Ecosystem & Socioeconomic Profile: Sablefish Report Card

Kalei Shotwell, November Groundfish Plan Team 2023

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NOAA FISHERIES

Overview

- **Appendix 3C in SAFE Report**
  - Full/partial ESPs in 2017-2020
  - Report Cards in 2021-2023
- **Report Card in 2023**
  - Simplified report with current data
  - Ecosystem and socioeconomic indicator assessment and analysis
  - 10 team, 16 contributors

Appendix 3C. Ecosystem and Socioeconomic Profile of the Sablefish stock in Alaska - Report Card

S. Kalei Shotwell (Editor)

Katy Echave, Bridget Ferriss, Dan Goethel, Chris Lunsford, Krista Oke, Elizabeth Siddon, Kevin Siwicke, Jane Sullivan, Marysia Szymkowiak, and Ben Williams (Team)
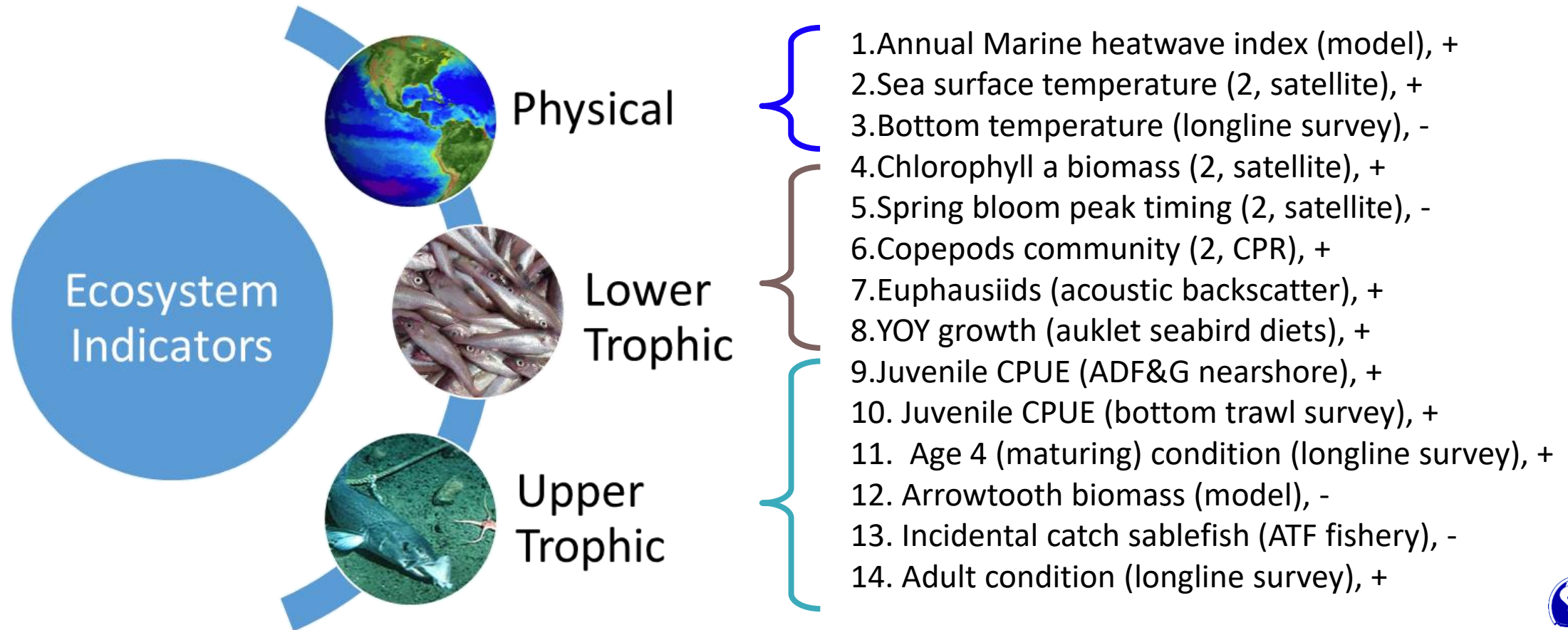
November 2023

