

Effects of Anthropogenic Noise on Reproduction in an Urban Population of Eastern Bluebirds (*Sialia sialis*)

Data Description

In this study, I analyzed breeding pairs of Eastern Bluebird (*Sialia sialis*) responses to both chronic traffic noise and experimentally added acute playback of common construction noises. The University of Florida campus (Gainesville, Alachua County, Florida USA) and its surrounding areas are ideal for our study on Eastern Bluebird because it encompasses a wide range of land uses including livestock and crop fields, open greenspace, high-rise buildings, hardscape, and heavily trafficked areas. From middle January to late August in 2019, we placed and monitored 100 Gilbertson style bluebird boxes (www.NABS.org) in selected experimental areas. We sampled approximate ambient noise levels (decibels, A scale) at all box sites multiple times (from 1 to 5) on different days using mobile software (Decibel X). After the first eggs were laid inside a box, the nest was randomly assigned as a playback treatment or control nest. For each occupied box, I recorded the nesting species, clutch number, number of produced eggs, playback status (yes or no), and number of hatched chicks. We also collected daily weather data from the nearest local weather stations. We sought a balanced design of treatments across the nesting season as follows: (1) Q: Quiet boxes without Playback of Construction Noise (Control), (2) QP: Quiet boxes + Playback of Construction Noise (Treatment), (3) N: Noisy Boxes without Playback of Construction Noise (Control), and (4) NP: Noisy Boxes + Playback of Construction Noise (Treatment)

Our data consists of 4 tables. Table 1: Treatment Groups, 6 variables with 4 rows. Table 2: Ambient Noise level: Ambient noise level for each box location, 21 variables with 90 rows. Table 3: Weather Data, 18 variables with 212 rows. Weather information of each day during study period. Table 4: Reproduction Outcome: 7 variables with 45 rows, recording the number of eggs produced, number of chicks hatched, hatching success of each, and noise treatment type codes for each nest.

Aims of the experiments

By analyzing the collected data, I plan to answer the following questions: (1) what's the impact of chronic ambient noise level on the reproductive success of Eastern Bluebirds? (2) Does the acute construction noise playback impact the overall reproductive success of Eastern Bluebirds?

(3) Do Eastern Bluebirds that nested in the quiet areas and those that nested in noisy areas react similarly to the additional construction noise from the perspective of hatching success?

Hypotheses

This study addresses the overall hypothesis that noise in the urban environment can interfere with reproduction in wild birds. Specifically, I hypothesize that construction and traffic noise affect hatching success.

1. Construction noise impacts negatively on the reproductive success of Eastern Bluebirds.
2. Eastern Bluebirds that nested in quiet areas respond strongly to the additional construction noise than those that nested in noisy areas.

Proposed methods

I plan to use the following R packages/functions:

- ① ggplot2: `geom_boxplot()`, `geom_point`, and `geom_col()`; ② tidyverse: `distinct()`, `summarise()`, `tally()`, and `pivot_longer()`; ③ basic R; ④ MANOVA.RM

I plan to use the following figures to communicate the findings: Boxplots with error bars, histograms, and scatter plots.

For graduate students: I plan to use MANOVA and MGLM to test the hypothesis.

Simple summary stats of the data (see code in “SimpleSummary.R”)

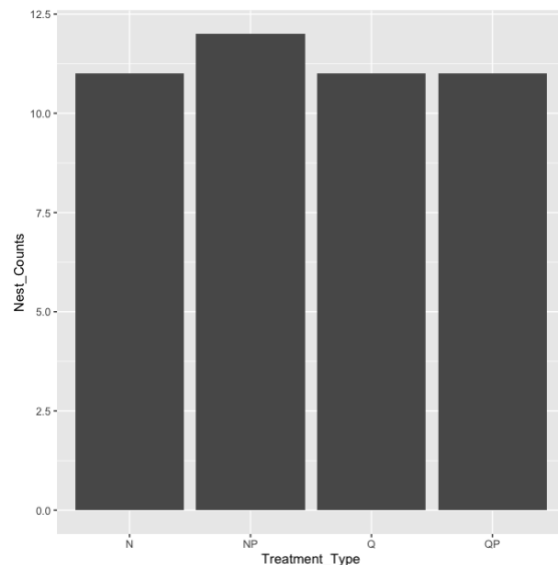


Figure 1: sample size of each treatment type. The counts of nest in four treatment types : 11 in N (Noisy area without playback), 12 in NP (Noisy area with playback), 11 in Q (Quiet area without playback), and 11 in Q (Quiet area with playback).