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# Climate change and marine mammals in the northern Bering and Chukchi seas:

## What do we know? Why should we care?



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NPFMC's Scientific and  
Statistical Committee  
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# Phocid “true” seals



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Polar  
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**Ringed  
Seal**



**Bearded  
Seal**



**Ribbon  
Seal**



**Spotted  
Seal**



**Harbor  
Seal**

Ice-associated seals

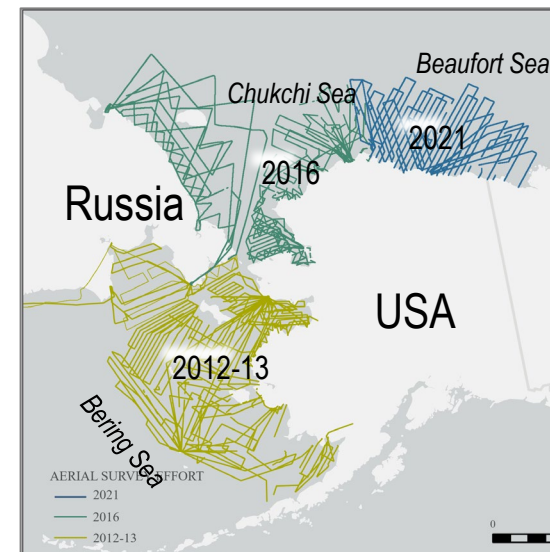
Program leader

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# Seals and their prey in the Bering and Chukchi Seas

## What do we know?

- **Seals are abundant**
  - ~1.87 Million based on joint US and Russian aerial surveys of the
    - Bering Sea (2012/13) and the
    - Chukchi Sea (2016)
- **Seals are large, high-trophic consumers with high metabolic demands**
- **Seals in the Bering and Chukchi Seas consume roughly 1.6M tons of prey each year**
  - A large portion of that in the N. Bering and S. Chukchi seas



# Seals and their prey in the Bering and Chukchi Seas

## Why should we care?

- **Alaska fisheries took an estimated 1.6M tons of Pollock in 2021 (or about the same biomass as the prey consumed by seals)**
- **The trophic roles of seals are significant in Alaska, but their impacts are poorly understood**
- **Seals have largely been absent from ecosystem models and the NPFMC EBFM process**

# Seals and changes in the annual extent of sea ice

## What do we know?

- The ice extent in the Bering Sea has been trending downwards
- Sea ice is critical habitat for ice seals (especially in spring/summer)
  - Provides protection from killer whales:
  - Serves as a platform for:
    - Pupping:
    - Nursing:
    - Molting:
    - Resting:



# Seals and changes in the annual extent of sea ice

## Why should we care?

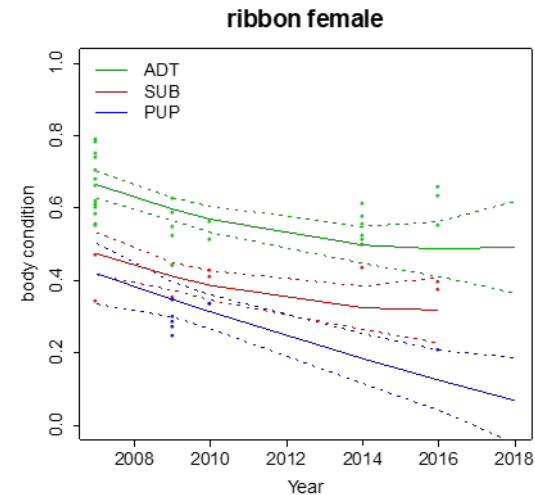
- **Climate models forecast that the extremely-low April sea ice conditions in 2018 will become normal by the end of the century**
- **A reduction in ice-covered areas in April likely has negative implications for all populations of ice seals in the Bering Sea**
  - Provides protection from killer whales: - *Increased predation?*
  - Serves as a platform for:
    - Pupping: - *Poor pup production?*
    - Nursing: - *Poor pup survival?*
    - Molting: - *Increased parasites and disease?*
    - Resting : - *Poor nutrition and reduced body condition due to ecosystem effects on prey?*

# Seal body condition & Unusual Mortality Events (UME)

## What do we know?

- Evidence that seal body condition (mass/length) has declined over last decade (2007-2018) in harbor, spotted and ribbon seals

- Declined in pups for all three species
- Declined in ribbon seal sub-adults and adults



- **2011–2016: UME Symptoms**

- Hair loss and lethargic, but otherwise OK. - *Unknown cause*

- **2018-2022: UME Symptoms**

- Mostly young and emaciated (i.e., poor nutrition; bottom up)
- Likely linked to marine heatwave (2018 record low sea ice extent) suggesting climate-related impacts - *as in piscivorous seabirds*
- 5 to 7 times the yearly average of strandings from 2000-2017

