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Study shows invasive rusty crayfish sabotage own habitat

By David Nutt

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The rusty crayfish found its way into Wisconsin waters as an invasive species in the 1960s, when it was used as live bait by anglers. It displaced other crayfish and reduced the diversity and abundance of aquatic plants and macroinvertebrates, as well as some fish species. But it also made its own survival difficult.

A new study, "**Habitat Explains Patterns of Population Decline for an Invasive Crayfish** (https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecy.2659)" published March 28 in Ecology, shows that in lakes with muck and sand bottoms, the rusty crayfish has been contributing to its own population decline by destroying the very plant life that shelters and protects it from predators.

Researchers from the University of Illinois were able to track the long-term impact and occasional decline of rusty crayfish through data collected in the lab of the paper's senior author, **David Lodge** (http://www.atkinson.cornell.edu/about/people/Lodge.php), professor of ecology and evolutionary biology and the Frank J. DiSalvo Director of Cornell's **Atkinson Center for a Sustainable Future** (http://www.atkinson.cornell.edu/).

Lodge has been tracking rusty crayfish populations in northern Wisconsin lakes since 1983, first as a postdoctoral researcher at the University of Wisconsin-Madison and later at the University of Notre Dame.

"The impact of invasive species on biodiversity and ecosystem function is one of the most major globally important impacts, ranking up there with climate change, water pollution and land-use change," Lodge said. "Invasive species have appeared to be an intractable problem because they're a living, reproducing and spreading form of pollution. And they are really difficult to detect early on, particularly underwater invasions.

"Rarely," he said, "have we had an opportunity to follow multiple invasions of the same species from their beginning."

The researchers analyzed samples from 17 lakes, taken between 1972 and 2017, which showed that after an initial boom in population, rusty crayfish had declined in about half of the lakes during that time. Using an underwater video camera system to examine the characteristics of the lake bottoms, the researchers found that the rusty crayfish were disappearing only from lakes that had mucky and sandy substrate. That's

because rusty crayfish decimate aquatic plants by foraging and burrowing, sometimes nearly wiping out all plant life. In lakes with rocky bottoms, the rusty crayfish continue to thrive because they are able to use the boulders and cobble to hide from predators like fish, river otters and wading birds. Those rocky substrates are more difficult for the crayfish to disturb.

Now that researchers have a better understanding of why the rusty crayfish can flourish in certain environments and dwindle in others, they can more efficiently and effectively focus mitigation efforts.

“Habitat explains these population patterns for rusty crayfish well, but there are some lakes where the trend is less clear,” says Eric Larson, lead author on the paper and an assistant professor at the University of Illinois at Urbana-Champaign. “In the future, we’d like to look at other factors potentially affecting rusty crayfish populations, including interactions with predatory fish, parasites and climate.”

Even if the habits of rusty crayfish can be self-defeating in some lakes, their damage endures even in those lakes where their population declines. For most lakes, it’s worth investing in prevention early, according to Lodge.

“There was a long-standing idea that invasions boomed, and then we don’t need to worry about them because they will bust on their own,” Lodge said. “Our experience with many invasions in oceans and on land and in freshwater is they don’t seem to bust, and they appear to permanently alter the ecosystems they invade.”

Co-authors include researchers from Bridgewater College and University of Notre Dame. The research, performed over several decades, was supported by the National Science Foundation, U.S. Forest Service, University of Notre Dame, Shedd Aquarium and the Wisconsin Department of Natural Resources.

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