

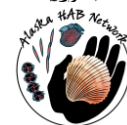
# Ecosystem Status Report: Gulf of Alaska 2022



Bridget Ferriss & Stephani Zador

## *With contributions from:*

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# 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

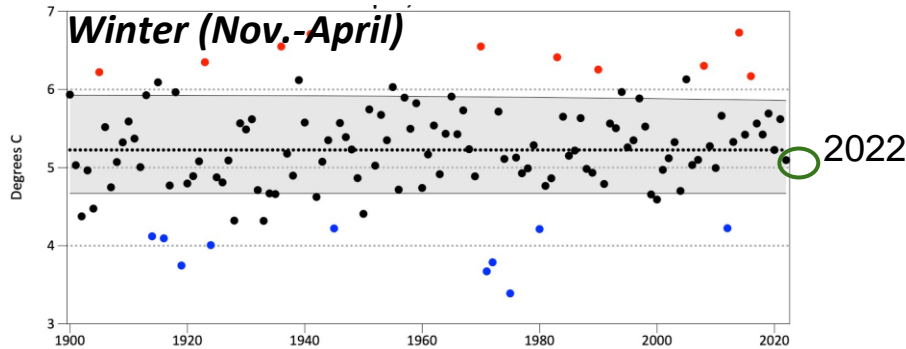
*(No apparent environmental/ ecosystem concerns)*

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

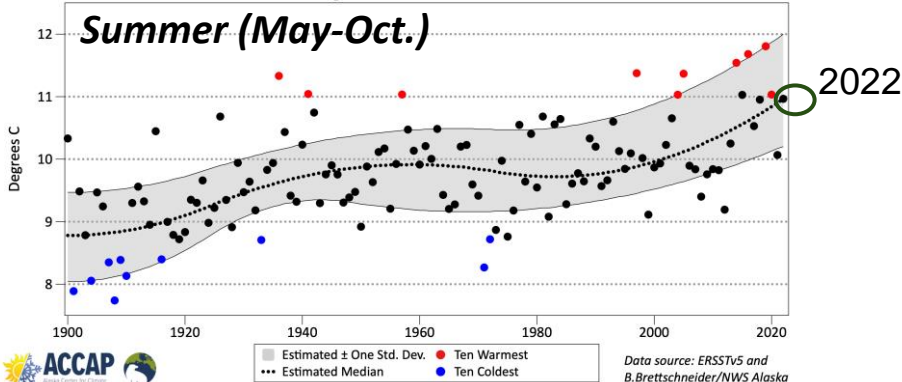
*\*Higher uncertainty due to less relevant ecosystem/prey data; fewer known mechanistic relationships*

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

R. Thoman



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



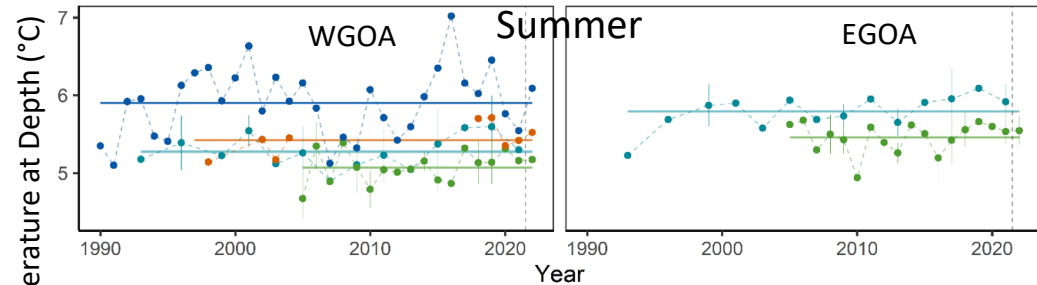
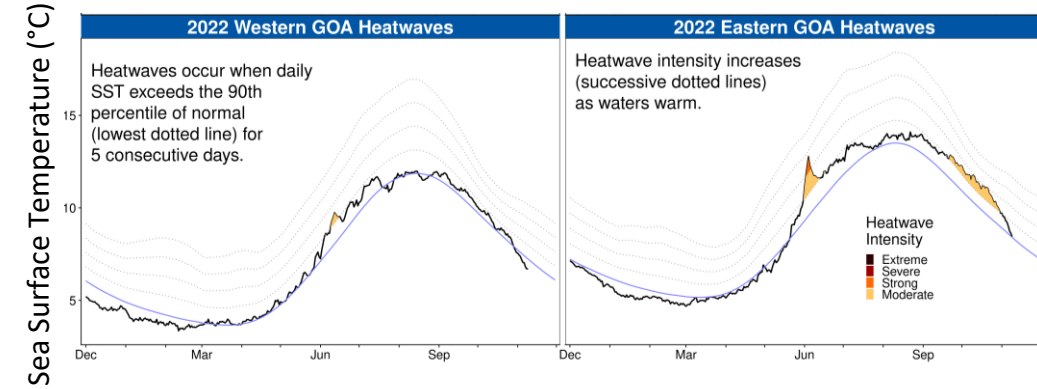
Estimated  $\pm$  One Std. Dev. ••• Estimated Median  
• Ten Warmest • Ten Coldest

