

Ketterson / Nolan Research Group Collection

This document is part of a collection that serves two purposes. First it is a public archive for data and documents resulting from evolutionary, ecological, and behavioral research conducted by the Ketterson-Nolan research group. The focus of the research is an abundant North American songbird, the dark-eyed junco, *Junco hyemalis*, and the primary sources of support have been the National Science Foundation and Indiana University. The research was conducted in collaboration with numerous colleagues and students, and the objective of this site is to preserve not only the published products of the research, but also to document the organization and people that led to the published findings. Second it is a repository for the works of Val Nolan Jr., who studied songbirds in addition to the junco: in particular the prairie warbler, *Dendroica discolor*. This site was originally compiled and organized by Eric Snajdr, Nicole Gerlach, and Ellen Ketterson.

Context Statement

This document was generated as part of a long-term biological research project on a songbird, the dark-eyed junco, conducted by the Ketterson/Nolan research group at Indiana University. For more information, please see IUScholarWorks (<https://scholarworks.iu.edu/dspace/handle/2022/7911>).

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Behavioral and physiological responses to simulated territorial intrusions of short- and long-range song in male dark-eyed juncos (*Junco hyemalis*)

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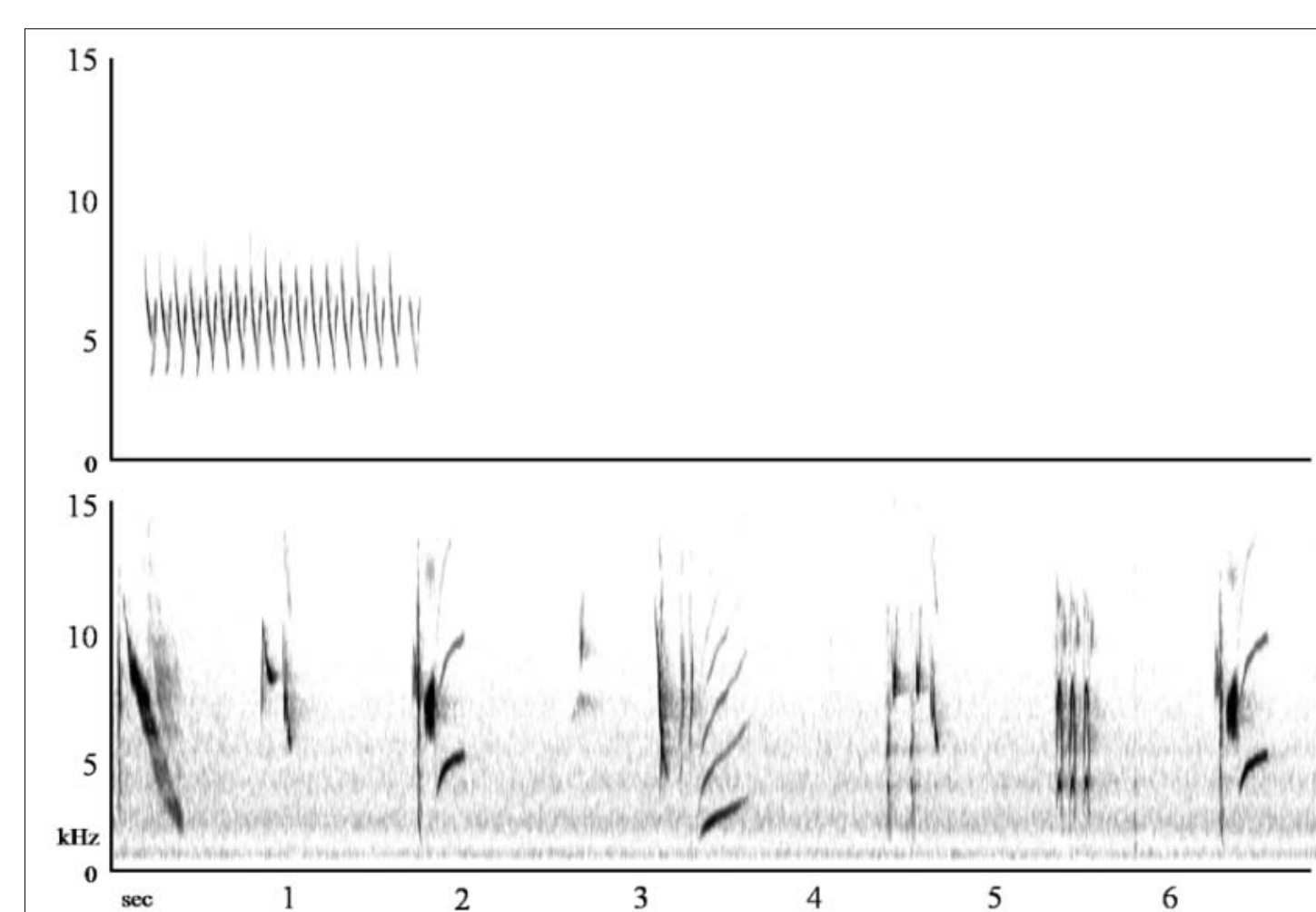
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Introduction

