

THE IMPACT OF ANTHIDIUM MANICATUM ON NATIVE POLLINATORS

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Abstract

Exotic species often confer fitness effects on existing species through the alteration of the native landscape. *Anthidium manicatum*, commonly known as the European wool carder bee, is a nonnative species introduced to North America in the 1960s that has been documented to alter the foraging patterns of native bumblebees. This study looked at the fitness effects of *A. manicatum* on a native bumblebee, *Bombus impatiens*, using bumblebee hive weight change and individual bee count, weight, and measurements as a proxy for fitness. No correlation was found between the weight change in experimental and control conditions (Student's t-Test, $p > .10$) but continuation of the experiment in the form of individual bee count, weight, and size analysis must be conducted before conclusions are drawn.



Methods

Twelve enclosures were set up at Tufts University between June and September 2015 with one catmint, one blue fortune, and one salvia in each. Twelve colonies of *Bombus impatiens* were each allowed access to a distinct enclosure and the field through tubes. Two to four *Anthidium manicatum* were kept in six of the enclosures while the other six were kept without any *A. manicatum*. The workers in the *B. impatiens* hives had the choice to forage in the enclosure or out in the field, and this preference was documented twice a week. These observations were done by monitoring the tubes that lead to the field and enclosure and documenting the number of bumblebees that went to and from each. Two to three times a week, the number of *B. impatiens* were counted in each of the enclosures, along with the specific plants the bees were visiting in the enclosure. Once a week the hives were closed and the weight of the hives was measured. Normal enclosure maintenance, such as plant watering and wasp removal, was conducted throughout the duration of the experiment as well.

Research Question

What is the fitness effect of the European wool carder bee, *Anthidium manicatum*, on the common eastern bumblebee, *Bombus impatiens*?

Hypothesis

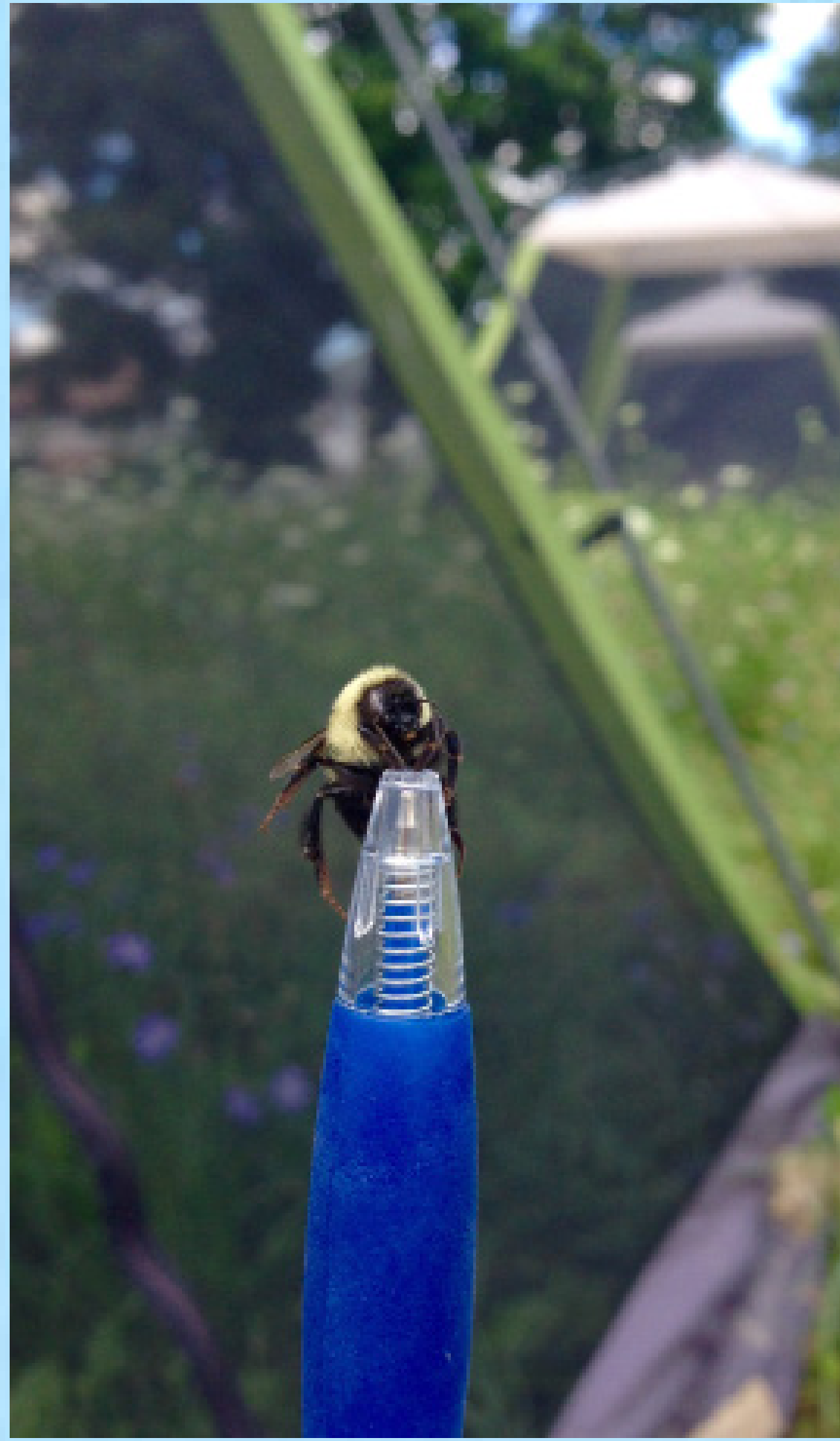
B. impatiens hives foraging near *A. manicatum* will have decreased fitness, seen by lower hive weights, and fewer and smaller individuals, than the hives foraging in *A. manicatum*-free areas.

