# Is arctic sea ice retreat and variability affecting the body condition of bowhead whales?


Credit: Craig George

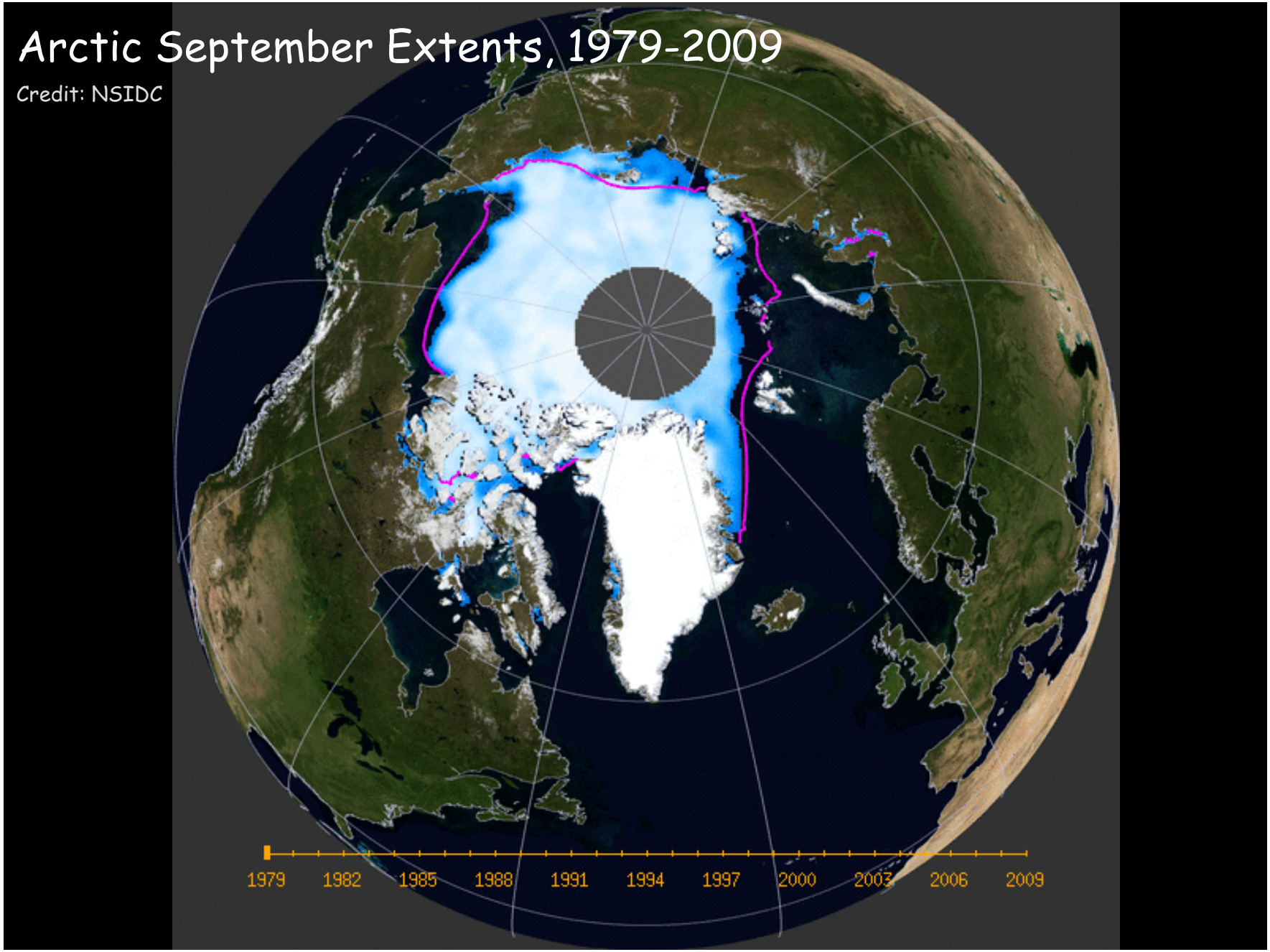
Matt Druckenmiller, National Snow and Ice Data Center

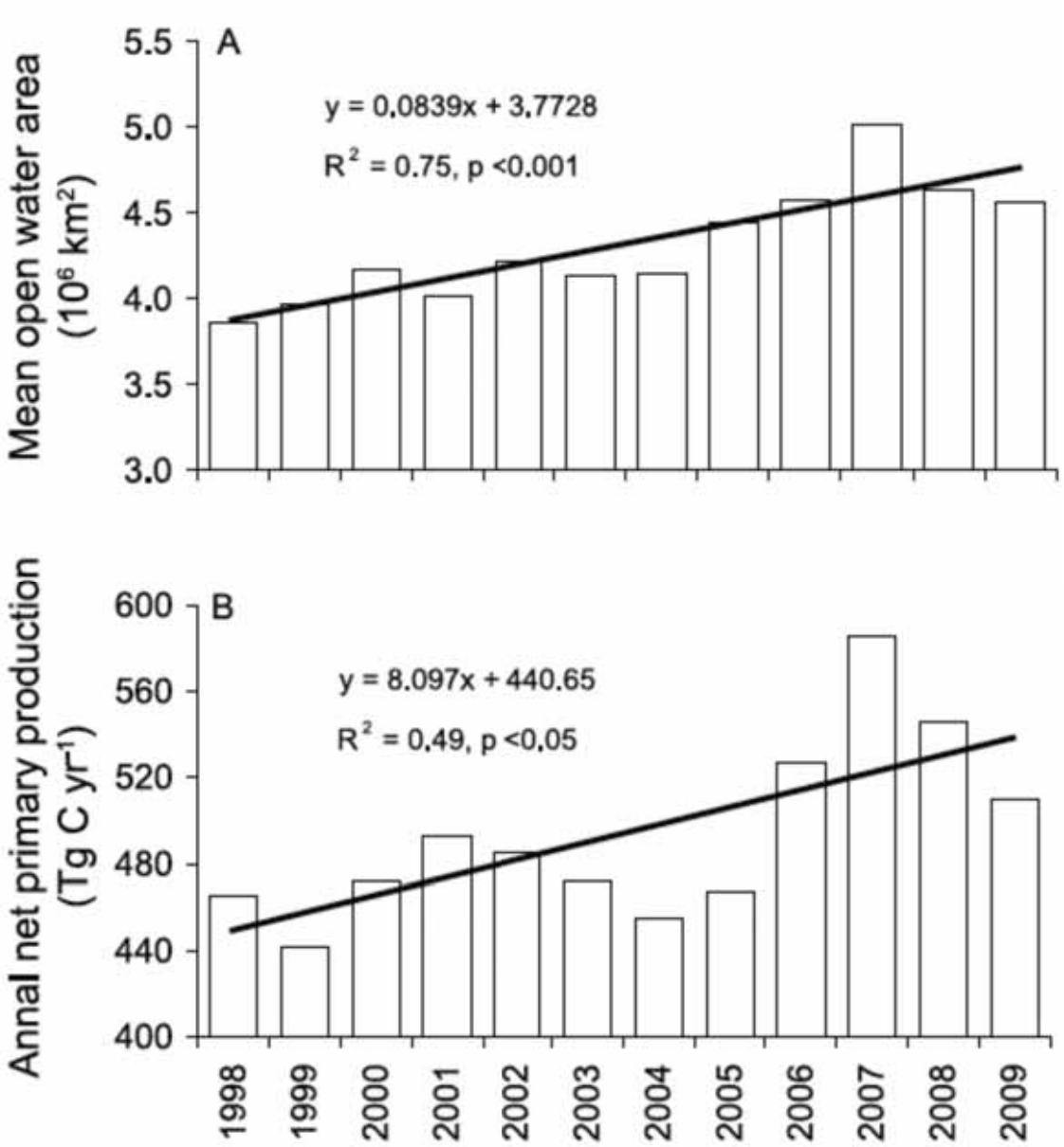
Phytoplankton blooms require sunlight (or PAR – photosynthetically active radiation) and nutrients.

