Ecosystem Status Report Aleutian Islands 2024 – SSC Dec

Thank you !

Ivonne Ortiz & Stephani Zador

With contributions from:

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photos: photolib.noaa.gov

Response to SSC comments (December 2023)

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"…the authors consider moving East Kamchatka pink salmon indicators and POP indicators into the report cards. For pink salmon, it was discussed that additional information on biomass may be valuable…"

We will be evaluating how to best update the report cards with new information, not only with POP/rockfish and pink salmon biomass, but temperature and seabird information as well. Biomass plots are now included in EK pink salmon contribution. This year, we placed that biomass in context with historical levels of EK pink salmon and biomass of AI groundfish stocks.

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?

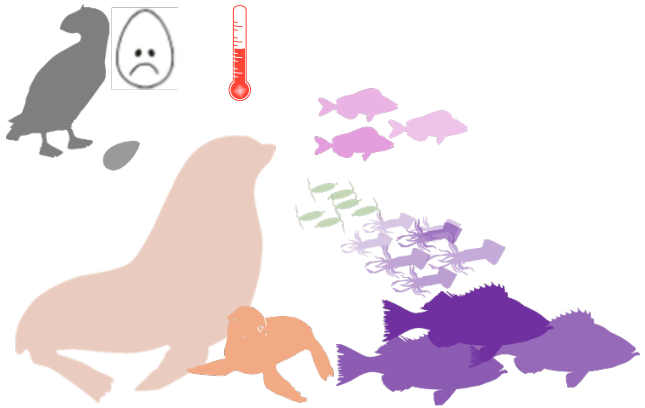
3. Few pink salmon, but this "low" year is now as high as previous high years

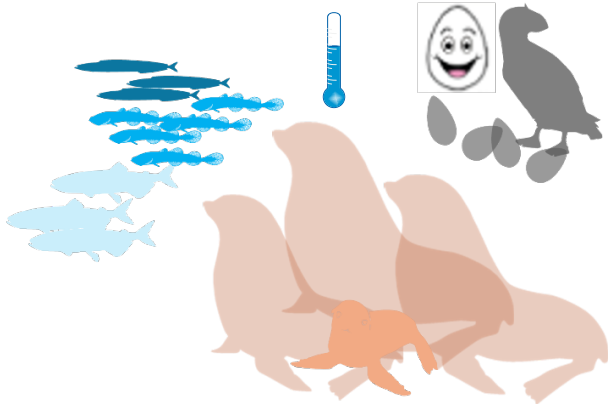
All those EK Pinks are exporting energy, as low abundance = 60,000 mt

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





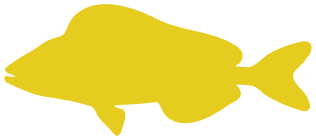
Sustained Level 2

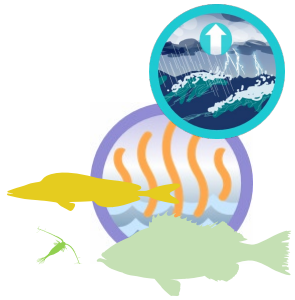
AI Pacific cod

- 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

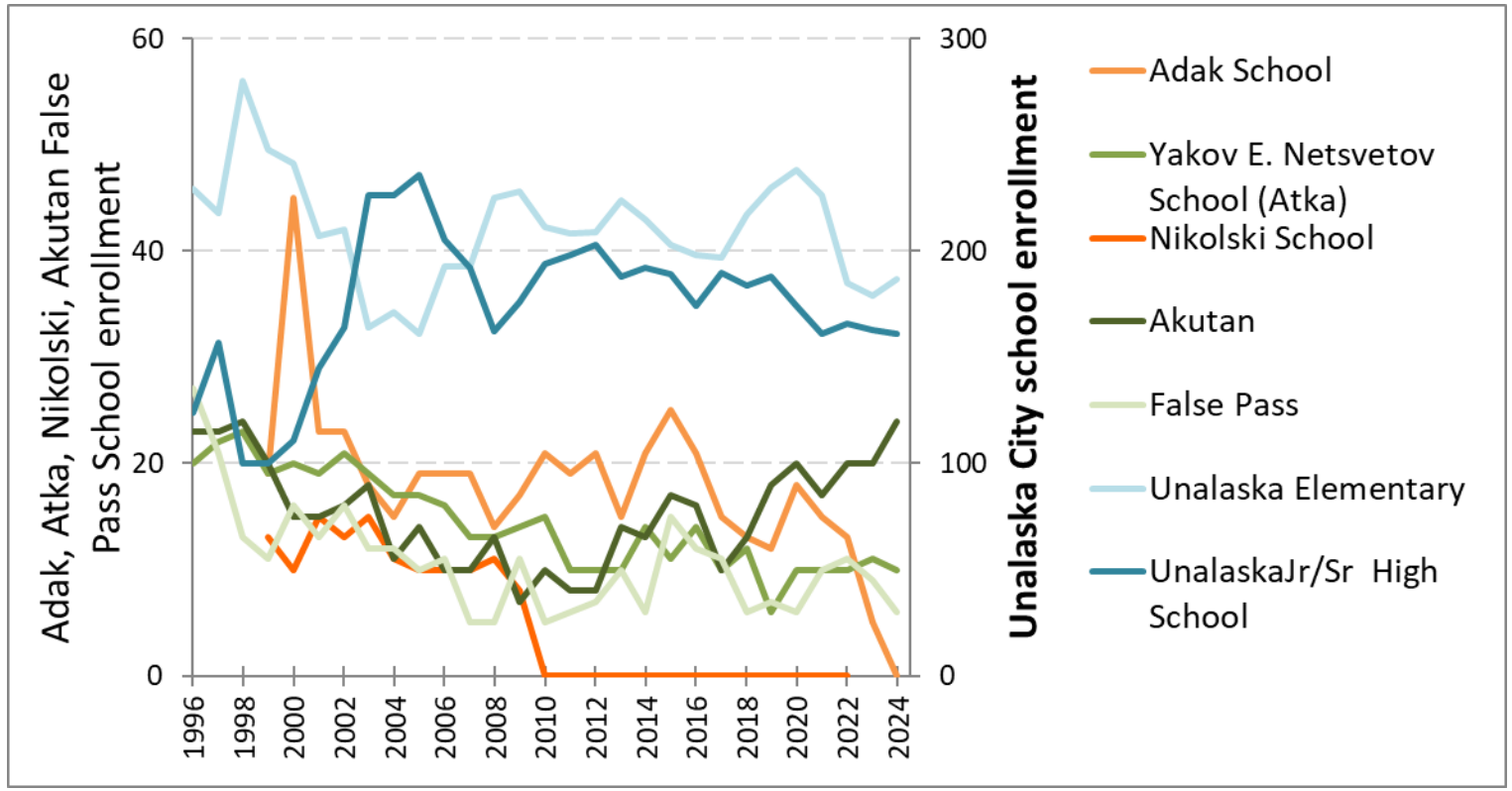
Atka mackerel





- 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)

Decreasing trend in school enrollment

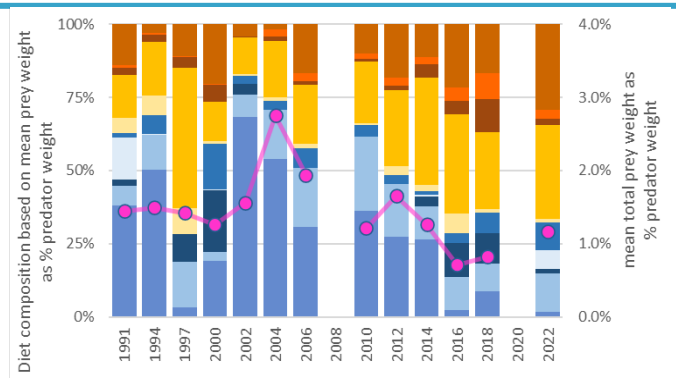


- School at Adak closed
- Decreasing trend even in Unalaska
- Akutan – only one increasing

