

# Thermal Environments Within Leach's Storm-Petrel (*Hydrobates leucorhous*) Burrows On Great Duck Island

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## Abstract

Leach's Storm-Petrels (*Hydrobates leucorhous*) are small, pelagic, burrow-nesting seabirds. Great Duck Island, located 13 kilometers south of Mount Desert Island, is the largest Leach's Storm-Petrel colony in the continental United States. Burrows are typically dug in soil under cover objects such as fallen logs. One member of the nesting pair typically incubates the egg while the other feeds at sea. Incubation shifts can last for 2-5 days, and neglect periods where neither parent is present sometimes occur. I investigated whether temperature sensors could be used to track periods of egg neglect by deploying iButton temperature sensors in 18 Leach's Storm-Petrel burrows over a period of 28 days. Temperature data did not reveal incubation shifts or neglect periods but still offered insight into the relatively stable thermal environment of the Leach's Storm-Petrel burrow.

## Methods



Fig 1 (Left) Great Duck Island, shown in relationship to MDI and Schoodic Peninsula  
Fig 2 (Right): The south end of Great Duck Island with the locations of study burrows shown.

- iButton ThermoChron sensors (range -5°C to 26 °C, accurate within +/- 1 °C) were deployed in 18 Leach's Storm-Petrel burrows where adult birds were present between June 14<sup>th</sup> and June 16<sup>th</sup>
- Four control sensors were deployed either aboveground at surface level or underground in artificial burrows
- Sensors recorded temperatures every thirty minutes throughout the deployment period and were recovered between July 7<sup>th</sup> and July 10<sup>th</sup>, before any eggs began to hatch.



Fig 3 (Left): The entrance to a study burrow. iButtons were attached to tabs of balsa wood and tied to stakes outside the burrow for easy removal. Photo by author.  
Fig 4 (Right): An adult Leach's Storm-Petrel with a USGS aluminum federal band. Photo by author.

