

Ecosystem Status Reports: October Council Meeting Preview



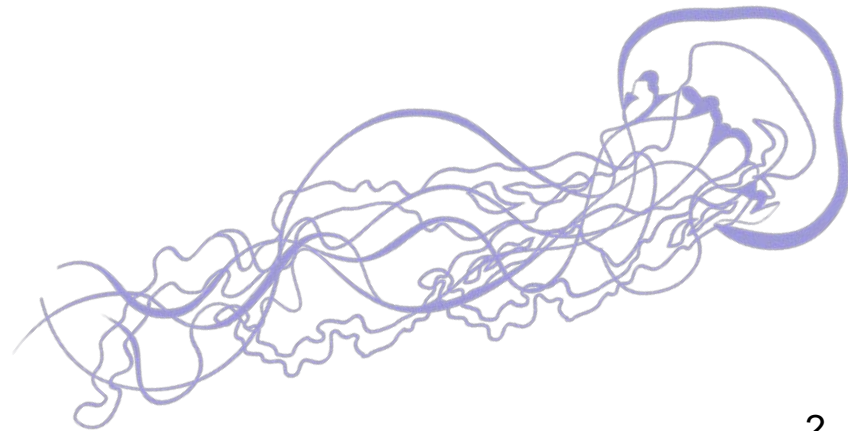
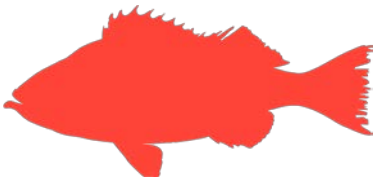
Bridget Ferriss
Elizabeth Siddon
Ivonne Ortiz
Stephani Zador
Kerim Aydin

NPFMC SSC
October 1, 2021



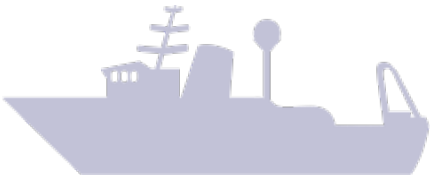
Objective:

- Highlight areas of concern, noteworthy topics, and developing narratives by region.



Continued COVID-related Data Loss to inform ESRs in 2021

- Limited (GOA, AI); Moderate (EBS)
 - Survey cancellations
 - Survey reductions (smaller footprints)
 - Lab processing delays due to limited building access over the past ~18 months
 - Data processing delays due to surveys logistics



Thank you to all contributors, including NOAA and external partners, who continue to inform our understanding of Alaska's ecosystems!

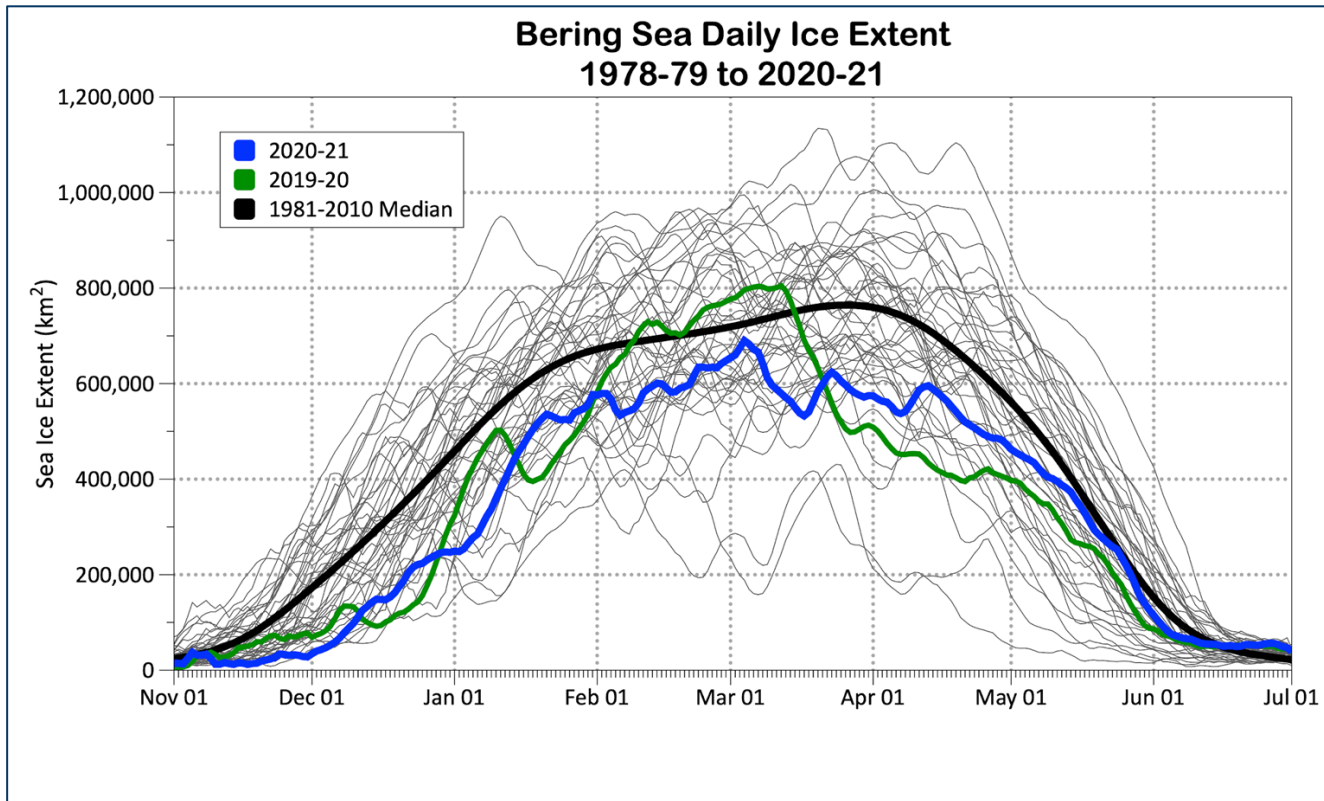
A map of the Eastern Bering Sea region, showing the coastline of Alaska and the surrounding waters. The map is overlaid with a grid of latitude and longitude lines. A semi-transparent white box is positioned over the upper right portion of the map, containing the title text.

Eastern Bering Sea Ecosystem Status Report Preview: 2.0



Bering Sea Ice Extent

Thoman

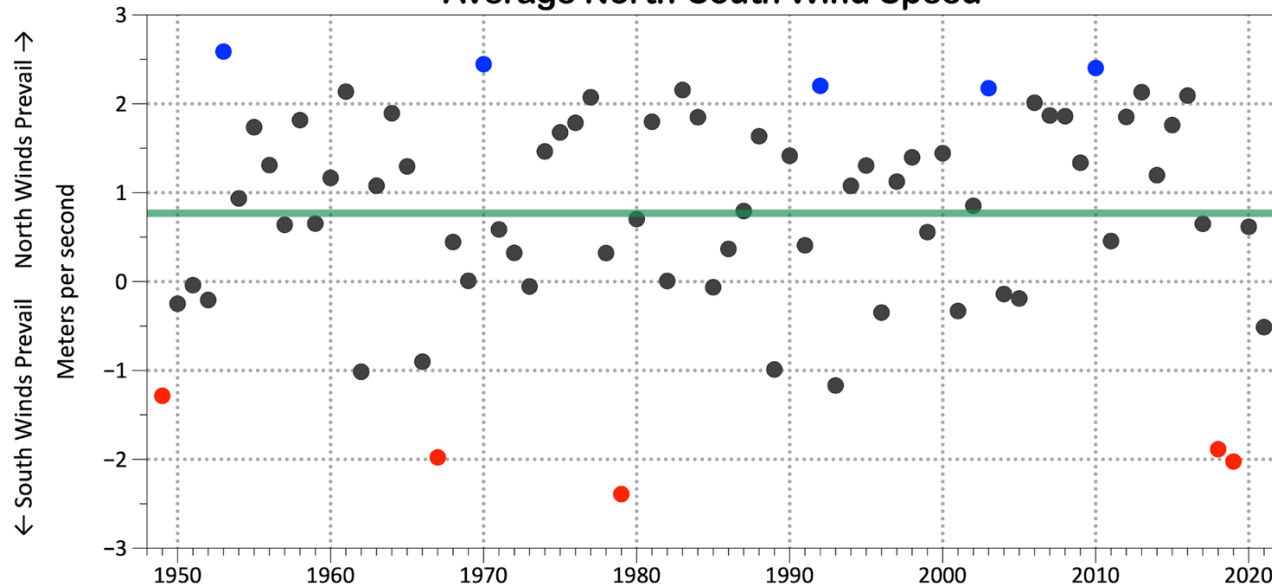


- Ice advance stalled at end of January.
- Ice was steady February through early April.
- Wind pattern in Jan-Mar resulted in decoupled ice dynamics between the NBS and SEBS.

