Aleutian Islands Ecosystem Status Report

North Pacific Fishery Management Council

Council presentation

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Outline

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Salmon 	2019
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- New this year
- Contributors
- Noteworthy
- Multi-year Patterns, Regional Coherency
- Regional Differences
- 2019 biological info; 2020 physical info
- Summary/ Implications
- Questions and/or Comments?

New this year

- Physical Environment Synthesis, Integrated Seabird information and Aleutian Islands Ecosystem Status Report In Brief

- New indicators with ecoregion-specific information when possible: marine heatwaves, eddy kinetic energy, Kamchatka pink salmon, marine mammal strandings, expanded Steller Sea Lion and seabird information, harmful algal blooms (HABs).

- Processes/responses were synthesized for each ecoregion in an effort to provide insights to ongoing trends.

COASST

2020 Ecosystem Status Reports

Individual Contributors and Contributing Partners

Thank you !

Sonia Batten, Nick Bond, Hillary Burgess, Benjamin Fissel, Cate Jenipher, Tim Jones, Stephen Kasperski, Mandy Keogh, Joseph Krieger, Kathy Kuletz, Carol Ladd, Ned Laman, Jean Lee, Jackie Lindsey, Calvin Mordy, Clare Ostle, Noel Pelland, Heather Renner, Melissa Rhodes-Reese, Sean Rohan, Nora Rojek, Greg Ruggerone, Kim Sparks, Phyllis Stabeno, Katie Sweeney, Jordan Watson, George Whitehouse, Sarah Wise, and Stephani Zador

photos: photolib.noaa.gov

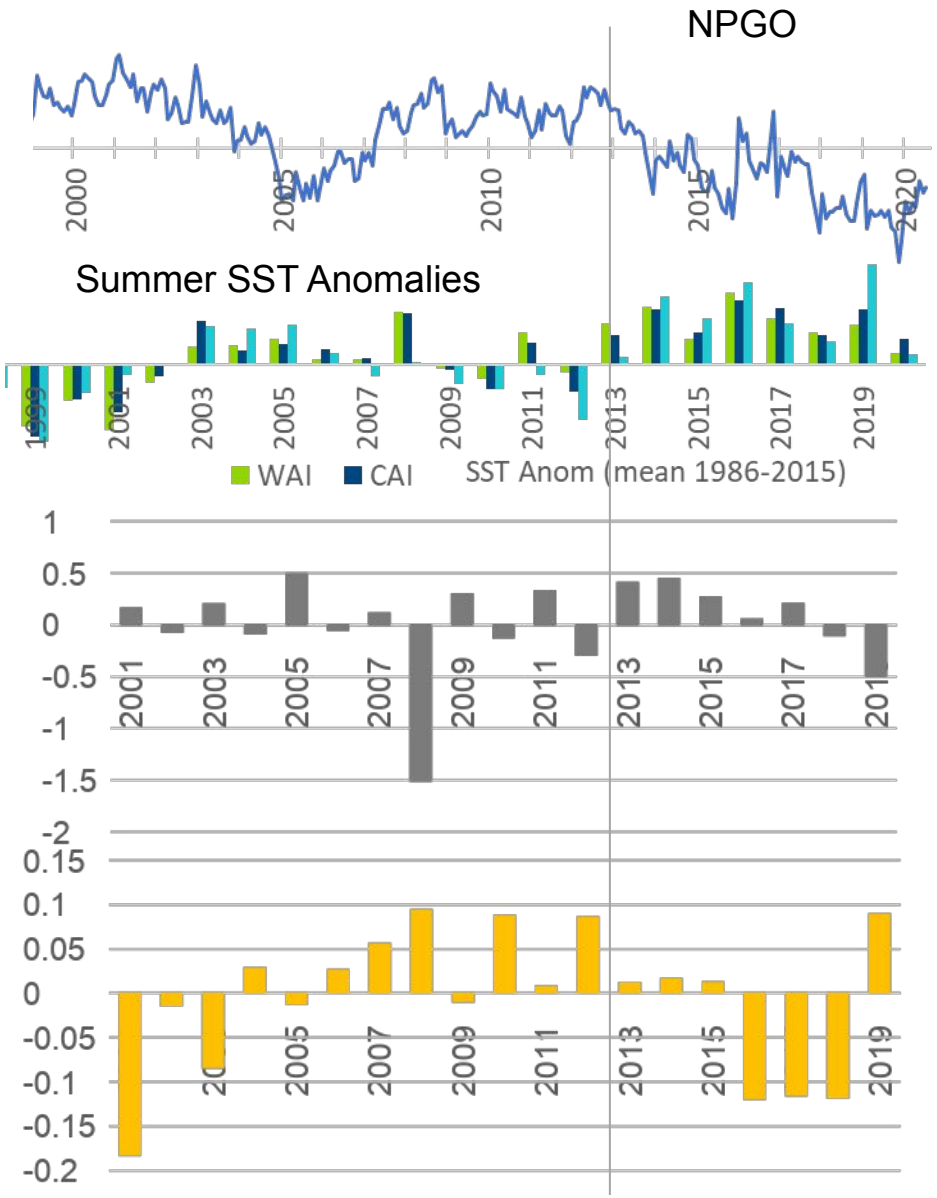
Noteworthy

- COVID-19 year: Industry spent over $50 million to reduce the risk of COVID-19 transmissions. There were no biological surveys for fish, marine mammals or seabirds in the Aleutians; surveys were canceled or postponed.