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 12<sup>th</sup> 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

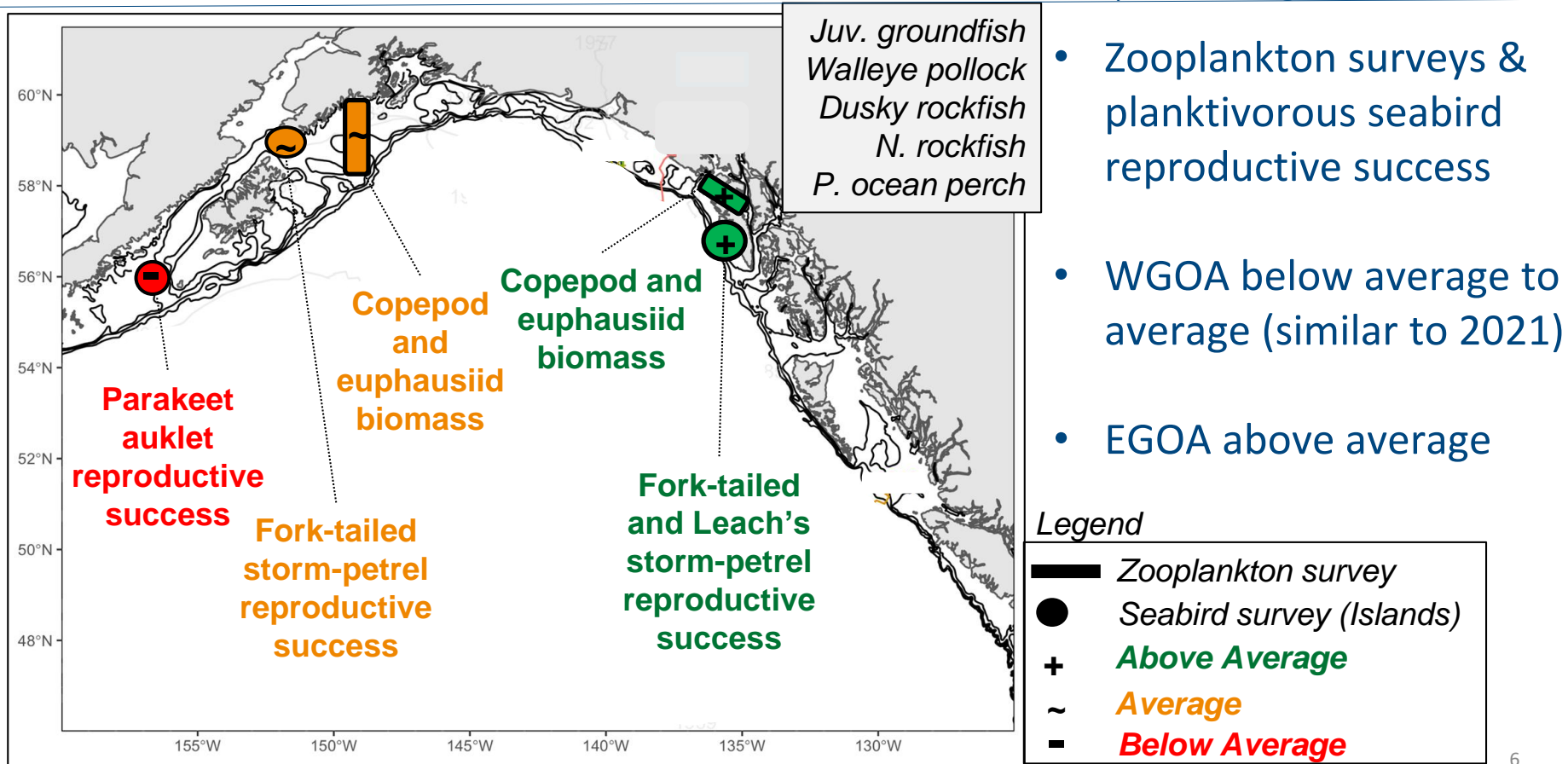


- ADF&G Large Mesh Trawl (Kodiak) (bottom: 36m-250m)
- Gulf Watch Seward Line (176-226m)
- NOAA Bottom Trawl (shelf) (195-205m)
- NOAA Longline (shelf edge) (246-255m)

