# Tracking Change in the US Arctic

Ecosystems and Fisheries Oceanography Coordinated Investigations

GOMO Community Workshop | June 2023

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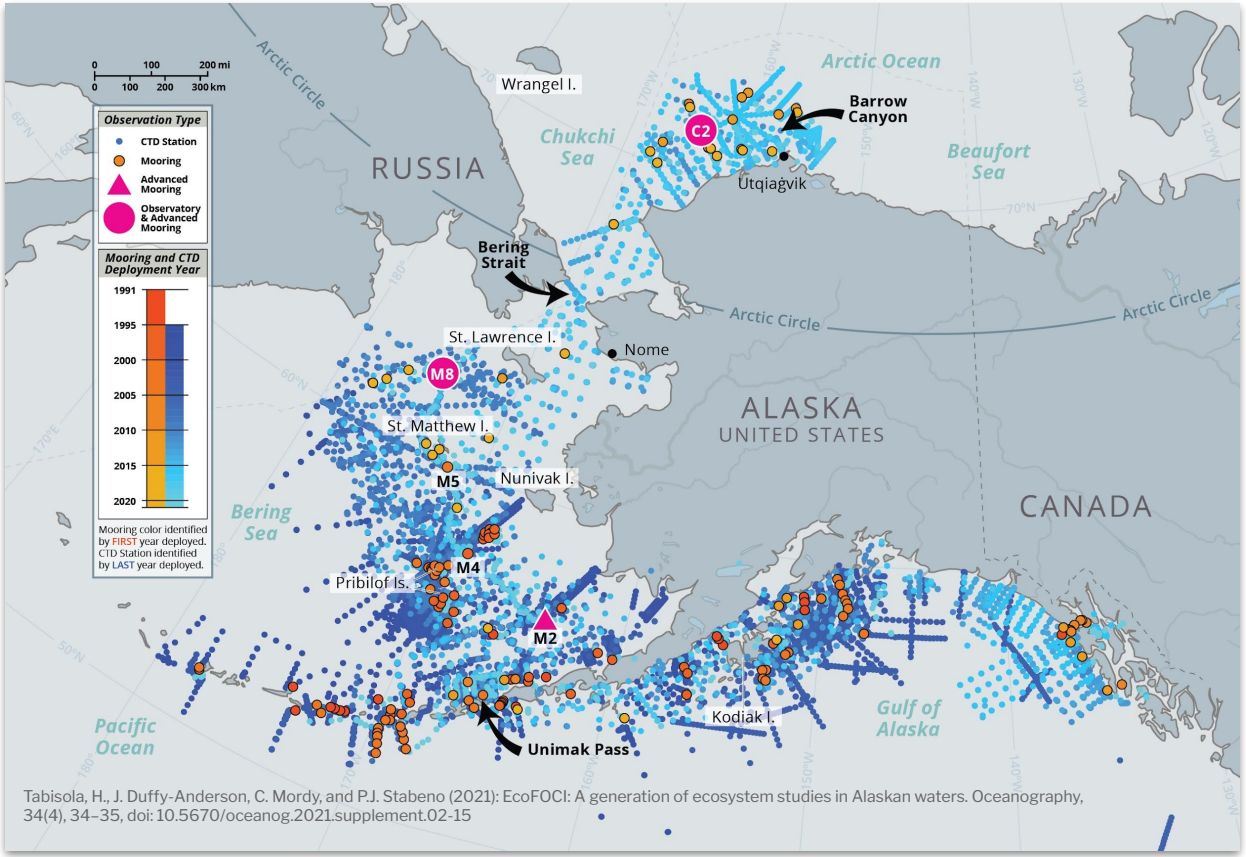


Tabisola, H., J. Duffy-Anderson, C. Mordy, and P.J. Stabeno (2021): EcoFOCI: A generation of ecosystem studies in Alaskan waters. Oceanography, 34(4), 34–35, doi: 10.5670/oceanog.2021.supplement.02-15


