Undergraduate Research Symposium May 18, 2018 Mary Gates Hall

Online Proceedings

SESSION 1D

MARINE ECOLOGY AND FOOD WEBS

Session Moderator: Bonnie Becker, Academic Affairs (Tacoma)
MGH 228
12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Effects of Male Coercion in Bottlenose Dolphins (*Tursiops aduncus*) on Female Foraging Behavior
Elizabeth Marina (Liz) Allyn, Senior, Aquatic & Fishery Sciences
UW Honors Program
Mentor: Janet Mann, Biology, Georgetown University
Mentor: Aaron Wirsing, Environmental and Forest Sciences
Mentor: Megan Wallen

In the population of bottlenose dolphins (*Tursiops aduncus*) in Shark Bay, Australia, groups of two or three adult males form long-term alliances that sequester, harass, and intimidate adult females, presumably to increase their chances of mating success. Costs that males inflict on females include physical injury, changes in home range and habitat use, reduced foraging, and changes in calf care. Although altered female behavior is evident during association with males, the direct impact males have on female behavior is not entirely clear. That is, male behavior and female responses to such behavior during consortships have not been explicitly documented. A long-term study has collected detailed behavioral data on the Shark Bay population since 1988. Using this dataset, this project will quantify the rate of male aggression directed at females and how female activity budgets and foraging tactics change in response. Preliminary work indicated that rates of received aggression were higher for cycling females than non-cycling females, and higher when females were in the presence of more than one male, potentially confirming that males use aggression to coerce reproductively viable females. Females also spent less time foraging when in the presence of more than one male, hinting at potential costs to the female owing to loss of food. Because females have highly specialized foraging tactics, changes in foraging behavior and home range during prolonged or repeated consortships could impact female condition.

SESSION 1M

LIFE AND DEATH IN THE OCEAN

Session Moderator: Virginia Armbrust, Oceanography
MGH 284
12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Mortality of Juvenile Manila Clams from Predation in Sand and Gravel Sediment
Malise Ching Yun, Senior, Anthropology
Mary Gates Scholar
Mentor: Megan Dethier, Biology

Despite the large number of gametes that clams release, very few offspring survive to reproductive age and harvestable sizes. There are several ways that aquaculturists try to protect young settlers, including adding gravel on top of fine sediment. We tested whether the addition of gravel helped decrease the mortality rate from small crabs in lab experiments. We tested predation rates on juvenile manila clams, *Ruditapes philippinarum* by the hairy shore crab, *Hemigrapsus oregonensis* in different sediments. Clams were placed in tubs with no sediment (NS), fine sand (FS), or sand with gravel on top (SG). After allowing time for the clams to burrow, crabs were added to each tub and given 24 hours to consume the clams. Crabs consumed some clams in all treatments although there was high variation among individuals. Gravel addition did not reduce predation rates compared to fine sand alone, but there was a trend for more predation in no sediment than with sediment. We also tested the ability to consume small clams of different predators that live in the same sediment habitat as *R. philippinarum*. The worms, *Nereis brandti, Paranemertes peregrina* and *Hemipodus borealis* all showed no predation on clams within a 24-hour period. The snail, *Alia* also showed no predation on juvenile clams. By understanding multiple factors that lead to juvenile clam mortality, fisheries can improve upon their methods to increase harvestable populations.

SESSION 1R

POPULATION HEALTH

Session Moderator: Clarence Spigner, Health Services
JHN 026
12:30 PM to 2:15 PM
* Note: Titles in order of presentation.

Establishing and Sustaining Walking School Buses in Seattle Elementary Schools
Carolyn Celia Birkenfeld, Senior, Community, Environment, & Planning
Mentor: Megan Herzog, Urban Design & Planning, Community, Environment & Planning

A Walking School Bus is a safe, physically active way for children to commute to and from school with adult supervision. Volunteers walk along designated routes through the neighborhood, as students join the group to walk to school while practicing pedestrian safety skills and starting the day with exercise. With 21% of Seattle youth suffering from obesity and 83% of students living within the walk-zone of their school, there is a clear need and opportunity to provide students with a viable option to walk to school. The Seattle Department of Transportation (SDOT) Safe Routes to School (SRTS) division recognizes this gap and is looking toward Walking School Buses as a strategy to increase the number of children walking to school and improve traffic safety for children. I plan use this project to determine the most effective way that SDOT can provide support for schools across Seattle to establish their own Walking School Buses. One of the primary challenges in determining what support looks like, is identifying what schools need. Since every school has a different assortment of resources, assets, cultures, geographies, and capacities, a Walking School Bus will likely look very different from one school to the next. I plan to develop a set of recommendations that outline how SDOT can best support schools, what support looks like, and how that varies based on the school. I will conduct interviews with parents and schools staff who have had experience with Walking School Buses, develop case studies of Seattle walk-to-school programs, and research national and international examples. I hope to create a resource that can provide all elementary students in Seattle with a safe and viable way to walk to school.

