

Shifts in Orca Phenology and their Prey in the Salish Sea

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Background

1. Southern resident killer whales (SRKWs) are a threatened population, recieved much scientific and public attention.
2. SRKWs use of the Salish Sea varies seasonally across two broad areas: the upper Salish Sea (north of Admiralty Inlet, reference Map).
3. Efforts are underway to alter hatchery production to benefit orca whales, because one of the threats facing SRKWs is thought to be lack of prey. We know that SRKWs forage on chinook salmon as a primary food source (cite hanson papers), but there are lots of questions about what other species they use and how their prey varies seasonally.
4. SRKW activity is generally thought to be related to finding prey. In recent decades, salmon abundance and phenology has shifted in the Salish Sea (Weinheimer et al., 2017; Reed et al., 2011; Ford et al., 2006)(add Nelson for chinook hatchery release timing, others for abundance data), though rates vary by species and location. We would therefore expect SRKW phenology to have shifted during this time, if prey is a primary driver of their activity in the Salish Sea.
5. SRKWs may be spending more time in Puget Sound (Olson et al., 2018). However, the details are unclear because monitoring effort has also increased duiring this time. Understanding how SRKW activity varies seasonally and how these seasonal patterns have shifted in recent decades will allow us to develop and test hypotheses about potential drivers of these shifts, which in turn will provide information that may be useful for management decision-making to conserve SRKWs.
6. Altenratively/additionally: could make this more explicitly about changes in effort/presence-only database and citizen science.

Research Questions

Here, we ask:

1. Has the timing of SRKW activity (phenology) shifted in the upper Salish Sea and/or Puget Sound? (First observation date, Last observation date, number of days observed)
2. If there have been phenological shifts in SRKW activity, do these shifts coincide with shifts in phenology or abundance of their prey (chinook, coho, chum salmon)?

Methods

1. Data

- (a) Orca Master Database for Whale Sighting Data (Whale Museum 1978-2017).
 - (b) WDFW adult salmon return data for coho, chum, chinook in XX streams
 - (c) Alternatively, may use RMIS data for coho, chum, chinook.
2. Analysis
- (a) Linear regression to identify trends over time for all SRKWs and for salmon adult migration timing.
 - (b) Simulation to investigate extent to which changes in effort may explain trends.
 - (c) Pod-specific occupancy models that incorporate effort to estimate detectability separately from presence/absence.

Results

Discussion

Conclusion

Figures

1. 3-paneled figure with the following panels:
 - (a) Map of Salish Sea showing 2 seasons and habitat use areas.
 - (b) Observations in Puget Sound (fall/winter)
 - (c) Observations in the upper salish sea (spring/summer)
2. Trends in first and last observation dates of whales in upper Salish Sea (summer habitat) and south Puget Sound (winter habitat)

References

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