Ecosystem & Socioeconomic Profile: GOA Pollock Report Card

Kalei Shotwell and Russel Dame, November Groundfish Plan Team 2024

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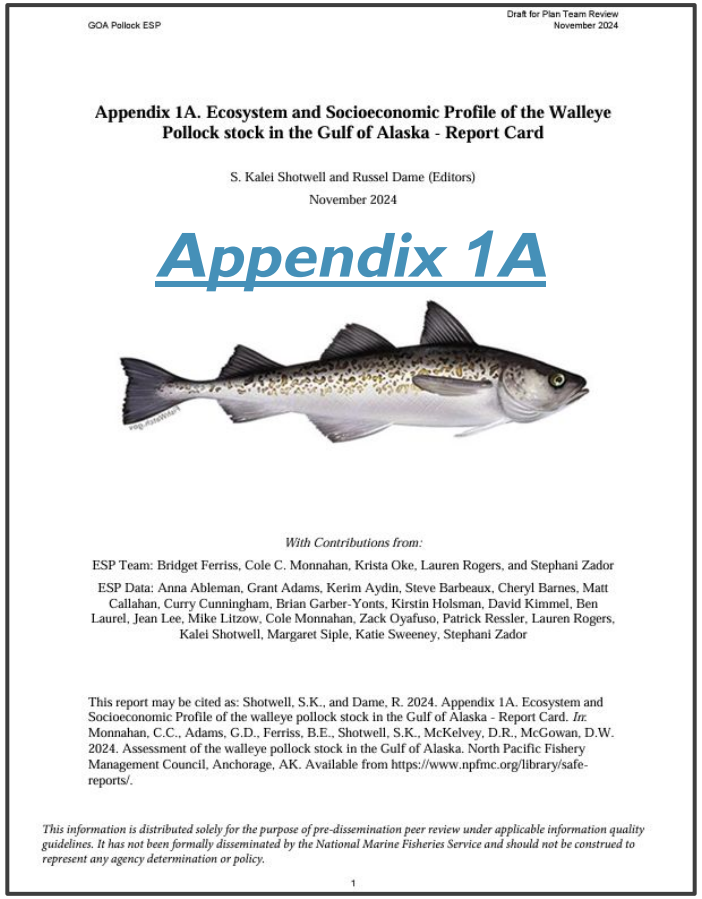
NOAA FISHERIES

Overview

- Appendix 1A in SAFE Report
  - Full/partial ESPs in 2019-2020
  - Report Cards in 2021-2024
- Report Card in 2024
  - Updated organization, new categories for ecosystem, new, modified, and removed indicators
  - CEATTLE model and indicators updated to 2024 projection



GOA Pollock ESP

Draft for Plan Team Review
November 2024

Appendix 1A. Ecosystem and Socioeconomic Profile of the Walleye Pollock stock in the Gulf of Alaska - Report Card

S. Kalei Shotwell and Russel Dame (Editors)

November 2024

Appendix 1A

With Contributions from:

ESP Team: Bridget Ferriss, Cole C. Monnahan, Krista Oke, Lauren Rogers, and Stephani Zador

ESP Data: Anna Ableman, Grant Adams, Kerim Aydin, Steve Barbeaux, Cheryl Barnes, Matt Callahan, Curry Cunningham, Brian Garber-Yonts, Kirstin Holsman, David Kimmel, Ben Laurel, Jean Lee, Mike Litzow, Cole Monnahan, Zack Oyafuso, Patrick Ressler, Lauren Rogers, Kalei Shotwell, Margaret Siple, Katie Sweeney, Stephani Zador

