

A Comparison of Avian Sampling Methodologies: Is Species Richness Accurately Detected?

Alejandra S. Martinez^{1*}, Jessica L. Glasscock¹, Brian P. Oswald¹, Reuber Antoniazzi¹, Christopher M. Schalk², Selma N. Glasscock³

¹Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, Nacogdoches, Texas, 75962

²U.S. Forest Service, Southern Research Station, Nacogdoches, Texas, 75965

³Welder Wildlife Foundation, Sinton, Texas, 78387

Email: *martinezas@jacks.sfasu.edu



Introduction

Different sampling methods generate biases, which act as filters, such as the greater ability to observe cryptic species over aural species. The ability to choose a suitable sampling method is critical to obtaining accurate community and population data, whilst considering limitations to a project's objectives, budget, and personnel.

Goals and Objectives:

- Utilizing the Monitoring Avian Productivity and Survivorship (MAPS) protocol and data, mist netting surveys, and point count surveys, we compared the effectiveness of each sampling method in detecting a complete breeding avian community, whilst considering implications for monitoring programs, allocation of limited resources, and time to detection.
- Specifically, our objectives were to compare within methodologies (I) species richness, (II) time to detection and (III) presence and absence of individual species.

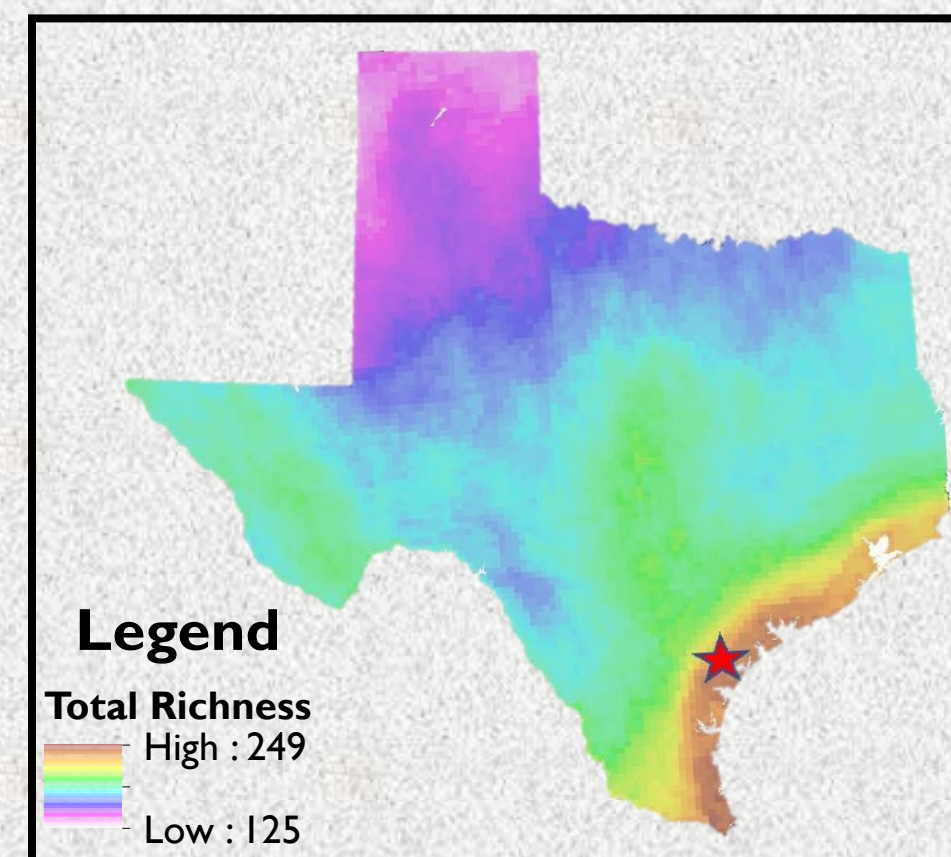


Figure 1. Avian species richness across Texas. Clinton N. Jenkins.

Methods

Study Area:

- Rob and Bessie Welder Wildlife Foundation – Hackberry Motte (Fig. 1).

Sampling Methodology:

- Point count surveys are a sampling method where species observed visually or aurally within a five-minute period, are tallied and recorded.
- Autonomous Recording Units (ARUs) are a passive sampling technique with the ability to collect presence-absence data through aural recordings (Fig. 2).
- MAPS is a capture-mark-recapture technique that observes species captured in nets and those observed visually and aurally within the study area (Fig. 3).