- HABS: high toxicity in Unalaska and Kamchatka Peninsula. In Unalaska (140 shellfish 140x above regulatory limit) consumption of blue mussels and snails resulted in a community member fatality in July (full contribution in ESR by Alaska HAB Network). In the Kamchatka Peninsula, extreme event (Sep '20) resulted in dead seals, octopi, benthic invertebrates, sickness in humans).

- Processing plant closes in Adak, previously closed in 2013 operated by Icicles Seafoods. The closure may set back the stability needed to maintain services, support a stable population, and attract long-term residents.

Multi-year Patterns



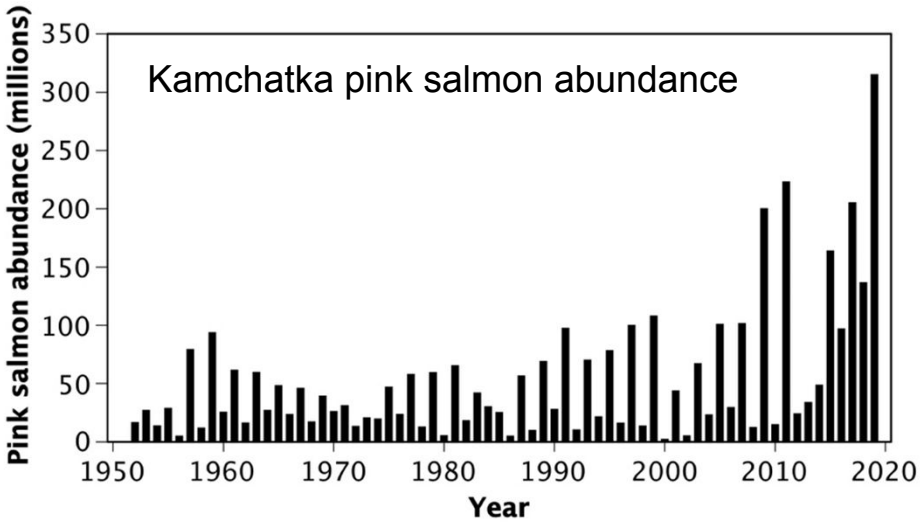
Several indicators show consistent conditions since 2013-2014 across the entire Aleutians chain:

- NPGO: below long-term average since 2013-2014.
- Summer Sea Surface Temperatures (SST) above long-term mean.
- Decreasing trend in large diatom abundance
- Decreasing trend in copepod community size

Implications: Higher temperatures increase bioenergetic costs, which may have increased prey consumption.

NPGO, Nick Bond; Sea Surface Temperature, Jordan Watson;
Diatom and Copepod Community Size, Clare Ostle and Sonia Batten

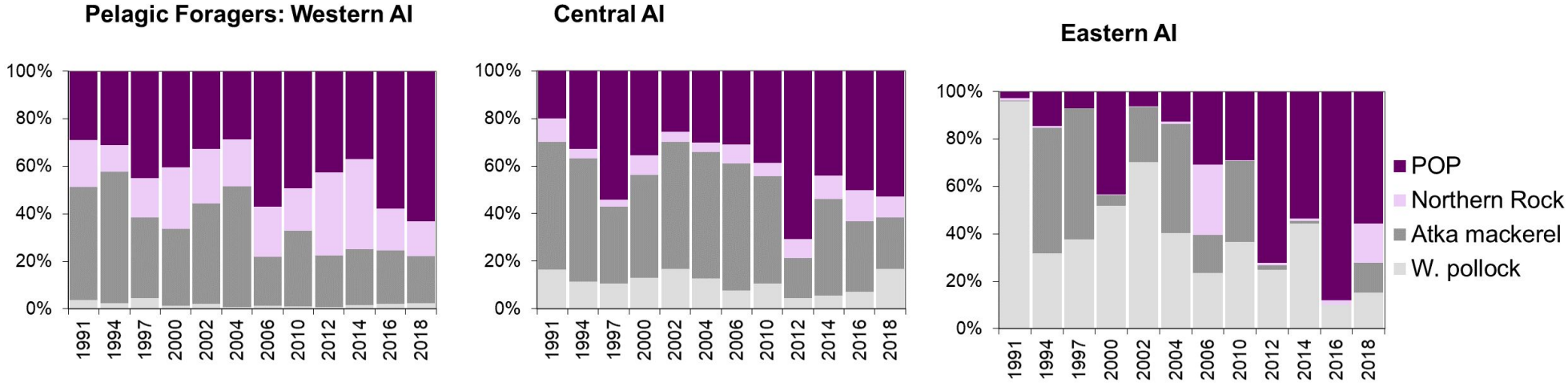
Multi-year Patterns: Fish Biomass



- Biomass of Kamchatka pink salmon and Pacific ocean perch (POP), primarily planktivorous species, has increased and stayed high in the last few years, while Atka mackerel has decreased.
- Area occupied by POP has also increased (Spencer et. al., POP SAFE)

