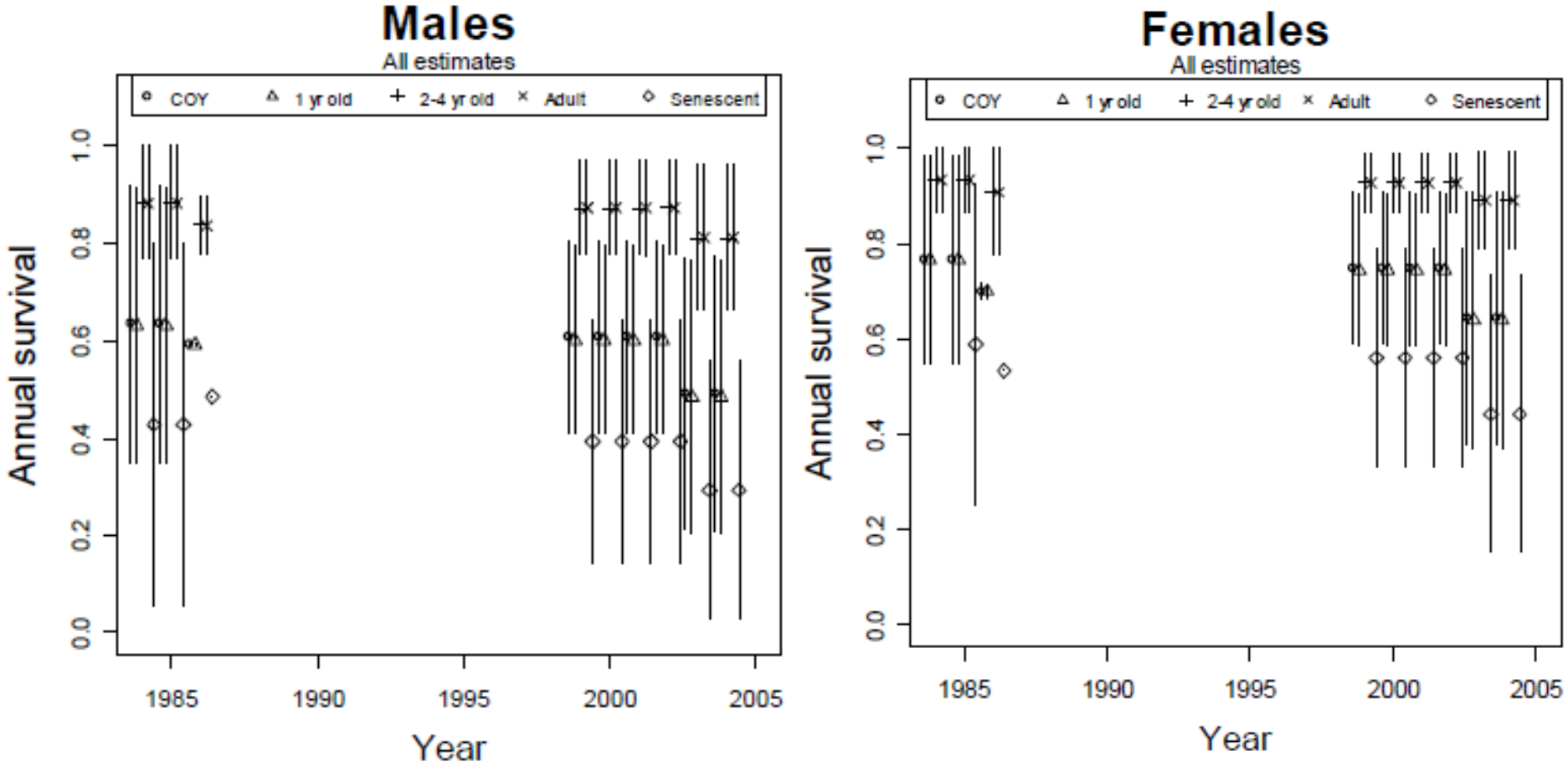
Distance sampling

Year	% COY	%Yearling	% sub	% Ad female
2011	19	15	8	36
2016	30	5	6	34
2021	18	18	7	38

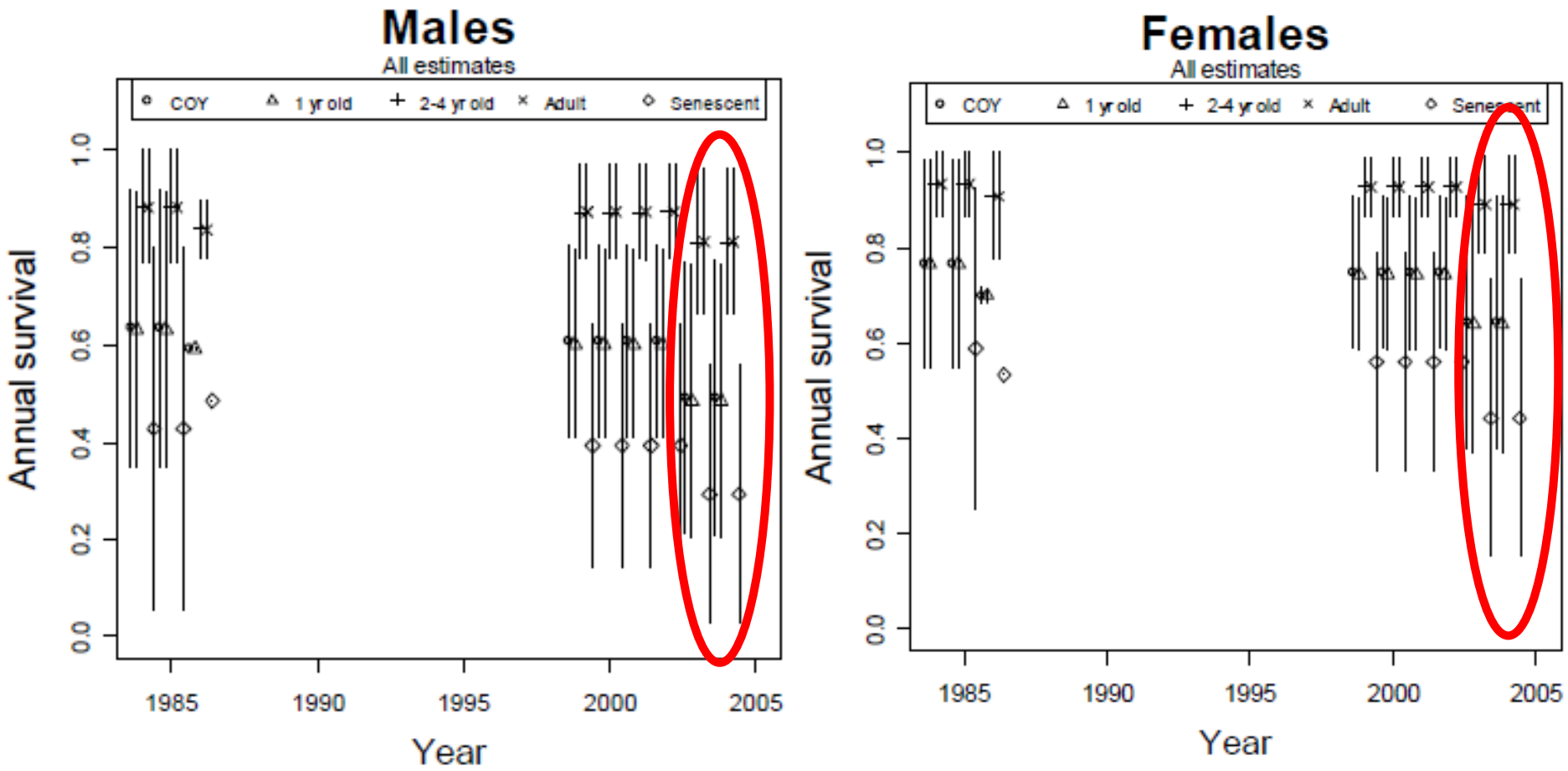
Coastal

Year	% COY	%Yearling	% sub	% Ad female
2011	15	12	13	20
2016	17	3	8	19
2018	10	7	9	19
2021	12	10	9	22

