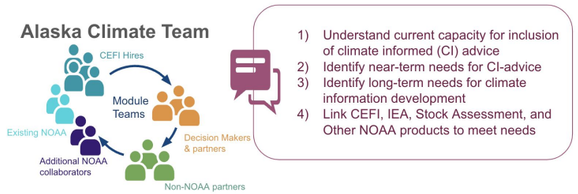
What is the ACT?

The ACT is the Alaska CEFI Regional Decision Support Team. The Alaska Climate CEFI Team (ACT), established in fall 2021, and expanding to include new members and partner liaisons in 2024, guides regional development of publicly accessible CEFI tools and products to support climate-informed advice and adaptation planning.

Regional Decision Support Teams

Regional Decision Support Teams produce climate-related information and advice for effective management of fisheries, ecosystems, and protected species and industry, and community adaptation planning. They operate through NOAA's Regional Fisheries Science Centers to provide:

- Early warnings and projections of ecosystem conditions
- Risk assessments & scenario planning for fisheries and fishing communities
- Science support for climate-ready Ecosystem-Based Management



How will CEFI change advice?

Scientists from the Alaska Fisheries Science Center have been leading pilot projects such as the Alaska Climate Integrated Modeling project (ACLIM) and the Gulf of Alaska Integrated Modeling project (GOACLIM). These projects serve as prototypes for the decision support tools and advice that CEFI may support. They demonstrate improved model performance with climate linkages and provide integrated climate advice that considers climate changes, biological and ecosystem responses, and alternative management and adaptation options to support climate-smart Ecosystem-Based Management and thriving climate-resilient communities in Alaska. Advice is designed to provide climate information via the existing Council process and advice pathways.

More Information

CEFI Fact Sheet

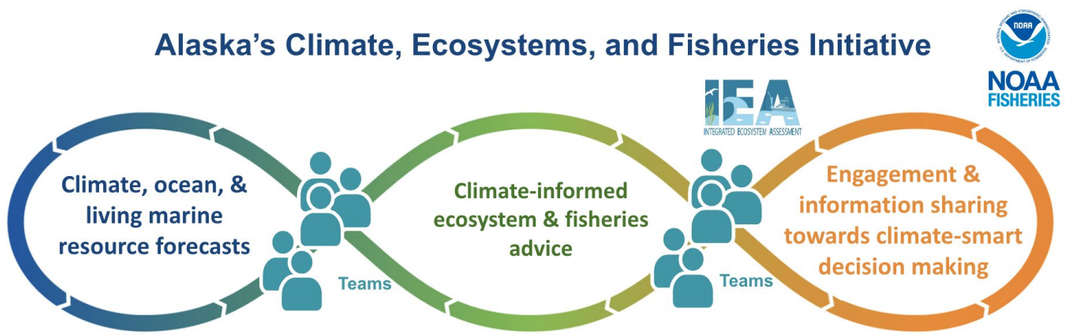
NOAA's Climate.gov

Alaska IEA Program

Questions? Email us!

Kirstin Holsman (ACT Lead),
kirstin.holsman@noaa.gov

Alaska's Climate, Ecosystems, and Fisheries Initiative



Gina M. Raimondo
U.S. Secretary of Commerce

Richard W. Spinrad
Under Secretary of Commerce for Oceans and Atmosphere

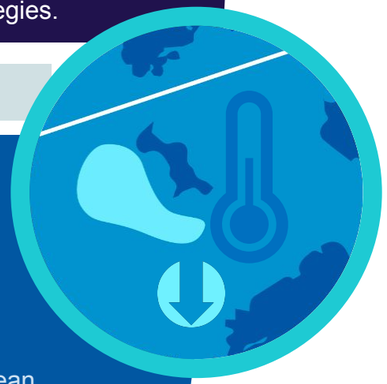
Janet Coit
Assistant Administrator for Fisheries

National Marine Fisheries Service
Alaska Fisheries Science Center
7600 Sand Point Way N.E., Seattle, WA 98115-6349
www.fisheries.noaa.gov

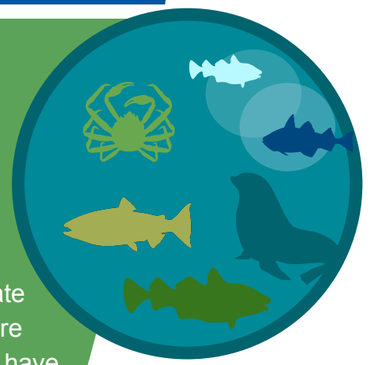
2024 Climate Science Update

ALASKA'S MARINE ECOSYSTEMS are undergoing climate-driven changes, including rising sea temperatures, shrinking sea ice, & shifts in ocean acidification & productivity, impacting species from snow crab to whales. Impacts on **FISHERIES & FISHING COMMUNITIES** have been widespread affecting economies, livelihoods, family structures, mental health, sharing networks, & food security. Future projections indicate further changes in species distributions, stock abundances, and ecosystem dynamics, requiring climate planning & adaptive, flexible, & ecosystem-based strategies.

