UNIVERSITY of WASHINGTON

Undergraduate Research Symposium May 17, 2013 Mary Gates Hall

Online Proceedings

1H

AQUATIC ECOLOGY AND BIODIVERSITY

Session Moderator: Julia Parrish, Aquatic & Fishery Sciences

248 MGH

1:15 PM to 2:45 PM

* Note: Titles in order of presentation.

Fatty Acid Signatures and Growth in Juvenile *Idotea wosnesenskii* Respond to Differing Macroalgal Diets

Morgan Elizabeth Eisenlord, Senior, Biology (Ecology, Evolution & Conservation)

Mary Gates Scholar

Mentor: Megan Dethier, Biology

Mentor: Aaron Galloway

Fatty acids (FA) are commonly used as biomarkers to infer contributions of different basal energy sources to consumers. However, modification, catabolism, and storage of dietary FA are poorly understood for most animals. Controlled feeding experiments are critically needed to determine the appropriate use of FA as dietary tracers. We conducted two such experiments with juvenile isopods to investigate their use as a model organism for FA signature analysis in a direct herbivore. Newly hatched *Idotea wosnesenskii* were raised for 10 weeks on five different macroalgal diets at two different temperatures. Broods were raised from hatching on a single food source. Highest growth rates were on *Ulva* spp., fresh *Nereocystis luetkeana*, and aged *N. luetkeana*. Animals grew significantly slower on diets with chemical (*Fucus distichus*) and structural (*Mazzaella splendens*) anti-herbivore defenses. Temperature did not substantially affect growth rates. Preliminary analyses indicate that FA in *Idotea* tissues reflect those of their diets, and that FA driving the patterns include common biomarkers for the algae consumed. Juvenile *Idotea* are a promising model organism for FA trophic ecology because they generally thrive in a laboratory setting and can be hatched and quickly grown on a variety of diets.

Non-Native Predator vs. Monsoon: The Role of Biotic and Abiotic Drivers in Shaping Aquatic Invertebrate Communities in Desert Environments

Jessica (Jessie) Hale, Senior, Aquatic & Fishery Sciences

Mentor: Julian Olden, Aquatic & Fishery Sciences

Mentor: Meryl Mims, School of Aquatic and Fishery Sciences

In the desert Southwest, predation and monsoon thunderstorms are determinants of aquatic invertebrate communities. Recent research has focused on the potential of non-native species, like bullfrogs (*Rana catesbeiana*), to change communities into which they are introduced. Bullfrogs were introduced into Arizona in the mid-1900s and have established widespread populations that predate on and compete with native fauna. In an effort to control bullfrog populations, state and federal agencies have focused on the eradication of bullfrogs in Southeast Arizona – a biodiversity hotspot with many endemic species. Although the effects of bullfrogs on vertebrate species are documented, how and whether bullfrogs alter aquatic invertebrate communities remains uncertain. We examined how the effects of bullfrogs compare to the seasonal effects of the monsoon in influencing invertebrate communities. The objectives of this study were to 1) examine and quantify the effects of bullfrogs on aquatic invertebrate communities by comparing ponds with and without bullfrogs; 2) determine the effect of monsoonal seasonality by sampling invertebrate communities during the early- and late-monsoon, and 3) observe the interaction of bullfrogs and monsoonal seasonality to explore the relative importance of these two factors in shaping aquatic invertebrate communities. We hypothesized a lower invertebrate abundance and richness in ponds with bullfrogs. We expected to see taxonomic differences in community composition based on body size, dispersal ability, habitat use, feeding group, and defense. We anticipated smaller invertebrates and a higher number of defended invertebrates in ponds with bullfrogs. Finally, we expected that the relative abundance of high dispersing insects would increase in late monsoon samples. Preliminary analyses suggest that invertebrate abundance and richness is negatively related to the number of bullfrogs present at a pond. By studying the effects of bullfrogs on aquatic invertebrate communities, we can begin to understand and quantify the impact of this heavily managed non-native predator.

