Camera Trapping Techniques for Small Mammal Communities

Orion Groff, Claire Rohrer, Kevin Bratina, Mary Weiss

Faculty Advisor: Dr. Aaron Haines (contact: aaron.haines@millersville.edu)

Millersville University

Introduction

Small mammals (e.g., shrews, voles and mice) are important herbivores, seed dispersers, prey species, predators, and pollinators (Mychajliw et al., 2024). Despite their ecological importance, small mammals are often neglected in conservation efforts in favor of larger, more charismatic, species (Roberge, 2014). While live-trapping can be used to monitor small mammal populations, these efforts can be invasive and expensive (Chiron et al., 2018). Recently, multiple studies have used modified camera-traps to monitor small mammals (Thomas et al., 2020; Littlewood et al., 2021; Mölle et al., 2021; Gracanin et al., 2022). Our objective was to compare small mammal capture success using 3 separate low-cost, remote camera trap types to improve survey efforts for small mammals.
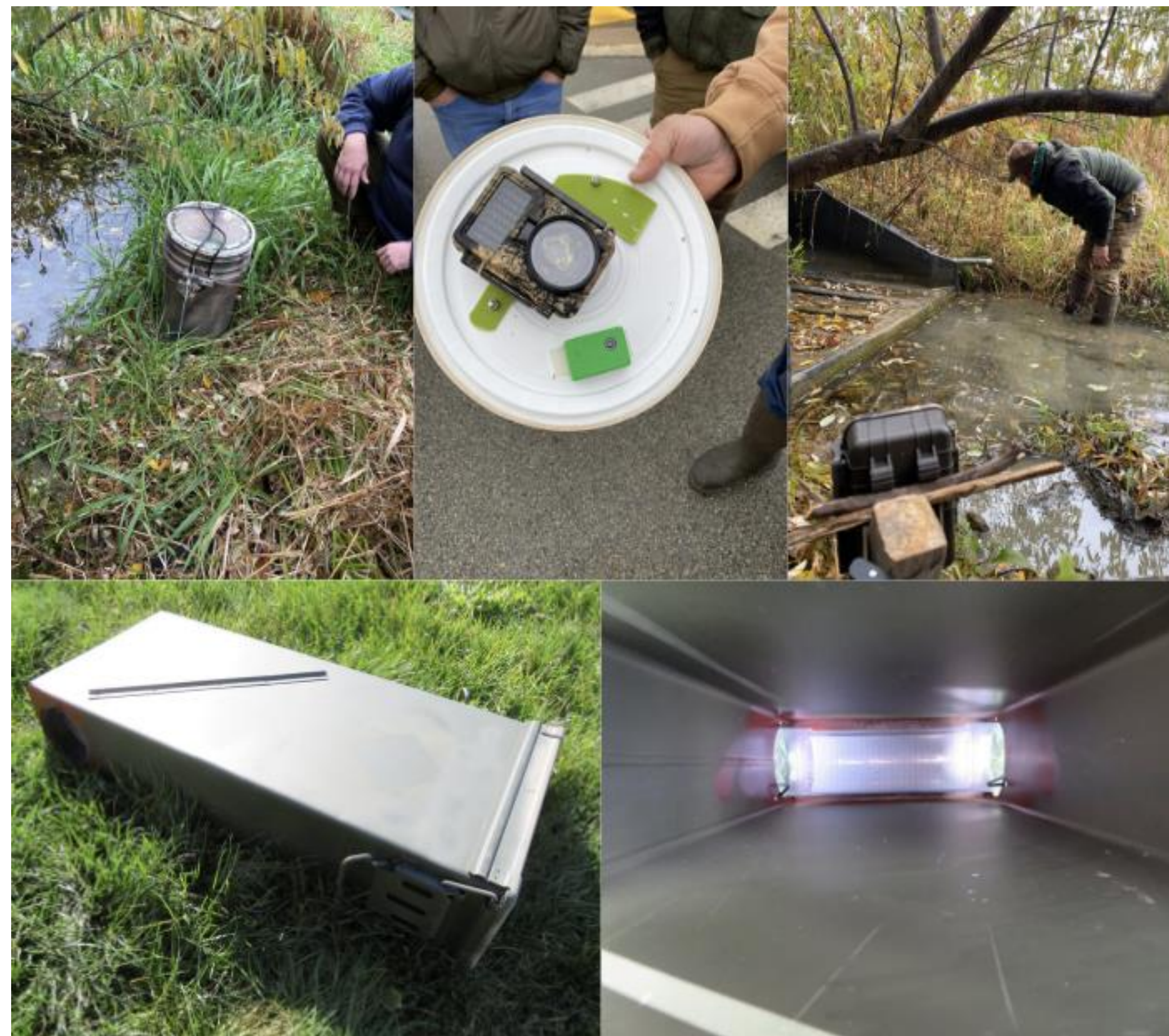

