

USFWS B Report NPFMC April 5, 2017

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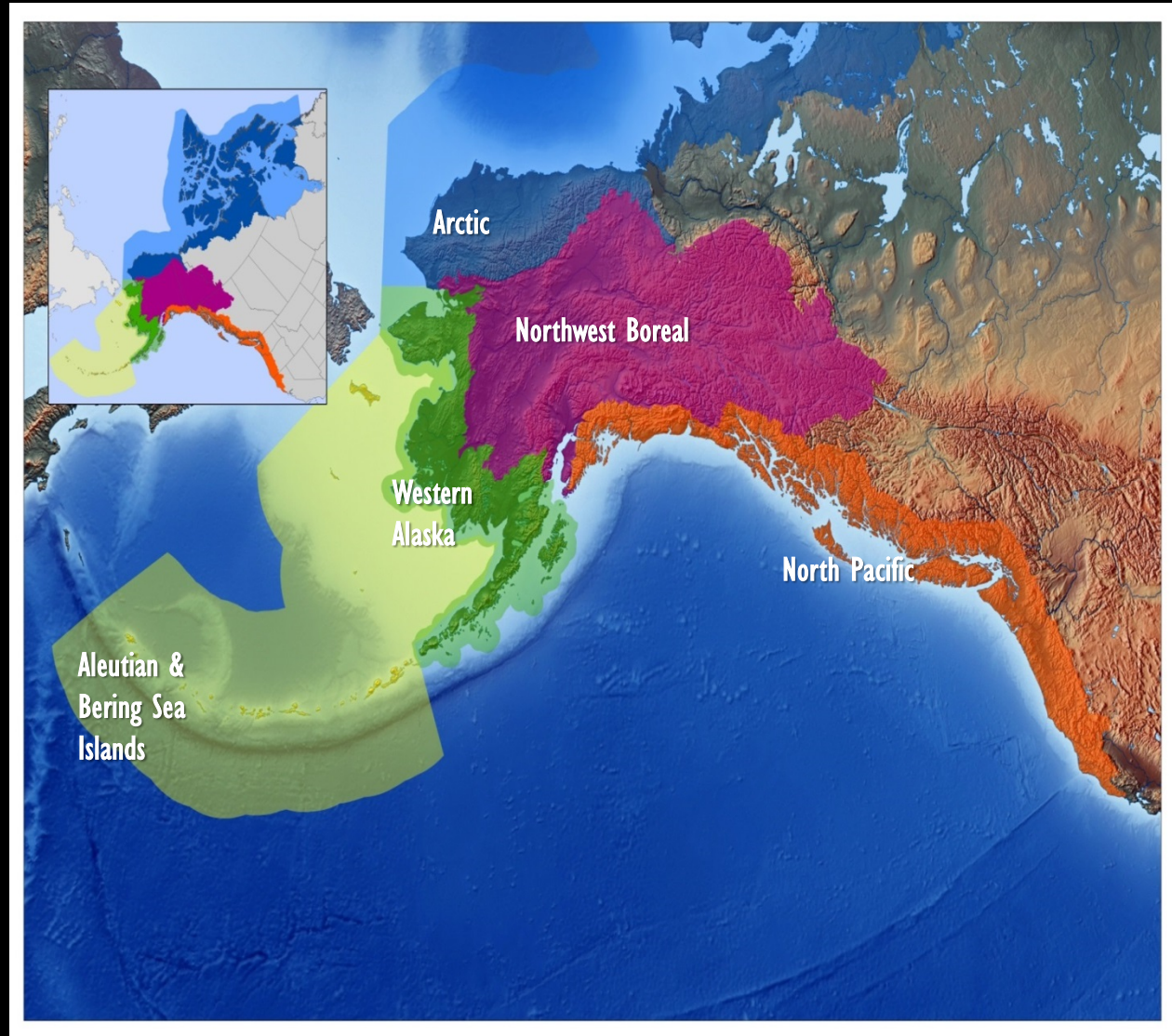
Landscape Conservation Cooperatives “LCCs”

Public-private partnerships focused on conservation.

Tackling BIG issues like climate change that are too large for any entity to handle alone.

Largely funded by the U.S. Fish and Wildlife Service.

In Alaska—over 130 partnering organizations including agencies, tribes, NGOs, and universities.



