Going Batty! Bat Ultrasonic Monitoring in Windsor, CT

Contributions to National Monitoring via NABat

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Background and Objectives:

Beginning in New York in 2006, an invasive fungus known as **white-nose syndrome** (*Pseudogymnoascus destructans*) began a deadly chiropteran (bat) pandemic that has spread across the northern United States and Canada.[1] This infection has proven so deadly that in the following decade, the *Myotis* genus (e.g. Northern Long-eared bat) has found itself reduced to 10% of its former size.[1] My project aims to identify bat populations in a critical recording cell for the North American Bat Monitoring initiative (NABat) to help researchers focus their bat conservation efforts.

Guiding Question:
Based upon features of microhabitats, are we able to make conclusions about bat activity by species and possible roost locations?

Primary Objectives:

1. Monitor bat activity at different microhabitats within NABat Priority Cell 720
2. Analyze data by species, time, and date

Fig 1: Eastern Red (Labo)

Fig. 2: Northern Long-eared (Myle)

Fig 3: Tri-coloured (Pesu)

Fig. 4: Hoary (Laci)

Fig. 5: Big Brown (Epfu)

Fig 6: Silver-haired (Lano)

Methods: Field Data + Acoustic Analysis

Field Data Collection

- Monitored three geographic areas in NABat Priority Cell 720, which correspond to the following in Windsor, CT:
  - Loomis Chaffee, Waterworks Brook, and Northwest Park
  - Each area included 3-5 relevant recording sites based upon understanding of bat flyway and habitat use
    - e.g., proximity to water bodies, wooded areas
- Used two different monitor types (Song Meter and Audiomoth)
  - Optimized monitoring location and directionality for data collection

Acoustic Analysis

- Recorded over 10k audio files between late June to November of 2022
- Used Sonobat's Datawizard, Sonobatch, and Sonovet to analyze files and provide species classification
- Performed manual classification where necessary

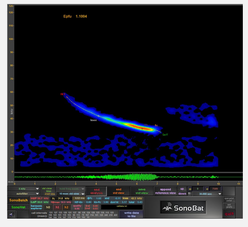
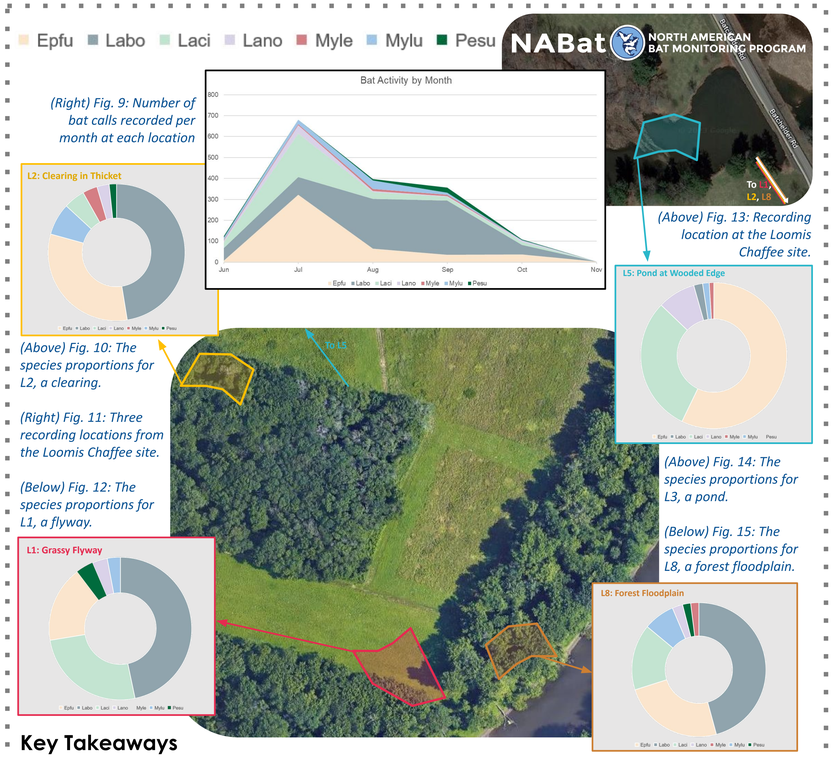


Fig. 7: The analysis view for a file recorded on August 12, 2022 at L1.

