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Salish Sea Ecosystem Conference

2018 Salish Sea Ecosystem Conference  
(Seattle, Wash.)

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Apr 6th, 9:30 AM - 9:45 AM

## Changes in hatchery subsidies of Chinook salmon in the Salish Sea: implications for predators, fisheries, and conservation

Benjamin Nelson

*Northwest Fisheries Science Center (U.S.), nelson.benjamin@gmail.com*

Eric John Ward

*Northwest Fisheries Science Center (U.S.), eric.ward@noaa.gov*

Ole Shelton

*Northwest Fisheries Science Center (U.S.), ole.shelton@noaa.gov*

Joseph H. Anderson

*Washington (State). Department of Fish and Wildlife, joseph.anderson@dfw.wa.gov*

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Nelson, Benjamin; Ward, Eric John; Shelton, Ole; and Anderson, Joseph H., "Changes in hatchery subsidies of Chinook salmon in the Salish Sea: implications for predators, fisheries, and conservation" (2018). *Salish Sea Ecosystem Conference*. 477.

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# Changes in hatchery subsidies of Chinook salmon in the Salish Sea: implications for ecology and conservation

Benjamin Nelson<sup>1</sup>, Ole Shelton<sup>1</sup>,  
Joe Anderson<sup>2</sup>, Eric Ward<sup>1</sup>



Salish Sea Ecosystem Conference  
April 6<sup>th</sup> 2018 | Seattle, WA



# Goals of Salish Sea hatcheries

Fishery supplementation




Recovery, mitigation



Photos: [flylifemagazine.com](http://flylifemagazine.com)





