

The Effect of Yeast and Nectar Robbing on Hummingbird Feeding and Competitive Behavior

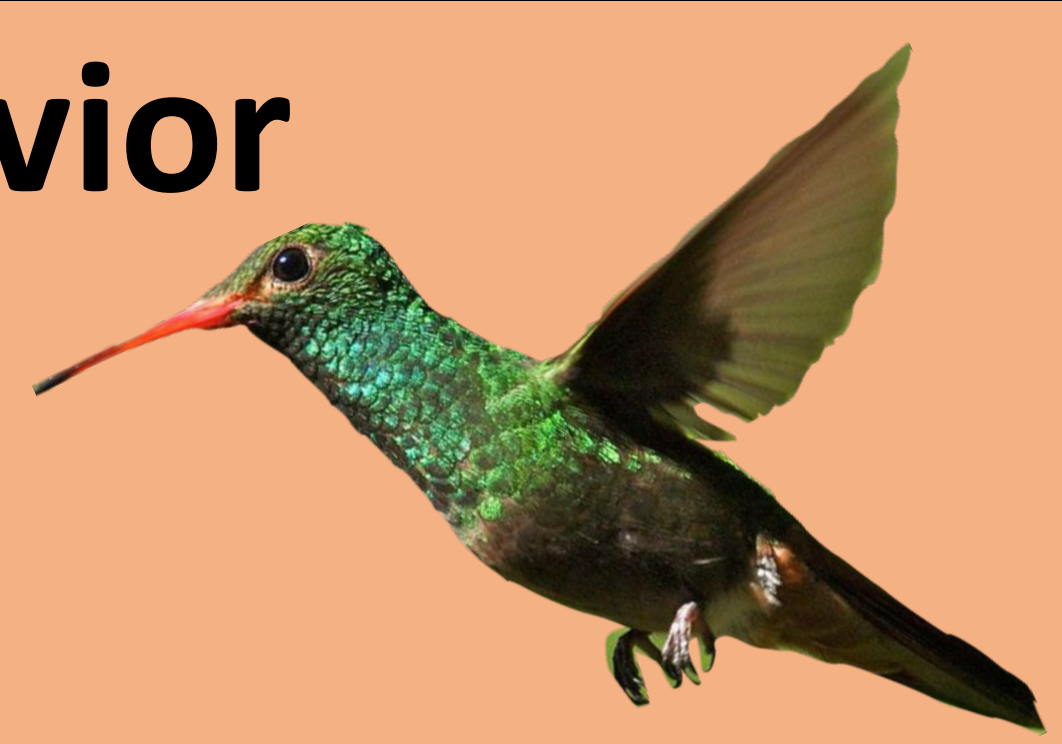


Odum School of Ecology
UNIVERSITY OF GEORGIA

in *Stachytarpheta jamaicensis* Flowers

Calvin Carey, Ron Carroll, Amanda T. Rugenski

Odum School of Ecology



Introduction

- Yeast naturally occurs in many flowers and can alter not only the attractive characteristics of the flower, but of the nectar within as well (3). Yeast residing in flowers may act as a source of protein for the hummingbirds, however there is a gap in research on how yeast is incorporated into hummingbird diets and how they interact with it.
- Nectar robbing insects represent a unique role in competition with hummingbirds, as their feeding strategy involves creating holes in the bottoms of flowers and extracting the nectar. Research has shown that the activity of nectar robbing bees on *I. aggregata* reduces hummingbird visitation rates on those flowers (1).



Questions and Hypotheses

- Q: How does yeast in flowers affect hummingbird feeding time, visitation rates and competitive activity?
- H: We hypothesize that yeast treated *S. jamaicensis* flowers will receive higher visitations, less feeding time, and more competitive events than untreated flowers.
- Q: Can hummingbirds effectively detect and avoid nectar robbing in *S. jamaicensis* flowers?
- H: We hypothesize that nectar robbed *S. jamaicensis* flowers will receive less visitations, feeding time, and competitive events than non-robbed flowers.