## Results

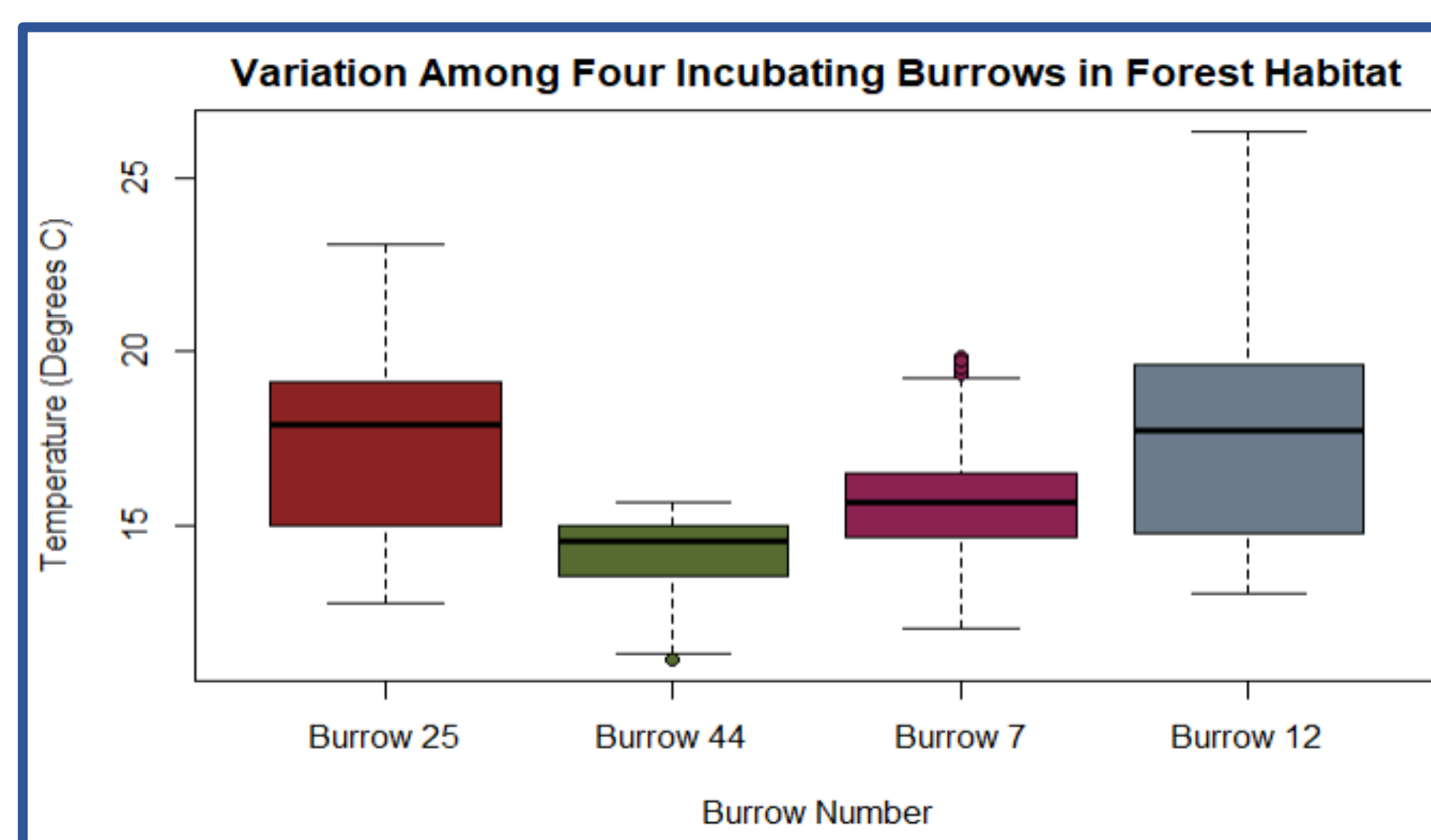
