

5.2 Predator Invasion Disrupts the Conservation of Natural Enemy Biodiversity

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Pest suppression may be strongest when natural enemy communities are species rich (high richness) with similar abundances among those species (high evenness). While conservation biological control has focused on encouraging greater species richness, it is less clear how to promote greater natural enemy evenness. Working on over 50 mixed-vegetable farms across three US states, we used structural equation models to examine relationships between evenness of ground-active generalist predators and the availability of two resources – non-pest prey and refuges habitats – thought to encourage greater natural enemy biodiversity. We found that higher densities of detritus-feeding springtails, important non-pest prey, correlated with increasing predator evenness. However, increasing densities of the invasive ground beetle *Pterostichus melanarius* (Illiger) (Coleoptera: Carabidae) correlated with reduced evenness among native predators, counterbalancing any benefit of springtails. Structural complexity and alternative food provided by non-crop plants encouraged higher densities of *P. melanarius*, reinforcing the harm of the invaders to predator evenness. Altogether, these results suggest that the presence of a non-native ground beetle complicates any effort to conserve evenness among native ground-foraging natural enemies. Indeed, negative effects of *P. melanarius* appeared sufficiently strong to overwhelm efforts to promote greater predator evenness by enhancing prey diversity, food plants, or shelter.