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Diversity of Bees in Trees and Their Foraging Preferences on an Urban College Campus

Aidan Castricone
Providence College

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PROVIDENCE COLLEGE

Aidan Castricone, Rachael Bonoan
Biology Department, Providence College, Providence, RI, USA
acastri1@friars.providence.edu

Background

Pollinators collect nutrients from blooming flowers; pollen provides proteins and fats, nectar provides carbohydrates. The few plants that bloom during early Spring are trees such as crabapple (*Malus sp).*

Current research however, mainly focuses on pollinators that forage on the ground and overlooks pollinators foraging in the canopy of trees. Past research showed increased generalization of pollen foraging in bees as seasons move from spring to summer.[1]

Here I identified which bee species forage in the canopy on Providence College campus and will analyze the pollen collected using microscopy. This data can inform more specific research on diet breadth, foraging behavior, conservation, etc.

Methods

- Bee cups were strung up and collected weekly. Cups were painted green, yellow, and white and filled with soapy water.[2]
- Sweep netting was done 1-2 times a week for 10 minutes at each tree.
- Sweep netted bees with pollen were taken back to the lab. Pollen was collected using fuschin jelly cubes[3,4,5] and analyzed using microscopy.[6]
- All specimen brought back to the lab were pinned and identified

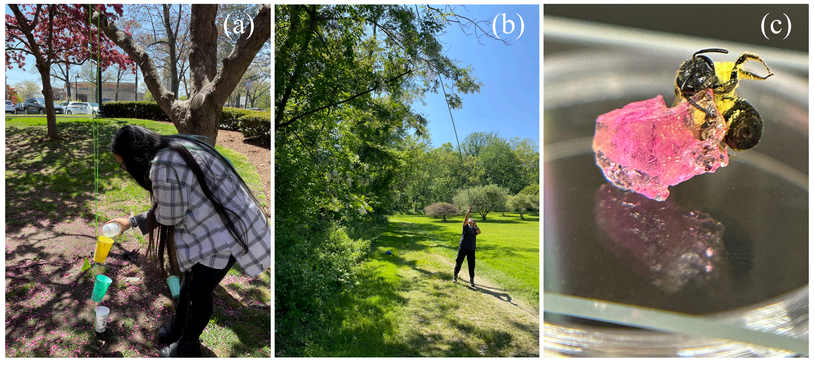

Fig. 1 : (a) Setting up cups in a crabapple (*Malus sp*.)
(b) Sweep netting black locust (*Robina pseudoacacis*)
(c) Sweat bee (*Halibuts sp*.) stuck to a cube of fuschin gelatin

Results

In total I caught 57 bees spanning 25 genera/species.
White and yellow cups trapped significantly more bee species than green and clear cups (Fig. 2: Anova, $X^2 = 9.4674$, df = 3, $p < 0.05$). Trees of the genera *Castanea*, *Stewart*, and *Syringa* had higher species richness (Fig. 3: Anova, $X^2 = 213.38$, df = 10, $p < 0.001$) and summer had a significantly higher species richness than spring (Fig. 4: Anova, $X^2 = 32.269$, df = 1, $p < 0.001$).

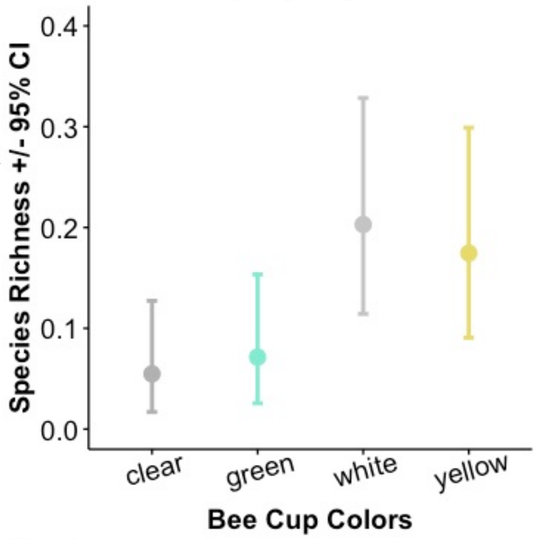

Fig. 2 Average amount of species caught in each cup per week during spring and summer

