

Name and professional address:

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Project title:

Application of the emerging field of Conservation Paleobiology to uncover baselines for Olympia oyster restoration

Brief description and significance of research results, including abstract

My project titled “*Application of the emerging field of Conservation Paleobiology to uncover baselines for Olympia oyster restoration*” is ongoing but all the data has been collected and the field work and lab work have been finalized. Some analysis and the writing of a manuscript are in progress. In terms of the findings to date, I obtained archeological and fossil shells from three populations (Fig. 1A): the archeological shells are from Sequim Bay, WA (n = 49), the Holocene fossil shells from Lynch Cove, WA (n = 338), and Pleistocene shells from Bay Center, WA (n = 256, Fig. 1B). I measured shell height for all oysters from the three populations (Fig. 1C) and sent 20 shells (10 from Sequim Bay and 10 from Lynch Cove, Fig. 1D) for radiocarbon dating. The shells from Bay Center have been dated with AAR and the estimated ages are between 100-125K (Kvenvolden et al. 1979). For the isotope and trace metal analysis, I collaborated with two students that processed and prepared the samples. For the oxygen isotopes, we found that the mean $\delta^{18}\text{O}$ values of *O. lurida* fossil samples range from -3.77260‰ to -2.64900‰, while previously estimated values for *O. lurida* shells collected in Spring 2013 have a mean $\delta^{18}\text{O}$ value of -1.86675‰. For trace metals, we used ICP-MS to measure the concentration of 13 trace elements in the archeological population, the Holocene population and a modern population. The element concentrations obtained did not indicate an increase in metal contaminants between the archeological and modern samples consistent with sewage and other anthropogenic effects. An interesting finding was that Ba and Ba/Ca ratios suggest archeological oysters experienced more upwelling than the fossil and the modern oysters.

Some additional incidental observations we made while processing the samples include the presence of traces by shell-boring polychaetes of the genus *Polydora* and related. This observation was the start of a new project where I’m now integrating findings from the isotopes, trace metals and radiocarbon work with the prevalence of these polychaetes over time to better understand the past of this interaction. Finally, in terms of the significance of this work, I already shared my preliminary findings with local Washington Tribes that are restoring the native oysters, as well as non-profit organizations that collaborate with NOAA and state government agencies such as WDFW to implement and incorporate some of findings to the WDFW Native Oyster Restoration Plan and ongoing monitoring of restoration projects of some Washington State Tribes.

1. Figures and references

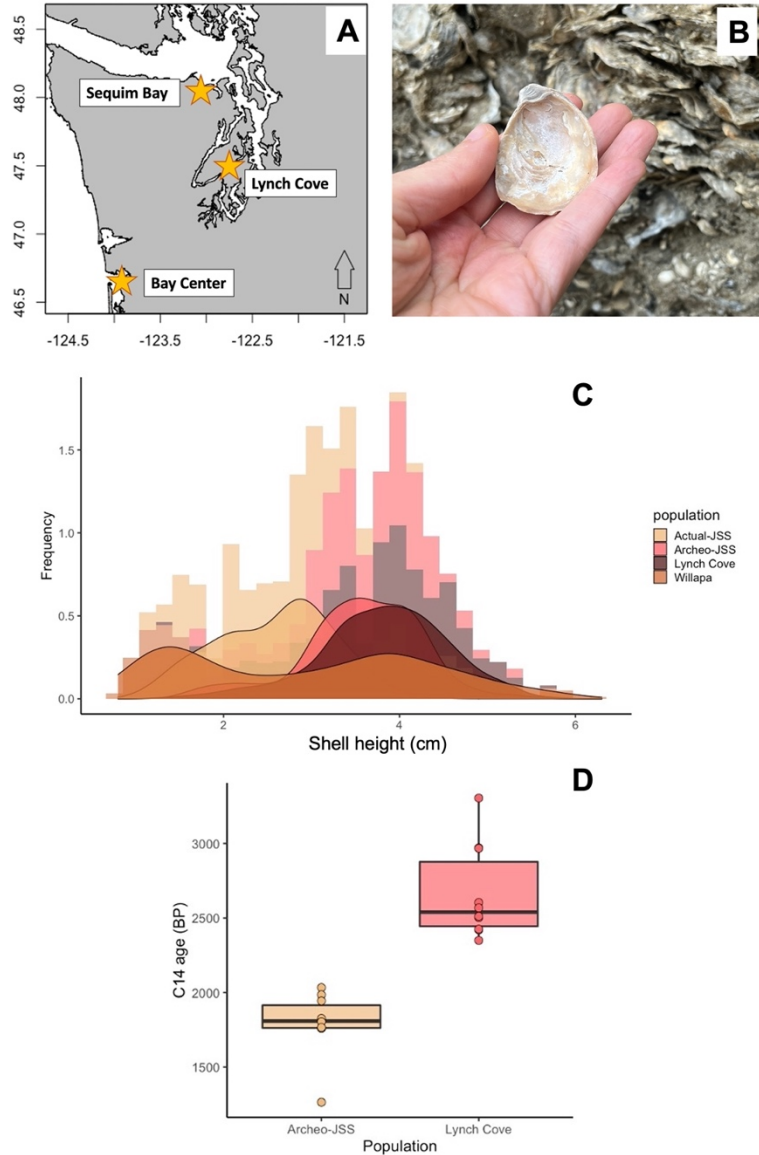


Figure 1. (A) Sites in Washington State where oysters were collected, (B) *Ostrea lurida* shell in Bay Center, Washington, (C) Frequency of shell height values for the different populations (legend to the right of the plot, Willapa = Bay Center). The image is an overlaid plot of a histogram and a density plot, (D) Radiocarbon ages estimated for the archeological population and the fossil population from Lynch Cove. These dates need to be corrected for delta R.

Reference:

Kvenvolden KA, Blunt DJ & Clifton HE (1979) Amino-acid racemization in Quaternary shell deposits at Willapa Bay, Washington. *Geochimica et Cosmochimica Acta*, 43: 1505-1520.

Presentations and publications resulting from the QRC Grant

I presented preliminary results on these findings in two instances:

- 1) August 19th: Online presentation for the Natural Resources Committee of the Jamestown S’Klallam Tribe (Sequim, WA) who are stakeholders and collaborators of this project.
- 2) August 25th: Online presentation for restoration practitioners and managers from the Washington Department of Fish and Wildlife, the Puget Sound Restoration Fund, Washington Sea Grant, the Swinomish Tribe, the Nisqually Tribe, local Washington shellfish growers that value Olympia oysters and are involved in restoration and decision-making processes.

Research budget

Item	Partner Lab	Budget estimate	Actual cost
Trace metal analyses	TraceLab, University of Washington	\$1098 per day, estimated 3 days for 20 samples: \$ 3294	\$ 1187
Radiocarbon dating	AminoAcid Geochronology Lab, Northern Arizona University	\$110 per sample, estimated for 10 shells: \$ 1100	\$ 3840
Oxygen Isotope analyses	IsoLab, University of Washington	\$18 per sample, estimated for 3 replicates for 20 shells: \$ 1080	\$ 496