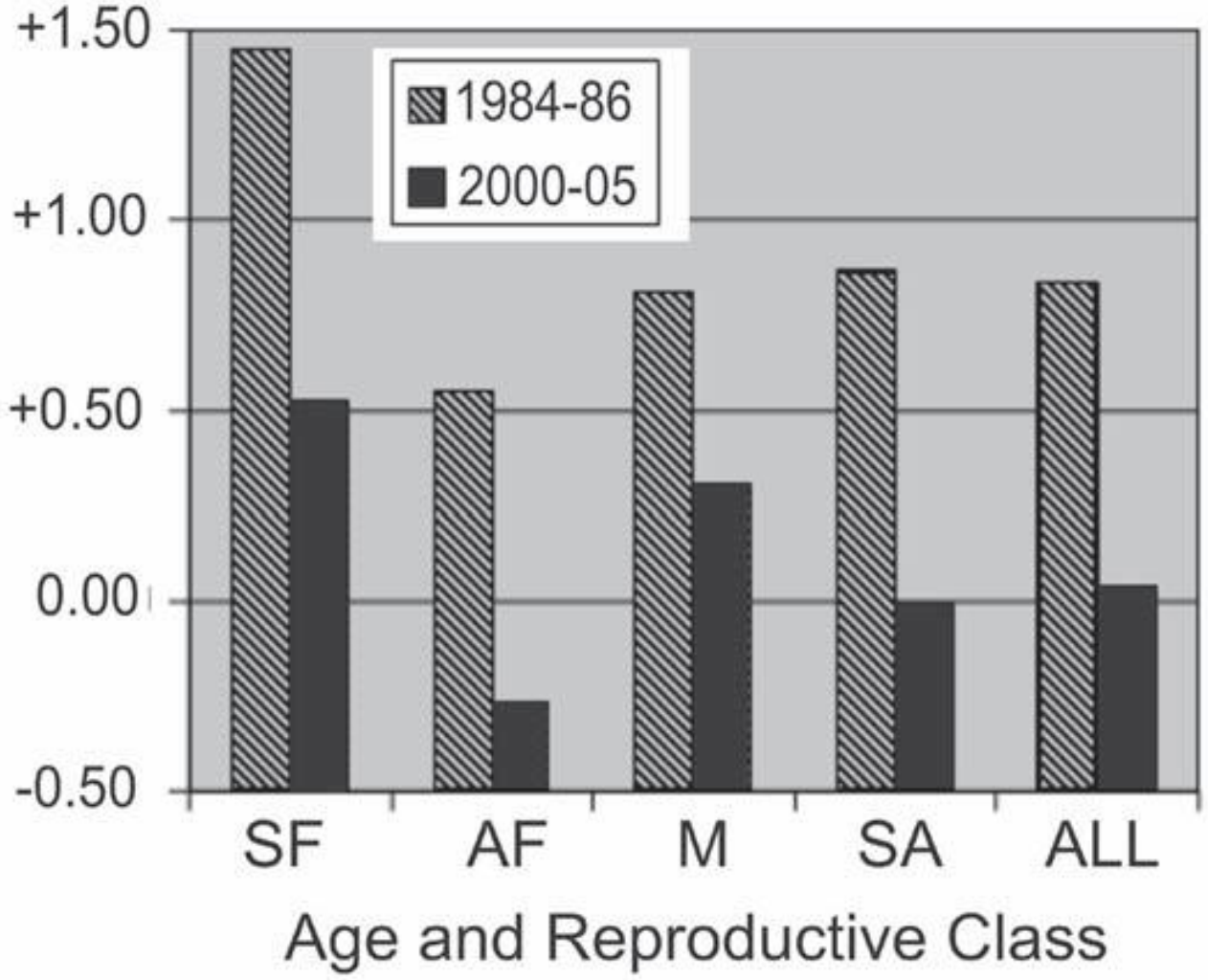
Survival may be declining



Survival may be declining

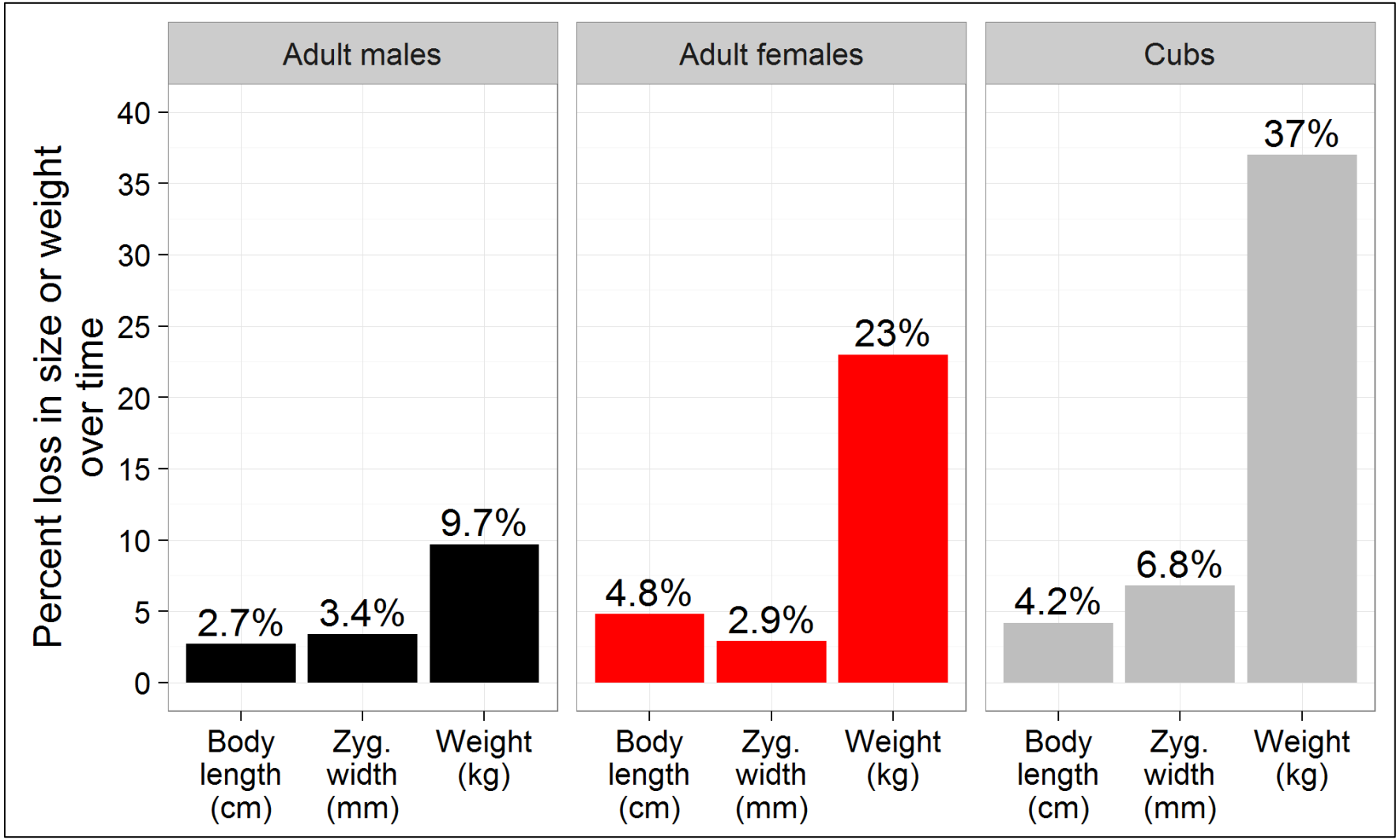


Body condition of bears that were handled declined 1980s – 2000s



Obbard et al. 2006

Body size of bears that were handled declined 1980s – 2000s



Obbard & Newton unpublished

Outline

- Overview of Ontario government and collaborators research and monitoring in SH

- General information on SH subpopulation

- Scientific information
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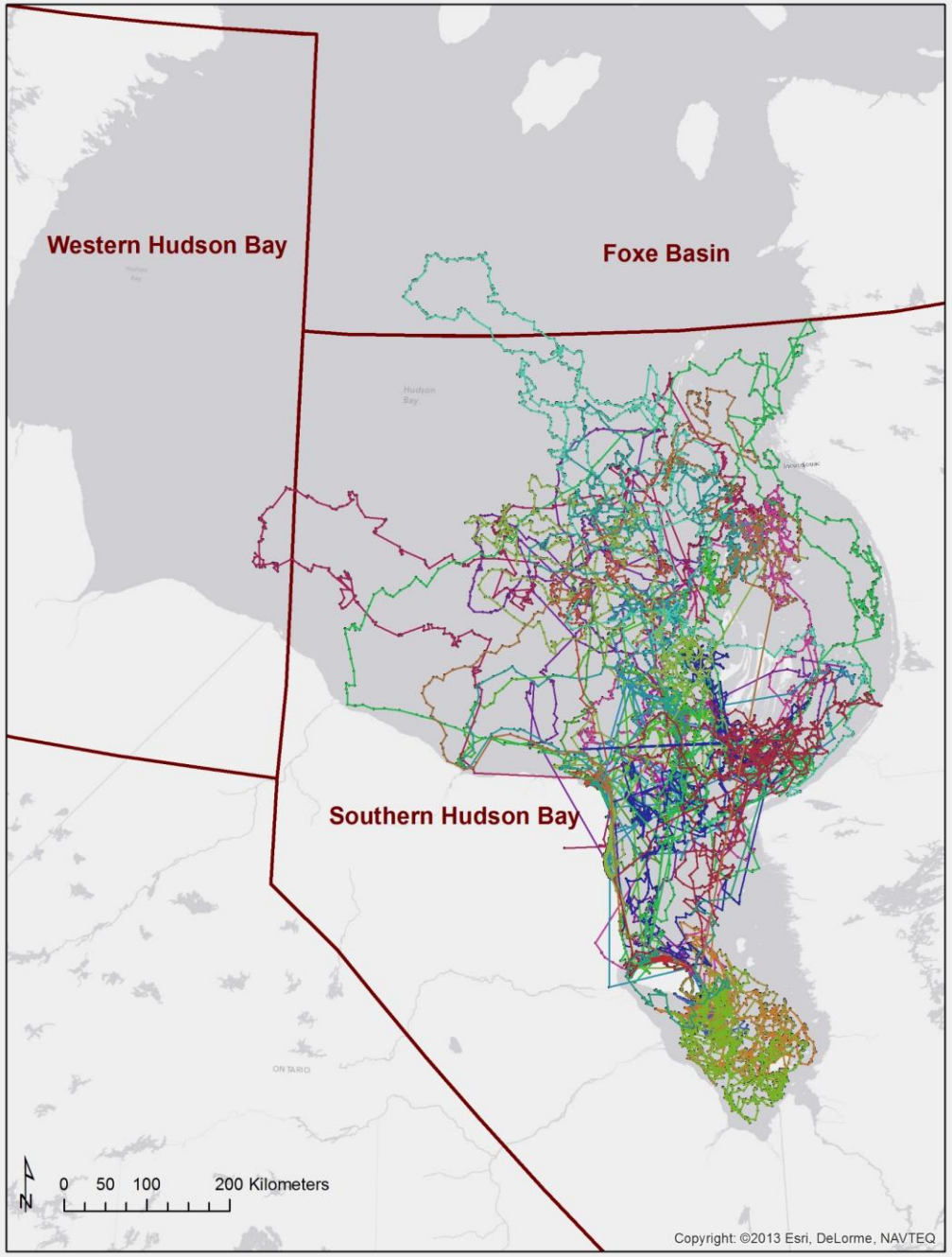
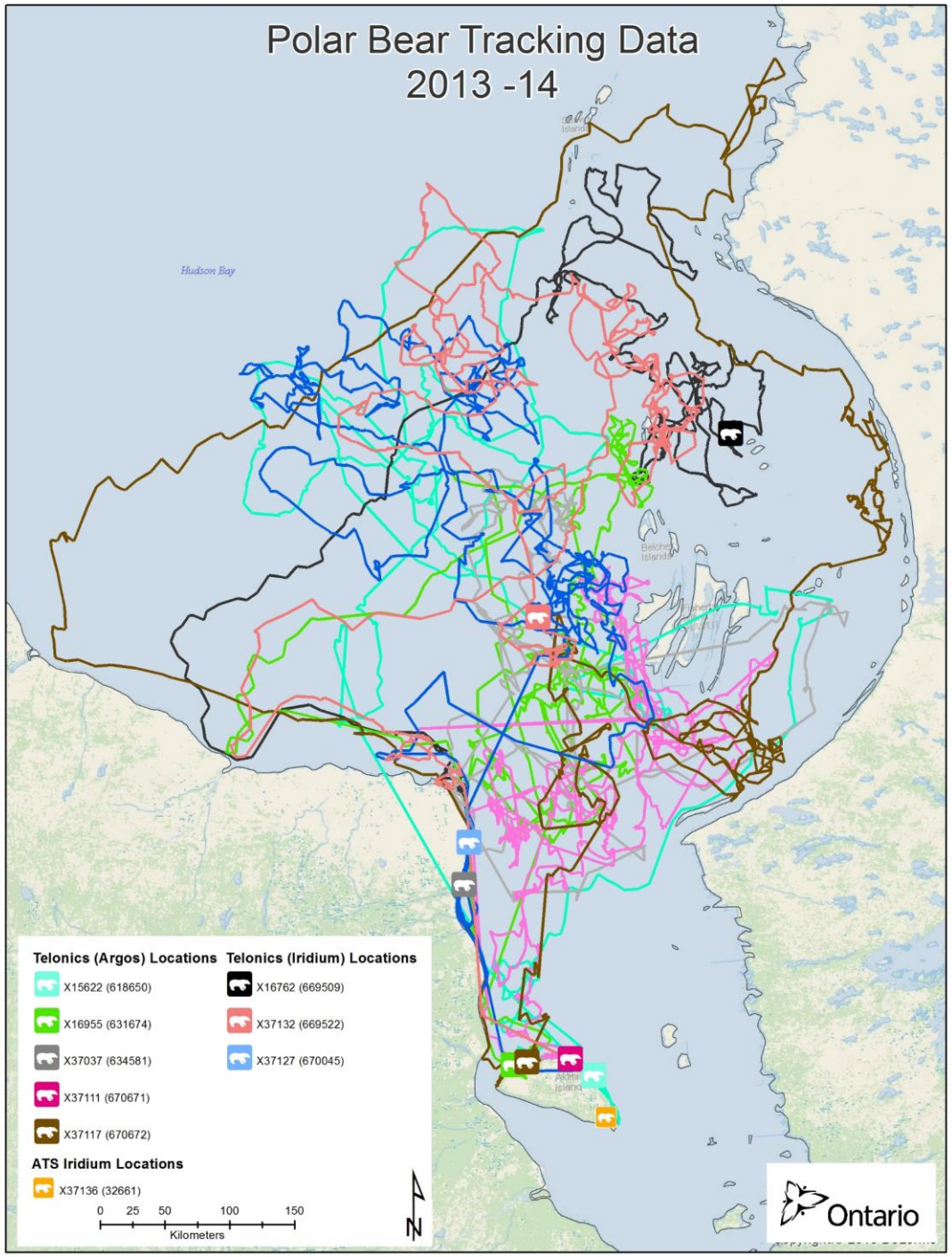
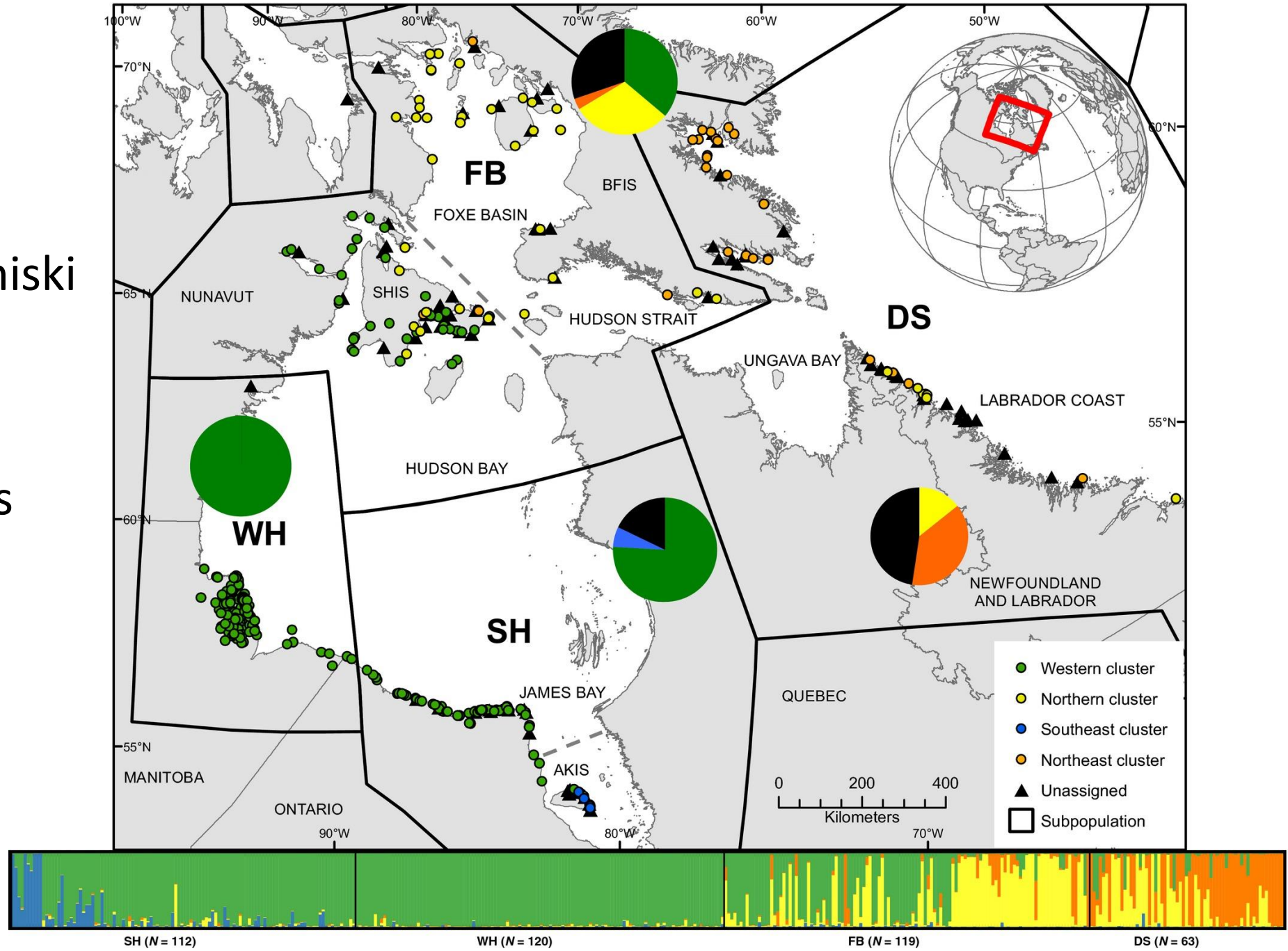
Movements of bears collared in SH



