Northwest **Power** and **Conservation** Council

March 9, 2022

MEMORANDUM

TO: **Council Members**

FROM: **Mark Fritsch**

SUBJECT: **Briefing on Ocean Observations and Outlooks for Salmon Returns**

BACKGROUND:

Presenter: Brian Burke (Supervisory Research Fish Biologist, National Oceanic and Atmospheric Administration, Northwest Fisheries Science Center)

Summary: Brian will present research findings and outlooks associated with Chinook and Coho returns to the Columbia River based on indicators of ocean conditions. These monitoring efforts have been consistently supported by the Council and were also highlighted as critical in both the 2014 Fish and Wildlife Program and the 2020 addendum. The monitoring efforts are support through Project #1998-014-00, *Ocean Survival Of Salmonids.*

Relevance: This information is relevant to our high-level indicators and strategy performance indicators by providing a preview for what is expected for adult returns in the current year. This work also addresses several measures in the Fish and Wildlife Program.

Workplan: Fish and Wildlife Division work plan 2022; Program planning & policy, and Program Implementation.

Background: The Council's research and monitoring efforts related to the marine environment for anadromous fish began in 1998 in response to the 1996 amendment to the Northwest Power Act, which calls on the Council to consider ocean conditions when making project funding

recommendations. The Council's Fish and Wildlife Program recognizes the ocean environment as an integral component of the Columbia River ecosystem. Measures in the Program support monitoring the ocean conditions and in-river restoration actions to determine those actions of greatest benefit, to separate the effects of ocean-related mortality from that caused in the freshwater part of the life cycle, and to assess salmonid survival and evaluate restoration potential given variable ocean conditions. To date, full support for this baseline information has not been provided by Bonneville.

More Info:

- Ocean and Plume Science and Management Forum website
- Mainstem and Program Support Project review, *Final Decision Document August 14, 2019, Project-Specific Recommendations (page 13)*

Salmon in the Ocean:

A temporary respite

Northwest Power and Conservation Council Meeting
March 15th, 2022

Presenter: Brian Burke
NOAA Fisheries, NWFSC

Team: Brian Beckman, Cindy Bucher, Brandon Chasco, Elizabeth Daly, Susan Hinton, David Huff, Mary Hunsicker, Kym Jacobson, Meredith Journey, Jessica Miller, **Cheryl Morgan**, Krista Nichols, Craig Norrie, Joe Smith, Don Van Doornik, Laurie Weitkamp, Brian Wells, Jen Zamon

Also supported by:

Take home message:

- We are experiencing a temporary respite from a continuous and dramatic decline in ocean conditions
  - In the short term, this means slightly higher returns of adult salmon than we've seen in the last few years
  - In the long term, we are failing to do the minimum ocean science required for adequate management recommendations to mitigate or offset the decline in ocean conditions

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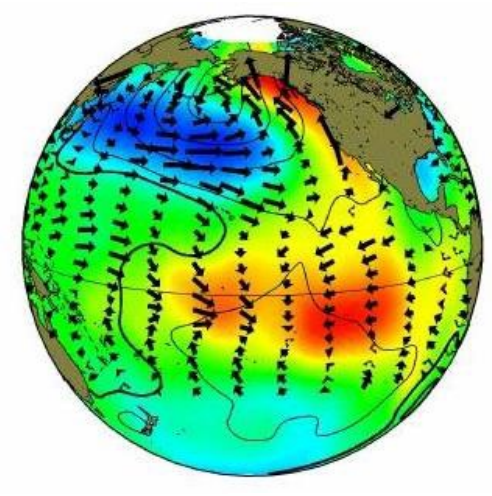
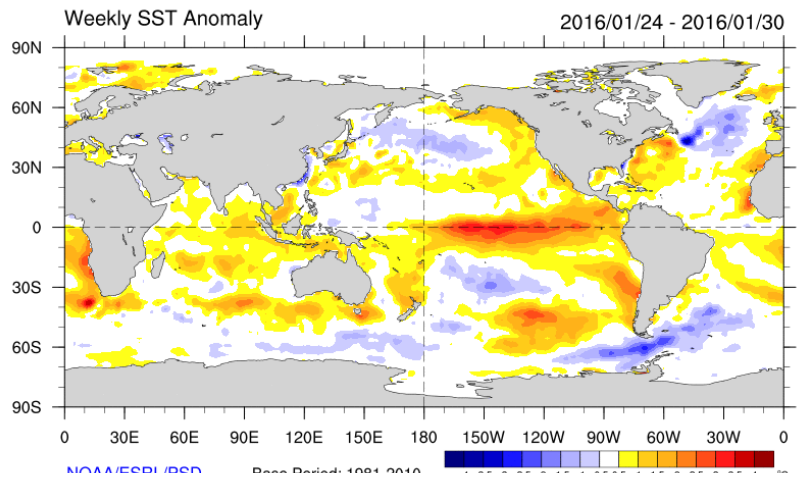
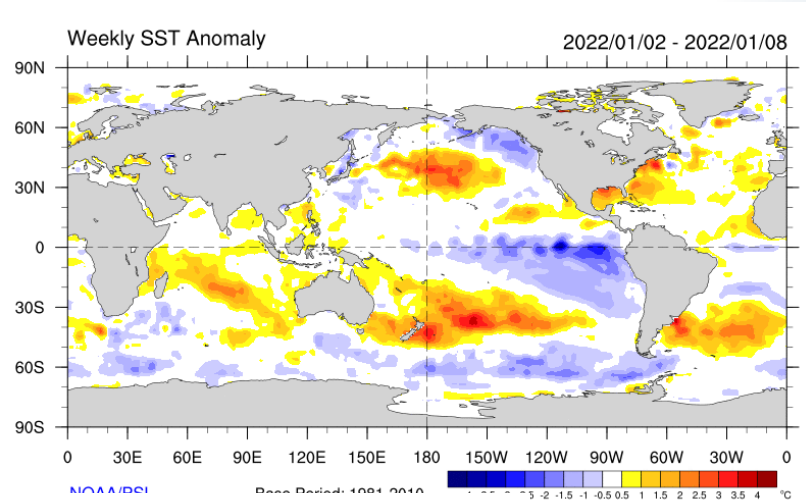
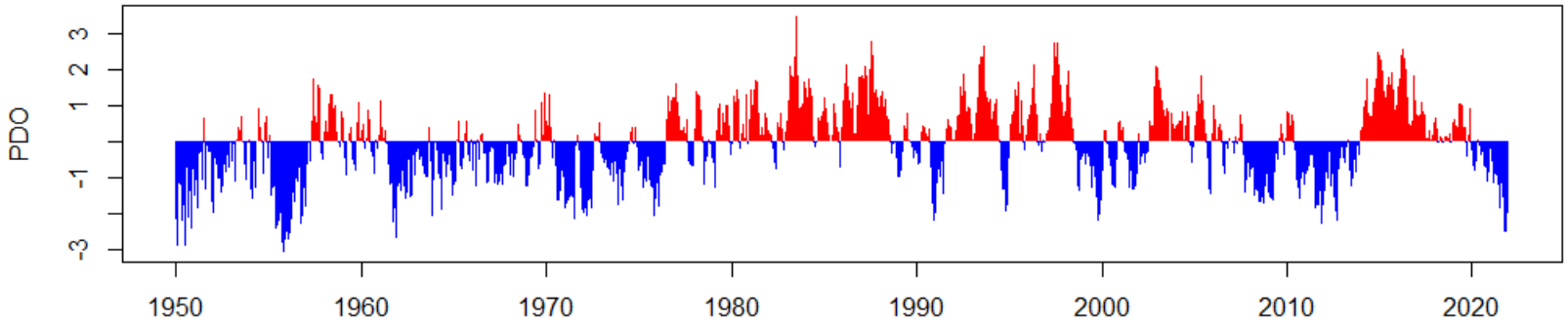
1. Salmon Research and Monitoring Ocean Conditions
2. Modeling Survival and Climate Impacts

Pacific Decadal Oscillation (PDO)









