

Western Washington University
Western CEDAR

Salish Sea Ecosystem Conference

2020 Salish Sea Ecosystem Conference (Online)

Apr 21st, 12:30 PM - 2:00 PM

Shifting phenology of an apex/specialist predator tracks changes in its favored prey

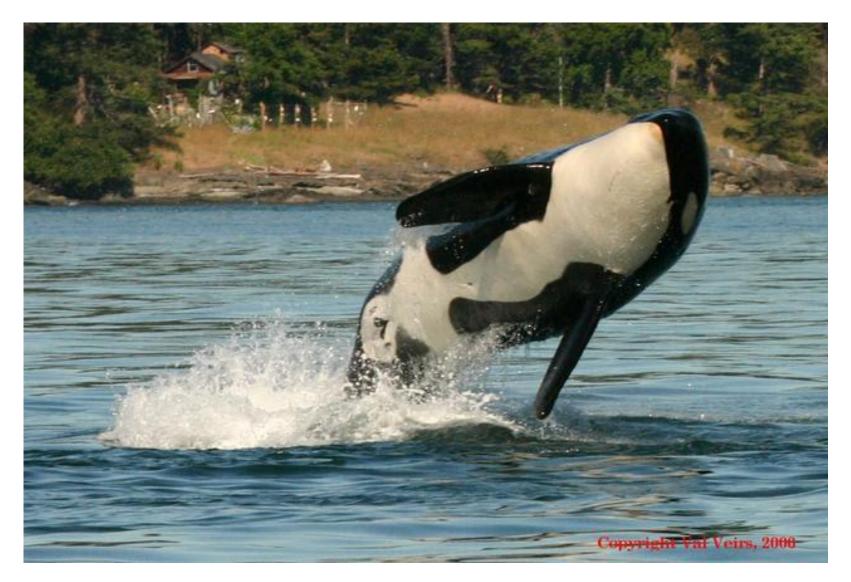
Ailene Ettinger The Nature Conservancey- Washington Field Office, ailene.ettinger@tnc.org

Follow this and additional works at: https://cedar.wwu.edu/ssec

Part of the Fresh Water Studies Commons, Marine Biology Commons, Natural Resources and Conservation Commons, and the Terrestrial and Aquatic Ecology Commons

Ettinger, Ailene, "Shifting phenology of an apex/specialist predator tracks changes in its favored prey" (2020). *Salish Sea Ecosystem Conference*. 80. https://cedar.wwu.edu/ssec/2020ssec/allsessions/80

This Event is brought to you for free and open access by the Conferences and Events at Western CEDAR. It has been accepted for inclusion in Salish Sea Ecosystem Conference by an authorized administrator of Western CEDAR. For more information, please contact westerncedar@wwu.edu.



Shifting phenology of an endangered apex predator tracks changes in its favored prey

Ailene Ettinger

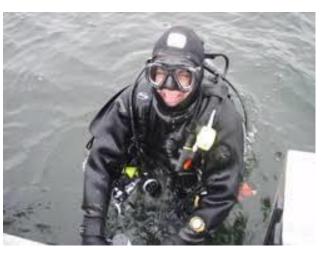
Quantitative Ecologist ailene.attinger@tnc.org



Shifting phenology of an endangered apex predator tracks changes in its favored prey

<u>Coauthors</u>

Jameal Samhouri Chris Harvey Candi Emmons Brad Hanson Eric Ward Jennifer Olson



















Southern resident killer whales (*Orcinus orca*) are an endangered population

Killer whales are widespread, with different populations

- Resident killer whales = fish-eating
- Southern residents (SRKWs) listed as endangered in 2005

3 pods: J,K,L

Current threats include lack of food, vessel noise, pollution, small population size





Southern resident killer whales may be shifting their activity in the Salish Sea

Where are the southern resident orcas? Researchers see longest absence ever from summer waters

July 3, 2019 at 4:22 pm | Updated July 4, 2019 at 3:00 pm



■ 10f3 | This 26-year-old female transient orca tosses around the pelt of a Stellar sea lion after the kill. Taken May... (Jeff Friedman / Pacific Whale Watch Association) More ∨



Where are the salmon and the orcas? Tribe, scientists grapple with unprecedented disappearance in Washington waters

Aug. 6, 2019 at 6:00 am | Updated Aug. 6, 2019 at 3:46 pm



■ 1 of 13 | Lummi Nation spiritualist Richard Solomon offers a prayer for the southern-resident orcas on a private beach in the San Juan... (Alan Berner / The Seattle Times) More ∨

By Lynda V. Mapes y Seattle Times environment reporter

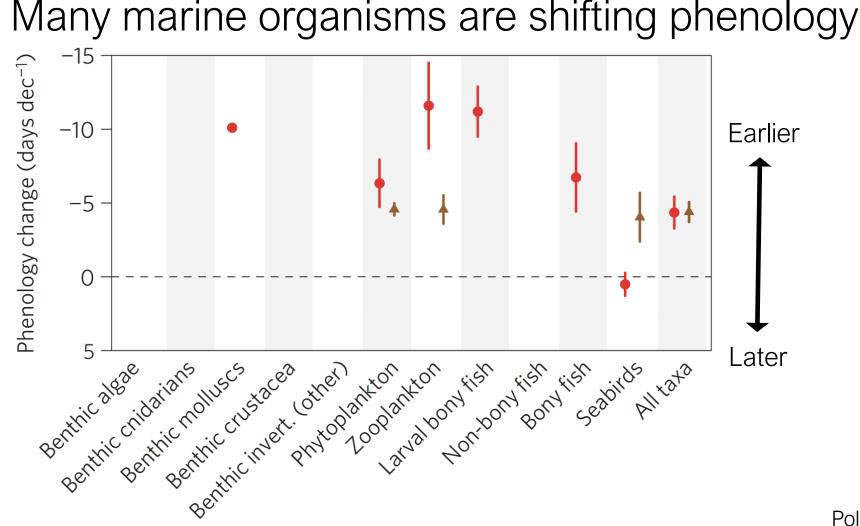
ABOARD THE LENGESOT IN THE SALISH SEA — The tote was loaded and full of water, the cedar boughs cut and stacked on deck. But as Lummi tribal members headed out on their traditional waters to offer a ceremonial feeding of live chinook salmon to the endangered southern-resident killer whales, neither whale nor fish was anywhere to be found.

