

Assessing the relationship between migratory distance and biomarkers of stress and aging in a sunflower crop pest, the red-winged blackbird

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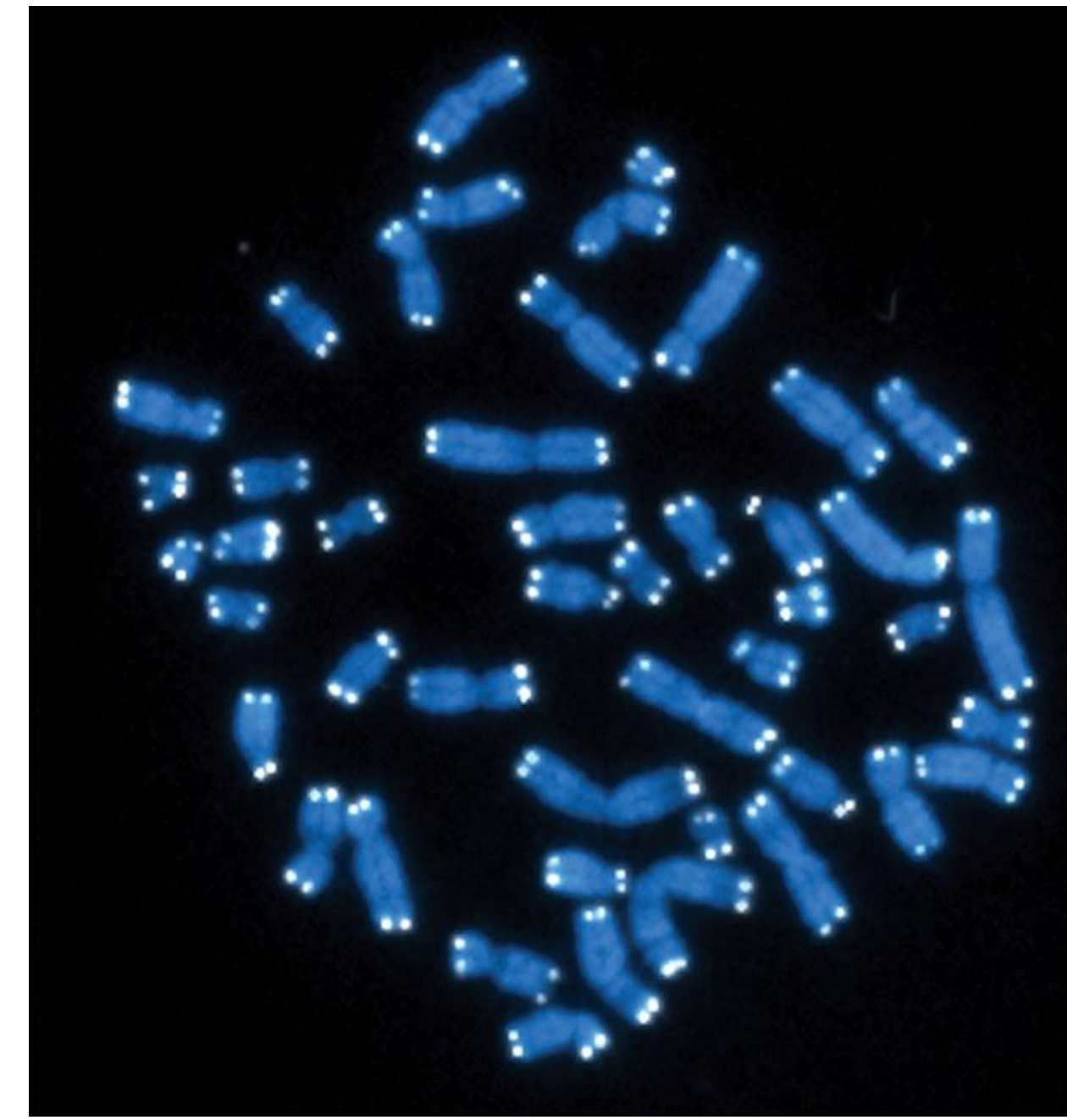


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INTRODUCTION

- Understanding biology of red-winged blackbirds can improve management strategies to reduce its impact on sunflower crops.
- Telomeres, as biomarker of stress and aging, can provide information to manage this sunflower pest, such as mortality risk factors.
- Telomeres are DNA-protein complexes on the end of chromosomes of eukaryotic cells that protect cells from harmful events such as chromosome degradation [2] (Figure 1).
- Telomeres are exposed to damage caused by oxidative stress from metabolic activities associated with life history stages such as migration [4].
- A study showed first-year migrant slated-colored dark-eyed juncos (*Junco hyemalis*) had shorter telomeres than residents [1].
- The objectives of this research are to test the hypothesis that (1) telomere loss is related to migratory distance from the non-breeding to the breeding grounds, and (2) telomere loss represents a biomarker capable of predicting a trade-off effect of migration in the subsequent breeding season.