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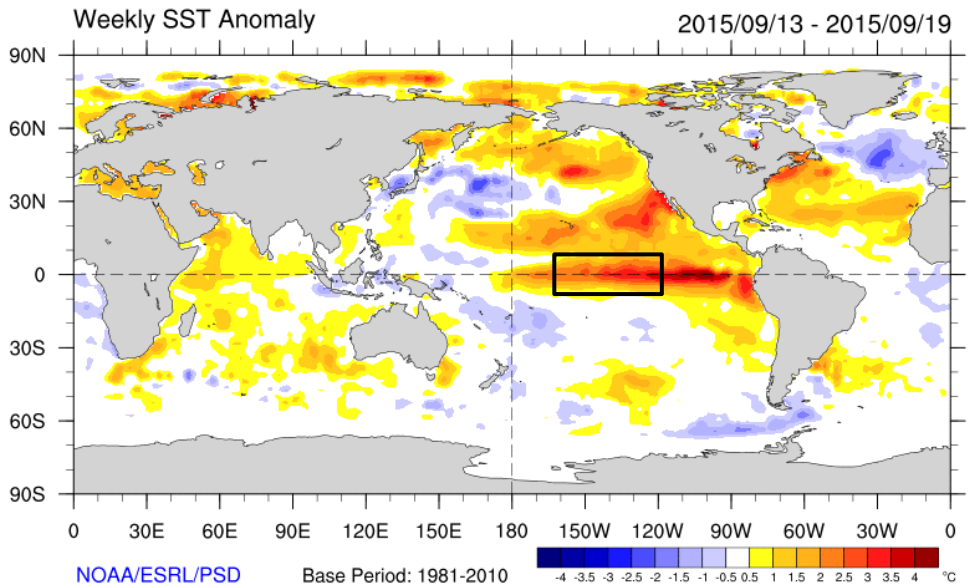
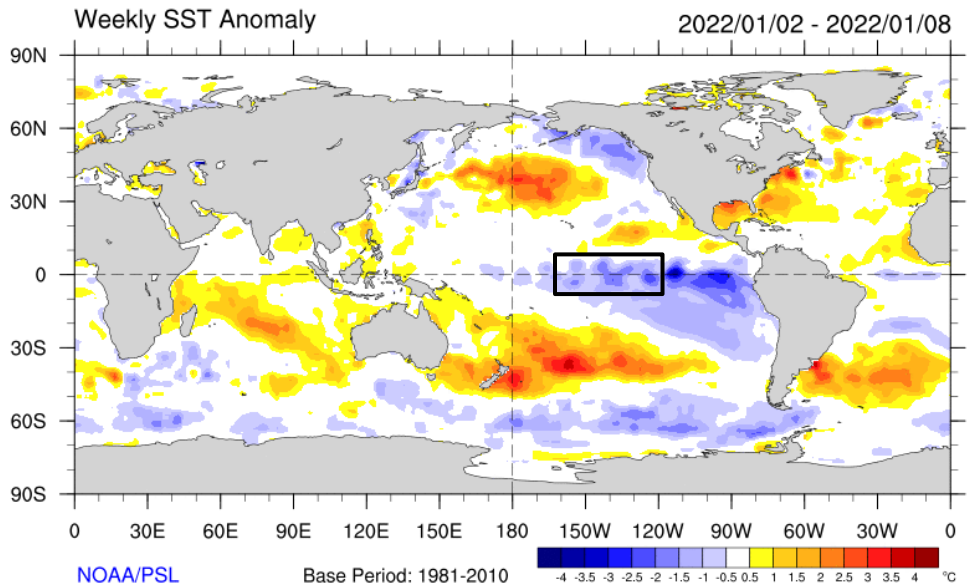
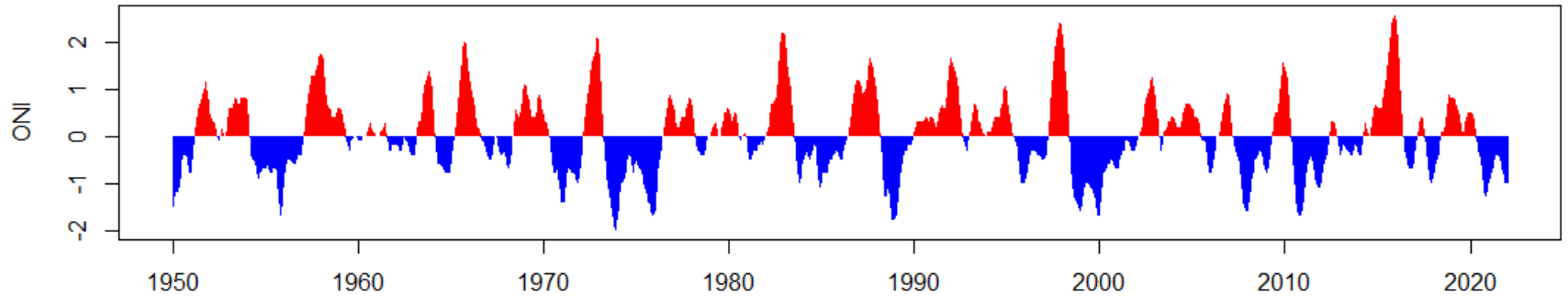
El Niño







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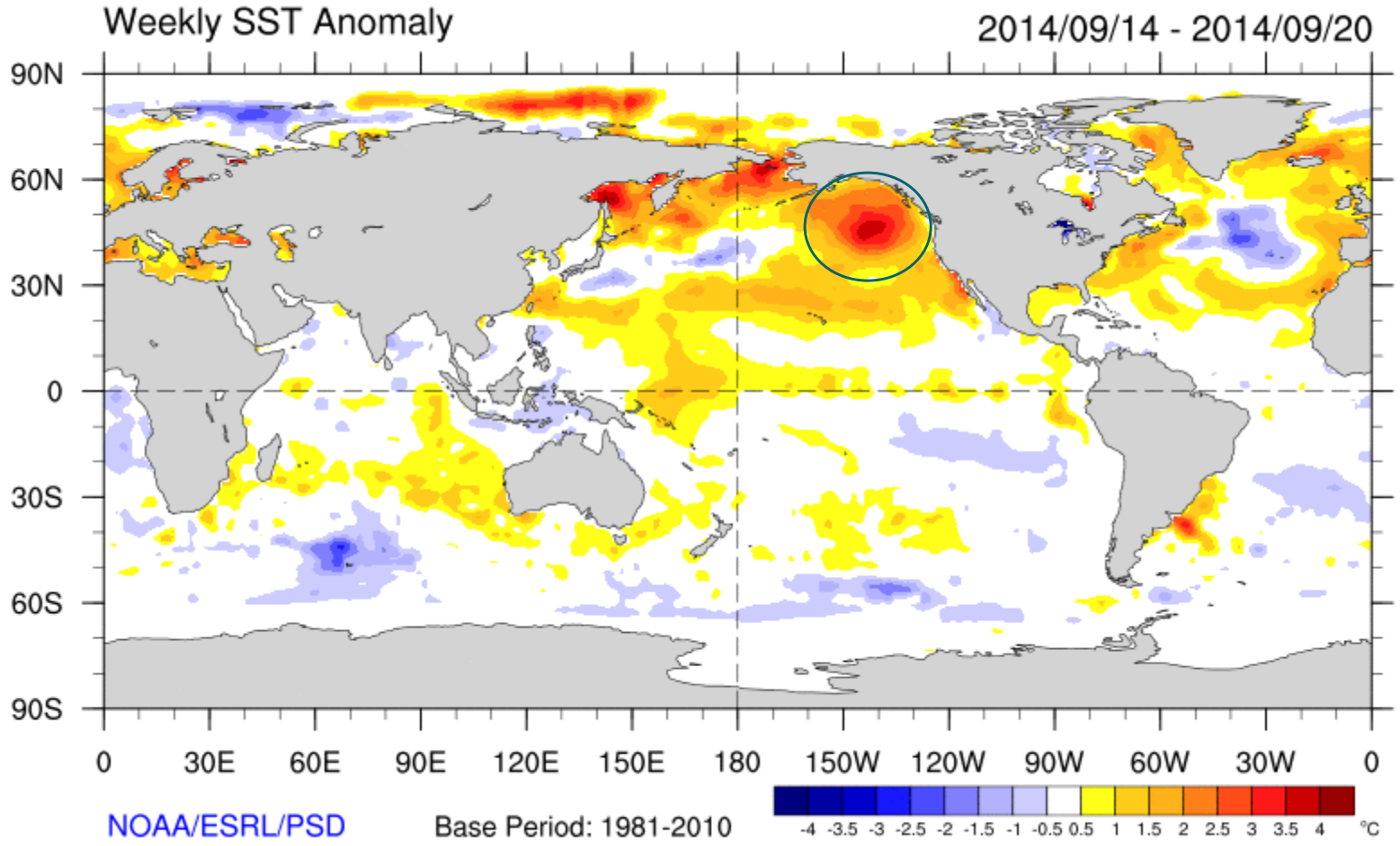
Marine Heat Wave



* High pressure reduces winter storms, resulting in less mixing with deep, cold water
https://psl.noaa.gov/map/clim/sst.shtml

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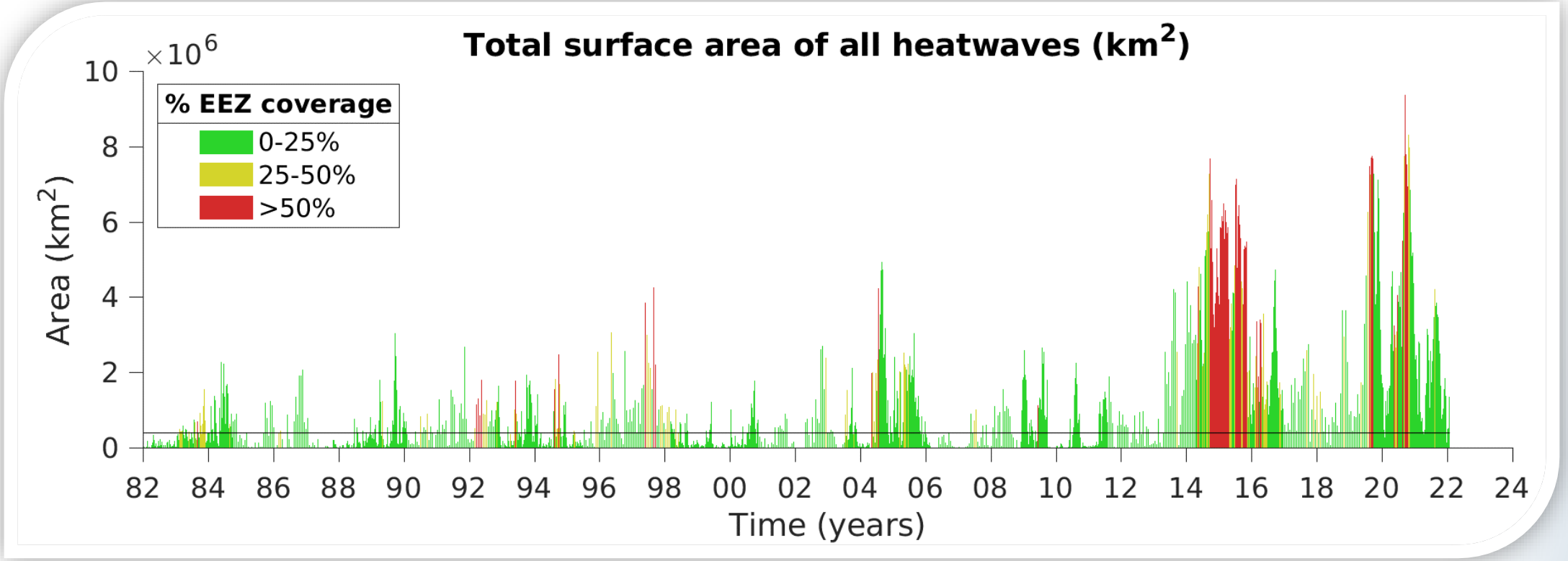
NE Pacific marine heatwaves are increasing