Fig. 8: A Songmeter setup recording at L1, facing the river.

Outcomes: Bat Activity by Microhabitat



(Right) Fig. 9: Number of bat calls recorded per month at each location

(Above) Fig. 10: The species proportions for L2, a clearing.

(Right) Fig. 11: Three recording locations from the Loomis Chaffee site.

(Below) Fig. 12: The species proportions for L1, a flyway.

(Above) Fig. 13: Recording location at the Loomis Chaffee site.

(Above) Fig. 14: The species proportions for L3, a pond.

(Below) Fig. 15: The species proportions for L8, a forest floodplain.

Key Takeaways

- The consistent presence of state endangered tri-colored and *myotis* bats presents an opportunity for conservation research at the Loomis Chaffee campus.
- Microhabitat may influence bat activity times and species distribution, as evidenced by the difference between the pond (L5) and flyway (L1) locations.
- The observation of bats at dusk and early morning at L1, L5, and L8 could indicate the potential presence of nearby maternity roosts.
- Effectively dealing with large data sets is difficult; preplanning and frequent data analysis allows one to improve final data integrity.

Community Partner: Devaughn Fraser

Initial Collaboration

- Connected with Dr. Fraser in January of 2022
- Received feedback on monitoring hardware, software, and location
- Dr. Fraser guided me through analyzing initial ultrasonic recordings

As a Community Partner

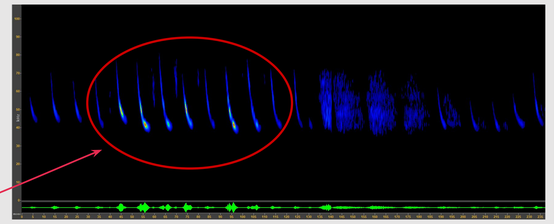
- Worked with her on CT DEEP's Bat Day celebration (Fig 16) attended by >150 people in September of 2022
- Participated in a monitoring workshop, developing my acoustic analysis skills
- Assisted in the analysis process for Audiomoth files

Fig 16: CT DEEP's Bat Day at Old New-Gate Prison in East Granby

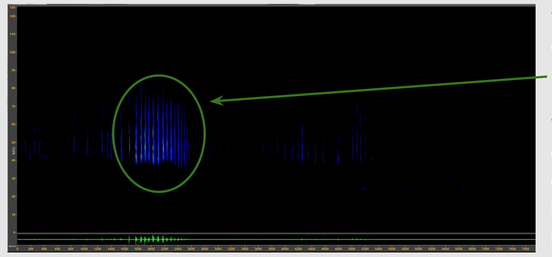
Classification: Manual vs Automated

I used the program Sonobat to classify my raw data and output its analysis in a tabular format. While this makes it possible to handle enormous volumes of data, it has the unfortunate downside of making automated errors.

For example, Sonobat incorrectly classified this 8/19/22 spectrogram recording as *Myotis septentrionalis* (Northern Long-Eared bat) based on this section of calls.



While compressed, the file looks like the above. In real time, however…



The section highlighted above corresponds to this section of the file.

The sections before and after, however, are critical because they highlight the bat's search phase.

Bat calls have three phases: search, approach, and terminal, or a feeding buzz. That last phase in particular can be mistaken for a species of higher frequency, a common occurrence that leads to critical data error.

Future Directions

Classification (Software):

- Further improve the automatic vetting capability of bat call analysis software
- Manually vet key data elements and regions

Recording Procedure (Hardware):

- Upgrade existing devices from open recording to bat call-triggered
- Identify additional recording sites of significance, including roost locations

Experimental Design:

- Establish a consistent regimen for recording
  - Incorporate current findings to determine focus per location
- Highlight features that impact bat activity per location

Acknowledgements and References

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1. Rubeck, M. (2021). White-nose syndrome killed over 90% of three North American bat species: U.S. geological survey. Retrieved March 20, 2023: https://www.usgs.gov/news/national-news-release/white-nose-syndrome-killed-over-90-three-north-american-bat-species