

Frightening blackbirds foraging in sunflower: Testing natural and artificial sounds broadcast from a drone

Koby Pearson-Bortle¹, Jessica L. Duttonhefner¹, & Page E. Klug²

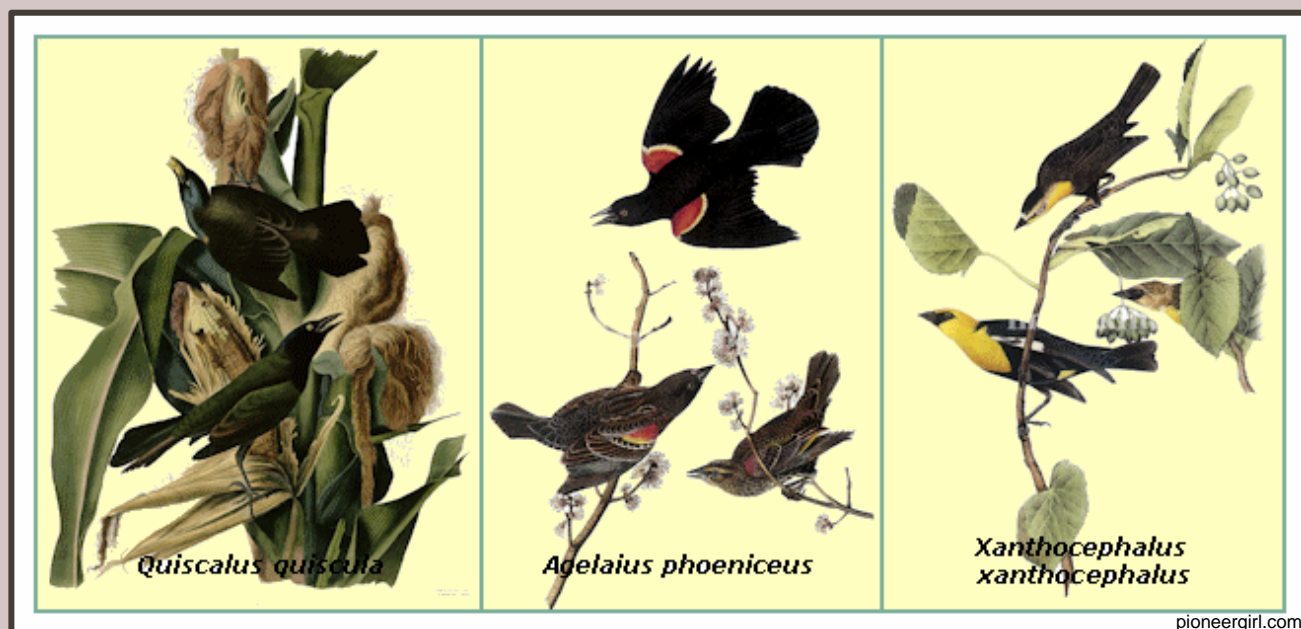
¹Department of Biological Sciences, North Dakota State University, Fargo, ND

²USDA-APHIS-Wildlife Services, National Wildlife Research Center, Fargo, ND

NDSU NORTH DAKOTA STATE UNIVERSITY

Introduction

- Blackbirds (*Icteridae*) cause significant sunflower damage in North Dakota [2,1].
- Current methods to deter blackbirds include propane cannons, pyrotechnics, firearms, and drones [4].
- Due to the protected status of native blackbirds [3], there needs to be effective, nonlethal methods to resolve conflict.



