UNIVERSITY of WASHINGTON

Undergraduate Research Symposium May 18, 2018 Mary Gates Hall

Online Proceedings

Poster Session 1

MGH 241, Easel 149

11:00 AM to 1:00 PM

Comparing Microclimates and Coverage by Foliar Diseases and Epiphytes that Affect Photosynthesis in a Secondary Forest Elevational Gradient in Costa Rica

Kimberly Stewart, Senior, Environmental Science, Heritage College

McNair Scholar

Mentor: Michael Heim, Lac Courte Oreilles Ojibwa Community College

Mentor: Corbin Schuster, Heritage University

Foliar (leaf) diseases and epiphytes are a major hindrance to photosynthesis throughout the wet tropics. The research sought to determine whether there is a correlation between foliar epiphyte and disease coverage in a relatively small elevational gradient with a hypothesis that a decrease in elevation increases humidity levels which then correlates with greater coverage by foliar diseases and epiphytes on *Geonoma oxycarpa*. The study took place in three wet pre-montane secondary forest sites in southern Costa Rica, ranging in elevation from 1130.8 – 1188.7 m, and focused on *G. oxycarpa* due to its accessibility and observable patterns of foliar epiphytes coverage and disease. Three specimens of *G. oxycarpa* were chosen at each site, and initial estimates of the percentage of foliar epiphytes and diseases were done visually. Photos were then taken for analysis using ImageJ and a metric scale ruler was used to determine the total area of a leaf sample and the healthy portions of the leaf. Weather meters were used to determine the average relative humidity at each of the three sites. All the data was used in linear regression exploratory analysis using the open source software 'R'. It was determined through clear, though not statistically significant, trends in the data that increased coverage of foliar diseases and epiphytes was related to a decrease in elevation and a corresponding increase in humidity, confirming our hypothesis. These findings indicate that native plants that can tolerate or better defend themselves against the onslaught of foliar epiphytes and diseases should be chosen for the more humid, lower microclimates. Because of this implication, this study is particularly important regarding the preservation of forest microclimates for indigenous cultures that depend upon native tropical plant life for a wide variety of ethnobotanical uses and crucial to the success of native plant restoration and preservation efforts.

Poster Session 2

MGH 206, Easel 174

1:00 PM to 2:30 PM

The Bike Sharing Industry: A New Shared Contact Point for Bacterial Colonization in Seattle

Aaron Jeglum, Sophomore, Environmental Science, Ecology, South Seattle College

Huy Nguyen, Freshman, Associate of Science, South Seattle College

Jordan Amorasin

Mentor: Henry Olson, Biology, South Seattle College

The spread of disease can occur through bacterial colonization of shared contact points within a community. Potential platforms for bacterial colonization and subsequent spread have been introduced with the bike share applications across the city of Seattle. The bike handles serve as a shared contact point for each rider with the extent of bacterial colonization of those handles unknown. Using swabs to collect bacteria samples from bikes, we are able to assess the number of colony forming units present on each handle. Our ongoing research is examining the levels of bacteria found on the bikes in different parts of the city at different times. This analysis will show the extent of bacterial colonization, whether there is a time or location dependence, and provide a basis for further study into the risk this new shared contact point may pose.

Poster Session 3

MGH 241, Easel 155

2:30 PM to 4:00 PM

Optimization of Extraction and Detection Methods for the Analysis of Imidacloprid in Honey and Water Using Gas Chromatography-Mass Spectrometry

Nick Yakobchuk, Senior, Molecular Biosciences, Bellevue Coll
Alexandra Kelm, Sophomore, Environmental Science, Bellevue College
Bin Li, Non-Matriculated, UW Honors Program
Mentor: Richard Glover, Science, Lane Community College
Mentor: Lucas Monkkonen, Chemistry, Bellevue College

Imidacloprid is the most widely used agricultural pesticide in the world. As a neonicotinoid, it is highly potent against insects while having low toxicity to mammals. One area of concern is its effect on honeybees, possibly playing a role in colony collapse disorder (CCD), a sudden disappearance of worker bees from an otherwise healthy population. Bees are known to be sensitive to imidacloprid at high concentrations, but what is unclear is whether chronic exposure to the low doses used to protect crops can also be harmful. The E.U. and Canada have taken steps to ban the use of imidacloprid as a precaution, and the U.S. EPA has warned users of its potential for leaching into groundwater. It may also persist for years in soil, pollen, and nectar. Due to its low volatility, high boiling point, and high solubility in polar solvents, imidacloprid can be difficult to reliably detect in environmental samples using current gas chromatography (GC) methods. To address this, we evaluated GC-MS detection of imidacloprid in methanol standards, spiked water, and spiked honey. Samples were evaluated after clean-up with both C18 solid-phase extraction (SPE) and dispersive solid-phase extraction (DSPE) methods, using two different GC columns (Restek Rxi-5MS and Rtx-1701). Samples were also subjected to a range of pH conditions, and ionized by both electron ionization (EI) and chemical ionization (CI). As GC is typically faster, cheaper, and easier than liquid chromatography, currently the method of choice for detection of neonicotinoids, our research could benefit the study of imidacloprid toxicity by reducing the attendant time, cost, and training requirements. Preliminary results have shown reliable detection of imidacloprid-urea, the main hydrolysis compound of imidacloprid, at pH 5-7.

POSTER SESSION 4

MGH 258, Easel 189

4:00 PM to 6:00 PM

Seasonal Variation in Abundance of Nutrients and Heavy Metals Present in Eelgrass Beds

Annika Goranson, Sophomore, Environmental Science, Actuarial Science, Everett Community College
Mentor: Robin Araniva, Everett Community College
Mentor: Ardi Kveven, Ocean Research College Academy, Everett Community College
Mentor: Josh Searle, Ocean Research College Academy, Everett Community College

The focus of this research is on the abundance of nutrients and which non-toxic heavy metals concentrations in estuarine eelgrass (*Zostera marina L.*). Eelgrass beds are an important factor in the marine environment, providing a secure habitat for marine life to forge, obtain shelter, spawn, and stabilize the sediment. Also, eelgrass beds reduce costal erosion, meaning healthy eelgrass beds maintain stability in the marine ecosystem. Nutrients and heavy metal concentration is an important element to eelgrass health. Eelgrass plants rely on nutrient abundance to fuel growth, and non-toxic heavy metals in the sediment are absorbed by the plants. Previous research has shown that productive eelgrass beds reduce coastal erosion and cycle carbon dioxide and nutrients into the surrounding ecosystem, acting as a filter for an estuarine habitat. Data collected by the Ocean Research College Academy (ORCA) between 2009 and 2017 were analyzed. It was hypothesized that phosphate and nitrate in the water column would be most abundant during the cold seasons due to high intake of nutrients during the spring and summer, and heavy metal concentration would be more abundant during the spring and summer due to industrial runoff. Results support the original hypothesis, as the data indicate that the highest nutrient abundance occurred December-February each year. Phosphate levels at Site 1 had an abundance of 2.47 [PO_4] μM in December of 2010, which was the highest phosphate level observed. The lowest phosphate abundance throughout the year occurred during the spring of each year. Arsenic, copper, zinc and lead were found to be the most common non-toxic metals concentrated in the eelgrass, which also appeared to have some seasonal influence, likely do to industrial runoff during the spring .