

Specialist pollinator *Andrena rudbeckiae* removes more *Echinacea angustifolia* pollen per visit than more generalist bee taxa

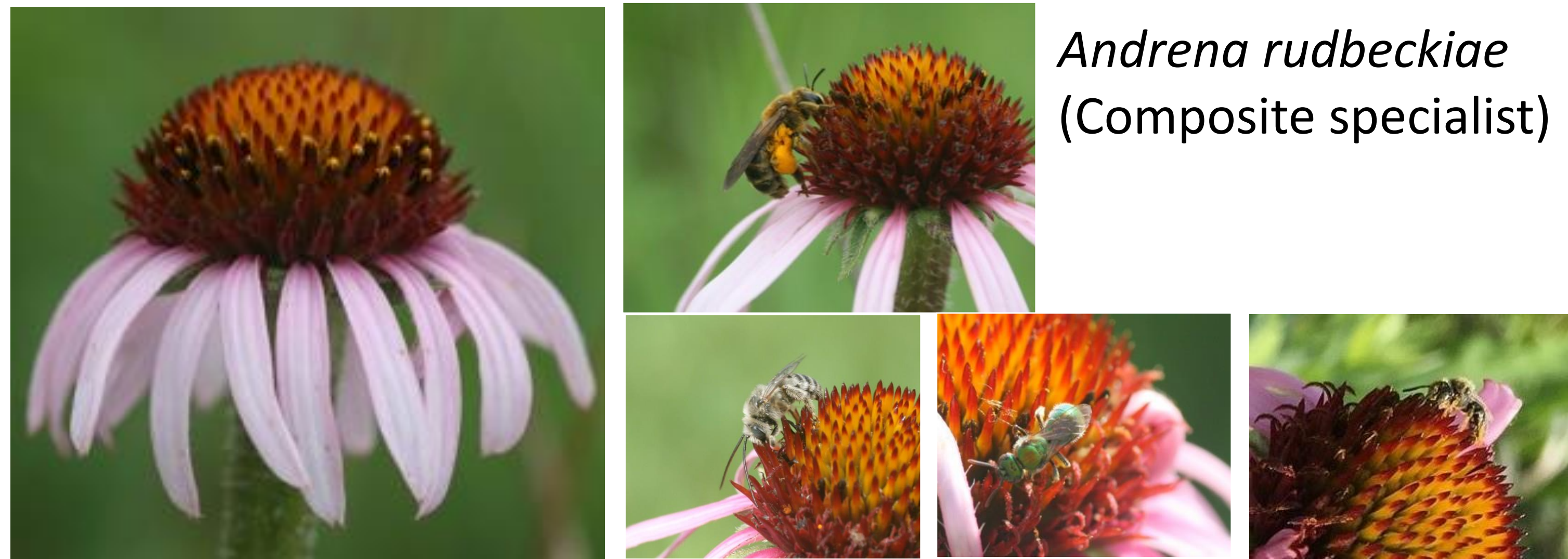
THE COLLEGE OF
WOOSTER

Evan Jackson, Ezekiel Zelman, Jennifer L. Ison



Background

- Only 1% of the prairie remains, and what is left is highly fragmented.¹
- Flowering plants in these small fragmented populations often face reproductive failure.²
- Per visit pollen removal and deposition is a measure of a pollinator's impact on a plant's reproductive fitness.
- To examine the impact of specific pollinators, I studied a perennial prairie plant and native specialist and generalist pollinators.



Echinacea angustifolia (Prairie plant) Male *Melissodes* (Generalist) *Augochlorella aurata* (Generalist) Small black bees (Generalists)