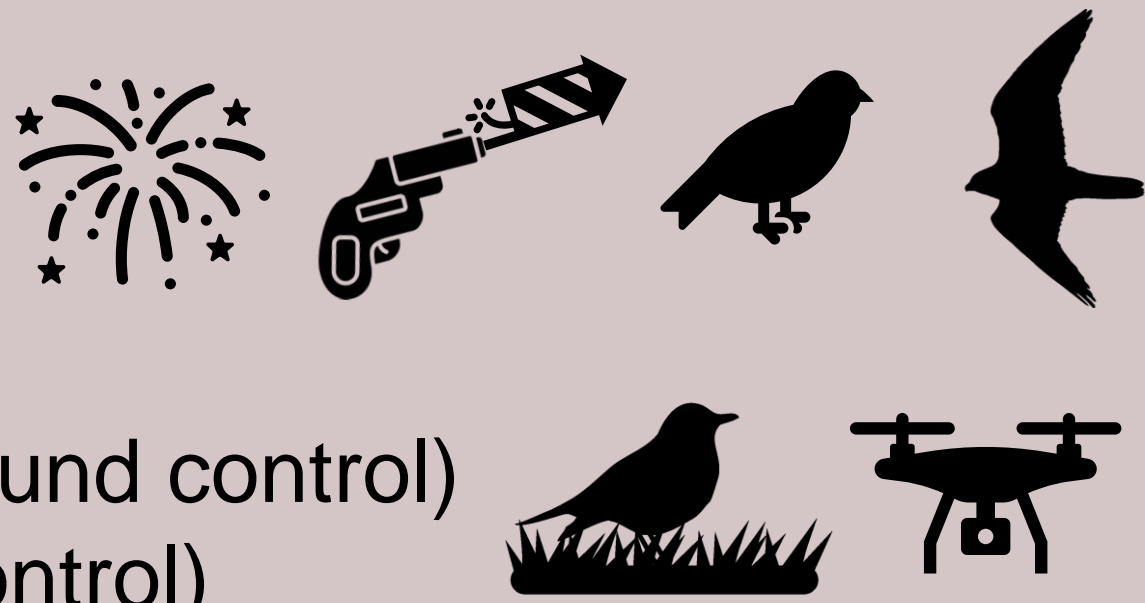
Objectives

- Find the sound perceived as “scariest” by foraging birds based on flushing, reactivity, and response distance.
- Determine if broadcasting from a moving or stationary drone, is more effective at frightening blackbirds.

Methods

We tested 6 pre-recorded sounds:

- Firecrackers
- Pyrotechnic
- Distress calls
- Raptor calls
- Robin calls (sound control)
- Drone rotor (control)



- 3 recordings for all sounds (5 s each)
- Recorded firecracker, pyrotechnic, and distress calls (from captured blackbirds) and obtained merlin and robin calls from the Cornell Lab of Ornithology Macaulay Library
- Adjusted sounds to similar amplitudes (65 dB)
- Broadcast from a DJI Mavic 3T with loudspeaker
- Positioned drone 50 m above flock
- Played all 6 sounds in systematic order (**Stationary**)
- Played 1 sound on repeat while descending (1 m/s) to 15 m above ground level or until flock flushed (**Moving**)
- Repeated for all 6 sounds



Stationary

Moving

50m

50m

15m



- Observed flock for 1 min after each sound broadcast in the field
- Recorded behavior
 - flight [Y/N]
 - chaos [0-5]
 - flight initiation distance [FID]

