Seal body condition influences polar bear body condition, recruitment and feeding ecology in the Chukchi Sea

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Collaboration with US Fish and Wildlife Service, Alaska Department of Fish and Game, and University of Washington

Capture-based polar bear study, 2008–2017

OBJECTIVES

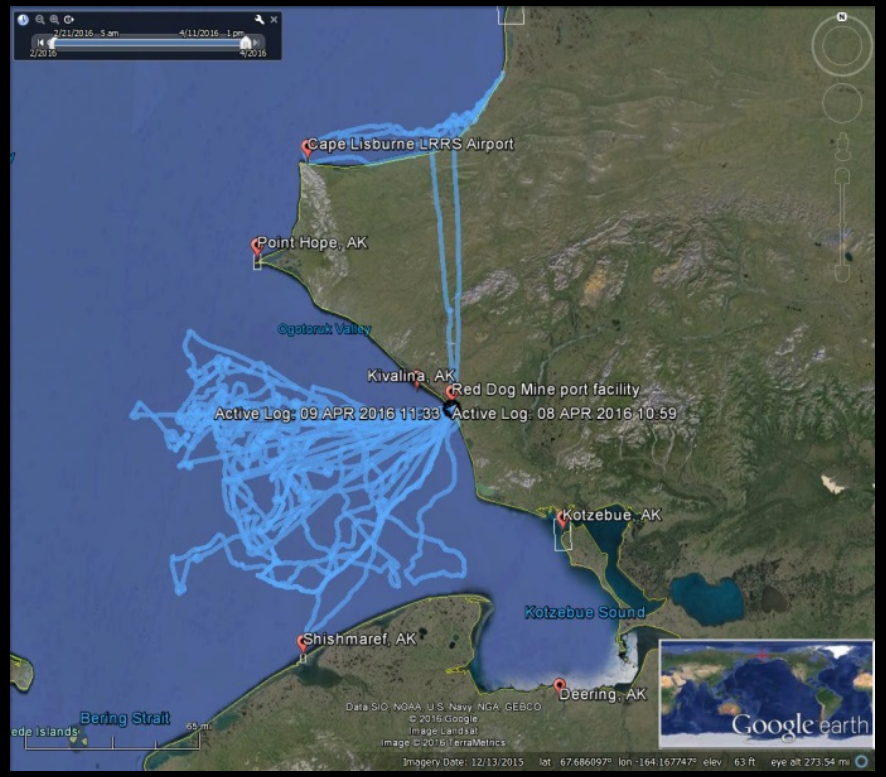
1. Estimate the size and status of the population
2. Determine environmental and ecological factors that affect population abundance