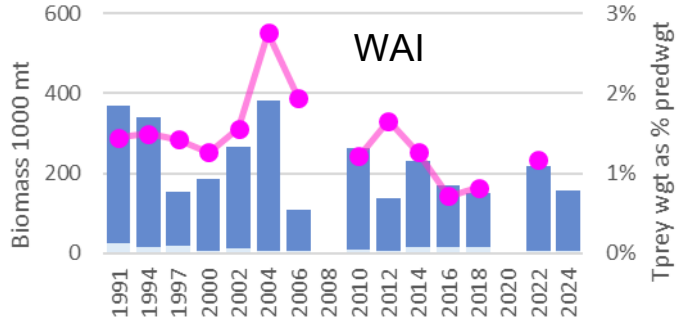
Noteworthy

Changes in Pacific cod diets II

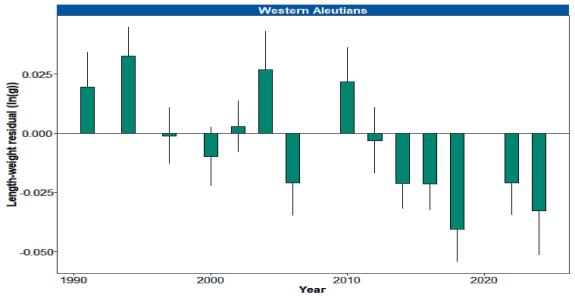
Pcod diet



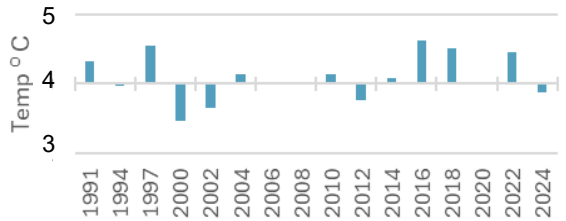
Prey biomass vs consumed prey

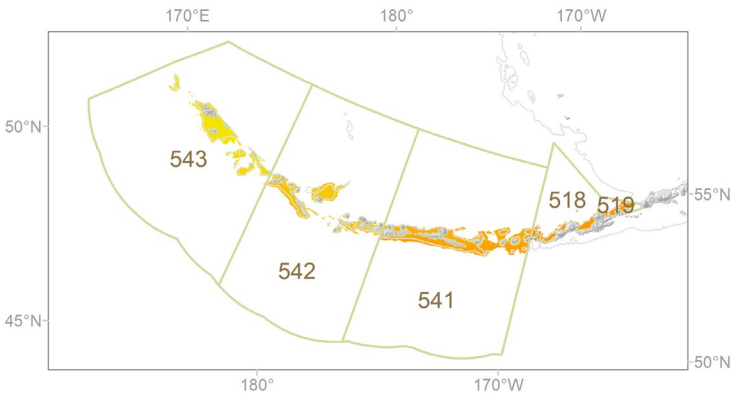


Fish condition



Bottom T °C





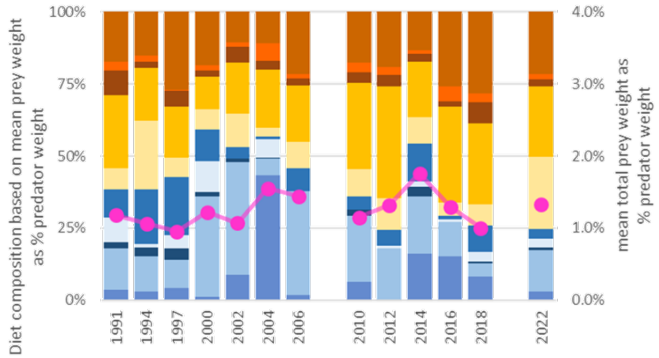
Western Aleutians NMFS 543

- Less fish in diets
- Consumption of prey needs to be at least 1% of predator weight
- Correspondence between Atka mackerel biomass and total prey consumption
- Correspondence 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



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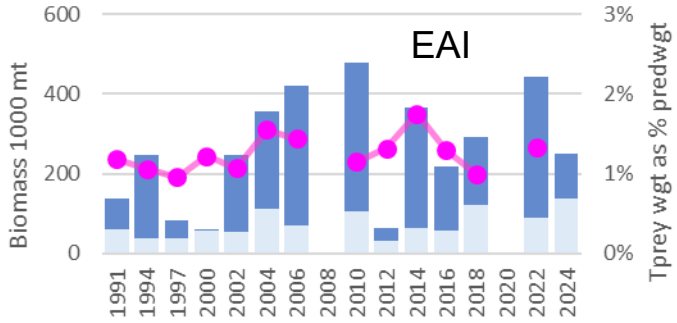
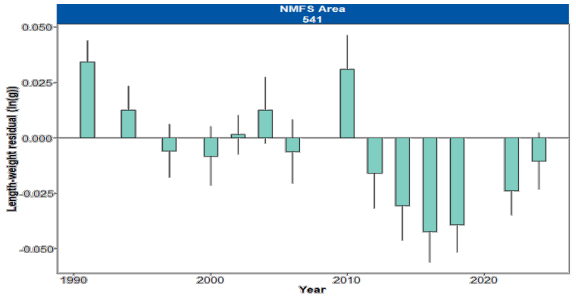


Fish condition



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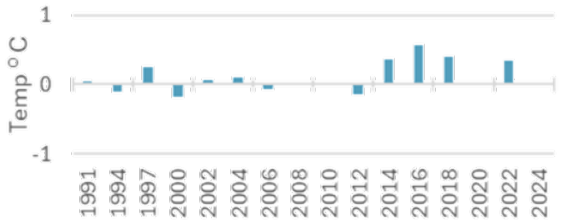
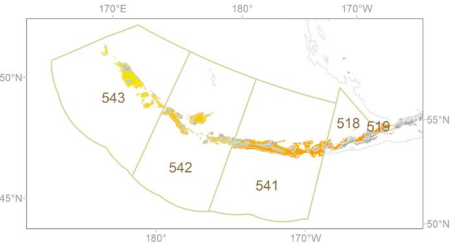




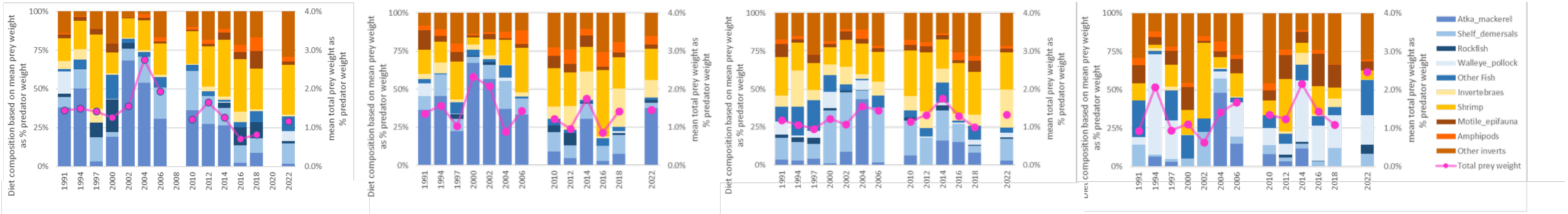
Eastern Aleutians NMFS 541

- Less fish in diets
- Consumption of prey needs to be at least 1% of predator weight but of adequate caloric value?
- Less correspondence between Atka mackerel biomass and total prey consumption
- Less correspondence between total prey consumed and fish condition – quality of prey may partly explain this?
- 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



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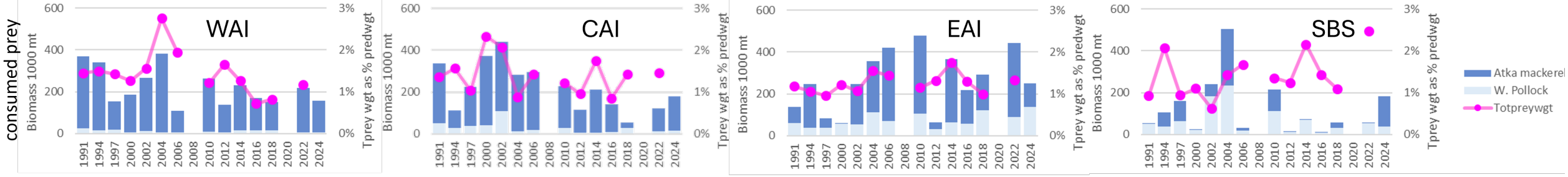
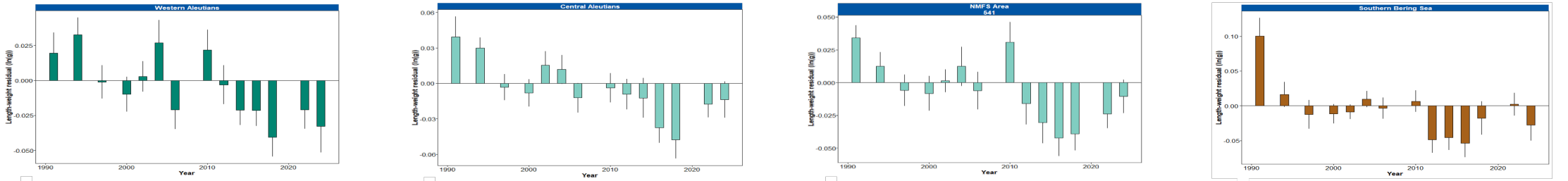