Methods

- The yeast experiment took place in three sites at the UGA campus in Monteverde, Costa Rica as well as one offsite location in Pocosol. A sugar and kitchen yeast solution was prepared and dropped into ten *Stachytarpheta jamaicensis* flowers in patches of five at 6:30 AM. Hummingbird activity was then monitored at the flowers for one hour at each site four times, with our measured variables being visitation count, feeding time, and competitive events such as chasing.
- The nectar robbing experiment took place at the same three sites on campus. Flowers were checked for nectar robbing then marked and observed for an hour. Our measured variables were visitation count, feeding time, and competitive events.



Results

YEAST EXPERIMENT

- 124 of 885 visitations were to yeast treated flowers (Fig. 1)
- No significant difference in average feeding (~2.00 seconds; Fig. 2)
- 9 yeast treated flower chases and 16 untreated flower chases

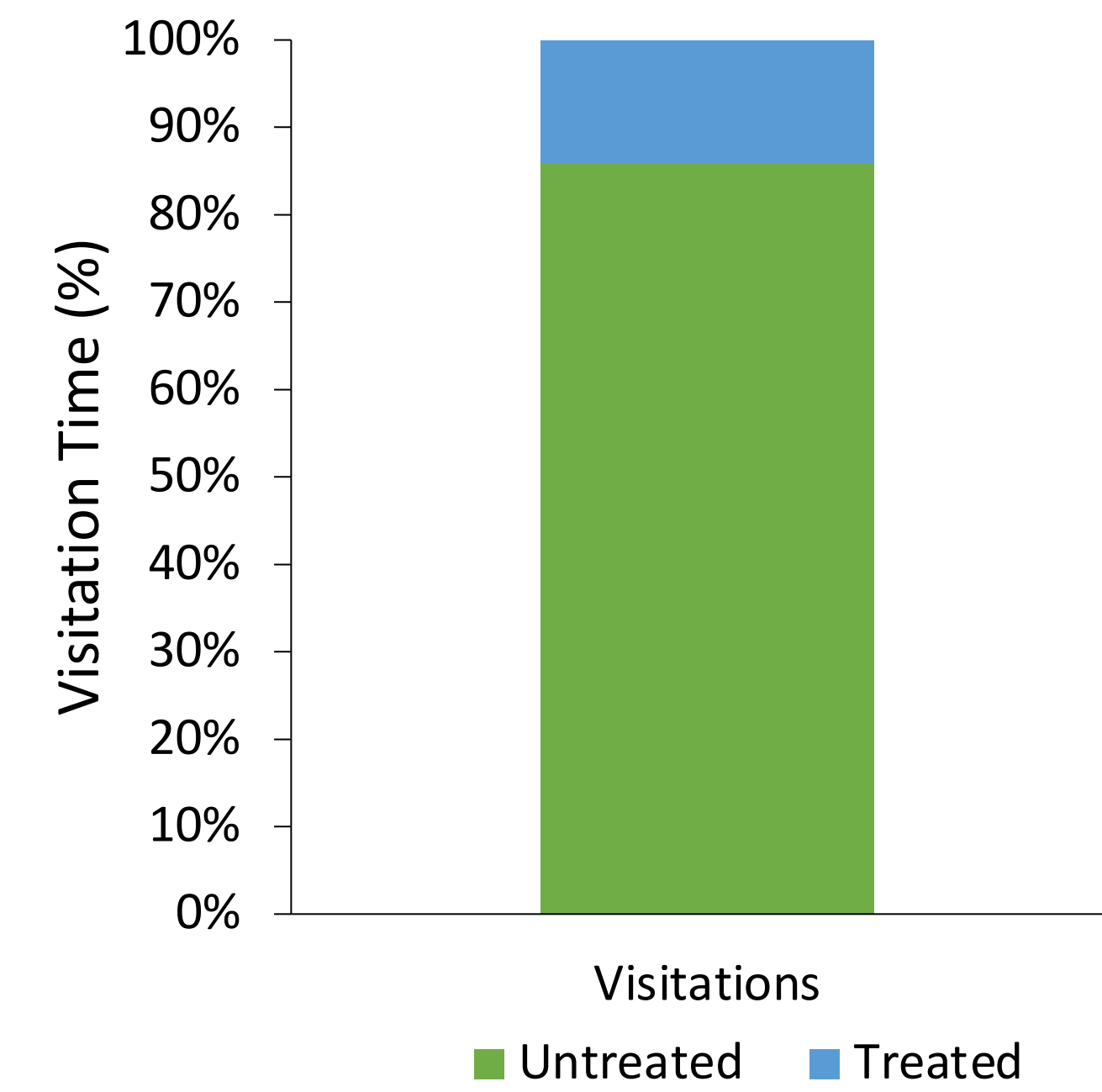


Figure 1. Total visitation on treated vs. untreated flowers over twelve observation hours.