Bering Sea Winds

Thoman

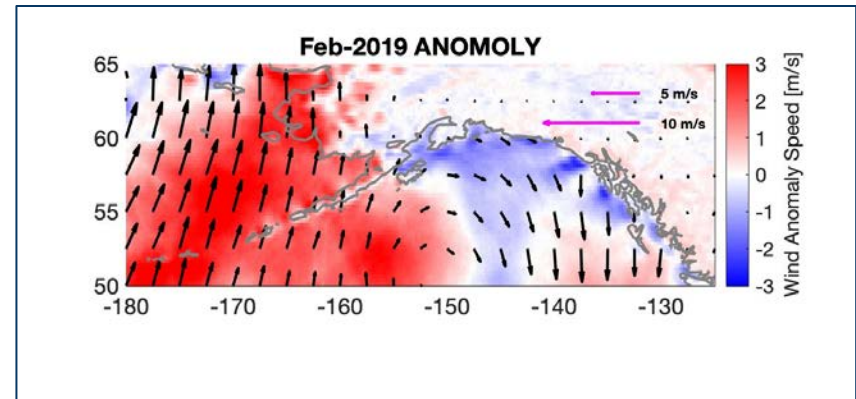
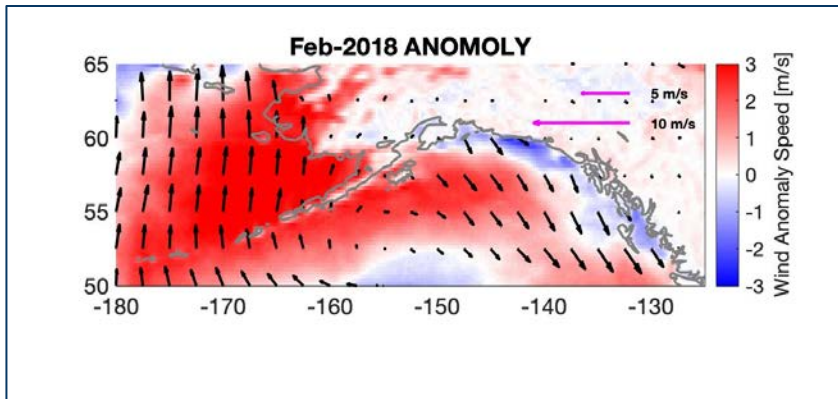
November through March, 1948-49 through 2020-21
Eastern Bering Sea
Average North-South Wind Speed



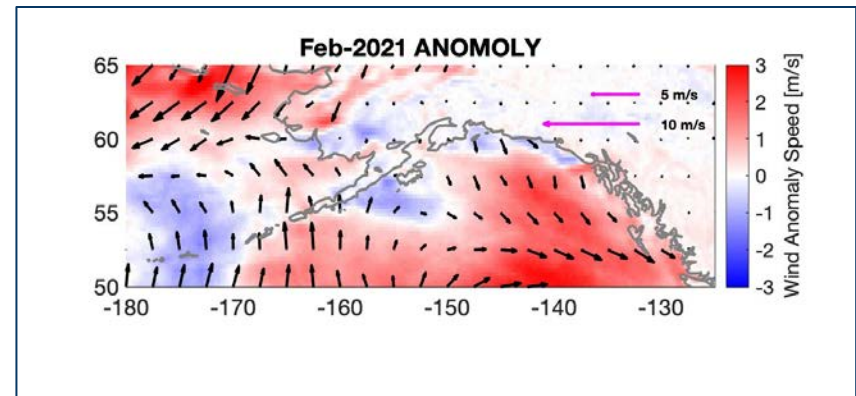
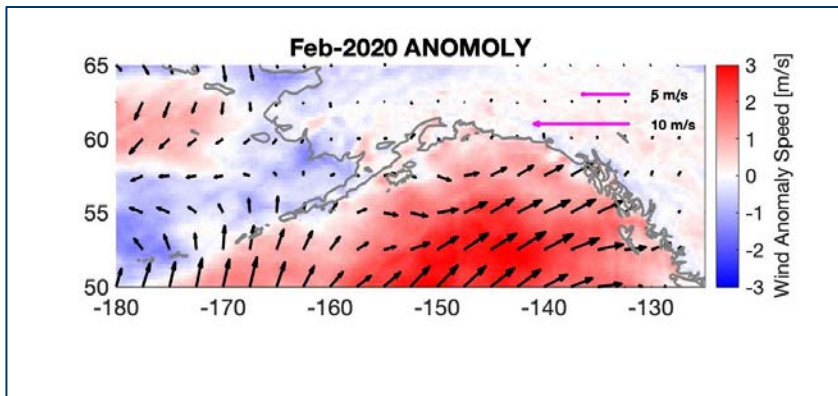
- Winters 2017/2018 and 2018/2019 had anomalous winds from the south.
- Winter 2019/2020 had wind speed direction near the long-term average.
- Winter 2020/2021 weather pattern allowed ice in the NBS to thicken, but prevented ice from moving to the south.

Bering Sea Winds

Hennon



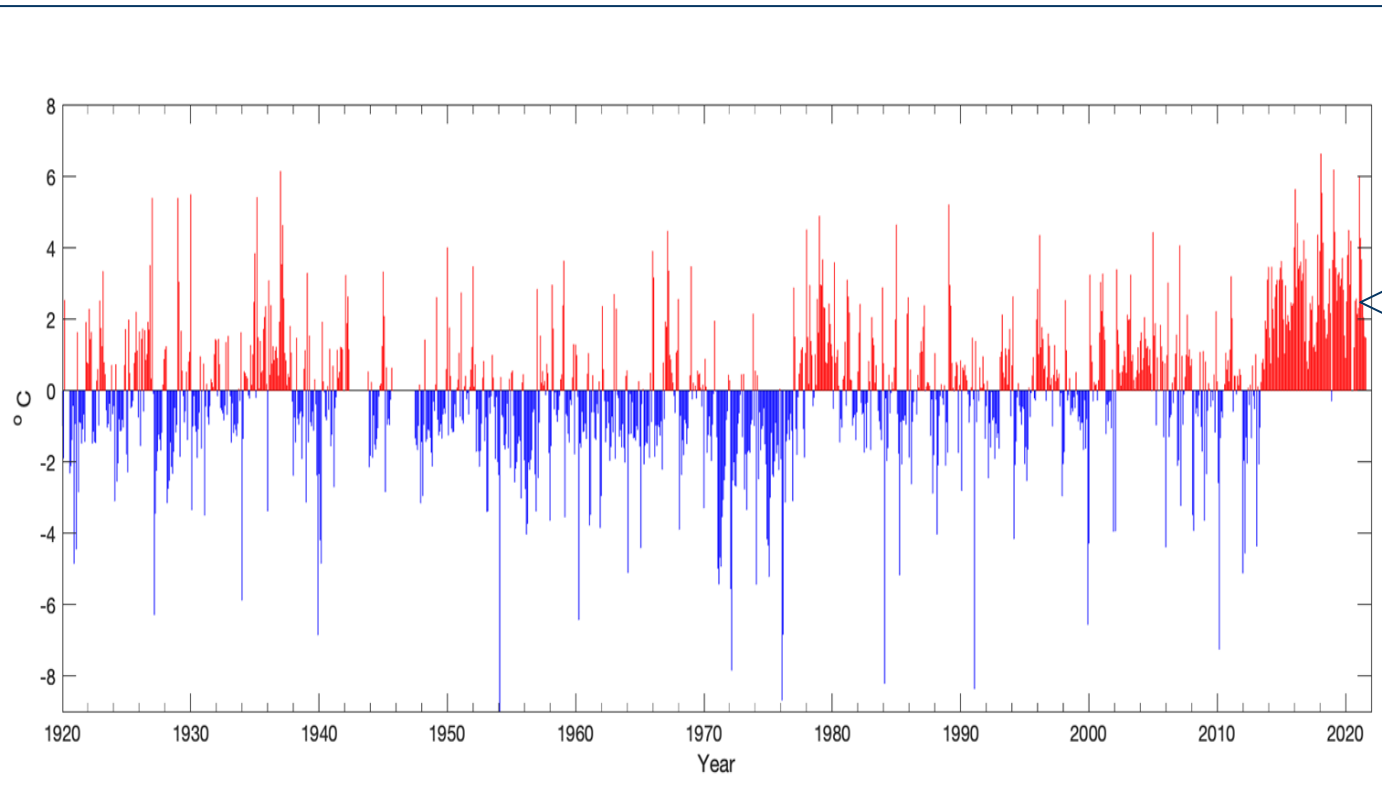
- 2018 and 2019 had strong winds from the south during February.