# Seal body condition & Unusual Mortality Events (UME)

## Why should we care?

- **The two UMEs in an 8-year period may have reduced the populations**
  - Particularly for spotted and ribbon seals
- **Given connection to climate, we can expect continued and more severe impacts**
  - Eventually they'll have impacts on vital rates (if not already)
- **Canary in the coal mine:**
  - **Most of these top-level predators are foraging generalists**
  - **Starving seals suggests deeper ecosystem-wide causes**
    - poor nutrition for mothers during gestation and/or nursing
    - de-coupling of sea ice habitat from preferred foraging areas
      - e.g., reduced sea ice in 2018 prevented nursing ribbon seals from reaching their preferred foraging habitat off the shelf



# ESA “threatened” listing for bearded and ringed seals

## What do we know?

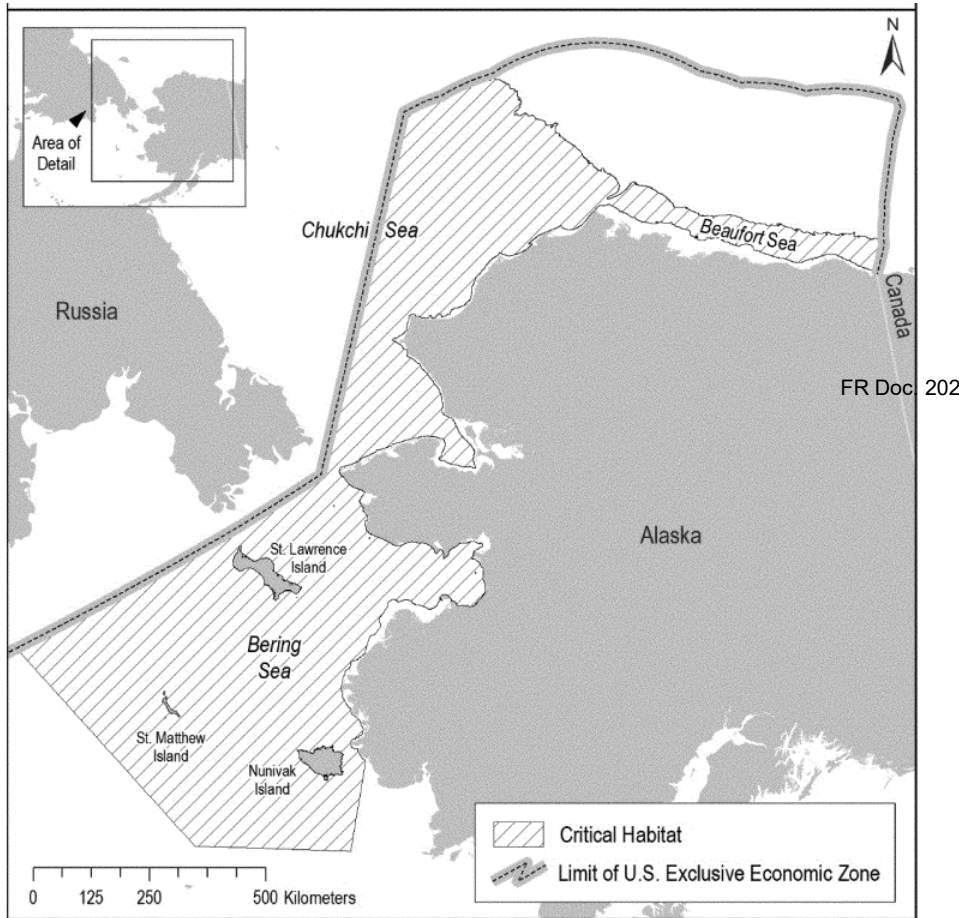
- Populations are currently large, but were listed as “threatened” (vs. endangered) due to predictions of a reduced sea ice habitat
- In April 2022, NOAA designated critical habitat for each species that cover nearly all of the US Bering-Chukchi-Beaufort Shelf
  - Essential features
    - Sea ice extent (in April)
    - Water depth ( $\leq 200\text{m}$ ) – *Bearded seals*
    - Snow-covered ice habitat for subnivean lairs – *Ringed seals*

## Why should we care?

- Currently the ESA listings and critical habitat designations have no impact on fisheries, but reductions in available habitat, population abundance, body condition, etc. could make interactions with fisheries more important