Figure 1. Top left and middle: bucket trap; top right: open trap; bottom left and right: box trap.

Methods

We used three different camera trap types (open, box, bucket; **Figure 1**) to photo-capture small mammals across Pennsylvania. Data collection occurred from January 2022-April 2023. We had 14 survey locations where we set-up all 3 camera types 2-3m apart to operate simultaneously. Thus, all camera trap types had the same number of trap days. Cameras were checked every 2-4 weeks for individual photo-capture events. An independent capture event was determined for same species photographed >1hr apart (Weerakoon et al. 2014). Small mammal guilds included mice such as Genus *Peromyscus and Mus*, voles such as *Microtus* and *Clethrionomys*, and shrews including *Blarina* and *Sorex* (**Figure 2**). We used nonparametric pair-wise comparisons tests to compare capture rates between camera trap types ($\alpha=0.05$) using the nparcomp package in R (Konietschke 2015).

Results

We reviewed over 1 year of photos for 3,438 trap days and recorded 1,253 independent small mammal captures (**Table 1 & Figure 2**). We recorded fewer small mammal captures with open cameras compared to box and bucket cameras and we captured no voles or shrews with open cameras (**Table 1 & Figure 3**). Overall, box cameras were most successful in capturing small mammals but number of captures did not significantly differ from bucket traps (**Figure 3**).

Table 1. Summary of photo-capture events for small mammals (<100 grams) captured at 14 survey locations in Pennsylvania using 3 different camera trap types: box, bucket and open. Camera trap types were run simultaneously and thus had same number of trap days (n=1146).

