

Ecosystem Status Report Aleutian Islands 2023 – GPT NOV

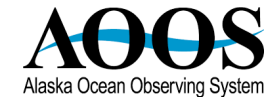
Thank you!

Ivonne Ortiz & Stephani Zador



With contributions from:

Mayumi Arimitsu, Kerim Aydin, Lewis Barnett, Sonia Batten, Jessica Beck, Shawn Bell, Thaddaeus Buser, Mathew W. Callahan, Wei Cheng, Christina Conrath, Alexandra Dowlin, Thomas Farrugia, Sarah Friedman, Sarah Gaichas, Tom Gelatt, Rebecca Howard, Robb Kaler, Mandy Keogh, Ned Laman, Geoffrey M. Lang, Emily Lemagie, Jackie Lindsey, Jackie McConnell, Ivonne Ortiz, Clare Ostle, James Overland, Bianca Prohaska, Sean Rohan, Nora Rojek, Natalie Rouse, Greg Ruggerone, Margaret Siple, Phyllis Stabeno, Katie Sweeney, Cathy Tide, Rick Thoman, Muyin Wang, George A. Whitehouse, Bruce Wright, Stephani Zador, Adam Zaleski, Mark Zimmermann
photos: photolib.noaa.gov



2024 Ecosystem Status Report – Aleutian Islands

Risk Table

Environmental/Ecosystem Considerations

Sustained Level 2

Multiple indicators showing consistent adverse signals a) across the same trophic level as the stock, and/or b) up or down trophic levels (i.e., predators and prey of the stock)

- AI Pacific cod
- Atka mackerel

Sustained Level 1

No apparent ecosystem concerns related to biological status (e.g., environment, prey), or minor concerns with uncertain impacts on the stock.

- Pacific ocean perch
 - AI pollock
- Bogoslof pollock
 - R&B rockfish
 - Shortraker
 - Other rockfish

Assessment 2024

1. Relaxation of prolonged warming

Finally. But is it cool enough for the ecosystem to respond?

2. Gradient of mostly poor productivity in west to good productivity in east

Why different responses to the improved conditions?

3. Few pink salmon, but this “low” year is now as high as previous high years

All those EK Pinks are exporting energy, as low abundance = 60,000 mt current AI P.cod biomass = 70-80,000 mt

4. Groundfish condition mostly poor throughout, even though environmental conditions would predict otherwise

Is a rebalancing of the ecosystem keeping groundfish from finding enough food



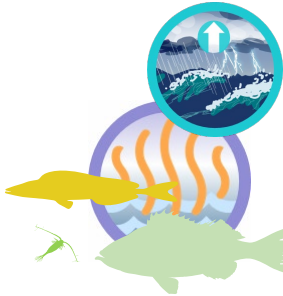
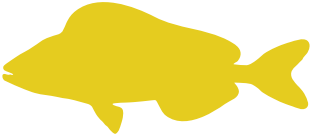
AI Pacific cod



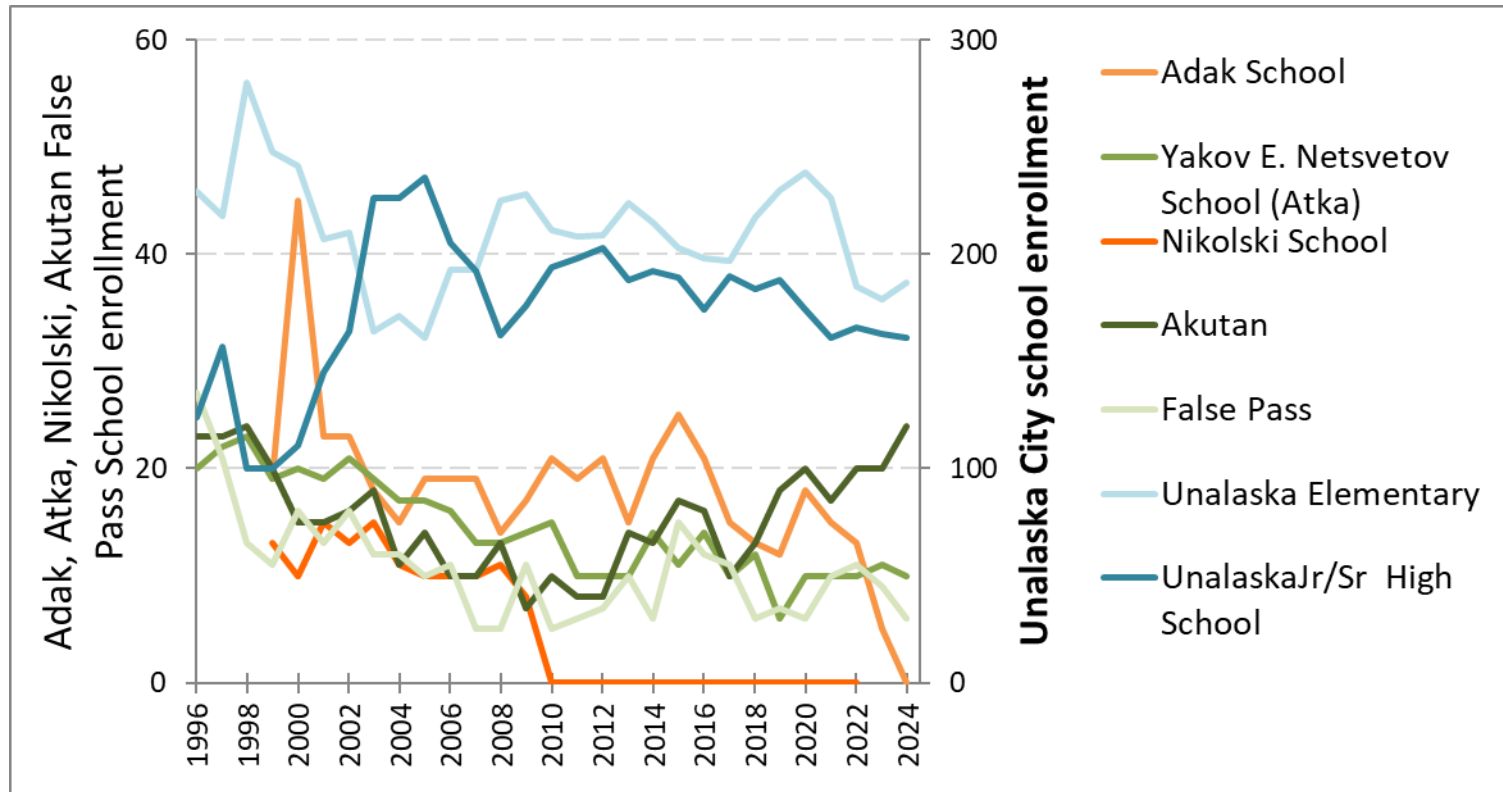
- Warm winter conditions
- Lower amount of fish in diet since ~2010
- Lower prey quality resulting in reduced fish condition.
- Decreased consumption of Atka as prey due to lower availability of Atka.

Sustained Level 2

Atka mackerel



- Warm winter conditions
- Smaller species in copepod communities
- Deeper mixed layer: potential impact on availability of prey in water column
- Lower than average fish condition across the entire chain
- Increased competition for prey (high rockfish abundance)

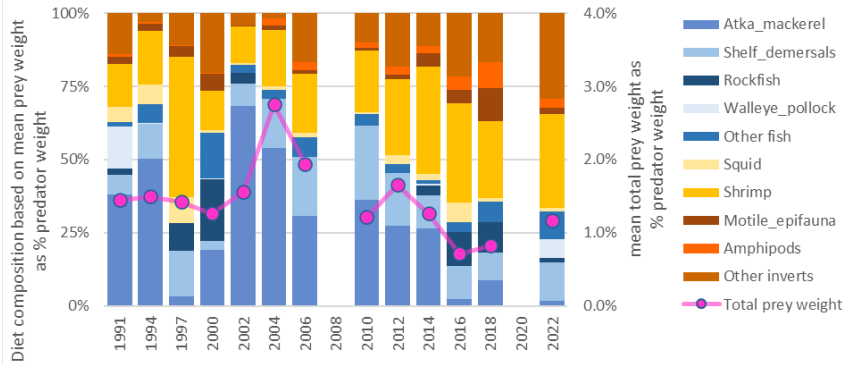


- School at Adak closed
- Decreasing trend even in Unalaska
- Akutan – only one increasing

