Climate Change and Arctic Marine Mammals: Living on the Edge

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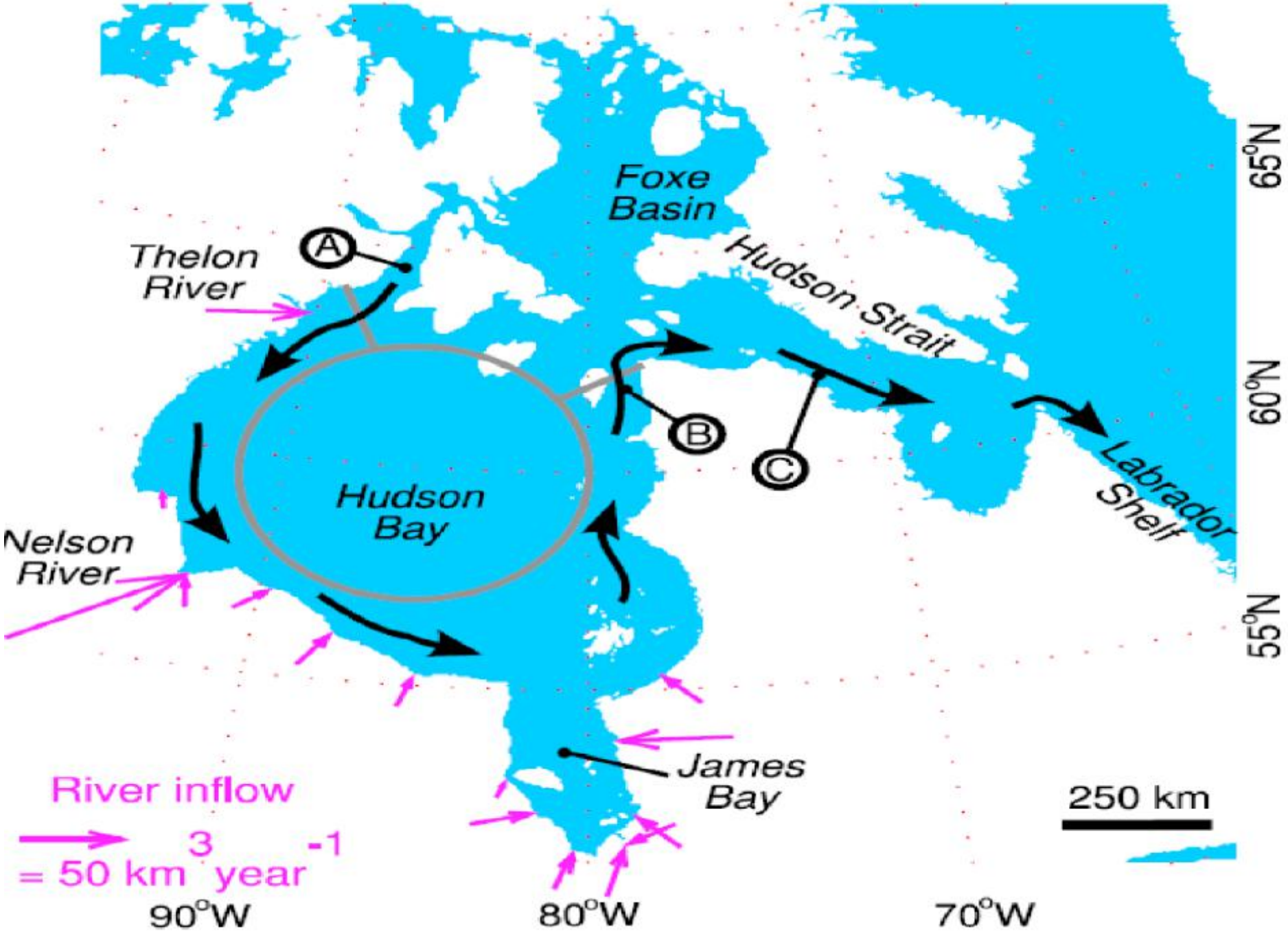
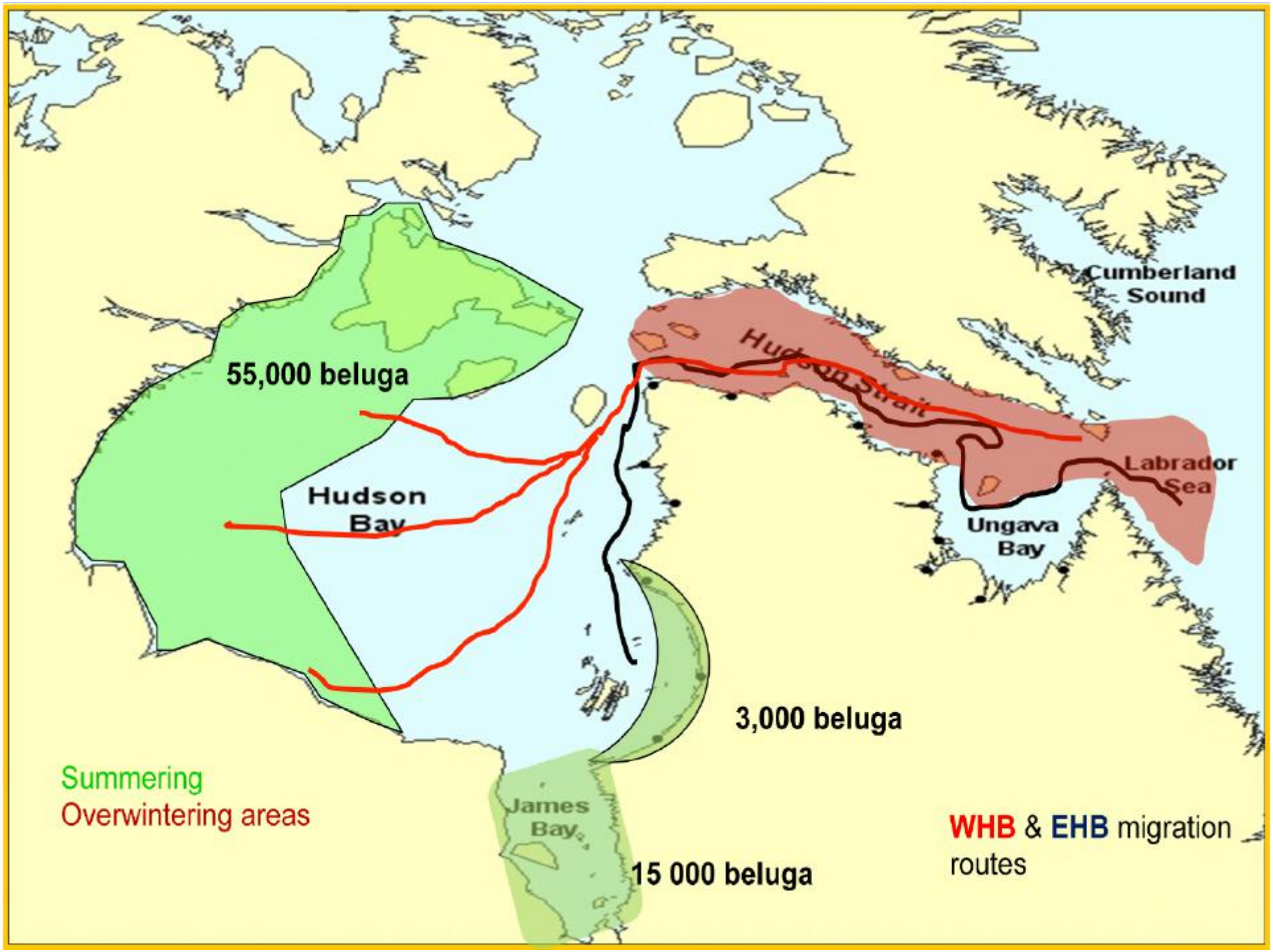
Outline:

- Hudson Bay-
- Bears (losers?)
- Killer whales (winners?)
- Beluga (Collateral damage?)


