

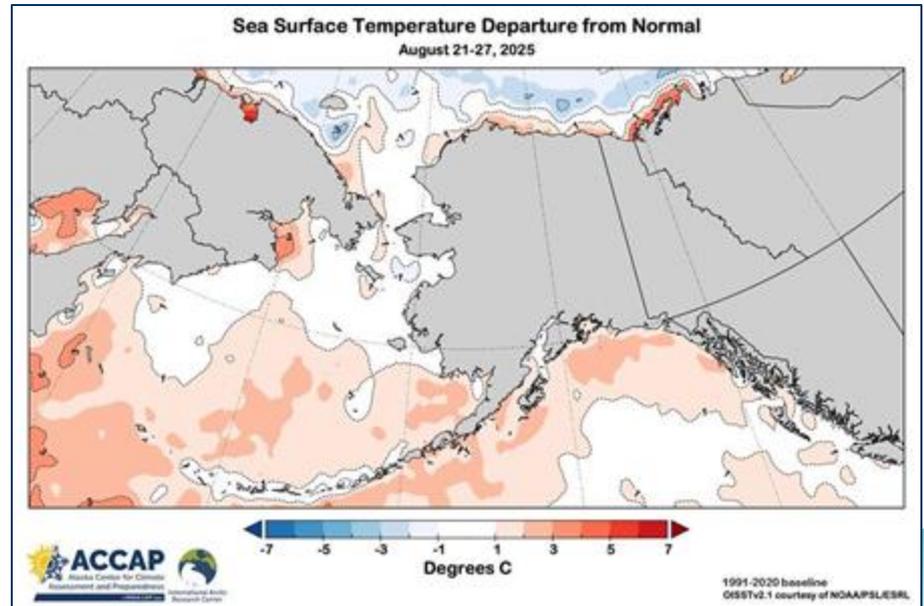
# Ecosystem Status Report

## Gulf of Alaska, Aleutian Islands, and Eastern Bering Sea Climate and Oceanography Update



Elizabeth Siddon  
Bridget Ferriss  
Ivonne Ortiz

NPFMC Groundfish Plan Team  
September 16, 2025



# Outline

## 1. ESRs and ESPs are complementary

## 2. Alaska-wide conditions

- Sea surface temperature and winds
- SST projections into 2026

## 3. Large Marine Ecosystem Conditions

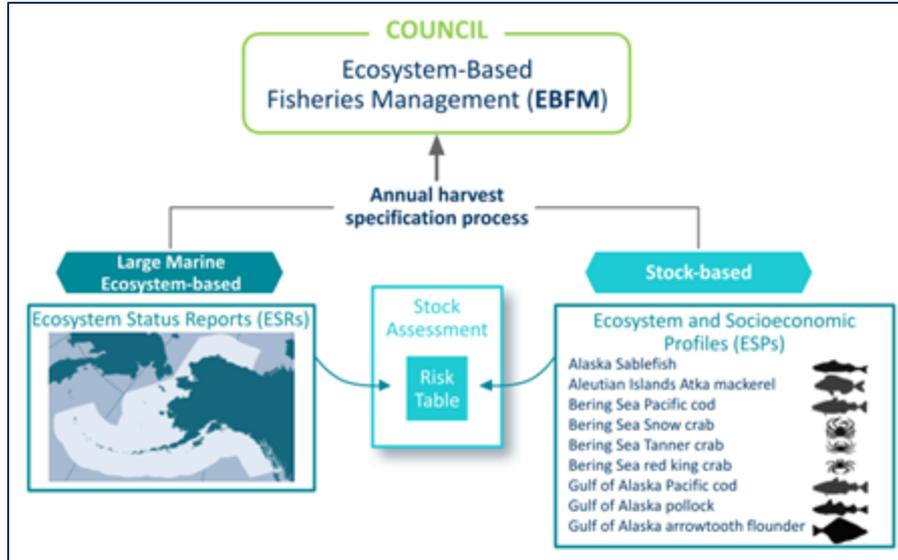
- Gulf of Alaska
- Aleutian Islands
- Eastern Bering Sea



# Ecosystem Status Reports (ESRs) & Ecosystem and Socioeconomic Profiles (ESPs)

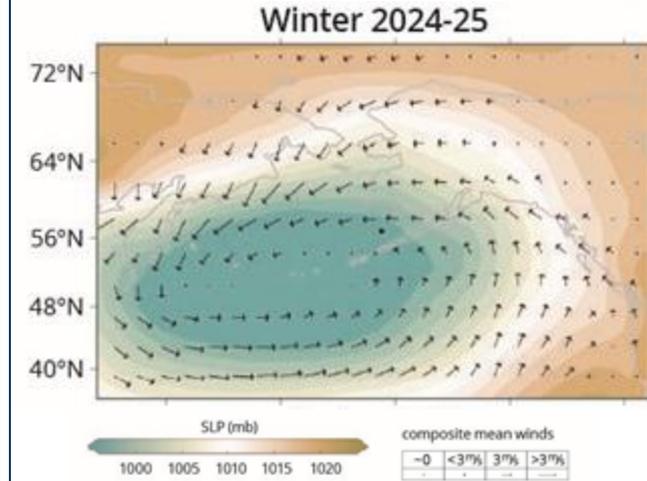
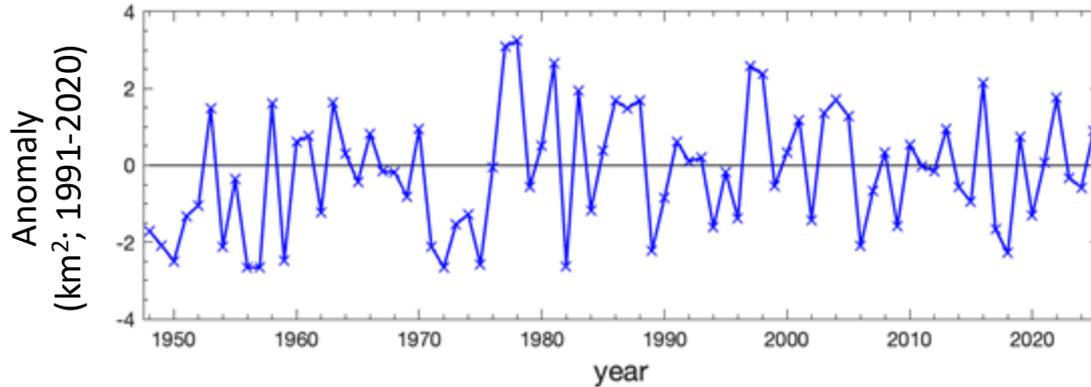
Both ESRs and ESPs allow for incorporating ecosystem information into management decisions. They inform the SSC's ABC and OFL recommendations, as well as final TAC determination.

- ESRs provide Large Marine Ecosystem scale status and trends
- ESRs provide contextual assessments that reflect ecosystem components ranging from physical oceanography up through the food web



- ESPs are stock-specific and appended to stock assessments
- ESPs identify key ecosystem and socioeconomic indicators relevant to the stock assessment model

## Aleutian Low Index (Jan-Feb)



Winter (2024/2025) conditions across the North Pacific were ***warm and stormy, with less sea ice in the Bering Sea***

# Winter: Strong Winds and Warm Oceans

The winter Aleutian Low created strong winds and warm oceans across regions:

## Gulf of Alaska

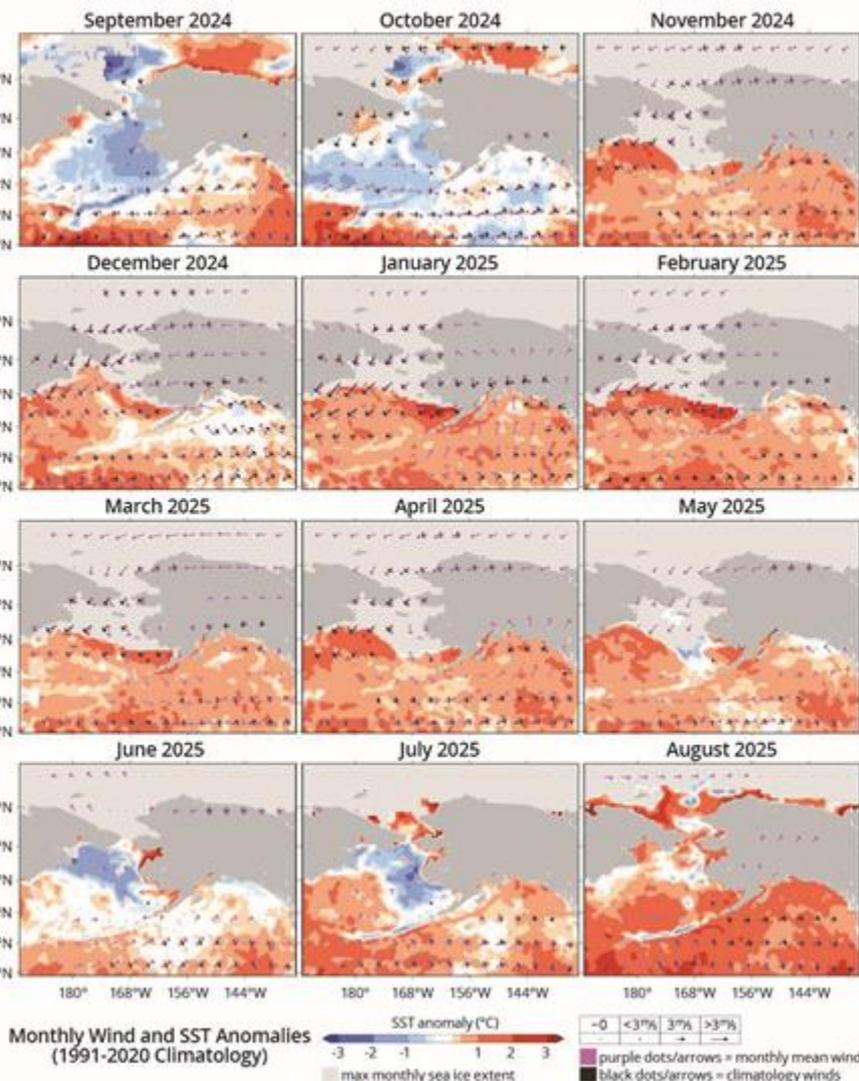
- Strong gyre circulation
- Brought warm water onto the shelf

