

Alaska Fisheries Science Center Science Update

Dr. Robert Foy

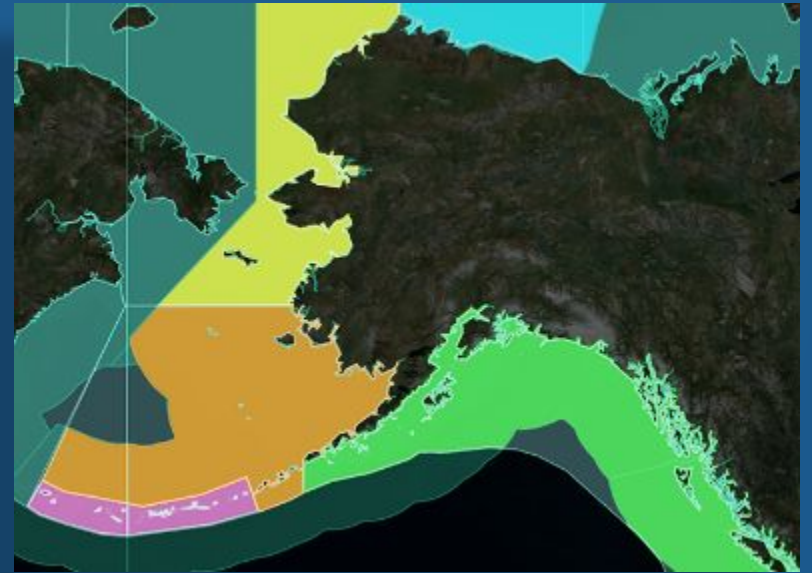
AFSC Research and Science Director

Dr. Elizabeth Siddon

Research Scientist

Dr. Marysia
Szymkowiak

Research Social Scientist



*Presentation for
Alaska House
Fisheries Committee
April 12, 2022*



Our Mission

To provide science and services in support of productive and sustainable fisheries, recovery and conservation of protected resources, and healthy ecosystems in the marine waters of Alaska.

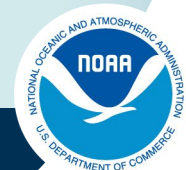
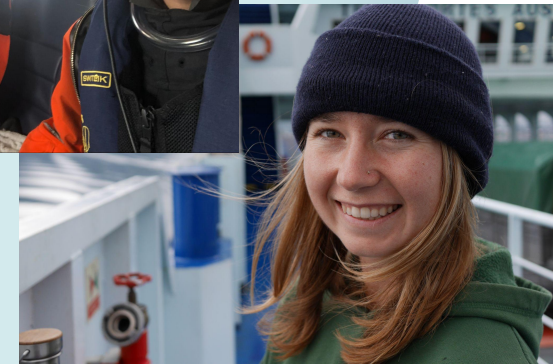
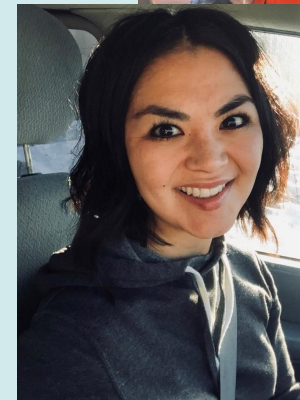
<https://www.fisheries.noaa.gov/resource/document/alaska-fisheries-science-center-strategic-plan-fy2023-fy2027>



NOAA
FISHERIES

Who we are

- 314 Federal employees & 131 contractors
- 6 divisions implement mission-essential research, operations, and administrative activities.
- Offices in Seattle, Juneau, Kodiak, Anchorage, Dutch Harbor, Baranof Island, St. Paul Island, Newport



NOAA
FISHERIES

Northern Bering
Sea/Chukchi

Beaufort Sea



- **Healthy Marine Ecosystems**
 - 24+ Research Surveys
 - 250+ fish and crab species
 - 42 marine mammal species
- **Ecosystem-Based Fisheries Management**
- **Conservation of protected species**



Eastern
Bering Sea

Gulf of Alaska



- Alaska EEZ = 1.5 million nm²
- 5 Large Marine Ecosystems
- 60% U.S.-caught seafood
- \$13.8B economic output to U.S.
- Top 3 volume fishing ports in U.S.
- Seafood Industry contributes \$73 m to state in form of taxes, fees, etc.

THE CHALLENGE

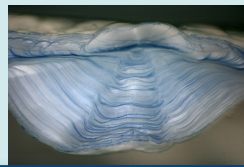
Complexity and geographic **scope** of the mission is increasing



Balanced Research Portfolio

Why?

- Building resilience in shifting ecosystem states
- Environmental variability & climate change
- Static management



Fish & Crab Surveys



Fish & Crab Stock Assessments



Bycatch Reduction Research



Fishery Monitoring



Marine Mammal Surveys & Co-Mgt



Marine Mammal Stock Assessments

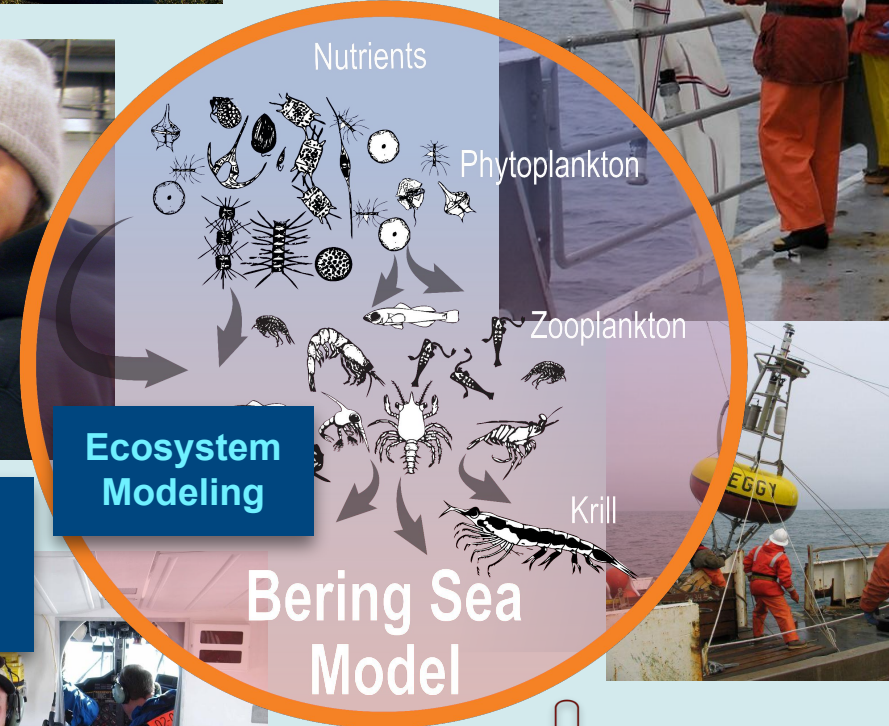


Habitat & Process Research

Socio-economic Research



Ecosystem Surveys



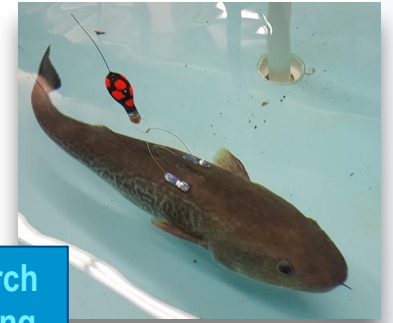
Climate Modeling for fisheries



What's Needed

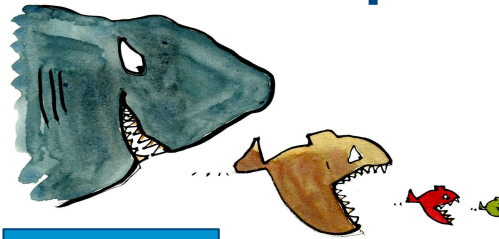
Sustainable Fisheries/Climate Adaptation

