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

PROVIDENCE COLLEGE

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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

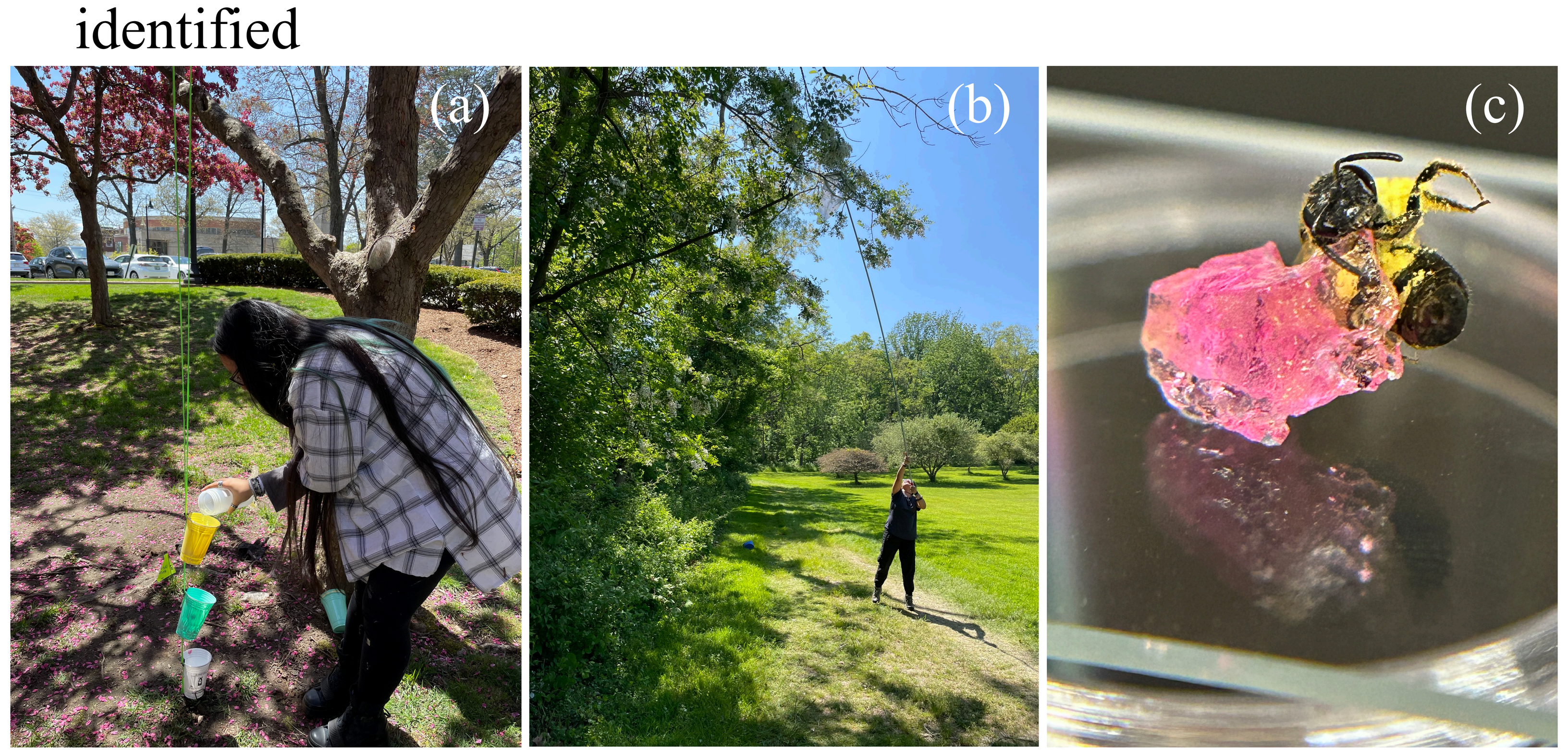

Fig. 1 : (a) Setting up cups in a crabapple (*Malus sp.*)
(b) Sweep netting black locust (*Robina pseudoacacis*)
(c) Sweat bee (*Halibuts sp.*) stuck to a cube of fuschin gelatin