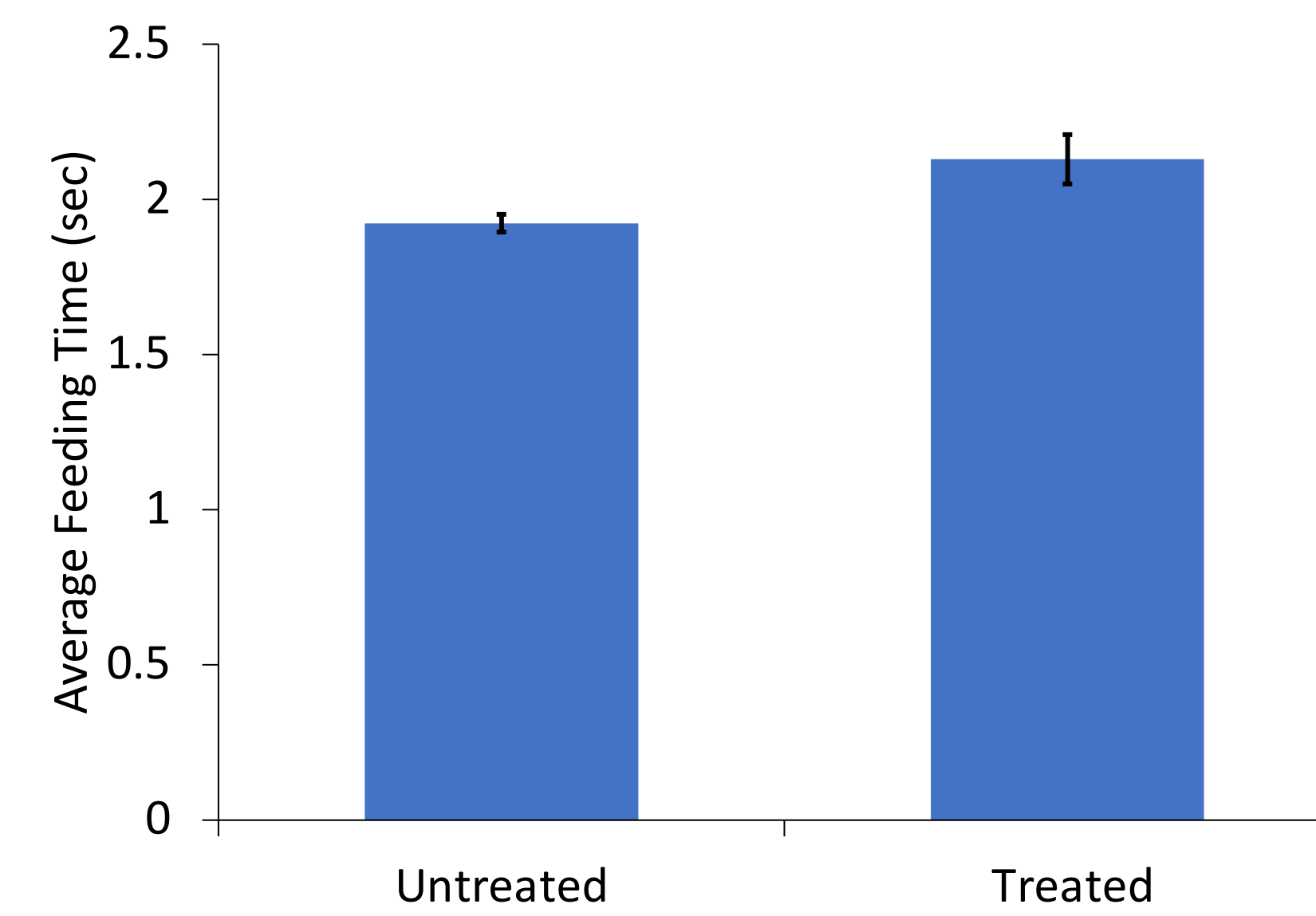


Figure 2. Average feeding time on treated vs. untreated flowers (error bars +_1 SE).