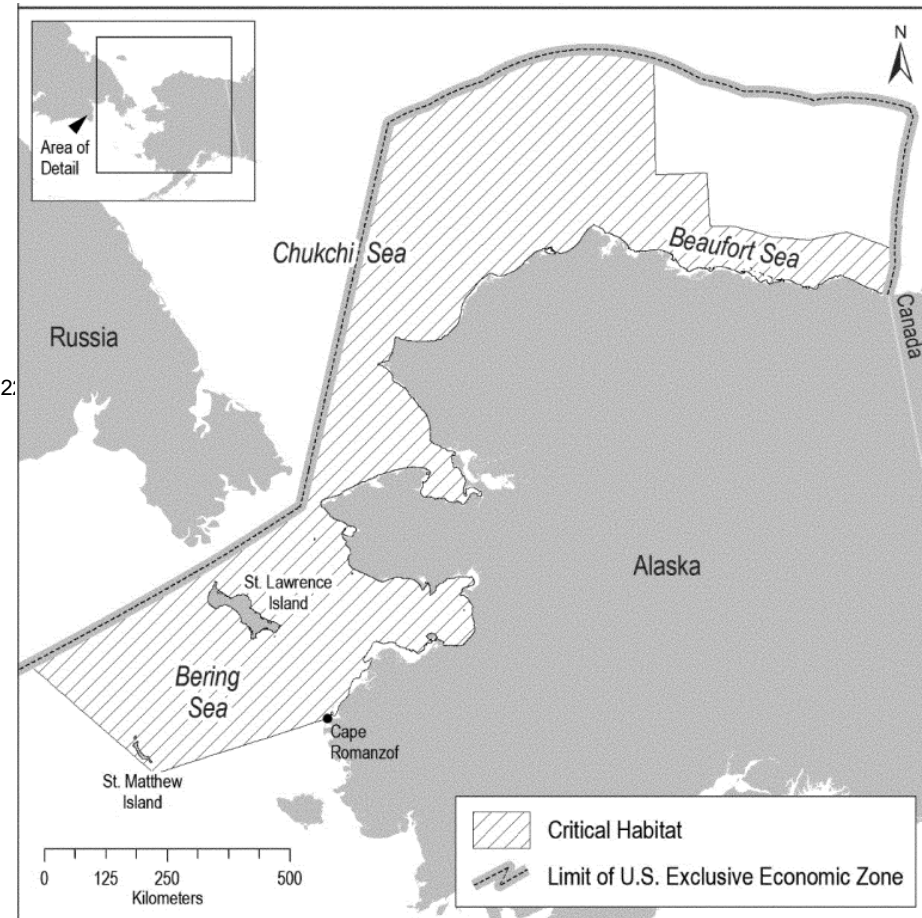
# ESA “threatened” listing for bearded and ringed seals

## “Beringia” Distinct Population Segment (DPS) of the Bearded Seal



FR Doc. 2022-06173

## Arctic Ringed seal



FR Doc. 2022-06197

# Cetaceans: Bering & Chukchi seas



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## Subsistence harvested

Bowhead whale (*also endangered*)  
Beluga whale (Beaufort Sea stock)  
Beluga whale (e. Chukchi Sea stock)  
Beluga whale, e. Bering Sea stock)

## ESA endangered

North Pacific right whale  
Fin whale  
Humpback whale (w. N. Pacific stock)  
Humpback whale (Mexico stock)

## Additional species/stocks

Humpback whale (Hawaii stock)  
Gray whale  
Narwhal  
Killer whale (e. N. Pacific AK resident)  
Killer whale (e. N. Pacific transient)  
Harbor porpoise, Bering Sea  
Dall's porpoise

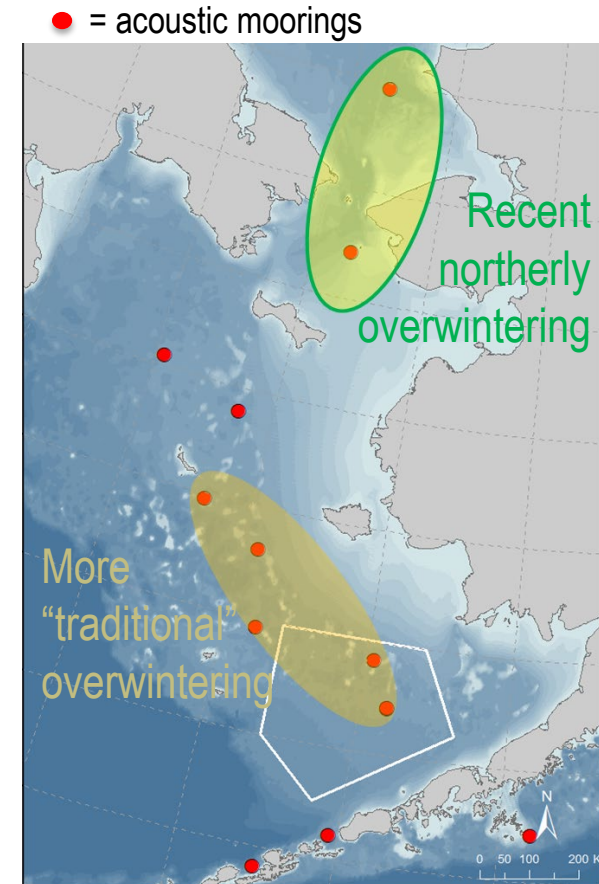
**Spatial and temporal distributions of multiple cetacean stocks are shifting as sea ice cover changes**

Program leader  
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# Bowhead whale distribution

## What do we know?

- Migration patterns are changing and shifting north: bowheads used to migrate south through the Bering Strait in fall and north into the Chukchi Sea in the spring
- With warming and sea ice changes, during past 5 years some bowheads now winter-over in the southern Chukchi Sea
- Bowheads sometimes still travel south into SE Bering Sea with sea ice (as recently as 2020)



