The Impact of Agricultural Complexity on Arthropod Diversity

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Abstract

The complexity of landscapes surrounding agriculture may have an effect on the diversity of arthropods living on farms. Understanding the relationship between landscape complexity and biodiversity may provide valuable information to natural pest control and conservation. The effects of landscape complexity on arthropod richness were analyzed by monitoring arthropods at 24 different organic broccoli farm sites from 2006-2008, in landscapes ranging from 3%-80% natural habitat surrounding the farm. Univariate regression analyses did not reveal a significant relationship between the landscape gradient and the total species richness of all arthropods. In contrast to expectations, landscape complexity showed no significant relationship to the total species richness of wasps, beetles, and true bugs; however, spider diversity increased with increasing landscape complexity and fly diversity decreased with decreasing landscape complexity at specific spatial scales. A comparison in data with previous studies shows that this study has a fairly lower-diversity system, and could possibly explain the results obtained.

Methods

• The study is based in Central California, on 24 organic broccoli farm sites. The 24 farms represent a landscape gradient, ranging from 3%-80% natural habitat within 1.5 km of the farm. The two extremes of the landscape gradients are shown below (various shades of green are different types of natural habitat, spotted beige colors show agricultural areas).

Results (continued)

• Figure 2a shows the results of regression analyses that we ran on Natural Enemy species against landscape complexity at multiple scales.

Figure 2a. Enemy Species Richness vs. Natural Habitat

Discussion

• Other studies analyzed more than 80 species of a single group (Purtauf et al., 2008), where I found on avg. 8 species per group, and it is possible that differences can not be detected in such a low diversity system.

• Flies species declining with landscape complexity may be due to an increase in predation as well as the added stress of finding appropriate plants.

• Spiders in particular may benefit from landscape complexity because they are generalists (Drapela et al., 2008) and this is supported by their strong response at all scales.

Results

• From the samples collected, 6 different groups of arthropods were found: 8 spider species, 15 unknown specimens, 8 bug species, 13 wasp species, 5 fly species and 9 species of beetles.

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Works Cited


*Photos taken by Ruth Lopez and Rebecca Kramer

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