PMEL Pacific Marine Environmental Laboratory | CICOES | NOAA FISHERIES

Bering Sea:

M2

and

M8

Transition to observatories

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# *EcoFOCI uses moorings and shipboard surveys*

## **M2** *(1995 - present)*

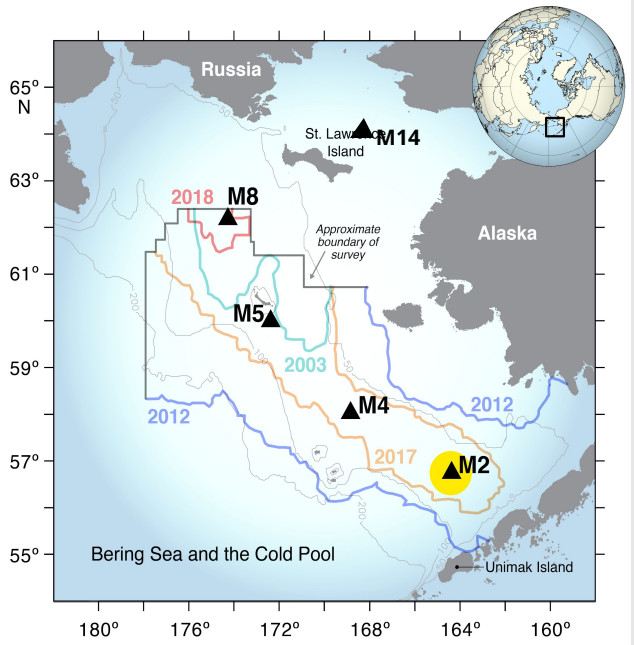
EcoFOCI: Variables: T, S, O2, chlorophyll fluorescence, nitrate, currents, meteorological data (summer)

Partners: Passive acoustics, eDNA, $CO_2$

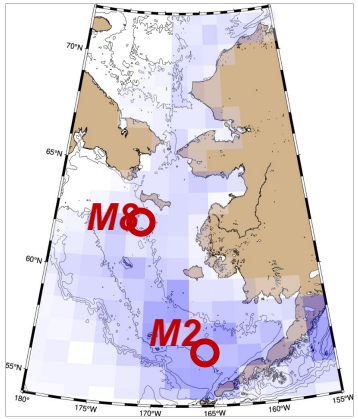
## **M8** *(2005 - present)*

EcoFOCI: Variables: temperature, salinity, O2, chlorophyll fluorescence, nitrate, currents

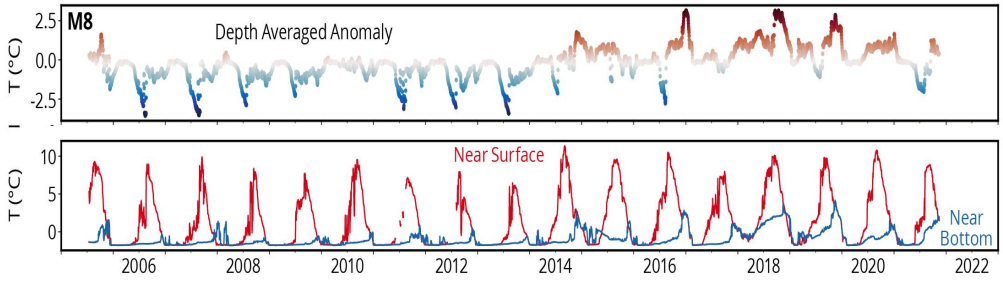
Partners: Passive acoustics, eDNA, sediment traps



