

Impact of Cloud Cover on Emergence Patterns of Congress Avenue Bridge Bats

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Introduction

The Congress Avenue Bridge in Austin, Texas, is home to the largest urban bat colony in North America. These Mexican free-tailed bats (*Tadarida brasiliensis*) are crucial for insect control and ecosystem balance. While temperature, humidity, and light pollution have been studied for their effects on bat behavior,^{1,2} the impact of cloud cover remains relatively unexplored. This study investigates whether cloud cover influences bat emergence patterns, addressing a gap in current research and contributing to our understanding of bat ecology.

Research Questions

This study aims to address the following two questions:

1. Does cloud cover affect the timing of bat emergence from Congress Avenue Bridge in the evening?
2. How do the findings on cloud cover impact our understanding of bat behavior and ecology?

Methods and Materials

- **Bat Emergence Data:** Recorded daily by the Austin Bat Refuge.³ Data is pulled from the past year of emergence records. Extensive data cleaning was needed to make this data usable.
- **Environmental Data:** Cloud cover data, along with temperature and humidity, were obtained from Visual Crossing.⁴
- **Observation Tools:** R, a statistical and visualization language, was utilized to clean, analyze, and visualize the data, within RStudio, a graphical user interface for R.
- **Correlation Analysis:** Statistical analysis was conducted to examine the relationship between cloud cover and bat emergence times. The emergence times were ranked and compared to cloud coverage using the Kendall's tau rank significance test.

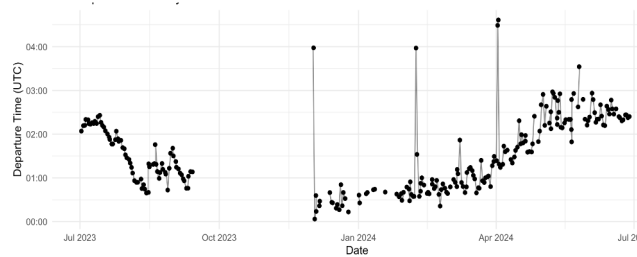


Figure One: Bat emergence time by date, for the year July 2023 – July 2024.³

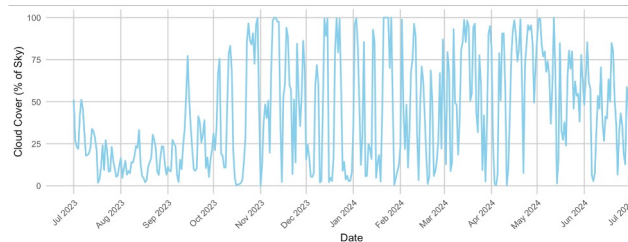


Figure Two: Austin cloud cover, for the year July 2023 – July 2024.⁴

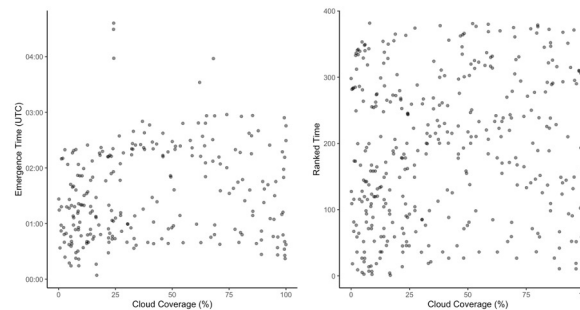


Figure Three (left): Scatter plot comparing bat emergence time to cloud coverage.
Figure Four (right): Scatter plot comparing ranked bat emergence times to cloud coverage for Kendall's tau rank significance test.

Results

The scatter plot of bat emergence time vs. cloud cover was completely random (Fig. 3). Although others have seen correlations with other atmospheric variables such as temperature and light,^{1,2} there appears to be no correlation of bat emergence time with cloud cover on visual observation of the graph, which was further confirmed through a Kendall's tau rank significance test ($\tau = 0.115$) (Fig. 4).

Discussion

While there was no statistically significant relationship found between emergence time and cloud coverage for the Congress bats, all is not lost. A negative result is just as important as finding a correlation.

Future Directions:

As these bats live in an urban environment, how might sound pollution affect their emergence times when compared to rural bats of the same species?

Acknowledgments

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References

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