Capture-based polar bear study started in 2008

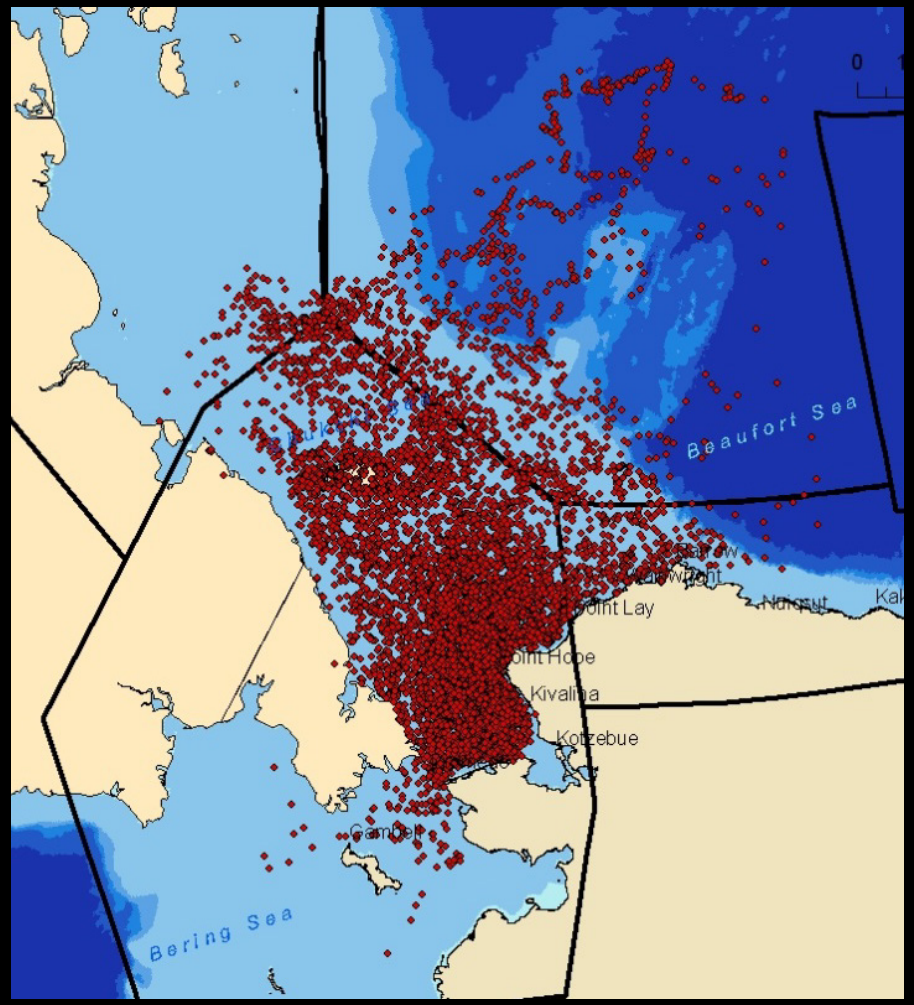
OBJECTIVES

1. Estimate the size and status of the population

Flight paths tracking polar bears in 2017



Locations of bears tagged 2008–2016

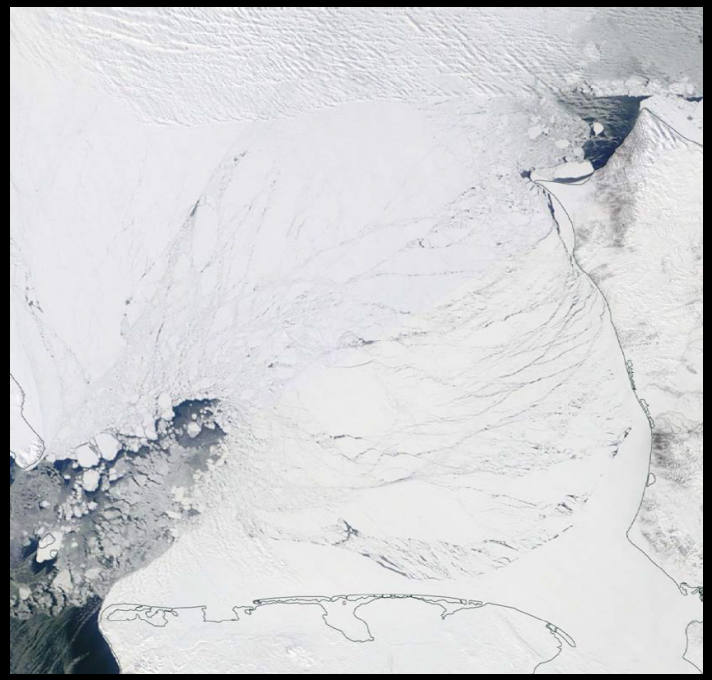


Population abundance and vital rate estimates can be difficult to obtain for polar bears

- Expensive
- Logistically complex
- Large uncertainty

Changing sea ice conditions are limiting polar bear research making identifying indicators of status and health increasing important for polar bear population monitoring