Firecrackers most likely to cause blackbirds to flush

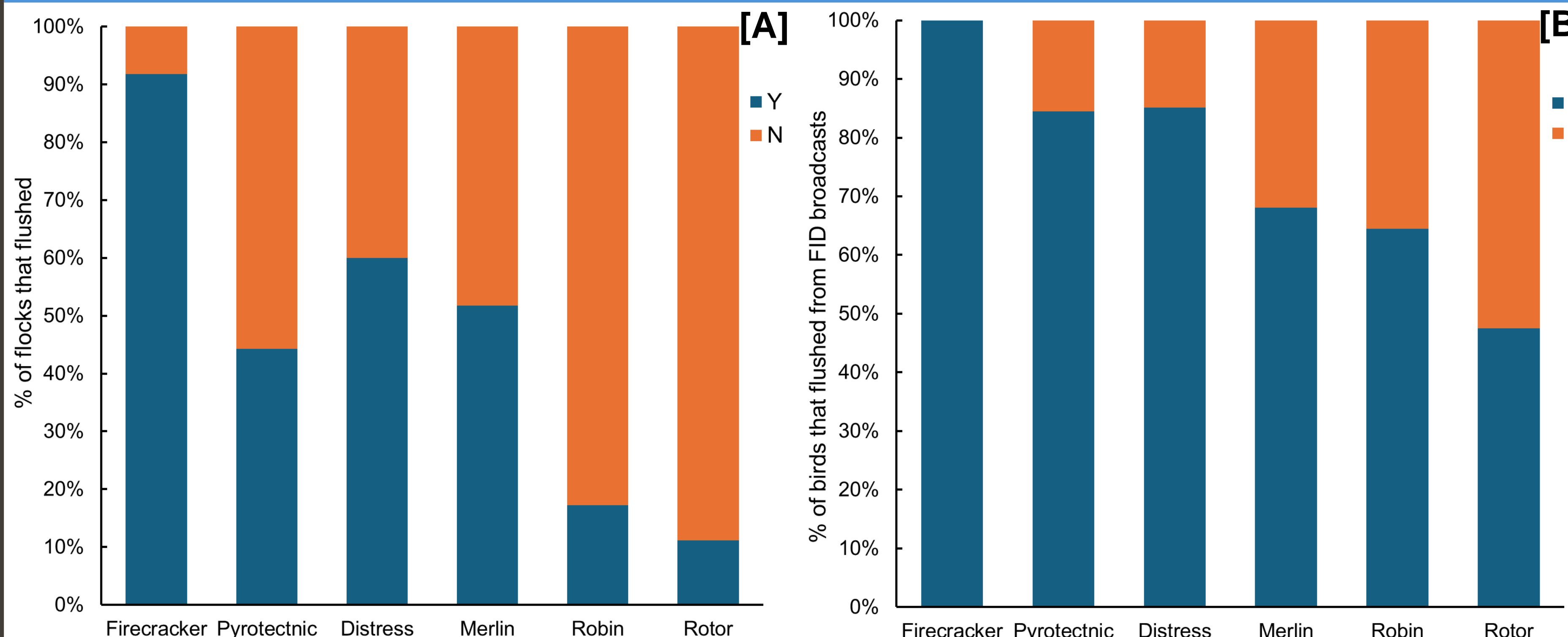


Fig. 1: Firecrackers had the highest probability of flushing a blackbird flock off sunflower for both [A] stationary (92%) and [B] moving broadcasts from a drone (100%).

