

Ecosystem Status Report: Gulf of Alaska 2022



Bridget Ferriss & Stephani Zador

With contributions from:

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2022 Changes to GOA ESR/ Response to SSC

“The SSC concurs with the BSAI GPT recommendation for a forage species workshop...”

- The ESR editors, the Forage Report editor, and others at NOAA's Alaska Fisheries Science Center convened a virtual “Forage Congress” in March-April 2022. The workshop helped to develop an understanding of AFSC's internal engagement in forage research and monitoring, to be able to better engage in the broader discussions described by the SSC in their request.

“The SSC supports a holistic review of how economic and social science information is communicated and applied to Council decision-informing analytic products...”

- Economic and social science contributions will focus on other products to inform the Council (Economic SAFE, ACEPO reports, AKFIN’s Human Dimensions of Fisheries Data Explorer, ESPs) but will not be in the ESRs.

Other ESR Changes

- New: Meredith Pochardt (eulachon) (Chilkoot Indian Association, Skagway Traditional Council, Takshanuk Watershed Council)
- New: Rick Thoman (long-term temperature)
- Formatting (standardized figures, report colors)

Public CIE review Feb. 28-Mar. 2, 2023

GOA 2022: Key Messages

1. Third consecutive non-marine heatwave year, BUT warm summer and fall surface & summer depth

2. Generally productive pelagic prey base

- Zooplankton: WGOA (below ave./average) EGOA (above average)
- Forage fish: above average

3. Marine mammals- Steller sea lions and humpback whales impacted by marine heatwaves?

4. Multi-year Trends:

- Shelf edge/upper slope habitat concerns
- 2023: Transitioning from marine heatwave to cooler but different community?



GOA Full Assessment Risk Tables: Environmental/ Ecosystem Considerations

Level 1

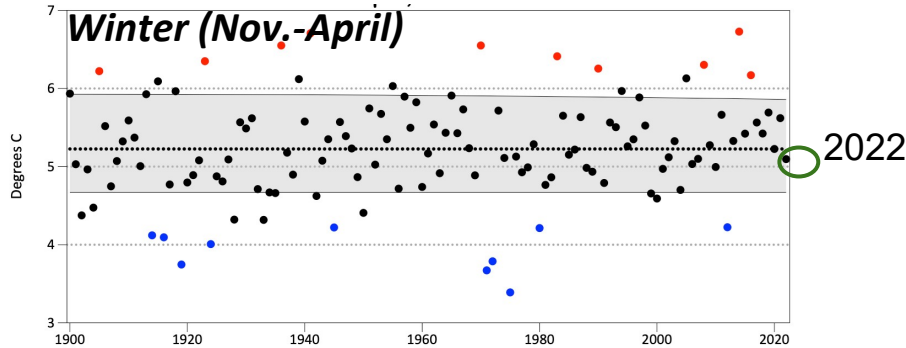
(No apparent environmental/ ecosystem concerns)

- Walleye pollock
- Pacific cod
- Sablefish (statewide)
- Flathead sole*
- Northern rockfish
- Dusky rockfish
- Demersal shelf rockfish*
- Thornyhead rockfish*
- Sharks (statewide)*

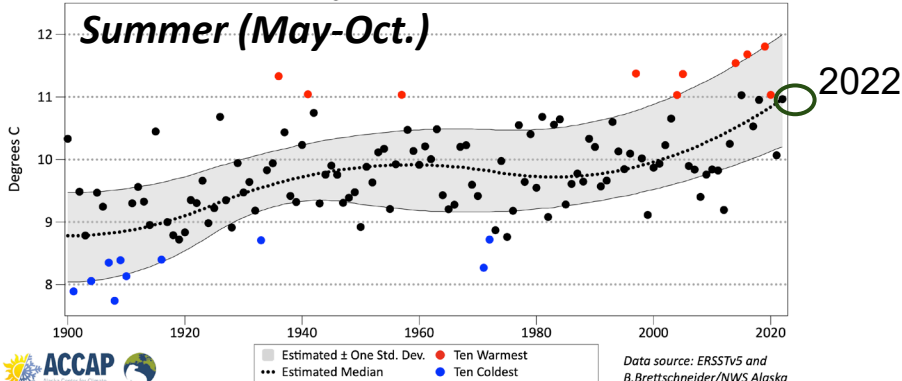
**Higher uncertainty due to less relevant ecosystem/prey data; fewer known mechanistic relationships*

