

Paper offers new insights into predator-prey relationships

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(PhysOrg.com) -- For those old enough to remember Mutual of Omaha's "Wild Kingdom" television series, the dynamics of predator-prey relationships seemed clear enough: predators thinned out prey populations, which enabled a smaller, but stronger, population to survive and reproduce.

However, a new paper by University of Notre Dame biologist Gary Belovsky appearing in the prestigious journal [Ecology Letters](#) suggests that [predator-prey](#) relationships are much more complex than originally

thought.

The paper arose out of pioneering studies Belovsky, who also is director of the Notre Dame Environmental Research Center (UNDERC), has been conducting on [grasshopper](#) populations since 1978 at Montana's National Bison Range, now a location for one of UNDERC's national undergraduate programs.

Belovsky conducted an experiment to examine how behavioral responses of grasshoppers to avian predators affected grasshopper survival and reproduction at different grasshopper population densities. A series of cages containing grasshoppers were enclosed within a tent constructed of aviary netting, creating a "no threat" area because its design prevented birds from approaching the cages and "scarring" the grasshoppers. A second set of cages provided a "threat" area because it was not enclosed in a tent, which allowed birds to feed around the cages, perch on top consuming grasshoppers caught outside the cages and "scare" the grasshoppers inside the cages.

The research demonstrated that grasshopper behavior changed with the threat of predators, reducing grasshopper feeding, and this was apparent at all grasshopper densities. The behavioral changes with the threat of predation increased survival at low grasshopper densities, as reduced feeding made food available to more individuals, while the changes decreased survival at higher densities, as severe food shortages were made worse by reduced feeding. However, the behavioral changes decreased per capita reproduction over all grasshopper population densities, as grasshoppers traded off survival and reproduction as competition among the grasshoppers increased with greater population densities.

"This type of variable response is generally overlooked when prey behavioral changes with predation are considered in how predation

affects prey populations,” Belovsky said. “Resource availability may need to be considered when assessing how prey behavioral changes with predation threat affect population and food web dynamics.”

Belovsky also notes that the new paper reinforces the importance of his western prairie research, which is now the longest running experimental study at a site examining what controls grasshopper populations. Although it isn’t feasible to conduct a population study like this with populations of larger animals, such as elk and wolves in far-flung areas such as Alaska, the more easily observable field work with grasshoppers and birds offers important predator-prey insights that can be applied to these types of populations.

Provided by University of Notre Dame

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