POSTER SESSION 2

Commons West, Easel 34
1:00 PM to 2:30 PM

Toxicity of Emamectin Benzoate to Juvenile Ghost Shrimp: Implications for the Control of Burrowing Shrimp on Shellfish Beds in Washington
Karrin Noel Leazer, Senior, Oceanography
Katelyn Elizabeth Cramer, Junior, Extended Pre-Major
Allison Caci (Allison) Dekerlegand, Senior, Environmental Science & Resource Management
Rose Ann Denney, Senior, Environmental Science & Resource Management (Wildlife Conservation)
James Ryland Mc Coy, Junior, Environmental Science & Resource Management
Abigail Ilene Moosmiller, Junior, Aquatic & Fishery Sciences
Mary Gates Scholar
Renz Torres, Senior, Extended Pre-Major
Cara Joelle Christensen, Senior, Biology (General)
Sarah Michelle Colosimo, Senior, Aquatic & Fishery Sciences
Mary Gates Scholar
Wesley R. Rostomily, Senior, Aquatic & Fishery Sciences
Alexandra Claire Sawyer, Fifth Year, Aquatic & Fishery Sciences
Mentor: Christian Grue, Aquatic & Fishery Sciences
Mentor: Megan Hintz, School of Aquatic and Fishery Sciences

Imidacloprid (IMI), a neonicotinoid, is being sought as an alternative to the carbamate pesticide, carbaryl 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). Previous laboratory tests indicate juvenile and adult ghost shrimp are overtly affected (immobilized) when exposed to IMI in artificial seawater (SW) at concentrations expected during control operations, but not killed and subsequently recover. Our objective was to determine if emamectin benzoate (EB) is an alternative to IMI. EB, the active ingredient (a.i.) in Slice®, is currently registered for use in marine waters for the control of sea lice on farmed salmon. We targeted juvenile shrimp because they are likely more sensitive than adults and reside within the upper 10-15 cm of the sediment facilitating control. In an initial test to determine the effective range, we exposed juvenile ghost shrimp (mean carapace length = 2.3 mm) to static concentrations of EB (as the insecticide Proclaim®) ranging from 0.01 to 100 ppb a.i. within artificial SW for 96 h. All shrimp within the 100 ppb treatment died within 48 h and 27% exposed to 10 ppb succumbed by 96 h. In a subsequent 96-h test (static 48-h renewal), we exposed juveniles (mean carapace length = 2.1 mm) to concentrations of EB ranging from 10 to 100 ppb to determine the median lethal concentration (LC50). All shrimp exposed to 100 ppb died within 24 h. The 96-h LC50 was 18.8 ppb compared to $>$12,000 ppb for IMI. EB may provide more effective control than IMI because it targets the primary neurophysiology of the shrimp. Further tests are re-

quired to determine effective concentrations within sediment, assess potential non-target effects, and evaluate environmental fate.

SESSION 2J

HOME, SWEET HOME: ECOLOGICAL AND EVOLUTIONARY FACTORS INFLUENCING ORGANISMAL PERFORMANCE AND SPECIES' DISTRIBUTIONS

Session Moderator: Janneke Hille Ris Lambers, Biology
MGH 271
3:30 PM to 5:15 PM

* Note: Titles in order of presentation.

Intertidal Murder Mystery: The Case of the Juvenile Manila Clam
Abigail Ilene Moosmiller, Junior, Aquatic & Fishery Sciences
Mary Gates Scholar
Mentor: Megan Dethier, Biology

Manila clams, *Ruditapes philippinarum*, are a widely used species in Washington shellfish aquaculture. Juveniles in particular have high mortality rates due in part to predation, but the extent of this predation is unknown. This study investigates the prey size range and preference shown by the crabs *Hemigrapsus nudus*, *Metacarcinus gracilis*, *Cancer productus*, and *Romaleon antennarium* when preying on *R. philippinarum*. To test if crabs prefer to prey on larger clams due to their higher food content, we placed crabs and clams together in microcosms and measured mortality rates of the clams. It was found that all crabs could eat all tested clam sizes. Cancrid crabs preferred to eat larger clams; *R. antennarium* ate the most clams. In contrast, *H. nudus* had no preference for a particular clam size. Based on these results, countermeasures against juvenile Manila predation should have a special focus on cancrid crabs, and further research on the reasons behind the trend of cancrid preference for larger juveniles should be considered.

POSTER SESSION 3

Commons East, Easel 60
2:30 PM to 4:00 PM

Tracking the Spatial Distribution of *Ostrea lurida* (Olympia Oysters) in Fidalgo Bay, WA
Suji G. Kim, Senior, Interdisciplinary Arts & Sciences (Environmental Studies), UW Tacoma
Mentor: Bonnie Becker, Academic Affairs (Tacoma), UW Tacoma
Mentor: Michelle McCartha, UWT IAS
Mentor: Megan Hintz, School of Aquatic and Fishery Sciences

Olympia oysters (*Ostrea lurida*) are the only native oyster species in Washington State. Over the past 100 years populations have dwindled, but due to restoration efforts, Olympia oysters are slowly recovering. So far there is limited information about the behavior during the larval stage. Previous observations suggest that larvae would be more abundant at the surface compared to the bottom of the water column. In this study, we measured the spatial distribution of larvae at surface and bottom depths in Fidalgo Bay, WA during the Summer of 2013. Plankton samples were taken from 4 intertidal and 2 subtidal stations pumping 100L of seawater through a 75 μm sieve. Olympia oyster larvae were identified using light microscopy, measured for shell height and length, and tallied to determine abundance and distribution. As predicted, larvae were not randomly distributed across the bay, and more larvae were found at the surface for each site. We found an order of magnitude of more larvae at surface depths during ebb tide, indicating that larvae are being transported out of the bay. These results are being combined with additional temporal and spatial sampling, as well as environmental data, to fully describe the larval distribution of oysters in the bay. This study will improve restoration efforts as well as inform researchers and local communities about the early life stages of Olympia oysters.