# Bowhead whale distribution

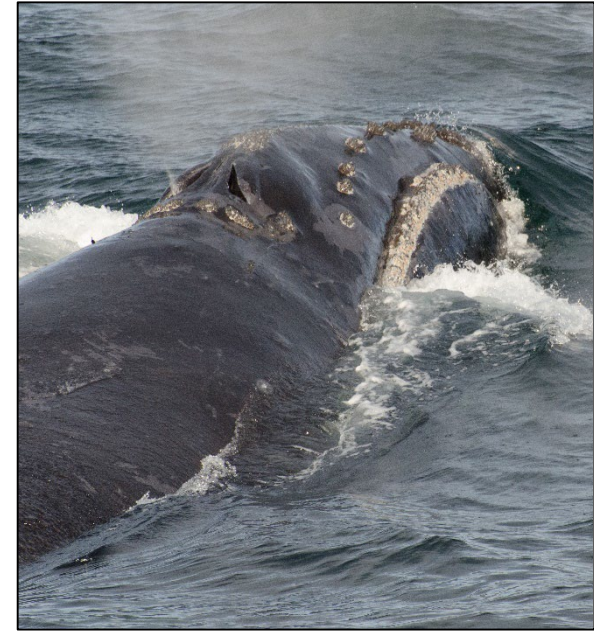
## Why should we care?

- **Bowhead whales are ESA listed as “endangered” and a critically important subsistence resource for Alaska Natives**
- **Shifting and overlapping distributions of bowheads and fisheries may increase incidental serious injury and mortality**
- **12.4% of bowhead whales photographed in 2011 had evidence of entanglement in lines and other gear**
- **Will entanglement and incidental mortality rates of this high profile, endangered species increase with changing distributions of both whales and fisheries?**

# North Pacific right whales

## What do we know?

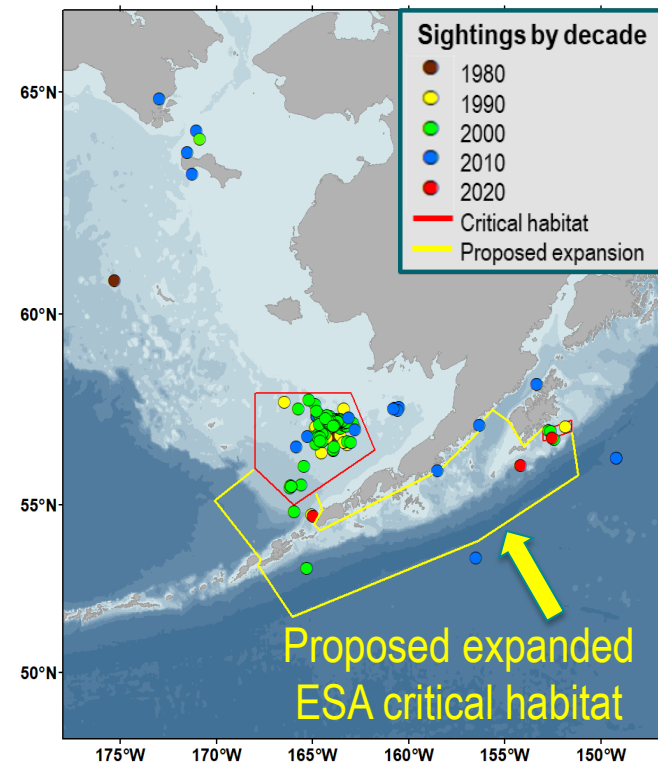
- **Total abundance of the eastern stock is estimated to be only 30 individuals -- making this the most critically endangered large whale in the U.S. (and perhaps the closest to extinction in the world)**
- **Acoustics data suggest that North Pacific right whales are more concentrated in the eastern Bering Sea during cold (i.e., more sea ice) years, but are more widely distributed during warm years (i.e., future climate warming may result in broader distribution)**