## Aleutian Islands

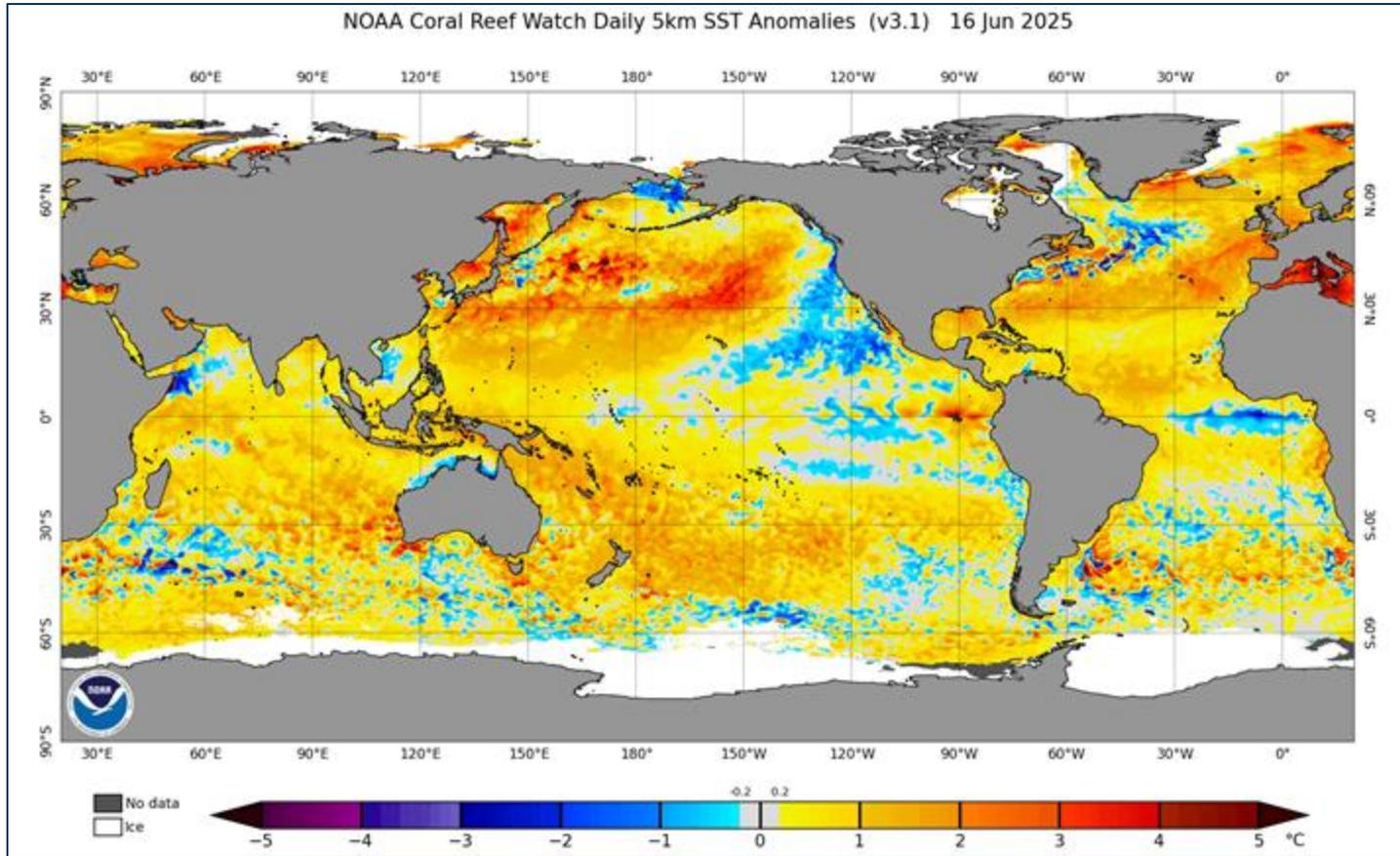
- Strong Alaska Coastal Current and AK Stream
- Strong eddies increased transport through eastern and western passes

