

# The Influence of Tin Coverboard Temperature Variation on The Capture of Kirtland's and Garter Snakes

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## Abstract

Kirtland's populations can be found sporadically from Pennsylvania to Illinois and depending on the state where they occur, populations are listed as threatened or endangered. Coverboard surveys can be a useful tool to gain information on Kirtland's Snakes with the use of passive integrated transponders (PIT tags) to execute a mark-recapture study at Leadingham Prairie Preserve in Clark County, Ohio. Only one Kirtland's Snake was captured, and PIT tagged during this 5 week survey, with no recaptures in any of the snake species sampled. Temperature data was also collected at 30-minute intervals to help gain information about temperature influence on snake activity and retreat-site preference.

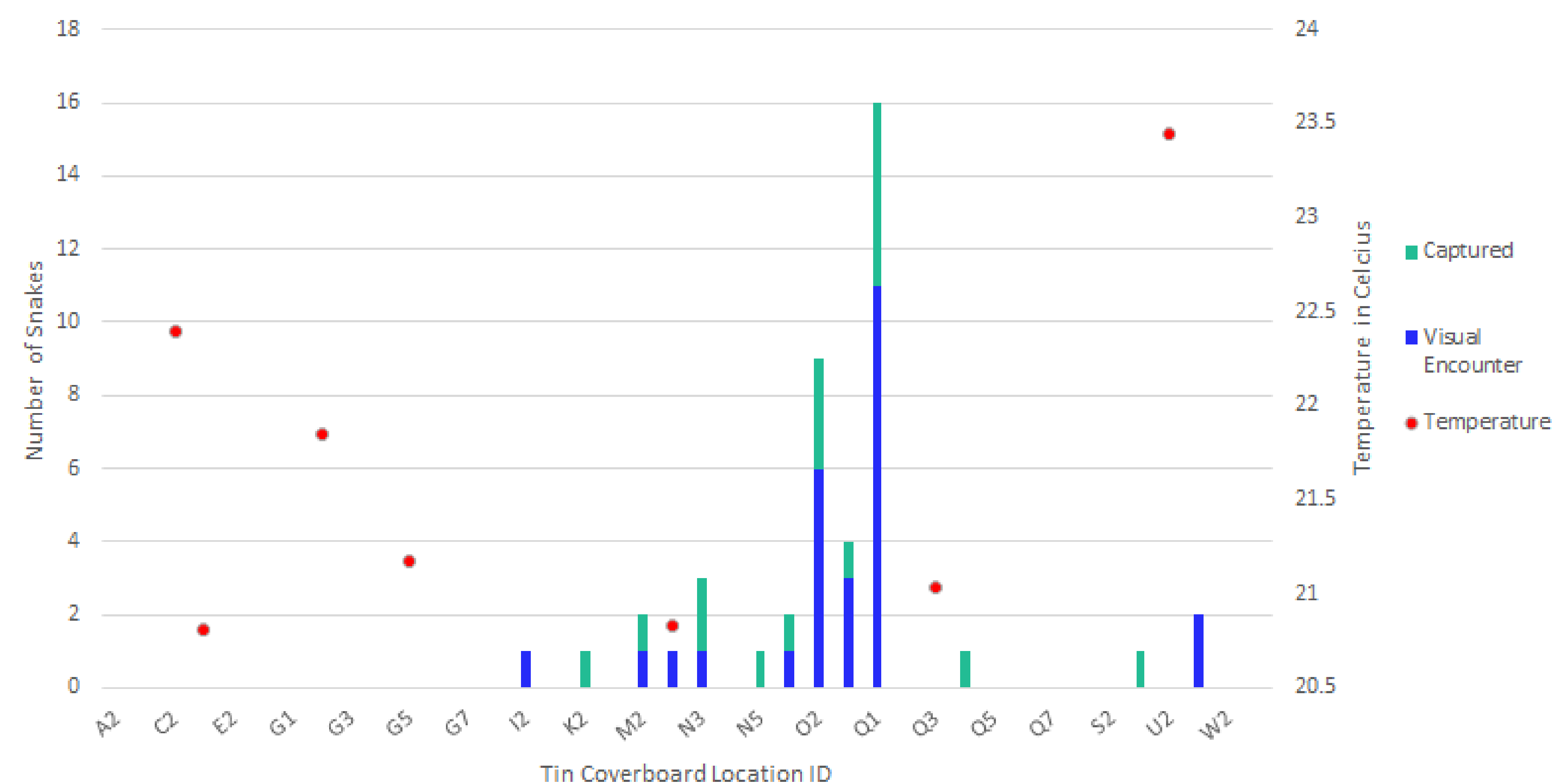
## Introduction

- Kirtland's snake populations have been sporadically found from Pennsylvania to Illinois (Barton and Lee 2010).
- These populations have been under review by the USFWS (United States Fish and Wildlife Services) for a potential federal listing.
- Data collection can be difficult to obtain due to the species rarity, but is believed to inhabit wet, open meadows and damp prairies (Gibson and Kingbury 2004).
- Kirtland's snakes diet consist soft invertebrates such as earthworms and slugs but will also frequently feed small vertebrates like crayfish that are abundant at the sampling location.
- Retreat-site selection is impacted by temperature variability and therefore there is a selection preference of retreat-sites for suitable thermoregulatory opportunities (Huey et al., 1989).