Long-term GOA Sea Surface Temperature: *warming summer*

R. Thoman



Gulf of Alaska Marine Management Areas
Average Sea Surface Temperature
May-October, 1900-2022



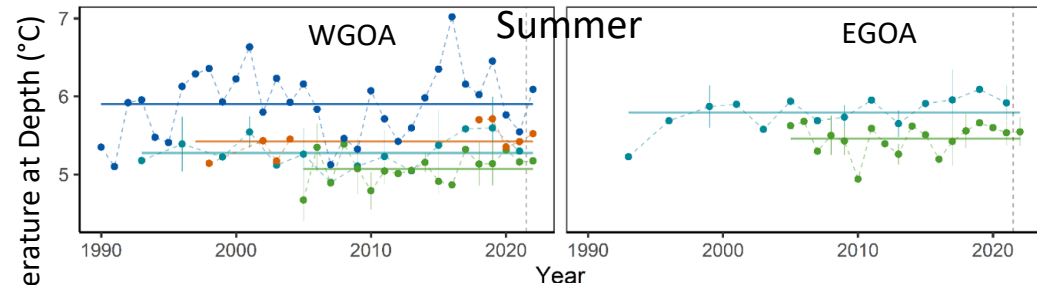
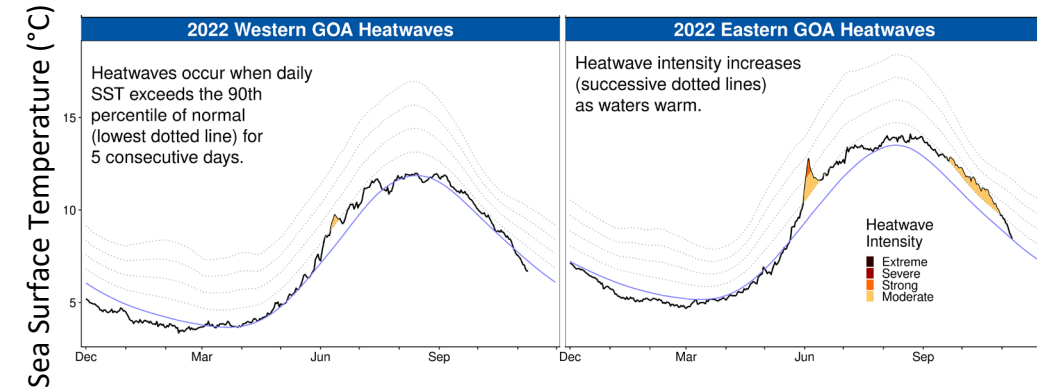
Estimated \pm One Std. Dev. ••• Estimated Median
• Ten Warmest • Ten Coldest

Data source: ERSSTv5 and
B. Brettschneider/NWS Alaska

- GOA shelf SST (NOAA's Extended Reconstructed SST, ERSSTv5)
- Winter (Nov.-April '21/'22) SST close to median; no long-term trend
- Summer (May-Oct. '22) approximately median SST of increasing trend over long-term
- **Summer 2022 was 12th warmest in the time series**

GOA Temperature: *Cool surface winter/spring; Warm summer/fall; Warm summer at depth*