2020-21 California Current Ecosystem Status Report
NOAA California Current IEA Team

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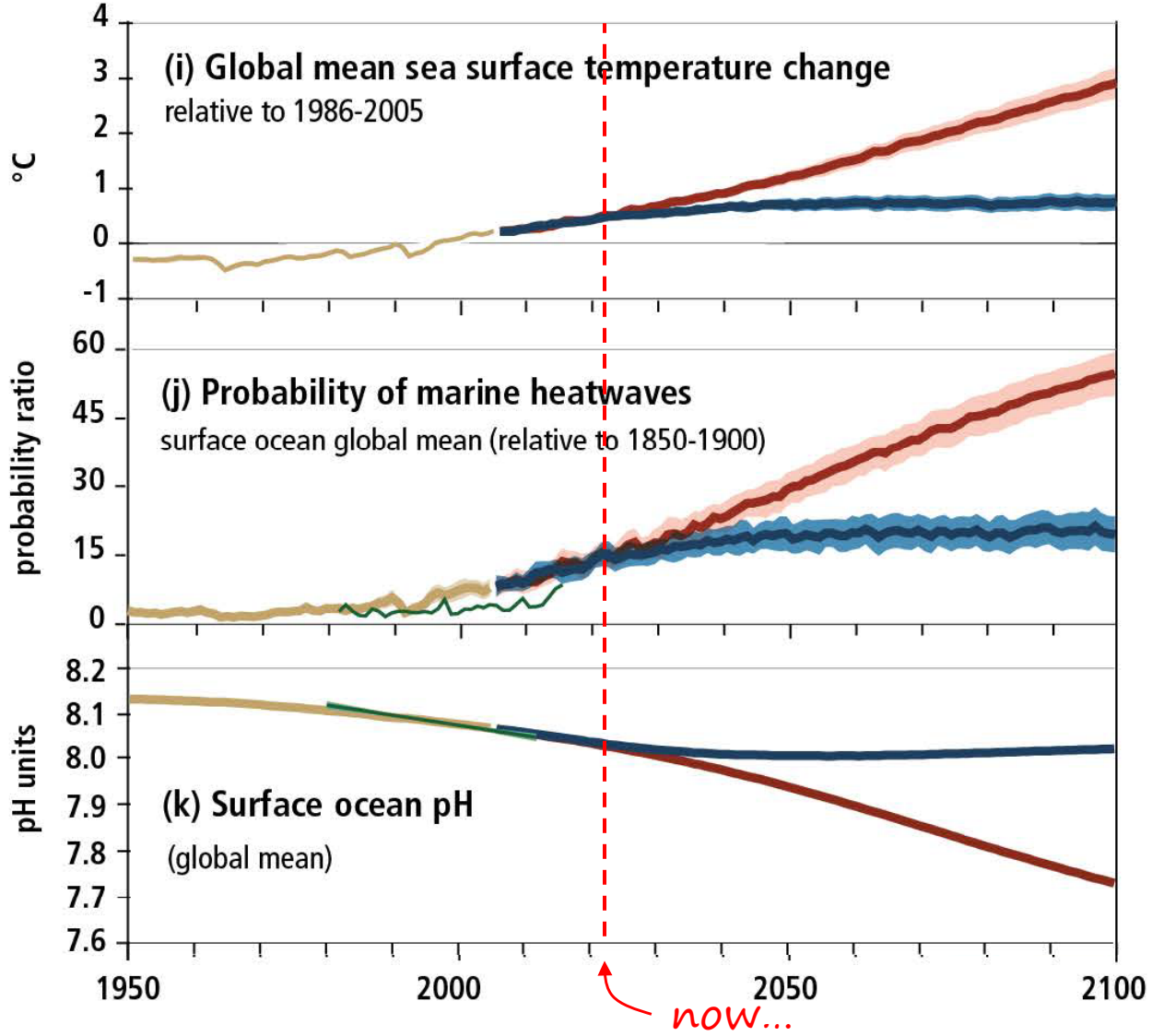
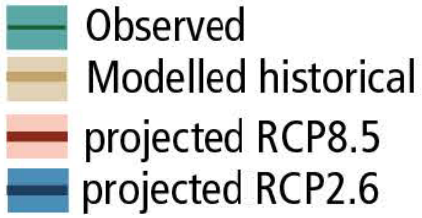
NE Pacific marine heatwaves are increasing





ipcc
INTERGOVERNMENTAL PANEL ON climate change

IPCC 2019. The Ocean and Cryosphere in a Changing Climate, Fig SPM.1

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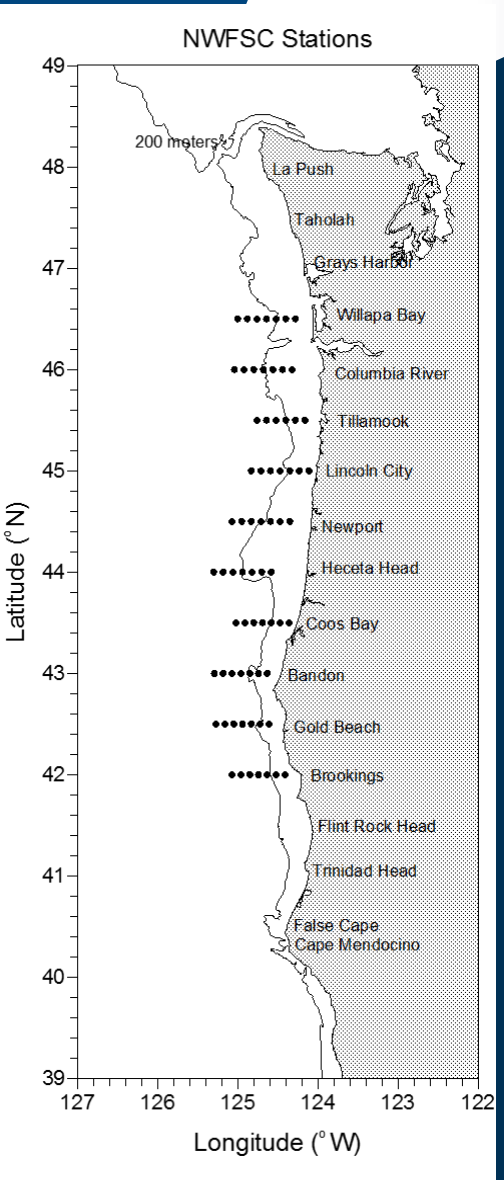
Newport Hydrographic Line and Northern California Current Survey



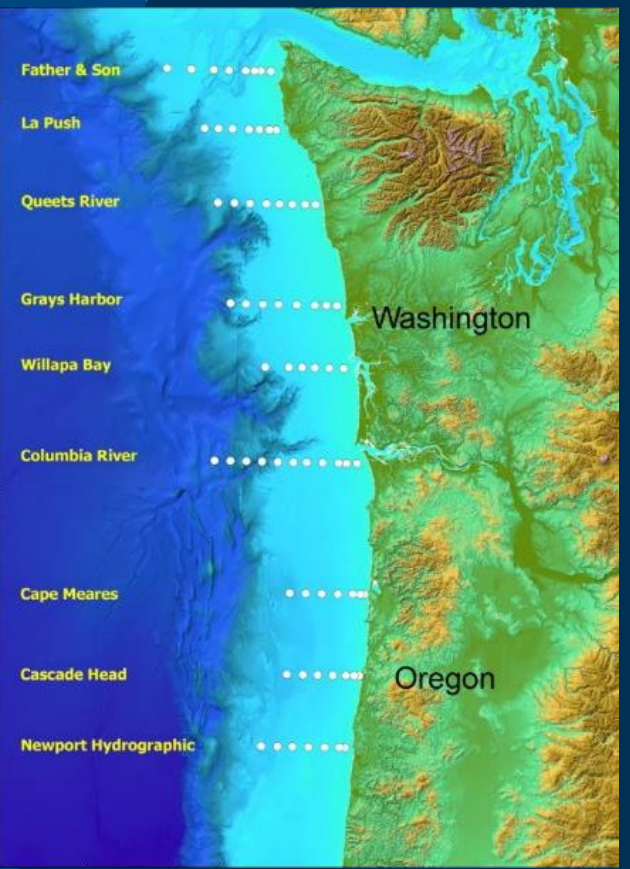
Newport Line: Sampled biweekly for 27 years

Pre-recruit: May-June (2011, 2013-2019)

NCC Survey: Seasonal (2-4 times per year)

Juvenile Salmon and Ocean Ecosystem Survey (JSOES)

- May (2006 – 2012, 2015 - present)
- June (1998 – present)
- September (1998 – 2012)