Fish condition



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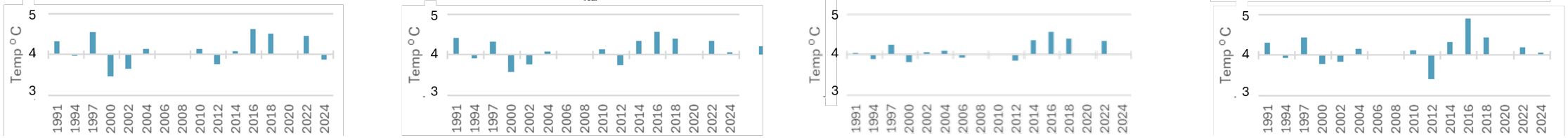
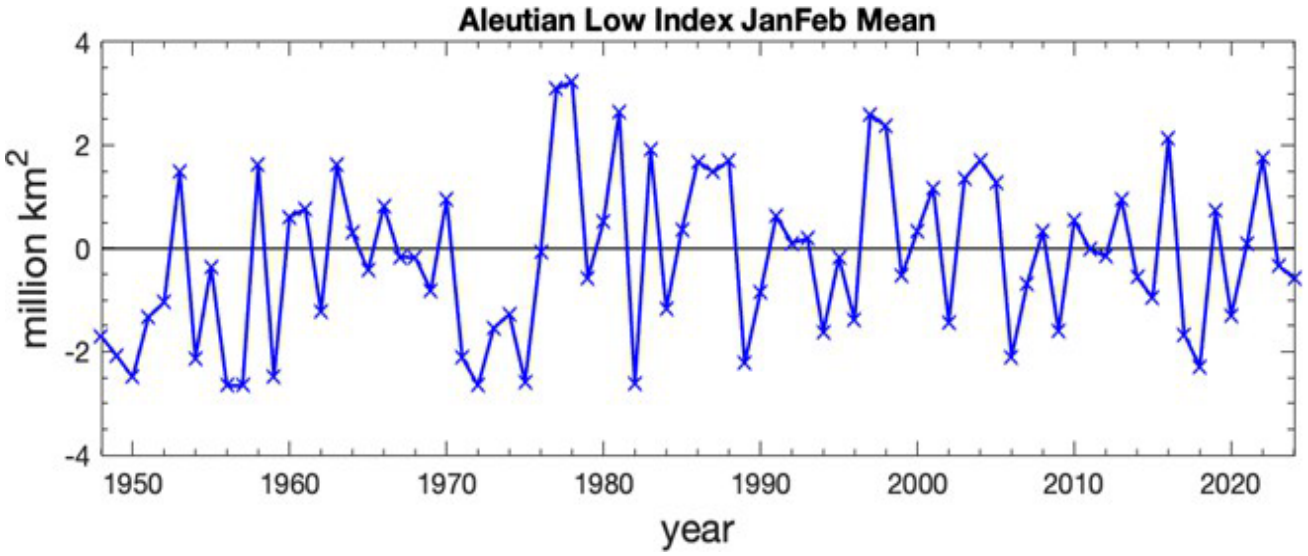


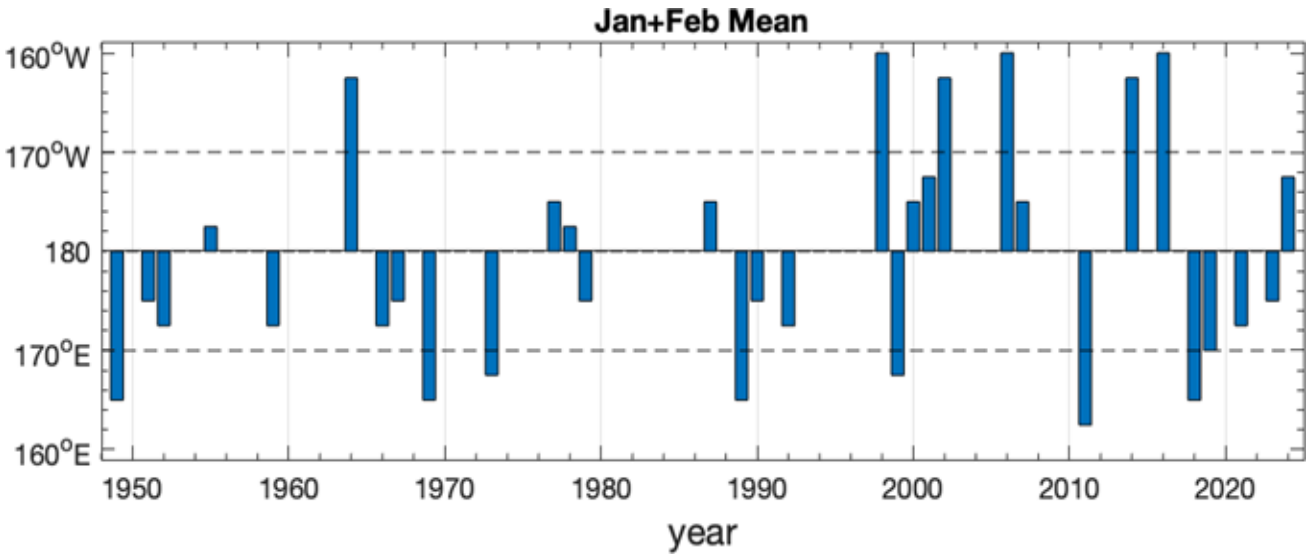
NMFS 543

NMFS 542

NMFS 541

NMFS 518, 519

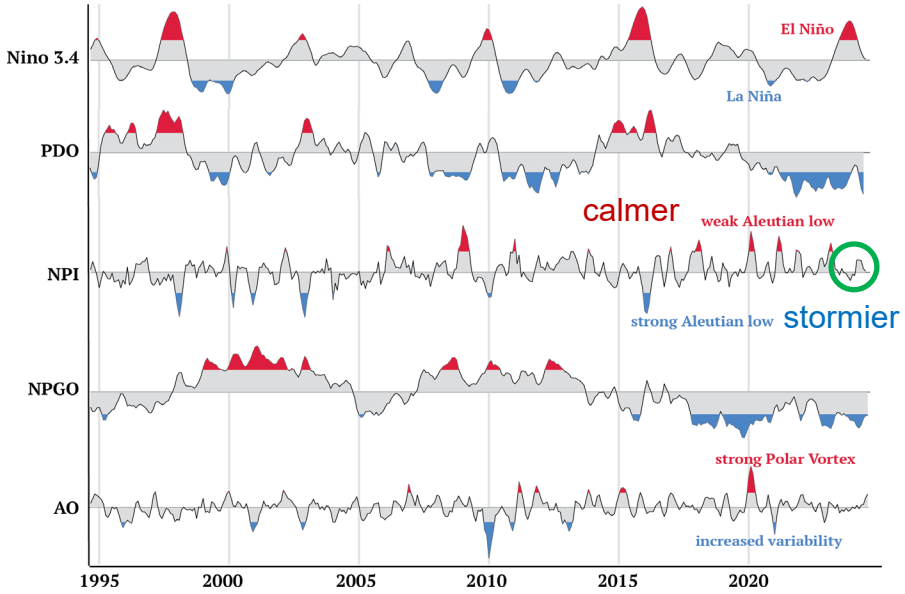




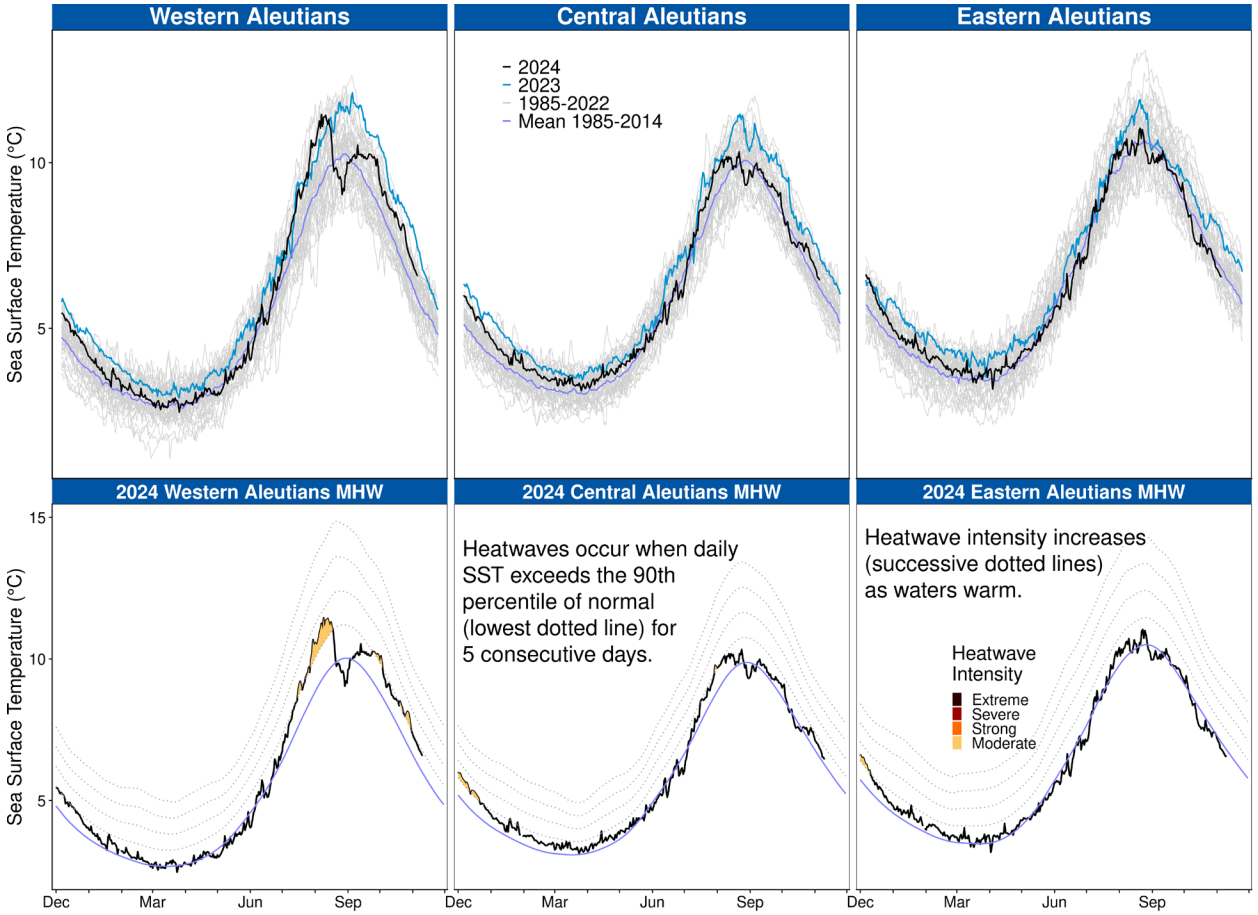
Aleutian Low –dominant atmospheric pressure system in winter Jan-Feb

