

Climate warming may have unexpected impact on invasive species

August 7 2014

Rising temperatures may be seen as universally beneficial for non-native species expanding northward, but a Dartmouth College study suggests a warmer world may help some invaders but hurt others depending on how they and native enemies and competitors respond.

The study, which sheds light on the uncertain relationship between [climate change](#) and invasive species, appears in the journal *Ecology*.

Climate change and invasive species rank among the largest predicted threats to global ecosystems over the next century, but they are typically treated independently. To date, research focusing on the connection between these two threats has primarily focused on the idea that species from lower latitudes, which typically experience warmer temperatures than those in higher latitude ecosystems, will perform better at higher latitudes as temperatures warm. The Dartmouth study focuses instead on how a trait common among certain [invasive species](#)—benefiting from "enemy release"—can be influenced by changes in temperatures. The "enemy release" hypothesis holds that certain [invading species](#) succeed because they escape from their natural enemies—pathogens, parasites, herbivores and predators—in their native habitat. The Dartmouth study's approach takes into account that invading species are attempting to establish in locations where other species already exist, and the interactions with these existing species are important to consider.

The researchers conducted a six-week experiment manipulating the presence of sunfish and [water temperature](#) using two non-native and

native crustacean zooplankton. They found that increases in water [temperature](#) favored the non-native crustacean due its faster growth rate at higher temperatures, as well as the fact that sunfish predators of both crustaceans eat more at higher temperatures. The sunfish's increased appetite disproportionately benefits the non-native crustacean because it has more effective defenses against fish predation—hence its "release" from this particular enemy—than the native crustacean.

The results suggest that warming temperatures can affect the strength of "enemy release," which will alter the success of invading species. "But the direction of this effect depends on the physiology of the [species](#) present. As such, warming could increase or decrease the strength of 'enemy release' depending on the organisms that exist in a given location," says the study's lead author [Samuel Fey](#), a visiting scholar at Dartmouth and a postdoctoral fellow at Yale University who recently received a Ph.D. from Dartmouth's Ecology and Evolutionary Biology program.

Provided by Dartmouth College

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