E. Lemagie, M. Callahan, K. Siwicke, N. Laman, S. Danielson, C. Worton

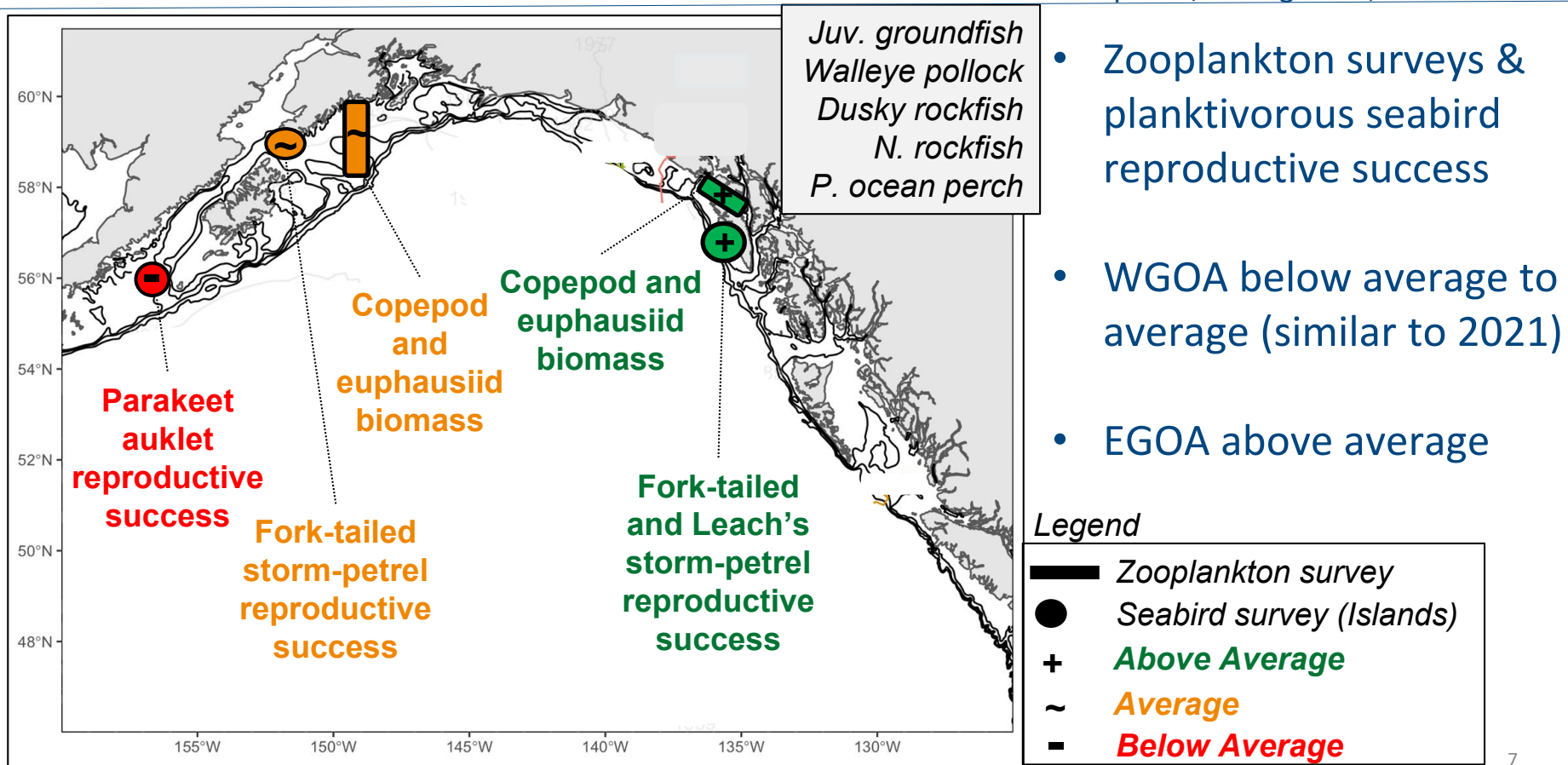


- ADF&G Large Mesh Trawl (Kodiak) (bottom: 36m-250m)
- Gulf Watch Seward Line (176-226m)
- NOAA Bottom Trawl (shelf) (195-205m)
- NOAA Longline (shelf edge) (246-255m)