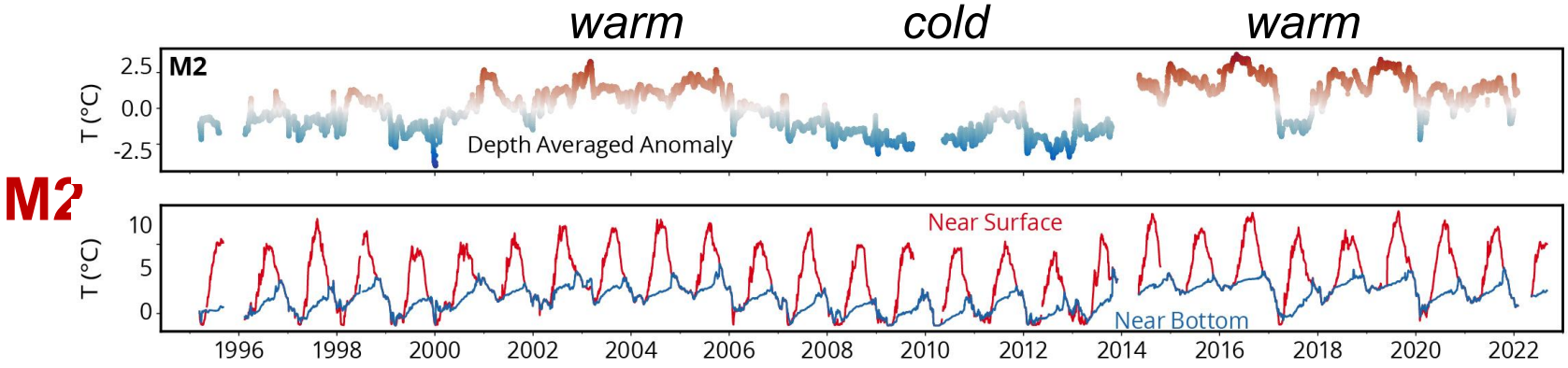
# Temperature at M2 and M8




M8




M2

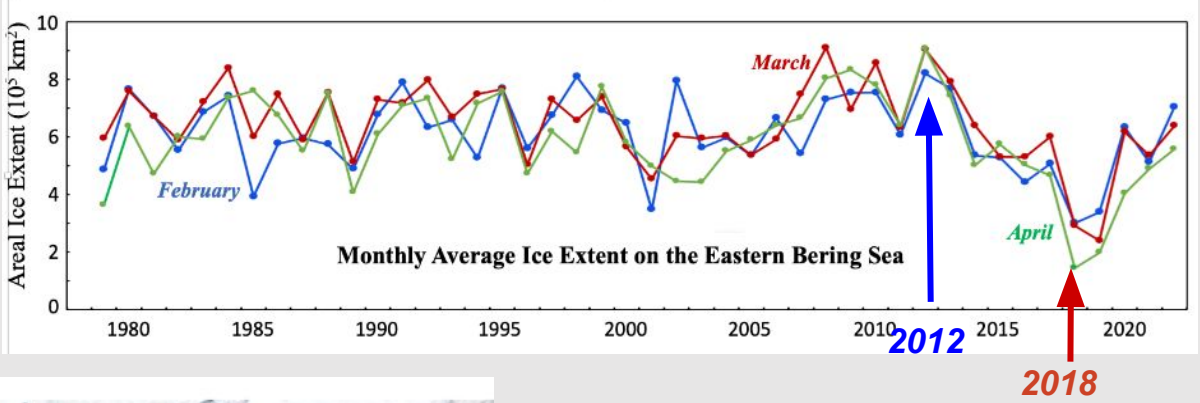


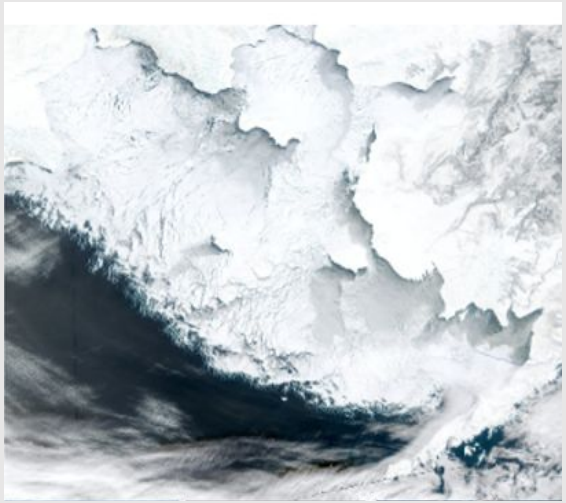
Cold pool

*versus*

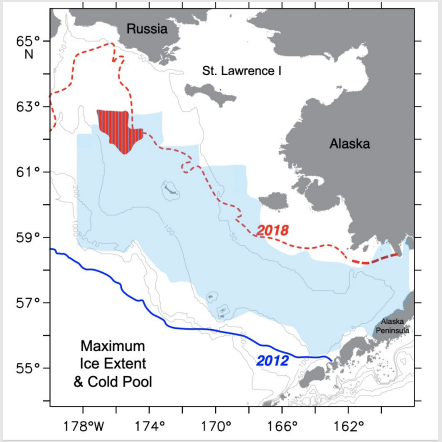
Cold puddle

# Understanding Implications of the Cold Pool - A Refuge, Barrier and Corridor



*A difference of ~700,000 km$^2$*