In this historic summer of unthinkables, day after day is passing without the orcas and fish that normally enliven the waters of the inland Salish Sea.

Are these recent events part of long-term phenological shifts?



Are these recent events part of long-term phenological shifts?

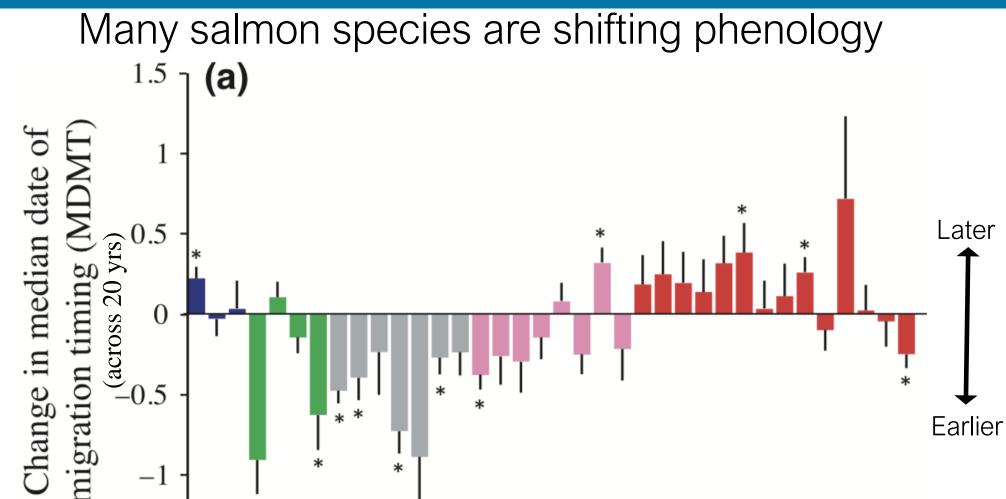




Are these recent events part of long-term phenological shifts?

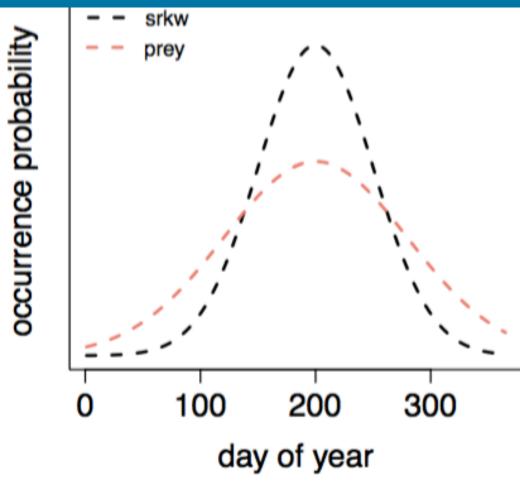
The Nature Conservancy

Washington



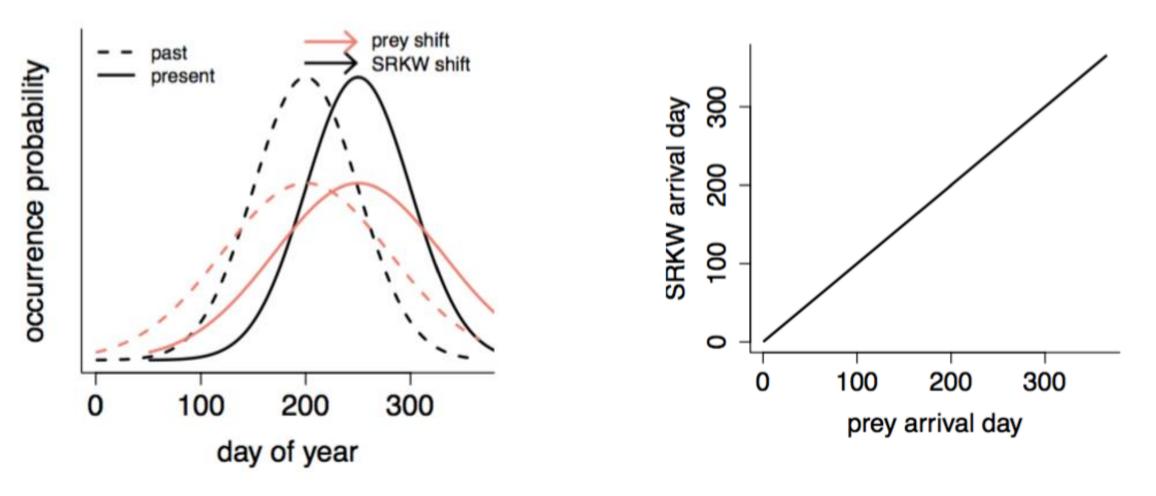
Kovach et al 2015

Asynchronous shifts between SRKWs and their prey could reduce prey availability ("phenological mismatch")