# North Pacific right whales

## Why should we care?

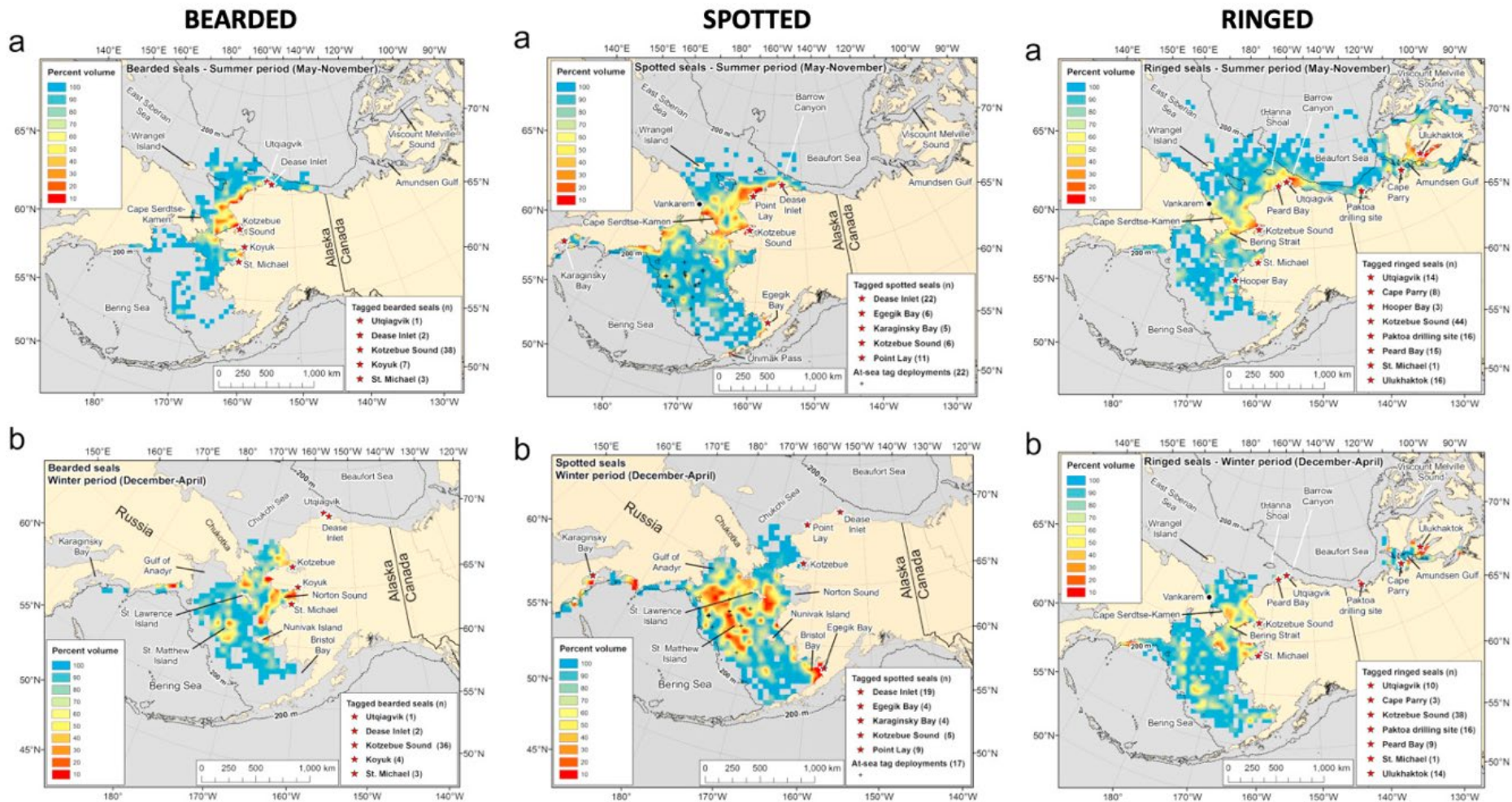
- NMFS has been petitioned to expand ESA critical habitat
- With more warm years in the future, eastern North Pacific right whales may become more broadly distributed and develop increased fisheries interactions
- Greatest risk to right whales may be entanglement in gear & vessel strikes
- The mortality of a single animal would have devastating population level consequences





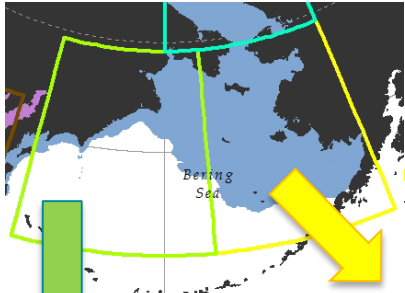


# Seals and their prey in the Bering and Chukchi Seas



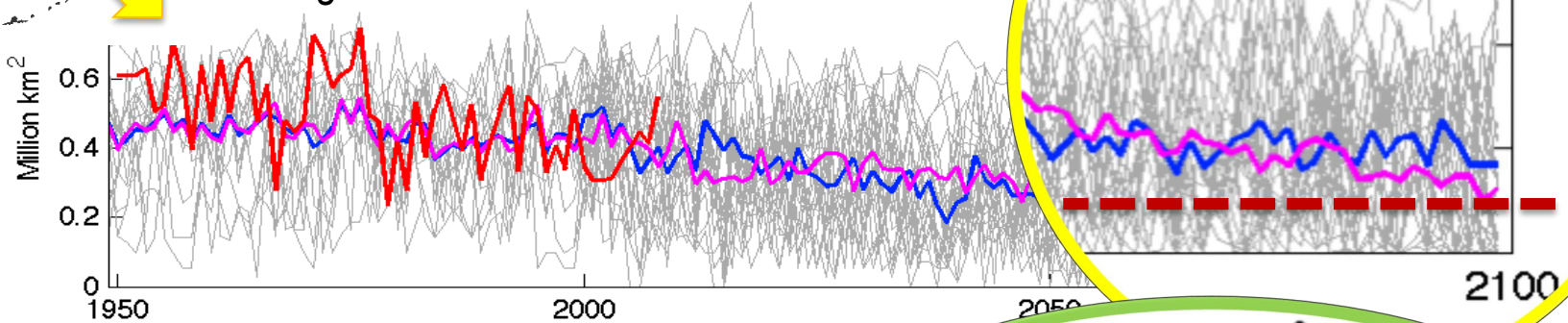
Spatial seasonal utilization distributions for bearded, spotted, and ringed seals obtained from satellite-telemetry of seal movements in the summer (top row) and winter (bottom row) seasons (Citta et al. 2018).