## Eastern Bering Sea

- Warm waters over the shelf
- Prevented sea ice expansion until late spring

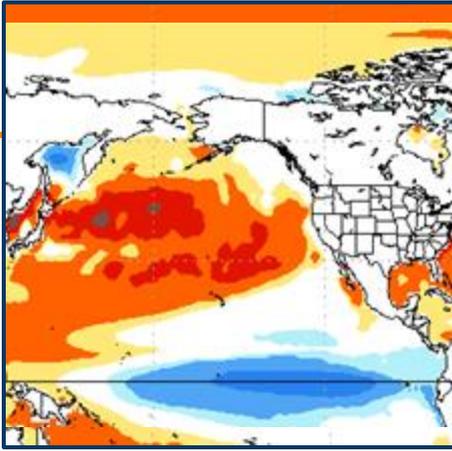


# Warmth Builds at End of Summer (June 16 - Sept 13)

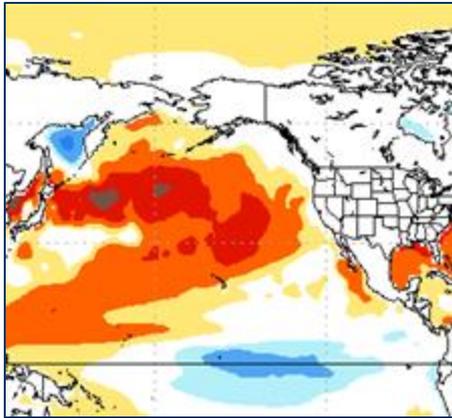


# SST Projections from the National Multi-Model Ensemble

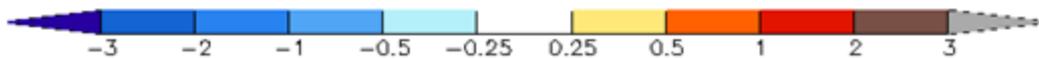
Nov 2025  
- Jan 2026



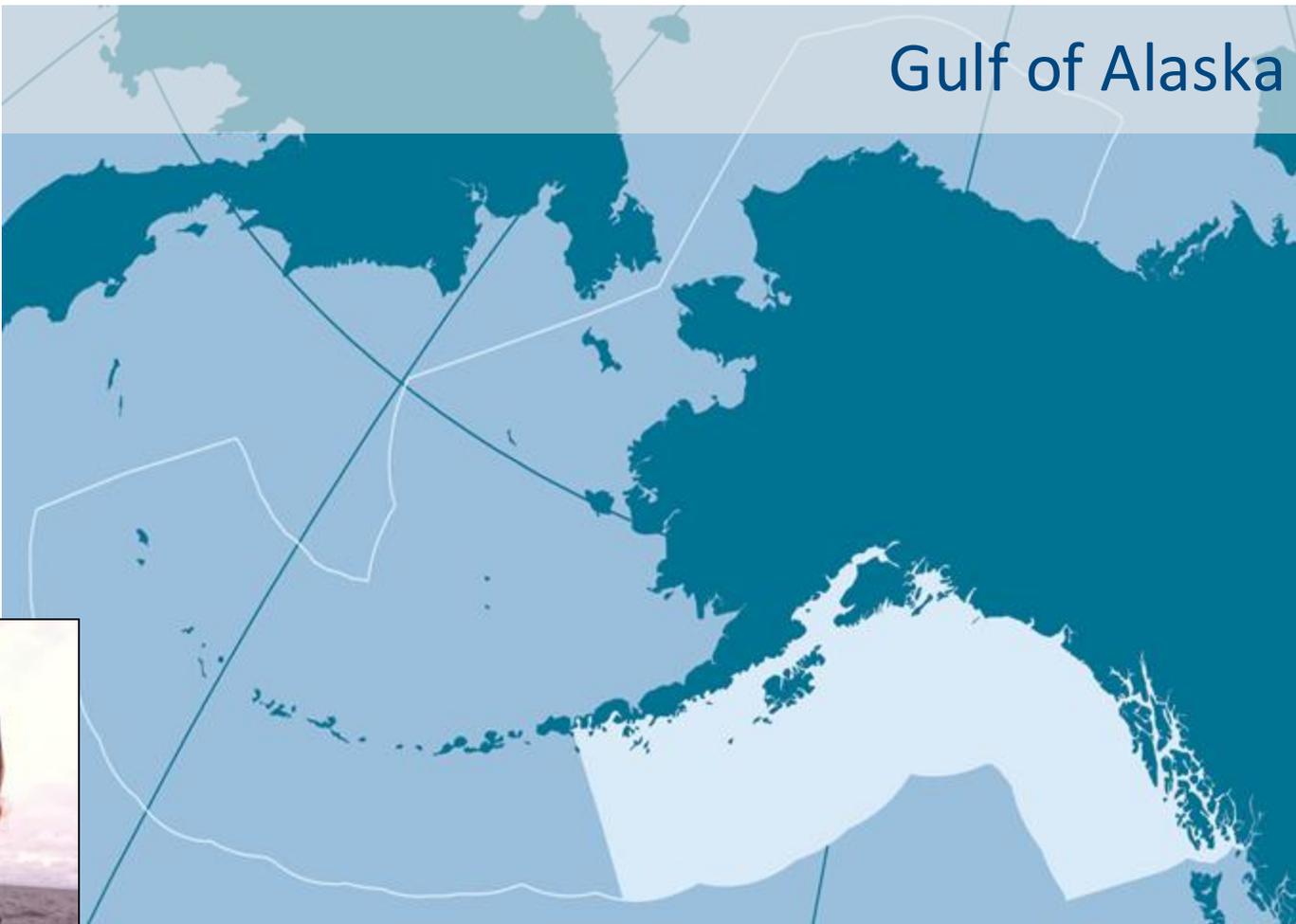
Jan - Mar  
2026



- Transition to La Niña likely in the next couple of months
- **Warm SST** anomalies:
  - Western-central North Pacific
  - Aleutian Islands
  - Southern Bering Sea
- **Neutral SST** anomalies:
  - Coastal Gulf of Alaska
  - Northern Bering Sea
  - Coastal U.S. Arctic



# Gulf of Alaska



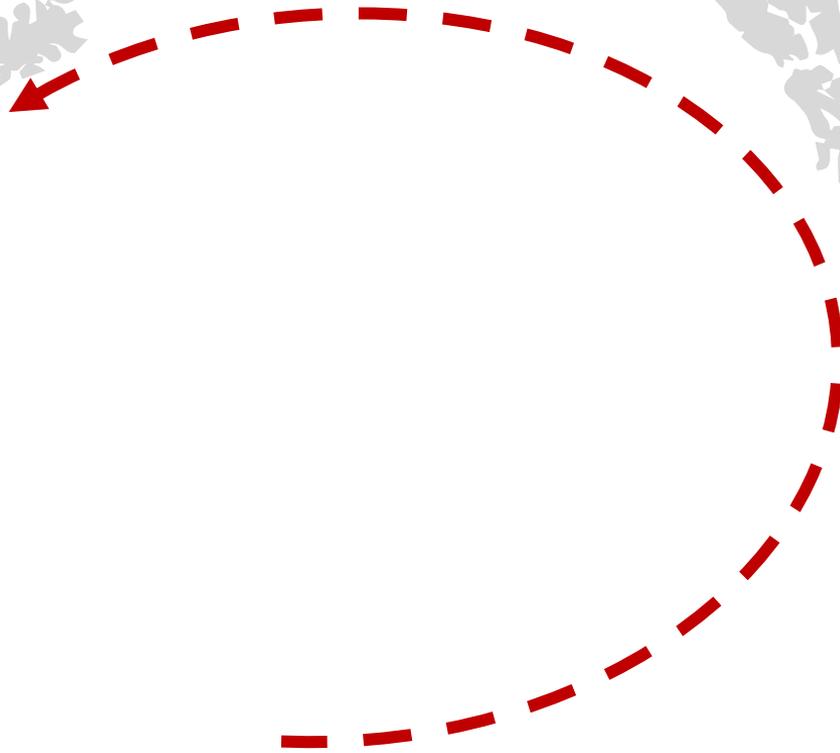
# GOA 2025 was very warm; strong circulation on the shelf

## 1. Two sources of warmth in GOA shelf ( - - > )

1. Warm waters from western/central N. Pacific



2. Warm waters from GOA gyre



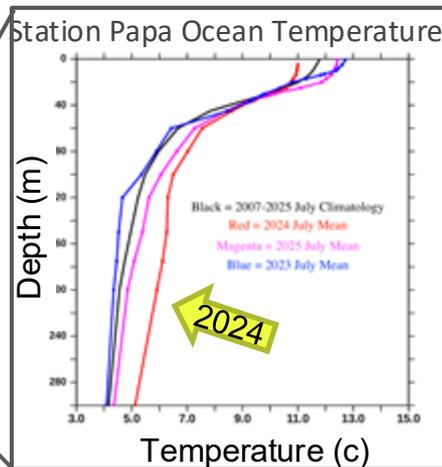
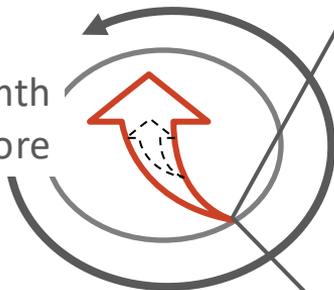
# GOA 2025 was very warm; strong circulation on the shelf

1. Two sources of warmth in GOA shelf ( - - ▶ )
2. **Strong Aleutian Low, winds, & GOA gyre circulation** (E. Lemagie, S. Bell, C. Hauri, R. Pages)
3. **Strong eddy activity & cross shelf transport** (W. Cheng, M. Wang, W. Stockhausen)
4. **Increased offshore upwelling** (C. Hauri, R. Pages)

1. Warm waters from western/central N. Pacific



Incr. upwelled warmth from depth offshore



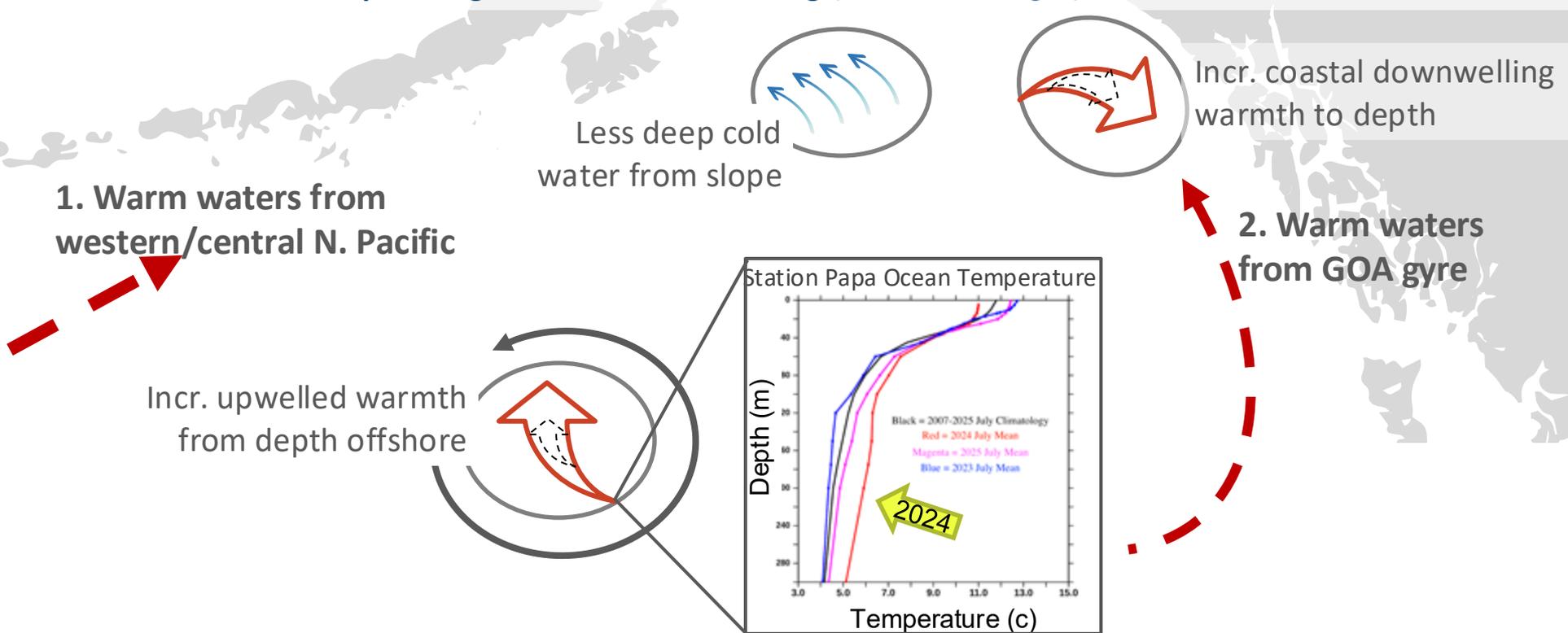
2. Warm waters from GOA gyre



(D. Zhang)

