Ecosystem & Socioeconomic Profile

Eastern Bering Sea Snow Crab

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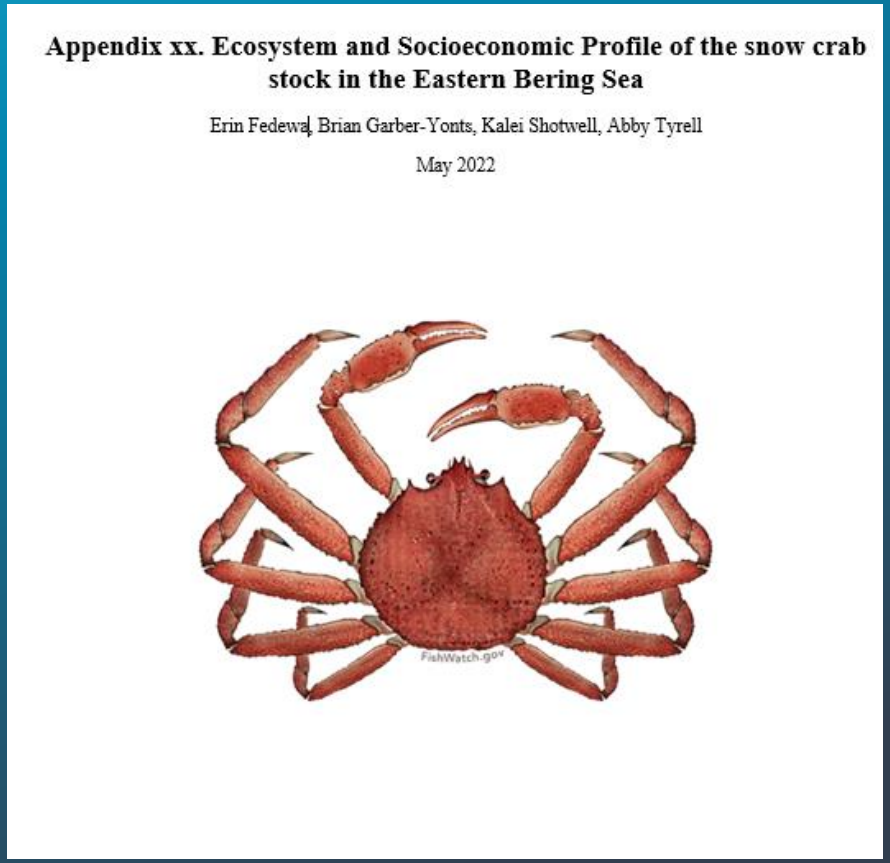
NOAA FISHERIES

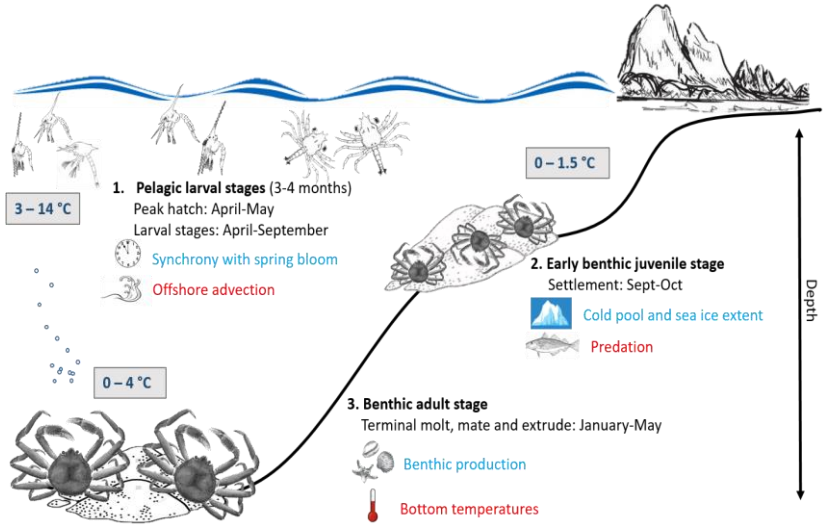
Overview

- May 2022 Draft ESP
  - Intro: justification, data sources
  - Metrics assessment: baseline, processes
  - Indicators assessment: time series, analyses
  - Recommendations; data gaps, future priorities
- Sept 2022 Full ESP
  - Updates and current year indicators