Assessing the Risk of Marine Invasive Species in the Bering Sea



The Bering Sea



"Botrylloides violaceus" credit: Dann Blackwood (USGS)



"Carcinus maenas" Credit: © Hans Hillewaert



"Didemnum vexillum" credit: Dann Blackwood (USGS)

J. Reimer, A. Droghini, A. Fischbach, A. Poe, B. Bernard, J. Watson, A. Haynie

Quantitative Ranking System

- Thematic ranking:
 - Distribution and Usable Habitat
 - Anthropogenic Influence
 - Biological Characteristics
 - Ecological and Socioeconomic impacts
- 160 potential species with 53 ranked
- External Expert Review

33.2



77.8

55.21 ± 9.9 SD

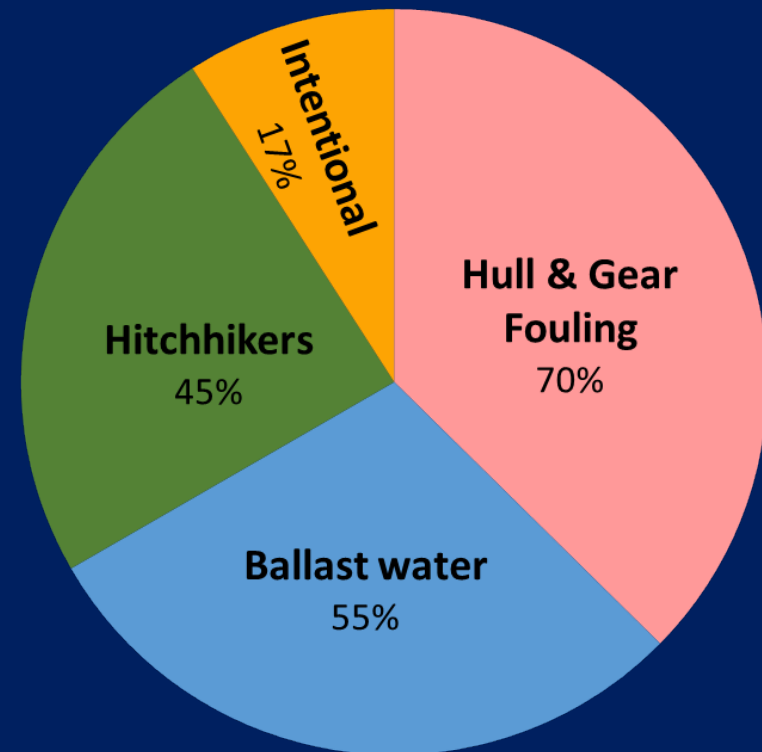
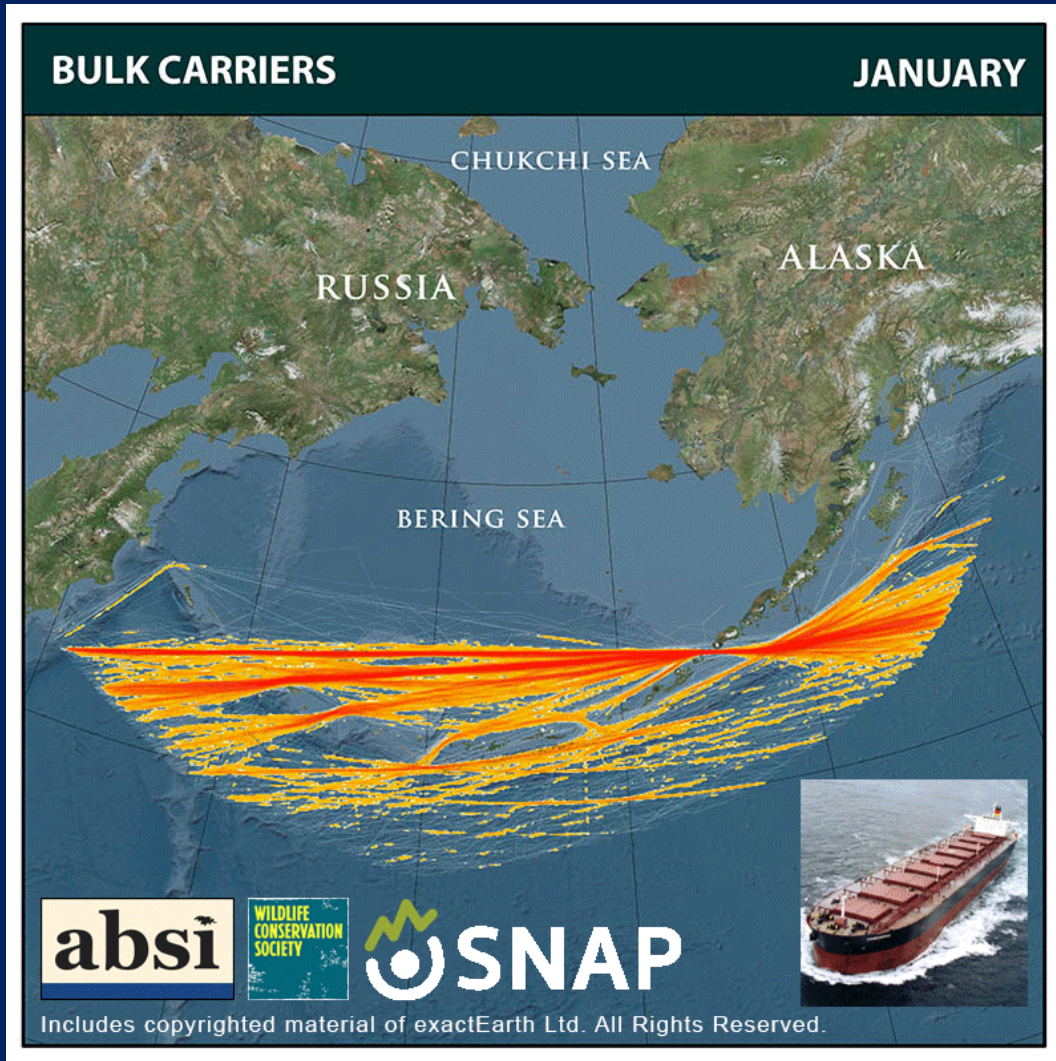


Pseudodiaptomus inopinus
Copepod spp.