- 2020 had calm winds (blue colors) with some moderately strong winds from the north in the western portion of the NBS.
- 2021 had strong winds from the north in the NBS and moderately strong winds from the south in the SEBS, contributing to the decoupling of the sea ice.

St. Paul Air Temperature Anomalies

Wang

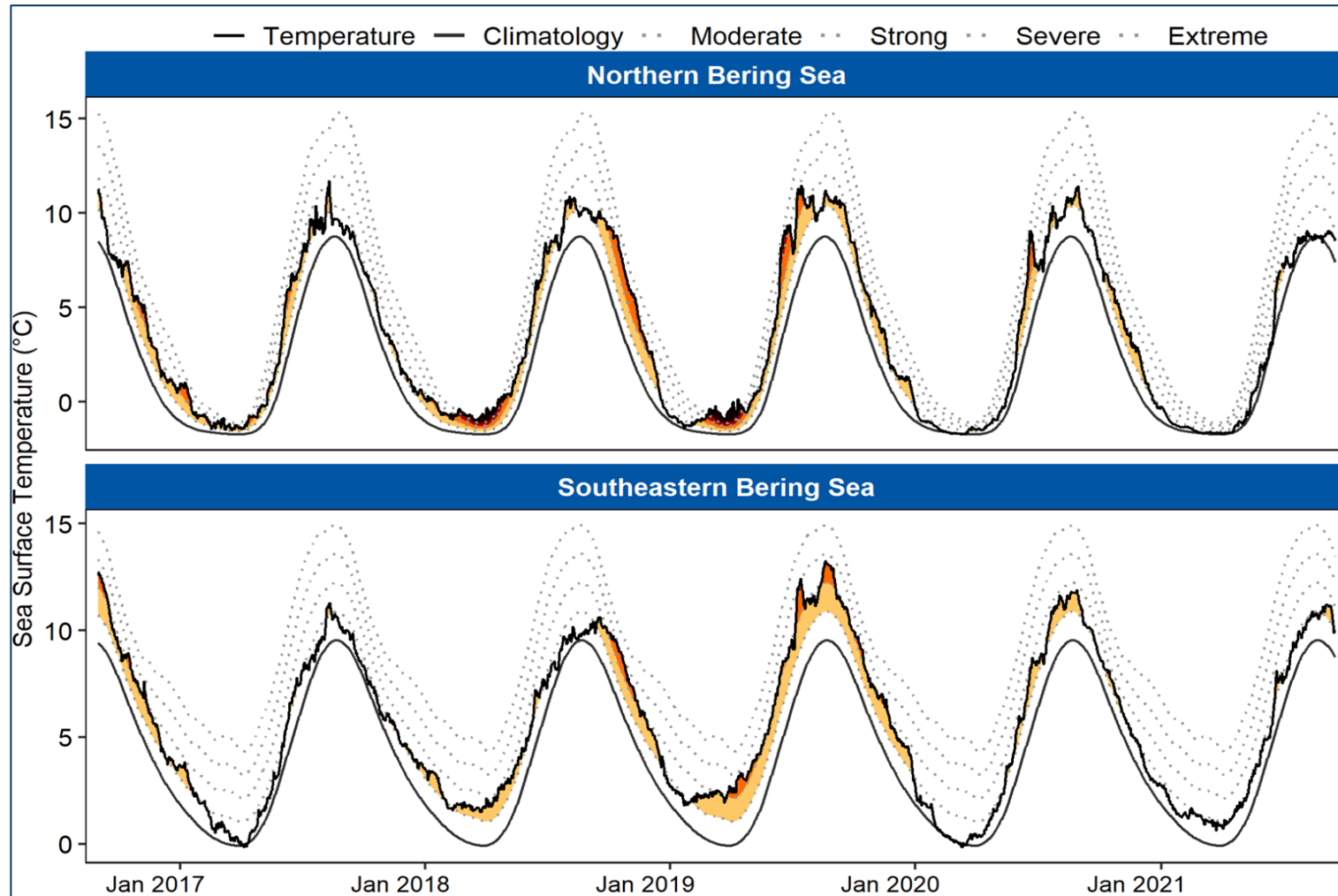


Increased duration and magnitude of current warm period.

“Is the Bering Sea more vulnerable to continued change with thinner and less sea ice?” - Jim Overland

EBS Marine Heatwave Index

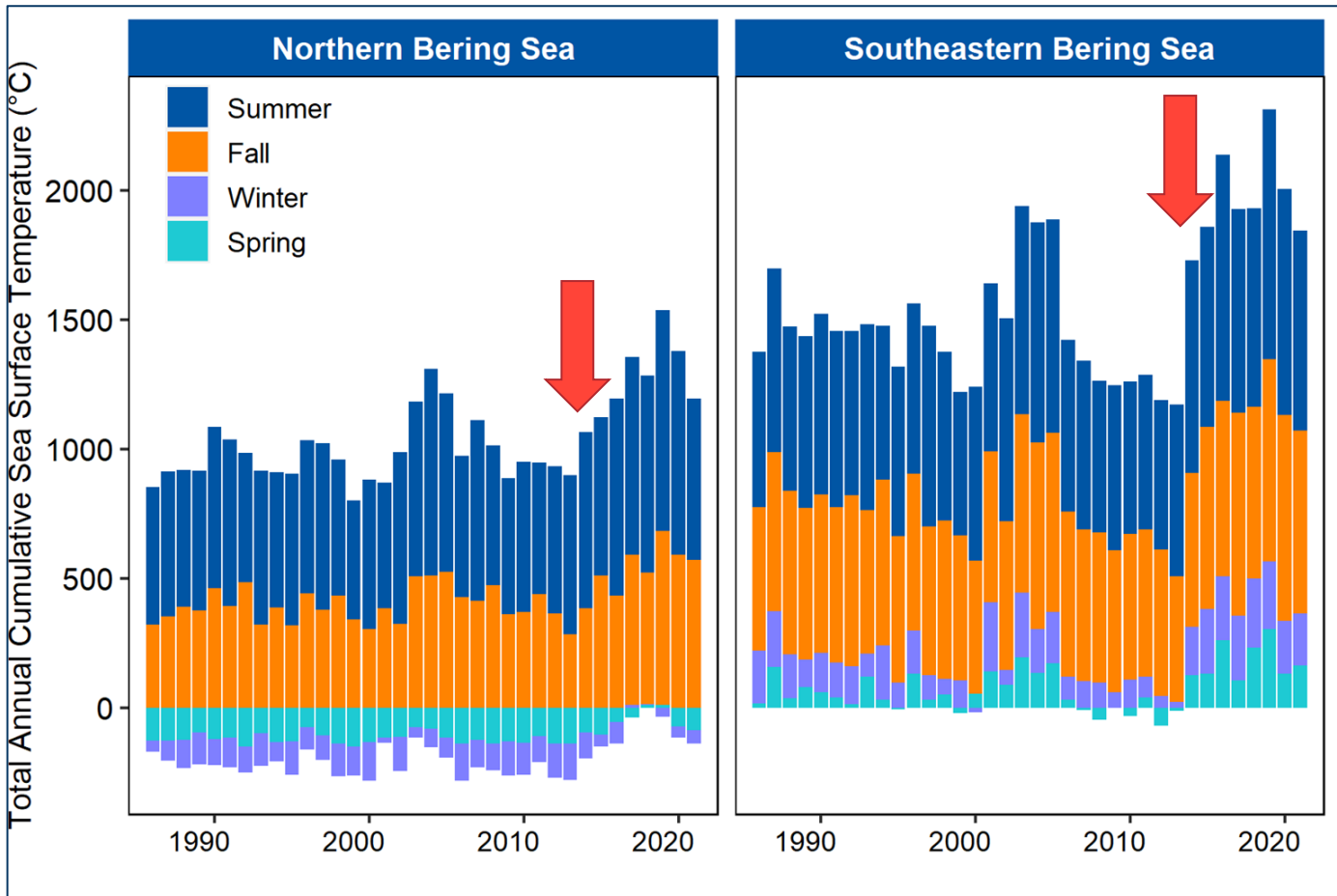
Watson



- MHWs did not occur as *often* or as *severely* during 2021 compared to recent years.
- However, temperatures hovered just below the MHW threshold, resulting in cumulatively warm SST conditions.

