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COCCINELLIDAE DISTRIBUTION THROUGH DIFFERENT HABITATS

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ABSTRACT

Coccinellidae, commonly known as ladybugs, hibernate every Winter and awaken every Spring. This experiment studies where Coccinellidae distribute a few weeks after they awaken. This is the time of year that they lay their eggs and start to establish food sources. Coccinellidae distribution was studied in a backyard in New Windsor Maryland in late April. 5 traps were each established at 5 different habitats to estimate approximately how many Coccinellidae were inhabiting a location. These habitats assessed were a bed of flowers, in the woods, in a small garden, in the open sun, and under the shade of a house porch. It was hypothesized that the Flowers site would trap the most Coccinellidae due to it being the most ideal habitat for new larvae while also having large quantities of food and copious sheltering locations. It was also hypothesized that the Open Sun location would capture the least number of Coccinellidae as there is very little shelter and food while also leaving the beetles very exposed to predation. The evidence supported this hypothesis with 18 of the 45 Coccinellidae captured being from the Flowers location and only 4 being from the Open Sun site. A two-way ANOVA found a p value of 0.0174 making the results significant. This shows that Coccinellidae prefer to spend much of their time around flower beds due to it'd abundant resources.

Keywords: Abundance, Aphids, Coccinellidae, Distribution, Ladybug

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INTRODUCTION

Coccinellidae is a large family of beetles commonly known as ladybugs or ladybirds. There are approximately 500 species of Coccinellidae in the United States. They are found in every state but are more common in rural areas since they prefer grasslands and various foliage. Although some Coccinellidae are herbivores, most are predatory and consume smaller insects such as aphids. Coccinellidae are very adaptable and often roam through different habitats in search of food (Sloggett 1999). Coccinellidae are not opposed from entering most habitats as long as it is capable of surviving in it. Coccinellidae lay their eggs on aphid infested crops and shrubbery during early Spring to early Summer. These aphids and vegetation will feed the growing larvae. When they reach adulthood, they expand this territory to other temporary habitats in search of more food. During the Winter, Coccinellidae hibernate in small, ground level, covered location. Some common hibernation locations are crops, forest edges, gardens, and walls (Honěk 2007). This experiment was conducted in late April, shortly after Coccinellidae awaken from hibernation. By examining their habitat choice after they exit hibernation, we can get a better understanding of what their preferences are during this time and what qualities they look for. It is hypothesized that:

Hypothesis 1. The Flower site will have the greatest abundance of Coccinellidae due to its abundant food and locations for the beetles to hibernate in Winter

Hypothesis 2. The Open Sun site will have the least abundance of Coccinellidae due to its lack of protection and food.

FIELD SITE

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The experiment was conducted in a backyard in New Windsor Maryland. There are 5 different site locations, all within a 300' radius of each other. The first site is a small patch of various wildflowers that grow in the middle of an open field. These flowers often attract a large array of different beetles, butterflies, and pollinators. The flowers are very colorful and range in color from yellows, to reds, to purples and grow about 5" tall. The second site is located in a nearby wooded area. This area is filled with various oak trees with very little underbrush. The woods have lots of megafauna species including fox, turkey, and deer. Other than the leaves on the trees, there are very little flowers or bushes. The third site is a vegetable garden. The garden grows different crops such as blueberries and asparagus. There are not many plants surrounding the garden, leaving the crops to be the main source of vegetation other than grass. The fourth site is in the middle of an open field in the middle of the sunlight. There is no vegetation near the trap other than some grass. The trap will be in the direct line of sun throughout the day. The fifth site is in the shade near a porch. This location will have no access to sunlight as it will be shaded by the roof of the porch. The porch has many different bushes with several types of flowers nearby. This location is often visited by several other bug species, especially pollinators, due to the presence of the different flowers. The site locations are in the yard of a house in New Windsor Maryland. This area is rural and has a large ladybug population. This study was also conducted during the end of April and beginning of May, the time of year when Coccinellidae start to exit their hibernation from the Winter.

METHODS AND MATERIALS

Coccinellidae were collected in 5 different traps at each site location, leading to 25 traps total. Each trap was created with standard water bottles. After collecting 25 empty and dry water bottles, I cut off the top 3 inches of the bottle, inverted it, and placed it back into the bottom half of the bottle. The lids were removed so that the Coccinellidae could fall into the bottle and the two halves were sealed together with glue to prevent it from falling apart. This was done to 25 bottles to create the rest of the traps. I then set up 5 traps in each site. The traps were about ground level and stood vertical. The traps were recollected after a day and the number of Coccinellidae were counted in each bottle. The traps were only out for one day because of constantly changing weather in the area. All other specimens were not counted and were released. After the data was collected, the Coccinellidae were released outside. The data was then organized into a graph and a two-way-ANOVA test was run to note any significant differences between the abundances of Coccinellidae in each site.

RESULTS

Table 1: Number of Coccinellidae caught in traps at each site.

	Flowers	Woods	Garden	Open Sun	Porch Shade
Trap One	2	1	2	0	4
Trap Two	5	1	0	1	3
Trap Three	4	2	2	0	1
Trap Four	3	0	3	3	2
Trap Five	4	1	0	0	1
Total	**18**	**5**	**7**	**4**	**11**

Figure 1: Graphic representation of the distribution of Coccinellidae caught in traps at each site.