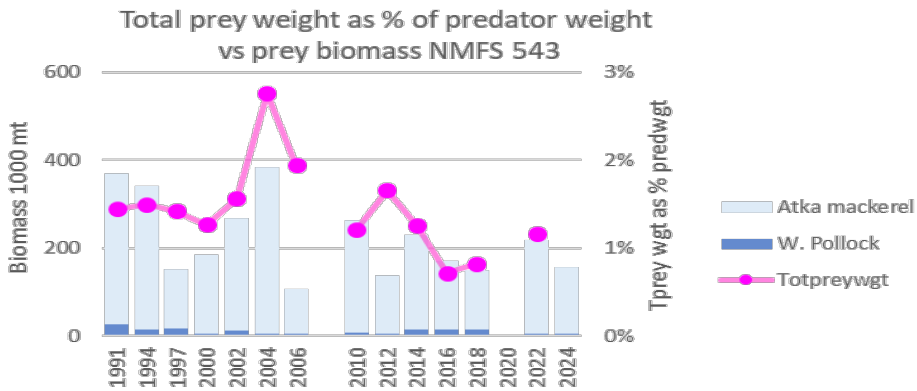
Noteworthy

Changes in Pacific cod diets II

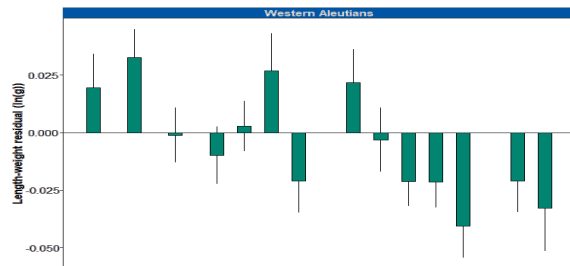
Pcod diet WAI



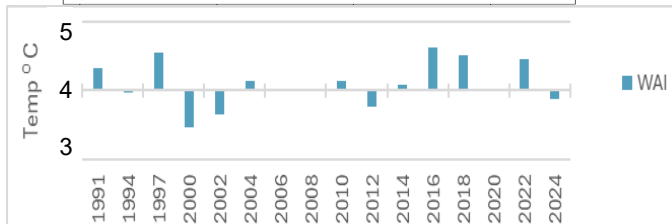
Prey biomass vs consumed prey



Fish condition

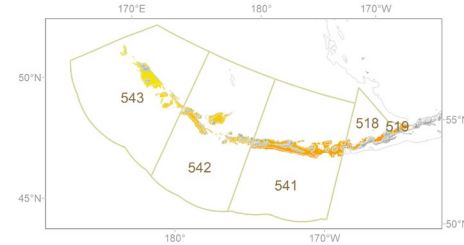


Bottom T °C



Western Aleutians

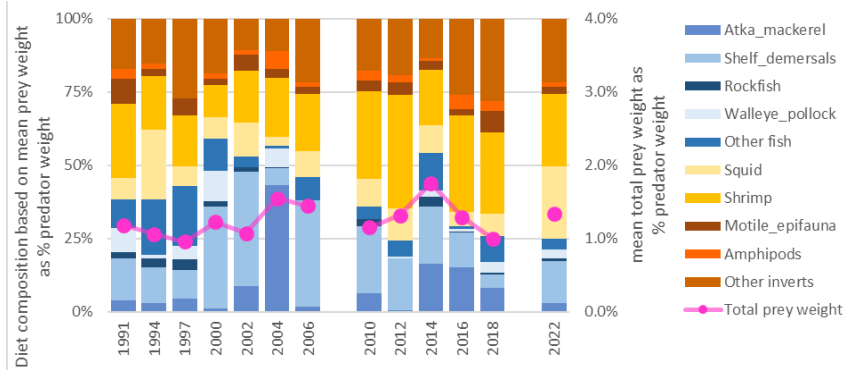
- Less fish in diets
- Consumption of prey needs to be at least 1% of predator weight
- Coherence between Atka mackerel biomass and total prey consumption
- Coherence between total prey consumed and fish condition
- Atka mackerel biomass drives fish consumption in Western, Central Aleutians • higher temperature coincide with lower condition



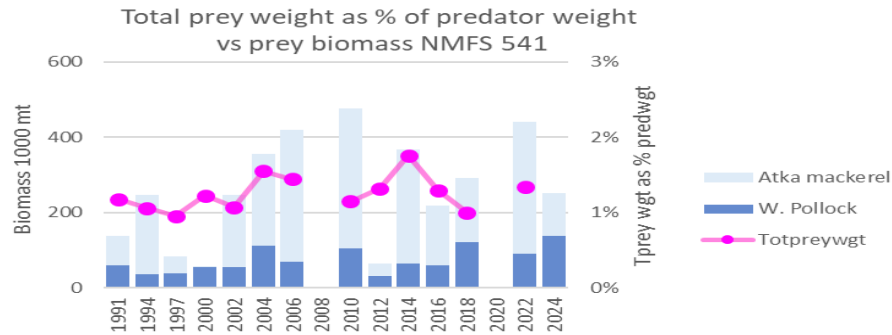
Noteworthy

Changes in Pacific cod diets II

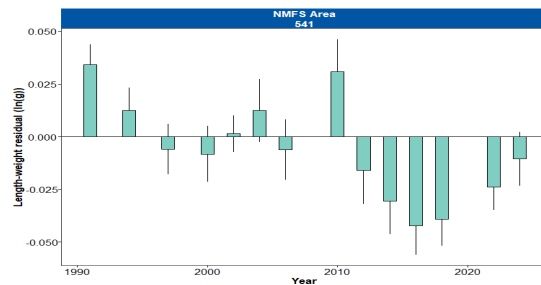
Pcod diet WAI



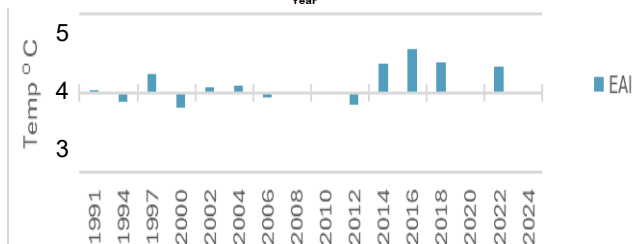
Prey biomass vs consumed prey



Fish condition

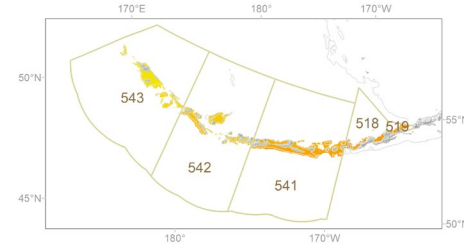


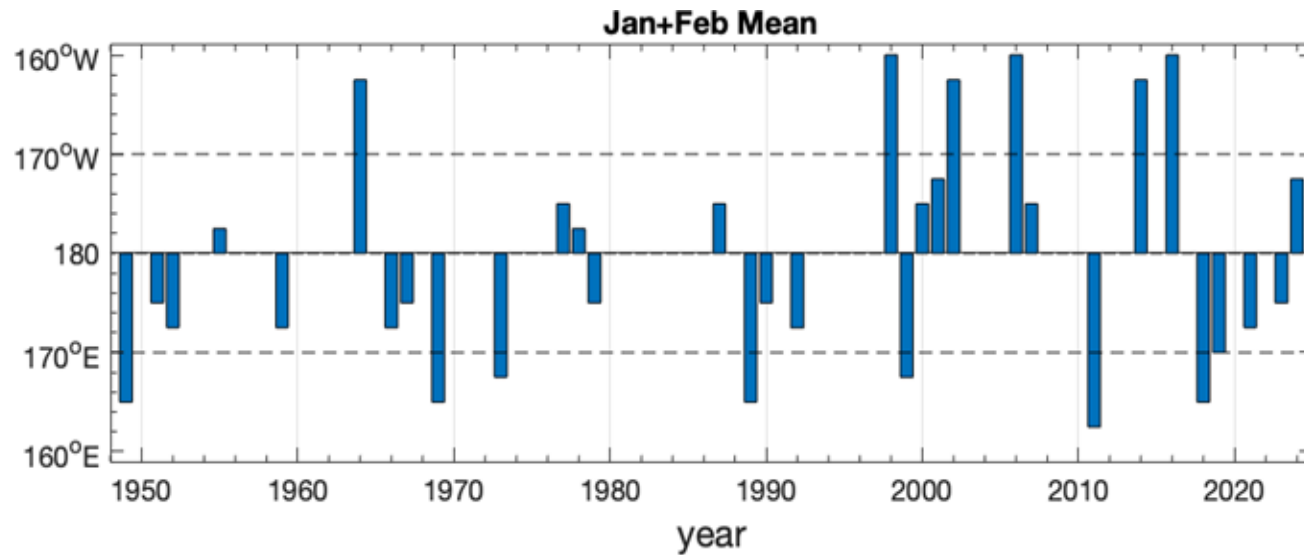
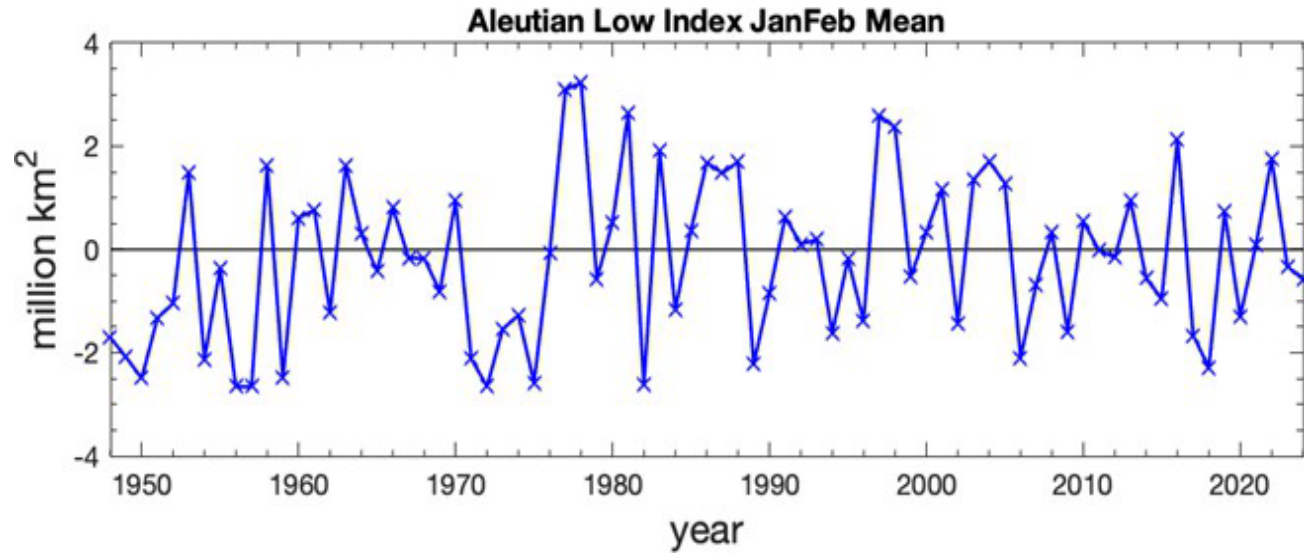
Bottom T °C



