Ecosystem & Socioeconomic Profile (ESP): Gulf of Alaska (GOA) Pacific Cod



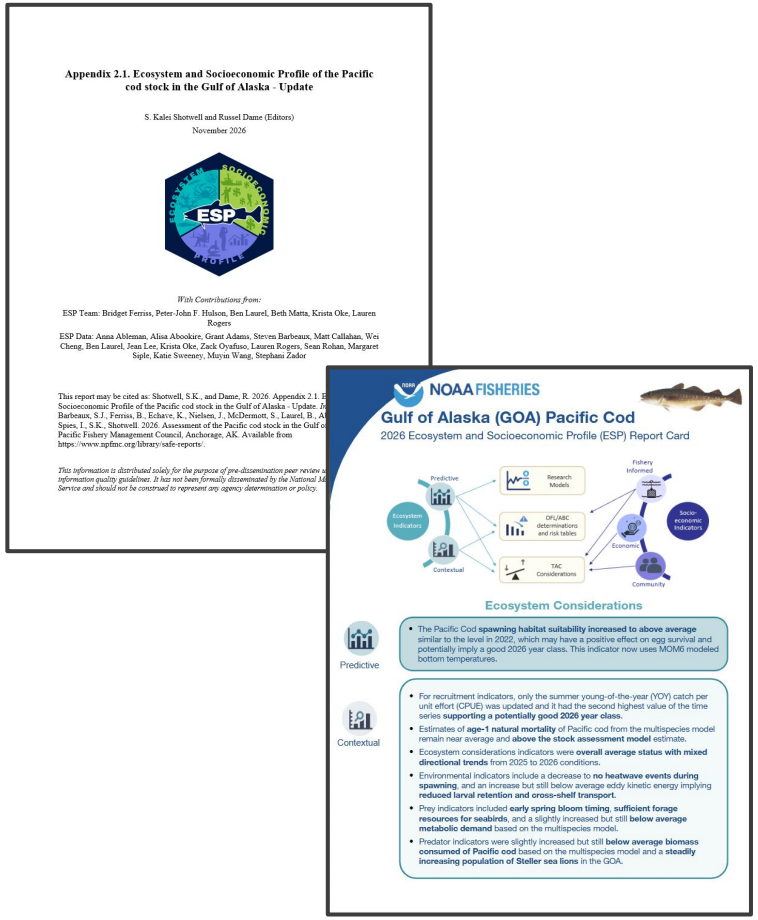
Kalei Shotwell & Russel Dame,
November 2026 Groundfish Plan Team

ESP Team and Contributors:

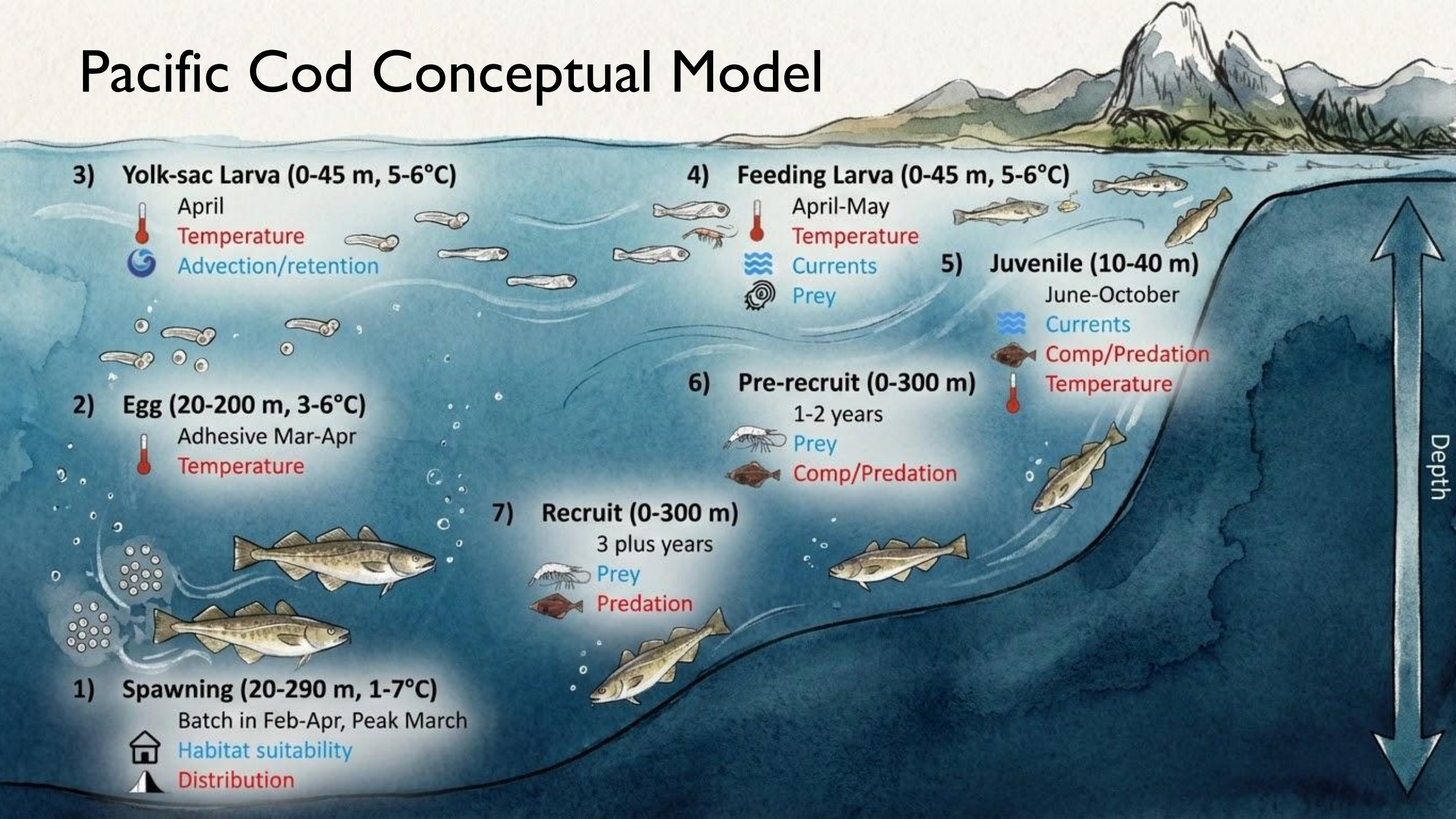
Anna Ableman
Alisa Abookire
Grant Adams
Steven Barbeaux
Matt Callahan
Wei Cheng
Bridget Ferriss
Peter-John Hulson
Ben Laurel
Jean Lee
Beth Matta
Krista Oke
Zack Oyafuso
Lauren Rogers
Sean Rohan
Margaret Siple
Katie Sweeney
Muyin Wang
Stephani Zador