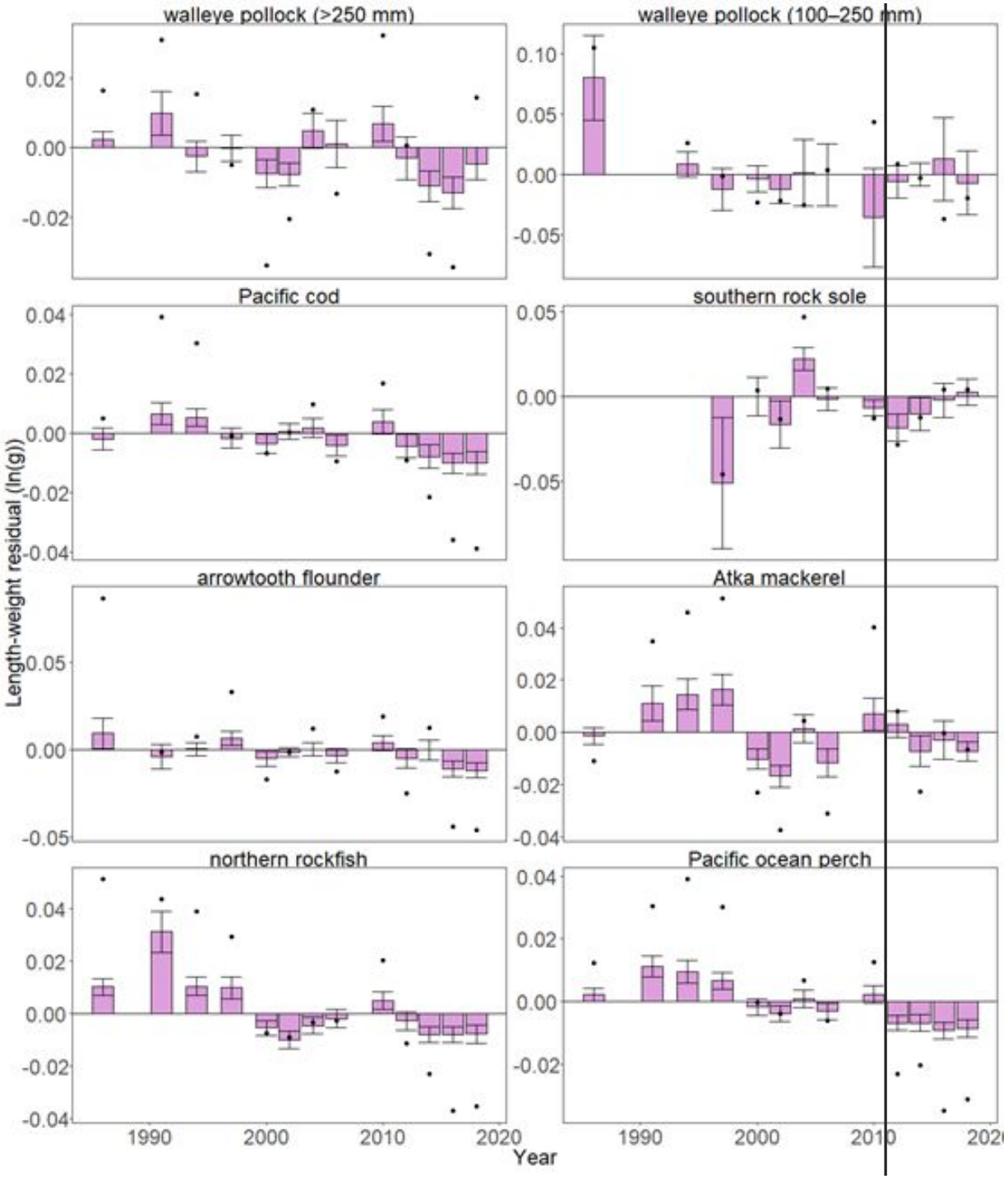
Implications: increased competition for available prey

Biomass proportion of POP, northern rockfish, Atka mackerel and pollock



Kamchatka pink salmon, Greg Ruggerone;
Pelagic forager biomass, BT survey, Ivonne Ortiz