# Seals and changes in the annual extent of sea ice

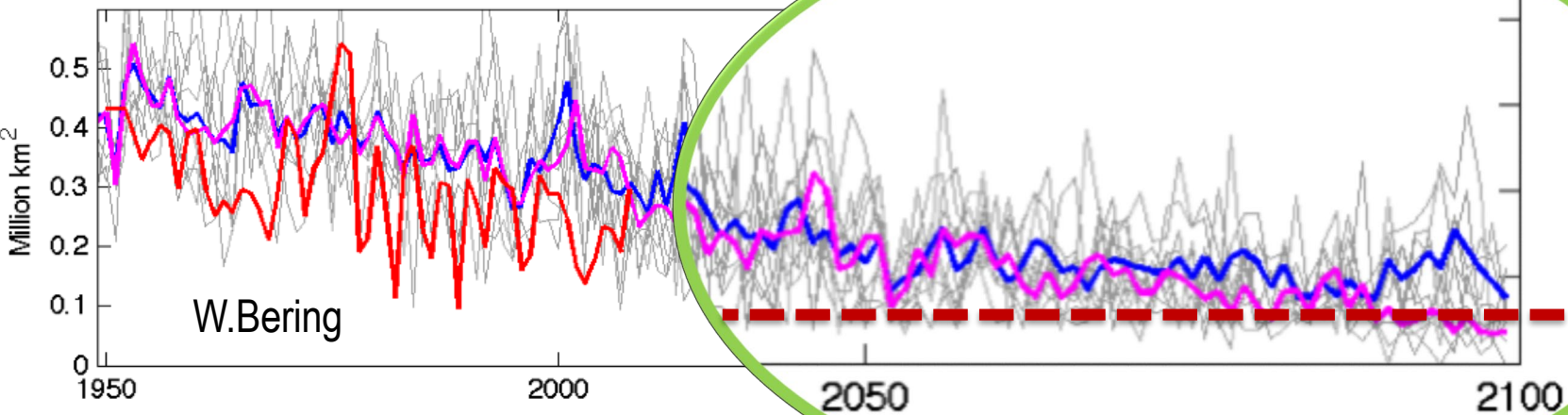


2018: an analogue for the future

E.Bering

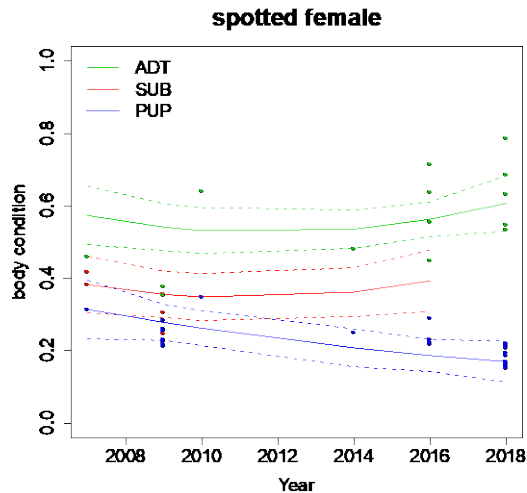
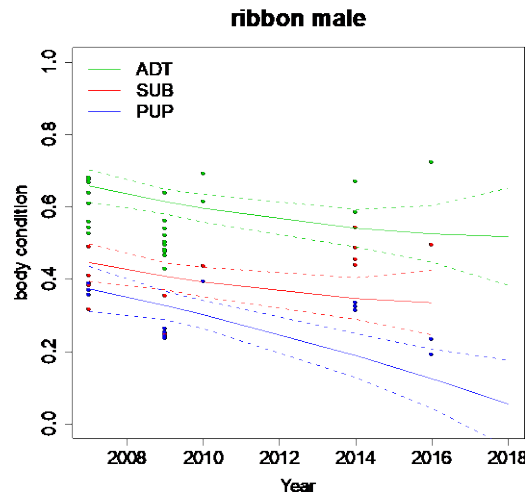
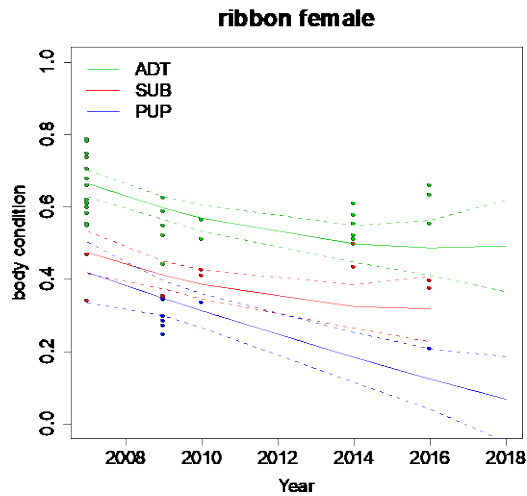