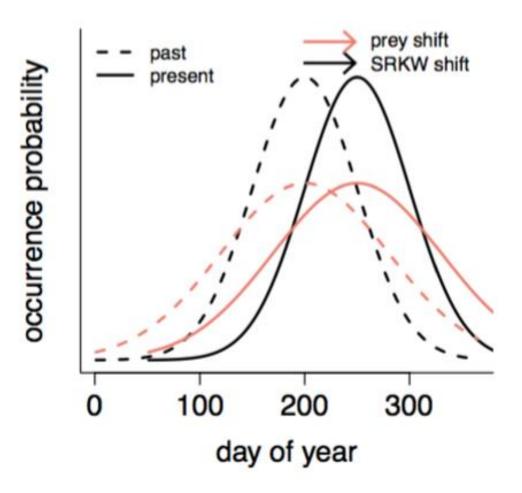


If phenological shifts are similar, the amount of matching will not change:



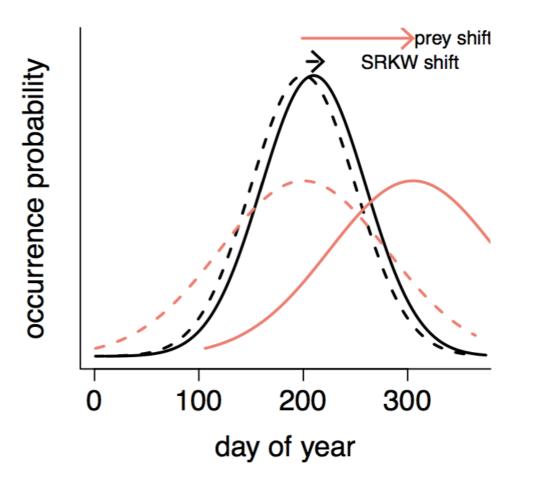


If phenological shifts are similar, the amount of matching will not change:



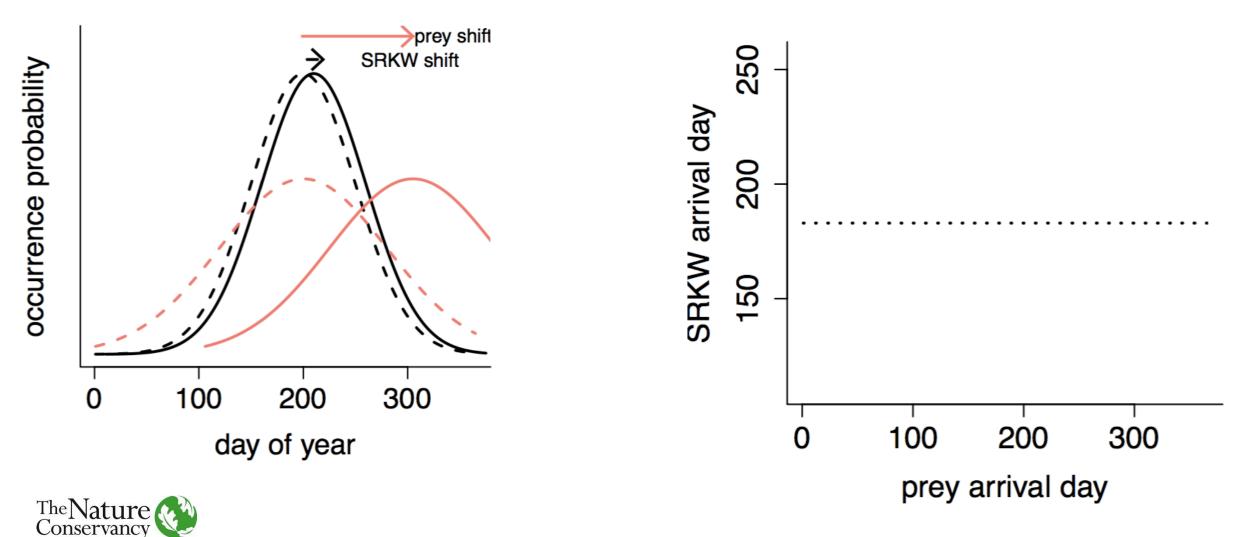


Asynchronous shifts between SRKWs and their prey could reduce prey availability ("phenological mismatch")



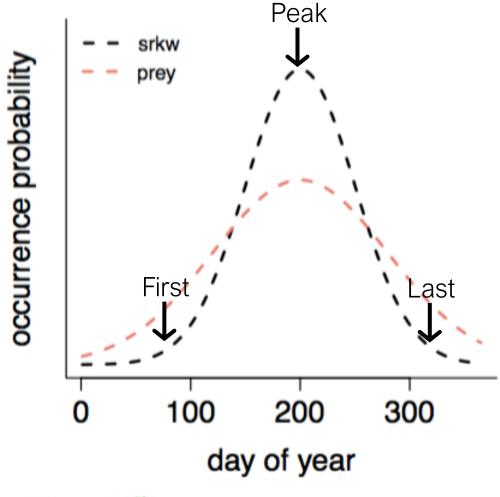


Asynchronous shifts between SRKWs and their prey could reduce prey availability ("phenological mismatch")



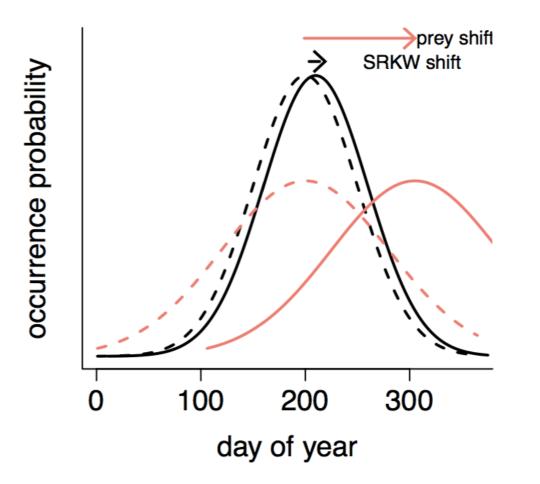
Washington

Shifts could be occurring in first, peak, last occurrence probability





Asynchronous shifts between SRKWs and their prey could reduce prey availability ("phenological mismatch")



Study Questions

1. Has the timing of SRKW activity shifted in the Salish Sea?

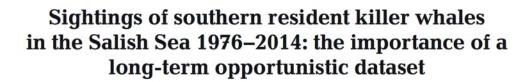
2. Do shifts coincide with shifts in phenology of salmon?