Multi-year Patterns: Fish Condition



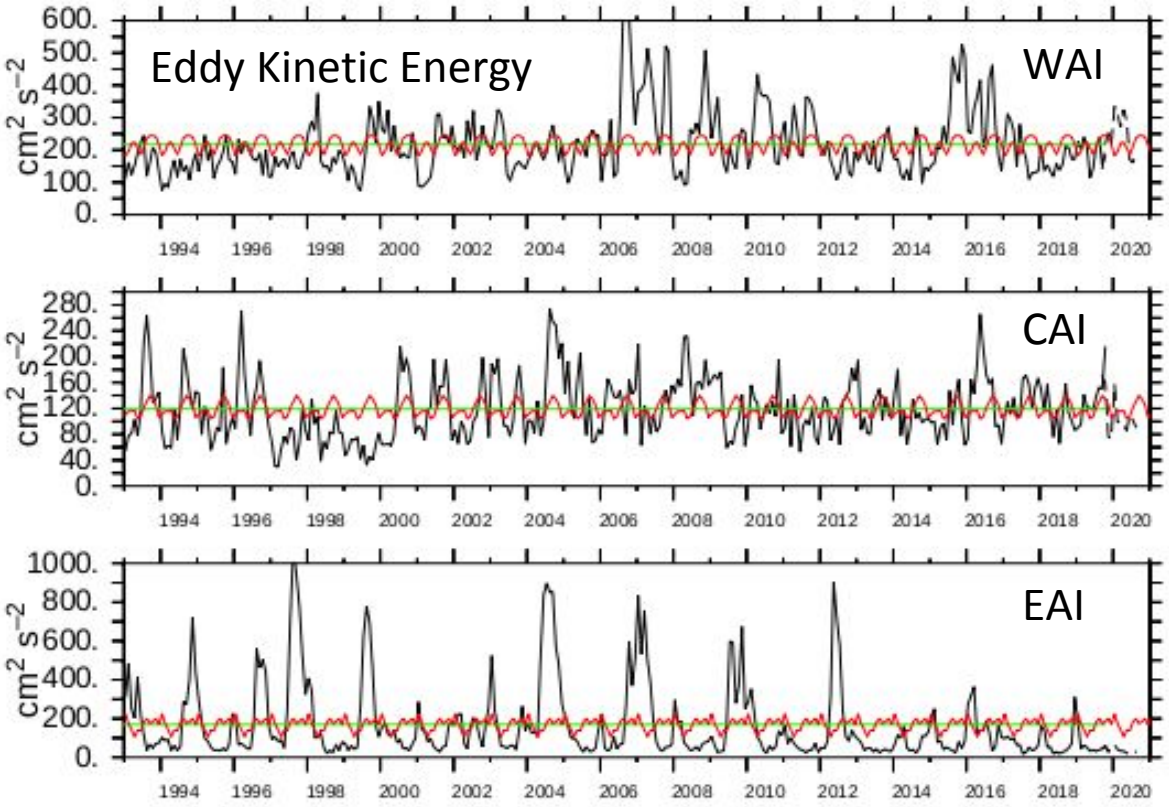
- Lower than average fish condition since 2012 for several commercially important groundfish

Implications: skinnier fish are lower quality prey

Increased salmon and Pacific ocean perch, along with increased temperatures, lower heat and nutrient fluxes, less diatoms and smaller copepods may have cumulative detrimental effects on fish.

Fish condition, Ned Laman and Sean Rohan

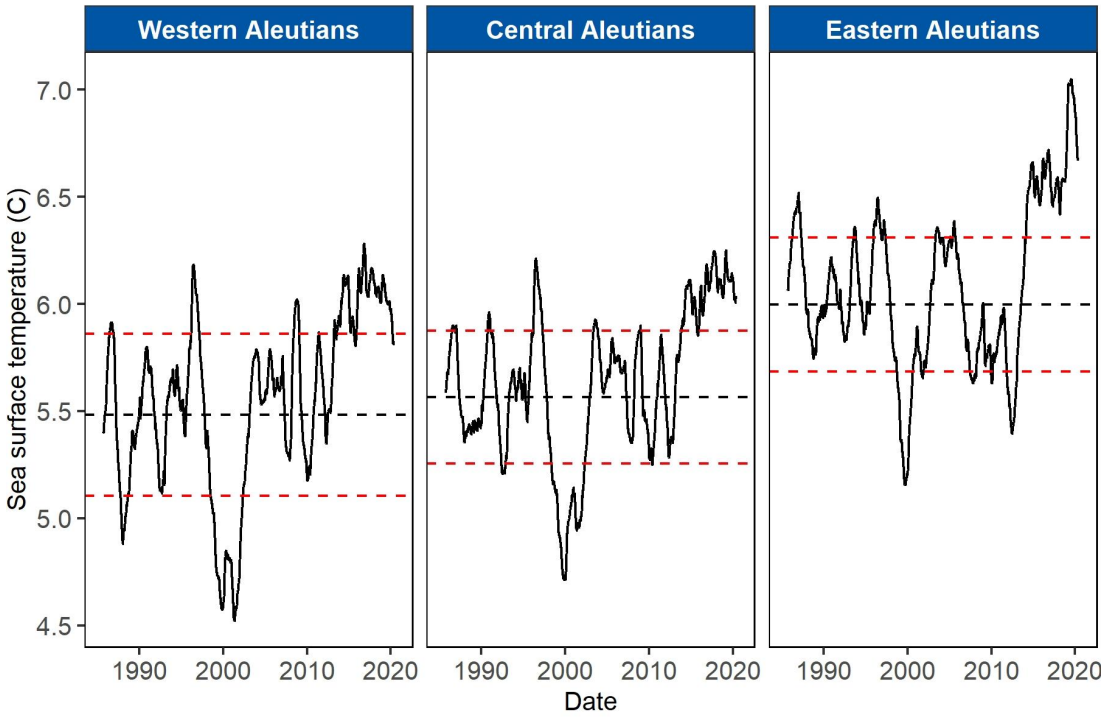
Regional Differences: Eddy Kinetic Energy (EKE)



- WEST: Multi-year or consecutive eddies of lower intensity
- EAST: Discrete intense eddy events

- Black line (line with highest variability): monthly EKE (dashed part of line is from near-real-time altimetry product which is less accurate than the delayed altimetry product).
- Red: seasonal cycle.
- Green (straight line) : mean over entire time series (1993 - Dec 2019)
- Near average EKE in western and central AI; low EKE in eastern AI.