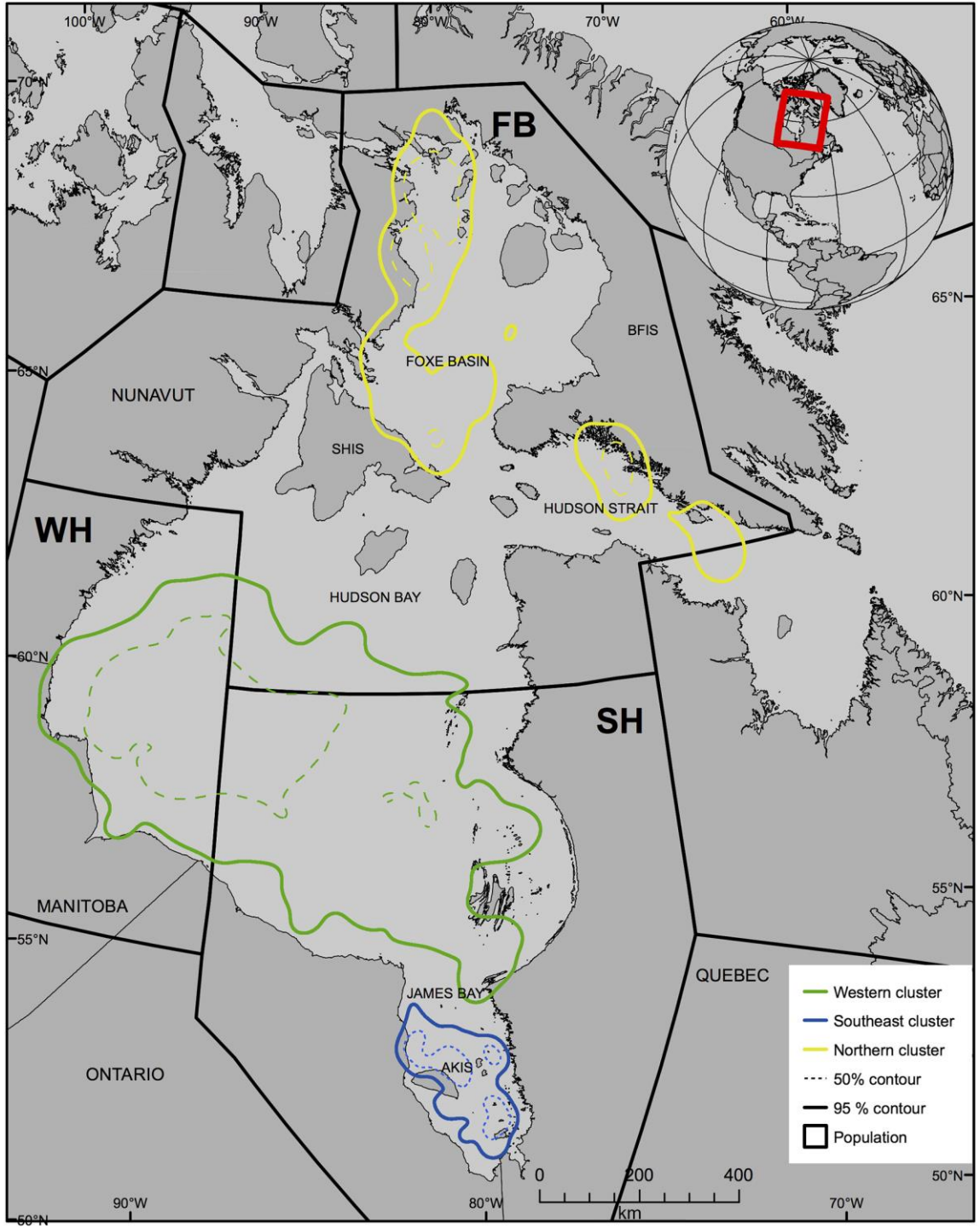
Movements of Akimiski Island bears



- Polar bears on Akimiski Island in James Bay appear to be genetically distinct from other SH bears



- And, these bears tend to use James Bay predominantly, though some do move into Eastern Hudson Bay