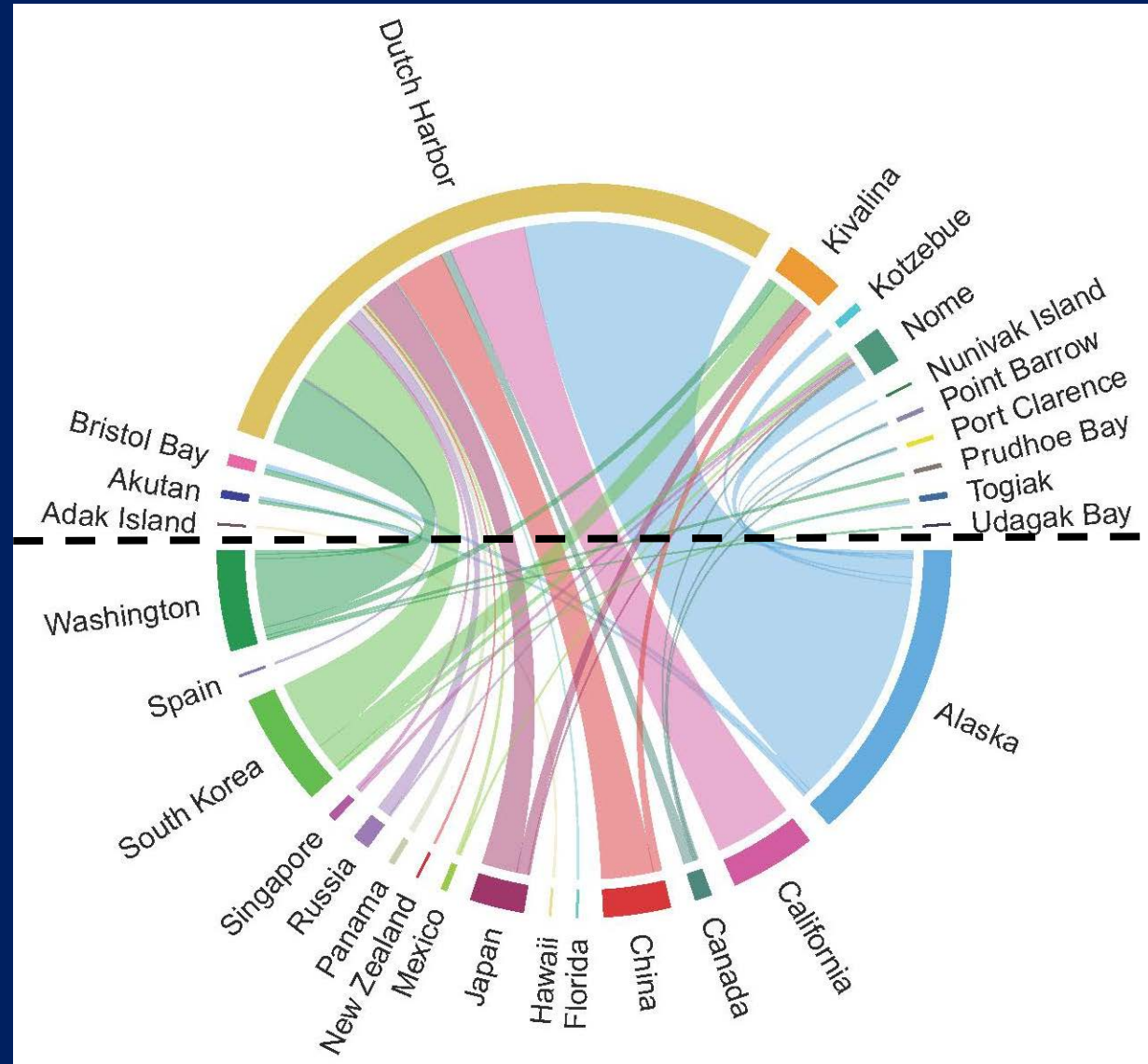
Carcinus maenas
Green crab

How will they get to the Bering?