Overview

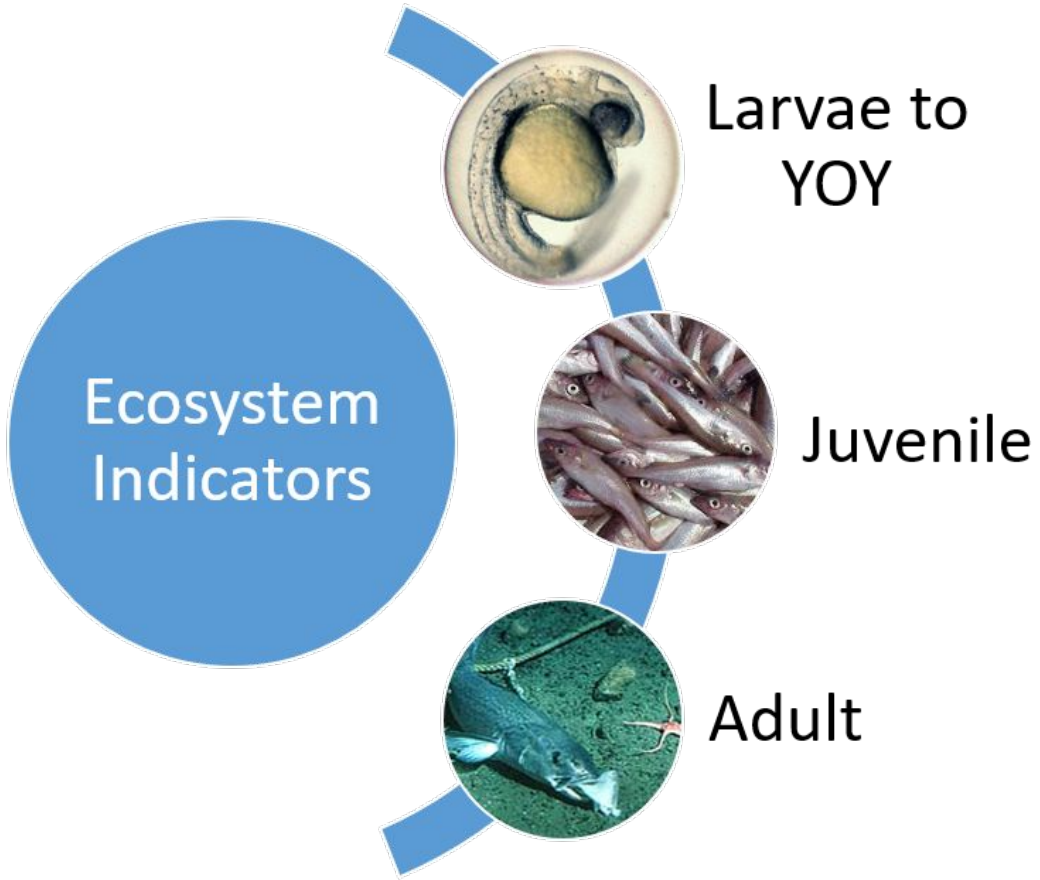
- Requested: 2016, 2019
- Completed in 2021 as Appendix 2.1 in the GOA Pacific Cod SAFE Report
- Annual updates ever since with two updates this year due to special request
- Bayesian Adaptive Sampling (BAS) analysis for ecosystem indicators (frozen from 2025/2026 ESP)
- Summary of indicator status/trends
- Future plans



