2015 Autumn UWaTERS

STUDENT ABSTRACTS

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Monitoring Plastic Debris in Marine Sediments in Puget Sound: Preliminary Study
Ren-Chieh Chang, Ashley Fowler, Julie Masura (mentor), and Cheryl Greengrove (mentor)

Plastic marine debris is a growing concern due to its durability in the ocean environment and the variety of potential impacts on marine organisms. Characterization of plastic debris is approached via size as macroplastics (> 5mm), microplastics (5-0.330mm), and nanoplastics (<0.330mm), and location as in surface waters, within the water column, on beaches, and among seafloor sediments. Sediments are known to be a sink, although rigorous studies are generally lacking. This is a preliminary look at the volume and spatial distribution of plastics in sediments from the Puget Sound. In collaboration with the Washington State Department of Ecology's, Marine Sediment Monitoring Team (MSMT) and the Puget Sound Ecosystem Monitoring Program (PSEMP), ten samples were processed to establish a baseline to determine the concentrations of plastics in marine benthic communities and work to deepen our understanding of the impacts of plastic debris on marine ecosystems throughout the Pacific Northwest.

Oviposition Behavior Observed in *Drosophila suzukii*
Danika Davis and Jeremy Davis (mentor)

The invasive species of fruit fly, *Drosophila suzukii* has become a worldwide nuisance. This experiment tested two situational preferences for egg laying by *Drosophila suzukii*. Based on volatile experiments, I predicted increased oviposition in berries near leaves. The experiment was carried out utilizing glass fish tanks. 3 females occupied each tank and were given the choice to lay eggs in berries placed close to a respiring leaf or in berries placed 1.5 feet away. Environmental controls include light, room temperature and food availability over a 24-48 hour period. Eggs were counted for both leaf proximities. Flies showed a non-significant preference for berries further from leaves ($f=0.00$, $df=1, 8$ and $p=0.991$). The experiment also utilized solid and clear containers to run a no-choice assay testing the influence of light on oviposition. The results revealed a significant influence ($f=36.761$, $df=1,8$ and $p=0.00$). The results indicate that leaf volatiles may not play the role in *Drosophila suzukii* oviposition that has been previously speculated.

Does soil inoculation increase mycorrhizal diversity of Douglas-fir *(Pseudotsuga menziesii)* for restoration of the Elwha Dam site?
Lisa Hamaker, Pedro Mendoza, and Erica Cline (mentor)

Elwha River, located near Port Angeles, Washington on the Olympic Peninsula, empties into Juan de Fuca. In 1910, a dam was built which excluded salmon migration. Its removal in 2014 allowed salmon to return but as water rushed downstream, massive amounts of nutrient-poor sediment was deposited. This raised challenges for re-vegetation. Ectomychorrizal fungi (EMF) are known to facilitate the uptake of nutrients and water helping in seedling establishment, survival and growth. Choosing a tree species common to the area, Douglas-fir (*Pseudotsuga menziesii)* seedlings were planted in either nursery potting soil (control) or from the local forest

soil (inoculated). EMF species were identified by morphology, PCR (ITS-1F and ITS-4 primers), and sequence analysis using published fungal sequences and BLAST algorithm. Soil inoculation had no effect on EMF diversity and percent colonization and suggests that inoculation using mature forest soils is not an effective practice for Douglas-fir seedling preparation for restoration projects.

Historical Abundance of the Harmful Dinoflagellate *Alexandrium catenella* in Quartermaster Harbor Sediment

Alison-Marie Johnson and Julie Masura (mentor)

Alexandrium catenella is a dinoflagellate which produces saxitoxin and is responsible for paralytic shellfish poisoning (PSP). Due to the possibility of PSP and potential economic impacts, the presence of *A. catenella* is regularly monitored in Puget Sound waters and shellfish. The purpose of this study is to determine the historical distribution of *A. catenella* within Quartermaster Harbor; a harbor with low flushing rates due to is geographical orientation. A sediment core was collected form Quartermaster Harbor; sections were processed and stained with Primulin before being analyzed using epifluorescence under a microscope. *A. catenella* showed a rapid decrease in cyst density with increasing core depth before completely disappearing. These results suggest *A. catenella* was not present in the Puget Sound in the past and since introduction has established successful populations. Using ^{210}Pb analysis and sedimentation rates, we will gain a better understanding of precisely when *A. catenella* arrived in Quartermaster Harbor.