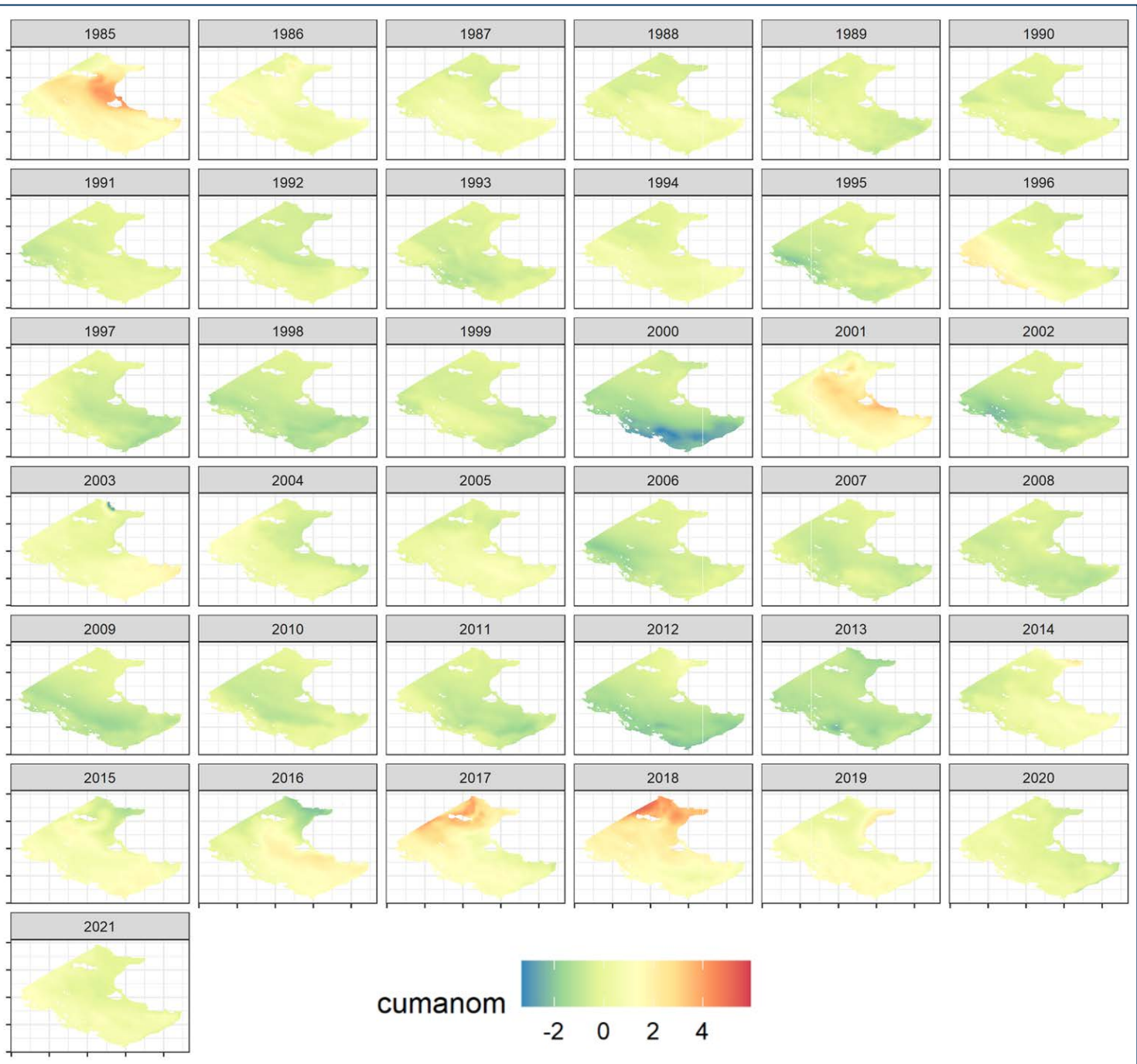
Cumulative Sea Surface Temperature

Watson



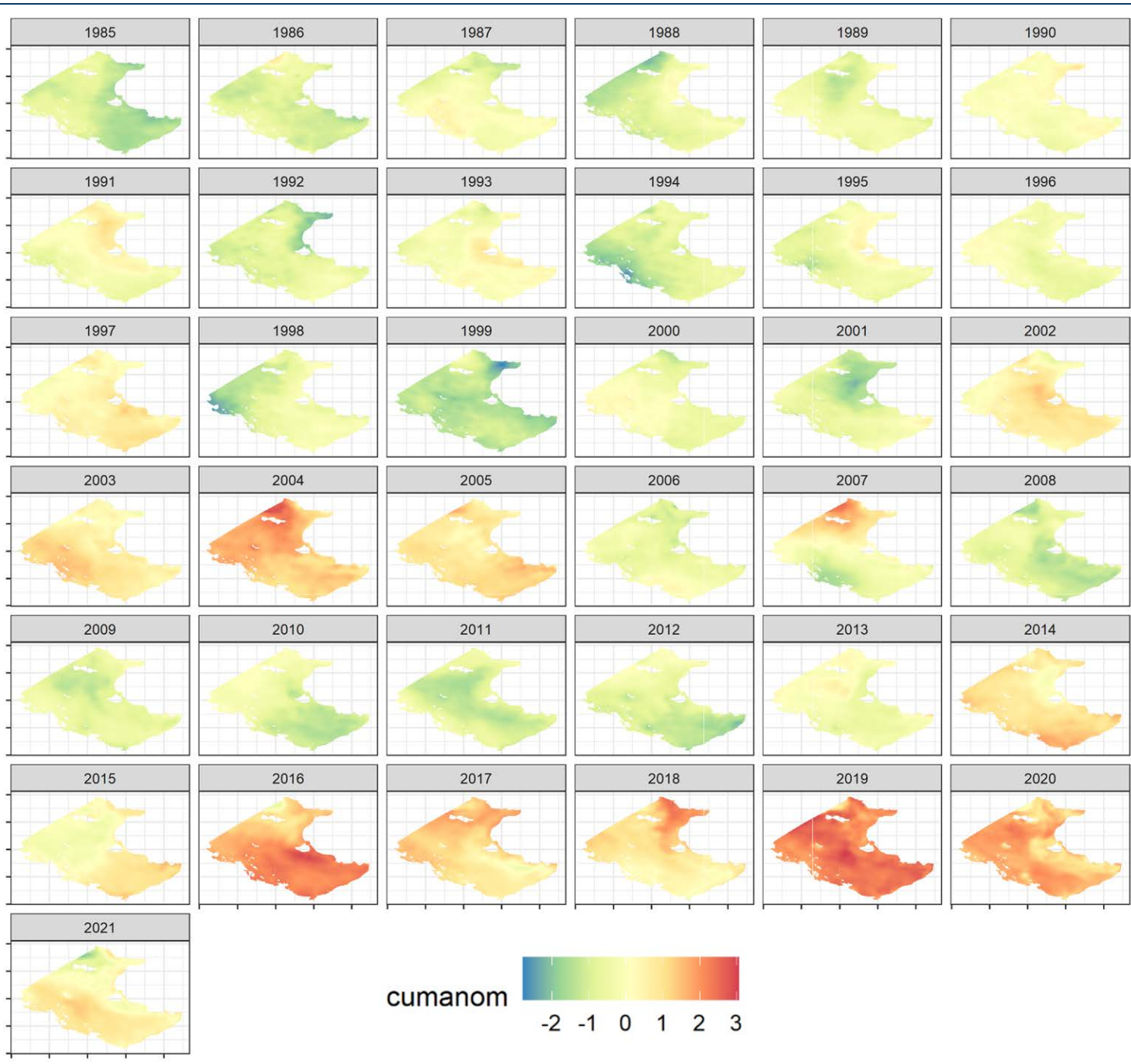
- Negative values in Winter and Spring driven by sea ice (-1.8°C).
- Sept 1 - August 31
- NBS and SEBS shift in ~2014.
- Shifts driven by Winter and Spring contributions?