Foxe
Basin
Thelon
River
A
Hudson Strait
B
C
Labrador
Shelf
Hudson
Bay
Nelson
River
James
Bay
River inflow
= 50 km 3 year -1
250 km
65°N
60°N
55°N
90°W
80°W
70°W

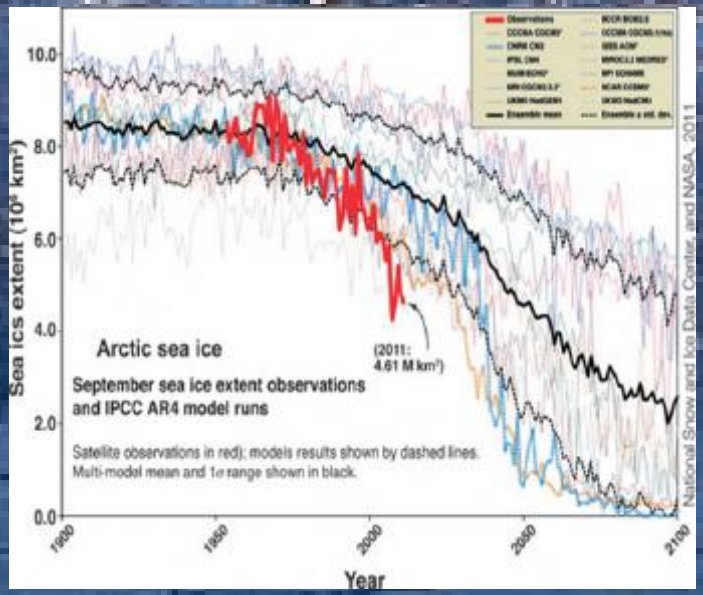
2012

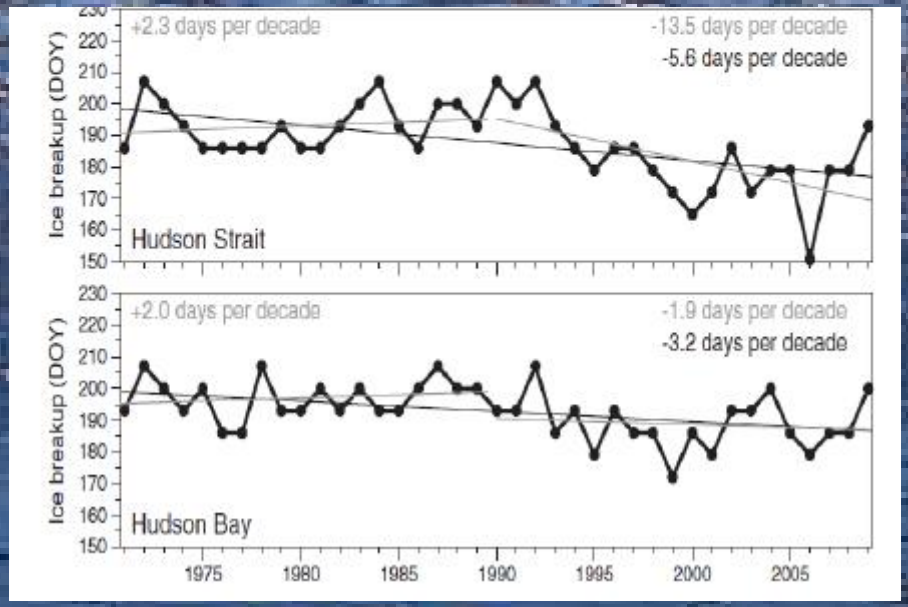
Who lives there?


Cumberland Sound
55,000 beluga
Hudson Strait
Labrador Sea
Hudson Bay
Ungava Bay
3,000 beluga
Summering
Overwintering areas
James Bay
15 000 beluga
WHB & EHB migration routes

Minimum sea ice projections

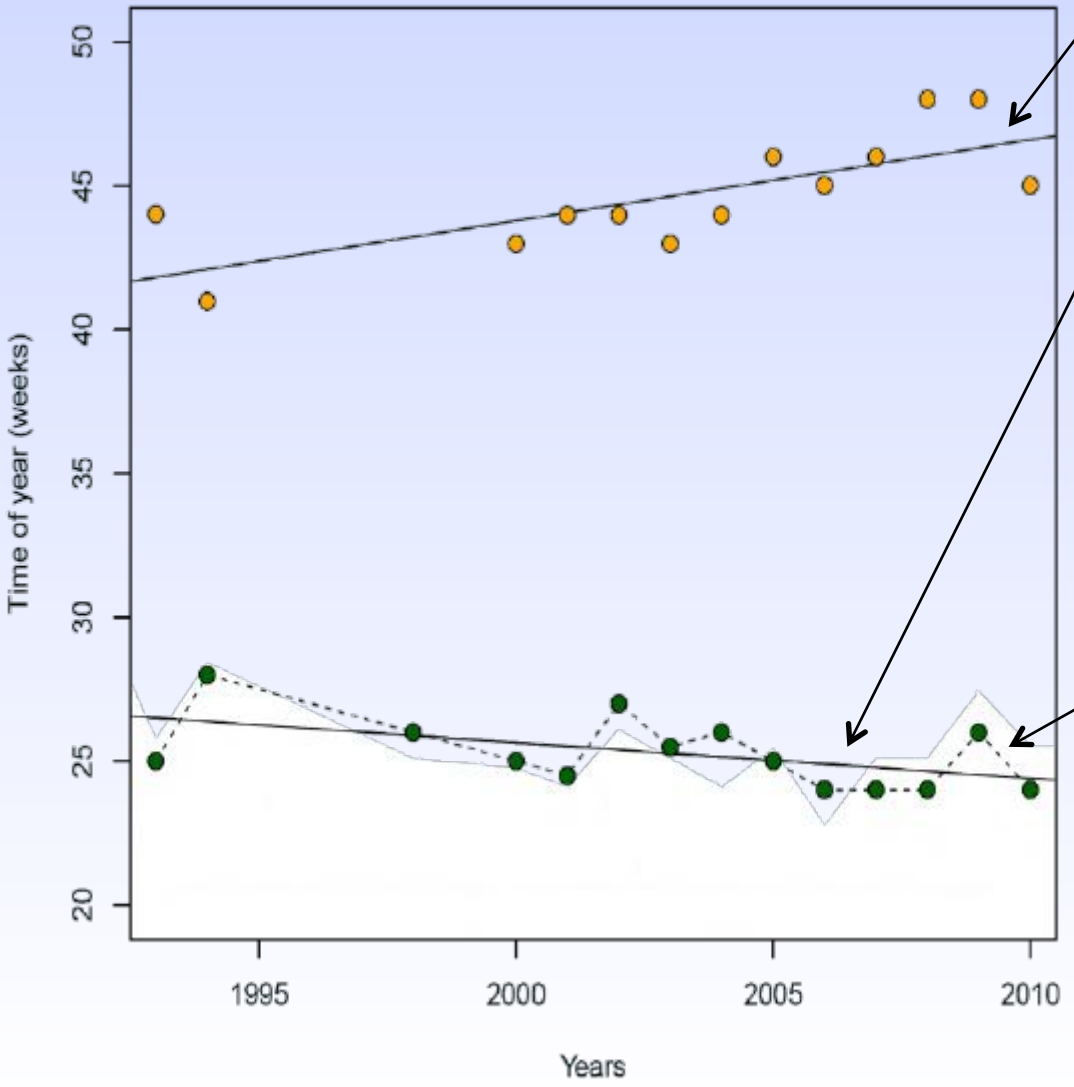
(© National Snow and Ice Data Center and NASA 2008, updated from Stroeve et al., 2007) Galbraith and Larouche 2011.





