It's the Little Things in (a Grasshopper's) Life: How the Carolina Grasshopper Visually Signals to Conspecifics While Minimizing Predation Risk

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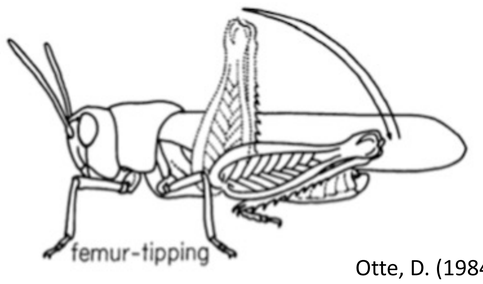
Introduction

The Carolina grasshopper, *Dissosteira carolina*, has coarse vision (Duncan et al., 2021) that may hinder the distance at which they can use visual signals, an important component of their communication (Kerr, 1974). The main predator of grasshoppers, birds, have relatively high visual acuities (Jones et al., 2007), making these visual signals a seemingly dangerous activity. How do these grasshoppers visually signal to each other while maintaining a low level of interception by predators?

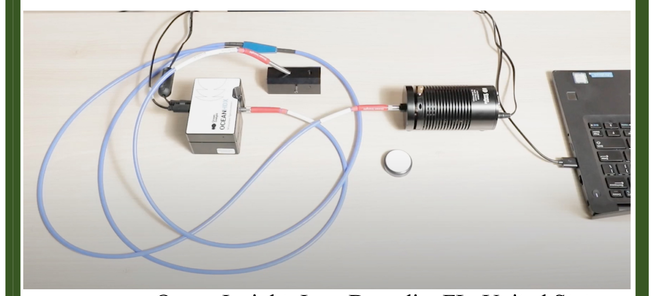
Methods

Temporal Analysis of Signals



Otte, D. (1984).

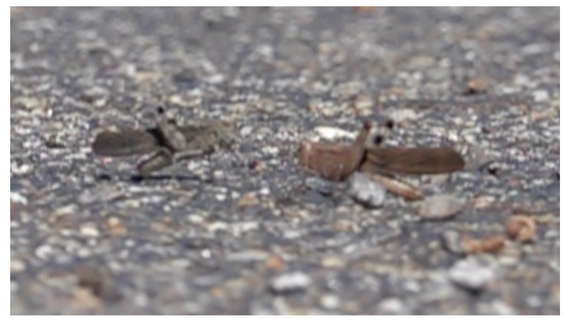
Color Modeling of Bands on Legs



Ocean Insight, Inc., Dunedin, FL, United States

Spatial Modeling of Legs

Observed Signaling Distances



Results

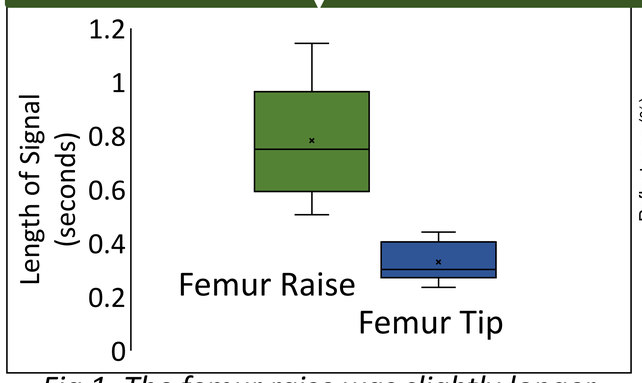


Fig 1: The femur raise was slightly longer than the tip

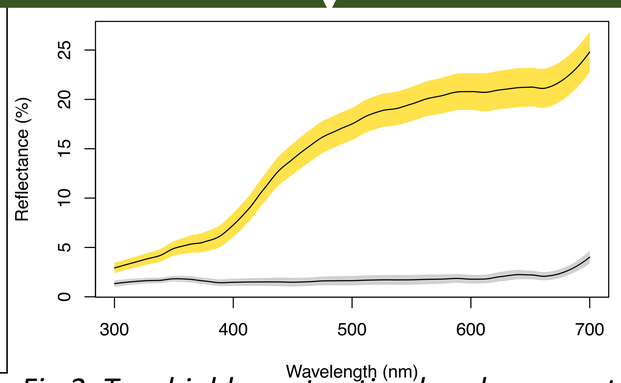


Fig 2: Two highly contrasting bands present on the femur

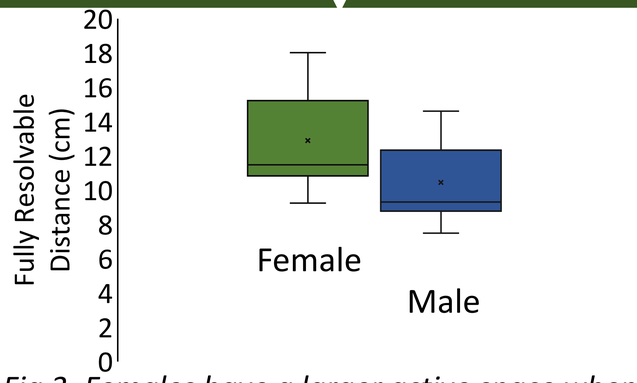


Fig 3: Females have a larger active space when viewing signals

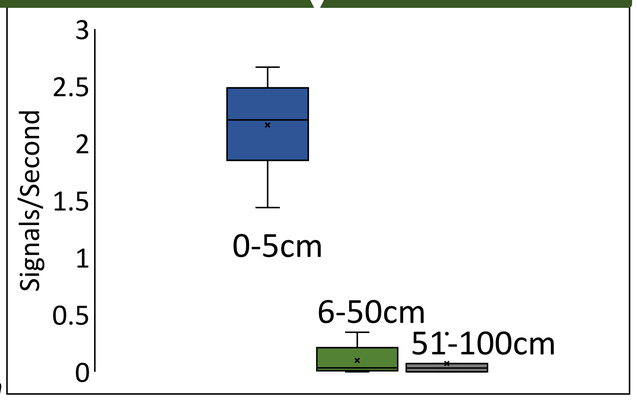


Fig 4: Signals are mainly used within 5cm

Conclusions

The size and color of the legs may allow for an inconspicuous signal when occurring at the high speeds the grasshoppers use. The grasshoppers have a relatively small active signaling space, both experimentally and observationally determined. Taken together, this could mean that Carolina grasshoppers are able to overcome their coarse vision and predatory dangers to visually signal to conspecifics both effectively and efficiently.

Duncan, A. B., Salazar, B. A., Garcia, S. R., & Brandley, N. C. (2021). A Sexual Dimorphism in the Spatial Vision of North American Band-Winged Grasshoppers. *Integrative Organismal Biology*, *3*(1), obab008. https://doi.org/10.1093/iob/obab008

Jones, M. P., Pierce, K. E., & Ward, D. (2007). Avian Vision: A Review of Form and Function with Special Consideration to Birds of Prey. *Journal of Exotic Pet Medicine*, *16*(2), 69–87. https://doi.org/10.1053/j.jepm.2007.03.012

Kerr, G. E. (1974). VISUAL AND ACOUSTICAL COMMUNICATIVE BEHAVIOUR IN *DISSOSTEIRA CAROLINA* (ORTHOPTERA: ACRIDIDAE). *The Canadian Entomologist*, *106*(3), 263–272. https://doi.org/10.4039/Ent106263-3

Otte, D. (1984). *The North American Grasshoppers. 2: Acrididae: Oedipodinae*.

Acknowledgments

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