- 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*

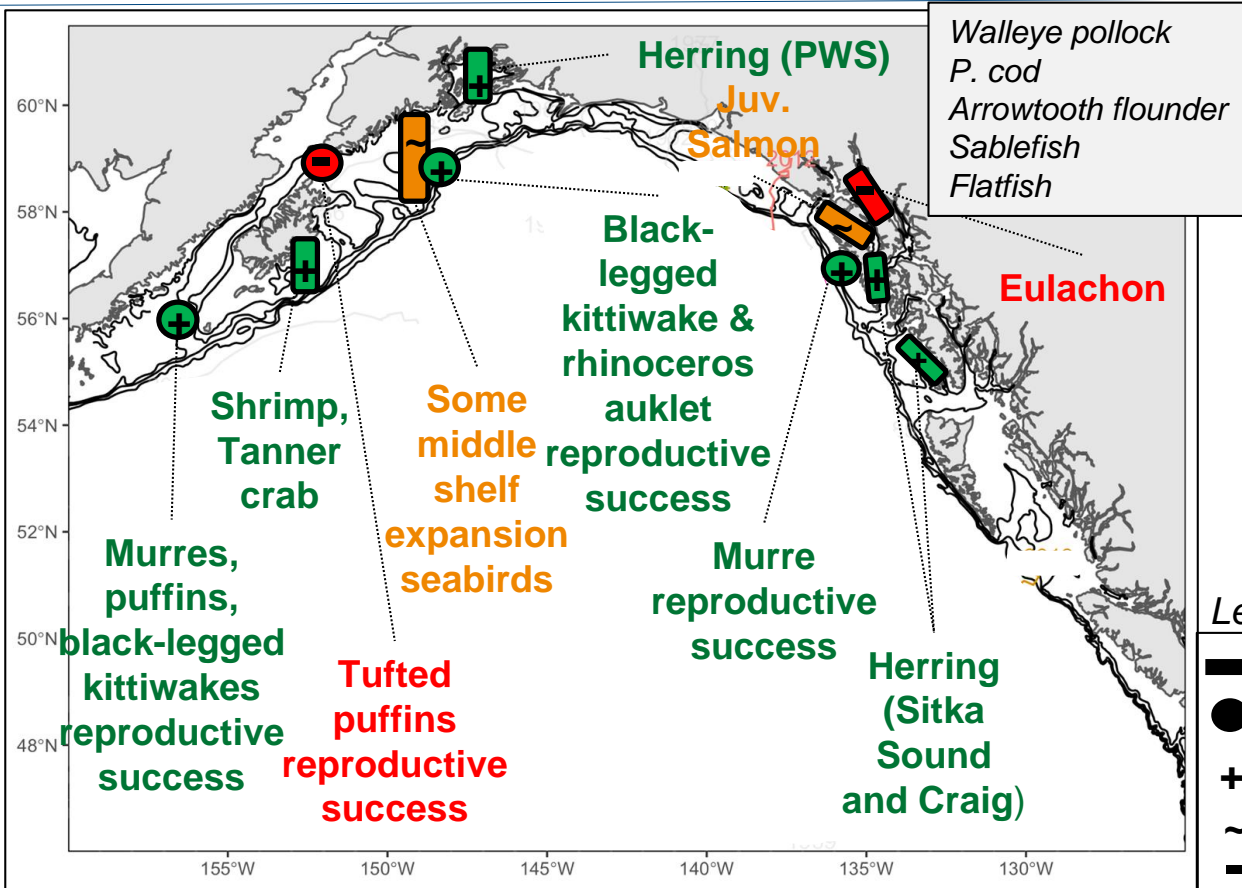
R. Hopcroft, E. Fergusson, B. Drummond



- 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



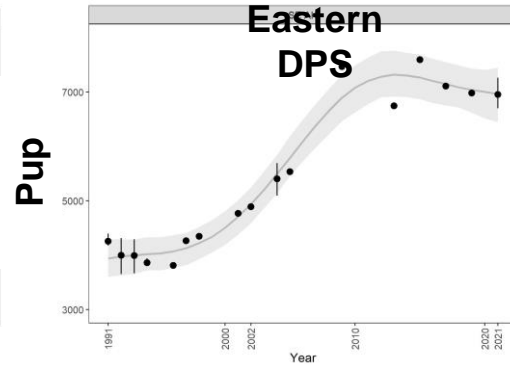
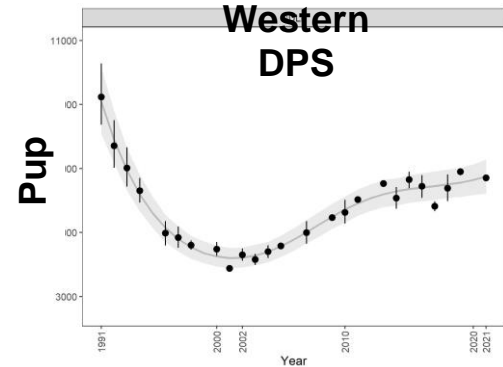
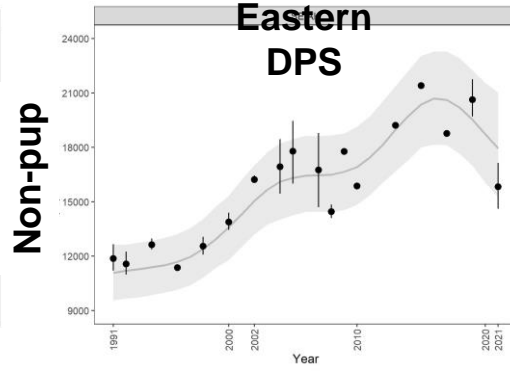
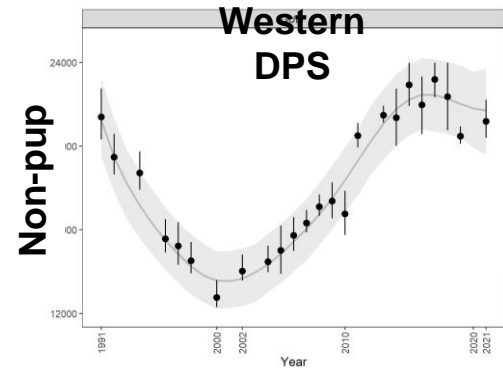
- Forage surveys & piscivorous seabird reproductive success
- Generally above average across GOA (with exceptions)

**Legend**

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