Source: IUCN/SSC Polar Bear Specialist Group, and

Observations from Inuit hunters: Hudson Strait

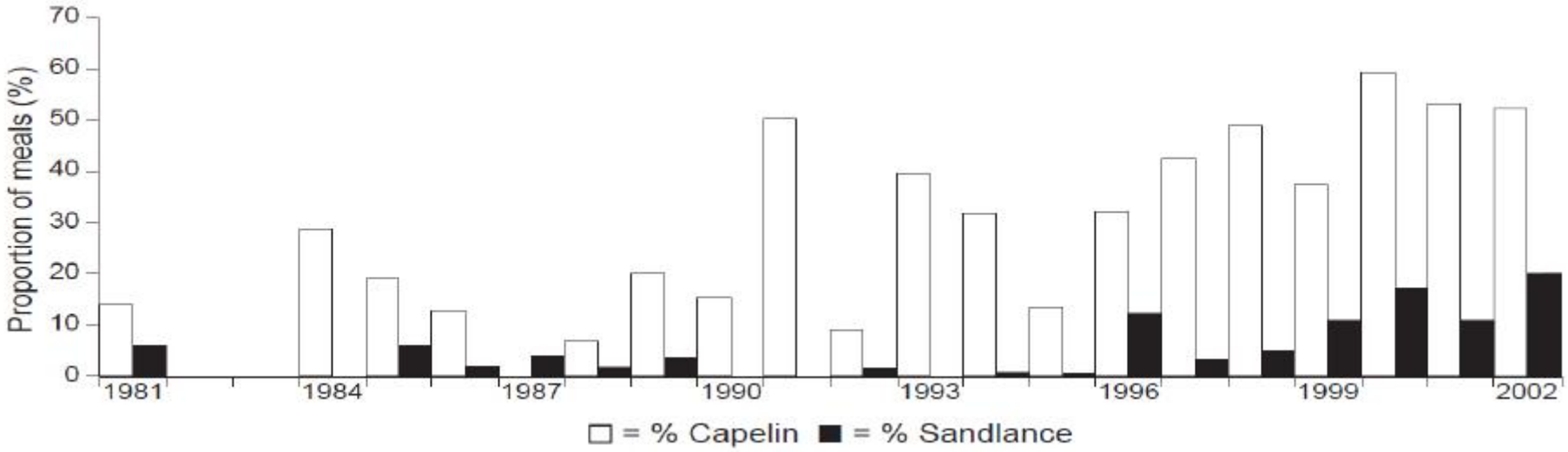


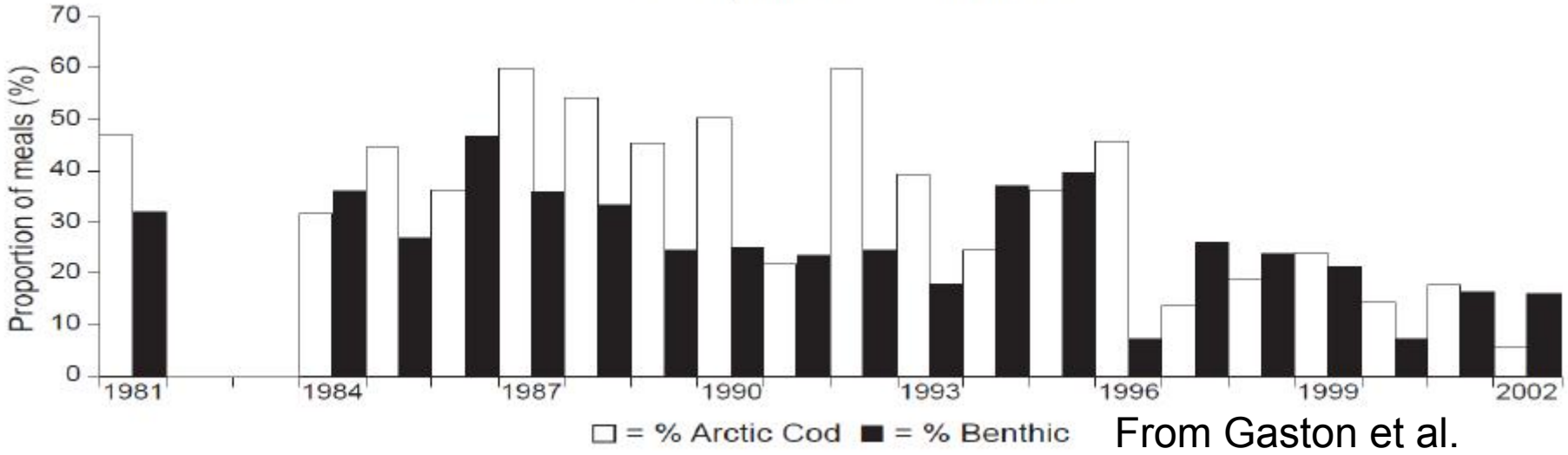
Fall migration ~ 18 days later per decade ($p<0.01$)

•Spring migration ~ 8 days earlier per decade ($p<0.05$), similar to trend in the timing of ice break-up in Hudson Strait over the same period

•Inter-annual variation in spring migration was correlated to variation in ice break-up dates in Hudson Strait from Galbraith & Larouche 2011 ($r^2=0.6$, $p<0.01$)

Ecosystem changes: Thick-billed murres



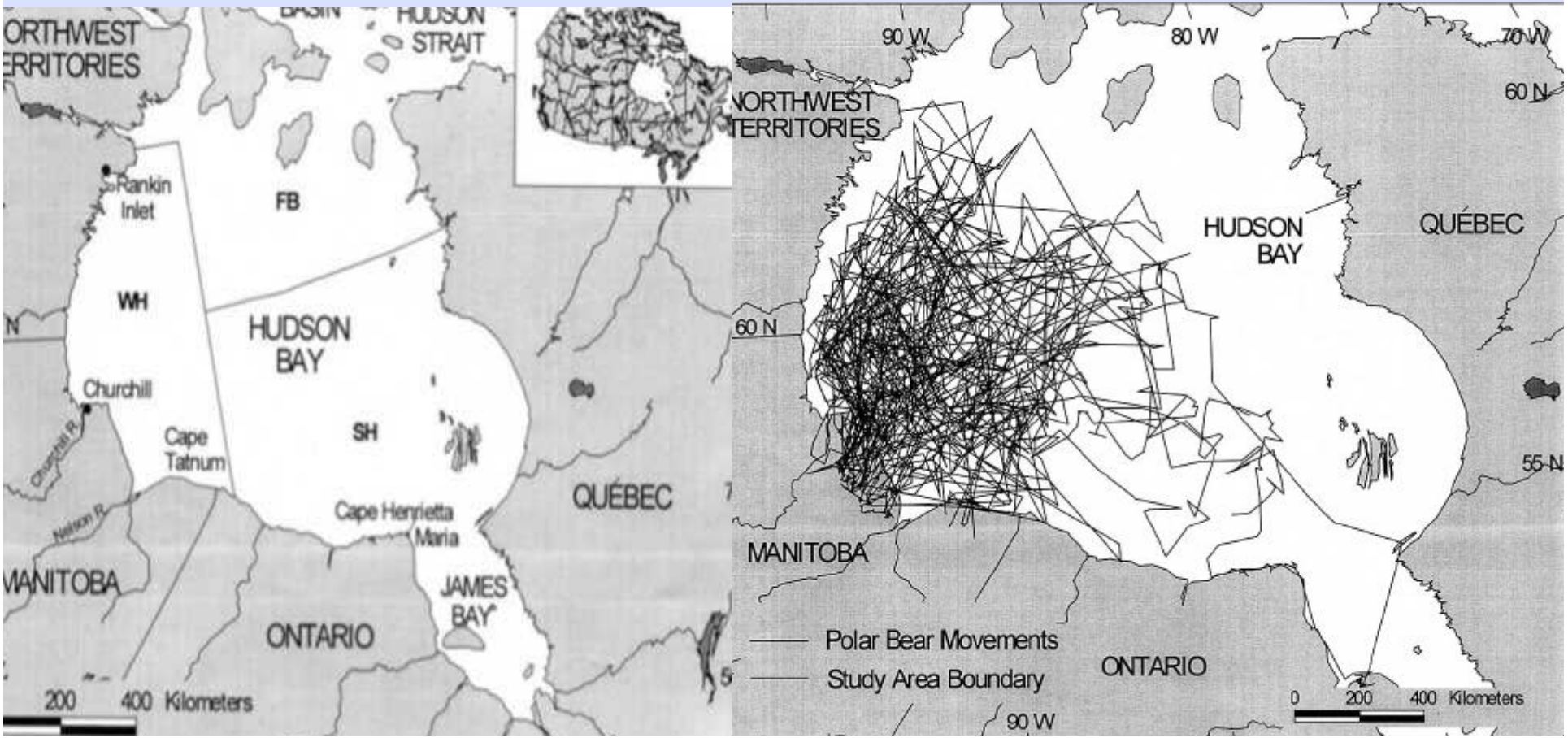


From Gaston et al. 2003

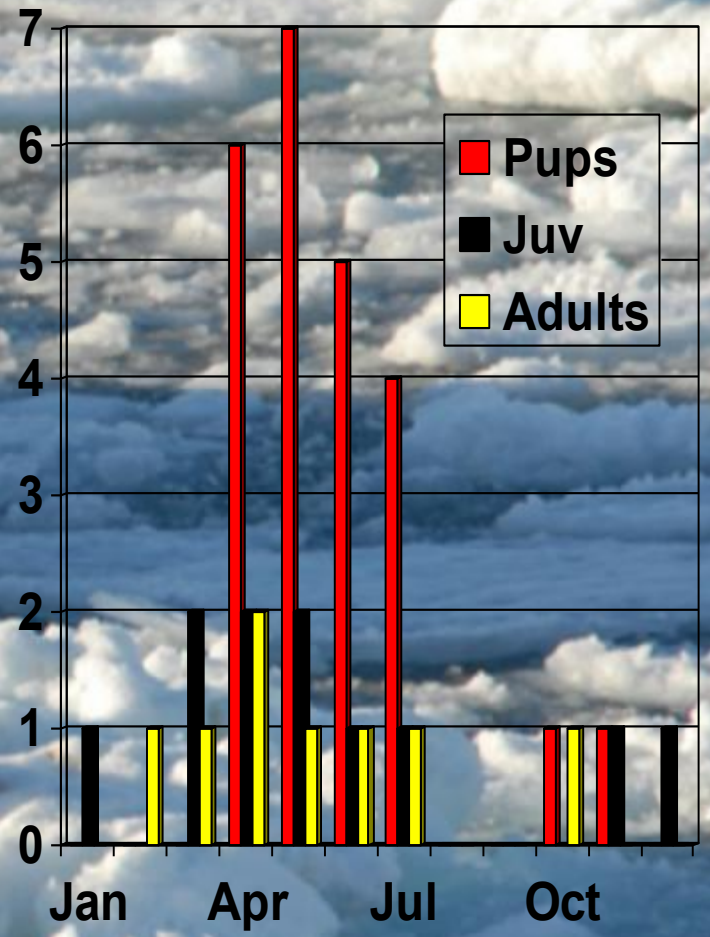
Bears in Hudson Bay summer
on land,
Move to Ice:
Males: Nov-breakup,
Females: March-breakup.