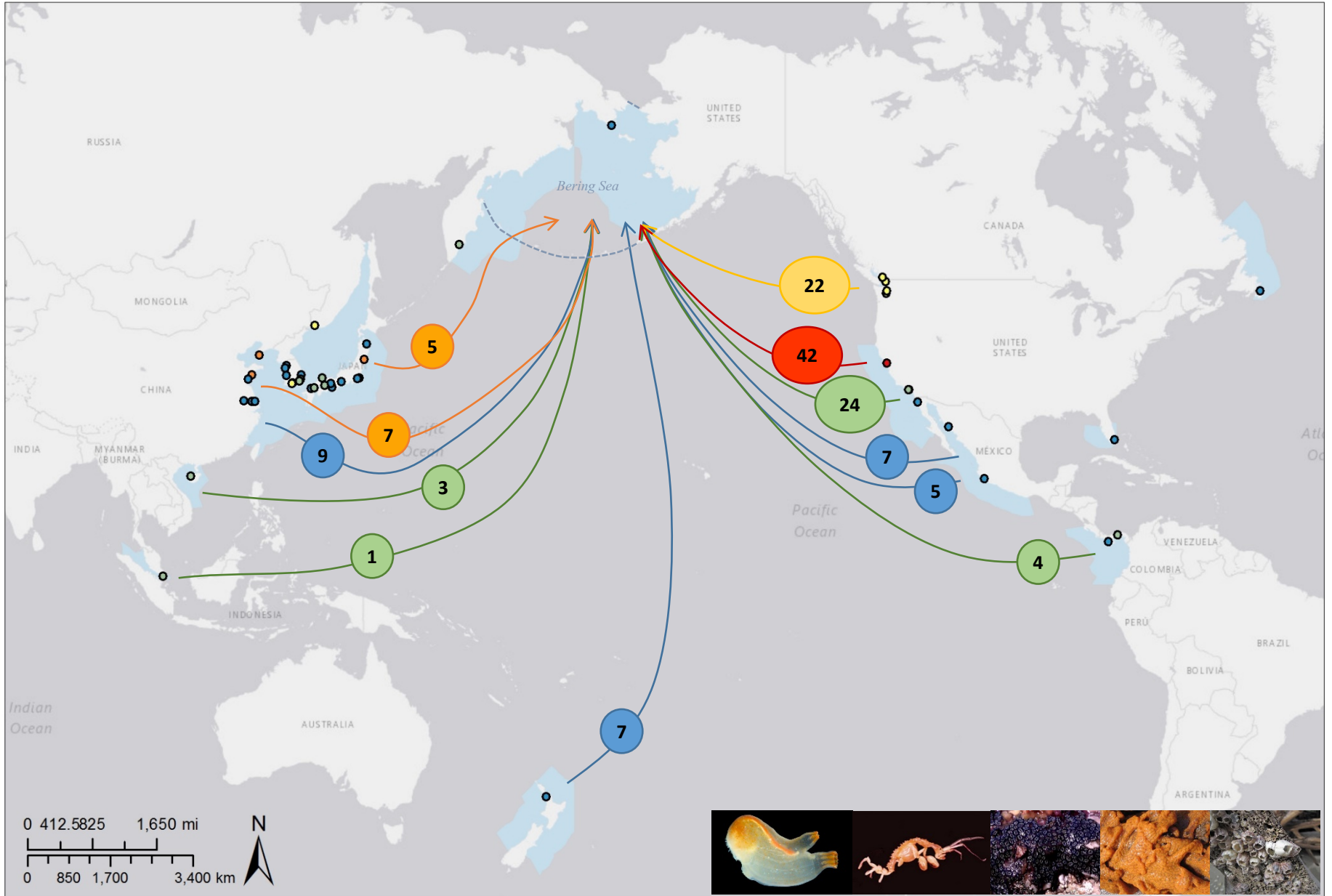


How will they get here: A Network Analysis

- Ballast water database for other vessel types
- VMS data (in port)
- Other traffic