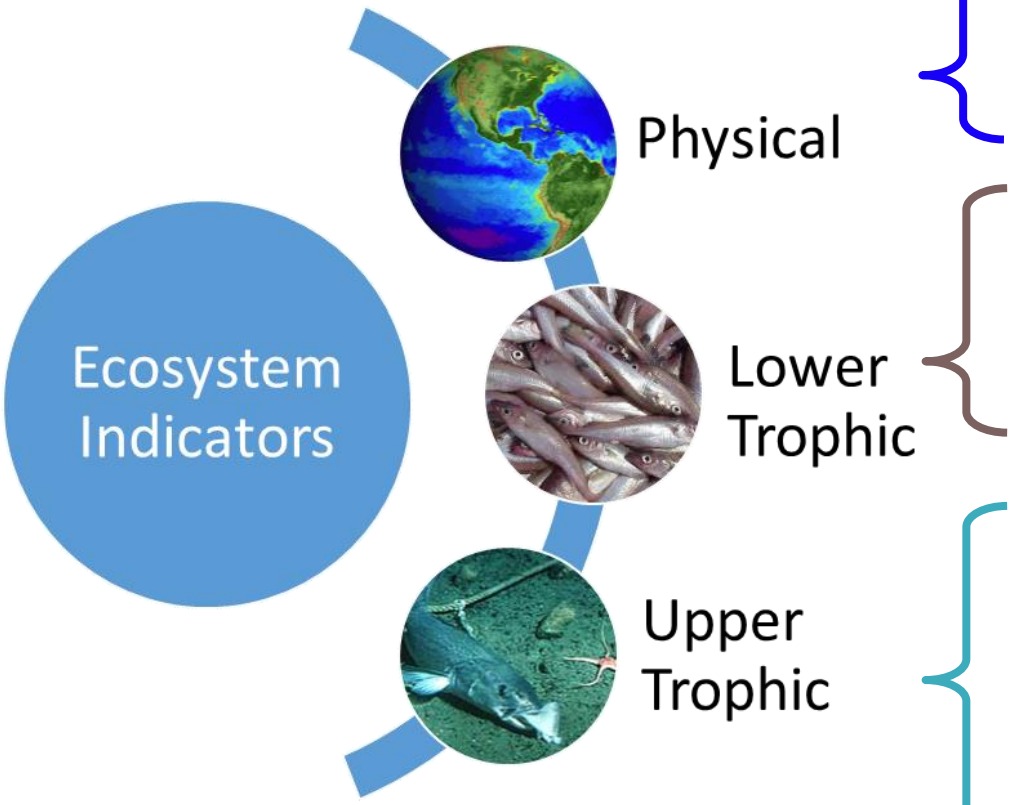
Ecosystem and Socioeconomic Processes

- Ecosystem
  - Conceptual model
  - LH and key processes tables
- Socioeconomic
  - Lacking well-specified conceptual model
  - Fishery <> stock interaction - spatial/temporal/selectivity
  - Economic factors <> fishery behavior



Stage	Habitat & Distribution	Phenology	Age, Length, Growth	Energetics
Egg	Clutch of embryos brooded under the female's abdomen until hatching	240 days at 6°C to 353 days at -1°C; cold temperatures trigger a 2-year reproductive cycle(1)	Egg diameter: 644.4-772.1 µm(2)	Optimal: 0°C – 3°C(3)
Larvae	Pelagic; concentrated in the upper 20m over the middle shelf(4)	April-June hatch	Mean carapace length: 1.25mm	Optimal: 6.9°C – 9.1°C(5)