When there is less sea ice, more sunlight enters the upper level of the ocean and drives increased primary production (production of organic compounds through photosynthesis).

# Arctic September Extents, 1979-2009

Credit: NSIDC



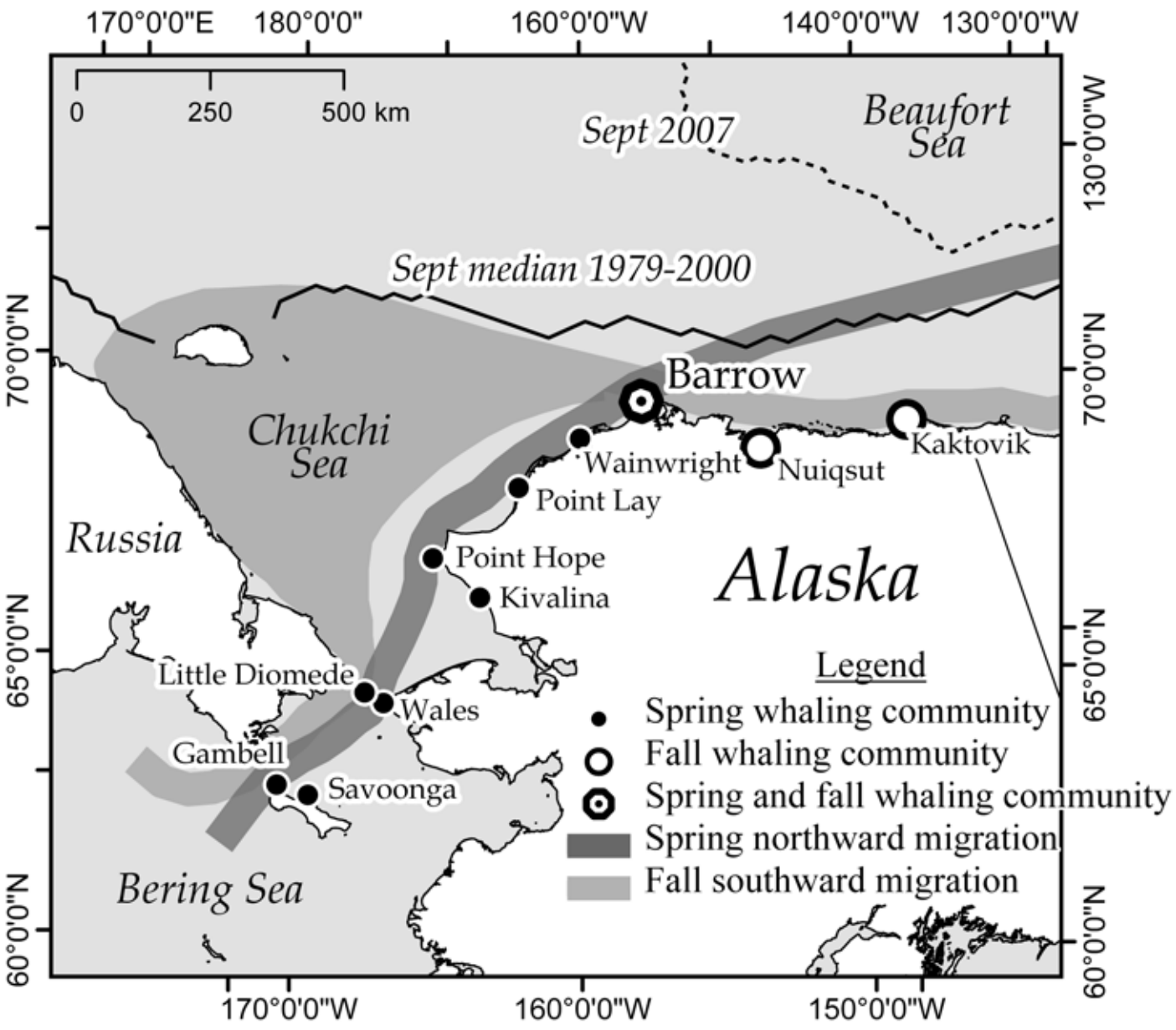


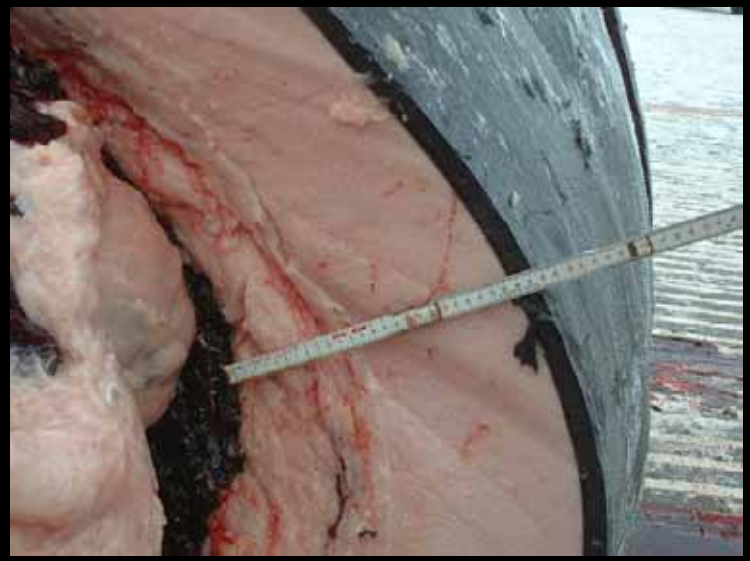

**Arrigo and van Dijken 2011**

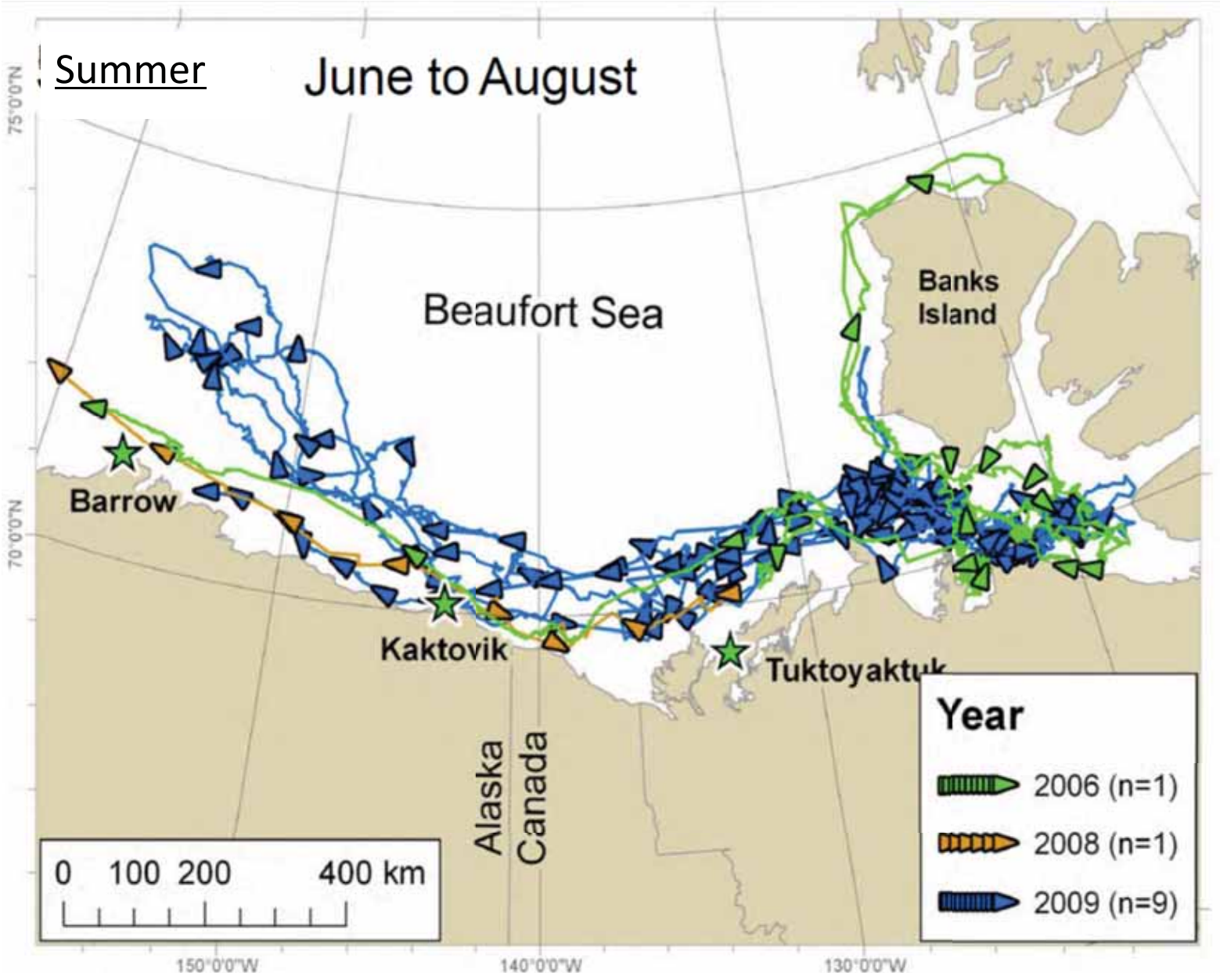