Eastern Aleutians

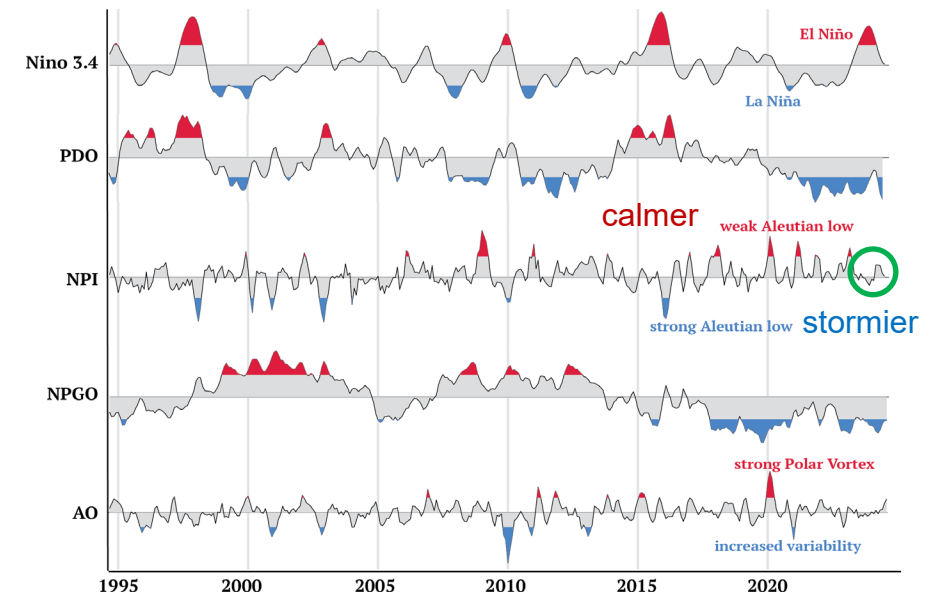
- Less fish in diets
- Consumption of prey needs to be at least 1% of predator weight but of adequate caloric value?
- Less coherence between Atka mackerel biomass and total prey consumption
- Little Coherence between total prey consumed and fish condition
- Atka mackerel biomass drives fish consumption in Western, Central Aleutians • higher temperature coincide with lower condition



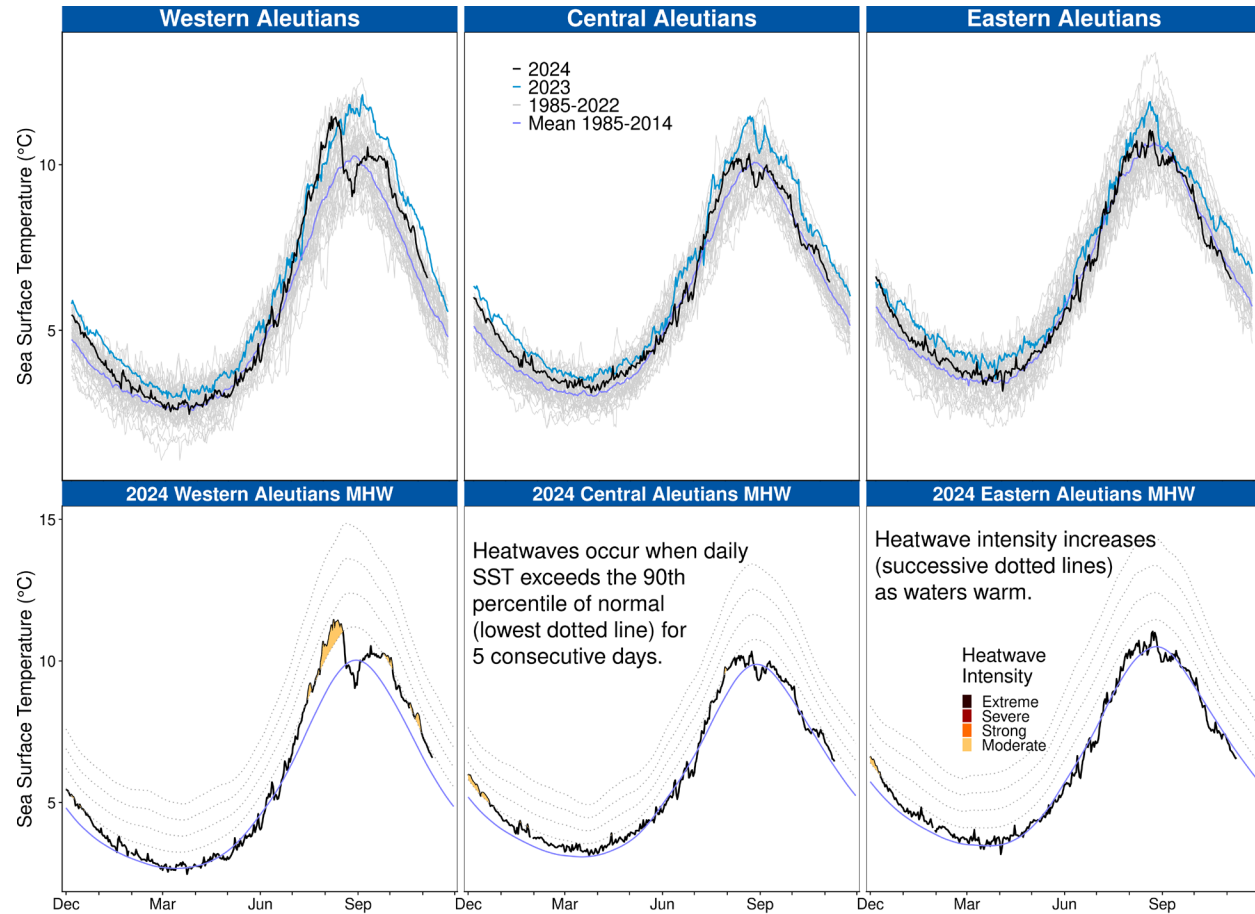


Aleutian Low –dominant atmospheric pressure system in winter Jan-Feb

- Defined by extent of pressure system & location of center on Aleutian Low; 2024: near average
- Strong winds and stormy conditions (mean NPI), deeper mixed layer, potentially changing availability of prey



