

# State of Alaska

## Arctic Marine Mammal Program

Bowheads – Satellite Tracking  
Traditional Knowledge

Belugas – Diet

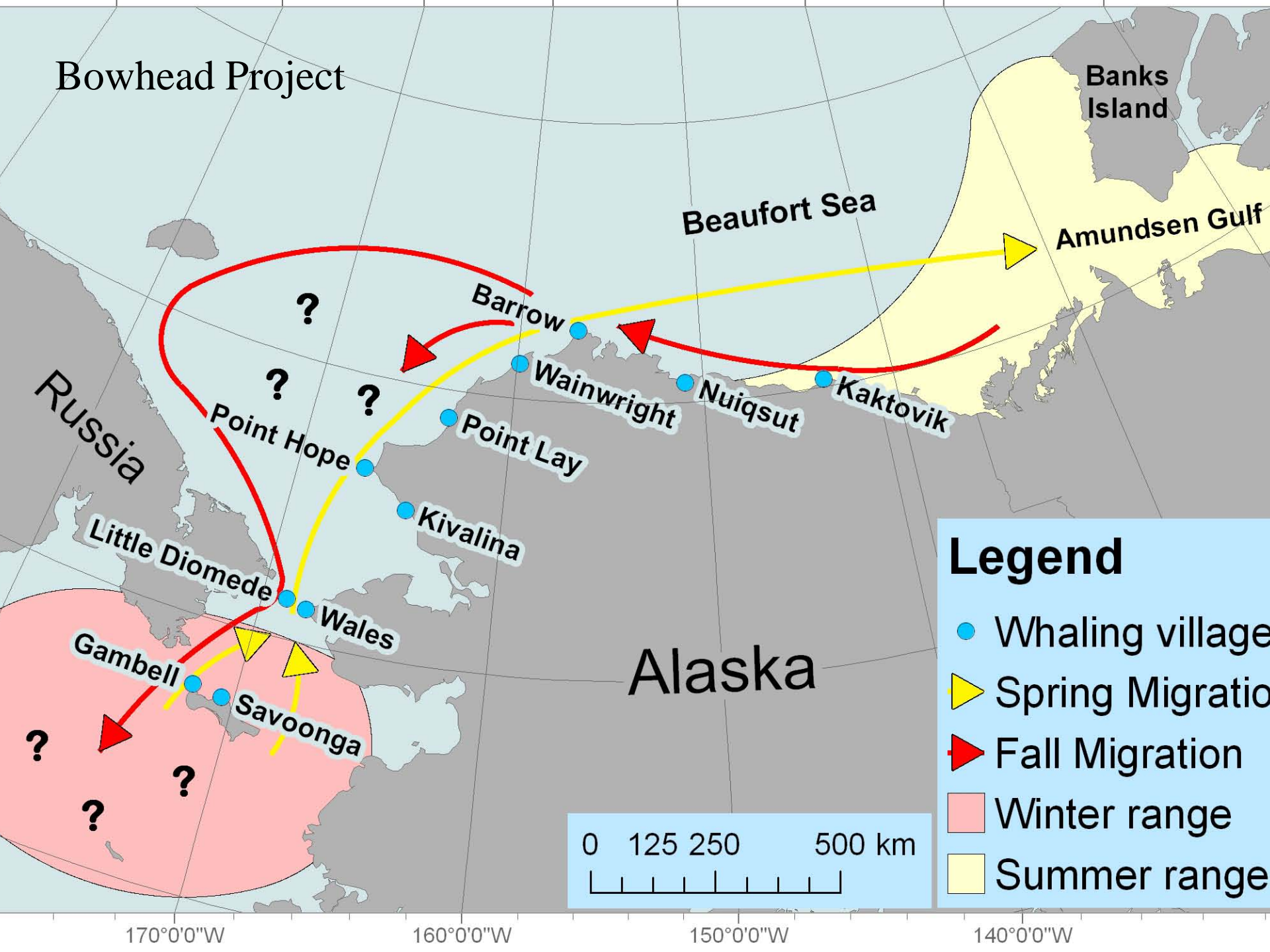
Ice Seals – Bio-monitoring  
Satellite Tracking

Walruses – Satellite tracking  
haulout monitoring

# Bowhead Satellite Tracking



# Bowhead Project



Banks Island

Beaufort Sea

Amundsen Gulf

Barrow

Wainwright

Nuiqsut

Kaktovik

Point Hope

Point Lay

Kivalina

Russia

Little Diomede

Wales

Alaska

Gambell

Savoonga

## Legend

- Whaling village
- ▶ Spring Migration
- ▶ Fall Migration
- Winter range
- Summer range

0 125 250 500 km

170°0'0"W

160°0'0"W

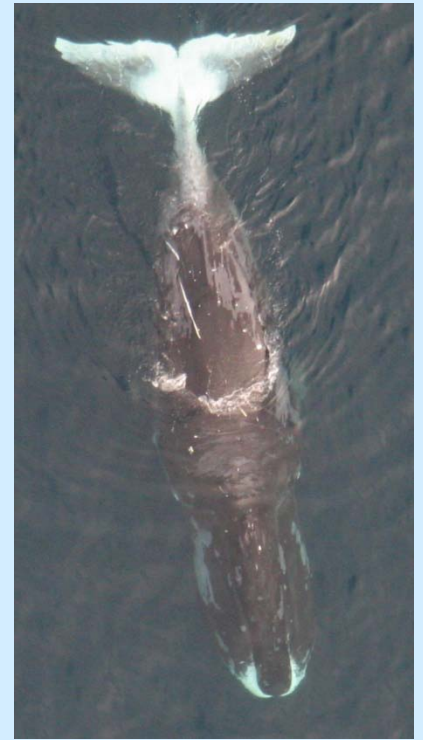
150°0'0"W

140°0'0"W

# Objectives

Use satellite telemetry to:

- 1) Identify important habitats like feeding areas.
- 2) Document behavior relative to industrial activities (e.g., seismic, drilling), ice and ocean conditions, water depth, and distance from shore.
- 3) Determine migration routes and timing of movements and the rates of travel.



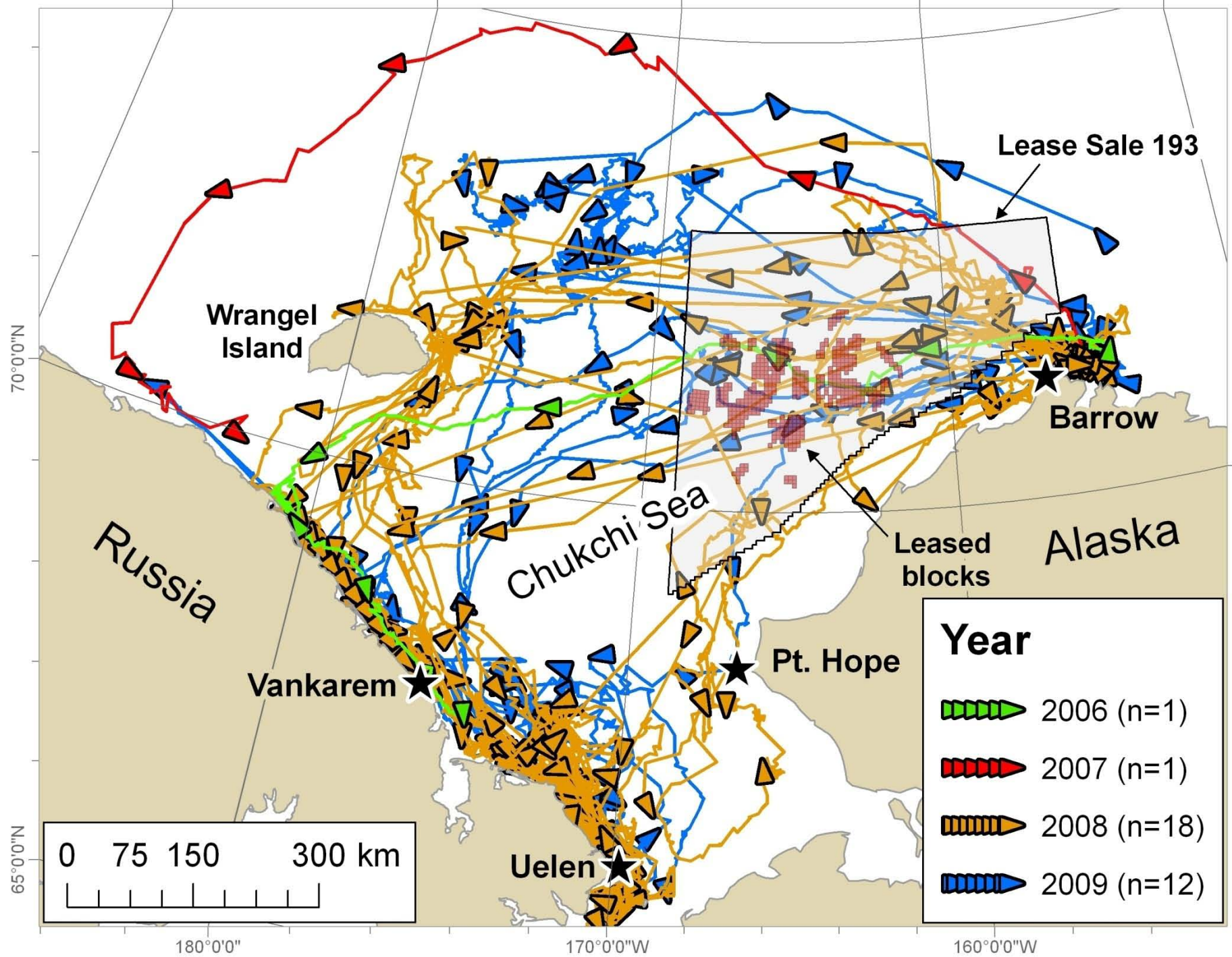
# Work with whalers to deploy satellite transmitters