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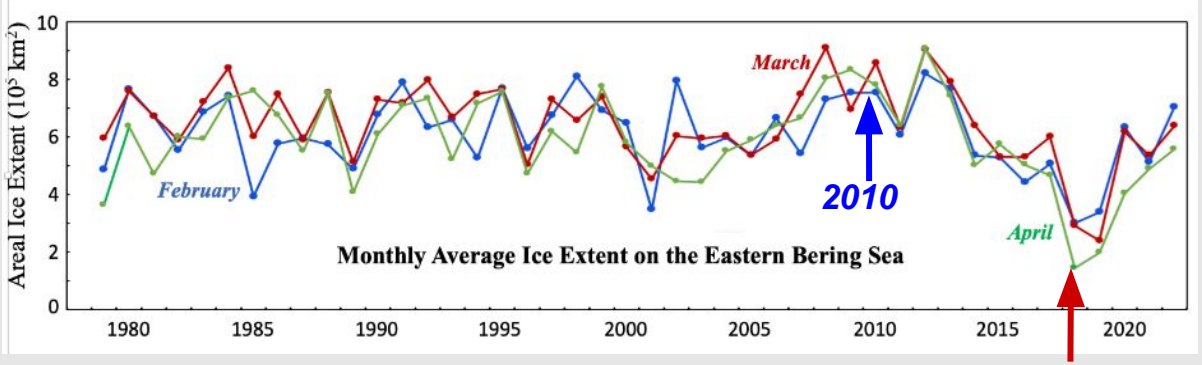
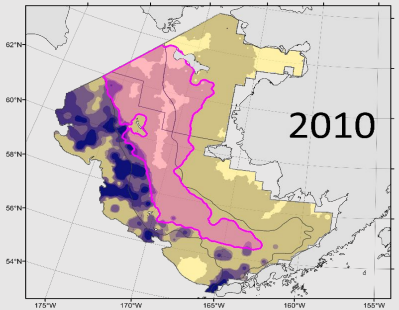
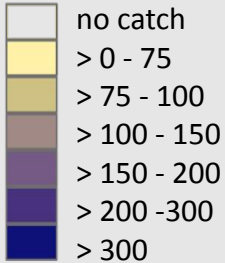
Implications of a shrinking cold pool

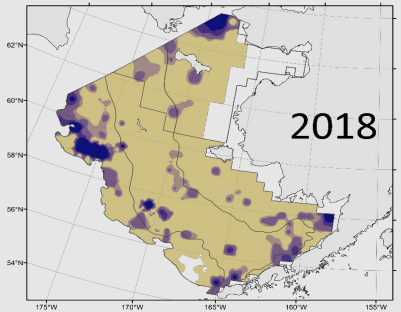
# Understanding Implications of the Cold Pool - A Refuge, Barrier and Corridor