Appendix 3C

With Contributions from:

Anna Ableman, Mayumi Arimitsu, Steve Barbeaux, Matt Callahan, Curry Cunningham, Brian Garber-Yonts, Dana Hanselman, Jean Lee, Jens Nielsen, Clare Ostle, Patrick Ressler, Cara Rodgveller, Kalei Shotwell, Kevin Siwicke, Kally Spalinger, Jane Sullivan

Ecosystem Indicators

Ecosystem Indicators

Physical
1. Annual Marine heatwave index (model), +
2. Sea surface temperature (2, satellite), +
3. Bottom temperature (longline survey), -

Lower Trophic
4. Chlorophyll a biomass (2, satellite), +
5. Spring bloom peak timing (2, satellite), -
6. Copepods community (2, CPR), +
7. Euphausiids (acoustic backscatter), +
8. YOY growth (auklet seabird diets), +

Upper Trophic
9. Juvenile CPUE (ADF&G nearshore), +
10. Juvenile CPUE (bottom trawl survey), +
11. Age 4 (maturing) condition (longline survey), +
12. Arrowtooth biomass (model), -
13. Incidental catch sablefish (ATF fishery), -
14. Adult condition (longline survey), +

Ecosystem Summary Table

Category	Indicator	2019 Status	2020 Status	2021 Status	2022 Status	2023 Status
Physical	Annual Heatwave GOA Model	*high*	neutral	neutral	neutral	neutral
	Spring Temperature Surface GOA Satellite	*high*	*high*	neutral	neutral	neutral
	Spring Temperature Surface SEBS Satellite	*high*	*high*	neutral	neutral	neutral
	Summer Temperature 250m GOA Survey	**high**	neutral	neutral	**high**	neutral
Lower Trophic	Spring Chlorophyll a Biomass GOA Satellite	**low**	**low**	neutral	neutral	**low**
	Spring Chlorophyll a Biomass SEBS Satellite	neutral	neutral	neutral	neutral	**low**
	Spring Chlorophyll a Peak GOA Satellite	**high**	neutral	neutral	neutral	**high**
	Spring Chlorophyll a Peak SEBS Satellite	*low*	neutral	neutral	neutral	neutral
	Annual Copepod Community Size EGOA Survey	**low**	neutral	neutral	neutral	NA
	Annual Copepod Community Size WGOA Survey	*high*	neutral	neutral	**low**	NA
	Summer Euphausiid Abundance Kodiak Survey	neutral	NA	NA	NA	NA
	Annual Sablefish Growth YOY Middleton Survey	*high*	neutral	neutral	neutral	neutral
Upper Trophic	Summer Sablefish CPUE Juvenile Nearshore GOAAI	*high*	*high*	*high*	*high*	neutral
	Summer Sablefish CPUE Juvenile GOA Survey	neutral	NA	neutral	NA	neutral
	Summer Sablefish Condition Female Age4 GOA Survey	**low**	neutral	*high*	**low**	NA
	Annual Arrowtooth Biomass GOA Model	neutral	*low*	*low*	NA	NA
	Annual Sablefish Incidental Catch ATF Target GOA	**high**	neutral	neutral	neutral	neutral
	Summer Sablefish Condition Female Adult GOA Survey	neutral	neutral	neutral	**low**	*high*

Ecosystem Considerations

- Marine heatwave events were below average, surface temperatures in the Gulf of Alaska (GOA) and southeastern Bering Sea (SEBS) were below average, and bottom temperatures on the slope in the GOA decreased but still above average similar to 2021.

- Chlorophyll *a* biomass was low in the GOA and lowest of the time series in the SEBS, while the spring bloom timing was high (late) in the GOA and average in the SEBS, implications for larval feeding conditions

- Zooplankton community size in the eastern GOA was below average and low in the western GOA in 2022, implying a smaller sized community.

- Growth of YOY sablefish was slightly below average, but mean length was low in 2023 (selectivity influence).

