



# Undergraduate Research Symposium May 17, 2019 Mary Gates Hall

## Online Proceedings

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### POSTER SESSION 1

Commons East, Easel 55

11:00 AM to 1:00 PM

#### **Snail Intermediate Host Behavior in Schistosomiasis Transmission**

*Hiruni Thisanka Jayasekera, Senior, Environmental Science & Resource Management*

*UW Honors Program*

*Mentor: Chelsea Wood, Aquatic and Fishery Sciences*

Schistosomiasis is classified as a neglected tropical disease, ranking second only to malaria as the most common parasitic disease in the world. The two species of interest for this project are *Schistosoma haematobium* and *Schistosoma mansoni*, both of which can infect humans who come into contact with infested waters. The disease can manifest in urogenital (*S. haematobium*) or intestinal (*S. mansoni*) forms, leading to a variety of symptoms, including chronic pain, bladder and liver cancer, and – in extreme cases – death. Despite the extremely infective nature of schistosomiasis’ environmental stages and its complex transmission ecology, relatively little has been done to understand the effect of schistosome parasitism on the behaviors on its intermediate snail host. Expanding our understanding of snail behavior is necessary to explain the transmission dynamics of the disease and to reduce rates of human infection. In this research project, I examine snail choice behavior in infected and uninfected snails in a simulated lake habitat, and determine if schistosome infected and uninfected freshwater snails exhibit a difference in aggregation behavior, and where within a simulated pond environment infected and uninfected snails reside. I hypothesize that in a large population, both infected and uninfected snails will aggregate towards infected snails. I also hypothesize that infected snails will tend to linger closer to the surface of the water than uninfected snails and be less likely to quit the water, thus increasing the probability of transmission to a mammalian host. Understanding snail intermediate host behavior in the transmission of schistosomiasis gives us a way to control infection rates from an ecological perspective in addition to the traditional medical perspective.

### POSTER SESSION 1

Commons East, Easel 56

11:00 AM to 1:00 PM

#### **Parasitism in Nearshore and Offshore Herring in the Puget Sound**

*Emily C Oven, Senior, Aquatic & Fishery Sciences*

*Mentor: Chelsea Wood, Aquatic and Fishery Sciences*

*Mentor: Emily Oven*

Forage fish such as Pacific herring, *Clupea pallasii*, are a valuable economic and ecological resource in marine food webs. Forage fish are integral species as they can drive both top-down and bottom-up effects in pelagic marine communities. Understanding population dynamics of herring and other forage fish species is essential to management. Although poorly studied, parasites of forage fish are of particular interest due to their potential effects on population dynamics and ability to predict the presence of anthropogenic contaminants in the environment. The goal of this study is to determine if parasite communities differ in composition and diversity between year-zero herring collected in offshore and nearshore (marina) environments in the Puget Sound. I am performing necropsies on 180 herring collected from 6 Puget Sound sites. I expect to find a greater abundance of parasites that use direct transmission in nearshore herring due to decreased stock mixing, as well as a greater prevalence of certain parasites due to closer proximity to anthropogenic contaminants. Parasites remain understudied in important forage fish like herring; and, this research can be used to understand population dynamics of herring in local marine environments as well as aid in fisheries management.

### POSTER SESSION 1

Commons East, Easel 72

11:00 AM to 1:00 PM

#### **Linking *Clavinema mariae* Abundance to the Diet of English Sole *Parophrys vetulus***

*Abigail Ilene Moosmiller, Senior, Aquatic & Fishery Sciences*

*Mentor: Chelsea Wood, Aquatic and Fishery Sciences*

*Mentor: Evan Fiorenza*

English sole *Parophrys vetulus* is a species of benthic flatfish that is commercially and tribally exploited off the coast of Washington State. The commercial value of English sole can decrease if the fish is infected with parasites, which degrade their appearance and health; in fact, widespread parasitic infection contributed to the closure of the commercial fishery in south Puget Sound in 1948. *Clavinema mariae* is a