- Winter and early spring cooler than average (1985-2014): *moderate conditions for shelf spawning & spring larval conditions (P. cod, walleye pollock, N. rock sole)*
- Summer and fall warmer than average: *potentially impact winter survival of age-0 groundfish*
- Marine heatwave in July/Oct. (EGOA); fall MHW days similar to 2018
- Summer temperatures at depth were above average; shelf edge (250m) above average since 2017 (WGOA)/ 2018 (EGOA) (green time series)

Zooplankton Prey Base: *below to above average*

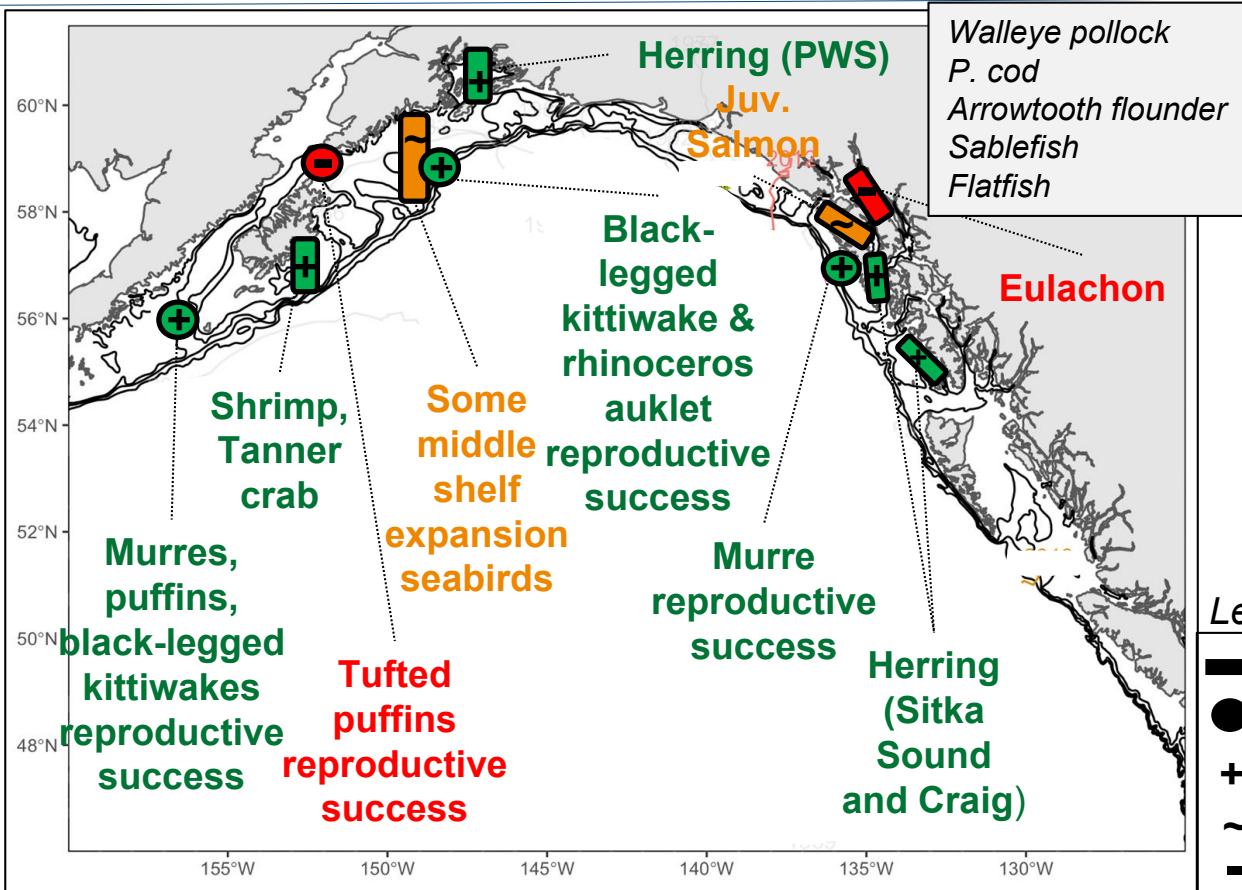
R. Hopcroft, E. Fergusson, B. Drummond



- Zooplankton surveys & planktivorous seabird reproductive success
- WGOA below average to average (similar to 2021)
- EGOA above average