3.7 billion  
Chinook  
released  
since 1950

300  
hatcheries

> 600 different  
locations

Pacific Ocean

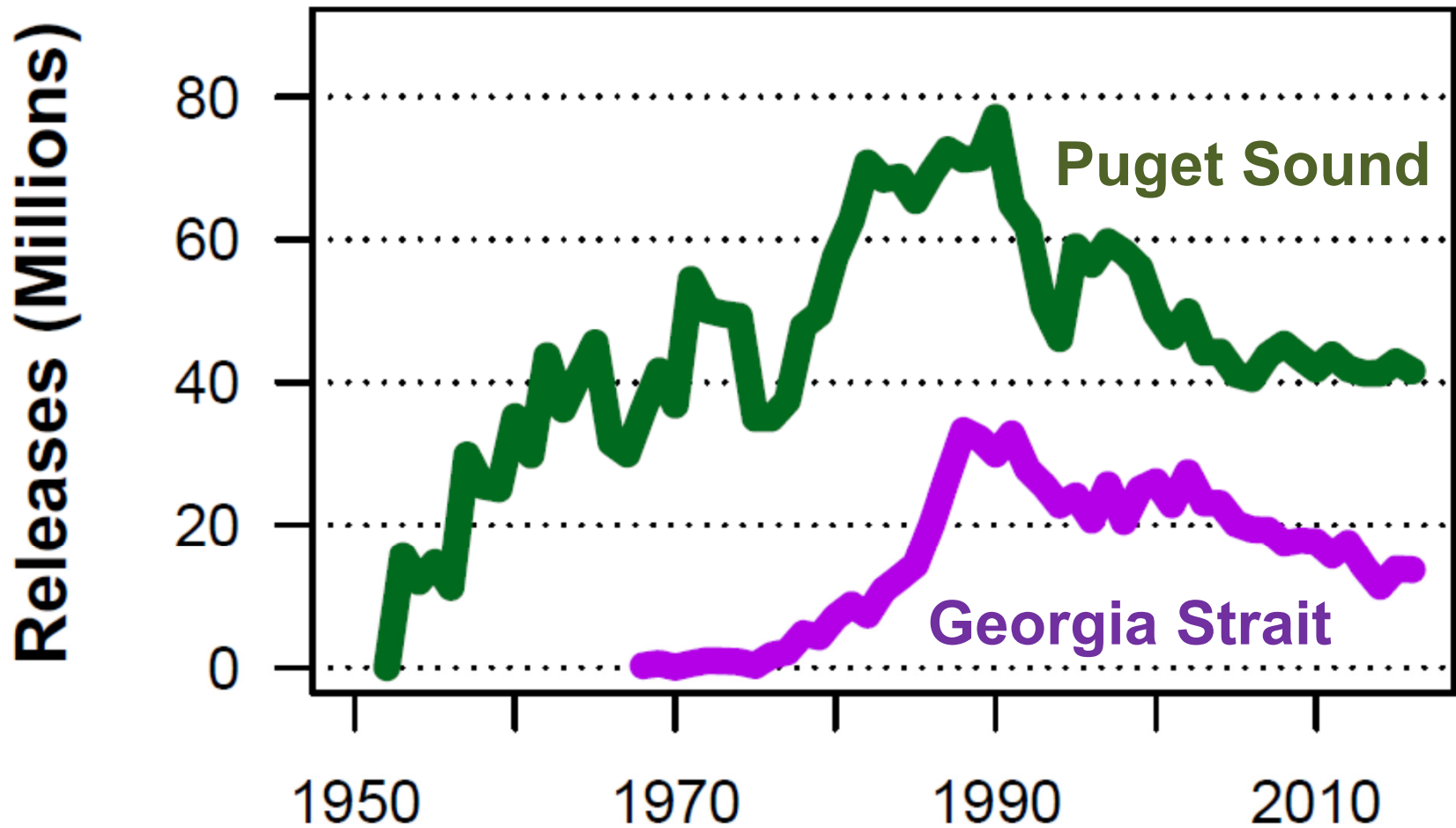
Strait  
Geor

Juan c

Puget  
Sound

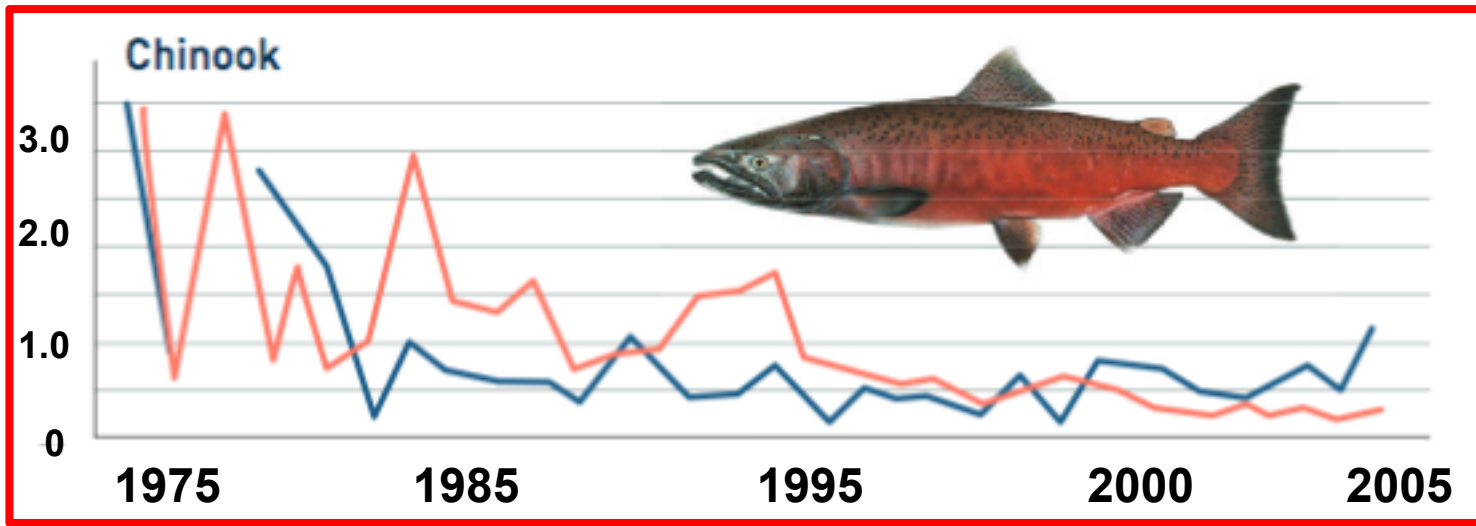
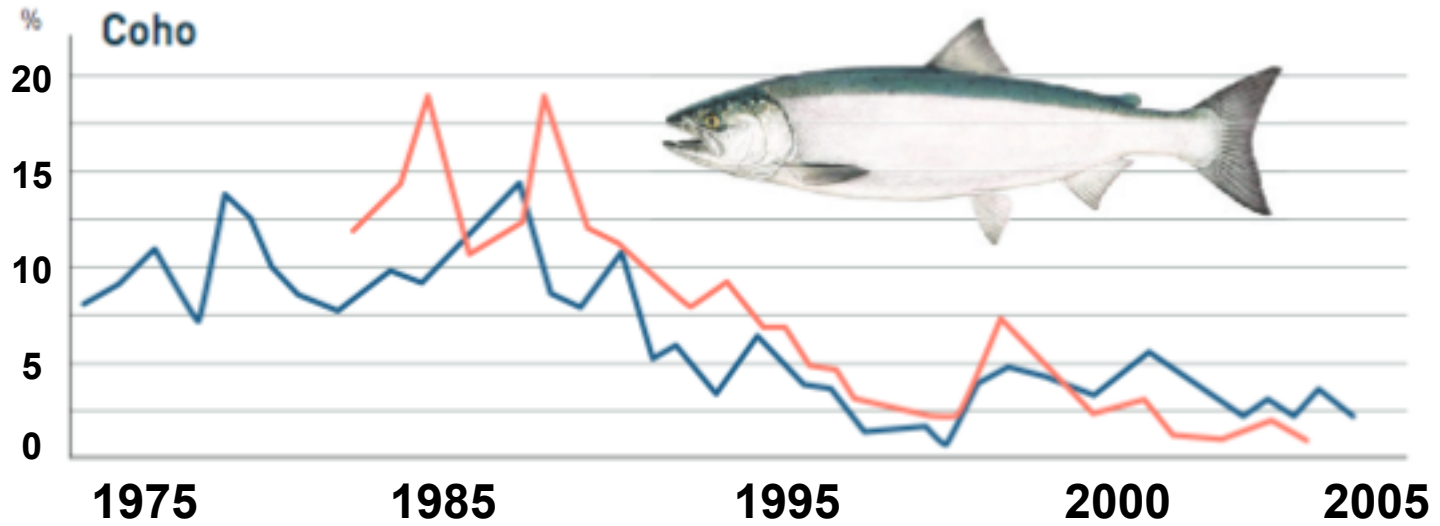
# The Salish Sea