More phytoplankton provides for greater zooplankton.

Bowhead whales are filter-feeders that eat almost entirely zooplankton, including copepods (below). Zooplankton characterize secondary production, representing a critical level in the Arctic Ocean food chain.

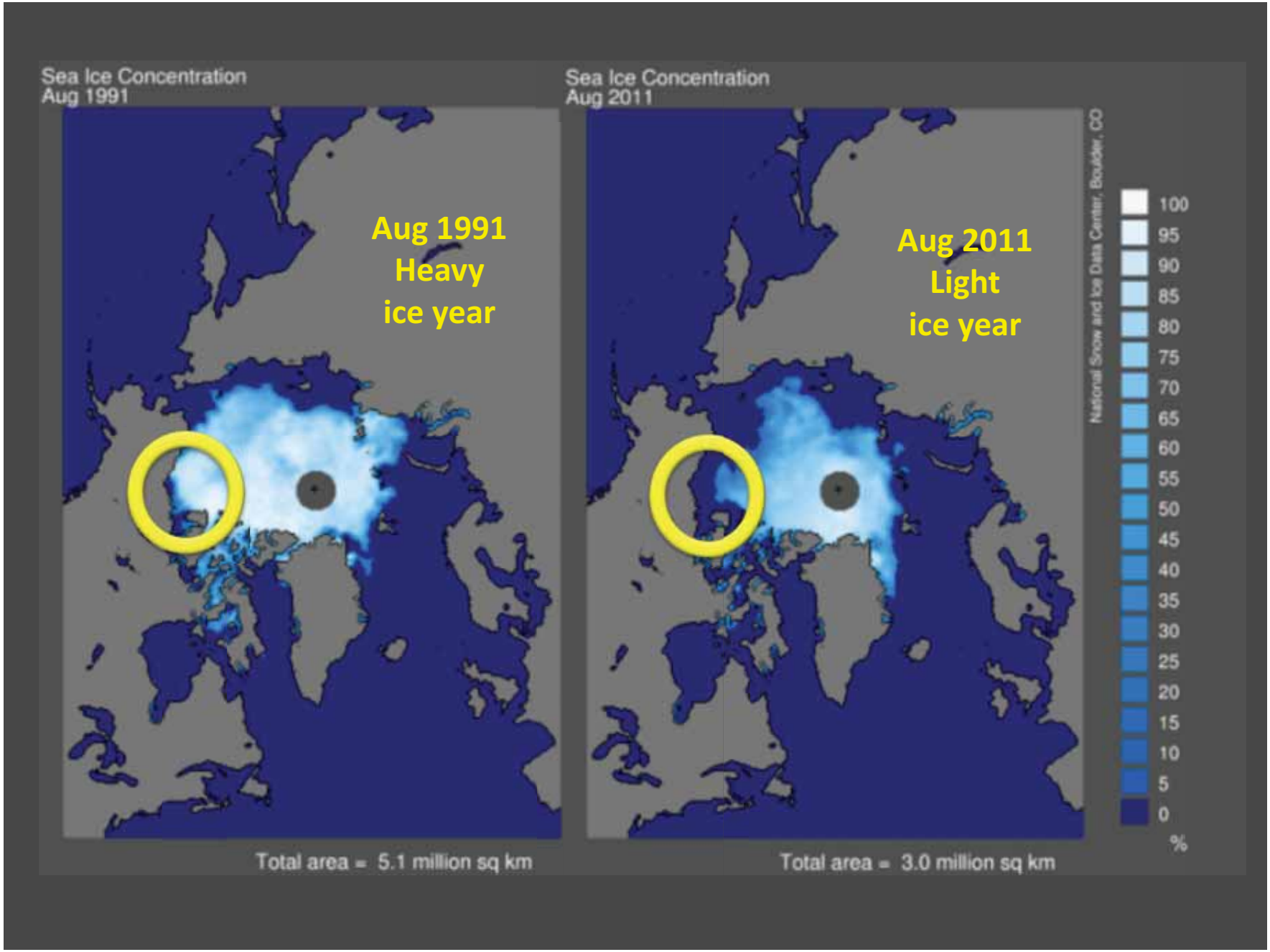
Do summers of reduced sea ice allow bowhead whales to eat more and increase in body size (girth)?

