

# What physiological factors are associated with greater parental investment and production of red-winged blackbirds, a sunflower crop pest?

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## INTRODUCTION

- Physiological condition could predict parental investment during breeding season.
- The terminal investment hypothesis posits that an organism with a reduced residual reproductive value will allocate energy and resources to increase effort in rearing current offspring.
- Thus, it could be expected that adults with higher levels of oxidative damage (Figure 1) will invest more in their offspring (Figure 2). This potentially contributes to the damage to sunflower crops through increased number young produced.
- The objective of this study is to test the hypothesis that oxidative damage is a physiological marker that can predict parental investment in red-winged blackbirds (*Agelaius phoeniceus*).
- Predictions: Females with higher oxidative damage (protein carbonyls and MDA) will invest more in current reproduction thus having (a) heavier nestlings, and (b) higher provisioning rates.

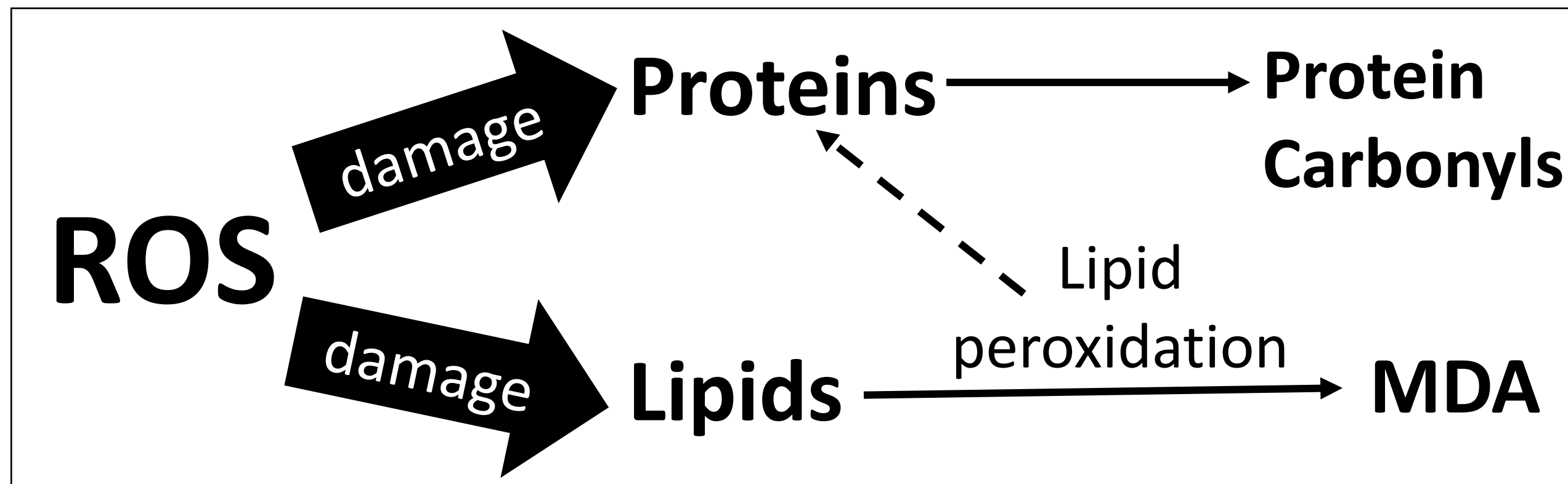


Figure 1: Reactive oxidative species (ROS), an aerobic metabolism product, can damage important molecules. Lipid peroxidation is initiated by ROS producing an intermediate, Malondialdehyde (MDA). Protein carbonyl is a biomarker of oxidative damage to proteins. Oxidative damage to proteins can be caused by ROS attack or, indirectly, by the attack of end-products of lipid peroxidation.

