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Researchers Show Fear of Predators Impacts the Health of Prey Populations

Wolf spiders scare the daylights out of grasshoppers. So much so that grasshoppers will starve to death rather than come out of hiding to forage and feed when a wolf spider is nearby. Such behavior demonstrates how a predator -- in this case the spider -- can impact its prey without actually killing or consuming it.

Research conducted by a group of scientists associated with UC Santa Barbara's National Center for Ecological Analysis and Synthesis (NCEAS) indicates that the defensive strategies organisms employ to avoid being eaten by predators affect the health of their populations as much as or more significantly than does consumption itself. The researchers's findings are published in a series of three articles in the September issue of *Ecology*, the journal of the Ecological Society of America.

"These articles make the point that behavior matters, that it affects entire populations and ecosystems," said Evan Preisser, an assistant professor at the University of Rhode Island and a co-author of two of the articles. He and Daniel Bolnick, an assistant professor at the University of Texas at Austin, co-chaired the NCEAS working group that examined the topic, and both are guest editors of the special issue of *Ecology* in which the articles appear.

In one article, titled "Revisiting the Classics: Considering Non-Consumptive Effects in Textbook Examples of Predator-Prey Interactions," lead author Barbara Peckarsky, of the University of Wisconsin, Madison, takes case studies of predator/prey relationships commonly found in ecology textbooks and examines the effects of prey behavior. Research studying 200 years of data on the predator/prey cycle involving the snowshoe hare and lynx, for example, reveals that the predator/prey dynamics are driven by factors beyond consumption.

"Even though healthy rabbits are at a low risk of being eaten by a lynx, each one still worries that it will be the one that gets caught," said Preisser. "This creates a very stressful environment in which everyone is always on guard and the females are constantly releasing stress hormones. The result is they have offspring that don't thrive as well as they might otherwise."

The second article, titled "From Individuals to Ecosystem Function: Toward an Integration of Evolutionary and Ecosystem Ecology," examines how fear can affect ecosystem processes by altering the flow of energy within the ecosystem. The lead author is Oswald Schmitz of Yale University's School of Forestry and Environmental Studies.

"Energy comes from plants and is transferred up to herbivores and then to predators," said Preisser. "It turns out that fear changes the way energy is transferred." Using the interaction of wolves and deer as an example, he explained that in the presence of wolves, a population of deer will minimize its feeding time and, therefore, its food consumption. "The deer aren't putting on a bunch of extra weight so the number and quality of their offspring are reduced. That's energy that's lost from the system, but it doesn't go to benefit the predator," he said.

In the third article, titled "Consumptive and Nonconsumptive Effects of Predators on Metacommunities of Competing Prey," lead author John Orrock, of NCEAS and the Department of Biology at Washington University in St. Louis, takes a look at how predators can affect communities other than their own by impacting prey movement from one area to another.

"If you're a deer and wolves come into your area, the response would be to go someplace else," said Preisser. "That movement alters the dynamics of the community you leave as well as the community you enter."

Contrary to what some people believe, behavior really does matter, he said.

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