Results

Over two field seasons (2022 and 2023), I caught 178 bees spanning 52 genera/species. Trees of the genera *Syringa*, *Tilia*, *Stewart*, and *Castanea* had higher species richness (Fig. 2, 3: Anova, $X^2 = 397.07$ df = 11, $p < 0.001$). Both temperature and season (spring or summer) had a significant effect on species richness. Significantly more species were caught in the spring (Fig. 4: Anova, $X^2 = 5.2007$, df = 1, p = 0.022). The effect of temperature differed between seasons (Fig. 4: Anova, $X^2 = 6.7838$, df = 1, p = 0.009).

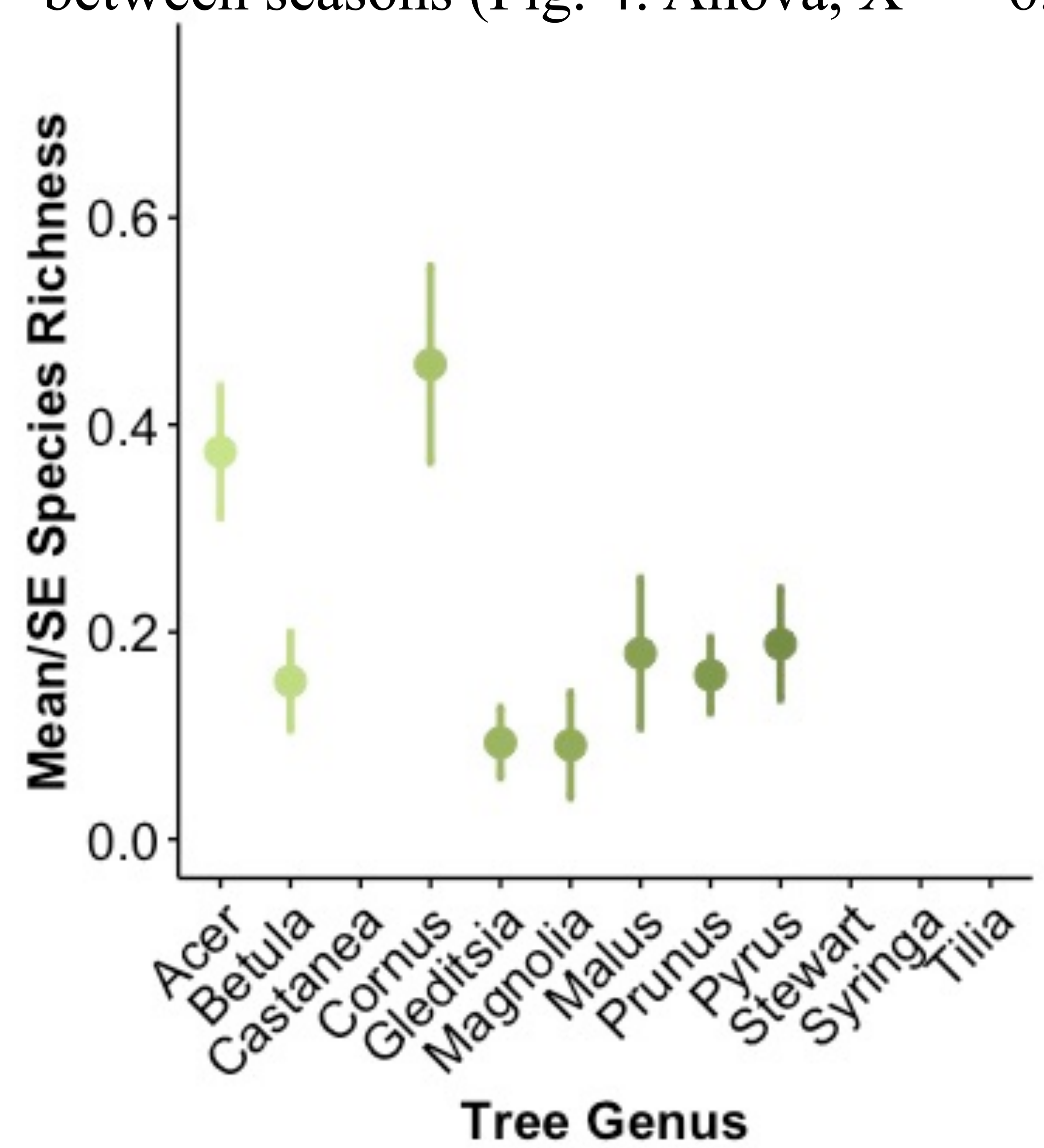

Fig. 2 Mean +/- SE bee species richness of tree genera. Focuses on the smaller richness numbers.