The Orca Master Database



Published October 10



Jennifer K. Olson^{1,*}, Jason Wood², Richard W. Osborne³, Lance Barrett-Lennard⁴, Shawn Larson¹

> ¹The Whale Museum, Friday Harbor, WA 98250, USA ²SMRU Consulting, Friday Harbor, WA 98250, USA ³University of Washington, Olympic Natural Resources Center, Forks, WA 98331, USA ⁴Coastal Ocean Research Institute, Ocean Wise, Vancouver, BC, V6B 3X8, Canada

ABSTRACT: Southern resident killer whales (SRKWs) Orcinus orca may be present year round in the Salish Sea, i.e. the inland waterways of Washington State (USA) and southern British Columbia (Canada). SRKWs were listed as endangered in 2005 under the US Endangered Species Act. The Whale Museum (Washington, USA) has been collecting opportunistic sightings reports on SRKWs since 1976 with a goal of providing managers and regulatory agencies with reliable spatial and temporal data on this population. Information in this dataset comes from 5 classes of killer whale sighting sources and is systematically evaluated for accuracy before integration into the dataset. From 1976 to 2014, The Whale Museum's Orca Master dataset documented a total of 82 447 SRKW sightings in the Salish Sea. Sightings were concentrated in a few key hot spots, with an overall pattern of consistent presence in the Central Salish Sea during the summer months and a presence in Puget Sound proper during the fall and early winter months. A shift in SRKW presence in Puget Sound was documented in the late 1990s, possibly driven by increased foraging on fall chum salmon Oncorhynchus keta by 2 pods ('K' and 'L'), and is consistent with the hypothesis that the movement patterns of these whales may be driven by prey availability. The Whale Museum's dataset highlights the importance of long-term monitoring to document shifts that may take decades, and shows how opportunistic datasets can be valuable tools for illuminating spatial and temporal trends.



Home | About + | Lolita/Tokitae + | News + | Sightings + | Strandings + | Orcas + | Media + | Actions + | Donate/Shop + | Search

Sightings



Recent whale sightings in the Salish Sea

(Puget Sound, Northwest Straits, Gulf Islands and Georgia Strait)

Sightings Summaries Archives

Sighting Report Archives



Sign up for Whale Sightings Alerts and updates!

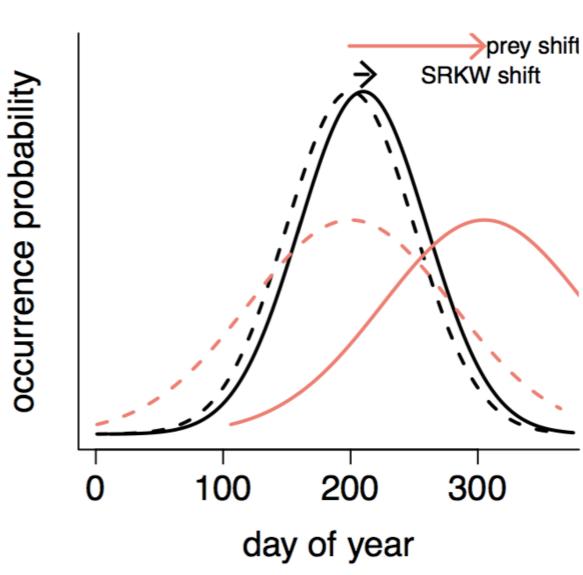
To find viewpoints along shorelines from Deception Pass to Olympia, go to: Whale Sightings Viewpoints Map Page

To report whales please go to the Orca Network Sightings Report Page.

The purpose of Orca Network's Whale Sighting Network and Education Project is to encourage observation and increase awareness and knowledge about the Southern Resident Community of orcas (J, K and L pods), and foster a stewardship ethic to motivate a diverse audience to take action to protect and restore these orcas' critical habitat.

The orcas' steep population decline of 20% from 1995 to 2001 is a reflection of the problems and issues facing the greater Puget Sound marine and watershed ecosystems: *declining salmon runs, PCB contamination, and the effects of a rapidly increasing human population including habitat loss and resource depletion.* Through a volunteer Whale Sighting Network, sightings and observations of this orca community are gathered and disseminated to researchers and volunteers, and posted on our website.

Asynchronous shifts between SRKWs and their prey could reduce prey availability ("phenological mismatch")



Study Questions

1. Has the timing of SRKW activity shifted in the Salish Sea?

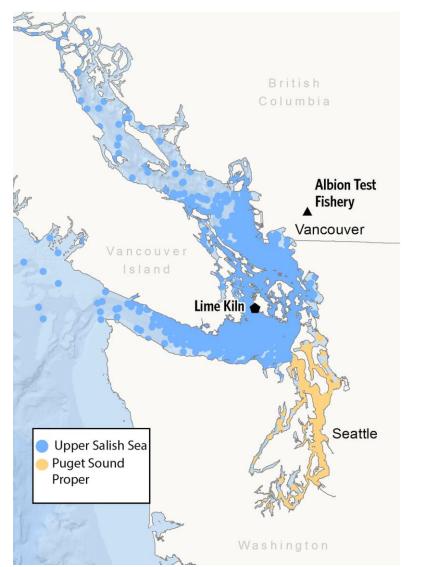
2. Do shifts coincide with shifts in phenology of salmon?

