Student: Julian Vallyeason
Firm: University of Maryland College Park, Department of Psychology
Mentor: Dr. Jens Herberholz
Title: Role of Sensory Signals in Maintaining Dominance Hierarchies in Crayfish

Background:

Crayfish are highly aggressive crustaceans that tend to form social hierarchies when living in communities. Formation of these hierarchies often involves a series of agonistic interactions between crayfish to establish a dominant and a subordinate. Despite the stability provided by these hierarchies, they are transient and easily disrupted through the introduction of outsider crayfish or through changing environmental factors. The purpose of this study was to determine how transmission of sensory signals such as vision and olfaction can affect the stability of hierarchies formed by *Procambarus clarkii*.

Description:

Communication of social status between two crayfish is critical in the maintenance of a hierarchy. Without adequate communication, a hierarchy will break down, leading to heightened levels of aggression in both animals. Methods of communicating social status include secreted urine, antennule contact, physical contact, and visual contact. However, the relative importance of these different forms of sensory communication, along with their influence on hierarchy stability, remains unknown. We hypothesized that when visual contact and olfactory contact are allowed between two crayfish, hierarchy stability will be maintained, leading to lower levels of aggression.

By comparing behavioral counts from a baseline fight to those from a future fight following a disruption in communication, the influence of sensory signals on hierarchies can be determined. Changes in the values of a dominance index, a consolidated measure of the aggressive and subordinate behaviors observed during a fight, would indicate hierarchy disruption. In this study, dividers that allowed for visual, olfactory, visual and olfactory (VO) or no contact were used following a baseline fight. Crayfish were then removed after one week in a communication-deprived condition, and allowed to re-establish a hierarchy. It was found that crayfish paired with a divider allowing only for olfaction experienced the largest increase in reversals, a switch in the roles of dominants and subordinates. Changes in aggression between the two fights were also largest in this condition. This indicates that maintaining olfactory, but not visual contact, has the ability to disrupt existing hierarchies and cause elevated levels of both aggressive and submissive behaviors.