Study of the Cellular and Molecular Signaling Processes which Influence Algal-Cnidarian Symbiosis and Bleaching

Aultman, Andrew

Coral reefs and Cnidarians are hosts to symbiotic, nutrient-providing dinoflagellates (Symbiodinium/zooxanthellae). Almost all coral reefs experienced a major decline in the 1980s and climate change and ocean acidification continue to threaten reefs on a global scale (Buccheim 1998, Baker 2008). This decline is due to coral reef bleaching, which occurs when corals lose zooxanthellae, making them appear white or “bleached.” Bleaching can occur for a variety of reasons, including high solar irradiation, changes in temperature, and disease (Brown 1997). Despite differences in thermal tolerances among the various clades of symbionts, most cnidarians preferentially select a clade for reinfection after bleaching (Kinzie 2001). Specificity is likely governed by cellular signaling though the exact mechanisms are unknown. This project aims to further scientific research regarding which pathways are involved. It is hypothesized that an immune response governs the cellular signaling, though more information is needed to understand this process (Shinzato 2014). The initiation of an immune response against dinoflagellate presence was attempted by varying temperature of the cnidarian Cassiopeia xamachana jellyfish and adding biologically-related pharmaceuticals into the host environment. Qualitative and quantitative analysis of cellular densities and color intensity aberration determined any effects of variables on symbionts. Results indicated that both temperature variation and temperature change and pharmaceutical presence together affect host health and symbiont densities negatively. Indomethacin presence may be correlated to symbiont loss.

Awards Won:
Fourth Award of $500