Forage Fish Prey Base: *above average*

B. Drummond, D. Cushing, S. Hatch, K. Hebert, S. Pegau, E. Pochardt, W. Strasburger, C. Worton



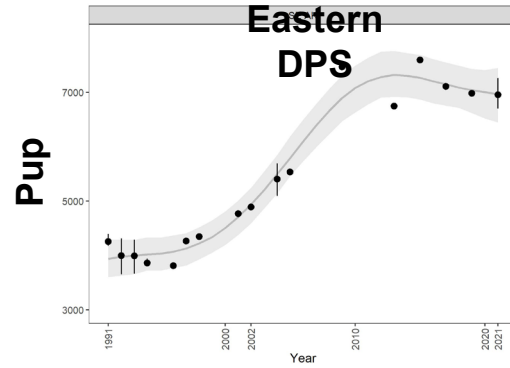
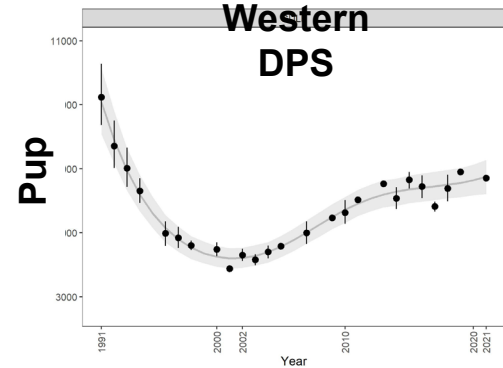
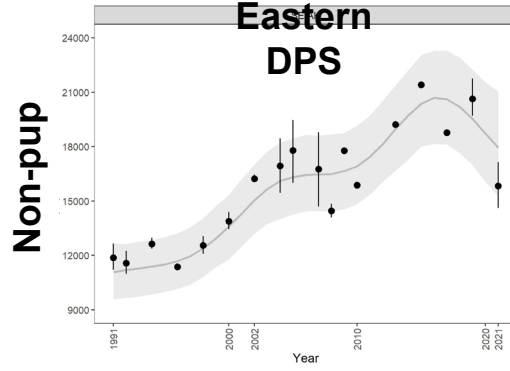
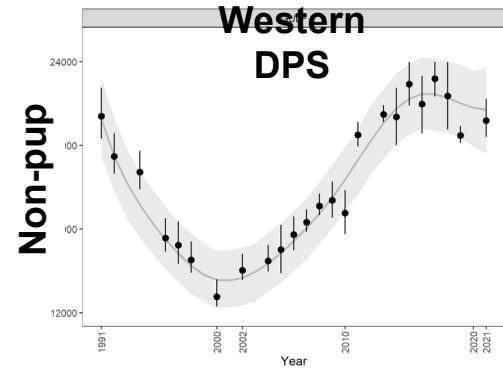
- Forage surveys & piscivorous seabird reproductive success
- Generally above average across GOA (with exceptions)

Legend

- █ Surveys
- Seabird survey (Islands)
- + Above Average
- ~ Average
- Below Average