NECTAR ROBBING EXPERIMENT

- 20 out of 631 visitations were to nectar robbed flowers (Fig. 5)
- Average feeding time was significantly higher on non-robbed flowers (1.27s vs. 1.93s, $p < 0.001$; Fig. 6)
- There were 9 chases at non-robbed flowers and zero chases at robbed flowers

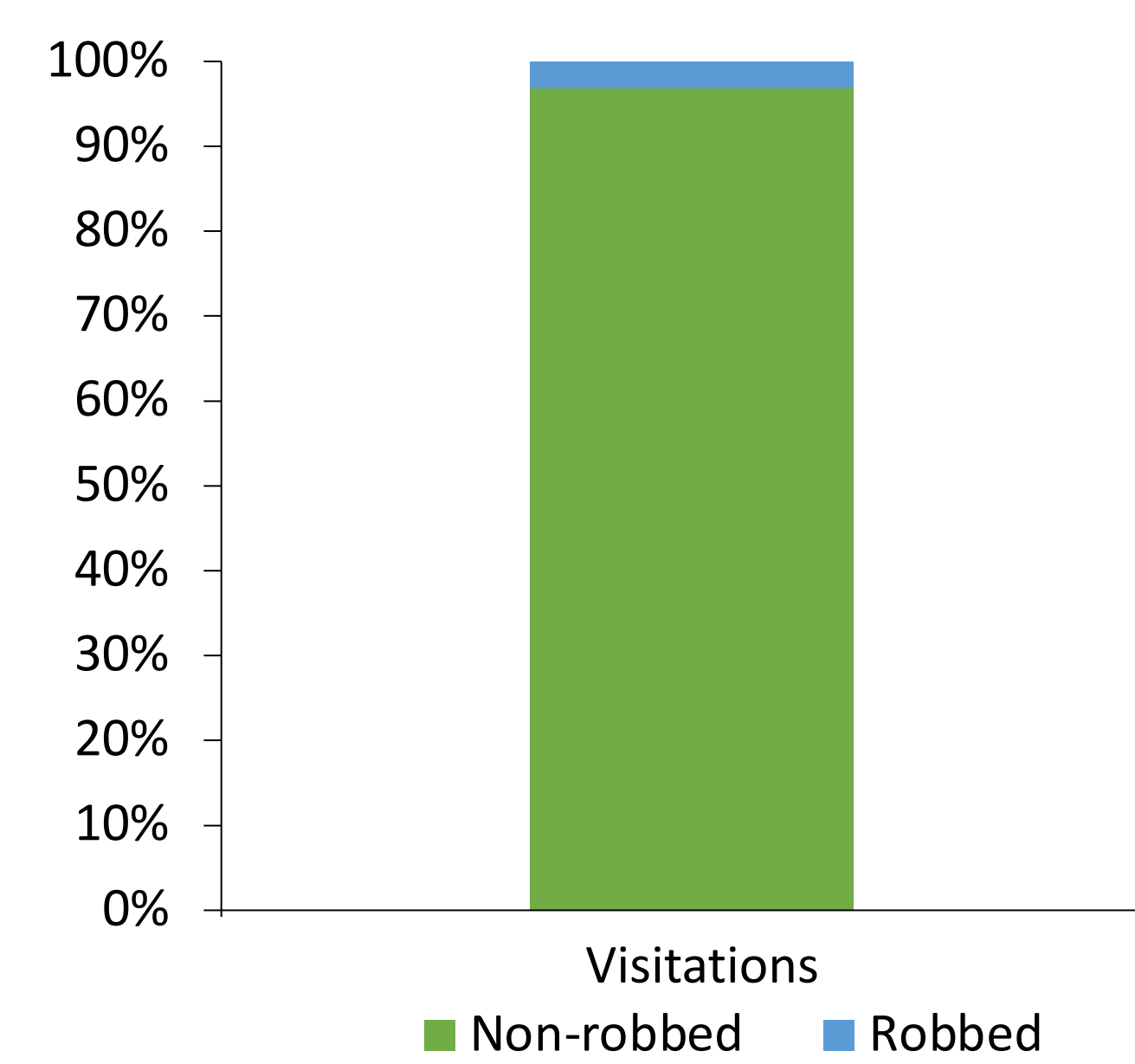


Figure 5. Total visitation on robbed vs. non-robbed flowers.

