Desert Pocket Mouse Threats Assessment and Population Monitoring

University of Nevada, Las Vegas

BEC Environmental

Presented by:

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Project Purpose

The desert pocket mouse (*Chaetodipus penicillatus*)

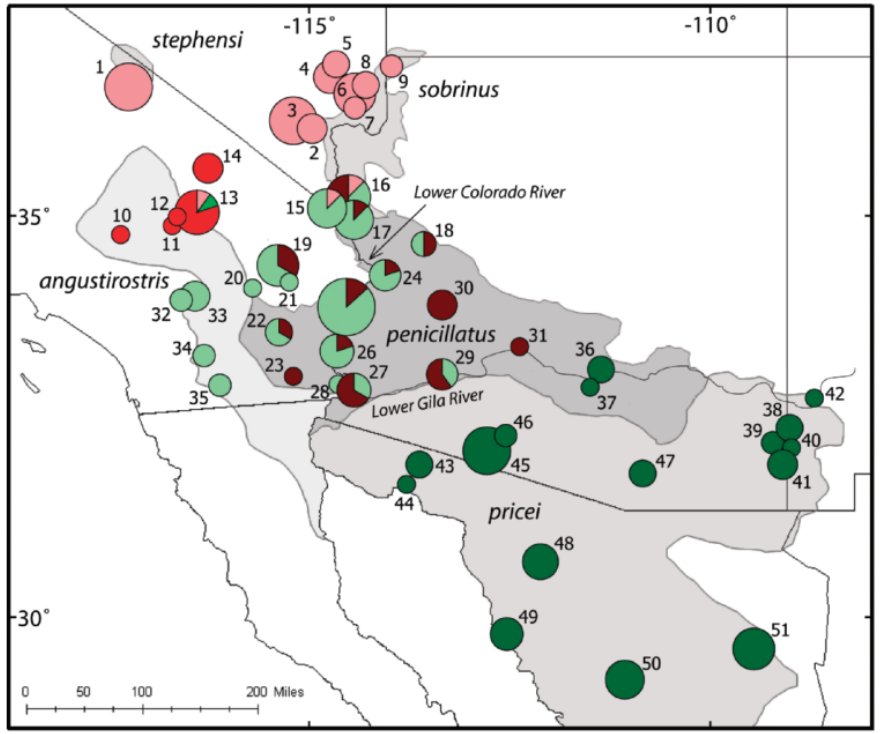
- *C. p. sobrinus*
- conservation concern by Clark County
- Greatest Conservation Need by NDOW.

The species has been proposed for inclusion as a covered species under the MSHCP and Incidental Take Permit.

This project was established to collect information on the species to develop conservation strategies.

C. p. sobrinus – Why do we care?

- Isolated.