Ecosystem Surveys & Next Generation Assessments



Pac Cod Research Process & Tagging

Salmon Bycatch - Aging Support



Food Habits - Collection & Analysis

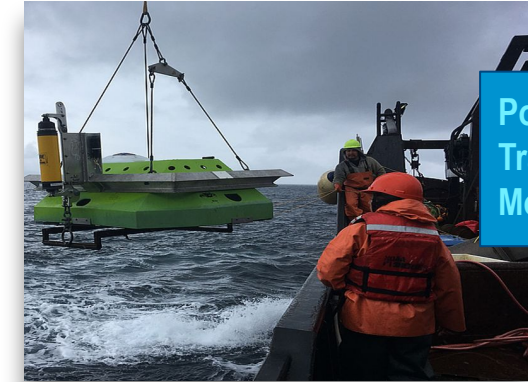
New Survey Technology



Genetic Studies



Chukchi & Beaufort Fish Surveys



Pollock Transboundary Movements

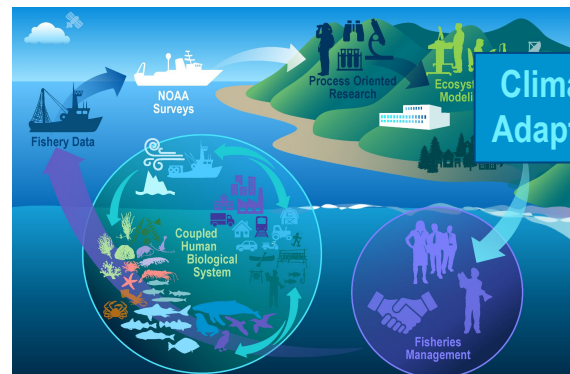
Co-Management

Marine Mammal Observer Program

Marine Mammal Surveys & Food Habit Studies

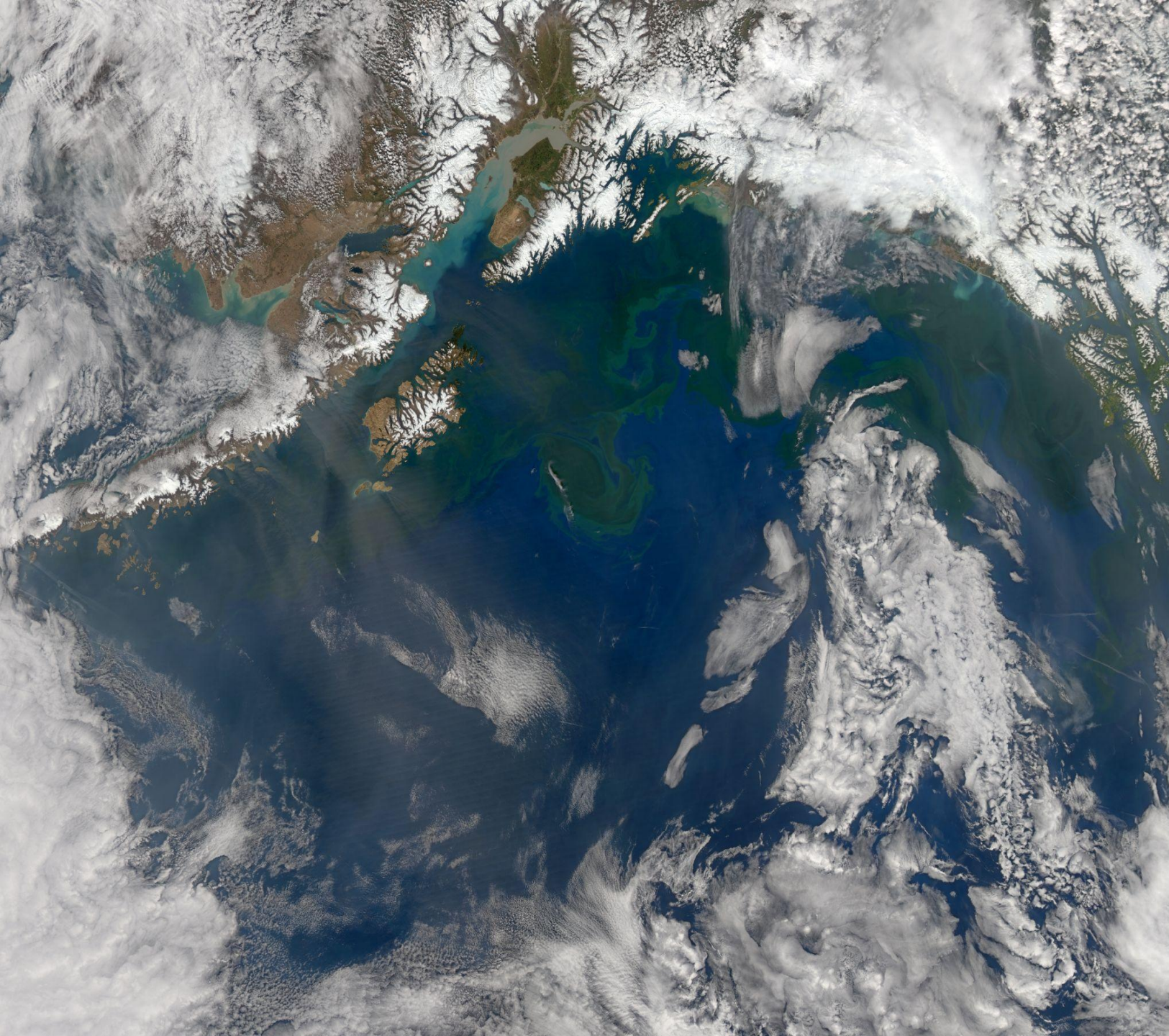


Climate Modeling-Adaptation



Little Port Walter Research