# GOA 2025 was very warm; strong circulation on the shelf

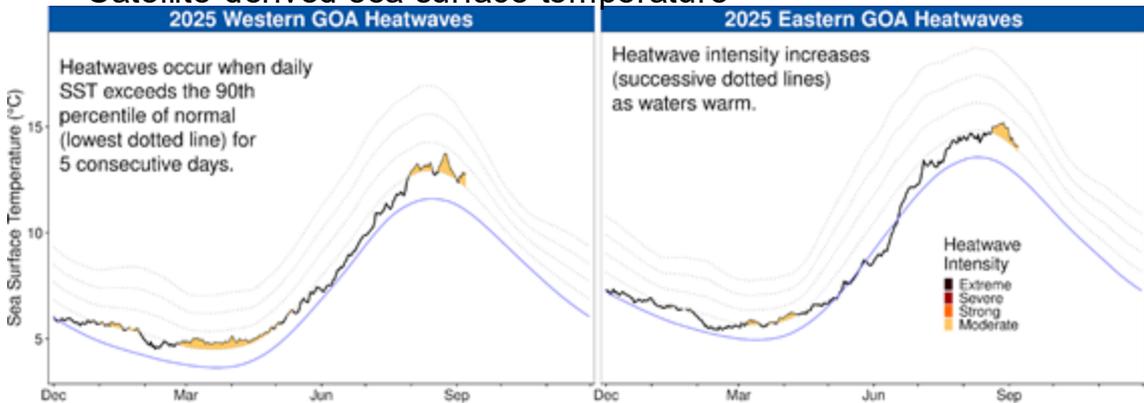
1. Two sources of warmth in GOA shelf (- - ▶ )
2. Strong Aleutian Low, winds, & GOA gyre circulation (E. Lemagie, S. Bell, C. Hauri, R. Pages)
3. Strong eddy activity & cross shelf transport (W. Cheng, M. Wang, W. Stockhausen)
4. **Increased offshore upwelling & coastal downwelling** (C. Hauri, R. Pages)



# GOA was very warm in 2025 (shelf, gyre, surface, depth)

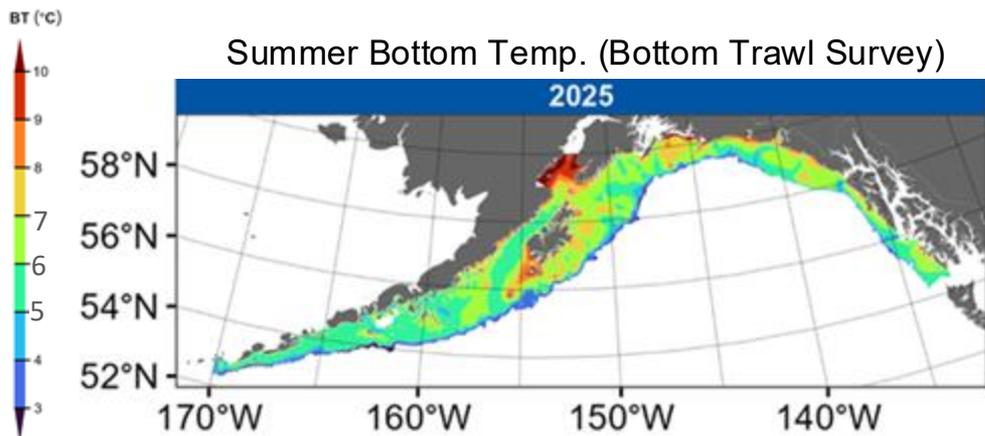
*K. Axler, S. Bell, M. Callahan, T. Hennon, K. Kearney, E. Lemagie, L. Rogers, R. Thoman, S. Rohan*

## Satellite-derived sea surface temperature



- Warm SST; marine heatwave conditions; average spring (EGOA)/early summer months (GOA)
- Limits of optimal temperature thresholds of eggs/larvae? (spring Shelikof Str. SST: 7.3°C; 100-150m: 5.9°C) (2015, 2019)
- Warm bottom temperatures
- Warm fall?
- Second warm winter in a row

## Summer Bottom Temp. (Bottom Trawl Survey)



# Questions to be asking in a warm year...

## Survival and strength of egg/larvae of future recruits?

### Benefit?

Viviparous (live-bearing):

- Rockfish

Deep/Slope Spawners:

- Sablefish, Arrowtooth flounder, Rex sole, Halibut

Other: S. rock sole

---

### At Risk?

- Pacific cod
- Walleye pollock
- N. rock sole

## Summer distribution of adult groundfish (availability to surveys, fisheries, or predator/prey overlap)?

### Shallower?

- P. Ocean perch
- 

### Deeper?

- Pacific cod
  - Arrowtooth flounder
  - Pollock
- 

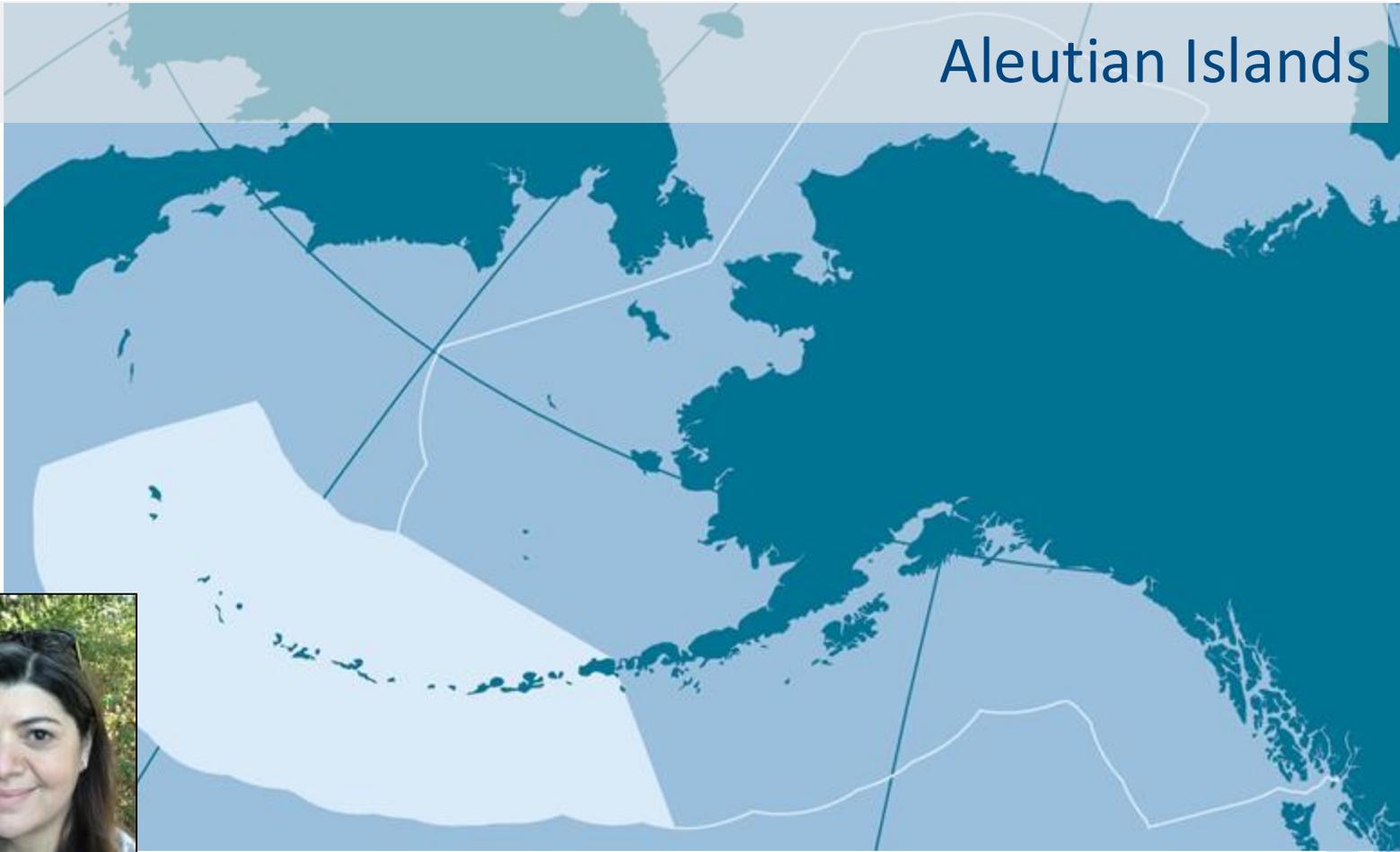
### No Change?

