

INTRODUCTION



The world has become louder, more industrialized, and increasingly urbanized over the past several decades making animals that rely on vocal communication susceptible to endangerment. This **noise pollution** has interfered with species' ability to perform many natural behaviors and comes mostly in the form of **masking** (when the noise source has similar sound traits and occurs at the same time as biological sounds) and **distracting** (when an organism's attention suddenly shifts from the target source to the anthropogenic source). The Order **Chiroptera**, along with their primary prey, insects, heavily rely on echolocation and sounds to perform their behaviors: thus, studying **how anthropogenic noise affects bat activity and insect abundance** is crucial to addressing a potential issue for such an important organism.

METHODS

Location:
Ponds and lakes around Macon and Jackson Counties, North Carolina from September to October 2022. Eight sites classified as low-medium noise levels.

Noise Production:
Sonic and ultrasonic noise files along with a third "no noise" option. Each sound was played four times for fifteen minutes, in a randomly selected order (three hours total).

Bat Monitoring:
Song Meter SM4BAT-FS ultrasonic recorder and SMM-U2 microphone, Mounted with the microphone three meters above the ground and facing the middle of the body of water. Recorded three hours continuously beginning at sunset. Each session files were analyzed using a bat ID program. The automatically processed audio files were assigned to a bat species and each of these files indicated a bat pass (at least three complete bat echolocation calls within 0.5 seconds).

Insect Abundance:
Nocturnal arthropods were collected to inspect prey presence and diversity. We used a universal blacklight trap from BioQuip. The insects were collected and held in one gallon Ziploc bags labeled with the date, location, and specific time interval each time. These bags were collected every 15 minutes during our 3-hour time interval. Insects were transferred to a petri dish and identified by order under a microscope.

