



# Undergraduate Research Symposium May 17, 2019 Mary Gates Hall

## Online Proceedings

### POSTER SESSION 1

Commons East, Easel 54

11:00 AM to 1:00 PM

#### **Arbuscular Mycorrhizal Fungi across Multiple Saltmarsh Plant Species in Mitigating the Impacts of Climate Change Induced Sea-Level Rise**

*Rayna Koberstein, Senior, Environmental Studies, Portland State University*

*McNair Scholar*

*Mentor: Catherine de Rivera, Environmental Science & Management, Portland State University*

The impacts of climate change may be partially ameliorated by positive interactions among species, such as native plants and arbuscular mycorrhizal fungi (AMF). Sea level rise caused by climate change will detrimentally impact saltmarsh habitats by increasing the elevation and rate of terrestrial salt water inundation, thereby reducing effective functionality of ecosystem services provided by saltmarshes. Facilitations, positive interactions between species, is key in determining which species can survive in habitats characterized by abiotic stress, such as salt marshes. Halophytic plants within salt marshes can benefit from symbiotic AMF facilitations through increased inundation tolerance, greater nutrient availability and uptake, and relief from saline stress. This study identifies the presence of AMF across multiple saltmarsh plant species and measures the impacts of AMF within Oregon's Salmon River Estuary at Cascade Head. I have extracted samples from four monoculture plots within high and low marsh elevations across four species that grow at both elevations: jaumea (*Jaumea carnosa*), Lyngbye's sedge (*Carex lyngbyei*), pickleweed (*Salicornia virginica*) and salt grass (*Distichlis spicata*). I have centrifuged soil samples from each plant, and calculated AMF spore abundance at each sample location. I am also processing soil samples for percent water in the sediment, soil salinity and pH. Additional samples from both elevations within polyculture plots have been collected to develop a secondary index to cross-reference my primary findings. Through this research, land managers developing sea-level rise mitigation plans will have data supporting which plants will be most resilient to sea level rise. Potential inoculation of host plants could protect estuaries from sea level rise and increased frequency and intensity of storm events in coastal regions. In identifying plants which host beneficial AMF, fungal inoculation of plants in marshes

could help plants grow further into lower marsh elevations, increasing sediment accretion and decreasing erosion and soil degradation.

### SESSION 2D

#### **BIOLOGICAL RESPONSES TO ENVIRONMENTAL FACTORS**

*Session Moderator: Frieda B. Taub, Aquatic & Fishery Science*

**MGH 234**

3:30 PM to 5:15 PM

\* Note: Titles in order of presentation.

#### **Melastomataceae Diversity and Abundance along an Elevational Gradient of an Andean Ecological Corridor**

*Grant Gallaher, Junior, Environmental Studies, Biology, Whitman College*

*Mentor: Lou Jost*

I present a baseline assessment of the plant family Melastomataceae along an elevational gradient of the Llanganates-Sangay ecological corridor in central Ecuador. Conservation efforts within this corridor aim to preserve the high levels of diversity and endemism present in the region. Melastomataceae, as the third most diverse plant family in Ecuador, contributes valuable biodiversity, biomass, and ecological services to the ecosystems of this corridor. On Cerro Mayor-domo (max elevation: 3,383 m), 300 m transects were established at four different elevations, and six 5x5 m plots were assessed along each transect (600 m<sup>2</sup> assessed total). All melastome species encountered in plots were grouped and counted based on morphological characteristics. My findings reveal a positive correlation of melastome diversity and abundance with elevation up to 2,500 meters. At 3,000 meters, species diversity decreases sharply, but total abundance remains high. Jaccard, Sorenson, and Morisita-Horn similarity indices indicate dramatic changes in melastome community composition over even slight differences in elevation. Eighteen species of flowering melastomes belonging to four genera were found, revealing a subset of the family's astounding diversity in this region. The results of my study will be used to inform future conservation efforts and ecological studies in this incredibly unique and important Andean corridor.

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## SESSION 2D

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#### **Interactions Of Heavy Metals, Water Chemistry, And Anthropogenic Activity With Marine Mammal Populations In The Snohomish River Estuary: A Study Of The Whidbey Basin**

*Elizabeth Lee, Sophomore, Environmental Studies, Everett Community College*

*Mentor: Kylie Rexroat, Ocean Research College Academy, Everett Community College*

*Mentor: Katherine Dye, Everett Community College*

*Mentor: Robin Araniva, Life Sciences, Everett Community College*

The Snohomish River estuary serves as a conjoined and bio-diverse body of water in Everett, WA, with influence from the freshwater Snohomish River and saltwater from the Pacific Ocean flowing through the Strait of Juan de Fuca into the Possession Sound. Factors of water chemistry and heavy metals, residing in sediment and influenced by surrounding anthropogenic activity, contribute to the estuary ecosystem and support various trophic levels of marine life. This study observes temperature, salinity, pH, and chlorophyll in the water column, and lead, copper, zinc, and mercury in sediment from 2009 to 2018 at three sites with differing proximity to the Snohomish River: MBT, Buoy, and Everett Marina. The parameters were analyzed through boat-based research and Sea-Bird CTD data collected by the Ocean Research College Academy (ORCA) with funding from the National Science Foundation and in partnership with the University of Washington, Gravity Marine Consulting, and the State Department of Ecology. Longitudinal research at ORCA allows students to monitor marine mammal abundance, including sightings of harbor seals, California sea lions, gray whales and harbor porpoise. This investigation is motivated by potential connections between water quality parameters and the abundance of marine mammals. Results indicate heavy metal levels at Buoy reached a maximum in 2011 with mercury, copper, lead and zinc metals averaging 0.05 mg/kg, 29.73 mg/kg, 7.03 mg/kg, and 54.33 mg/kg, respectively; however, average zinc levels were highest at approximately 55.60 mg/kg in 2016. Comparably, MBT heavy metal concentrations were lower and demonstrated greater variability. In 2018, Everett Marina salinity levels show more fluctuation than MBT, while chlorophyll had a max of approximately 46.4 ug/L at MBT.