Assessment of the Microbial Community in Newaukum Creek

Katrina Ledig, David Hirschberg (mentor) and Andy James (mentor)

Over the summer of 2015, I worked to develop new protocols and extraction procedures for the assessment of the microbial community in Newaukum Creek. We used the Pathomap/Metasub protocols as a basis and built our own protocols. The ultimate goal of the project was to build a microbial library of bacteria found in the Pacific Northwest and build a lab at Univerity of Washington, Tacoma. My contribution to the project was to go to Newaukum Creek and take water samples at five locations. These samples were paired with King County's samples and the Center for Urban Waters did a chemical analysis. We collected samples and extracted DNA from the samples. These samples were run through the Qubit to establish the known presence of DNA. Though the pilot test did not yield DNA, we were able to establish the need for a change in protocol in collecting the DNA, and are continuing to modify and test the protocol for effectiveness.

Supplementation and Habitat Impacts on Wild Hood Canal Steelhead Populations

Ashley Loudermilk, Erik McDonald (mentor), Madison Benson and Brittany Eisel

Puget Sound steelhead populations once ranged from 325,000 to 800,000. Factors such as human influence and environmental change have caused populations to decline to

approximately 13,000. Fish hatcheries have long been used to supplement depressed populations, though traditional hatchery practices have proven detrimental to wild populations. For this reason, a unique approach is being considered to reestablish wild populations. Screw traps were used to capture steelhead smolt from two controlled streams (Tahuya and Little Quilcene), and one supplemented stream (Dewato) within the Hood Canal. Stream habitat, a contributing factor in populations, was also characterized within different sections (upper, middle, lower) of each stream. This study aims to uncover any correlation within the wild steelhead populations that inhabit said streams. Increased smolt populations were seen within all three streams, the Dewato having the greatest. Of the three streams the Dewato was also found to contain more favorable habitat characteristics.

Composting yard waste in UWT Giving Garden serves as an opportunity to educate public
Danny Luong and Kim Davenport (mentor)

Compost has been described as a key ingredient in soil vitality. In recent years, farming practices have demonstrated that when organic matter has been broken down and converted into fertilizer, plant growth increases due to the added nutrients in the soil. The application of composting serves as a sustainable model to address the increase in population size the planet is anticipated to carry, which invariably correlates to waste production - a portion of which can be recycled. In the wake of campus-wide composting on several academic institutions including the University of Washington Tacoma (UWT), it becomes increasing important that students understand which types of waste qualifies as compostable and what is involved in the decomposition process so that they can make informed decisions about how waste is disposed. This was the intent behind the construction of a three-unit compost bin for the Giving Garden at UWT involved in this project.

Tracking Growth of Olympia Oyster Larvae and Testing Doping Techniques
Jared Mosier, Brittany Eisel, Megan Hintz, and Bonnie Becker (mentor)

The Olympia oyster plays an important role in the ecosystems in which it lives by creating habitat, filtering water, and its role in the food web. Unsustainable harvesting practices nearly wiped out wild populations. In this study we studied the growth of Olympia oyster larvae from Port Gamble and South Sound, which are thought to have different growth rates, by periodically measuring larvae. We also investigated a method for doping brooding adults to remove their larvae that doesn't result in death to the adult. A significant difference was found between Port Gamble and South Sound larvae sizes at time of release and after 1 month. This information will help Olympia oyster recovery because the population with the fastest growth will result in a better chance of survival and can be raised more quickly. The recovery of native oysters will be necessary for restoring the marine ecosystems of Puget Sound.