Figure 2. ARU deployment.

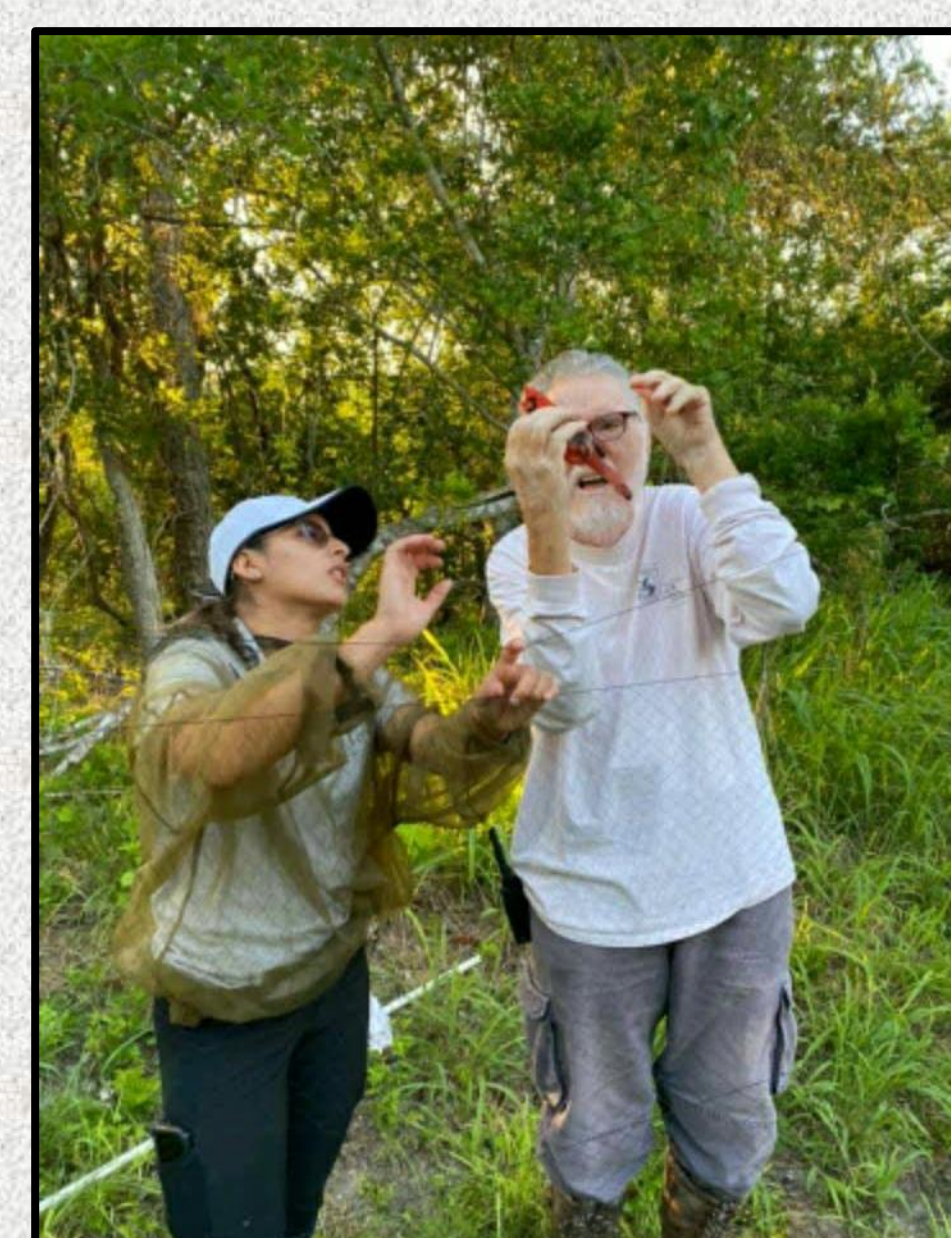


Figure 3. Bird extraction from mist-net.

Data Analysis:

- A Ven Diagram allowed us to identify species richness of the captured community among the different methodologies.
- Time to detection graph allowed us to highlight time required to obtain a full breeding community, per method.
- Bubble chart called attention to observed and un-observed species of the breeding community, per method.

