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.

Investigating Population Structure of Sockeye Salmon in Lake Washington and Lake Sammamish
Johnathan Forrest (John) Monson, Junior, Biology (Bothell Campus)
Mentor: Jeffrey Jensen, Biological Sciences, STEM, UW Bothell

The focus of my research is to clarify the population structure of sockeye salmon, and in particular kokanee salmon, in the Lake Washington and Lake Sammamish watershed. There is a poorly understood population of kokanee, a form of sockeye that does not migrate to the ocean, that often migrates from Lake Washington into the Sammamish river, and does not appear to be a part of the main sockeye population in our lakes. This population is understudied but is particularly intriguing because a native population of kokanee was once abundant in the lake. It is possible that this population is a remnant of these native kokanee and represents the only remaining native salmon genes in the lake. It is also possible that this population is a newly evolved freshwater form of introduced sockeye. Either result would be of great interest in terms of conservation and evolutionary biology. Native genes in Lake Washington would represent an important focus for conservation efforts (as are currently underway in Lake Sammamish), and finding a population that has evolved in Lake Washington within the last century would be an exciting demonstration of the adaptability of salmon. Physical examination of specimen scales, gill rakers and otoliths can reveal evidence of the populations life history and feeding habits. Furthermore, genetic analysis and comparison to known sockeye populations can also provide evidence to suggest the identity of this particular population. Using these morphological and genetic observations I hope to illuminate the mysterious origins of this population and contribute to their conservation and restoration. People living along the rivers in the Lake Washington drainage have benefitted from the kokanee salmon for hundreds of years. The little red fish continues to be a cultural icon and important natural resource in Washington state.

SESSION 1E

FROM VIRAL PATHOGENESIS TO GENETIC DISEASES TO BUILDING A BETTER KIDNEY

Session Moderator: Michael Lagunoff, Microbiology
MGH 231
12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Gait Evaluation of *mdx*^{4}*cv* Mice Expressing Micro Dystrophin Transgene
Indu Tejasa Vanteru, Senior, Biology (Molecular, Cellular & Developmental)
Mary Gates Scholar, UW Honors Program
Mentor: Jeffrey S Chamberlain, Neurology
Mentor: Katrin Hollinger, Neurology

Duchenne muscular dystrophy (DMD) is an X-linked recessive genetic disorder, marked by progressive muscle degeneration due to the absence or impairment of the dystrophin protein. Our laboratory has been developing methods for gene therapy of DMD. The dystrophin gene is the largest known gene, which complicates gene therapy. We have shown that gene delivery vectors based on adeno-associated virus (AAV) can be used to deliver new genes body wide. However, AAV has a ˜5 kb carrying capacity, so we have been developing miniaturized dystrophins. These smaller, highly functional dystrophins, which we named micro-dystrophin (μdys) were tested in a transgenic *mdx*^{4}*cv*mouse model for DMD. Furthermore, we sought to develop a non-invasive method to evaluate treatment efficiency of μdys. In this project, the gait of *mdx*^{4}*cv*, wild type (WT) and transgenic mice were observed to deduce potential benefits of the μdys transgene. We hypothesized that μdys treatment will enable the gait of the transgenic mice to resemble that of WT animals as opposed to *mdx*^{4}*cv*. To test this, gait was assessed at three time points: 1.5, 3 and 6 months of age using the video-based Noldus CatWalk XT. Our results show that the length of a single stride of the transgenic mice hind paws increased over time compared to *mdx*^{4}*cv*. The normal walking pattern of mice con-

sists of placing diagonal paws on the surface, one front and one hind from opposite sides. In the case of mdx^4cv, more paws were placed down for majority of the walk, as a compensatory mechanism for muscle weakness. The transgenic mice were found to walk with a diagonal pattern more frequently, like WT mice. Similarities in the gait of transgenic and WT mice help us conclude the μdys treatment was successfully able to mitigate the effects of DMD as seen by the gait analysis.