# Salish Sea Chinook hatchery releases



# Marine Survival in the Salish Sea

■ Puget Sound  
■ Strait of Georgia



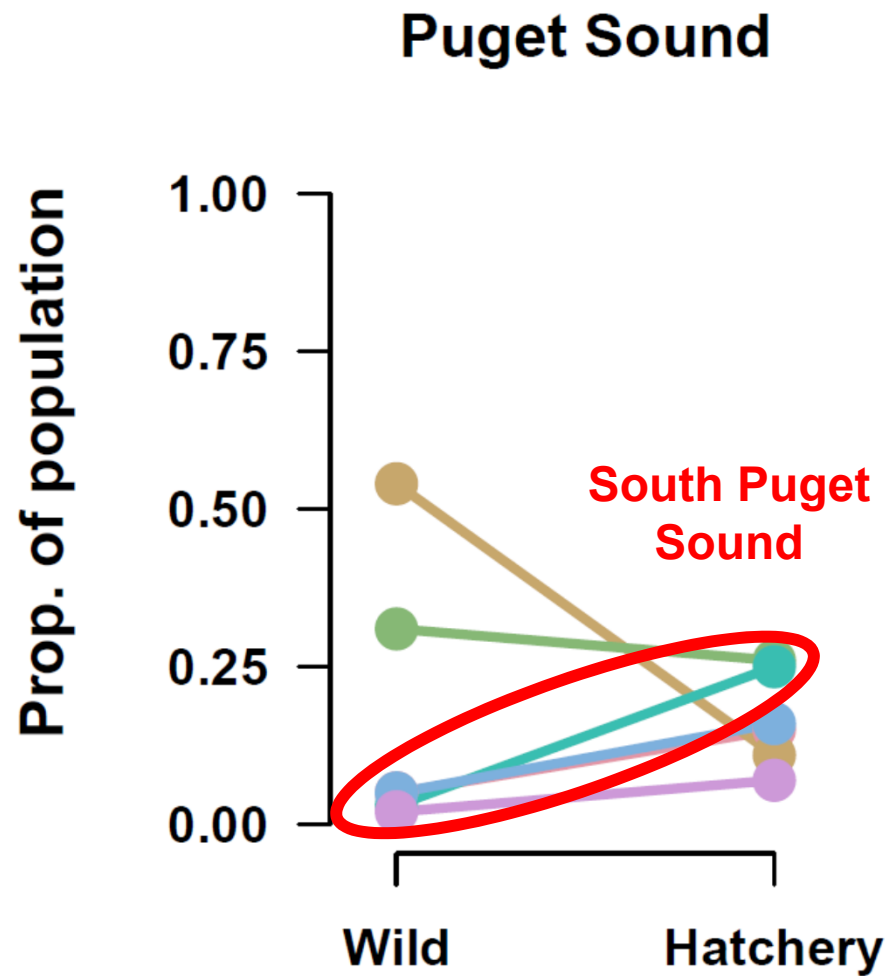
Credit: Pacific Salmon Foundation

# Project goals

1. **Compile 65 years of data**
2. **How have hatchery practices changed?**
  - **Spatial distribution**
  - **Size and time of releases**
  - **Synchrony of releases**
  - **Wild vs. hatchery populations**
3. **What does this mean for the Salish Sea ecosystem, salmon conservation?**