- N&S rock sole
- Sablefish
- Dover sole

*(Sigler et al., 2001; Laurel et al., 2008; Laurel et al., 2011; Doyle et al., 2009, 2016 & 2018; Moss et al., 2016; Bian et al., 2016; Hinckley et al., 2019; Krieger et al., 2019, Conrath et al., 2021)*

*(Yang et al., 2019; Li et al., 2019)*

# Aleutian Islands

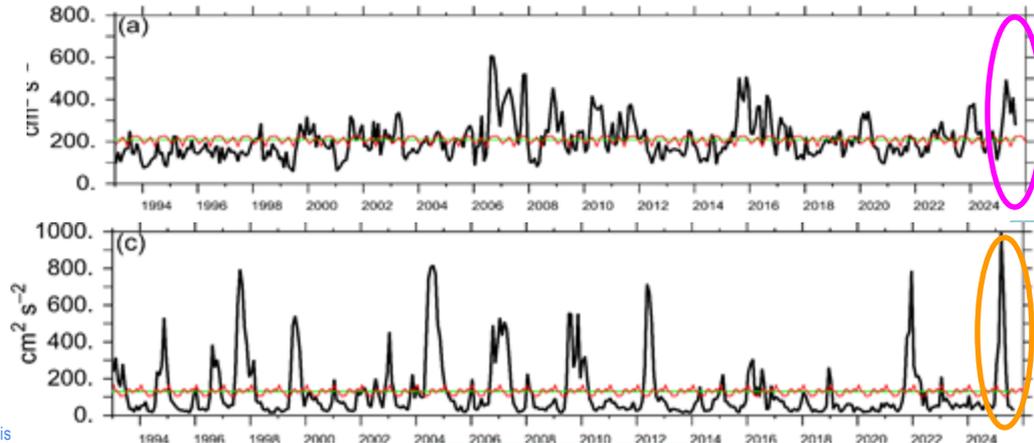
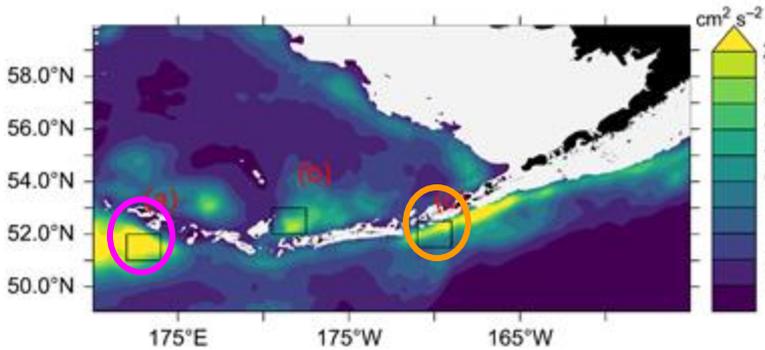


**NOAA**  
FISHERIES

# Strong AK Currents > stronger transport > increased nutrients

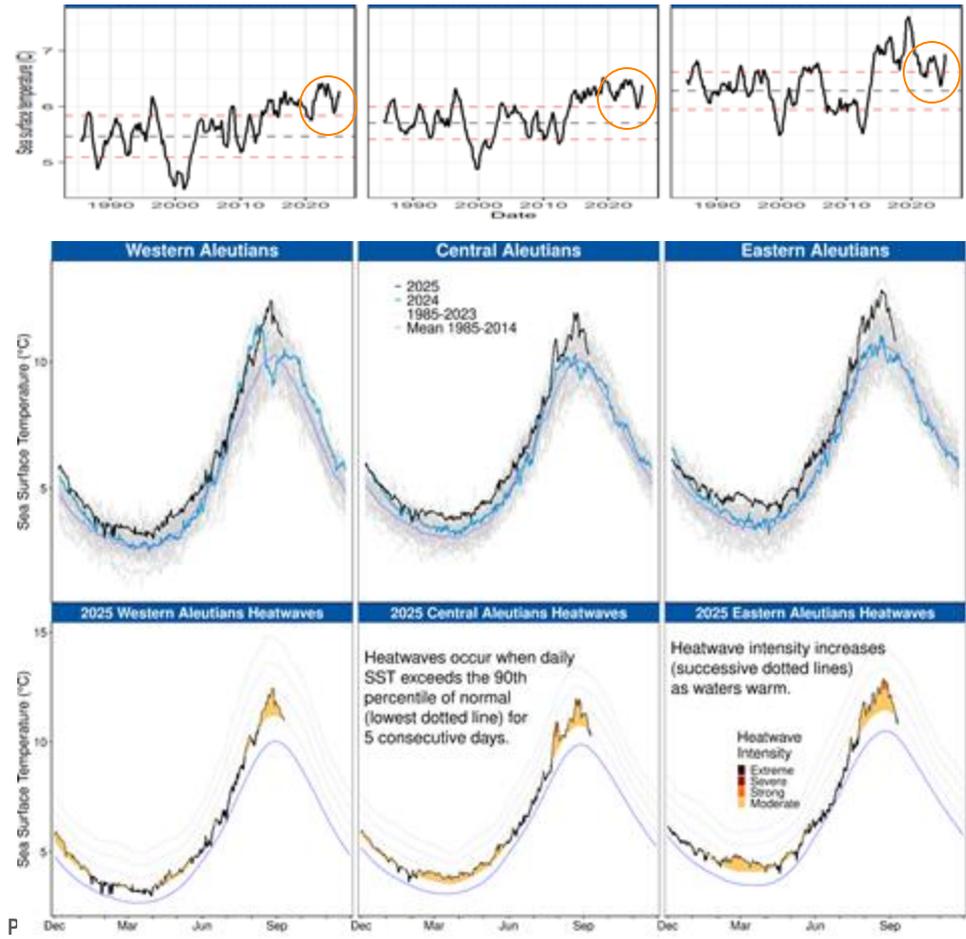
*E. Lemagie, S. Bell, W. Cheng*

- Strong Aleutian Low brings strong winds
- Strong winds strengthen AK currents
- Strong AK currents increase EKE & transport at eastern & western passes
- Increased nutrients favor increased phytoplankton biomass



# Above average warm temperatures are back

*E. Lemagie, M. Callahan, R. Thorman, K. Kearney*



- 2024 cooler SST still above average
- 2025 SST: Year-round warm waters
- Second warmest winter; summer among 10 warmest ~2021, 2023
- Some reprieve between seasons

## Things to think about...

### Other factors

High abundance year for Eastern Kamchatka pink salmon  
= increased phytoplankton biomass due to higher predation on zooplankton

Sustained high abundance of Pacific Ocean perch

---

### Benefit?

Increased biomass despite increased temperatures, changes in pelagic fish community

- Pacific Ocean Perch
  - Sablefish
- 

- Yellow Irish Lord

### At Risk?

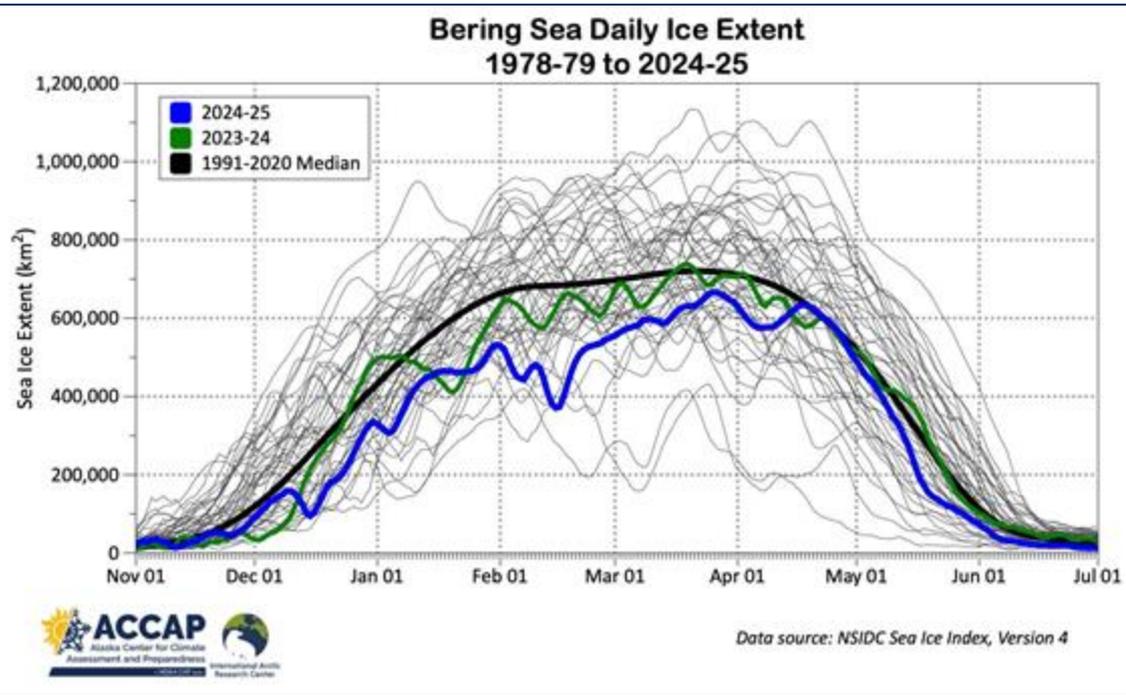
Decreasing biomass with increased temperatures, changes in pelagic fish community