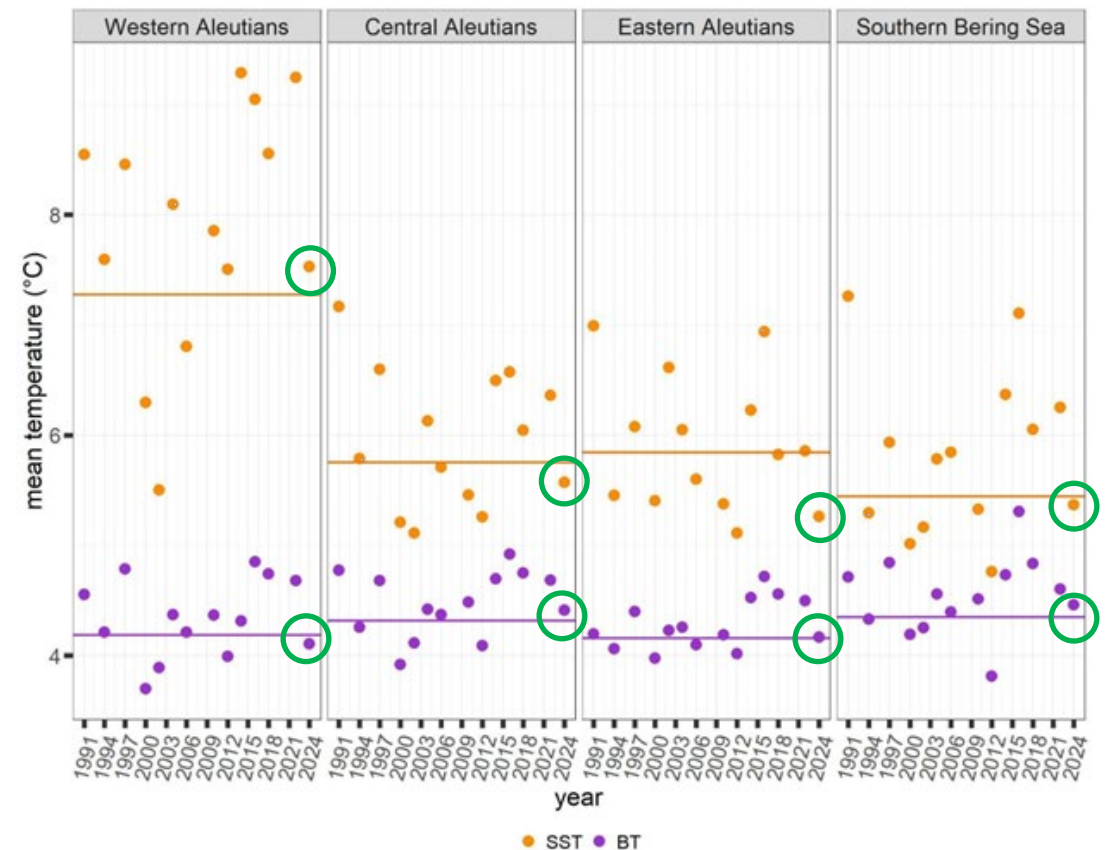
data through 11-12-2023

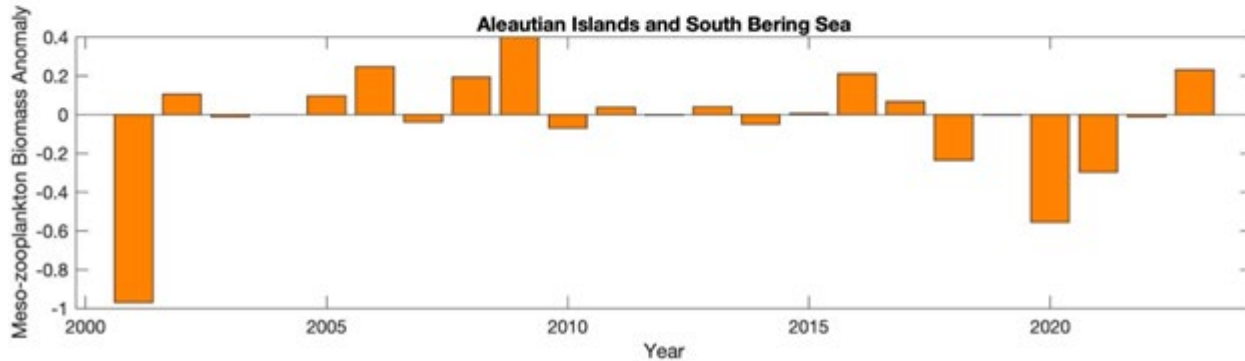
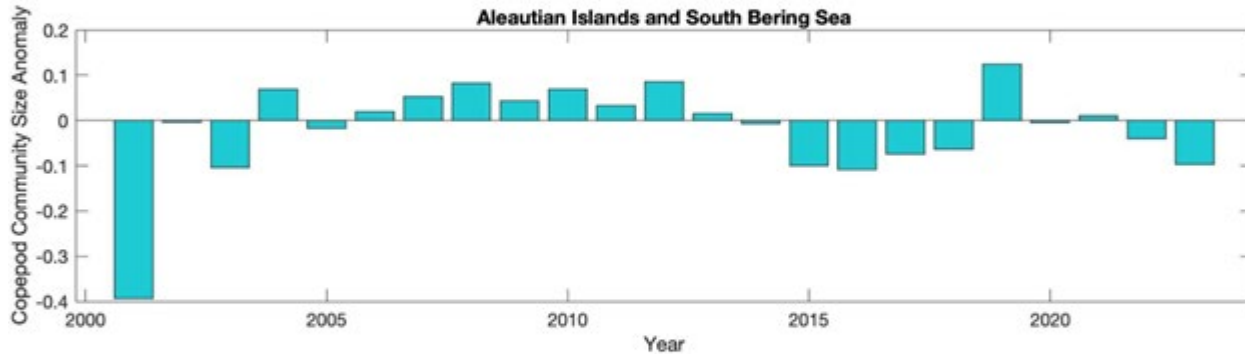
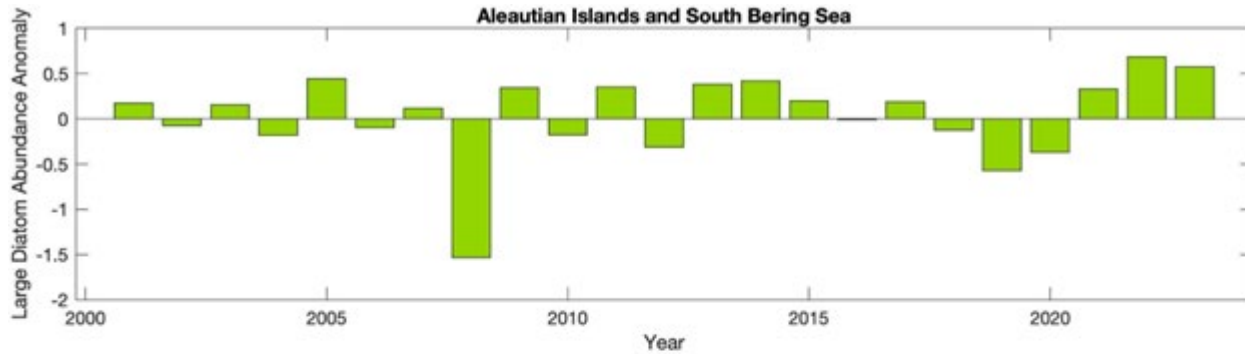


NOAA Coral Reef Watch data, courtesy NOAA Pacific Islands Ocean Observing System (Updated: 11-10-2024)
Data are modeled satellite products and periodic discrepancies or gaps may exist across sensors and products.
Contact: matt.callahan@noaa.gov, Alaska Fisheries Science Center

Satellite SST

- Warm winter throughout, among 10 warmest winters
- Cooler spring & summer but still at or above 1985-2015 mean
- WAI – temperatures increased again in late summer and fall