SOBaD Advanced Technologies and Emerging Tools

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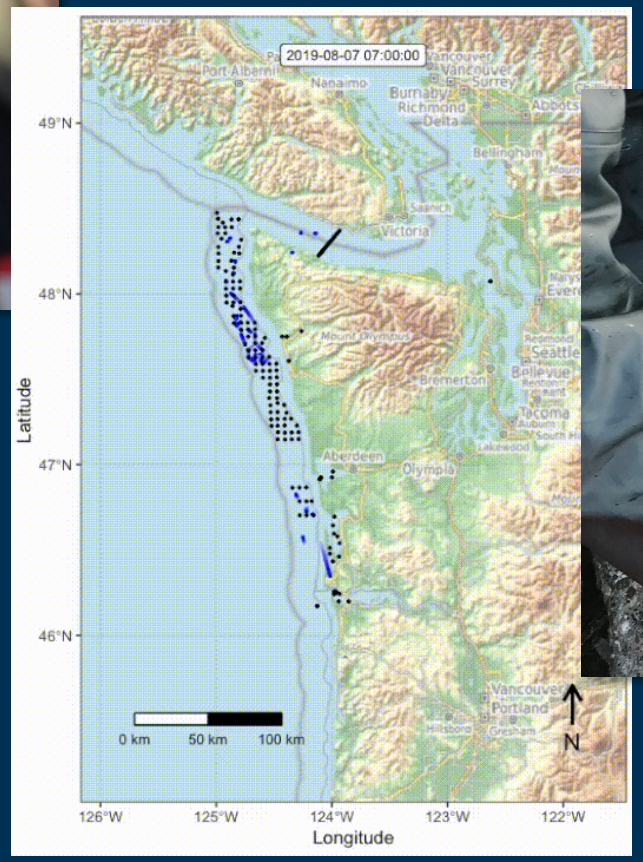
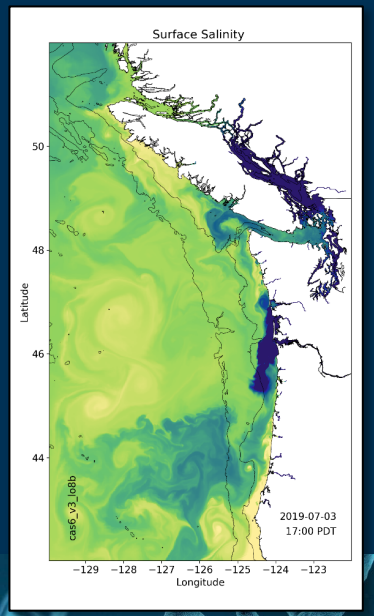
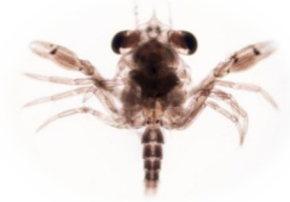
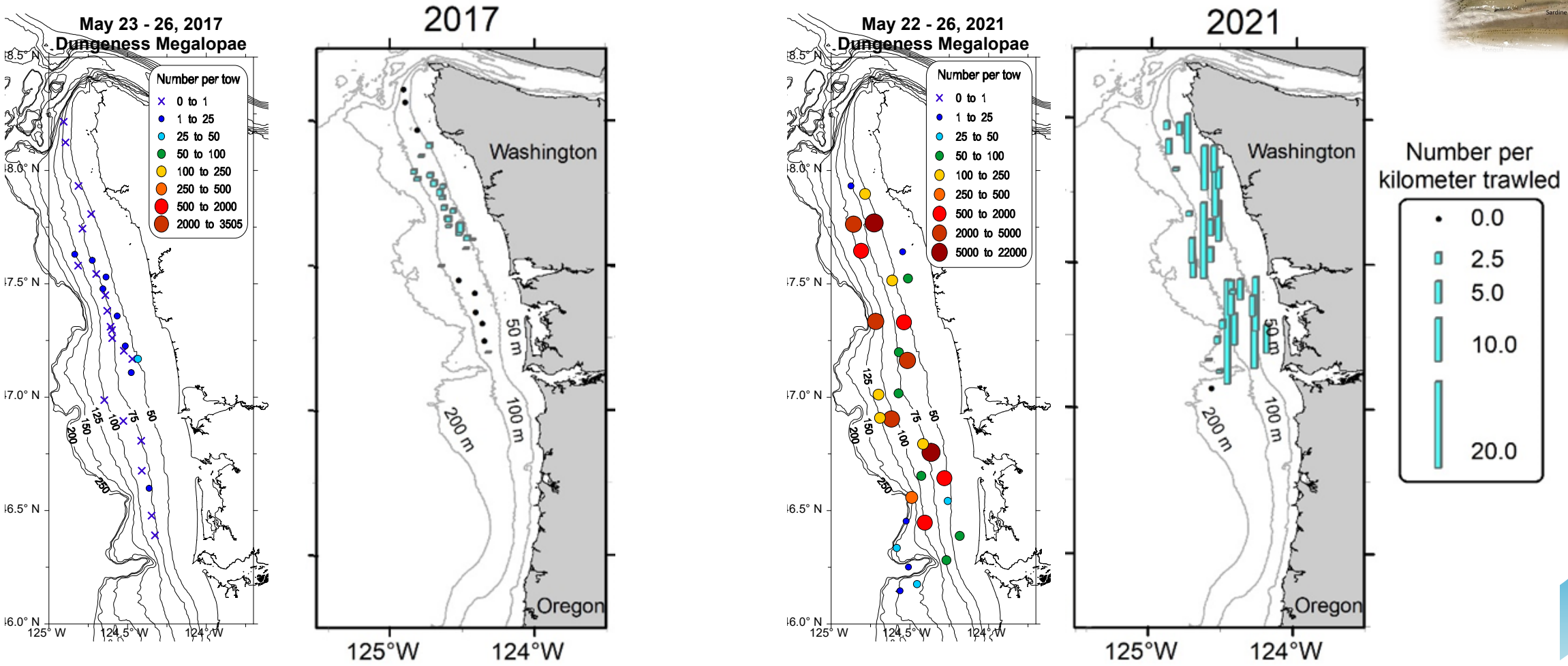




Food Resources are Critical





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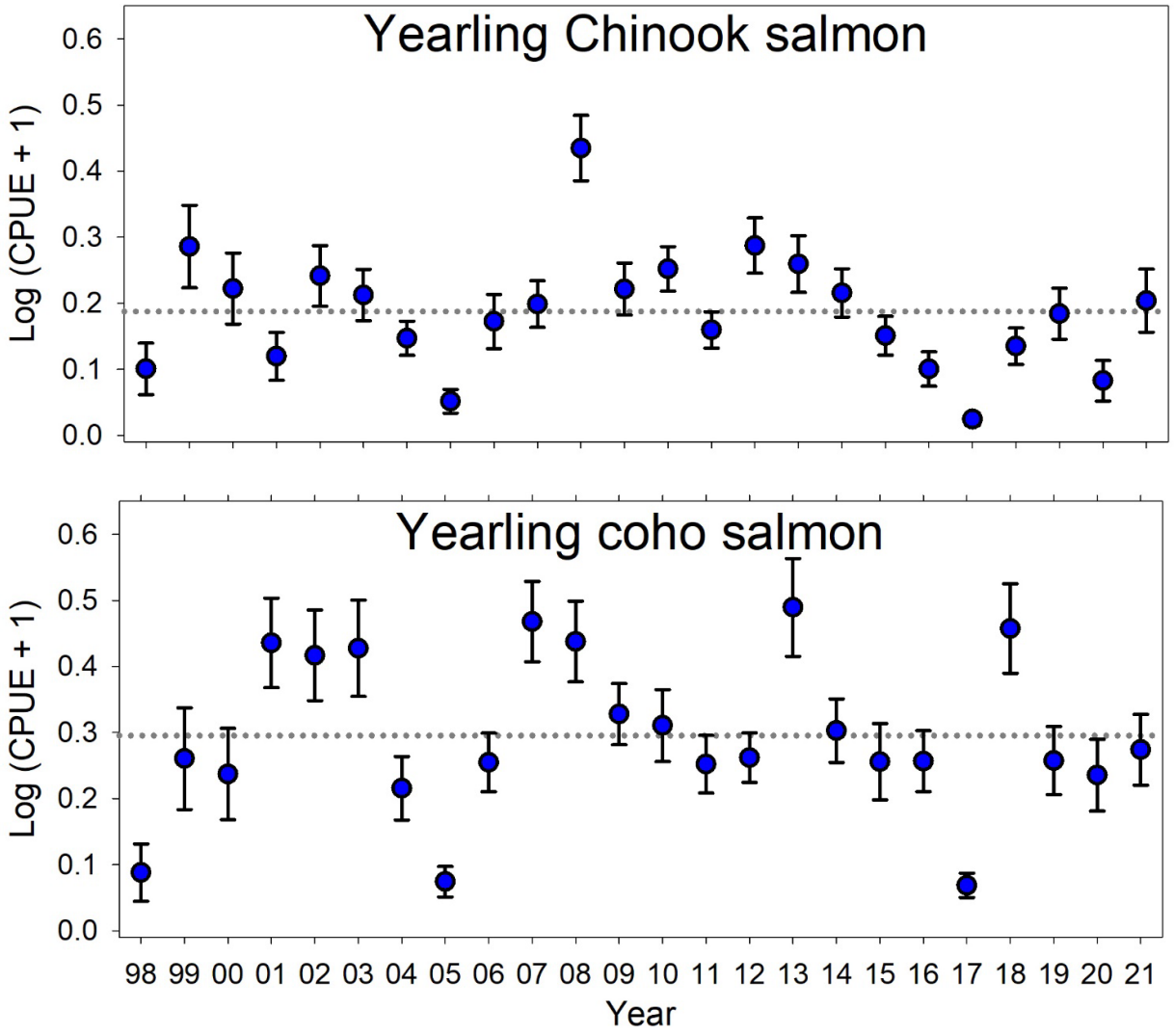
Chinook and Coho ~ average CPUE in 2021