April 16, 2016



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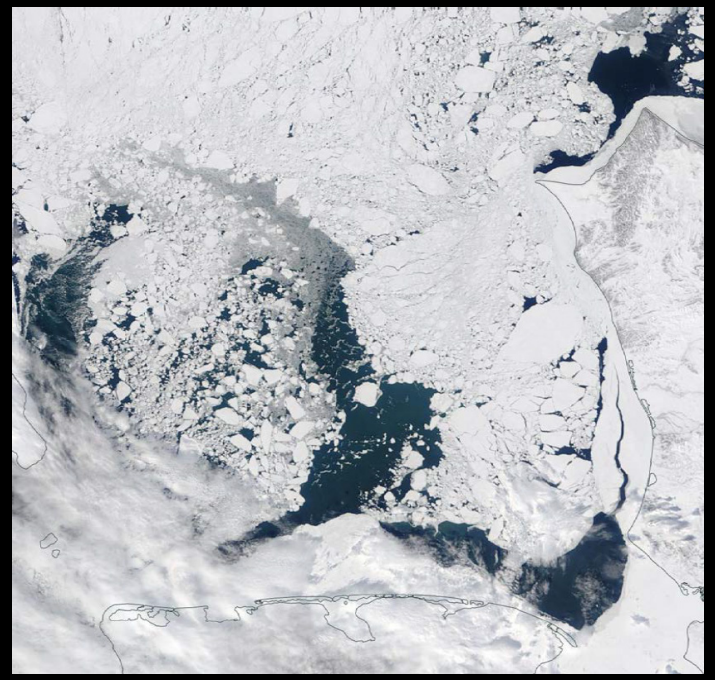

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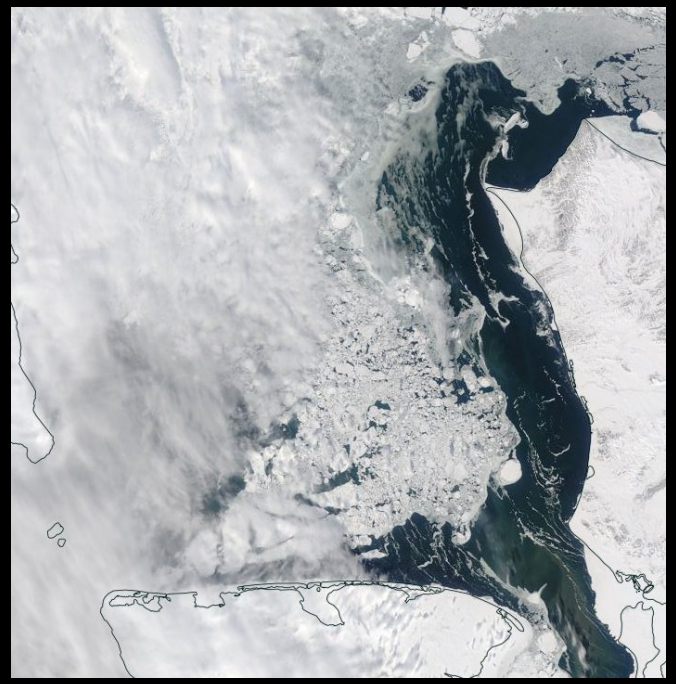