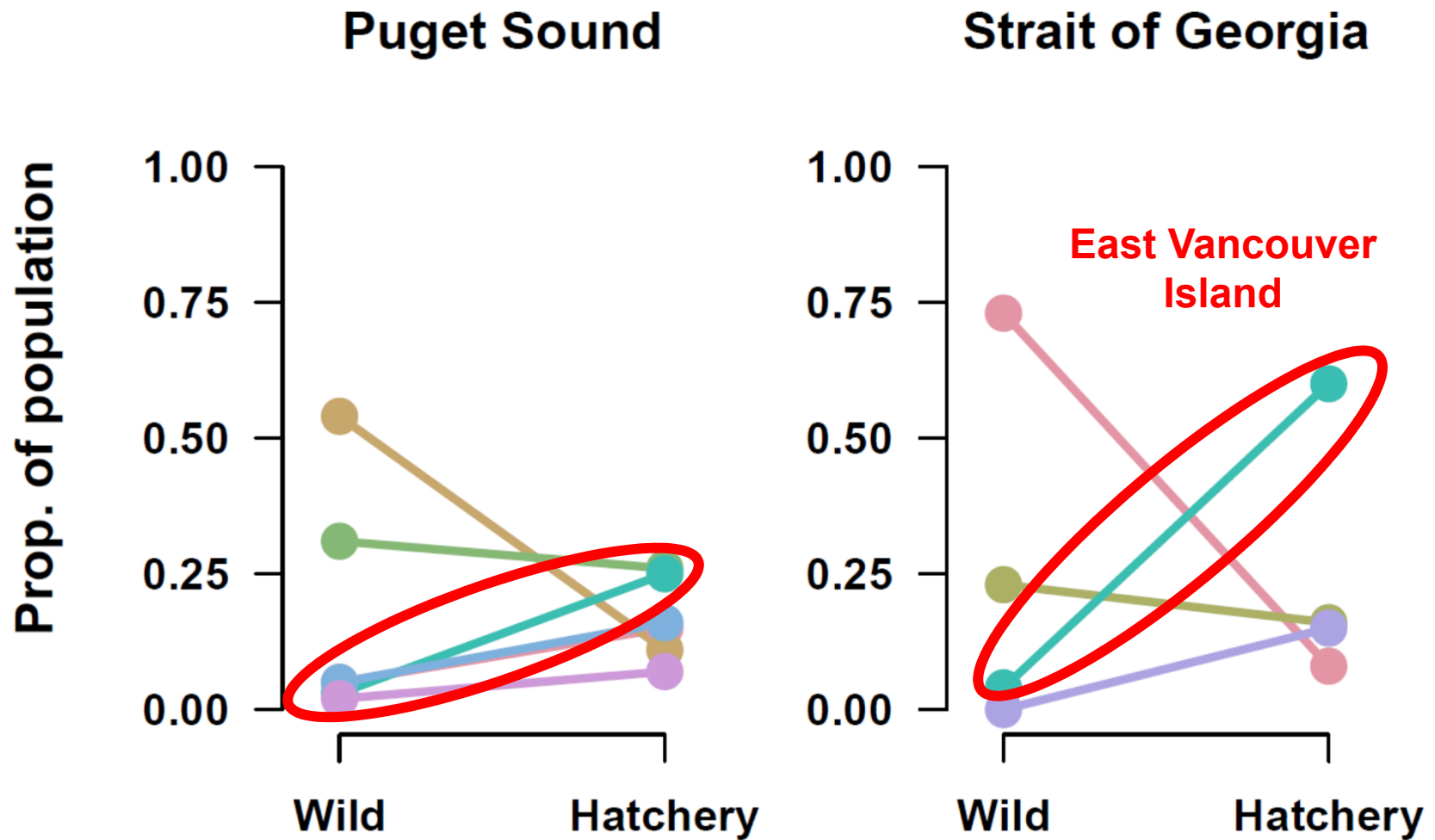


# Hatcheries have re-distributed Chinook smolts throughout the Salish Sea

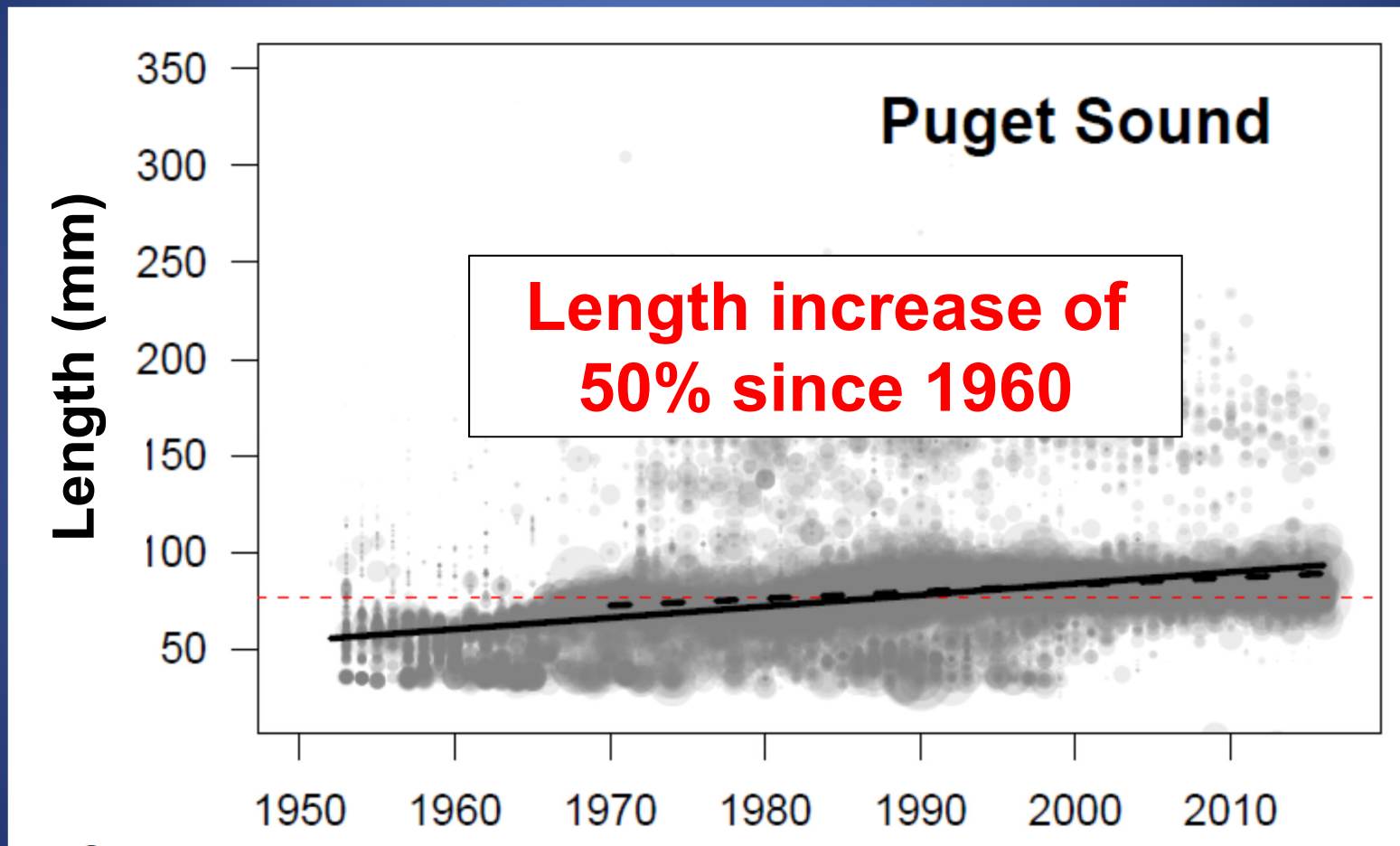




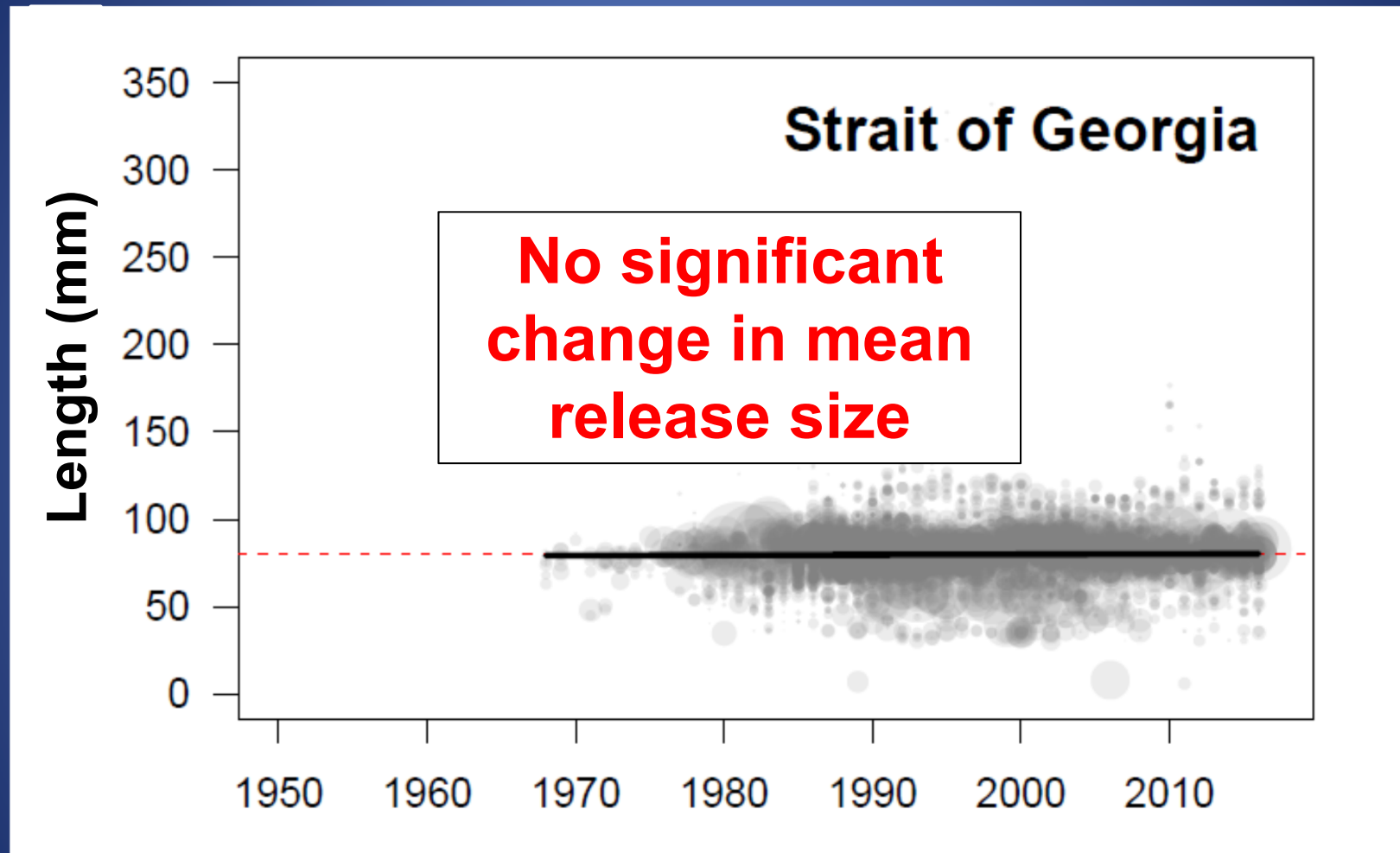
# Hatcheries have re-distributed Chinook smolts throughout the Salish Sea



