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Ice seals in Alaska: Effects of climate change on their sea ice habitat



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“Ice seals” in Alaska

Pan-Arctic



Ringed

P. A. Folkens



Bearded

P. A. Folkens

Pacific



Ribbon

P. A. Folkens



Spotted

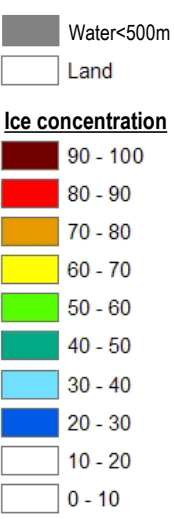
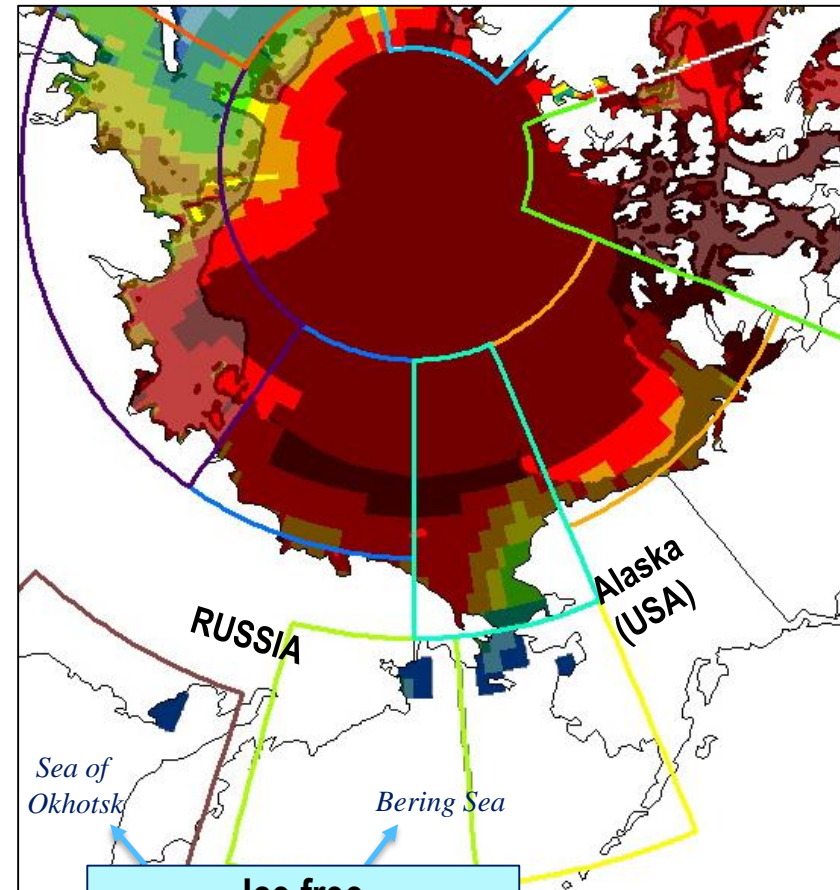
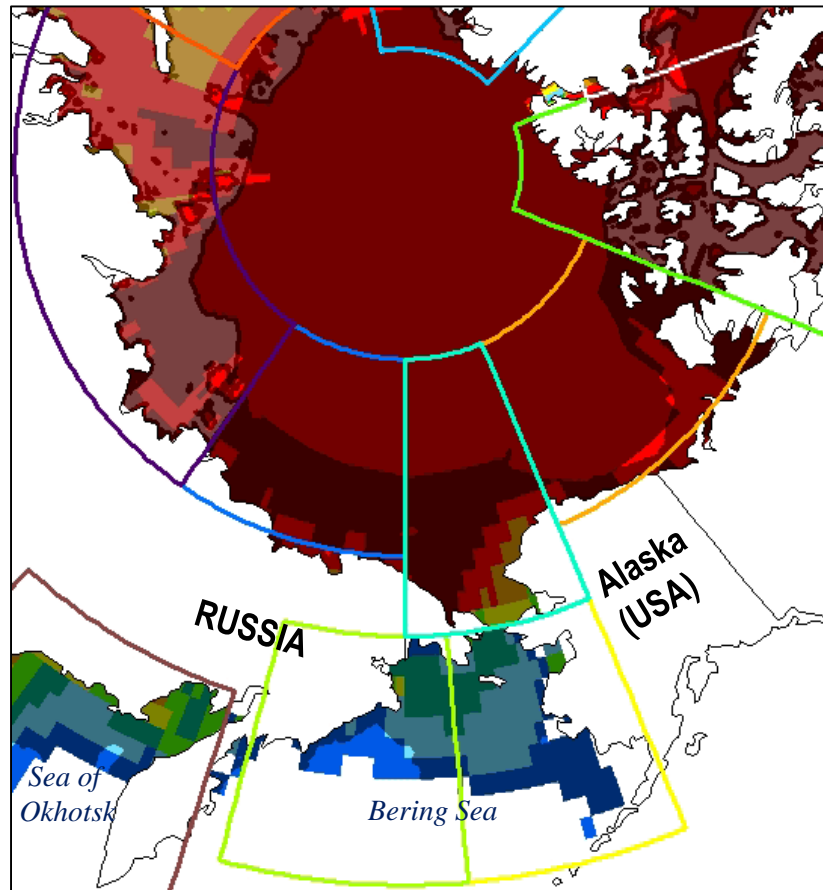
P. A. Folkens