Pacific Cod Conceptual Model



Ecosystem Indicators



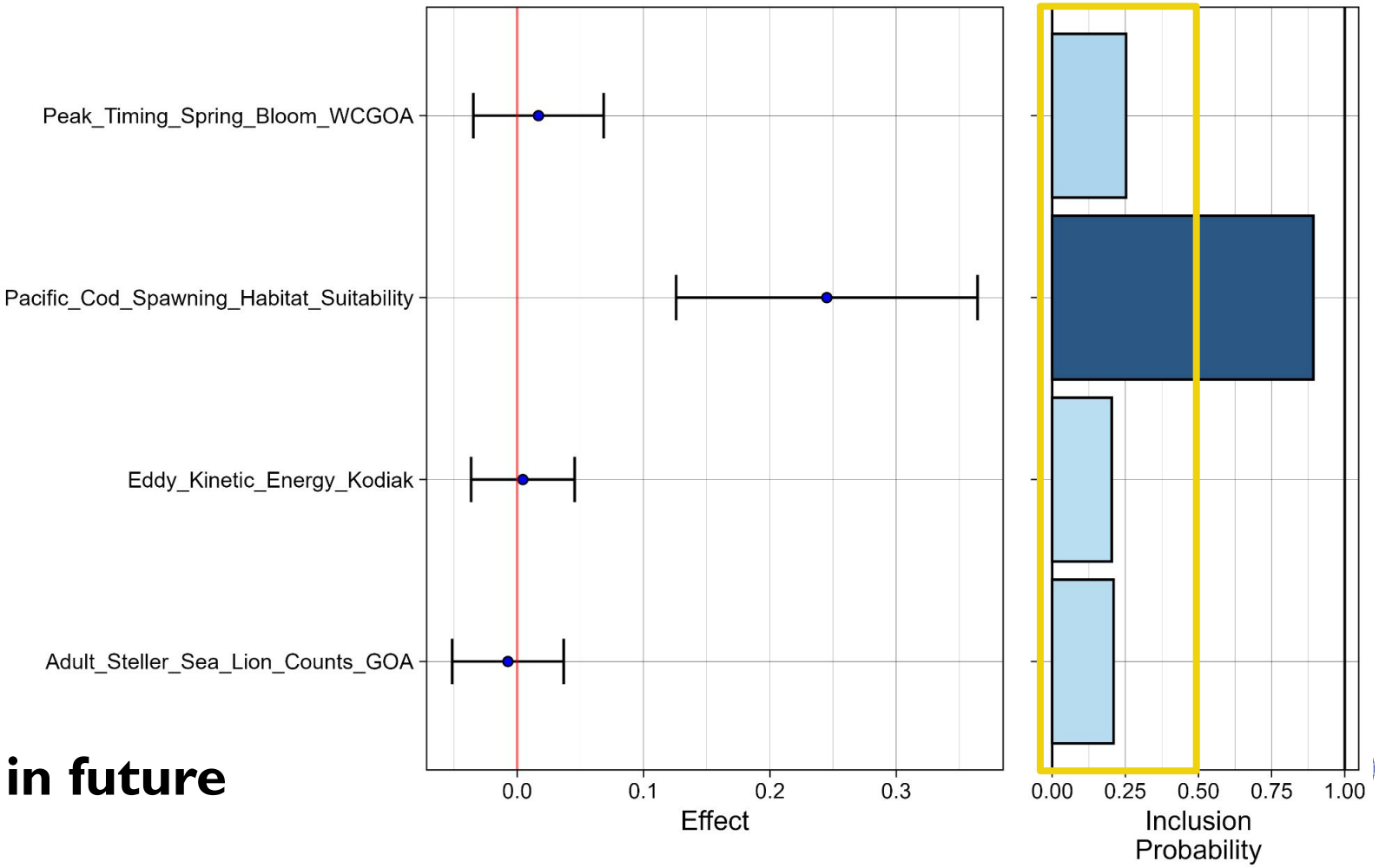
- Marine heatwave index spawning (OISST), -
- **Spawning habitat suitability** (model), +
- **Eddy kinetic energy Kodiak** (CMEMS), +
- **Peak timing spring bloom** WCGOA (OC-CCI), +
- Summer large copepods Shelikof (EcoFOCI), +
- Spring Pacific cod larvae Shelikof (EcoFOCI), +
- Murre reproductive success Chowiet (USFWS), +
- YOY Pacific cod CPUE WCGOA (Beach Seine), +
- Age-1 natural mortality (multispecies model), -
- Bottom temperature shelf (CFSR), -
- Juvenile condition (GAP), +
- Adult condition (GAP), +
- Annual Pacific cod ration (multispecies model), -
- Center of gravity, both North and East (GAP), -
- Area occupied (GAP), +
- Biomass eaten of Pacific cod (multispecies model), -
- **Adult Steller sea lion counts** (MML), -