Results

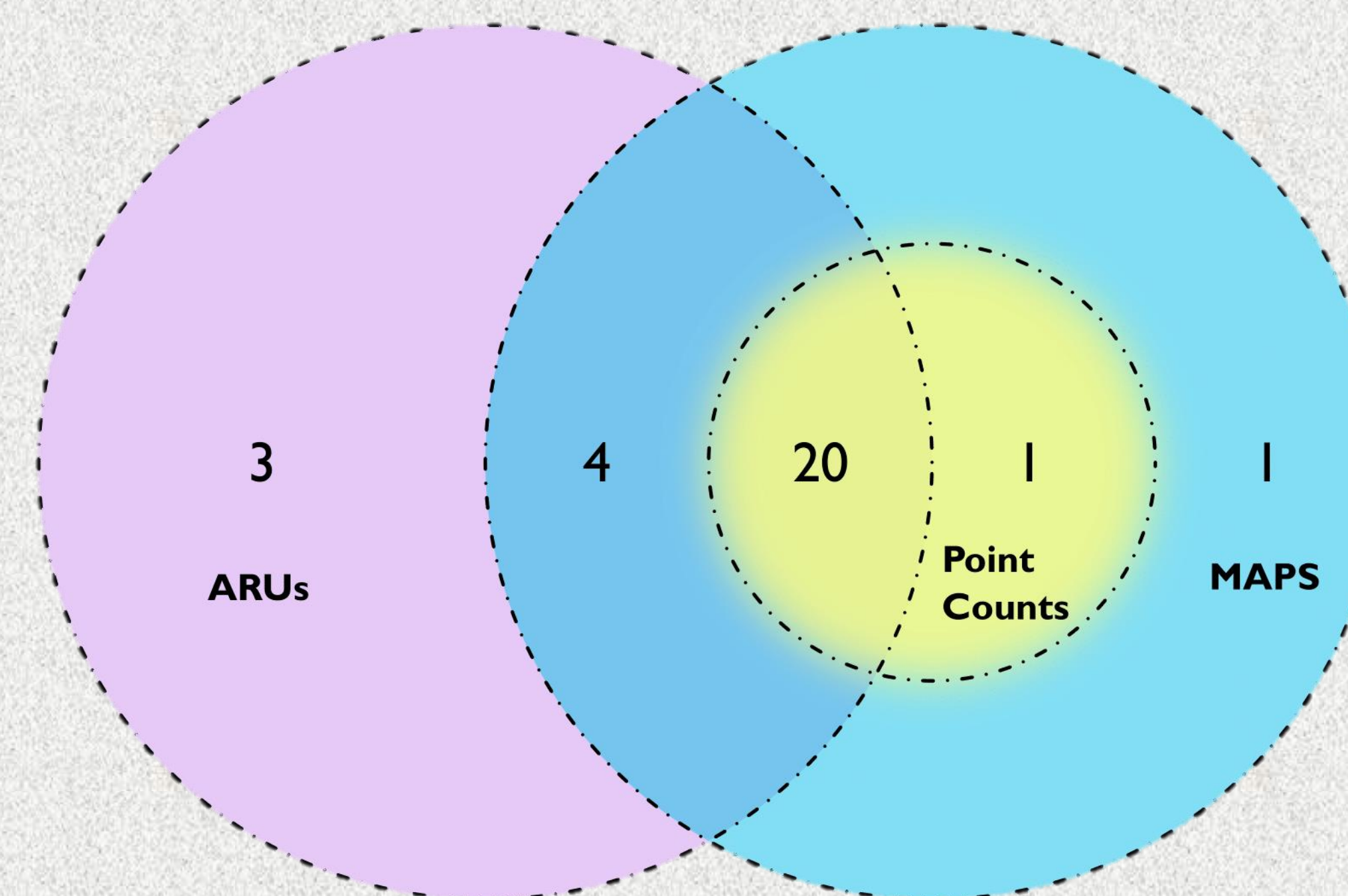


Figure 4. Ven Diagram representing unique and common species observed within the breeding community by different methodologies. Three unique species observed through ARUs and one unique species observed by MAPS. One common species observed by point counts and MAPS, four common species were observed within MAPS and ARUs methodologies, while a total of 20 species were observed by all three methods.