Steller Sea Lions (2021): *declining/plateauing*

K. Sweeney, Skipper Science Partnership

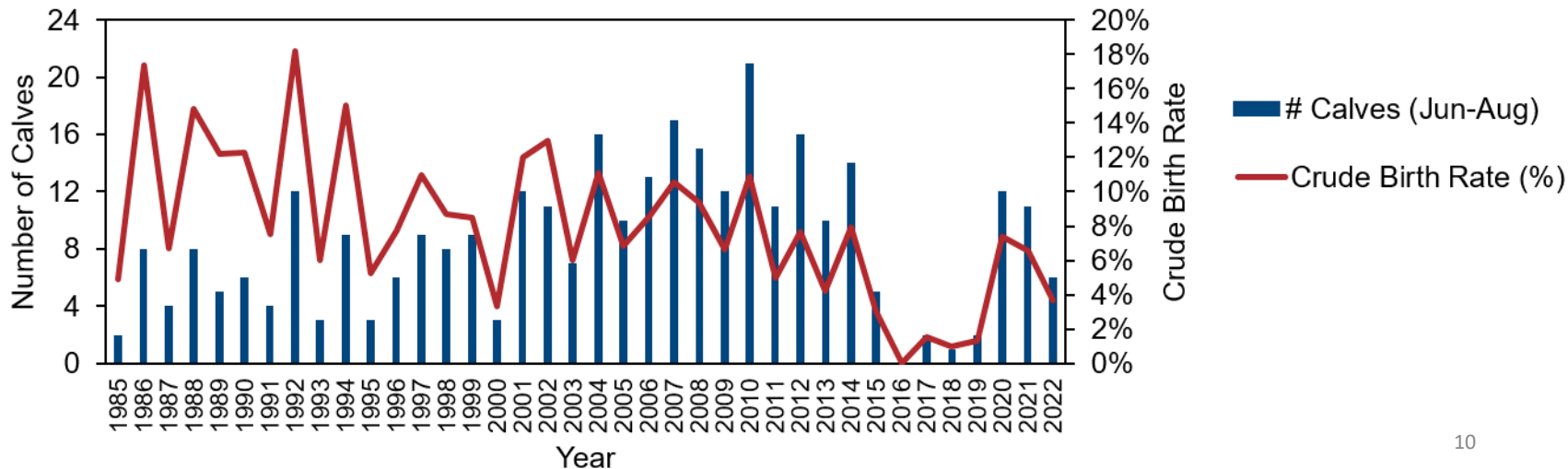


- WGOA/EGOA: increasing since 2000 then decline/plateau since 2017
- Prey availability (P. cod, walleye pollock)? EGOA adult movement
- 2022 (Skipper Science) - More and increasing numbers of Steller sea lions than expected; “More fish with ‘seal/ sea lion’ bites on salmon” - observations reported from WGOA, SEAK

Glacier Bay/ Icy Strait Humpback Whales: *lower # calves*

C. Gabriele

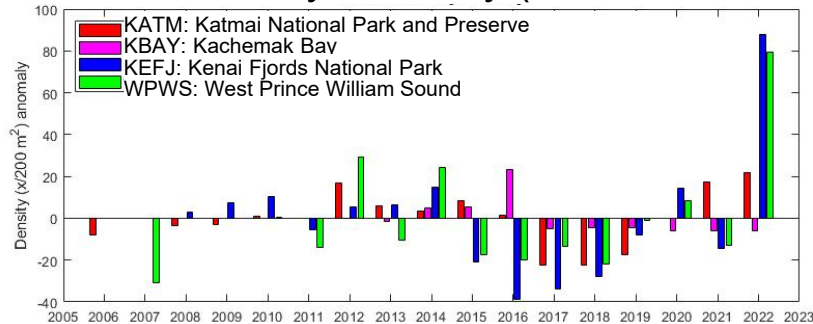
- Reduced # calves in 2022 after increases in '20/'21
- Forage conditions in 2020/2021?
- Missing cohort of reproductive females (mortality as juveniles in 2014-2016)
- Prince William Sound humpback sightings have not returned to pre-2014 levels



Sea Stars (recovering) & Tanner crab: Kodiak (cont. increase)