Potential Port Invaders

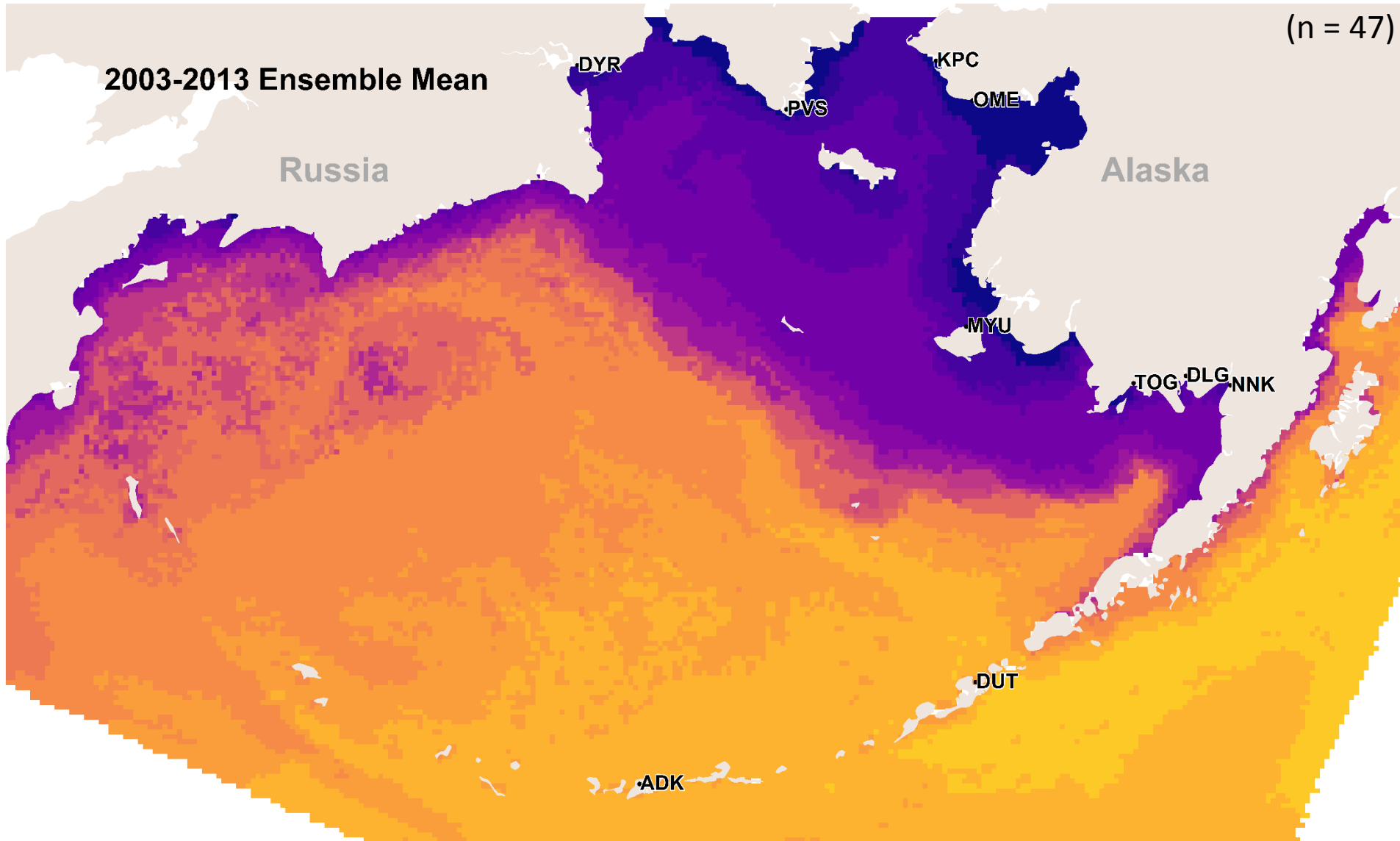


Species survival

Year round

0 spp.

34 spp.



Species survival

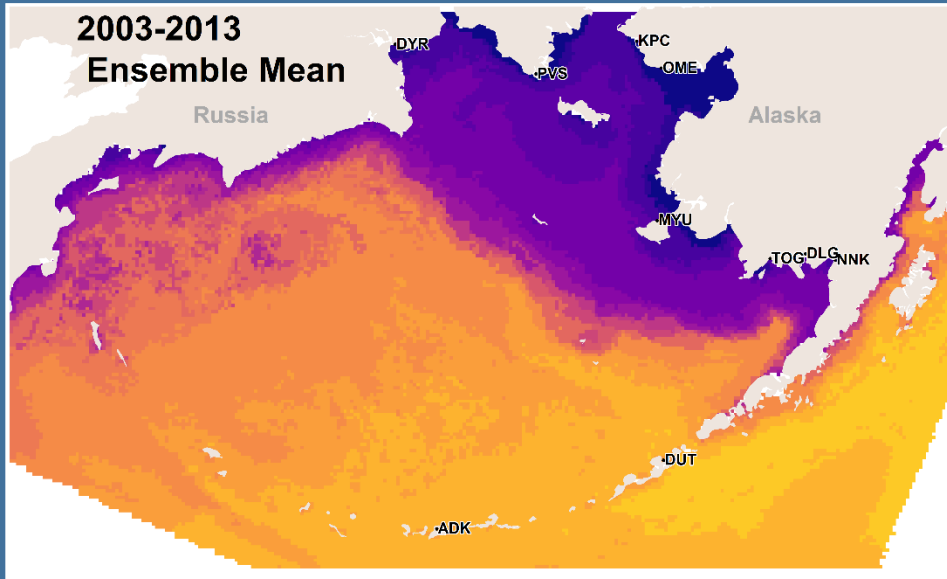
Year round

0 spp.

34 spp.