Winter SST Anomalies Watson



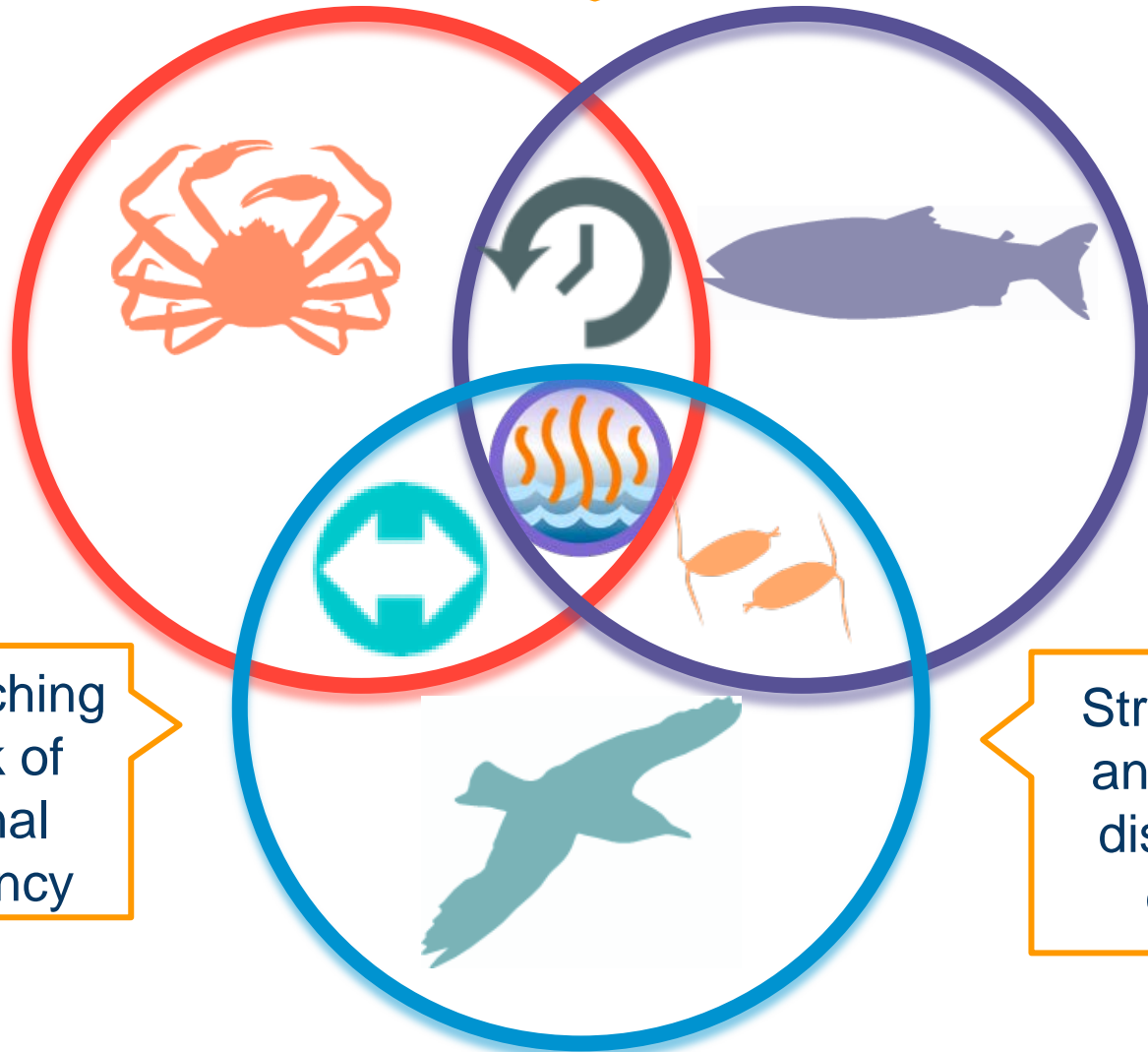
- Standardized anomalies
- Value of 2 indicates 2 SDs above the mean

Summer SST Anomalies Watson



Hypotheses we're tracking...

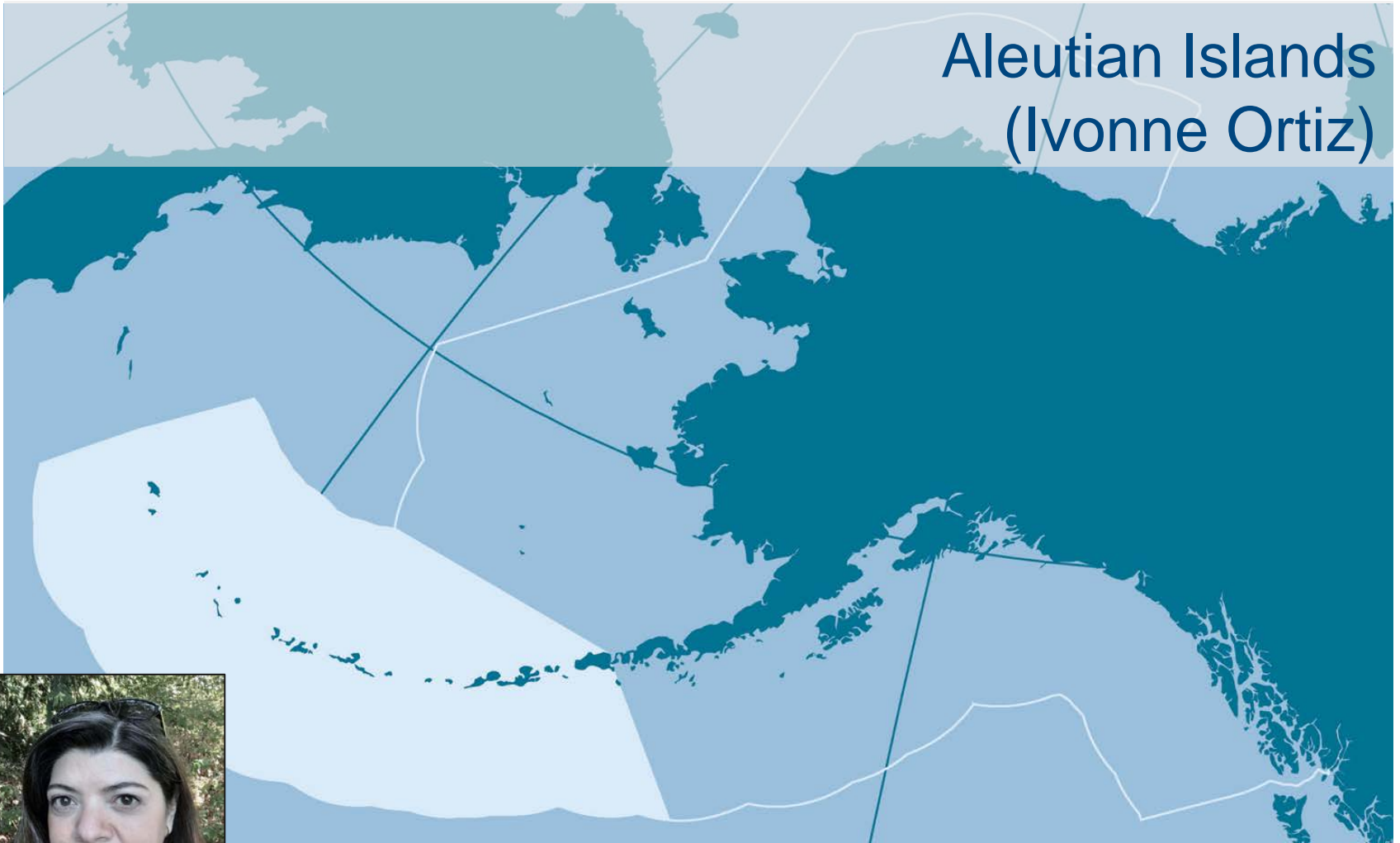
Cumulative impacts of
thermal exposure and
metabolic demands



Prey switching
and lack of
functional
redundancy

Stratification
and vertical
distribution
of prey

Aleutian Islands (Ivonne Ortiz)