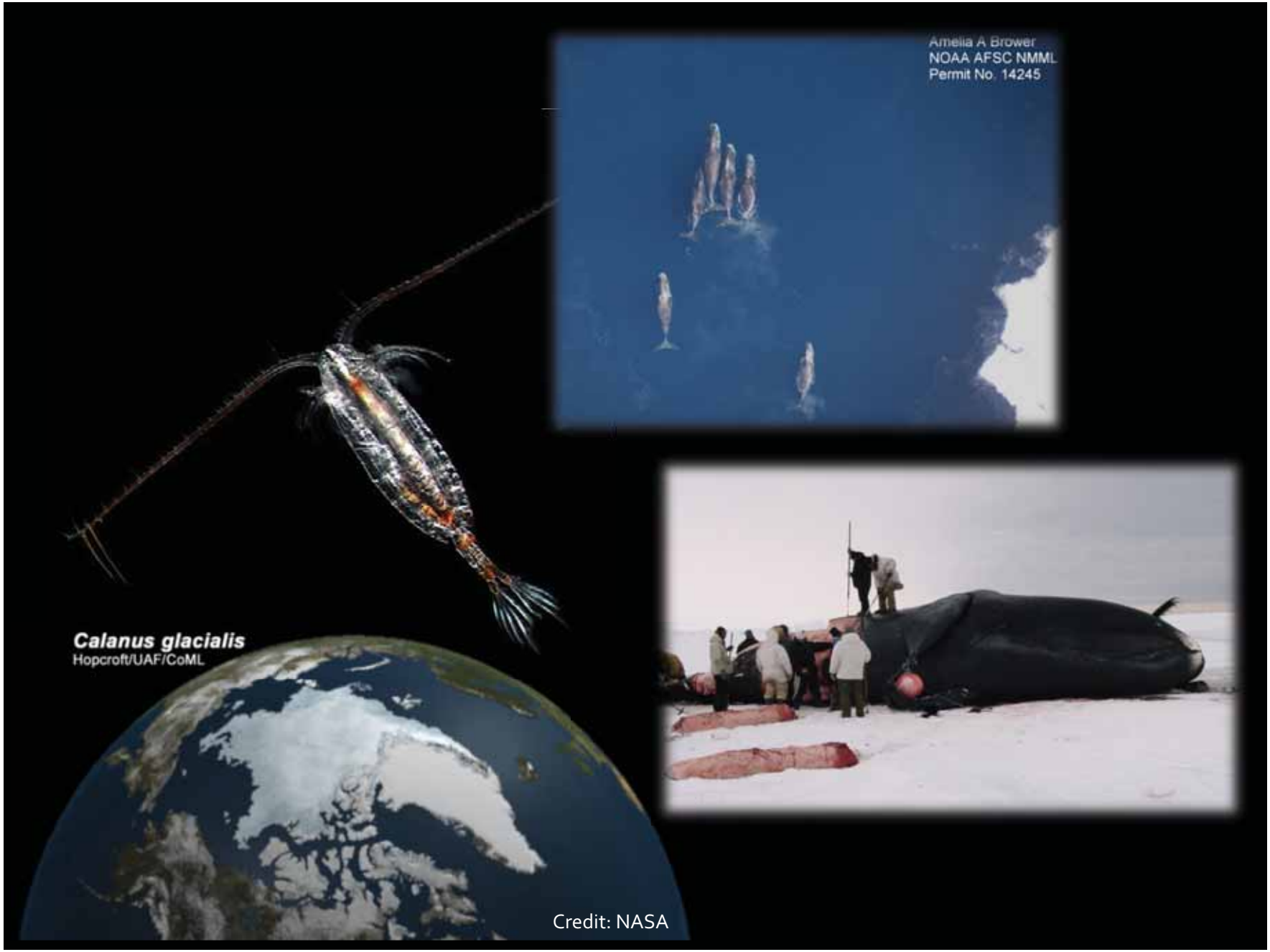

170°0'0"E
180°0'0"
160°0'0"W
140°0'0"W
130°0'0"W
0
250
500 km
Sept 2007
Beaufort Sea
Sept median 1979-2000
70°0'0"N
65°0'0"N
60°0'0"N
Barrow
Chukchi Sea
Wainwright
Nuiqsut
Kaktovik
Point Lay
Russia
Point Hope
Kivalina
Alaska
Little Diomede
Wales
Gambell
Savoonga
Bering Sea
Legend
Spring whaling community
Fall whaling community
Spring and fall whaling community
Spring northward migration
Fall southward migration
170°0'0"W
160°0'0"W
150°0'0"W






Credit: Alaska Department of Fish and Game


Sea Ice Concentration
Aug 1991
Aug 1991
Heavy
ice year
Total area = 5.1 million sq km
Sea Ice Concentration
Aug 2011
Aug 2011
Light
ice year
Total area = 3.0 million sq km
National Snow and Ice Data Center, Boulder, CO
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
%


Amelia A Brower
NOAA AFSC NMML
Permit No. 14245
Calanus glacialis
Hopcroft/UAF/CoML
Credit: NASA