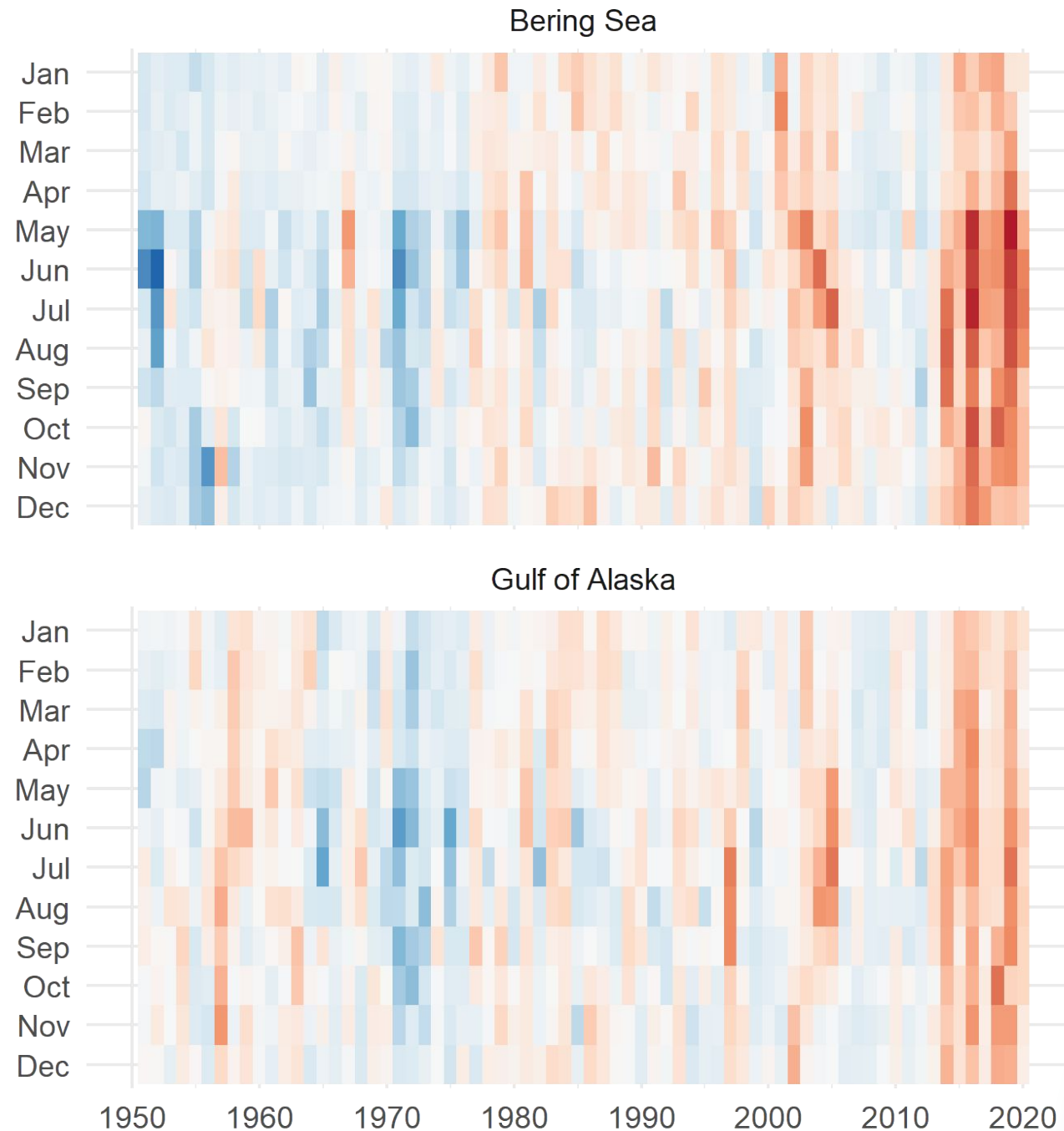




Ecosystem Response to Changing Climate

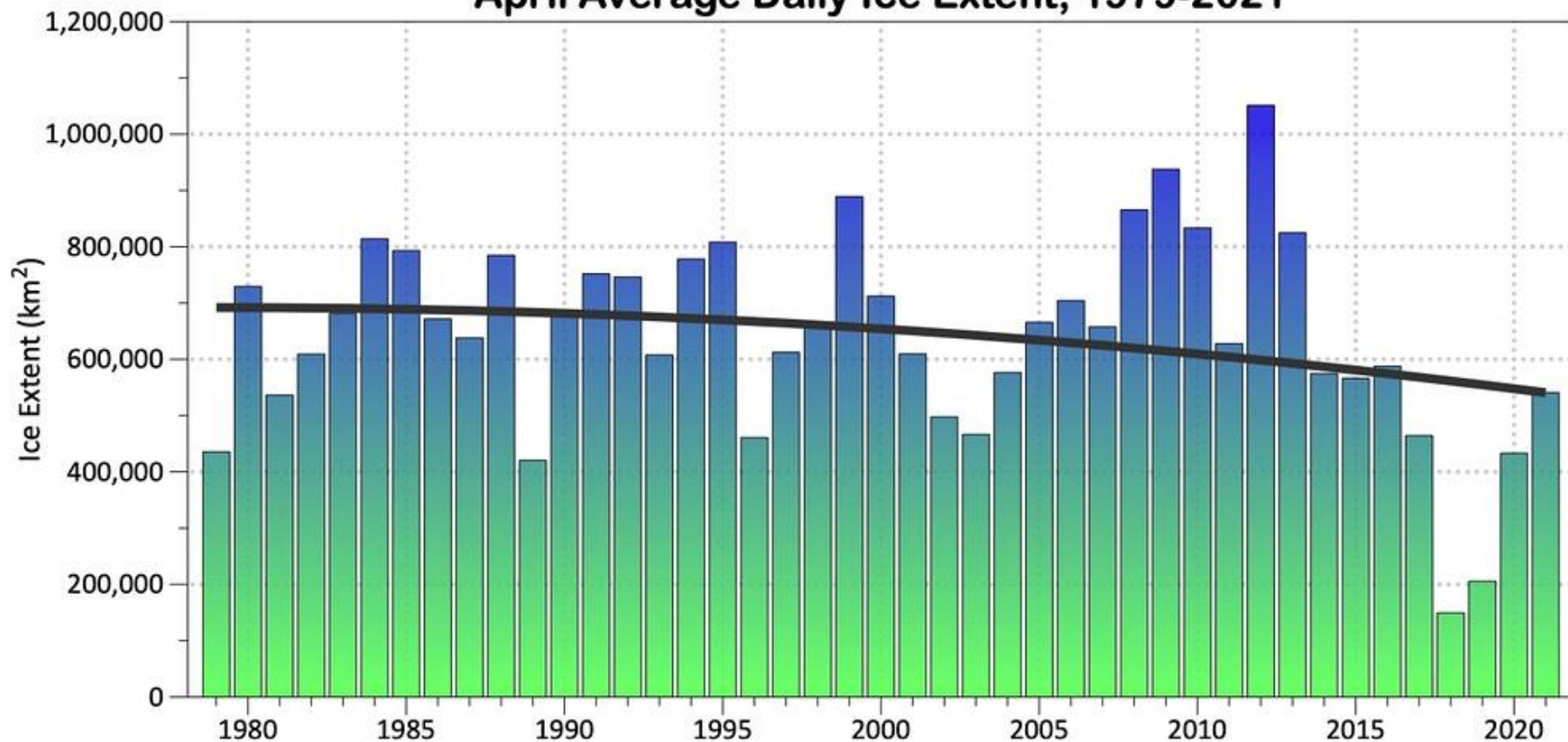
Alaskan Sea Surface Temperature

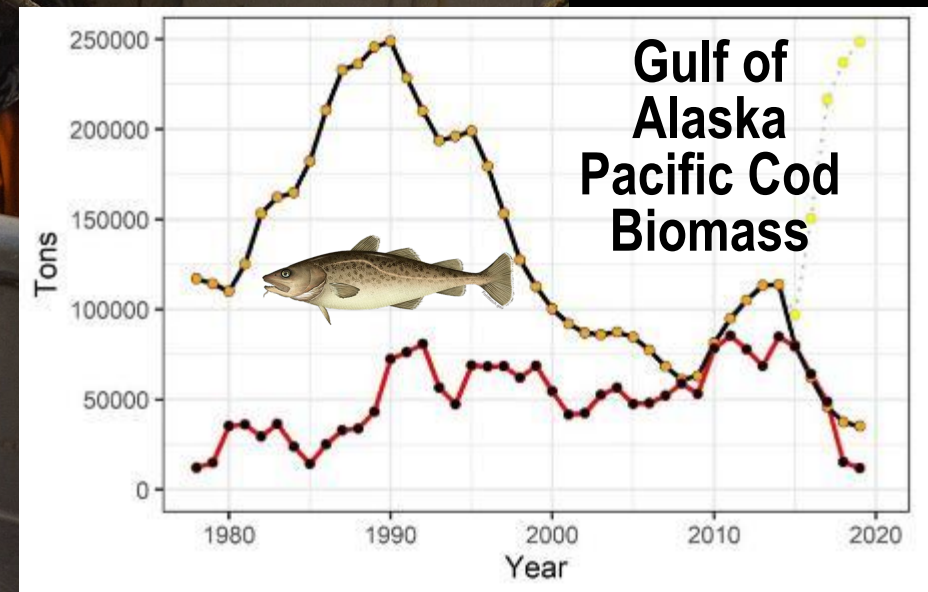
Difference from
Average Monthly
Temperature,
1950-2021



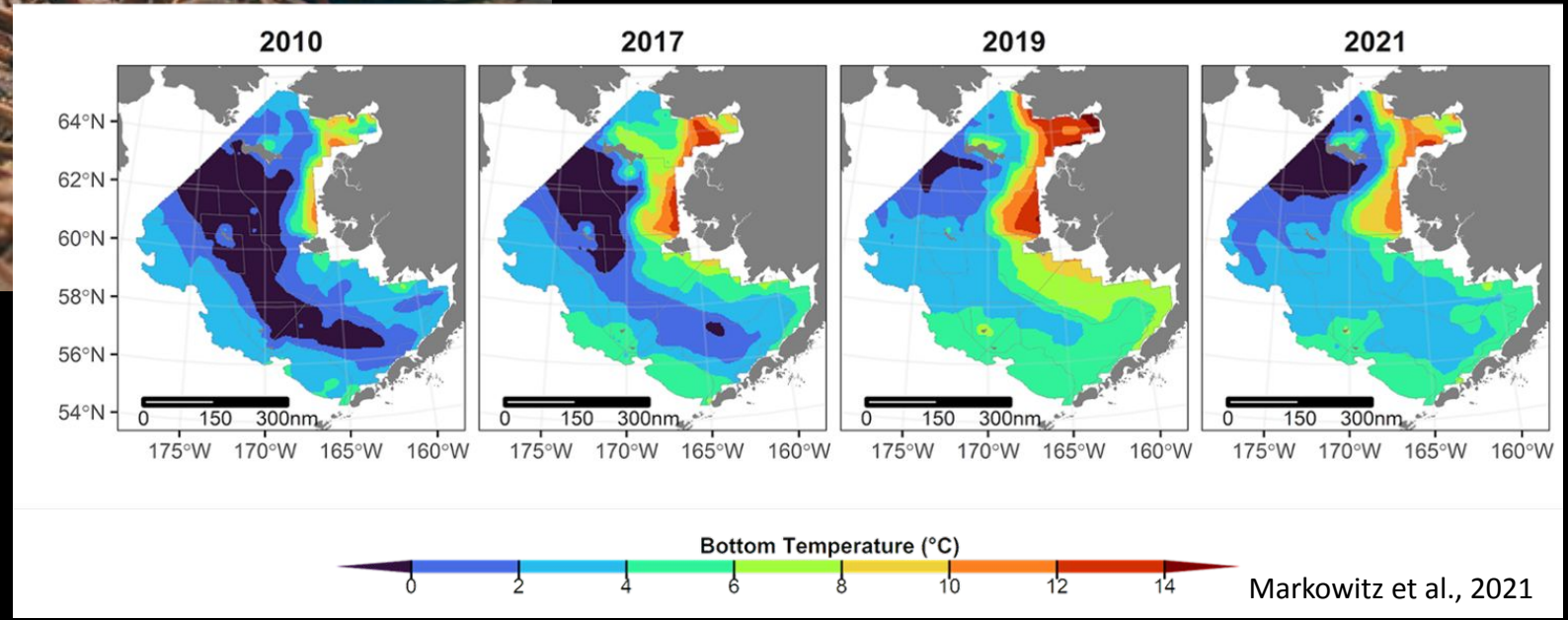
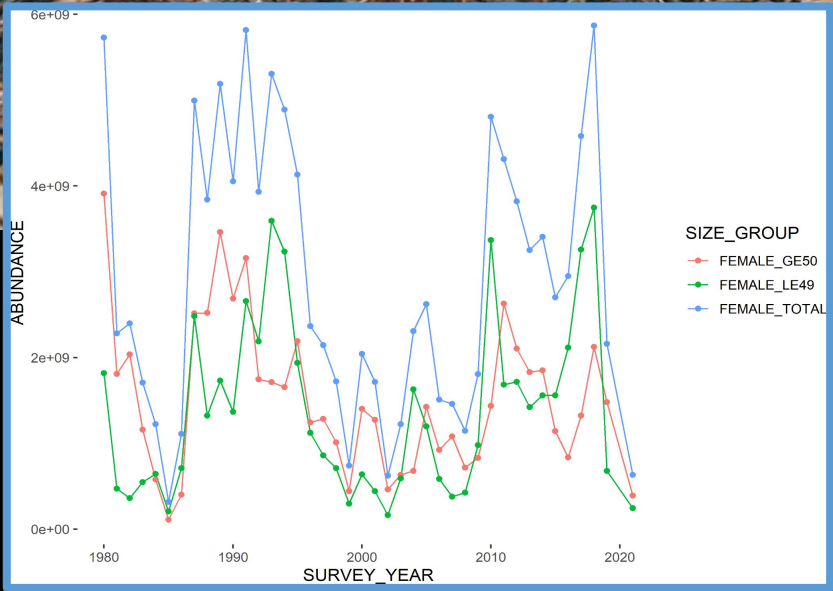
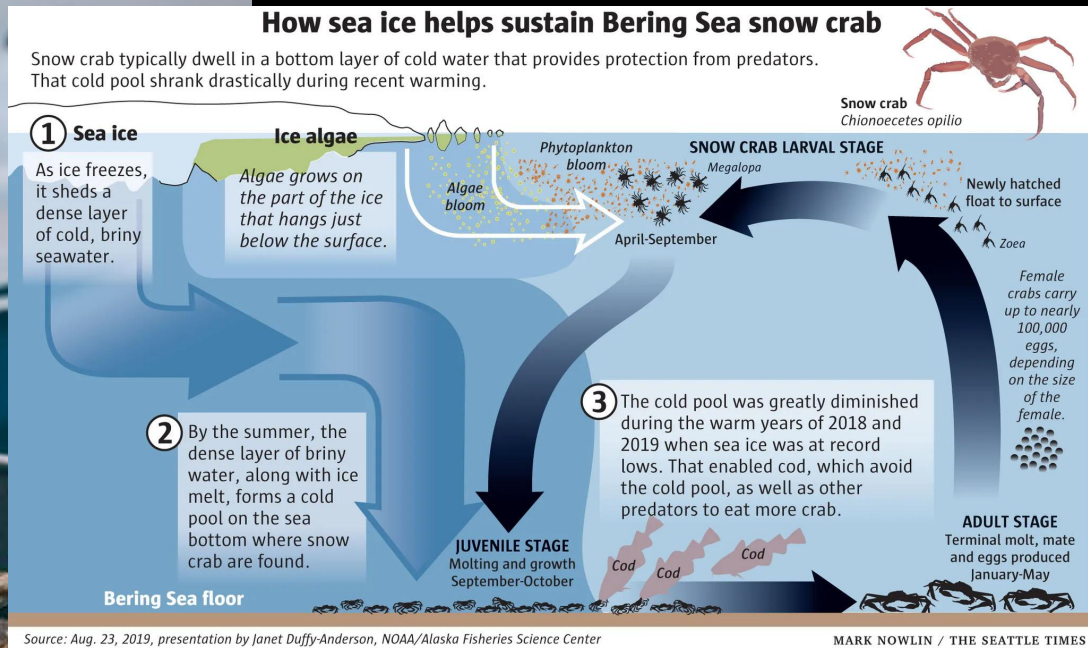
NOAA
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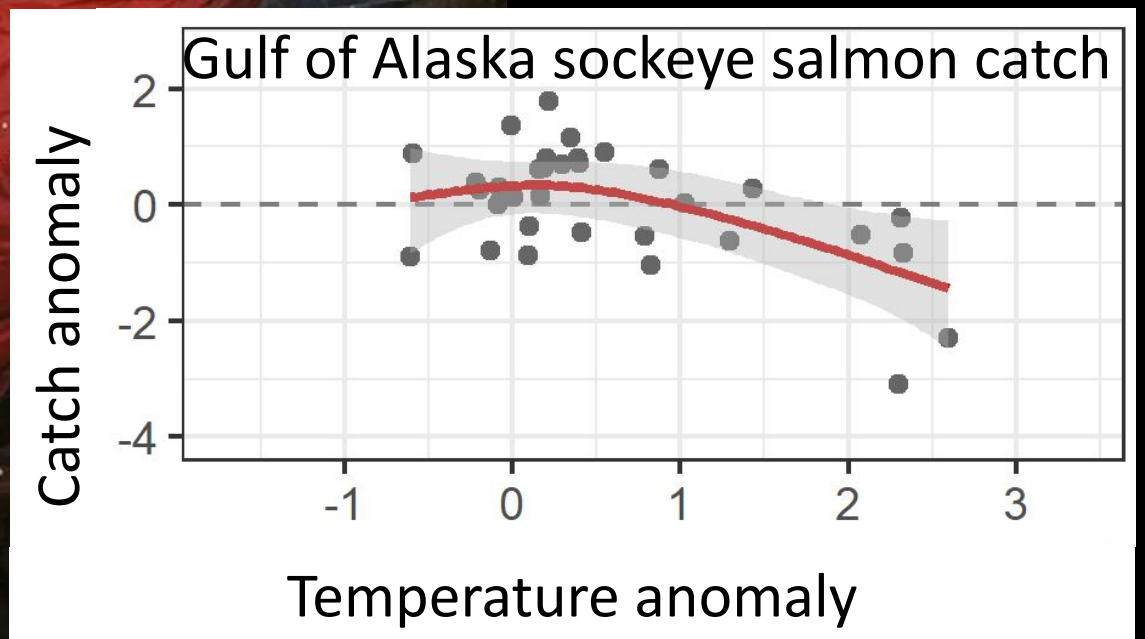
Bering Sea April Average Daily Ice Extent, 1979-2021