Ecosystem Indicators

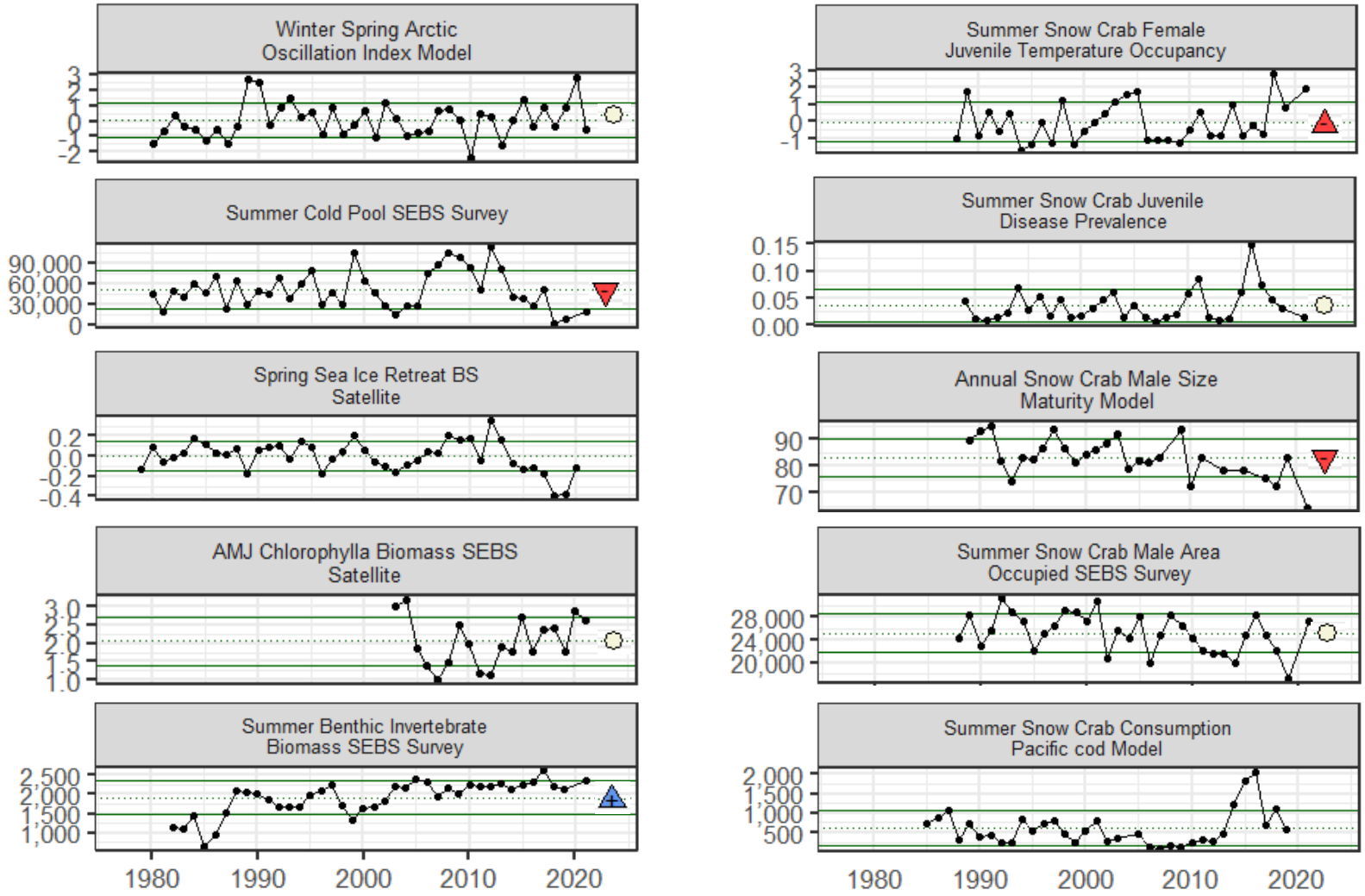


1. Arctic Oscillation (climate model)
2. Cold pool extent (BTS)
3. Sea-ice retreat (satellite)

4. Production (chlorophyll *a*, satellite)
5. Benthic prey biomass (BTS)

6. Snow crab area occupied (BTS)
7. Temperature of occupancy (BTS)
8. Snow crab center of distribution (BTS)
9. Pcod consumption of snow crab (BTS)
10. Male snow crab size at maturity (BTS)
11. Snow crab disease prevalence (BTS)

Ecosystem Indicators



Indicator Analysis Stage 1: Traffic Light Table

Indicator category	Indicator	2018 Status	2019 Status	2020 Status	2021 Status
Physical	Winter Spring Arctic Oscillation Index Model	neutral	neutral	**high**	neutral
	Summer Cold Pool SEBS Survey	**low**	**low**	NA	**low**
	Spring Sea Ice Retreat BS Satellite	**low**	**low**	neutral	NA
Lower Trophic	AMJ Chlorophyll a Biomass SEBS Satellite	neutral	neutral	*high*	neutral
	Summer Benthic Invertebrate Biomass SEBS Survey	neutral	neutral	NA	*high*
Upper Trophic	Summer Snow Crab Female Juvenile Temperature Occupancy	**high**	neutral	NA	**high**
	Summer Snow Crab Juvenile Disease Prevalence	neutral	neutral	NA	neutral
	Annual Snow Crab Male Size Maturity	**low**	neutral	NA	**low**
	Summer Snow Crab Male Area Occupied SEBS Survey	neutral	**low**	NA	neutral
	Summer Snow Crab Male Center Distribution SEBS Survey	neutral	neutral	NA	*high*
	Summer Snow Crab Consumption Pacific cod Model	**high**	neutral	NA	NA