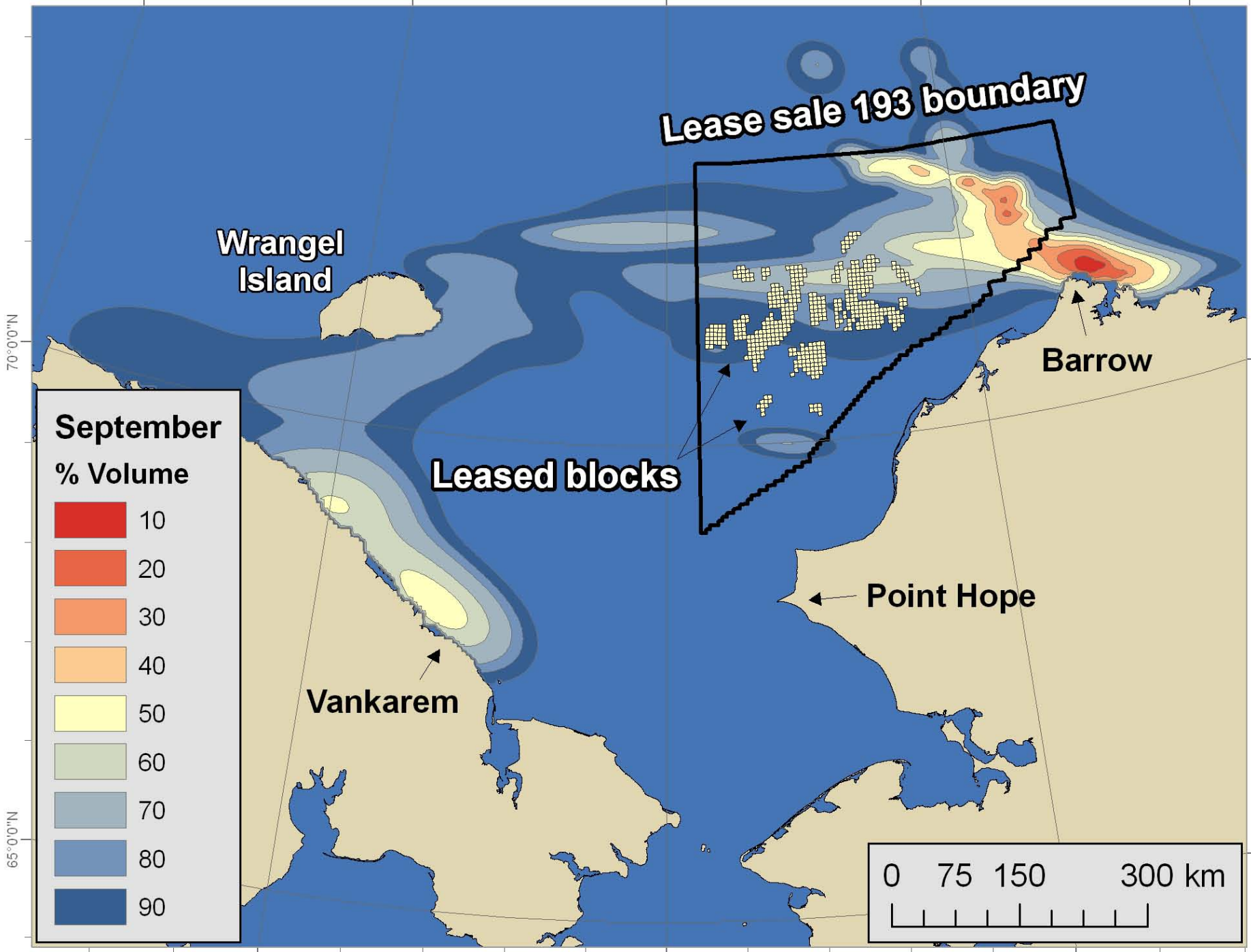


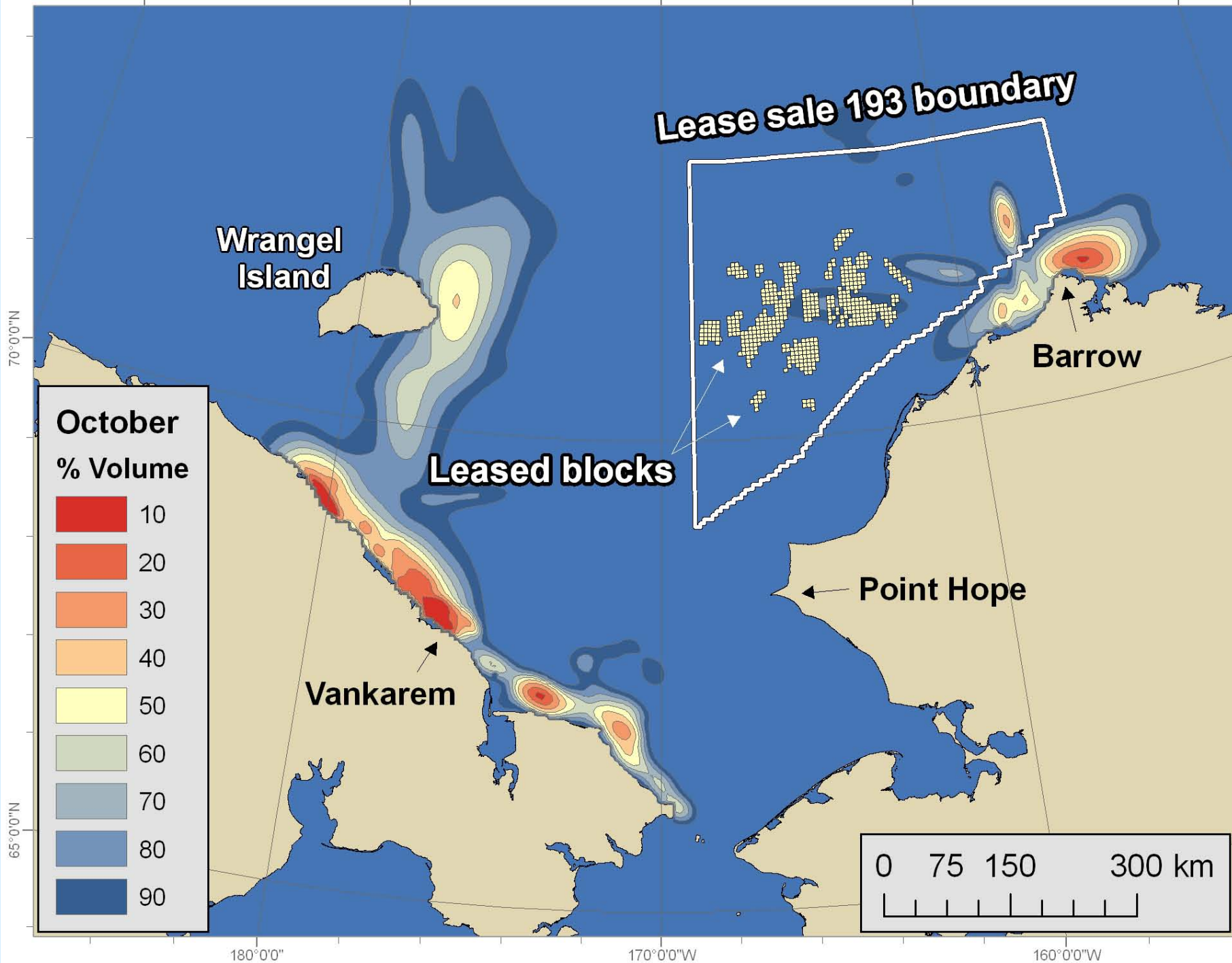


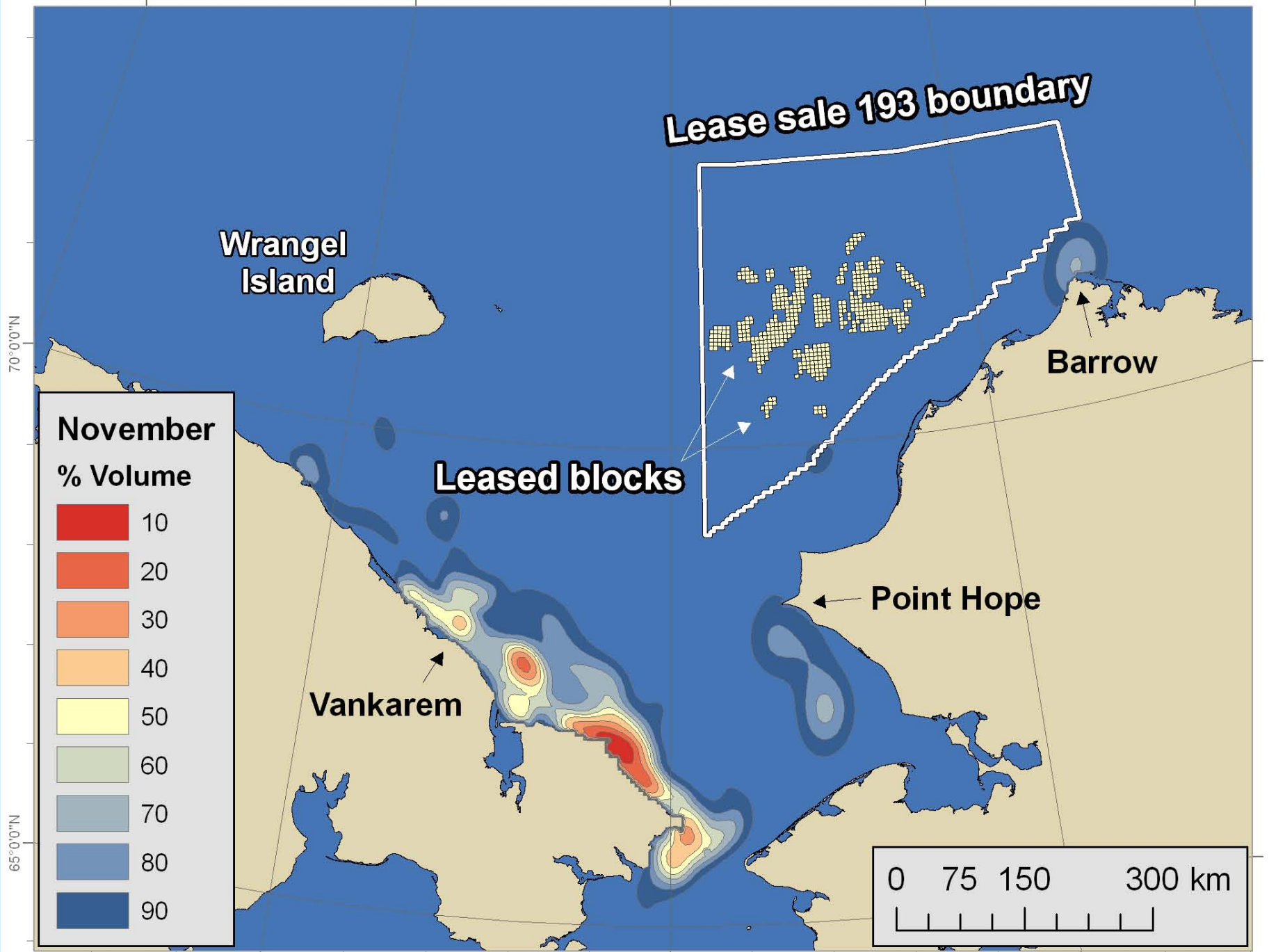
Photo: Shaun







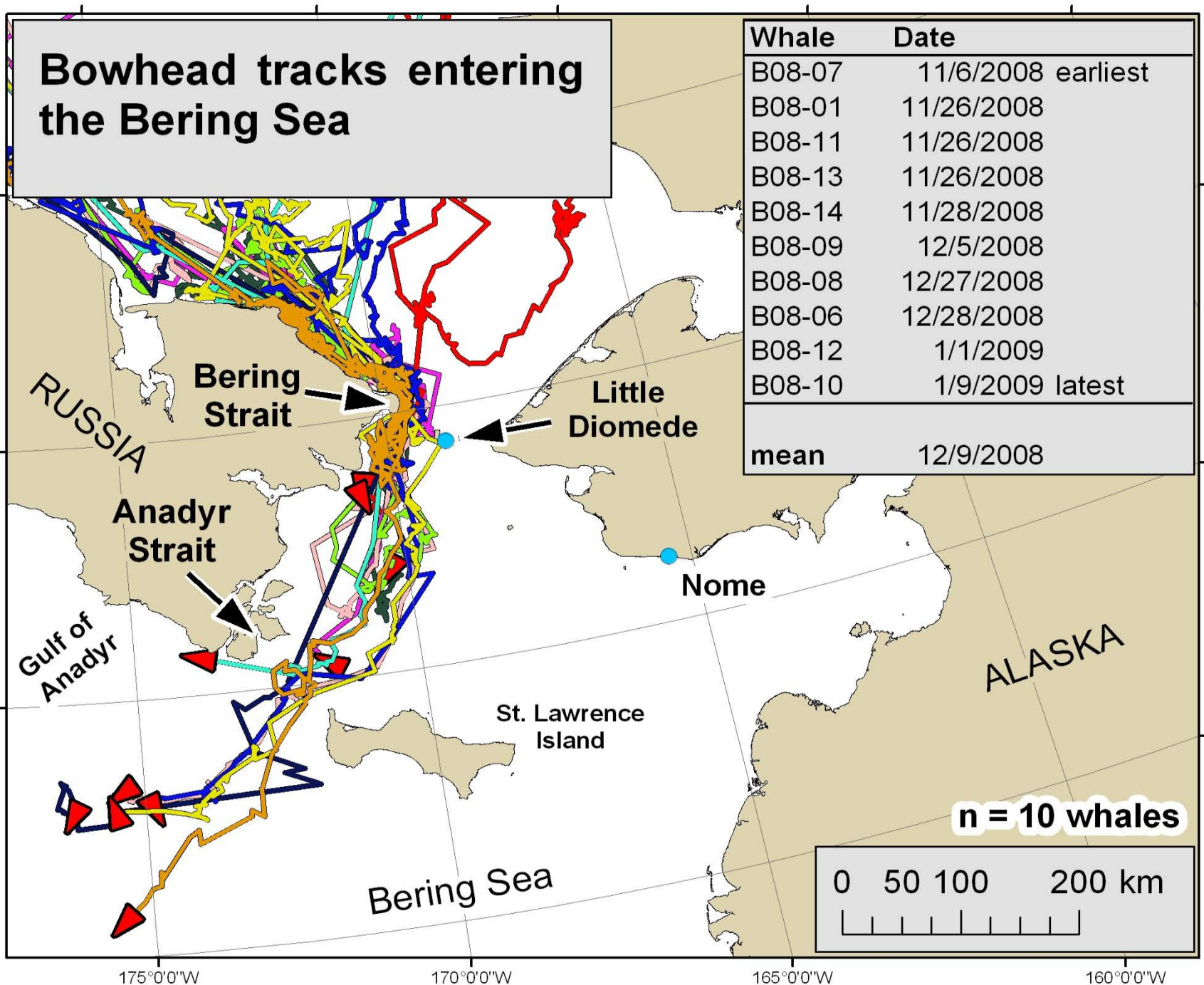




# Bowhead tracks entering the Bering Sea

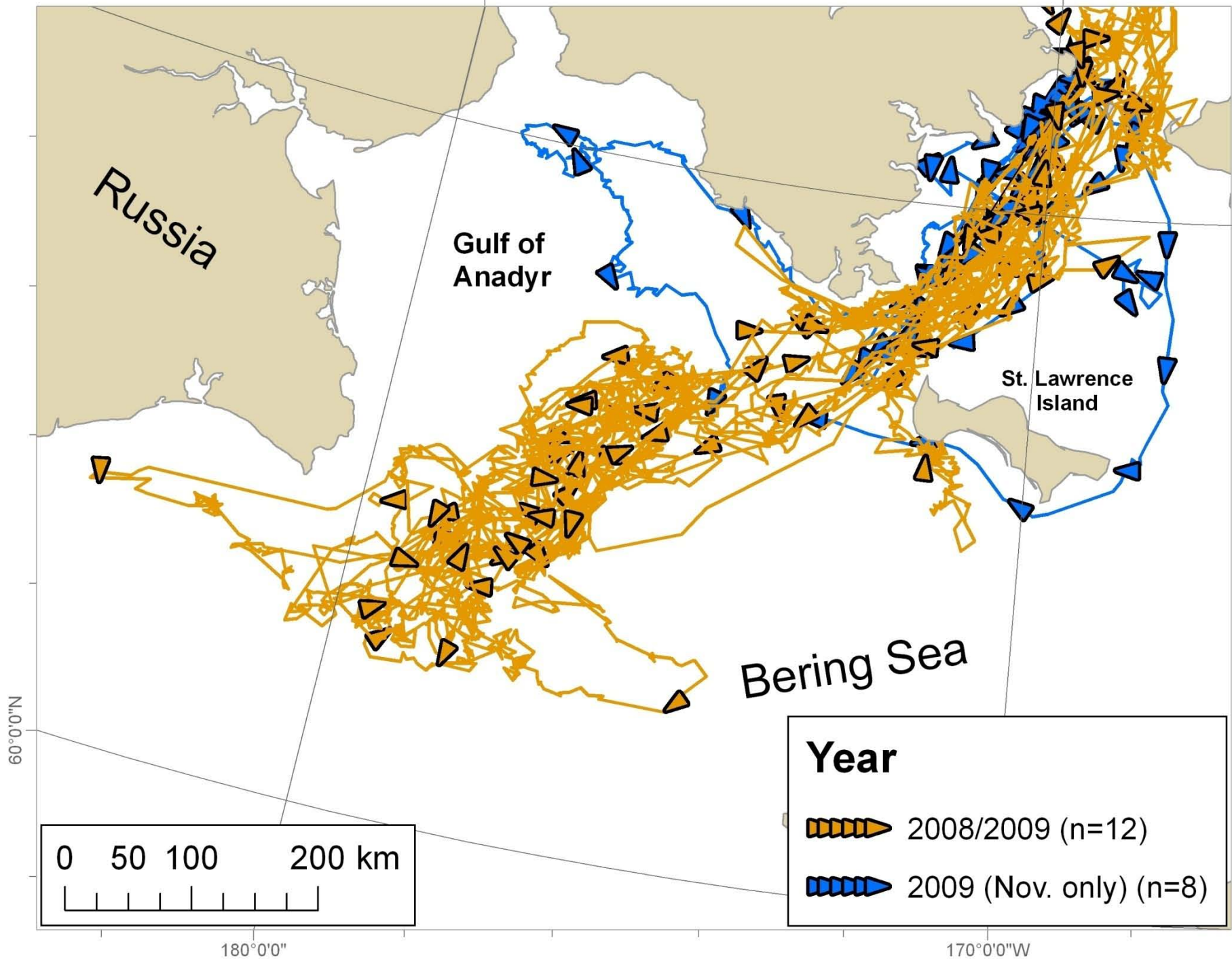
Whale	Date
B08-07	11/6/2008 earliest
B08-01	11/26/2008
B08-11	11/26/2008
B08-13	11/26/2008
B08-14	11/28/2008
B08-09	12/5/2008
B08-08	12/27/2008
B08-06	12/28/2008
B08-12	1/1/2009
B08-10	1/9/2009 latest