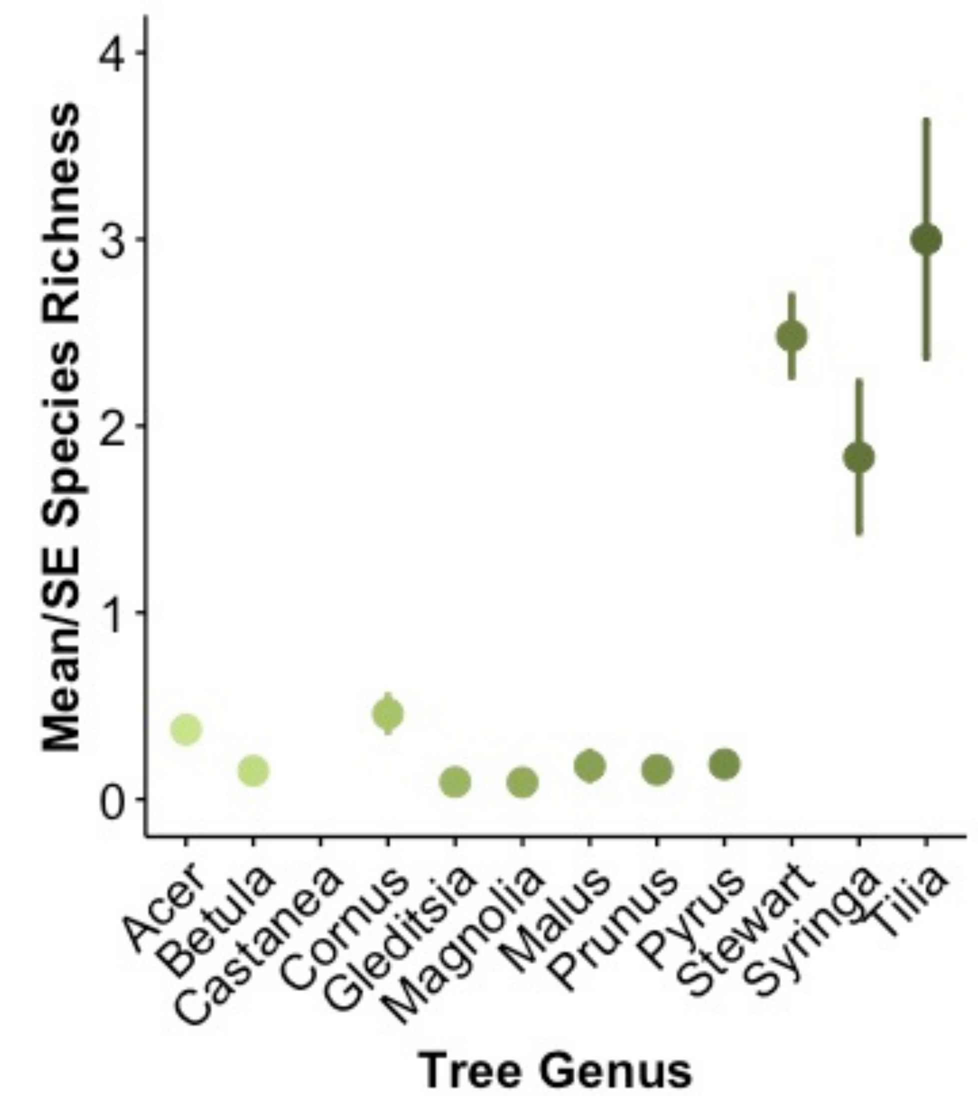

Fig. 3 Mean +/- SE bee species richness of tree genera. Total view of the species richness for all the tree genera. *Castanea* (mean = 20, se = NA) is not graphed because it has a higher mean than the other trees.

