Title: Quantifying the Effects of Starvation, Thermal, and Photosynthetic Stress, and Microplastics on *Astrangia poculata* to Understand the Anthropogenic Impacts on Temperate Corals.

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Abstract:

The environment has undergone and will continue to undergo major changes. In order to understand how climate change is affecting ecosystems and species within them, scientists are replicating or exasperating environmental conditions in controlled experiments. Used by a quarter of all marine species as a reliable source for food, shelter, and protection, coral reefs play an invaluable role in the oceans' ecological system. This project explores the impact of anthropogenic activities on the temperate Northern Star coral (*Astrangia poculata*), located on the east coast of the United States, by inducing starvation, mimicking thermal and photosynthetic stress, and introducing microplastics into a controlled aquatic environment.

The objective of the project is to quantify the hierarchy of these anthropogenic stressors by observing how different combinations of stressors affect the phenotype and symbiotic state of *A. poculata*, and inhibit its ability to cope with marine diseases such as *E. coli*. These changes were monitored through several tests. Phenotypes were observed through photographic comparison, and to measure the density of the symbionts, individual coral fragments were photographed and analyzed using the red, green, and blue (RGB) color model following Winters *et. al* (2009). Pulse amplitude modulated (PAM) measurements were taken once a week to measure the photosynthetic efficiency of the symbionts. To measure the oxygen consumption and its ability to cope with *E. coli., A. poculata* fragments were subjected to respirometry experiments.

This paper focuses exclusively on the results of the different impacts of photosynthetic stress on *A. poculata's* survival probability and photosynthetic efficiency based on phenotype. The results found that photosynthetic stress, generally, is not stressful for *A. poculata* because it is a faculatative species and not obligate. This explains the relatively similar fatalities across varying photosynthetically stressful environmental conditions. Varying fatalaties across different treatments are more likely attributed to the experiments other stressors, such as thermal stress, than photosynthetic stress.