W.Bering



# The body condition of harbor, spotted and ringed seals

Boveng, P. L., *et al.* 2020. Body condition of phocid seals during a period of rapid environmental change in the Bering Sea and Aleutian Islands. Deep Sea Research Part II: <https://doi.org/10.1016/j.dsr2.2020.104904>

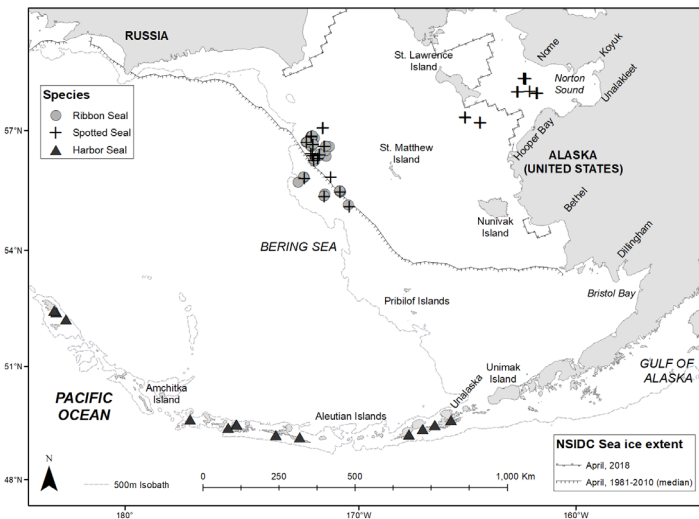


## Bering Sea: 2007-2018

- Ribbon seals (n=98)
- + Spotted seals (n=94)

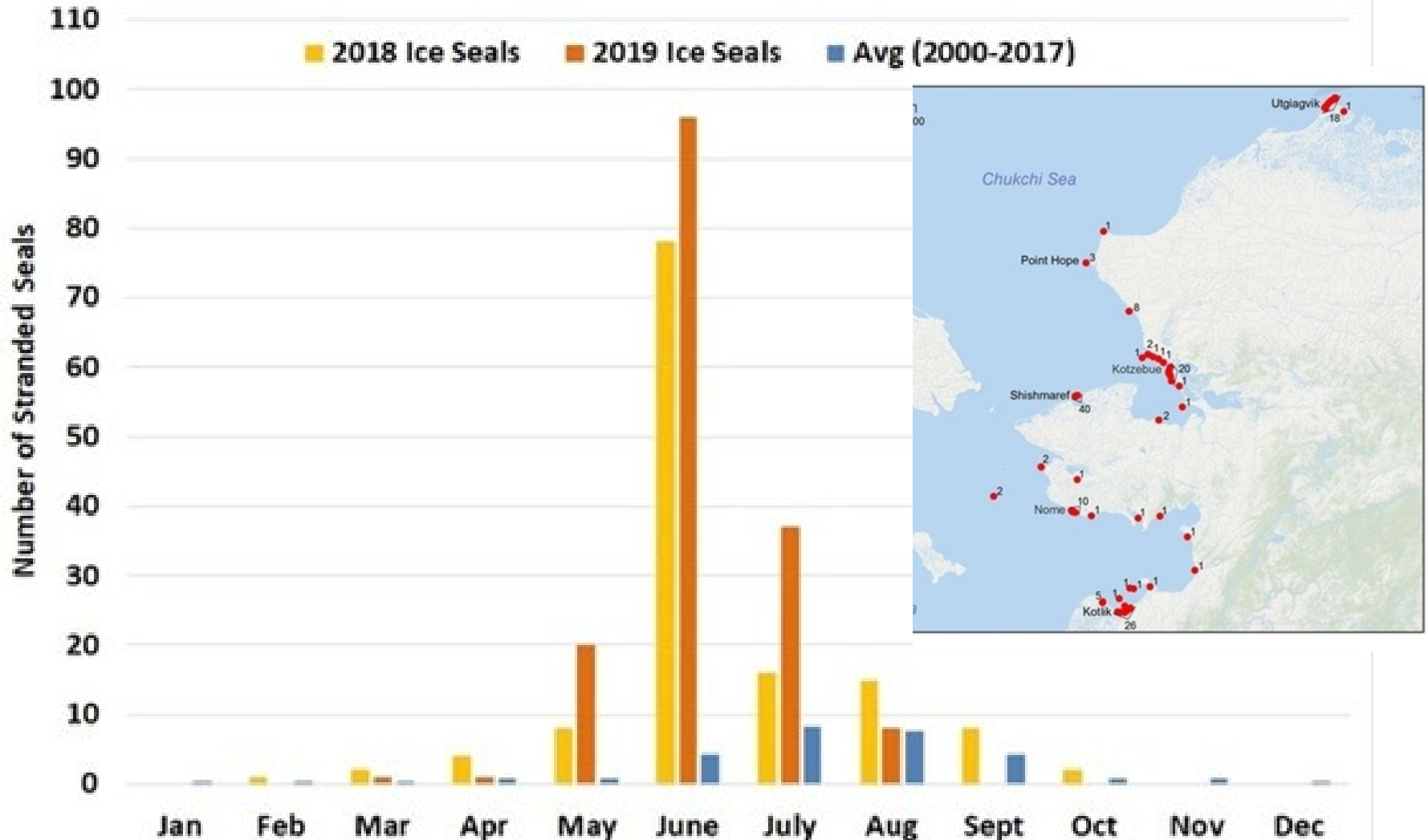
## Aleutian Islands: 2014-2016

- ▲ Harbor seals (n=80)

