**Interactive Shiny App for Comparative Analysis of Circadian Activity in Mosquito species Using LAM Data**

Mosquitoes are the world’s most dangerous organisms due to their competence for human pathogens which can be spread by females through sequential bloodmeals. Mosquitoes across genera are well adapted to a wide range of environments that experience diverse seasonal photoperiods (time of day). Behaviors like sugar and blood feeding are time-of-day specific, and therefore regulated by an individual’s endogenous circadian clock. Across diverse photoperiods, mosquito populations must adapt their clocks to tune time-of-day specific behaviors. These behavioral adaptations are key to understand vector behavior and subsequent disease transmission patterns. To quantify activity and rhythmicity for the assessment of biological clock function, Locomotor Activity Monitoring systems have been widely used in insects like *Drosophila*, the same approach can be easily extended to work on mosquitoes. The primary objective of this project is to develop an interactive software to output graphical activity data for comparative analysis between populations of mosquitoes throughout the globe.

This project has the ability to utilize raw activity data collected from individual mosquitoes using a LAM system. The system outputs data with each column representing an individual mosquito's activity, recorded every 30 minutes over a period of five days. I have developed, through conversation in ChatGPT (Merow et al. 2023), an interactive R Shiny app that allows users to load a tidy dataset, filter the by character (mosquito ID, treatment, species, etc), and output their desired visualization. The app has been developed using R and relies on the packages tidyverse, ggplot2, lubridate, DT, and shiny and will cantains the ability to compute and output summary statistics (total activity, peak periods, average hourly activity) as well as display and output the visualizations formatted as actograms, heatmaps, and smoothed time series plots. This application will aid researchers by streamlining the process from data collection to publishable figures to informs agencies on seasonal time-of-day activity patterns of clinically significant mosquito populations.

**References**

Clements, A. N. (1999). *The Biology of Mosquitoes: Sensory Reception and Behaviour*.

CABI Publishing.

Rosato, E., & Kyriacou, C. P. (2006). Analysis of locomotor activity rhythms

in *Drosophila*. *Nature Protocols*, 1(2),

559568. https://doi.org/10.1038/nprot.2006. Wickham, H. (2016). *ggplot2:*

*Elegant Graphics for Data Analysis*. Springer.

Merow, C., Serra-Diaz, J. M., Enquist, B. J., & Wilson, A. M. (2023). AI chatbots can

boost scientific coding. *Nature Ecology & Evolution*, 7(7), 960-

962. https://doi.org/10.1038/s41559-023-02063-3

Meuti, M. E., Stone, M., Ikeno, T., & Denlinger, D. L. (2015). Functional circadian clock

genes are essential for the overwintering diapause of the Northern house

mosquito, Culex pipiens. *The Journal of* *Experimental Biology*, *218*(Pt 3), 412–

422. https://doi.org/10.1242/jeb.113233

Chang, V., & Meuti, M. E. (2020). Circadian transcription factors differentially regulate

features of the adult overwintering diapause in the Northern house mosquito,

*Culex pipiens*. *Insect Biochemistry and* *Molecular Biology*, *121*, 103365.

https://doi.org/10.1016/j.ibmb.2020.103365