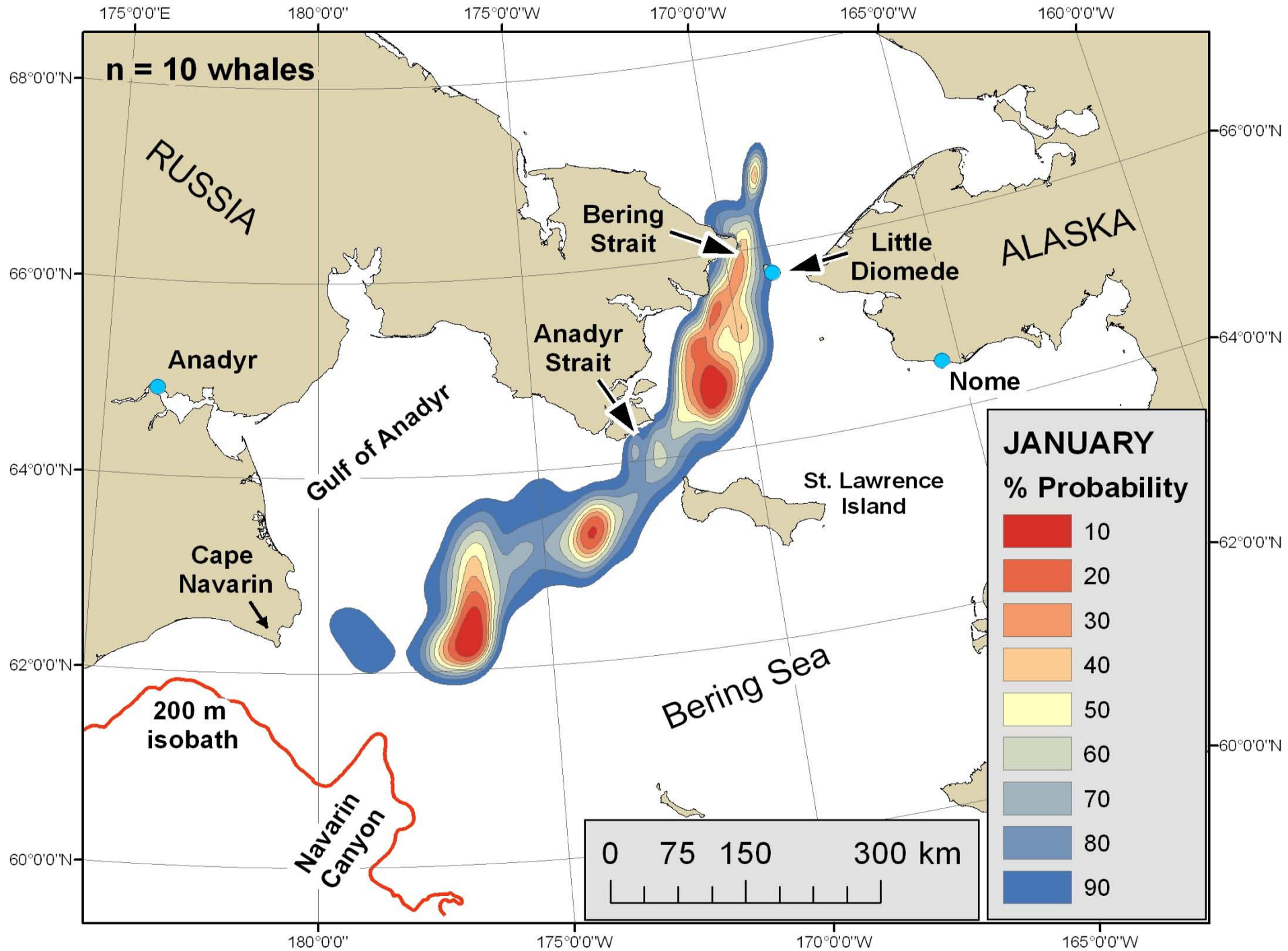
mean 12/9/2008

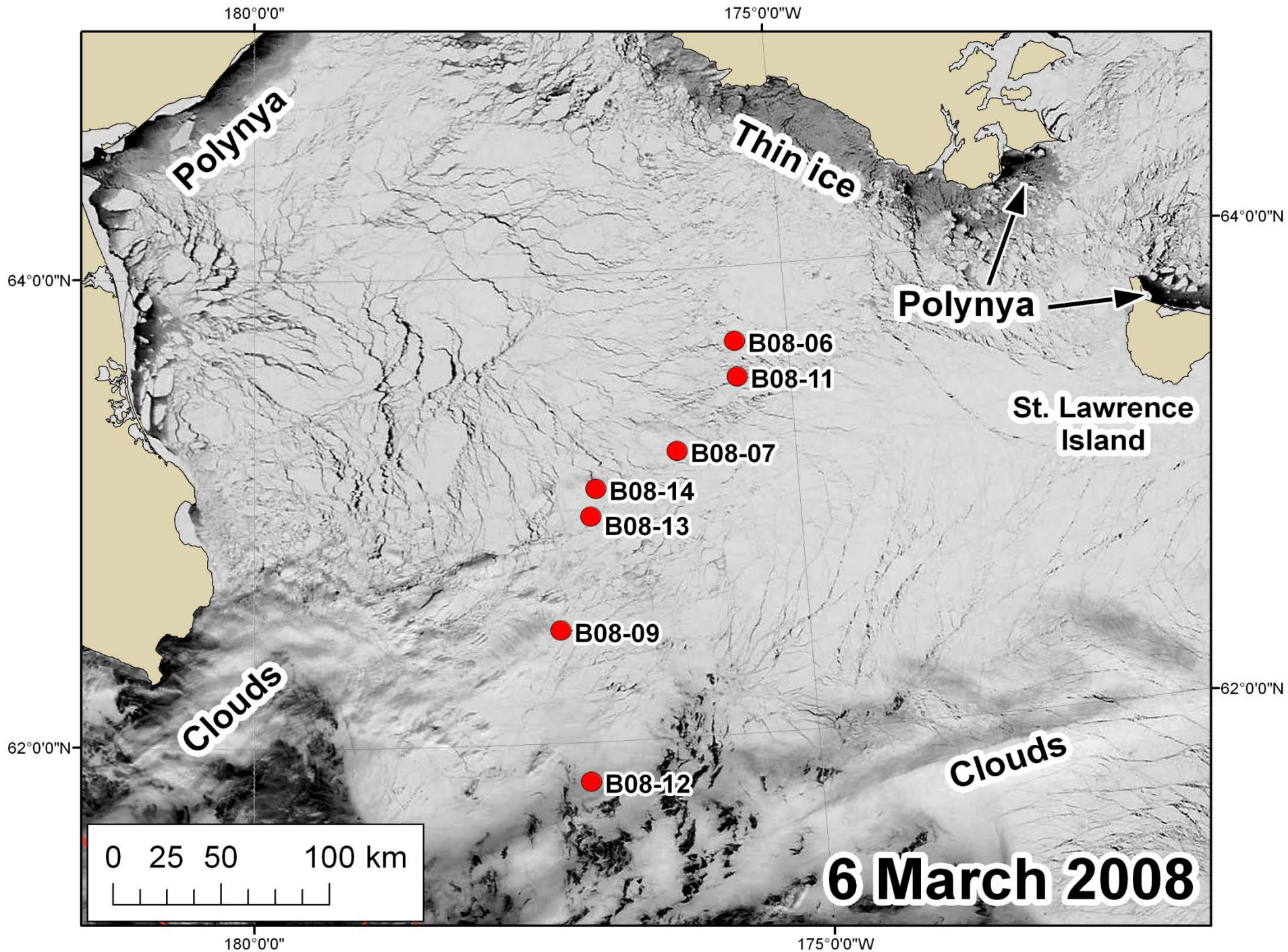


**n = 10 whales**





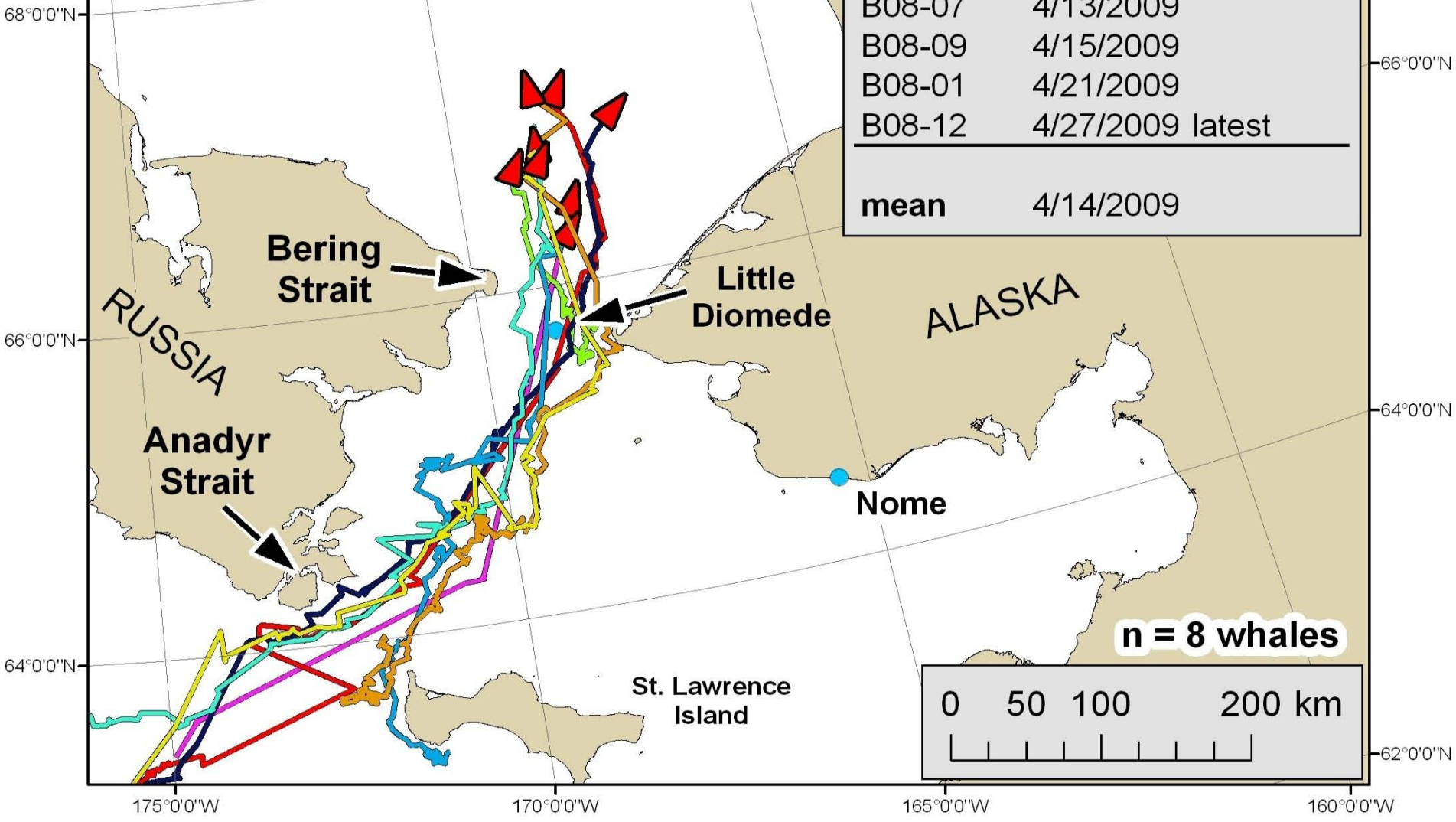




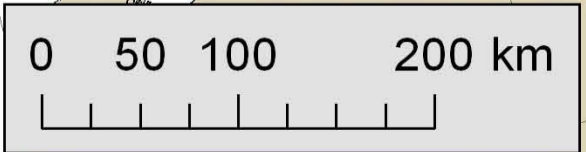
175°0'0"W 170°0'0"W 165°0'0"W 160°0'0"W 155°0'0"W

# Bowheads tracks leaving the Bering Sea.

Whale	Date
B08-08	3/31/2009 earliest
B08-10	4/10/2009
B08-11	4/11/2009
B08-14	4/12/2009
B08-07	4/13/2009
B08-09	4/15/2009
B08-01	4/21/2009
B08-12	4/27/2009 latest
<b>mean</b>	<b>4/14/2009</b>



**n = 8 whales**



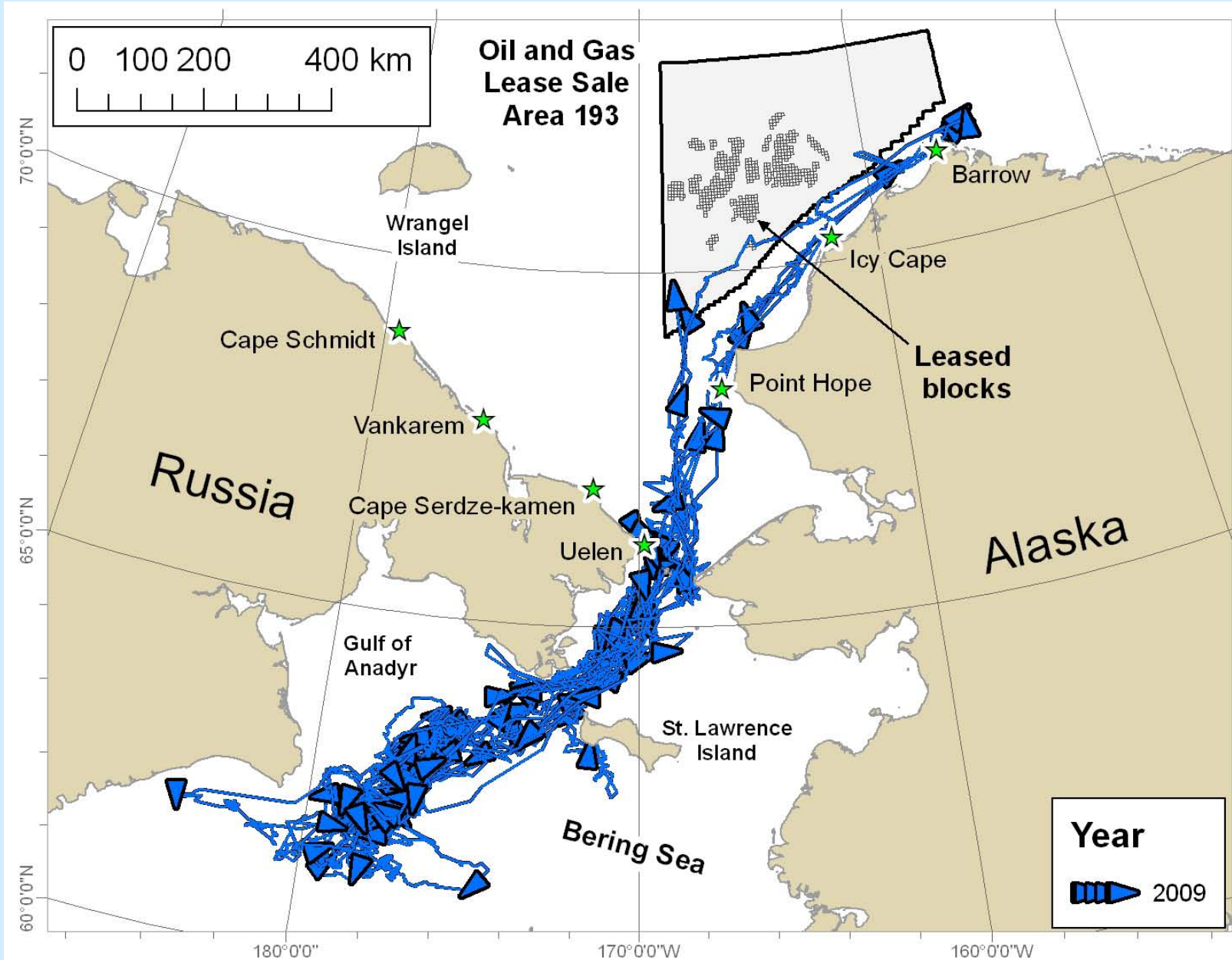
68°0'0"N  
66°0'0"N  
64°0'0"N  
62°0'0"N