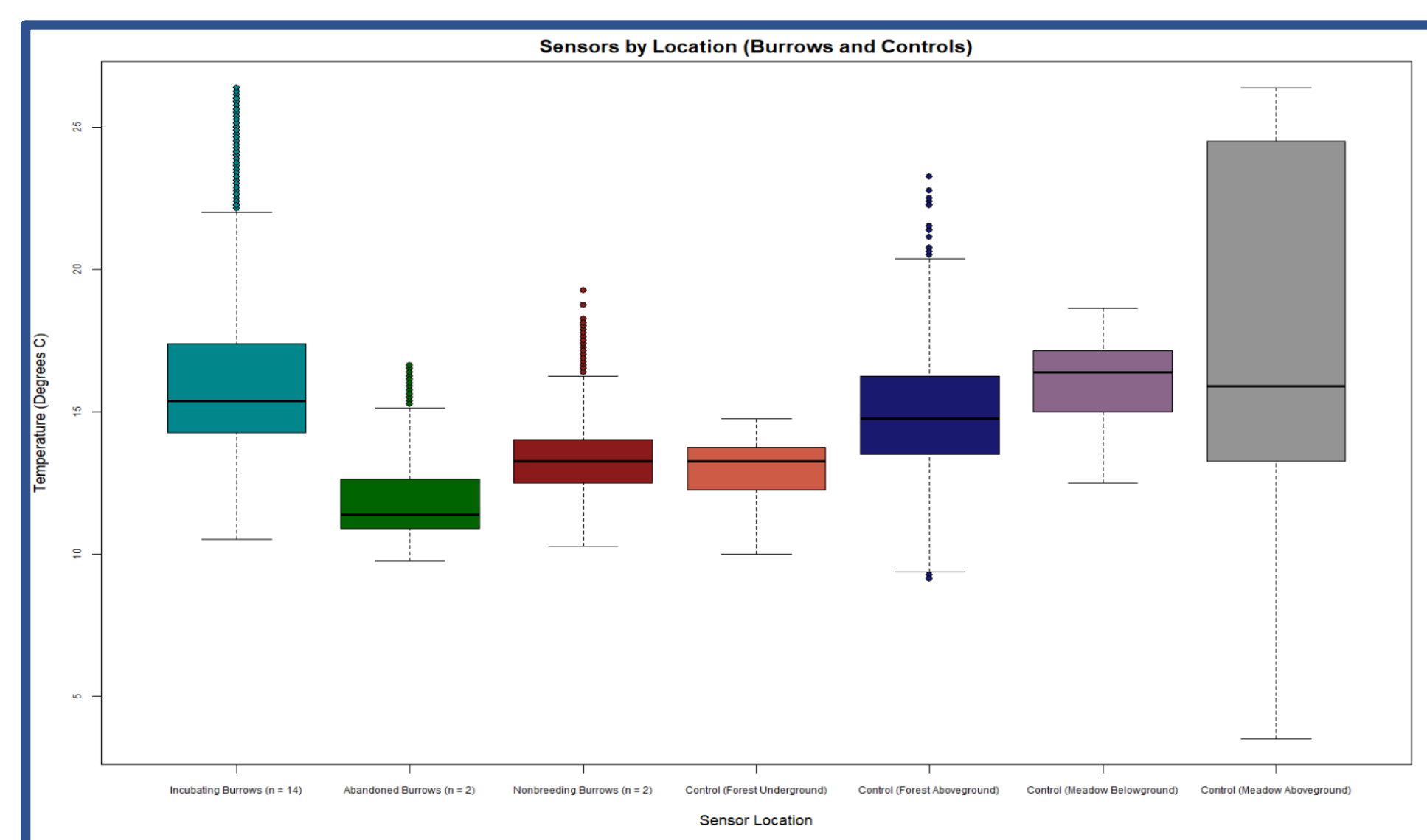


