Monarch Butterfly Oviposition Preference Between Biomes at The Chicago Botanic Gardens

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Background

- Monarch butterfly populations have declined by 84% between 1996-2015 (1).
- Much work has been done to restore the Monarch population by creating new habitat. Still, the risk of quasi-extinction remains a threat (2).
- Understanding Monarch oviposition preferences can help inform the type of habitat most needed for Monarch restoration.

Purpose

Question:
- Which biome do modern-day monarch butterflies prefer for oviposition: woodland or prairie?

Hypothesis:
- We believe that there will be more monarch oviposition and visitation in the prairie than the woodland.
- This is because the prairie most likely has higher flower diversity, more milkweed and therefore more egg laying options, and more frequent disturbances, resulting in smaller milkweed shoots which studies have found to positively influence oviposition (3).

Methods

- Between 7/9 and 7/30/24, observations were made on *Asclepia syriaca* (common milkweed) patches , two in the Dixon prairie, a reconstructed prairie in the Chicago Botanic Garden, and two in the Barbara Brown Nature preserve , a nearby restored woodland.
- Daily observations were broken into Stem and Patch Observations
- Stem Observations:
  o Monitored 3 randomly selected milkweed stems for Monarch eggs and caterpillars.
  o Recorded flowering stage (early, middle, late flowering).
  o Recorded # of 3 types of monarch predators (ants, spiders, milkweed beetles).
- Patch Observations:
  o Monitored an entire patch for monarch visitation for 20-minute increments, noting anytime a monarch butterfly lands on one or more milkweed stems.
- **Statistical Analyses:**
  o Caterpillar and egg counts were analyzed using a generalized linear model which accounted for predictor variables such as milkweed flowering stage and date.
  o Predator data was analyzed using a chi-square test.

Results

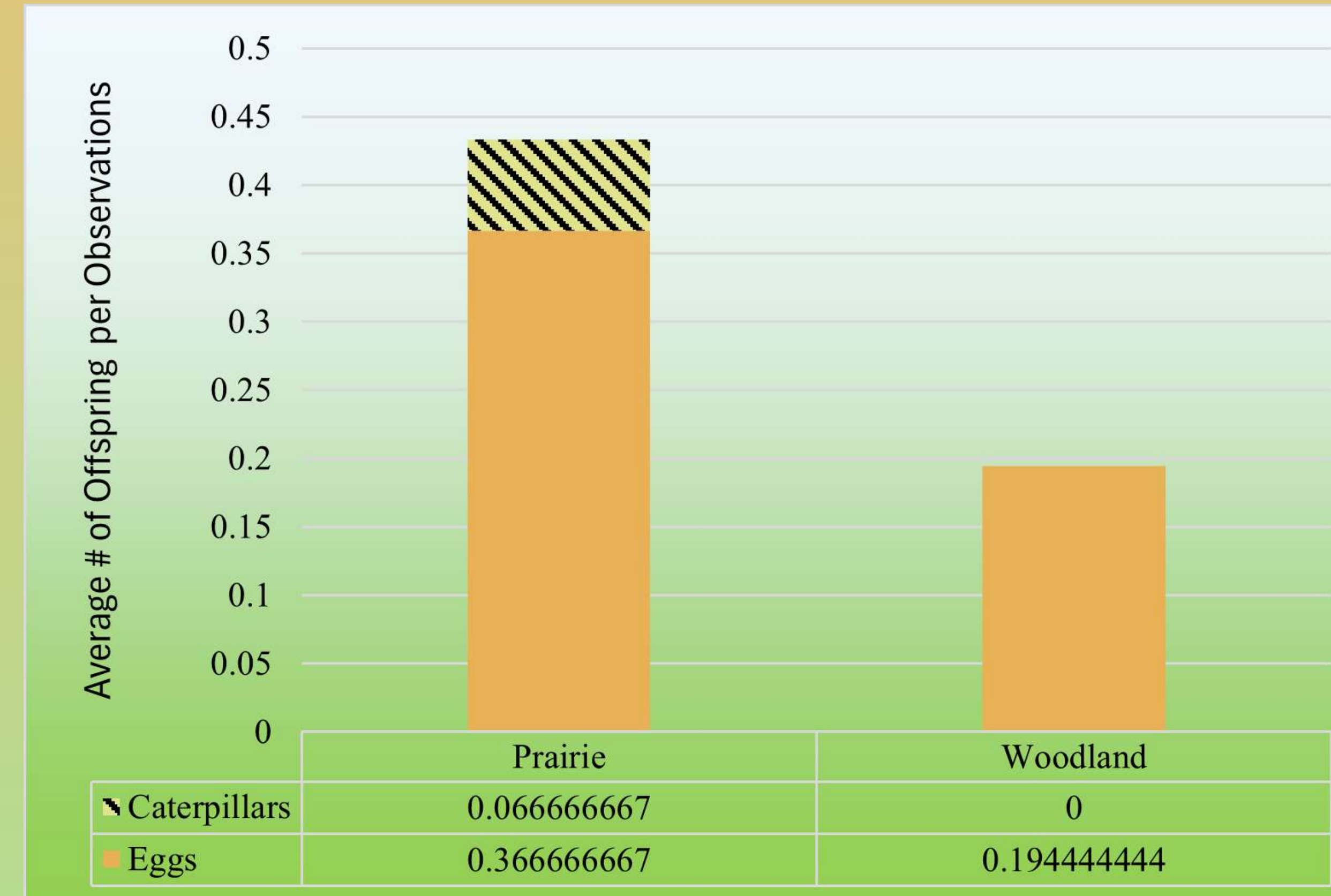|	Prairie	Woodland
Caterpillars	0.066666667	0
Eggs	0.366666667	0.194444444