## Methods and Materials

- 40 aluminum roofing tins measuring 4' by 3' were arranged along transects 15-20 m apart at Leadingham Prairie in Clark County Ohio (figure 1).
- Twelve 1-Wire/Button temperature loggers were placed. Loggers 1 through 4 were placed to log ambient temperature (Photo 1) and loggers 5 through 12 were placed to log tin temperature (Photo 2).
- Each logger was set to record temperature in Celsius every 30 minutes.
- Loggers were then numbered and placed into a balloon to prevent any direct contact with water.
- Cover boards were checked four times weekly two of which were in the AM and two in the PM.
- Each captured snake was processed on site and the following data was collected: species, weight, SVL, tail length, and sex.
- Each individual was then injected with a Passive Integrated Transponder (PIT tag) with a 16-gauge needle.
- PIT tags were placed between the first two dorsal scales around  $\frac{3}{4}$  of the way down the length of the snake.
- Individuals in which the tag weighed more than 5% of their body weight were not PIT tag.
- Injection sites were then sealed with Liquid Skin and each individual was released at the capture site.

Variation in Average Daily Tin Temperature and The Number of Snakes Captured and Visually Encountered at Each Tin Location



**Figure 2:** This graph represents the relationship between retreat site selection and temperature. The number of snakes includes all species both captured for processing and visually encountered individuals under tins. The temperature is represented by the average daily temperature of each individually marked tin throughout the entire study period. Tins that had greater snake encounters had lower average daily temperature.