Regional Differences: Sea Surface Temperature

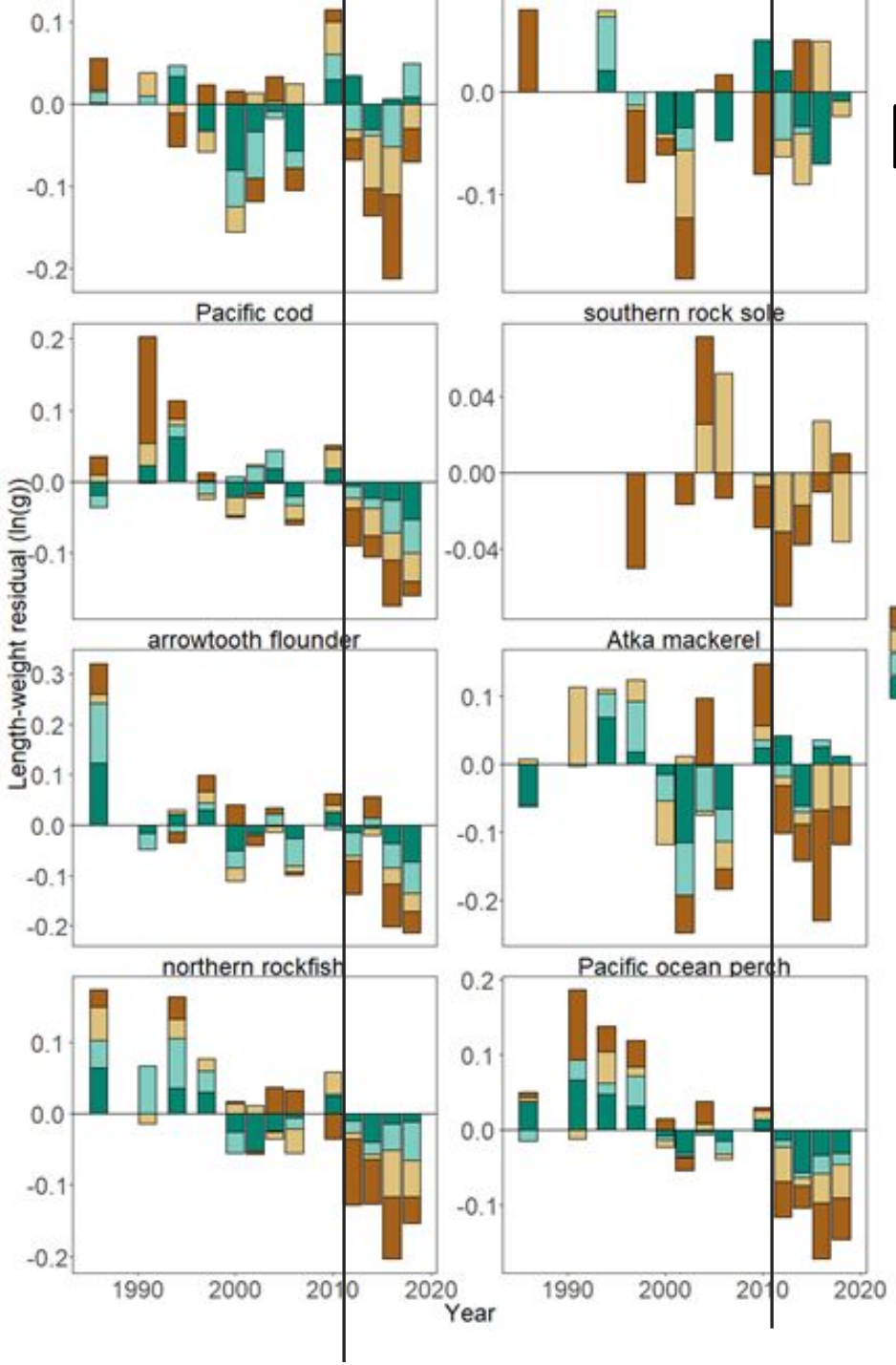


- WEST: lower temperatures
- EAST: higher temperatures, higher variability

- Satellite-derived sea surface temperature
- Removed seasonality and noise from the time series.
- Trends are compared to the mean (±1 SD) from 30-year baseline (1986-2015).