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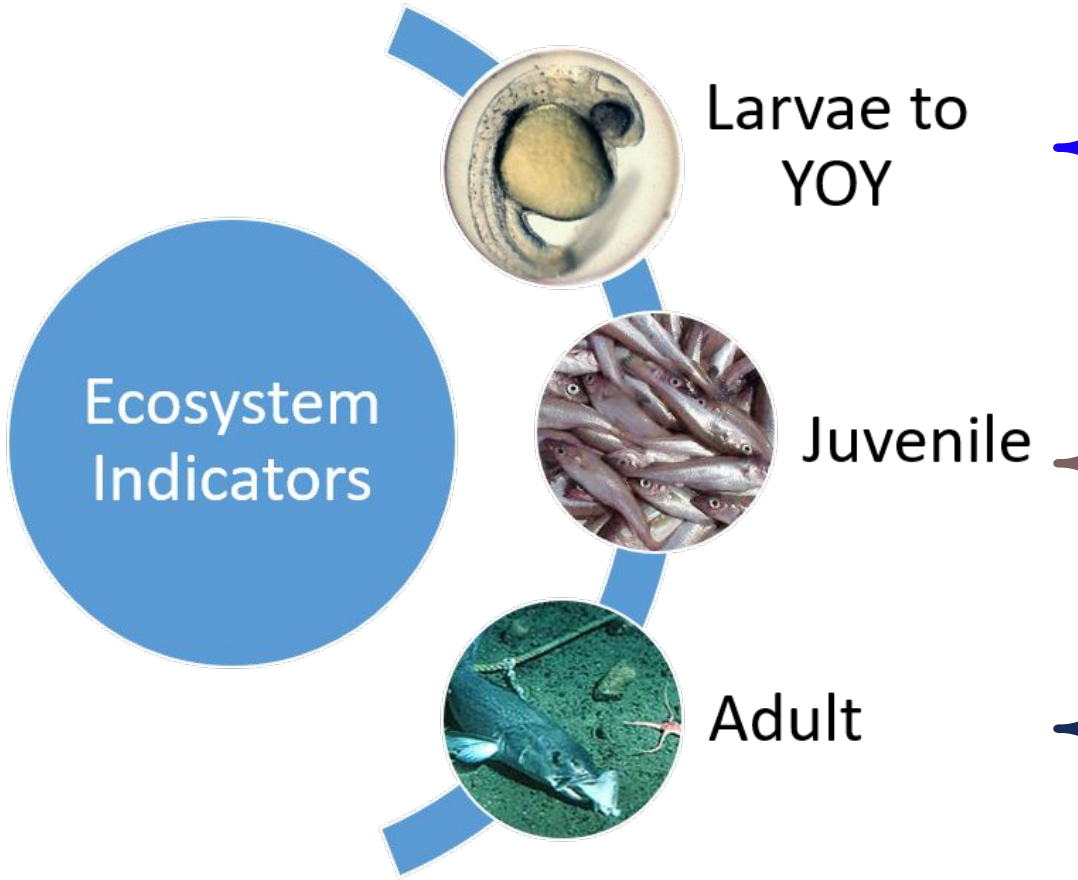
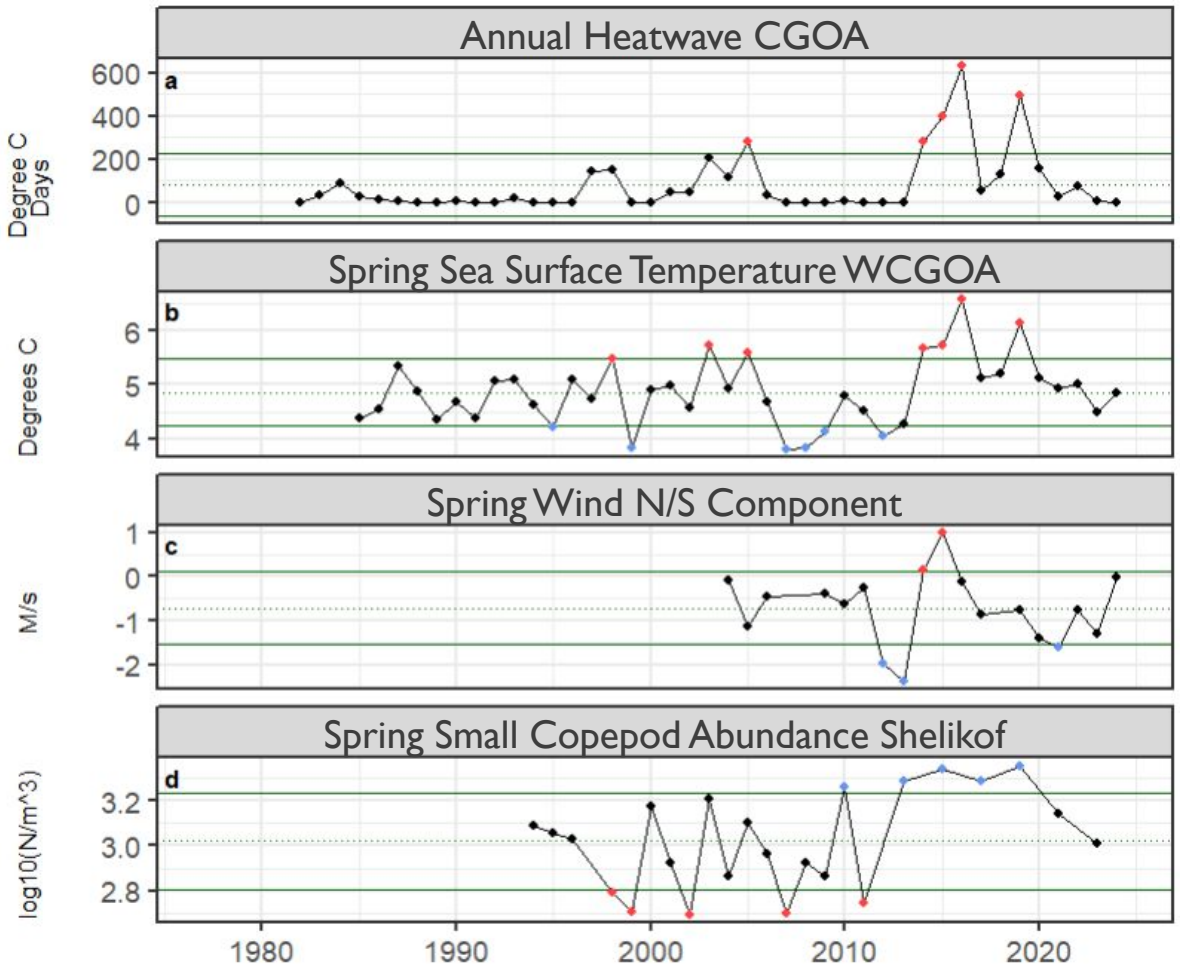
Ecosystem Indicators