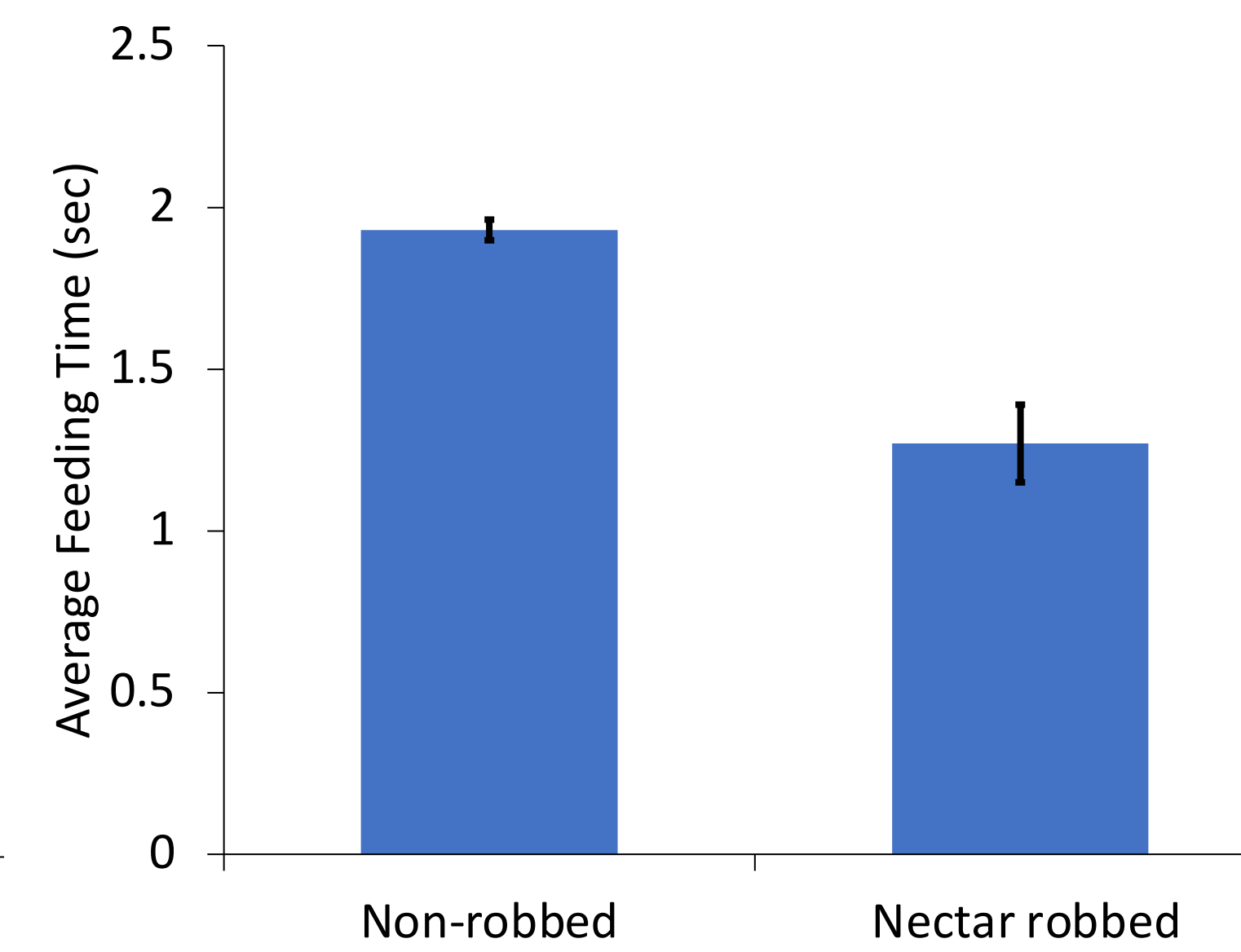