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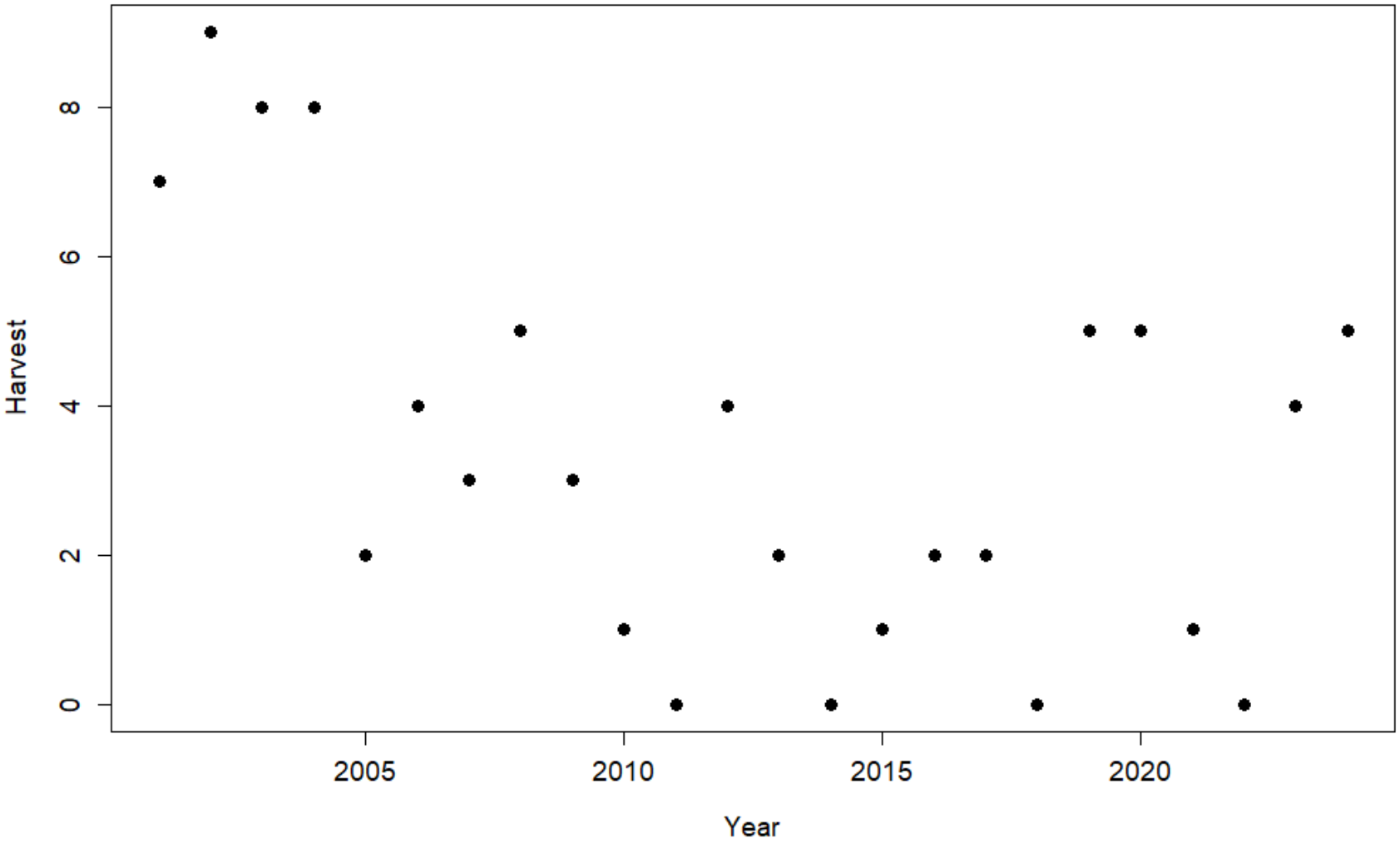
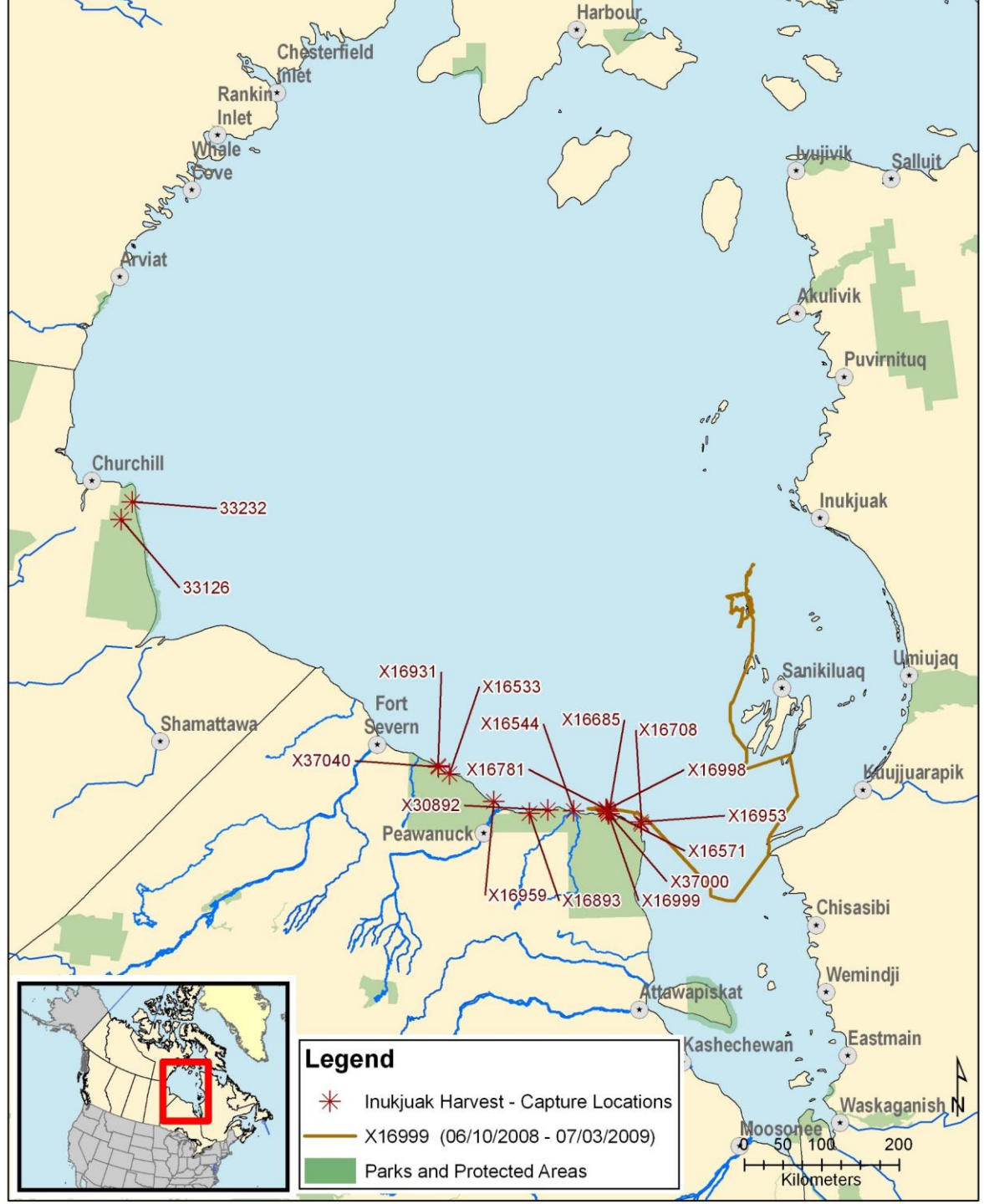
Harvest in Ontario 2000-2024



Recent years are minimum harvest levels as reporting is imperfect


Harbour
Chesterfield Inlet
Rankin Inlet
Whale Cove
Arviat
Ivujivik
Salluit
Akulivik
Puvirnituq
Churchill
33232
33126
Inukjuak
Sanikiluaq
Umiujaq
X16931
X16533
X16544
X16685
X16708
Fort Severn
Shamattawa
X37040
X16781
X16998
Kuujjuarapik
X30892
X16953
Peawanuck
X16571
X37000
X16959
X16893
X16999
Chisasibi
Wemindji
Attawapiskat
Kashechewan
Eastmain
Waskaganish
Moosonee
Legend
Inukjuak Harvest - Capture Locations
X16999 (06/10/2008 - 07/03/2009)
Parks and Protected Areas
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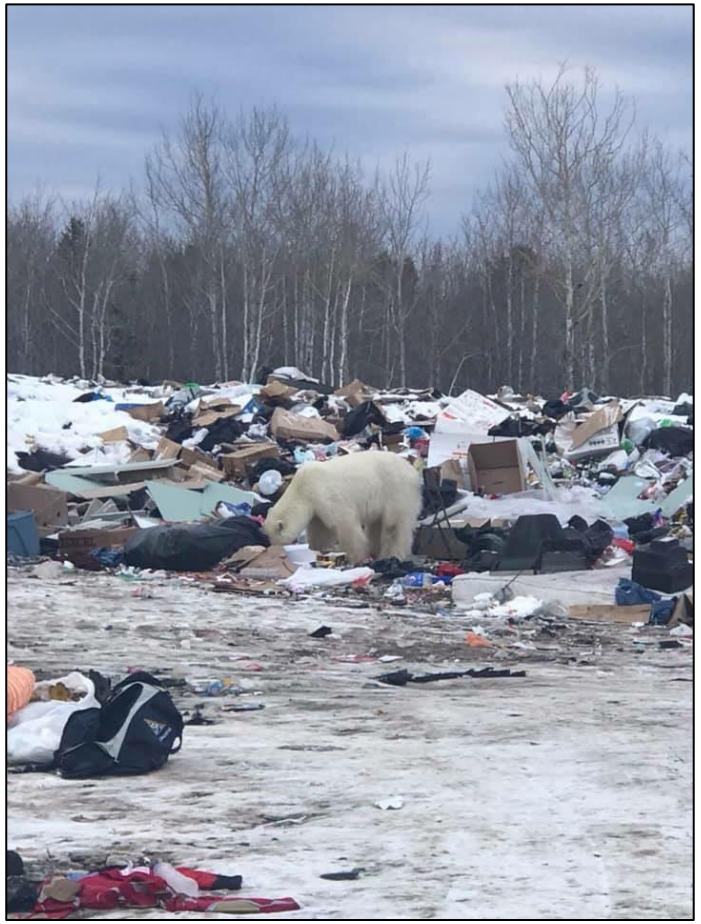
0 50 100 200
Kilometers



Summary of scientific information

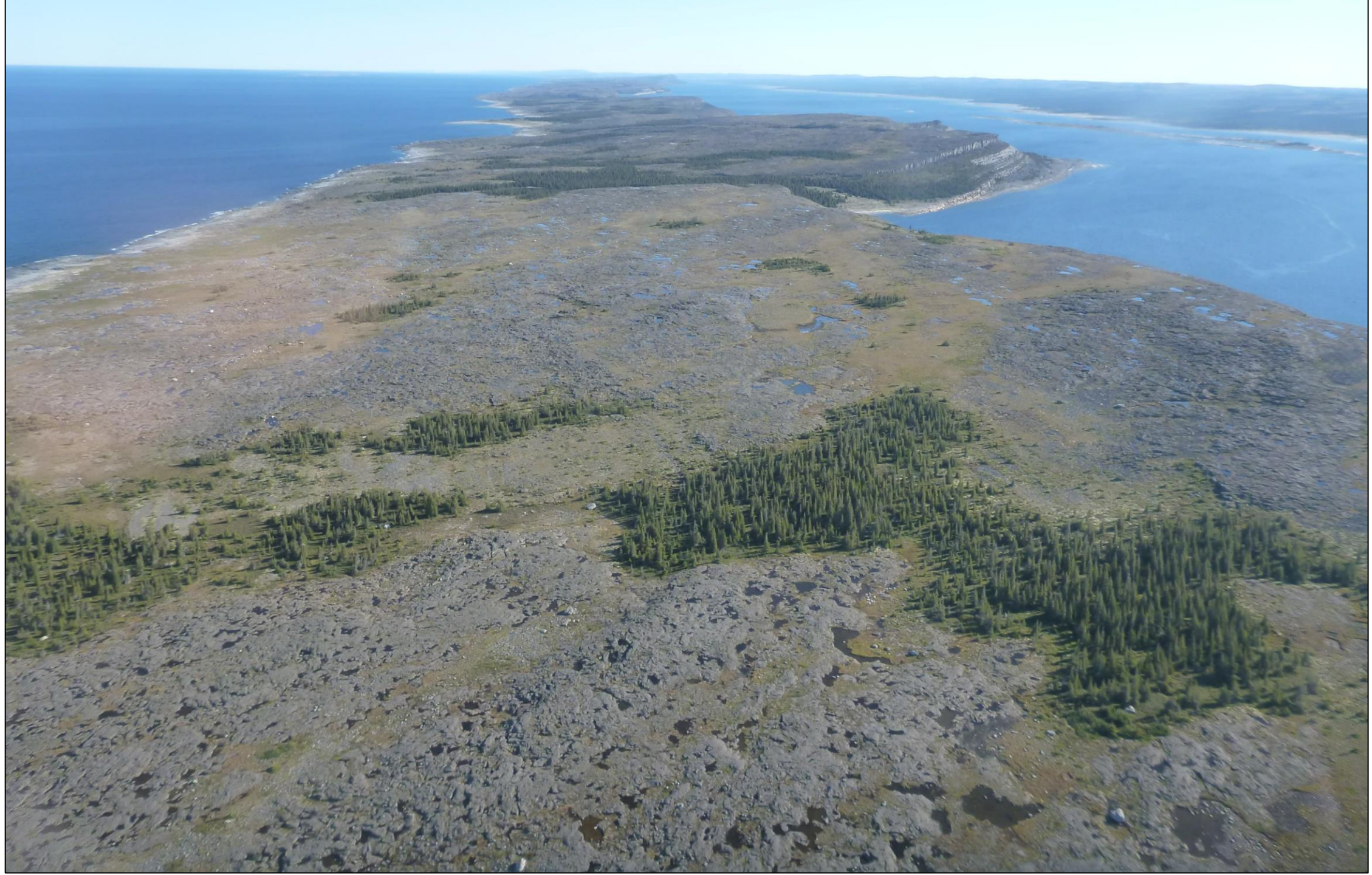
- Polar bears in SH exist further south than any polar bears globally and have a relatively short on-ice time
- Polar bears in this area are threatened by climate change, which represents a conservation concern for this subpopulation. Some scientific assessments suggest bears could disappear from this subpopulation within the next 50 years.
- Body condition and potentially survival have declined from the 1980s
- Most of the bears summer in ON and James Bay BUT travel throughout the bay, into FB, WH and the NMR and EMR
- Lots of interannual variation in the number of bears in SH and WH
- Combined population of SH and WH has declined since 2010 but likely remained stable 2016-2021
- DLPKs and conflicts appear to be increasing

James Bay summary

- James Bay is now ice free for nearly 6 months of the years
- James Bay bears appear to be genetically distinct from other bears and there are relatively few bears. The number of bears in James Bay appears to be declining based on aerial survey results from 2011/12, 2016 and 2021
- It is unclear what has caused this genetic distinction, but it is possible that small population size and genetic drift is the cause
- Bears in James Bay face imminent threat from climate change
- DLPKs and conflicts appear to be increasing in James Bay
- Limited understanding of what supports these bears and if they can continue to exist under the current environmental conditions
- These bears are at risk of harvest in the NMR
- Therefore, there is conservation concern for bears in James Bay and harvest of these bears has the potential to accelerate possible declines

Questions?

