

**Recovery of the native *Olympia* oyster, *Ostrea lurida*, in Northern Puget Sound:
measuring the larval import to and export from a restored subpopulation (R/HCE-8)**

PI: Bonnie Becker (University of Washington Tacoma, UW Tacoma) Co-PIs: Henry Carson (WA Department of Fish and Wildlife, WDFW); Marco Hatch/Andres Quesada (Northwest Indian College, NWIC); Brian Allen (Puget Sound Restoration Fund, PSRF); Brent Vadopalas (UW School of Aquatic and Fishery Sciences, SAFS); Betsy Peabody (PSRF)

This narrative describes the progress of the project from February 1, 2016 through January 31, 2017. In our first year, we completed all field work and began processing samples. This year, was spent in the laboratory, quantifying ecological samples, preparing samples for elemental fingerprinting, creating laser-ablation analysis methods, and beginning to analyze our samples. We also submitted our first peer-reviewed paper that resulted from this work, and had solid education and outreach efforts. Note that we have been given an extension on this work and have one more year to complete the analysis.

Further detail is given below, organized by goals outlined in our original proposal.

Research Goals

Goal A. Creating spatial reference signatures by conducting surveys of brooded larvae around the Puget Sound

During the summer of 2015, our research team completed field sampling of over 14,000 oysters, and collected shelled larvae from over 100 individuals. This year we completed our analysis of the samples, and are very close to having a complete data set of the early life history (brood, larvae, and settlers) of *Olympia* oysters at our two main sites. We are analyzing these ecological data for publication in year 3.

In addition to quantifying the samples, they have been processed at the clean lab of the UW Tacoma Center for Urban Waters for chemical analysis. We developed our chemical methods using LA-ICP-MS and have begun to run our actual samples. This work was done by UW Tacoma students, WDFW Staff, and Brian Rusk from the Department of Geology at WWU, as explained in our year 1 report. Unfortunately, the LA-ICP-MS was out of service for six months during this year, significantly delaying our progress. We are planning to complete the analysis by the end of the fall of 2017.

In the past, we have had to sacrifice adults to check for brooding. Due to the large numbers of oysters we needed to sample, we used a non-lethal sampling method, originally developed by students in Steven Robert's lab at SAFS but further refined by our team. This year we completed a manuscript on this technique and submitted it for publication.

Goal B: Characterizing provenance of planktonic larvae based on reference signatures.

Planktonic larval samples were collected by pump at the two focus sites (Fidalgo Bay and Dyes Inlet) every other week throughout the summer of 2015. Larval samples for trace elemental fingerprinting have been hand sorted using visual identification methods by UW Tacoma

students and volunteers. This work is almost complete. The samples have been further analyzed using quantitative PCR for species validation purposes with results pending. The planktonic larval samples will be processed using similar methods as developed for brooding larvae for analysis at WWU as described above.

Goal C: Assigning settlers to reference signatures to assign them to a place of origin.

Settler samples were collected from the two focus sites every other week throughout the summer of 2015. Settlers were quantified by visual identification methods by NWIC staff and students in year 1. Cleaning for trace metal analysis was completed this year, and will be analyzed in year 3 with the other field samples.

In sum, we are on track to complete our research goals by the end of year 3, with additional time for analysis and writing of publications.

Education and Outreach Goals

Goal D: Training American Indian and non-traditional students in scientific methods to prepare them for careers in applied marine ecology.

This work involves students at multiple levels and institutions. Megan Hintz is working towards her MS degree from SAFS with this study as her thesis project. Ms. Hintz was a first-generation college student who graduated with a BS in Environmental Science from UW Tacoma in 2014. She originally worked as a technician on this project (funded through matching funds) until beginning at SAFS in fall 2015. She has already presented some of her work at a number of conferences in year 2. In our original proposal, we anticipated that a new MS degree at UW Tacoma would start at this time, but it was postponed due to budget constraints. Instead, Ms. Hintz is attending SAFS with Drs. Becker and Roberts as co-chairs. Since SAFS requires six quarters of funding, we were granted an extension of our funding to cover her tuition and stipend through spring 2017.

At UW Tacoma, seven undergraduate students have worked on this project over both years, with two continuing into year 2. Five of these students are first generation college students. They come from a diversity of backgrounds, including a Pacific Islander, students of Chinese- and Filipino-American descent, and two first generation immigrants from Vietnam. They have presented their work in local and regional venues. Of the five students that have already graduated, three have found employment (with a private marine ecology consulting firm, a government environmental agency, and with Tacoma Public Schools) and two are in pharmacy school at WSU. In addition, one high school student participated in this work, and presented a resulting poster at a regional and state science fair; she placed first in her category and was awarded a college scholarship as a result. She declined that scholarship and has been accepted to and has committed to attending University of Washington in fall 2017. She plans to pursue the proposed UW Marine Biology major.

An American Indian student from NWIC has participated in this project from the beginning. He completed his capstone looking at oyster settlement and has presented his work in a number of venues including the Salish Sea Ecosystem Conference in year 2. He graduated in 2016 with a BS in Native Environmental Science and participated in an REU program at Shannon Point Marine Station last summer. In fall, he started an MS program in Environmental Science at Western Washington University.

Goal E: Educating coastal landowners and the general public on the importance of native oyster restoration and stewardship of nearshore habitats, and about the importance of connectivity in preserving and restoring Puget Sound

We reached out to the public in a number of ways this year. A PSRF-created field guide to Olympia oysters and production was partially funded with this grant. PSRF has distributed 48 of the field guides with Sea Grant funding. Three associated workshops, including a field component, were completed, two in Kitsap County (April 2 and 9) and one at the Northwest Indian College (April 25) with a total of 48 participants. This included beach naturalists from the Poulsbo and Seabeck areas.

UW Tacoma staff gave a number of public talks about this work this year, including through Washington History Museum Scholarly Selections and UW Tacoma venues. Many conference talks were given, as outlined in the report. In addition, a webpage that includes blog posts about this work, including contributions from students, has received over 7000 hits and a corresponding YouTube channel has over 2200 views.