- Communication plays a vital role in mediating intra-specific interactions in animals.
- Simulated territorial interactions containing song playback cause an increase in circulating testosterone (T) in many songbird species.¹
- Songbirds sing two distinct song types: long-range song (LRS) and short-range song (SRS).²
- LRS and SRS are known to elicit different levels of aggressive behavior³; thus, we may expect variation in plasma T to accompany these differences.

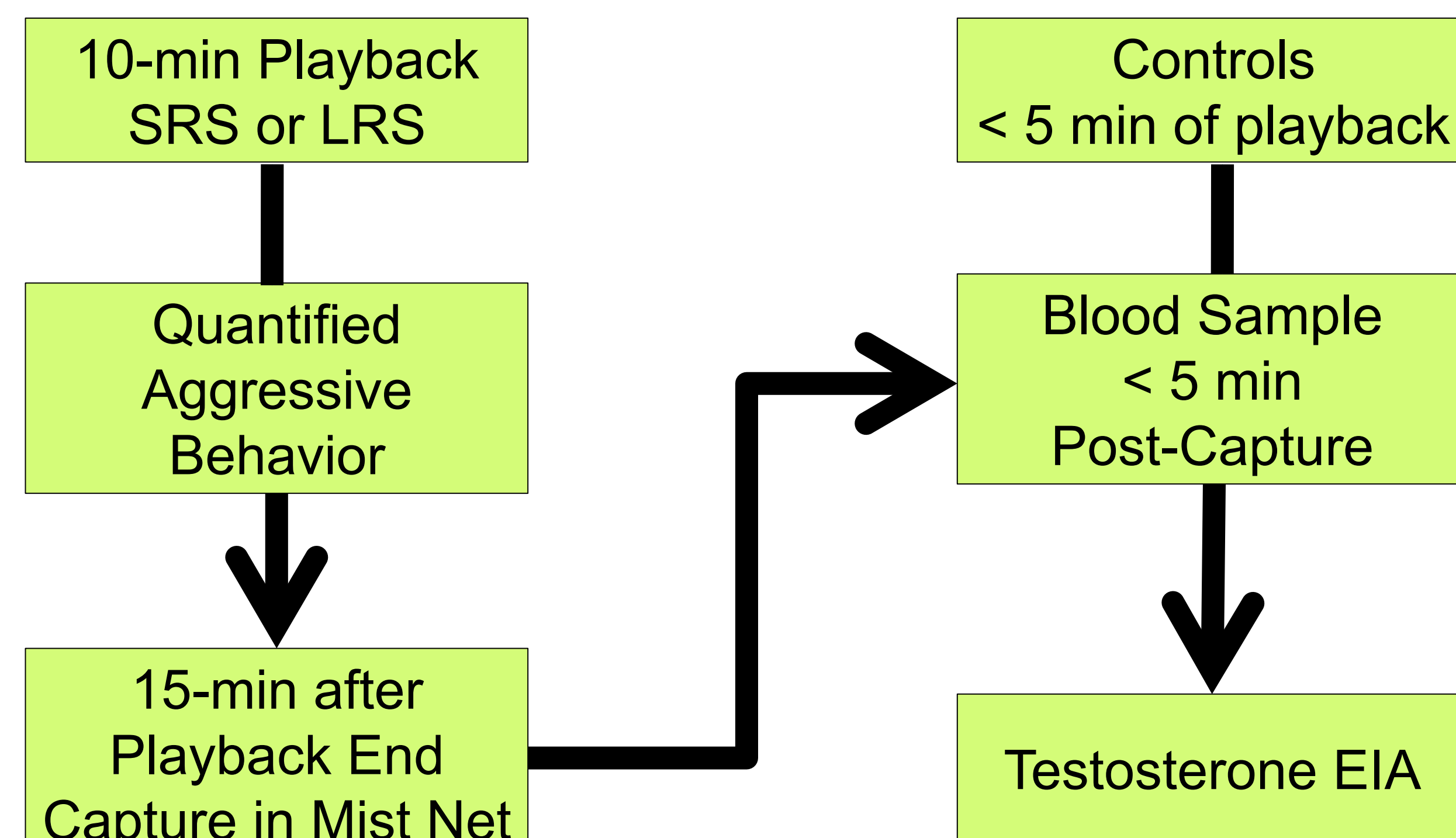
Methods

- Study population consisted of male pink-sided juncos in Grand Teton National Park.



Long-range Song (LRS)

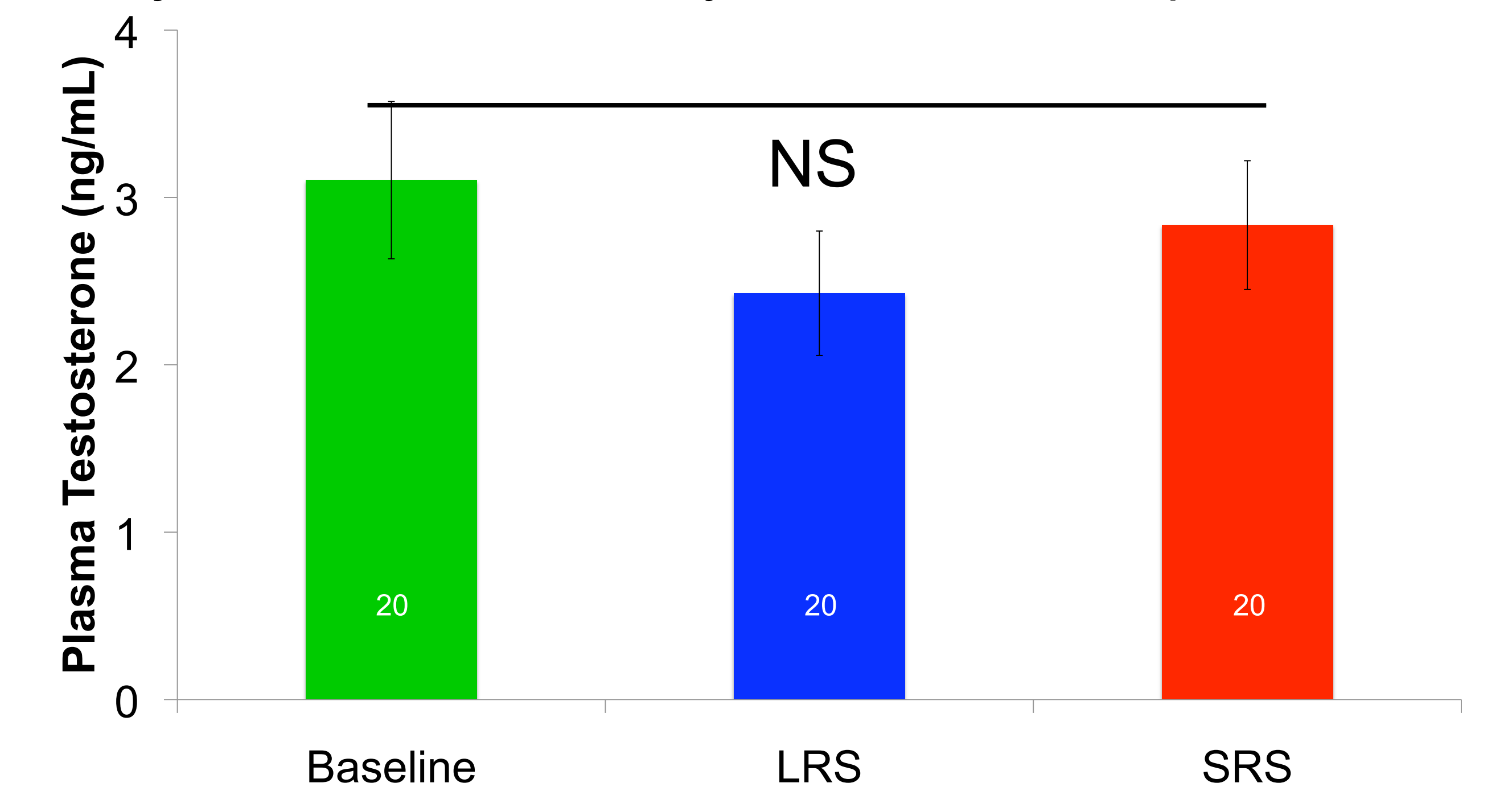
Short-range Song (SRS)