Kamchatka Pink Salmon

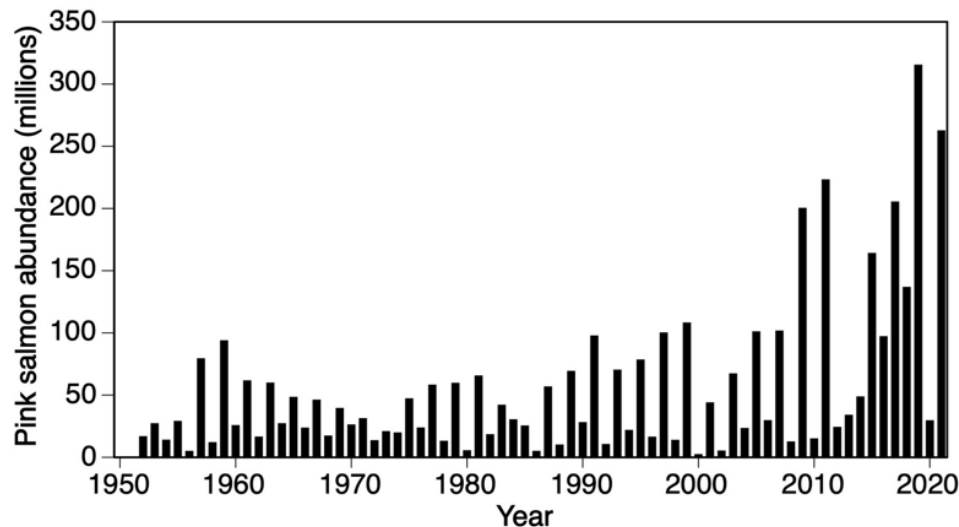
Ruggerone

Potential effects on other salmon

- frequent marine heatwaves and high abundances of pink salmon in 2018 and 2019 hypothesized to cause salmon decline in 2020
- increased early marine growth and survival in warmer of Bristol Bay sockeye salmon suggested higher than competition with pink salmon later in marine life.

Biennial trends & trophic cascades

- high pinks' abundance, zooplankton decline, phytoplankton increases
- biennial patterns in seabird prey and seabird productivity at Buldir
- shearwaters in SE Australia lower abundance in odd years; otolith growth lower in odd years in Atka mackerel

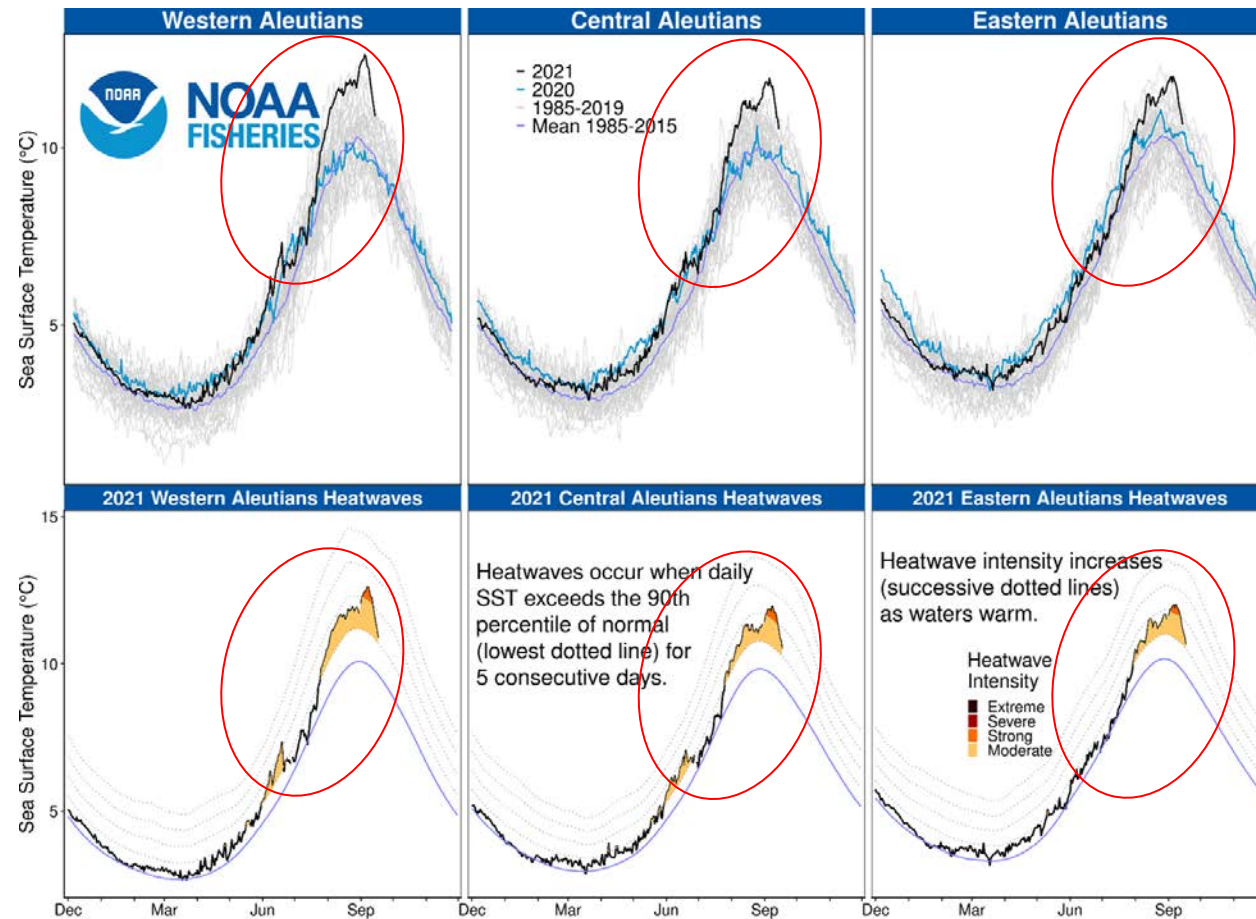


Values include catch and spawner abundances

2021 value based on preliminary harvest data

SST and Marine Heatwaves

Jordan and Callahan



Summer

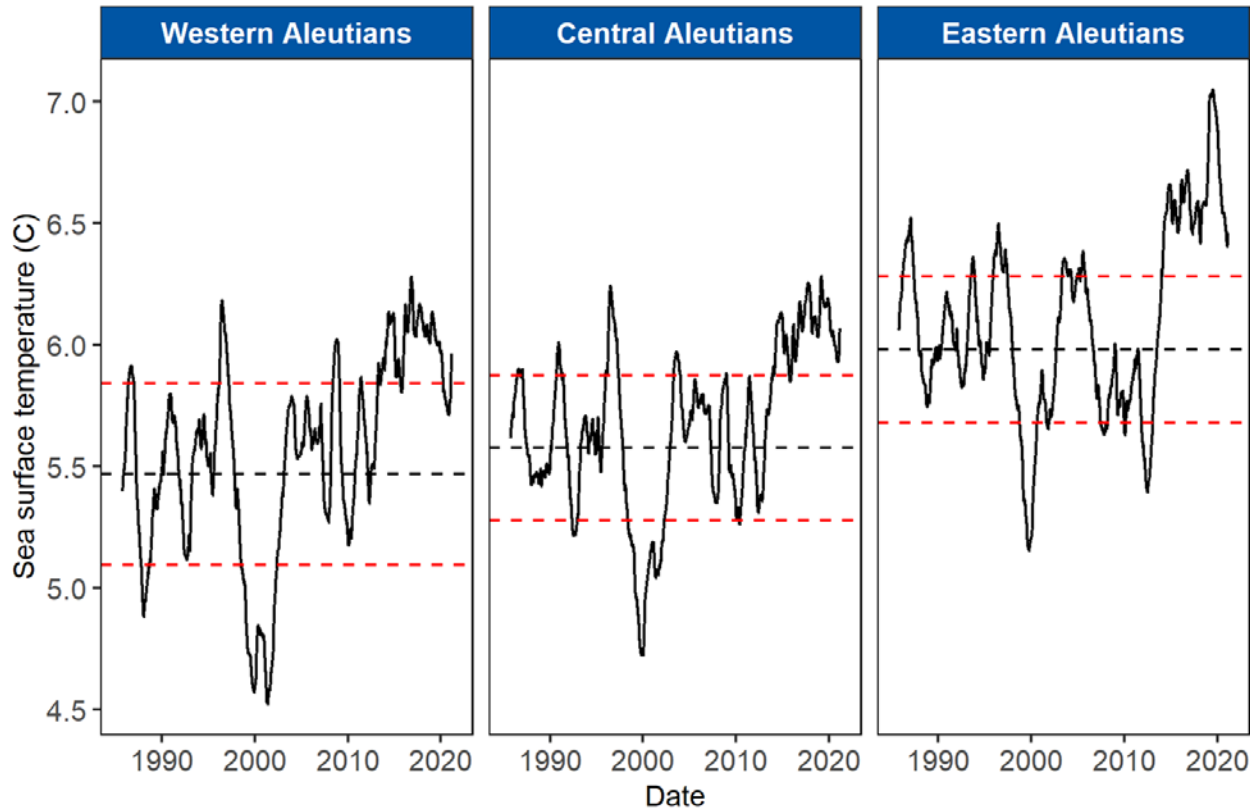
- Moderate short MHW in June in WAI and CAI, Aug, all AI