Fig 5 (Top): Temperature distributions for burrows of different breeding statuses and for controls, reflecting the entire period of deployment

Fig 6 (Bottom): Temperature distributions for four burrows in the same habitat and with the same breeding status. Some variation between these burrows is likely accounted for by sensor position within the breeding chamber.

- Day/night fluctuations were visible in all control sensors in both meadow and forest, and are more easily observed in meadow burrows than forest burrows.
- In non-breeding burrows, temperature spikes at night may indicate visits by their occupants.
- Occasional drops in temperature were observed in incubating burrows, possibly indicating neglect periods, but typically burrow temperatures were too stable to record detailed bird movements.

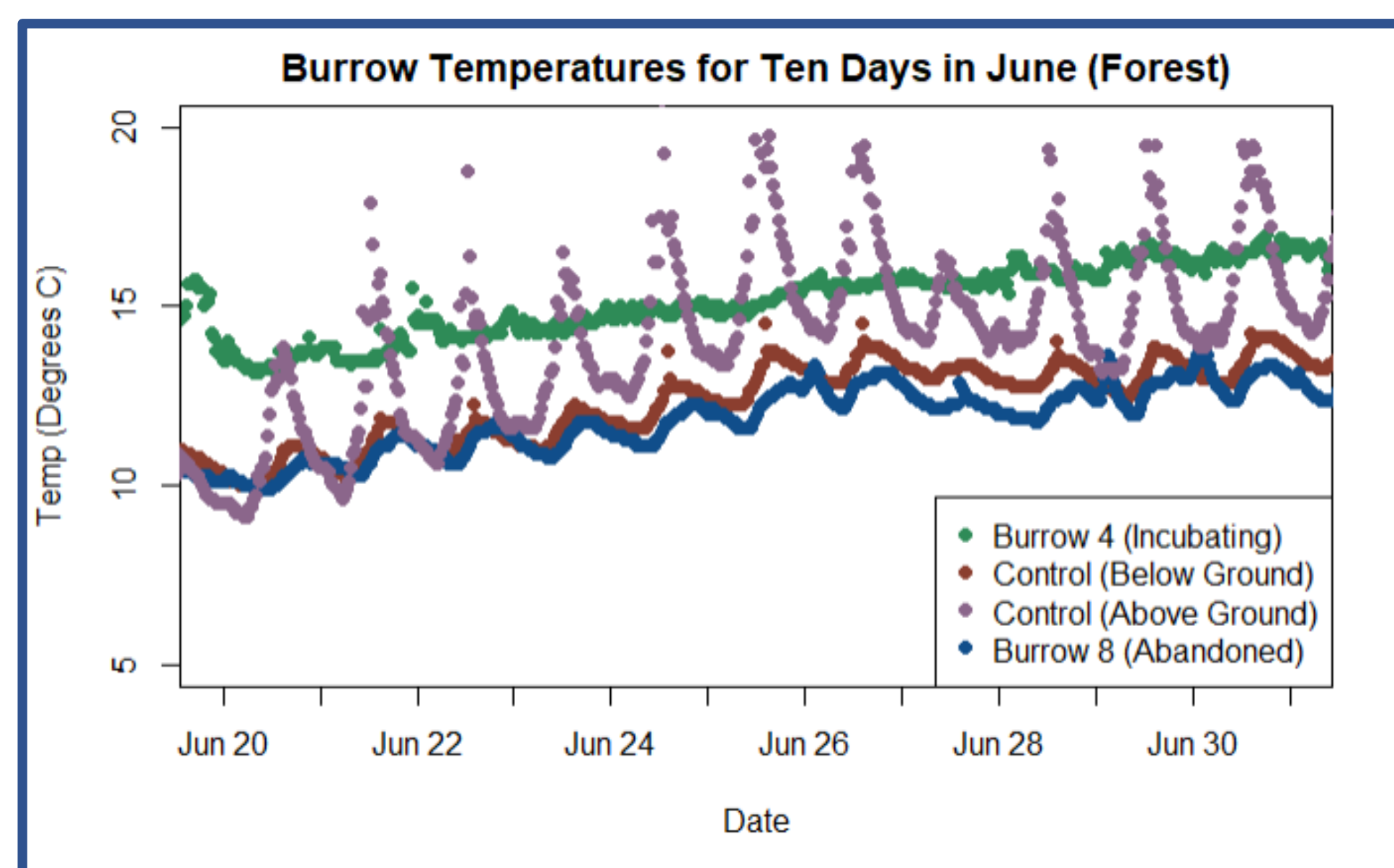


Fig 8: Temperatures recorded between June 20<sup>th</sup> and July 1<sup>st</sup> for forest burrows and their respective controls. Burrow 8 was abandoned in late June.

- The mean temperature inside incubating burrows was 16.3°C, with a standard deviation of 3.25°C
- The lowest temperature recorded inside an incubating burrow was 10.5 °C.
- Abandoned and non-breeding burrows both had lower mean temperatures (11.79 °C and 13.22 °C respectively) than incubating burrows. Abandoned, non-breeding, and incubating burrows differed significantly (One-way ANOVA, df = 2, F = 3276, p < 0.005), though differences in sample size should inspire caution.
- Incubating burrows in meadow habitat were significantly warmer than those in forest habitat (Welch's 2-sample t-test, df = 6276.2, p < 0.005), though the difference in sample size should inspire caution.