trophically transmitted nematode parasite that has increased in abundance by eight-fold since 1930 in Puget Sound. Since *C. mariae* is a nematode that infects hosts via ingestion, I used a diet analysis of English sole to: 1) assess the types of prey that sole consume, and 2) correlate the prey type abundance to *C. mariae* abundance. I evaluated the gut contents of contemporary sole collected in 2017 and historical sole collected over the past 80 years and held in the UW Fish Collection. I categorized gut contents to the lowest taxonomic family. Sole are hypothesized to primarily consume invertebrates, and *C. mariae* is transmitted by copepods, thus we expect copepods to represent a larger portion of the diet in more recently collected, more heavily infected sole. Knowing the type and number of organisms that English sole consume will improve our understanding of how sole interact with the Puget Sound food web; specifically, how they are initially infected with *C. mariae*, which would offer insight to their observed increase in abundance in sole over the past 80 years.

## POSTER SESSION 1

MGH 241, Easel 136

11:00 AM to 1:00 PM

### Using Paper Yarns to Improve Smart Papers and Nanotechnology

*Daniel Nguyen (Daniel) Phung, Senior, Bioresource Science and Engineering*

*UW Honors Program*

*Mentor: Anthony Dichiara, Bioresource Science & Engineering*

For more than 4,000 years, paper has been made from cellulose, the most abundant natural polymer, for the purpose of recording information. With the incorporation of fillers, such as carbon nanotubes (CNTs) and cellulose nanofibers (CNFs), conventional paper can exhibit enhanced strength, electrical conductivity, and high sensitivity to external stimuli (e.g. strain, temperature, humidity. . .), which has a great potential for applications in portable electronics and wearable devices. The present research consists of me spinning one or multiple strips of smart papers into highly robust yarns. I also prepare different strips of dried and wet paper. They are prepared from bleached soft wood pulp and are twisted into densely compacted yarns. I then exam their pore structure and strength properties using analytical methods. Results indicate that paper yarns made out of two strips exhibit the highest tensile strength, while the incorporation of additional strips shows only limited strength improvement. This work is important because it can let us know more about the physical ability of smart papers and nanotechnology and how to improve them in the future using yarn method.

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## SESSION 1B

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### FROM RIVERS TO THE SEA

*Session Moderator: Virginia Armbrust, Oceanography*

**MGH 082A**

12:30 PM to 2:15 PM

\* Note: Titles in order of presentation.

#### Suspend your Disbelief: Variation and Controls on Suspended Sediment Concentration in the Elwha River Nearshore Region

*Anna Weitkamp Boyar, Senior, Oceanography*

*Mary Gates Scholar*

*Mentor: Andrea Ogston, Oceanography*

Suspended sediment in the bottom boundary layer impacts both ecosystems and geomorphology. High concentrations of suspended sediment affect light attenuation, harming benthic plants, and sediment resuspension and transport can affect the distribution and size of sediment on the seafloor. The purpose of this project was to determine the variations and controls on suspended sediment in the Elwha River nearshore region and to find relationships between bed shear velocity and suspended sediment concentration. The 2011 Elwha River dam removal released a large pulse of sediment, giving us the opportunity to study a coastal environment with fine sediment deposits, and varying hydrodynamic conditions. Data collection measured near-bed turbidity and wave conditions, and sediment grab samples were collected to characterize bed conditions. Harmonic tidal analysis was used to predict tidal current velocity. Over the sampling period, on the east side of the river mouth, currents ranging from ~0 to 100 cm/s and wave heights up to 1.0 m were sufficient to resuspend sediment. Suspended sediment concentrations generally ranged from 1.5 to 25 mg/L. In Freshwater Bay, currents ranging from ~0 to 31 cm/s and wave heights up to 0.86 m were not sufficient to resuspend sediment. Instead, fine sediment settled out of the water column, resulting in near-bed sediment concentrations generally ranging from 1 mg/L to 101 mg/L. These findings show how variable the processes controlling sediment in suspension can be in a tidal environment with complex morphology.