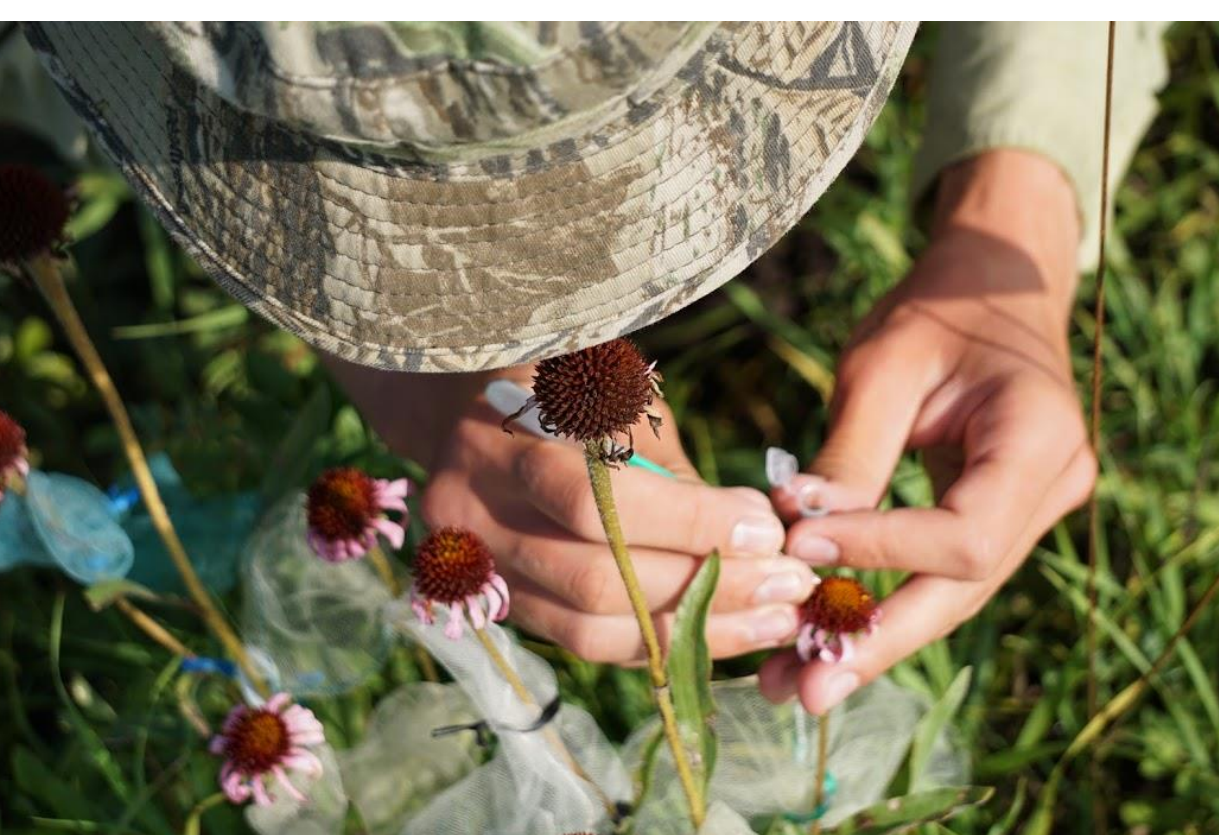
Research Question

- My research objectives were (1) to count the number of pollen grains that each bee taxa removed per visit, and (2) the number of pollen grains that each taxa deposited per visit.

Methods

I observed flower heads and waited for pollinator visits, I collected male and female phase floret samples before and after each visit. I conducted 183 observations

I counted the number of pollen grains in each sample. 154 observations for pollen removal, and 149 for deposition.



I compared the pollen removal coefficients using a Fisher's LSD post-hoc test (Figure 1)