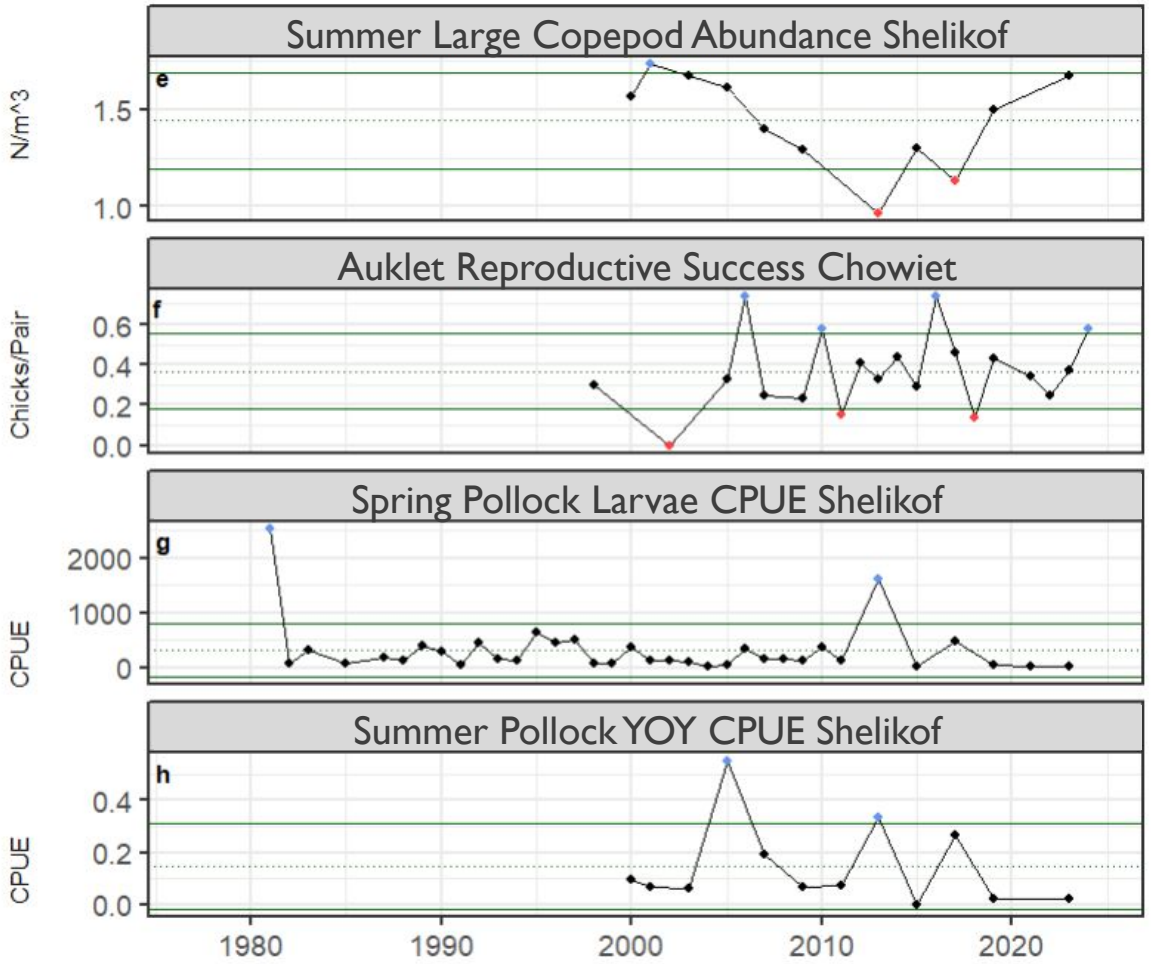
1. Annual Marine heatwave index (model), -
2. Sea surface temperature (satellite), -
3. *Spring wind N/S direction* (buoy data), -
4. Spring, summer copepods (EcoFOCI), +
5. Auklet reproductive success Chowiet, +
6. Pollock larvae, YOY, condition (EcoFOCI), +
7. Nearshore pollock CPUE (Kodiak), +
8. Pollock relative biomass Aiktak puffin, +
9. *Age-1 natural mortality* (CEATTLE), -
10. Pollock euphausiid in diet (survey), +
11. Bottom temperature (trawl survey), -
12. Fall fishery, winter survey condition, +
13. **Annual pollock ration** (CEATTLE), -
14. COG northeast, area occupied (VAST), -/+
15. **Biomass eaten of pollock** (CEATTLE), -
16. *POP, Sablefish total biomass* (model), -
17. Adult Steller sea lions counts (survey), -

Larval Indicators



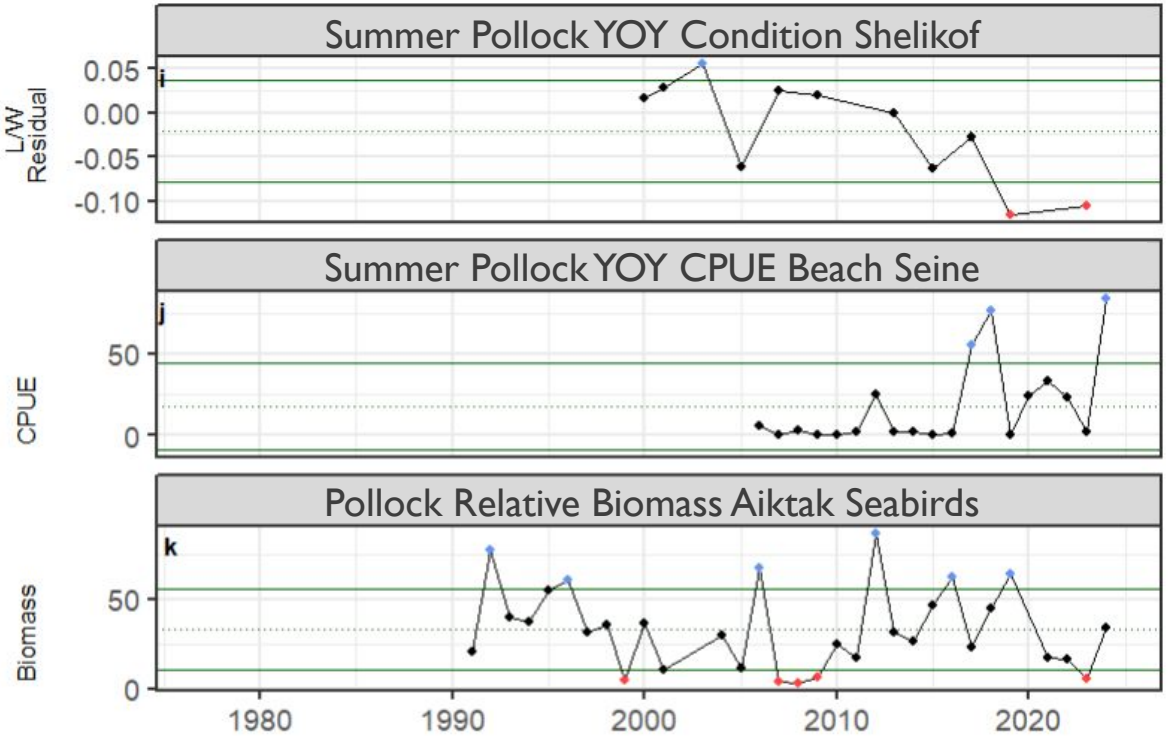
- No marine heatwave events, average sea surface temperatures, and mean wind direction toward the west suggest neutral to favorable egg and larval habitat conditions.