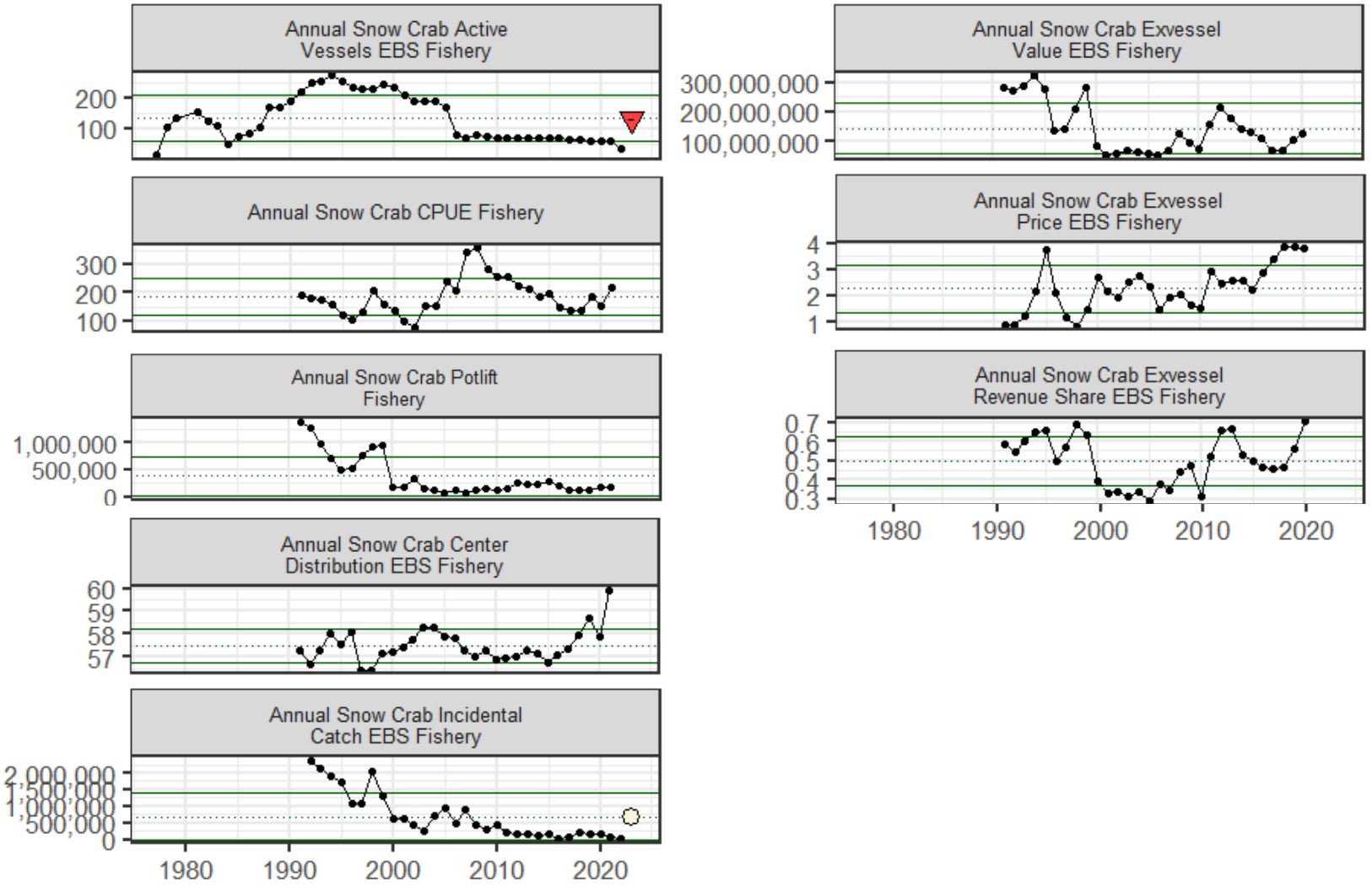
Socioeconomic Indicators

1. Center of gravity (snow crab fishery)
2. Catch-per-unit-effort (snow crab fishery)
3. Total potlifts (snow crab fishery)
4. Number active vessels (snow crab fishery)
5. Incidental catch of snow crab

6. Ex-vessel value (snow crab fishery)
7. Ex-vessel price/lb (snow crab fishery)
8. Ex-vessel revenue share (snow crab fishery)