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

K. Sweeney, Skipper Science Partnership



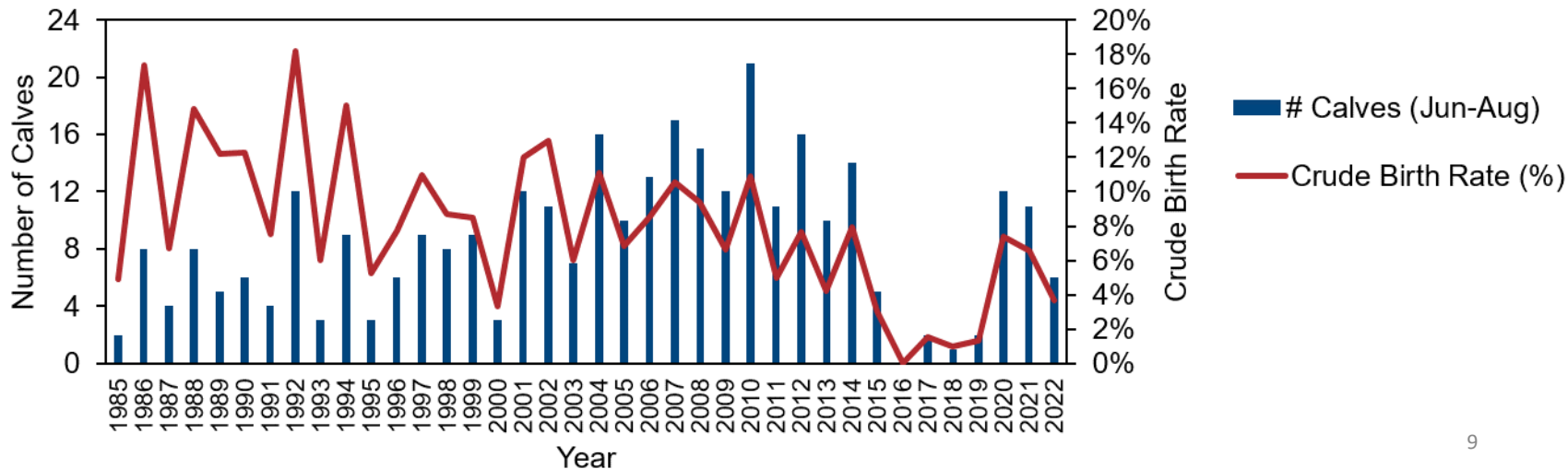
- WGOA/EGOA: increasing since 2000 then decline/plateau since 2017
- Prey availability (P. cod, walleye pollock)? EGOA adult movement
- 2022 (Skipper Science) - More and increasing numbers of Steller sea lions than expected; “More fish with ‘seal/ sea lion’ bites on salmon” - observations reported from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