Population fidelity

Distance from original capture location of 1386 bears captured 1 to 11 year intervals: 46-62 km



PB consume 43 ringed seals per year. (Stirling and Oritsland 1995)



84% feeding occurs March until breakup

61% of feeding = pups

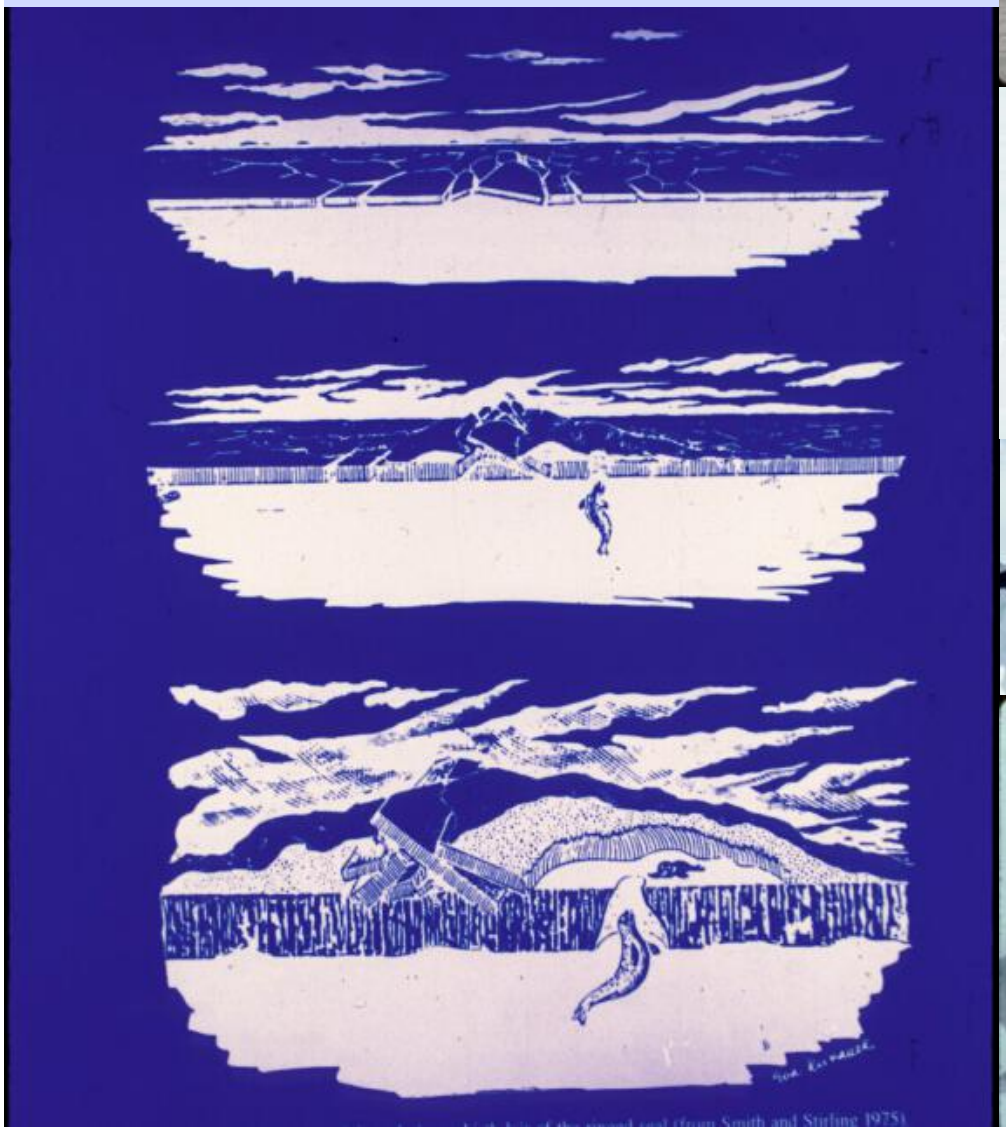
Ringed seal Hudson Bay

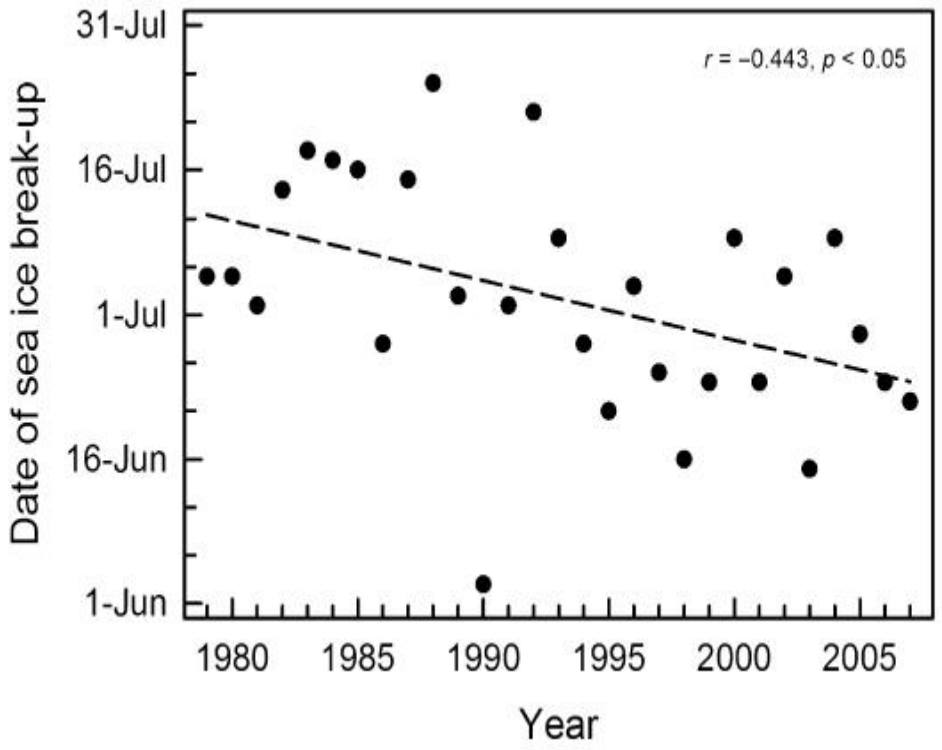
- Small seal 80 kg
- Associated with fast ice
- Pups born in snow caves
- No long term trend in abundance, dynamics,
- Possible decadal changes
- Data are limited

Surveys flown about 2 weeks earlier than 20 years ago

Ringed seal

(Smith and Stirling 1975; Hammill and Smith 1989)