Juvenile Salmon and Ocean Ecosystem Surveys
June, 1998-2021

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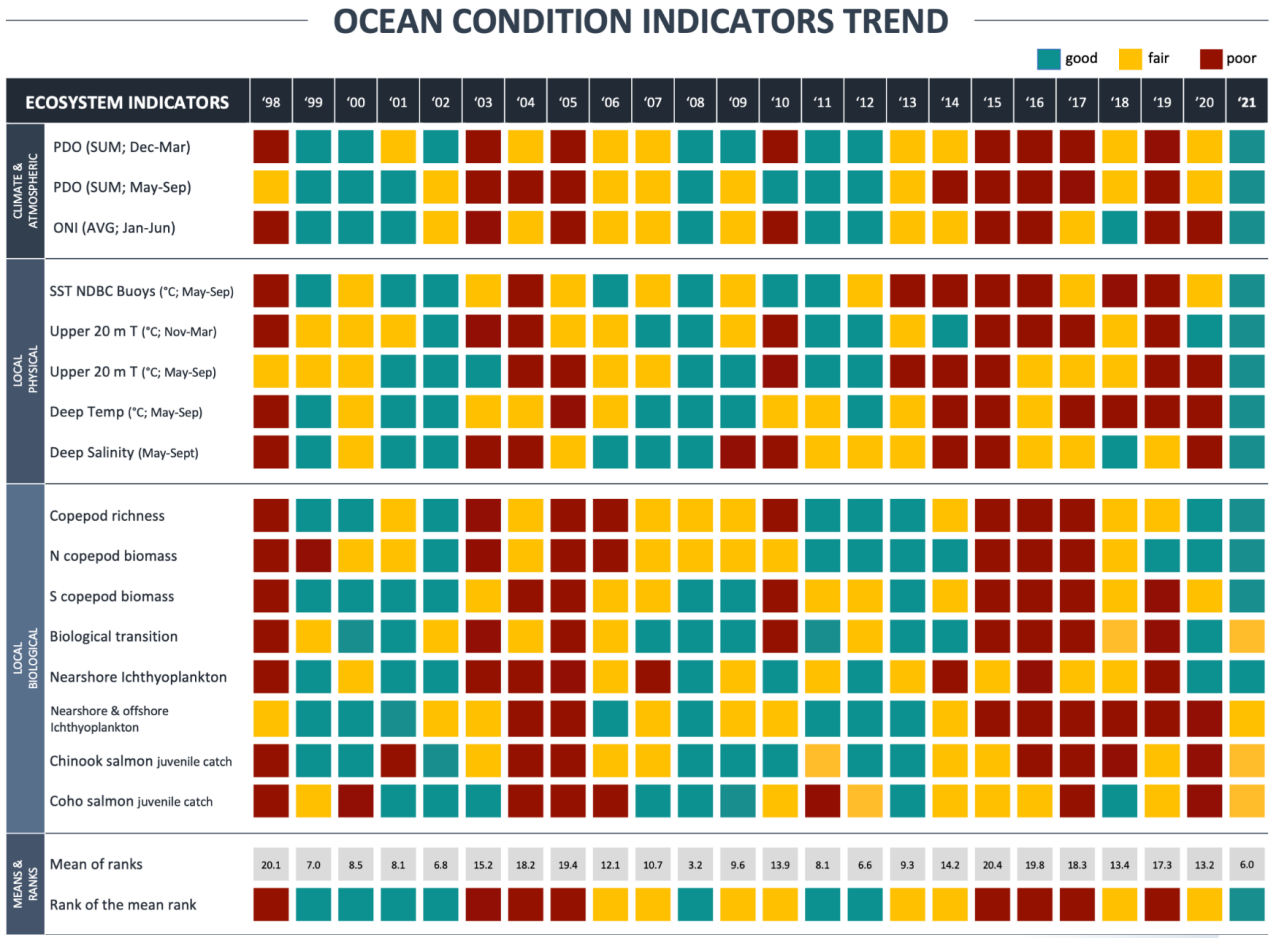
New ‘Stoplight’ Website

https://www.fisheries.noaa.gov/west-coast/science-data/ocean-ecosystem-indicators-pacific-salmon-marine-survival-northern

Stoplight Table

Ocean Conditions Summary

Newportal Blog



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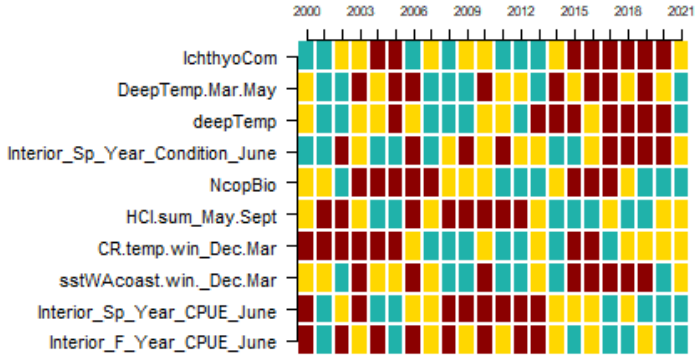
1. Salmon Research and Monitoring Ocean Conditions
2. Modeling Survival and Climate Impacts

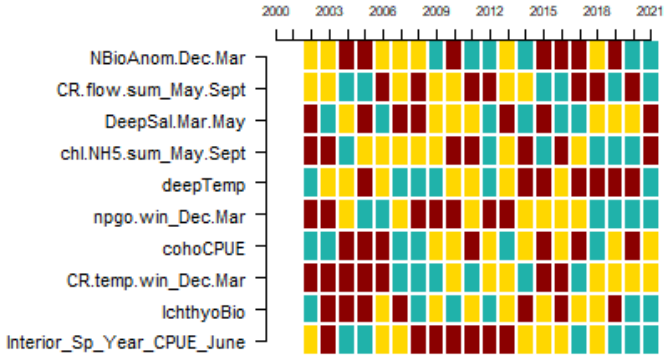
Stock-specific Stoplight Charts (the ink is still drying)

Snake River

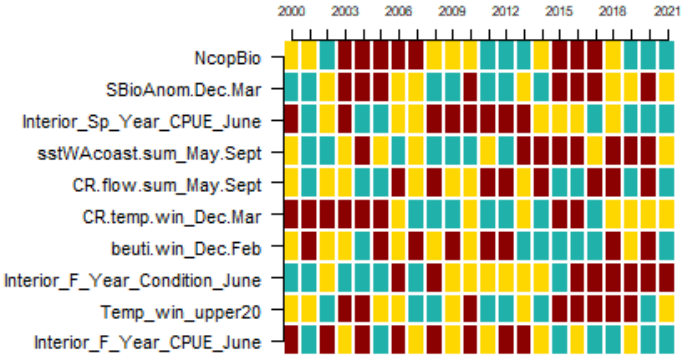
Spring/Summer Chinook



Fall Chinook

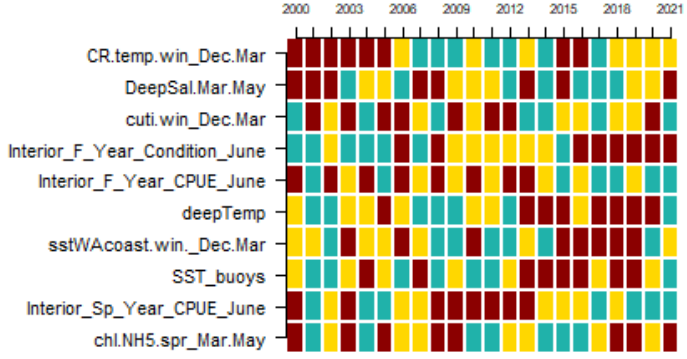


Steelhead

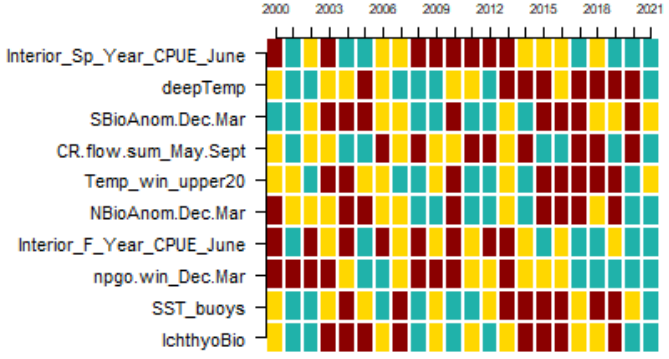


Columbia River

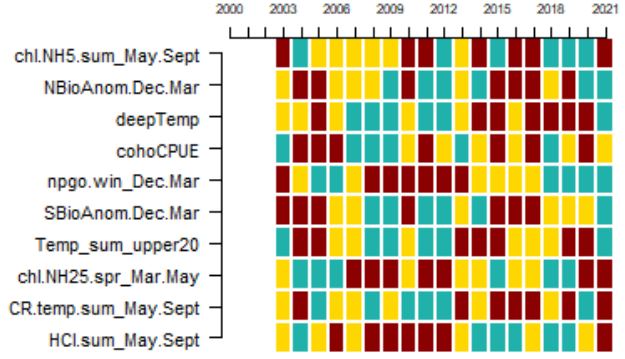
Spring Chinook



Summer/Fall Chinook



Steelhead



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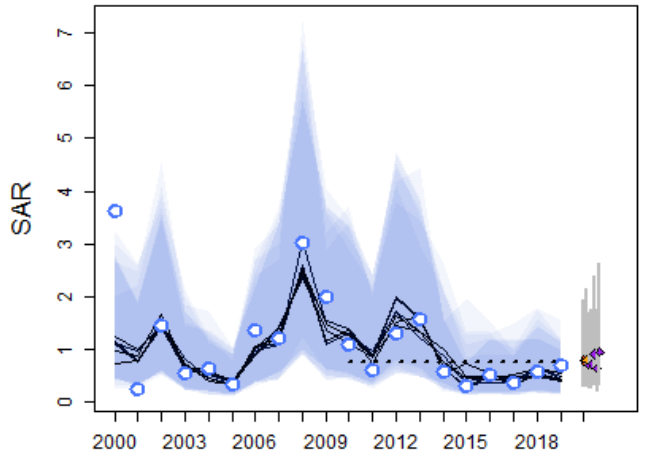
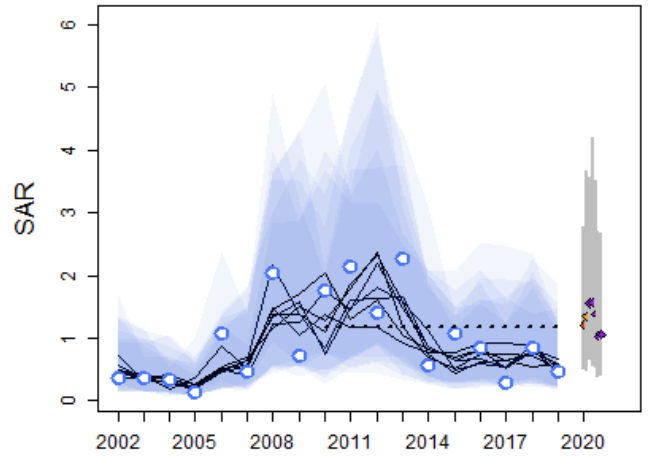
One-Step Ahead Predictions and 2020 Estimated SAR