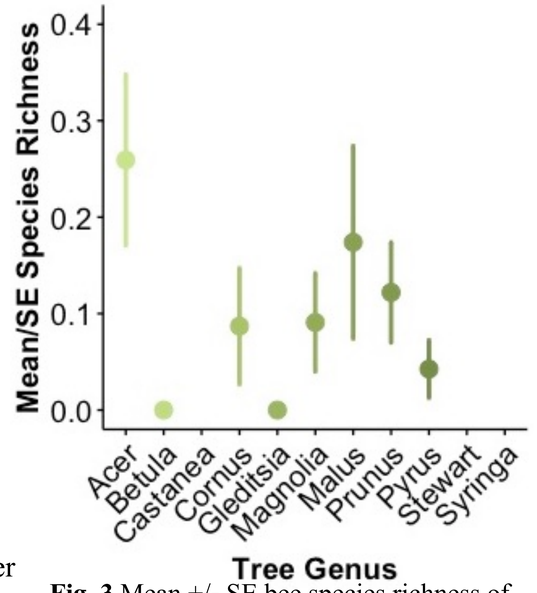

Fig. 3 Mean +/- SE bee species richness of tree genera. *Castanea* (mean = 16, se = NA), *Stewart* (mean = 3, se = 0.548), and *Syringa* (mean = 1.83, se = 0.401) are not graphed because they have a higher mean/se species richness than the rest of the trees.

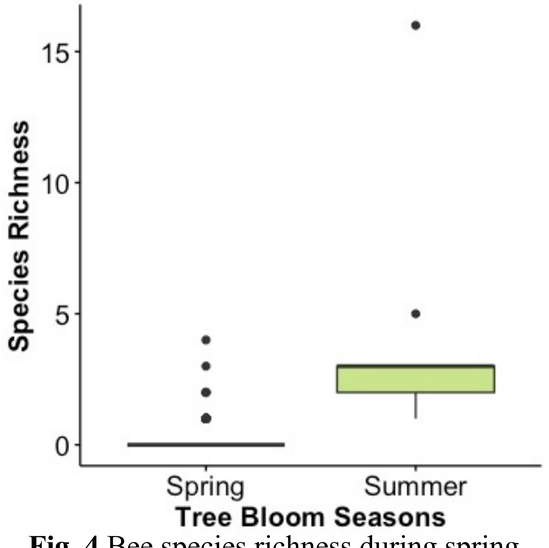

Fig. 4 Bee species richness during spring (March - June) and summer (July - August)

Fig. 5 Bearded mining bee (*Andrena barbilalris*)

Conclusion(s)

Overall, summer had a more diverse range of species with *Castanea*, *Stewart*, and *Syringa* (summer blooming trees) hosting more species.

During the upcoming fall semester, I plan to identify the tree pollen bees are foraging to see if they are more general foragers or specialized in the type of pollen collected. Along with that, a campus tree pollen reference collection will be put together.

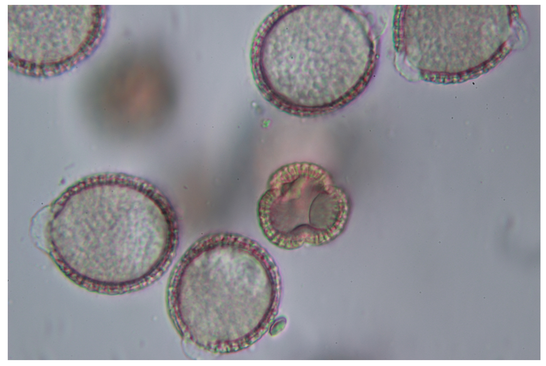

Fig. 6 Pollen from carpenter bee (*Xylocopa virginica*) foraging on Japanese Lilac (*Syringa reticula*)

Acknowledgements

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