Figure 1: Average # of monarch offspring observed in prairie vs woodland. A trend for higher # of combined eggs and caterpillars in the prairie ($n_{prairie}$ = 30, $n_{woodland}$ = 36, z value = -1.767, df = 65, p = 0.08)
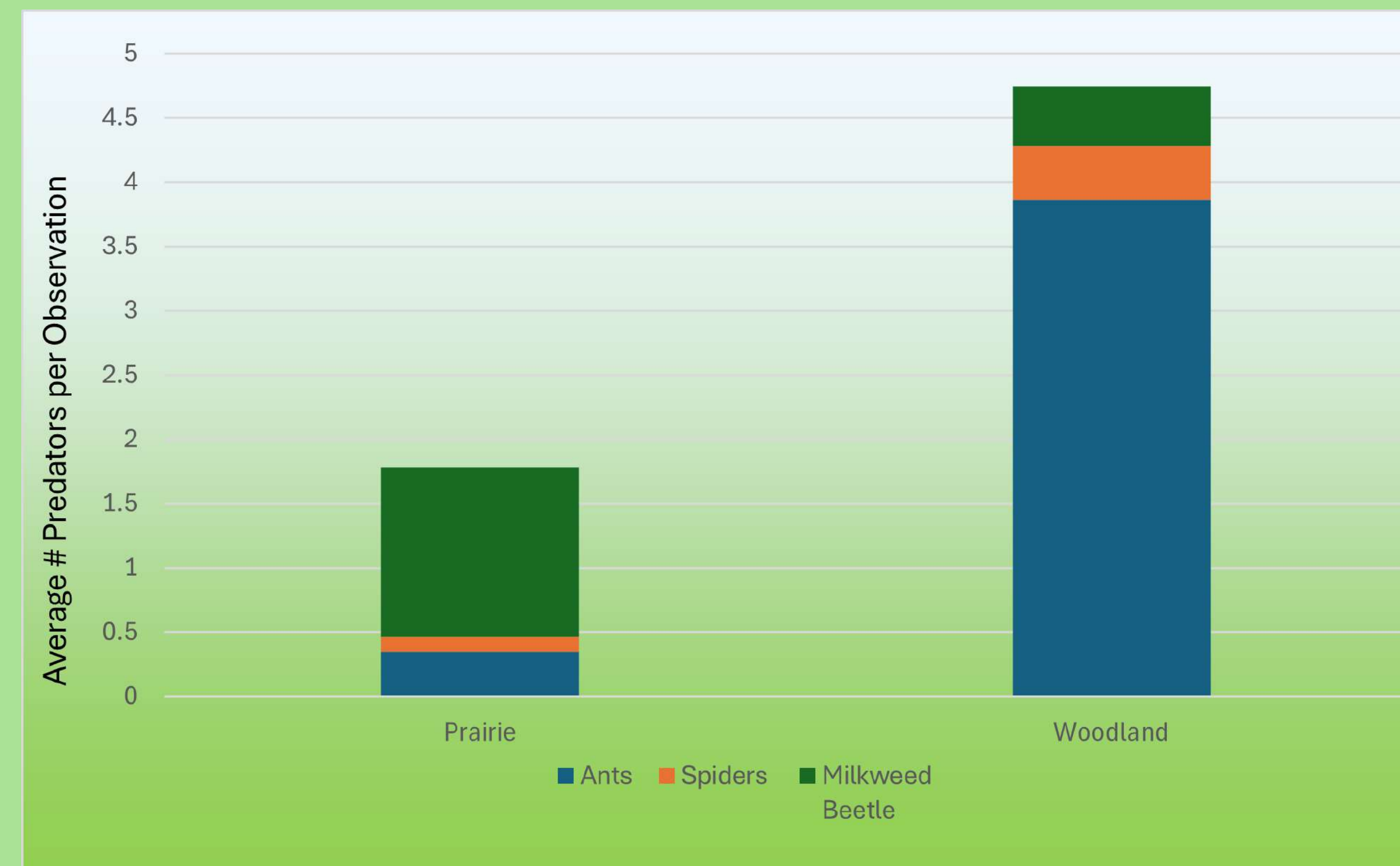

Figure 2: Average # of predators observed in prairie vs woodland. Predator abundance differed in the prairie and woodland ($n_{prairie}$ = 41, $n_{woodland}$ =30 chi-square = 93.43, df = 2, p < 0.0001), with higher ants than expected in the woodlands (standardize residual = +3.32) and higher milkweed beetles in the prairie (standardized residual = +6.35)

- In our patch observations there were 10 adult monarch visitations (average of 0.416666667) all of which were in the prairie.

Discussion

- We found some evidence for more monarch oviposition and activity in the prairie than in the woodland.
- There was a trend for higher numbers of caterpillars and eggs in the prairie (Fig. 1)
- Although not statistically significant, this trend is supported by anecdotal evidence - we only observed caterpillars and adult visitations in the prairie.
- Overall, the woodland had a more abundant predator population than the prairie, particularly for ants, which commonly predate on milkweed eggs (4). This offers a potential explanation on why monarchs may prefer prairie to woodland.
- While the prairie did have a sizeable milkweed beetles population, there is only limited evidence that milkweed beetles are an effective predator of monarchs (4).

Future Direction

- Although we found that there may be a correlation between oviposition and biomes, more evidence is needed.
- Though we found that there were a higher abundance of predators in the woodland then the prairie, future studies could identify predators on a species level and focus on species that most commonly predate on monarchs.

Future questions:

- If we considered additional *Asclepia* species, when comparing biomes, would the popularity of those species, factor out or contextualize the role biomes play in oviposition?

Acknowledgments

References

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