- Pacific cod
- Walleye pollock
- Atka mackerel

# Eastern Bering Sea



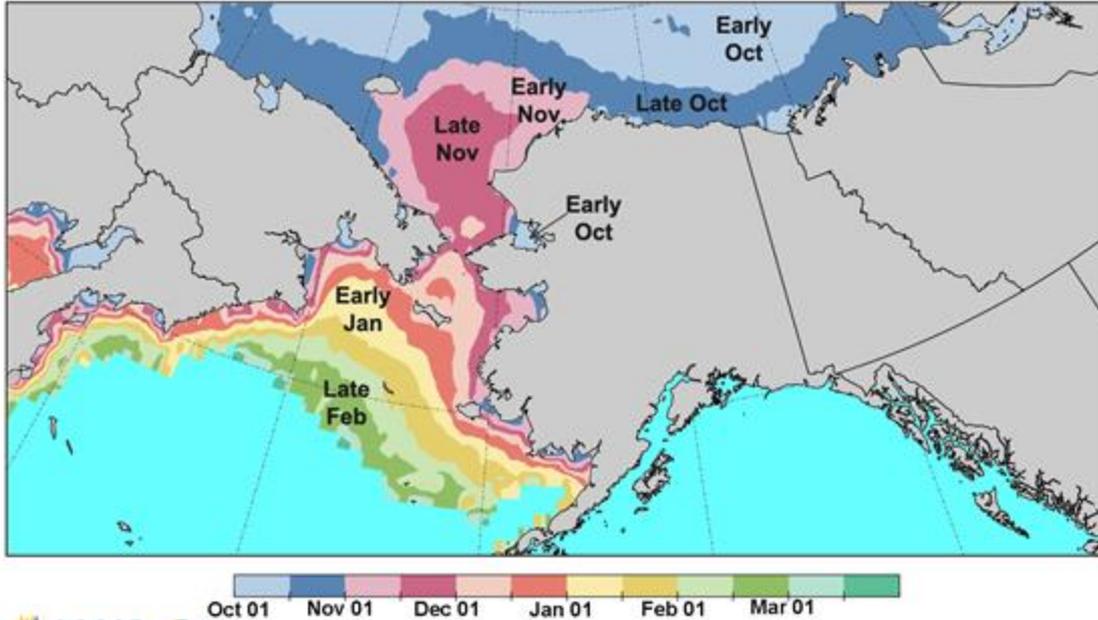
Sea ice extent was below average for most of winter 2024/2025;  
ice is expected to arrive later in winter 2025/2026.



- Sea ice arrived late in fall 2024
- December and February storms led to ice retreat
- Ice stalled at ~60°N in March/April

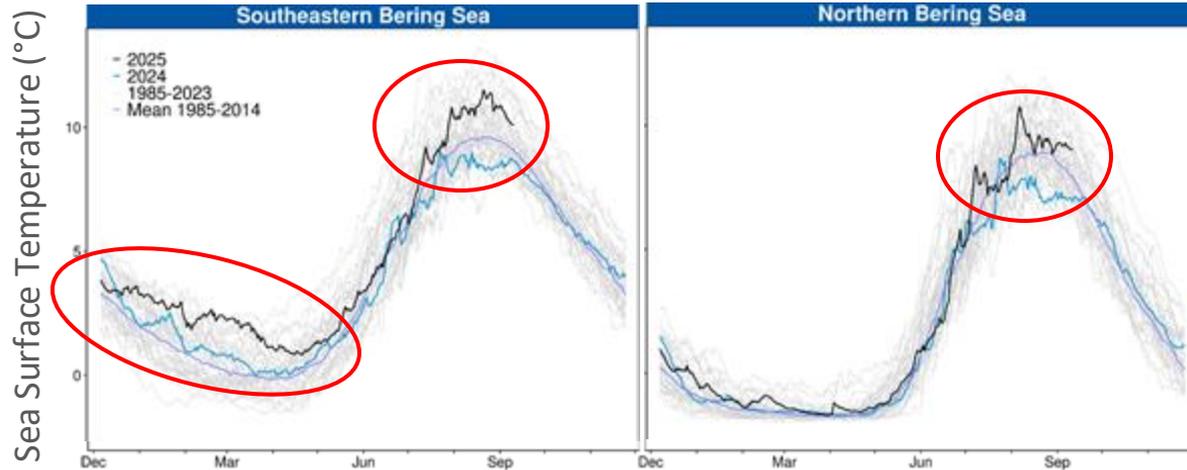
Sea ice extent was below average for most of winter 2024/2025;  
ice is expected to arrive later in winter 2025/2026.

Date of first sea ice concentration 15 percent or higher  
Autumn/Winter 2025-26



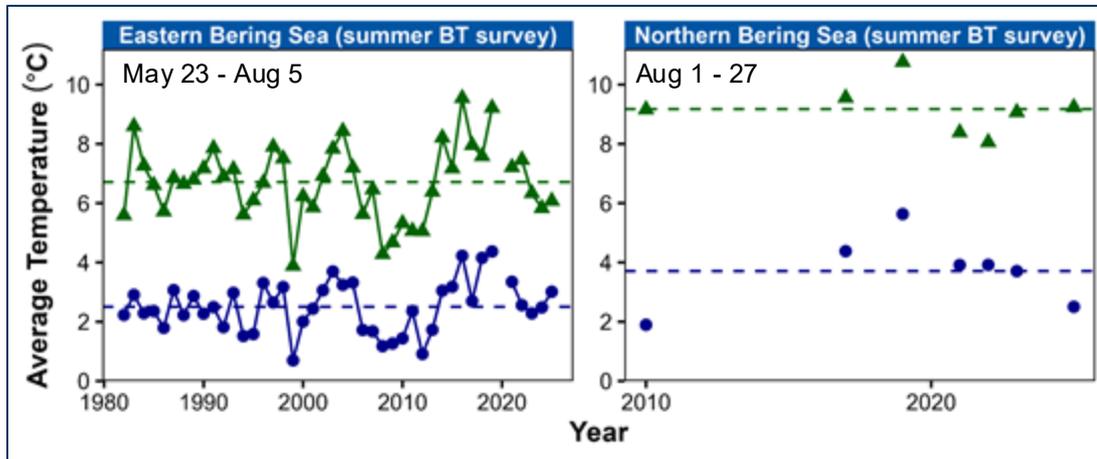
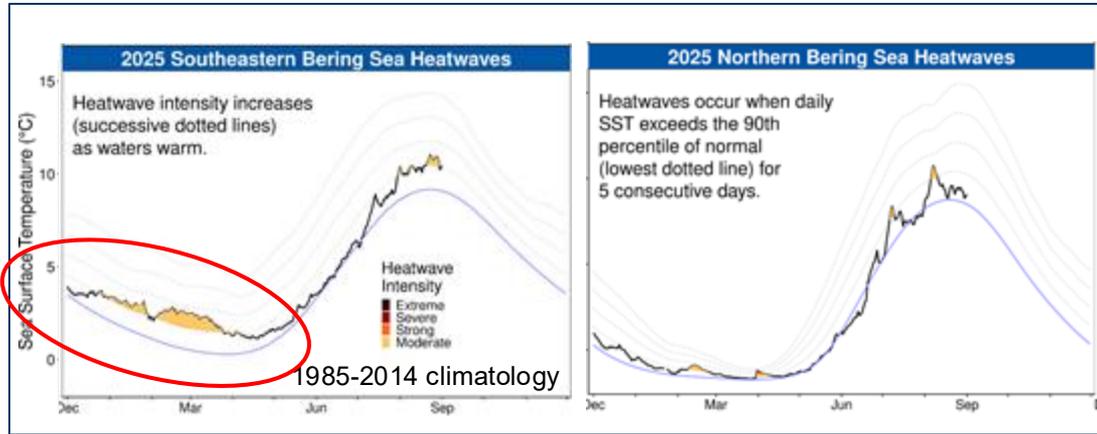
- Sea ice arrived late in fall 2024
- December and February storms led to ice retreat
- Ice stalled at  $\sim 60^{\circ}\text{N}$  in March/April
- Ice is *expected to arrive later* in winter 2025/2026 than 2024/2025 due to low ice currently in the Chukchi Sea

## 2025 was warmer than 2024, especially in the south



- **Southeastern Bering Sea**
  - 2025 warmer than 2024
  - Late spring reprieve
- **Northern Bering Sea**
  - August to present 2025 warmer than 2024