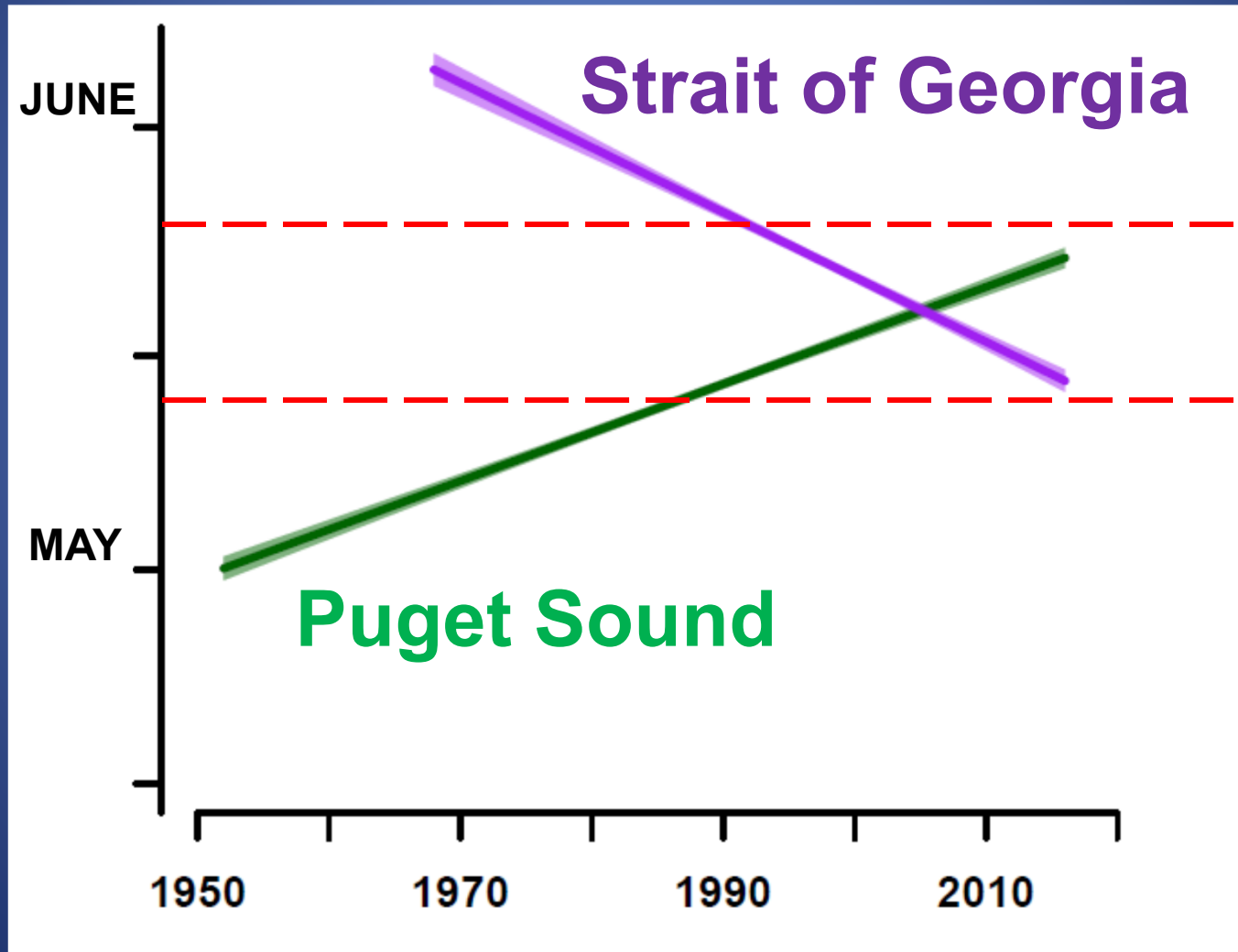
# Change in release size of Chinook



# Change in release size of Chinook



# Change in release date of Chinook



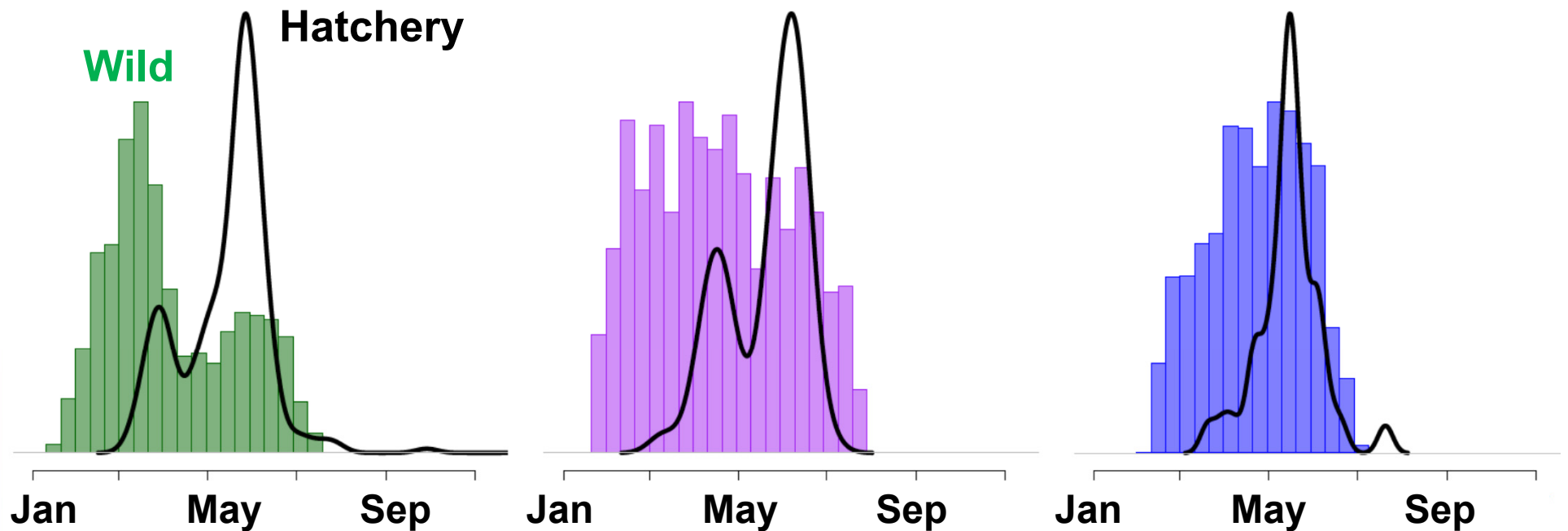