- 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



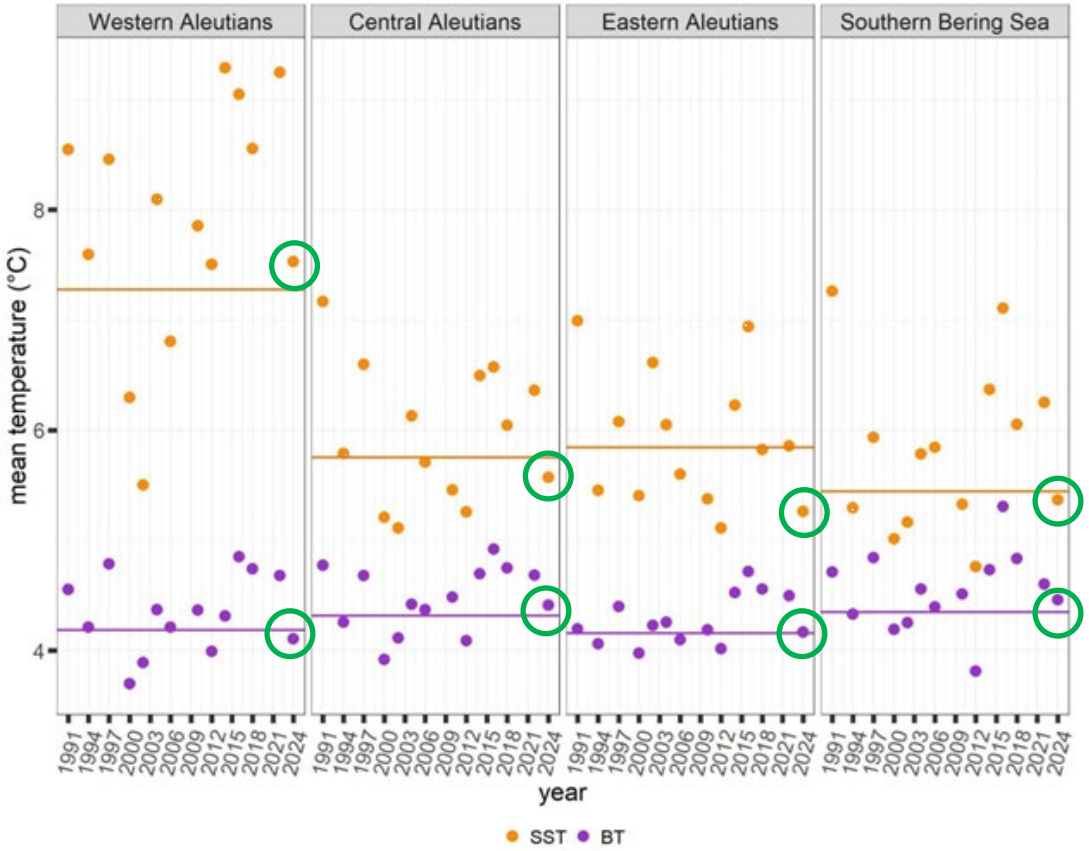
data through 11-12-2023

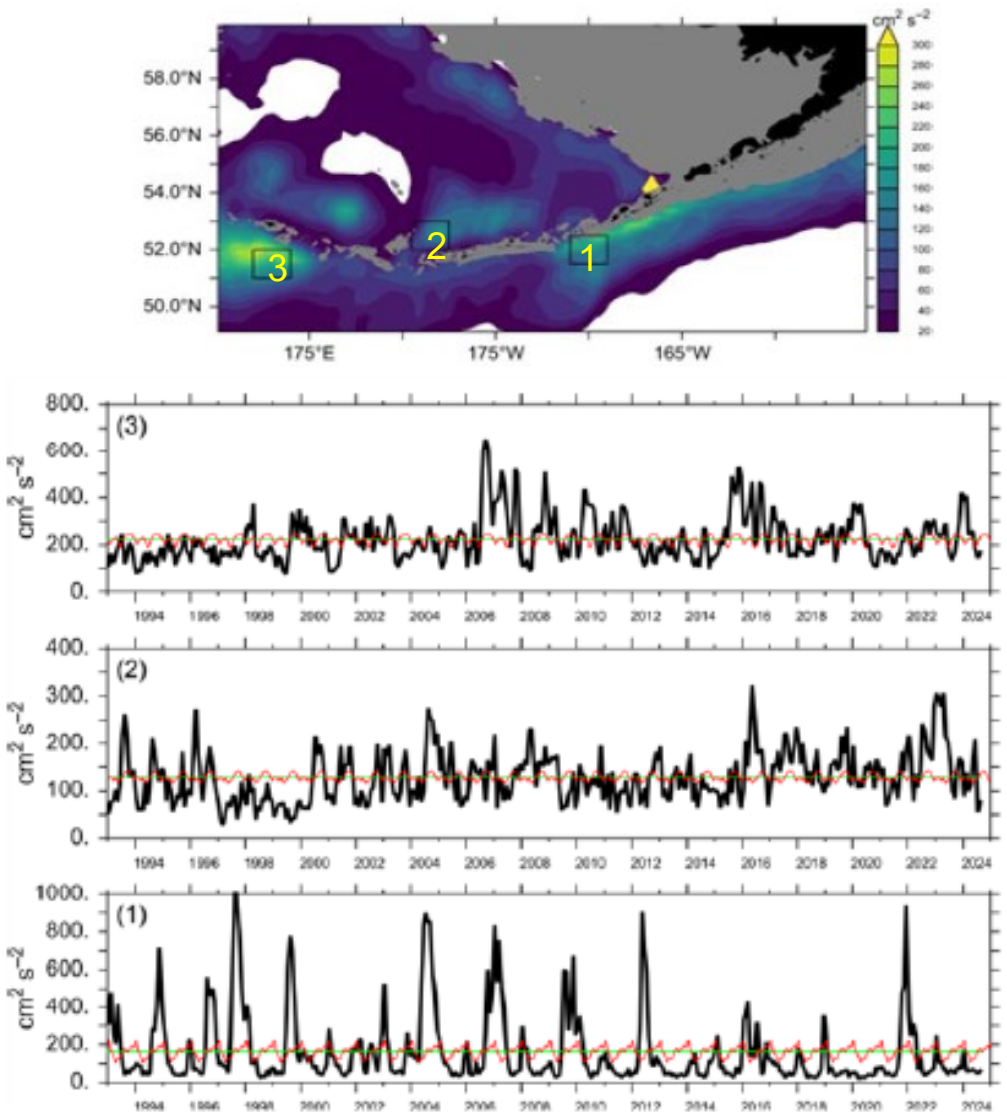


NOAA Coral Reef Watch data, courtesy NOAA Pacific Islands Ocean Observing System (Updated: 11-10-2024)
Data are modeled satellite products and periodic discrepancies or gaps may exist across sensors and products.
Contact: matt.callahan@noaa.gov, Alaska Fisheries Science Center

Satellite SST

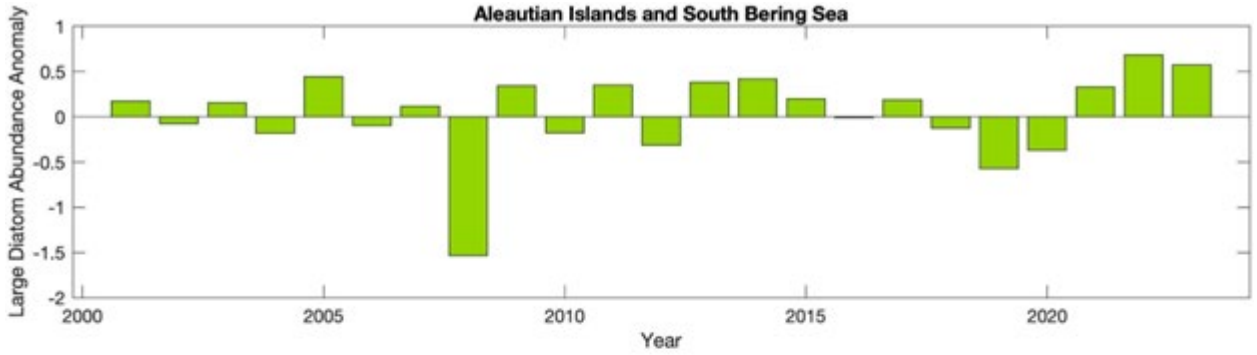
- Warm winter throughout, among 10 warmest winters
- Cooler spring & summer but still at or above 1985-2015 mean
- WAI – temperatures increased again in late summer and fall