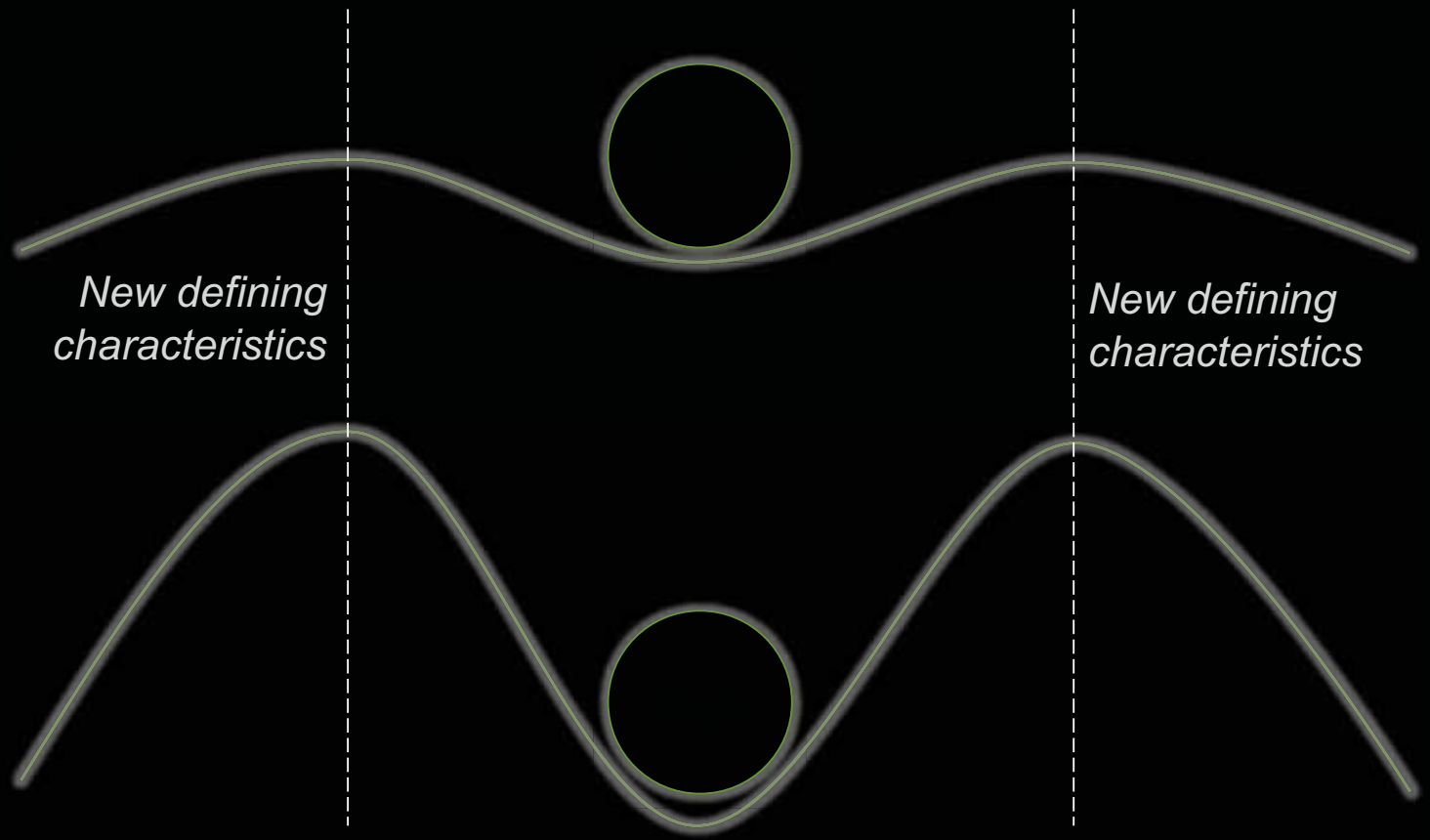
# RESILIENCE OF ARCTIC PEOPLES

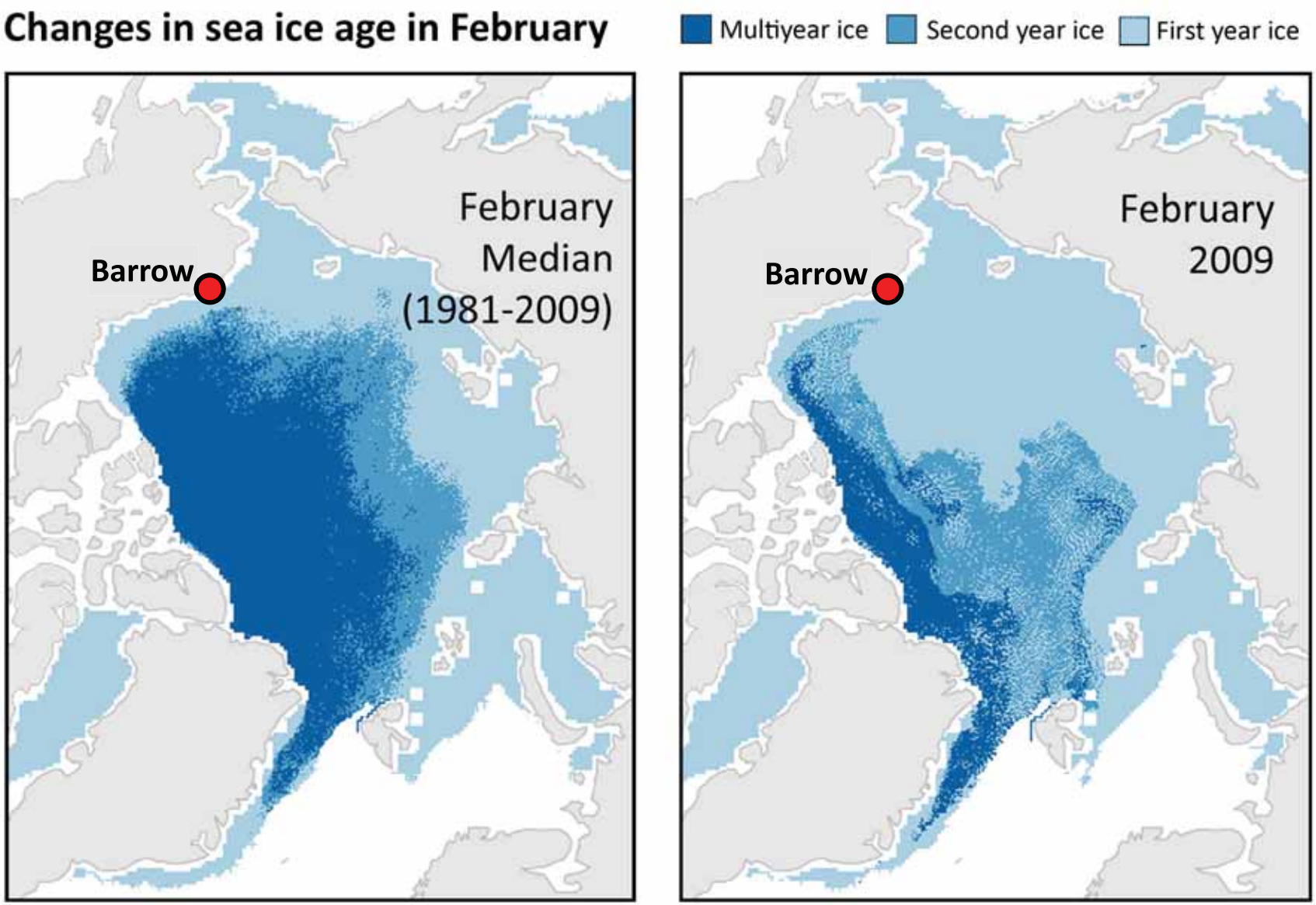
# WHAT IS RESILIENCE?

The amount of change (and the rate of change) a system can undergo and retain its defining characteristics

# WHAT IS RESILIENCE?

The capacity to absorb disturbance



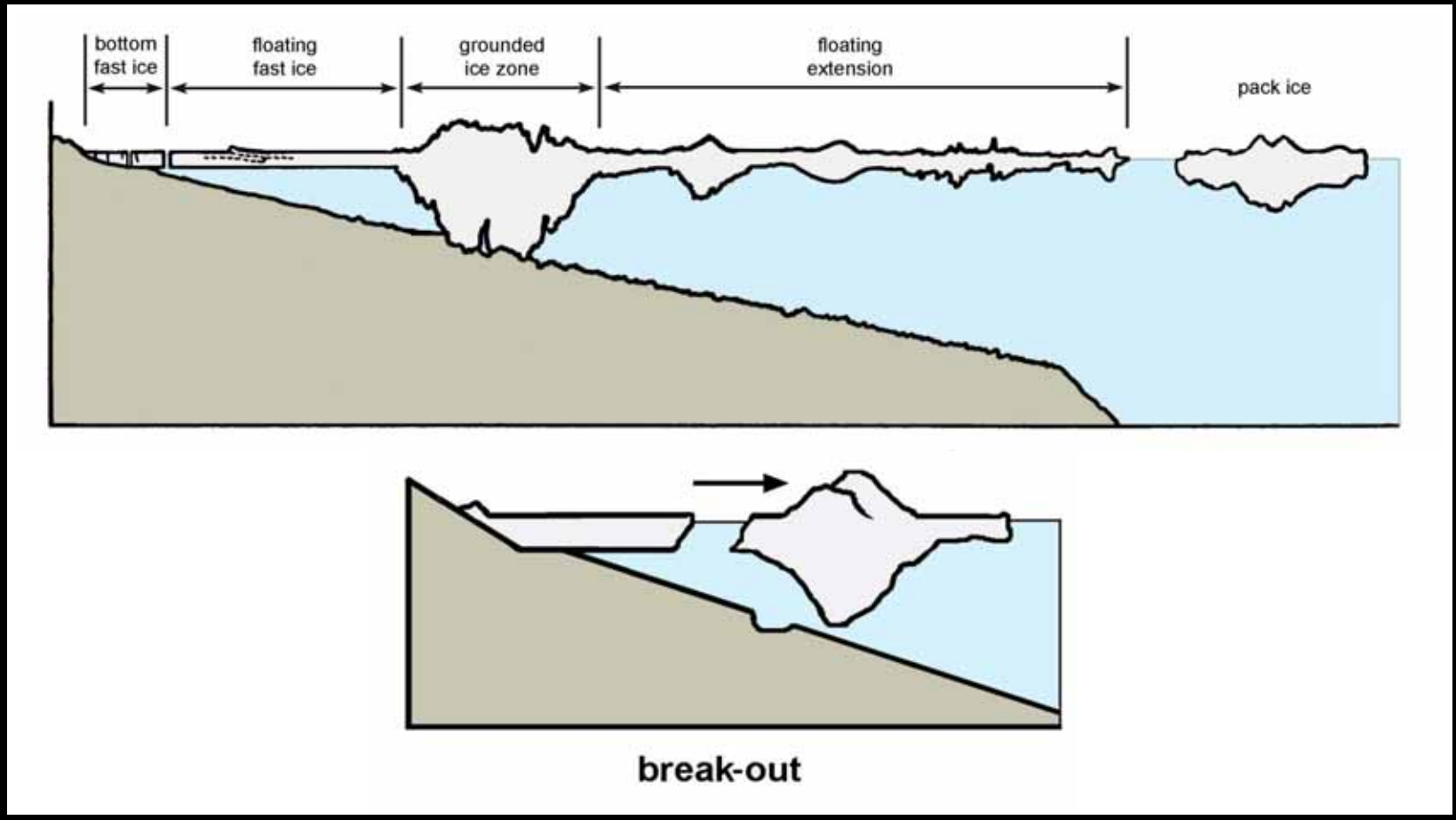



Source: Maslanik and Fowler, University of Colorado; satellite and drifting buoy data

# Community observations of sea ice change

- Less abundant multiyear ice
- Later fall freeze-up and earlier spring melt
- Increased variability in ice conditions
- Less stable shorefast ice in springtime

# Shorefast sea ice



# Ice floe breaks: 58 whalers flown to safety

Tim MacDonald/Arctic Sounder

*Willie Sakeagak gets a hug from his mother, Cora, after he and 57 other whalers were rescued by helicopter when the ice they were camped on broke loose from the shore ice. All whalers on the ice survived the ordeal, and only two snowmachines were lost.*

**By Tim MacDonald**
Arctic Sounder

BARROW — It was about 1 a.m. on Sunday morning May 12. The air was thumping with the heavy rotors of one of the North Slope Borough's big search and rescue helicopters. It landed on the beach behind the live-in office of the "Arctic Sounder." Whalers in their white parkas unloaded out the side door. Not good.

