Extent of effectiveness of the propane cannon based on anti-predator response of red-winged blackbirds and brown-headed cowbirds

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Background

- The propane cannon is a popular and cost-effective tool to minimize damage and disperse roosting and foraging blackbirds [1].
- USDA North Dakota Wildlife Services (WS) distributed 607 propane cannons to sunflower producers in 2020 (John Paulson, pers. comm.).
- Efficacy of these tools has yet to be fully explored.
- Past studies have tested efficacy by the change in bird numbers and the difference in damage in fields with and without cannons [2,3].
- This study evaluates species-specific hearing capabilities and anti-predator behavior to the detonation of a propane cannon.
- This knowledge will help inform farmers of the range of their propane cannons and inform the density of cannons required to protect their fields.

Objectives

Our main goal was to evaluate the distances at which a propane blast evokes an anti-predator response in captive birds. Specifically, we

1) measured sound attenuation at frequencies relevant to birds.
2) evaluated antipredator behavioral responses to sound as a function of distance from the propane cannon.

Methods

Fig. 1. Brown-headed cowbirds (n = 32) and red-winged blackbirds (n = 32). were placed in individual enclosures (24 x 24 x 18.25 in) equipped with a wooden dowel for perching, corn, a water dish, and two GoPro cameras to record behavior during trials at the NDSU Casselton Seed Farm.

- After the propane blasts, we categorized the behavioral responses as one of the following:

Relaxed

Vigilant

Startled

Fig. 2. We took two approaches; A) we randomly assigned birds a distance between 15-495 m from the propane cannon (RWBL = 28; BHCO = 22) and **B)** we approached birds with successive blasts starting at 495 m from the propane cannon (RWBL = 20; BHCO = 17).

Results

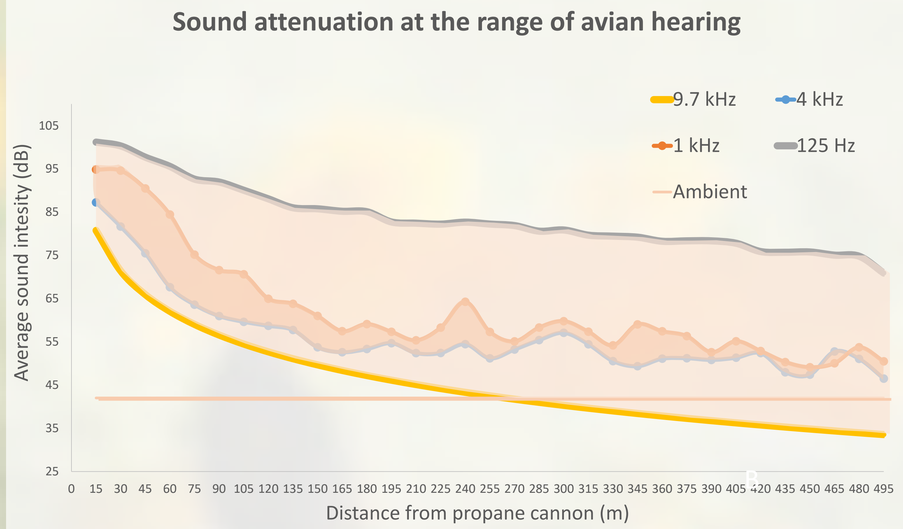


Fig. 3. We recorded sound intensity (dB) at a range of frequencies (kHz) using a SoundTek ST-105 Class 1 Integrating Sound Meter with attenuation graphed as a function of distance (m) from the cannon. Birds have greatest sensitivity between 1-4 kHz. RWBL and BHCO can hear up to 9.7 kHz.

Fig. 4. The occurrence of startle and vigilance behavior relative to distance from the propane cannon and the Z-weighted sound attenuation curve.

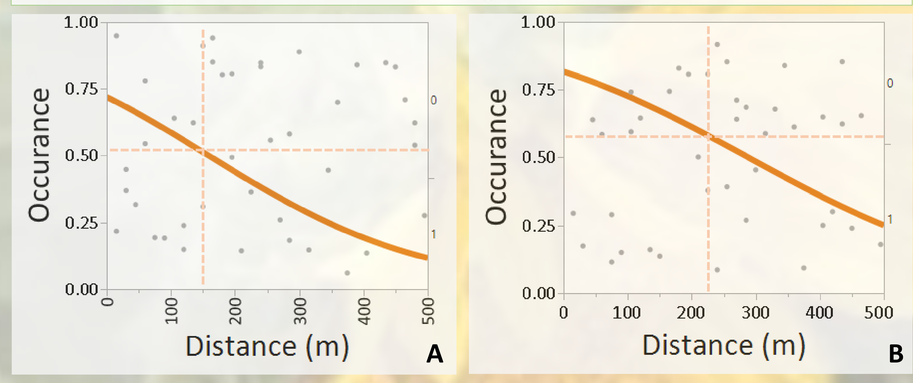


Fig. 5. Probability that a bird will exhibit vigilance (0) or startle behavior (1) as a function of distance. A) For RWBL (χ^2 = 6.01, p = 0.014, n = 41) there is a 67% probability of startle behavior at 150 m. B) For BHCO (χ^2 = 4.26, p = 0.039, n = 40) there is a 58% probability of startle behavior at 225 m.

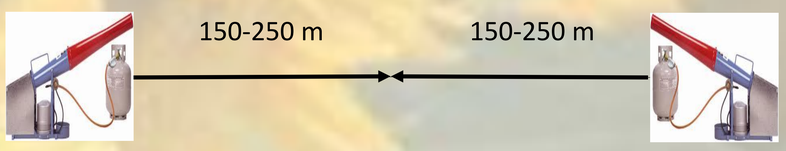
Fig. 6. A) brown-headed cowbird (*Molothrus ater*) and **B)** red-winged blackbird (*Agelaius phoeniceus*).

Summary

- In both approaches, a species-specific difference in anti-predator behavior was evident.
  - Startle behavior becomes > than vigilance at 225 m for BHCO and at 150 m for RWBL.
  - 58% chance BHCO would exhibit startle behavior at 225 meters, and a 67% chance RWBL would exhibit a startle response at 150 meters.
  - Both species exhibit vigilance consistently in the first 500 m.
  - These are conservative estimates for the extent of effectiveness of the propane cannon given birds are not free-ranging but containing in a cage where flight is limited.

Future Directions & Recommendations

- Further research should include
  - Greater distances (> 500 m) from the propane cannon to determine where vigilance behavior begins.
  - How sound attenuation and antipredator behavior varies with cannon direction, terrain, weather, and vegetation.
- Our recommendations:
  - Place propane cannons 300-500 m apart.
  - Create paths into fields to allow interior cannon placement



Acknowledgements & References:

We thank John Paulson (USDA Wildlife Services) for providing us with propane cannon distribution data, and Brian Ottesen (NDSU) for allowing us to use the Casselton Seed Farm. We would like to thank Emily Kotten, Morgan Donaldson, and Mallory White for their assistance on this project.

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