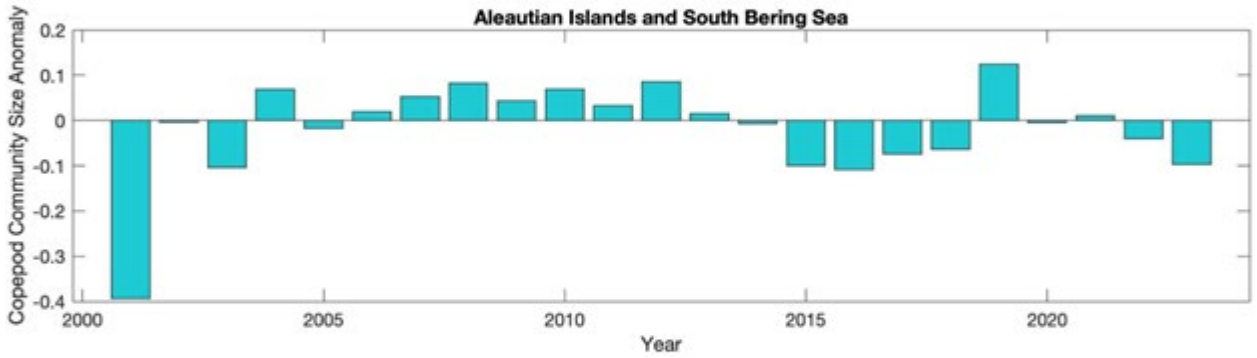


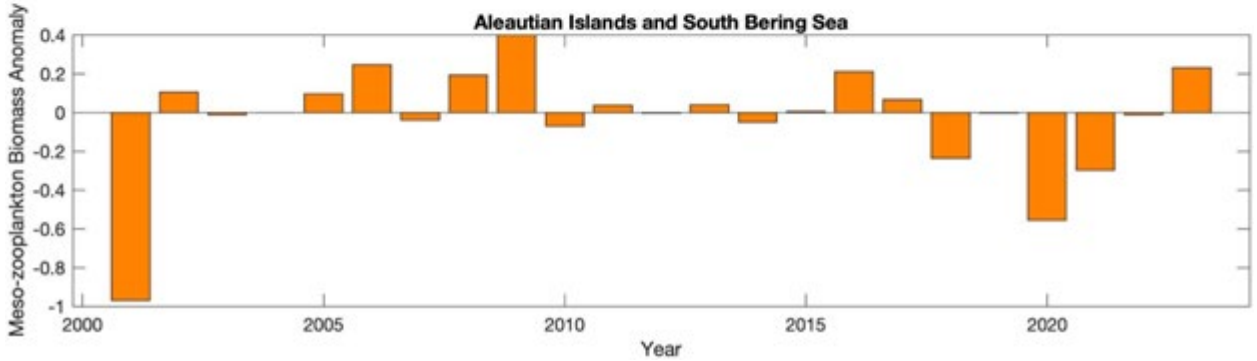


Eddy Kinetic Energy

- Some increased flows in WAI beginning of year
- Currently below average in all three regions
- Lower transport of heat, salt and nutrients through passes
- EAI influenced by GOA weakening of coastal circulation and movement of eddies offshore related to the marine heatwave (warm events in general with increased upwelling) (Rallu De Malibran et al. 2024)







Continuous Plankton Recorder

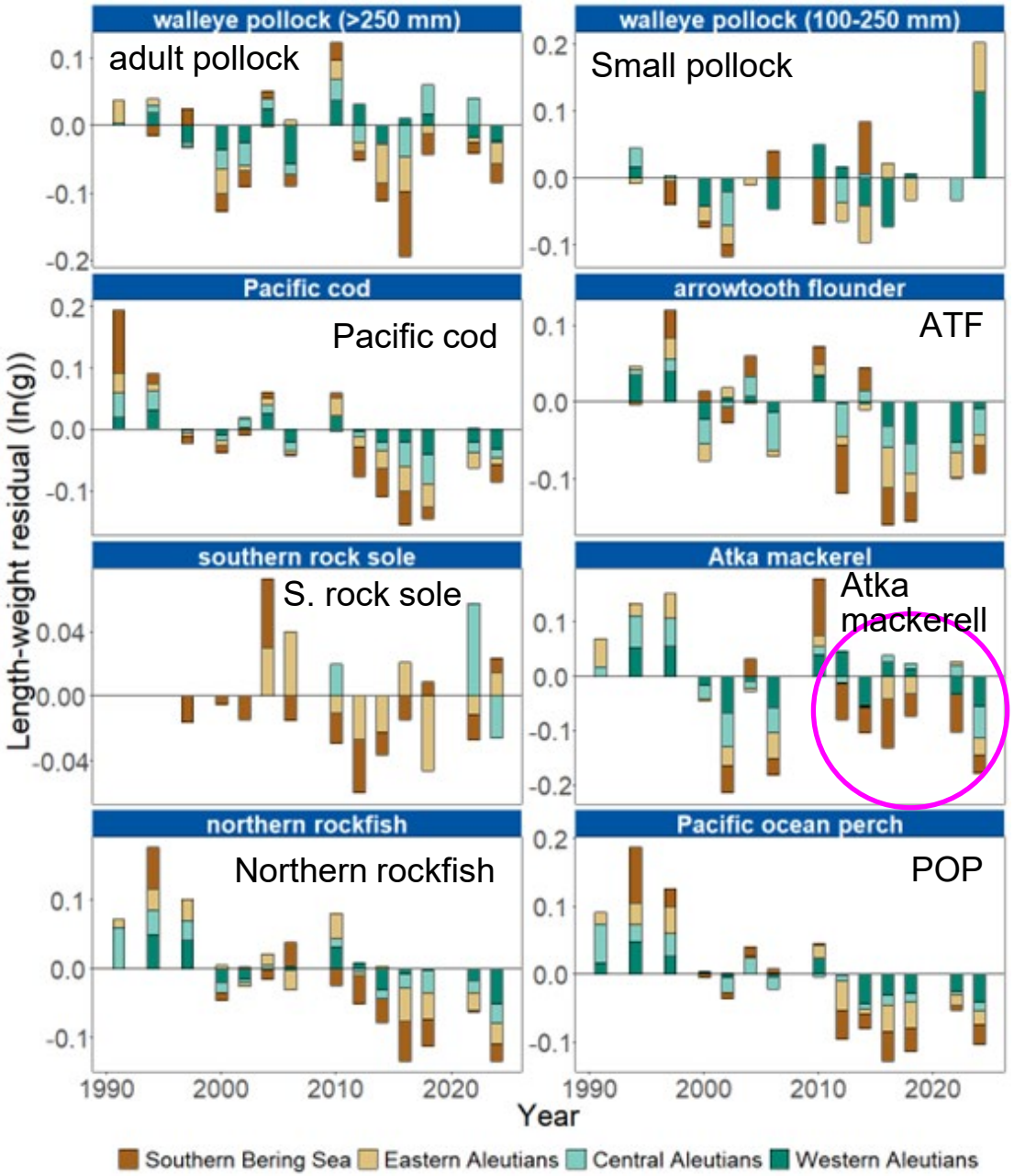
- Large diatom biomass in 2023: above mean for third year

  biennial pattern – gone after 2012?

- Smaller size of copepod community **potentially due to warmer temperatures**

  below average since 2024

- First year with above average meso-zooplankton biomass



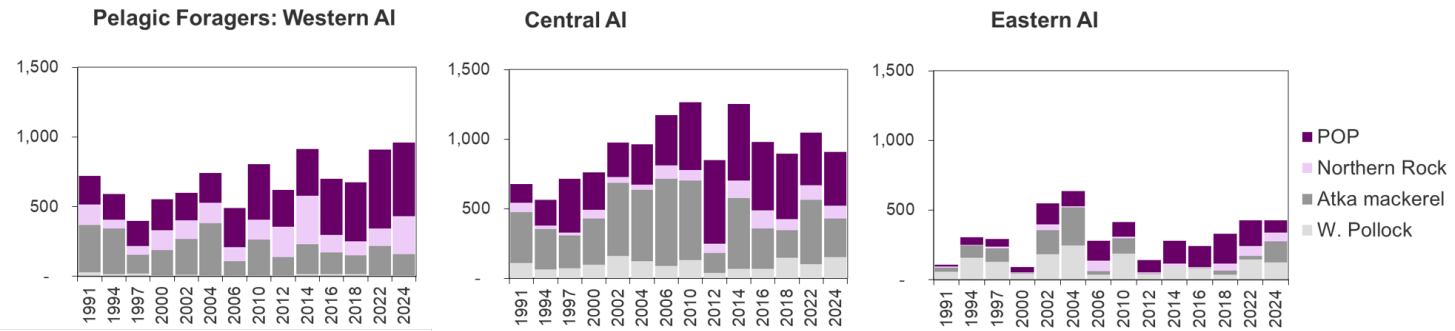
- Condition decreased across entire chain
- Atka mackerel condition decreased even in western and central Aleutians
- Pacific cod, northern rockfish and Pacific ocean perch below average condition since 2012
- Exceptions:

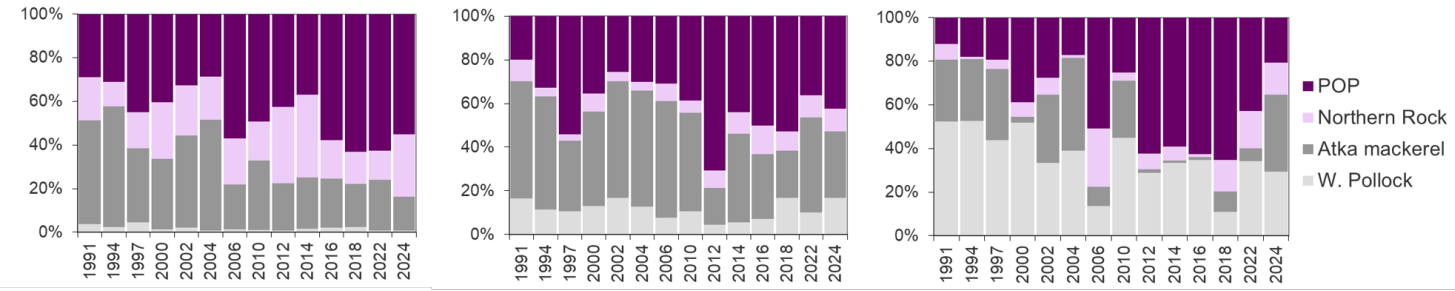
  small pollock and southern rock sole

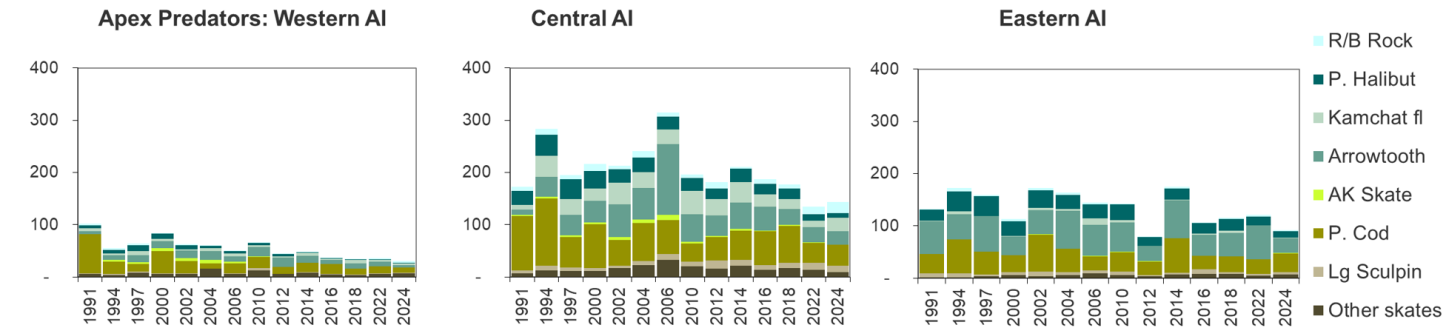
Werb and Rudnick, 2023. Remarkable changes in the dominant modes of North Pacific sea surface temperature. Modified from Figures 1b and 3b.

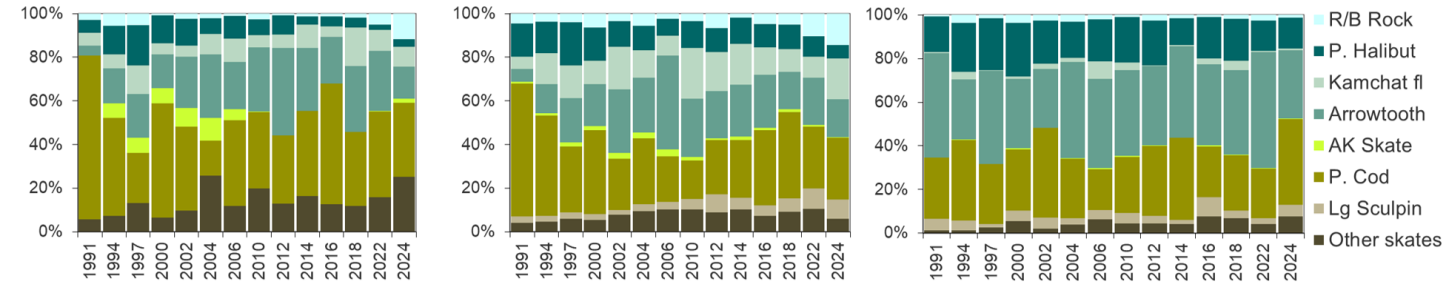
Ortiz

Biomass of Pelagic Foragers and Apex Predators





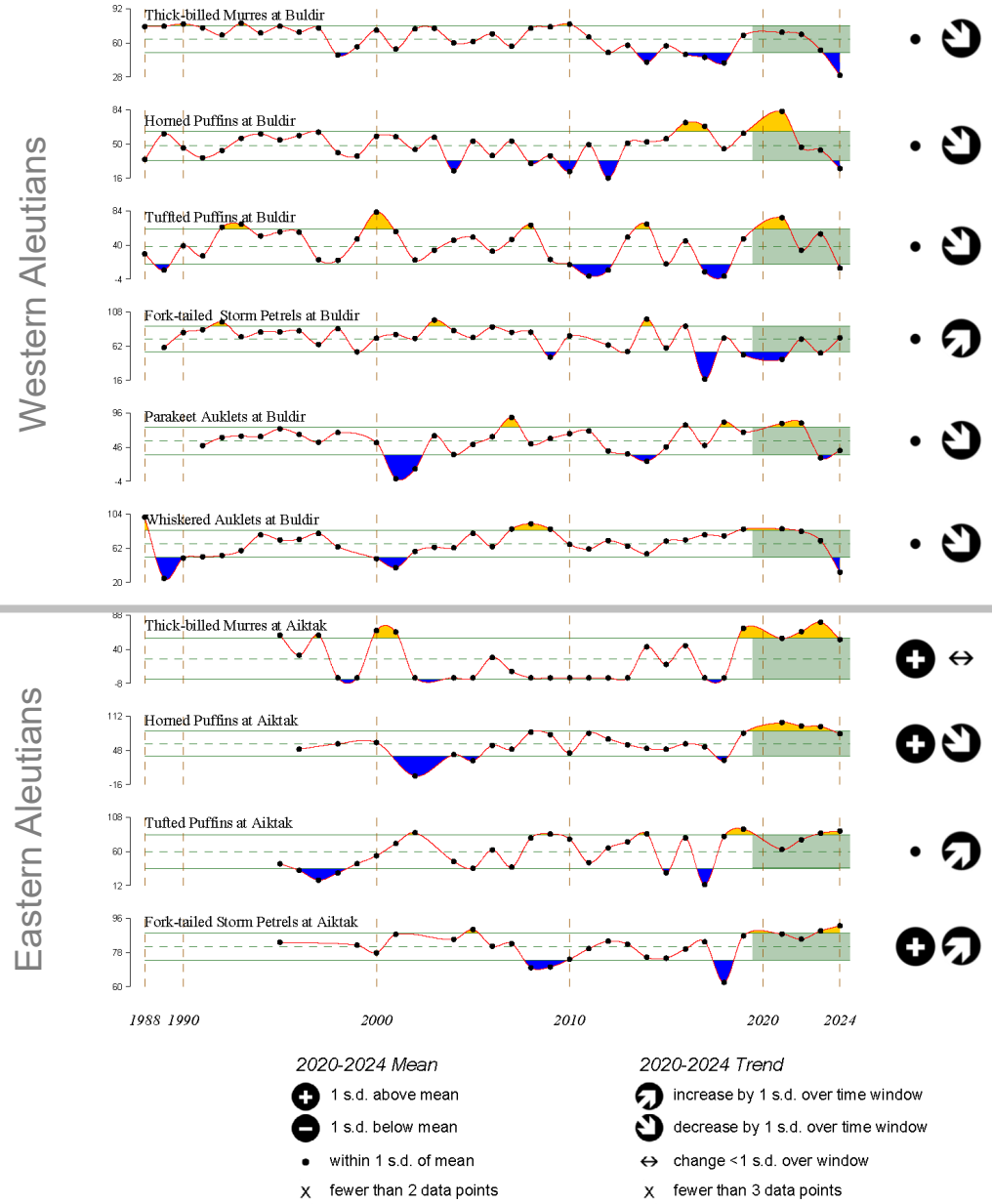




- Stable or increasing biomass of pelagic foragers across the chain
- Slow decrease of apex predators, lowest and decreasing biomass in Western Aleutians

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?