Approach:

-Explore for one location with consistent data for SRKWs & salmon

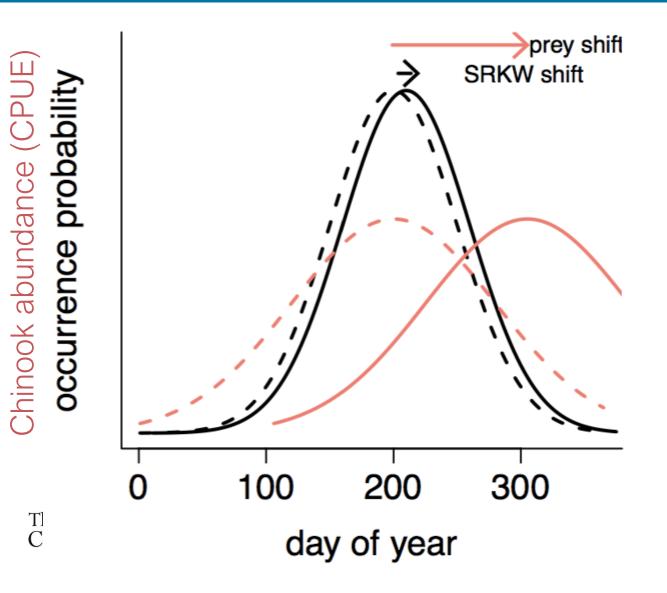
-Expand to broader geographic region

One location with consistent data: Lime Kiln Point State Park





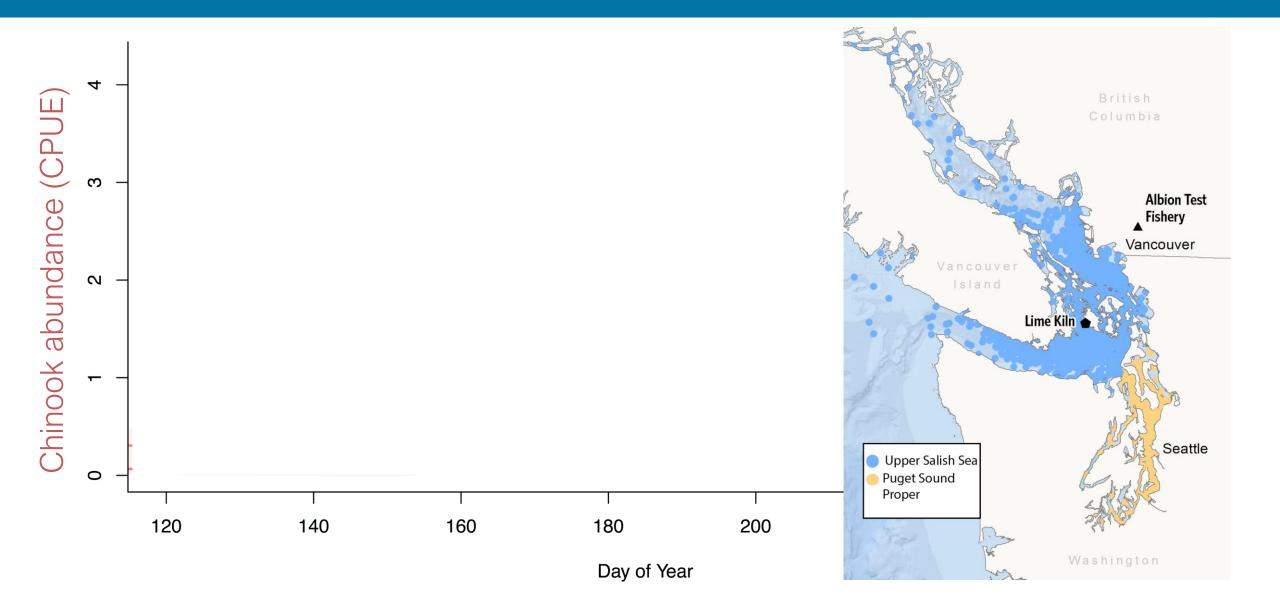
Approach



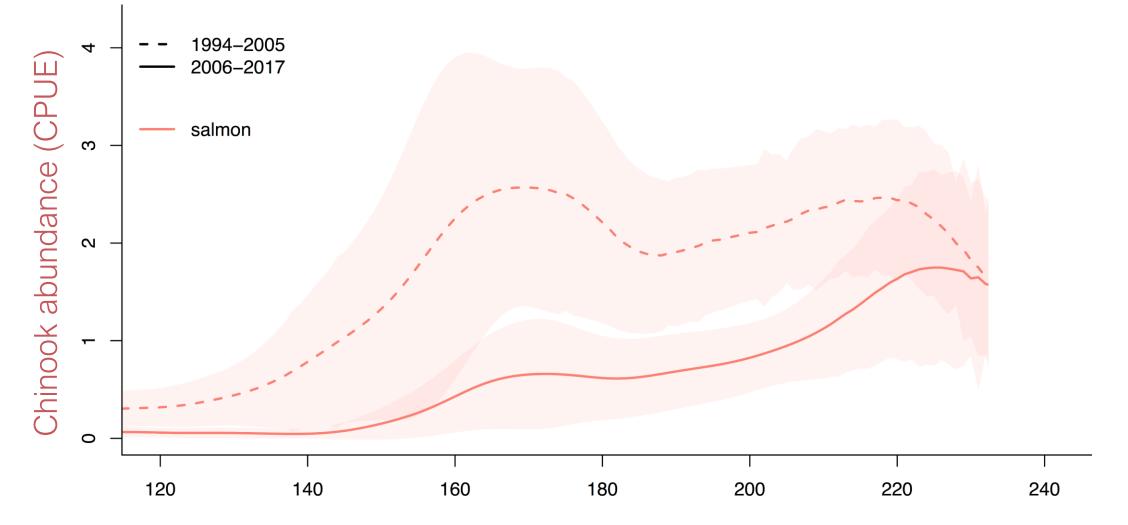
<u>Fit 2 models</u> Response variables: Presence/absence of SRKW Abundance for chinook