Satellite-derived Sea Surface Temperature, Jordan Watson

Regional Differences: Fish Condition



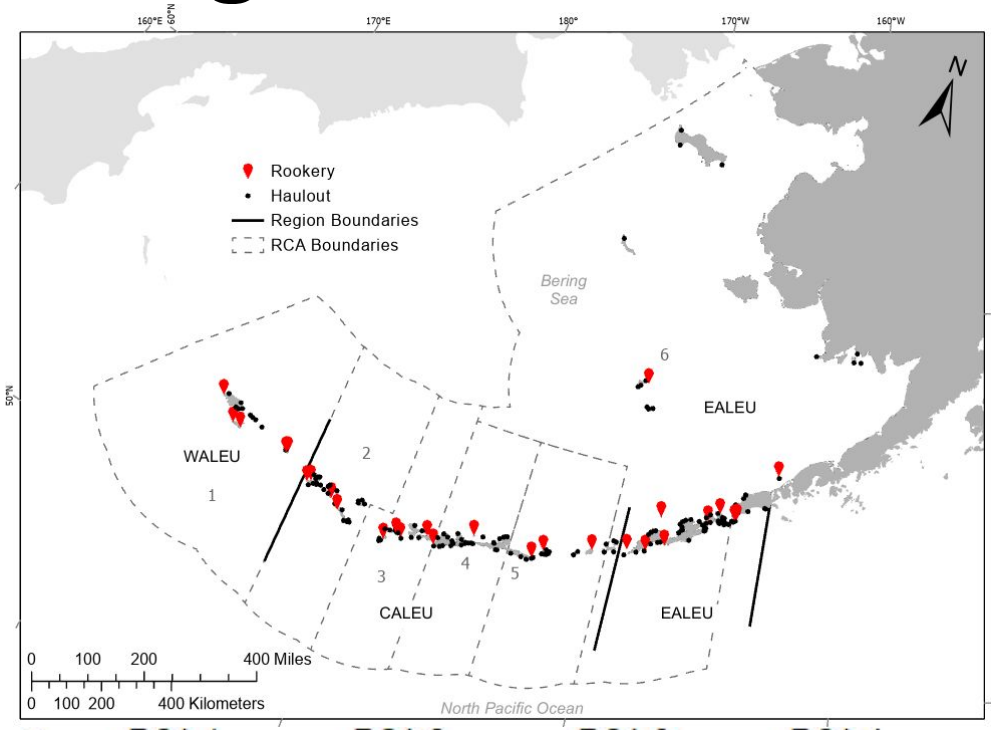
- WEST: Fish condition occasionally fatter Atka mackerel and large pollock
- EAST: Occasionally fatter small pollock and rock sole
- Overall skinny since 2012: Pacific cod, Pacific ocean perch and Northern rockfish

Southern Bering Sea = Eastern AI east of 170°W;
Central and Eastern= Central AI 170°W-177 °E

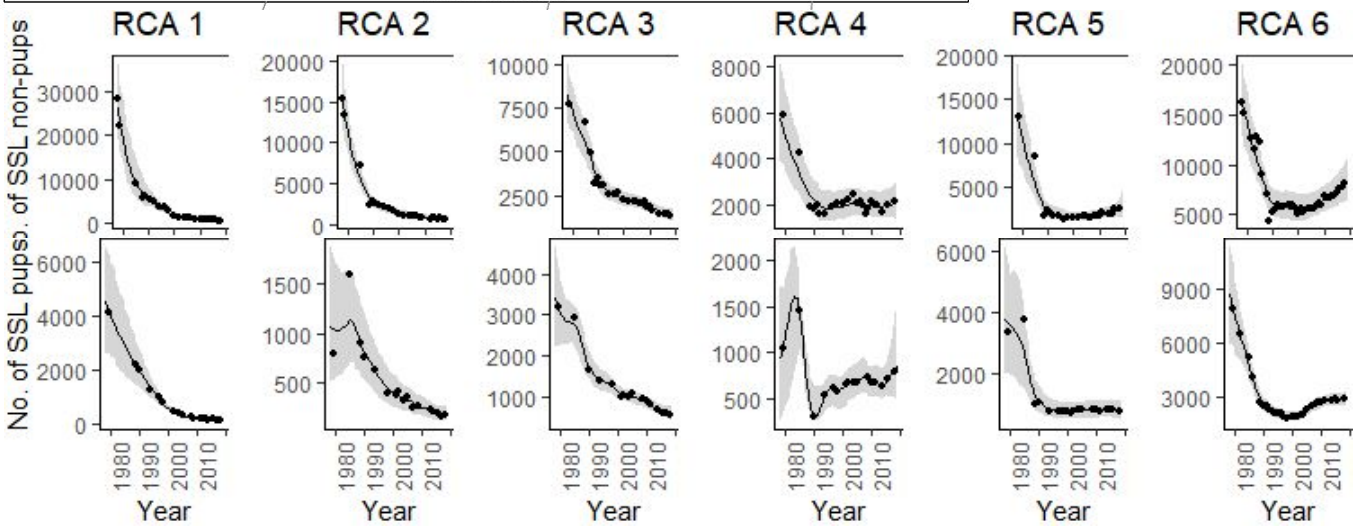
Implications: different prey quality west vs east and overall skinnier rockfish and fish predators

Ned Laman and Sean Rohan

Regional Differences: Steller Sea Lions



- WEST: Declining numbers of pups and non-pups
- EAST: Increasing numbers of pups and non-pup




Steller sea lion estimated numbers, Katie Sweeney

2019 Seabirds: Hatching chronology

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

hatching chronology was >3 days earlier than average.

within 3 days of average.