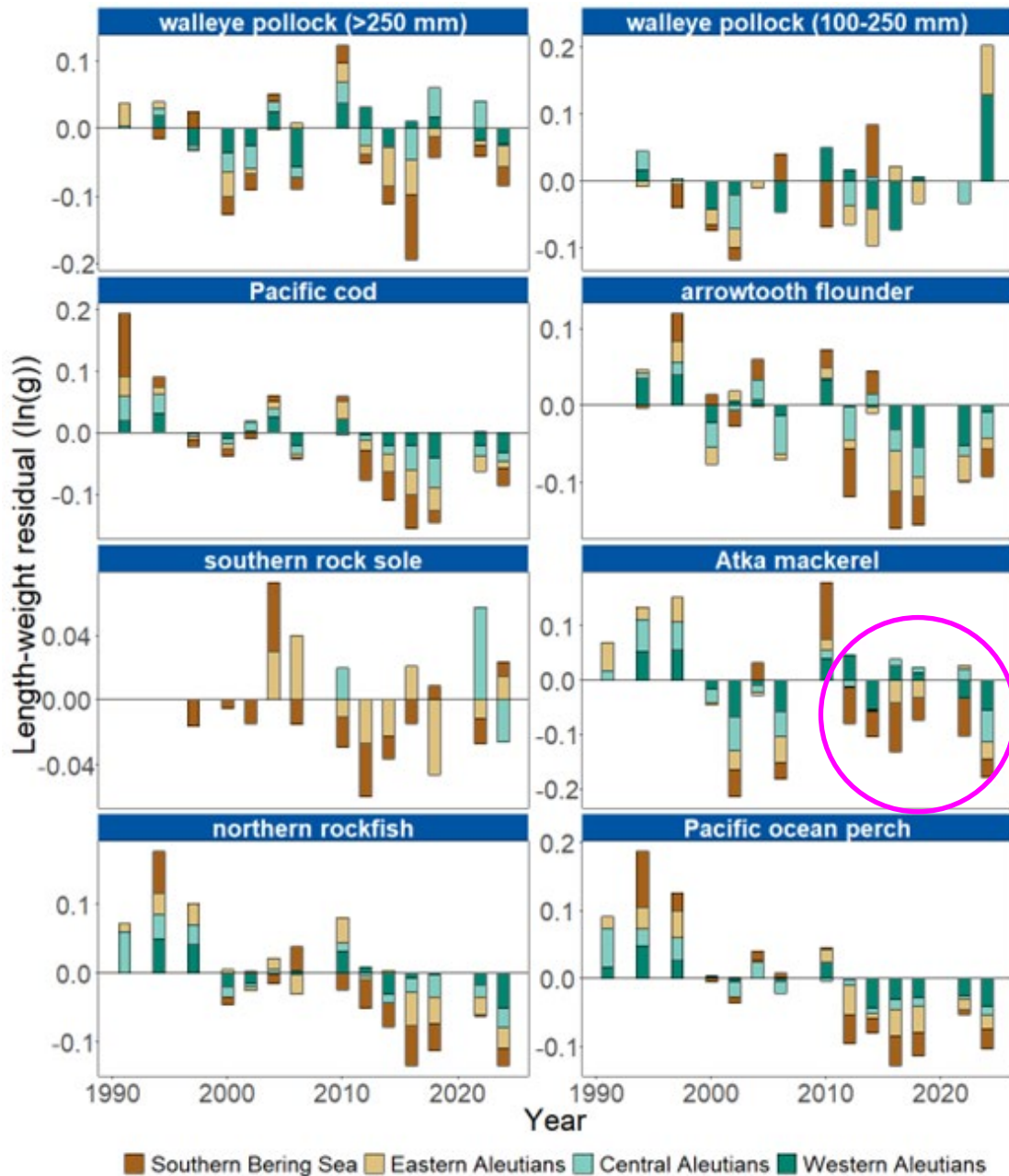


Eddy Kinetic Energy

- Some increased flows in WAI beginning of year
- Currently below average in all three regions
- Lower transport of heat, salt and nutrients through passes

Continuous Plankton Recorder *has to be updated in ESR

- Large diatom biomass in 2023: above mean for third year
- Smaller size of copepod community potentially due to warmer temperatures
- First year with above average meso-zooplankton biomass



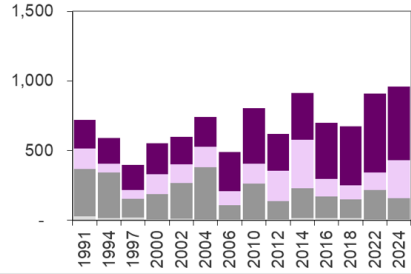
- Condition decreased across entire chain
- Atka mackerel condition decreased even in western and central Aleutians
- Exceptions:
small pollock and southern rock sole

Werb and Rudnick, 2023. Remarkable changes in the dominant modes of North Pacific sea surface temperature. Modified from Figures 1b and 3b.

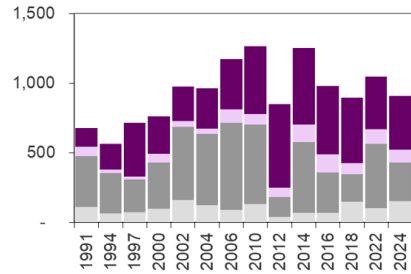
Ortiz

Biomass of Pelagic foragers and Apex predators

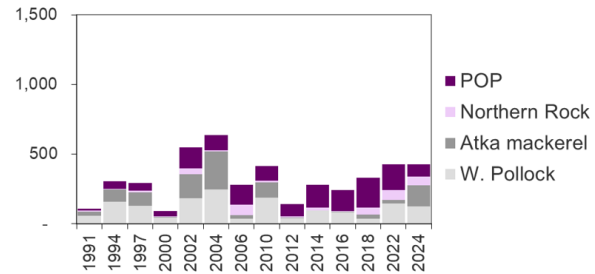
Pelagic Foragers: Western AI



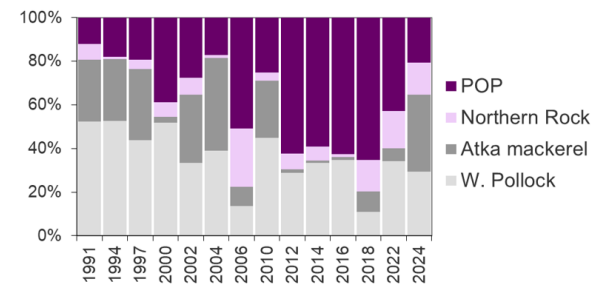
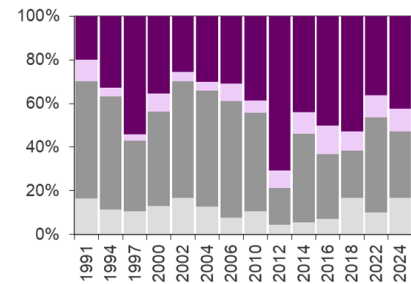
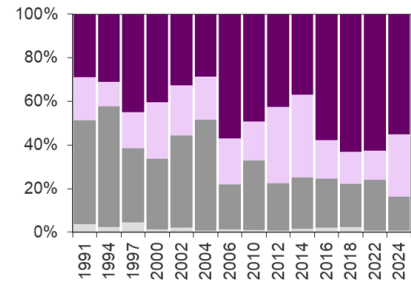
Central AI



Eastern AI

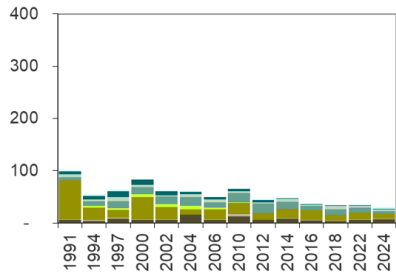


- POP
- Northern Rock
- Atka mackerel
- W. Pollock

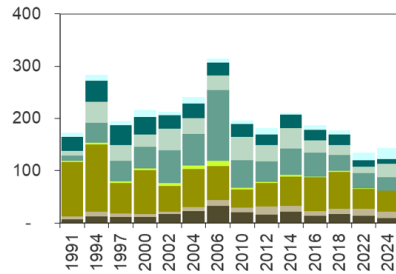


- POP
- Northern Rock
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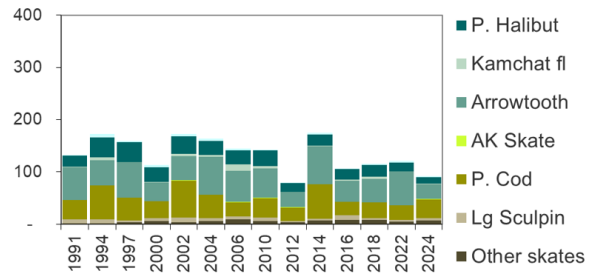
Apex Predators: Western AI



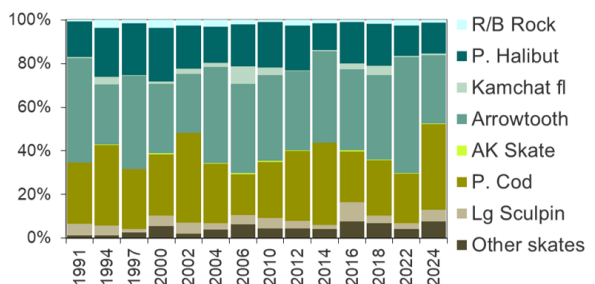
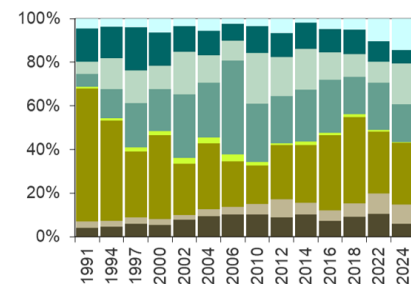
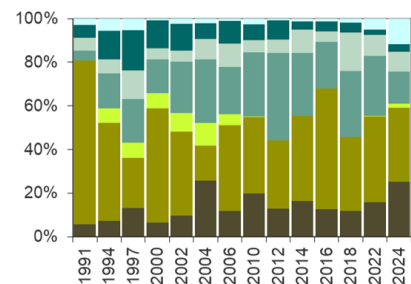
Central AI