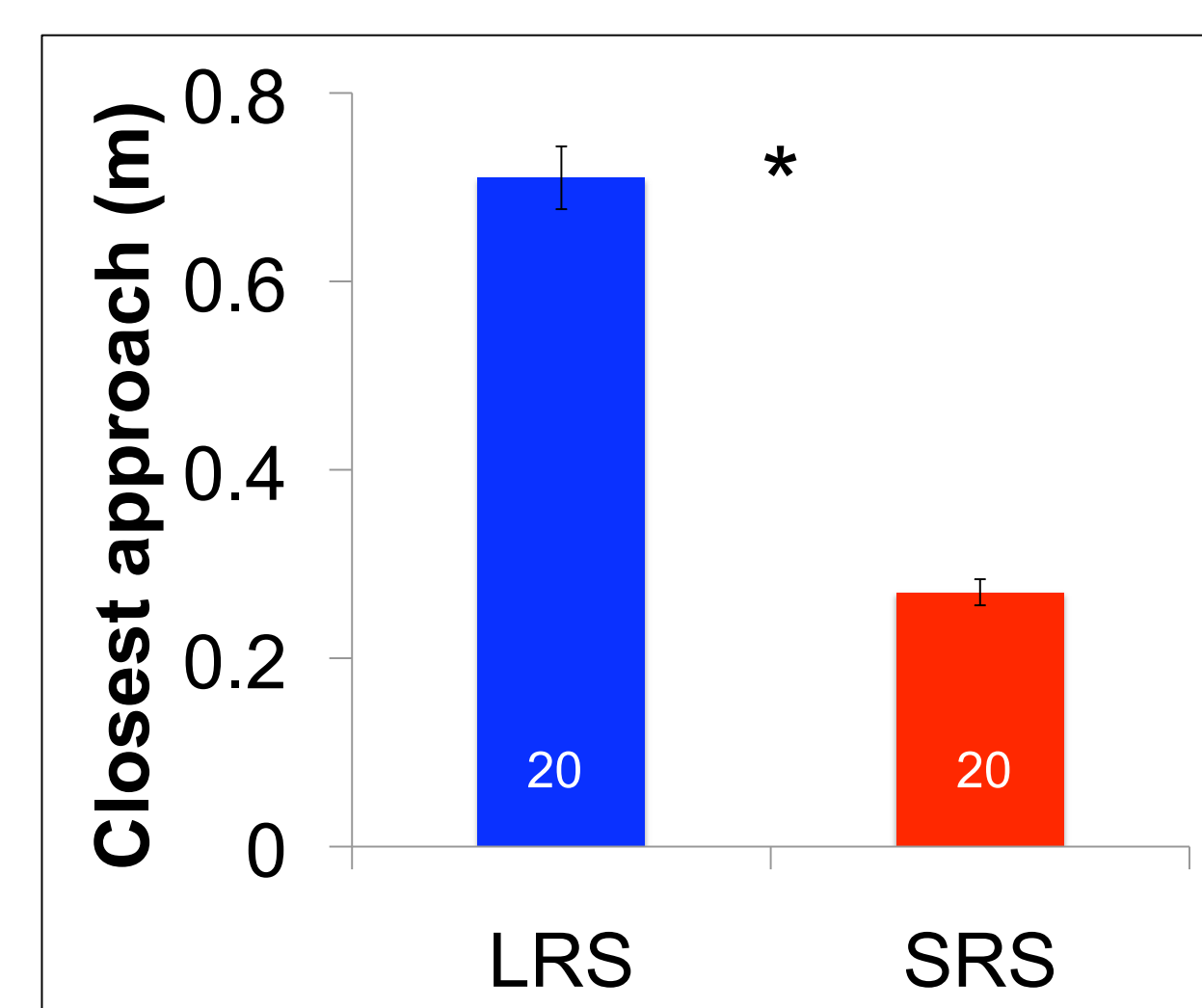
Abstract

Social interactions between conspecifics, such as auditory communication, can have profound impacts on the behavior and physiology of an organism. In songbirds, communication is heavily reliant on song, which can be broadly classified based on differences in amplitude: (1) low amplitude short-range song (SRS), used in close-proximity aggression and courtship displays, and (2) high amplitude long-range song (LRS), important in territory maintenance and mate attraction. SRS and LRS can also differ substantially in structure and complexity and can elicit very different behavioral responses from territorial males. However, whether these song classes differentially affect the physiology of male receivers remains unknown. Thus, we presented free-living male dark-eyed juncos (*Junco hyemalis*) with simulated territorial intrusions consisting of 10 min of LRS or SRS playback and recorded their behavioral response. Then, 15 minutes after playback ended, we captured each male and collected plasma to measure post-intrusion testosterone (T) levels and assay results are pending. Males spent significantly more time near the speaker and flew significantly less during SRS playback than during LRS playback, indicating a more aggressive response to the SRS intrusion. Differences in both the behavioral and hormonal responses to these two song classes will be discussed in the terms of the perceived threat and function of each class as well as within the context of the Challenge Hypothesis.