Dramatic changes for Arctic sea ice (extent)

Decadal mean sea ice concentrations for May

2010-2019

2090-2099



Dramatic changes for Arctic sea ice (age)

Changes in sea ice quality

Since the late 1970s, Arctic sea ice area and thickness have decreased [by 1/2 - 2/3].

Sea ice becoming younger, thinner and more dynamic.

(IPCC 2021).

Older (multiyear) sea ice is thicker, more stable and more likely to create the ridging that can provide windbreaks and facilitate the accumulation of snow for subnivean lairs.

No multiyear ice by 2100



Important factors

- Season
- Location
- Quality

2 April, 2018



What will happen to ice seals as sea ice declines?

Three key questions for assessing risk to seals

- When, where and how does the species use sea ice?
- What are the predictions for future habitat (ice and snow) conditions?
- What traits will help (or hinder) each species' resilience to change?



Ice-associated seals: Life history and sea ice

- **Sea ice is critical habitat for all ice seals, especially March to May**
Provides protection from predators: - *Reduced survival?*
 - Serves as a stable platform for:
 - Pupping: - *Poor pup production?*
 - Nursing: - *Poor pup survival?*
 - Molting: - *Increased parasites and disease?*
 - Resting: - *Reduced body condition?*



Bearded Seal





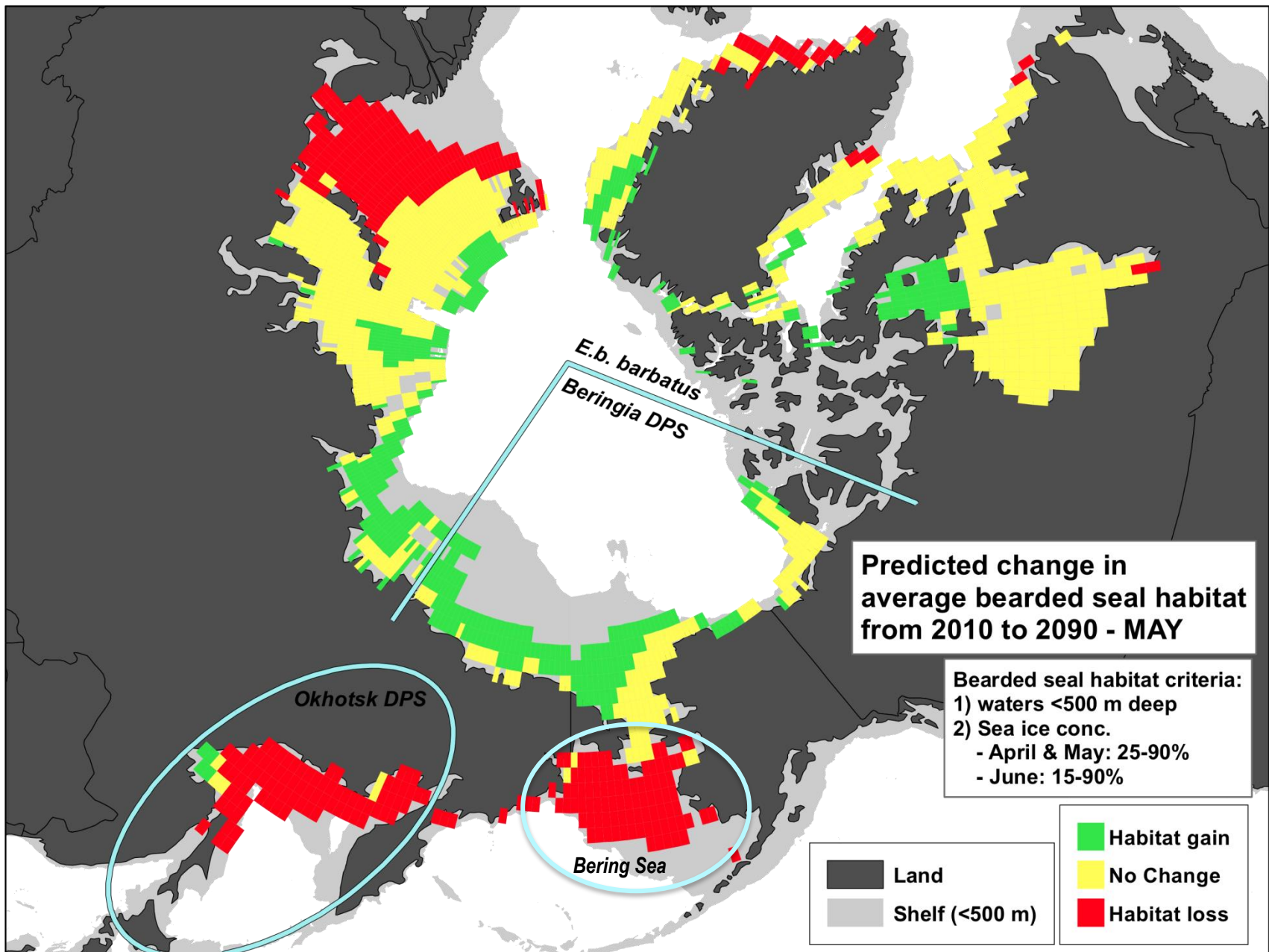
Basic Habitat Requirements:

- Shallow water (<500 m deep)
- Sea ice (<90% concentration) in April and May



Bearded Seal







Basic Habitat Requirements:

- Sea ice: April through early-June
- Sufficient snow for lairs

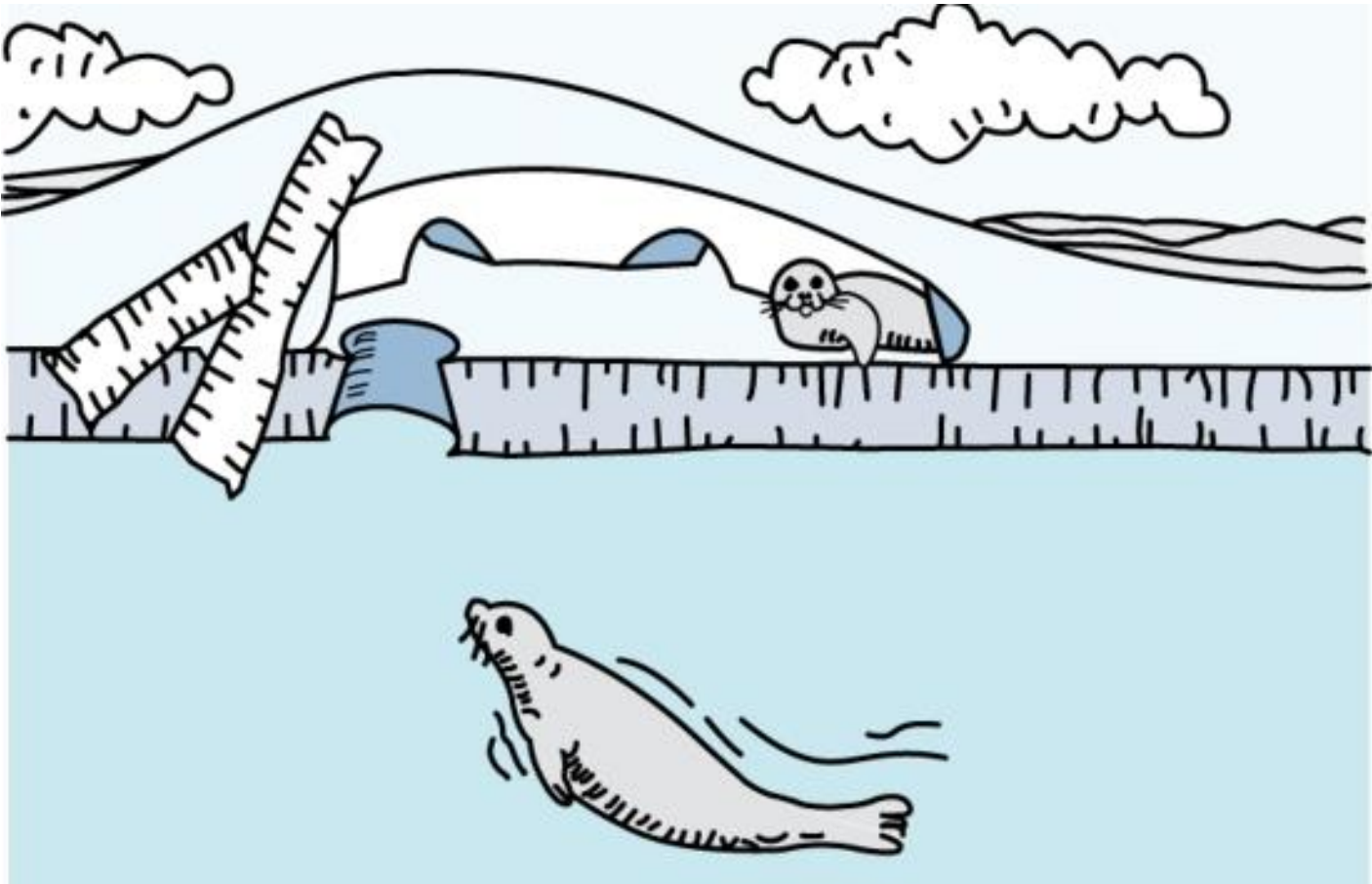


Ringed Seal



Ringed seals need sea ice...and snow

Snow lairs provide protection from freezing...



Robert Barnes, UNEP/GRID-Arendal, based on Gjertz, I. and Lydersen, C. (1983). Pupping in ringed seals in Svalbard. Fauna, 36, 65-66



...and from this.



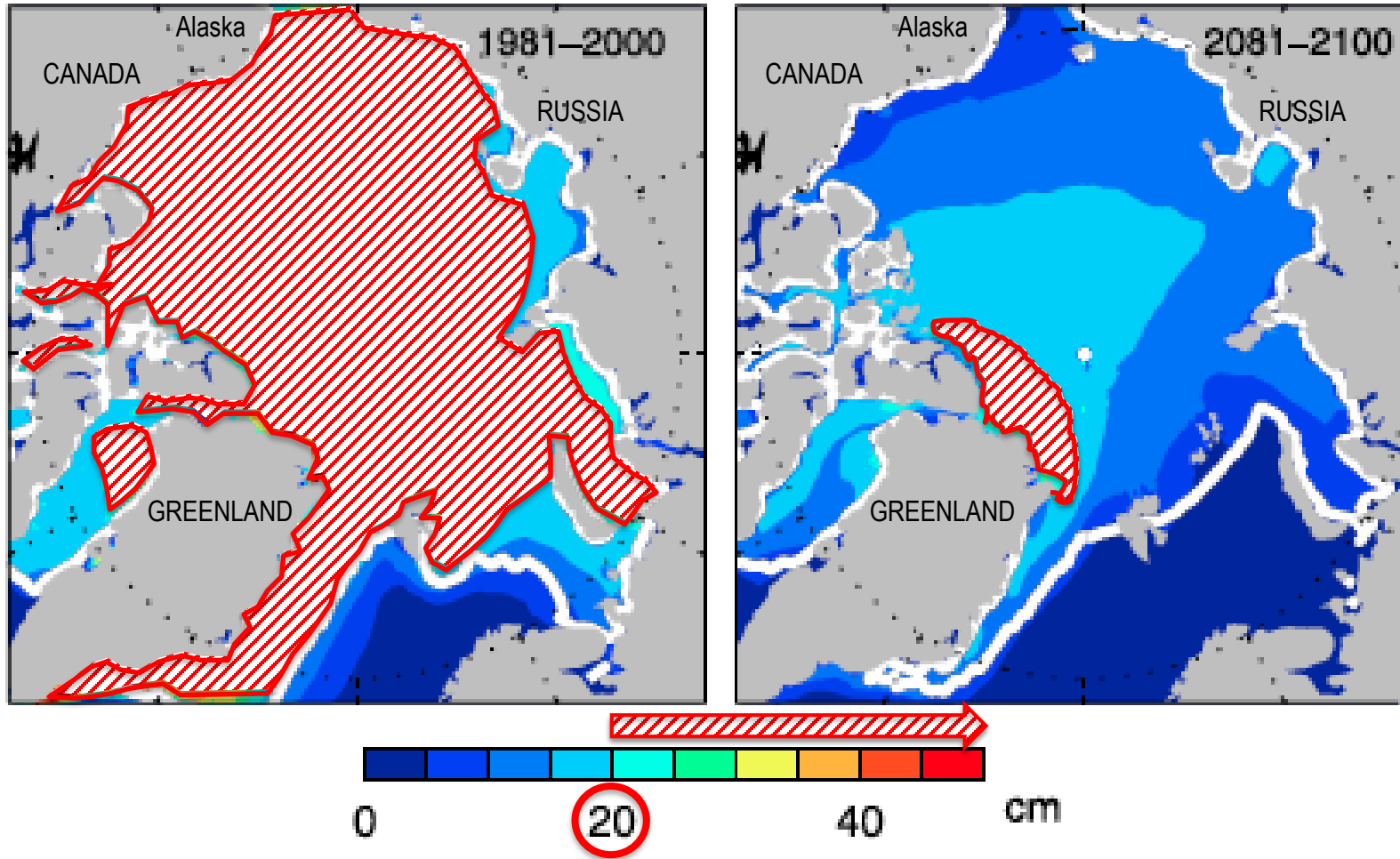
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Distribution of Snow Depths, RCP 8.5