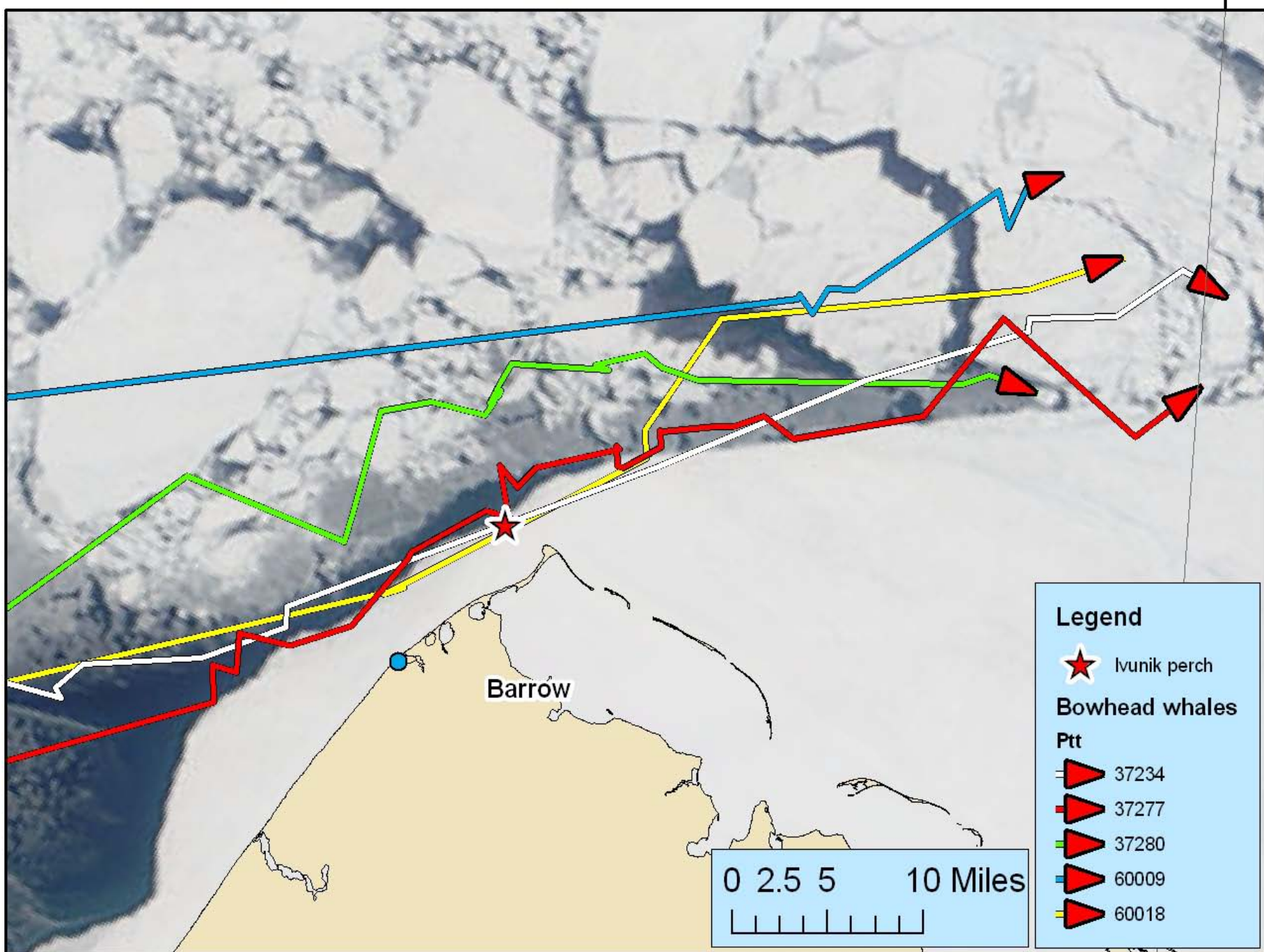
68°0'0"N  
66°0'0"N  
64°0'0"N  
62°0'0"N

175°0'0"W 170°0'0"W 165°0'0"W 160°0'0"W

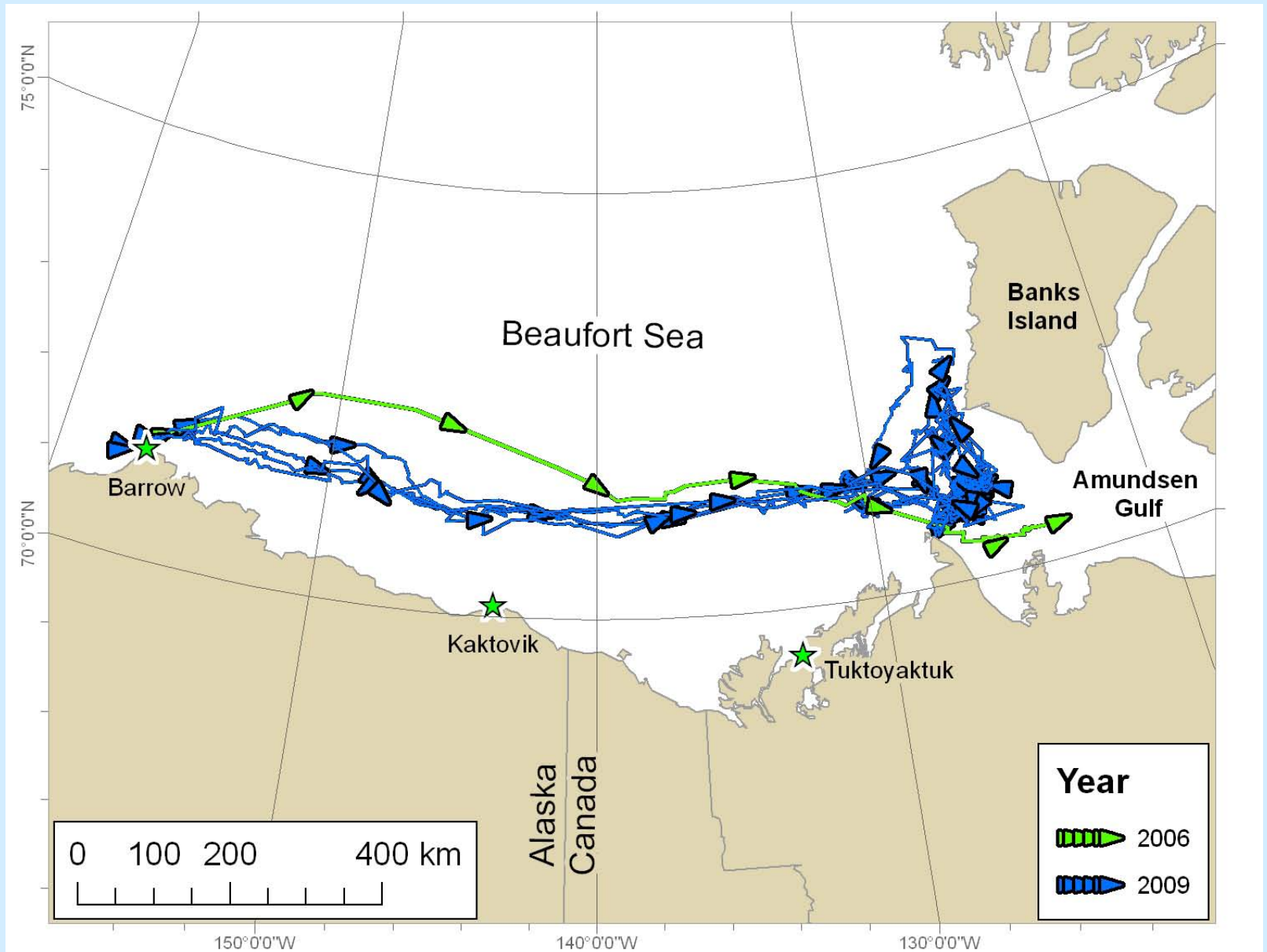


# Tracks of 6-14 bowhead whales between December 2008-May 2009





# Tracks of bowhead whales between April and June in 2006 and 2009



**Bowhead tracks between 14 and 24 May, 2009.**  
MODIS image courtesy of the MODIS Rapid Response System at NASA, dated 23 May. For more information, visit: <http://www.wildlife.alaska.gov/index.cfm?adfg=marinemammals.bowhead>.

0 15 30 60 Miles



**Bowheads**

Ptt

- 37233
- 37234
- 37277
- 37280
- 60009
- 60018

Atkinson Point

Tuktoyaktuk Pen.

Cape Bathurst

Banks Island

Amundsen Gulf

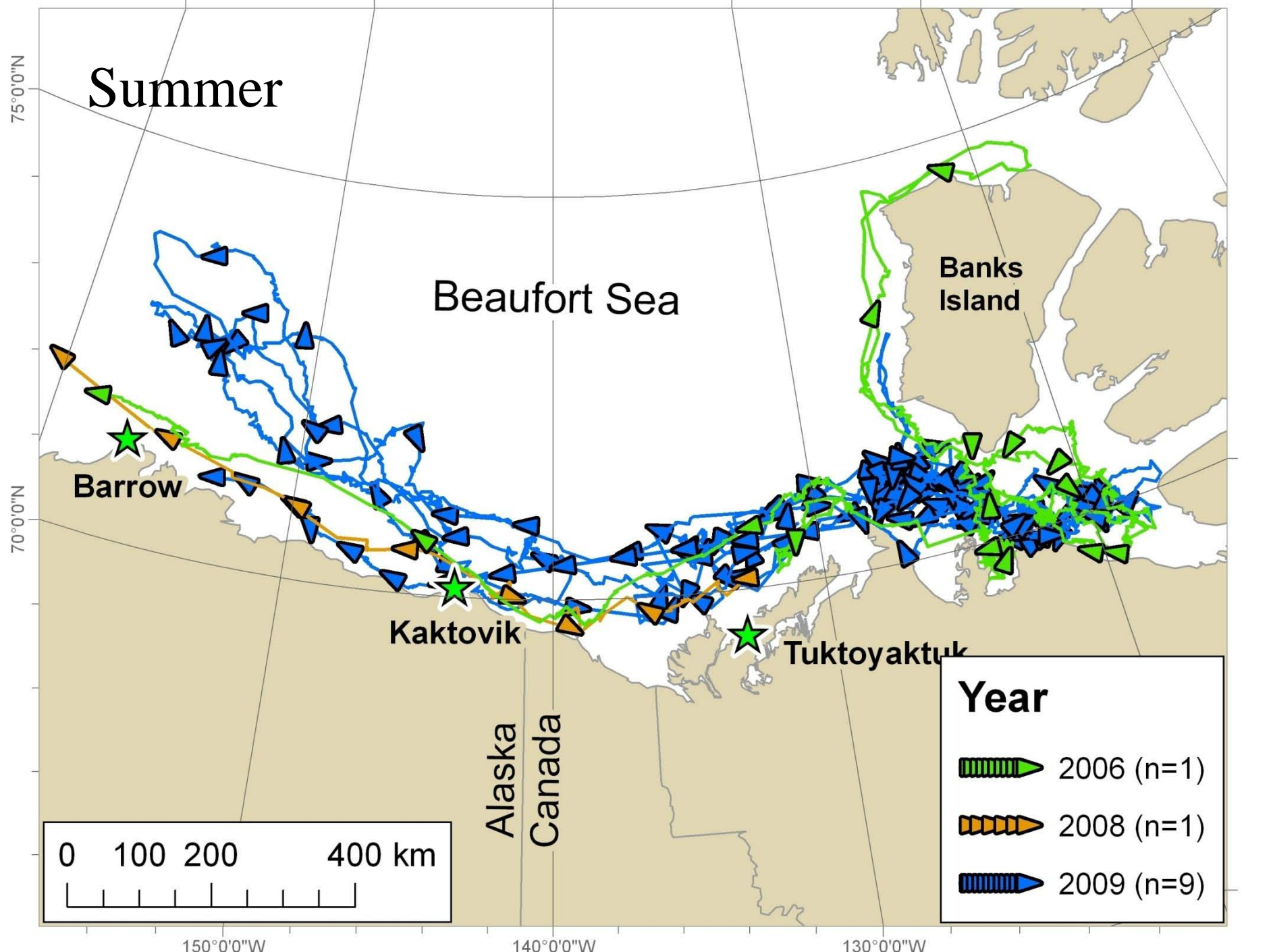
135°0'0"W

130°0'0"W

125°0'0"W

74°0'0"N




72°0'0"N













Beaufort Sea

Closest interactions occur here; See figures below

### Legend

-  Bowhead track
-  Seismic survey
-  Shut-down location

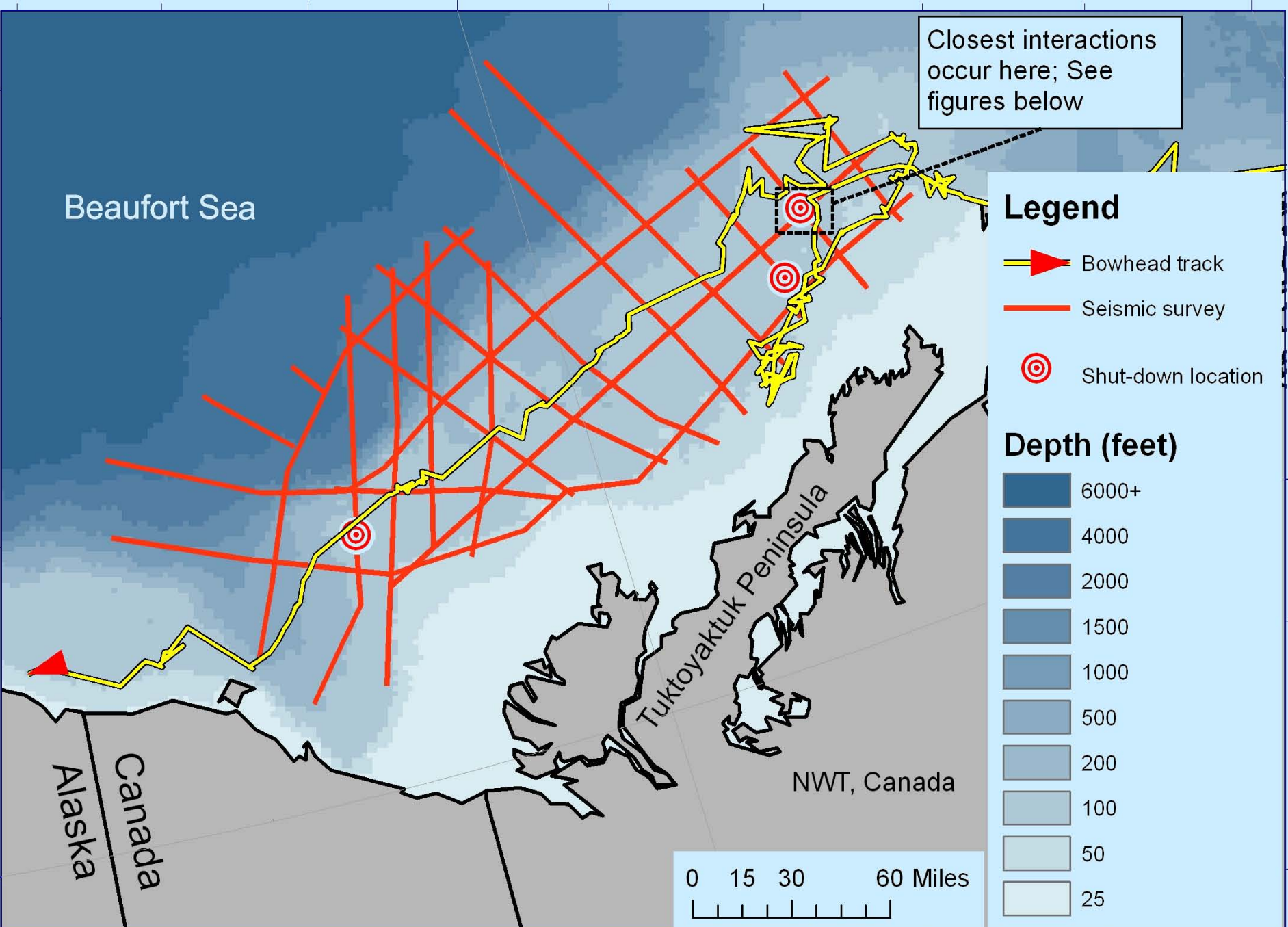
### Depth (feet)

