

When less is more: Death in moderation boosts population density in nature

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In nature, the right amount of death at the right time might actually help boost a species' population density, according to new research that could help in understanding animal populations, pest control and managing fish and wildlife stocks.

In a paper in the journal *Trends in Ecology and Evolution*, a Princeton University researcher and European colleagues conclude that the kind of positive population effect an overall species experiences from a loss of individuals, or mortality, depends on the size and [developmental stage](#) of the creatures that die.

If many juveniles perish, more adults are freed up to reproduce, but if more adults die, the number of juveniles that mature will increase because density dependence is relaxed, explained co-author Anieke van Leeuwen, a postdoctoral researcher in Princeton's Department of Ecology and Evolutionary Biology. Van Leeuwen worked with first author Arne Schröder, a postdoctoral research fellow at the Leibniz-Institute of Freshwater Ecology and Inland Fisheries in Berlin, and Tom Cameron, a lecturer in aquatic community ecology at the University of Essex in the United Kingdom.

This dynamic wherein the loss of individuals in one developmental stage translates to more robust individuals in another stage can be important to managing wildlife, pests or resource stocks, van Leeuwen said. For instance, targeting the adults of an invasive insect could have a counterproductive effect of making more food available to growing

larvae, she said.

"It doesn't matter which developmental stage you target, if you impose mortality on one you will get overcompensation on the opposite end of the size range," van Leeuwen said. "This effect can be especially advantageous in situations where we want to manage resources we want to harvest. Knowing that there are potential effects that result in an increase in that segment of the population we want to encourage is highly relevant."

At a certain point, of course, mortality becomes too high and the species as a whole declines, the researchers report.

The researchers compared existing theoretical and experimental work on the effect of mortality on population density to resolve various inconsistencies between the two. Existing mathematical models have predicted this phenomenon, and laboratory and field studies have shown that the effect holds true for a variety of animal species.

Many ecological theories and models, however, have ignored differences in body size and development, and predicted that a modest amount of mortality would result in an increase in the total number of individuals, the researchers wrote. On the other hand, experiments have predominantly shown—along with certain models—that mortality has a positive effect within certain life stages or size classes. The researchers concluded that the overlap of experimental and theoretical data indicates that the benefit of [mortality](#) is likely divided by developmental stage. In addition, the number of species in which the phenomenon has been observed makes it commonplace in the natural world.

More information: The paper, "When less is more: Positive population-level effects of mortality," was published in the November 2014 issue of *Trends in Ecology and Evolution*.

Provided by Princeton University

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