- Nearshore survey sablefish CPUE declined since 2020, but remain above average, length frequencies support strong 2019 year class (yc) and age-1 sablefish from the bottom trawl survey support above average 2022 yc.

- Condition of the 2018 year-class (2022 data) was low suggesting insufficient resources just prior to maturing, while condition of adult females in the longline survey was high in 2023, relative to low in 2022.

- Arrowtooth flounder total biomass remains low in the GOA and spatial overlap between sablefish migrating to adult slope habitat and the arrowtooth flounder population decreased to average.

Socioeconomic Indicators

Socio-economic Indicators

Fishery Performance

Economic

Community

1. CPUE longline fishery GOA, +
2. CPUE pot fishery BSAI, +
3. Incidental catch (GOA fisheries), -
4. Incidental catch (BSAI fisheries), -
5. Fish condition GOA fishery, +
6. Fish condition BSAI fishery, +
7. Ex-vessel value
8. Ex-vessel price per pound

Optional: revenue per unit effort (RPUE)

Explorations: environmentally linked fishery-dependent data (Watson and Callahan, 2021)

Socioeconomic Summary Table

Category	Indicator	2019 Status	2020 Status	2021 Status	2022 Status	2023 Status
Fishery Performance	Annual Sablefish Combined CPUE Alaska Fishery	low	low	neutral	high	NA
	Annual Sablefish Pot CPUE Alaska Fishery	high	neutral	high	high	NA
	Annual Sablefish Incidental Catch GOA Fishery	high	high	neutral	neutral	low
	Annual Sablefish Incidental Catch BSAI Fishery	high	high	high	high	high
	Annual Sablefish Condition Female Adult GOA Fishery	neutral	high	neutral	low	neutral
Economic	Annual Sablefish Real Exvessel Value Fishery	low	low	low	neutral	NA
	Annual Sablefish Real Exvessel Price Fishery	neutral	low	low	low	NA

Socioeconomic Considerations

- Standardized fishery CPUE indicators demonstrate similar trends, with the combined fishery indicator increasing to high and the pot fishery index at an all-time high for the time series.

- Incidental catch of sablefish in non-sablefish targeted fisheries in 2023 decreased to low in the GOA but remains high in the BSAI (Appendix D)

- Condition of adult female sablefish in the GOA fisheries increased from low in 2022 to slightly below average in 2023, but sample sizes were small compared to previous years.

