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Perturbing a littoral-zone lake community to release a biological

Rusty crayfish (*Orconectes rusticus*) are aggressive invaders of the Great Lakes ecosystem. When introduced into new lakes, they drive down native crayfish populations, disturb macrophytes, interfere with fish recruitment, and cause the overgrazing of algae and snails. Recently, the population density of rusty crayfish in some lakes has far exceeded previously recorded levels. Management of this nuisance species is necessary.

The interaction between rusty crayfish and indigenous smallmouth bass (*Micropterus dolomieu*) involves a mixture of competitive and predator-prey relationships. Juvenile smallmouth bass compete with all life stages of the invasive rusty crayfish. However, mature smallmouth bass are major predators of rusty crayfish. Intraspecific interactions for rusty crayfish also include cannibalism and resource competition.

We used mathematical and computer models to investigate the influence of biological control of rusty crayfish by smallmouth bass. The method is to apply perturbations to shift the dominance in a competitive bottleneck from rusty crayfish to smallmouth bass. The perturbations include crayfish trapping, trawling and changes to lake fishing regulations.

Our model was developed and parameterised using long term field data and laboratory experiments. The analysis suggests methods for effective control. Model validation will be carried out by use of a controlled experiment in Lake Ottawa, Michigan. We will test the hypothesis that trawling for crayfish is sufficient for control without changing fishing regulations. Our long term goal is to implement the control methods in selected lakes.