Snake River

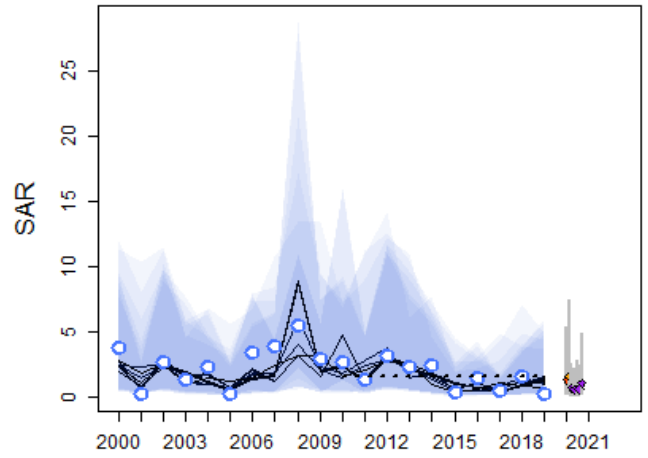
Spring/Summer Chinook



Fall Chinook

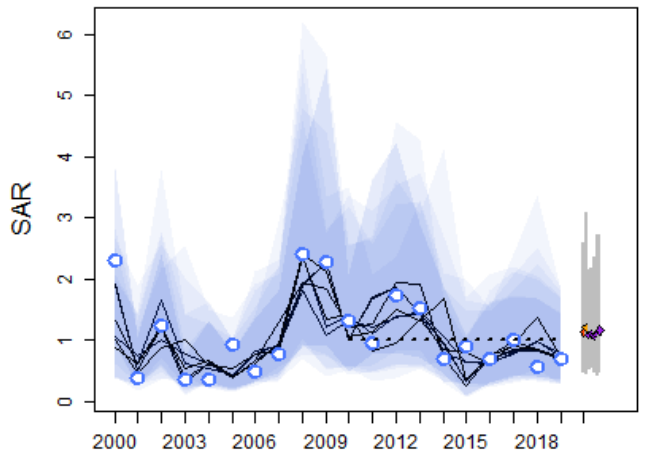


Steelhead

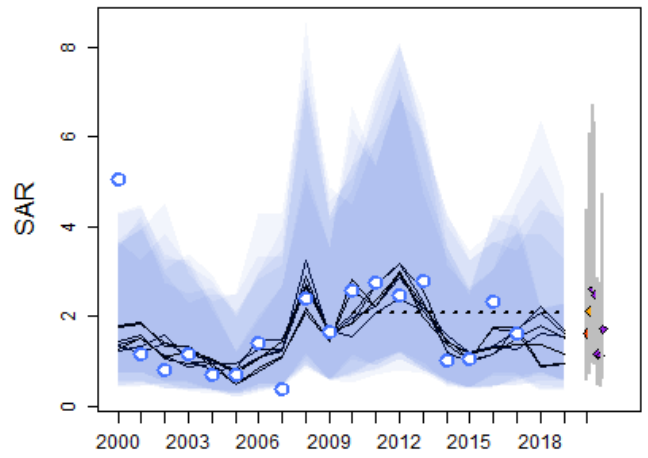


Columbia River

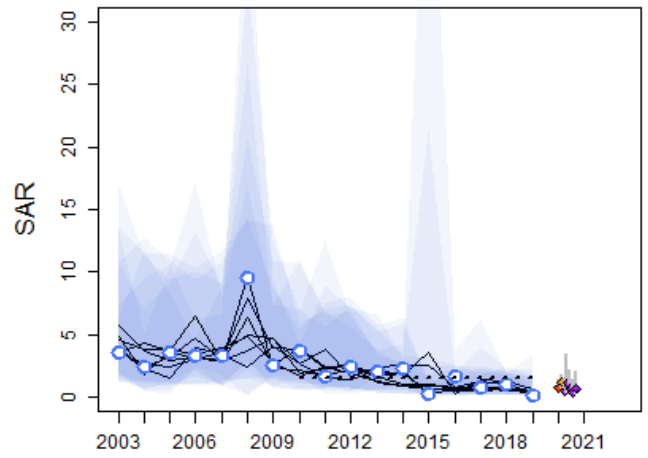
Spring Chinook



Summer/Fall Chinook



Steelhead



PIT tag data from Columbia Basin Research: http://www.cbr.washington.edu/dart

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Estimates of SAR (Bonn to Bonn)

		Spring Chinook		Fall Chinook		Steelhead	
	Outmigration Year	Mean Estimate	Proportion of 10-yr mean	Mean Estimate	Proportion of 10-yr mean	Mean Estimate	Proportion of 10-yr mean
Snake R	2020	0.8	1.04	1.3	1.12	0.9	0.58
	2021	1.0	1.31	2.2	1.88	1.5	0.90
Up Col. R	2020	1.1	1.10	1.8	0.88	0.8	0.48
	2021	1.4	1.35	2.9	1.42	2.1	1.29

- Estimates are means of 7 models – details available upon request
- 2020 Chinook estimates include jack counts as a covariate
- Snake R. summer run included with spring run, Up Col. R summer run included with fall run

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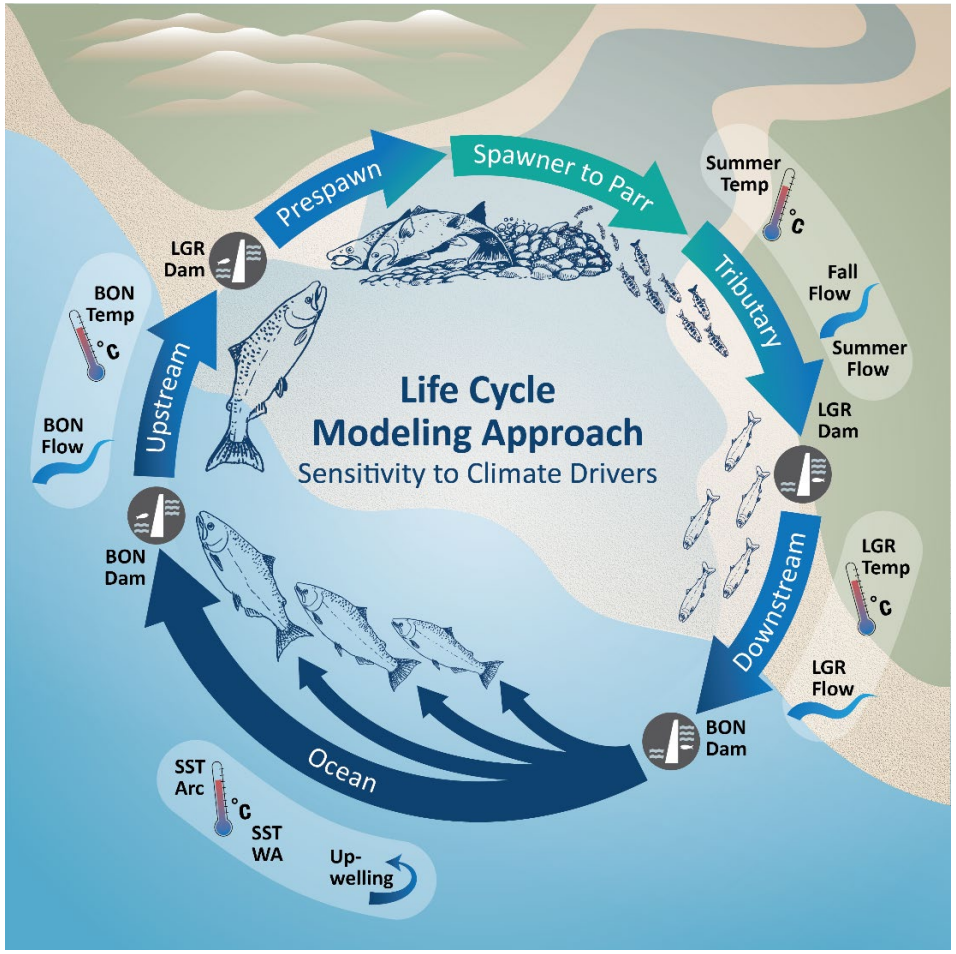
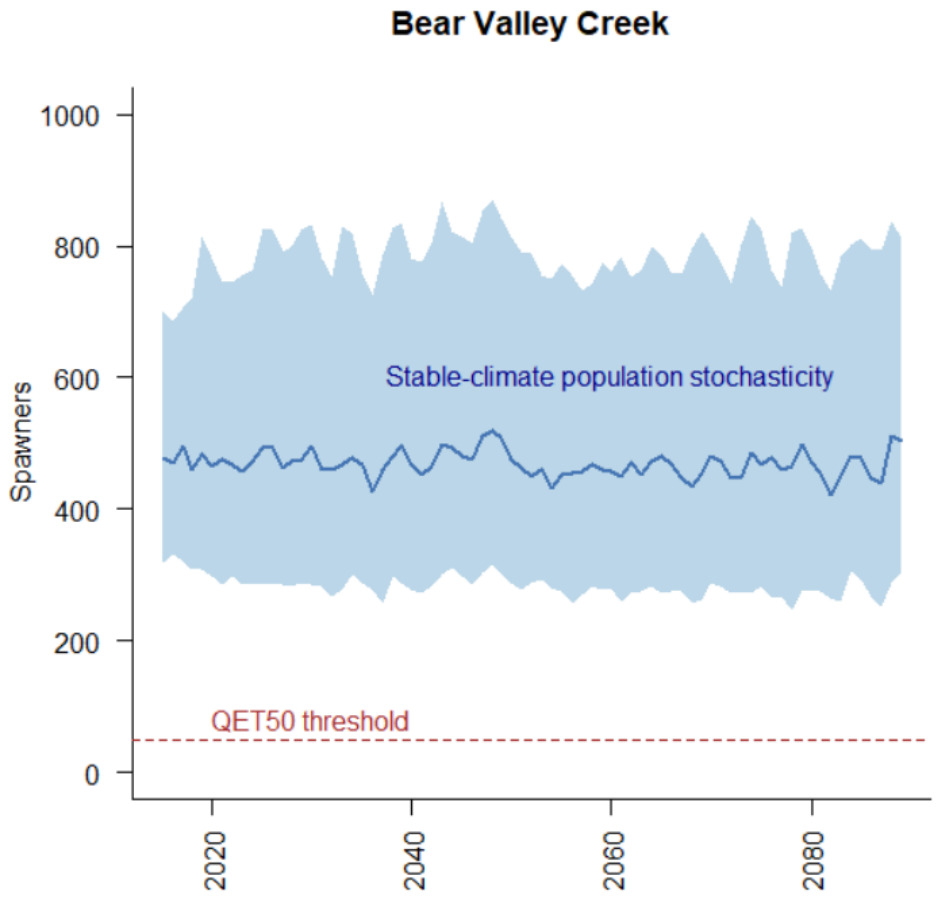
Life Cycle Models and Climate Effects