Fall - Sep -Nov

- Warmest temperatures on record in WAI and CAI
- Short strong MHW (based on international standards Hobday et al. 2018)

SST and Marine Heatwaves

Jordan and Callahan



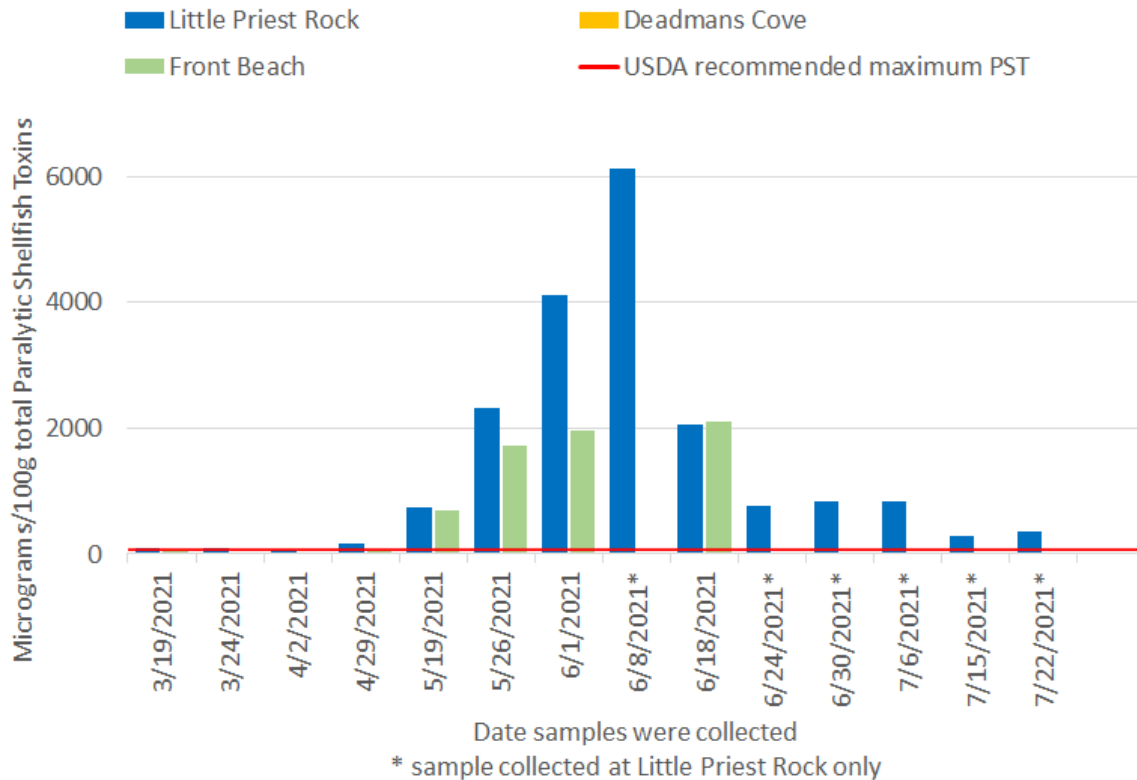
Longer-term context

- Time series trend (one year moving average) of SST; data through Mar 2021
- Sustained SST above average starting 2013 across the chain
- Note 2021 MHV not included in plot yet

Harmful Algal Blooms & PST Farrugia, Duggan, Poe, Lefebvre, Anderson



Total Paralytic Shellfish Toxins micrograms/100g
Blue mussels sampled from multiple sites on Unalaska



Parasitic Shellfish Toxins In blue mussels, Unalaska

- 76x the regulatory limit
- Similar to last year at Little Priest Rock
- Last year's fatal ingestion was 140x the regulatory limit
- Limit = 80 µg/ 100g

Mercury in AI food webs

Rea



Photo: NOAA

Mercury in SSL, groundfish in WAI, CAI

- Relatively high concentration in pups exposed during in utero development
- Percent of pups with THg > 20 $\mu\text{g/g}$ doubles in 8 years at Agattu (20.6%, 2011 to 46.4%, 2019);
> 20 $\mu\text{g/g}$ = adverse effects in pinnipeds
- Higher THg in WAI than CAI in several fish
- New large set of invertebrates to be analyzed