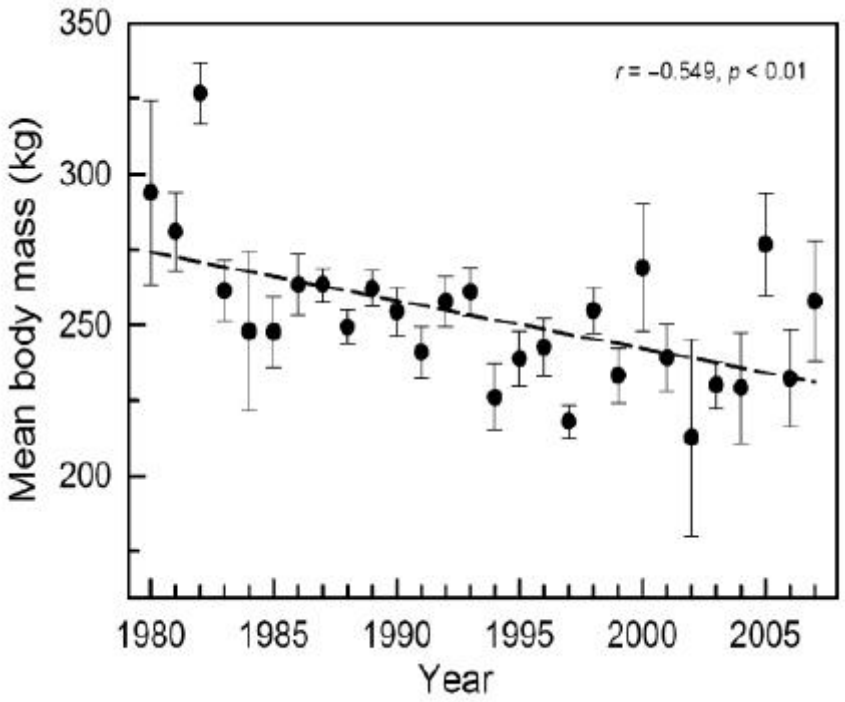




Date of breakup in western Hudson Bay

From Stirling and Dersocher 2012

Change in mass of female bears



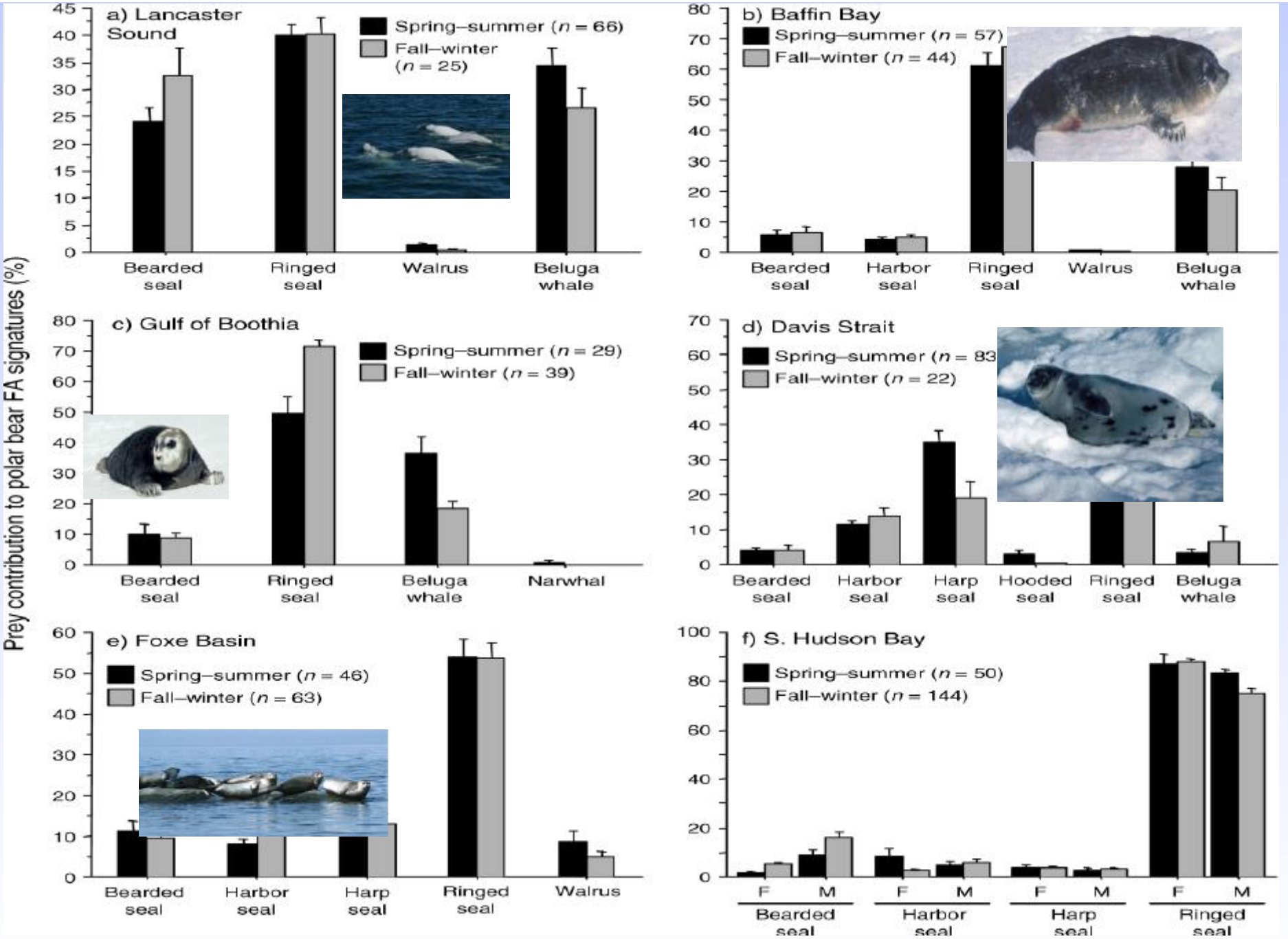
Western Hudson Bay Polar Bears today (Stirling and Derocher 2012)

- W. Hudson B 1980s
- Triplet litters=12%
- % of population composed of independent yearlings=80%

- W. Hudson B. today
- <1%
- <1%

Future prospects

- Access to traditional food is decreasing
- Longer term outlook for ringed seals may be negative due to declines in ice, snow cover
- Could bears access alternative foods eg harbour seals, other sources?