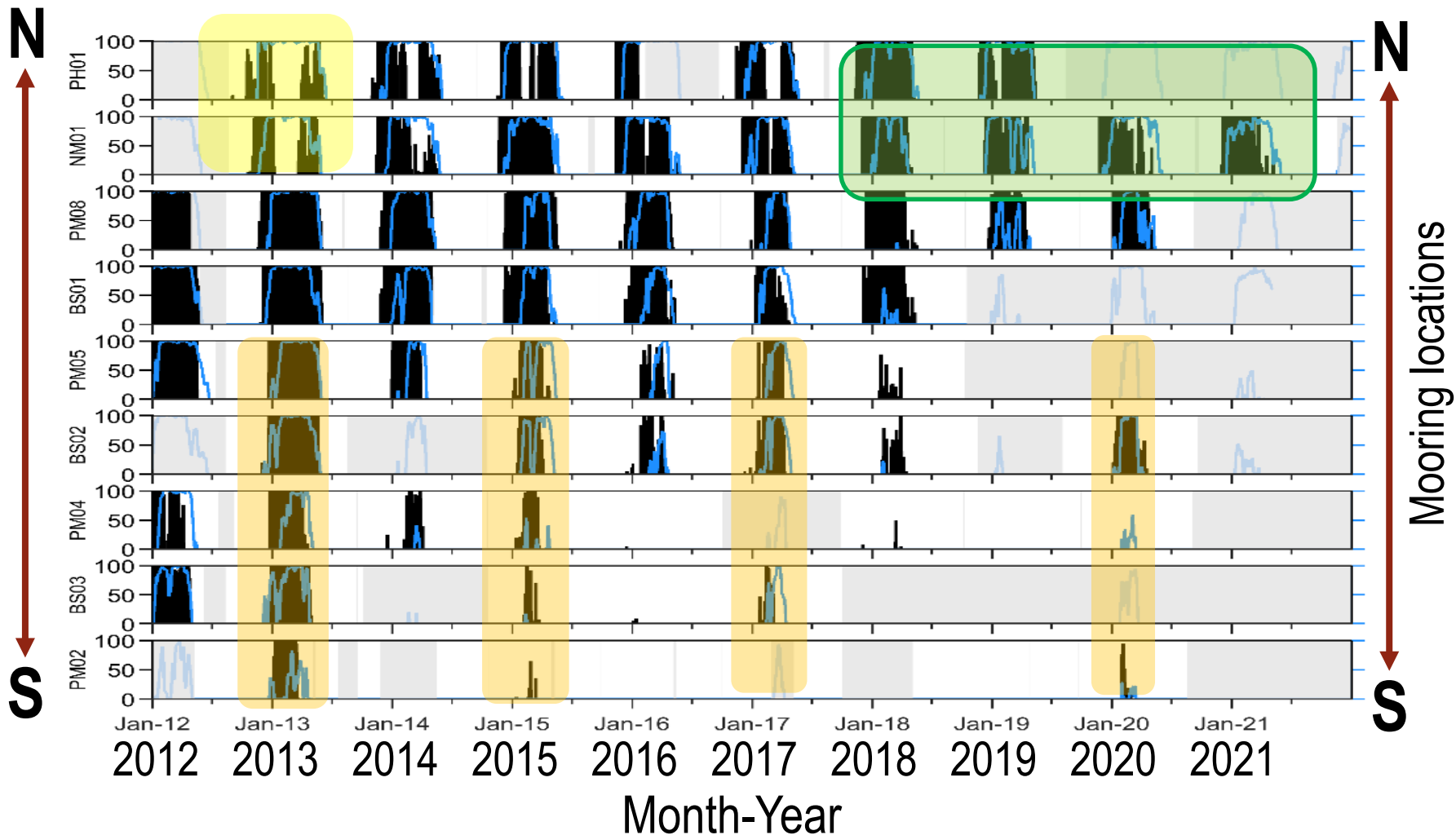


# Unusual Mortality Events (UME) of seals in Alaska

## 2018-2020 Ice seal strandings by month



# Bowhead whale distribution



# Overview: Status of information on pinnipeds and cetaceans in the northern Bering Sea and Chukchi Sea

	Number of stocks	Number of ESA-listed stocks	Number of stocks with no reliable abundance estimate	Number of stocks with no trend in abundance	Number of stocks important for subsistence
Pinnipeds	5	4	0	4	5
Cetaceans	15	5	9	14	4
TOTAL	20	9	9	18	9

Limited data are available to support management decisions about mitigating potential impacts – or confirming lack of impacts – of anthropogenic activities on ESA-listed species and species important to subsistence hunters in the northern Bering Sea and southern Chukchi Sea