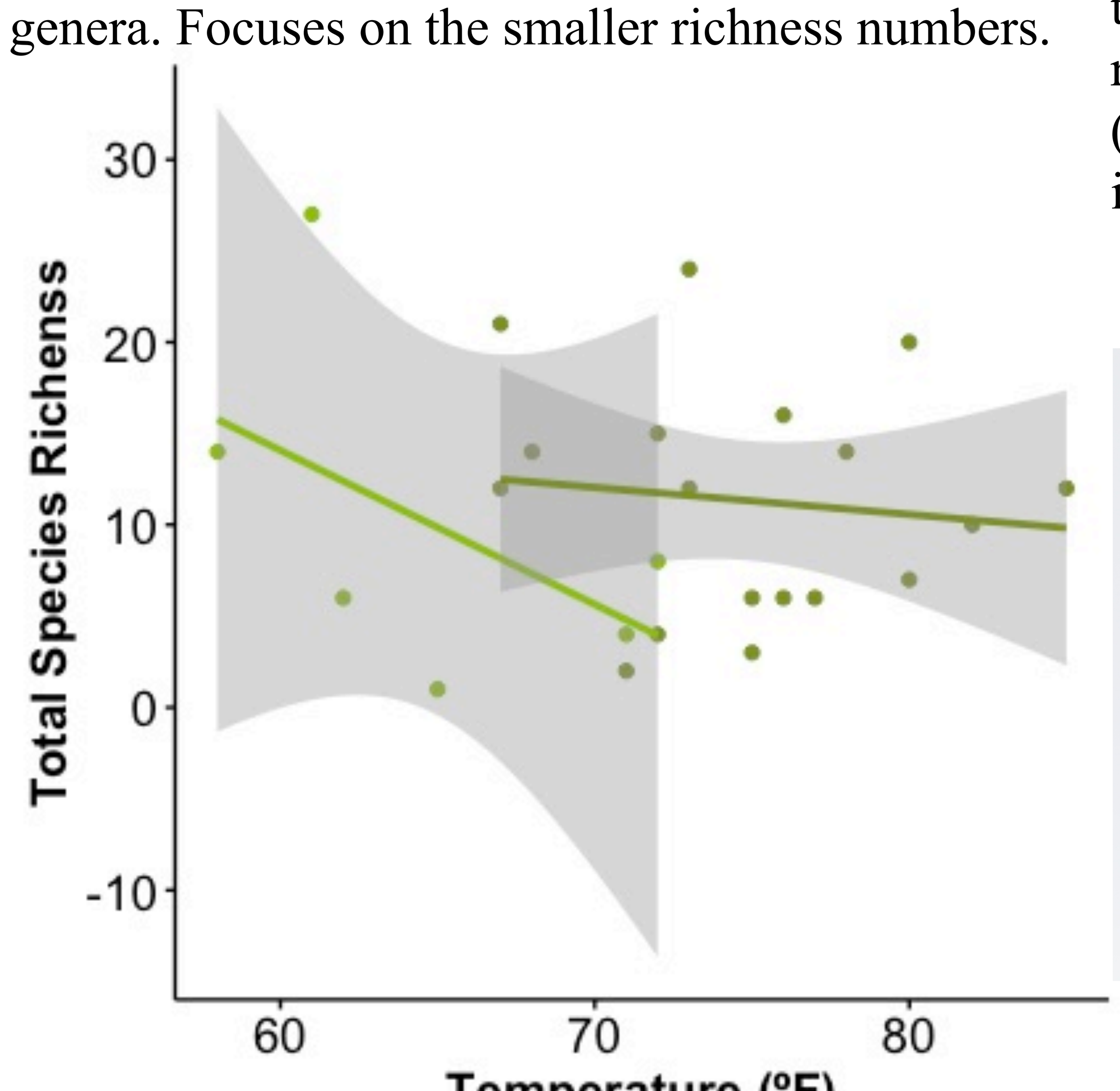

Fig. 4 Total bee species richness of temperature

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

Conclusion(s)

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

Future research will focus on generalist v. specialist bee abundance across the changing seasons by determining if the pollen load (Fig 6) has more variety as the seasons change or remains specified. In conjunction, a pollen reference collection will be created.

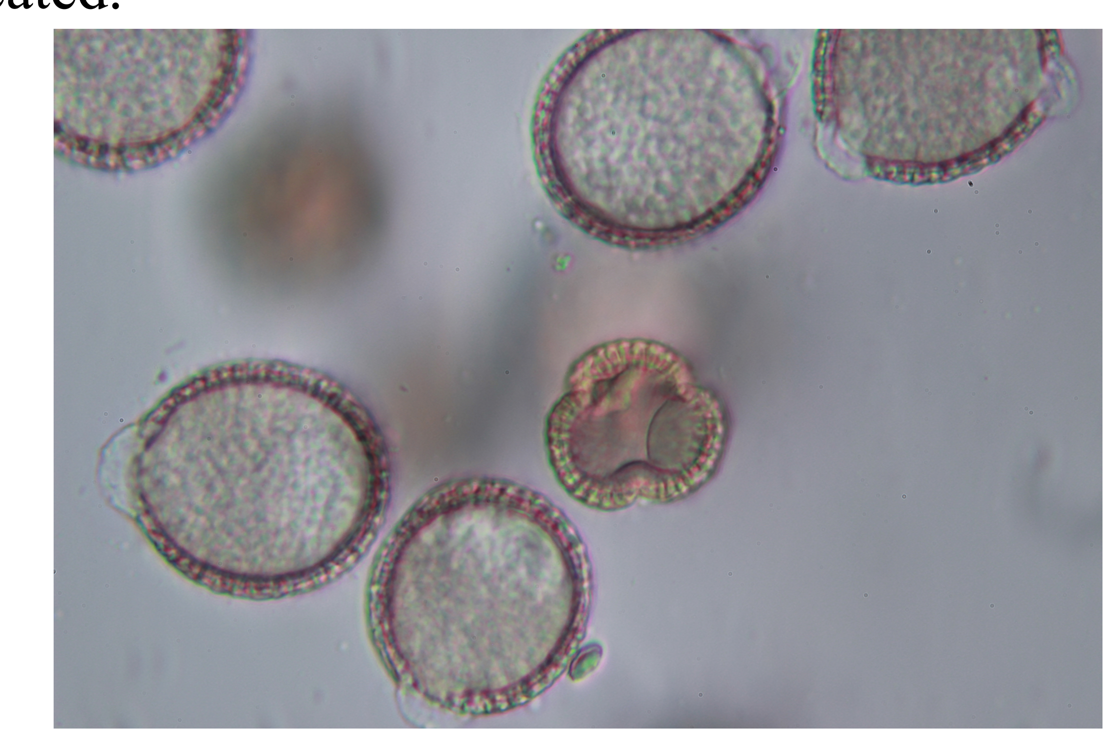

Fig. 6 Pollen from carpenter bee (*Xylocopa virginica*) foraging on Japanese Lilac (*Syringa reticula*)

Acknowledgements

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