CLIMATE IMPACTS: *2024 spotlight on the EBS*



TEMPERATURE RISE: SSTs in the Eastern Bering Sea have risen by 1.0°C to 1.5°C, with a further increase of 1.5°C to 3.0°C expected by century's end. **SEA ICE DECLINE:** Arctic sea ice has declined precipitously over the observed record from 1978 to present. Eastern Bering Sea ice has remained stable, but experienced unprecedented lows in this region in 2018 and 2019 that have been attributed to human-caused climate change. **OCEAN ACIDIFICATION:** Global ocean surface pH has dropped by 0.1 units since 1750, with a further decline of 0.1 - 0.3 projected for the Bering Sea by the end of the century.



PACIFIC COD: Marine Heatwaves (MHW) were associated with a rapid redistribution of roughly half of Pacific cod biomass into the N. Bering Sea (NBS) in 2018 - 2019 as well as declines in biomass and recruitment. Future warming may push Pacific cod further north, expanding spawning habitat but potentially altering NBS carrying capacity. **SNOW CRAB** have also collapsed in response to marine heatwaves, & future warming is expected to further amplify impacts. Several WESTERN ALASKA **SALMON** stocks have declined in recent years, potentially linked to climate change, though impacts across across freshwater & marine life histories are complex. In contrast, Bristol Bay **SOCKEYE SALMON** & **SABLEFISH** have had increased abundance under warming conditions. The exact reasons for these divergent responses across species and stocks are still being evaluated.

CEFI: The Climate, Ecosystems, & Fisheries Initiative is a **cross-NOAA** effort to build the to build ocean modeling capacity & provide science support needed to allow management & resource users to adapt to changing ocean conditions. CEFI aims to provide: (1) **Robust forecasts** , decadal predictions, and long-term projections of ocean conditions; (2) **Publicly available** climate-linked early warnings, climate-enhanced stock, ecosystem, & risk assessments, & evaluations of climate-robust management response; (3) Increased capacity to provide **climate- informed advice** to support long-term sustainability & resilience.

NOAA FISHERIES
Alaska Fisheries Science Center

What we are planning & what we will do

Oceanographic

Region-specific oceanographic products will be developed for public use to support climate change adaptation. This includes the current Bering10K Regional Ocean Modeling System (ROMS) and the advanced Modular Ocean Model 6 (MOM6). These high resolution, three dimensional ocean models effectively simulate past ocean conditions and lower trophic level dynamics, from phytoplankton to krill, and are instrumental in forecasting future changes.

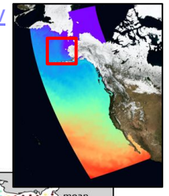
Hindcasts: hindcasts are a powerful tool for reconstructing the climate and environmental conditions of the recent past. Through CEFI, hincasts will be produced to recreate the oceanic and sea ice states over the past several decades. The ACT will evaluate the accuracy of these reconstructions by comparing them with historical ocean observations. Once validated, these model outputs will provide continuous data on ocean conditions from seabed to the surface. This information will enhance understanding of the ocean dynamics during different fishing and harvest seasons, and will help identify the drivers of species population changes, spatial shifts, and broader ecosystem responses to warming and marine heatwaves.

Forecasts: Forecasts from the same models will be updated each season to provide neartem projections of ocean conditions one to twelve months out.

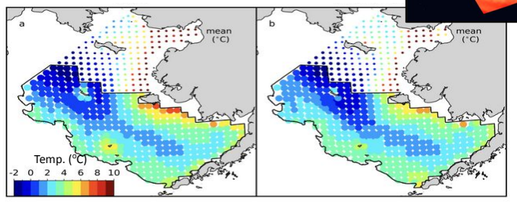
Decadal predictions will provide data-driven outlook of potential ocean conditions up to 10 years into the future.

Long-term projections under high and low warming scenarios will deliver detailed information to support risk analyses and climate adaptation planning.

Kelly Kearney, kelly.kearney@noaa.gov
Wei Cheng, wei.cheng@noaa.gov



MOM6 Bering Sea Cold Pool



Model NMFS trawl survey

Biological

Develop dynamic climate-informed **multispecies distribution models** for Bering Sea groundfish, crab, and marine mammal species.