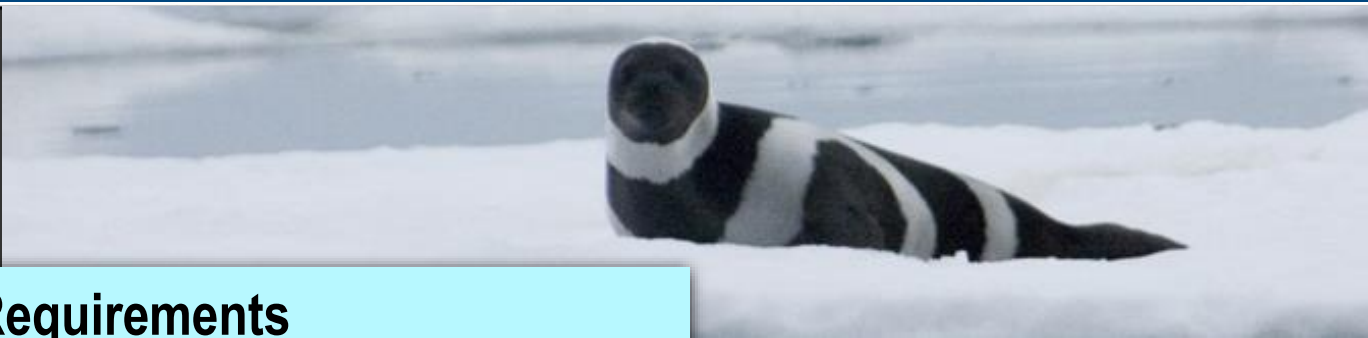
Hezel, P. J., X. Zhang, C. M. Bitz, B. P. Kelly, and F. Massonnet. 2012. Projected decline in spring snow depth on Arctic sea ice caused by progressively later autumn open ocean freeze-up this century. *Geophysical Research Letters* 39:L17505.