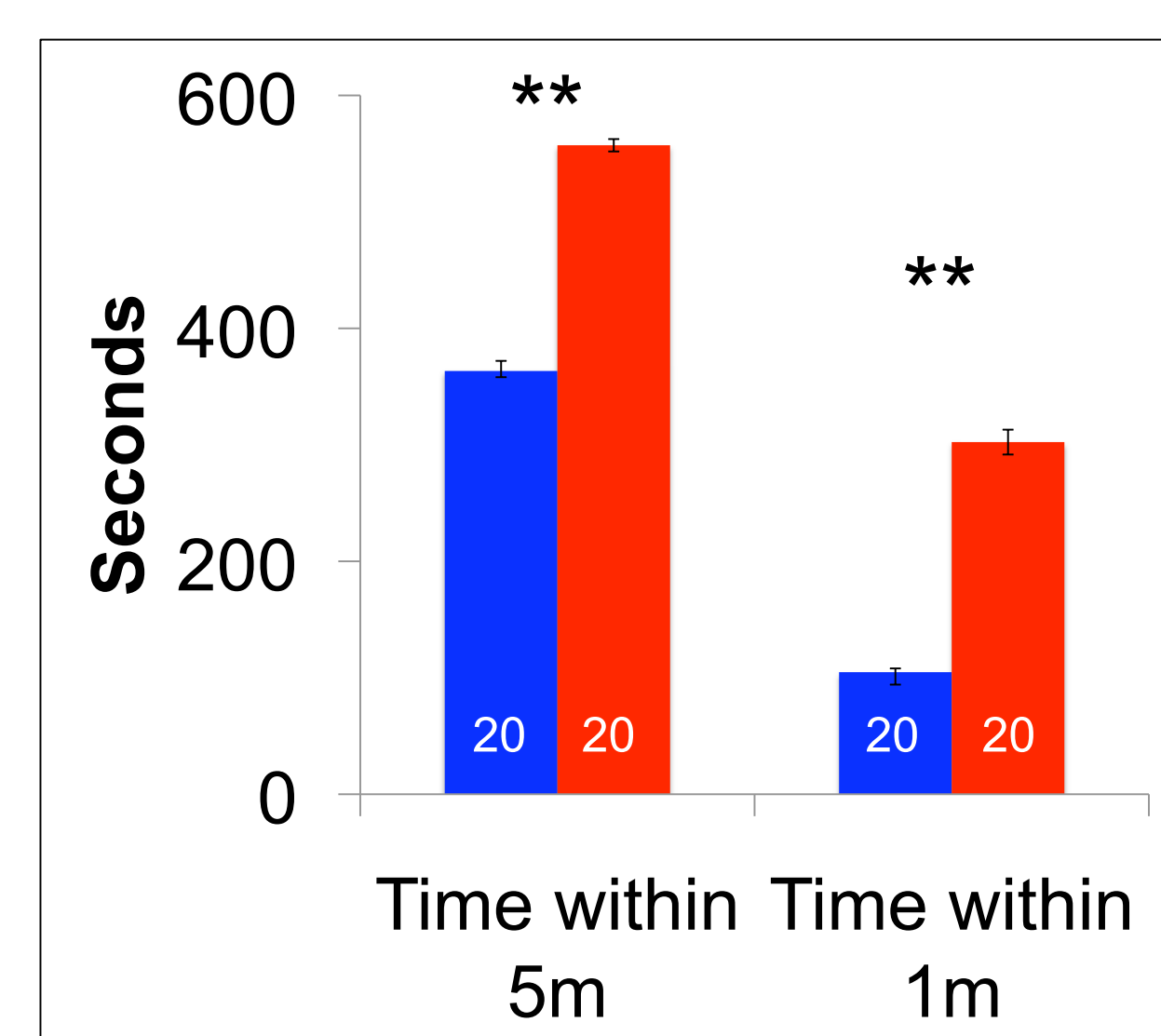
Male juncos do not detectably modulate T in response to STIs



