

Climate change and the ecology of fear

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Climate change is predicted to have major impacts on the many species that call our rocky shorelines home. Indeed, species living in these intertidal habitats, which spend half their day exposed to air and the other half submerged by water, may be subjected to a double whammy as both air and water temperatures rise. Given the reliance of human society on nearshore coastal ecosystems, it is critical that we better understand how climate change will affect them.

In a recent study published in [Global Change Biology](#), Northeastern University professor Geoffrey C. Trussell, postdoctoral scholar Luke Miller, and PhD student Catherine Matassa, examine how the simultaneous changes in ocean and air temperatures affect the interaction between an invasive crab predator and one of its common prey. "Species interactions, particularly those between predators and their prey, are the lattice that often determine the organization and dynamics of these communities. And many ecologists think that climate change stands to alter these interactions, which can be quite disruptive for the health and functioning of natural communities."

This paper delivers a novel approach that allows realistic, experimental simulations of predicted climate change scenarios for marine organisms. Trussell and his team developed a "climate change array" that tracks natural variation in climate and combines that with projected warming scenarios for rocky intertidal habitats in Massachusetts Bay. "This approach is much more appropriate because it does not hammer organisms with constant elevated temperatures, which could lead to overestimates of [climate change impacts](#)," says Trussell. "Despite our

more conservative approach, we still witnessed strong negative impacts of elevated air and water temperature, particularly for the prey species in our experimental food chains."

In many systems, predation risk prompts strong avoidance behaviors in prey that can shape the organization and dynamics of natural communities, and when you begin to factor in climate change, the dynamics change even further. "There is increased recognition that the ecology of fear can strongly shape natural communities. We discovered that the effect of fear combined with projected warming can cause prey to deplete their energy reserves as they try to cope with both stressors."

These results suggest that the negative consequences of climate change may be more pronounced in food chains where predator risk is a strong driver of species interactions. Interestingly, while prey in the middle of their experimental food chains were strongly impacted, Trussell and his team found no effects of warming on the predators and the resources that supported the food chain. Trussell notes, "We think our study makes a strong case for the need to consider multiple species and their interactions if we are to better understand the ecological consequences of [climate change](#)."

Provided by Northeastern University

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