Whaling captain Marchie Nageak was in the group. "Ice breaking up," he hollered above the noisy helicopter, now taking off.

"How many are out there?" I asked.

"Too many. Go to rescue base, they'll know," Nageak said.

At the Barrow Volunteer Search and Rescue base in Browerville, whaling captains Oliver Leavitt and Jake Adams were manning the radio, which crackled with short messages in

See **Rescue**, page 8

Arctic Sounder, May 2002

# Shorefast ice break-out event in Spring 2007


Barrow sea ice radar

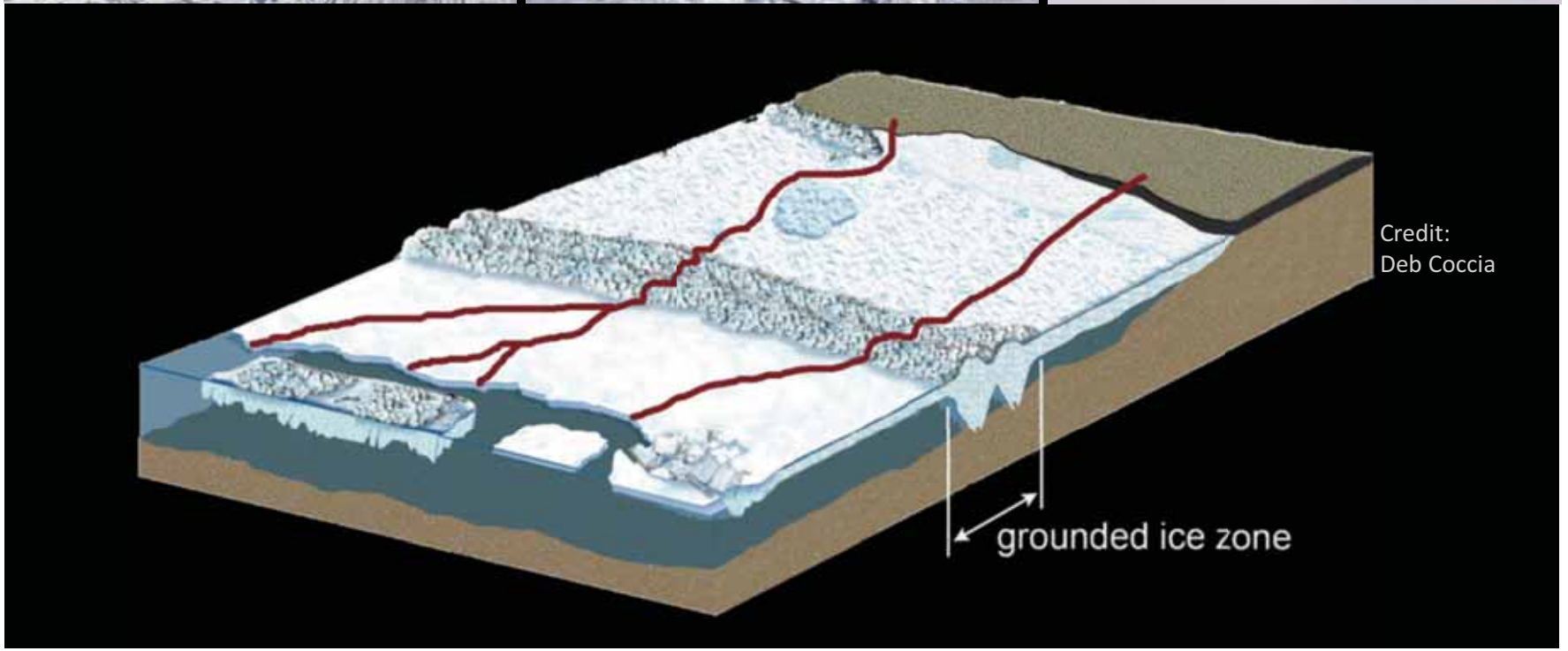
For animations, go to:
http://seaice.alaska.edu/gi/observatories/barrow_radar