Indicator Analysis - Importance Testing

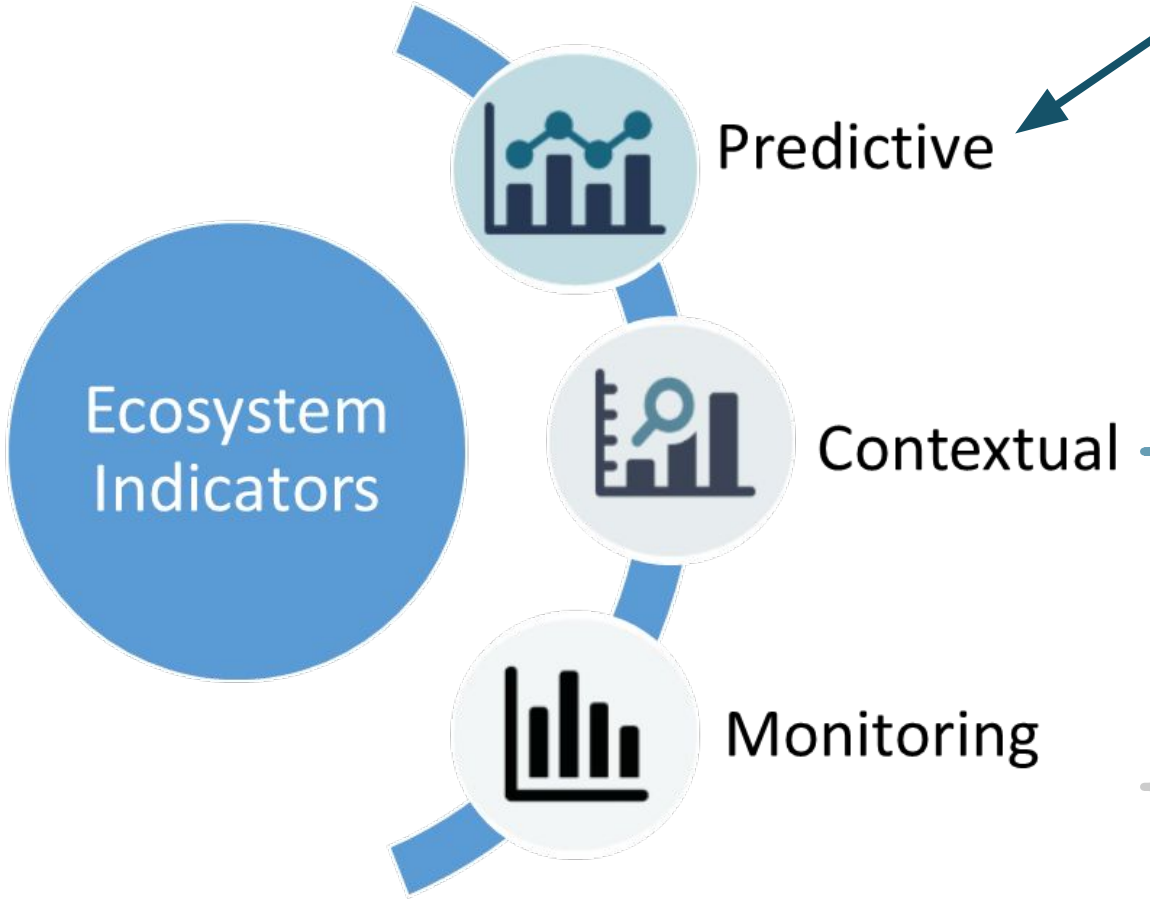
One indicator with importance > 0.5:

- Pacific Cod Spawning Habitat Suitability (0.89 probability)
- Positive effect, matches conceptual model
- 1998-2022 year class