Heavy Metals Uptake in Mushrooms Harvested in Western Washington
Bryan Moxcey and Erica Cline (mentor)

The Puget Sound region of Washington State has seen increasing levels of heavy metal contaminants, due mostly to anthropogenic pollution. Large amounts of these toxic heavy metals end up in forests and parks, where fungi such as mushrooms absorb them. Many edible species of mushrooms collected by the general public for human consumption are known to uptake some of these toxic metals in varying quantities. Studies have shown that concentrations of toxic heavy metals uptake can vary by location and species. Concern for unsafe levels of heavy metals in edibles has prompted local groups to push for the testing of metal concentrations absorbed by local mushrooms. This study, with the assistance of the Puget Sound Mycological Society, gathered edible mushrooms from various locations throughout Western Washington and tested for the concentrations of the following: arsenic, silver, cadmium, copper, lead, zinc and selenium. Results will determine the public's exposure to toxic metals through mushrooms.

Nutrient Sources in Eutrophic Waughop Lake, Pierce County, WA
Rebecca Rigg, Corey King and Jim Gawel (mentor)

Waughop Lake, located in Lakewood, Washington, has been affected by significant past and present human influences resulting in the eutrophic status of the lake today. Eutrophication is the process of increased nutrient flow into an aquatic system, either by natural or human interference. It can lead to increased plant growth, large algal blooms and anoxic conditions that kill fish and other aquatic life. Though groundwater and waterfowl were originally inferenced to be the greatest source of nutrient flow into the lake, incongruities between regional groundwater data and a completed hydrologic model of the lake indicate that dissolution from the sediment may be the greatest source, with approximately $1.2x10^4$ kg of total phosphorus and $2.2x10^4$ kg of total nitrogen entering the system through the sediment. Though reduction of external nutrients should continue, the focus of restoration for this system should primarily be the lake sediment itself.

Aggregation preferences in the Spotted Wing Drosophila
Iain Robertson and Jeremy Davis (mentor)

The Spotted Wing Drosophila (*Drosophila suzukii)* is an invasive pest of small fruit, which causes millions of damage to berry crops on the west coast. Little research has been done on the aggregation choices of the SWD which we sought to elucidate. Aggregation choices were tested using varied berry sizes and presence of males. We found that flies in all trials exhibit aggregated egg laying regardless of egg size, with male presence significantly increasing aggregation scores. We also found that the SWD preferred to lay eggs into larger berries, regardless of male presence. This research provides additional knowledge into the lifestyle and reproductive preferences of *D. suzukii*, which may aid in future pest control projects.

Native Species at the University of Washington Giving Garden

Viktoria Rush and Erica Cline (mentor)

Native plants are an important element of the Pacific Northwest's natural heritage. These plants provide food and shelter for other organisms, offer insights into past and present natural processes, and provide us with comfort and enjoyment. There are numerous native species that have been used by Native American tribes in this area for many years. The goal of this education project is to create a demonstration native plant garden, and to educate and allow the public to experience the aesthetic as well as practical attributes of these plants. I have designed interpretive signs to provide public education about indigenous names and historic and current uses of native plants, and will design a plan for planting of additional native plants within the Giving Garden. Interpretive signs will include the common name, scientific name, Native American name, and practical uses. With the completion of this project, the Tacoma community near the Giving Garden will have access to not only educational information on numerous types of plants but will be given the opportunity to harvest the edible native species as well.

Occurrence of Perfluorinated Compounds (PFCs) in Mussels from Puget Sound, Washington

Solomiya Tsvan and Joyce Dinglasan-Panlilio (mentor)

Perfluorinated chemicals (PFCs) are organofluorine compounds that vary in their long nonpolar chains. They are consumed by fat-soluble mussels and used as bio-indicators for the exposure of these harmful compounds. In this study, mussels were collected from Puget Sound, Pacific Ocean to test the levels of PFCs in fresh water. The mussels were extracted by solid-liquid extraction followed by Gas Chromatography-Mass Spectrometry (GC-MS). Two different experiments were done based on Fernandez-Sanjuan et al. study and So M et al. study. The results had higher percent recovery based on Fernandez-Sanjuan et al. study (method 1) with acetonitrile rather than methanol in So M et al. experiment (method 2). The percent recovery for Experiment 1 varied from 13.93-107.70% compared to So M. et al.; where levels were not detected in the GC-MS. Method 1 was repeated for experiment 2 and 3, with percent recovery at 20.08-112.68% and 15.46-156.77% respectively.