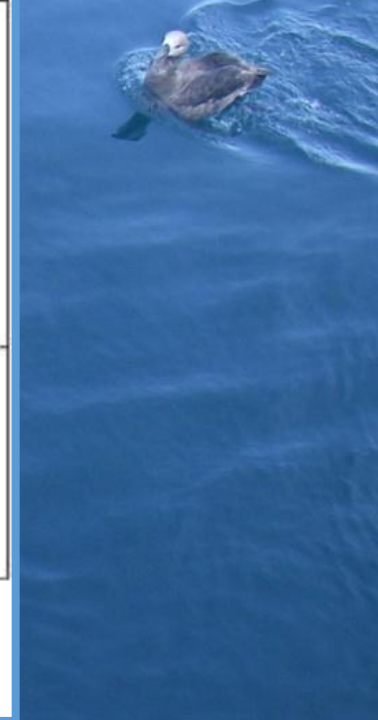
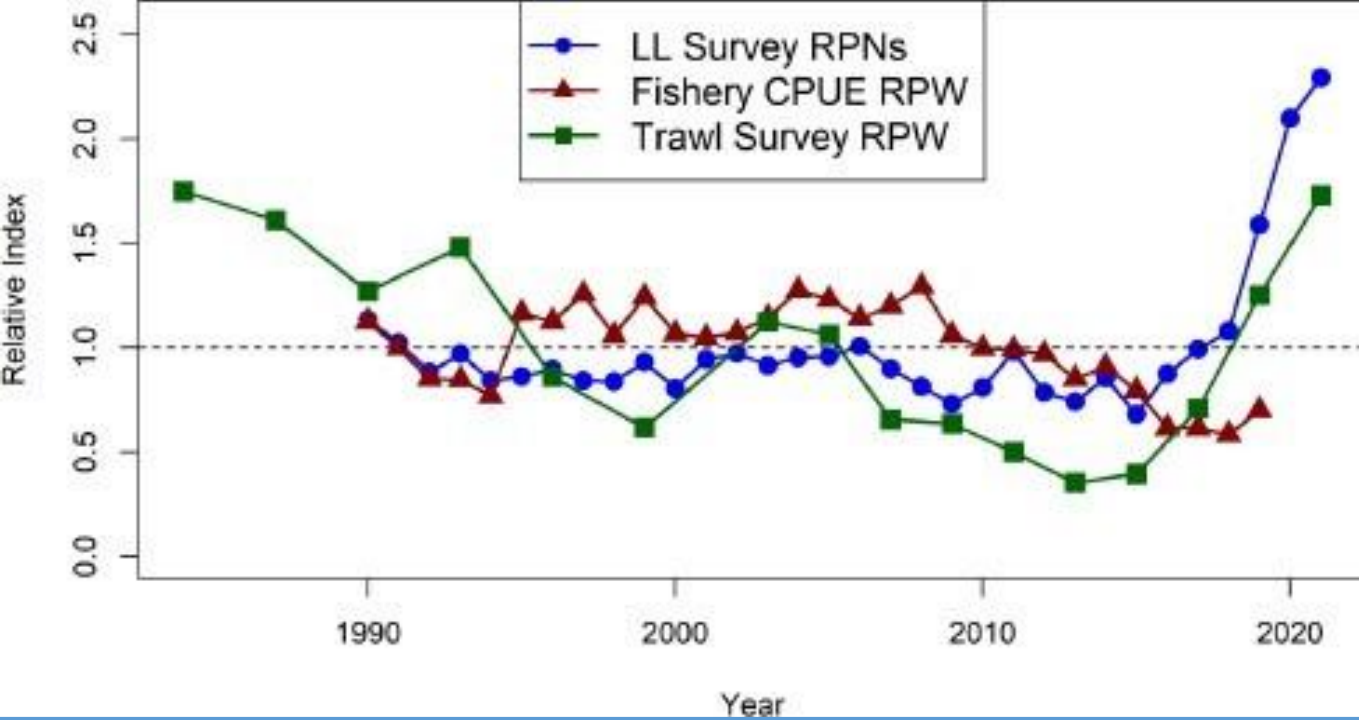


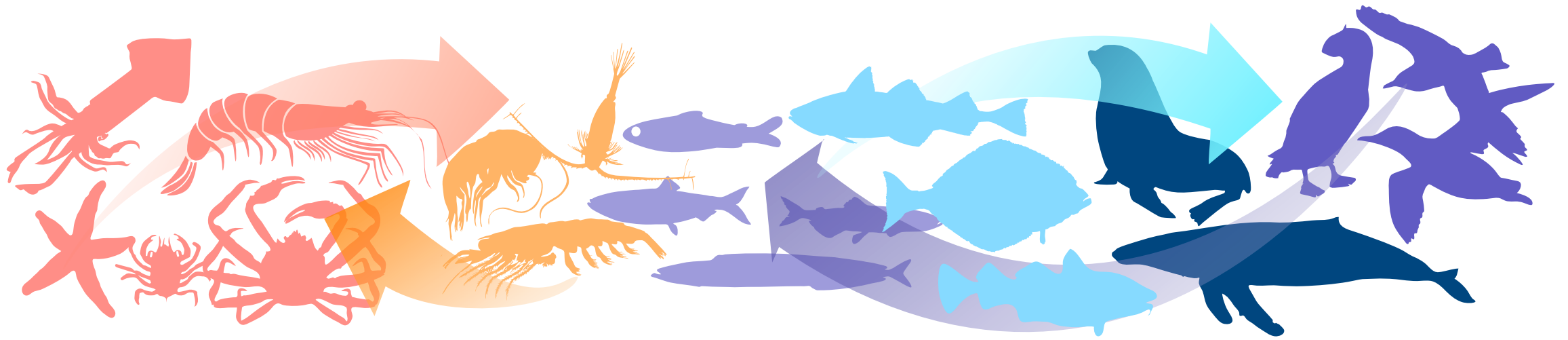


Barbeaux et al. 2021. Assessment of the Pacific cod stock in the Gulf of Alaska









NOAA Alaska Fisheries Science Center Ecosystem Status Reports

Dr. Elizabeth Siddon (Eastern Bering Sea)

