Relationships between biomass and symbiont density under different food and light treatments in temperate scleractinian coral *Astrangia poculata*

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A fundamental question in coral biology is, “How much do endosymbiotic algae contribute to the energetics of the coral holobiont?” The relationship between biomass (a proxy for energy) and symbiont density was examined across different food and light levels in the temperate, facultatively symbiotic scleractinian coral *Astrangia poculata*. Little is known about this relationship, and this experiment sought to understand how the two factors interact with each other and how they are impacted by different ratios of autotrophy and heterotrophy. Using samples collected in Rhode Island, the biomass of each coral was calculated by correcting the ash-free dry weight (AFDW) to surface area. AFDW was measured by weighing the coral tissue before and after all of the organic matter was combusted, with the difference being the dry weight. The symbiotic state of each coral was assigned visually at the beginning of the experiment, and later the symbiont density was attained by analyzing an image of the sample in MATLAB, using the red channel value (RCV) of the image as a proxy for symbiont density. The corals were split into groups: fed and starved, and high, medium, low, and dark levels of light in experimental tanks. Measurements were taken after 90 days in these treatments. There was no significant relationship between biomass and symbiont density across the samples, but for aposymbiotic corals (corals without symbiotic zooxanthellae), a higher symbiont density was correlated with a lower biomass. There was little difference in biomass between treatments, possibly due to corals entering quiescence under low light and/or starvation, but symbiont density showed a greater influence from differing treatments.