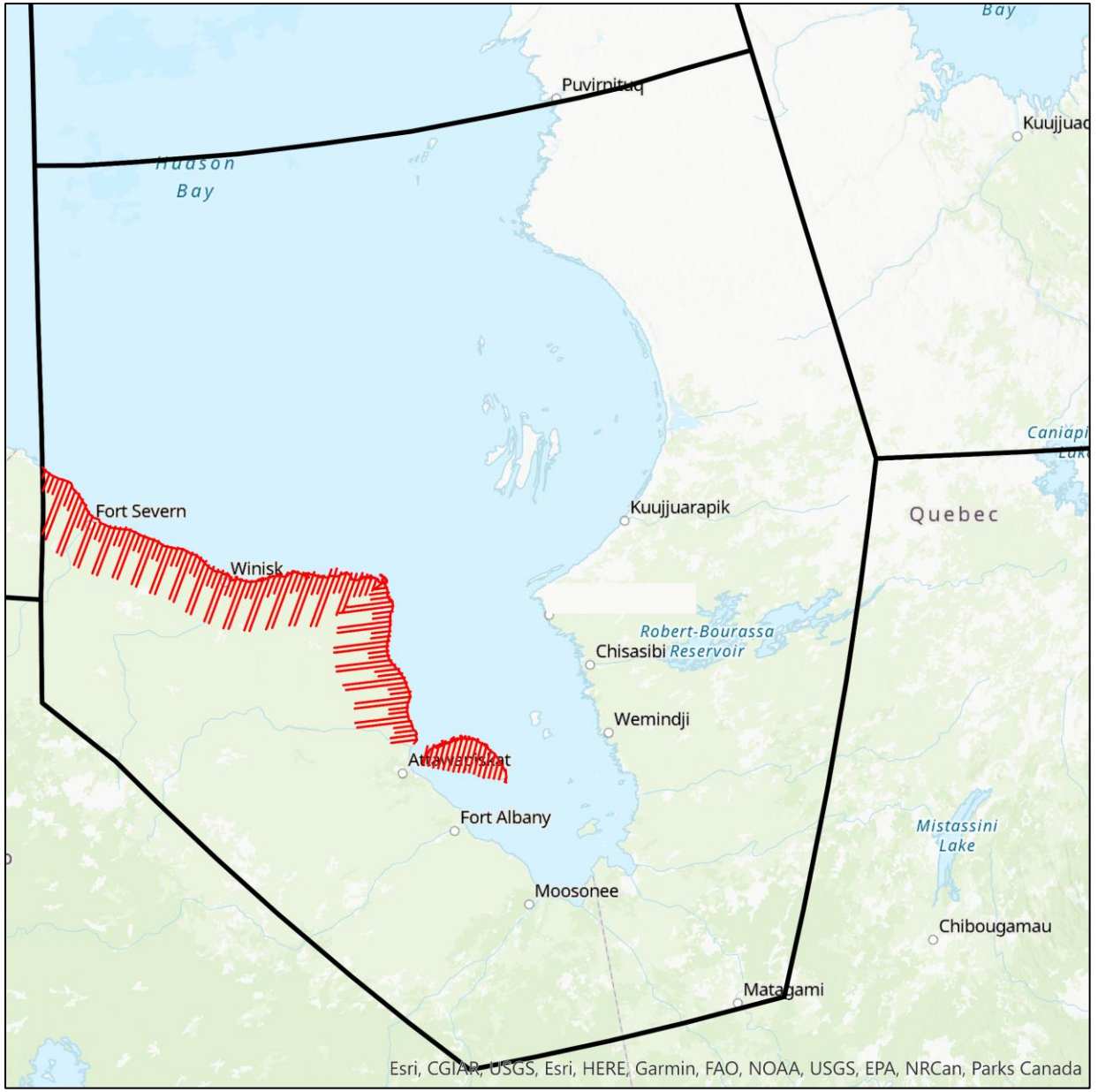
Additional slides



Ontario and Akimiski Island

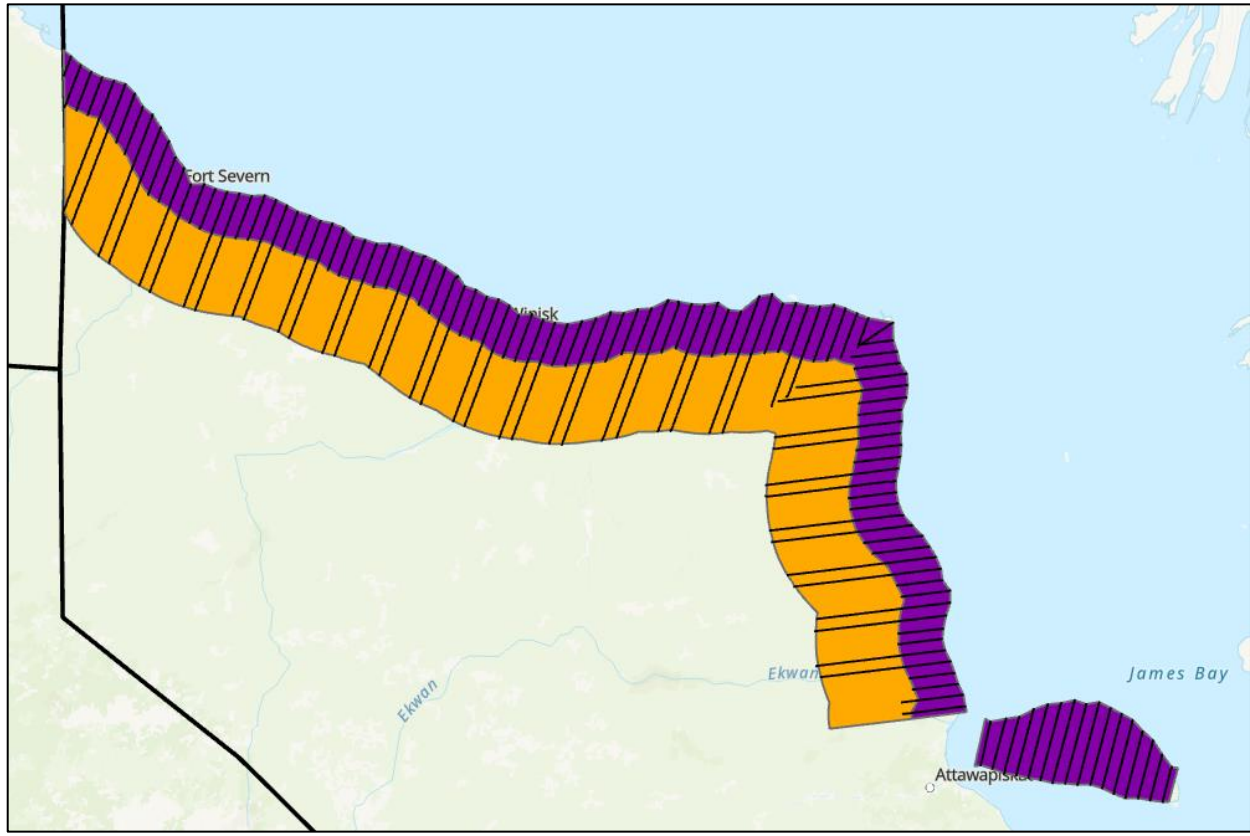
- Helicopter

- Complicated survey design due to large gradient in bear density- lots of bears on the coast in very clumped distribution

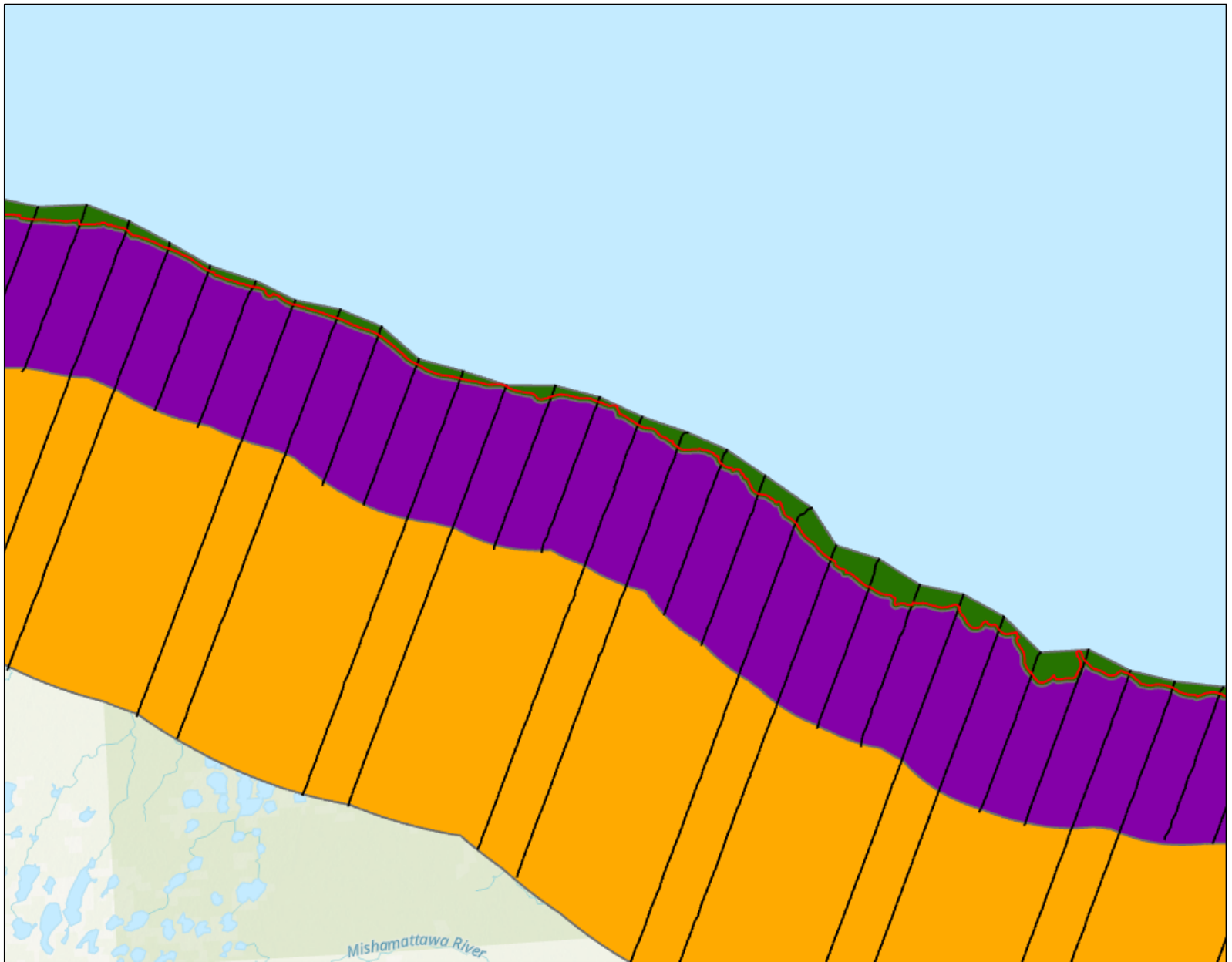


Distance sampling

- High density stratum: 0-20km from coast- 6km spacing
- Low density stratum: 20-60km from coast- 6km pairs spaced 18km apart
- All of Akimiski deemed high density
- One estimate for entire shaded area