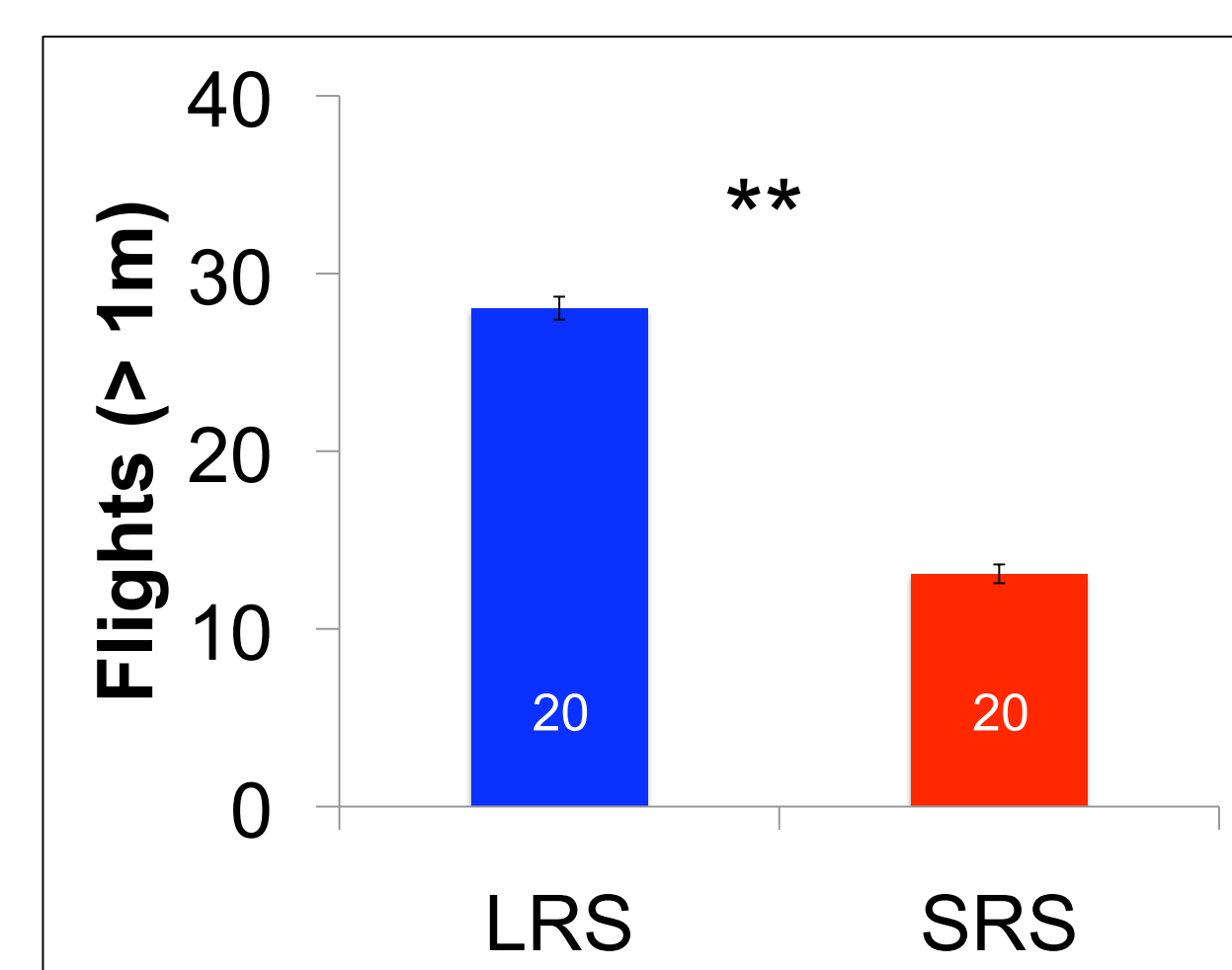
Results



Males approached significantly closer to the speaker during SRS playback.



Males spent significantly longer within 5m and 1m of the speaker during SRS playback.



Males flew significantly less during SRS playback.

For all graphs * indicates $P < 0.05$, ** indicates $P < 0.001$.

Discussion

- Males responded more aggressively to SRS than to LRS but did not modulate T in response to either song type.
- SRS is known to elicit a more aggressive response from males with fertile mates³; thus, this response may be a defense against extra-pair copulations.
- Juncos have previously demonstrated an increase in T in response to STIs.⁴
- Juncos may not regulate T in response to song alone.
- Songbirds with short breeding seasons are known to increase corticosterone (CORT) in response to STIs without modulating T.⁵
- Do male pink-sided juncos modulate CORT in response to vocal stimulus alone?

Literature Cited

1. Goymann, W. 2009. Gen. Comp. Endocrin. 163: 149-57
2. Titus, R.C. 1998. Auk 115: 386-93
3. Reichard et al. 2011. Am. Nat. 178: 478-87
4. McGlothlin et al. 2008. J. Evol. Biol. 21: 39-48
5. Landys et al. 2010. Horm. Behav. 58: 317-25

Acknowledgements

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