**Figure 1 (Left):** Aerial view of the study location representing the tin transects and labeled with the tin ID.

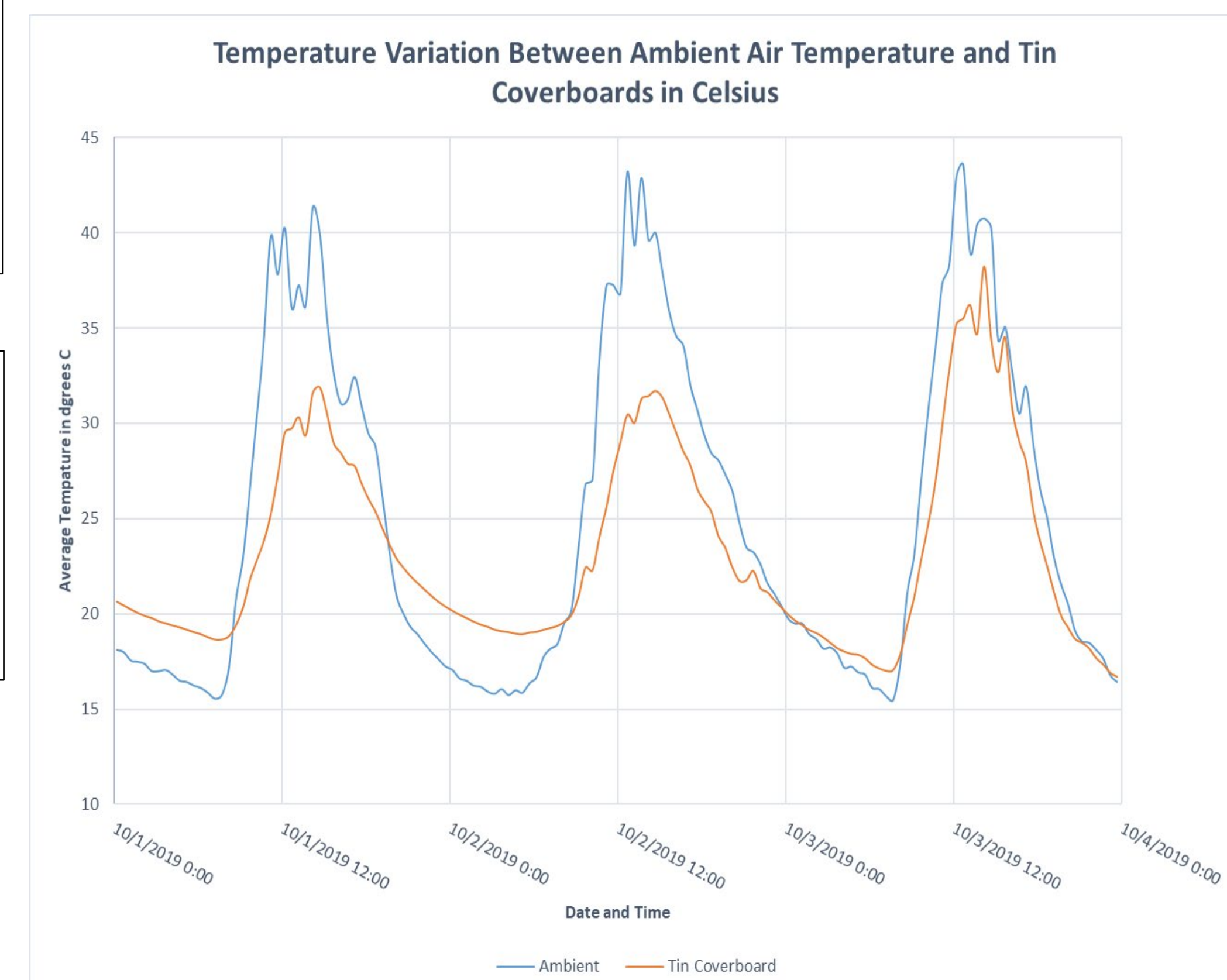


**Photo 1:** Tin Coverboard temperature logger placed into a Ziplock bag and taped to the underside of a tin coverboard to record tin temperature.



**Photo 2:** Ambient temperature logger placed into a Ziplock bag and tied into a small tree with flagging to easily find and record ambient temperature.

**Figure 3 (Right):** Graph showing the daily fluctuation in tin versus ambient temperature over a three-day time period.



## Results and Discussion

- A total 14 coverboard surveys were conducted from 30 September 2019 to 02 November 2019 resulting in the capture of 1 female Kirtland's snake (*Clonophis kirtlandii*), 1 male Northern Brown snake (*Storeria dekayi*) and 14 Eastern Garter snakes (*Thamnophis sirtalis*), with 9 being male and 5 being female.
- There were no recapture events for any of the species, but a total of 10 individuals were marked with a PIT tag.
- None of the marked individuals were recaptured. This could be a result of reoccurring detection difficulties, larger population than predicted, or potential movement of individuals in or out of the sampling area.
- Temperature data collection showed that tins with greater preference for retreat site selection had a lower average daily temperature (Figure 2).
- On average the tin temperature stays warmer during the night but stays cooler during the day which allows for less temperature variation (Figure 3).
- Less variation in temperature allows for less movement by the snake to reach optimal temperature for thermoregulation processes needed to carry out life requirements.
- The continuation of research at Leadingham Prairie would likely benefit our overall understanding of the species and increase the efficiency of the mark recapture survey.

## Acknowledgements

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## Literature Cited

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- Huey, R. B., Peterson, C. R., Arnold, S. J., & Porter, W. P. 1989. Hot Rocks and Not-So-Hot Rocks: Retreat-Site Selection by Garter Snakes and Its Thermal Consequences. *Ecology*, 70(4), 931-944.