No community indicators proposed

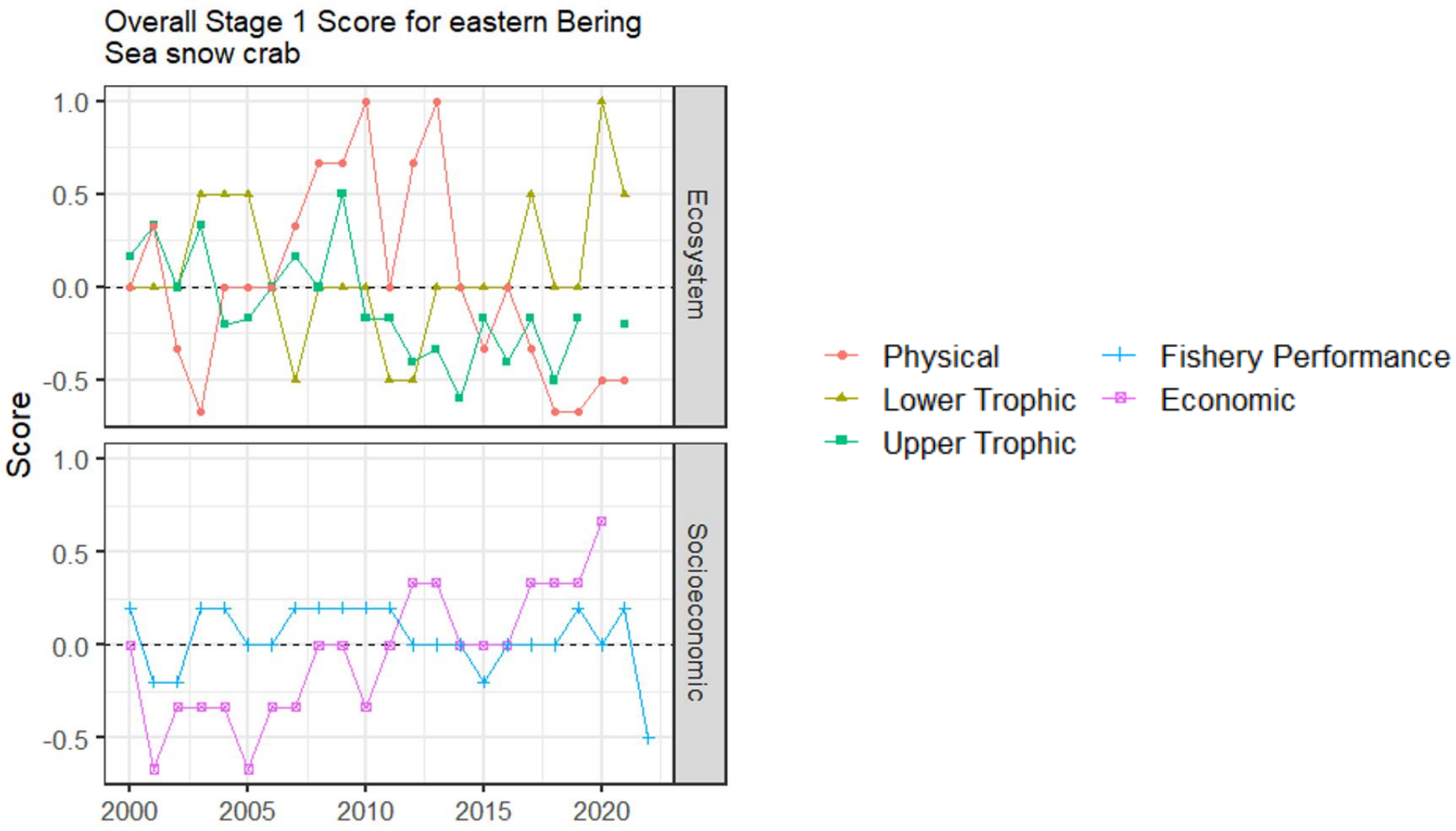
Socioeconomic Indicators



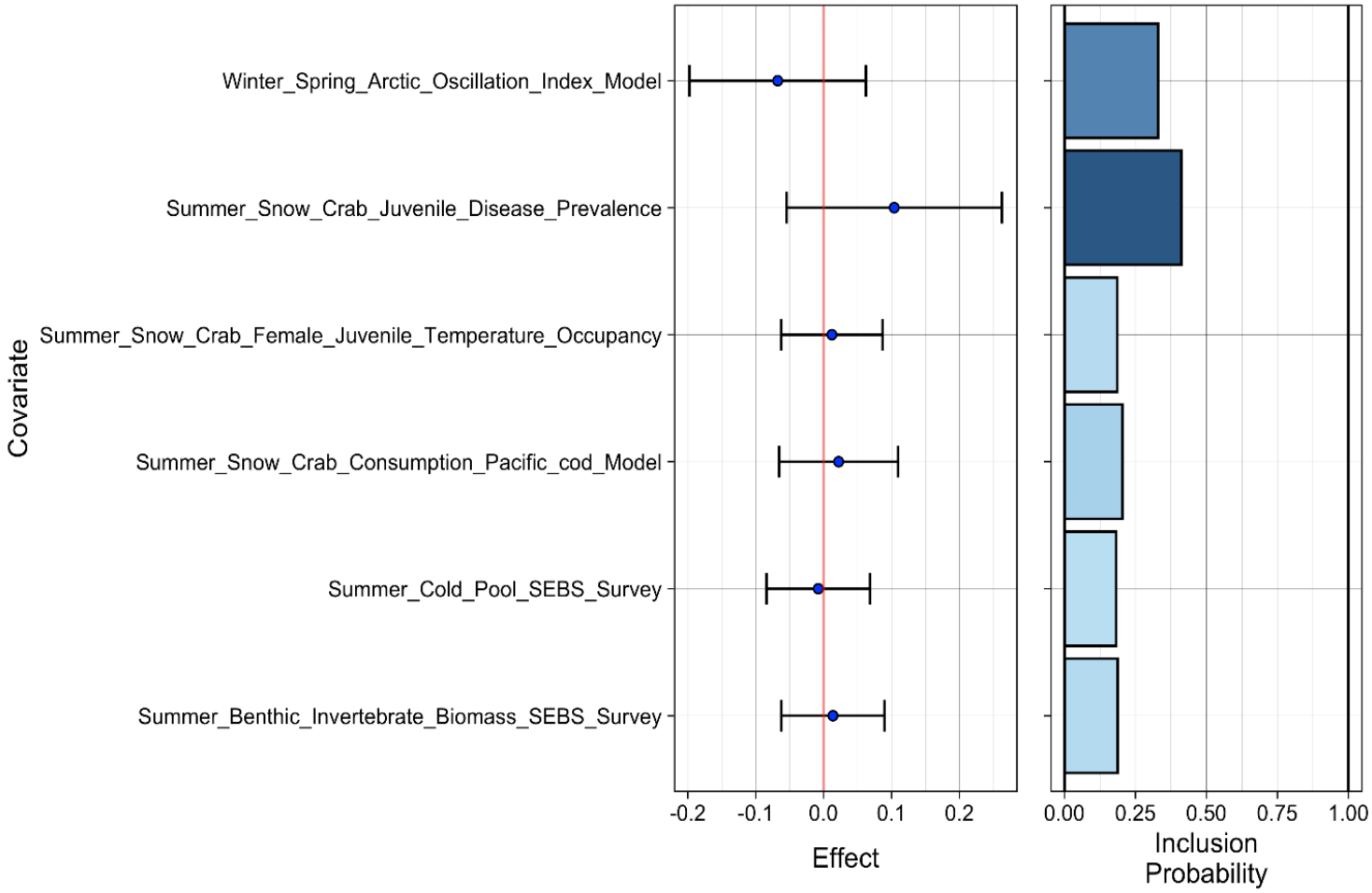
Indicator Analysis Stage 1: Traffic Light Table

Indicator category	Indicator	2018 Status	2019 Status	2020 Status	2021 Status	2022 Status
Fishery Performance	Annual Snow Crab Active Vessels EBS Fishery	neutral	neutral	neutral	neutral	low
	Annual Snow Crab CPUE Fishery	neutral	neutral	neutral	neutral	NA
	Annual Snow Crab Potlift Fishery	neutral	neutral	neutral	neutral	NA
	Annual Snow Crab Center Distribution EBS Fishery	neutral	high	neutral	high	NA
	Annual Snow Crab Incidental Catch EBS Fishery	neutral	neutral	neutral	neutral	neutral
Economic	Annual Snow Crab Exvessel Value EBS Fishery	neutral	neutral	neutral	NA	NA
	Annual Snow Crab Exvessel Price EBS Fishery	high	high	high	NA	NA
	Annual Snow Crab Exvessel Revenue Share EBS Fishery	neutral	neutral	high	NA	NA