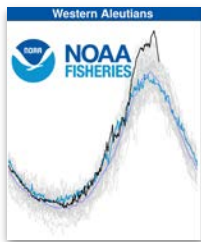
AI Summary



1. Limited COVID-related data loss



2. High abundance year for pink salmon



3. Record warm SST WAI-CAI, above average 8 years in a row

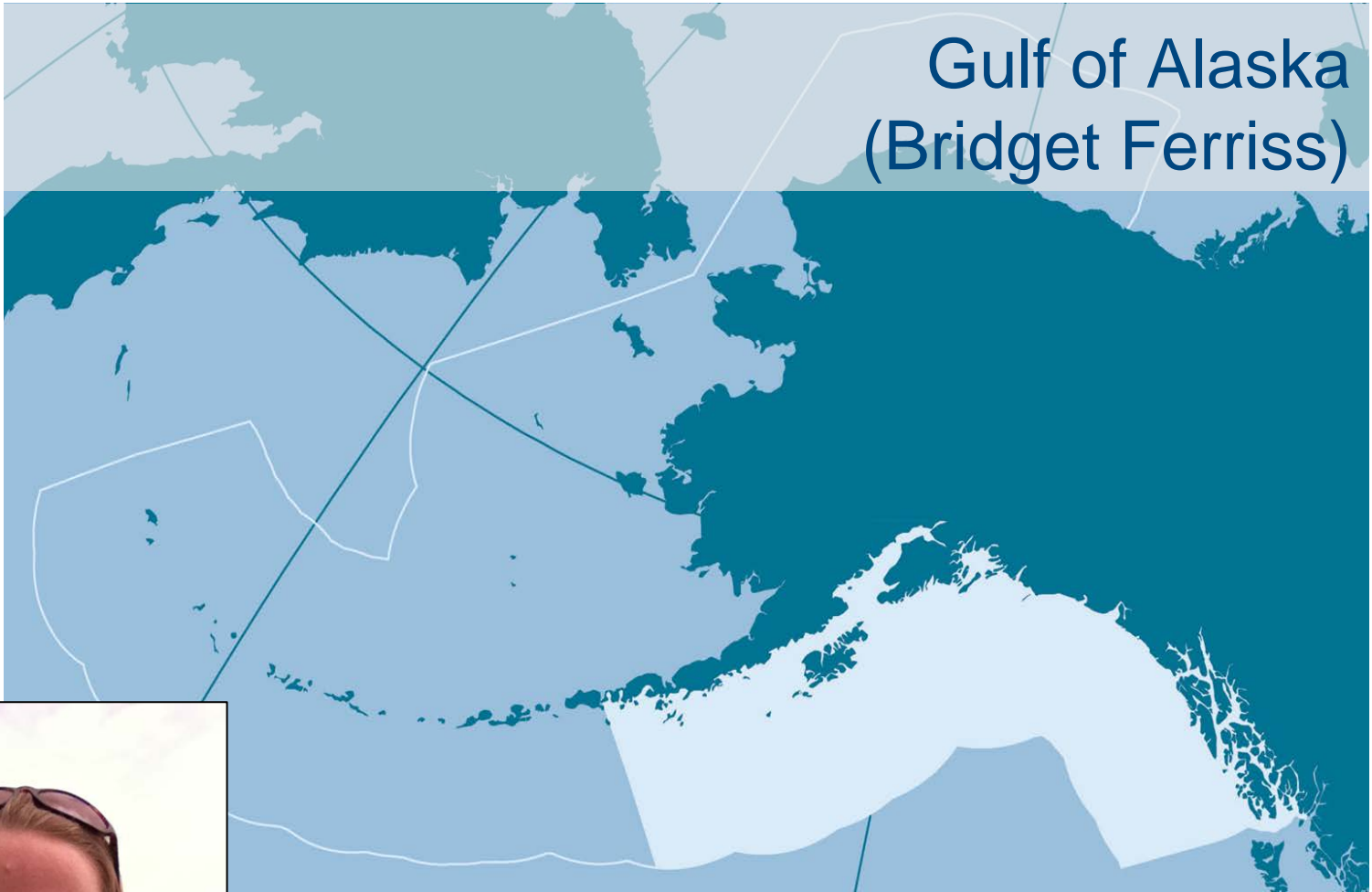


4. High toxins in shellfish in Unalaska, again

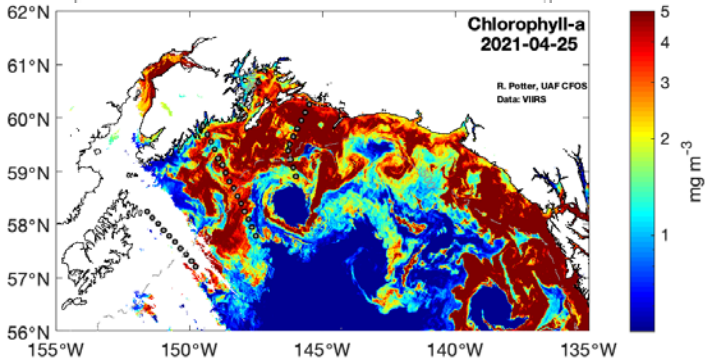
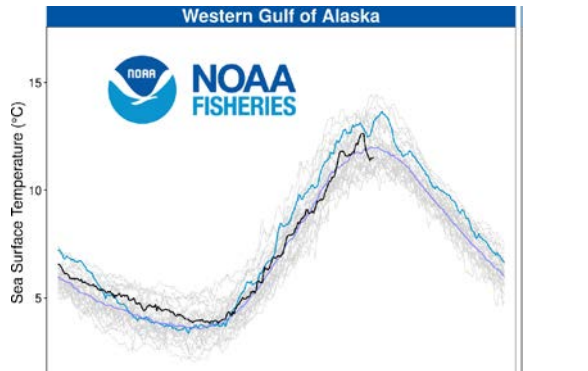


5. Mercury in food webs higher in WAI,
Twice as many SSL pups with THg>20 in SSL
pups twice as much within 8 years

Gulf of Alaska (Bridget Ferriss)



In Development: Productive Conditions (with exceptions)



- Ocean temperature: cooler
 - Except WGOA spring surface
- Largest spring phytoplankton bloom in 24 years: Seward Line east to Kayak Island
 - But lower GOA average chla concentrations
- Abundant large lipid-rich copepods (Icy Strait, Seward Line, maybe South Kodiak)

➔ Impact on GOA upper trophic levels & system overall?
➔ WGOA vs EGOA?

TBD- Groundfish, seabird, forage data will inform

Middleton Island Kittiwake Mortality Event

Sara Schoen & John Piatt (USGS), Shannon Whelan & Fred Tremblay (ISRC), Valerie Shearn-Bochsler & Barb Bodenstein (NWHC), Sasha Kitaysky, Alexis Will & Jack Chen (UAF), Robb Kaler (FWS), Eric Bortz & Doug Causey (UAA), and Kate Sheehan (Frostburg State University)



Photo by Morgan Benowitz-Fredericks
Black-legged kittiwake
breeding pair

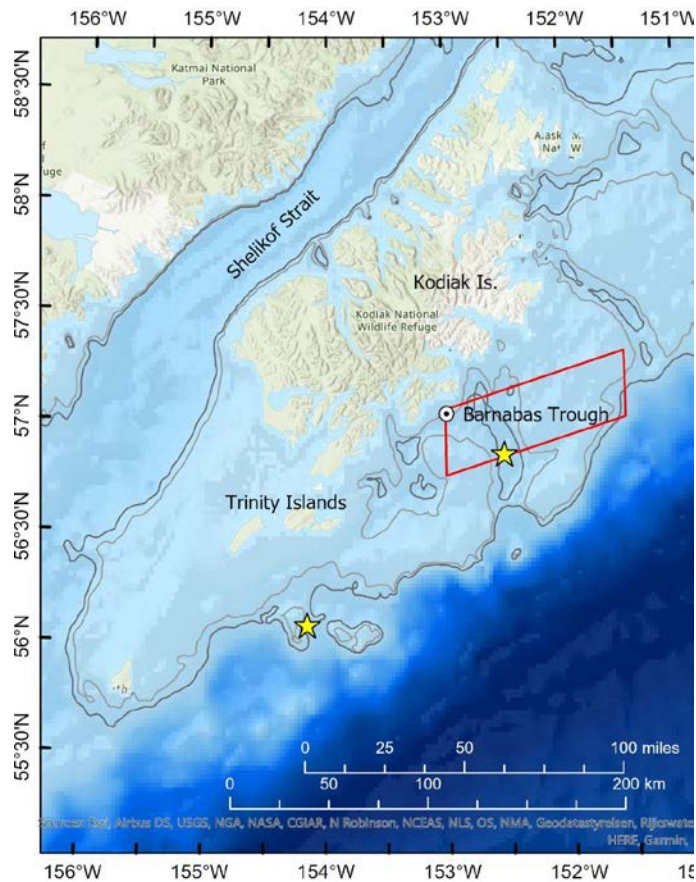
- July 2021, south of Prince William Sound
- At least 250 kittiwakes died, 70 Glaucous-winged Gulls & 2 Herring Gulls.
- Botulism type C is the the primary suspect
- Birds and their prey (mussels, plankton, and forage samples) tested negative for biotoxins (saxitoxin and domoic acid).
- Continued analyses of the mortality event

Right Whale Observations

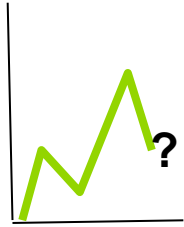
J. Crance



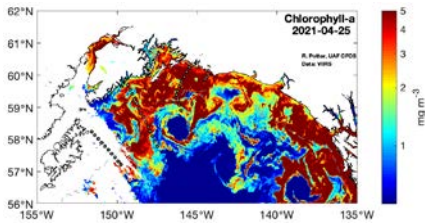
- 4 North Pacific right whales seen in GOA marine mammal survey
- Population N Pacific ~100; eastern stock ~30)
- Barnabas Trough & Trinity Islands
- First NOAA large whale survey in GOA since 2015 (PacMAPPs)



GOA Summary



1. Limited COVID-related data loss



2. In development: Productive year?



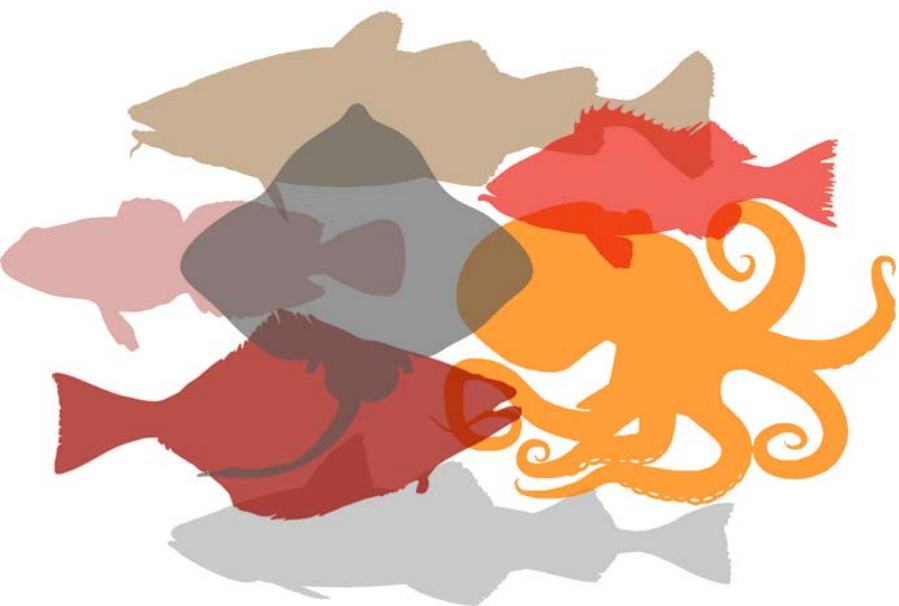
3. Seabird mortality event Middleton Island



4. Right whales observed

Next Steps

Ecosystem Status Reports 2021



1. Stock Assessment Risk Tables (October)
1. Groundfish Plan Team (November)
1. North Pacific Fisheries Management Council (December)
1. 'In Brief' summaries (December)