Larval Indicators



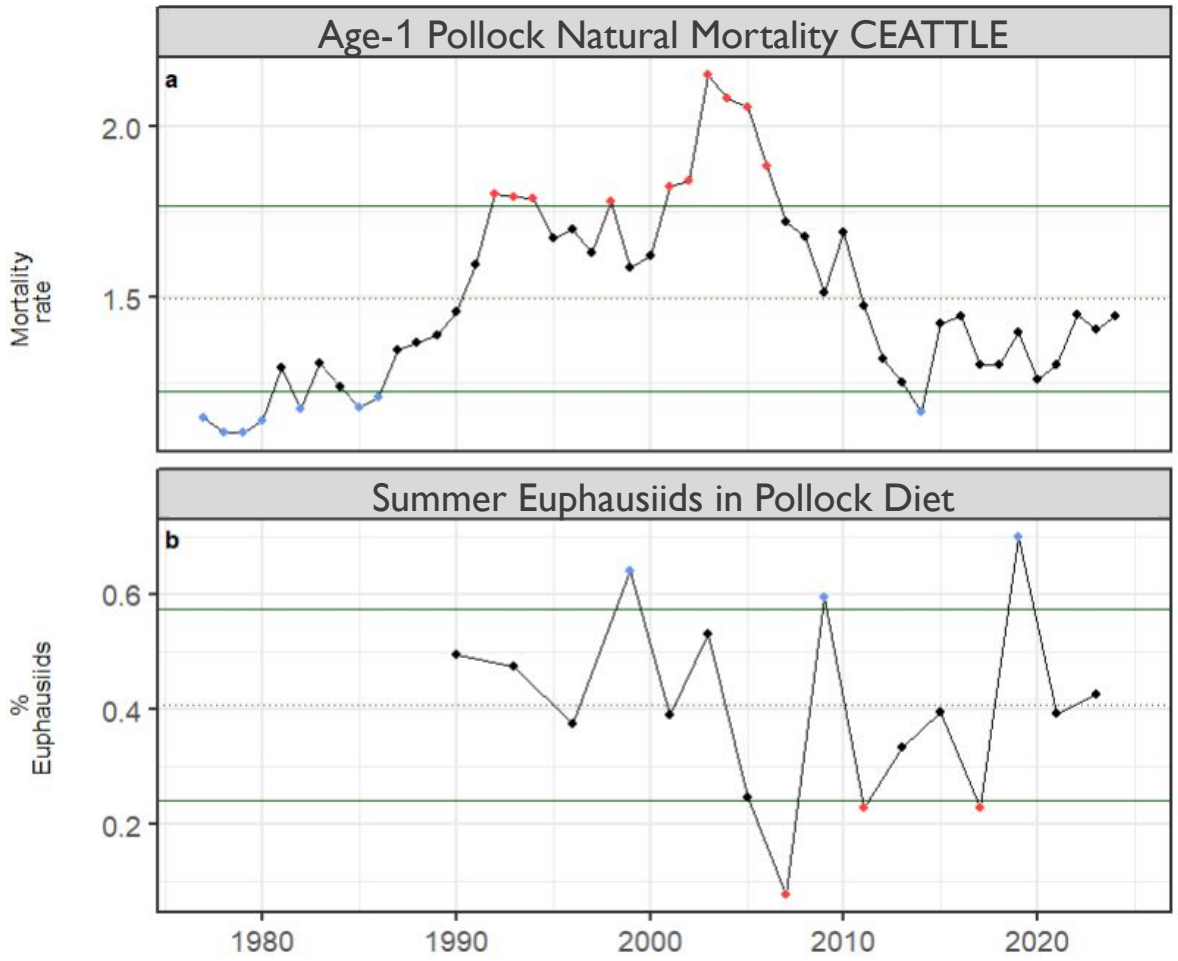
- Few larval prey indicators due to biennial survey sampling but high planktivore seabird reproductive success suggests adequate prey for larvae

Larval Indicators



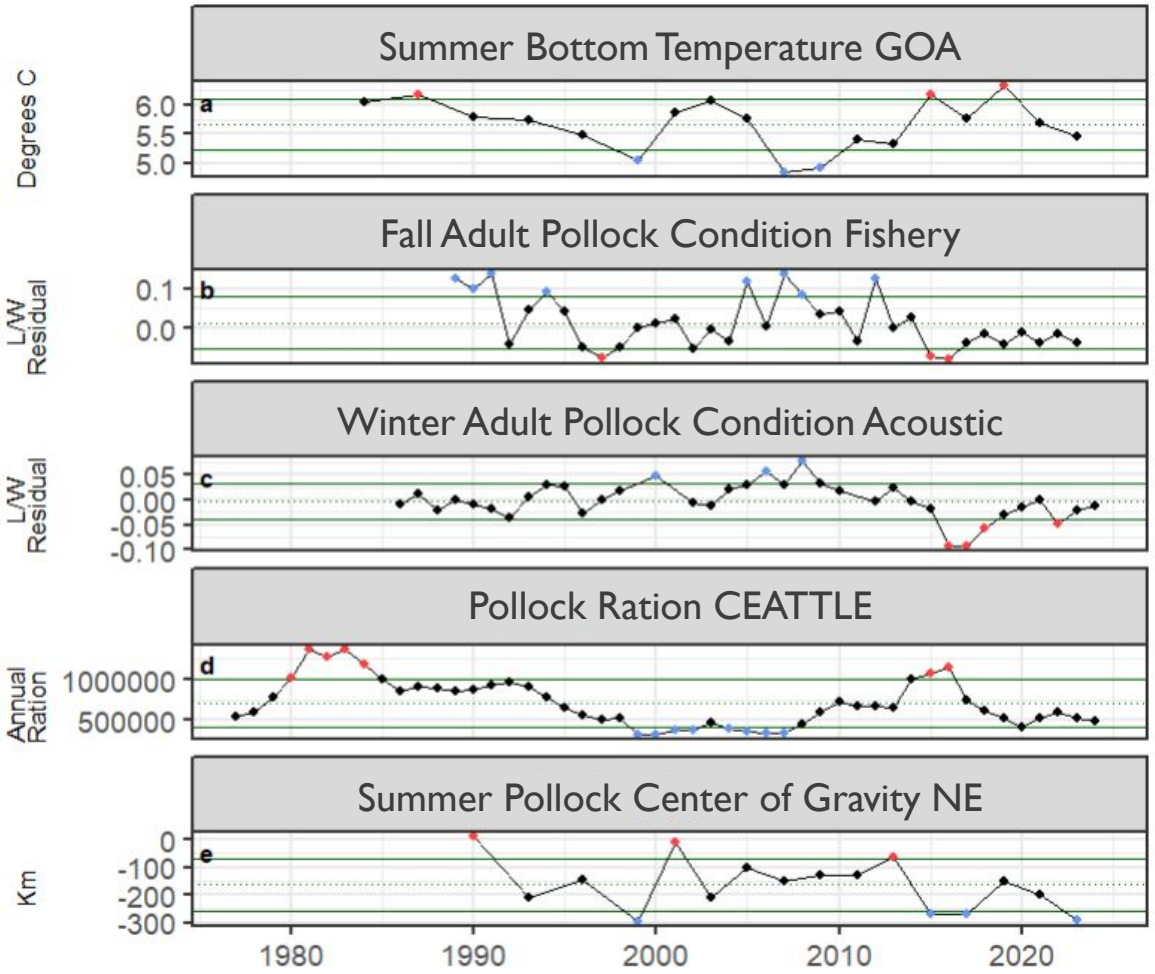
- High catch-per-unit-effort (CPUE) of young-of-the-year (YOY) pollock in the nearshore Kodiak survey and average relative biomass of pollock YOY in seabird diets suggest an average to above average 2024 year-class