Indicator Analysis Stage 1: Traffic Light Score



Indicator Analysis Stage 2: BAS Indicator Importance



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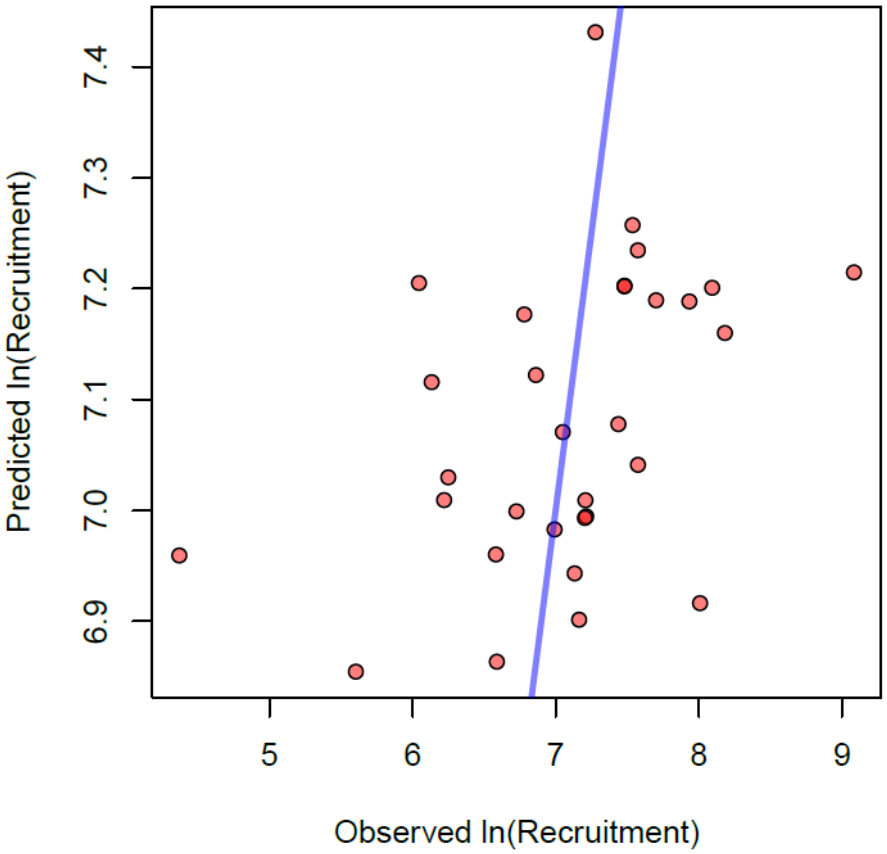
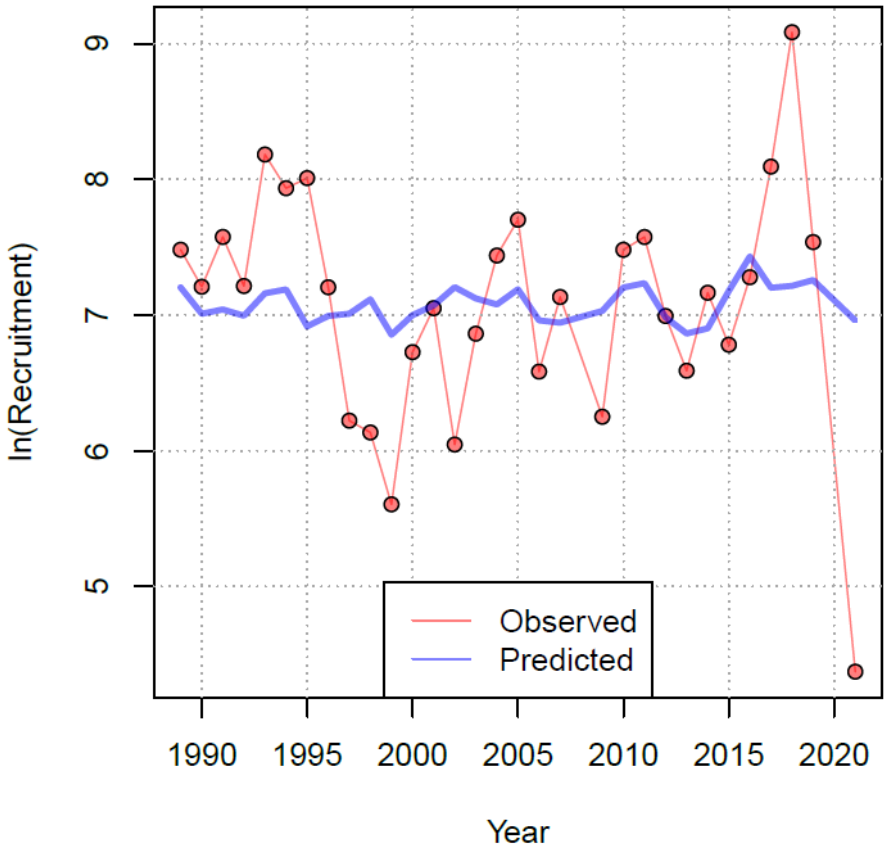