Firecrackers create the most chaos in flock reactivity

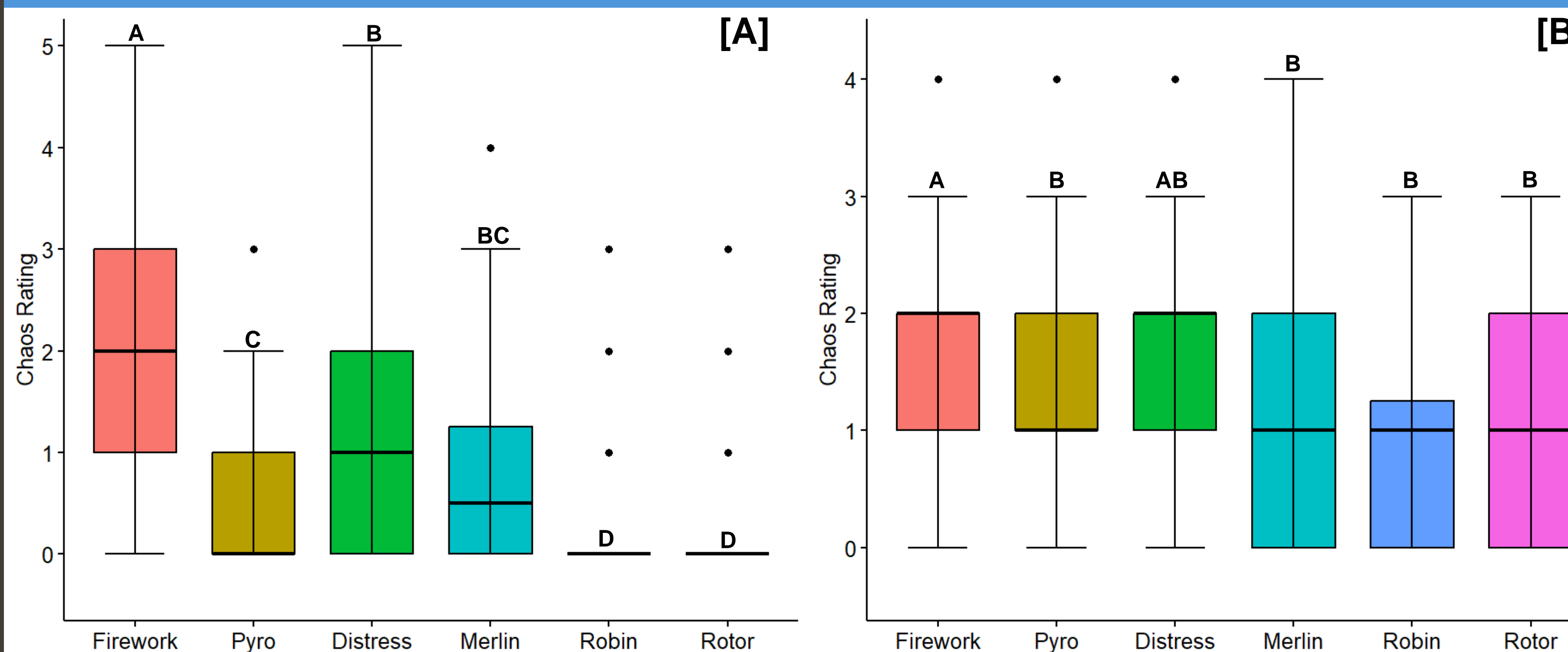


Fig. 2: Firecrackers had highest chaos rating for both [A] stationary and [B] moving broadcasts from a drone ($p < 0.05$). Chaos refers to how “reactive” flocks were to a sound: 0 = no reaction and 5 = flush with birds not moving in a coordinated direction (i.e., erratic boiling of the flock).

