

## Undergraduate Research Symposium May 18, 2018 Mary Gates Hall

### Online Proceedings

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#### SESSION 1D

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##### 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.

##### **Are All Herbivores Created Equal? Linking Diet to Morphology in Phytophagous Pacus**

*Jonathan Michael Huie, Junior, Aquatic & Fishery Sciences  
Mary Gates Scholar, UW Honors Program*  
Mentor: *Adam Summers, Biology*  
Mentor: *Matthew Kolmann, Friday Harbor Labs*

Herbivorous fishes feed on stems, leaves, flowers, seeds, fruits, and nuts of diverse aquatic plants, as well as algae. In the Neotropics, many of these fishes have intricately tied ecologies with their prey plant's life history and facilitate seed dispersal; including the herbivorous cousins of piranhas, pacus. Most pacus experience fluctuation in their diet that reflects the changes in seasonality and plant part availability. A few species of pacus, however, exhibit a specialized feeding strategy known as phytophagy; solely consuming the plant material of *Podostemaceae* (riverweed). This trend of dietary specialization may be paralleled by a similar shift, away from general herbivory, and towards a specialized phytophage morphology. To investigate the link between diet and morphology within the greater scope of herbivory, we examined four coexisting species including: the seemingly specialized phytophage, *Ossubtus xinguense*; the generalized phytophages, *Tometes kranponhah* and *Tometes ancylorhynchus*; and a facultative phytophage, *Myloplus rhomboidalis*. We compared the gross morphology of these species with several other serrasalmids using micro-computed tomography scanning to measure functional jaw characteristics, as well as using geometric morphometrics to compare body shapes. Jaw biomechanics indicate that *O. xinguense* produces the weakest jaw leverage potentially as a result of its sub-terminal mouth. However, we also concluded that the phytophagous species as a group, do not overtly differ from the more generalized herbivorous pacus in terms of jaw mechanics (but remain distinct from the piscivorous piranhas). Body shape analyses also show little divergence among phytophage and herbivore

body shapes, suggesting that many herbivores share a similar bauplan adapted for fast flowing waters. With the exception of *O. xinguense*, phytophagous pacus appear to be equipped with a general herbivory feeding morphology sufficient for a specialized diet. This suggests that phytophagy is not a particularly challenging feeding strategy, but performance may be augmented by additional morphological specialization.

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#### SESSION 1M

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##### 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.

##### **Use It or Lose It: Three Ways That Snailfishes (Liparidae) Reduce Their Skeleton in the Deep**

*Abigail (Abby) Von Hagel, Senior, Biology (Molecular, Cellular & Developmental), Neurobiology*  
*Mary Gates Scholar, UW Honors Program*  
Mentor: *Adam Summers, Biology*  
Mentor: *Stacy Farina, Friday Harbor Laboratories*  
Mentor: *Mackenzie Geringer, Friday Harbor Labs*  
Mentor: *Matthew Kolmann, Friday Harbor Labs*

Skeletal reduction is a common feature among deep-sea fishes that have diversified from shallow-water relatives, such as snailfishes. These skeletal reductions may be an adaptation to environmental conditions of high pressures, low temperatures, declining luminosity and limited food availability. Snailfishes (family Liparidae) are found across a large bathymetric range (0 → 8,000 m), with intertidal ancestors giving rise to a large clade of deep-sea species. We used micro-computed tomography (micro-CT) to estimate average bone mineral density and examine jaw, pectoral girdle, and neurocranium morphology. Our results suggest at least three mechanisms of skeletal reduction: (1) reduction of bone size, (2) reduction of bone density, and (3) loss of skeletal elements. First, using phylogenetic generalized least squares (PGLS) analysis, we found that the change in cranial dimensions with depth was not uniform. While the size of the maxilla, dentary, and pectoral girdle decreased with greater depth, length of the upper premaxilla and the neurocranium did not vary with collection depth. Second, average density of the lower

jaw decreased with increasing depth. Lastly, the ventral suction disc has been lost multiple times within the deep sea lineage. While all three methods are seen in snailfishes, other groups may use some or all of these mechanisms to different extents. Some mechanisms of skeletal reduction may be more advantageous than others. The extent to which a structure is retained in deep-dwelling fishes may indicate its functional importance. Variable skeletal reduction in the family Lipariidae provides insights into the physiological adaptations that allow fishes to survive in deep-water environments. We conclude that some skeletal elements are maintained at the expense of others as fishes balance the functional demands of life in the deep sea.