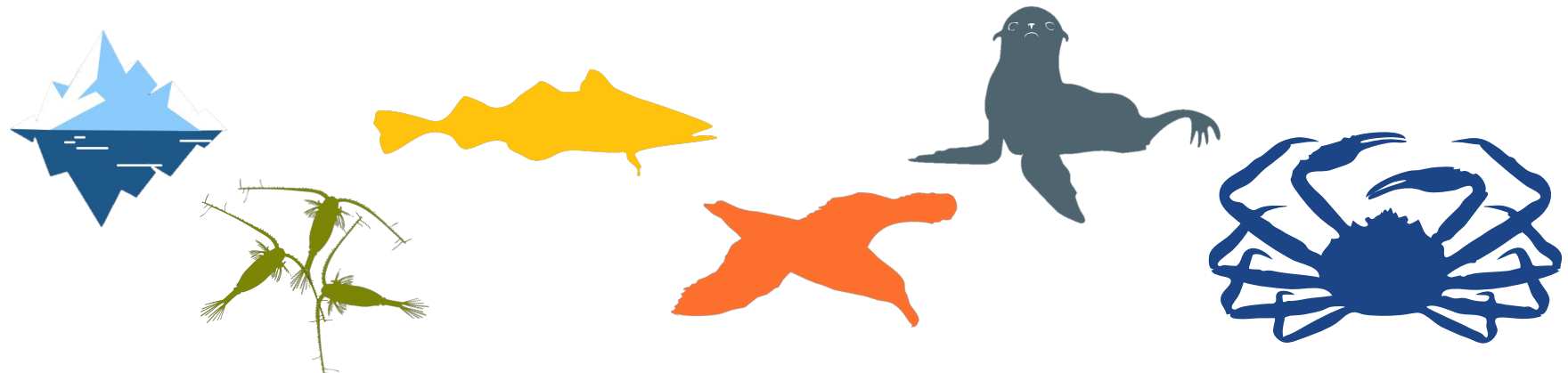
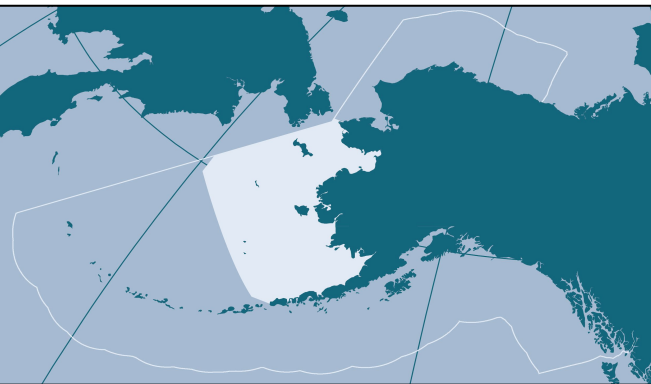
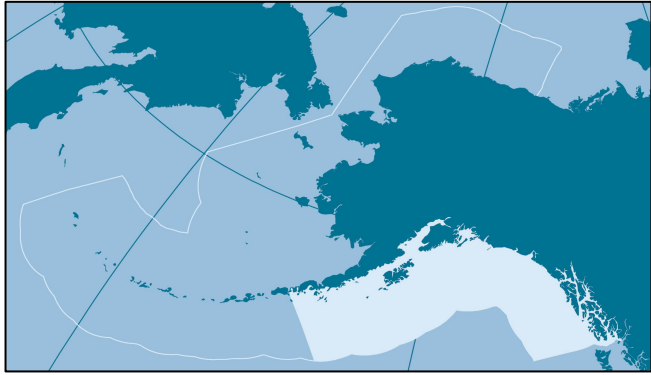
Dr. Bridget Ferriss (Gulf of Alaska)

Dr. Ivonne Ortiz (Aleutian Islands)

Ecosystem Status Reports

Using the best ecosystem information available to manage federal fisheries in Alaska, ensuring sustainable fisheries and marine ecosystems now and into the future

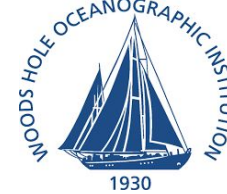
- Synthesis of ecosystem status by region
- Reviewed in tandem with stock assessments through the annual fisheries management process



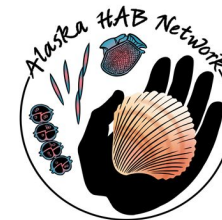
2021 Ecosystem Status Reports



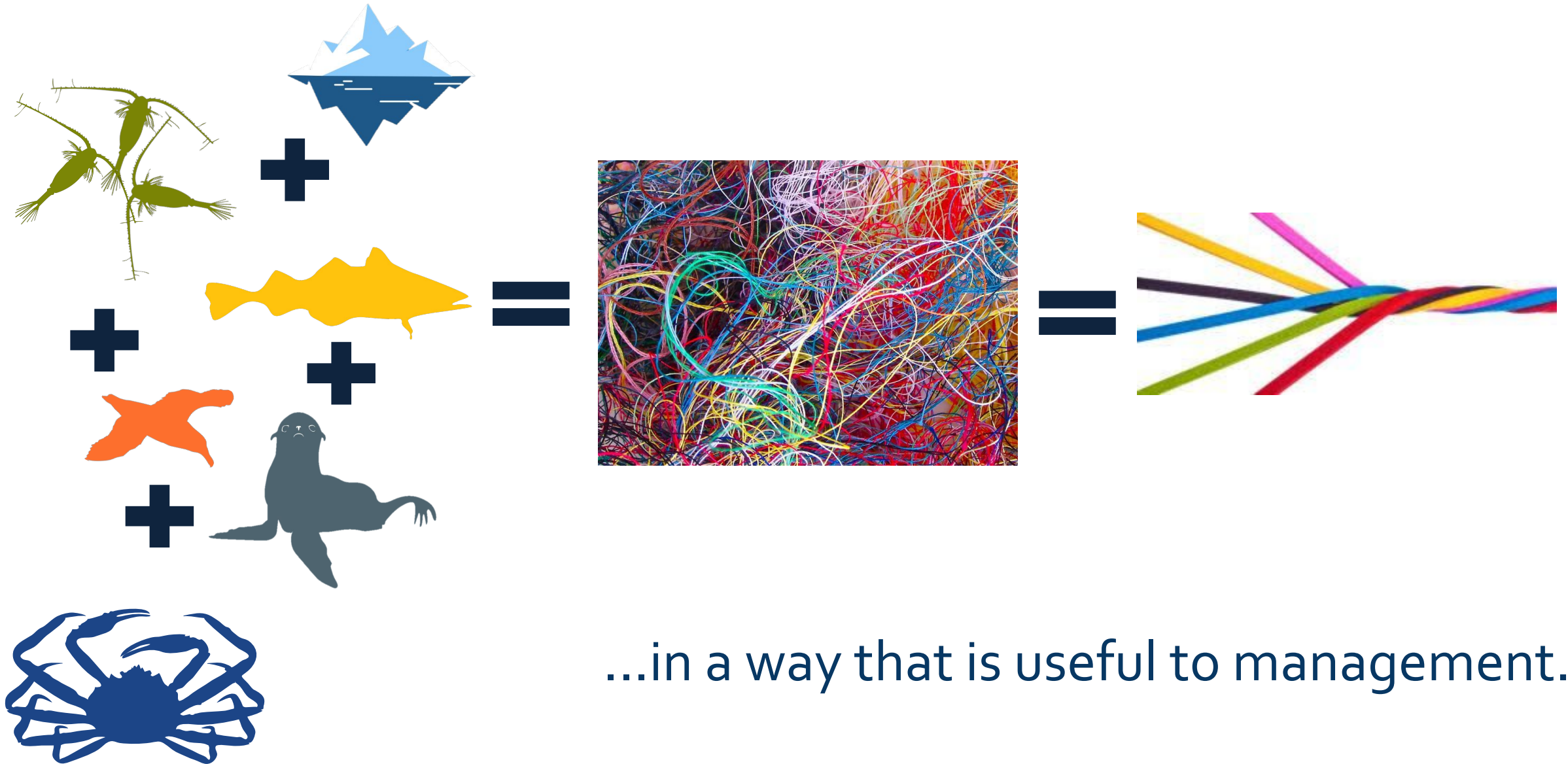
**NOAA
FISHERIES**



COAST



Our job is to synthesize all of the individual pieces...

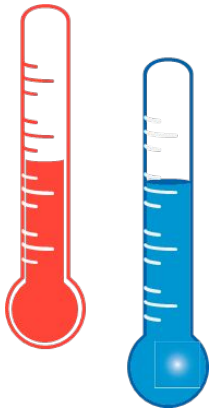


...in a way that is useful to management.

Ecosystem Based Fisheries Management (EBFM) in Alaska



- Communication, collaboration, and transparency build trust



- Science and management are being challenged by extreme environmental changes

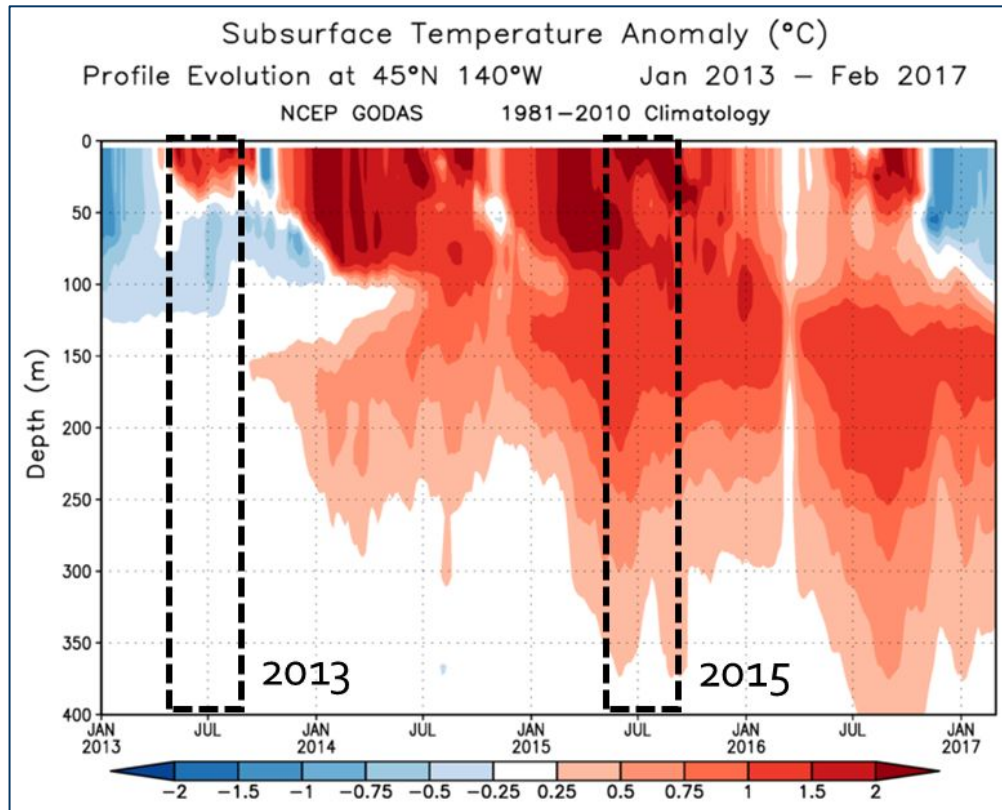


- Utilize survey information and modeling/forecasting tools to make real-time decisions

EBFM Example: 2017 Gulf of Alaska Pacific cod

2014-2016 Marine Heatwave ("The Blob")