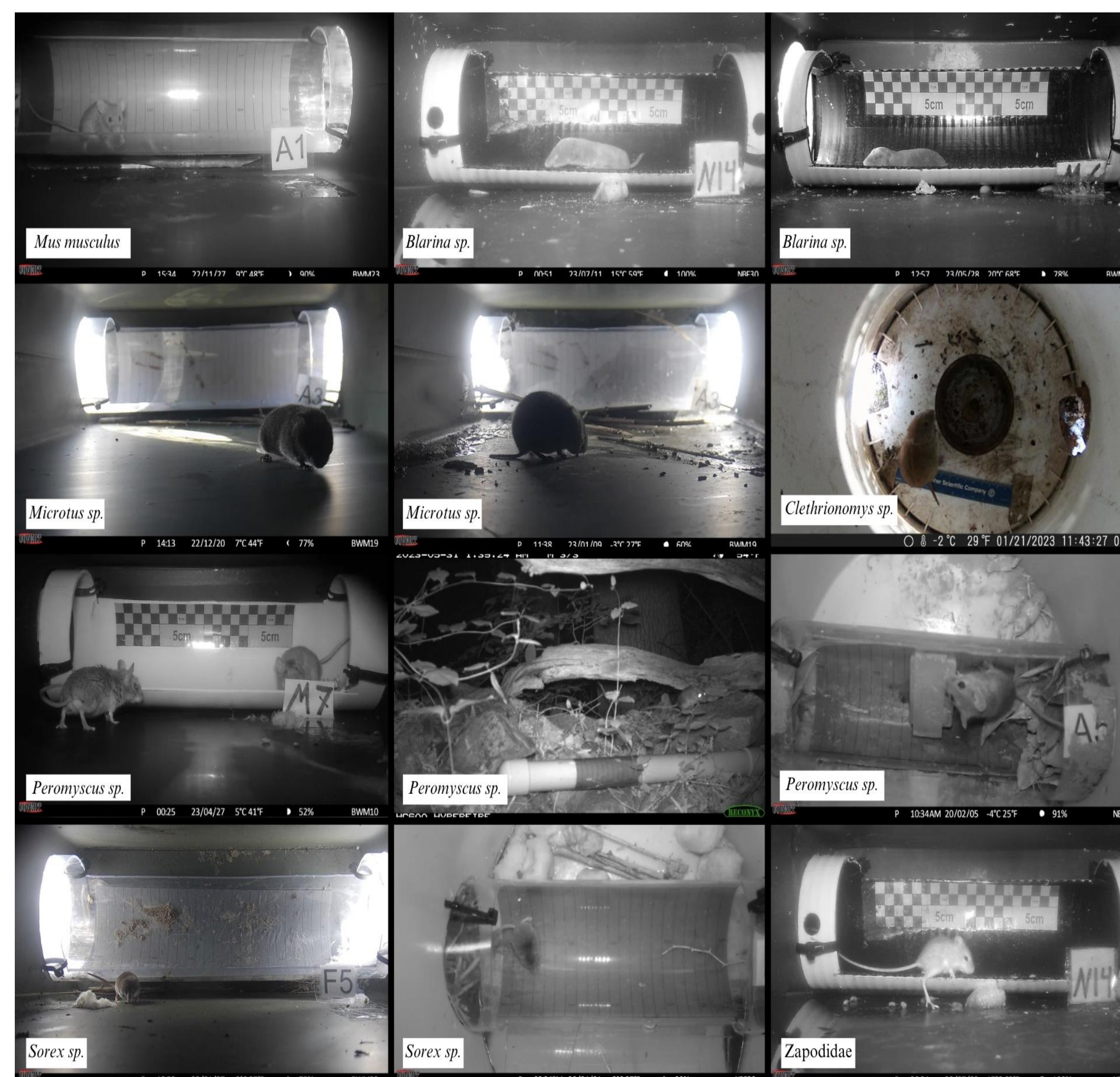| Camera Trap Type	Number of Small Mammal Captures		
	Mouse	Vole	Shrew
Box	537	71	17
Bucket	333	43	23
Open	229	0	0
Total	**1099**	**114**	**40**