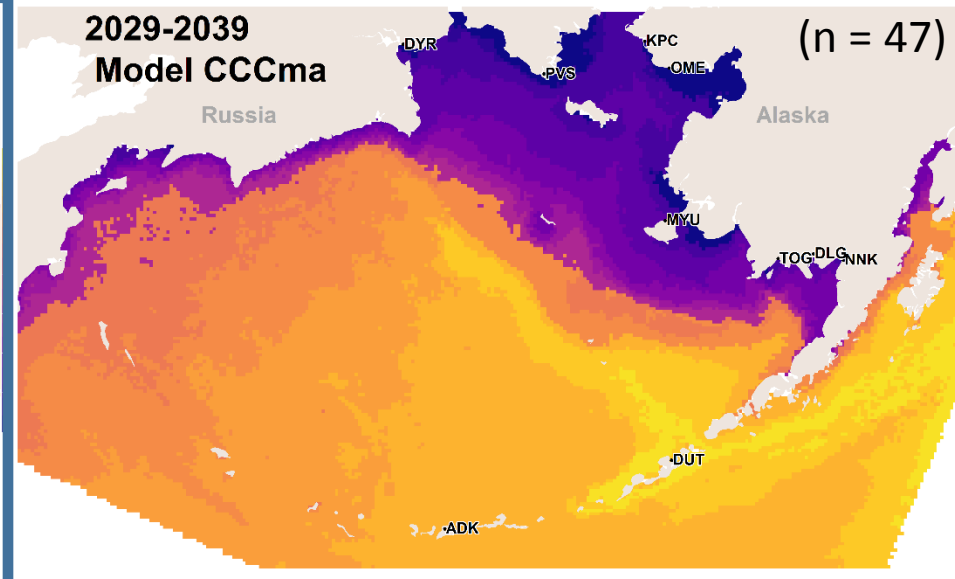


2003-2013
Ensemble Mean

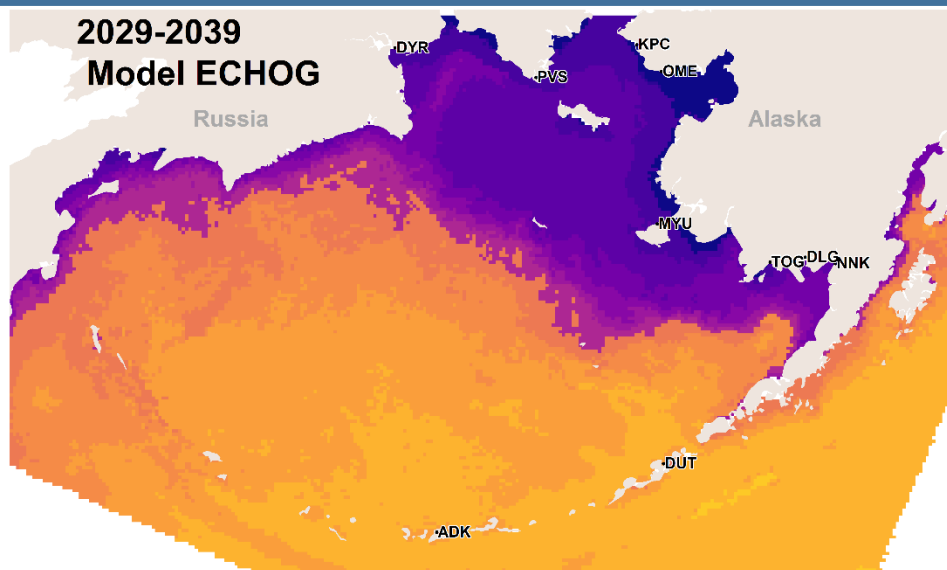


2029-2039
Model CCCma

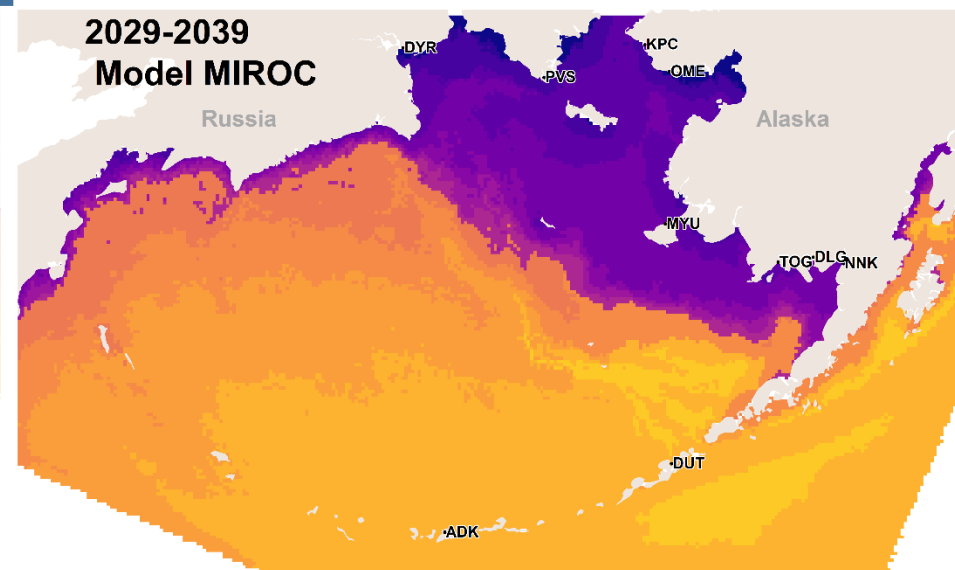
(n = 47)



2029-2039
Model ECHOG



2029-2039
Model MIROC



Next Steps and Opportunities...