Eastern AI



- R/B Rock
- P. Halibut
- Kamchat fl
- Arrowtooth
- AK Skate
- P. Cod
- Lg Sculpin
- Other skates



- R/B Rock
- P. Halibut
- Kamchat fl
- Arrowtooth
- AK Skate
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- Lg Sculpin
- Other skates

- Stable or increasing biomass of pelagic foragers across the chain

- Slow decrease of apex predators, lowest and decreasing biomass in Western Aleutians

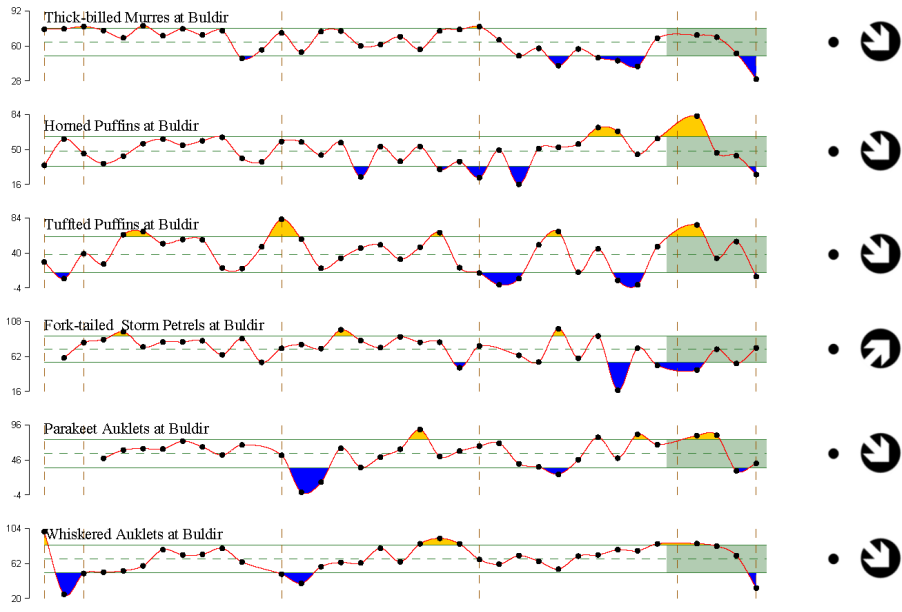
Other related trends:

- Eelpouts, shrimp (common prey of apex predators) decreasing across the chain

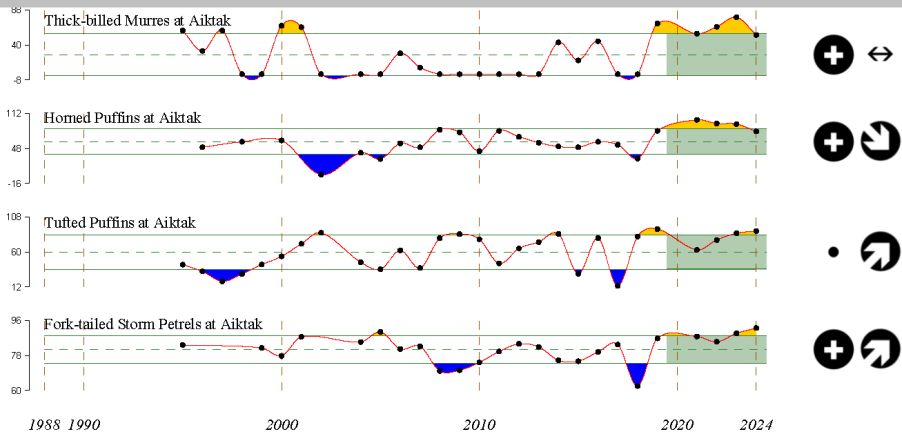
- Structural epifauna is either decreasing or stable in the western and central Aleutians, sea pens increasing in the east

- Low abundance year for Eastern Kamchatka pink salmon, continuing cascading effects but more moderate?

Western Aleutians



Eastern Aleutians



2020-2024 Mean
 + 1 s.d. above mean
 - 1 s.d. below mean
 • within 1 s.d. of mean
 x fewer than 2 data points

2020-2024 Trend
 ↗ increase by 1 s.d. over time window
 ↘ decrease by 1 s.d. over time window
 ↔ change <1 s.d. over window
 x fewer than 3 data points

Seabird Reproductive Success

- Average or above for EAI seabirds: good foraging conditions in summer for plankton and fish foragers; poor in WAI

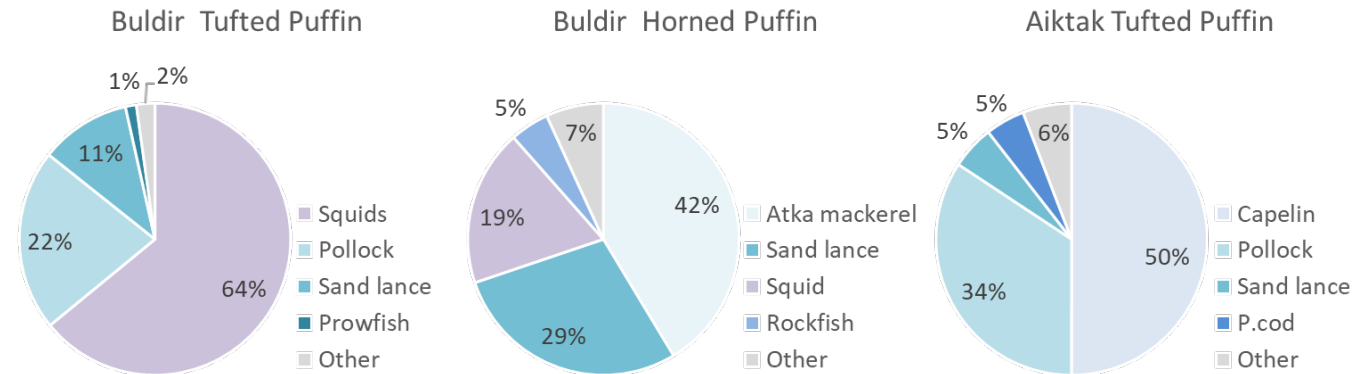
Site	Species													EAI WAI	
	Primarily fish eaters						Primarily zooplankton eaters								
	glaucous winged gull	common murre	thick billed murre	horned puffin	tufted puffin	red-legged kittiwake	black-legged kittiwake	fork-tailed storm-petrel	Leach's storm-petrel	ancient murrelet	parakeet auklet	least auklet	whiskered auklet	crested auklet	
Aiktak	😊	😊	😊	😊	😊	-	-	😊	😊	😊	-	-	-	-	EAI
Buldir	😊	-	😞	😞	😞	😞	😞	😞	😊	-	😞	😊	😞	😞	WAI