Crozier et al. 2021. Communications Biology
https://doi.org/10.1038/s42003-021-01734-w

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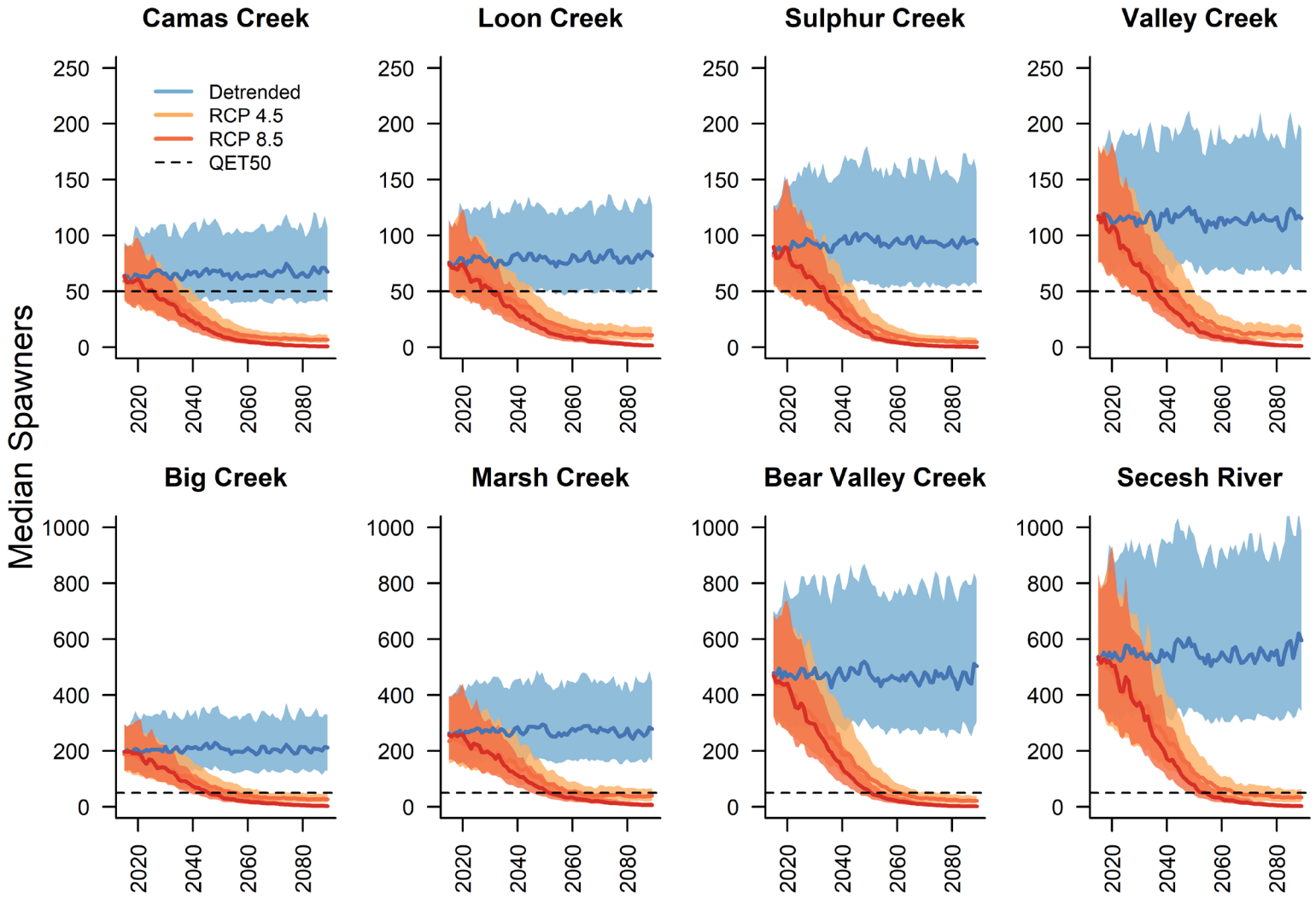
Rapid Declines in a Changing Climate



Crozier et al. 2021. Communications Biology https://doi.org/10.1038/s42003-021-01734-w

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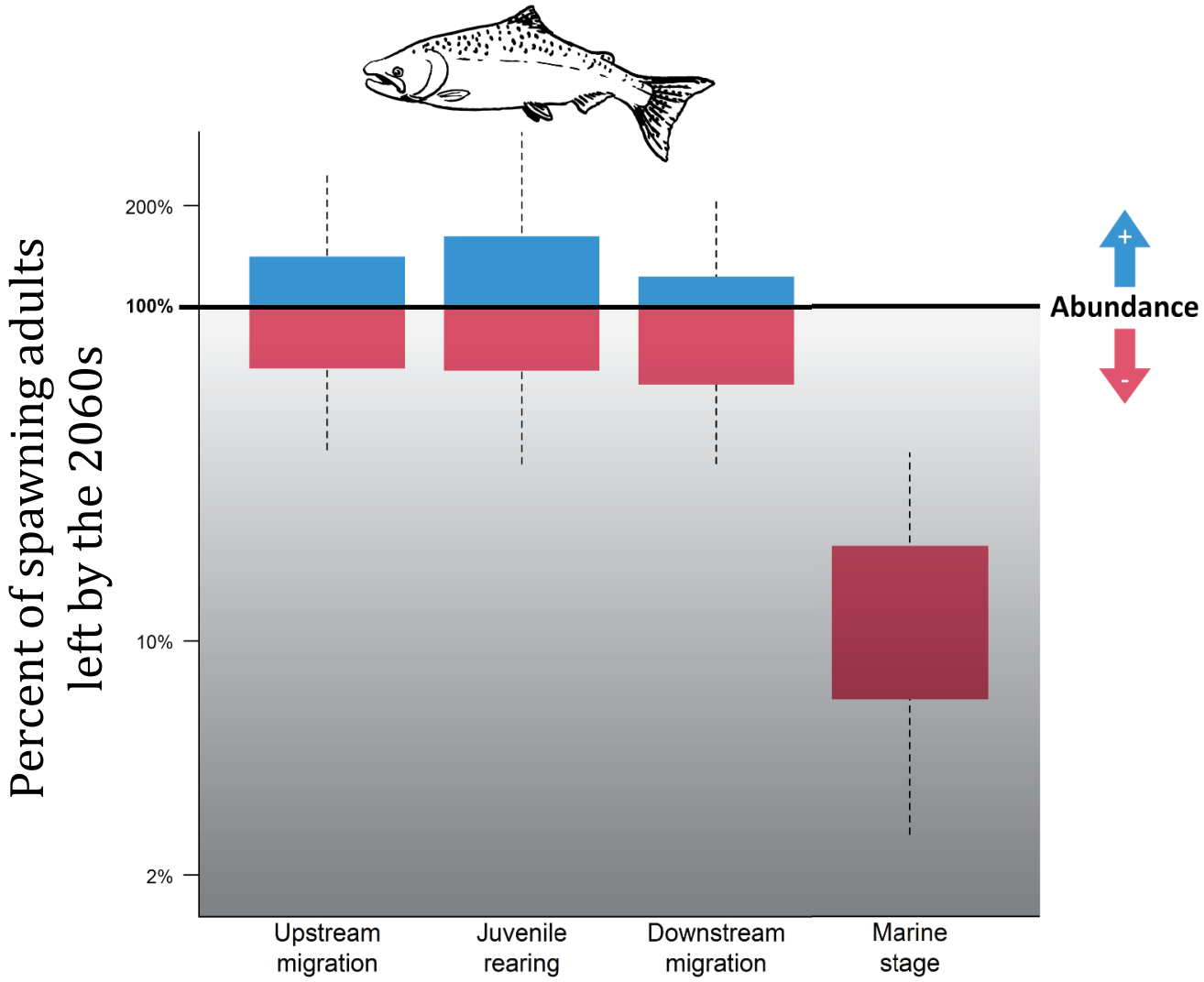
What if climate only impacted a single life stage?



