

## INTRODUCTION

- Wild bees increase the economic yield of crops through pollination<sup>1</sup>. Solitary bees are not well studied compared to honey and bumble bees but comprise >85% of the wild bee population<sup>2</sup>.
- Wild bees are facing population declines due to habitat degradation and loss, climate change, and parasites and pathogens<sup>3</sup>. One such pathogen is *Crithidia bombi*, a trypanosomatid gut parasite that decreases bumble bee survival and foraging<sup>4</sup>.
- Sunflower (*Helianthus annuus*) pollen significantly reduces *Crithidia* infection in the common eastern bumble bee<sup>5</sup>, but effects in solitary bees have not been assessed.
- Halictus ligatus* and *Melissodes agilis/trinodis* are solitary bees that are commonly found on sunflowers<sup>6</sup>.
- In previous studies, trypanosomatids have been found in *Halictus* and *Melissodes* collected from wildflowers<sup>7</sup>.

**What effect does sunflower pollen have on *Crithidia* infection in *Halictus ligatus* and *Melissodes agilis/trinodis*? Does *Crithidia* replicate in *Melissodes agilis/trinodis*?**

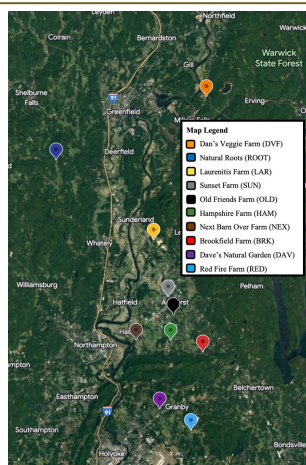
## METHODS

### Crithidia survey

- Halictus ligatus* and *Melissodes agilis/trinodis* were collected from 10 farms, 9 of which were growing sunflower, in western Massachusetts from mid-July until the end of August (Figure 3).
- Bees were incubated for  $\leq 24$  hours and provided with 30% sucrose.
- Bees were dissected, and the gut solution was assessed for *Crithidia*.
- Pollen samples were collected and analyzed for sunflower content.

### Infection Experiment

- I screened the feces of 30 *Melissodes agilis/trinodis* collected from RED (Figure 3) to determine infection levels.
- Bees were then starved for 3 hours before being hand-inoculated with *Crithidia bombi* and incubated with 30% sucrose.
- Bees were dissected in three intervals: <24 hours, 4 days, and 8 days post-collection.
- The gut solution was assessed for *Crithidia*.



**Figure 3.** *Melissodes agilis/trinodis* and *Halictus ligatus* were collected from 10 farms across western Massachusetts.



**Figure 1.** *Melissodes agilis/trinodis* on sunflower.



**Figure 2.** *Halictus ligatus* on sunflower.

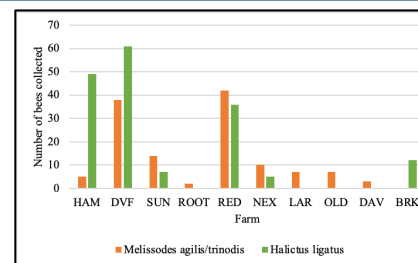
## RESULTS

### Crithidia survey

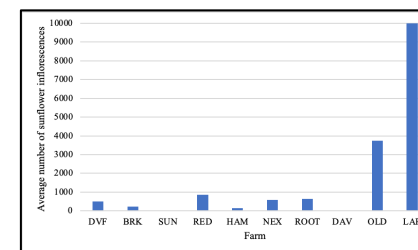
- 298 total bees were sampled (Figure 4). Of the 170 *Halictus*, none showed evidence of *Crithidia* infection. Of the 128 *Melissodes*, 3 (2.34%) showed evidence of *Crithidia* infection.
- The infected *Melissodes* were collected from DVF, NEX, and ROOT, which had average inflorescence values ranging from 498 to 641 (Figure 5).
- Overall, pollen samples taken from *Halictus* were 95% sunflower pollen, and pollen samples taken from *Melissodes* were 98% sunflower pollen.

### Infection Experiment

- 23 of the 30 bees died before their dissection date.
- Of the 7 live *Melissodes* dissected, 1 (14.29%) showed evidence of *Crithidia* infection. The infected bee was dissected 8 days post-collection, indicating a replicating *Crithidia* infection.



**Figure 4.** The number of *Melissodes agilis/trinodis* and *Halictus ligatus* collected from each farm.



**Figure 5.** The average number of sunflower inflorescences at each farm. Not shown: LAR extends beyond the maximum y-value, with 85738 inflorescences.

## DISCUSSION

### Crithidia survey

- In a prior field study, *Halictus ligatus* had a trypanosomatid prevalence of 38%, *Melissodes agilis* had a prevalence of 60%, and *Melissodes trinodis* had a prevalence of 47%<sup>7</sup>.
- In the current study, the much lower prevalence of *Crithidia* (none in *Halictus ligatus* and of 2.34% of *Melissodes agilis/trinodis*) suggests that infection levels are reduced in *Halictus* and *Melissodes* collected from sunflowers.
- The pollen samples showed evidence of *Halictus* and *Melissodes* feeding primarily on sunflower pollen. However, there was no correlation between the number of sunflower inflorescences and infection levels at a farm.
- Future research could explore the difference in infection intensity between infected *Halictus ligatus* and *Melissodes agilis/trinodis* fed sunflower compared to non-sunflower pollen.

### Infection Experiment

- A *Melissodes* kept for 8 days had *Crithidia* infection, indicating that *Crithidia* may replicate in *Melissodes* as the pathogen did not pass immediately through the gut.
- Future research could test replication of *Crithidia* in a larger sample size of *Melissodes*.

## ACKNOWLEDGMENTS & REFERENCES

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