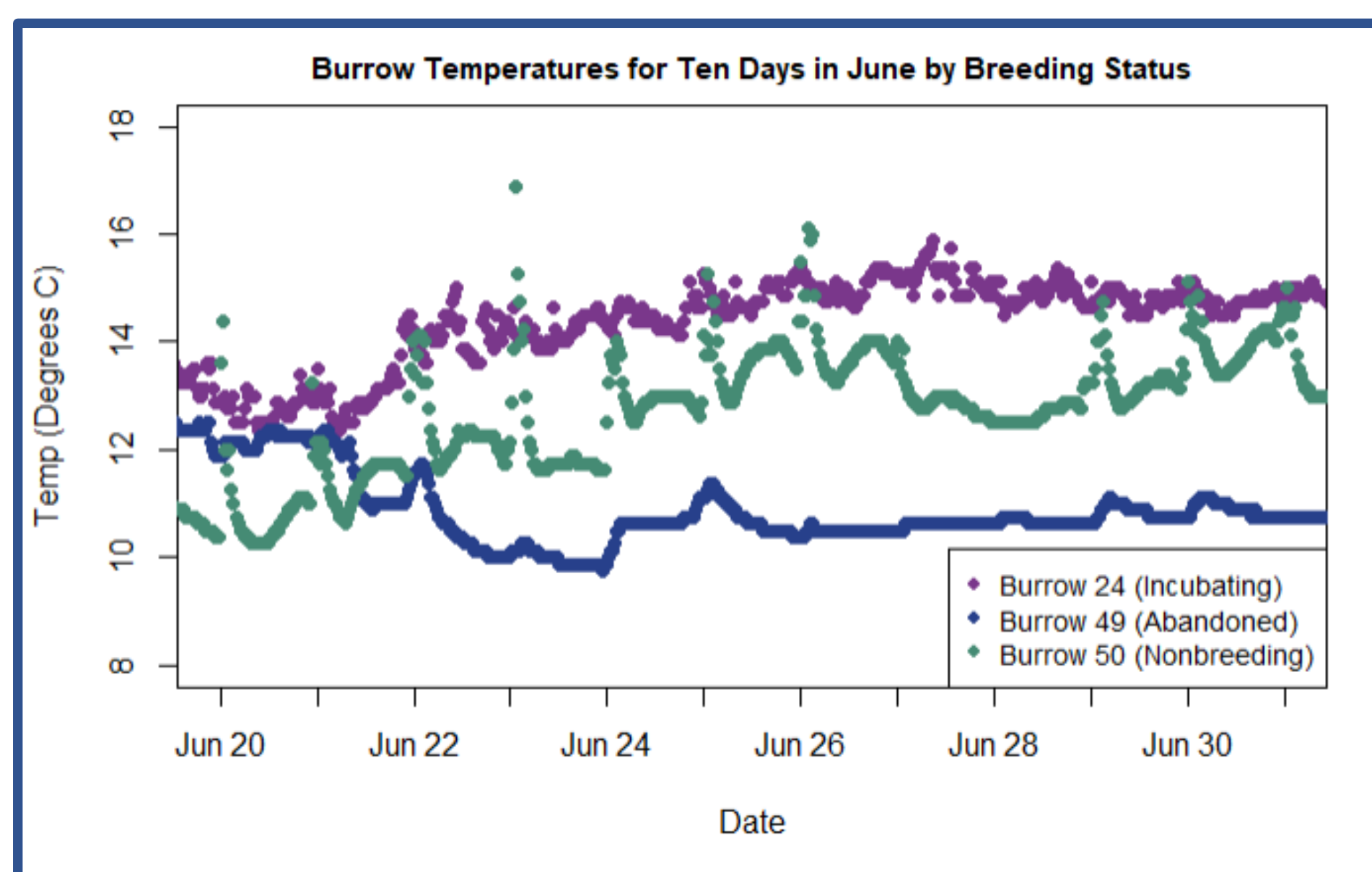


Fig 7: Temperatures recorded between June 20<sup>th</sup> and July 1<sup>st</sup> for three burrows of different breeding status. Burrow 49 was abandoned in late June. Petrels were found in Burrow 50 once during the day and multiple times at night, and temperature spikes indicate regular nighttime visits. All three of these burrows were located in "forest" habitat. All graphs from RStudio Team (2020). RStudio: Integrated Development for R. RStudio, PBC, Boston, MA URL <http://www.rstudio.com/>.