RESULTS

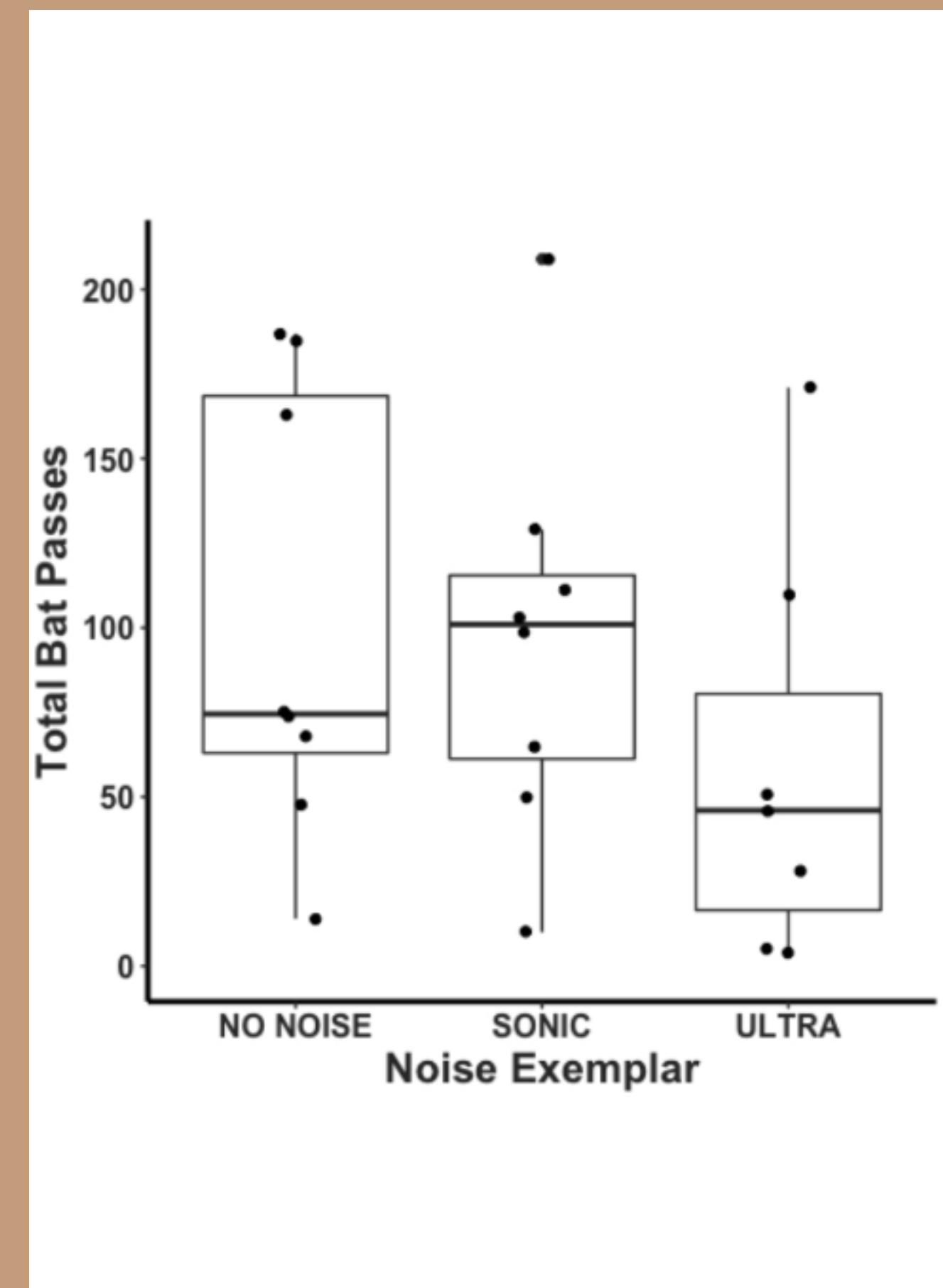


Fig. 1: Total bat calls from all eight sites across the three noise exemplars: no noise, sonic, and ultrasonic.