# Migration time of wild vs. hatchery Chinook smolts

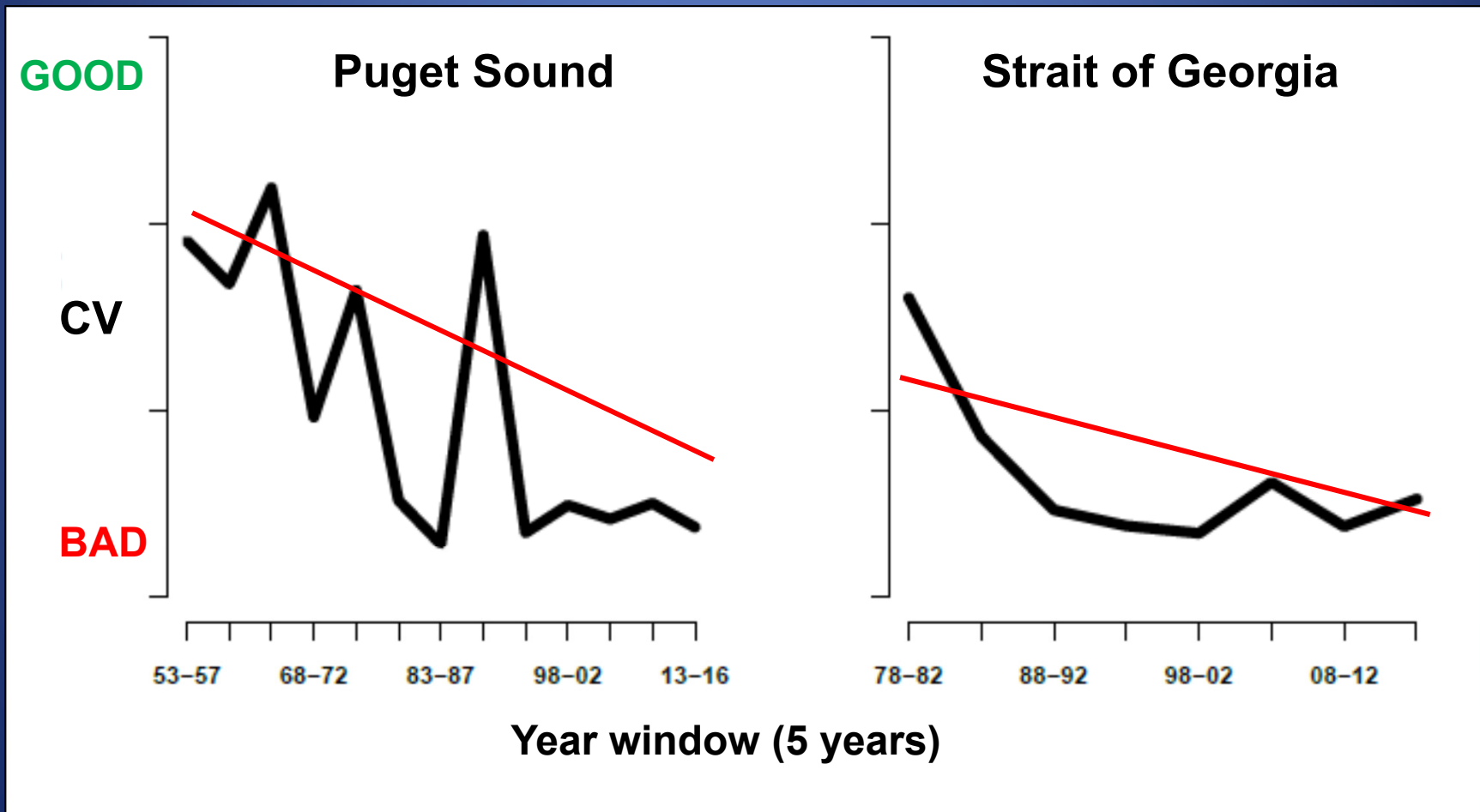
## Green

## Skagit

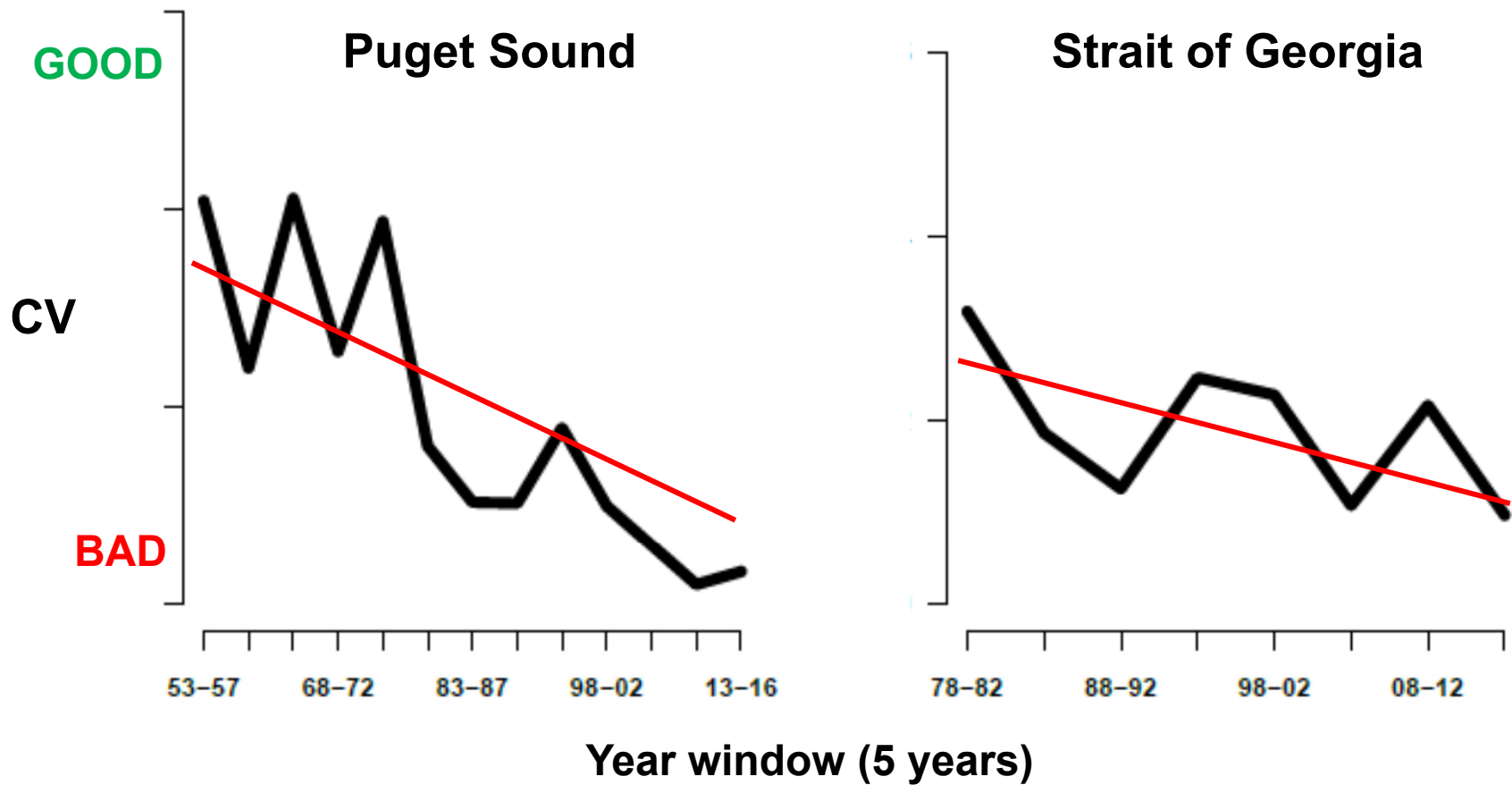
## Stillaguamish




# Synchrony in release date has increased



# Synchrony in release size