Assess **changes in spatial overlap** among species based on range projections under various climate scenarios.

Elizabeth McHuron, liz.mchuron@noaa.gov
Maurice Goodman, goodmm2@uw.edu

Link models and use ensemble approaches to quantify relationships between climate-ecosystem variables and **population dynamics** across fish species.

Identify best practices for selecting which climate-ecosystem variables can help predict stock dynamics.

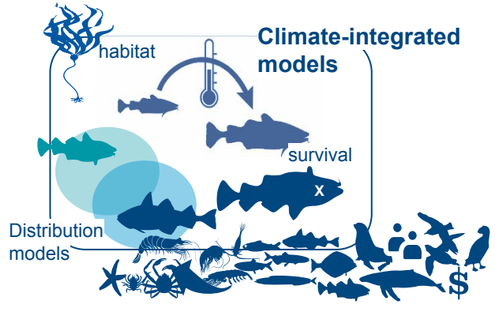
Jennifer Bigman, jennifer.bigman@noaa.gov
Grant Adams, grant.adams@noaa.gov
André Punt, aepunt@uw.edu

Develop **climate-linked harvest control rules** to determine ABC buffers for the North Pacific Fisheries Management Council.

Develop software to produce climate-informed short-term **growth and mortality forecasts** for NPFMC harvest control rules.

Support **climate-informed stock assessments and multispecies models** for groundfish in the Gulf of Alaska and Bering Sea.

Grant Adams, grant.adams@noaa.gov
Kirstin Holsman, kirstin.holsman@noaa.gov
André Punt, aepunt@uw.edu



What we are planning & what we will do

Social & Economic

Develop **social hindcast methodology** with pilot of community responses to climate-induced changes in Alaska fisheries (2018-2023) to better understand community adaptation strategies.

Identify possible **social indicators** using existing data sources to detect and monitor the effects of climate-induced changes associated with resilience and vulnerability of Alaska fishing communities.

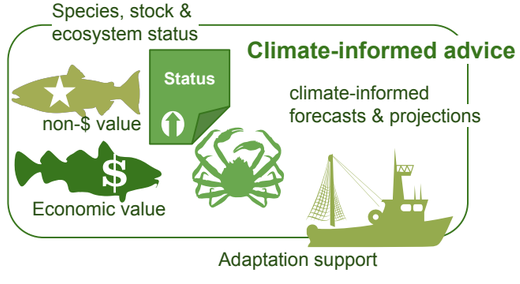
Support development of **publicly accessible, collaborative tools** allowing communities to view CEFI information products on climate-induced shifts in species distributions and ecological and oceanographic conditions.

Explore **pathways and examine barriers** for utilizing social and economic information to inform Council decision-making on climate resilient fisheries management.

Angela Abolhassani, angela.abolhassani@noaa.gov
Sarah Wise, sarah.wise@noaa.gov

Collaboratively identify drivers of Yukon River Chinook salmon marine survival using ROMS ocean temperature outputs, wind hindcasts, and Traditional Knowledge in partnership with the Yukon River Drainage Fisheries Association.

Ellen Yasumiishi, ellen.yasumiishi@noaa.gov
Sarah Wise, sarah.wise@noaa.gov



Council Coordination

In coordination with the Council points of contact, develop a process for **regular reporting of climate change impacts and responses to the Council** through existing pathways (or “on-ramps”). Fisheries Initiative (CEFI) potential projects and outputs could also help support the Council's climate readiness planning. This information will highlight current and proposed synergies between CEFI products and Council planning. Coordination on the development of these products will involve collaboration among the Council, NOAA’s Alaska CEFI team (ACT) and partners, and the Alaska Fisheries Information Network.

Facilitate Council planning for climate change impacts on fisheries and fishing communities in Alaska through iterative discussions, workshops, information reporting, and synthesis of medium to long-term impacts on Alaska marine ecosystems. Support management strategy evaluations (MSEs) to evaluate the performance of alternative management measures and assessments under future climate scenarios.

Annual climate-informed advice: Develop interactive and publicly accessible resources for decision making and exploring tradeoffs in annual fisheries management decisions. Support climate-informed biological reference points and harvest control rules.

Rapid response: Support the development and delivery of tools to aid in-season management and navigate emergent climate challenges.

Jodi Pirtle, jodi.pirtle@noaa.gov
Jason Gasper, jason.gasper@noaa.gov
Anne Marie Eich, annemarie.eich@noaa.gov

Katie Latanich, katie.latanich@noaa.gov
Diana Stram, diana.stram@noaa.gov

Kirstin Holsman, kirstin.holsman@noaa.gov
Angela Abolhassani, angela.abolhassani@noaa.gov