Juvenile Indicators



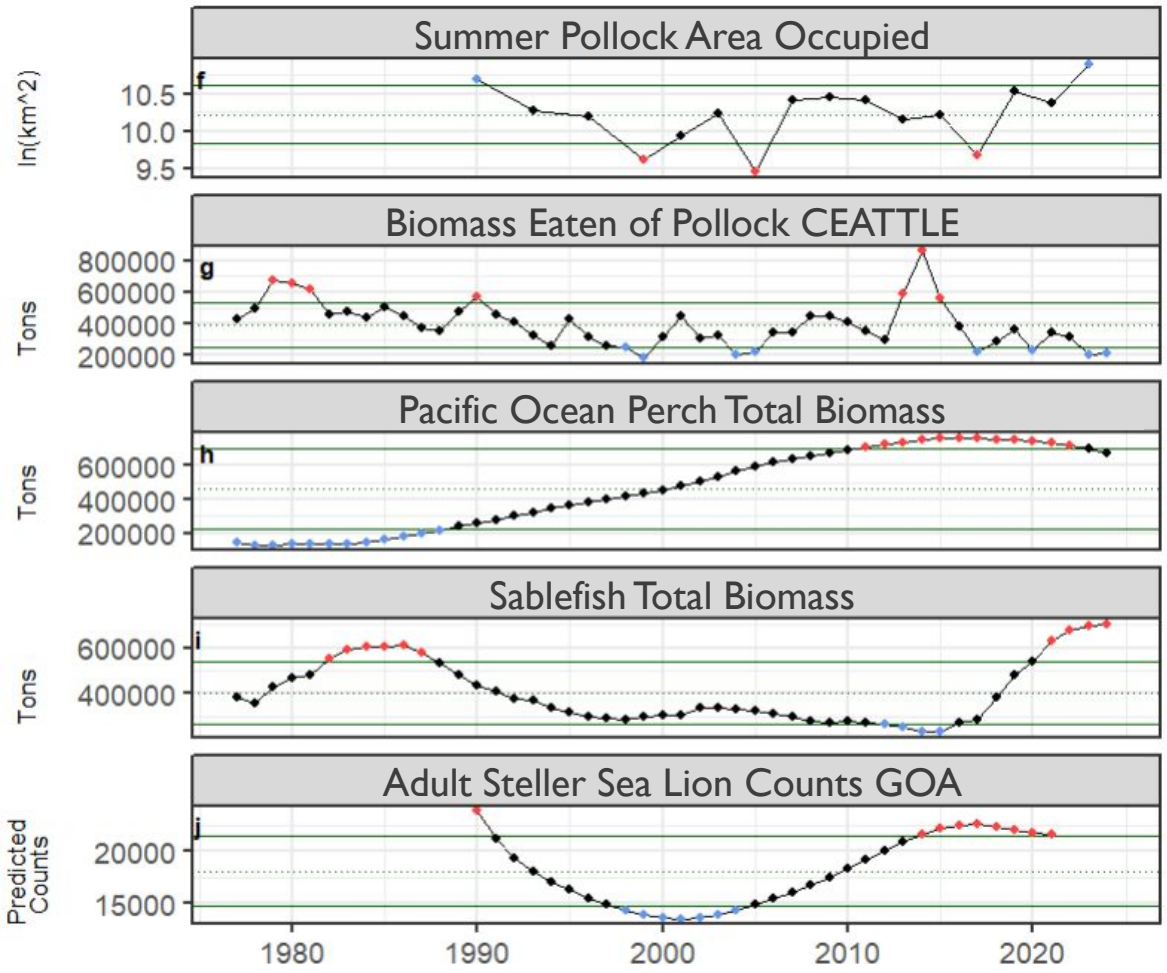
- Time-varying total mortality for age-1 pollock estimated within the CEATTLE multispecies model is currently above the value used in the operational stock assessment model
- No new information on euphausiids in the diet (no survey)

Adult Indicators



- Condition of fall pollock in the fishery in 2023 decreased and remains below average, but winter pollock condition in the acoustic survey in 2024 increased to near average.
- Predation demand of pollock for prey based on the CEATTLE model has been steadily decreasing since 2016 reflecting the ageing of the large 2013 cohort