- Planned outreach activities for communities & maritime industry
 - Camp Qungaayux (Unalaska)
 - Bering Sea Days (St. Paul)
 - Marine Expo in Seattle
- Tools to inform early detection & monitoring in the Bering (*who, where & when* for potential invaders)
- Possible further research...
 - Development of bio-economic models of impacts
 - Invasion models for ports

Promoting Coastal Resilience and Adaptation in Coastal Alaska



Karen Pletnikoff: Aleutian Pribilof Islands Association

Aaron Poe: Aleutian and Bering Sea Islands LCC

Karen Murphy & Leanna Heffner: Western Alaska LCC

Davin Holen: Alaska Sea Grant

Heather Stewart & Chris Beck: Agnew::Beck Consulting



Regional Coastal Resilience & Adaptation Workshops in 2016



- Bering Strait, Nome
- Aleutian/Pribilofs, Unalaska
- Bristol Bay, King Salmon
- Northwest Arctic, Kotzebue
- Southeast Alaska, Ketchikan (Alaska Sea Grant)

260 individuals, 52 tribes, 15 state & federal agencies

Getting Climate Change Information into the Hands of Decision-Makers

Project deliverables that **tell the story of what is happening in Alaska** and **provide information and resources** needed to tackle these issues.

What's Changing & What We Can Do About It

Two 'Toolboxes' with 200 co-authors:

1) Summary of the nature and severity of coastal climate change, including what to expect in the future

2) Case studies of Alaskan coastal communities and resource managers that are responding to climate change



The Ocean is Our Grocery Store & it's Changing in Ways We've Never Seen

The Bering Sea/Bering Strait and Chukchi Sea form one of the richest, most pristine and biologically productive ocean systems on the planet. The same unique characteristics that support this area's productivity - particularly the annual variations in sea ice - make this region especially vulnerable to the impacts of climate change.



Changing Sea Ice/Changing Ecosystems:
"We're seeing changing boundary lines; humpbacks, sea lions, other species are moving north" (Kotzebue).

"Currents push super rich deep sea water up onto the Bering Sea shelf; it's amazingly productive & the reason 30,000 people live in the region."
(King Salmon)



How is Climate Changing Impacting Marine Ecosystems? And How Might We Respond? Three Examples:

NEW PATHS FOR WHALES & MARINE SHIPPING?

CHANGE DRIVERS: Reduced sea ice opens the arctic to new vessel traffic, posing risks of oil spills and disturbance of species and subsistence hunting.



CHALLENGES & EMERGING STRATEGIES: Climate change is altering whale migration timing and pushing migration routes farther from shore, disrupting vital subsistence traditions and forcing hunters to travel farther into hazardous seas. Growing vessel traffic requires establishing rules for shipping routes and vessel noise, and creating capacity for local oil spill response.

WALRUS, EIDERS & MELTING SEA ICE

CHANGE DRIVERS: Algae grows on the underside of sea ice. When the ice melts the algae falls and feeds marine food chains. Less sea ice means fewer ocean nutrients, and a cascading decline in benthic (ocean bottom) creatures, including things we like to eat, like crab, halibut and walrus, and the creatures they eat.



CHALLENGES & EMERGING STRATEGIES: Arctic wildlife and people have evolved sophisticated ways of living based on sea ice. Lose the ice, and lose the platform that walrus, seals, eiders and people use to hunt for food, rest and raise young, and sustain cultural traditions. Emerging response strategies include managing newly established onshore walrus haulouts and tools so hunters have real time information on shifting sea ice.

SALMON, COD, POLLOCK IN A CHANGING OCEAN

CHANGE DRIVER: The health of Bering Sea salmon, cod and pollock stocks rests on a complex web of nearly invisible creatures, from algae to zooplankton. The building blocks of this rich system are being fundamentally altered by warming waters and ocean acidification. Impacts include shifting fish locations, growing risks of harmful algal blooms, and less nutritious zooplankton - a key food source for the whole ecosystem.



CHALLENGES & EMERGING STRATEGIES: Warming waters coupled with ocean acidification will modify and likely decrease key fish species populations. These changes will ripple through local life, affecting everything from subsistence to jobs & government tax revenues. Needed responses include better environmental monitoring and a new generation of regulations dynamic enough to keep up with a changing climate.