Ribbon Seal Distribution

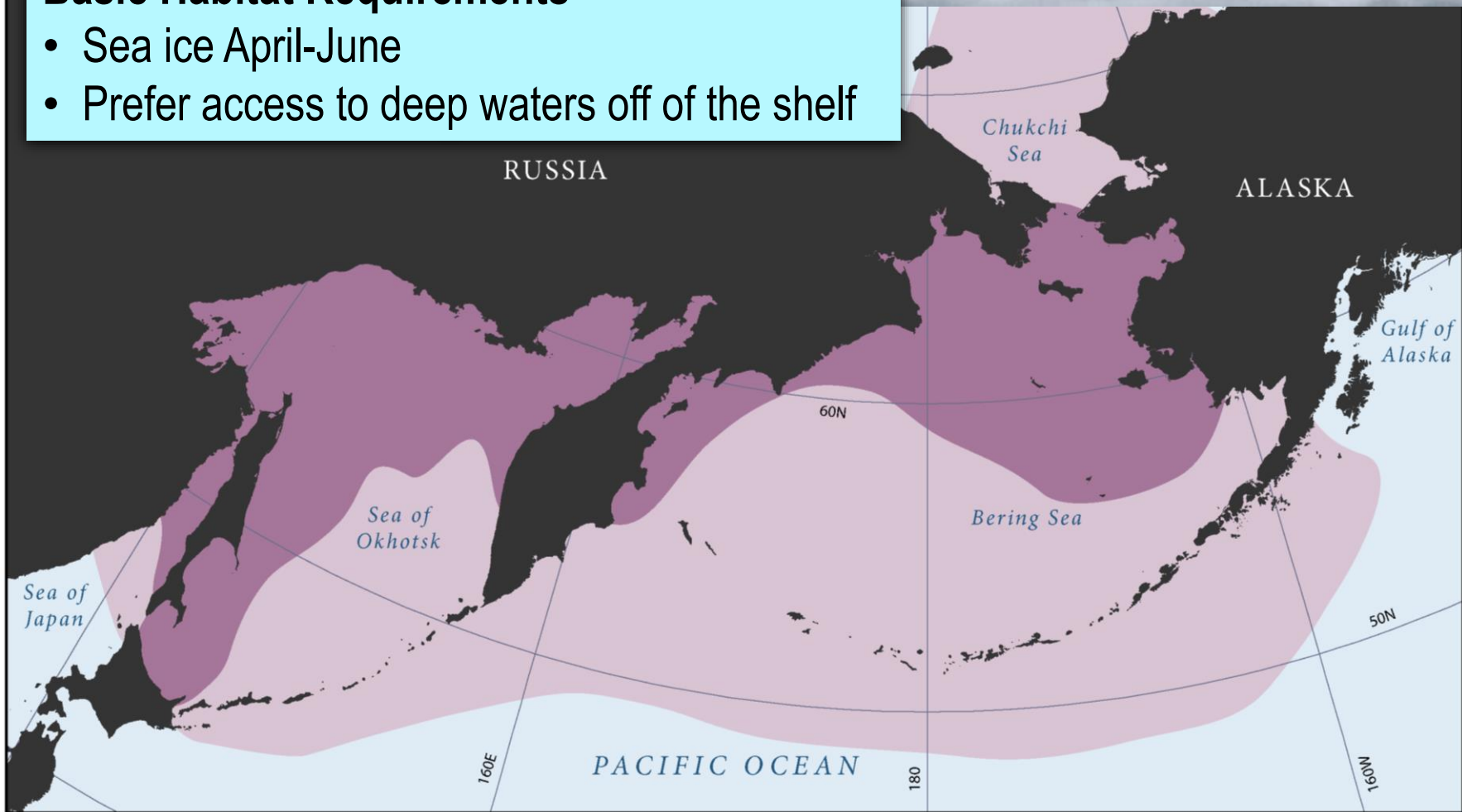
- Known Extent
- Pupping, Breeding and Molting