Capture-based polar bear study, 2008–2017

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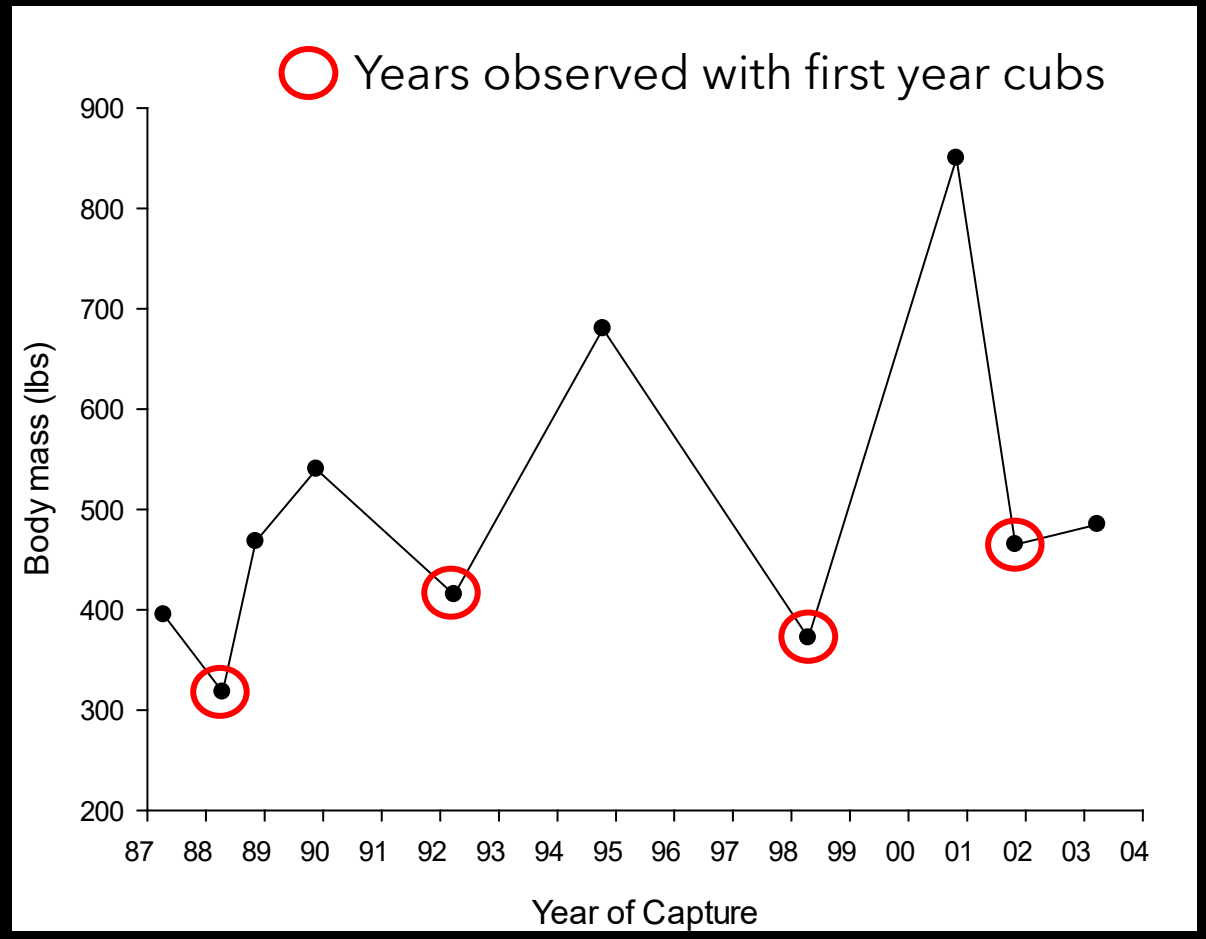
What factors affect healthy Chukchi Sea polar bear populations?

- Polar bear body condition is important for reproduction
- Seek to identify environmental and ecological factors that affect polar bear:
  - Body condition
  - Recruitment
  - Feeding behavior



What factors affect healthy Chukchi Sea polar bear populations?

Factors that may affect polar bears:

- Prey: Ringed and bearded seal body condition (ADFG Biomonitoring)
- Sea Ice: Summer and spring sea ice cover
- Arctic Oscillation (AO): an index of climate and sea ice