POSTER SESSION 3

Commons East, Easel 52

2:30 PM to 4:00 PM

Pulsar Signal Simulator

Jacob Chad Hesse, Senior, Earth & Space Sciences (Physics)
Undergraduate Research Conference Travel Awardee
Mentor: Joey Key, Physical Sciences Division, University of Washington Bothell
Mentor: Jeffrey Hazboun, Physical Sciences Division

Recent observations of gravitational waves have opened up a new field of gravitational astronomy. Through this new field, many questions, thought difficult to address with electromagnetic astronomy, have become tractable. Gravitational waves allow us to look further back in time than conventional telescopes, and allow us to directly observe the gravitational interaction of compact objects. The North American Nanohertz Observatory for Gravitational waves (NANOGrav) collaboration aims to detect and study gravitational waves using a Pulsar Timing Array (PTA) made of millisecond pulsars. Pulsars are a special type of neutron star that emits radio waves at extremely consistent time intervals. The pulsars are monitored using the Green Bank Telescope in West Virginia and the Arecibo Observatory in Puerto Rico. To help study the signal from these stars, a project called the Pulsar Signal Simulator (PSS) is being built by NANOGrav and is the focus of my research. The simulator is able to calculate a pulsar signal from source to detection. It starts with the initial signal of a pulsar and adds the different effects that alter the signal, before it reaches Earth, such as dispersion, scintillation, and scattering. My project is to work on a portion of the simulator that takes, as input, the name of a known pulsar and automatically simulates a signal with user-defined changes. I aim to increase efficiency as well as validate simulation output. This project is beneficial to the NANOGrav collaboration by characterizing the noise in our galactic scale gravitational wave detector. Progress in gravitational wave astronomy will allow for deeper insight into galaxy evolution, black holes, and the early history of the universe.

POSTER SESSION 4

MGH 241, Easel 133

4:00 PM to 6:00 PM

Morphological Match Between an Orchid and its Mosquito Pollinator

Sarah Melissa Trostle, Junior, Pre-Major (Arts & Sciences)
Joe Lim, Senior, Biology (Ecology, Evolution & Conservation)
Mentor: Jeffrey Riffell, Biology
Mentor: Ryo P. Okubo

The behaviors of female mosquitoes related to disease transmissions such as host-seeking and egg laying are heavily studied. It is also known that both male and female mosquitoes acquire sugar from plants. However, mosquito-plant interactions are relatively understudied even though both male and female mosquitoes rely on plants for sugar. This mosquito-plant interaction allows for mosquitoes to act as potential pollinators. Some researchers have argued that mosquitoes are generally nectar robbers, while other studies have shown mosquitoes can indeed contribute to pollination. However, their significance as pollinators has not been explored. Here, we discuss a species of snowmelt mosquito, *Ochlerotatus communis*, a major pollinator of *Platanthera obtusata*, the blunt-leaved rein orchid. Orchids utilize pollinia, or pollen sacs, which attach to stereotyped locations on their pollinators. This consistency ensures successful pollination on subsequent visits. In order to maintain this consistency, the morphology of mosquitoes should match that of the flower for successful pollination leading to higher reproductive success for the plant. Through multivariate linear measurements of mosquito head characteristics, we found that the proboscis length was a distinguishing character that accounts for the morphological variation among different species of mosquitoes that are sympatric with the *P. obtusata*. Our finding indicates that there is a possible morphological match and suggests that there is a possible match with the nectary length of the orchid and morphological characters of the mosquito. Our study demonstrates the first-ever analysis of mosquito morphology within the context of pollination. To further test this, additional studies can be done on verifying the significance of the lengths of the proboscis and nectary for successful pollinia removal.

POSTER SESSION 4

MGH 241, Easel 132

4:00 PM to 6:00 PM

Differential Olfactory Learning Across Mosquito Species

Erica Lee Peterson, Senior, Biology (Molecular, Cellular & Developmental)
Brian Russell Hughes, Recent Graduate,
Brian Michael Vickers, Senior, Biology (Physiology)
Mentor: Jeffrey Riffell, Biology
Mentor: Gabriella Wolff, Biology

There are more than 3,500 species of mosquitoes and within this group, there can be a very diverse range of host preferences. However, very little is known about the decision-making process in choosing a host. The main question behind our research is: do different species of mosquitoes learn odors associated with their preferred host? It has been previously shown that *Aedes Aegypti* have the ability to learn some odors and not others, but it was unknown whether the ability to learn odors varies across mosquito species. To test this, females of each species were trained using classical conditioning utilizing an aversive procedure. Learning was then tested in a Y-Maze two-choice test, using 3 different odors; octenol, hexanoic acid, and linalool. We also tested whether a dopamine agonist abolishes this learning. Our results showed that learning ability is related to known host preference; mosquitoes learned the odors associated with their preferred host. Understanding more about mosquito host preference will be beneficial to understanding patterns of mosquito transmitted diseases and impact of mosquitoes on global health.