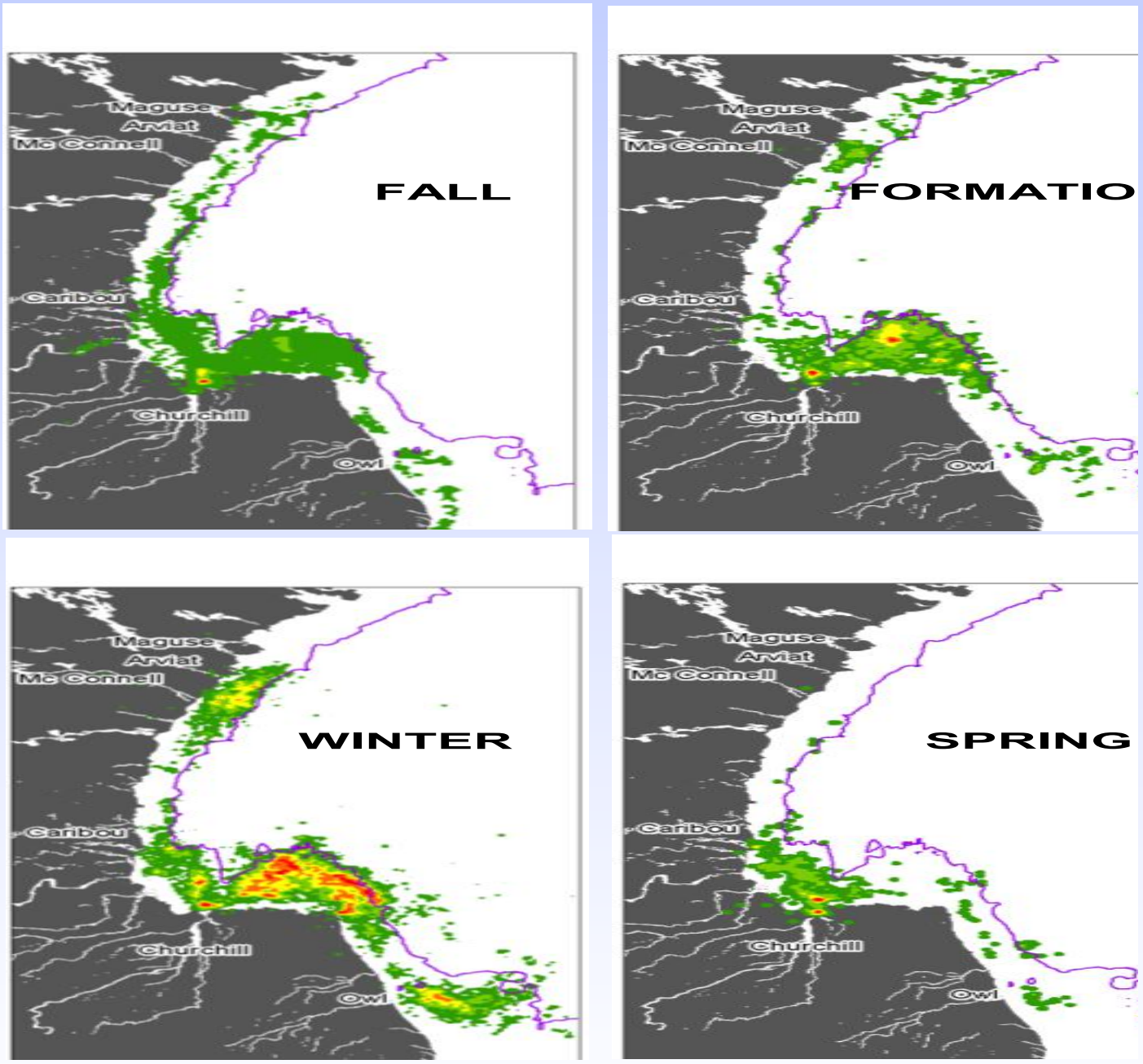


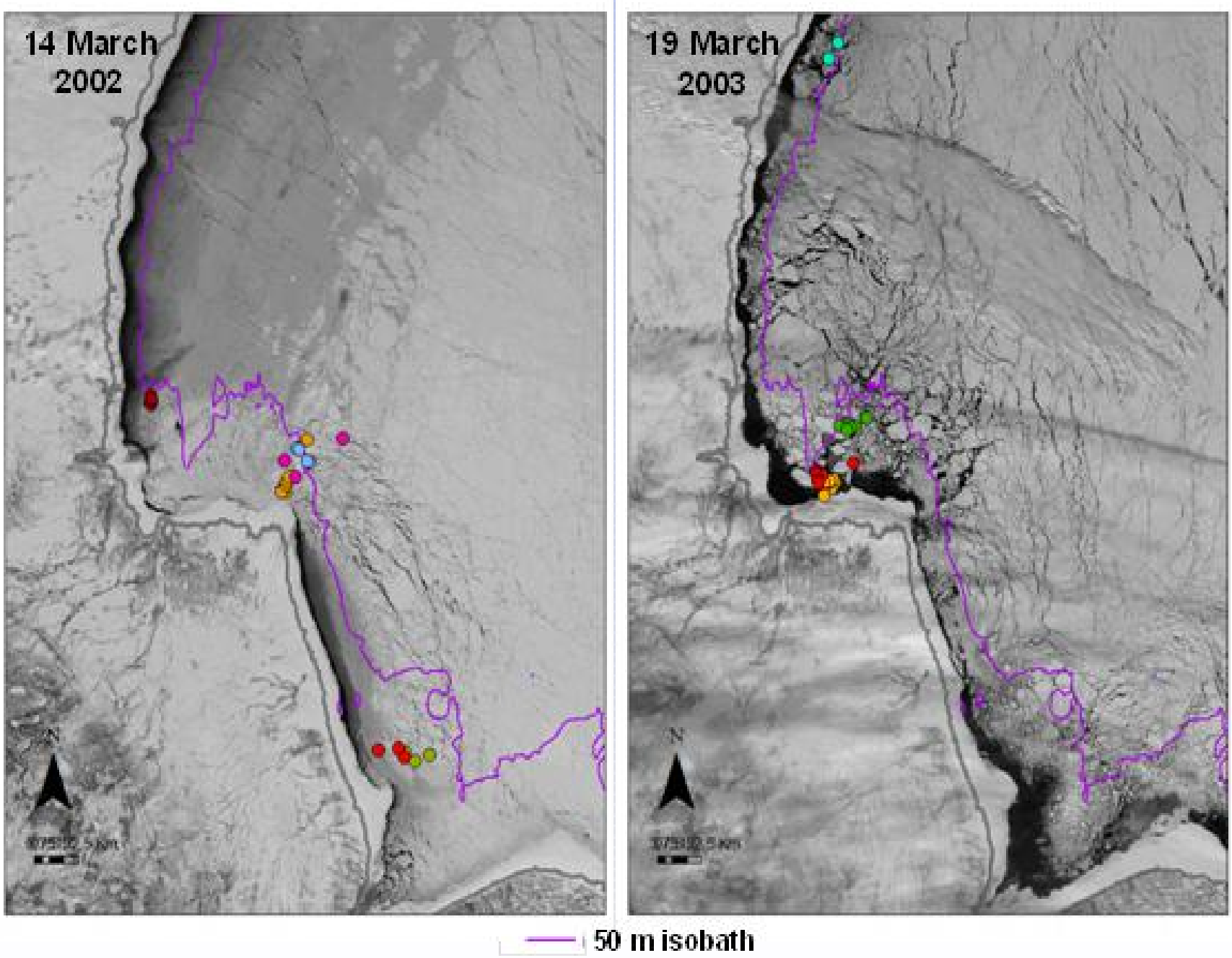
Modified from Thieman et al. 2008

Harbour seal

- Considered as coastal
- About 1.4m long, up to 110 kg
- Pups take to the water soon after birth and follow the female during lactation

Captured 18 , including 2 in 2001-2002


FALL
FORMATIO
WINTER
SPRING
Maguse
Arviat
Mc Connell
Caribou
Churchill
Owl
Location density distribution
Low
Moderate
High
50 m isobath


14 March
2002
19 March
2003
N
N
50 m isobath

Food chain impacts: Mis-Match, Junk food?

Ringed seals
Birth 5kg ,
Weaned 22kg
Blubber 11kg

Harbour seals:
10 kg,
25 kg
10 kg (Muellbert et al. 2003)

Summary

- Harbour seals are largely restricted to a narrow zone along the Hudson Bay coast, **in waters less than 50 m deep.**
- With a decline in ice, numbers will likely increase, but it is doubtful that they would expand to fill the gap, left by the decline in ringed seal numbers due to deteriorating ice
- Weaned harbour seal pups are more mobile than ringed seal pups, and energetically less interesting

Killer Whales

Up to 8 m long, 6 tonnes

Tend to feed on fish or marine mammals

Primarily beluga/ narwhal, bowhead, seals Higdon et al. 2012

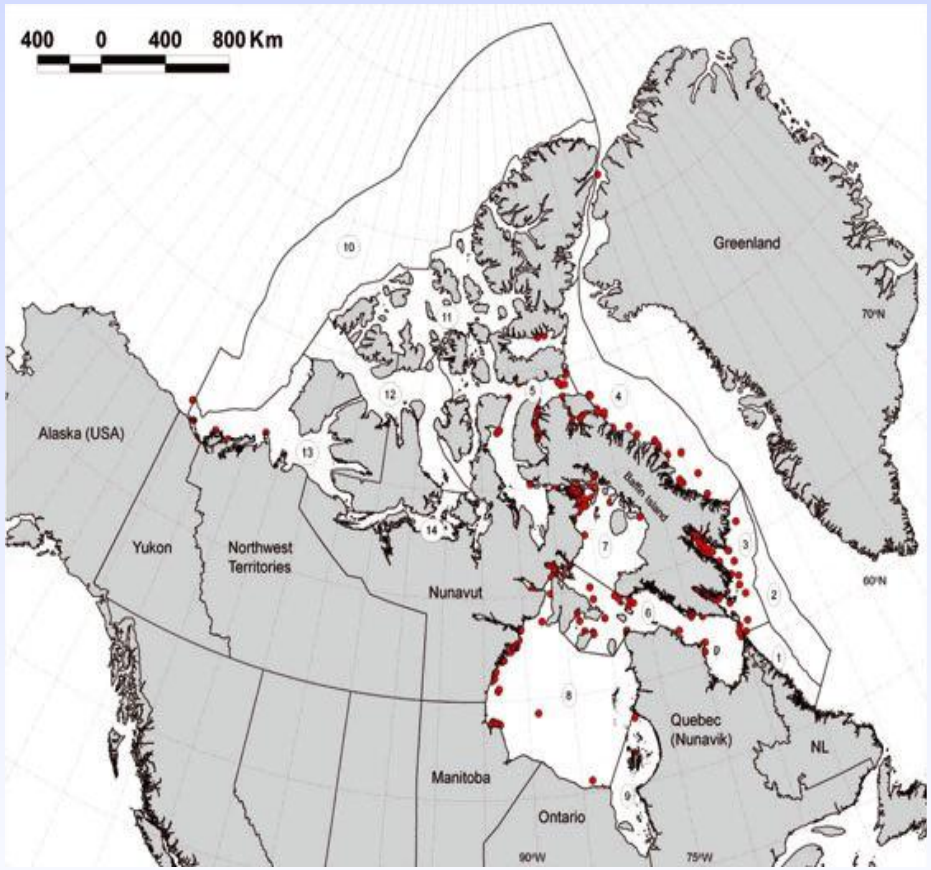
Seasonal visitors ,early spring to fall, in Canadian Arctic Higdon et al. 2012

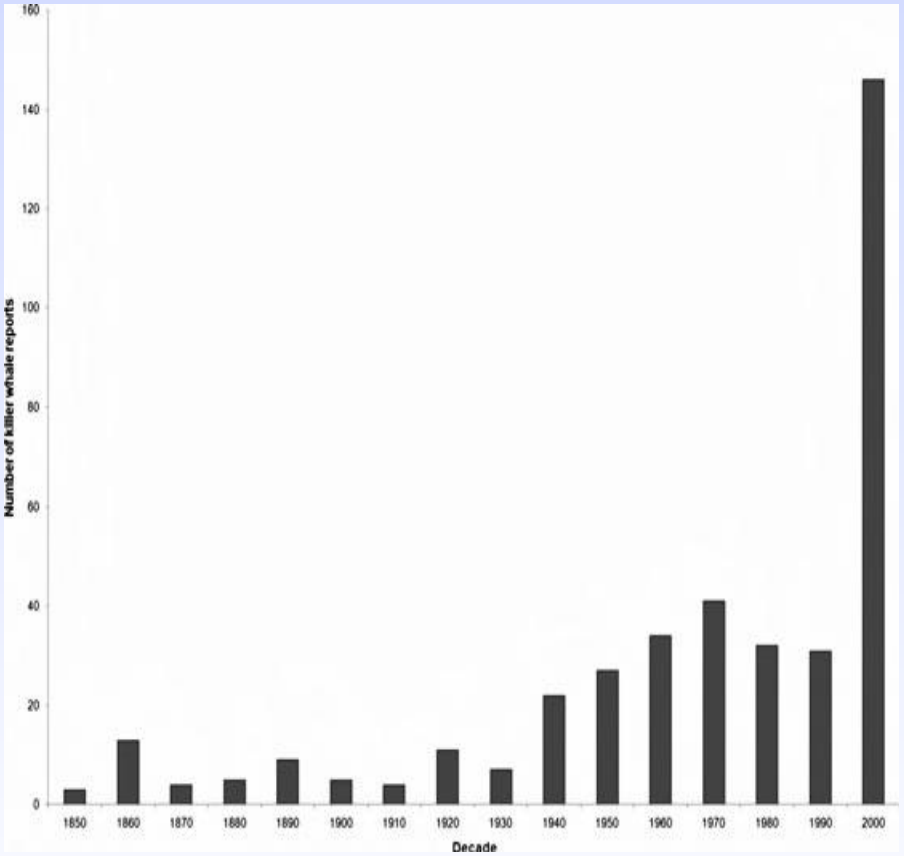
Arctic killer whales avoid heavy ice

John Ford

Killer whales

Most sightings from Hudson Bay-Foxe Basin area, rapid increase in recent years





Figures from Higdon et al. 2012

Killer whales

- Number is unknown
- Observations from hunters point to marine mammal diets
- Bowhead, narwhal, beluga and seals expected to be consumed
- Bowhead because of size, or Western Hudson Bay (WHB) beluga owing to abundance may be preferred prey

