Exploring the Effects of Ocean Warming on the Temperate Coral *Astrangia poculata*
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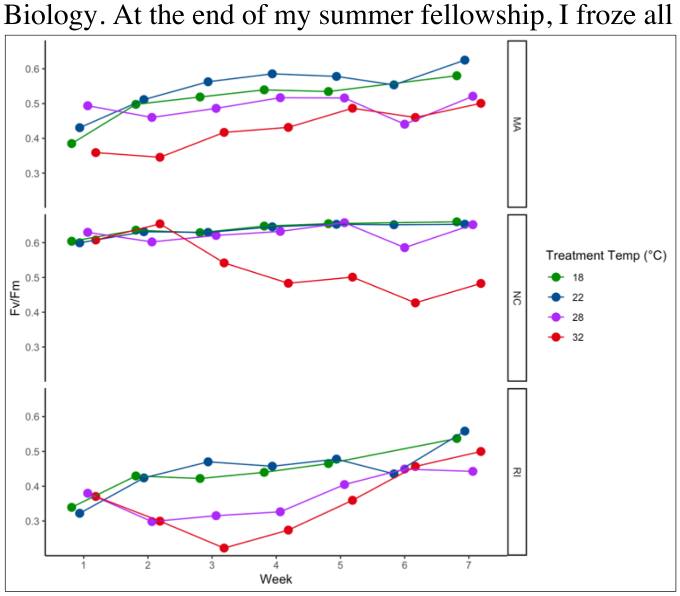
The world's coral reefs are deteriorating at frightening rates, in large part due to warming ocean temperatures driven by anthropogenic climate change. In the face of global coral reef decline, many scientists have begun to study variation in tolerance of corals to heat stress. Recent research has revealed that corals acclimated to higher ambient temperatures may demonstrate greater resiliency in the face of acute thermal stress. For example, Aichelman et al. (2019) found that samples of the temperate coral *Astrangia poculata* that were collected off the coast of Virginia were able to withstand higher temperatures than corals from off of Rhode Island, corresponding to the relatively warmer climate off of Virginia as compared to Rhode Island.[1] Continued study of differences in coral thermal limits may provide valuable insights into how coral species will respond to future temperature increases associated with global climate change.

Over the past 10 weeks, I studied the temperate coral *A. poculata*, a species native to the shallow subtidal waters of the western Atlantic Ocean, from Cape Cod to the Gulf of Mexico.[2] Like all coral species, the *A. poculata* coral host exists in symbiosis with photosynthetic algae—the coral provides shelter for the algae, and in return, the algae provide the products of photosynthesis (sugars) to the coral. However, unlike the obligate symbiosis of tropical corals, when faced with stressful environmental conditions, *A. poculata* has the rare ability to expel the algae from its tissues and support itself solely by heterotrophy (i.e., eating plankton from the water column). This capacity to live both with and without algal symbionts is called "facultative symbiosis," and makes *A. poculata* a particularly valuable model to study coral thermal acclimation and resiliency to ocean warming.

I conducted my research at the Schiller Coastal Studies Center in Harpswell, Maine, under the oversight of Dr. Justin Baumann and Dr. Barry Logan. Sourcing corals from populations in North Carolina, Rhode Island, and Massachusetts, I wanted to determine whether exposing *A. poculata* to elevated seawater temperatures for 40 days would impact rates of cellular respiration and photosynthesis, skeletal growth rates, and photosynthetic efficiency. I hypothesized that corals exposed to higher temperatures would demonstrate changes in their physiology indicative of heat stress. Furthermore, I anticipated that corals from North Carolina, which experienced higher temperatures in their native growth environment, would demonstrate greater resilience to thermal stress than the corals from New England.

I will be continuing my research with *A. poculata* during the academic year as a Honors Project in Biology. At the end of my summer fellowship, I froze all the coral samples at -80°C, in order to preserve them for additional analysis during the fall semester (including analysis of photosynthetic pigments, symbiont and mitochondrial density). In addition to these analyses, I will continue to dive into the data I collected during the summer. On the left is a preliminary figure that captures photosynthetic efficiency in each population over the course of the experiment and indicates that there is population-level variation in response to treatment. In particular, the corals from North Carolina demonstrate generally higher rates of photosynthetic efficiency, while the New England populations demonstrate more necrosis at the higher temperatures. I am excited to continue uncovering the patterns and ecological relevance within my data during the coming year.



[1] Aichelman HE, Zimmerman RC, and Barshis DJ. 2019. Adaptive signatures in thermal performance of the temperate coral *Astrangia poculata*. *J. Exp. Biol*. 22: jeb189225.
[2] Kaplan EH. 1988. A field guide to southeastern and Caribbean seashores: Cape Hatteras to the Gulf coast, Florida, and the Caribbean. Houghton Mifflin Co. Boston, MA. USA.