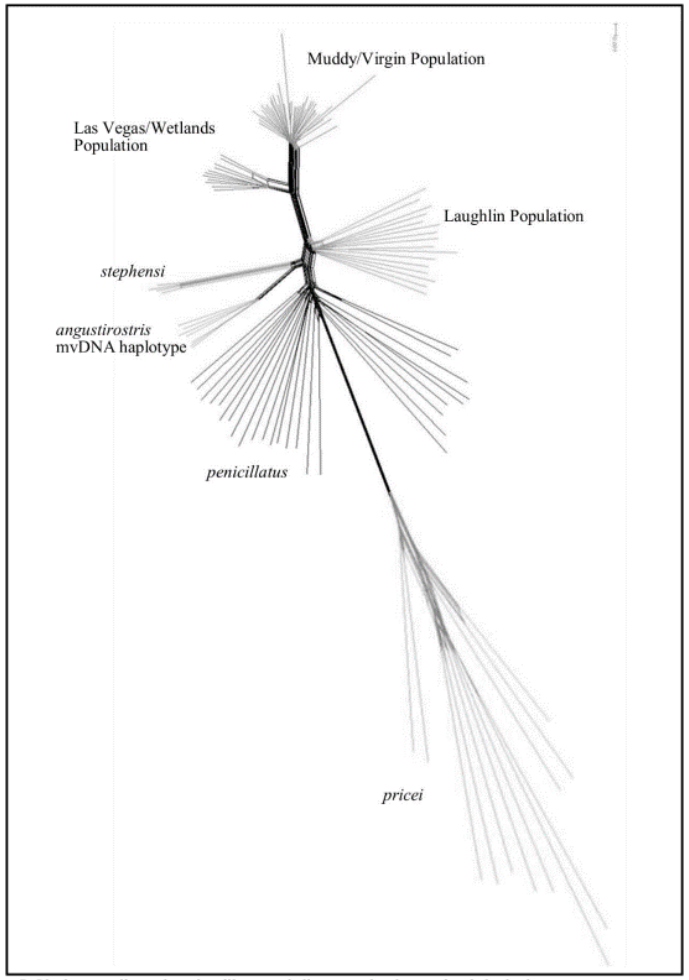
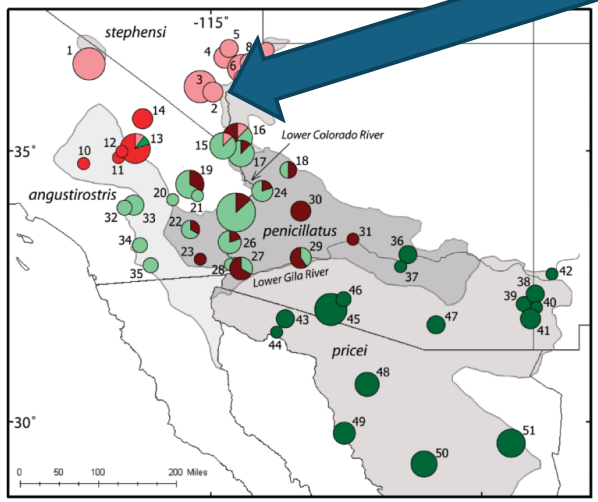


Fig. 3.—Distribution of major clades and subgroups of mtDNA control region sequences for *Chaetodipus penicillatus* identified in the median-joining network (Fig. 4). Sonoran clade indicated in green with shades indicating general north–south haplotype distributions. Mojave clade indicated in red shades with identified subgroups (burgundy = Southern Mojave subgroup, red = Western Mojave subgroup, pink = Northern Mojave subgroup). Pie graph sizes reflect sample size at each location progressing from smallest ($n = 1$) to largest ($n = 15$) and numbers identify sample localities listed in Appendix I. Background shading depicts nominate distributions of subspecies as in Fig. 1.

C. p. sobrinus – Why do we care?

- Isolated.
- At-risk.

?



