**SPU Internal Grant Final Grant Report[[1]](#footnote-1)**

**2015-2016 Faculty Research Grant**

**PI Name (and Co-PI’s): Ryan Ferrer**

**Original Title of the Proposal: Sandy Beaches, algal patches, and animal colonists: A sensory mechanism underlying navigation**

**Project Goals**

There were four primary objectives in this project. Field surveys and experimental manipulations were conducted to meet each objective.

1. Determine whether the olfactory system of amphipods is capable of detecting airborne emissions from algal wrack. Electrophysiological techniques were used to measure the antennal activity of amphipods to algal volatile (gaseous) emissions. Shane Bowman, an undergraduate biology major worked with me on this aspect of the project.

2. Test the effects of Ulvoid emissions (dimethyl sulfide, DMS) on amphipod olfactory stimulation by non-Ulvoid emissions. Electrophysiological techniques were used to measure antennal activity of amphipods to volatile emissions from Ulvoid species, as well as purified DMS. Shane Bowman worked with me on this aspect of the project.

3. Characterize behavioral responses of amphipods to algal emissions. Field surveys and behavioral assays were conducted to determine how amphipods respond to algal emissions. Amber Olander and Michaela Rubenstein, two undergraduate biology/ecology majors worked me on this aspect of the project.

4. Determine whether Ulvoid algae impact the ability of amphipods to colonize algal patches. Field surveys and behavioral assays were conducted to determine how amphipods respond to algal emissions. Amber Olander and Michaela Rubenstein worked me on this aspect of the project.

**Project Findings**

1. Despite numerous recordings from dozens of amphipod antennae, with diverse volatile stimuli across a wide range of intensities, we were only able to induce electrical activity from antennae to mechanical stimuli and not to chemical stimuli. To ensure that our equipment and experimental design were functional and appropriate, we conducted the same experiment with honeybees and relevant stimuli, a system with which we’ve had previous success. All components of the equipment/design worked well with honeybees. These findings suggest that amphipod antennae are insensitive to airborne stimuli and instead rely on their antennal system to detect mechanical stimuli (wind/touch) and/or surface bound or waterborne chemical stimuli.

2. Ulvoid emissions, including purified DMS have no effect on antennal activity. Consistent with Finding #1, these specific stimuli, which have been potent stimuli in many other organisms, do not appear to impact the antennal system of amphipods. This is an interesting finding, as our hypothesis, based on much previous research, was that DMS would be a strong olfactory signal, either positive or negative. Instead, amphipods were unresponsive to the gas.

3. Amphipods exhibited no distribution or behavioral bias toward algal patches of any kind relative to control conditions. Field surveys of amphipods indicated random distributions across the beach regardless of algal patches. Lab experiments, in which amphipods were exposed to volatile emissions from single algal species did not induce behaviors indicative of navigation toward preferential algae.

4. Ulvoid algae did not impact amphipod distributions in the field or behaviors in the lab.

**Dissemination of Project Findings**

Amber Olander (with co-authored credit to Michaela Rubenstein) presented her findings at the 2015 Murdock Conference in Vancouver, WA. Because of the negative nature of our findings (in the sense that no discernable difference between treatments and controls were observed), we expect that these findings will not be successfully disseminated in presentations at national or international conferences or in peer reviewed-publications at this time.

**Future Scholarly Works**

My lab is currently working on multiple projects related to animal detection of chemical information in an ecological context. We may explore the function of amphipod antennae in the detection of waterborne and/or surface bound chemical stimuli in the future.

**Extramural Funding**

Although I hope to pursue extramural funding in the future, it is unlikely that such endeavors would be directly related to this project.

**Challenges and Resolutions**

Issues facing electrophysiological recordings were overcome by using a similar test species to ensure that the equipment/system were functioning properly (see *Project Findings #1* above). Field survey sampling equipment was disrupted/removed by rising tides and human activity. We adjusted sampling sites and times to address the effects of rising tides. We adjusted sampling times and fitted equipment with identification placards to address human-associated issues.

**Student Participation**

Shane Bowman recently graduated with a degree in biology and biochemistry (both B.S.). He received hands on training and experience with electrophysiology instrumentation and physiological experimental design. Amber Olander recently graduated with a degree in biology (B.S.) and received hands on training and experience in designing and implementing field biology surveys. Michaela Rubenstein received training and experience similar to Amber and is continuing as an SPU student in ecology. She is currently working on an animal behavior study at the Woodland Park Zoo.

1. When electronically submitting your report to CSFD, please cc: your chair and/or dean (whomever received your original grant notification). [↑](#footnote-ref-1)