Credit: Hesus Padilla-Nash and Thomas Ried, National Cancer Institute, National Institutes of Health

Figure 1. Telomeres, marked in white, on chromosomes of a eukaryotic cell.

EXPECTED RESULTS

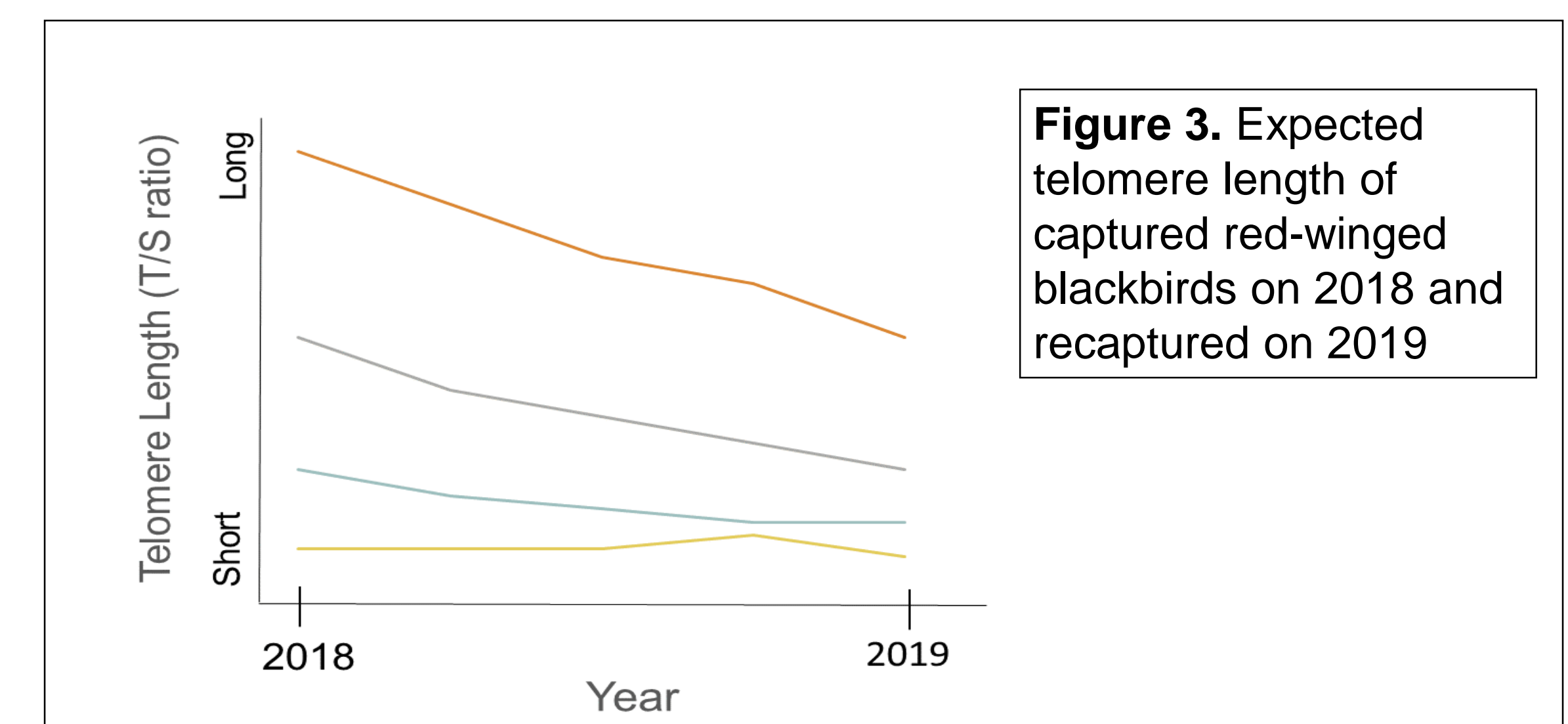


Figure 3. Expected telomere length of captured red-winged blackbirds on 2018 and recaptured on 2019