Indices of Nutrition with Depth from Two Seasons in the Green Urchin, *Strongylocentrotus droebachiensis*

Katie (Kate) Olson, Senior, Aquatic & Fishery Sciences
Mary Gates Scholar
Mentor: Megan Dethier, Biology
Mentor: David Duggins, Friday Harbor Labs
Mentor: Aaron Galloway

Drift algal material is expected to play a significant trophic role in ecosystems adjacent to kelp beds. The contribution of drift algae to the overall nutritional state of various invertebrates can be assessed using phenotypic traits such as gonad index (larger gonad mass with better nutrition) and for sea urchins, jaw diameter (larger jaws with inconsistent food supplies). In this study, we collected green urchins (*Strongylocentrotus droebachiensis*) within kelp beds (5m depth) in the shallow subtidal photic environment (SSPE) and outside of kelp beds in nearby deep subtidal environments (DSE; 100m depth) during spring and winter seasons. SSPE and DSE sampling stations were less than 1 km apart. In the initial spring analyses, urchins in the DSE had significantly larger gonads but also larger jaws than SSPE animals. Winter gonad indices showed a reverse pattern, in which SSPE urchins had larger gonad indices, but still had smaller jaw indices than the DSE urchins; gonads in all urchins on this sampling date were much larger than those in the previous spring. These results suggest that food supplies may vary among seasons, especially in deep habitats, where the subsidy of algal material exported from shallow water may be inconsistent; the jaws from DSE urchins concur with this hypothesis. Gut content analyses from winter samples will be used to evaluate the types of foods available to deep vs. shallow-water animals.

DNA Barcoding of African Amphibians

Heidi Joanne (Heidi) Rockney, Senior, Biology (General)
Mary Gates Scholar
Mentor: Adam Leache, Biology

Building a reference library of life on earth is an enormous task of paramount importance given the current threatened state of species across the planet. Collecting DNA barcodes - essentially genetic fingerprints - for every species on the planet has been proposed as a means of rapid species identification. In 2004, the Barcode of Life Database (BOLD) was initiated and is compiling DNA barcodes for every species using a small fraction of the genome called the, "CO1" gene. Unfortunately, the universal primers used to sequence the CO1 gene have a low success rate at producing DNA sequences for amphibians, and a relatively high error rate for species identification. My research investigates the success and accuracy of new amphibian-specific CO1 primers in comparison to an alternative DNA barcode, 16s rRNA, which is widely used in amphibian systematics and taxonomy, but is presently not accepted by the DNA barcoding community. I analyze and compare both CO1 and 16s genes for their utility as DNA barcodes by building phylogenetic trees using maximum likelihood and Bayesian inference to quantify their species identification accuracy. In collaboration with the UW Burke Museum of Natural History and Culture, I sequenced DNA for 162 frogs (representing 22 species) collected from the rainforest in Southern Ghana. The sub-Saharan rainforests of West Africa host a high number of endemic amphibian species. However, increasing habitat threat are heavily impacting species in these forest, and an estimated one third of amphibians are considered threatened. All DNA sequences obtained for this study are being submitted to the BOLD and GenBank databases and are linked to voucher specimens at the UW Burke Museum, which will inform future biodiversity studies, assist monitoring, and aid conservation efforts.

Temporal Habitat Usage, Range, and Diet of *Lontra canadensis* in Washington State's Snohomish River Estuary

Anna Russell, Sophomore, Public Health, Everett Community College
Mentor: Ardi Kveven, Ocean Research College Academy, Everett Community College
Mentor: Robin Araniva, Life Sciences, Everett Community College
Mentor: Josh Searle, ORCA, Everett Community College

The North American river otter, *Lontra canadensis*, population is widely distributed throughout the Northern Hemisphere, but has become increasingly rare in some areas due to anthropogenic effects. *L. canadensis* feeds primarily on shallow-water fish. Research has shown that *L. canadensis* feeds on crustaceans, insects, and birds. Feces are deposited in communal latrine sites along with scented mucilaginous material to mark territory. Foundational research was conducted between October 2012 and March 2013 in the Snohomish River Estuary to uncover the population distribution, predominant food sources, and presence of protozoa contaminants near Jetty Island at Everett, WA. Remote camera deployment recorded two individuals frequenting one of the latrine sites centrally located on Jetty Island, however, there have been no cameras deployed on North Jetty. Protozoan presence was not observed in preliminary samples. Thirty percent of collected samples are predominately fish scales and bones, while the remaining samples are crustaceans. Fifty-three percent of otoliths analyzed were Sebastes sp., which has been endangered since 2010. This research will help further understanding of the apex predator's behavior and predator-prey relationship in the estuarine system.