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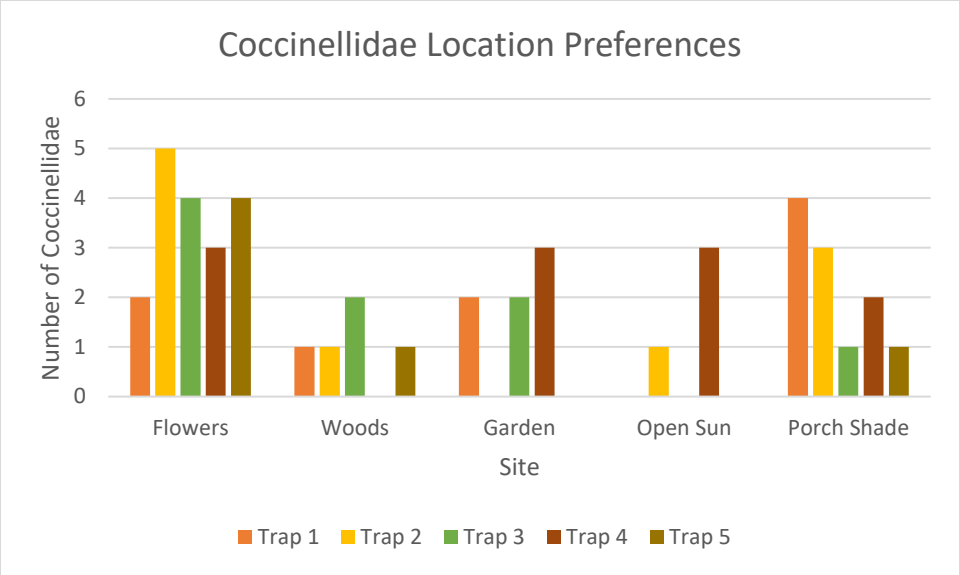

The two-way ANOVA created a p-value of $p=0.0174$, making it significant ($p<0.05$)

DISCUSSION

When comparing the distribution of Coccinellidae in different types of habitats, there was a significant difference between the locations. The p-value found with a two-way ANOVA is 0.0174 which is considered significant when the level of significance is $p<0.05$.

The Open Sun site supported Hypothesis 2 since it had the least number of Coccillendae as only 4 were captured in the 5 traps. This could be due to several factors. In the open sun, there was no nearby shelter for the Coccillendae to hide in case a predator, such as a bird, attempted to consume them. Also, despite the experiment being conducted during typical mating season, the beetles seemed to have been taking longer time than usual to come out of hibernation and resume typical activities. This is most likely due to the large fluctations in weather happening in the area; with temperatures much lower than usual. So prior to conducting this experiment, I noticed the Coccillendae were less active and continued to remain near their hibernation location. So, being out in an exposed open field, was less likely due to lack of shelter from the cold and inability to remain warm for extended periods of time. This location also did not have any vegetation other than grass, so aphids were most likely not living in the area.

The second least populous site was the Woods. The Woods had nearly the same amount of Coccillidae as the Open Sun location as it had only 5 captured in the 5 traps. The main reason for this is most likely lack of food availability. The Woods have very little foliage on the forest floor and much of this foliage consisted on pine needles, meaning this location most likely had very few aphids living there. The location did have places for the Coccillidae to hibernate and had plenty of shelter. Since Coccillidae often navigate through habitats for purposes of finding food, this could explain why there were so few captured in the traps.

The third least populous site was the Garden. The Garden had 7 Coccillidae captured between the 5 traps. This location had blueberry bushes and asparagus growing. During the early Summer, the garden is filled with several other crops such as corn, tomatoes, lettuce, and peppers. At the time of this experiment, the asparagus had already begun sprouting and the blueberry bushes were budding, but due to the unusual cold, the other crops had not begun to grow yet. It is possible that the Coccillidae would be near the Garden since it is entering the time of year when the aphids eat the crops. Since there was not many crops that were growing, this possibly led to less Coccillidae in at the site since resources were very limited, leaving less food and shelter for them. The Coccillidae that were present at the Garden may have been looking for food

in the available crops and may have been waiting for the other crops to begin to sprout and attract aphids.

The second most populous site was the Porch Shade. This location in the past has been a noticable hibernation location for Coccillidae. This is most likely due to the bushes surrounding the porch and the structure of the porch being a great place for them to hide through Winter. Snow is unable to reach under the porch due to it's roof so it is a much safer place for Coccillidae to hide. The porch is also within 50 feet of the Flower Site, which had the most Coccillidae. By being on the porch, they may be able to warm up faster as they may feel some warmth coming from the house. The faster they warm up, the sooner they can go out foraging in the same condition as they were in pre-hibernation.

The most populous site was the Flower site, supporting Hypothesis 1. This site had 18 Coccillidae captured in 5 traps. This area was most likely very popular because of the food source. It had several types of flowers and an approximately 10 foot tall tree in the middle of them. This area is popular among aphids so it provides a great source of food for the Coccillidae. The closeness of this food source towards the Porch Shade site can help explain why that site was so popular. The Flower site provided lots of shade over the Winter, with the tree protecting much of the site from large quanitities of snow. This area could also be a great area to lay eggs as it has the food to be able to sustain the Coccillidae's larvae.

The distribution may have been affected by the unusually cold weather in the days leading up to the experiment which may have altered results. Future research is needed to conduct a full assessment on Coccinellidae distribution on a larger scale and with different habitats.

LITERATURE CITED

Sloggett, J.J. and M. E. N. Majerus. 1999. Habitat preferences and diet in the predatory Coccinellidae (Coleoptera): an evolutionary perspective. Biological Journal of the Linnean Society **70**: 63-88

Honěk A., Á. Martinkov and S. Pekár. 2007. Aggregation characteristics of three species of Coccinellidae (Coloptera) at hibernation sites. Eur. J. Entomol **104** 51-56

Hodek, I. 1973. Biology of Coccinellidae. Springer-Science+Business Media. Van Stolkweg The Hague Holland