Predictors: Day of year (spline) Year (random effect)

At Lime Kiln:

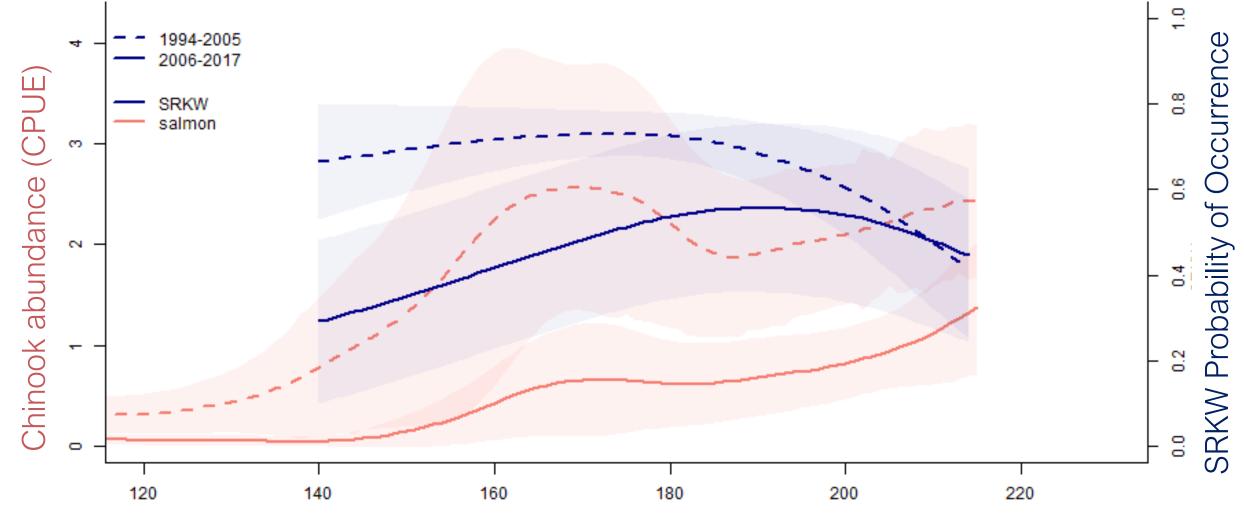


Chinook abundance and timing have shifted in the Fraser River:



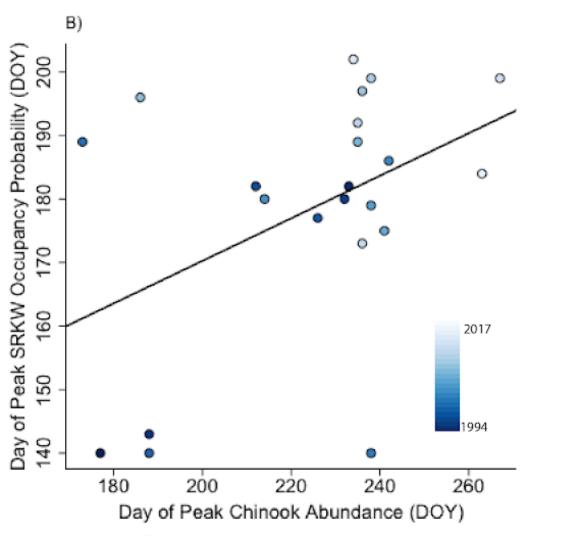
Day of Year

The timing of SRKW activity has shifted at Lime Kiln



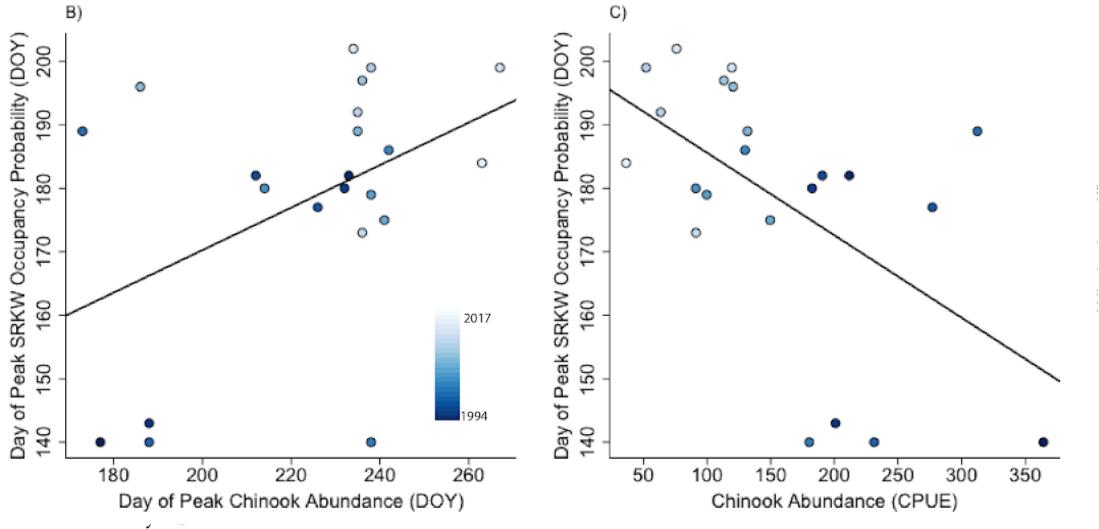
Day of Year

SRKW phenology is correlated with chinook peak phenolog



Washington

More Chinook = earlier SRKW activity



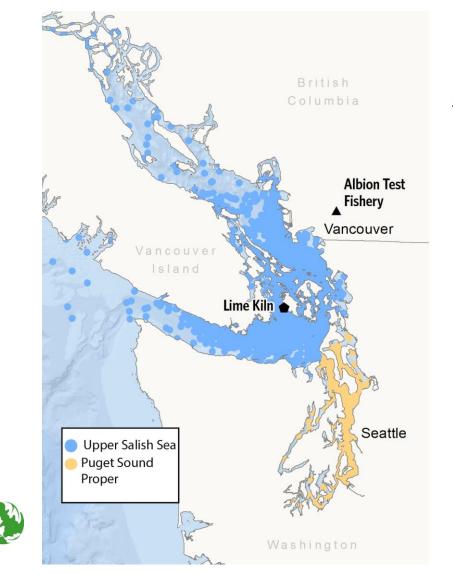
Washington

Broader geographic scope

The Nature

Washingtor

Conservancy

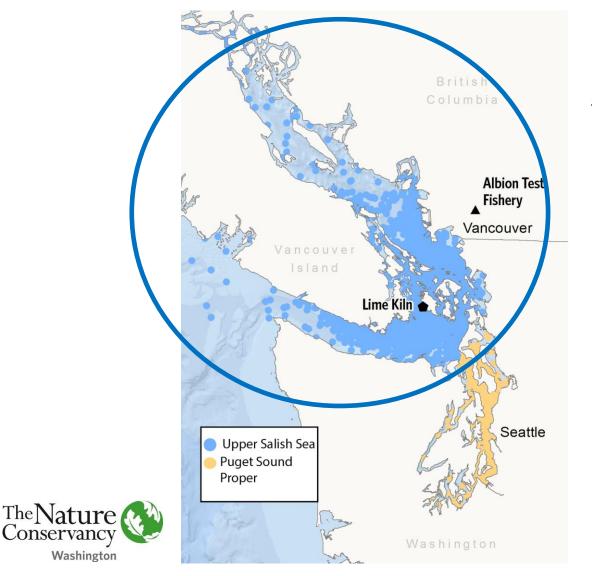


<u>Approach</u> Fit pod-specific occupancy models to 2 regions

Response variables: SRKW sightings

Predictors: Day of year (spline) Year, marine area (random effects)