Preliminary Results

- Only hives five and ten recorded net weight gain over the course of the weeks measured. Differences between experimental and control hives net weight change indicated no significance in weight changes in experimental and control conditions (Student's t-Test, $p > 0.10$).
- Counts of bumblebees entering and leaving the hives showed that on average experimental hives had 9.5 workers entering and leaving a hive over a 30 minute interval while control had 10.4 workers entering and leaving over the same time interval (Student's t-Test, $p > .10$).
- Individual counts, weights, and measurements of frozen *B. impatiens* hives have yet to be completed.

Table 1. Hive weights (kg) of *Bombus impatiens* weeks two through five with linear regression values. Unable to perform linear regression on hives two and three due to only two data points.

	Week 2	Week 3	Week 4	Week 5	Net weight change	R-squared value
Hive 1	1.0656	1.0582	1.0352	1.0500	-0.0156	0.44341
Hive 2	1.0310	1.0304	--	--	-0.0006	--
Hive 3	1.0384	1.0312	--	--	-0.0072	--
Hive 4	1.0152	1.0168	1.0002	1.0012	-0.014	0.72793
Hive 5	1.0430	1.0758	1.0346	1.0438	0.0008	0.07616
Hive 6	1.0452	1.0466	1.0374	1.0294	-0.0158	0.84647
Hive 7	1.0428	1.0386	1.0302	1.0258	-0.017	0.98124
Hive 8	1.0676	1.0730	1.0482	--	-0.0194	0.55317
Hive 9	1.0494	1.0448	1.0288	1.0138	-0.0356	0.95597
Hive 10	1.1480	1.1600	1.1484	1.1530	0.005	0.00618
Hive 11	1.0228	1.0138	1.0034	1.0006	-0.0222	0.95595
Hive 12	1.1372	1.1224	1.1054	1.0886	-0.0486	0.99903



Discussion

- Preliminary results of this experiment indicate that there is no significant difference in total hive weight loss or *B. impatiens* worker activity between hives of *B. impatiens* exposed to *A. manicatum* and *B. impatiens* hives without any exposure.
- To complete this study, additional hive weight measurements, as well as the count, weight, and measurement of individuals in the hives, will need to be documented.
- These analyses would allow for a more complete representation of the fitness effects *Anthidium manicatum* has on North American native pollinators.

Acknowledgements

I would like to thank Dr. Philip Starks and the Starks Lab for sponsoring this experiment and providing the materials with which to conduct the research. Graduate student Kelsey Graham was especially instrumental in her mentorship during the study, and undergraduates Sean Boyden and Kevin Lindell were also most helpful in the service they provided throughout the experiment.

References

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