Seabird Reproductive Success

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

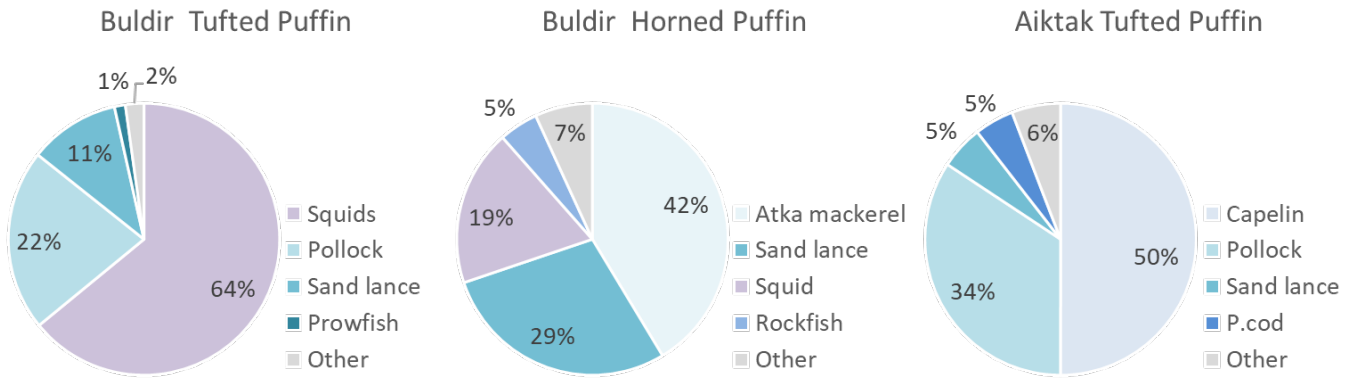
	Species: Primarily fish eaters ---------- Primarily zooplankton eaters													
Site	glaucous winged gull	common murre	thick billed murre	horned puffin	tufted puffin	red-legged kittiwake	black-legged kittiwake	fork-tailed storm-petrel	Leach's storm-petrel	ancient murrelet	parakeet auklet	least auklet	whiskered auklet	crested auklet
Aiktak (Average & above)	☺	😐	☺	☺	☺	-	-	☺	😐	☺	-	-	-	-
Buldir (Average & below)	☺	-	☹	☹	☹	☹	☹	☺	😐	-	☹	☺	☹	☹

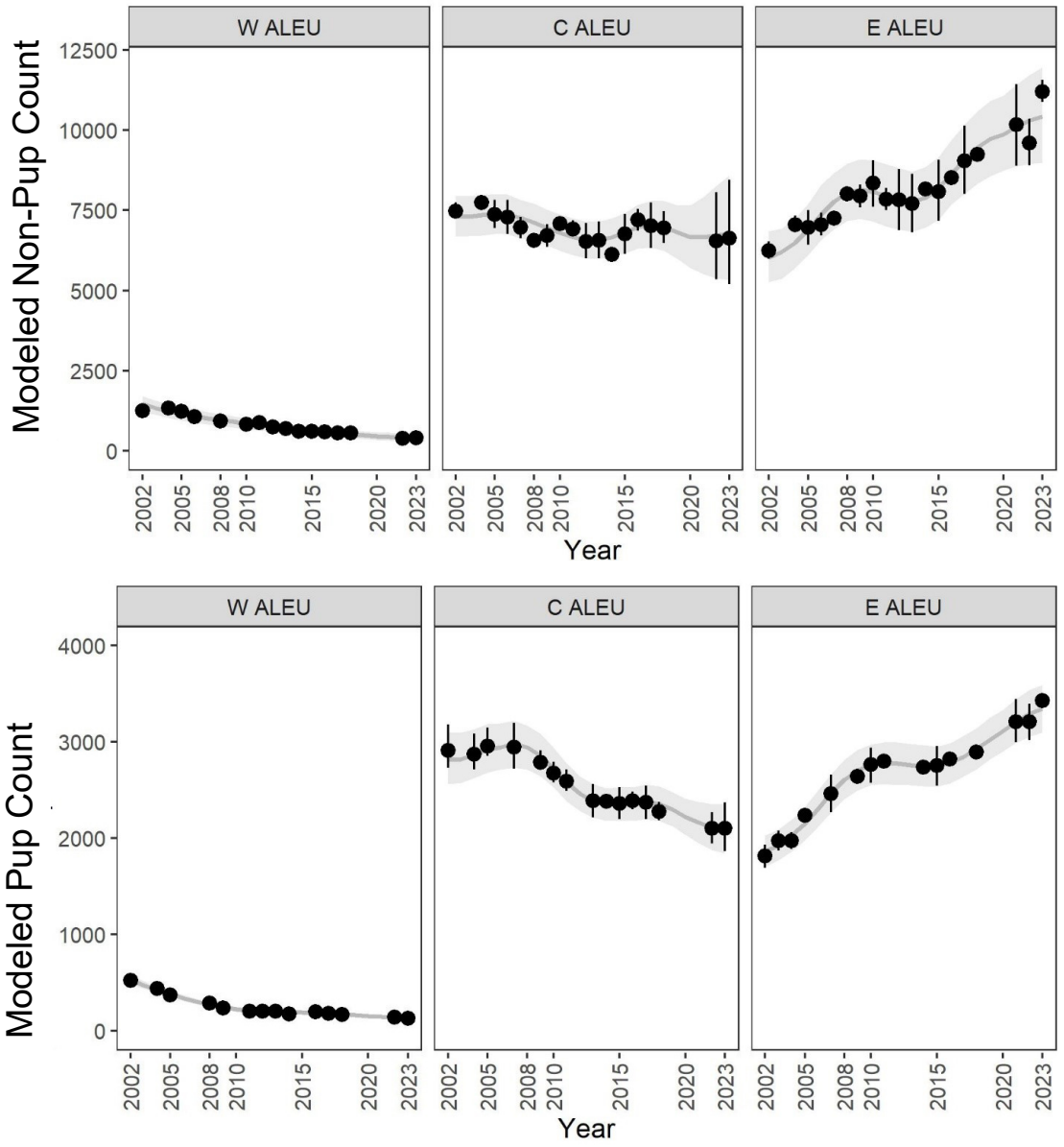
EAI
WAI

☺ 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:

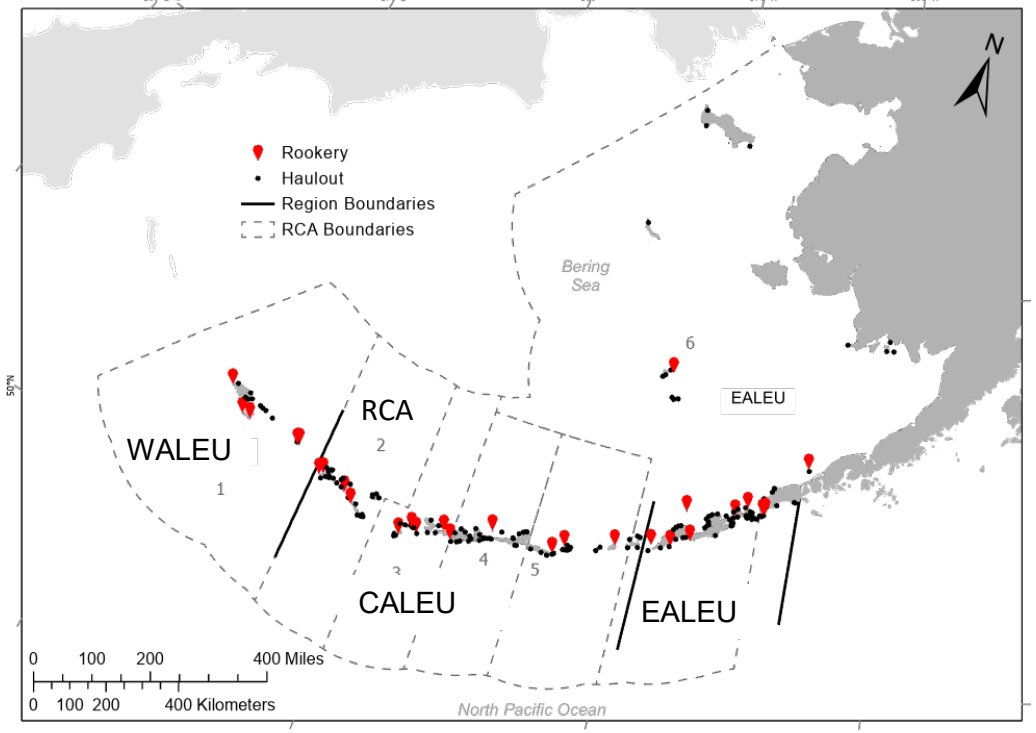
- western Distinct Population Segments non-pup and pup counts increased between 2008-2023
- Regionally:

  Western Aleutians non-pups and pups declined,

  Central Aleutians non-pups stable (but RCA 2,3 declined)

  pups declined, RCA 5 stable

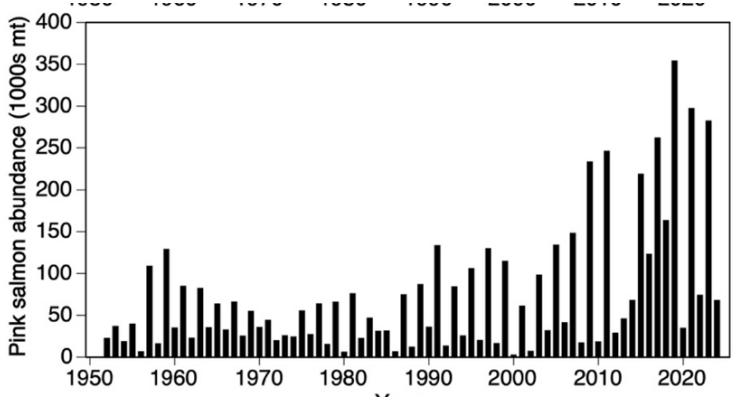
  Eastern Aleutians non-pups and pups increased