Crozier et al. 2021. Communications Biology https://doi.org/10.1038/s42003-021-01734-w

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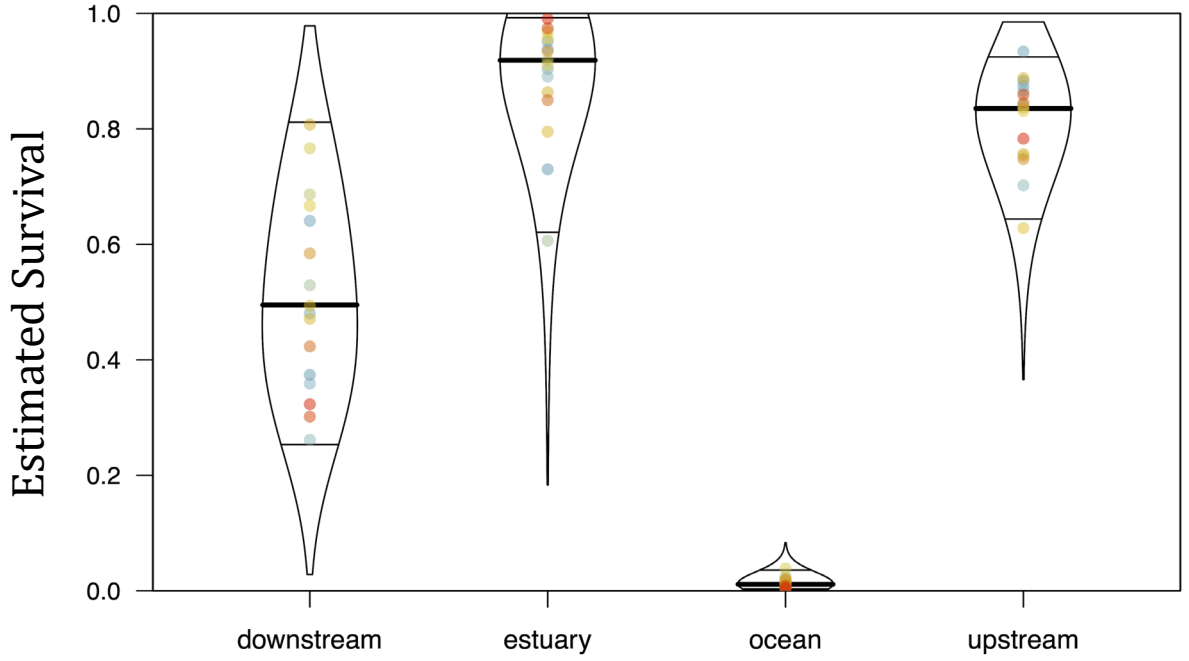
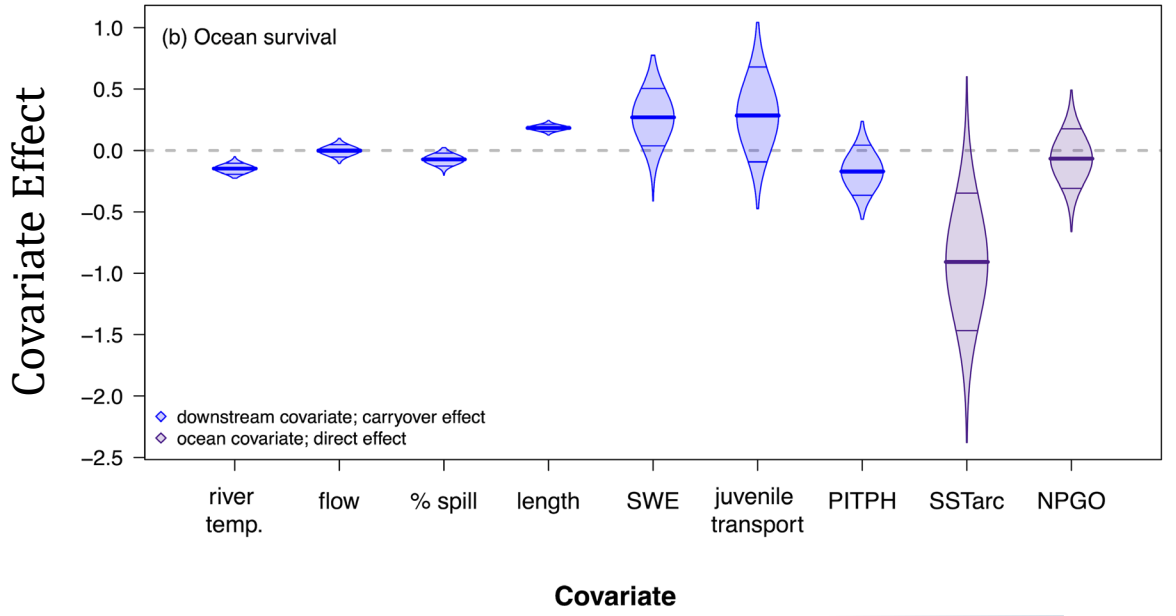
Carryover Effects on Ocean Survival





Gosselin *et al*. 2021. Ecosphere. 2021. 12(7):e03618.

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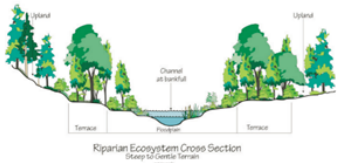
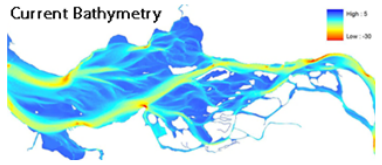
We Have Management Options

Riparian and floodplain restoration





Estuary Restoration Act

Fishery Management Plans:
- Coastal Pelagic Species
- Hake
- Salmon

Colony management

Marine Mammal Protection Act
Pinniped Removal Program

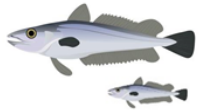
https://www.fisheries.noaa.gov/west-coast/marine-mammal-protection/marine-mammal-protection-act-section-120-pinniped-removal

Smolt body size and timing — Carryover effects

Zooplankton, invertebrates, fish larvae — Prey

Anchovy — Competitors, Prey

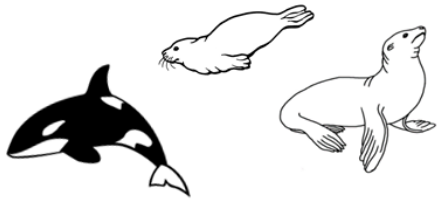
Hake — Predators, Competitors



Other Fisheries — Indirect effects

Seabirds — Predators

Marine mammals



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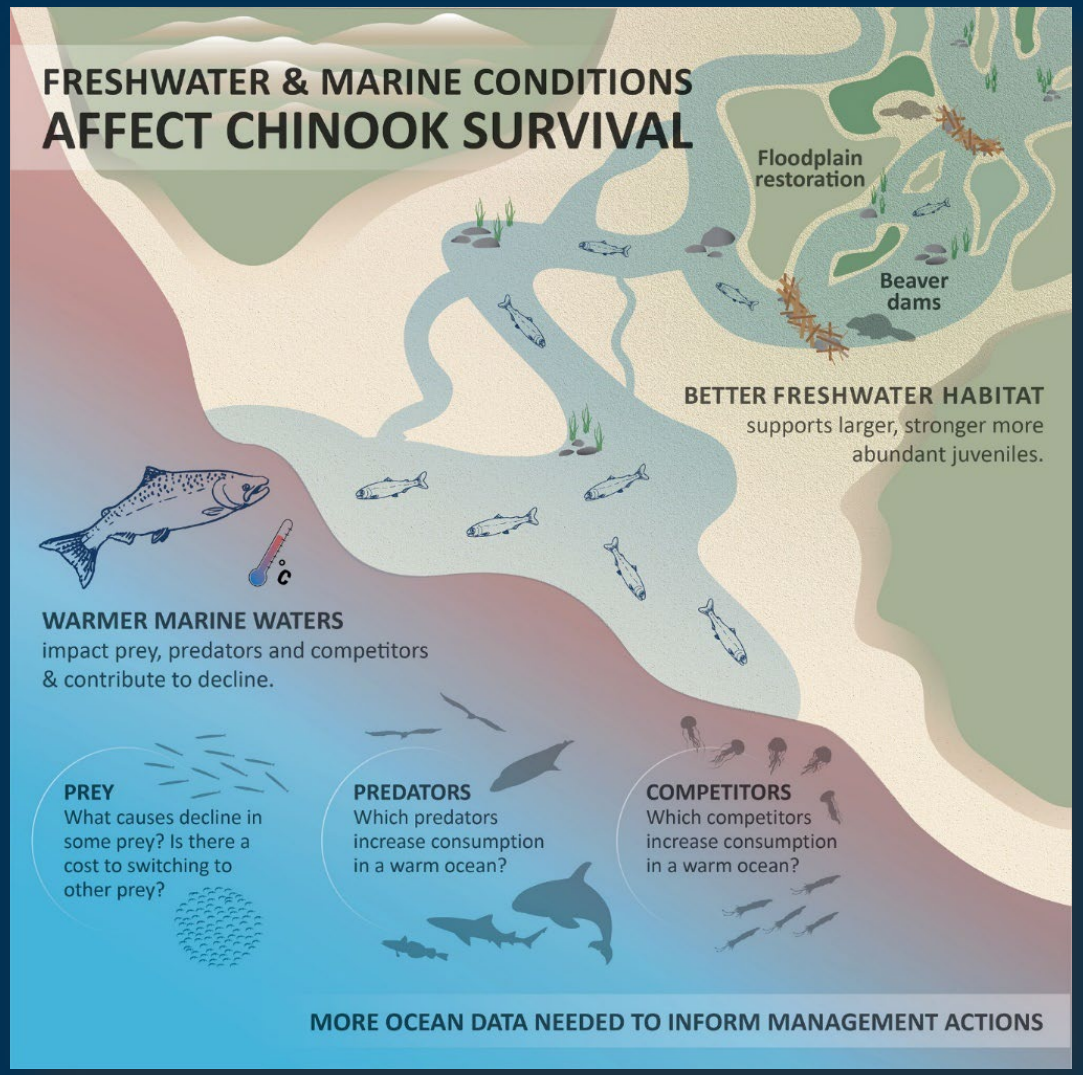

- We saw widespread and significant improvement in recent ocean conditions
- This is not the beginning of a general upward trend, but a temporary respite in a long-term decline
- Carry-over effects from the river and estuary represent important existing management levers
- But it is not enough - now is the time to ramp up marine science efforts to identify and inform additional management actions

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