Floral Preference of Bees in a Montane Meadow in Flagstaff, AZ

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Introduction

"The relationship between utilized and available resources in the same environment has not been studied in most wild bees" Dalmazzo *et al*. 2015. For the few bee species studied, known feeding behaviors range from broadly polylectic to oligolectic[4, 6, 7]. Evaluating floral resources and bee preferences is essential for understanding the interaction between plants and pollinators in a community. Most studies focus on the lifetime foraging of specific bee taxa, or are done by net sweeping[2, 4, 6]. This study is unique because it utilizes pan traps to analyze the pollen loads of all bees in a montane community at different times of day. Our hypotheses are:

- ***H1*: Pollen utilization by bees will not represent available floral resouces.**
- ***H2*: Bees will be mainly polylectic (i.e. non-specialists).**
- ***H3*: Floral preference will differ between species of bees.**
- ***H4*: Bees will change dietary preference throughout the day.**

Methods

- The study was conducted in a montane meadow in Flagstaff, AZ at an elevation of 2100m (fig. 1)
- White, blue and yellow pan traps were set out between July 2nd and July 29th and checked in the morning (7:00-11:00), afternoon (11:00-16:00) and evening (16:00-20:00) (fig. 2).
- Bees were swabbed for pollen using fuschin gel[3](fig. 3 & 4). The gel was melted onto a glass slide. The bees were pinned for identification.
- Slides were examined under a light microscope at 20x magnification. Pollen grains were counted and identified to the lowest possible taxon.
- A floral survey was conducted to assess pollen availability
- A pollen atlas was made for flowering plants using the same technique with flowers as with bees (fig. 5).
- A chi-squared goodness of fit test and the Kruskal Wallis chi-squared tests were used to analyze data. All tests were run in Rstudio 3.2.1.

Results

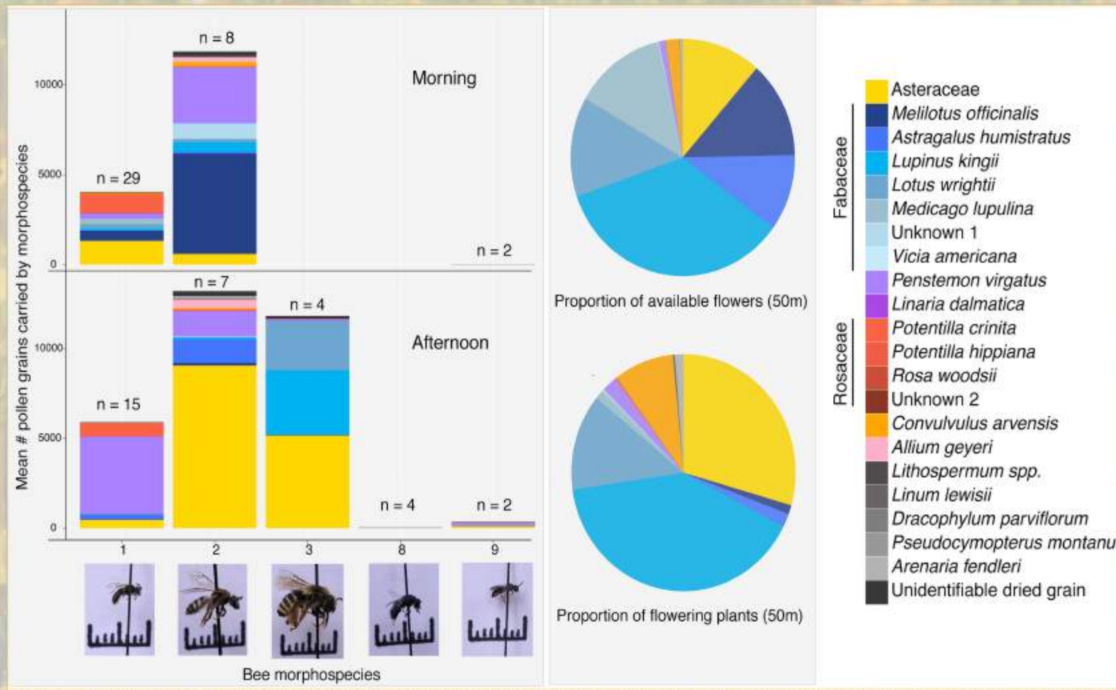


Fig. 6: Left: Pictures of each morphospecies with corresponding relative abundance of pollen in morning and afternoon. Sample sizes are indicated above each bar. Right: Results from floral survey based on number of flowers (above) and number of flowering plants (below). **Statistics:** Morphospecies 1, 2 and 3 all carried significantly different pollen compared to the pollen resources available based on a chi-squared goodness of fit test ($p<0.001$) . Morphospecies 2 and 3 carried more Asteraceae pollen than morphospecies 1 (Kruskal Wallis $X^2=9.3$, $p<0.01$). Morphospecies 2 carried more *M. officinalis* pollen in the morning than in the afternoon (Kruskal Wallis $X^2=5.7$, $p=0.017$), whereas morphospecies 1 carried marginally more *Penstemon* pollen in the afternoon than in the morning (Kruskal Wallis $X^2=3.2$, $p=0.07$).

Figure 2. Example of a pan trap location.

Figure 4. Fushin gel with bee pollen before melting

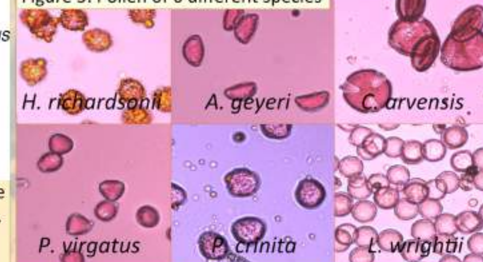
Figure 3. Morphospecies 3 before and after swabbing

Figure 1. Study site in Flagstaff, AZ

Results & Discussion

H1: Bee morphospecies 1, 2 and 3 showed floral preferences that were not proportional to pollen availability, suggesting that floral resource utilization does not match resource availability.
H2: Morphospecies 1, 2 & 3 are broadly polylectic, according to Cane (2006), because they fed on 3+ plant families. Morphospecies 8 & 9 didn't have a large enough sample size to determine preference.
H3: Each morphospecies of bee showed a difference in floral preference. This could be due to different species exploiting different niches.
H4: Floral preference changed between morning and afternoon for morphospecies 1 and 2. These bees could be responding to daily fluctuations in pollen availability, based on when pollen is produced by plants and when it is consumed by insects.

Figure 5: Pollen of 6 different species



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