

Associational effects of *E. speciosus* and *E. elatior* on their pollinators and seed predators

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Abstract

Studying the relationships between plants and insects is important in natural and agricultural communities. It has been shown that plant community composition has an effect on insect pollinators and herbivores. However, these relationships have only been researched independently and no study has comprehensively investigated the net effects of neighbors on pollinators and herbivores in the same system. In my study, I aimed to understand whether neighbor effects on pollinators differed from neighbor effects on herbivores. I worked with two species, *Erigeron speciosus* and *Erigeron elatior*, and arranged plots with varying relative abundances of the two plants. Throughout the flowering period, I recorded pollinator visits at each plot. I have collected the flower heads in order rear the seed predators and will have data to analyze in September. I will submit my final data and paper in late September or October 2014.

Introduction

In many natural and agricultural communities, it has been observed that the neighbors surrounding a plant affect how that plant is detected by insects that damage or pollinate it. The variety and abundance of different plant neighbors can either increase or decrease the vulnerability of certain plants. These effects are known as associational susceptibility and associational resistance, respectively (Underwood et al., 2014). I propose to study whether neighbor effects on pollinators will differ from neighbor effects on herbivores.

There are many mechanisms by which plant neighbors can affect insects. Neighboring plants are sometimes able to serve as alternative sources of prey when they share the same herbivores as the focal plant. Plants that are possibly more attractive to pollinators and herbivores can allow a less preferred plant species to exist at relatively high abundances (Atsatt and O'Dowd, 1976). Additionally, the abundance of neighboring plants is critically important to the focal plant if the neighbors also have traits that affect herbivores (Russell and Louda, 2005). When co-flowering plants share the same pollinators, the variety and abundance of plant neighbors can become significant due to competition for pollination (Mitchell et al., 2009).

Research has been conducted to understand the effects of plant neighbors on pollinators and herbivores independently, but little is available on how they are both affected using the same set of plant species. Although we know that the activity of pollinators and herbivores are affected by neighboring plants, most studies do not include both in their experimental design which could ultimately lead to an incorrect conclusion about the total effect of neighbors. Because the pollinators and herbivores may be responding to a different set of plant traits, my hypothesis is that the associational effects on pollinators will differ from associational effects on herbivores.

In natural systems, testing this hypothesis would increase our knowledge of the relationships between plants and insects because we would have an opportunity to assess how pollinators and herbivores respond using the same organisms. Beyond simply understanding these relationships more clearly, gathering more information about this topic is relevant to our understanding of agricultural systems. In agricultural communities, farmers are increasingly growing diverse plants in the same field in order to increase pollination and to decrease damage to their plants. For this technique to be effective, we need to understand more about whether herbivores and pollinators are affected similarly or differently.

Ultimately, further researching the connection between plants and insects will benefit us as we aim to improve our agricultural practices.

Methods

Study System

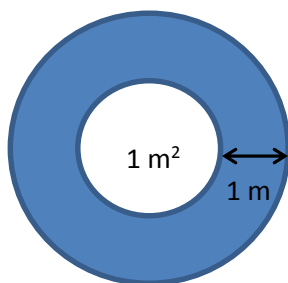
Erigeron speciosus and *Erigeron elatior* are two naturally co-occurring species in meadows surrounding RMBL. They appear as purple daisies and typically co-occur in mid-July (A. Iler, personal communication). They are good model organisms for studying associational effects because they share pollinators and seed predators while having natural variation in abundance within a field (B. Inouye, personal communication).

The pollinators of *Erigeron* include solitary bees, syrphid flies, and butterflies (B. Inouye, personal communication). The primary seed predator of *Erigeron* is *Neotephritis finalis*. Under laboratory conditions with wild sunflowers *Helianthus annuus* and *Helianthus petiolaris*, *N. finalis* was found ovipositing on flowers throughout their life cycle, from their budding to wilting. The length of time of development from egg to adult emergence was typically 18-22 days (Arthur and Mason, 1989).

Experimental Setup

In my study, I set up 40 circular plots encompassing 1 m² (56.5 cm radius) in a meadow to the south of South Gothic. Additionally, I collected data on all flowering composites within an additional 1 meter radius surrounding the plot (7.7 m² total area) to understand how the plants within a larger neighborhood could also be affecting the pollinators and seed predators of *Erigeron* (Fig 1). I chose locations for the square meter plots so that there is variation in the relative abundances of *E. speciosus* and *E. elatior*.

Figure 1

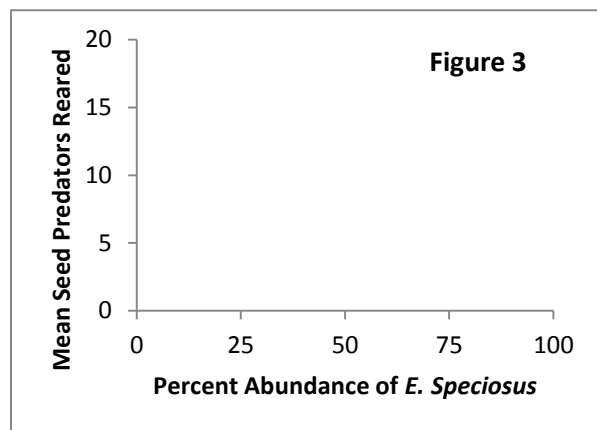
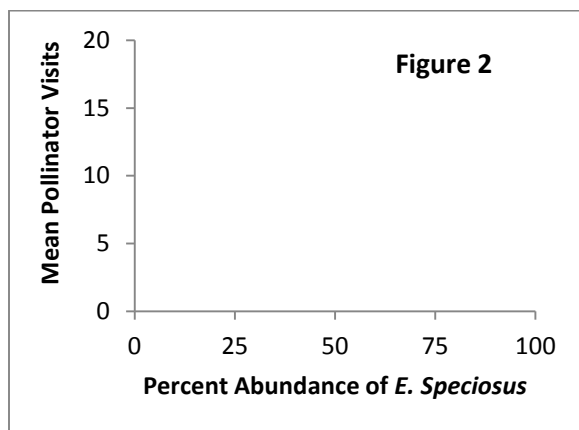


Data Collection

Every other day during the flowering period, I recorded the number of visits by pollinators the *Erigeron* receive in 20 of the 40 plots. I randomized the order in which I collected data from these plots so the time of day does not affect my results. At the end of the flowering period, I will collect the flower heads from all 40 plots and count how many *N. finalis* are reared from them.

Results

When I have data to present, I will analyze it by making graphs that look something like this:



Discussion

Because I don't have enough pollinator data and I won't have seed predator data until I open up the flower heads, I am not quite sure what I'll find. Hopefully there will be an interesting pattern! (I will send final results and completed paper in September or October 2014)

Literature Cited

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Underwood, N., B. D. Inouye, and P. A. Hambäck. 2014. A conceptual framework for associational effects: when do neighbors matter and how would we know?. *The Quarterly Review of Biology* 89: 1-19.

Figures:

