Do Weather Patterns Affect Bat Activity Levels?

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Background & Methodology:

Organisms have their own ecological niche, a set of environmental conditions in which they prefer living. Part of a region's habitats are the weather patterns they receive. This study is examining how differing weather patterns between 2018 and 2021 may affect bat activity levels on the SUNY Geneseo campus. It is known that bat activity typically increases with increasing temperature, but decreases when wind and precipitation increase (Gorman *et al*, 2021). Northeastern coastal areas see greater effects on bat activity due to weather patterns because of the increased wind with a temperate temperature (Gorman *et al*, 2021). Previous studies identified the big brown (*Eptesicus fuscus*), the silver-haired bat (*Lasionycteris noctivagans),* and the hoary bat (*Lasiurus cinereus*) as common bat species (Loce & Mann, 2018 and Licata & Mackey, 2021) on the SUNY Geneseo campus. This study can help gauge the role that weather patterns play in bat activity and also migratory timing as well. Some bats, like the silver-haired bat found at Geneseo, hibernate in caves or dwellings in these northeastern regions instead of migrating to overwinter grounds (Gorman *et al*, 2021). Knowing how weather patterns affect their activity levels might allow us to ensure suitable landscaping and environmental conditions that are within our control.

For this study, bat activity data from two previous studies (Loce & Mann, 2018 and Licata & Mackey, 2021) was used. Each of these studies recorded bat foraging calls during the month of August using an Echo Meter Touch 2 Bat Detector (Wildlife Acoustics). The 2018 study by Loce and Mann had bat calls per species per night recorded in excel. In order to retrieve the bat calls per species per recording night for the 2021 study, the software Kaleidoscope Pro was used. This software takes sound files and auto identifies bat species. The number of calls were then counted as the number of identities noted. To retrieve the weather data for both years, a weather recorder on the SUNY Geneseo campus Integrated Science Centers roof was utilized. The weather variables of temperature (degrees Celsius), relative humidity (percent), wind speed (m/s), and rain (mm) were then averaged for each of the three recording weeks per year.

The College Green - Google Photos

The Arboretum - Google Photos

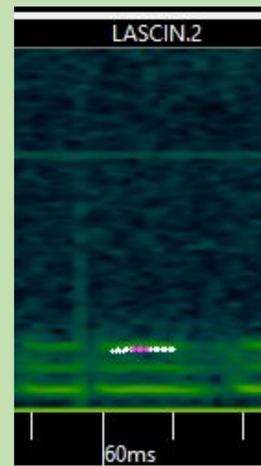Lot B - Peyton Mackey

Analysis:

Figure 1: Auto Identification of Bat Species With Kaleidoscope: This screenshot shows the auto identification of a call from the bat species *Lasiurus cinereus,* more commonly known as the Hoary Bat.
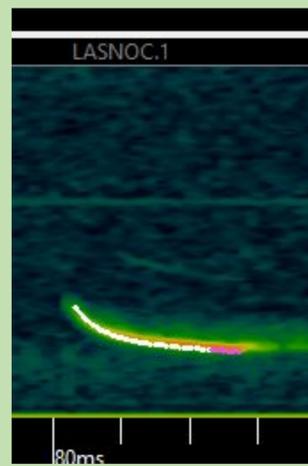

Figure 2: Auto Identification of Bat Species With Kaleidoscope: This screenshot shows the auto identification of a call from the bat species *Lasionycteris noctivagans,* more commonly known as the Silver-Haired bat.
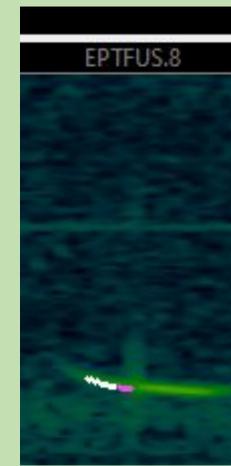

Figure 3: Auto Identification of Bat Species With Kaleidoscope: This screenshot shows the auto identification of a call from the bat species *Eptesicus fuscus,* more commonly known as the Big Brown Bat.

Conclusions and Future Recommendations:

The bat activity data, measured by number of bat foraging passes, on the SUNY Geneseo campus in the years 2018 and 2021 suggested a more favorable habitat in August 2021. I examined whether differences in weather could explain foraging habitat changes for the bats we observed. Out of the three recording weeks in both August 2018 and August 2021, temperature increased for two of the weeks in 2021 and rain decreased for all three. It should be noted that there was no rain detected from the weather recorder for all of August 2021. The temperature differences were shown to be nonsignificant (p=0.1266) while the rain differences were significant (p=0.0369) between years. I further examined the potential role of temperature to determine whether or not there is a correlation between temperature and total bat activity, and found no relationship across the two years (p=0.3659). I suggest continuing the study in the future to get a better understanding on how temperature and rain affect bat foraging activity. In data analysis, I saw that certain species prefer certain locations for foraging on campus. For example, the hoary bat (*Lasiurus cinereus)* was heard more frequently at the College Green which hints at specific microhabitat choice by species. The higher hoary bat activity in 2021 suggests foraging at the Green was better in this year even though the years were determined to be non significantly different in terms of hoary bat activity (p= 0.2482). Perhaps this was because of different weather patterns in 2021 compared to 2018, and the hoary bats were able to stick around longer instead of migrating early. Although a specific microhabitat did not stand out as much for the silver-haired bat (*Lasionycteris noctivagans*), it could be examined further in the future as a model of the foraging activities of cave dwelling bat species in the Northeastern region.
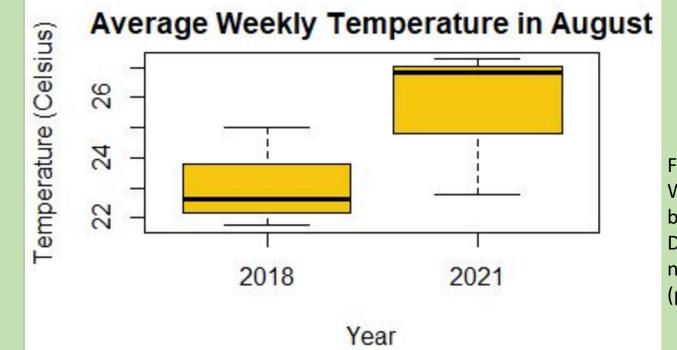
Results:

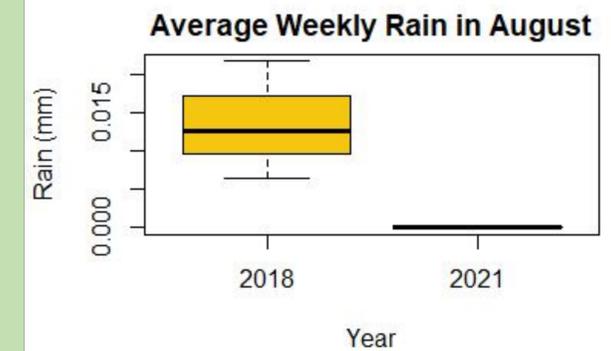Figure 4. Average Weekly Temperature for both recording years. Difference is nonsignificant (p=0.1266).

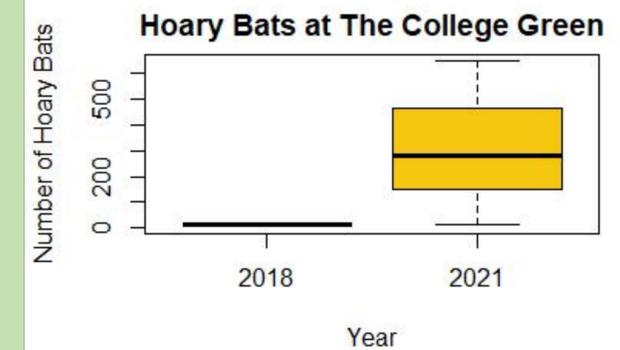Figure 5. Average weekly Rain for both recording years. Difference is significant (p=0.0369).

Figure 6. Total Number of Hoary Bat calls at The College Green for both recording years. Difference is nonsignificant (p=0.2402).
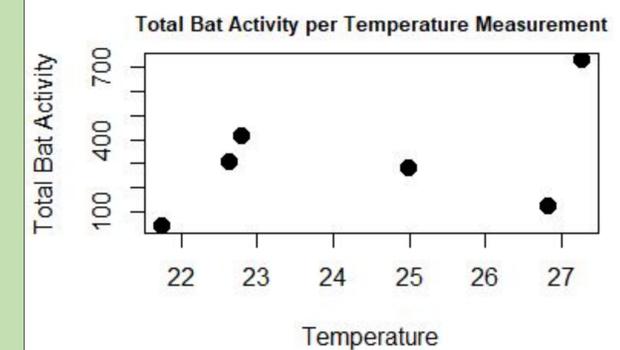

Figure 7. Total Bat Activity for each average weekly temperature, 3 weeks per recording year. No linear correlation (p=0.3659).

Literature Cited:

Gorman, K. M., Barr, E. L., Ries, L., Nocera, T., & Ford, W. M. (2021). Bat activity patterns relative to temporal and weather effects in a temperate coastal environment. In *Global Ecology and Conservation* (Vol. 30). https://doi.org/10.1016/j.gecco.2021.e01769

Licata, B. & Mackey, P. (2021, November). *Bat Populations Around the SUNY Geneseo Campus: Do Human Habits Affect Them?* Poster presented at SUNY Geneseo's Research Symposium, Geneseo, NY.

Loce, S. & Mann, A. (2018, April). *A Survey of Bat Species at The State University of New York at Geneseo*. Poster presented at SUNY Geneseo's GREAT Day, Geneseo, NY.

Acknowledgements:

GENESEO
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