Evaluating the Use of Autonomous Recording Units for Monitoring Northern Bobwhite Coveys

Elke Windschitl, Adam Janke, Kyla Yuza-Pate; Department of Natural Resource Ecology & Management; Iowa State University

INTRODUCTION

Northern bobwhite fall distribution is monitored annually as part of the National Bobwhite Conservation Initiative. This long-term initiative aims to strategically manage bobwhite habitat to increase bobwhite densities across the species' range. Typically, fall monitoring is done by point count surveys of bobwhite covey calls, but this is logistically difficult.

Autonomous Recording Units (ARUs) are increasingly being used to record avian acoustics and estimate bird abundances. ARUs are relatively inexpensive and can collect a lot of data. However, due to this technology being relatively new, it is unclear if ARU estimates are always accurate.

Figure 1. A Northern bobwhite

METHODS

Figure 2. An array of ARUs and callers were used for the feasibility assessment. A recorded sequence of covey calls was played at known distances from the ARUs on a calm day and a windy day. Audio processors determined whether the call could be heard and the power of the call at each distance.

Figure 3. ARUs were paired with point count surveys to compare abundance and ARU metrics. Audio processors selected all calling events and estimated the number of birds calling at a given time using Raven Pro sound analysis software.

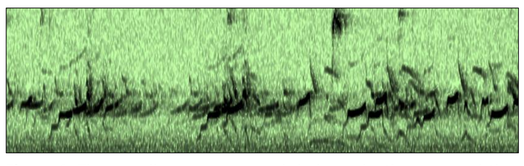

Figure 4. Three audio processors each independently processed the same four audio files for the 50-minute time range before sunrise.

FEASIBILITY ASSESSMENT

Objective

Evaluate the ability of ARUs to detect bobwhites using an array of ARUs and callers.

Results

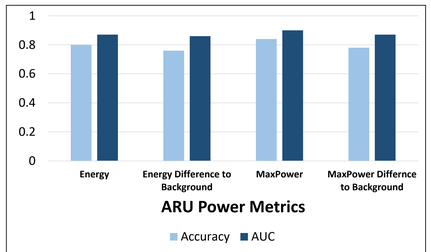

Figure 5. Logistic regression classifying detections within 250 meters showed maximum power was the most accurate metric for classifying distance (P = 3.74E-09, Accuracy = 0.84, AUC = 0.90)

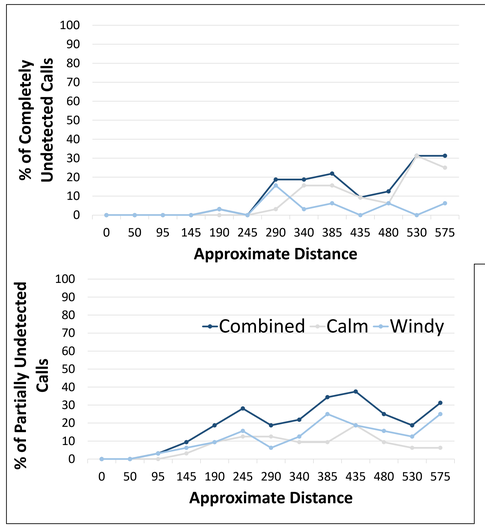

Figure 6. The percent of completely undetected (Top) and partially undetected (Bottom) calls increased as distance increased.

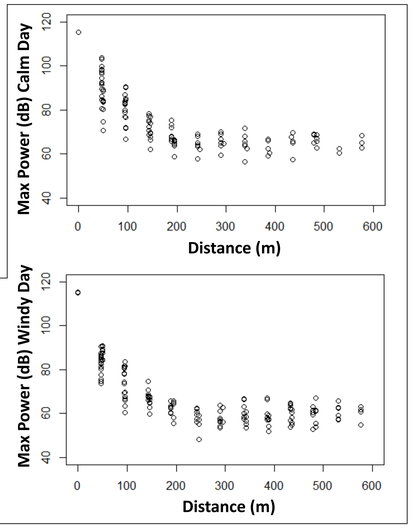

Figure 7. The maximum power of each call sequence decreased as distance increased for both calm days (Top) and windy days (Bottom).

Conclusions

- ARUs appear to accurately detect when a covey has called at short distances.
- Unsurprisingly, detectability decreased as distance increased.
- Detectability never dropped below 60 percent.
- There is a general pattern that power measurements decreased as distance increased.
  - Variability was too high to determine distance from any given power measurement.

COMPARING ABUNDANCE AND ARU METRICS

Objective

Compare ARU data with point count surveys for occupancy and density estimates.