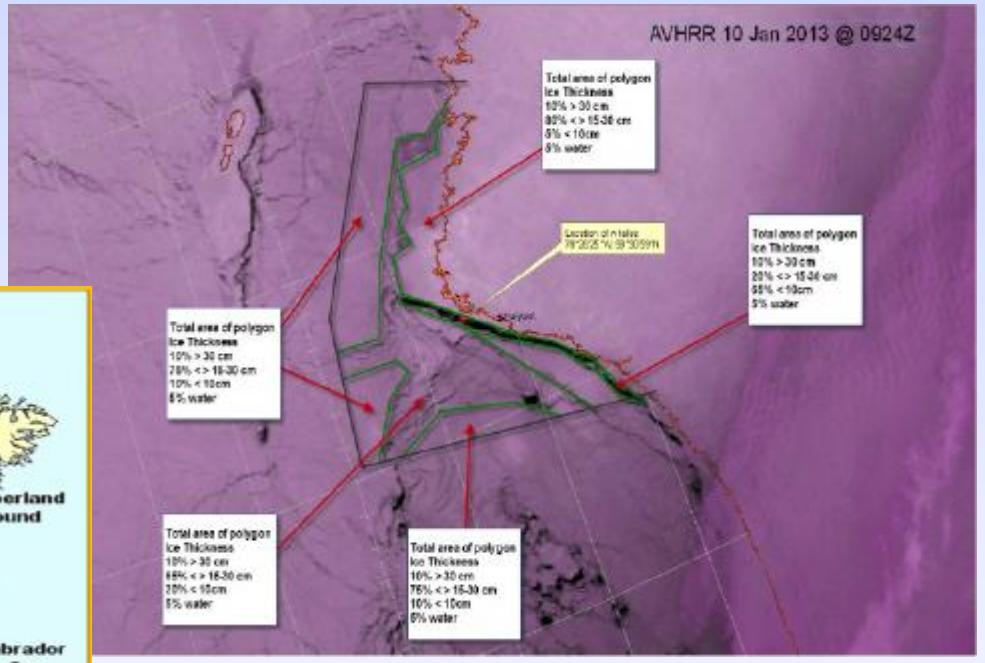
Killer whale entrapment- Hudson Bay, Jan 9 2013

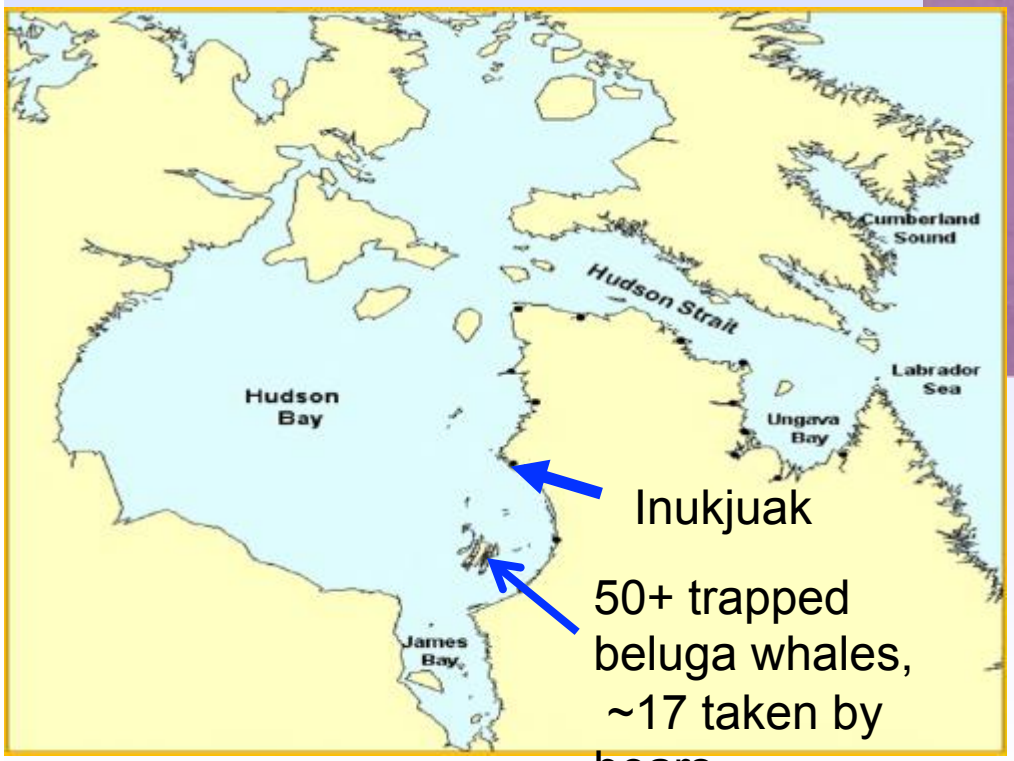
Things are fine if killer whales target bowhead, or WHB beluga