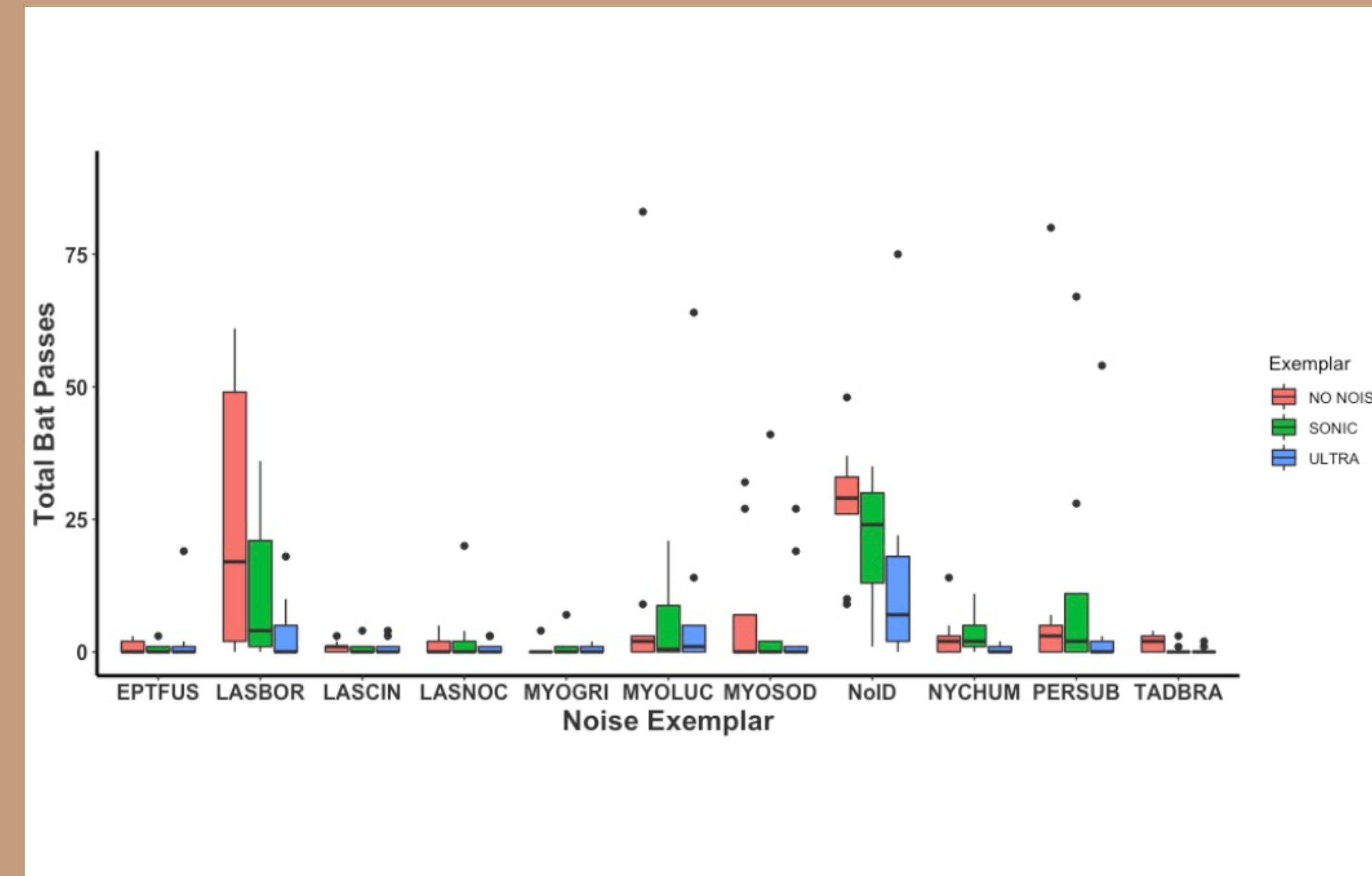


Fig. 2: Total bat calls from the thirteen individual species of focus, categorized by noise exemplars. The species included in the table are *Eptesicus fuscus* (EPTFUS), *Lasiurus borealis* (LASBOR), *Lasiurus cinereus* (LASCIN), *Lasionycteris noctivagans* (LASNOC), *Myotis grisescens* (MYOGRI), *Myotis leibii* (MYOLEI), *Myotis lucifugus* (MYOLUC), *Myotis sodalis* (MYOSOD), NoID, *Nycticeius humeralis* (NYCHUM), *Perimyotis subflavus* (PERSUB), and *Tadarida brasiliensis* (TADBRA).