Adult Indicators



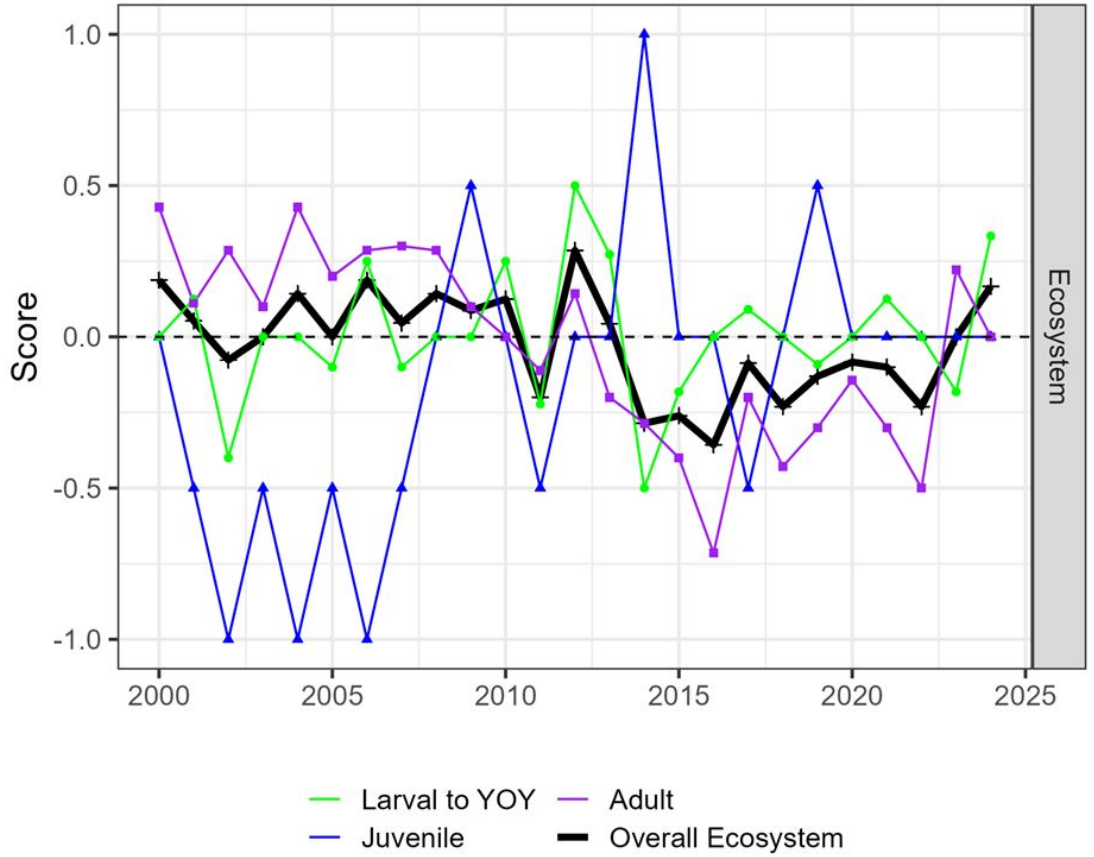
- Biomass consumed of GOA pollock as prey by all predators in the CEATTLE model remains low, reflecting the lower recent biomass of predators in the CEATTLE model and no recent large recruitment events of pollock
- Biomass estimates of GOA Pacific ocean perch and Alaska sablefish, competitors and predators of GOA pollock, continue to be large

Ecosystem Summary Table

Indicator category	Indicator	2020 Status	2021 Status	2022 Status	2023 Status	2024 Status
Larval_YOY	Annual Heatwave CGOA Model	neutral	neutral	neutral	neutral	neutral
	✻ Spring Temperature Surface WCGOA Satellite	neutral	neutral	neutral	neutral	neutral
	Spring Wind NS Direction	neutral	*low*	neutral	neutral	neutral
	Spring Small Copepod Abundance Shelikof Survey	NA	neutral	NA	neutral	NA
	Summer Large Copepod Abundance Shelikof Survey	NA	NA	NA	neutral	NA
	Annual Auklet Reproductive Success Chowiet Survey	NA	neutral	neutral	neutral	*high*
	Spring Pollock CPUE Larvae Shelikof Survey	NA	neutral	NA	neutral	NA
	Summer Pollock CPUE YOY Shelikof Survey	NA	NA	NA	neutral	NA
	Summer Pollock Condition YOY Shelikof Survey	NA	NA	NA	**low**	NA
	Summer Pollock CPUE YOY Nearshore Kodiak Survey	neutral	neutral	neutral	neutral	*high*
	Annual Pollock Relative Biomass Aiktak Survey	NA	neutral	neutral	**low**	neutral
Juvenile	Pollock Predation Mortality Age1 GOA Model	neutral	neutral	neutral	neutral	neutral
	Summer Pollock Euphausiid Diet Juvenile GOA Survey	NA	neutral	NA	neutral	NA
Adult	Summer Temperature Bottom GOA Survey	NA	neutral	NA	neutral	NA
	✻ Fall Pollock Condition Adult GOA Fishery	neutral	neutral	neutral	neutral	NA
	Winter Pollock Condition Adult GOA Survey	neutral	neutral	**low**	neutral	neutral
	Annual Ration Pollock GOA Model	neutral	neutral	neutral	neutral	neutral
	Summer Pollock Center Gravity Northeast WCGOA Model	NA	neutral	NA	*low*	NA
	Summer Pollock Area Occupied WCGOA Model	NA	neutral	NA	*high*	NA
	Annual Biomass Consumed Pollock GOA Model	*low*	neutral	neutral	*low*	*low*
	Annual Pacific Ocean Perch Biomass GOA Model	**high**	**high**	**high**	neutral	neutral
	Annual Sablefish Biomass GOA Model	neutral	**high**	**high**	**high**	**high**
	Annual Steller Sea Lion Adult GOA Survey	**high**	**high**	NA	NA	NA