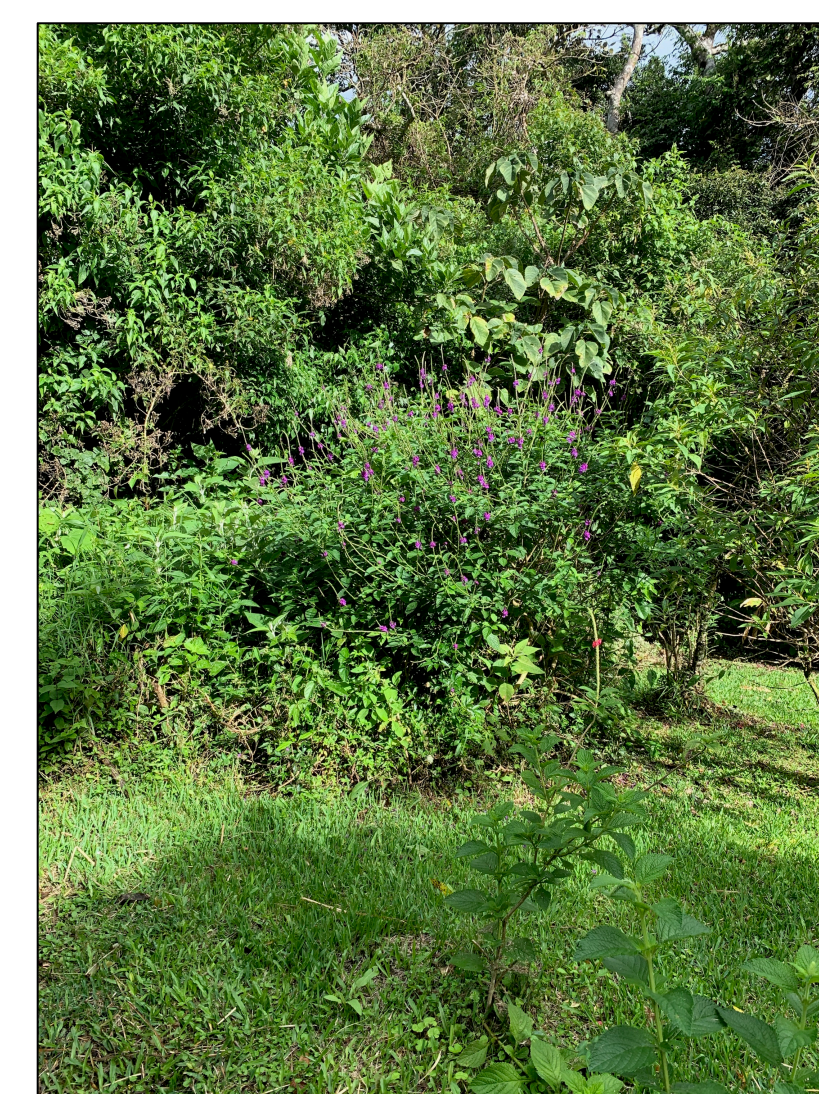