Complex Ecosystem Building Blocks are Vulnerable to Climate Change

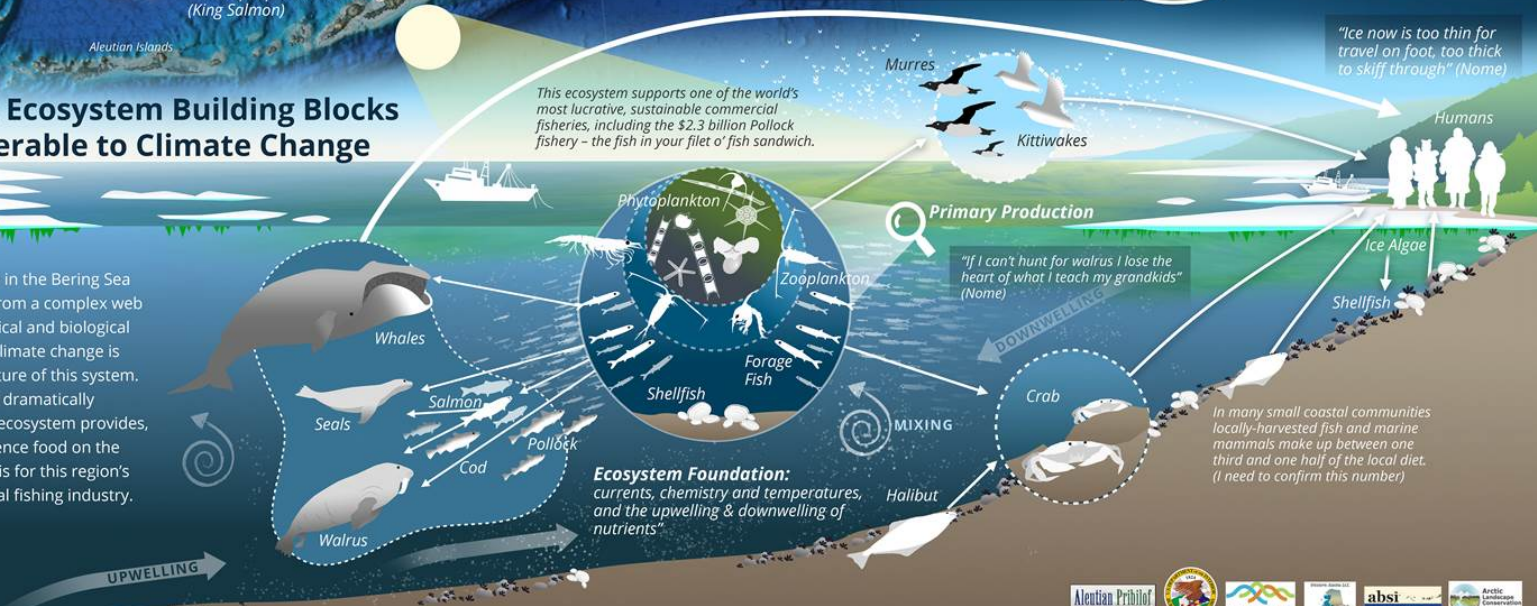
The abundant life in the Bering Sea region emerges from a complex web of physical, chemical and biological building blocks. Climate change is altering the structure of this system. This in turn could dramatically change what the ecosystem provides, including subsistence food on the table and the basis for this region's robust commercial fishing industry.

This ecosystem supports one of the world's most lucrative, sustainable commercial fisheries, including the \$2.3 billion Pollock fishery - the fish in your file o' fish sandwich.

"Ice now is too thin for travel on foot, too thick to skiff through" (Nome)

"If I can't hunt for walrus I lose the heart of what I teach my grandkids" (Nome)

In many small coastal communities locally-harvested fish and marine mammals make up between one third and one half of the local diet. (I need to confirm this number)



Ecosystem Foundation: currents, chemistry and temperatures, and the upwelling & downwelling of nutrients"



The Changing Climate of Southeast Alaska: Tribal led Monitoring, Mitigation and Adaptation Activities



Davin Holen

Assistant Professor

Coastal Community Resilience Specialist
Alaska Sea Grant Marine Advisory Program
College of Fisheries and Ocean Sciences
University of Alaska Fairbanks



Raymond Paddock
Environmental Program

Chris Whitehead
Sitka Tribe of Alaska



AOOS

Southeast Alaska Environmental
Conference





Southeast Alaska Climate Adaptation Workshop: A Component of the Southeast Environmental Conference

Goals:

1. Review current status of resources identified as culturally important. Also include human health.
2. Initiate monitoring and mitigation strategies.

- **Salmon**
- **Shellfish**
- Berries
- Yellow cedar
- Cultural sites
- Human health

Ketchikan

50 Tribal members from Southeast Alaska
30 presenters and other participants



Early Outcomes & Next Steps...

- ❖ Local Observer Network Coordination in Unalaska Including “Skipper Science” program pilot
- ❖ Tribal Climate Science Liaison
- ❖ A May work session for regional collaboration
- ❖ Adapt Alaska website in development

Opportunities for consideration...

- Communities want to work with industry and agencies to understand the distribution of key nursery habitats in nearshore areas.
- A 'new' research approach with communities engaged—from question development to data collection through to dissemination of results.
- Greater participation in the development of commercial harvest plans, policies, and regulations to ensure subsistence resources are not impacted.
- 60+ science and policy questions with marine connections...

Thank You

Ideas or questions? Contact us.

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