Gray whales that return to Possession Sound to feed on benthic organisms are potentially impacted by these conditions.

## POSTER SESSION 4

**Commons East, Easel 50**

*4:00 PM to 6:00 PM*

#### **Is Table Salt a Viable Alternative for the Control of Burrowing Shrimp on Shellfish Beds in Washington State?**

*Kylie Sahota, Junior, Aquatic & Fishery Sciences*

*NASA Space Grant Scholar, UW Honors Program*

*Eric R. Anderson, Junior, Environmental Science & Resource Management*

*William Gaege Baxter, Junior, Environmental Science & Resource Management*

*Rose Ann Denney, Senior, Environmental Science & Resource Management (Wildlife Conservation)*

*Victoria S. (Victoria) Fleck, Junior, Environmental Science & Resource Management (Landscape Ecology & Conservation), History*

*Isabela Sofia Garcia, Senior, Environmental Science & Resource Management (Wildlife Conservation)*

*Raegan E. Jarvis, Junior, Aquatic & Fishery Sciences*

*Claire Louise Johnston, Junior, Environmental Science & Resource Management*

*Claudia R. Penney, Sophomore, Aquatic & Fishery Sciences, Marine Biology*

*Allison Phillips, Junior, Environmental Science & Resource Management*

*Iona Mae Rohan, Senior, Environmental Science & Resource Management (Wildlife Conservation)*

*Gushneet Singh Sarna, Senior, Environmental Science & Resource Management*

*Jonathan L. (Jon) Schroeder, Junior, Aquatic & Fishery Sciences*

*Zach Thomas, Junior, Aquatic & Fishery Sciences, Spanish*

*Ariana Winkler, Senior, Environmental Studies, Environmental Science & Resource Management*

*UW Honors Program*

*Mentor: Christian Grue, Aquatic & Fishery Sciences*

Imidacloprid (IMI), a neonicotinoid insecticide, is being sought by shellfish growers to control burrowing shrimp (ghost shrimp, *Neotropea californiensis*) in Willapa Bay and Grays Harbor, Washington. The shrimp destabilize sediments resulting in poor survival and low yields of the commercially harvested Pacific oyster (*Crassostrea gigas*), threatening the local shellfish industry. A permit for the use of IMI has been denied by the State, Pacific County has declared an economic emergency, and the outcome of an appeal by the growers remains uncertain. We have undertaken studies to determine if un-iodized table salt may be an alternative to IMI, specifically targeting juvenile shrimp (recruits) inhabiting the upper

10-15 cm of the sediment. Studies in 2018 indicated that a 2-3-fold increase in salinity resulted in 100% mortality when juveniles were exposed in artificial seawater. In 2019, we exposed juveniles (3 replicates, 5 shrimp each) within 10 cm of native sediment to five different salt solutions to achieve sediment pore water salinities of 25 (ambient, control), 35, 50, 70, and 100 ppt. Salt solutions were prepared with native seawater, added on top of the sediment (depth = 2 cm), and allowed to percolate through the sediment column for 6 h (low tide). At 6 h, 2 cm of ambient seawater (25 ppt) were added to simulate tidal inundation and allowed to remain on the surface for 12 h (low-high + high low tide) with two subsequent drawdowns and tidal inundations at 25 ppt (total test duration = 48 h). The sediment was then sieved to remove the shrimp and determine mortality. Average survival of controls (25 ppt) was 73.3% whereas none of the shrimp exposed to elevated salinities survived. Additional tests are underway to examine different exposure scenarios. Results to date suggest table salt may be a viable and greener alternative to IMI.

include food truck operators, waste management contractors, food donation organizations, and customers. Findings from this research will be used to inform key recommendations to the City of Bellevue as well as the creation of a deliverable to be provided to food truck operators such as a map, infographic, brochure, etc. The goal of this research is not only to improve the sustainability of Bellevue's food trucks but to hopefully serve as a guide for other cities who are looking to incorporate sustainable practices into their own food truck programs.

## POSTER SESSION 4

### Commons West, Easel 6

4:00 PM to 6:00 PM

#### **Food Trucks and Food Waste: Recommendations for the City of Bellevue's Food Truck Permitting Process**

*Samara Danielle (Sam) Kleinfinger, Senior, Environmental Studies*

*UW Honors Program*

*Mentor: Tania Busch Isaksen, DEOHS*

Food trucks in the United States have grown exponentially in the past decade. In many major cities, these mobile kitchens have given entrepreneurs the opportunity to start a business at a relatively low start-up cost, provided consumers with more diverse dining options, and improved the overall quality of life in their communities. However, due to their design, these operations also produce a lot of waste, particularly in regards to plastic packaging and leftover food. The City of Bellevue, a community with a robust food truck culture, is looking to revise its current food truck permitting process and is interested in incorporating a sustainable waste management component. This policy analysis will identify successful existing sustainable food truck practices as well as barriers to these best practices in order to provide sound recommendations to be included in Bellevue's new permitting process. To identify current practices, a framework based off of pre-existing literature will be used to assess successful sustainable food truck operations around the country with the goal of elucidating best-sustainable food truck practices. This formative research will then be used to formulate interview questions about the main barriers to waste prevention, waste reduction, and food rescue for food trucks. Informational interviews will then be conducted with key stakeholders in Bellevue and will