I analyzed these data using a multi-linear regression model in R statistics

Results

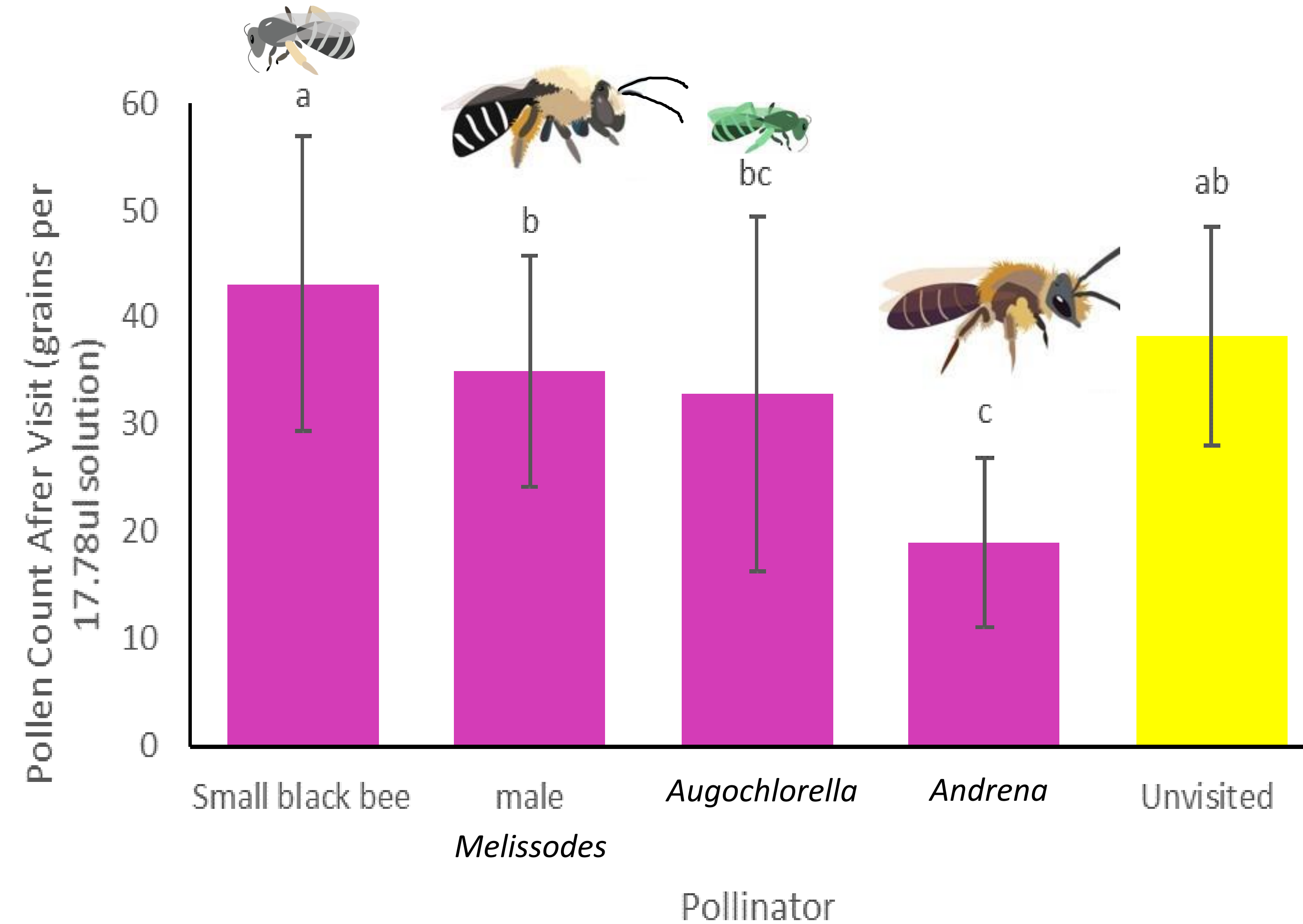


Figure 1. Multi-linear regression model coefficients of mean pollen count of male phase floret samples after visitation compared across pollinator taxa. Letters represent significant differences based on a Fisher's LSD post-hoc test (d.f.=141 P < 0.001). Error bars represent +/- 1 standard error (N=154).

