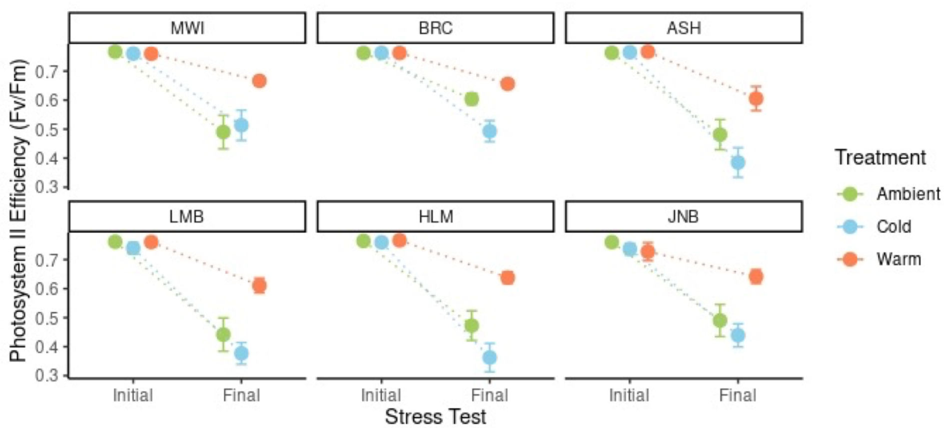
Testing the response of Gulf of Maine *Ascophyllum nodosum* to warming ocean temperatures

Tori Bacall, 2026

Between 1980 and 2011, the Northwest Atlantic Ocean warmed by 0.8-1.6 degrees Celsius (Wilson et al, 2015), and the Gulf of Maine is warming especially quickly (Saba et al, 2016). Increasing ocean temperatures will, and have already begun to influence the abundance and distribution of macroalgae. *Ascophyllum nodosum* is a common intertidal macroalgae in the North Atlantic Ocean. *A. nodosum* has both ecological and economic importance, as it forms large beds that provide habitat for over 100 invertebrate taxa (Khan et al, 2018), many of which are commercially important. Further, *A. nodosum* accumulates nutrients and minerals from the surrounding seawater, making its harvested biomass valuable to humans in fertilizer, animal feed, dietary supplements, and as a food additive (Pereira et al, 2020). Existing studies about the effect of warming ocean temperatures on the growth of *A. nodosum* have shown inconsistent results, some suggesting that the range of *A. nodosum* will expand (Khan et al, 2018) and others predicting that *A. nodosum* will no longer be able to persist in the warming Gulf of Maine (Jueterbock et al, 2013). This study seeks to answer the questions: How does acclimation at different temperatures affect the ability *of A. nodosum* from different sites to withstand thermal stress above their optimum?

I collected 16 individuals from 6 sites in the Gulf of Maine (3 northern and 3 southern). I cut off three apical growing tips from each individual, one to be subjected to each temperature treatment. I attached the tips to the bottom of 3-liter plastic containers, each of which housed 2 individuals from each population. These were grown in the wet lab of the Schiller Coastal Studies Center with flow-through seawater. I exposed individuals to3 different temperature treatments: a cold treatment (16°C) to mimic summer ocean temperatures in northern Maine, the ambient summer water temperature in Southern Maine (an average of 18.5°C), and a hot treatment (22°C) to model future ocean temperatures in southern Maine). I measured growth once a week for four weeks. After the four-week growth experiment, I ran a 7-hour high-temperature stress experiment measuring the photosystem II (PS II) efficiency of each tip before and after heat stress. .



A. nodosum tips that were subjected to the hot treatment had a smaller decrease in Fv/Fm following the heat stress event. There is a significant interactive effect of site, temperature, and treatment on Fv/Fm ($p = 0.02964$).

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