-  6000+
-  4000
-  2000
-  1500
-  1000
-  500
-  200
-  100
-  50
-  25

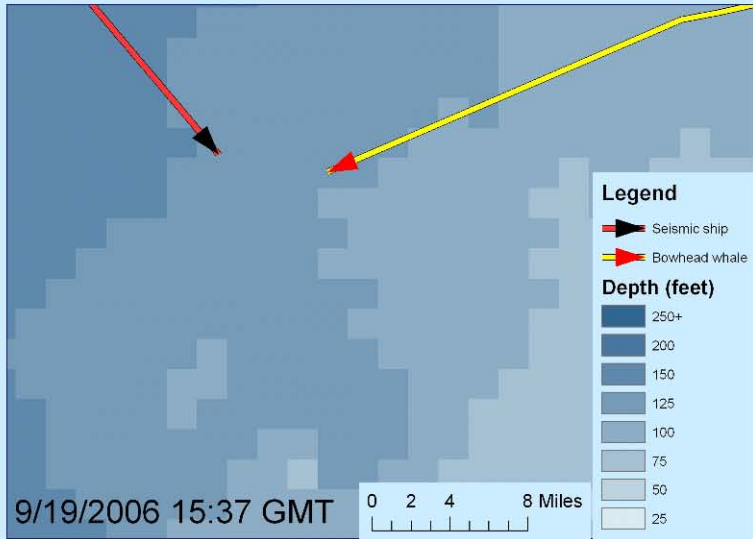
Alaska  
Canada

Tuktoyaktuk Peninsula

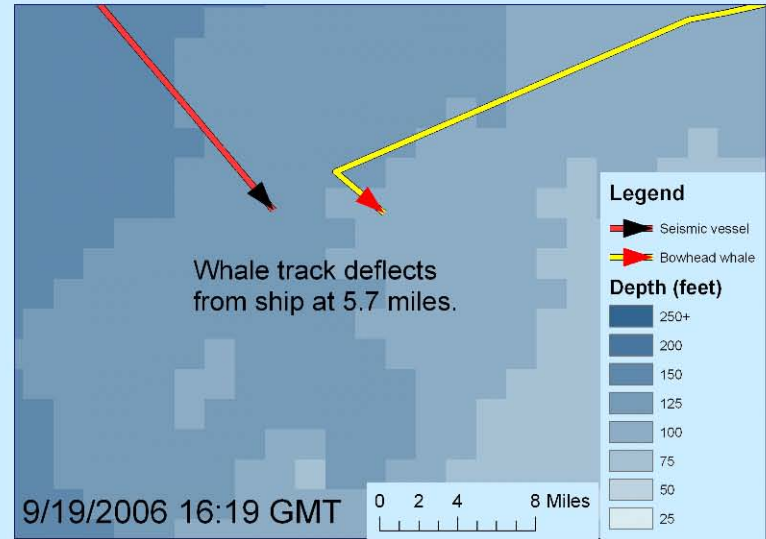
NWT, Canada



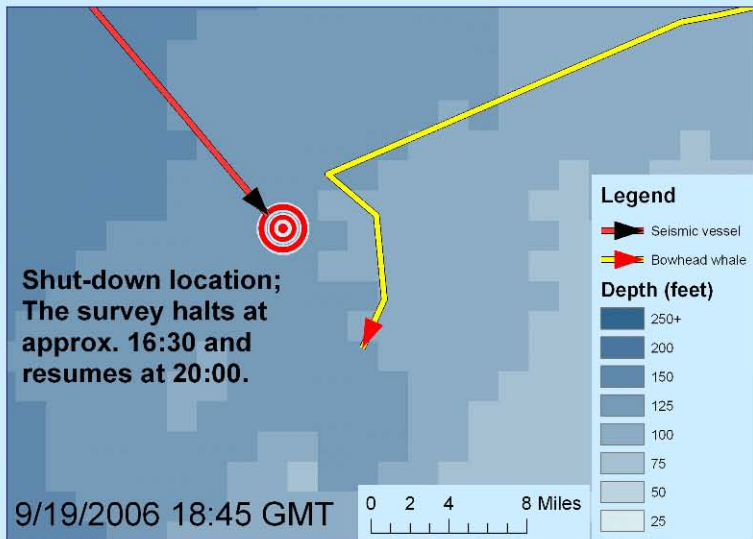
A



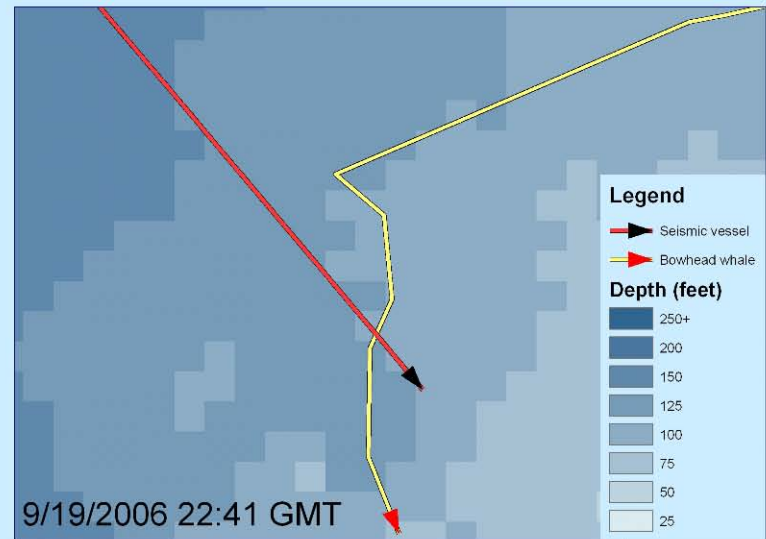
B



C

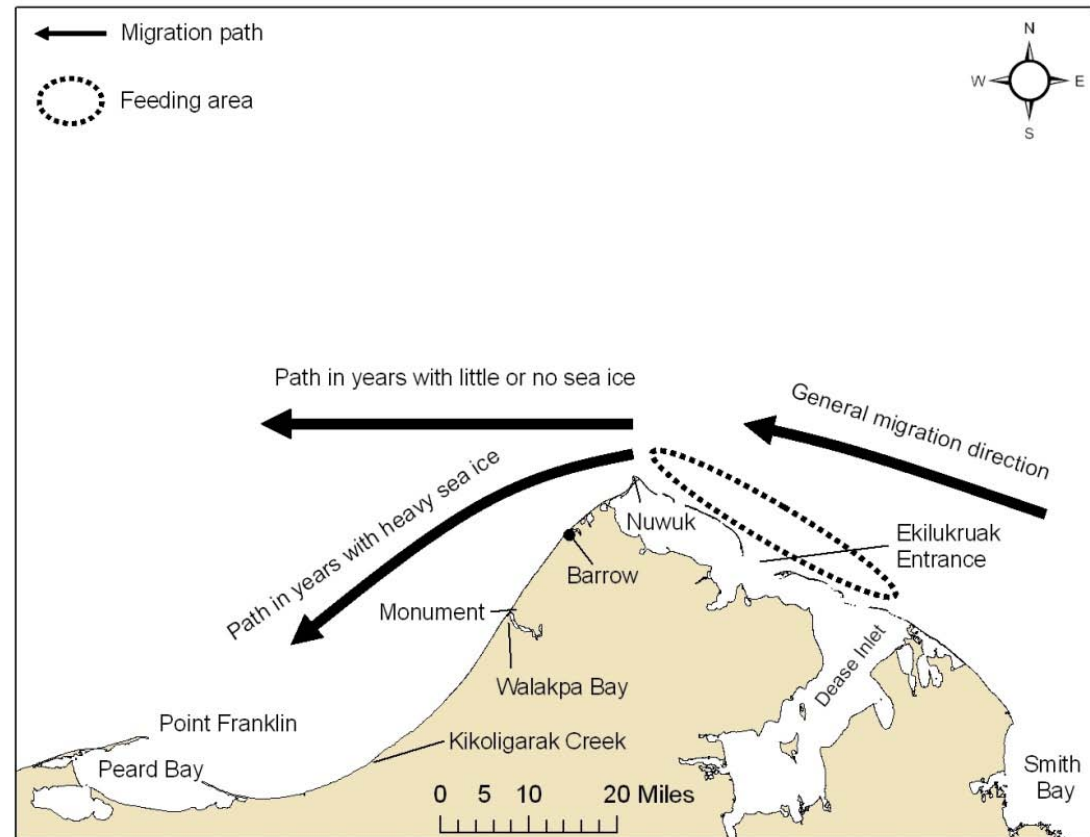
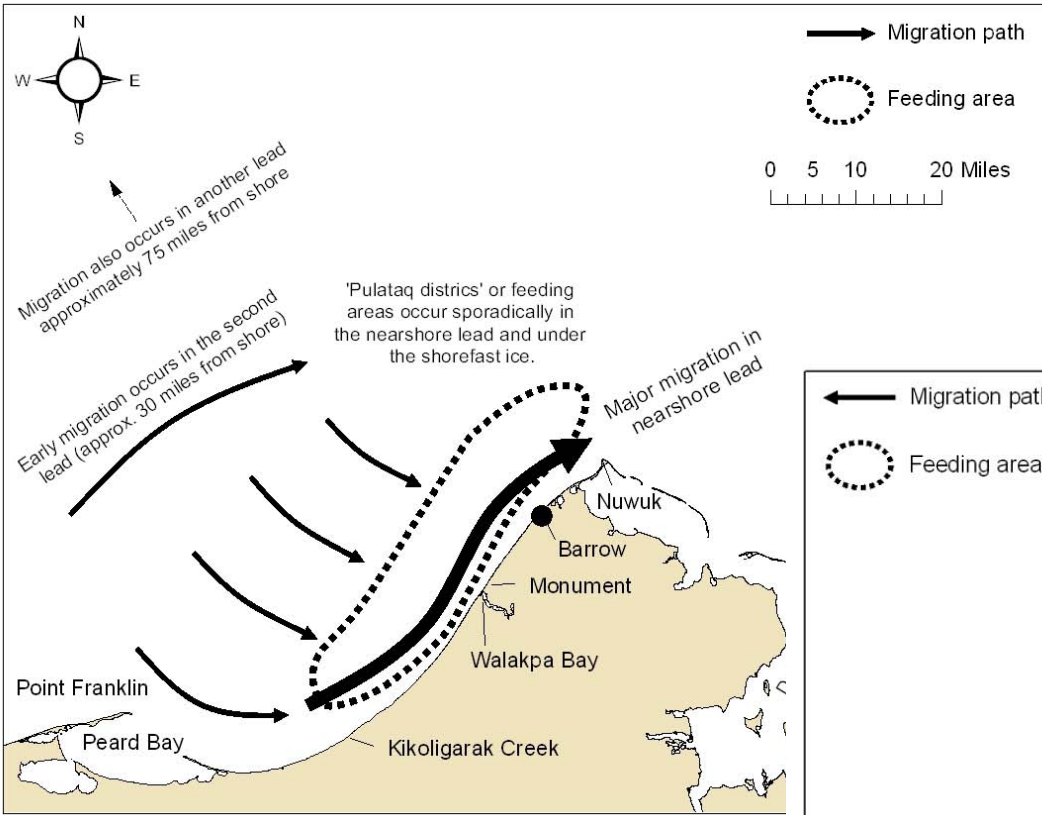