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## SESSION 2G

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### LEARNING AND GROWTH IN AND OUT OF THE CLASSROOM

*Session Moderator: Emily Kroshus, Pediatrics/Health Services*

**MGH 248**

3:30 PM to 5:15 PM

\* Note: Titles in order of presentation.

**Hemlock Encroachment in Olympic Peninsula Alpine Meadows: Digitizing the Story of the Marmot**

*Alishia Elizabeth Orloff, Senior, Environmental Science & Resource Management*

*UW Honors Program*

*Mentor: Kristiina Vogt, School of Environmental & Forest Sciences*

Indigenous peoples for generations have been meticulously maintaining and enhancing lands previous to colonial influence. As explorers set eyes on the landscapes of the North America, they mistakenly ascribed these lands as wild. Much to our behold, this was the working of carefully crafted ecological practices based on long established knowledges and understandings about the land. This perspective is rooted in the profound relationship of responsibility the indigenous peoples have developed with their lands. These connections are imperative as we navigate towards an ecologically sound future. Currently we are displaced from nature, deprived of a meaningful relationship with our land. This inextricable linkage of people with the land is a fundamental oversight of current work in conservation. Ecological imperatives are guided by external entities and do not comprehensively weigh holistic perspectives of impacted communities. Decisions on ecological management have been established on limited contextualization and uncomprehensive assumptions of a select few. Acknowledging these shortcomings, we can then reintegrate an engagement with the land into our education and refocus on the individuals that are directly connected to environmental issues. Through the Pipeline project in our Environmental Alternative Spring Break program, I aim to develop a bottom-up methodology that engages with individuals in the community to constructively develop discussions around conservation of the Olympic Marmot. This investigation of land stewardship has substantial implications towards current ecological methodology of land management and environmental engagement.

species such as the zebra mussel (*Dreissena polymorpha*), water pollution, and the construction of dams, which prevent the passage of the host fish necessary for mussel reproduction. Freshwater mussels provide vital ecosystem services by acting as biomonitors of stream health, improving water clarity by filter feeding, and providing microhabitats for other freshwater organisms. The focal species of the study is the federally endangered Higgins eye pearlymussel (*Lampsilis higginsii*) which are found in the Mississippi River and nine of its tributaries, including the Wapsipinicon River. The Wapsipinicon is valuable habitat for Higgins eye due to its lack of zebra mussels, but several dams, now up for removal, have restricted the species to just a few sections of the river. This study compares microhabitat factors and hydraulic parameters at sites with and without Higgins eye pearlymussel populations in five sections of the Wapsipinicon River to determine the habitat requirements of the species. Using GIS, a habitat suitability index was created and potential reintroduction areas in parts of the river that will become accessible following dam removal were mapped. Although the data are limited, there is some indication that Higgins eye prefer sandy substrate at river bottom elevations around 231 meters. All of the sites have significant areas that match this description and could provide habitat for Higgins eye in the future, but more data are necessary to select specific sites and confirm this conclusion. If these inaccessible areas are found to support Higgins eye populations we can encourage dam removals and improve our understanding of a struggling and under researched species.

## POSTER SESSION 3

Commons East, Easel 55

2:30 PM to 4:00 PM

**Sonar Mapping of Higgins Eye Pearlymussel (*Lampsilis higginsii*) Habitat**

*Erin Elizabeth Strand, Senior, Environmental Science & Resource Management*

*UW Honors Program*

*Mentor: L. Monika Moskal, College of the Environment*

Freshwater mussels are one of the most at-risk taxonomic groups in North America with about twenty percent of species and subspecies listed as endangered. Populations are thought to be declining due to habitat loss brought on by invasive