# Winter warmth, late spring reprieve, warmth returned in August



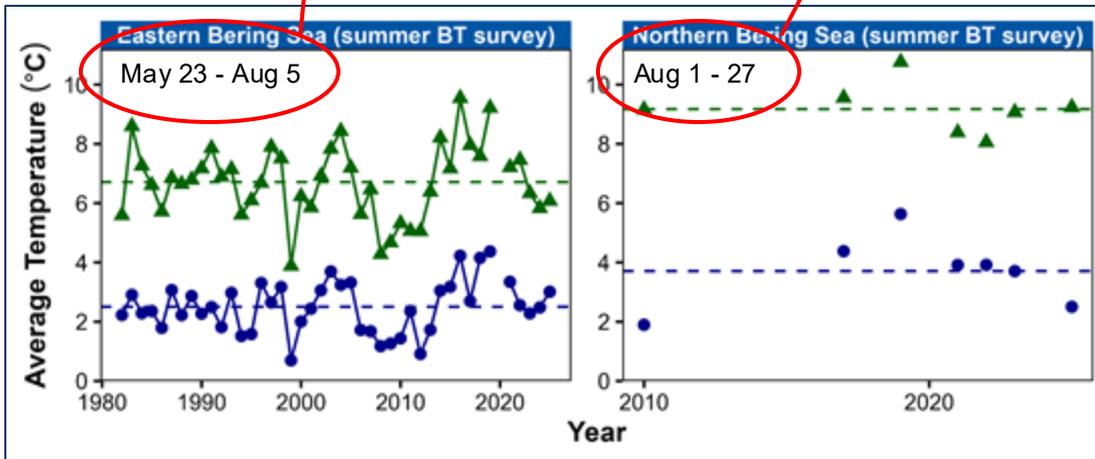
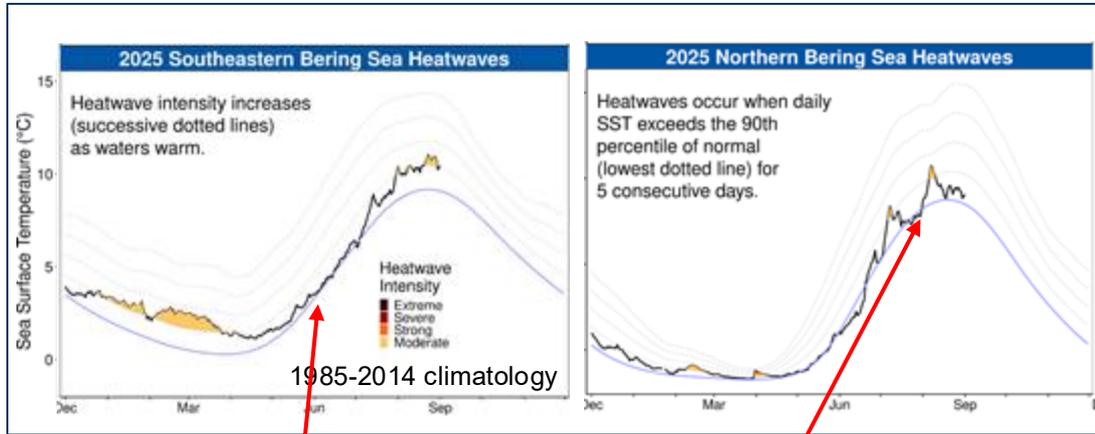
- **Southeastern Bering Sea**
  - Winter-spring MHW

- **Northern Bering Sea**
  - Brief and infrequent MHWs

- **SEBS survey** occurred when SSTs were cooler

- **NBS survey:** SSTs had warmed to average

# Winter warmth, late spring reprieve, warmth returned in August



- **Southeastern Bering Sea**
  - Winter-spring MHW

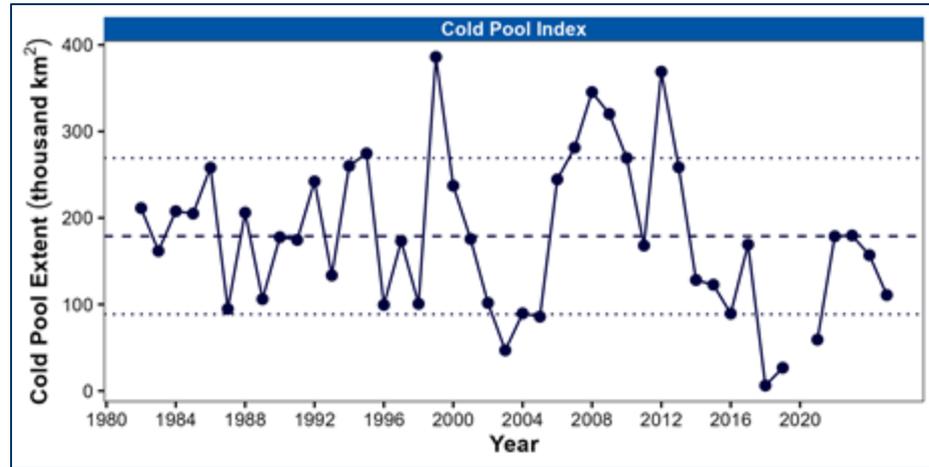
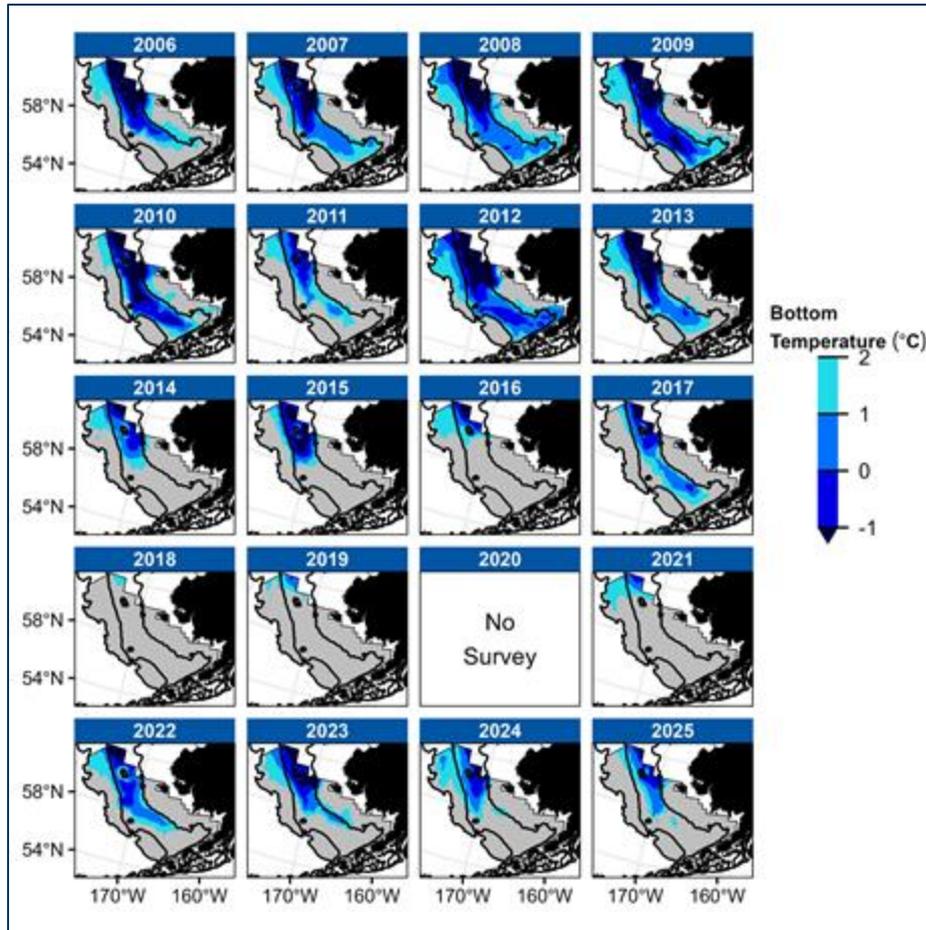
- **Northern Bering Sea**
  - Brief and infrequent MHWs