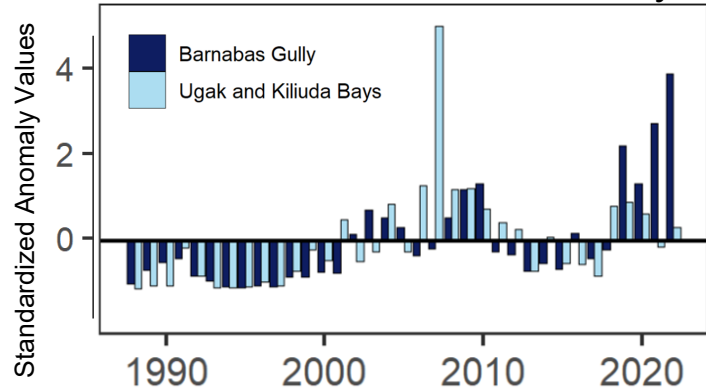
H. Coletti, C. Worton

Sea Star Density Anomaly (Intertidal Surveys)



- Sea stars recovering from sea star wasting disease/marine heatwave
- Also increased sea star CPUE in ADF&G large mesh trawl (Kodiak)

Tanner crab biomass anomaly



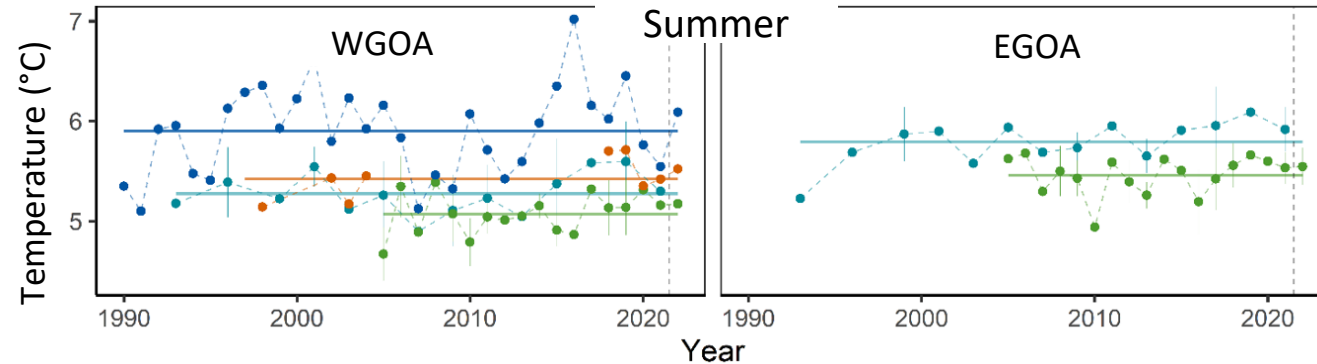
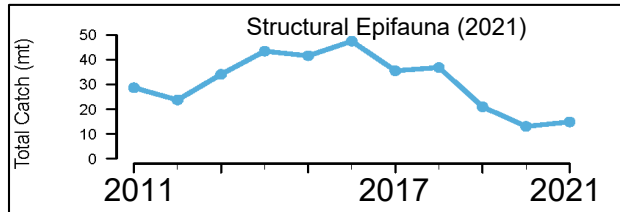
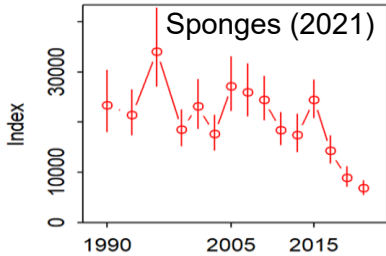
- Tanner crab continued increasing trend (ADF&G Survey Barnabas Gully off Kodiak)
- Predator (groundfish) release?