# Barrow's ice trails for spring whaling


Credit: M.L. Druckenmiller


Credit: M.L. Druckenmiller


Credit: Craig George

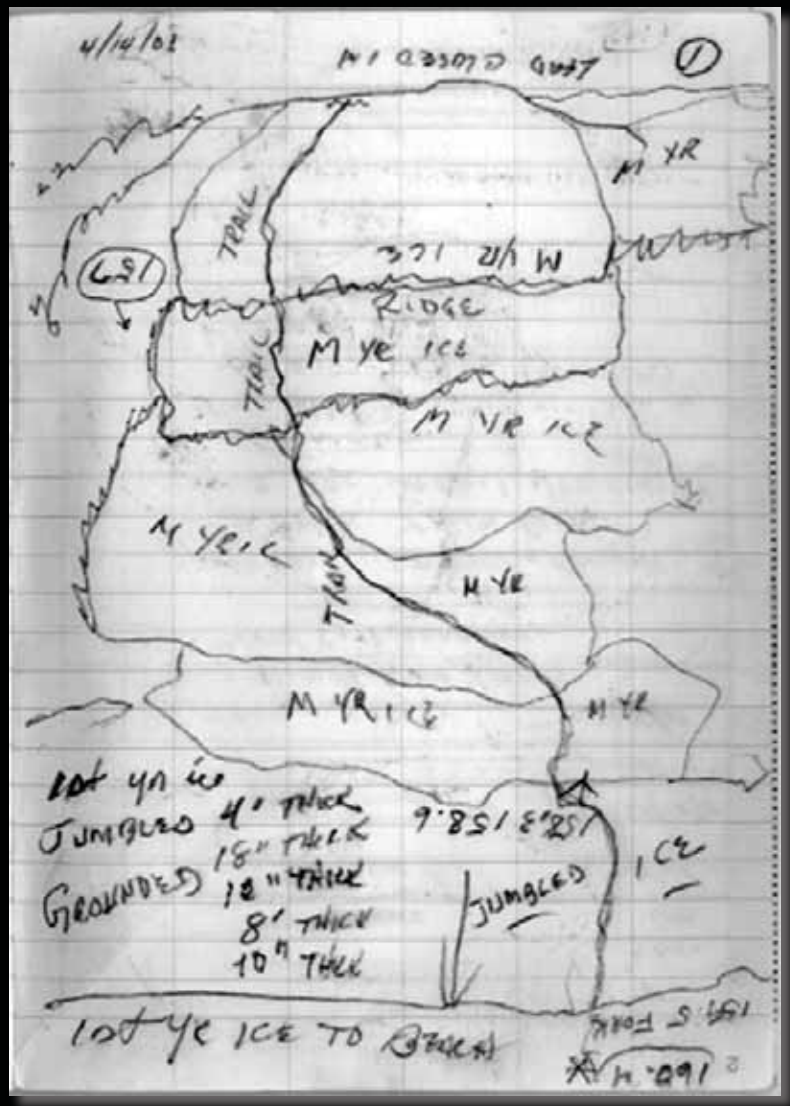


Credit:
Deb Coccia

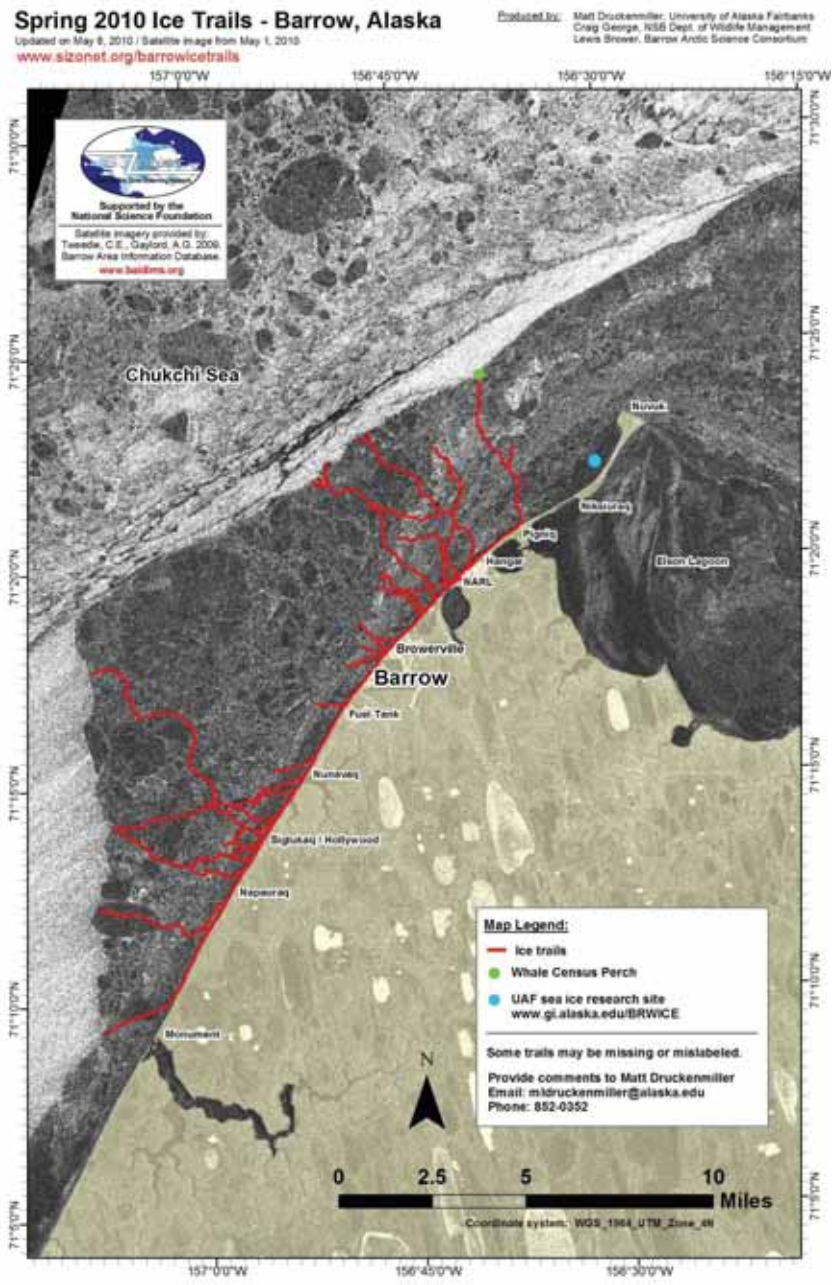
# An elder's hand sketches of the ice trails in 2001