R. Goulet

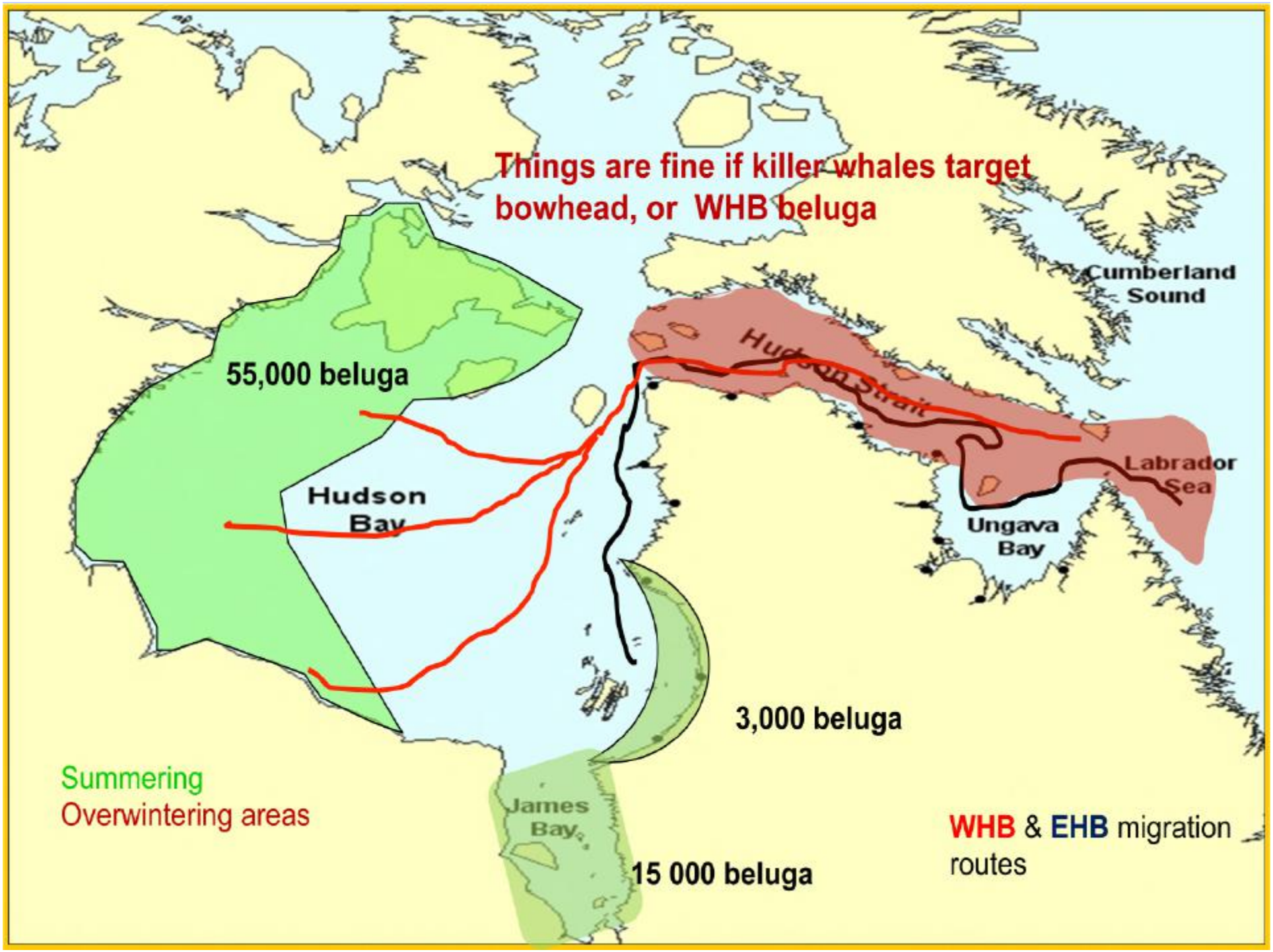
Maggie Okituk, Toronto Sun

Hudson Bay whale entrapments 2013





50+ trapped beluga whales, ~17 taken by bears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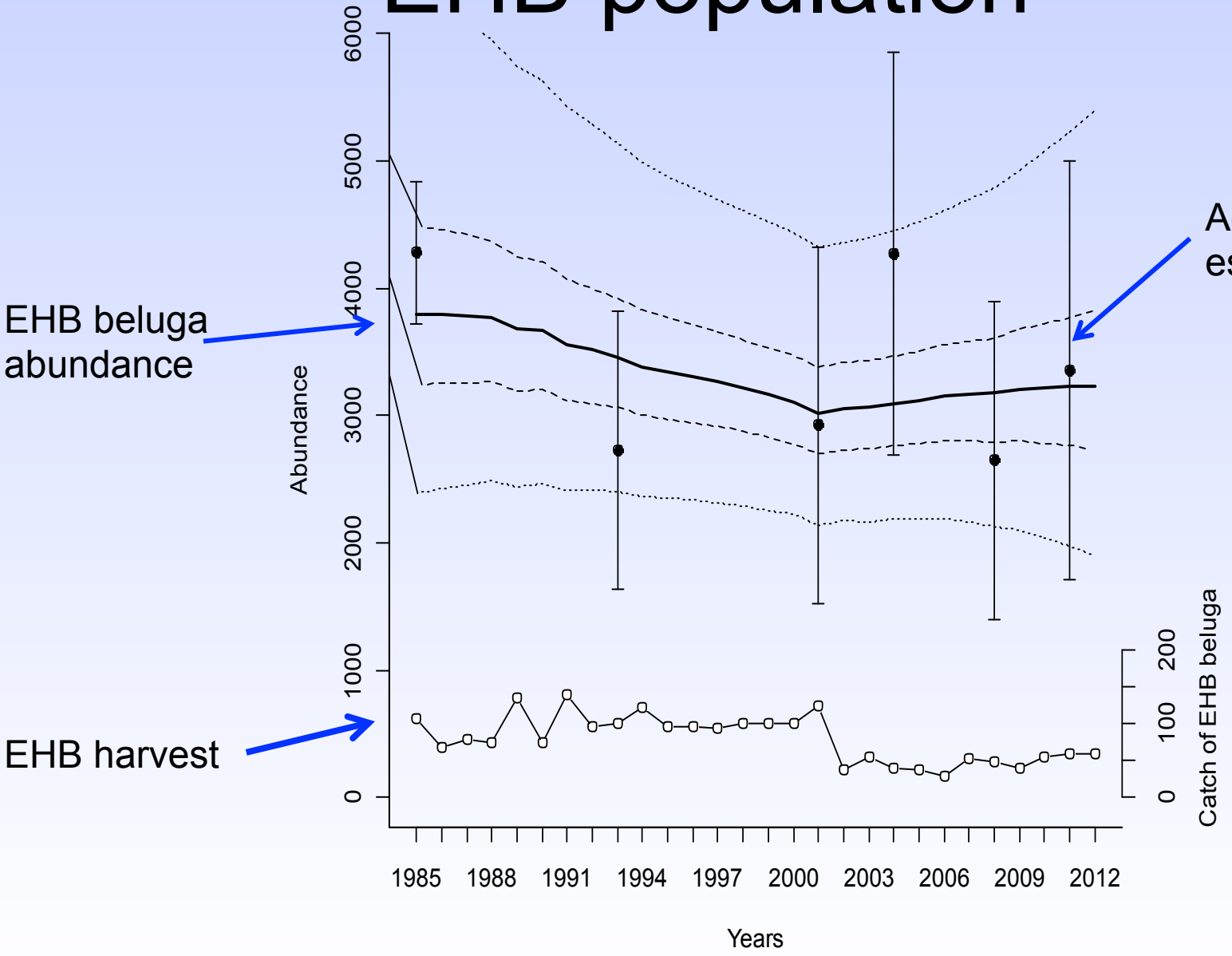
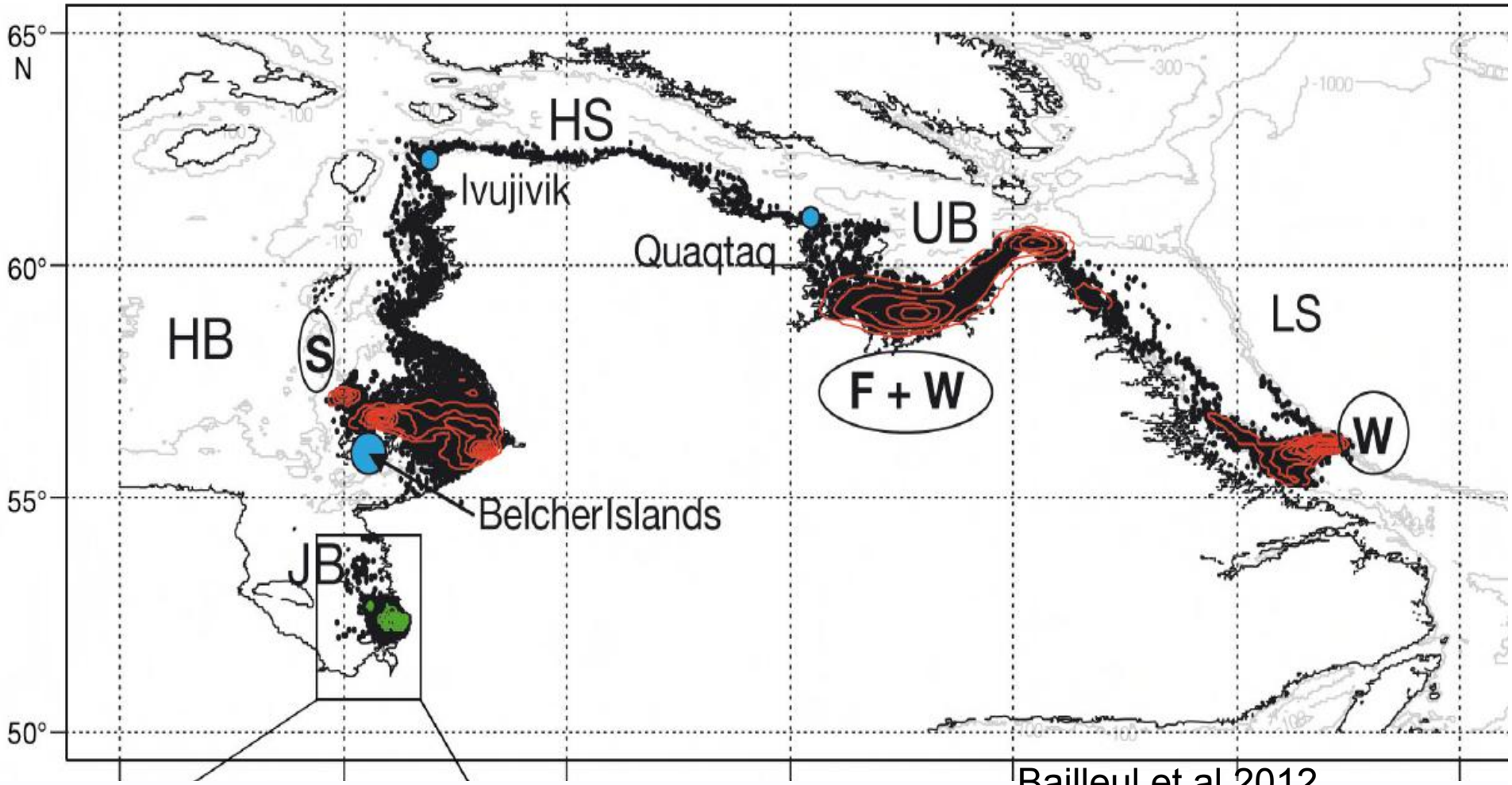
WHB & EHB migration routes

EHB population



Seasonal distribution of eastern Hudson Bay (EHB) beluga whales



Bailleul et al 2012

Western Hudson Bay (WHB) and Eastern Hudson Bay (EHB) Beluga Abundance

- WHB population approx 55,000
- EHB population approx 3,300, stabilize/ increased?
- Total HB harvests approx 600 whales, of which 50-60 from EHB-harvest is fully subscribed
- Longterm implications for ehb beluga-a recovering population
- New source of mortality, should be considered in evaluation

Killer whales

- Numbers in HB currently unknown
- EHB beluga stock is small, not evident as prey
- Stock fully subscribed, need to consider mortality from a new predator in harvest advice ?
- KW not likely abundant, Arctic travel likely learned behaviour
- Loss of pods due to entrapment could have important ecosystem consequences –for predator and prey

Summary

- Hudson Bay is a large inland sea with diverse marine mammal presence (permanent + seasonal).
- Top predator, Inuit hunters + polar bear
- Decline in ice will in short term affect bears, and its main prey ringed seal- alternative prey not evident.
- Ice reduction will favour a new top predator-Killer whale
- This will impact other cetaceans and has management subsistence harvesting considerations,
- However, future not risk free for killer whales either

Thanks to: I. Stirling, C. Bajzak, T. Doniol-Valcroze, V. Lesage, J-F Gosselin, S. Turgeon
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Canadian Wildlife Service
Photos:
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W. Lynch, E. Richardson
Y. Morin, I. Stirling, A

Cloud forest : Costa Rica