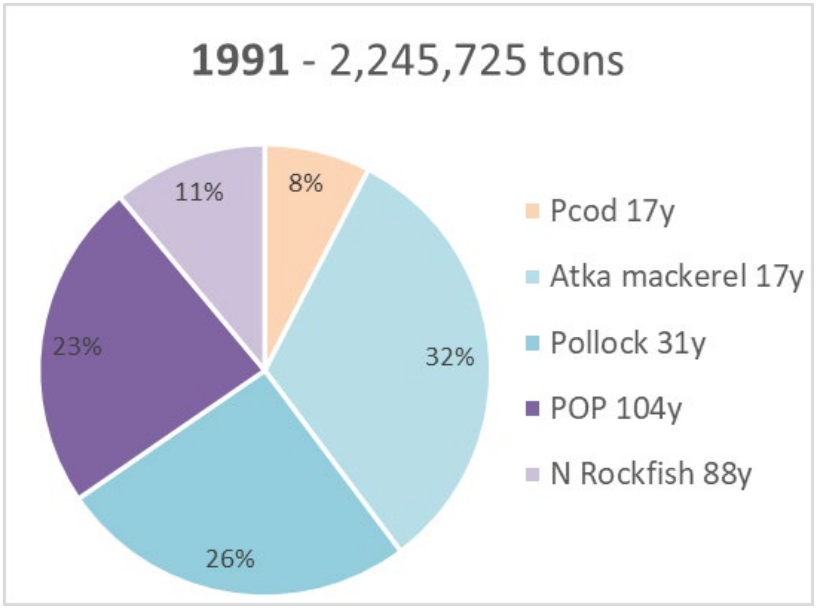


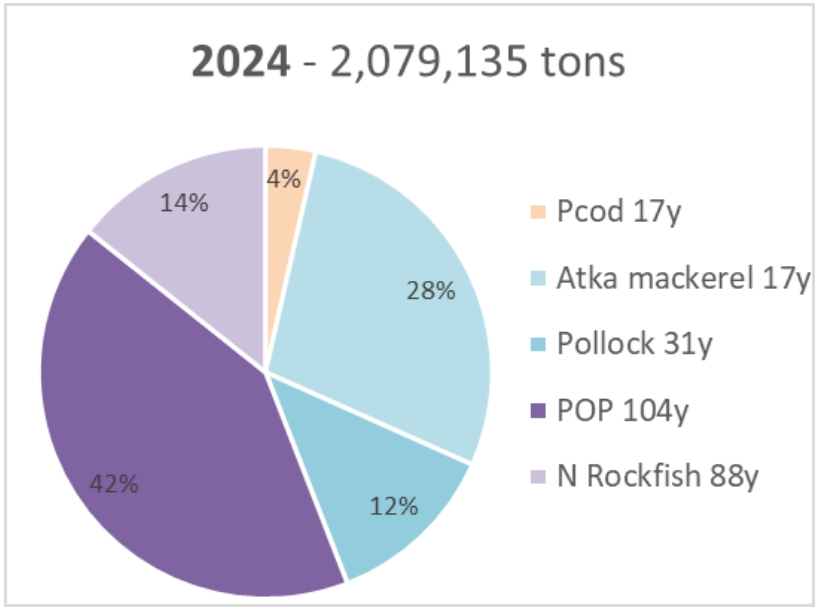
Rockfish as main pelagic foragers

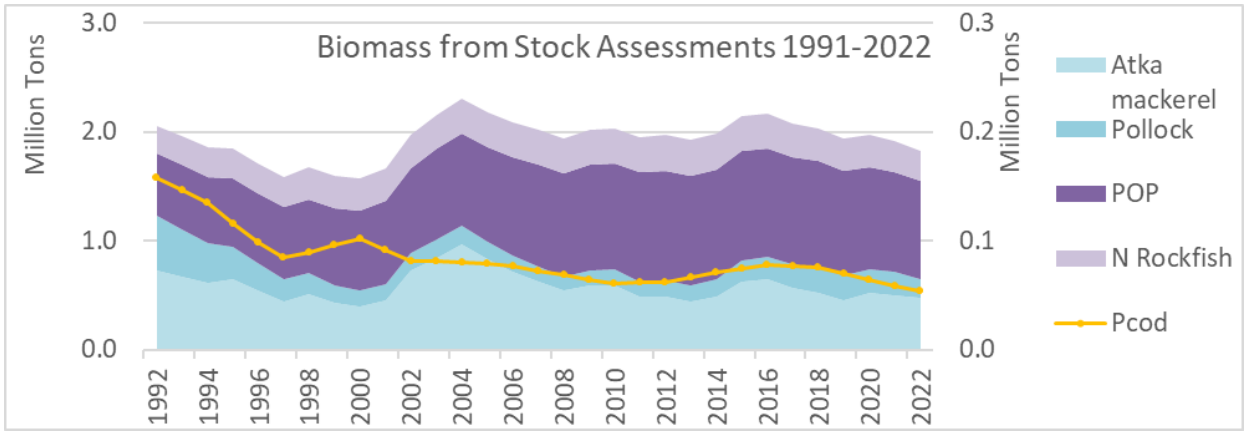
Multi-year patterns

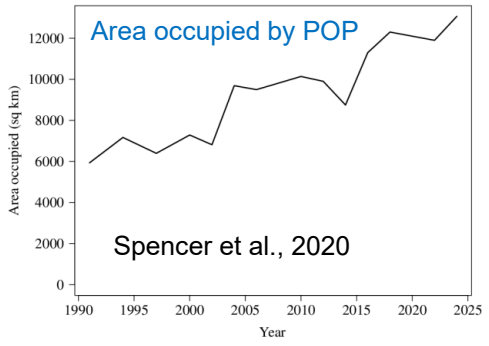
- 63% vs 34% of pelagic forager biomass with lifespan of 88-104 in 1991 and 2022 respectively

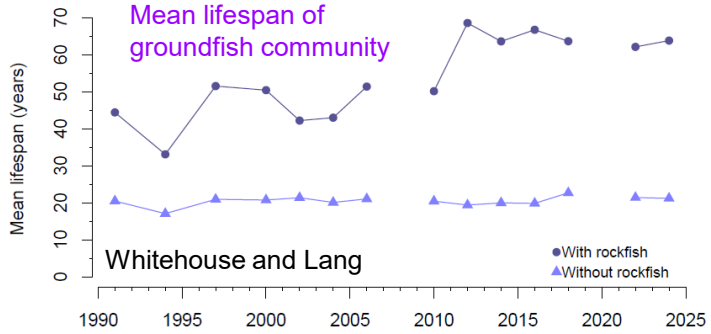








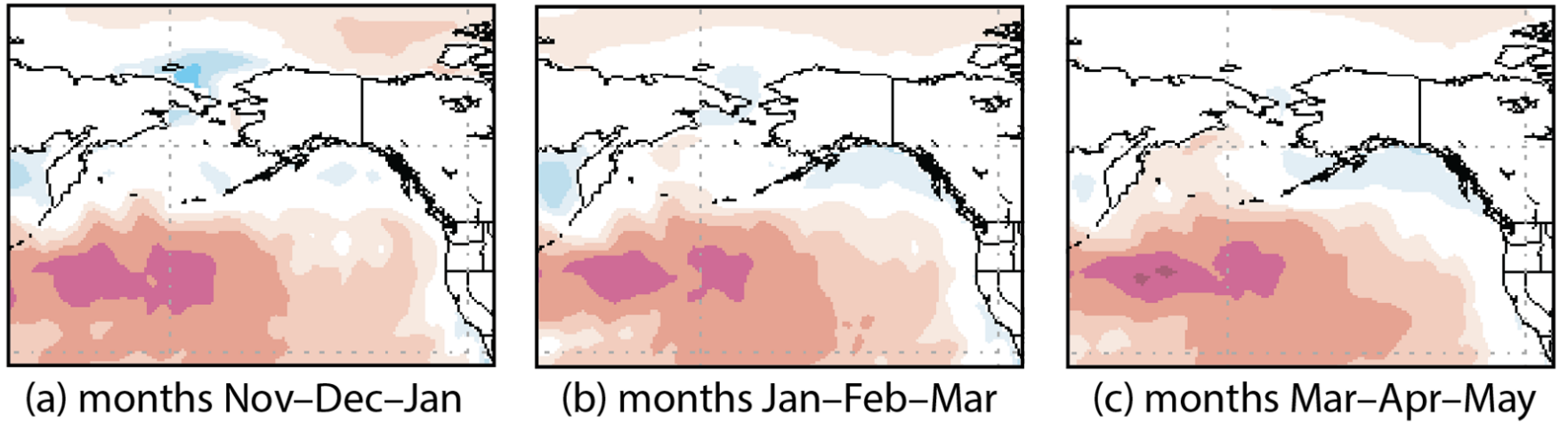




NMME Forecast 2024

- 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 meso-zooplankton 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 years 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 the ecosystem.

Additional Information Available

Ecosystem Status Reports through 2024 are available here:

ESR Reports (1999-2024)