0 200 400 800 km



Basic Habitat Requirements

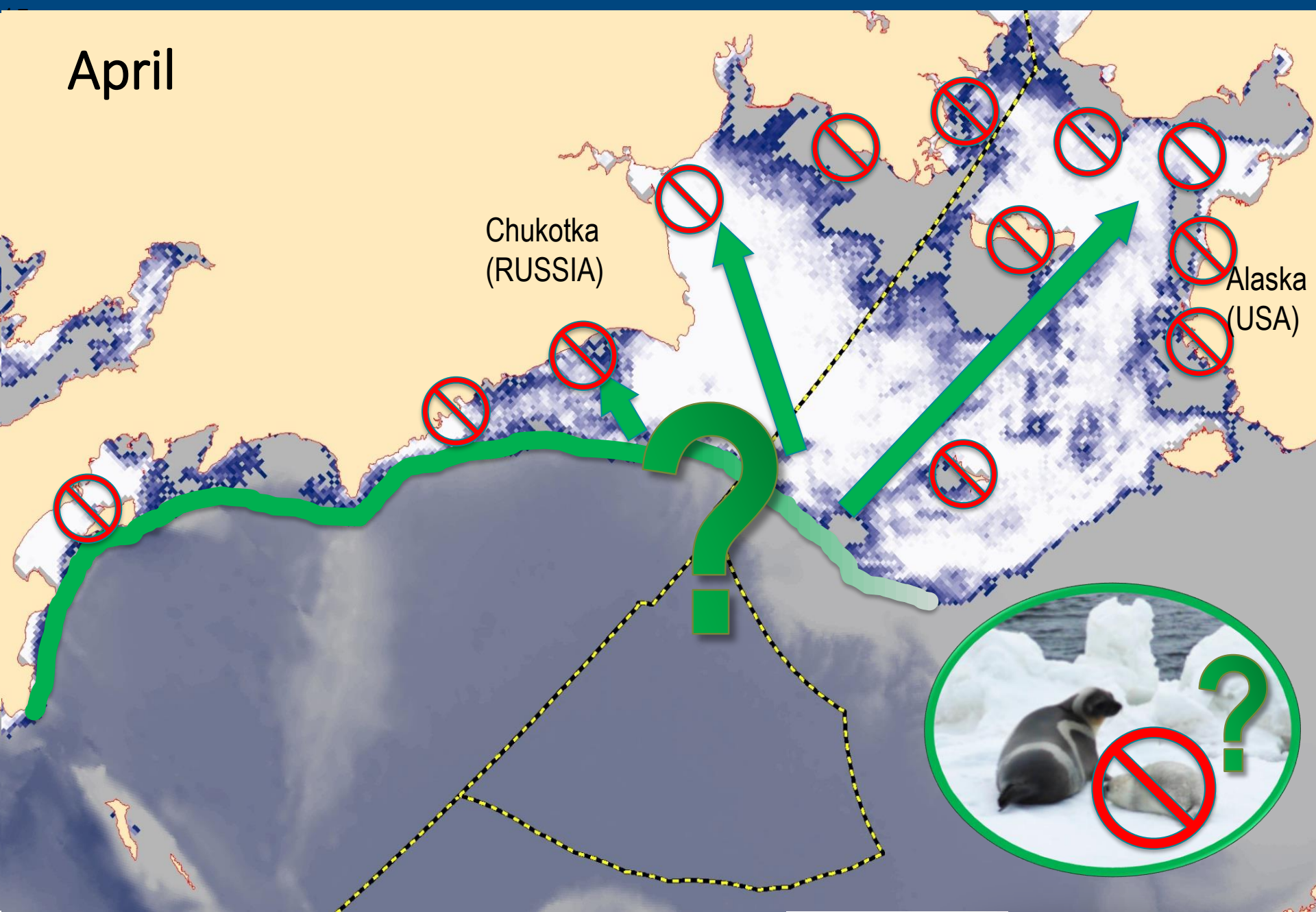
- Sea ice April-June
- Prefer access to deep waters off of the shelf