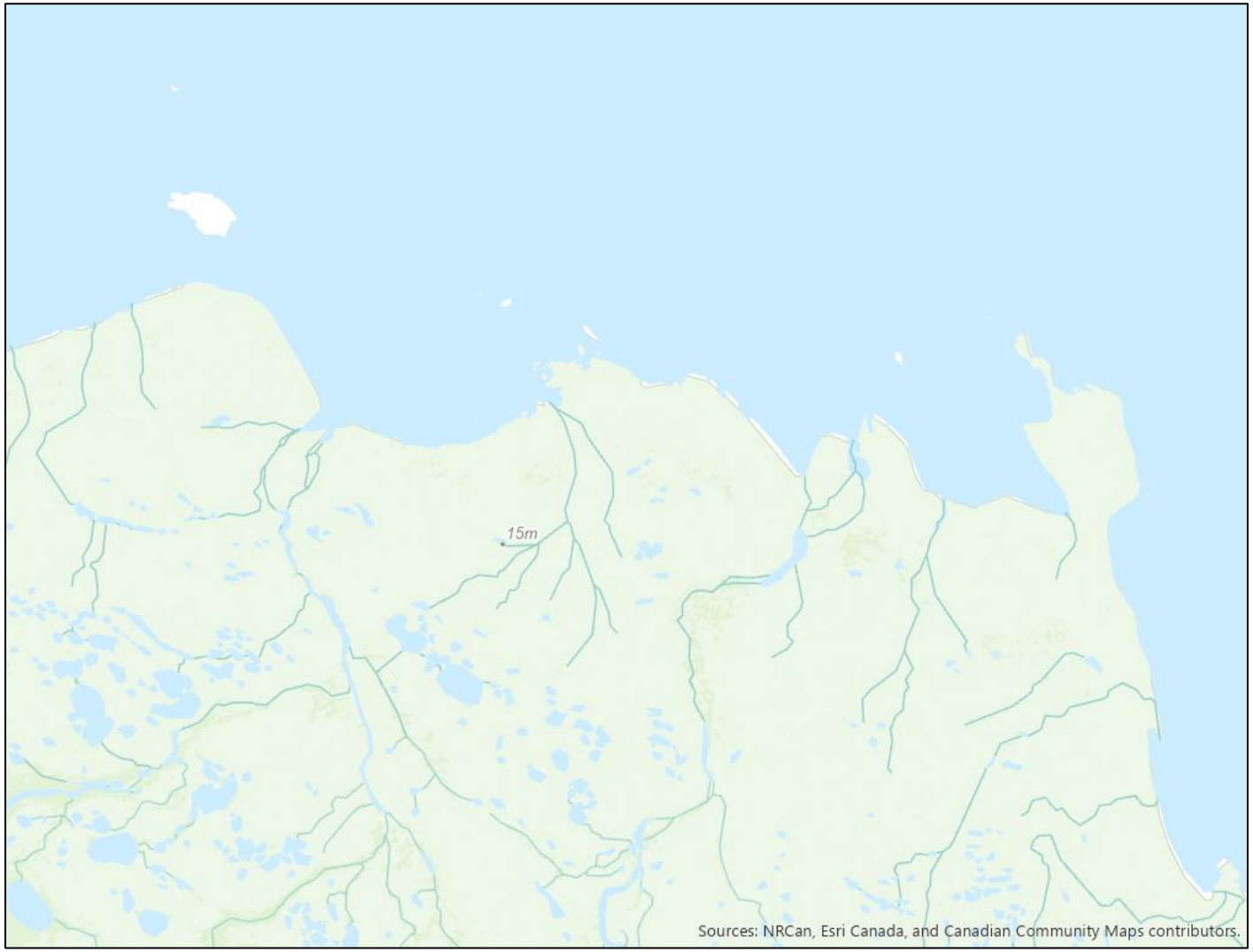
Double-observer mark-recapture coastal survey



- 500 m inland out to water
- Front and rear of helicopter separated by divider with observers working independently
- Calculate probability of detection based on detections/nondetections between front and rear

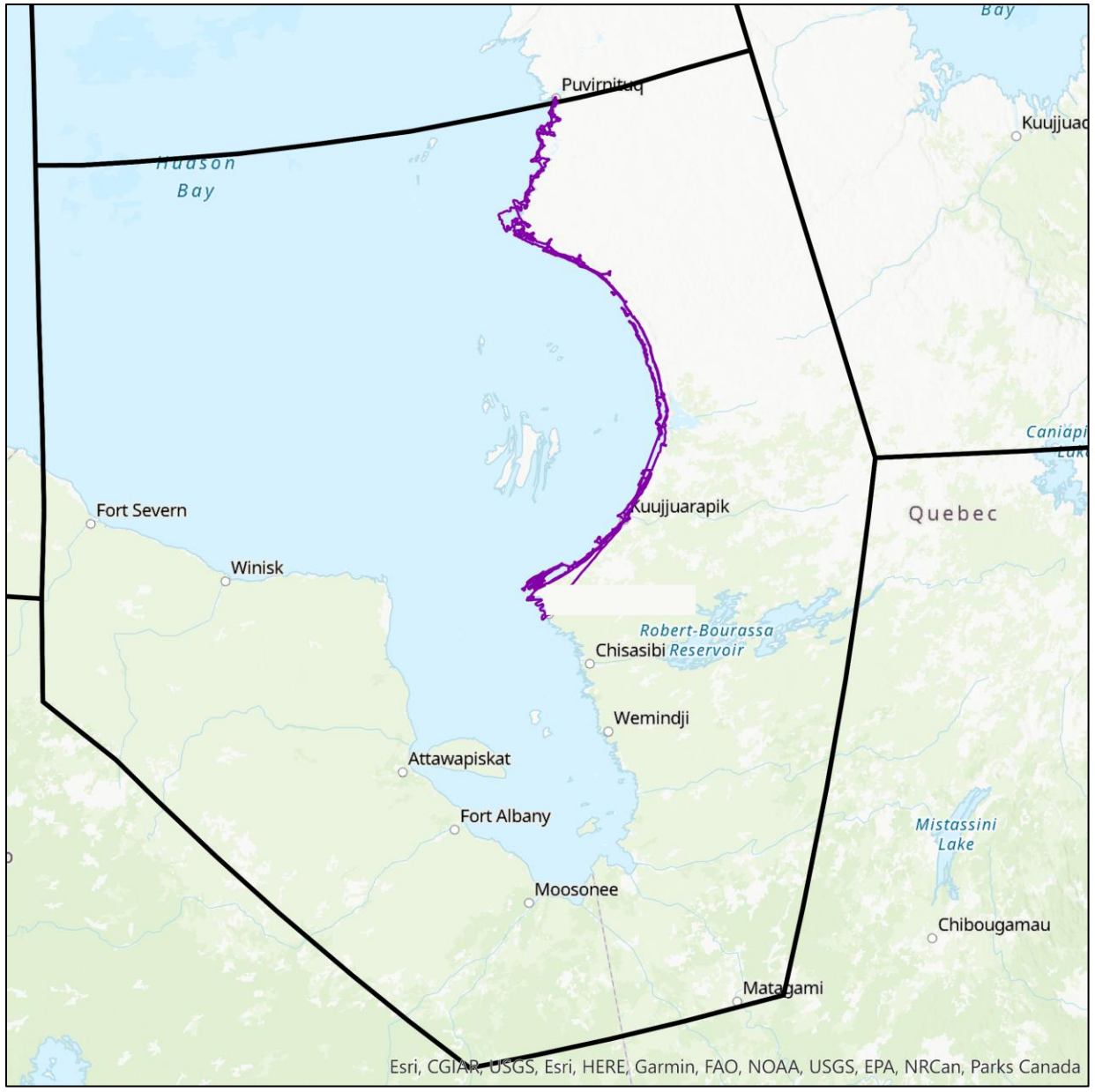
Nearshore islands

- Helicopter
- Census
- One count



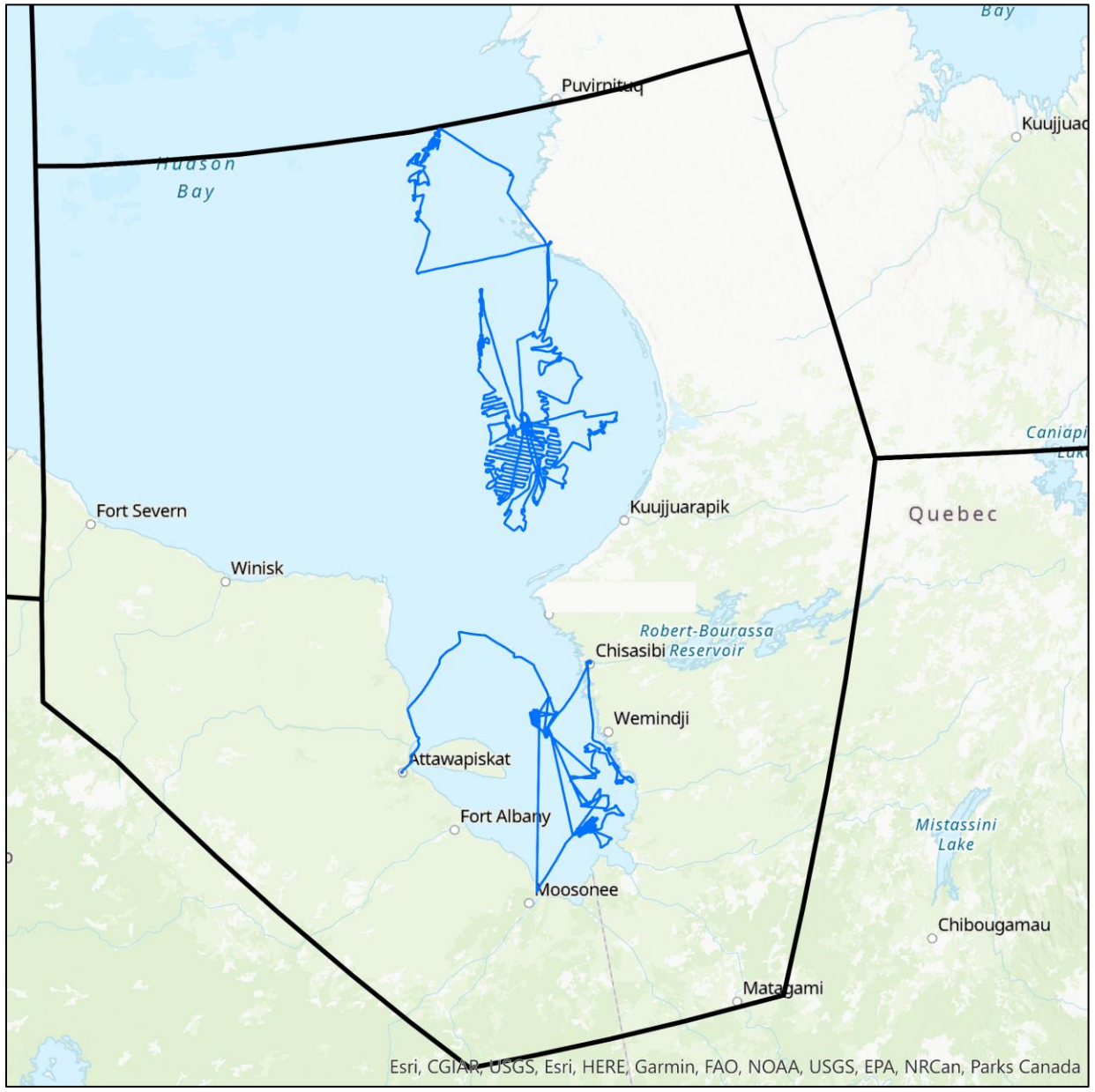
Quebec Coast

- Helicopter
- Double-observer mark-recapture
  - “Teams” of front and rear observers
  - Calculate sighting probability
  - Use to adjust number of groups seen upwards
- No bears observed