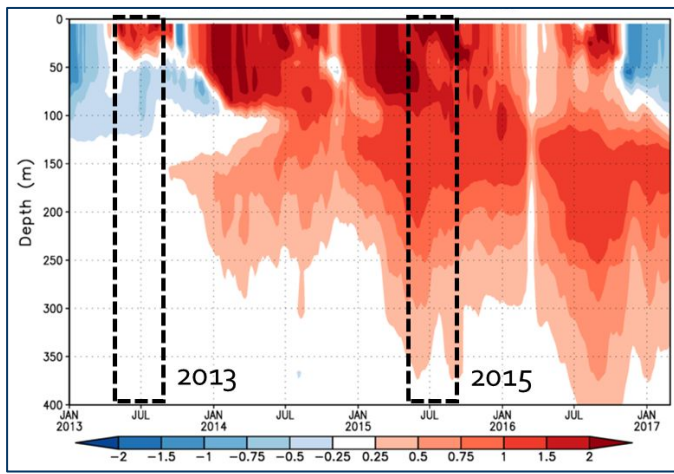
- Warm water persisted and deepened (endless summer)
- Pacific cod survey biomass **dropped 83%** from 2013 to 2017



Pacific cod had increased prey demands

Ecosystem Indicators suggested not enough food and high mortality:

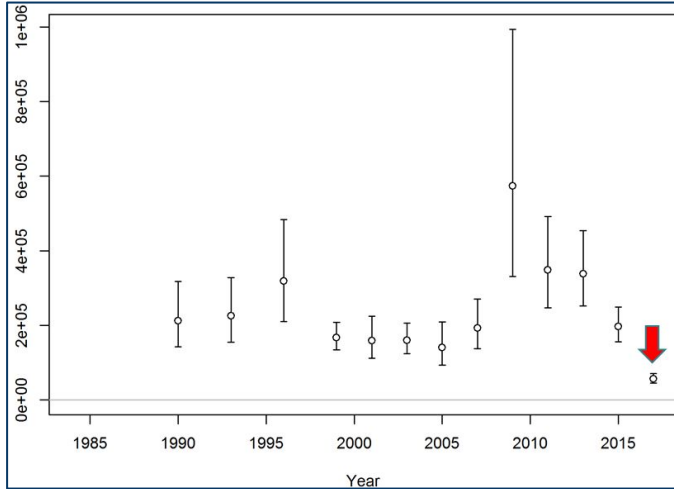
- Abundant, but small copepods
- Forage fish declines
- "Skinny" groundfish
- Seabird and whale die-offs and poor reproduction
- Sea lion population declines



2017 Gulf of Alaska Pacific cod

2017 stock assessment

Increased natural mortality parameter to reflect reduced prey and increased mortality



Scientific & Statistical Committee

"The SSC accepts this adjustment ... because of the **strong rationale presented by the author and the ecosystem group** in support of higher mortalities for the period 2015/2016."



Council

Quota was reduced; consideration of **ecosystem indicators** impacted management decisions

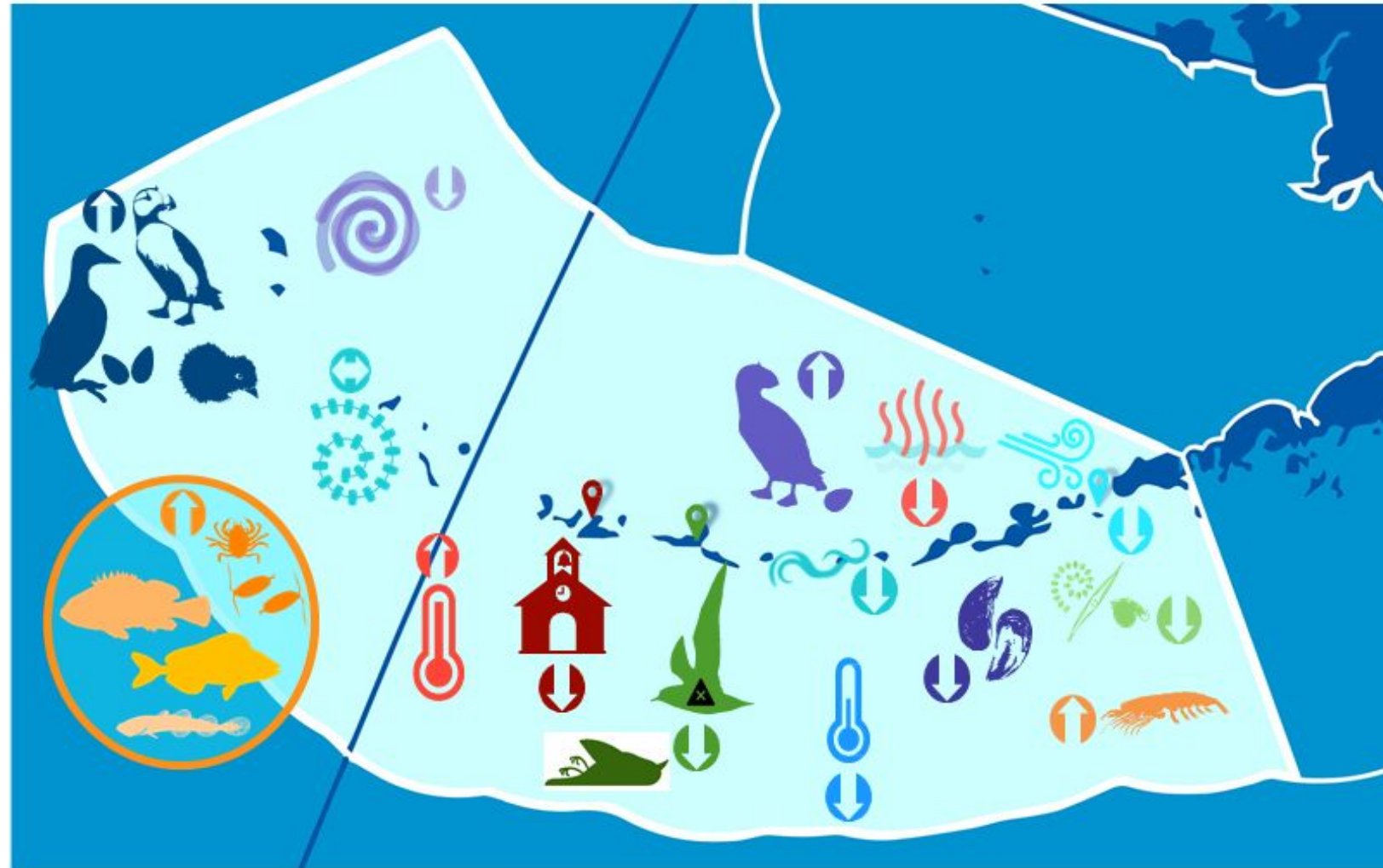
2021 Gulf of Alaska

- 2nd consecutive year without a marine heatwave; La Niña (cooler) conditions predicted to continue in 2022
- Mixed trends in the prey base
 - **Shrimp** and copepods
 - **Forage** fish
- Adult salmon returns improved from 2020 (**pink salmon**)
- **Multi-year trends**
 - Some populations remain reduced since the 2014-2016 and 2019 marine heatwaves



2021 Aleutian Islands

- Record high sea surface temperature (SST) in the western and central Aleutian Islands
- Most **seabirds** had above average reproduction
- **Multi-year trends**
 - Low eddy activity which impacts productivity and transport
 - Increased SSTs since 2013/2014



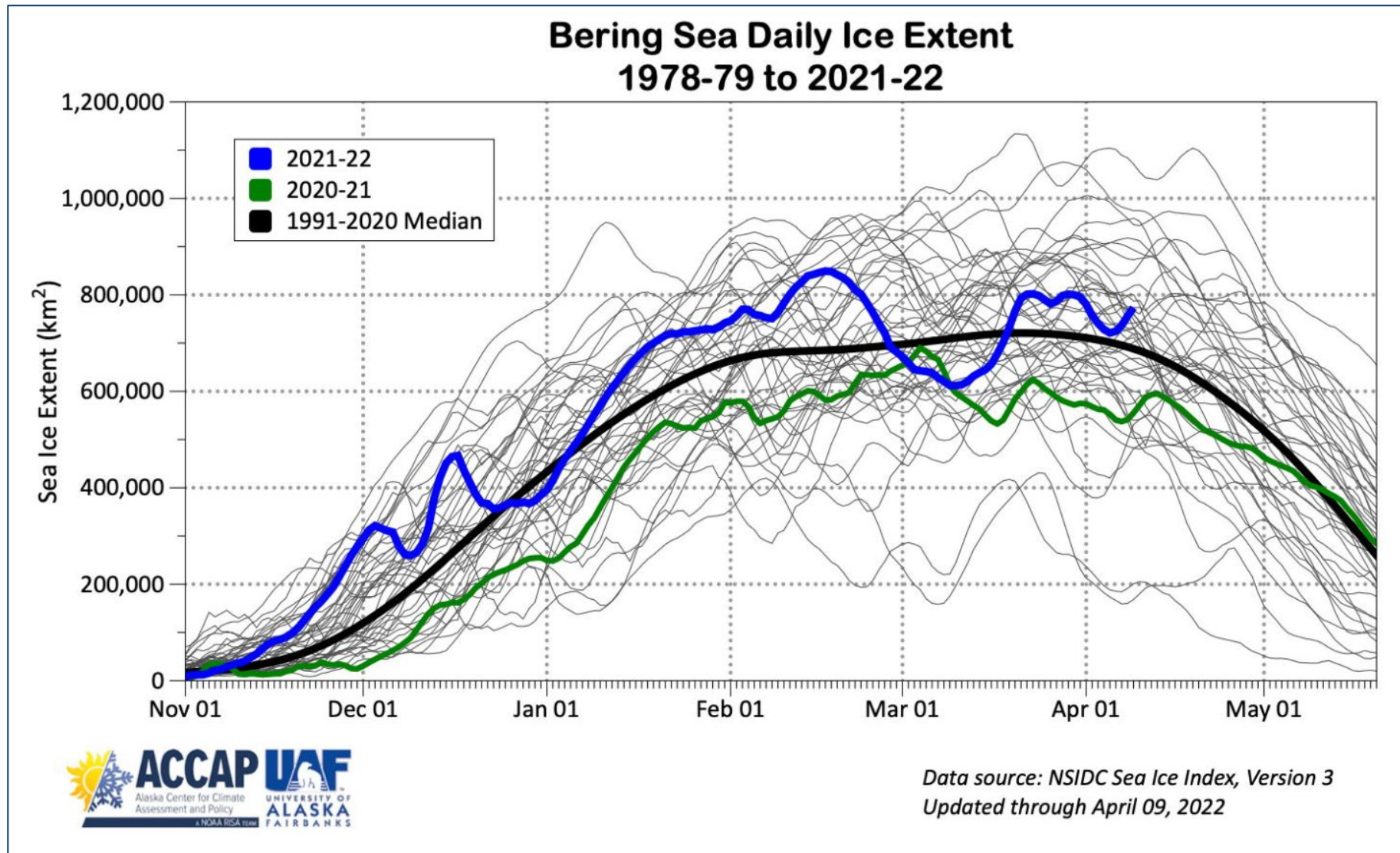
Current SST and Marine Heatwave conditions for all regions can be found here: <https://shinyfin.psmfc.org/ak-sst-mhw/>