D



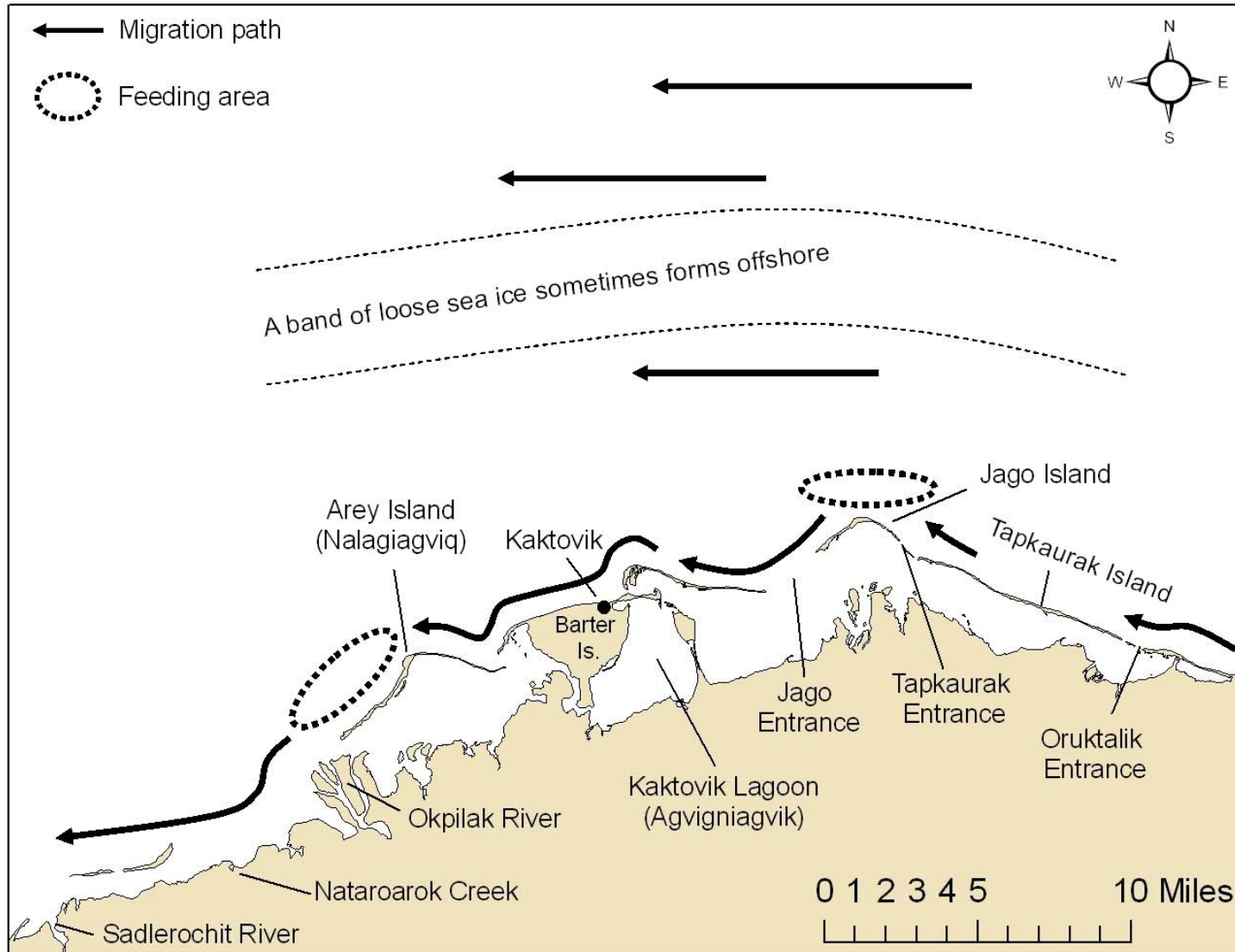
# Bowhead Traditional Knowledge

## Barrow

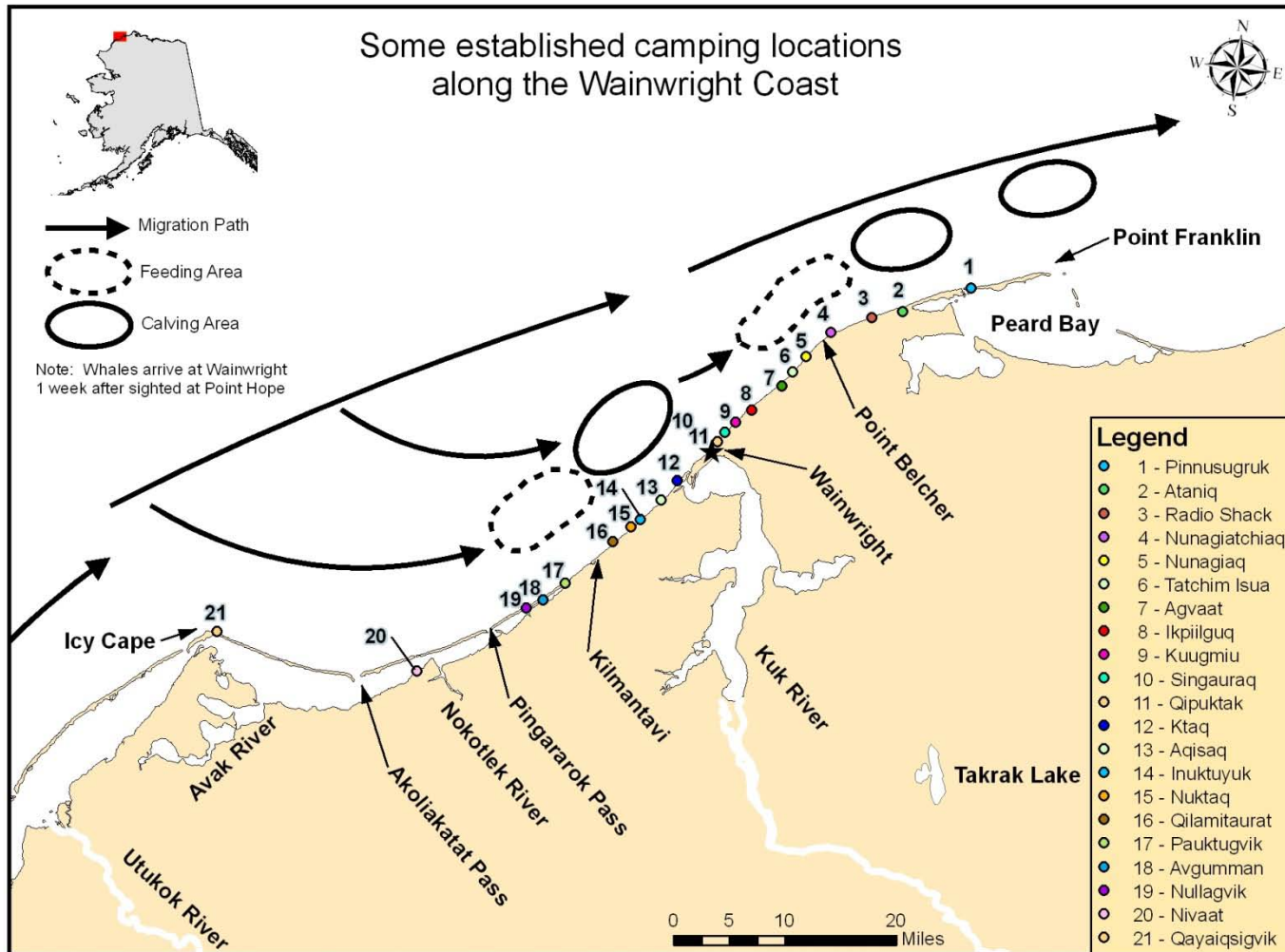




# Bowhead Traditional Knowledge



# Bowhead Traditional Knowledge



# Beluga Diet

Identification of prey items in stomachs of harvested beluga whales.

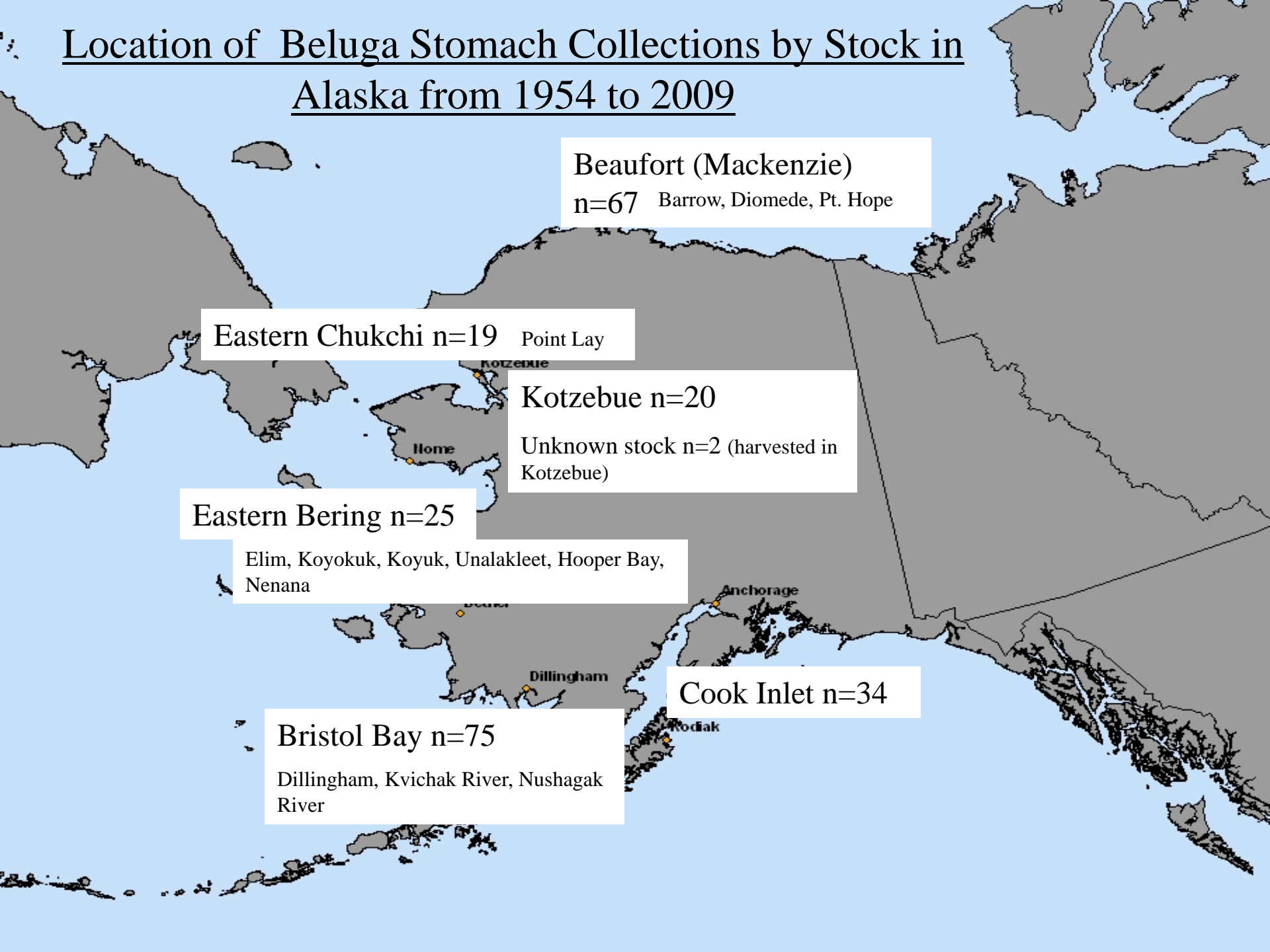


Squid beaks



Fish otoliths

# Location of Beluga Stomach Collections by Stock in Alaska from 1954 to 2009



Beaufort (Mackenzie)

n=67 Barrow, Diomedes, Pt. Hope

Eastern Chukchi n=19 Point Lay

Kotzebue n=20

Unknown stock n=2 (harvested in Kotzebue)

Eastern Bering n=25

Elim, Koyukuk, Koyuk, Unalakleet, Hooper Bay, Nenana

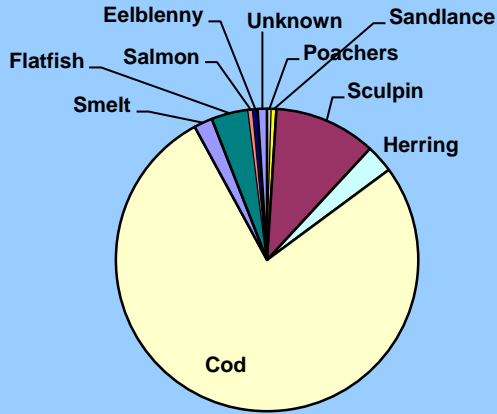
Bristol Bay n=75

Dillingham, Kvichak River, Nushagak River

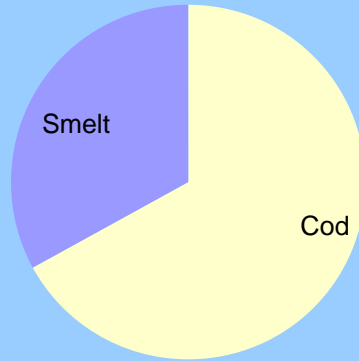
Cook Inlet n=34

# Beluga Diet – Fish

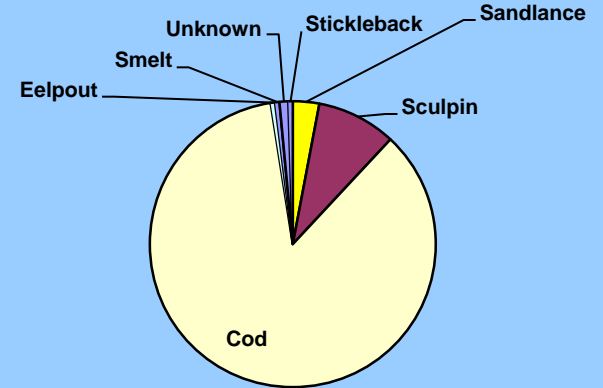
**Eastern Bering Stock (n = 14)**



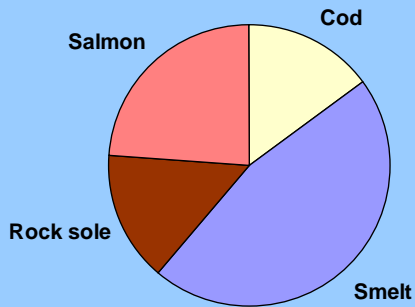
**Eastern Chukchi (n=2)**



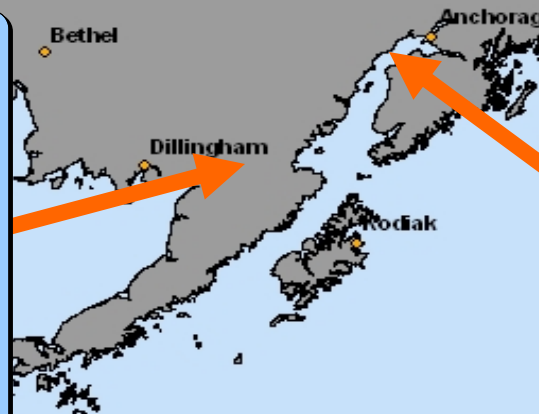
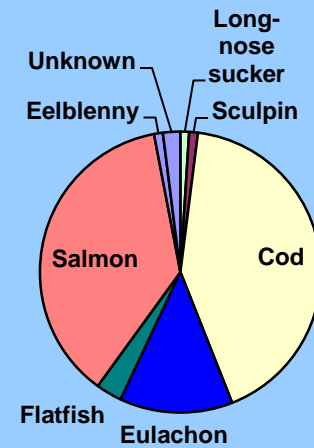
**Beaufort Stock (n = 24)**



**Bristol Bay Stock (n = 3)**

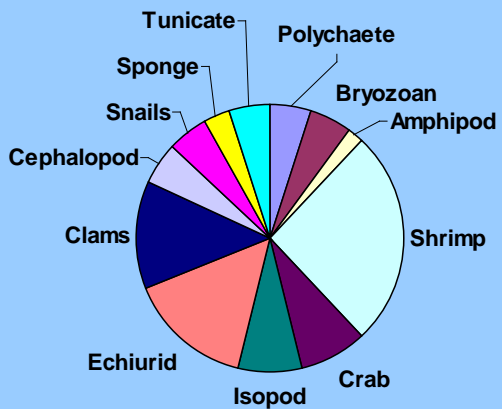


**Cook Inlet Stock (n = 14)**

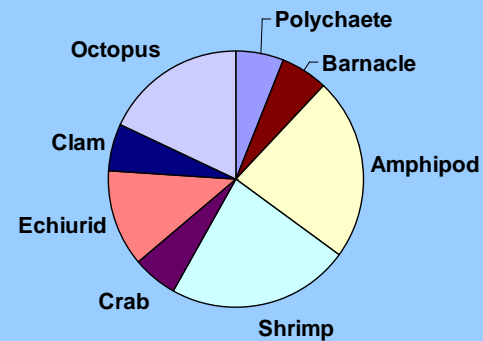


# Beluga Diet – Invertebrates

## Eastern Bering Stock (n=12)



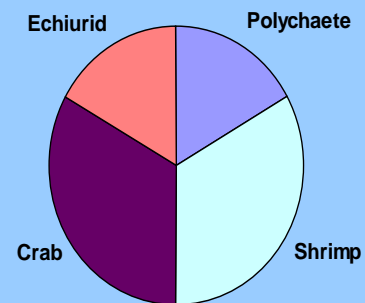
## Beaufort Stock (n = 6)



## Bristol Bay Stock (n=3)



## Cook Inlet Stock (n=4)



# Ice Seal Biomonitoring

Monitor health and status of ringed, bearded, spotted, and ribbon seals through samples collected from Native hunters