has increased








# Results summary

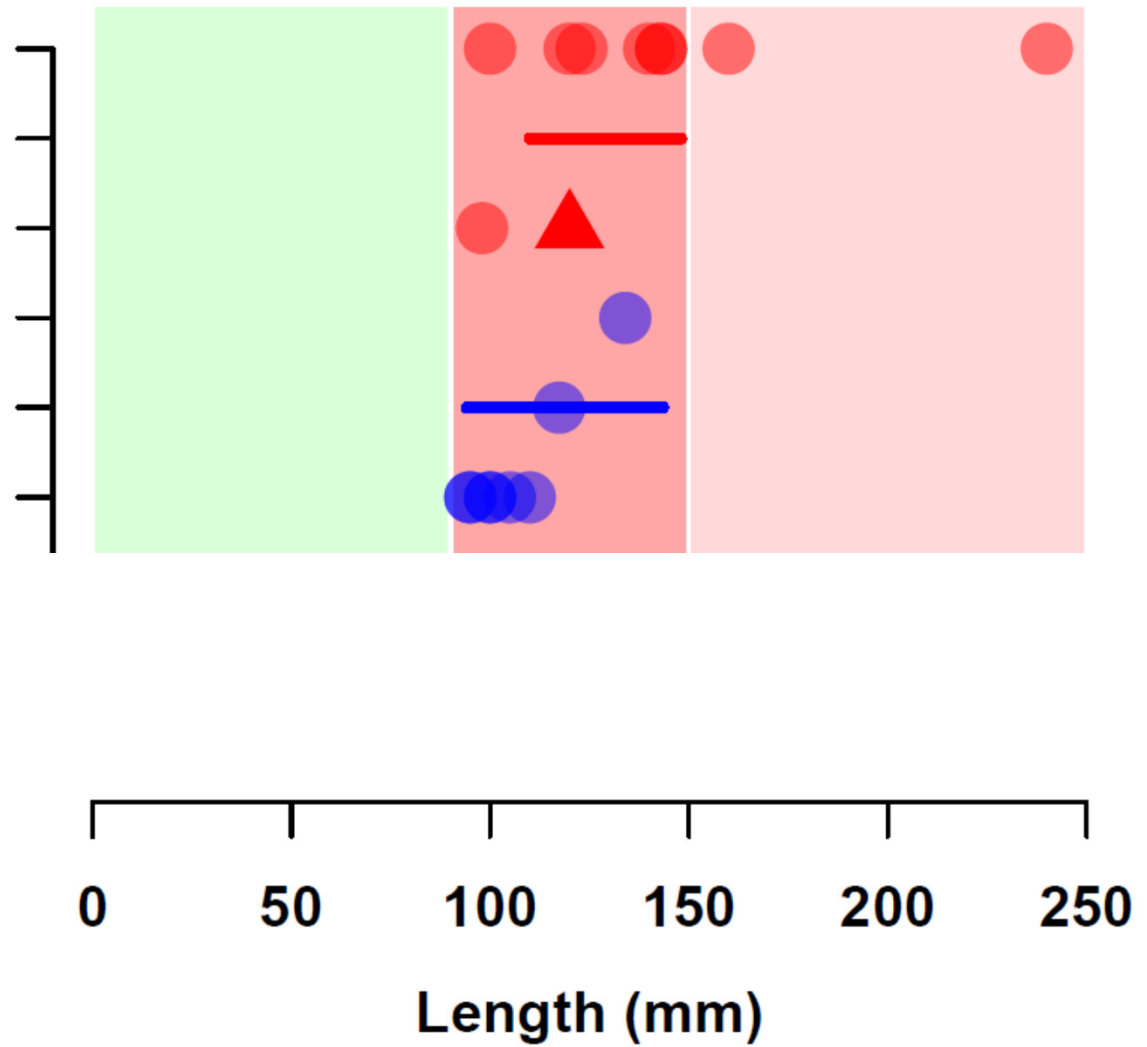
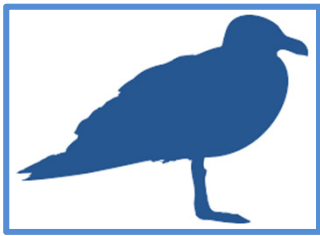
	Puget Sound	Strait of Georgia
Release Size		<b>NO CHANGE</b>
Release Date	<b>LATER</b>	<b>EARLIER</b>



