

# Researchers demonstrate relationship between predation and extinction in small populations

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(PhysOrg.com) -- Two ecological issues of increasing concern are the conservation of threatened and endangered species and the management of invasive species. A study by University of Georgia Odum School of Ecology postdoctoral researcher Andrew M. Kramer and associate professor John M. Drake has important implications for both.

Their paper shows, for the first time, experimental confirmation that predation can accelerate [extinction](#) in small populations. Published in a recent issue of the *Journal of Animal Ecology*, the article also was featured in the journal's "In Focus" section.

Kramer explained that there is a relationship between a population's density and its fitness, or ability to grow and thrive. Small populations can experience positive density dependence, which means that as density rises, so does fitness; as density decreases, the population's growth rate decreases as well. When this relationship is particularly strong, the population growth rate not only slows but actually becomes negative - which can lead to the extinction of the entire population.

Until now there has not been experimental evidence of such positive density dependence caused entirely by predation. For example, individuals in a small, low-density population may have difficulty finding a mate, which also can affect that population's growth rate. Earlier studies have not been able to separate the various potential

drivers of changes in populations. Kramer and Drake designed their experiment to ensure that predation was the sole possible mechanism that could induce this result.

Kramer and Drake established 56 populations of different sizes of the small aquatic crustacean *Daphnia magna*. They selected this species as the experimental prey because it reproduces asexually and practices no social cooperation, eliminating those potential mechanisms for a decrease in population growth. They then introduced *Chaoborus trivittatus* and *Chaoborus punctipennis* [larvae](#) as predators into half of the experimental populations. Their results were consistent with models that predicted that low population density combined with the presence of predators would lead to the highest extinction rates.

Stephen D. Gregory and Franck Courchamp, in their “In Focus” article about Kramer and Drake’s research, refer to the finding that predation can lead to extinction of low-density populations as “double-edged.” Kramer agreed. “It depends on your perspective,” he said. “If your goal is the eradication of an [invasive species](#), these results could offer some good news. But if you are trying to conserve a threatened or endangered species, the news is not too encouraging. It is clear, however, that we need to look more closely at predators and small populations if our goal is species conservation.”

Provided by University of Georgia

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