Shelf Edge/ Upper Slope Conditions: *habitat concerns*

K. Siwicke, G. Whitehouse, N. Laman



Sablefish, rockfish (e.g., shortraker rockfish, rougheye/ blackspotted rockfish, thornyhead rockfish, Pacific ocean perch), and flatfish (deepwater flatfish complex, including Dover sole)

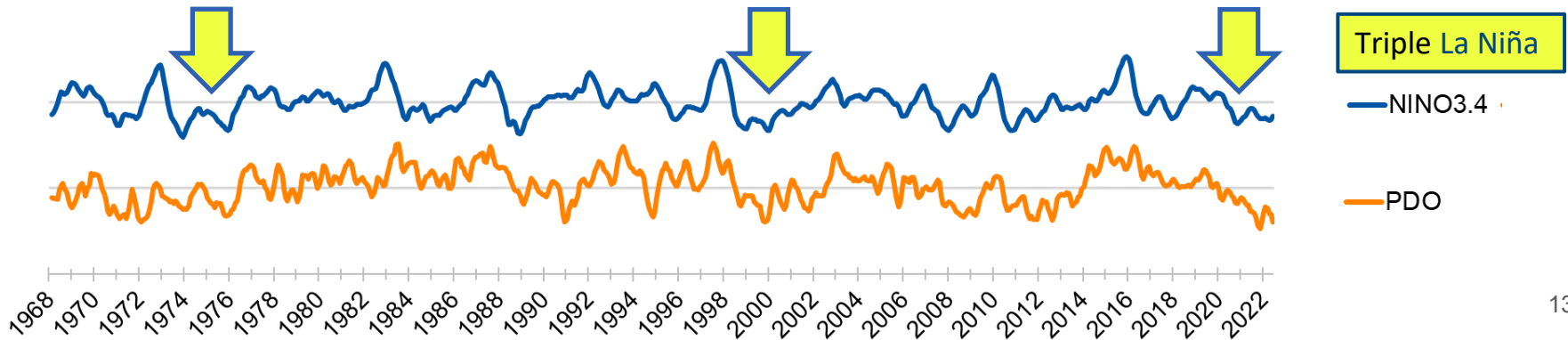
- Structural epifauna (e.g., sponges) declining; important rockfish habitat
- Summer temperature (250m) on shelf edge above average since 2017 (WGOA)/ 2018 (EGOA)





Where are we headed (2023 +)?

- Predicted third **La Niña** winter in a row, previous in 1973-76, 1998-2001; **PDO** continues to be negative (N. Bond)
- Dec-May 2023 GOA SST coastal waters predicted to be cooler than average (National Multi-Model Ensemble) (N. Bond)
- GOA transitioning from marine heatwave community to (different) cooler community? (sablefish & P. ocean perch ; arrowtooth flounder, P. cod 



GOA 2022: Key Messages

1. 3rd consecutive non-marine heatwave year*, BUT some warmth

- Winter/spring: *moderate conditions for shelf spawning & spring larval conditions (P. cod, walleye pollock, N. rock sole)*
- Summer (SST&depth)/fall (SST) : *SST may impact growth/winter survival of age-0*

2. Generally productive pelagic prey base (zooplankton, forage fish, shrimp, tanner crab) — Productive pelagic shelf system for piscivorous and planktivorous groundfish but data gap for prey of adult demersal/benthic rockfish and flatfish (e.g., thornyhead, FH sole)

3. Marine mammals- still impacted by marine heatwaves? — Steller sea lions reduced populations and humpback whales reduced calves

4. Multi-year Trends:

- Shelf edge/upper slope habitat concerns — *Temperature, structural epifauna*
- 2023: Transitioning from marine heatwave to cooler but different community?



Additional Information Available

Aleutian Islands: [Full GPT presentation](#) (@1:26:35), [ppt. only](#), [AI In Brief](#), [AI full report](#)

Eastern Bering Sea: [Full GPT presentation](#) (@28:15), [ppt. only](#), [EBS In Brief](#), [EBS full report](#)

Gulf of Alaska: [Full GPT presentation](#) (@33:17), [ppt. only](#), [GOA In Brief](#), [GOA full report](#)

Ecosystem Status Reports through 2021 are available [here](#):

