

Response to Disturbances in Soldier Beetles

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Abstract

Studying insects' response to disturbance can tell us how these organisms survive in hostile environments. Studies have shown that soldier beetles can have different mating behaviors depending on the species around them (Bernstein and Bernstein, 1999). They also exercise selective mating in changing ecological conditions (McLain, 2005). When disturbed, beetles are known to drop off plants onto the ground in order to get away from possible predators (Ben-Ari and Inbar, 2013). The goal of this experiment was to determine any trends in response to a probing disturbance by insects and more specifically, soldier beetles. I believed probing soldier beetles with a small disturbance would cause them to move away from the source of the disturbance, with individuals responding more than mating pairs. After collecting and analyzing the data, the conclusion is that the hypothesis is supported by having a greater reaction from individuals than mating pairs. These results suggest that an insect's tolerance to disturbance increases when mating. This may lead to a decrease in survival behavior in order to fulfill mating interests.

Purpose

The purpose of this research is to determine the effects of disturbances on insects and the differences of these disturbances between individuals and mating pairs.

Questions, Hypotheses, and Predictions

Question: How do soldier beetles react to disturbances?

Hypothesis: If individuals and mating pairs of soldier beetles are disturbed in their natural environment, then both will move away from the source of the disturbance, with individuals responding more than mating pairs.

Prediction: I predict that mating pairs will move less on average because they will be more focused on mating than avoiding potential predators. I also believe that differences in host flowers will not have any varying affect on the soldier beetles' reactions.

Study System

Soldier beetles are a family of beetles that mate during the late summer (August-September). Adults feed on pollen and nectar from various flowers, while their larvae are carnivorous and feed on other larvae and insects. The species studied in this experiment is known as the goldenrod soldier beetle. This species is known to gather around goldenrod to feed and mate, but it is also common to find them on other flowers. After mating, eggs are laid in the soil and pupate during the following Spring.



Methods and Experimental Design

To determine how disturbances affect soldier beetles, I traveled to the Kansas State Gardens where there was a substantial soldier beetle population during mating season.

Once a soldier beetle was located:

- 1) A thin paint brush was used to probe the dorsal side of the abdomen.
- 2) Observations were then recorded pertaining to the distance the beetle moved from the location of disturbance.
- 3) A second probing was done on the same beetle after it ceased moving from the initial disturbance and recorded.

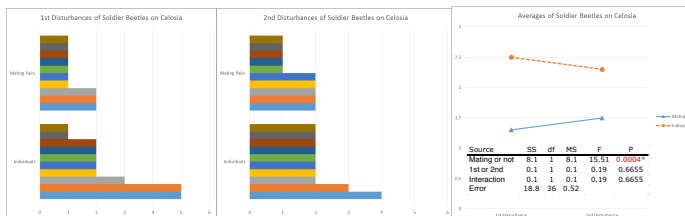
On mating pairs, the probing was done to the beetle attached to the back side of their mating partner.



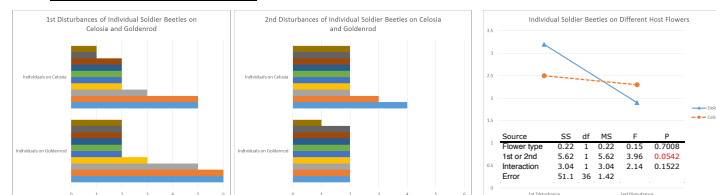
Results

After looking at the data collected, it appears that individuals travel further away from the source of the disturbance than mating pairs ($P=0.0004$). There is some evidence to support an effect of second disturbances. However, flower type does not seem to affect behavior ($P=0.7008$).

Difference in Individuals and Mating Pairs



Difference in Host Flowers



Legend

- 1 = No movement from disturbance
- 2 = Walks away from disturbance (within 2 inches)
- 3 = Walks away from disturbance (>2 inches)
- 4 = Walks away from disturbance to another flower
- 5 = Flies away from disturbance
- 6 = Flies away from disturbance (outside of view)

Conclusions

Based on the observations and data collected, my initial hypothesis and prediction seem to be supported. Mating pairs tended to move less after being disturbed than individuals, and different host flowers do not seem to affect disturbance responses. Further disturbances did not appear to yield any substantial trends. One unexpected outcome was the fact that there were not enough mating pairs on goldenrod to record any substantial data. This was unexpected because the species of soldier beetle I was studying is commonly known as the "goldenrod soldier beetle."

Future Directions

I believe the next step in this research is to study how soldier beetles respond to disturbances by other insects and predators instead of humans. This could be done by introducing foreign insects or predators into a population of mating soldier beetles. The soldier beetles' behavior in this situation can then be recorded through observations. Doing multiple trials on different host flowers could show different trends depending on available camouflage and flower structure. This experiment would be made easier by having a more controlled environment because one of the problems I had in this experiment was the difficulty finding reliable populations of soldier beetles to observe. Further study in this field can help us understand how insects deal with threats and how stressful situations affect their behavior.

References

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