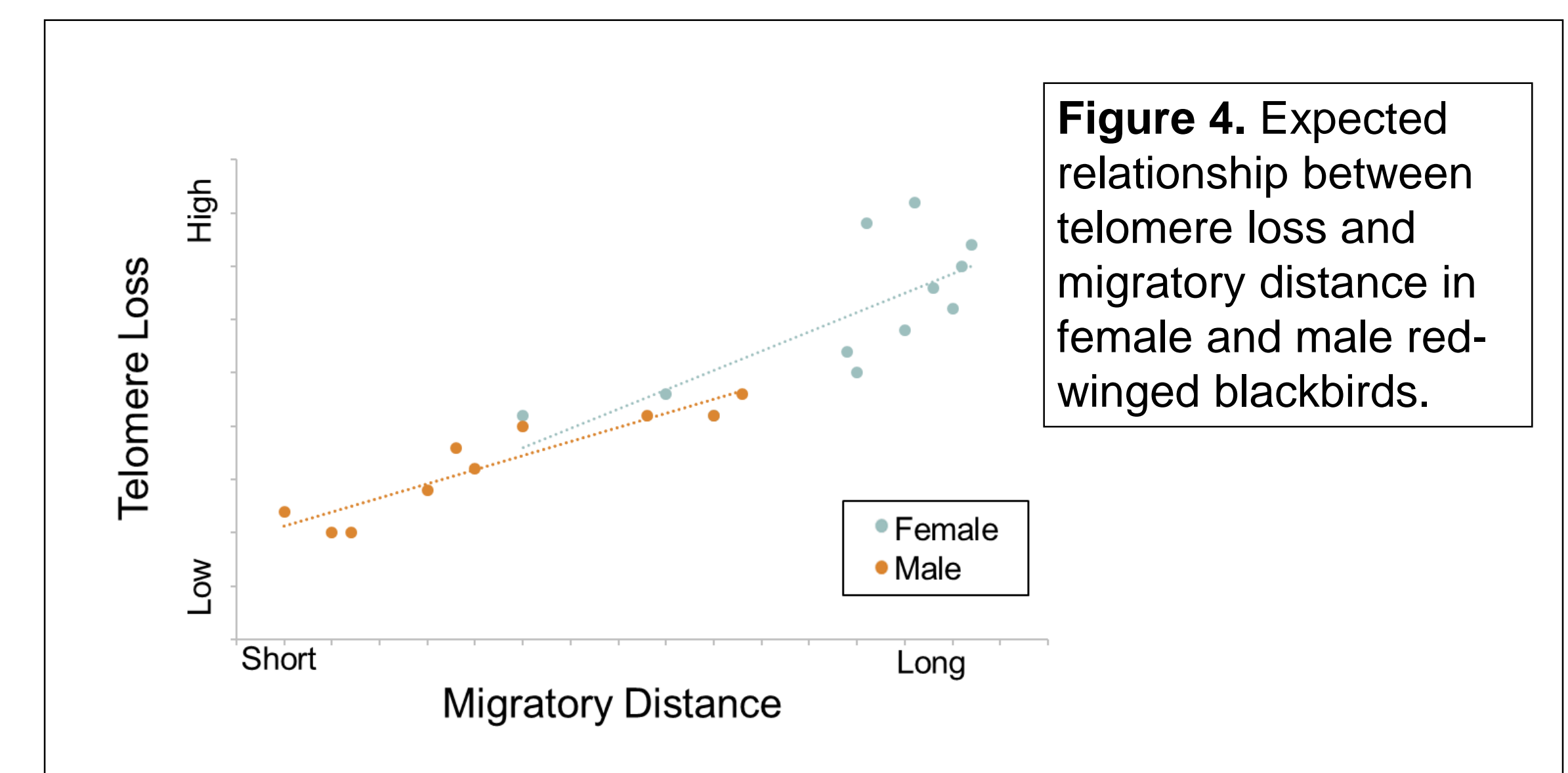


Figure 4. Expected relationship between telomere loss and migratory distance in female and male red-winged blackbirds.

METHODS

- Female and male red-winged blackbirds (*Agelaius phoeniceus*) will be captured using baited Potter walk-in traps in Alice, ND (Figure 2).
- Blood samples (100 μ l) will be taken from female and male red-winged blackbirds.
- A claw sample tissue (2.5 mm) will be collected to determine migratory distance [3].
- The migratory distance can be estimated using the latitudinal gradient of stable hydrogen isotope at the winter grounds where the claw was grown [6].
- Nesting attempts will be monitored to determinate the date of first egg-laying, nestling mass, and female reproductive success.
- Telomere lengths in 2018 and in 2019 will be measured using quantitative polymerase chain reaction (qPCR) for all recaptured red-winged blackbirds.
- Telomere loss will be assessed as the difference (Δ) of telomere lengths from 2018 to 2019 migratory event.