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

C. Gabriele

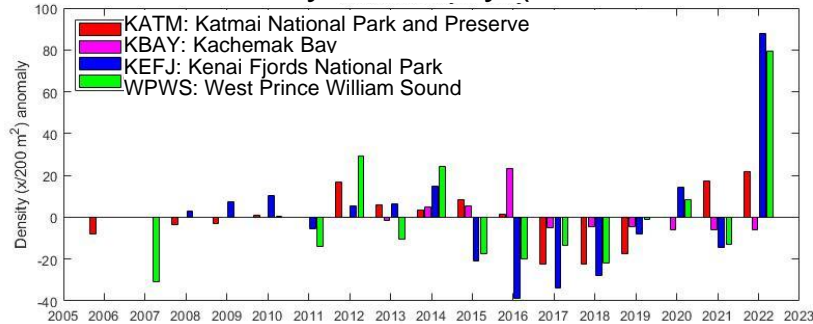
- Reduced # calves in 2022 after increases in '20/'21
- Forage conditions in 2020/2021?
- Missing cohort of reproductive females (mortality as juveniles in 2014-2016)
- Prince William Sound humpback sightings have not returned to pre-2014 levels



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

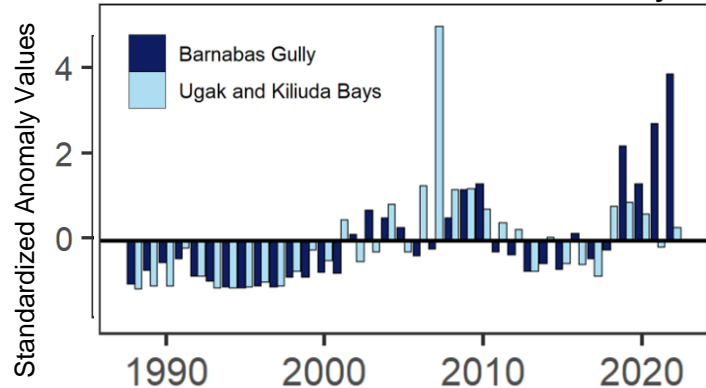
H. Coletti, C. Worton

## 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



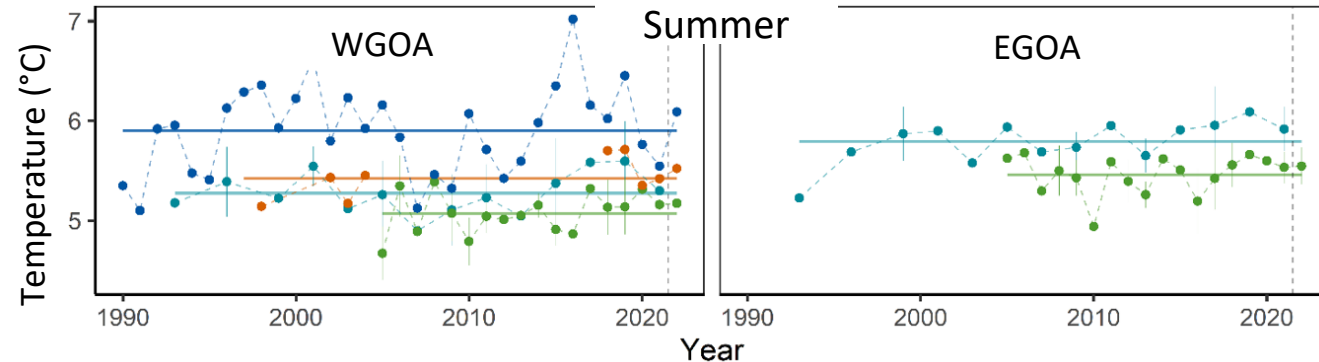
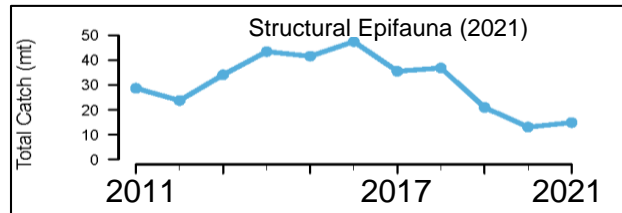
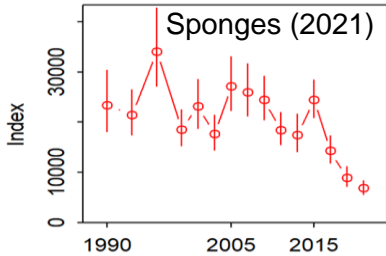
- Tanner crab continued increasing trend (ADF&G Survey Barnabas Gully off Kodiak)
- Predator (groundfish) release?