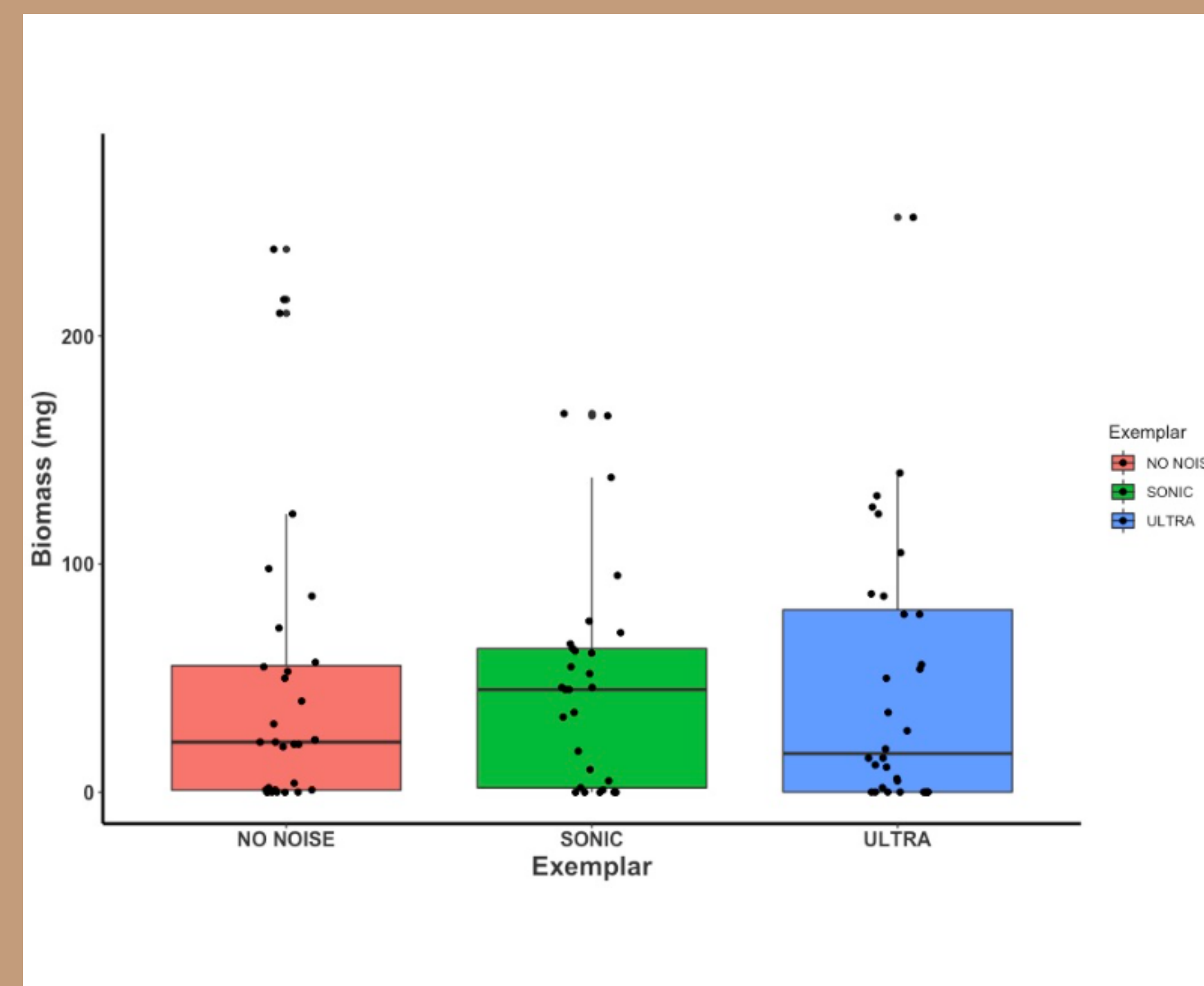


Fig. 3: Total biomass (mg) across all field sites and orders by sound exemplars

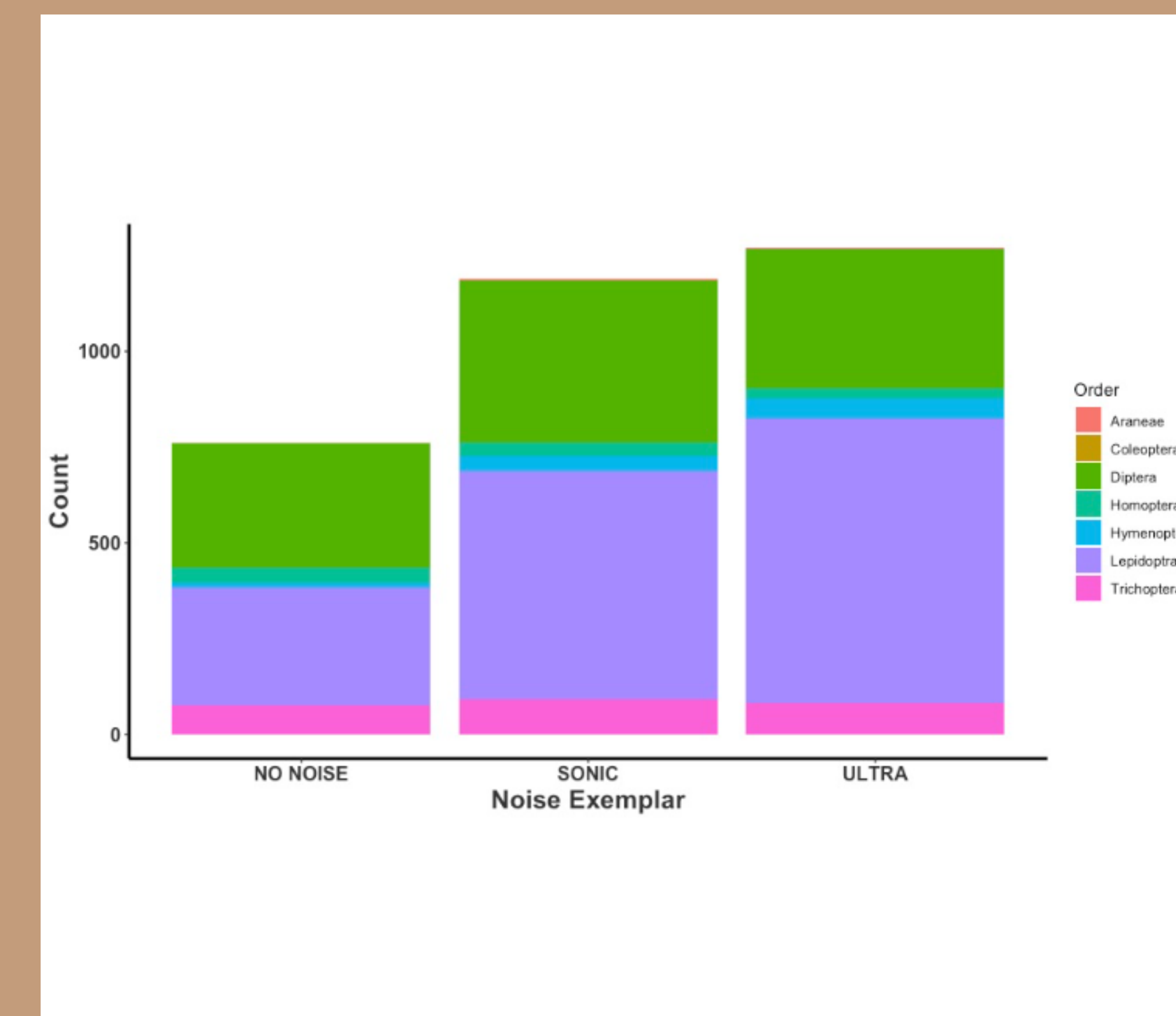


Fig. 4: Number of individuals from all sites by each Noise Exemplar, indicating proportions in each Order.

CONCLUSION

Bats appear to decrease their calls during ultrasonic trials, which would support the hypothesis that noise pollution masks natural sounds.

- Species-specific differences between each sound exemplar, warranting further investigation.
- This study was a preliminary analysis of insect abundance in the area, but it appears **Lepidoptera** are the most abundant during our trials.

Future Directions:

- Find study sites with higher background noise levels
- Replicate in the warmer months•Use GIS software to compare locations
- Further study impacts of noise pollution on insects in Southern Appalachia

This study is the first of many steps in evaluating the **drastic effects of anthropogenic noise on our environment**. Our land development influences wildlife in many ways, and sensitive key species like bats can be used to point at the greater problem of noise pollution.



ACKNOWLEDGEMENTS

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