Ringed



Spotted



Ribbon



Bearded







Wainwright

*Chukchi Sea*

Point Hope

**RUSSIA**

Shishmaref

Diomede

**ALASKA**

Gambell

Savoonga

*Bering Sea*

Hooper Bay

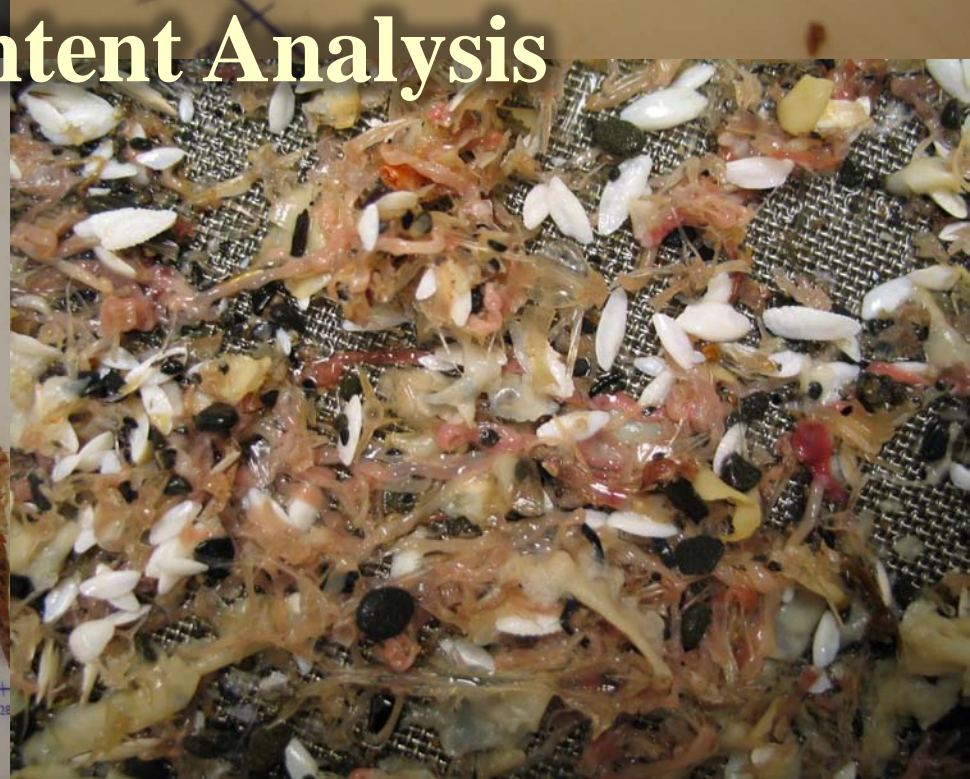


# Samples/Information Collected

- Stomachs for diet analysis
- Liver, kidney, blubber, muscle for contaminants
- Heart, lung, liver, gall bladder, intestine for parasites
- Skin for genetics
- Female reproductive tracts for productivity
- Physical measurements for body condition
- Teeth for aging
- Traditional knowledge by questionnaire

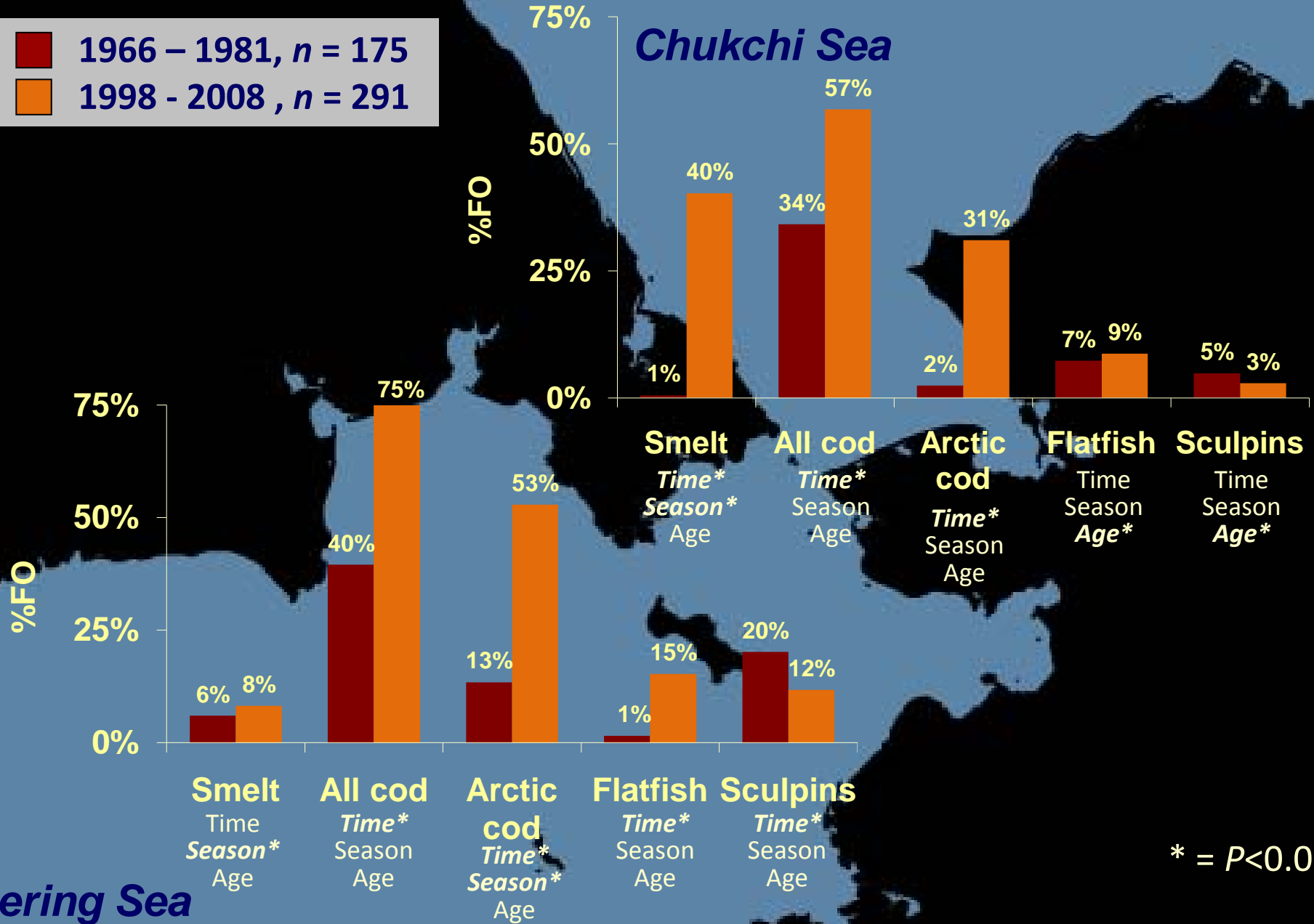


# Stomach Content Analysis



# Fish by Region: %FO

■ 1966 – 1981,  $n = 175$   
■ 1998 - 2008,  $n = 291$



\* =  $P < 0.05$

# Invertebrates by Region: %FO

1966 – 1981,  $n = 175$

1998 - 2008,  $n = 291$

%FO

50%

25%

0%

## Chukchi Sea

27%

10%

15%

2%

49%

20%

12%

1%

32%

14%

50%

25%

0%

## Bering Sea

13%

20%

6%

11%

33%

20%

7%

5%

18%

11%

Amphipoda  
Time\*  
Season\*  
Age

Parathemisto  
Time\*  
Season  
Age

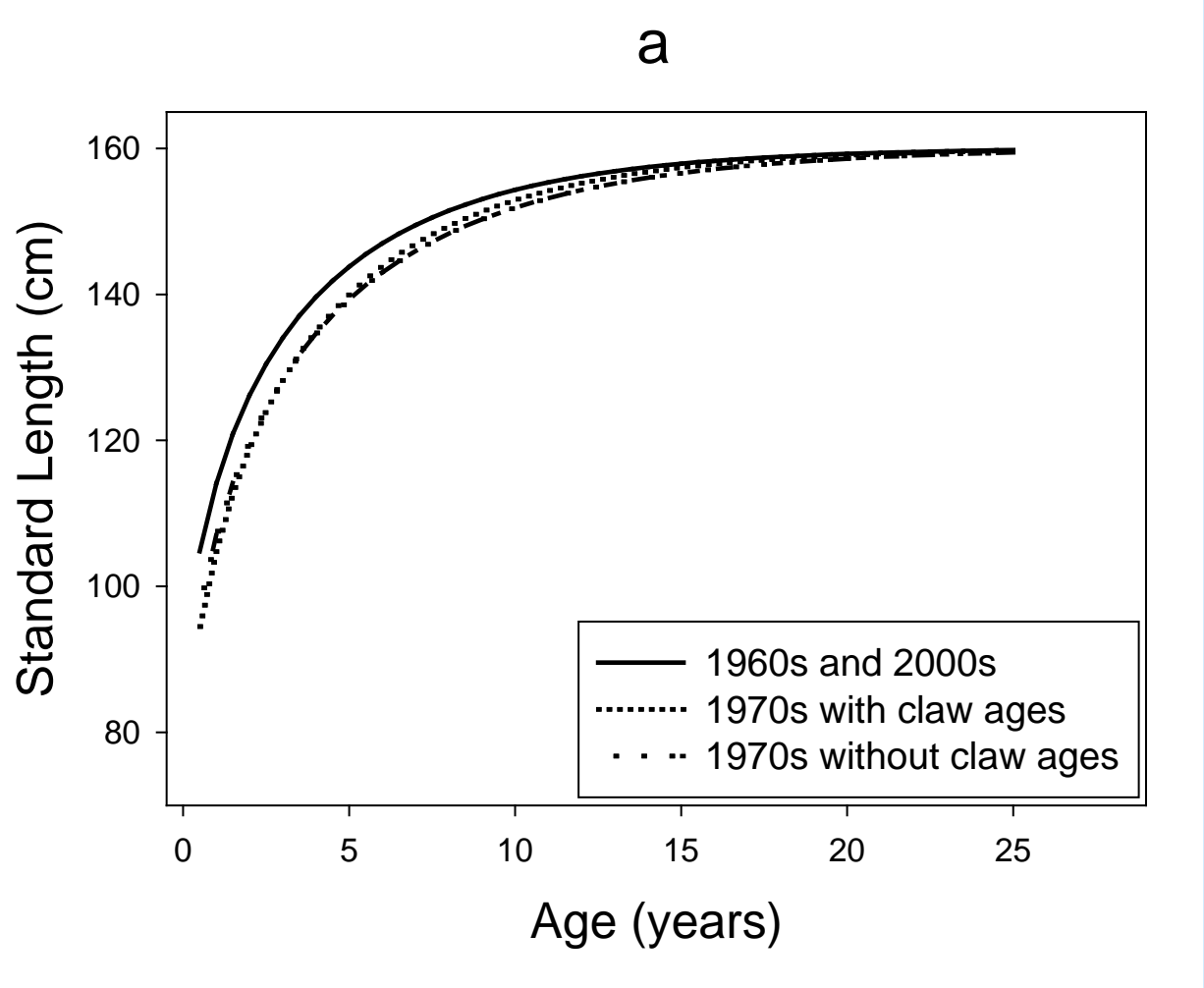
Shrimp  
Time\*  
Season\*  
Age

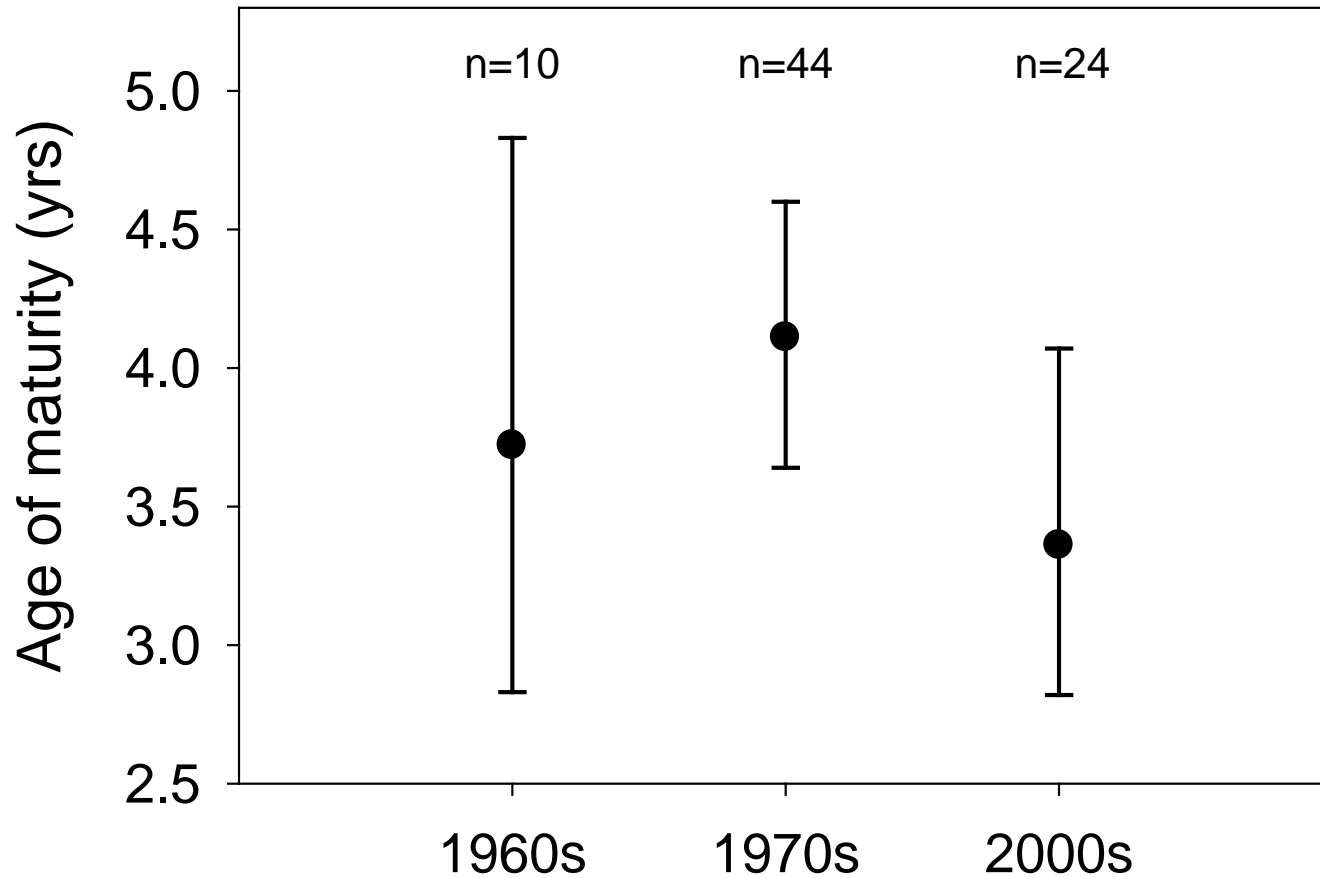
Pandalus  
Time  
Season  
Age

Crangonidae  
Time  
Season\*  
Age

\* =  $P < 0.05$

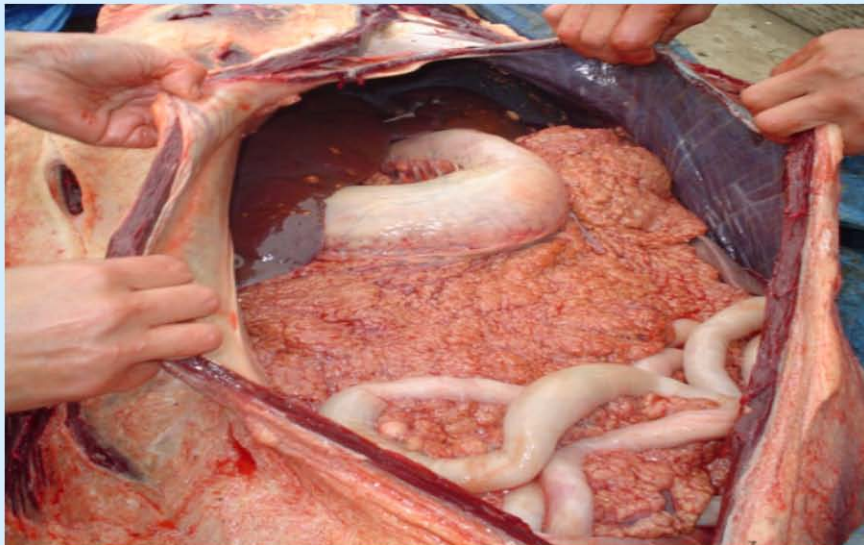
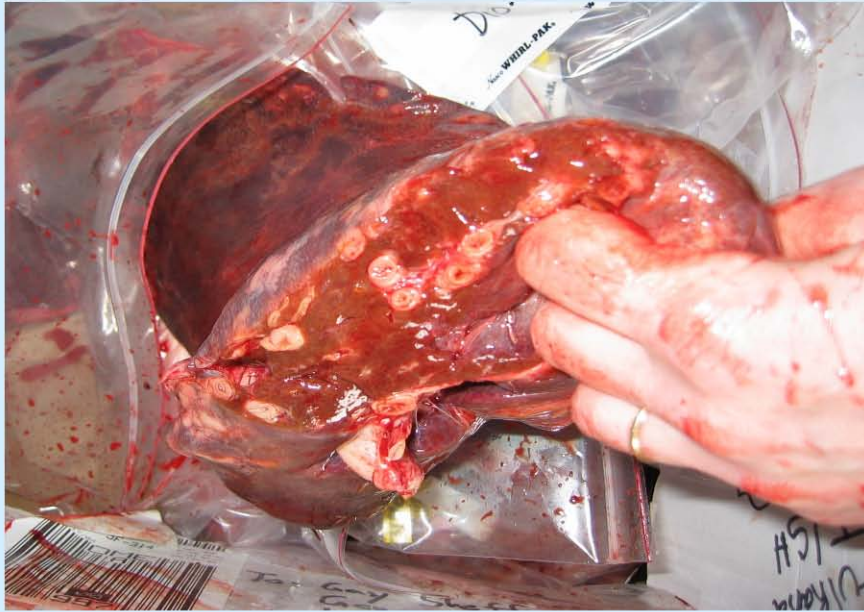
# Spotted Seals - length at age





