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Scientific Paper:

Climate Change Ecology (2022) 3, 100049

High-latitude calcified coralline algae exhibit seasonal vulnerability to acidification despite physical proximity to a non-calcified alga

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Abstract:

The emergent responses of vulnerable species to global change can vary depending on the relative quality of resources available to support their productivity under increased stress, as well as the biotic interactions with other species that may alter their access to these resources. This research tested how seawater p CO_2 may interact with seasonal light availability to affect the photosynthesis and calcification of high-latitude coralline algae, and whether the responses of these calcified macroalgae are modified by physical association with a non-calcified seaweed. Through an in situ approach, our study first investigated how current seasonal environmental variation affects the growth of the understory coralline algae *Crusticorallina* spp. and *Bossiella orbigniana* in Southeast Alaska's kelp forests. We then experimentally manipulated pH to simulate end-of-century acidification scenarios, light regime to simulate seasonal light availability at the benthos, and pairings of coralline algal species with and without a fleshy red alga to examine the interactive effects of these variables on coralline productivity and calcification. Our results indicate that: 1) coralline species may face net dissolution under projected future winter pH and carbonate saturation state conditions, 2) differences in seasonal light availability in productive, high- latitude waters may not be distinct enough to modify coralline algal net calcification, and 3) association with a non-calcified red alga does not alter the response of these coralline algal species to ocean acidification scenarios. This research highlights the necessity of incorporating locally informed scenarios of environmental variability and community interactions when predicting species' vulnerability to global change.

Keywords: ocean acidification (OA), global change, calcification, interaction, *Bossiella*, *Crusticorallina*