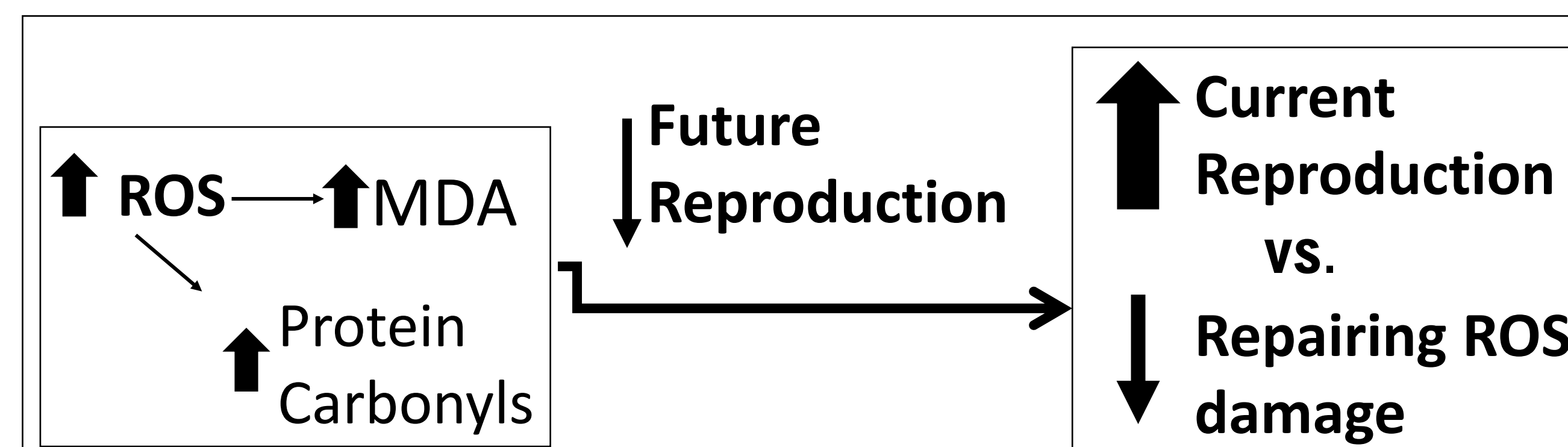


Figure 2: An individual with elevated ROS and/or oxidative damage may have a lower chance of future reproduction and prioritize investment in the current reproductive attempt over investment in repairing damage of ROS.

## METHODS

- Red-winged blackbirds (RWBL) captured in 2018 were recaptured from 2019 to 2021 at Alice, North Dakota.