Note: Moving to DSEM in future



Ecosystem Indicator Categorization



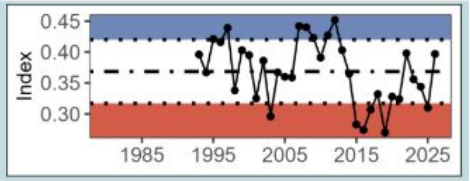
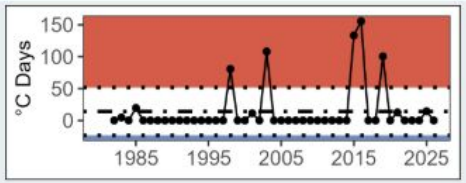
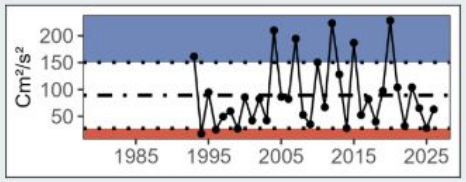
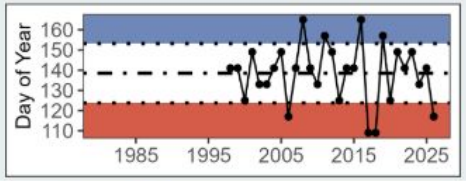
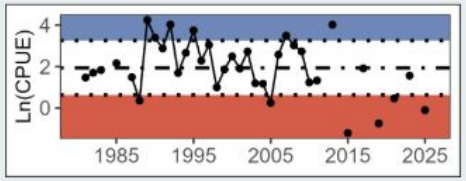
- Spawning habitat suitability (model), +
- Marine heatwave index spawning (OISST), -
- Eddy kinetic energy Kodiak (CMEMS), +
- Peak timing spring bloom WCGOA (OC-CCI), +
- Spring Pacific cod larvae Shelikof (EcoFOCI), +
- Murre reproductive success Chowiet (USFWS), +
- YOY Pacific cod CPUE WCGOA (Beach Seine), +
- Age-1 natural mortality (multispecies model), -
- Juvenile condition (GAP), +
- Adult condition (GAP), +
- Annual Pacific cod ration (multispecies model), -
- Biomass eaten of Pacific cod (multispecies model), -
- Adult Steller sea lion counts (MML), -
- Summer large copepods Shelikof (EcoFOCI), +
- Bottom temperature shelf (CFSR), -
- Center of gravity, North and East (GAP), -
- Area occupied (GAP), +

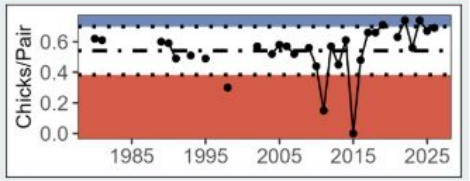
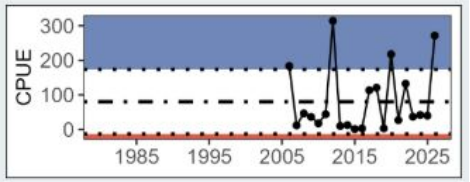
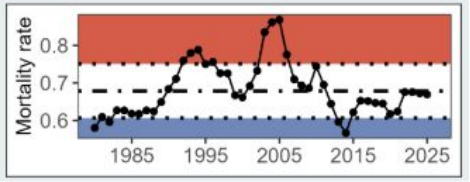
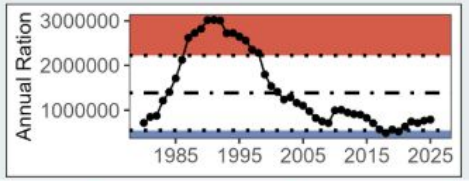
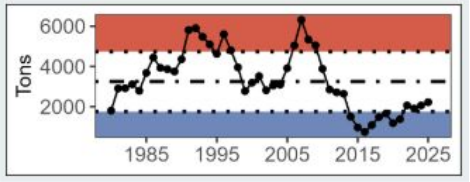
GOA Pacific Cod Report Card



Predictive

Contextual

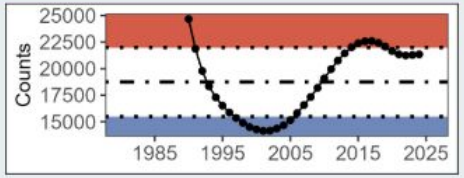
Indicator	Status	Trend
Pacific Cod Spawning Habitat Suitability	Near long-term mean	
Heatwave During Spawning in GOA	Near long-term mean	
Eddy Kinetic Energy in Kodiak	Near long-term mean	
Peak Timing of Spring Bloom in WCGOA	Below long-term mean	
Spring Pacific Cod Larvae CPUE in Shelikof	Below long-term mean	

Indicator	Status	Trend
Murre Reproductive Success on Chowiet	Near long-term mean	
Summer Pacific Cod YOY CPUE in WCGOA	Above long-term mean	
Age-1 Pacific Cod Natural Mortality	Near long-term mean	
Pacific Cod Ration in GOA	Near long-term mean	
Biomass Eaten of Pacific Cod	Near long-term mean	

GOA Pacific Cod Report Card



Contextual

Indicator	Status	Trend
Adult Steller Sea Lion Counts in GOA	Near long-term mean	

NOAA FISHERIES

Gulf of Alaska (GOA) Pacific Cod

2026 Ecosystem and Socioeconomic Profile (ESP) Report Card Summary



Predictive Indicators

Spawning habitat suitability increased to above average, similar to 2022, which may have a positive effect on egg survival and potentially support a good 2026 year class. This indicator now uses MOM6.