Indicator Monitoring Analysis - Traffic Light

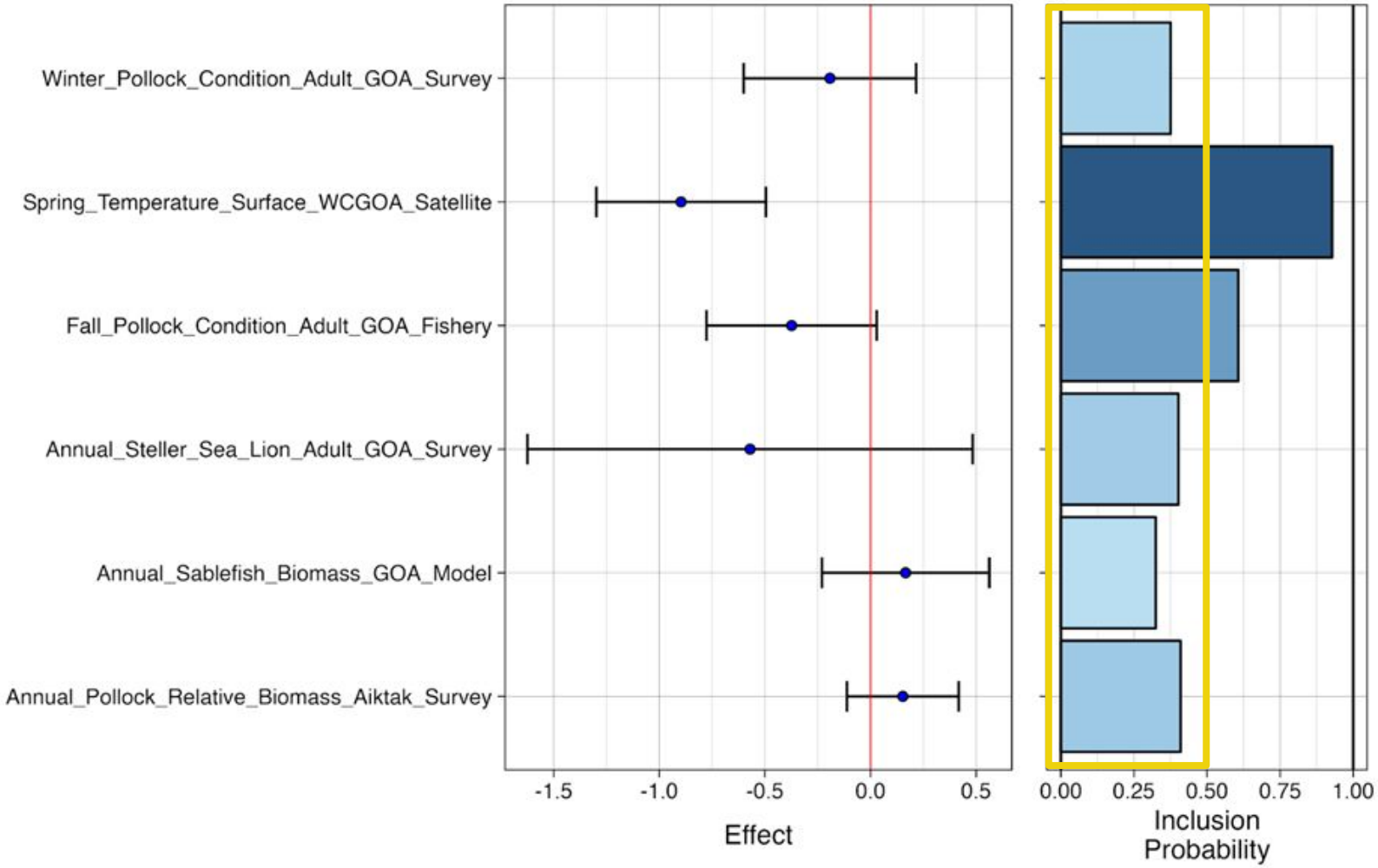
- Overall
  - 12 of 23 indicators updated
  - Increase from average to above average
- Category
  - Larval to YOY > from below average to above average
  - Juvenile remained average
  - Adult above average to average



Indicator Monitoring Analysis - Importance

Two indicators with importance > 0.5, same indicators as last year:

- Spring SST WCGOA
- Fall condition fishery
- 1991-2019 year class (missing some years)