- Real ex-vessel value increased to slightly above average and average price per pound remains low in 2022, in part due to continued small average fish size from recent large year classes and high quotas coastwide in recent years.
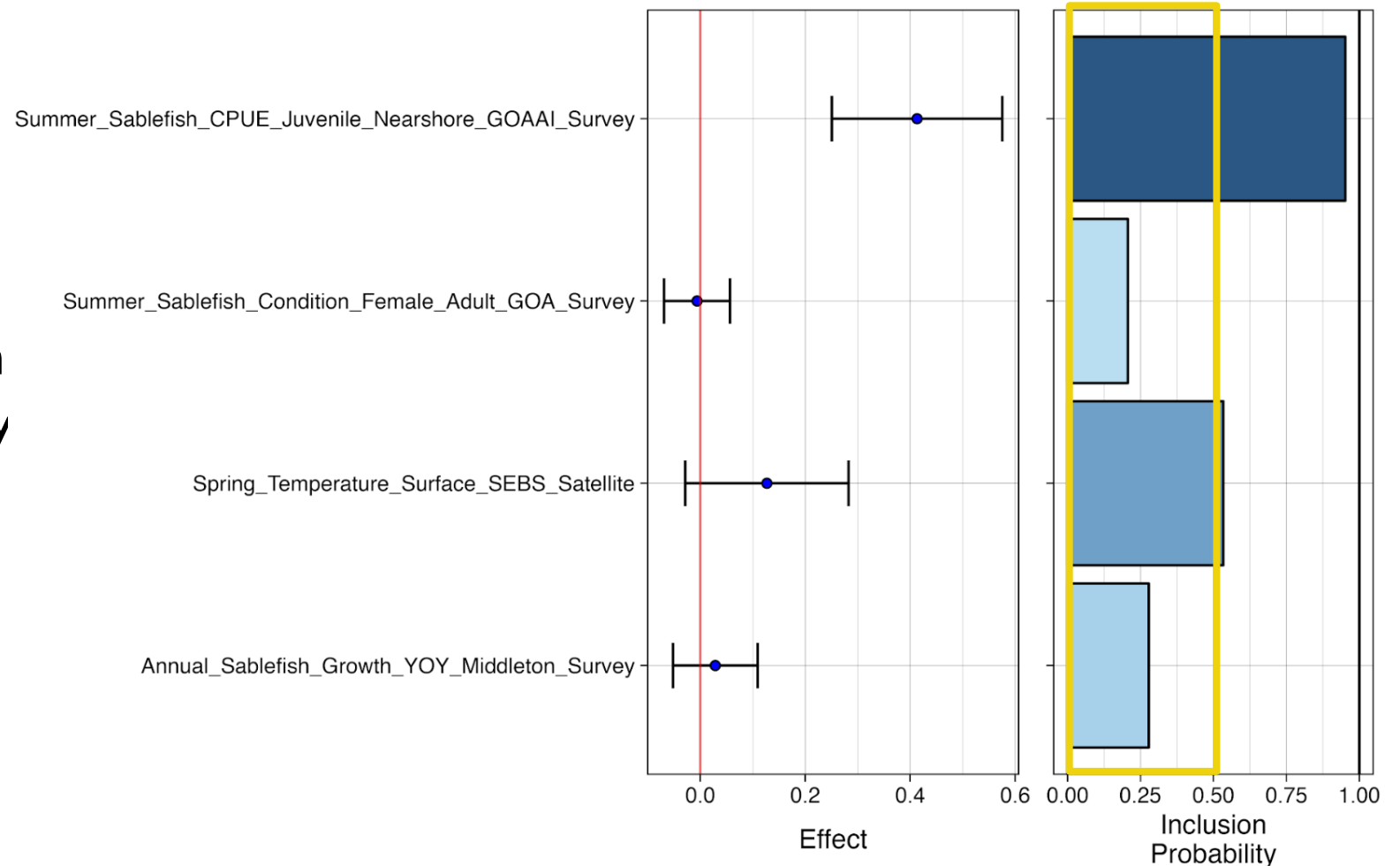
Indicator Monitoring Analysis: Overall Score