James Bay and Hudson Bay islands

- Twin otter
- Double-observer mark-recapture
  - “Teams” of front and rear observers
  - Calculate sighting probability
  - Use to adjust number of groups seen upwards
- One estimate produced



Ontario and Akimiski estimates

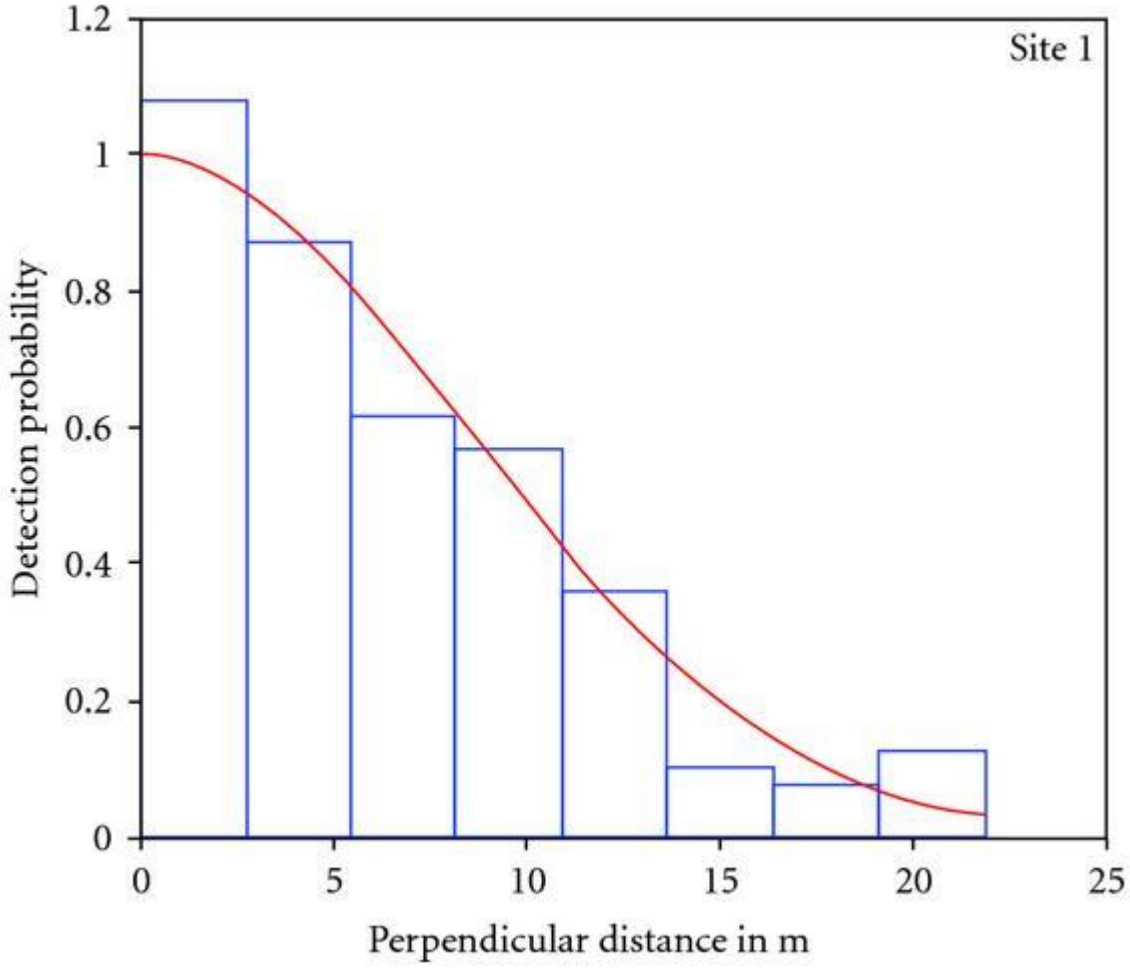
1. Distance sampling of entire area assuming perfect detection on transect

2. Distance sampling of entire area assuming perfect detection on transect EXCLUDING area within 500 m of high tide line PLUS coastal double-observer mark-recapture survey

MRDS vs. MCDS

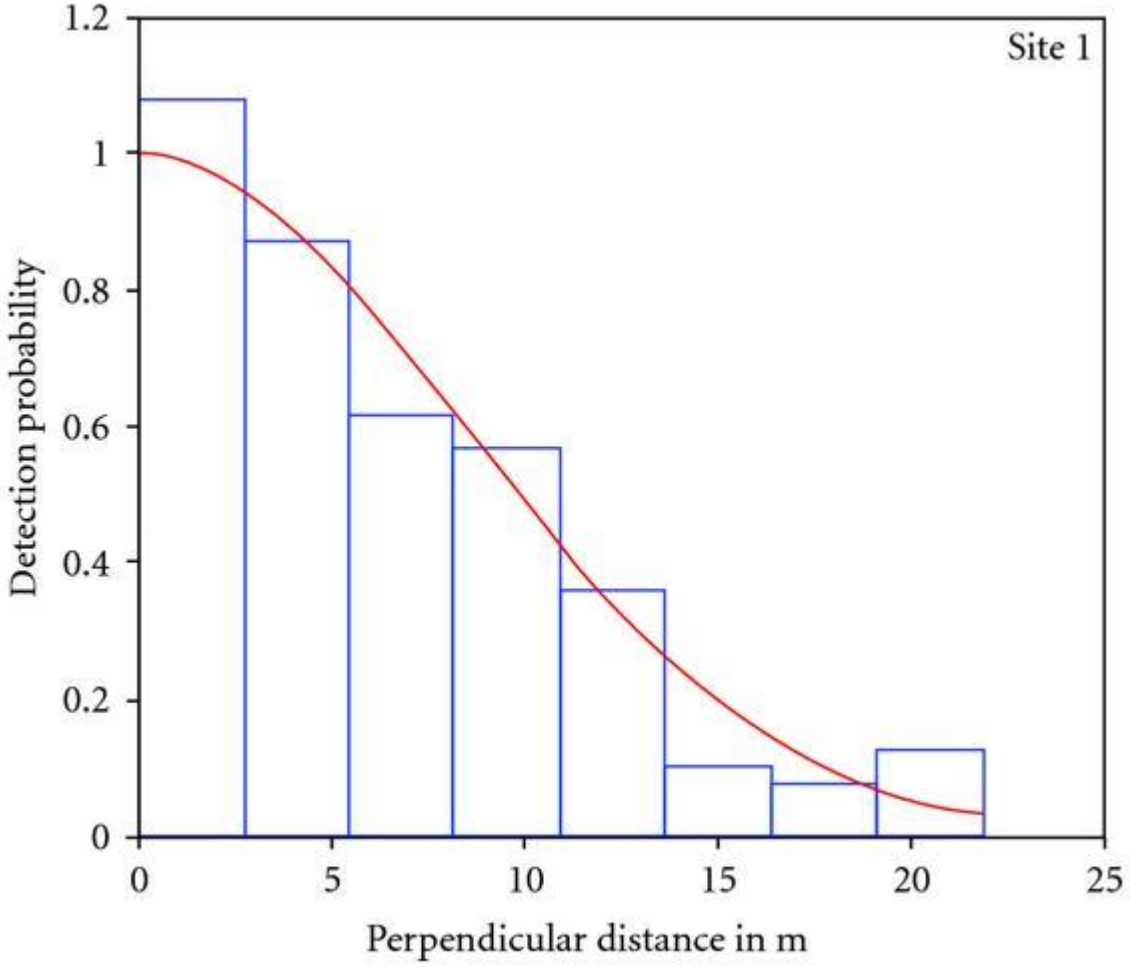
- Distance sampling assumes perfect detection on the transect line

- Can conduct mark-recapture distance sampling (MRDS) if this is not the case
  - Estimate typically will be higher!