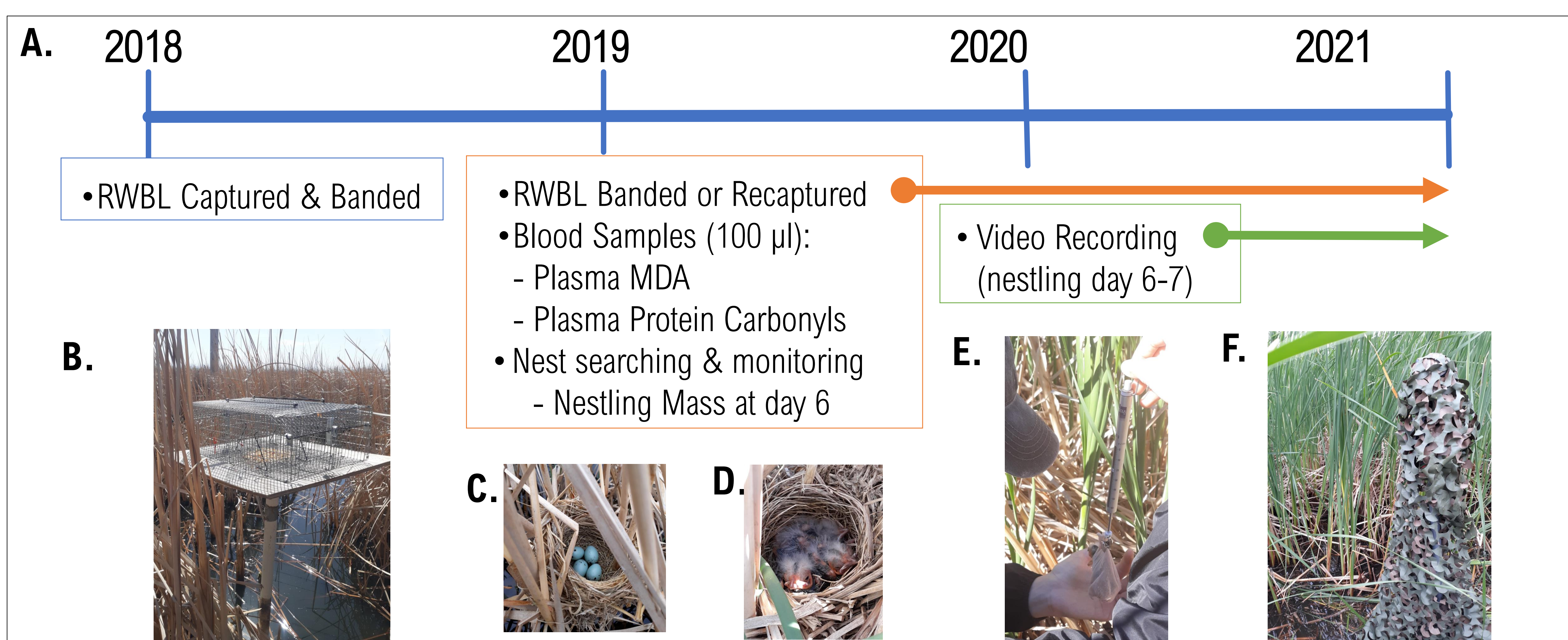


Figure 3: (A) Summary field methods and samples collected; (B) elevated trap; (C) RWBL nest with eggs; (D) RWBL nestlings at day 6; (E) mass of a nestling measured with a Pesola Spring scale; (F) tripod covered with camouflage netting used to set up video camera.

- Laboratory techniques:
  - Thiobarbituric Acid Reactive Substances (TBARS) Assay*: to measure oxidative damage to lipids
  - Protein Carbonyl Assay*: to measure oxidative damage to proteins by spectrophotometry
- Provisioning Rates = # trips per hour

## RESULTS

- Oxidative damage to proteins was not related with nestling mass ( $p$ -value = 0.22) or provisioning rates ( $p$ -value = 0.74).

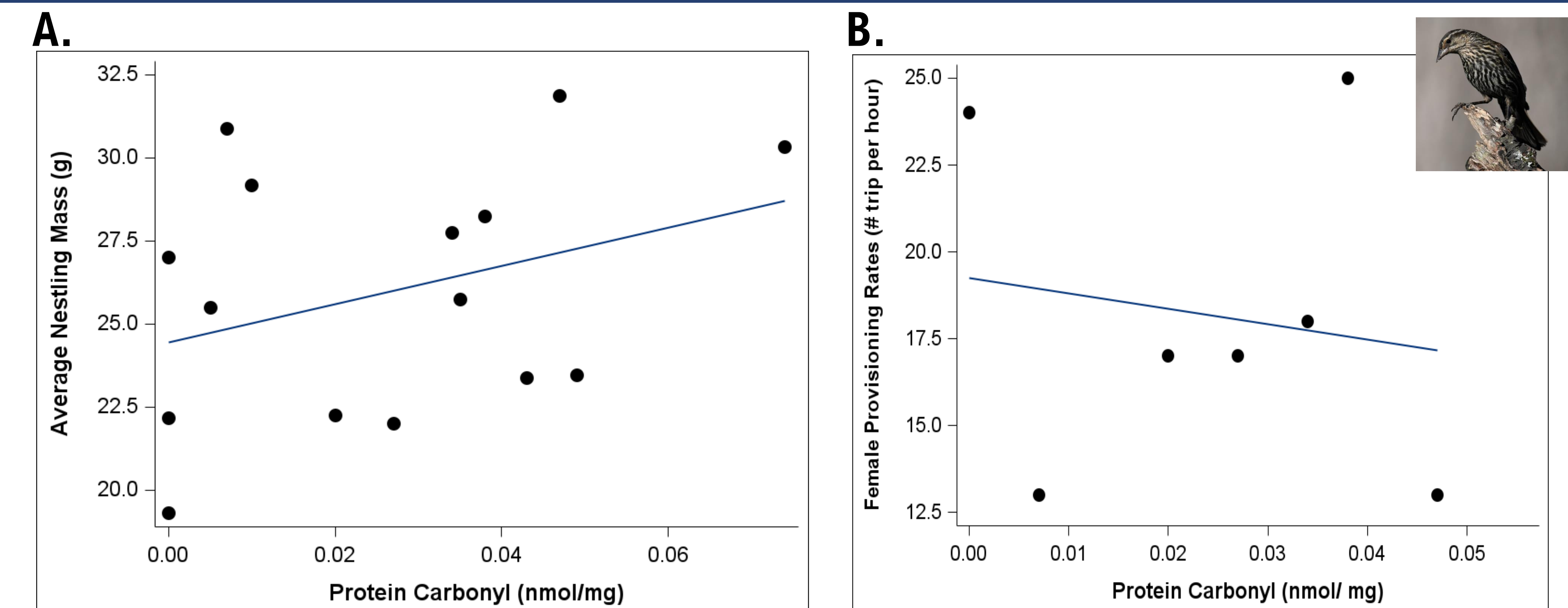


Figure 4: Relationship of oxidative damage to proteins (protein carbonyl) with (A) nestling mass at day 6, and (B) provisioning rates.