Ribbon seal



April



Basic Habitat Requirements

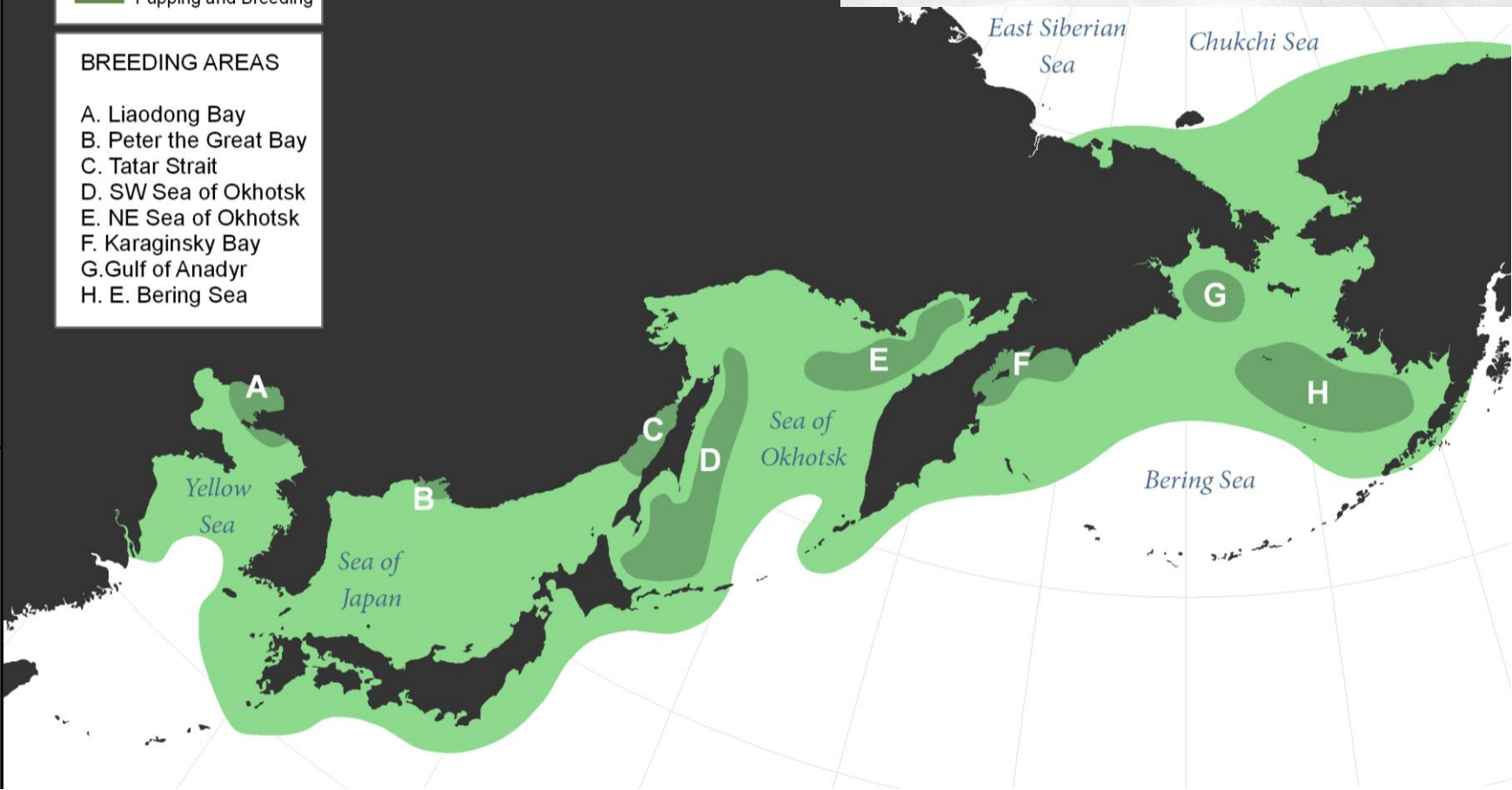
- Sea ice April-June
- Observed to haul out on land to pup and nurse



Spotted Seal Distribution

- Known Extent
- Pupping and Breeding

- BREEDING AREAS**
- A. Liaodong Bay
 - B. Peter the Great Bay
 - C. Tatar Strait
 - D. SW Sea of Okhotsk
 - E. NE Sea of Okhotsk
 - F. Karaginsky Bay
 - G. Gulf of Anadyr
 - H. E. Bering Sea



Spotted Seal



What are the impacts of reduced sea ice on ice seals?

direct



P. A. Folkens

Ringed

Habitat loss (sea ice and snow)



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Bearded

Habitat loss (southern extent of sea ice)



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Ribbon

Habitat loss

Unsure of response, but least likely to adapt to land



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Spotted

Habitat loss

But most likely to adapt to land

What are the impacts of reduced sea ice on ice seals?

Natural

indirect

- Increased incidence of diseases, parasites, contaminants/toxins
 - *One of the largest and most toxic Harmful Algal Blooms (“red tide”) ever recorded anywhere, was in the Bering and Chukchi in 2022. (Anderson et al. 2022)*
- Increased predation (foxes, wolves) if seals are forced to haul out on land
- ‘Bottom-up’ ecosystem effects from warming waters (e.g., changes to prey survival and distribution) could result in reduced seal body condition
 - *The body conditions of harbor and spotted seal pups (and all ages of ribbon seals) declined between 2007-2018 in the Bering Sea. (Boveng et al. 2020)*



Unusual Mortality Events (UME)

- **2011–2016: UME Symptoms**

- Hair loss, lethargic, lesions, poor body condition - *Unknown cause*



- **2018-2022: UME Symptoms**

- 5-7x the average numbers of strandings from previous years
- Mostly young and emaciated - *poor nutrition; bottom-up*
- Likely linked to 2018-19 marine heatwave –*as in piscivorous seabirds*



What are the impacts of reduced sea ice on ice seals?

indirect

Human factors

- Increased shipping / oil & gas activities
 - Increased potential for contact



- II



- Bycatch



Thank you



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