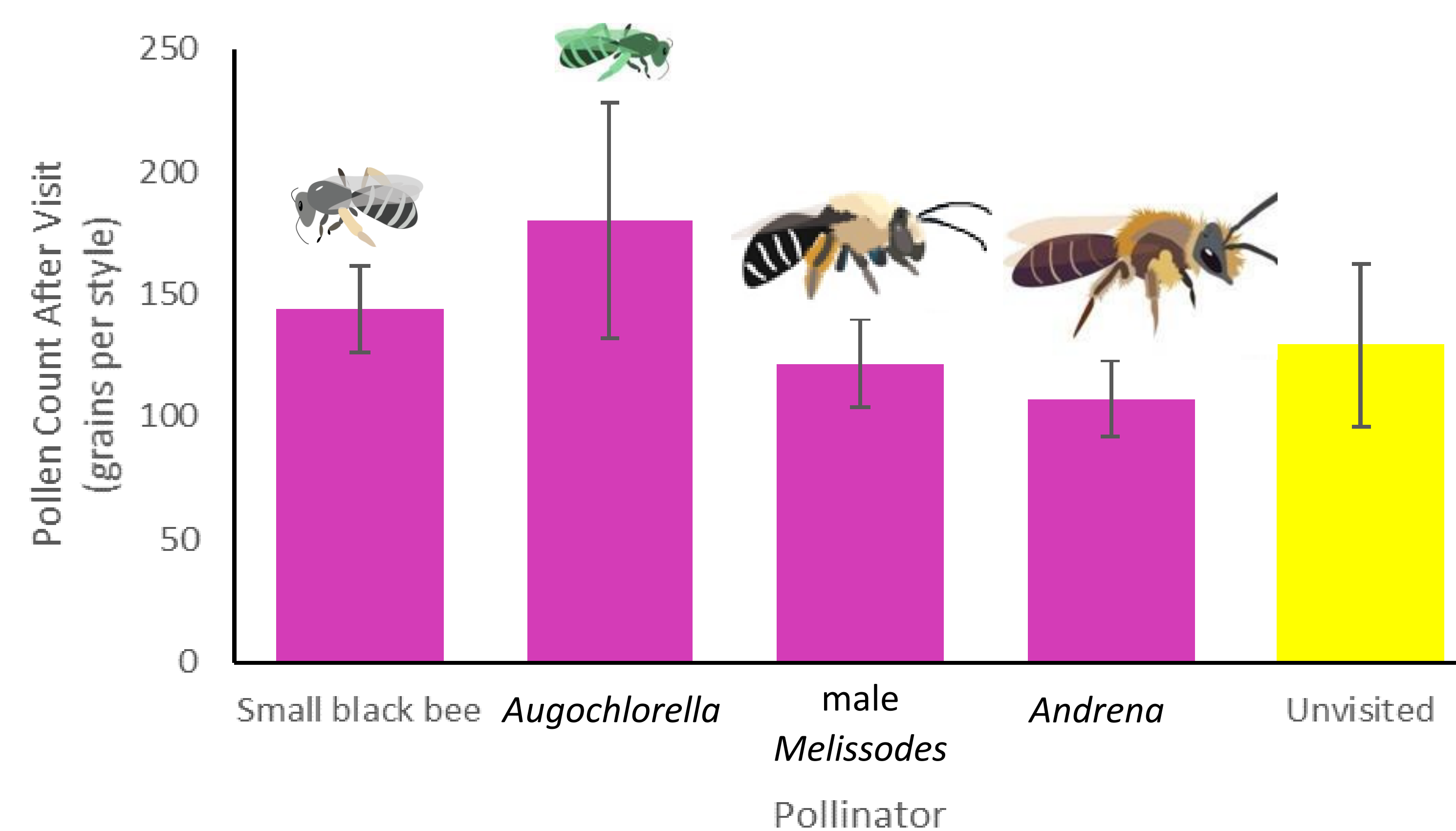


Figure 2. Mean pollen count of styles after visitation compared across pollinator taxa. Error bars represent +/- 1 standard error (N=149).

Acknowledgements & References

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2. Ison, J. L., Prescott, L. J., Nordstrom, S. W., Waananen, A., & Wagenius, S. (2018). Pollinator-mediated mechanisms for increased reproductive success in early flowering plants. *Oikos*, 0(0), 1-13
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Pollinator Group	Total number of visits observed	Number of visits during peak flowering (July 9 th -20 th)	Number of visits during late flowering (July 21 st -31 st)
<i>Andrena rudbeckiae</i>	18 (11.8%)	17 (27.9%)	1 (1.1%)
<i>Augochlorella aurata</i>	9 (5.9%)	3 (4.9%)	6 (6.5%)
Male <i>Melissodes</i>	53 (34.6%)	3 (4.9%)	50 (54.3%)
Small black bees	59 (38.6%)	26 (42.6%)	33 (35.9%)
Pollinators not included in analysis	14 (9.2%)	12 (19.7%)	2 (2.2%)
Unvisited	30	10	20

Table 1. The number of visits observed for each pollinator taxa at different times during the flowering season.

Discussion

- *Andrena rudbeckiae* removed the most pollen per visit, all taxa deposited the same amount of pollen.
- Small populations of flowering plants are unable to support specialist pollinators such as *Andrena rudbeckiae*, which could contribute to reproductive failure.
- Pollen limitation may be driven by high visitation from male *Melissodes* late in the flowering season (table 1, figure 1).
- Taken together my results and previous studies indicate that pollen removal, and foraging behavior may be more important indicators of a pollinator efficiency than pollen deposition.³
- Future research on the number of pollen grains that it takes to set a single seed is needed.
- More studies of native bees, specialists vs. generalist pollinators, and pollination in the Asteraceae need to be undertaken in order to better understand and preserve natural populations such as the prairie.