2021 Eastern Bering Sea

- Persistent warm phase since 2014
- Unprecedented low sea ice in winters 2017/2018 and 2018/2019
- **Snow crab population declines in the north**
- **Tanner and Red King Crab declines in the south**
- Salmon run failures in the AYK region
- **Banner year for Bristol Bay sockeye**
- Seabird die-offs & reproductive failures in the northern Bering Sea and Bering Strait region

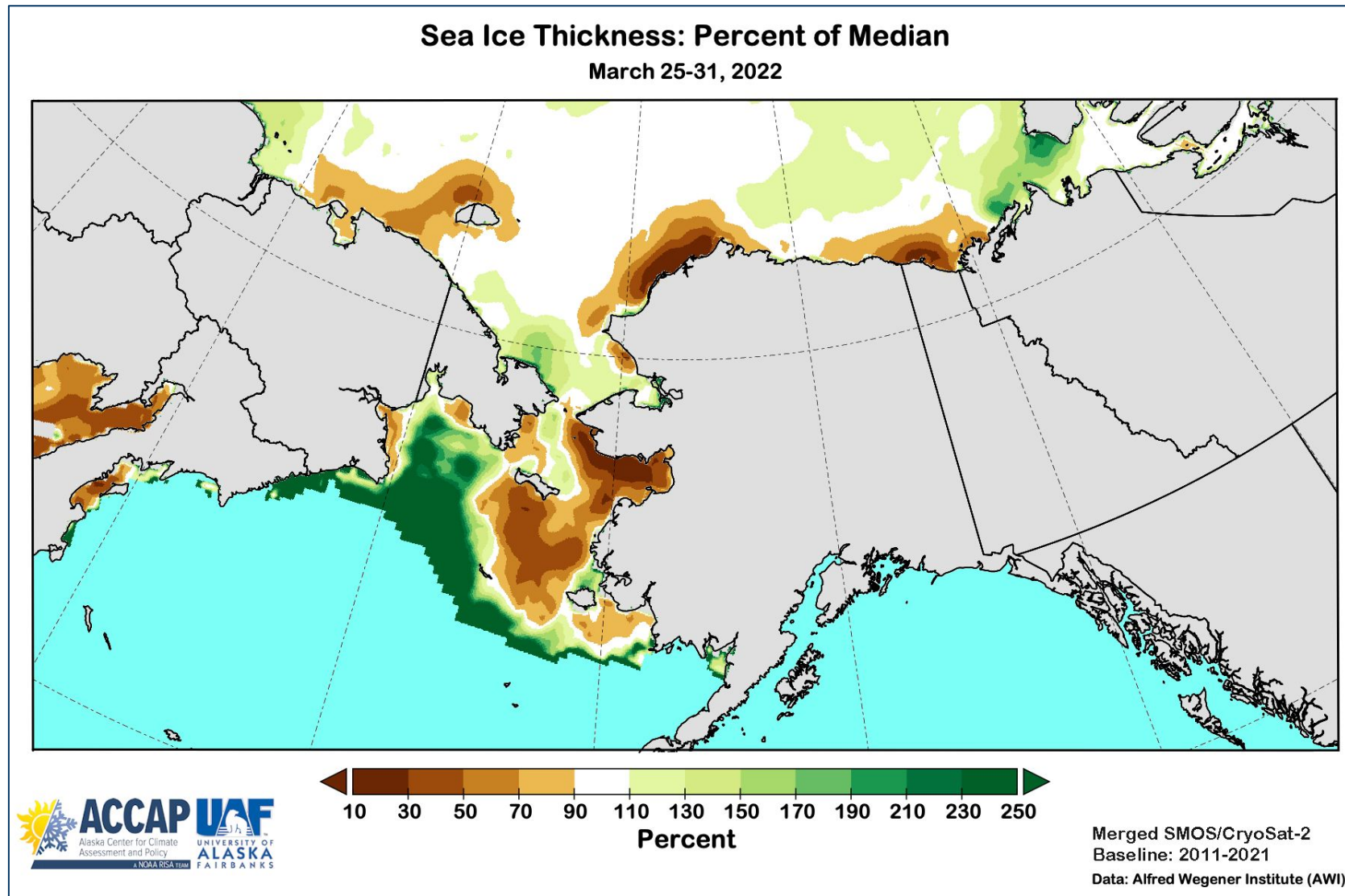


Winter 2021/2022 sea ice extent



Graphic courtesy Rick Thoman, UAF

Winter 2021/2022 sea ice thickness

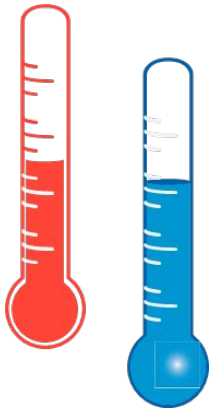


Graphic courtesy Rick Thoman, UAF

EBFM in Alaska:



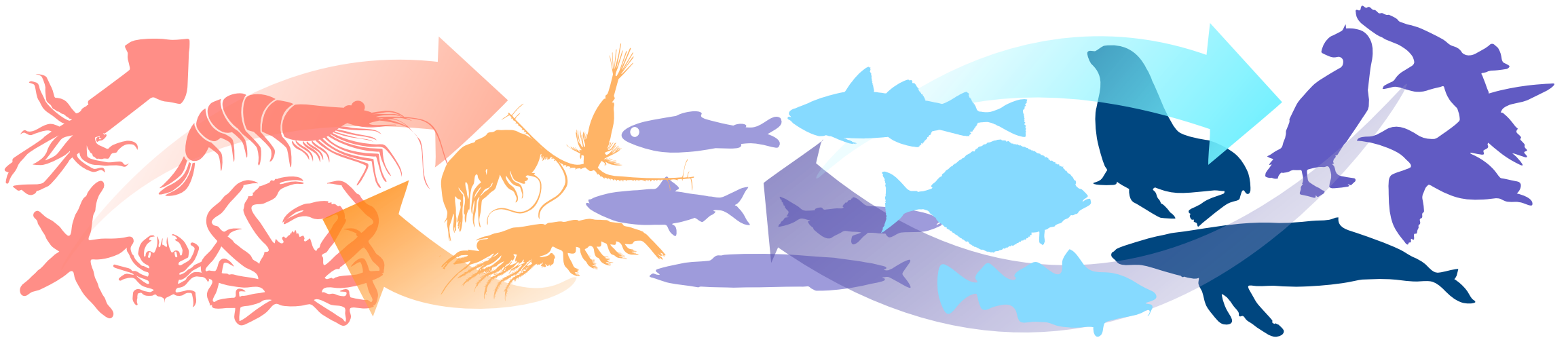
- Communication, collaboration, and transparency build trust



- Science and management are being challenged by extreme environmental changes



- Utilize survey information and modeling/forecasting tools to make real-time decisions



For more information, please visit:

2021 Reports:

<https://www.fisheries.noaa.gov/feature-story/noaa-releases-2021-ecosystem-status-reports-eastern-bering-sea-gulf-alaska-and>

Ecosystem Status Report video:

https://players.brightcove.net/659677166001/4b3c8a9e-7bf7-43dd-b693-2614cc1ed6b7_default/index.html?videoId=6287018070001

Archived Reports:

<https://www.fisheries.noaa.gov/alaska/ecosystems/ecosystem-status-reports-gulf-alaska-bering-sea-and-a-leutian-islands>

Social science research on Alaskan coastal communities under climate change





Who are we and what do we do?