POSTER SESSION 3

Balcony, Easel 99
2:30 PM to 4:00 PM

Elevating Seattle's Understanding of Cycle Tracks and Safety Perception
Shoshana Hahn Reist, Senior, Community, Environment, & Planning
Mentor: Megan Herzog, Urban Design & Planning, Community, Environment & Planning

Cycle tracks have been proven to be one of the safest forms of bike infrastructure in terms of car-bicycle collisions. Otherwise known as bikeways, a cycle track is a form of street-level bike infrastructure that uses a variety of methods for physical protection from passing traffic. This study examines individual perception of safety while biking and how it varies with different buffers. Through an online survey, individuals, both bikers and non-bikers, will be asked to rank their safety perception of cycle tracks with different types of

buffers. Results from this survey will determine which kind of buffer; between planters, raised concrete curb, two-to-three foot painted buffer with plastic flex posts, two-to-three foot painted buffer with parked cars, and grass with trees, has the highest ranking of safety perception. My findings will act as the evidence necessary to recommend that the City of Seattle's Department of Transportation implement more of this type of cycle track to ultimately increase ridership.

POSTER SESSION 3

Balcony, Easel 98

2:30 PM to 4:00 PM

Divesting from Disposables: An Analysis and Proposed Plan for Banning the Sale of Disposable Water Bottles at the University of Washington's Seattle Campus

Katheran Lee Mc Carroll, Senior, Community, Environment, & Planning
Mentor: Megan Herzog, Urban Design & Planning, Community, Environment & Planning

The University of Washington prides itself on being a leader in sustainability, but is currently not doing all that it can to reduce waste that ends up in landfills and lower their carbon emissions. While many universities across the United States have banned the sale of disposable water bottles on their campuses, including five Washington State schools, the University of Washington has not made an effort to do the same. Banning the sale of disposable water bottles would help lower the University's carbon footprint and divert plastic from landfills. I answered the question, what steps does the University of Washington need to take before they can stop selling bottled water at their Seattle campus? To do this I wrote a report where I analyzed the human, environmental, and economic impacts of divesting from disposable water bottles on the University of Washington Seattle campus. After completing this report I created a set of suggestions for the administration, detailing what needs to be done for the University to successfully stop selling bottled water. Disposable water bottles are an often forgotten source of pollution, both in terms of pollutants that enter your body when you drink from them, and in terms of environmental pollution. Pollution from bottled water occurs at every stage, production, transportation, consumption, and improper disposal. Getting the University of Washington to divest from selling disposable plastic water bottles on its Seattle campus will benefit student and environmental health.

POSTER SESSION 4

Balcony, Easel 86

4:00 PM to 6:00 PM

Next-Generation Sequencing to Evaluate Segregation Pattern of Candidate Causal Variants for Joubert Syndrome

Yong Han Hank (Hank) Cheng, Senior, Biochemistry
Mary Gates Scholar, NASA Space Grant Scholar
Mentor: Dan Doherty, Pediatrics
Mentor: Megan Grout, Pediatrics
Mentor: Caitlin Miller, Pediatrics

Joubert syndrome (JS) is a rare recessive genetic disorder characterized by hindbrain malformations appearing as the "molar tooth sign" on axial brain imaging. Causal genetic variants for JS need to fulfill three criteria: They need to be 1) rare, 2) deleterious, and 3) present in both alleles in the patient. Patients in our cohort are sequenced for rare predicted-deleterious variants (RDVs) to identify variants that satisfy the first two criteria. To determine whether the segregation pattern of the variants satisfies the third criterion, we sequence both parents, each of whom should carry only one of the variants. My research uses Next-Generation Sequencing to determine the segregation pattern for families in whom RDVs have already been identified. Specifically, I performed targeted-sequencing of putative causal variants in the parents using molecular inversion probes, and then I used the sequencing data to determine the segregation pattern. In most families, one RDV will be present in each parent, indicating that they affect both alleles in the child, because these variants are robust candidates that have passed the filters for being rare and deleterious. If both RDVs are present in one parent, then they have to be on the same allele and cannot be the cause of JS in the family. In these families, we will have to consider other variants or perform additional sequencing to identify the causal variants. Ultimately, the goal of my research is to elucidate the genetic basis of JS to improve prognostic and risk recurrence information, provide diagnostic, carrier and prenatal testing, and delineate the biological mechanisms of JS that will be the targets of future precision therapies.