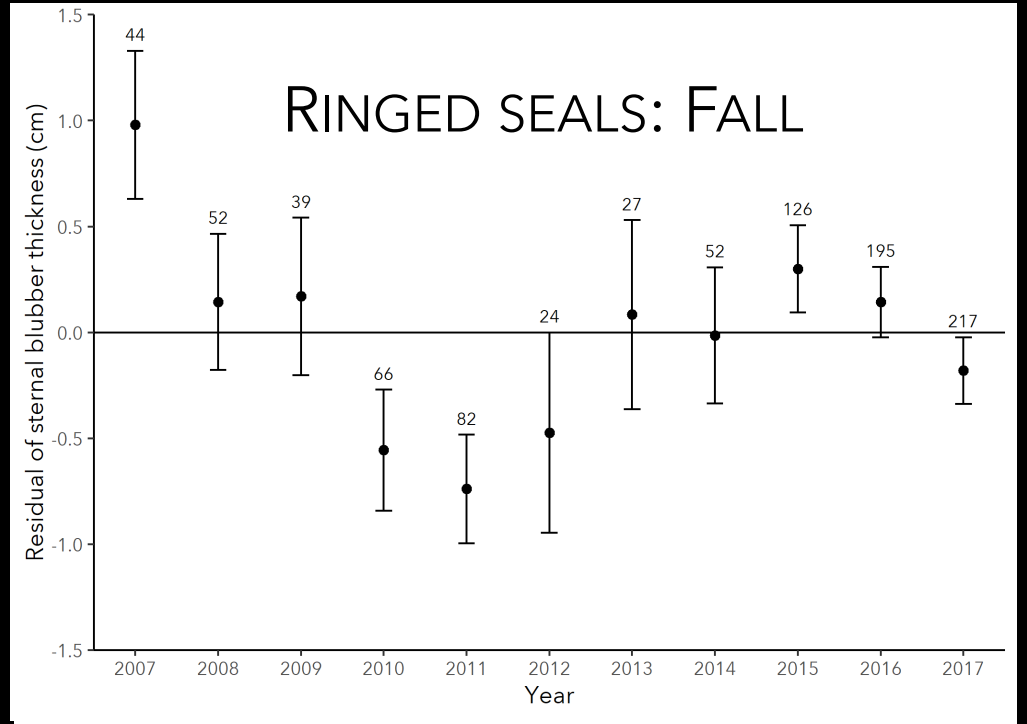
ADFG Ice Seal Biomonitoring Program

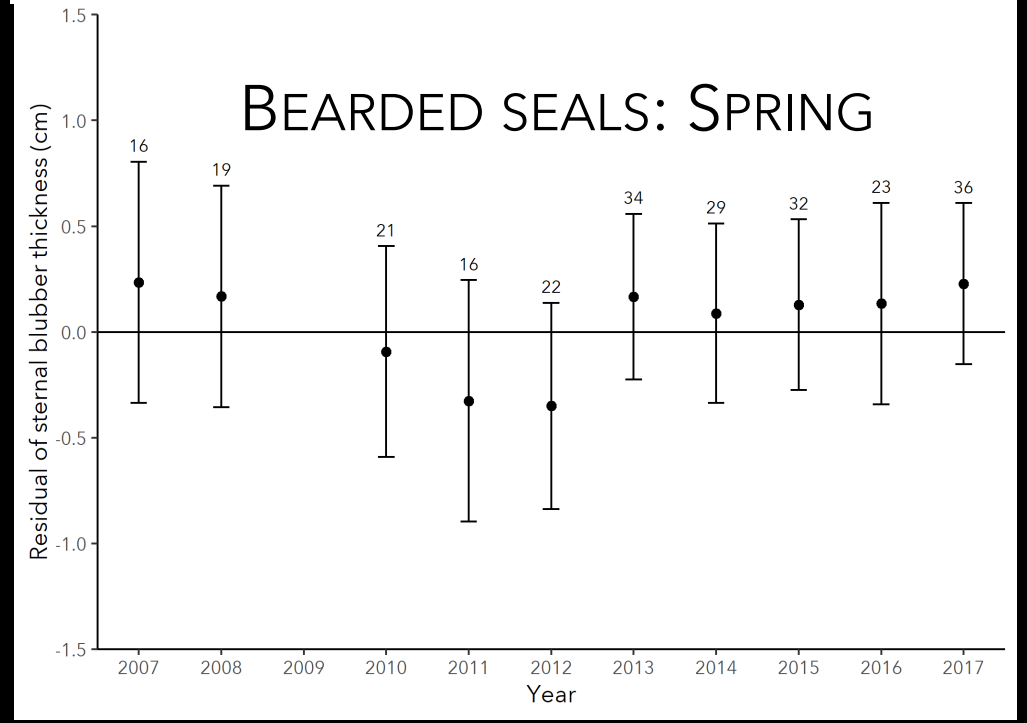
- Difficult to assess seal abundance and population trends
- Monitor health and status of ice seals through samples collected from Alaska Native harvests
- Samples include:
  - Physical measurements for body condition & growth (e.g., blubber thickness and length)
  - Teeth for aging
  - Stomachs for diet analysis
  - Female reproductive tracts for productivity (e.g., pregnancy rate, age at maturity)

Index of seal body condition, *sternal blubber thickness*

- Determined mean blubber thickness for each year relative to the average across all years.
  - *Identifies years seals were in good or poor condition.*
  - Accounts for season and seal age.