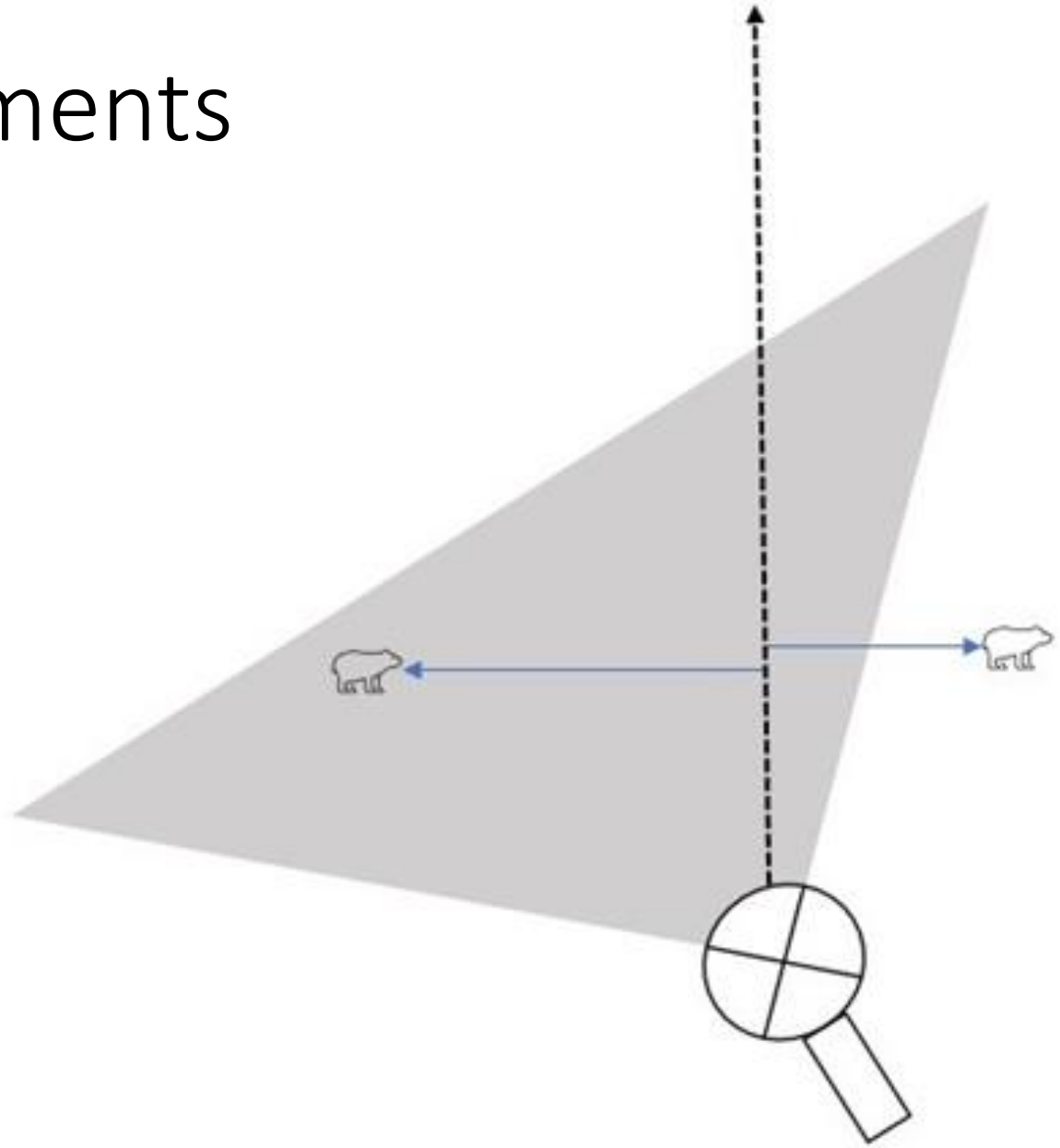
MRDS vs. MCDS

- 2011, 2016, 2021- data collected to fit MRDS models
- 2011- MRDS
- 2016- MCDS assuming perfect detection on the line (supported by data in 2016)
- MRDS models showed poor fit



2021 analytical adjustments

- Based on recent advancement by Wiig et al. 2022 working in Kane Basin
- Allows for imperfect detection on transect line due to “crabbing”
- MUCH improved fit to data, but MAY BE less comparable to 2016
- Produced 2 estimates



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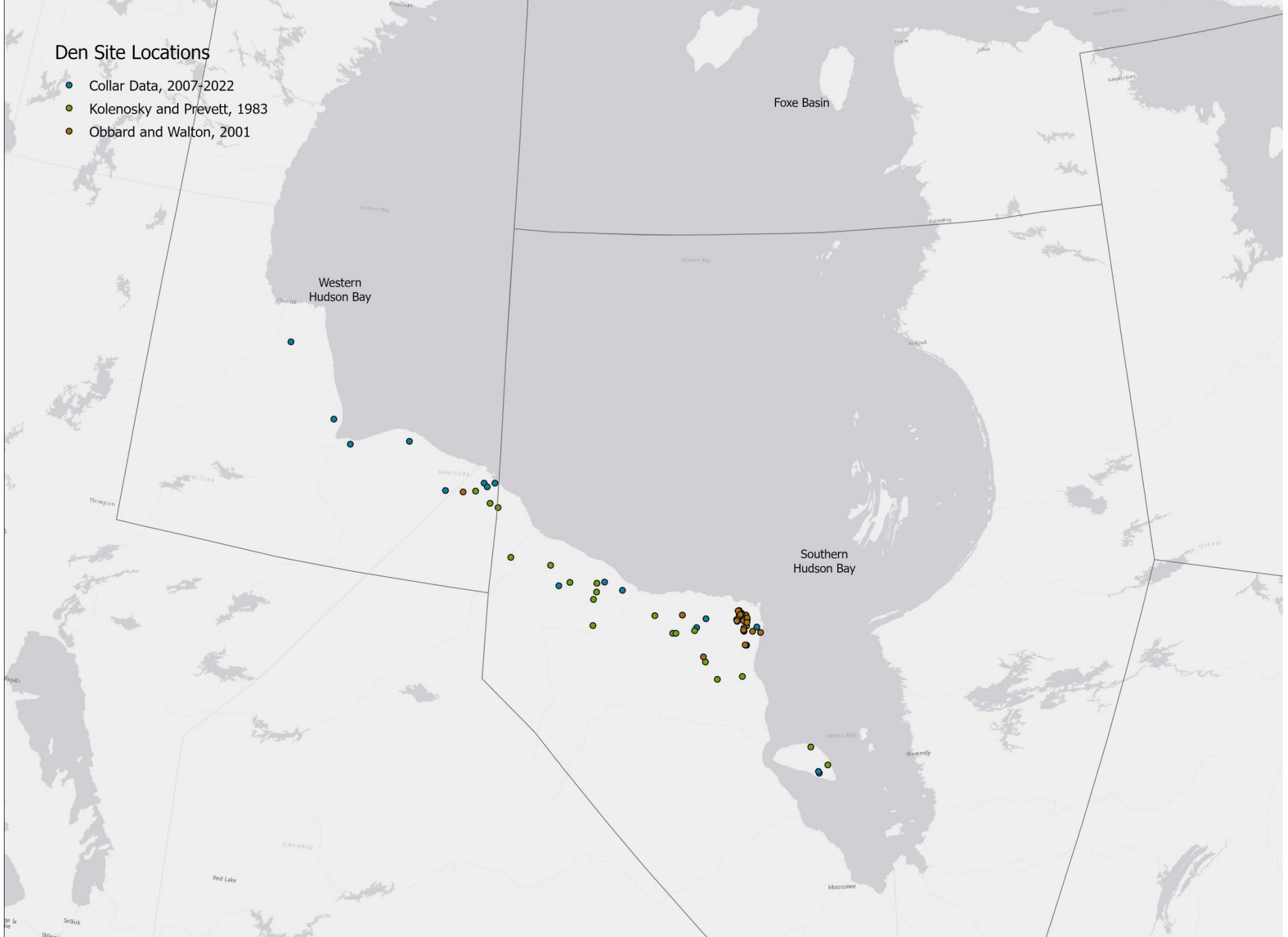
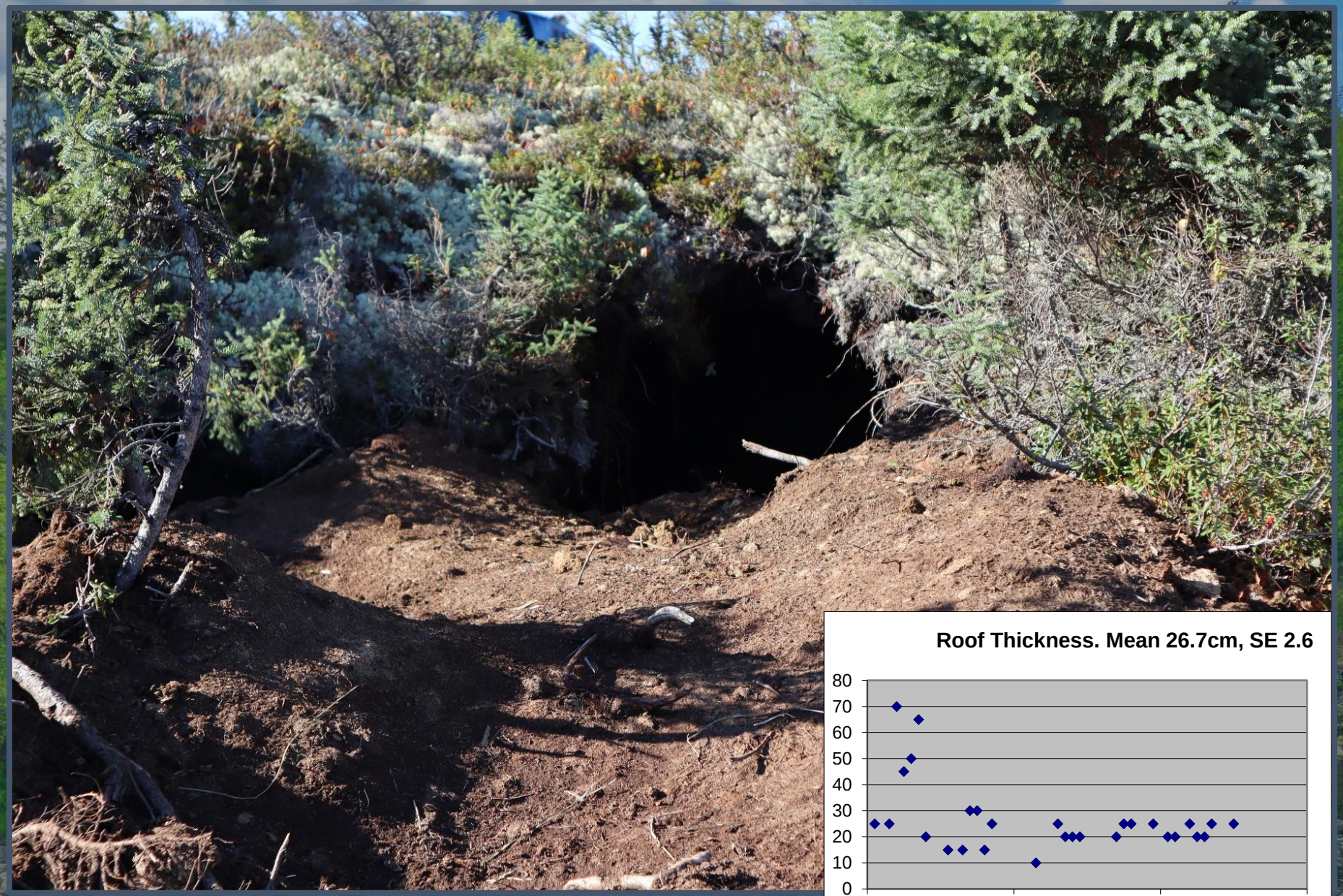
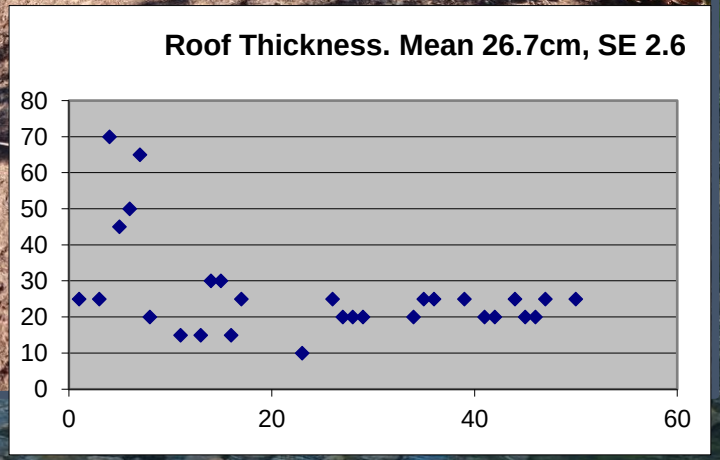
Single averaged estimate

3. Mark-recapture distance sampling assuming imperfect detection on transect
4. Mark-recapture distance sampling assuming imperfect detection on transect EXCLUDING area within 500 m of high tide line PLUS coastal double-observer mark-recapture survey

Single averaged estimate


Den Site Locations
Collar Data, 2007-2022
Kolenosky and Prevett, 1983
Obbard and Walton, 2001
Foxe Basin
Western
Hudson Bay
Southern
Hudson Bay
MANITOBA
ONTARIO
QUEBEC
Hudson Bay
James Bay
Churchill
Thompson
Red Lake
Moosonee
Wemindji




Roof Thickness. Mean 26.7cm, SE 2.6
80
70
60
50
40
30
20
10
0
0
20
40
60