Contextual Indicators

- **Age-1 mortality:** Near average and above the stock assessment model estimate.
- **Overall ecosystem status:** Average, with mixed directional trends from 2025 to 2026.
- **Environmental conditions:** No heatwave events during spawning, an increase but still below average eddy kinetic energy suggesting reduced larval retention and cross-shelf transport.
- **Prey and condition:** Early spring bloom, sufficient forage for seabirds, and slightly increased but still below-average metabolic demand.
- **Predators:** Slightly increased but below-average biomass consumed by Pacific cod, and a steadily increasing population of Steller sea lions.
- **Recruitment:** Summer YOY CPUE had the second highest value in the time series, supporting a potentially good 2026 year class.

Overall Takeaway

Predictive indicator suggests good conditions for 2026, supported by contextual recruitment indicators, but mixed environment, prey, and predation signals.

Socioeconomic Indicators

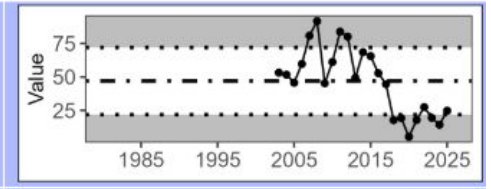
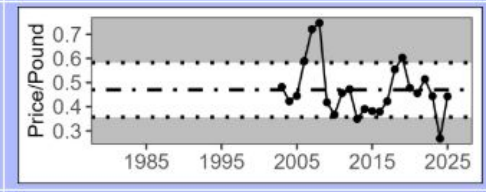
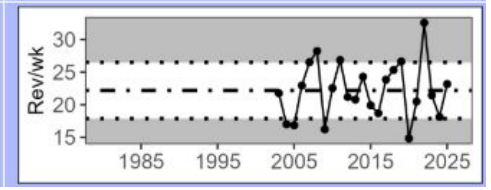


1. Ex-vessel value
2. Ex-vessel price per pound
3. Revenue per unit effort

EBS Pacific Cod Report Card



Economic

Indicator	2025 Status	Trend
Pacific Cod Real Ex-vessel Value in GOA	Near long-term mean	
Pacific Cod Real Ex-vessel Price in GOA	Near long-term mean	
Pacific Cod Real Revenue per Unit Effort in GOA	Near long-term mean	

NOAA FISHERIES

Gulf of Alaska (GOA) Pacific Cod

2026 Ecosystem and Socioeconomic Profile (ESP) Report Card – **Socioeconomic Indicators**



Economic Indicators

- **Ex-vessel value** increased by 77% from 2024, remaining within one-standard deviation of the historical range for only the second year of the last eight.
- The average **ex-vessel price** per pound increased in 2025 from an all time-series low (2024), increasing 69% from 2024 to within one-standard deviation of the historical range.
- **Revenue-per-unit-effort** increased by 28% from 2024, falling within the one-standard deviation of the historical range and greater than the historical average.

Overall Takeaway

Economic indicators increased in 2025, with higher values, prices, and revenue-per-unit-effort relative to recent years.



Planned ESP Developments

1) Request for information in 2027, use ESP data gaps and research priorities list, contact leads of current research projects for input on updating indicators, ESP team review of mechanism table

2) Improvements to indicator monitoring analysis based on recent work with DSEM in ESPs (GOA pollock, GOA arrowtooth, EBS pollock)

3) National ESP workshops and training to identify support systems that will work toward improving and operationalizing ESPs

Questions?



Contact:

Kalei Shotwell, AFSC
Russel Dame, AFSC

kalei.shotwell@noaa.gov
russel.a.dame@noaa.gov