- Ringed seals:
  - Prior fall (year *t* - 1) condition
- Bearded seals:
  - Current spring (year *t*) condition





Ringed seals were important prey for females and subadults

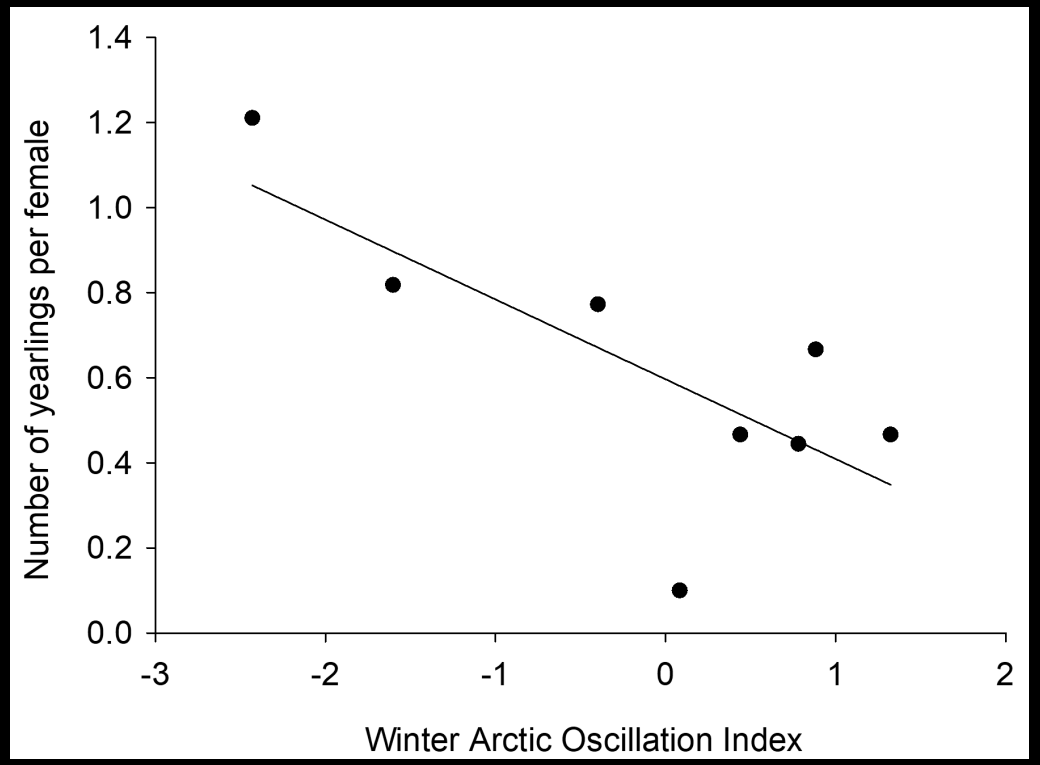
- Winter and spring diets of adult females and subadults was >50% ringed seal
- Polar bear body condition for females and dependent young were higher when fall ringed seal body condition was higher

Bearded seals were important prey for adult males

- Winter-spring diets of adult males were 40% bearded seal and 20% beluga whale
- Male body condition was related to the body condition of bearded seals, but not ringed seals
  - May suggest importance of larger prey for male polar bears.

Winter climate and sea ice (AO) relates to recruitment

Years with colder temperatures and heavier and thicker sea ice were associated with higher polar bear recruitment



Conclusions from 10 years studying factors affecting polar bear reproduction and survival

- The body condition of seals affect polar bear body condition
- Low Arctic Oscillation indices reflect conditions important to successful reproduction in polar bears