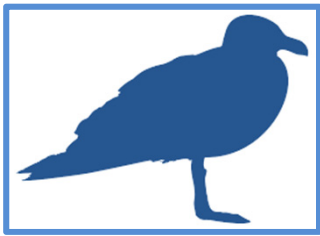
# Results summary

	Puget Sound	Strait of Georgia
<b>Release Size</b>		<b>NO CHANGE</b>
<b>Release Date</b>	<b>LATER</b>	<b>EARLIER</b>
<b>Synchrony Size</b>		
<b>Synchrony Date</b>		

# Size-selective predators



# Size-selective predators

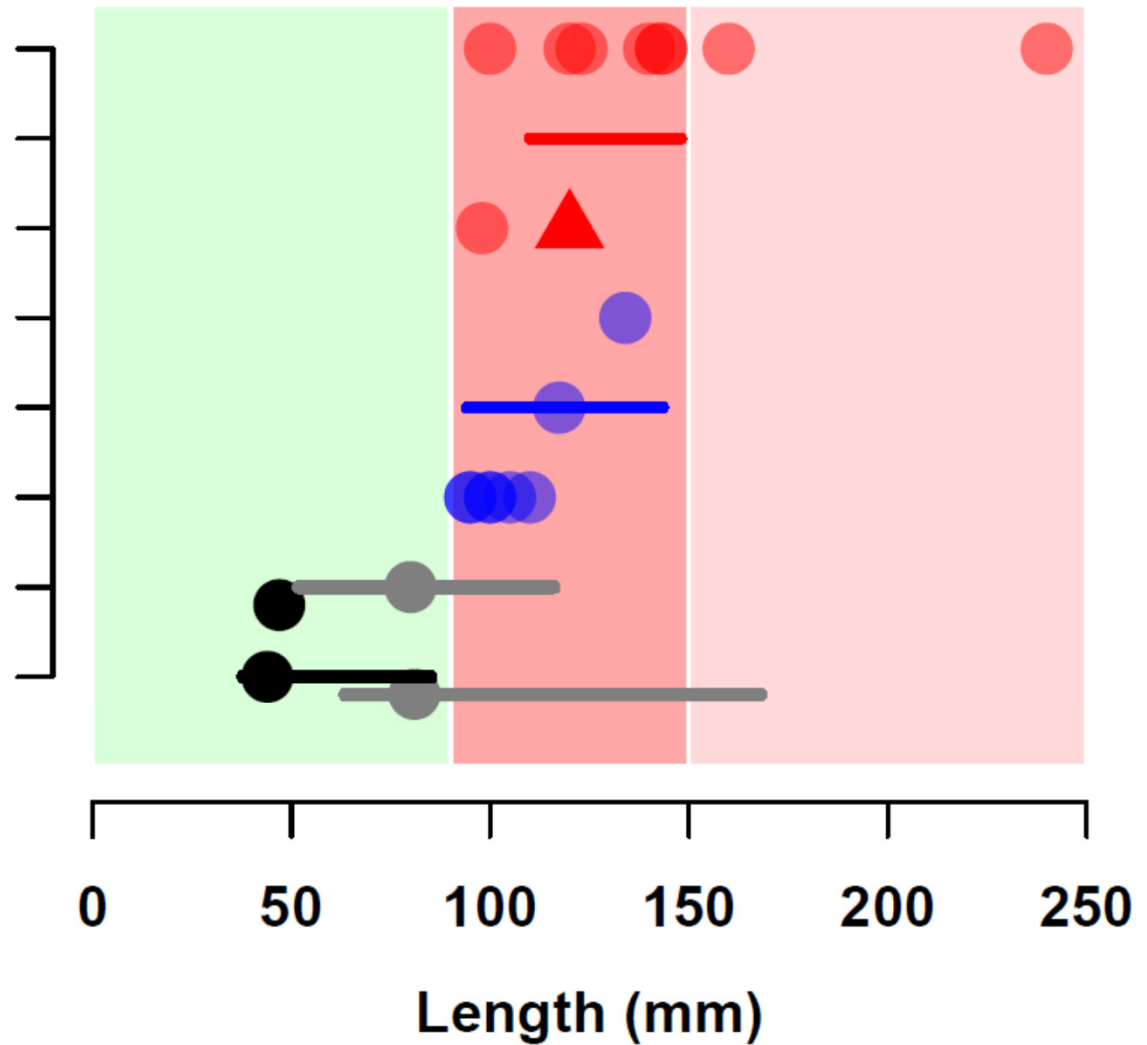


SOG Chinook

PS Chinook

● Wild

● Hatchery

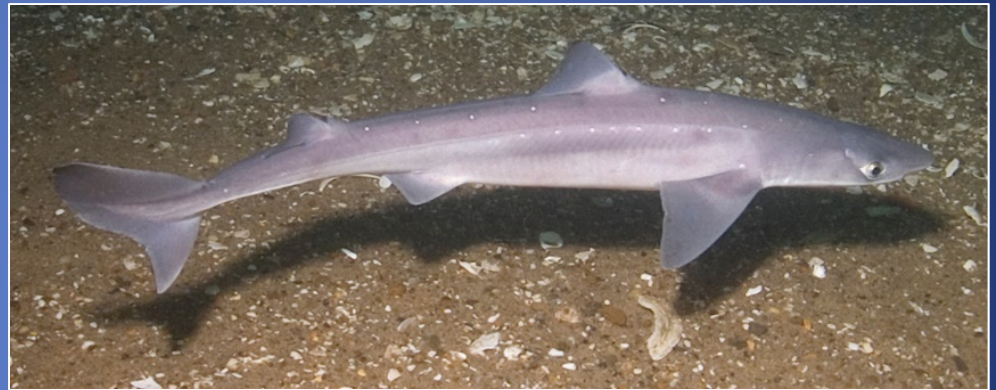


# Multiple predators respond to high densities of smolts

Wood 1987



Beamish et al. 1992



Allegue 2017



# Conclusions

- Hatchery-origin Chinook salmon have changed over the last 65 years
- Hatchery Chinook are different than wild conspecifics
- Chinook releases have become more synchronized— reduced portfolio effects
- Use hatcheries for controlled experiments

# Acknowledgements

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## Contributions

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