Anthropogenic noise does not impact nestling health in Eastern bluebirds

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Introduction

As the undeveloped areas of America are cut down for residential, commercial, and industrial uses, the resulting reduction in natural habitat forces wildlife into closer proximity with humans. With this increased proximity comes the potential for human-induced (anthropogenic) noise stress. Not all wildlife have the luxury of escape and so must endure the never-ending hum of human civilization.

In order to make informed decisions regarding bluebird conservation, we are studying the effects of noise stress on bluebird behavior and physiology. Previous projects have studied the effects of noise on bluebird nestlings through parental exposure to noise. Our project focused on determining the effects of nestling noise exposure, allowing for analysis of a possible direct relationship between noise stress and nestling health.

Day 14 returning chicks to nest box. Photo credit Hailey Jansson

Objectives

- Track nestling growth from birth to fledging period
- Quantify nestling stress by collecting and analyzing blood corticosterone levels and DNA telomere lengths
- Test new noise protocol to minimize parents' exposure to noise via internal MP3 speaker

Methods

Treatment

- RFID (Radio Frequency Identification) recorded parental visits and controlled noise playback within the box.
  - Set up within 3 days of hatching
  - At least one parent bled and PIT (Passive Induced Transponder) tagged
- Noise vs Control
  - Low frequency white noise played for 6 hours a day

Growth Rate

	Mass	Wing	Tarsus
Day 5	✔	✔	✘
Day 11	✔	✔	✔
Day 14	✔	✔	✔

Stress and Longevity

- Blood collected at Day 14
  - <3 minutes
- Corticosterone from plasma
  - ELISA
- Telomere from DNA in erythrocytes
  - qPCR

Day 14 measurements. Photo credit Hailey Jansson

Results

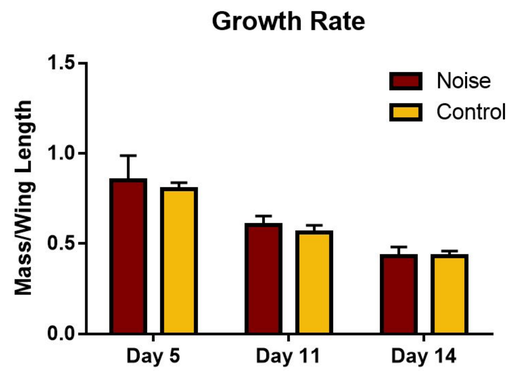

Figure 1: *Growth Rate of noise vs control nestlings. Two-way ANOVA analysis, p-value= 0.1807.*

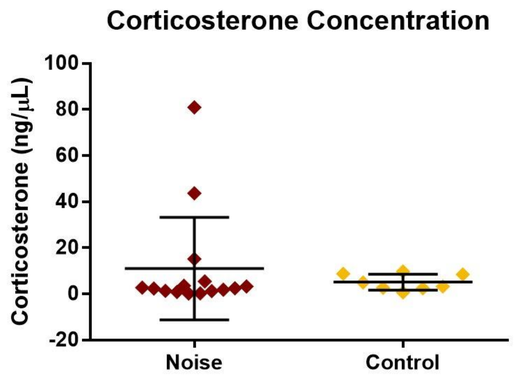

Figure 2: *Corticosterone concentrations in noise vs control samples quantified by ELISA analysis. t-Test: two-sample assuming equal variances, p-value= 0.489.*

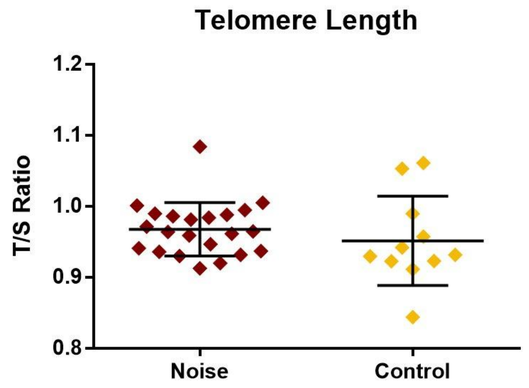

Figure 3: *Relative telomere lengths in noise vs control samples quantified by qPCR analysis. t-Test: two-sample assuming equal variances, p-value= 0.356.*

Day 14 bleeding/measuring. Photo credit Hailey Jansson

Conclusions

- No significant differences found between noise vs control bluebird nestlings.
- Challenges with the study include:
  - Constant equipment repair and replacement
  - Limited number of trackable boxes
  - Box predation
  - Lower power from small data set
- Together with our previous research we hypothesize that noise stress impacts nestlings indirectly via parental behavior. Direct impacts were not observed and is this outcome was similar in a previous study focused on white-crowned sparrows (1).
- This study provided insights for optimization of future studies.

Reference

(1) Ondi L. Crino, Erin E. Johnson, Jessica L. Blickley, Gail L. Patricelli, Creagh W. Breuner. Journal of Experimental Biology 2013 216: 2055-2062

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