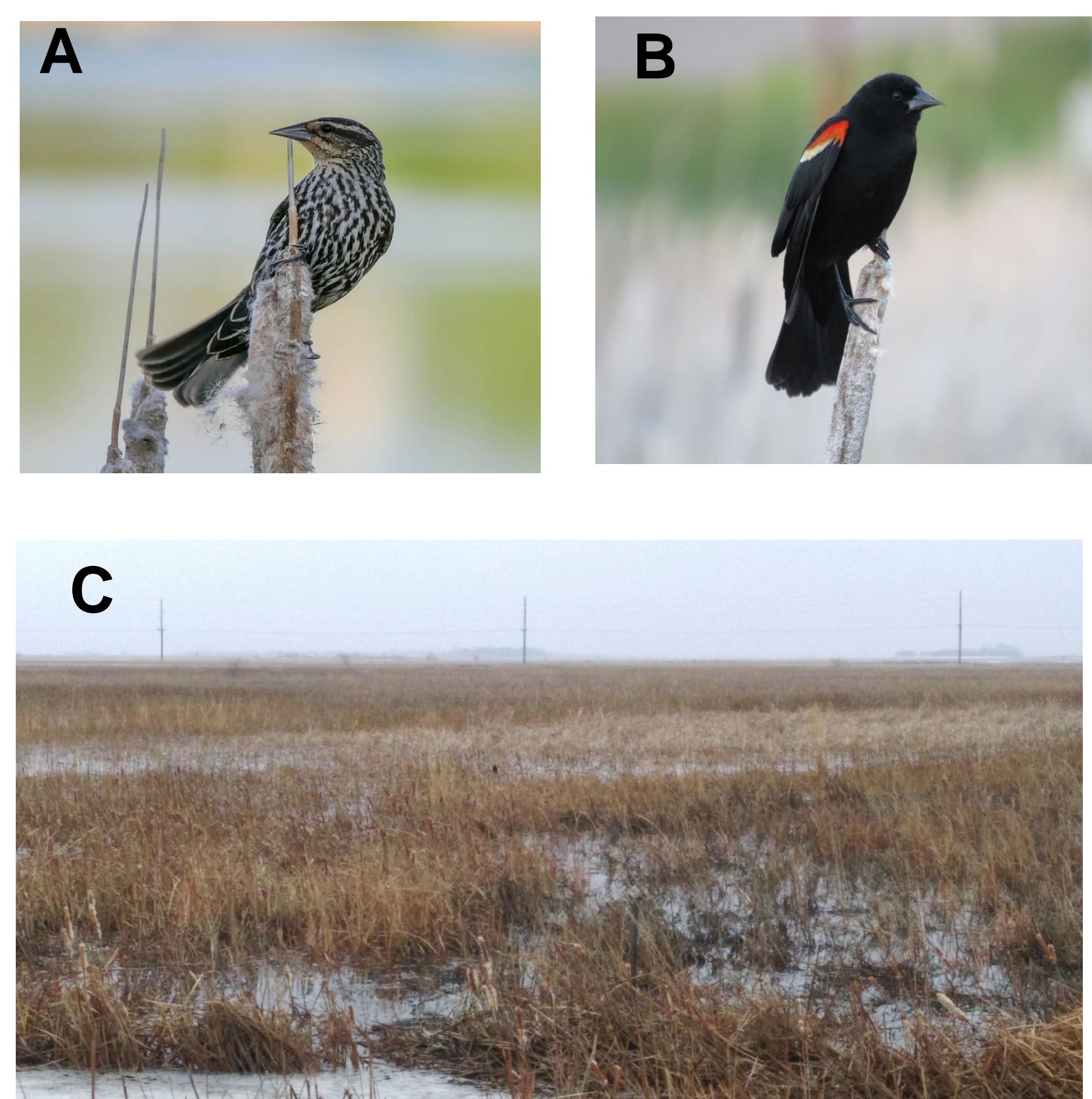


Figure 2. Male (A) and female (B) red-winged blackbirds. Study site (C) in Alice, ND.

DISCUSSION

- A migratory event is expected to have an influence in the telomere length (Figure 3). In migrant species, high telomere attrition may be related with low maintenance [1].
- A negative relationship between migratory distance and telomere loss is expected (Figure 4). Blackbirds traveling longer distances may be exposed to higher metabolic demand compared with those traveling a shorter distance. In addition, sex can be a factor that may influence telomere loss, as previous studies found female songbirds travel longer distance than males [3].
- Telomeres as biomarker of stress and aging can provide information about factors influencing red-winged blackbird populations. Shorter telomeres are associated with increased mortality risk [5]. Results of this study are expected to contribute to the biological knowledge of this sunflower crop pest and its response to stressors.

ACKNOWLEDGEMENTS

We thank to Dr. Giancarlo Lopez-Martinez for recommendations to this research proposal; Jennifer Vangorder-Braid for assistance with qPCR method; Mary Cremers and Sara Grillo for assistance during 2019 field season.

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