Walleye Pollock (kg/ha)




*Lyle Britt, AFSC*

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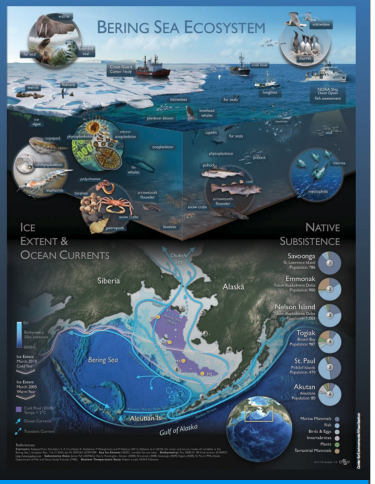
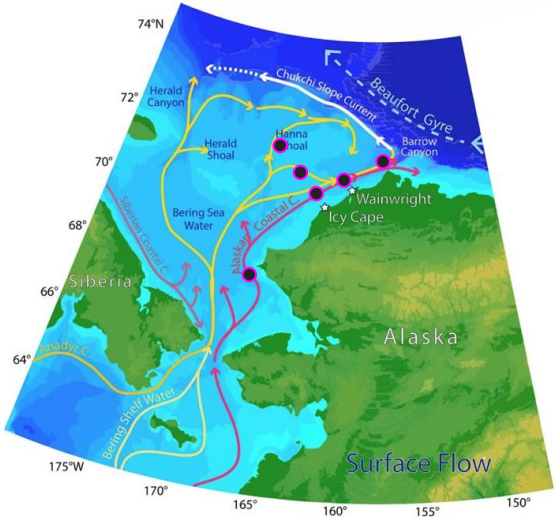
# Chukchi Sea:

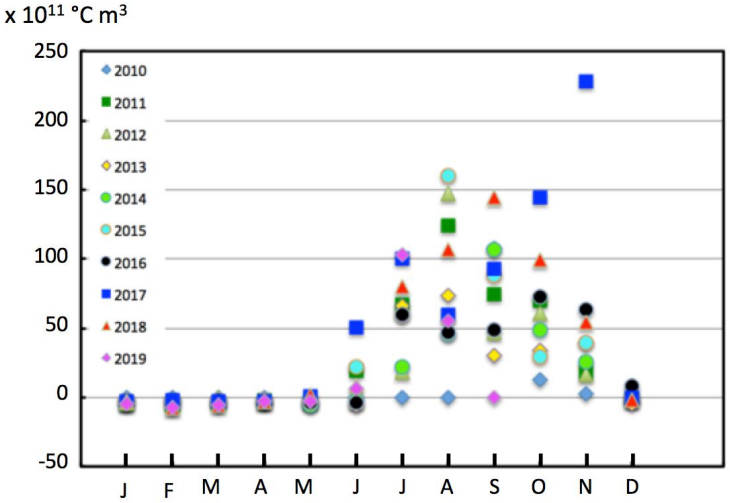
Heat Flux
&
Implications



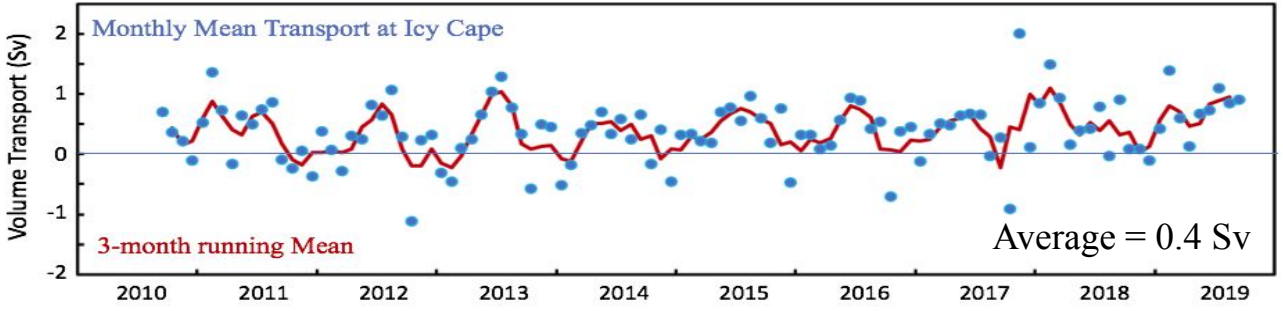

# Implications of Heat Flux into the Chukchi Sea




*6 long-term moorings*




…equivalent to an annual increase of ~0.5 °C to the top 100 m of the Beaufort Sea



# Products

The success of sustained observing by EcoFOCI provide the both essential and foundational data that support the new blue economy and a climate ready nation.

- Data | Distributed Biological Observatory
- Data | North Pacific Research Board - AIERP
- Data | Alaska Fisheries Science Center
- Analysis | North Pacific Fisheries Management Council
- Analysis | Preview of Ecosystem & Economic Conditions meetings
- Analysis | NOAA Arctic Report Card
- Analysis | Ecosystem Status Report
  - Eg.: 'Gross Primary Production at the M2 Mooring Site' Nielsen,et al. Ecosystem Status Report 2021: E. Bering Sea, Stock Assessment & Fishery Evaluation Report, N.P.Fishery Man.Council,
  - In 2022, scientists using EcoFOCI data (known) contributed to 16 topics across the LMEs
- Data & Analysis |Produce the bi-annual nowcast of the Bering Sea (provided to PEEC, NPFMC) & Long Term predictions (to 2100) in the Gulf of Alaska and Bering Sea as part of ACLIM; Data available at PMEL and National Centers for Environmental Information
- Publications | Scientific papers & Newsletters (e.g. PICES press)
- Communications | PMEL Web Stories
  - In 2022, EcoFOCI PMEL had 10 PMEL Web Page stories
- Communications | Fact Pages & Strait Science Series
- Outreach | Programs such as NOAA Science Camp
- Next-Generation Development | Internships
  - EcoFOCI hosted a NOAA College-supported Internship to support communications,
  - EcoFOCI hosted a NERTO student using ice data collected on EcoFOCI moorings
- Modeling - provide data for CEFI regional models (MOM6, ROMs) - Nowcasts and Forecasts

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- ## One interesting fact relevant to research, technology, region of study?

*Changing ecosystems are disproportionately affecting fishing communities and the people that rely on those fish. Food security due to fishery closures, Harmful Algal Blooms (HABs), and species migrations are all climate driven changes that are increasingly impacting these communities.*

- ## What is new? What is challenging? What is important?

*Ecosystem based fisheries management (EBFM) remains an elusive target due to limitations in both measurements and understanding of ecosystem dynamics. Despite reductions in support for field surveys, these observations of the ecosystem remain vital. A lack of observational data will only increase the uncertainty in fisheries management and further delay the realization of EBFM.*

- ## Implications and societal benefit of research

*We know that there are emerging challenges and opportunities in the Arctic that will impact all of us. As the waters warm and sea ice melts earlier in the year, the prolific ecosystems that inhabit the seabed are changing - from prey in the water and sediments to marine mammal and seabird consumers. EcoFOCI's long-term observational data collection provides foundational research beyond EcoFOCI to make informed management decisions and overall, a greater impact for NOAA.*

- ## Data Management & Access

*https://www.ecofoci.noaa.gov/data-links or contact phyllis.stabeno@noaa.gov* and shaun.bell@noaa.gov.

- ## Why should Congress fund your work?

*The Bering Sea produces 40% of all US Fisheries. Both the Bering and Chukchi Sea systems are changing rapidly with warming and the loss of sea ice. EcoFOCI is critical to understanding and providing time-sensitive information on climate impacts relevant to fisheries as the only collaborative, cross-line program that focuses on physics, chemistry, plankton, and juvenile fishes.*