- Oxidative damage to lipids was not related with nestling mass ( $p$ -value = 0.46) or provisioning rates ( $p$ -value = 0.81).

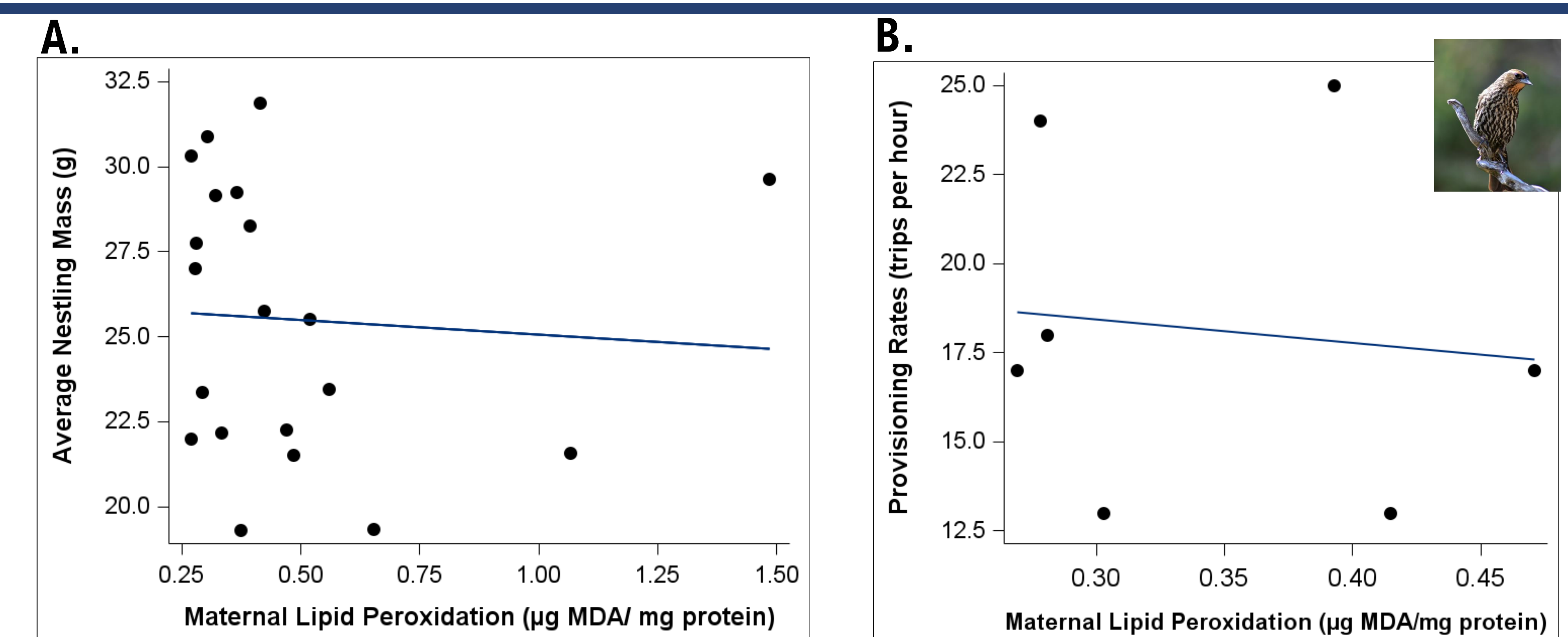


Figure 5: Relationship of oxidative damage to lipids (lipid peroxidation) with (A) nestling mass at day 6, and (B) provisioning rates.

## DISCUSSION AND FUTURE DIRECTIONS

- Understanding physiological factors influencing parental investment in red-winged blackbirds could provide useful information to improve management strategies for this sunflower crop pest.
- Preliminary data showed a tendency of females with higher protein damage to invest more in current offspring (nestling mass).
- Data will be further analyzed to include factors (e.g., age), that may influence relationships between physiological markers and parental investment.
- Small sample size ( $n=7$ ) is likely influencing the preliminary results for relationship between oxidative damage and provisioning rates.
- Preliminary results will be analyzed with data to be collected in 2022 to evaluate if the trend observed achieved statistical significance.

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