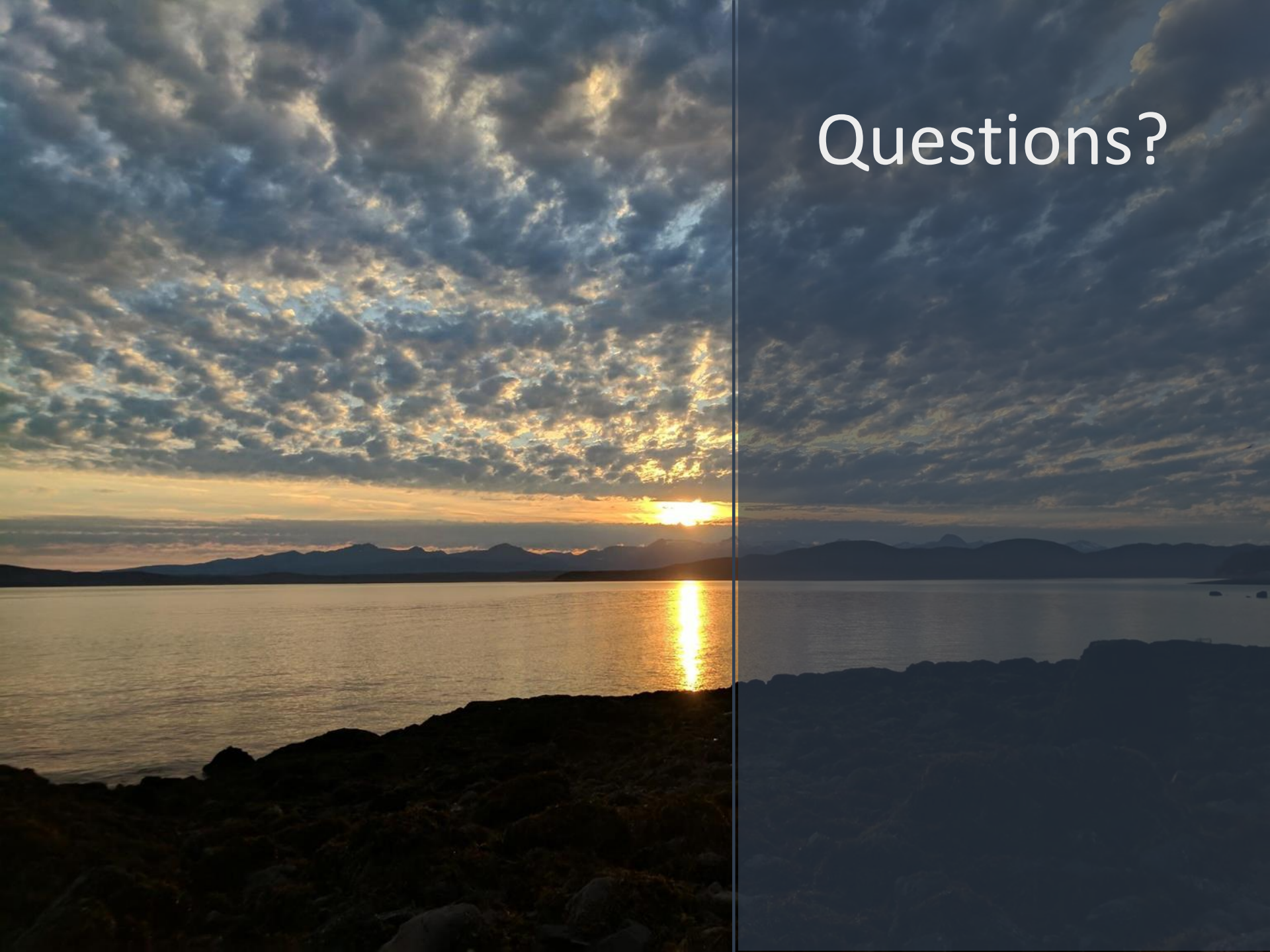


ESP Considerations

- Ecosystem Summary
  - 2020 AO index highest on record, cold pool extent well below average
  - BCS prevalence has continued to decline following 2016 peak
  - Temperatures occupied by juvenile snow crab remain above-average
  - Male population center shifted northwest in 2021 and size at 50% maturity declined dramatically
- Socioeconomic Summary
  - 2022 fleet consolidated to 37 vessels (60% of recent average fleet size)
  - Center of gravity of fishing shifted north (EEZ boundary), remote fishing grounds
  - Strong market demand has maintained historically high ex-vessel price over recent period, likely continuing through 2022
  - Ex-vessel revenue share of snow crab for participating vessels is historically high

Next Steps

- 2022 Full ESP (September CPT)
  - Updated 2022 ecosystem indicators
    -Addition of larval IBM indicators?
  - Improve/update existing indicators
  - Updated references, traffic light and BAS analysis
  - Appendix to main SAFE


Questions?