Credit: Shari Gearheard

Warren Matumeak

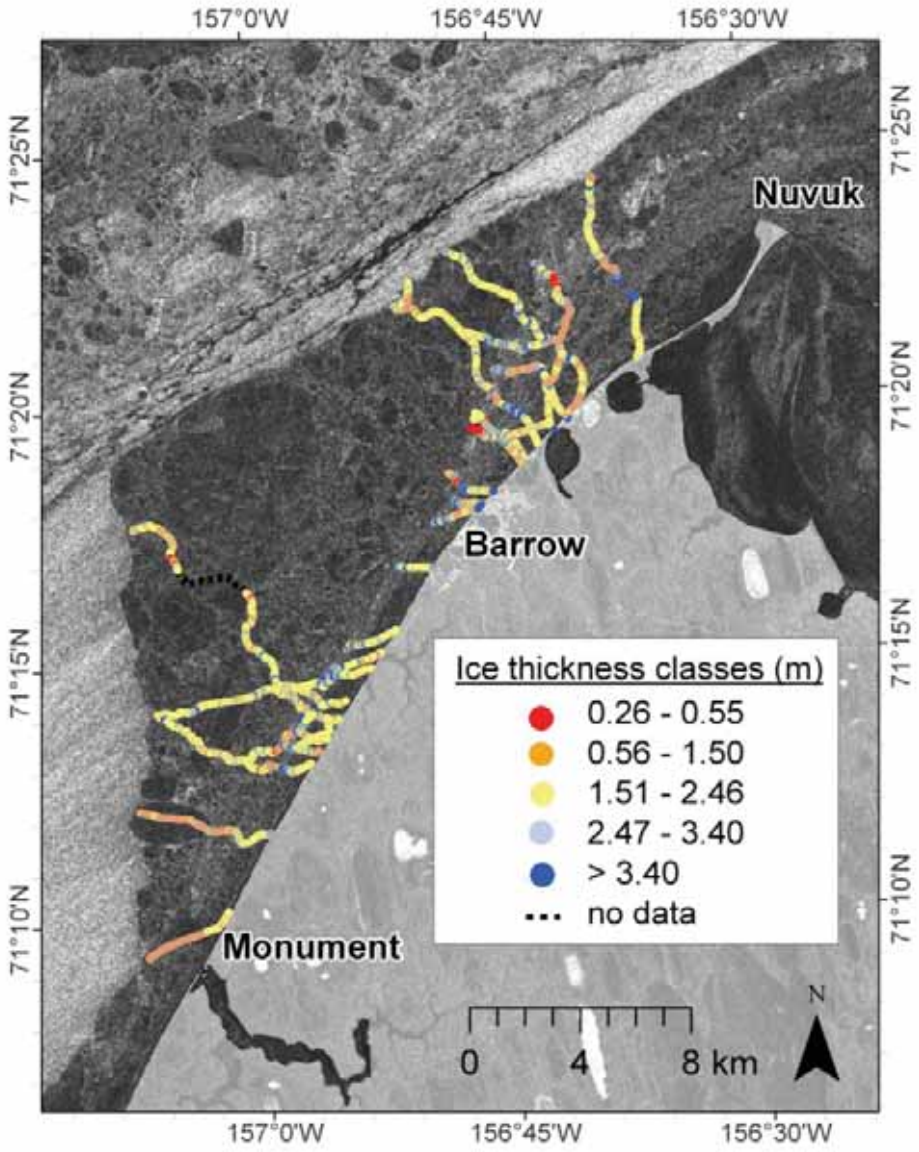



Credit: Warren Matumeak



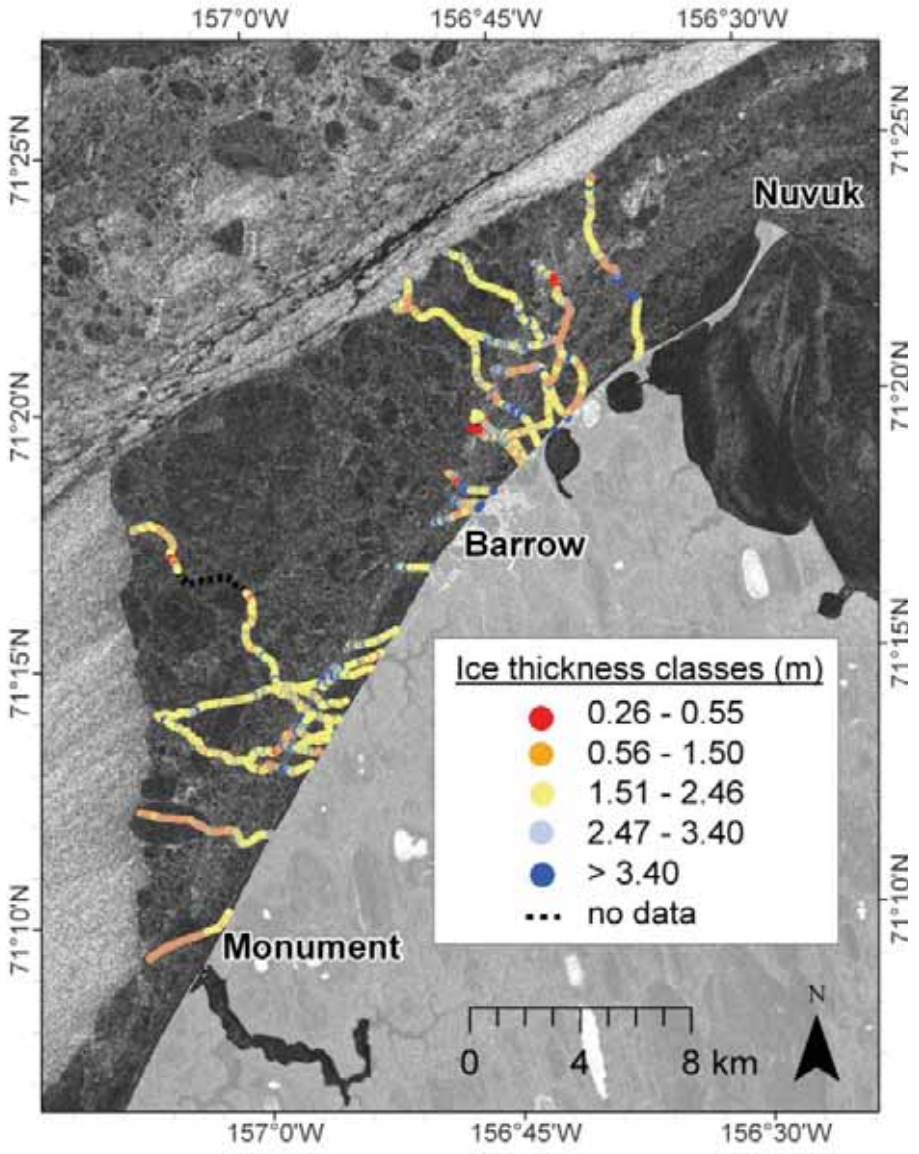

# Trail maps provide a tool for discussing ice conditions with hunters

## 2010 ice trail map with thickness values overlaid

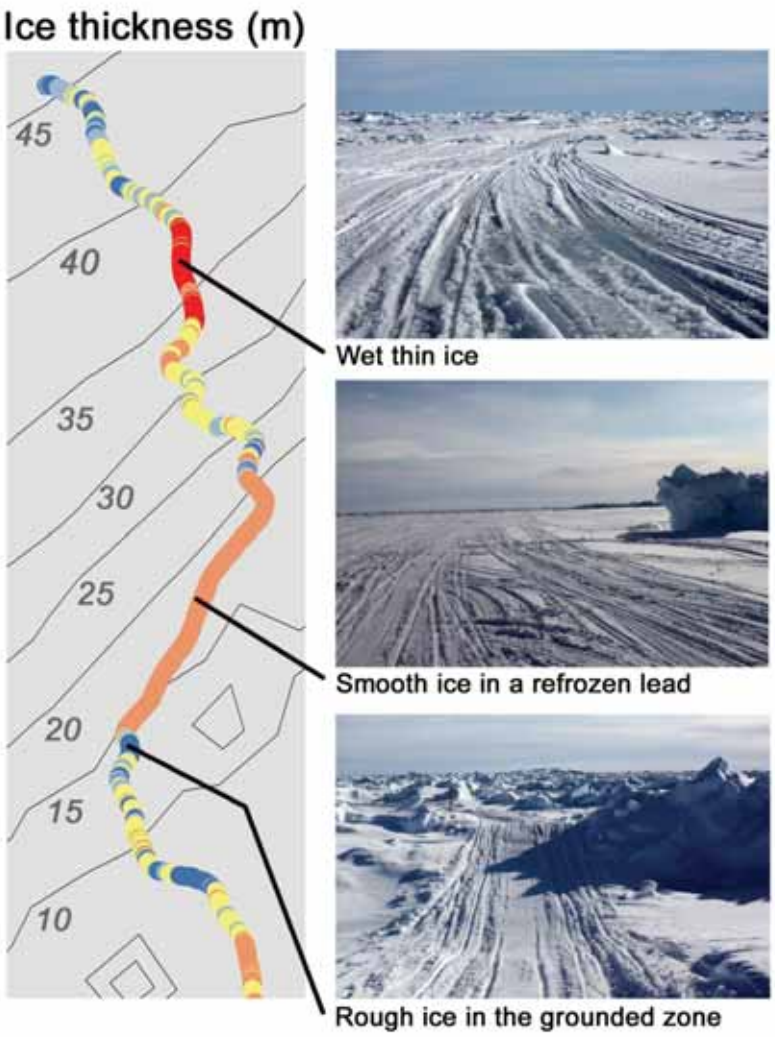



**Electromagnetic device for measuring ice thickness**

2010 ice trail map with thickness values overlaid




**Next step:**
**Greater ice type discrimination**



Tim MacDonald/Arctic Sounder

*Because of the size of the whale harvested May 30, and the thin ice, the maktak had to be cut from the whale as it was gradually pulled onto the ice. Workers were not able to salvage the whale's heavy head, but the rest of the whale meat and maktak made it to the community's ice cellars.*

# Big whale, thin ice

**By Tim MacDonald**
Arctic Sounder

BARROW — It was early, 4 a.m., on Thursday May 30 when the VHF radios began to buzz with Inupiaq. The Ugu crew had struck a whale near Point Barrow and members were searching for help to tow it in.

The Ugu crew was one of a handful of crews still on the ice after poor conditions had jinxed most of the season. Only two whales had been successfully landed, and three others had been lost by Barrow captains over the spring season.

One of the problems with whaling late in the season is that many of the whales are too large. Another is that the ice becomes too thin to support the whale while it is being butchered. After

See **Whale,** page 6

Arctic Sounder, June 2002

# WHAT IS RESILIENCE?

The amount of change (and the rate of change) a system can undergo and retain its defining characteristics

## COMMUNITIES PROMOTE RESILIENCE BY

- Partnering with science to diversify their knowledge and information (science as another tool in their toolbox)
- Remaining connected to and observant of the environment
- Understanding what is most important to them - knowing their key cultural aspects to sustain in a changing world

## COMMUNITIES DEMONSTRATE RESILIENCE BY DEALING WITH CHANGE AND VARIABILITY.

# Review of Sea-Ice & Related Climate Information Resources for Alaska's Arctic Coastal Communities

## A Manual for Accessing & Using Online Information

**Published August, 2010**
**by the Alaska Center for Climate Assessment & Policy (ACCAP)**
**http://ine.uaf.edu/accap/research/sea_ice_manual.htm**

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