Firecrackers were perceived as the scariest sound

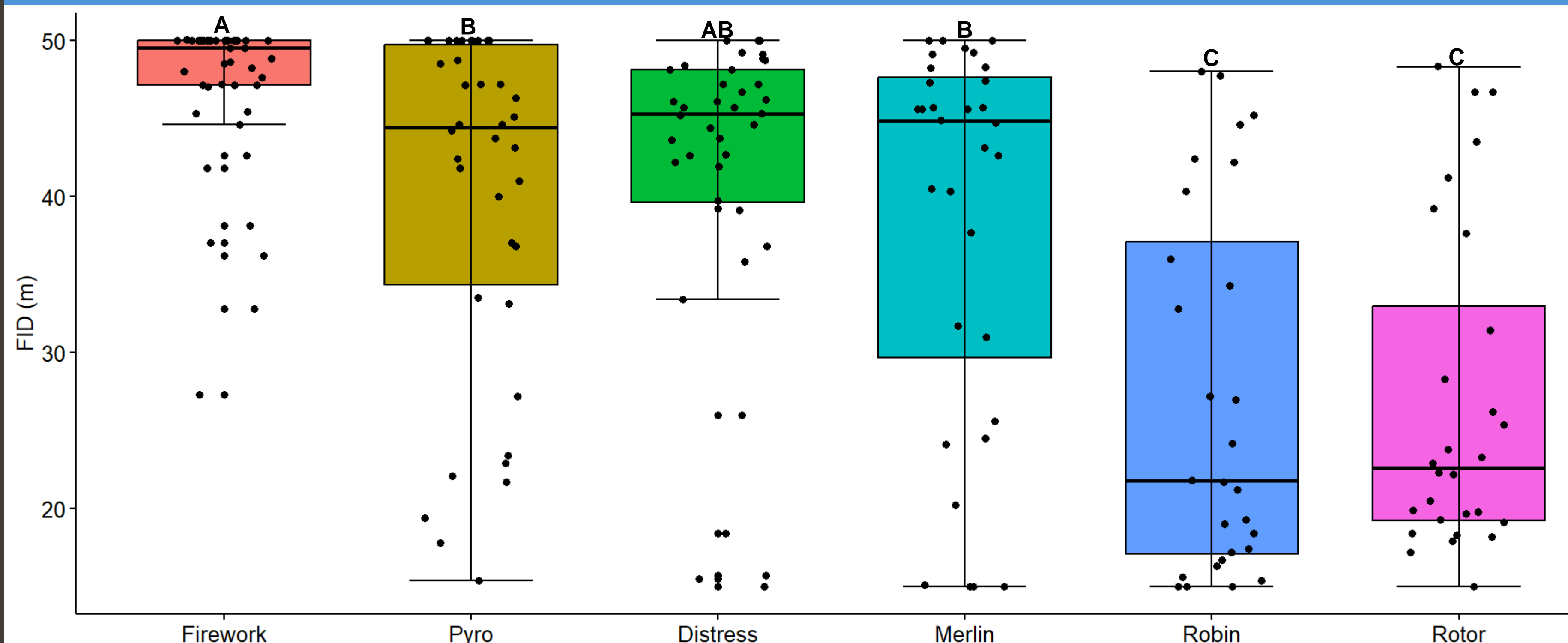


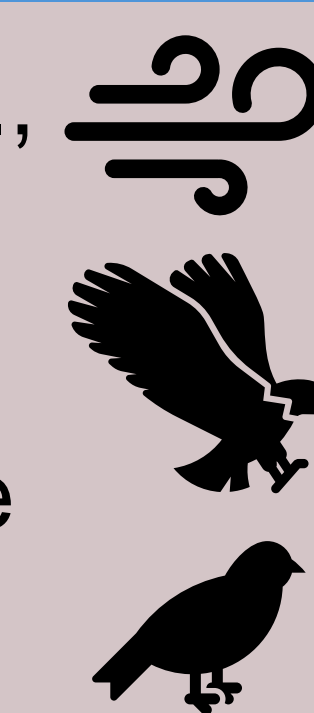
Fig. 3: Firecrackers had greatest flight initiation distance (FID = 47 m) when a drone broadcasting sounds descended on the flock from above. Each point is the altitude of the drone when flock flushed ($p < 0.05$). Flock perceptions of risk were highest for firecrackers (i.e., larger FIDs).