<3 days later than average.

Hatching chronology, Nora Rojek, Heather Renner

- WEST & EAST: Average or earlier **hatching chronology** of plankton and fish-eating seabirds, and larger copepod size (from CPR), may signal early spring bloom.

2019 Seabirds: reproductive success

	Species														
	Primarily fish eaters - Primarily zooplankton eaters														
Site	red-faced cormorant	glaucous winged gull	Common murre	thick-billed murre	horned puffin	tufted puffin	red-legged kittiwakes	black-legged kittiwakes	fork-tailed storm-petrel	Leach' s storm-petrel	ancient murrelet	parakeet auklets	least auklets	whiskered auklets	crested auklets
Aiktak	😊	😐	😐	😊	😊	😊	-	-	😊	😊	😐	-	-	-	-
Buldir	-	😊	😵	😐	😊	😐	☹	😐	☹	😐	-	😊	😐	😊	😊

😊 above average
😐 average
☹ below average
😵 failure

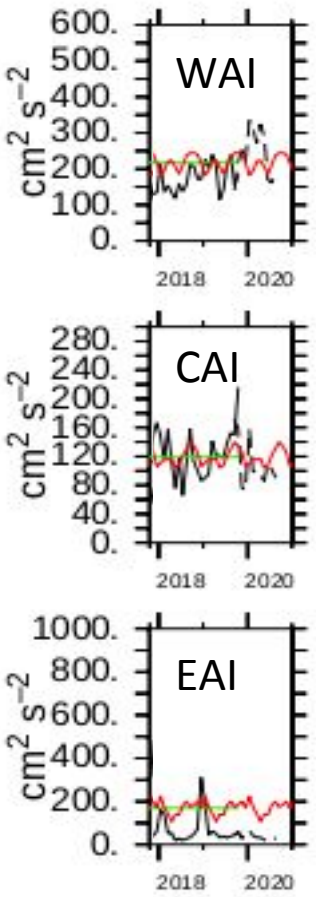
- WEST & EAST: Average or above average **reproductive success** of plankton and fish-eating seabirds compared to previous failure of fish-eating seabirds

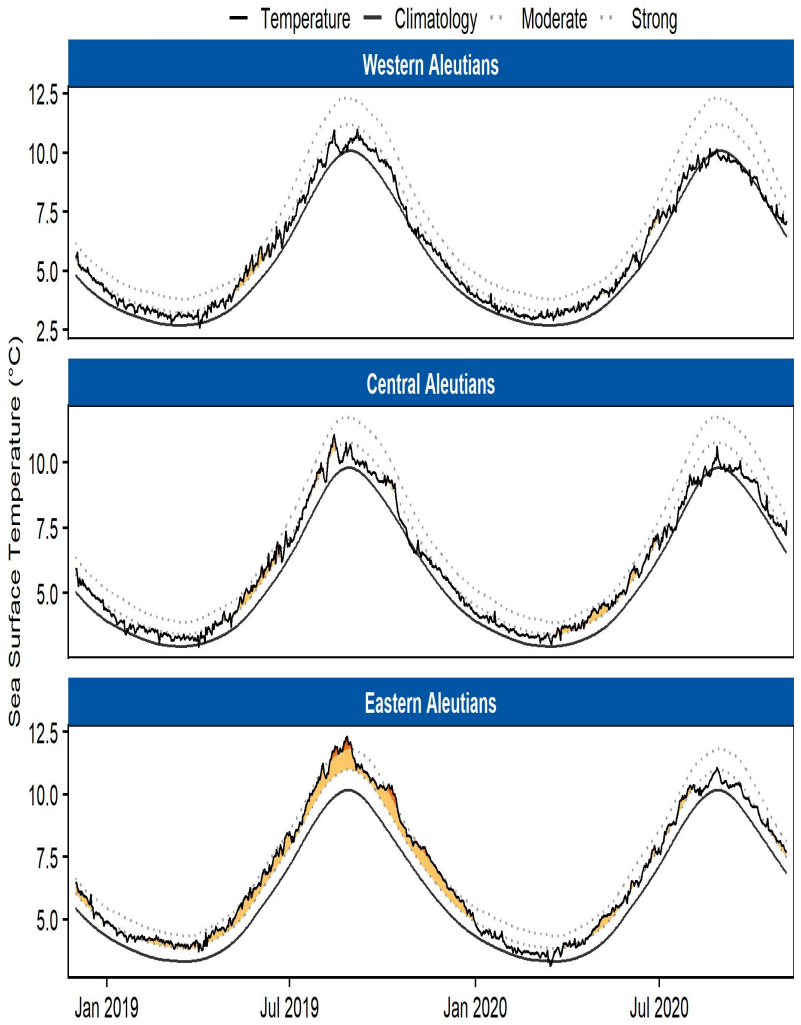
- Implications: favorable foraging for seabirds and groundfish