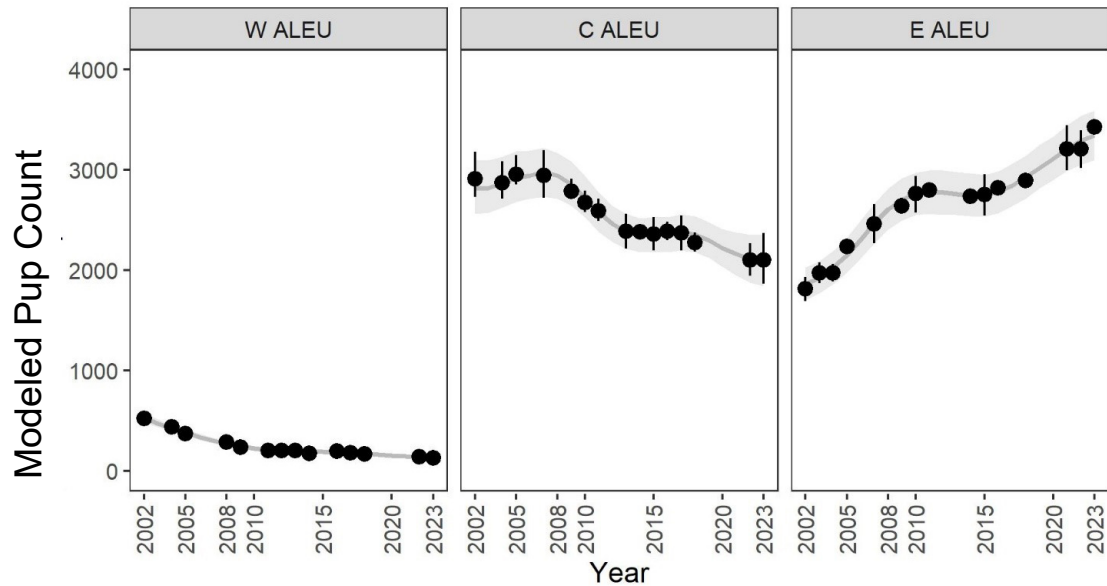
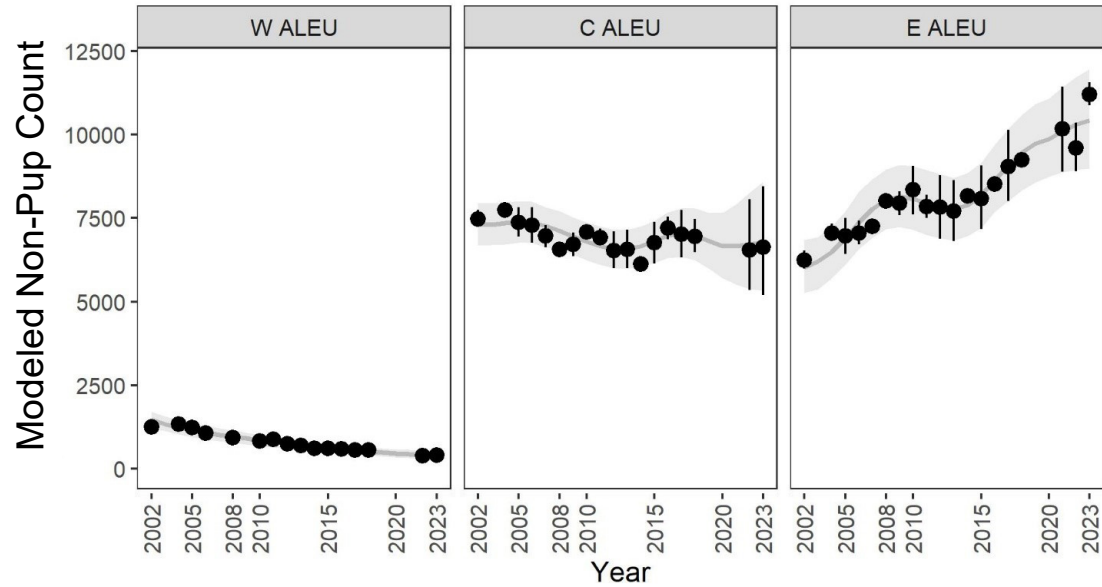
Average & above
 Average & below

😊 Above average 😐 Average 😞 Below average

Seabird Diets

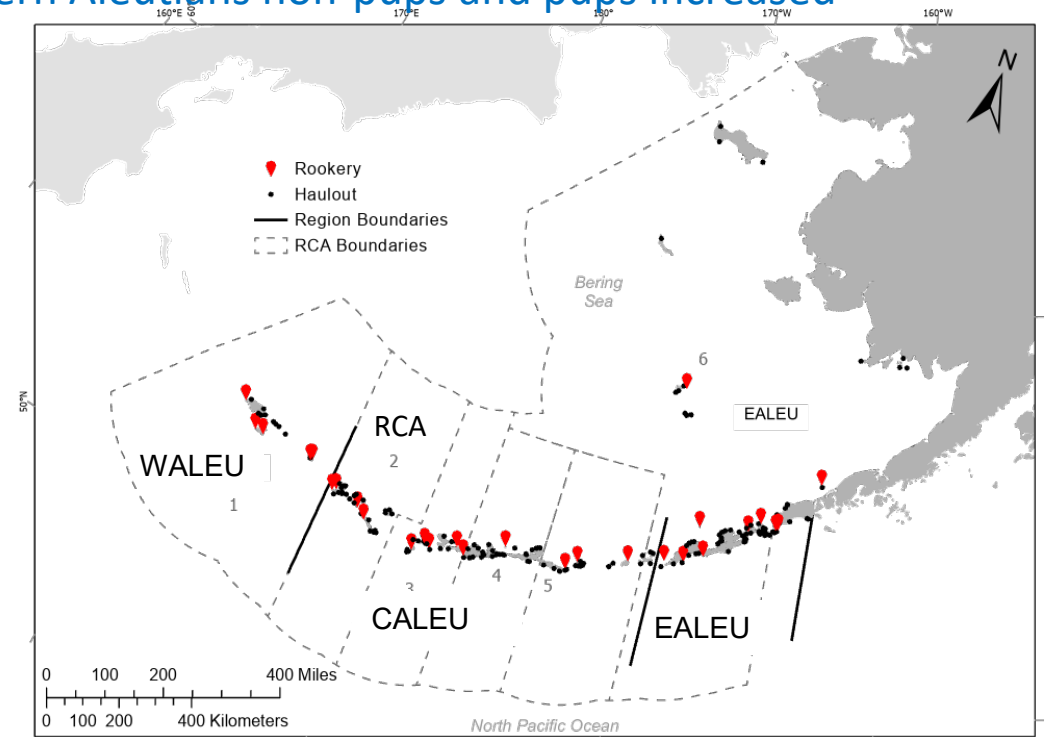
Mostly capelin in the EAI, Atka mackerel in CAI, squid in WAI:





Steller sea lions non-pups and pups:

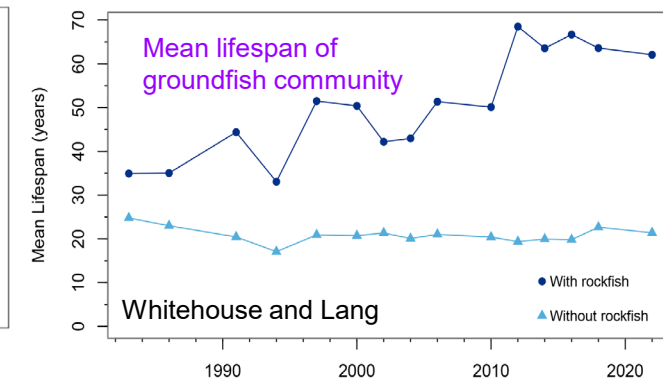
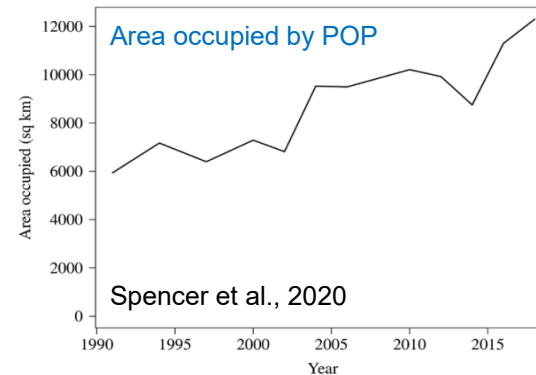
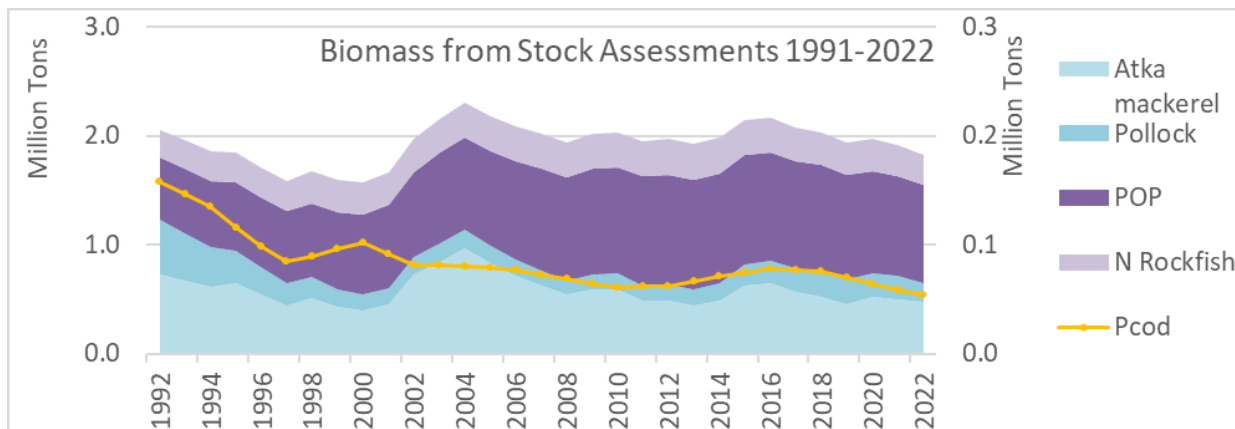
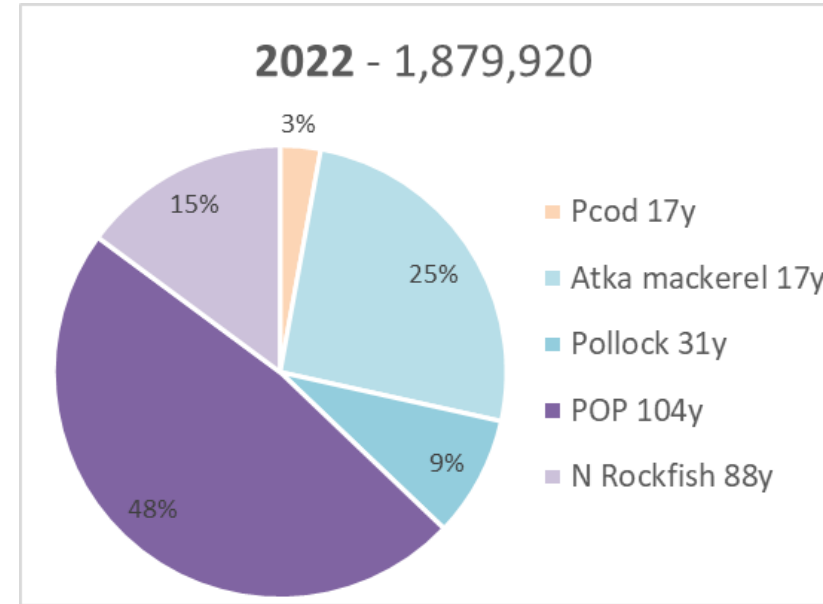
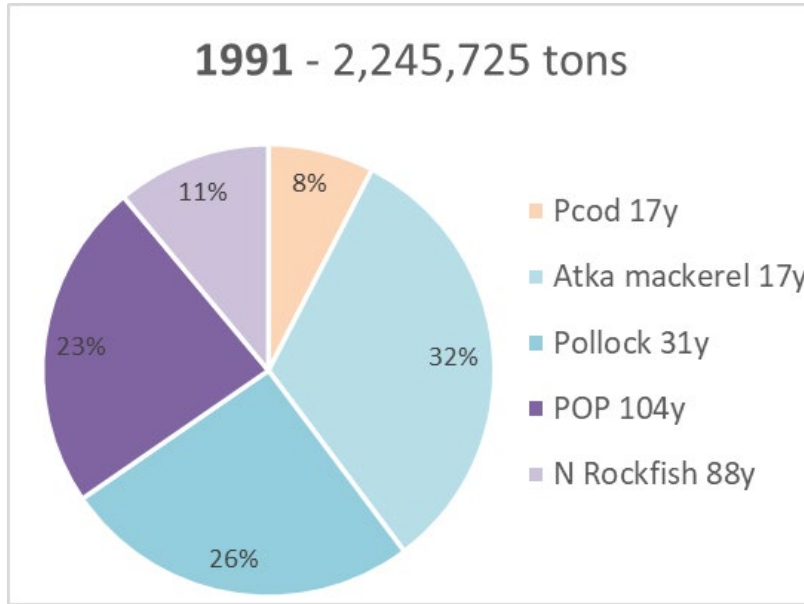
- western Distinct Population Segments non-pup and pup counts increased between 2008-2023
- Regionally:
Western Aleutians non-pups and pups declined,
Central Aleutians non-pups stable (but RCA 2,3 declined)
pups declined, RCA 5 stable
Eastern Aleutians non-pups and pups increased



Rockfish main pelagic foragers

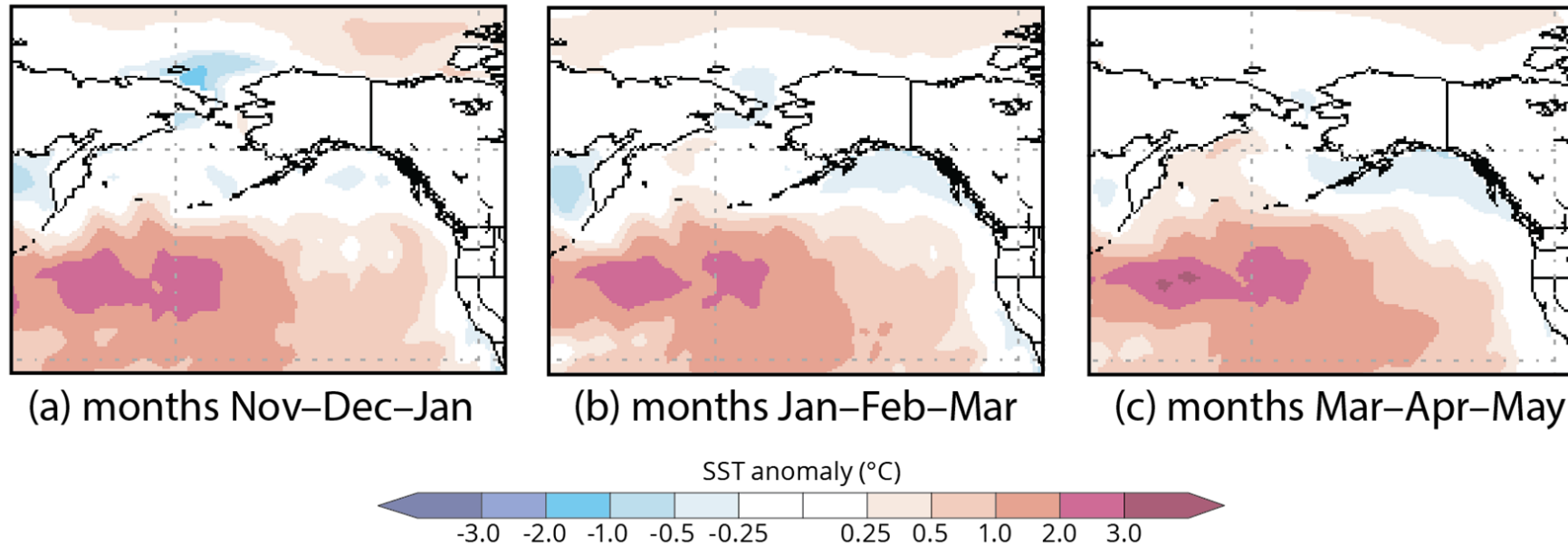
Multi-year patterns

- 63% vs 34% of pelagic forager biomass with lifespan of 88-104 in 1991 and 2022 respectively



- Last year prediction: sea ice should extend south of 60°N perhaps all the way to M2, largely borne out
- **60% chance of La Niña** during January – March 2025,
- Climate prediction center, NOAA https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.shtml
- **Warm** conditions for western Aleutians (NMME, Bond) for January - March
- Ensemble indicates conditions should not be extreme relative to the past 20-30 years

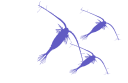
Sea surface anomalies from National Multi-Model Ensemble



Summary and implications



Jan – Mar among 10 warmest winter on record SST, cooler spring & summer except western Aleutian Islands; average bottom temperature
Potential concern for winter survival and winter spawners; lower bioenergetic costs but cooler temperature are just average



Small copepod size, larger mesozooplankton biomass (2023)

More zooplankton but lower availability of large copepods as prey



Pacific cod diets

consumption of prey >1% of predator weight coherent with above average condition, Atka mackerel main fish prey in WAI, CAI



Seabird reproductive success above average in EAI for plankton and fish-eating seabirds; poor for WAI

Indicates potential availability of prey and good foraging conditions for both plankton and fish eating groundfish in EAI, but poor availability in prey in WAI



Rockfish dominance of pelagic forage fish biomass

Potential for increased competition for zooplankton; Rockfish are now 64% of the guild biomass with lifespans between 88-104 which eans less fish prey for apex predators, slow response to environment which increases ecosystem stability



Increasing Eastern Kamchatka pink salmon during both low abundance and high abundance years

In a low abundance year, EK pink salmon is similar to current P. cod stock, peak abundance in 2019 reached 350,000 mt

Slow trends in the western and central Aleutians: decreasing structural epifauna, decreasing miscellaneous fish

potentially less alternative fish prey in the system and decreasing critical habitat

transition of the ecosystem to a state where rockfish are the main pathway of zooplankton into food web, pink salmon export energy from their prey.

Additional Information Available

Ecosystem Status Reports through 2024 are available [here](#):



ESR Reports (1999-2024)