- **Ecosystem (16 of 18 total)**
  - Physical > to average
  - Lower trophic < to below average
  - Upper trophic > to above average
- **Socioeconomic (7 of 7 total)**
  - Fishery performance (partially lagged) < to average
  - Economic (lagged) > below average
  - Recent drastic changes not well captured
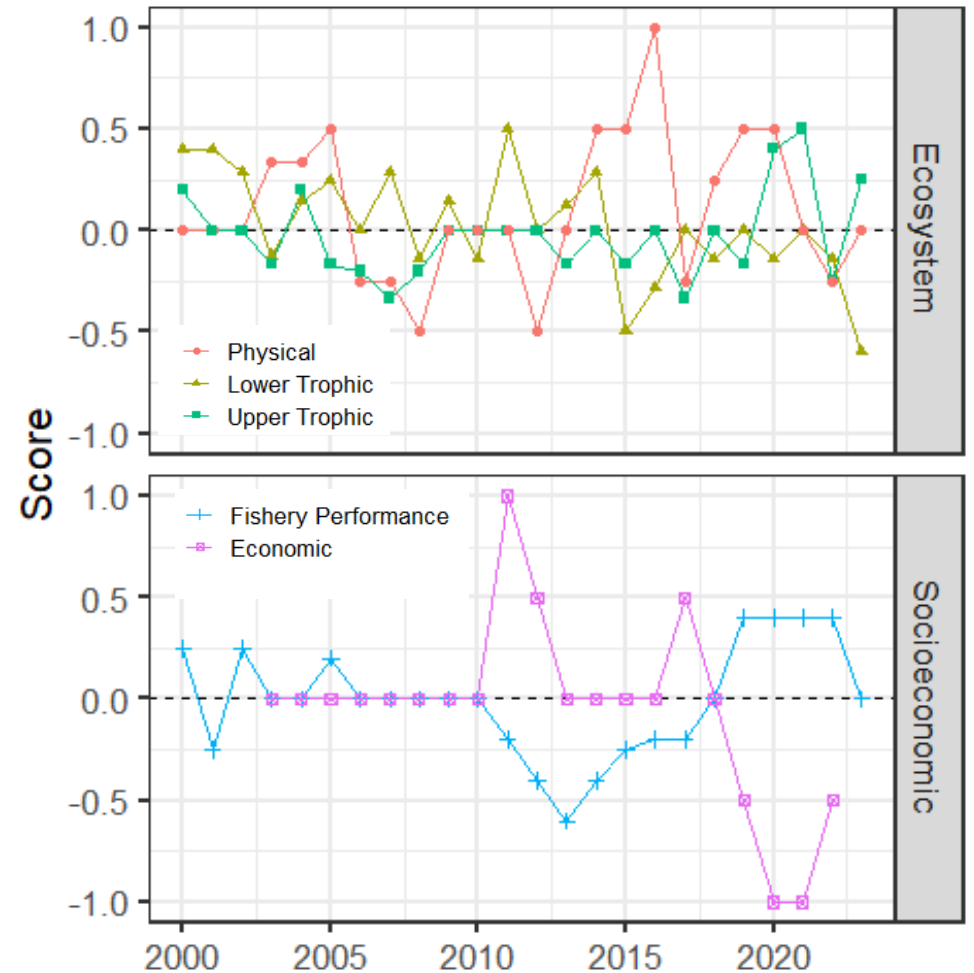
Indicator Monitoring Analysis: Importance Test
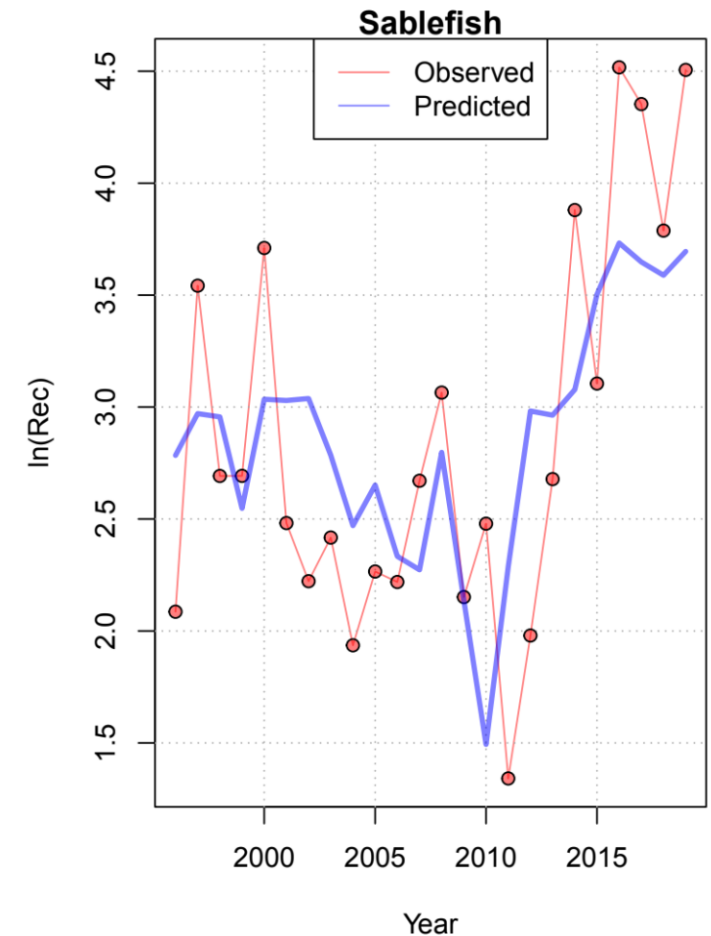
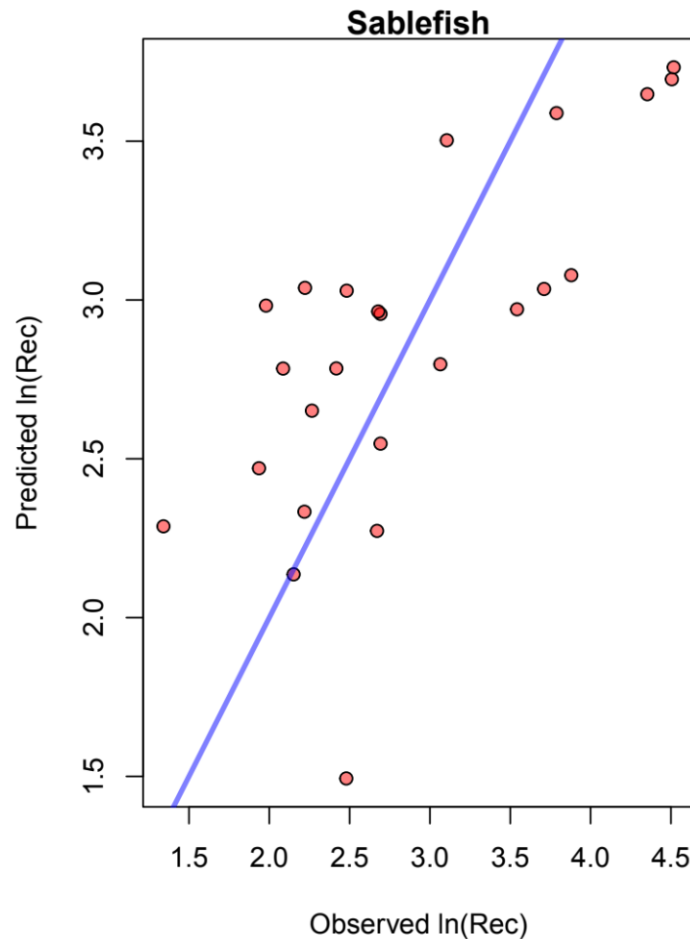Two indicators with importance > 0.5:

- Juvenile sablefish CPUE in ADF&G nearshore survey
- Spring sea surface temperature from SEBS
- 1996-2019 year class

Indicator Monitoring Analysis: Importance Test

Two indicators with importance > 0.5:

- Juvenile sablefish CPUE in ADF&G nearshore survey
- Spring sea surface temperature from SEBS
- 1996-2019 year class

Planned ESP Developments

1) Request for Indicators (RFI) in 2024, use ESP data gaps and research priorities list, indicators submitted in January, reviewed in February by ESP teams

2) New study uses multiple statistical approaches for evaluating indicators (Oke et al., *In Prep*), next stage plans to include nonstationarity, causal models (example in EBS ESR), and creation of a recruitment index to inform projections

3) Socioeconomic indicators evaluation with several groups, also part of the National ESP Initiative, emphasis on impact of small sablefish and historical use in coastal communities (SSC)

Questions?

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Ecosystem & Socioeconomic Profile (ESP) Highlights - Sablefish

- **Management Summary:**
  - Surface temps cool or average overall and bottom temp cooler but still above average in GOA, plankton lowest in time series and delayed peak, YOY growth average, but mean length very low
  - Nearshore juveniles decreased but still above average, bottom trawl survey juveniles above average, condition low for 2018 year class, female adult condition also low in 2022, but average (fishery) to high (survey) in 2023
  - Incidental catch sablefish in arrowtooth fishery average (competition overlap measure), overall fisheries low in GOA and remains high in BSAI
  - Fishery CPUE indicators time-series high, bycatch decreasing in GOA, stable and high in BSAI, ex-vessel value increased to average, price remains low in 2022
- **Modeling Summary:**
  - Two potential covariates for recruitment, CPUE from large mesh ADF&G survey, spring surface temperature in SEBS, 1996-2019 year class
  - Importance methods comparison project that includes nonstationarity, causal models (sablefish case study), recruitment index project to inform projections