- **SEBS survey** occurred when SSTs were cooler

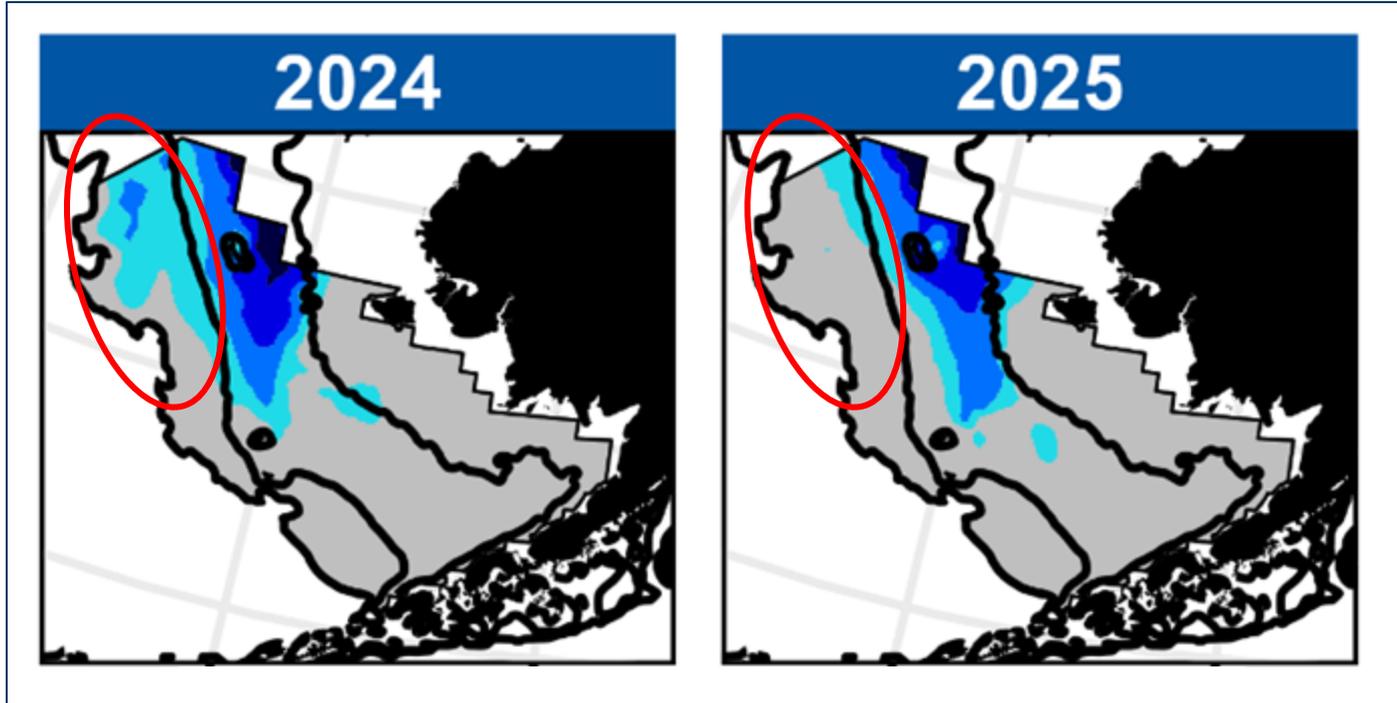
- **NBS survey:** SSTs had warmed to average

# SEBS: cold pool extent was below average in 2025

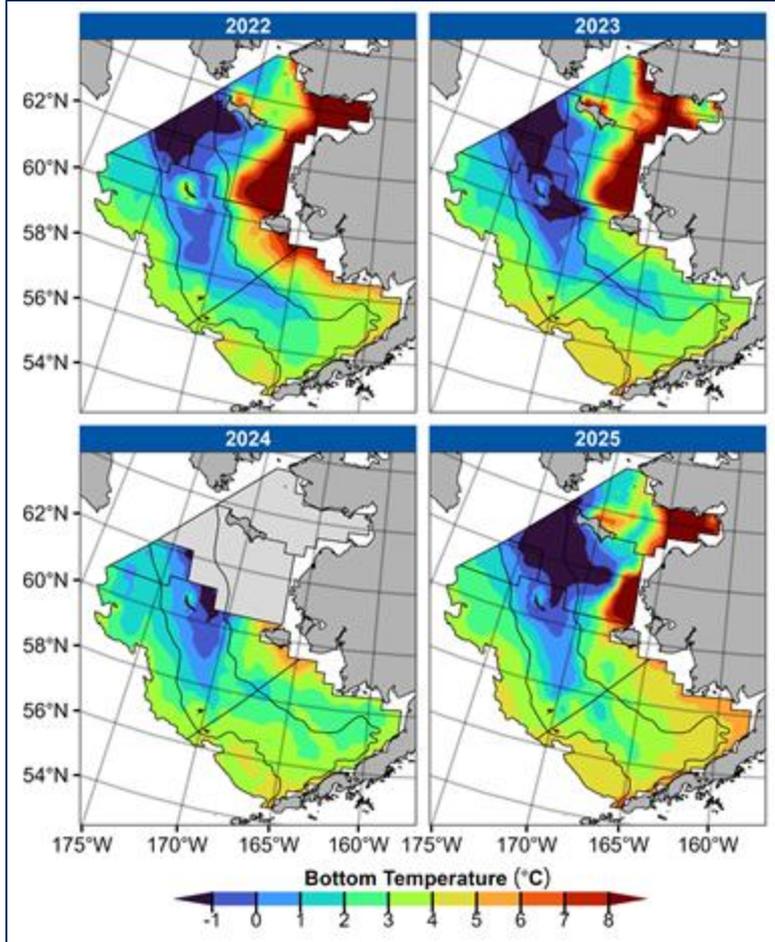
- A 29% decrease from 2024



SEBS: cold pool was confined to the middle shelf



## NBS: 2025 bottom temperatures coldest observed since 2017



- 2025 coldest bottom temperatures since 2017 (2010 was colder)
- Cold pool extended further east into the inner domain

# Things to be thinking about...

**Distribution Changes**

SEBS: loss of cold pool over the NW outer domain  
NBS: expansion of cold into the inner domain

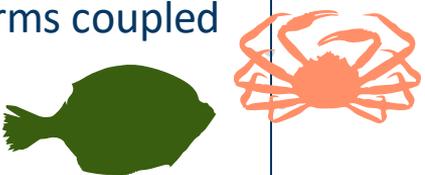
- Less northward, more eastward shifts?
- Increased overlap with coastal species?



**Ecological Transitions**

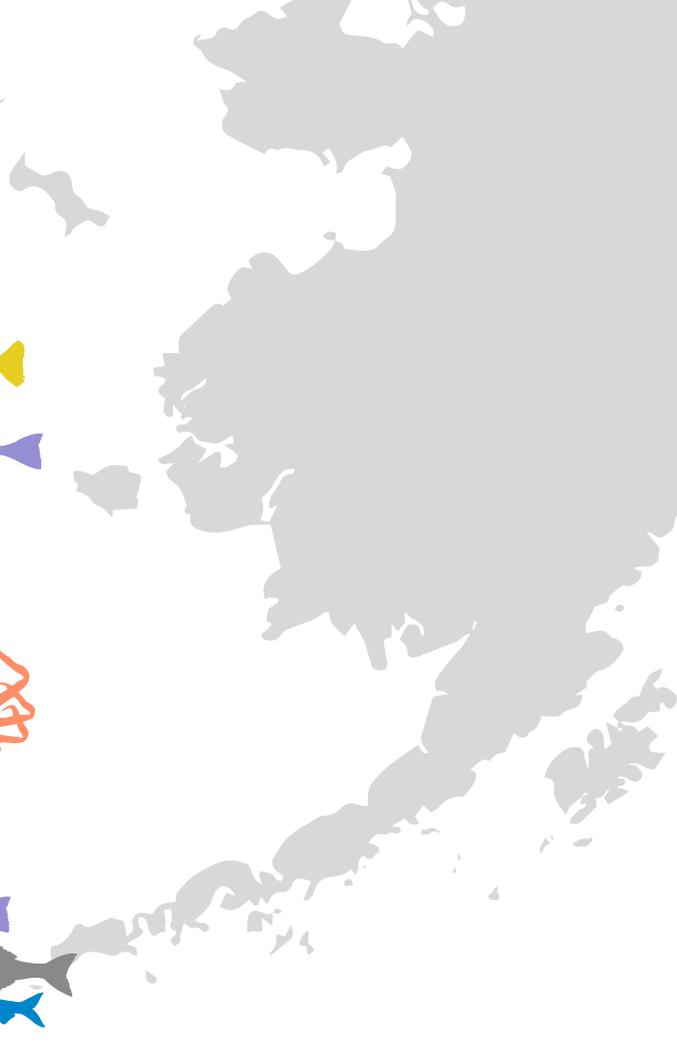
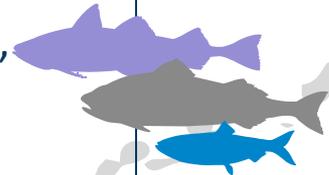
**Benthos:**

- Long-term increase of echinoderms coupled with declines in crab biomass
- Impacts for flatfish?



**Pelagic:**

- Large year classes moving through (e.g., pollock, sablefish, Togiak herring)
- What's coming behind them?



# Key Messages



- **North Pacific:** Similar warm & windy trends across all regions, but driven by region-specific dynamics



- **Gulf of Alaska (GOA):** Warm waters from western/central Pacific and from central GOA gyre in winter and late summer at surface and depth; coupled with strong transport across shelf



- **Aleutian Islands (AI):** Strong AK currents increase eddies and northward transport through eastern & western passes; year-round high sea surface temperatures are back



- **Eastern Bering Sea (EBS):** Warm waters in winter coupled with storms led to reduced sea ice; summer cold pool was reduced; sea ice expected to arrive later this winter

Thank You

# Alaska Fisheries Science Center Ecosystem Status Reports

[Ecosystem Status Reports For The Gulf Of Alaska, Bering Sea  
And Aleutian Islands | NOAA Fisheries](#)



[Bridget.Ferriss@noaa.gov](mailto:Bridget.Ferriss@noaa.gov) (Gulf of Alaska)

[Ivonne.Ortiz@noaa.gov](mailto:Ivonne.Ortiz@noaa.gov) (Aleutian Islands)

[Elizabeth.Siddon@noaa.gov](mailto:Elizabeth.Siddon@noaa.gov) (Eastern Bering Sea)