Figure 6. Average feeding time on robbed vs. non-robbed flowers (error bars are ± 1 SE).



Results

- The average feeding time was significantly lower in the robbed treatment compared to all other treatments (ANOVA, $p < 0.001$; Fig. 7) which had similar feeding times.

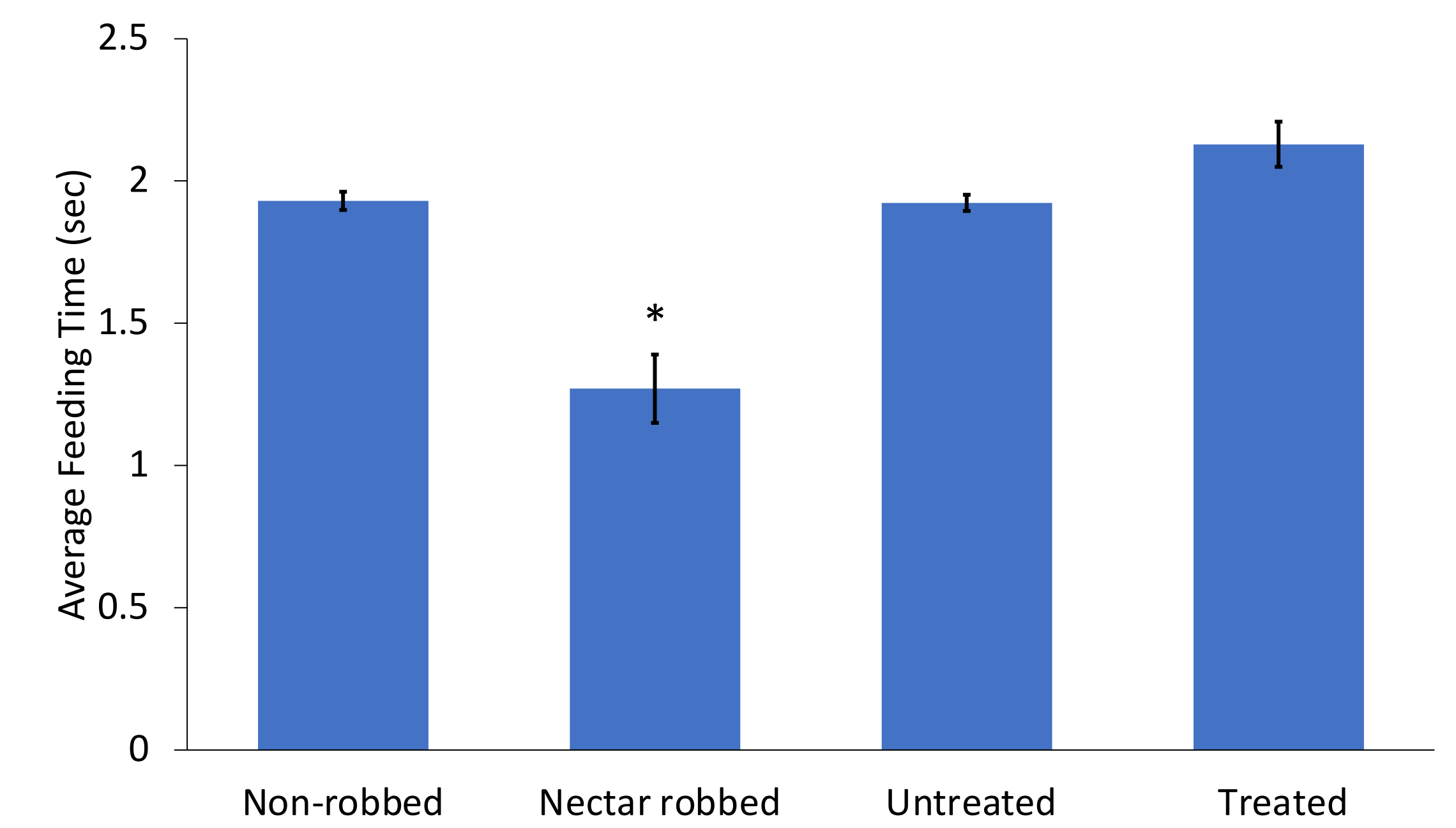


Figure 7- Average feeding time across non-robbed, robbed, untreated, and yeast treated flowers (Error bars are +_1 SE).

Conclusion

- Our hypotheses that yeast treated flowers would receive higher visitations, less feeding time, and more competitive events was not supported.
- However, competition events at yeast treated flowers vs. untreated flowers was high relative to the number of visitations.
- We believe that a revision of our experimental design that addresses issues such as the excess of untreated to treated flowers as well as the possibility that hummingbirds prefer high, unreachable flowers (2) may support our hypotheses.
- Our hypothesis for the nectar robbing experiment was supported, as we saw decreases in visitation, average feeding time, and competitive events in nectar robbed flowers.

Acknowledgements

- Special thanks to Dr. Ron Carroll for providing the inspiration behind this project, Ana Rojas for her assistance, and Dr. Amanda Rugenski for her unending support and hard work.

Literature Cited

- Irwin, R. E., & Brody, A. K. (1998). Nectar robbing in *Ipomopsis aggregata*: effects on pollinator behavior and plant fitness. *Oecologia*, 116(4), 519-527
- Primack, R. B., & Howe, H. F. (1975). Interference competition between a hummingbird (*Amazilia tzacatl*) and skipper butterflies (Hesperiidae). *Biotropica*, 55-58.
- Schaeffer, R. N., Mei, Y. Z., Andicochea, J., Manson, J. S., & Irwin, R. E. (2017). Consequences of a nectar yeast for pollinator preference and performance. *Functional ecology*, 31(3), 613-621.