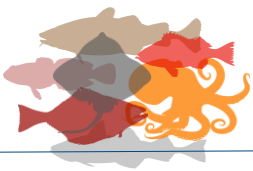
# Shelf Edge/ Upper Slope Conditions: *habitat concerns*

K. Siwicke, G. Whitehouse, N. Laman



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

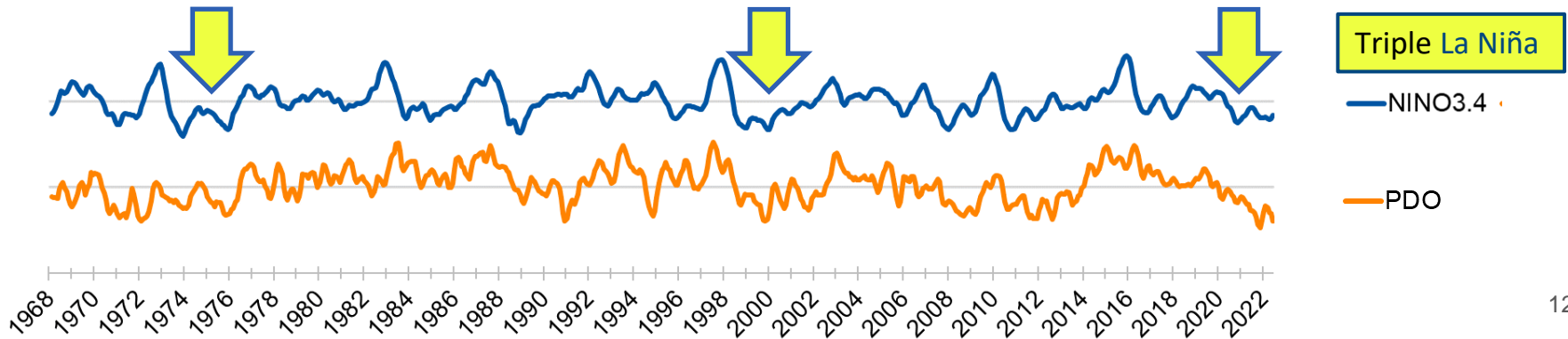
- Structural epifauna (e.g., sponges) declining; important rockfish habitat
- Summer temperature (250m) on shelf edge above average since 2017 (WGOA)/ 2018 (EGOA)





# 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. 3<sup>rd</sup> consecutive non-marine heatwave year\*, BUT some warmth

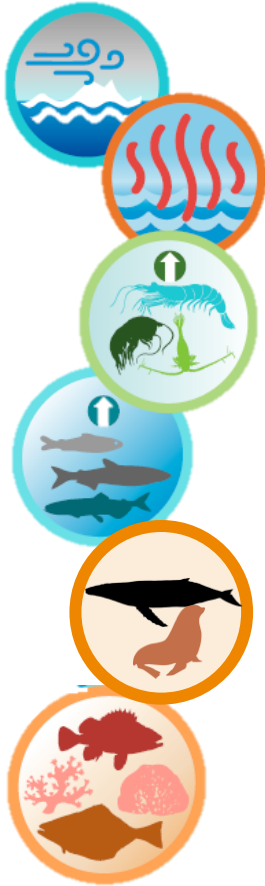
- Winter/spring: *moderate conditions for shelf spawning & spring larval conditions (P. cod, walleye pollock, N. rock sole)*
- Summer (SST&depth)/fall (SST) : *SST may impact growth/winter survival of age-0*

## 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](#):