Indicator Monitoring Analysis - Advanced

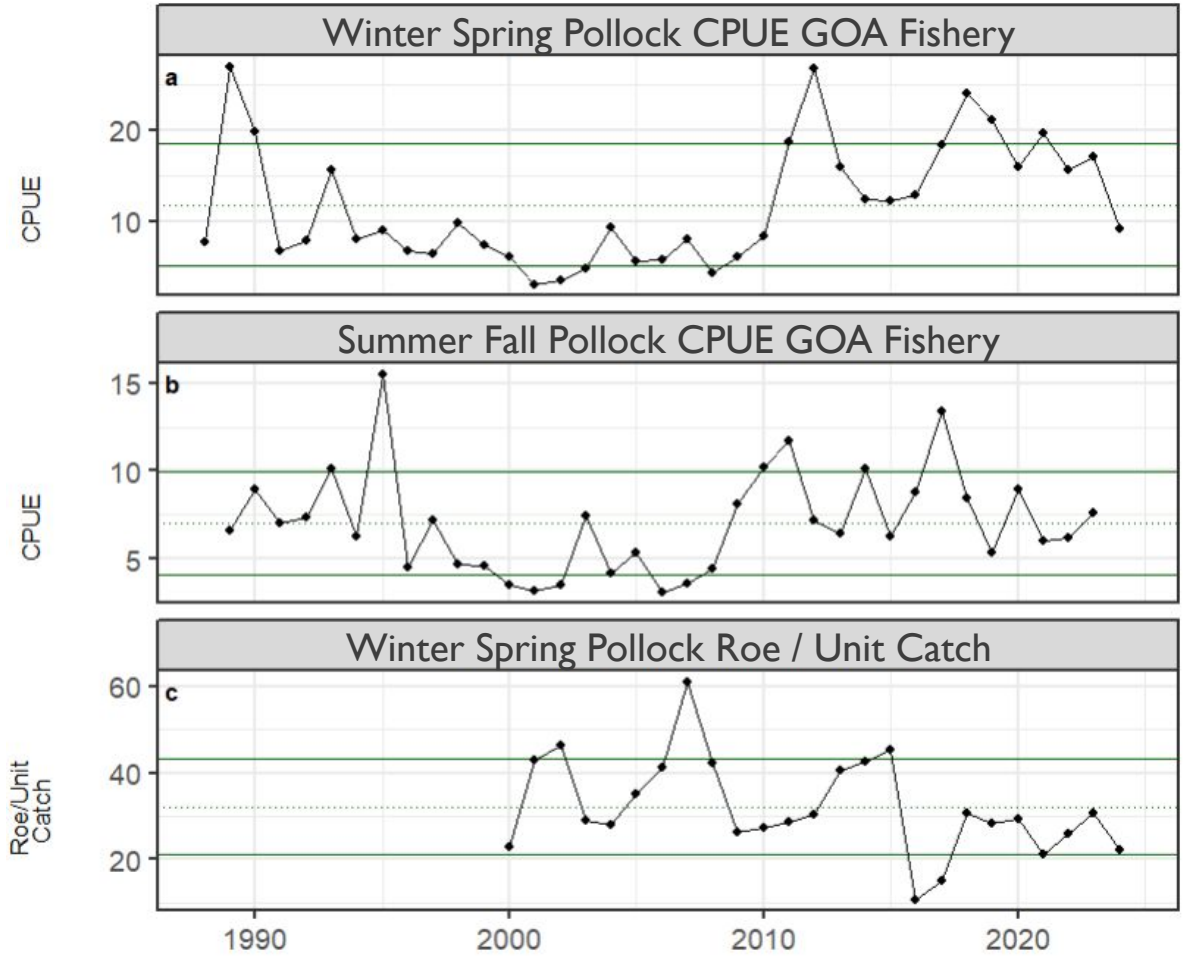
- CEATTLE Multispecies Model (Adams et al., 2022, Adams et al., 2024)
  - Based in part on most recent stock assessment model, 1979-present, of Pacific cod, pollock, arrowtooth, halibut
  - Developed to understand trends in total natural mortality
- Embedded Causal Model (Champagnat et al., *in prep*)
  - A new research model was developed in 2024 that formally incorporates the ESP indicators into the 2023 GOA pollock stock assessment model using an embedded dynamic structural equation modeling (DSEM) framework.
  - Initial results include significant reductions in recruitment variation and improved short-term projections of recruitment (Appendix 1E)

Socioeconomic Indicators

1. Winter, spring CPUE fishery
2. Summer, fall CPUE fishery

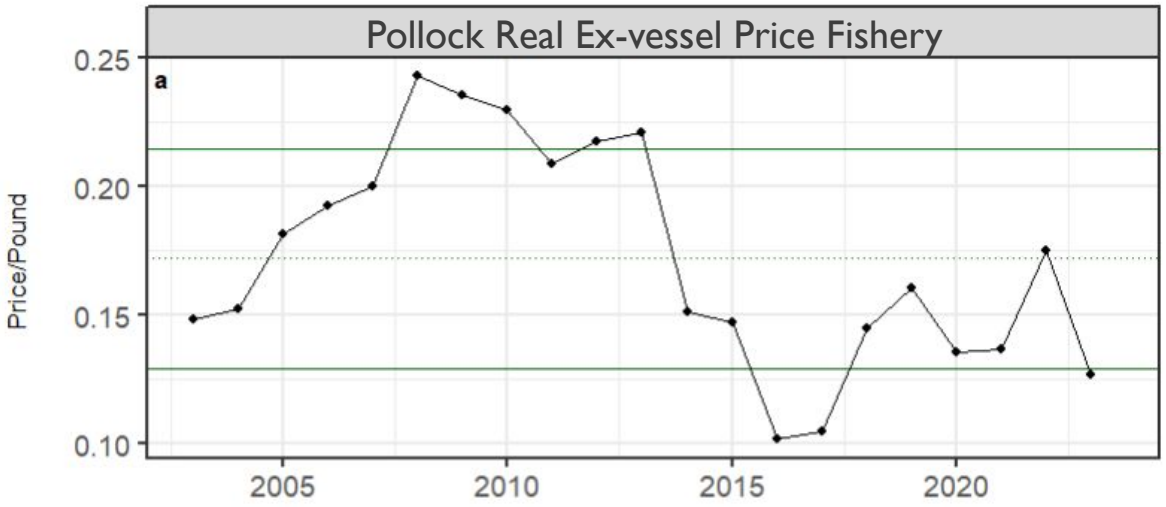
3. Ex-vessel price per pound
4. Roe per unit catch

Fishery-Informed Indicators



- Fishery CPUE in the winter-spring decreased in 2024, falling below the historical average but within 1 SD of the historical CPUE range implying pollock were less concentrated, so catch rates were lower and roe may be in slightly worse condition.
- Roe-per-unit-catch in the fishery decreased in 2024, remaining below the historical average but within one-standard deviation of the historical range

Economic Indicators



- The average annual ex-vessel price per pound declined from 2022 levels falling below one-standard deviation for the first time since 2017 and remained below the historical average for the ninth year in the last decade

Summary and Stickers!!!

Ecosystem (ABC Information):

- No heatwave, avg temp, moderate habitat conditions, few larval indicators (no survey) but sufficient prey based on seabirds
- High nearshore CPUE in beach seine
- Adult condition mixed, low biomass consumed, but high sablefish and POP
- DSEM + integrated in model

Socioeconomic (TAC Information):

- CPUE decreased in winter & spring, less concentrated
- May impact roe quality, ex-vessel price low

Planned ESP Developments

1) Request for Indicators (RFI) in 2025, use ESP data gaps and research priorities list, indicators submitted in February

2) Data modernization project begins in early 2025 to expand the ESP data management system (hosted by AKFIN) and streamline the AK-ESP R package for multiple templates (e.g., one-pager)

3) Indicator monitoring analysis for groundfish and crab ecosystem indicators presented to authors in the spring (likely May).

4) National ESP workshops to identify support systems that will work toward operationalizing ESPs

Questions?

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