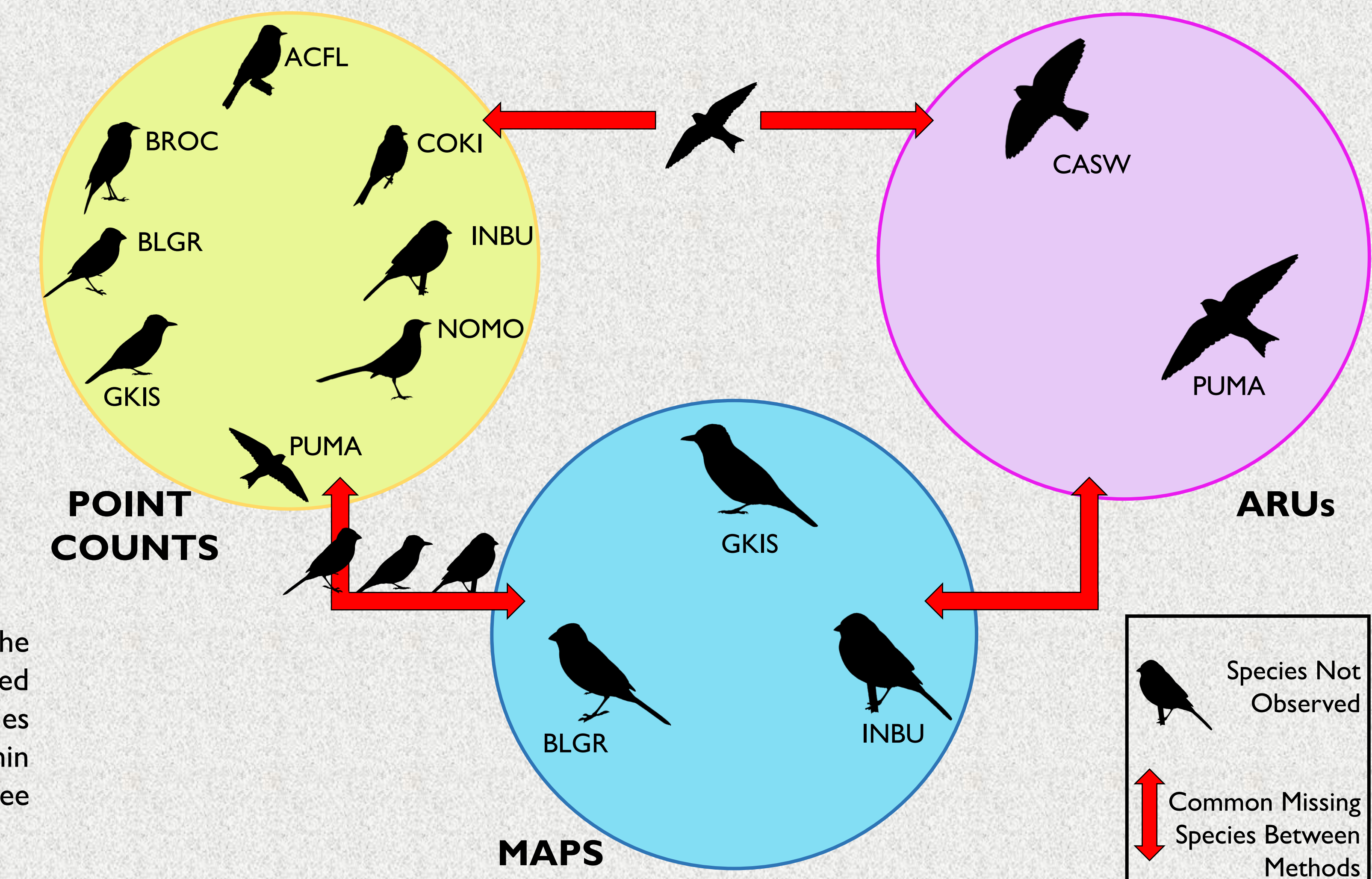


Figure 6. Bubble chart highlighting species present and absent within each methodology. Silhouettes spotlight species which failed to be detected among each method from the complete breeding community (n=29).