Broader geographic scope

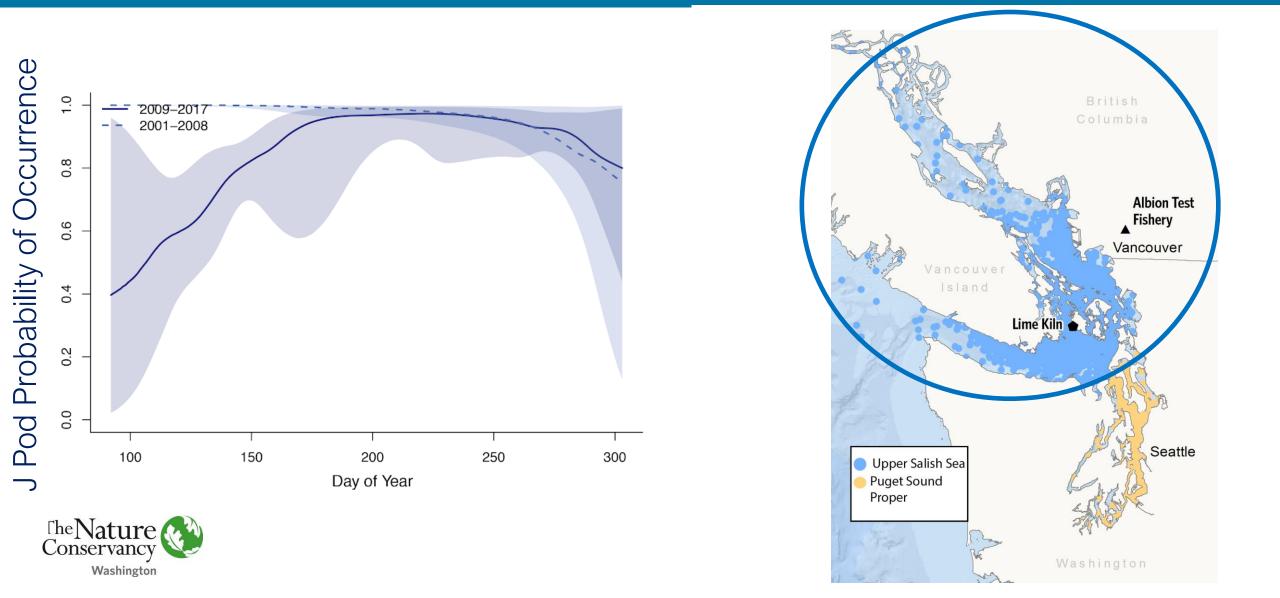


<u>Approach</u> Fit pod-specific occupancy models to 2 regions

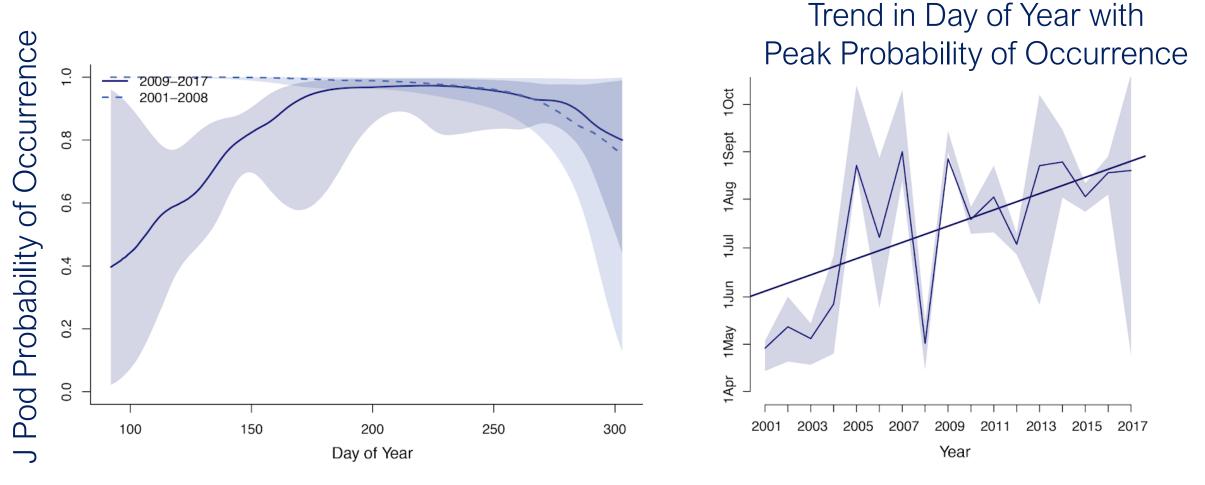
Response variables: SRKW sightings

Predictors: Day of year (spline) Year, marine area (random effects)

SRKWs are arriving later in the Central Salish Sea

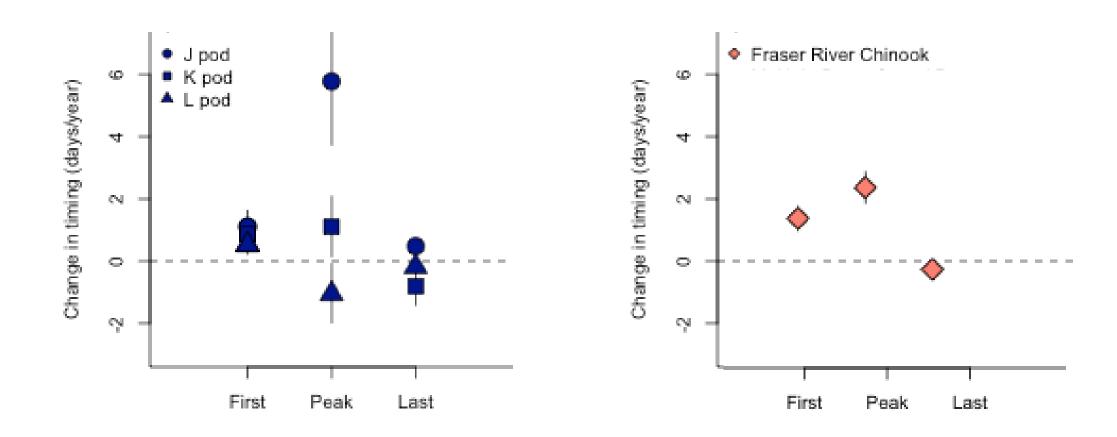


SRKWs are arriving later in the Central Salish Sea



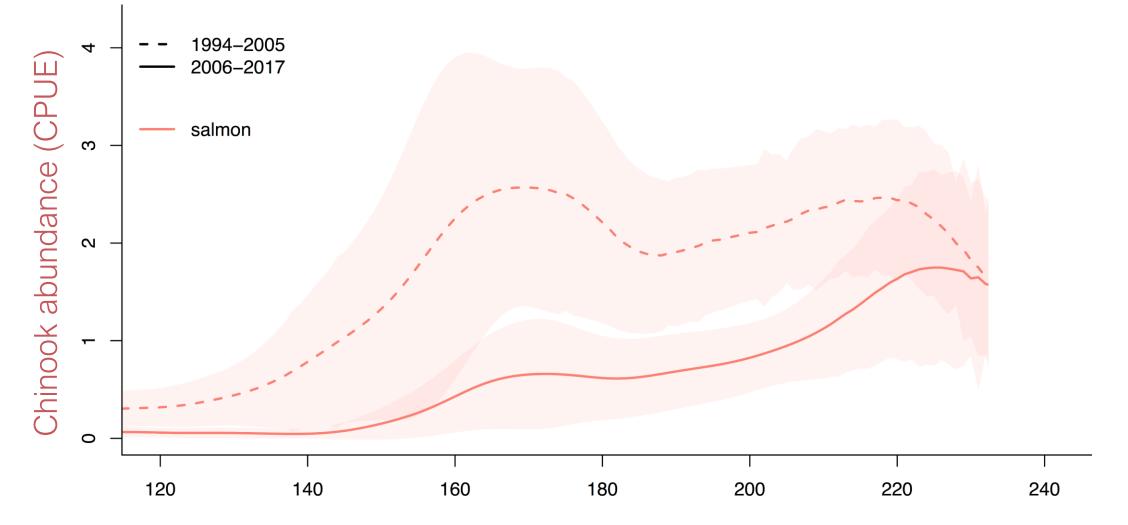


SRKWs are arriving later in the Central Salish Sea





Chinook abundance and timing have shifted in the Fraser River:



Day of Year

SRKW activity is affected by other things

- Ecosystem changes
- Behavioral/social changes
- Vessel traffic and noise





Summary and implications

- SRKW activity has shifted later at Lime Kiln Point State Park and the broader Central Salish Sea Region
- These shifts are consistent with shifts in their prey (Fraser River Chinook), and vary across pods
- SRKWs appear able to track shifts in their prey
- Proposed management to help SRKWs should incorporate phenology



Thank you!

Ailene Ettinger Quantitative Ecologist ailene.ettinger@tnc.org