Conclusions

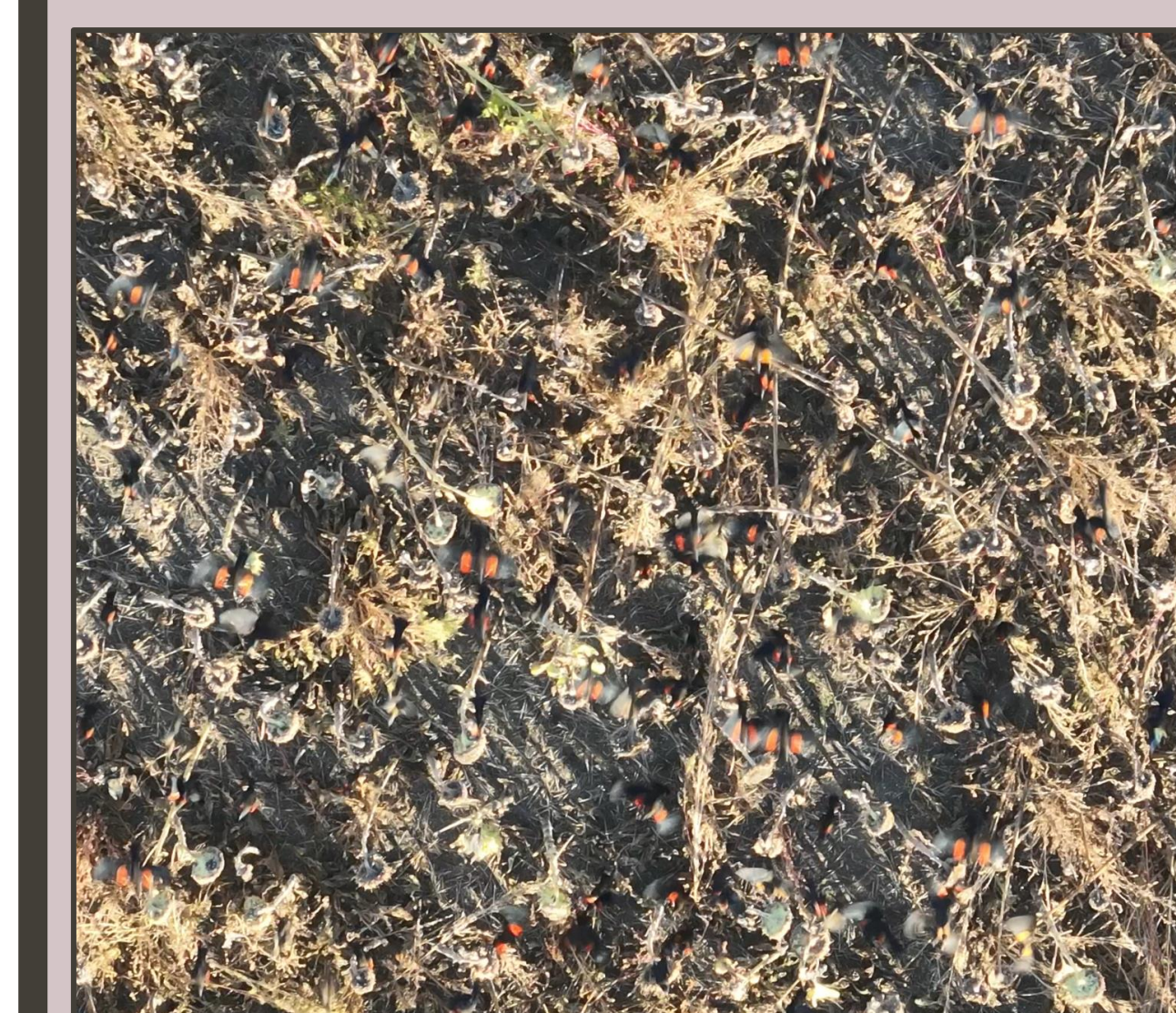
- Firecrackers caused the most flushes and chaos both when the drone was stationary and moving.
- Movement toward the flock with the drone increased antipredator behavior for all sounds
- Firecrackers caused birds to take flight sooner when drone descended on the flock.
- Blackbird distress calls were the 2nd most effective sound, followed by pyrotechnic and merlin calls.

Future Directions

- Analyze responses considering environment (e.g., wind speed), presence of raptors, field conditions (e.g., size), and flock size.
- Evaluate behavioral responses from video footage that may not have been observed in the field.



Picture on the left shows a zoomed in recording of birds flushing while the other shows the same birds flushing but in thermal.



- How to integrate sound (e.g., firecrackers) in drone hazing protocols to deter birds from sunflower fields.
- Evaluate how broadcasting merlin calls potentially attracted merlins to the drone to increase predators and the perceived riskiness of the landscape to blackbirds.



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