Chronoecology of the Cave Dwelling Orb-Weaver Spider, Meta ovalis (Araneae: Tetragnathidae)

Rebecca Steele
Clinton Elmore
Rebecca Wilson
Darrell James Moore
Blaine W. Schubert
See next page for additional authors

Follow this and additional works at: https://dc.etsu.edu/asrf
Author Names
Rebecca Steele, Clinton Elmore, Rebecca Wilson, Darrell James Moore, Blaine W. Schubert, and Thomas Charles Jones

This poster is available at Digital Commons @ East Tennessee State University: https://dc.etsu.edu/asrf/2019/schedule/198
Abstract

Circadian clocks are endogenous time keeping mechanisms that are ubiquitous among animals. They enable coordination of many essential biological and metabolic processes in relation to the 24 hour light cycle on earth. However, there are many habitats on earth that are not subject to this light cycle. This study aims to look at the potential genetic drift of the circadian rhythm of a subterranean species, Meta ovalis. (Fig 1) as well as gathering general natural history information on this understudied species. This study will fill general gaps in knowledge of this spider and its habitat, highlight the importance of studying organisms within a subterranean environment, and place importance on cave conservation and acquiring knowledge of these specialized, and sensitive species. This study integrates circadian and foraging theory to evaluate species as circadian specialists and generalists based on how narrowly or widely their activity is spread over the 24 h cycle (Fig 3). We suggest that M. ovalis benefits from a generalist strategy, showing small bursts of focused activity widely dispersed across the 24 h cycle, allowing it to capture prey opportunistically whenever it is available. Live spiders were collected from area caves, monitored in an environment controlled for light and temperature, and returned to their cave of origin. The activity of each spider was recorded for differences in circadian activity among and between populations to determine if there is a significant drift of the circadian strategy between isolated populations of Meta ovalis. We expect to see a different circadian strategy implemented between populations due to drift from the spiders being isolated from other populations.

Methods

- Locate populations, collect specimens, and note depth from cave mouth for each
- Samples were collected between June 2017 and January 2019
- Spiders captured were used in the study for their circadian activity and for foraging window
- Place spiders in activity monitor (Fig 2) recording 5 days of activity
- Samples from Quaker Knobs Cave, Chuckey TN: n=30
- Meta ovalis
- Meta ovalis egg case

Effect of Temporal Mismatch on Prey Capture

Fig 1 Female Meta ovalis

Fig 2 Activity Monitor set-up

Results

- Mean activity in LD 12:12 Sculpture Cave
- Mean Activity in LD 12:12 Quaker Knobs Cave

Conclusions and Future Work

Conclusions:
- This research shows significant difference between populations of M. ovalis freerunning period
- Sculpture cave shows nocturnal activity, with broadly spaced groupings of activity over a 24 h period
- Quaker Knobs cave shows an overall trend of long (~27 hr) freerunning periods

Future Studies:
- Locate additional caves to compare populations
- Comparative work with other species that dwell in the same type of environment
- Use infrared cameras within natural habitat to analyze normal activity patterns, as well as general natural history

References and Acknowledgements

Special Thanks To:
East Tennessee State University Department of Biological Sciences
ETSU Spider Lab
ETSU Fall 2017 Archaeology Course