Figure 2. Camera trap photos of small mammals (mice, voles, and shrews) captured using box, bucket and open camera-trap types across 14 locations in Pennsylvania, USA.
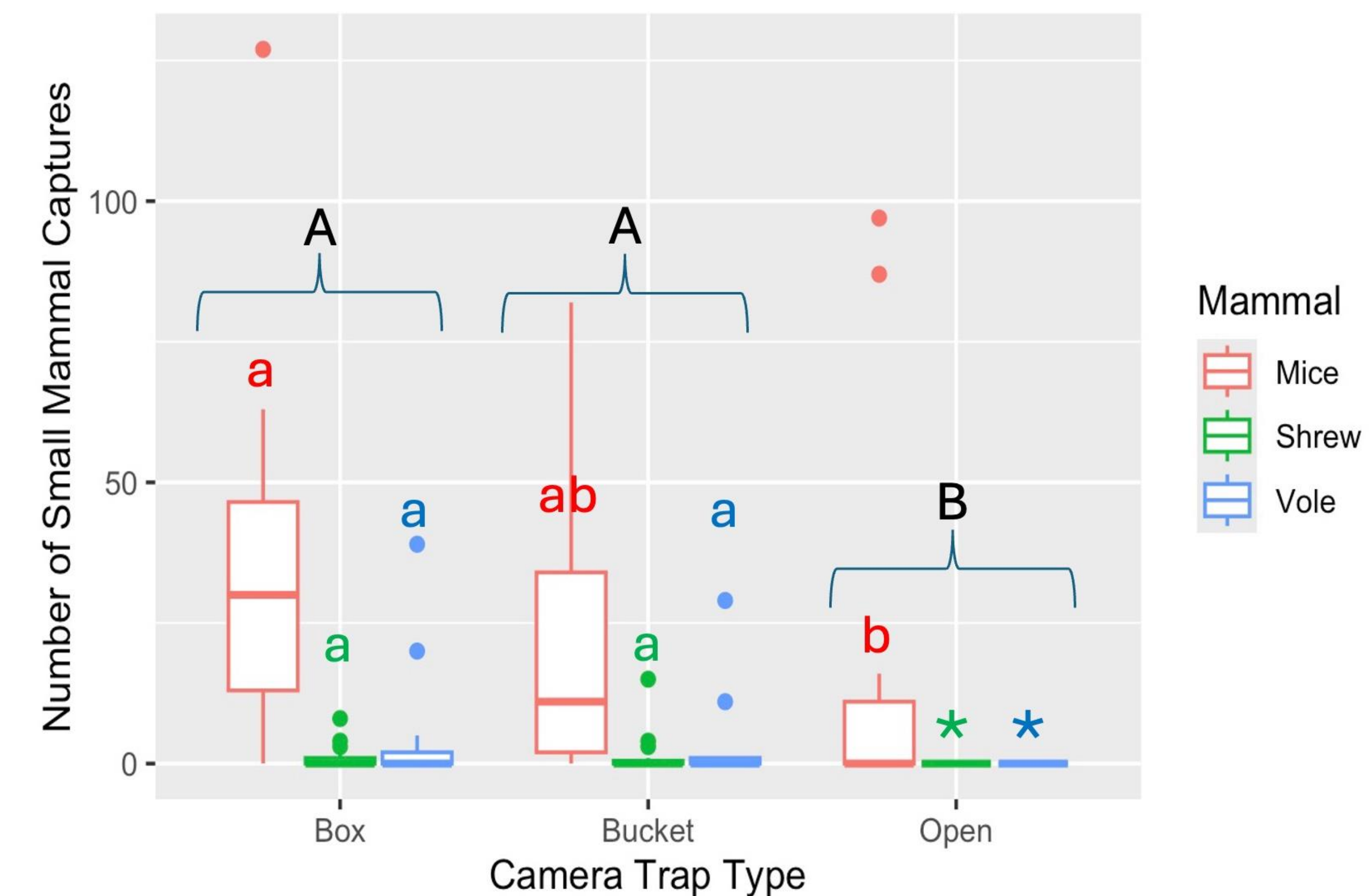

Figure 3. Number of small mammal captures by camera trap type and small mammal species guild. An 'A' denotes a significant difference between 'B' for total captures and an 'a' denotes a significant difference from 'b' between small mammal captures (i.e., mice, shrew, and vole). Open camera traps did not capture any voles or shrews.

Discussion & Future Efforts

We captured a greater total number of small mammal species with box cameras but the number of captures was not significantly different from bucket cameras (**Figure 3**). The use of AHDriFT fencing in combination with remote cameras (**Figure 4**) has proven successful in increasing photo-captures of small mammals (Martin et al. 2017). However, traditional AHDriFT camera trap set-ups have used bucket designs to house cameras (Martin et al. 2017, Amber et al. 2021, White et al. 2023). We suggest the option of using box cameras with AHDriFT systems to capture small mammals. From our experience in the field, box camera systems were easier to set-up, and allowed for better profile pictures of small mammals to better ascertain size (**Figures 1&2**). Our future efforts will involve incorporating box traps into AHDriFT fencing systems to improve small mammal capture success.

Figure 4. AHDriFT Remote Camera Trap Set-up.

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