Results

	Covey Detected in the Field	No Covey Detected in the Field
Covey Detected on the ARU	72	4
No Covey Detected on the ARU	0	2

Figure 8. Number days with or without detections from field observers and ARU data.

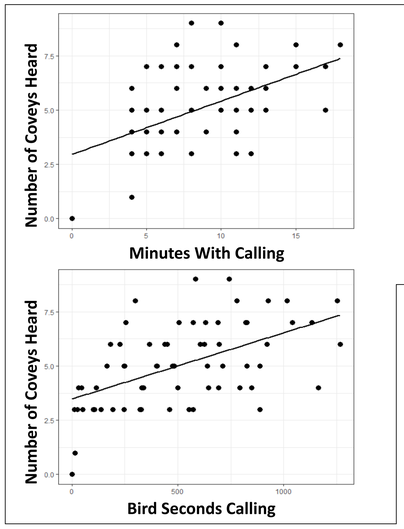

Figure 9. There was a weak positive relationship between minutes with calling (r^2=0.23, p<0.001) (Top) and bird seconds (r^2=0.28, p<0.001) (Bottom) and total number of coveys heard by observers during surveys. Bird seconds calling is the sum of each call duration multiplied by the estimated number of bobwhites calling at that time.

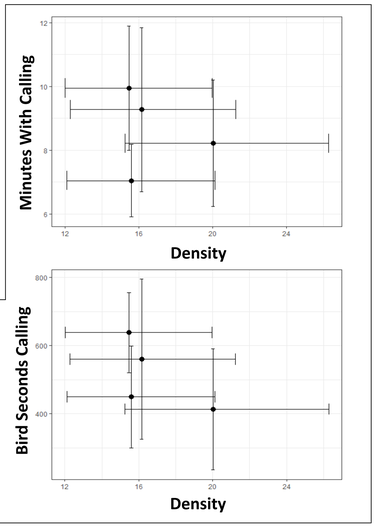

Figure 10. There was no apparent relationship between density means and confidence intervals estimated by distance sampling and minutes with calling on the ARUs (Top) or bird seconds calling (Bottom).

Conclusions

- Field observers and ARU processors had nearly the same estimates of occupancy.
  - This supports that ARUs accurately detect when a covey has called.
- There was no apparent relationship between any ARU metrics and the density means estimated from point count surveys.
- ARUs cannot be used to derive density estimates of bobwhites.

ARU PROCESSING EFFICIENCIES

Objective

Evaluate the methods for processing ARU data using Raven Pro.

Results

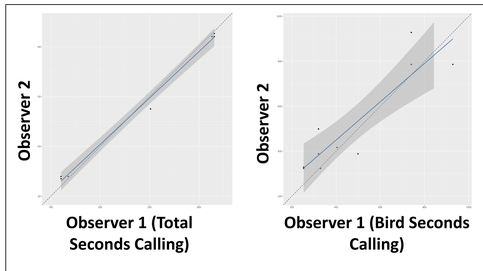

Figure 11. A comparison between each of the observers with a dotted 1:1 line for total seconds calling and bird seconds calling.

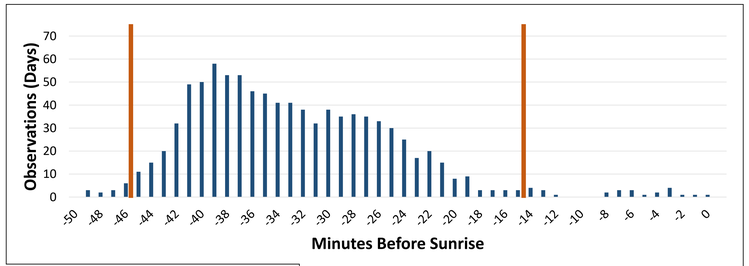

Figure 12. Histogram of number of days where a bobwhite call was detected in a given minute before sunrise for the full 50-minute processing window. The orange bars, placed at 45 minutes and 15 minutes before sunrise, represent the proposed 30-minute processing window.

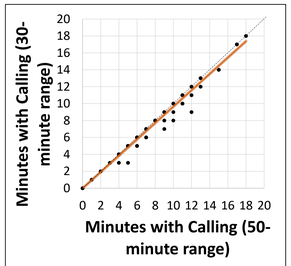

Figure 13. Scatterplot comparing minutes with calling in 50-minute range (x-axis) and minutes with calling in the 30-minute range (y-axis). The orange trend line is of the data, while the dotted is a 1:1 line.

Conclusions

- When using ARUs to survey for bobwhites, there will be minimal observer bias between trained processors using Raven Pro.
- Processors differ more on the number of birds present than simple detection.
- A 30-minute range in place of the 50-minute range would reduce the amount of time it takes to process the audio file without loss of much data.