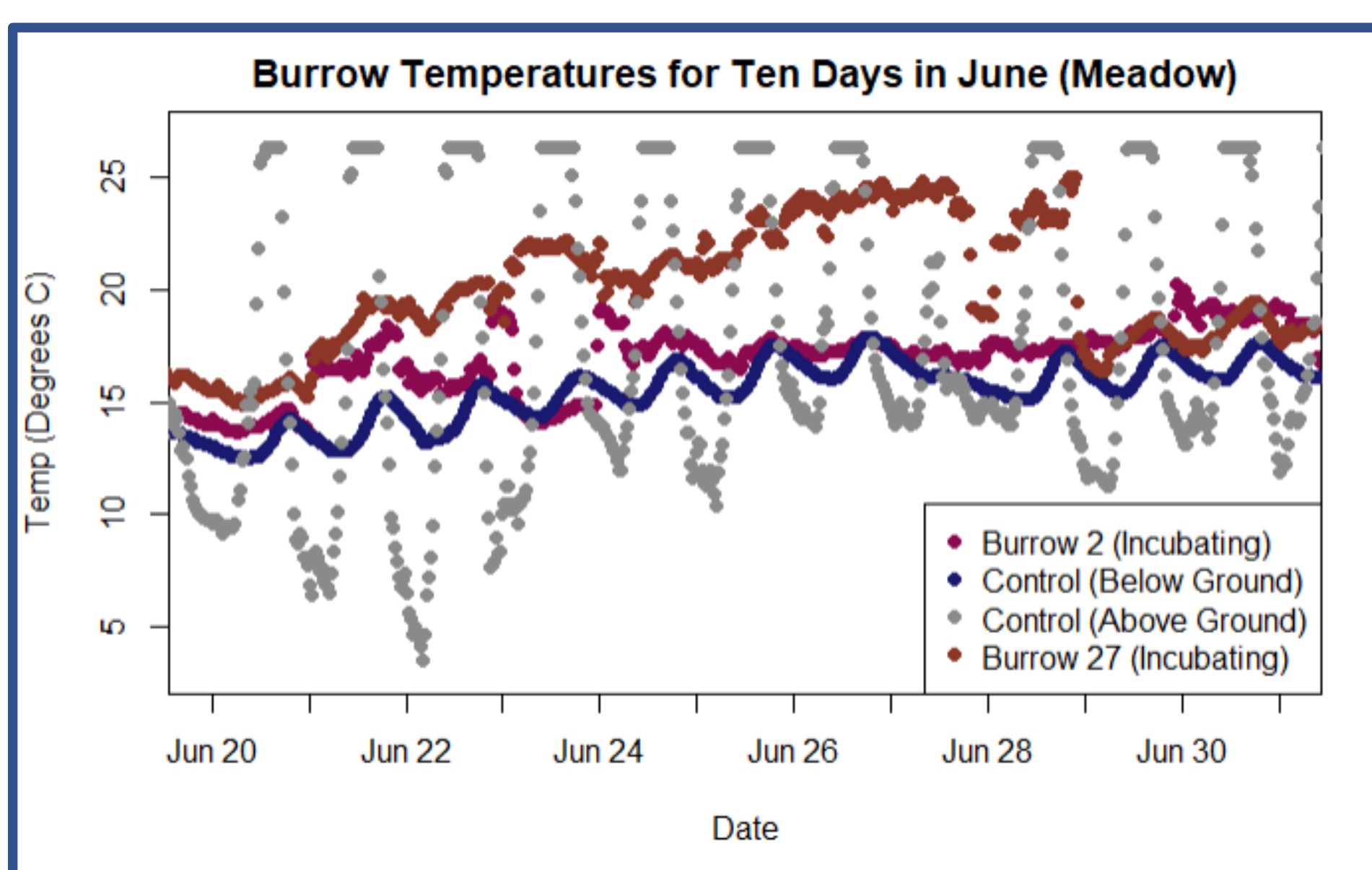


Fig 9: Temperatures recorded between June 20<sup>th</sup> and July 1<sup>st</sup> for meadow burrows and controls. Sensors did not record temperatures above 26°C.

## Discussion

Fig 10: An adult Leach's Storm-Petrel and its egg, removed from the burrow while temperature sensors were deployed. Photo by author



Temperatures within burrows were too stable to reveal movements of petrels except in occasional circumstances. However, they demonstrated that thermal environments within Storm-Petrel burrows varied by habitat and breeding status. Further explorations into burrow microclimates may reveal more about the breeding behavior of this seabird. Leach's Storm-Petrels are a species of conservation concern in Maine. Great Duck Island is changing as the Gulf of Maine warms. Understanding how Leach's Storm-Petrels use the island's habitat and how they may react to changes in the future is crucial for the conservation of this species.

This project was one of several investigations of Leach's Storm-Petrels during the 2022 breeding season. Other projects included an island-wide population census and an investigation of site and mate fidelity, and I am happy to discuss these projects, as well.

## Acknowledgements

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Fig 11: And adult Leach's Storm-Petrel held by the author.