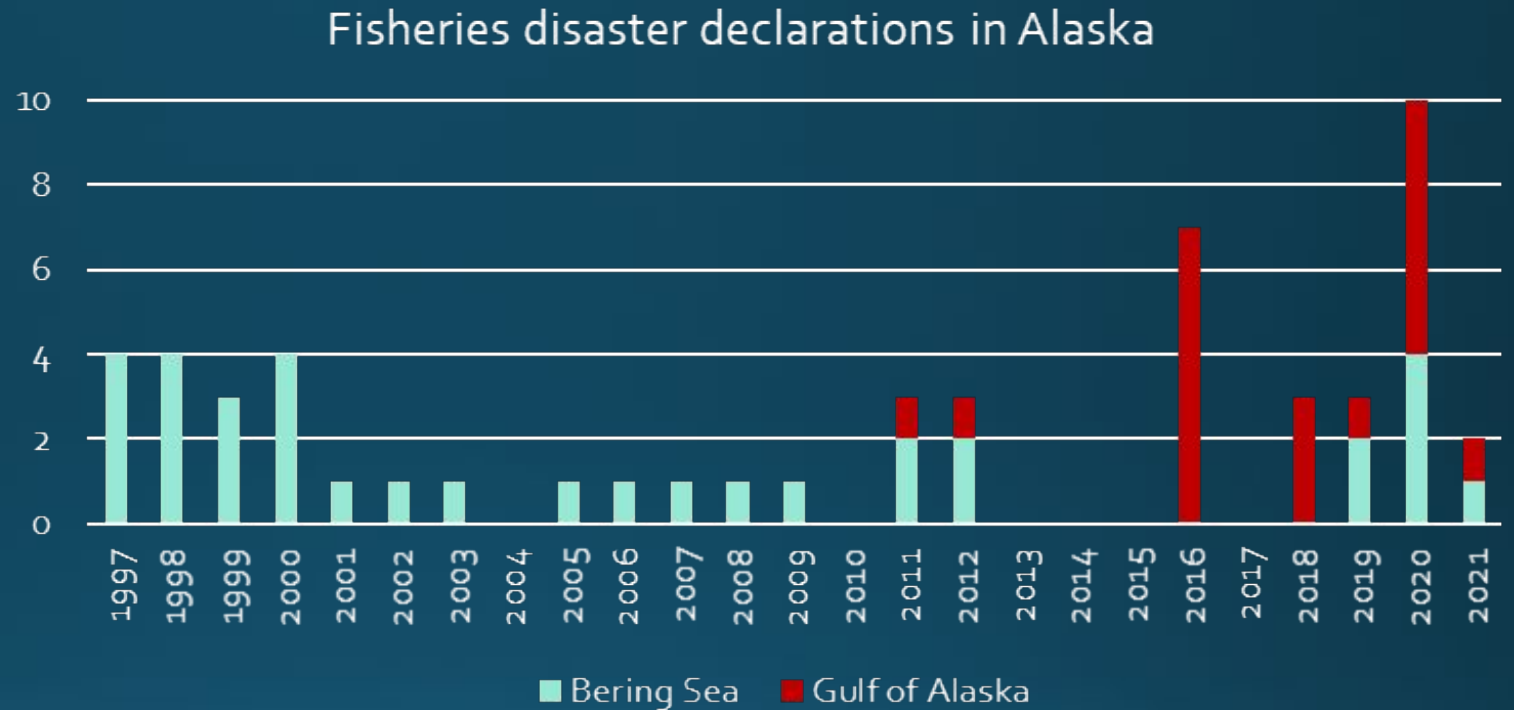
- Economic and Social Sciences Research Program
 - 10 FTEs and 10 contract employees
 - Provide economic and sociocultural information that will assist NMFS in meeting its stewardship responsibilities
- National Standards of Magnuson Stevens Act
 - *Principles that must be followed in any fishery management plan to ensure sustainable and responsible fishery management.*
 - *National Standard 8 - Communities*
 - *Conservation and management measures shall...take into account the importance of fishery resources to fishing communities by utilizing economic and social data...in order to (a) provide for the sustained participation of such communities, and (b) to the extent practicable, minimize adverse economic impacts on such communities.*

Social Change in Alaska's Coastal Communities

Social Changes

- Spatial shifts in commercial fleets
- Change in subsistence practice
- Increased maritime risks
- Increased shipping (300%)
- Fisheries disasters and downturns
- Revenue losses and multiplier impacts

cultural loss, psychological impacts, well-being effects



Fisheries disasters increase substantially following the Blob



How do we inform NOAA Fisheries with best available social science given this complexity?



Annual Economic and
Community Engagement and
Participation Reports

Integrated Ecosystem
Assessments (IEAs)



Climate Integrated
Modeling Projects (ACLIM
and GOACLIM)

Other Economic and
Sociocultural Research

Gulf of Alaska Climate Integrated Modeling Socioeconomics



- Interdisciplinary project focused on climate projections on fisheries and socioeconomic impacts
- *How will changing marine conditions in the Gulf affect fisheries?*
- *How will those changes impact fishermen and fishing communities?*
- *How can fishermen adapt to changing conditions?*

Research examining Climate Change Perceptions and Adaptations in the Gulf of Alaska

- How do fishermen perceive climate impacts on their fisheries and their adaptive capacity?
 - Commercial fishermen across the Gulf of Alaska
 - Interviews and workshops with fishermen
- Three major themes of discussion:
 - Ecosystem changes
 - Responses to those changes
 - Broader adaptation needs



Fishermen are on the frontlines of climate change

- Most prominent ecosystem changes of concern
 - Smaller fish, fewer fish, ocean acidification (OA)
 - Cumulative impacts and uncertainty in the system
- Shifting baselines of stock health, fish health, and economic opportunities in fisheries
- Economic losses are just one impact:
 - More severe weather, more risk taking > safety and physical well-being
 - Making up for income loss in other fisheries, other jobs > more time away from family
 - Mental stress

Smaller fish	Warming waters	Less food in the system
Greater stock variability	Timing and strength of runs is less predictable	Poorer fish quality
More powerful storms	Shifting seasons	More precipitation variability
Algae and jellyfish that plug nets	Fish migration offshore	Ocean acidification

Adaptation happens on a spectrum

Reactive change
Short-term perspective

Proactive change
Long-term perspective

Remain

"Business as usual"

Maintain current
fishing practices

Maintain current
management
regimes

Cope

React to maintain status quo

Follow the fish

Supplement income

Adapt

Increase flexibility

Diversify fisheries
and livelihood

Develop new
fisheries and
markets

Transform

Systemic change

Invest in workforce
development and
working waterfronts

Develop new
industries

Adaptation happens on a spectrum

Reactive change
Short-term perspective

Reactive, coping strategies happening
now can impede resilience planning
into the future

Proactive change
Long-term perspective

Remain

"Business as usual"

Maintain current
fishing practices

Maintain current
management
regimes

Cope

React to maintain status quo

Fish deeper, farther,
and different areas

Crewing

Temporary work

Adjust TACs, close
areas, close fisheries

Adapt

Increase flexibility

Diversify fisheries
and livelihood

Develop new
fisheries and
markets

Transform

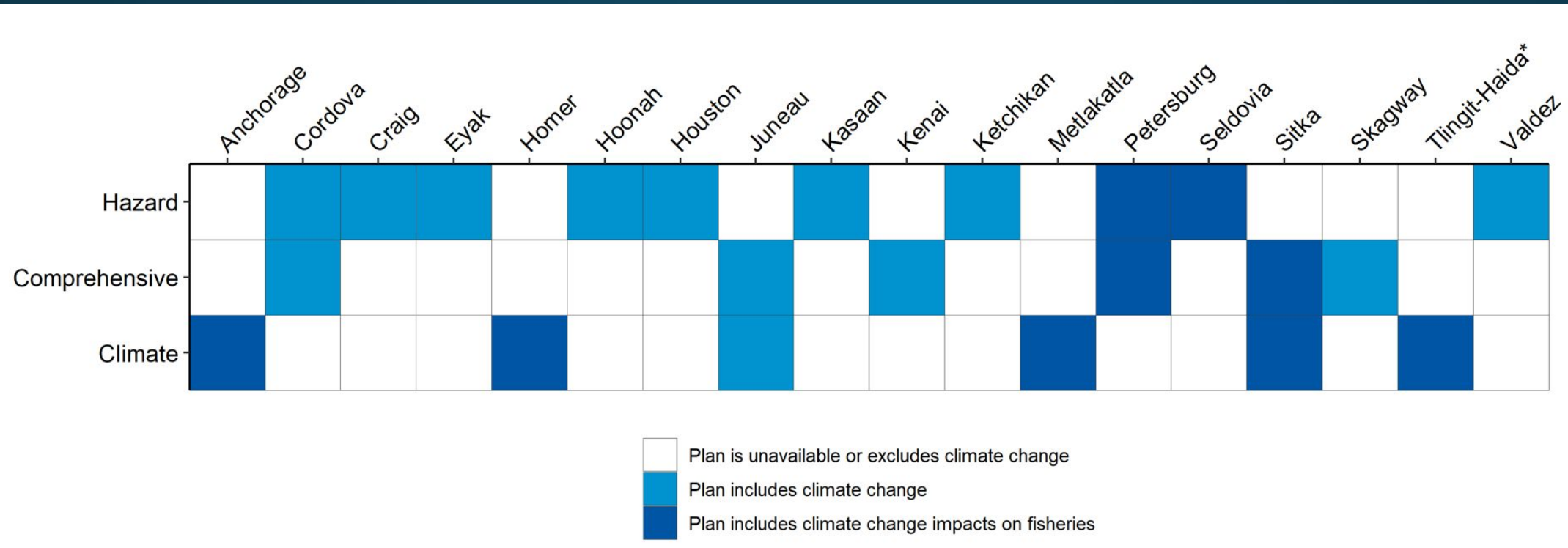
Systemic change

Invest in workforce
development and
working waterfronts

Develop new
industries

Adaptation planning for Gulf of Alaska communities is strikingly absent

- Very limited discourse about climate impacts on fisheries
 - Only six community and Tribal entities have formal climate plans in the Gulf
- Some hazard plans have integrated climate change as a formal hazard
 - But still very limited discourse on fisheries impacts



What do fishermen need to build resilience?

- Clear, continuous, and collaborative science
- Venues and networks for climate discourse
- Funding for:
 - Small-scale, localized resilience efforts
 - Vessel upgrades, fishing loans, habitat efforts
- Expedited policymaking and flexibility
 - Range shifts, emergent fisheries, and mariculture
- Consistency and predictability in:
 - Allocations and regulations
- Maintained, upgraded, and diversified working waterfronts
- Support services, skilled trades and workforce development



Summary points



- Climate change is fundamentally altering economic and sociocultural relationships of Alaskans to their marine ecosystems.
- Without planning, fishermen and fisheries systems are largely coping with those changes.
- Coping can impede future adaptation.
- Planning for resilience needs to and can happen now.

A photograph of a harbor filled with numerous fishing boats, their masts and rigging silhouetted against a sunset sky. The water reflects the boats and the colorful sky. In the background, snow-capped mountains are visible.

**Thank you to all the fishermen across the Gulf
of Alaska who have shared their experiences
with us.**

**Acknowledgements: Sarah Wise, Andrew Steinkruger, Katie Latanich, Alan Haynie, Chang
Seung, Steve Kasperski, Adam Hayes**

**Marysia Szymkowiak
marysia.szymkowiak@noaa.gov**

Please visit our website to see our 2021 Year in Review

<https://www.fisheries.noaa.gov/alaska/2021-alaska-fisheries-science-center-year-review>

Thank You!