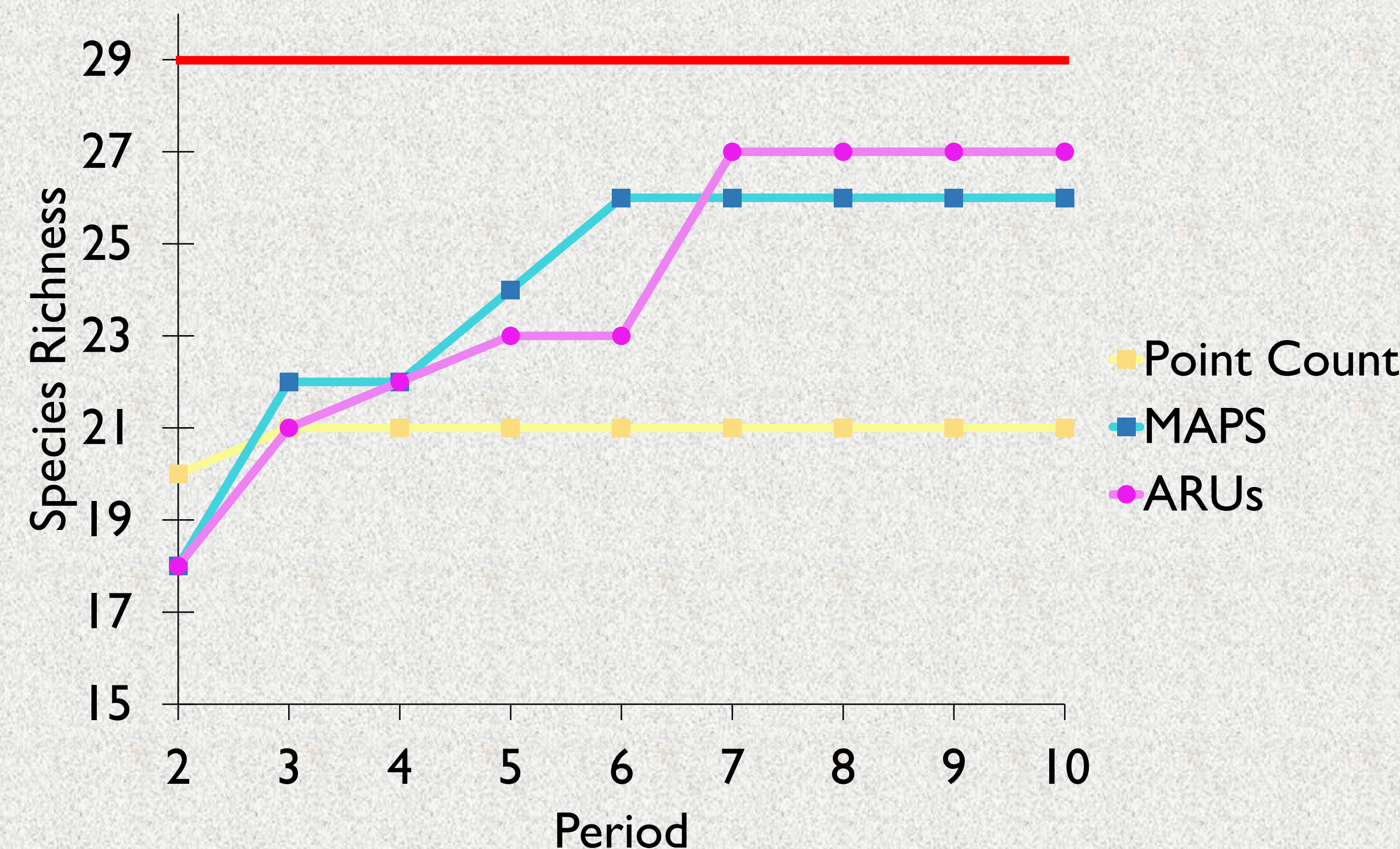


Figure 5. Time to detection graph demonstrating how many days (periods) for a complete breeding bird community to be observed by each methodology. ARUs observed the greatest number of species, with 27 detected by period seven. MAPS observed 26 species by period six and point count surveys observed the lowest number of species, with 21 species detected by period three.

Sampling Methodology Differences Identified:

- A total of 29 species were detected across the three sample methods, with 20 of those species being observed by all three methodologies (Fig. 4).
- Detection of species was greatest in ARUs, followed by MAPS, and finally point counts. However, ARUs detected a more complete breeding community in more time (days), whereas point counts observed six fewer species, in less time (days) (Fig. 5).
- ARUs observed the greatest species richness, species not detected were not reliant on the habitat for breeding. Point count surveys, a more traditional survey, observed lower species richness, missing an abundance of species who predominantly utilize open woodland or grassland habitats for breeding (Fig. 6).

Discussion

Independently, no methodology detected all species in the breeding community. Dependent on project goals, time allocation, and resource limitations, a combination of methodologies would best measure species richness. This research can help to improve long-term monitoring and conservation efforts.