Hatching chronology, Nora Rojek, Heather Renner

2020 Oceanography

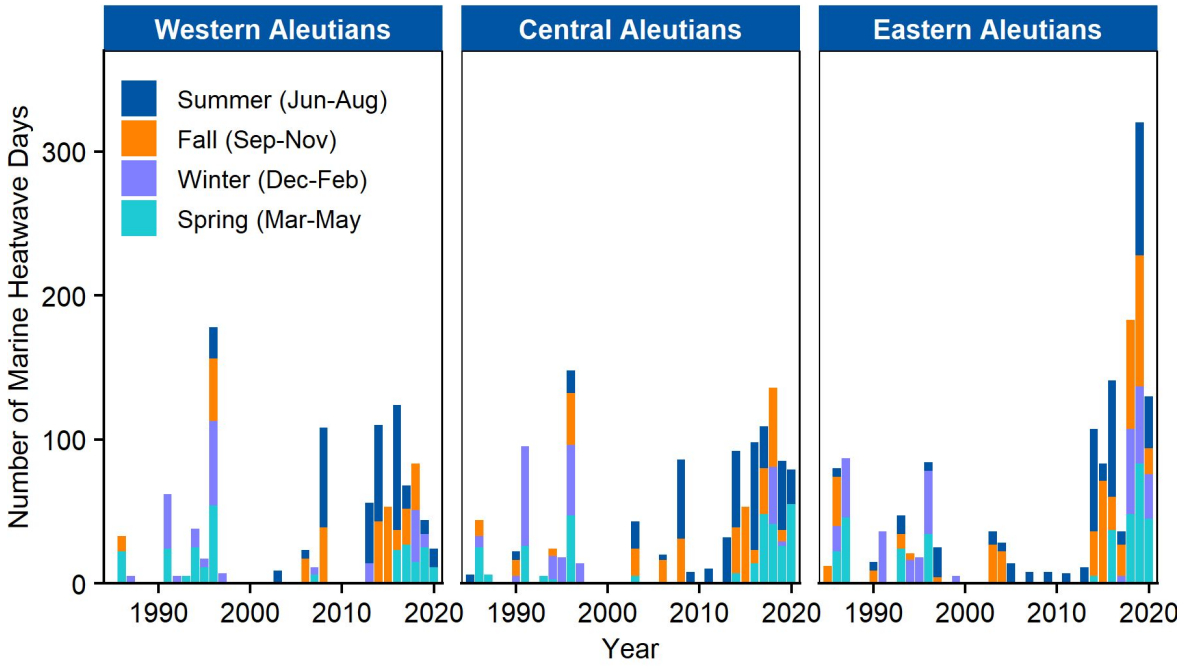
Eddy Kinetic Energy





- WEST & EAST: Low eddy kinetic energy (EKE), lower sea surface temperature (SST) but still above long-term average; fewer marine heatwave days.

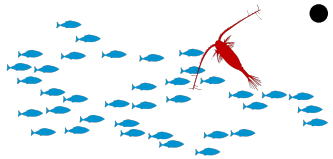
Climate indices except NPGO near average



Marine Heat-Wave, Jordan Watson; Eddy Kinetic Energy Carol Ladd

Summary and Implications

- Weak La Niña conditions are present, most climate indices are near long-term average, 2020 cooler than 2019 but still within period of above average sea surface temperatures and lower volume of heat, salt and nutrient flow through passes. Suppressed storminess through fall and winter 2019/2020 across the region, assumed to continue favoring seabird foraging.

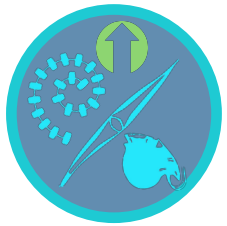


- 2020 potentially higher zooplankton since Kamchatka pink salmon is in off year (assumed lower abundance), potentially favoring young-of-the-year fish. No seabird die-offs or marine mammal unusual mortality events

- Expected 2020 conditions based on increased copepod size and early hatching chronology in 2019 might signal an earlier spring bloom. The decrease in large diatom abundance supports a higher abundance of large copepods. Average or above average reproductive success of seabirds in the western and eastern Aleutians signals favorable foraging conditions for rearing chicks, potentially also favorable foraging for groundfish in 2019, despite the almost year long heatwave in eastern Aleutians.

- Sea surface temperatures are forecasted to increase slightly in Winter - early Spring 2021 in the central and western Aleutians.

- Context: Multi-year decreasing trend in large diatom abundance and copepod size, skinnier fish and high the biomass of Kamchatka pink salmon and POP signal potentially higher competition for available prey. This may have contributed to the decrease in Atka mackerel; lower prey availability and quality would also cascade to apex predators.



- Increased risk: HABS, high toxicity at both ends of Aleutian chain during summer 2020 — in Unalaska and Kamchatka Peninsula — impacted marine mammals, fish, subsistence harvest, and human health.

Questions and/or comments?