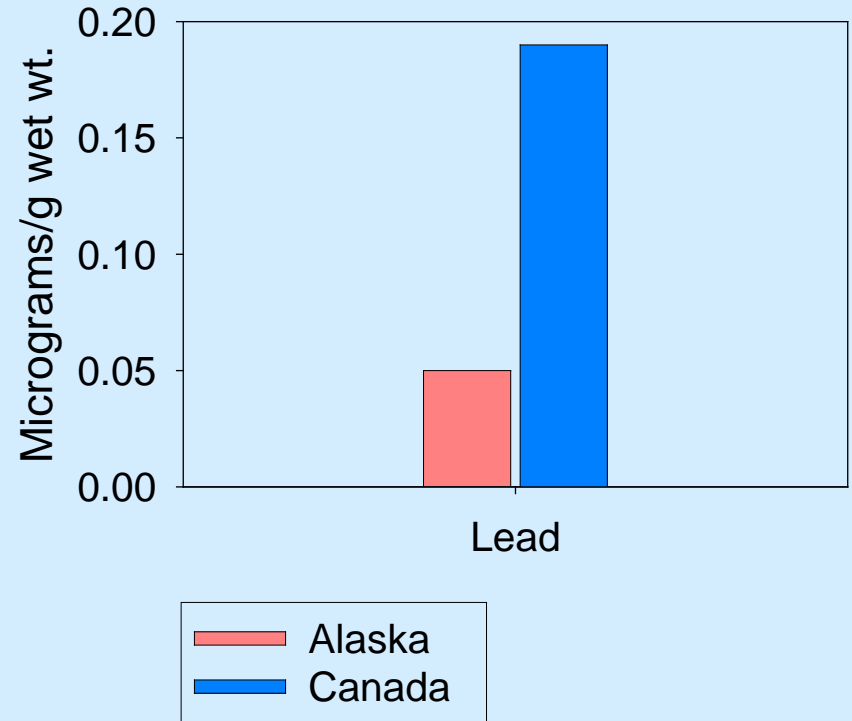
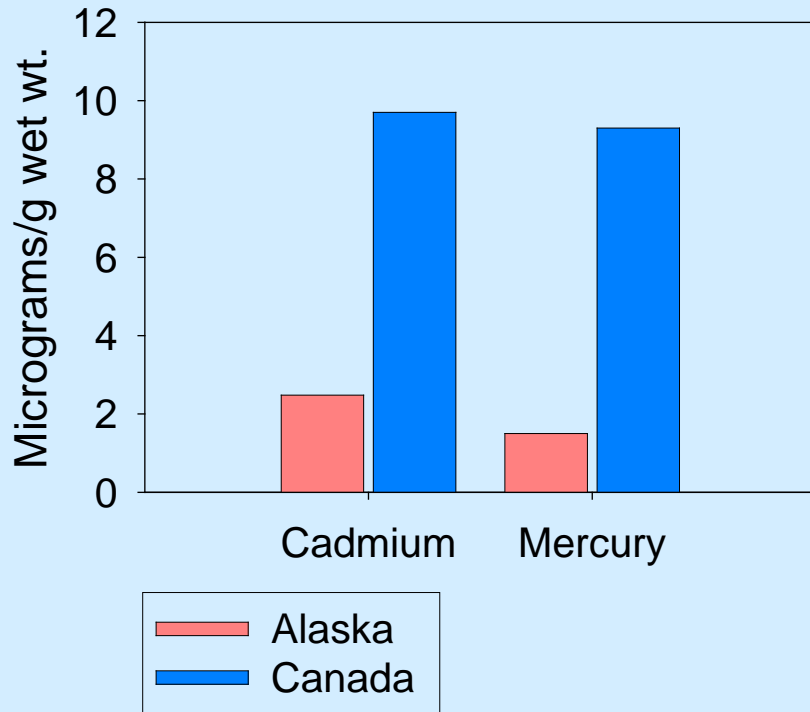
Spotted seals became mature at an older age in the 1970s than now. Age at maturity now is more similar to the 1960s.

# Diseases and Parasites





# Contaminants - Metals



Data from Canada is the average of 3 locations for ringed seals only.

Data from Alaska is the highest mean of ringed, bearded, spotted or ribbon seals from the 3 locations tested to date (Diomedede, Hooper Bay, and Pt. Hope).





# Seal Tagging Kotzebue

Working with local seal hunters to learn more about seal movements and important habitat areas.



# Kotzebue seal tagging project: 2007–2010

## Fall 2007

Ringed seals 12

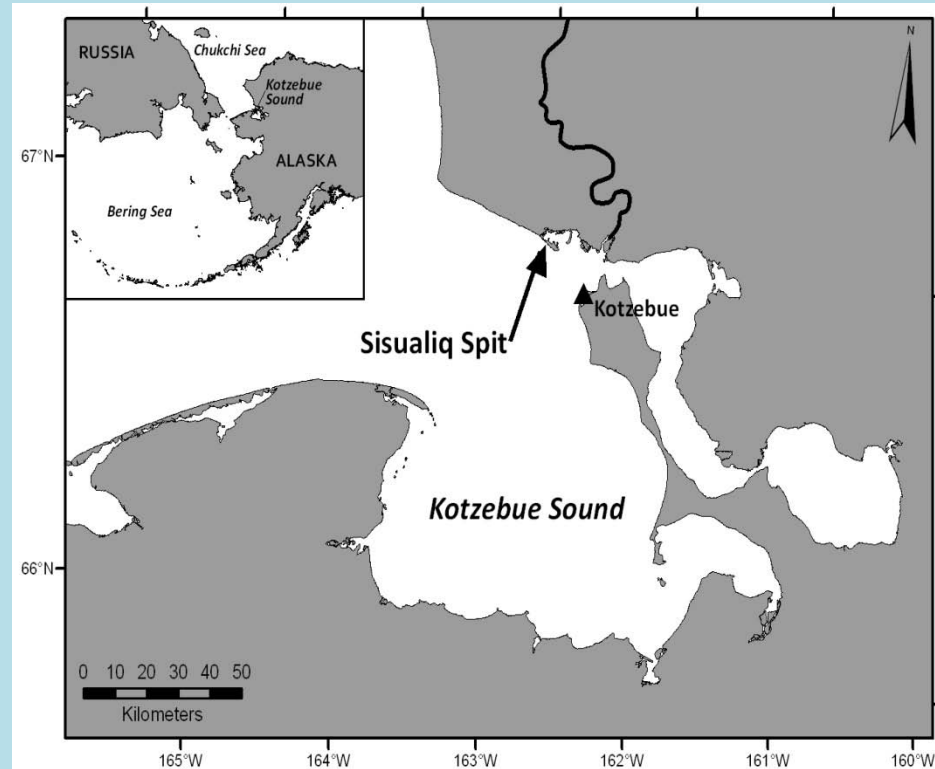
## Fall 2008

Ringed seals 13

## Fall 2009

Ringed seals 12

Bearded seals 11





# Ringed Seals: 2007-2010

(n=37)

Mean minimum ice extent (2008-2009)

Mean maximum ice extent (2008-2009)



# Ringed Seals: July – September 2008–2009

Mean minimum ice extent  
(2008-2009)



(n=7)

Russia

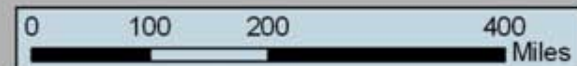
Chukchi Sea

Barrow

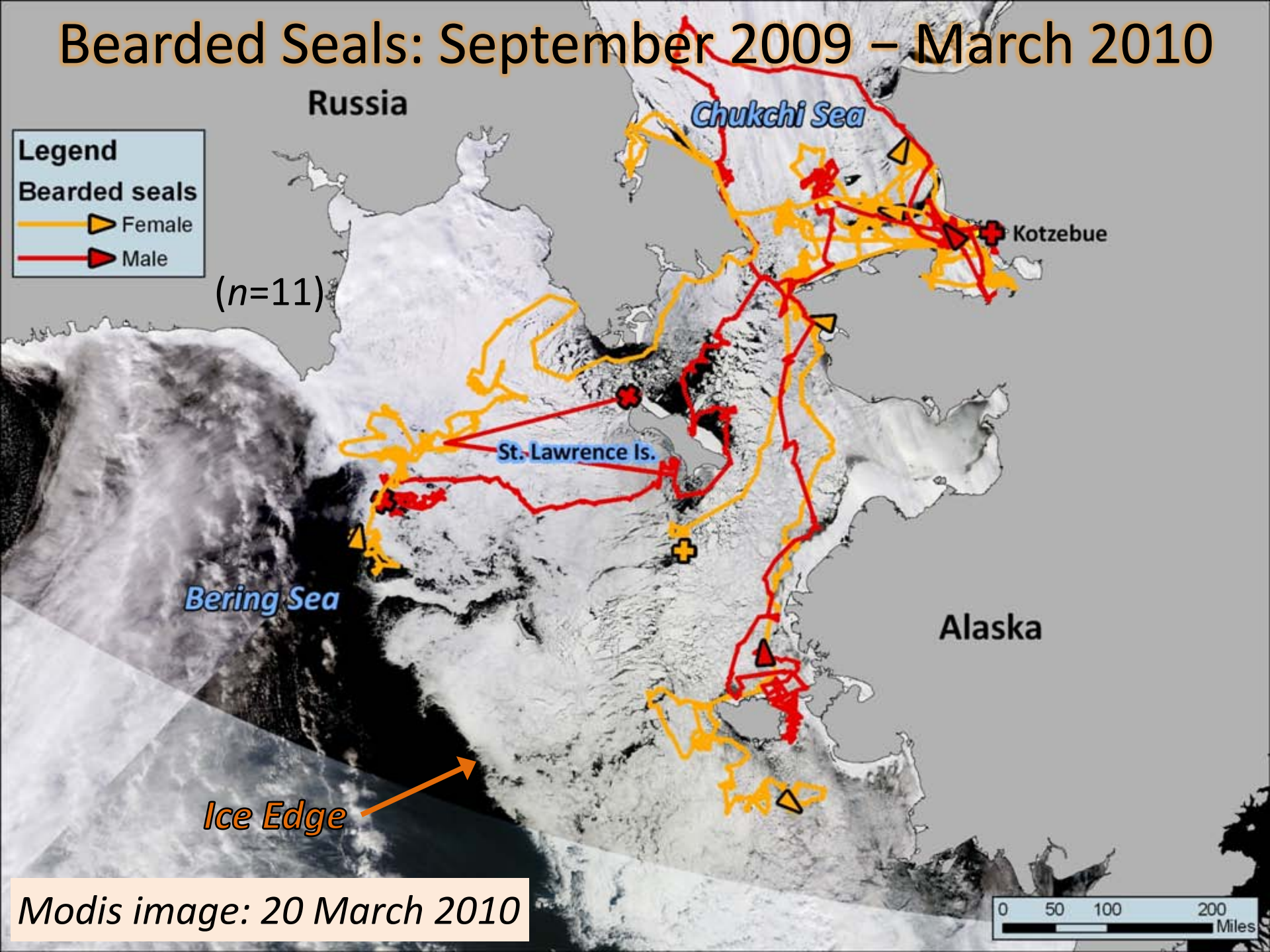
Kotzebue

Alaska

St. Lawrence Is.



# Bearded Seals: September 2009 – March 2010







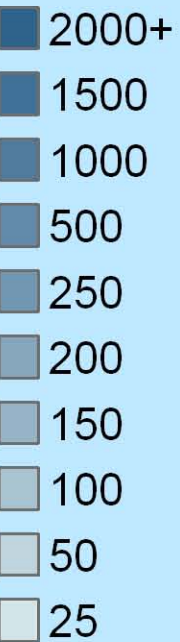
# Village-based Walrus Studies in the Alaskan Chukchi Sea



## Legend

— 100 m isobath

## Depth (m)



0 125 250 500 km



180°0'0"

170°0'0"W

160°0'0"W

150°0'0"W

140°

Canada Basin

Beaufort Sea

Chukchi Sea

Russia

Barrow

Wainwright

Kaktovik

Point Lay

Point Hope

Kotzebue

Little Diomedede

Nome

Alaska



Near Cape Lisburne – 2007 (~3,200 walrus)



# Objectives of Study

1) Work with hunters to deploy tags on walrus to document spring and summer movements in the Chukchi Sea for feeding, resting, and interacting with oil and gas activities.

# Objectives of Study

## 2) Conduct:

- Counts
- Behavioral observations
- Provide protection against disturbance while walruses on land

# Objectives of Study

3) Conduct all aspects of the study so that it does not interfere with subsistence hunting.

4) Share data with USGS to maximize information available regarding movements, habitat use, haulout behavior, and interactions with oil and gas activities.



# Objectives of Study

5) Conduct traditional knowledge (TEK) interviews to collect information on what walrus hunters know about movements, feeding areas, behavior, and land haulouts to combine with information from tagged walruses.

# Acknowledgements

Bowhead satellite tracking funded by MMS (**Cooperators – AEWC, NSB, Barrow and Kaktovik Whaling Captain's Assoc. DFO Canada**)

Bowhead TEK study funded by ConocoPhillips, MMS/CMI (**Cooperators – AEWC, NSB, and Barrow, Kaktovik, and Wainwright Whaling Captain's Assoc.**)

Seal biomonitoring funded by NOAA/NMFS, NPRB, NSF, NMFS/NMML

Seal tagging funded by Fish and Wildlife Service Tribal Grant (**Cooperators – Kotzebue IRA, UAF, NMFS, Shell**).

Beluga whale diet funded by Alaska Beluga Whale Committee and NMFS

Village-based walrus studies funded by MMS (**Cooperator – EWC**)

***Hunters and the subsistence communities!***