## POSTER SESSION 2

Commons West, Easel 19

1:00 PM to 2:30 PM

### **Color Blindness and Allophilia in White Undergraduates**

*Mintesinot Nurri (Mintay) Misgano, Senior, Psychology*

*Grace Bahn, Sophomore, Pre-Sciences*

*Priscilla C. Nguyen, Freshman, Pre-Sciences*

*Mentor: Jonathan Kanter, Psychology*

*Mentor: Mariah Corey, Psychology*

*Mentor: Adam Kuczynski, Psychology, Center for the Science of Social Connection*

Color blindness is defined as a perspective understanding one's racial identity is irrelevant and it is best to ignore the importance of race and skin color. This ideology is embraced by whites who deny their prejudice through this modern form of racism by diminishing other's race and culture and claiming to view all people as equal. Although white people may believe their intentions behind color blindness are good by not judging people by the color of their skin, but rather by the content of their character, alternately the true motivation behind the color blindness ideology may be white people's discomfort around black people, which causes them to avoid color all together. We believe that color blindness is a modern form of racism in which individuals suppress their discomfort among blacks. Therefore, we predict higher levels of color-blindness will correlate with lower levels of allophilia, which represents positive attitudes, feelings, and demeanor towards minorities. We tested this prediction in a survey study in which UW undergraduate students completed measures of color-blindness and allophilia towards Black people. The current study also seeks to investigate how social desirability influences this relationship between color blindness and allophilia. Social desirability is a biased response in which the respondent answers the survey question in a way that would be generally accepted and favored by society rather than being truthful. We hypothesize that if we account for social desirability, the correlation between color blindness and allophilia will be stronger because we predict that social desir-

ability masks the real relationship between the two variables. Thus, people with higher social desirability will be more untruthful, resulting in a higher score of allophilia, when in reality their allophilia score should be lower. Our study explores the relationship between color blindness and allophilia and the role in which social desirability plays.

## POSTER SESSION 4

MGH 241, Easel 152

4:00 PM to 6:00 PM

### **The Role of Ethnic Identity in Depression and Anxiety**

*Christine Lew, Sophomore, Pre-Sciences*

*UW Honors Program*

*Peter Benjamin Holmes, Junior, Pre-Sciences*

*Oluwapelumi E (Pelumi) Ajibade, Junior, Psychology*

*Undergraduate Research Conference Travel Awardee*

*Mentor: Mariah Corey, Psychology*

*Mentor: Jonathan Kanter, Psychology*

*Mentor: Adam Kuczynski, Psychology, Center for the Science of Social Connection*

In the United States, Major Depressive Disorder and Generalized Anxiety Disorder are among the most prevalent of mental health disorders. There are, however, disparities in the prevalence of depression and anxiety between racial and ethnic groups. Generally, whites have higher rates of depression and anxiety than blacks, but blacks have a higher rate of persistent depression than whites. One potential factor relevant to this disparity in depression and anxiety rates is ethnic identity. This study therefore sought to investigate how ethnic identity predicts depression and anxiety differentially between blacks and whites. Based on past literature, we hypothesized that higher ethnic identity would predict lower depression and anxiety in blacks, in that having a strong black identity would inoculate individuals from the harmful and depressogenic effects of discrimination, a known risk for depression in blacks. We hypothesized that ethnic identity would have no effect in whites. The study recruited black (n=54) and white (n=64) participants from Amazon Mechanical Turk to complete a battery of self-report questionnaires including measures of ethnic identity, depression, and anxiety. A linear regression analysis was computed predicting depression and anxiety from measures of ethnic identity, with race as a moderator variable. Results indicated that higher ethnic identity had no significant effect on depression and anxiety in whites, but predicted higher depression and anxiety in blacks. Therefore our hypothesis was not supported. These data contradict previous findings that strong ethnic identity can be a protective factor against depression and anxiety. It is possible that, in today's political climate of increased white nationalism and violence against blacks, ethnic identity may in fact be becoming a risk factor. Future studies would explore how ethnic identity corresponds to heightened sensitivity to dis-

crimination, thereby predicting higher depression and anxiety in blacks.

## **POSTER SESSION 4**

**MGH 241, Easel 123**

*4:00 PM to 6:00 PM*

### **Binding and Inhibition of Heme-Regulated eIF2 $\alpha$ Kinase by the Human Cytomegalovirus TRS1 Protein**

*Munif Nyem Chowdhury, Senior, Microbiology*

*Mentor: Adam Geballe, Allergy and Infectious Diseases*

Human cytomegalovirus (HCMV) is a member of the Herpesvirus family. Most of the US population has been exposed to this virus, but it is only deadly in immunocompromised individuals. When a human cell becomes infected, one of the earliest mechanisms of anti-viral defense is the activation of protein kinase R (PKR). Active PKR phosphorylates the translation initiation factor, eIF2 $\alpha$ , shutting down most protein synthesis in the cell. HCMV circumvents cellular shut-down by expressing protein TRS1, which binds to PKR and inhibits it. Another cellular kinase, the heme-regulated inhibitor (HRI), also phosphorylates eIF2 $\alpha$  upon activation by reactive oxygen species. Because HRI and PKR are similar in structure, I hypothesize that HRI activation during HCMV infection is inhibited by TRS1. I infected PKR-knockout human fibroblasts with HCMV and then activated HRI expression by inducing production of reactive oxygen species. These cells also have a luciferase gene, expression of which is induced upon eIF2 $\alpha$  phosphorylation. I measured the abundance of phosphorylated eIF2 $\alpha$  (eIF2 $\alpha$ -P) and luciferase activity in the lysate of infected cells in which HRI has been activated. I expect that TRS1 will bind and inhibit HRI, therefore eIF2 $\alpha$ -P levels and luciferase activity will be low compared to cells lacking TRS1. These results reveal that HCMV replication is sensitive to HRI activation in reactive oxygen-rich inflammatory tissues and provides insights into the evolutionary history and structural similarities between HRI and PKR.