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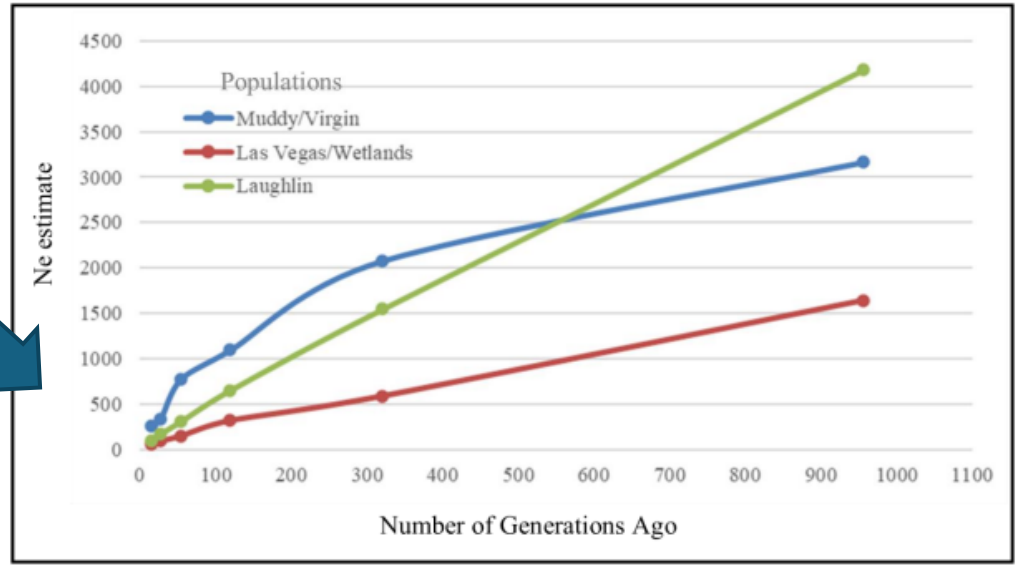
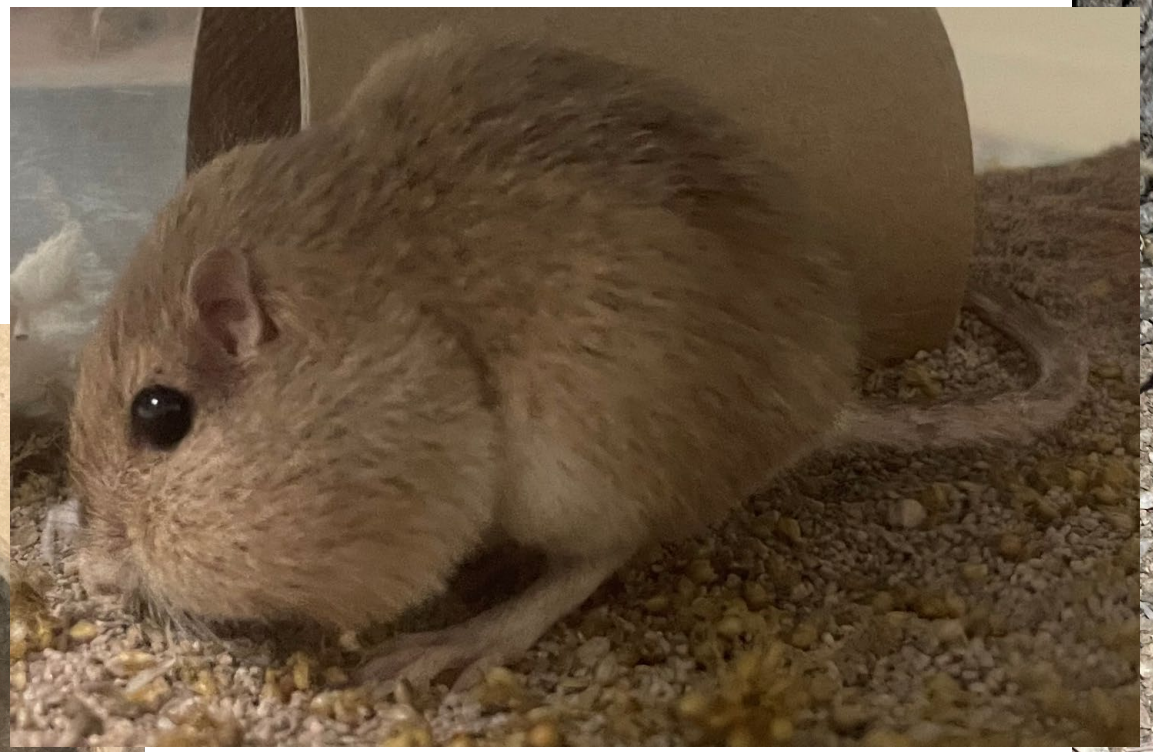


Figure 6. Estimate of historical effective population sizes (Ne) of *C. P. sobrinus* populations in Clark County, NV.

C. p. sobrinus – Why do we care?

- Isolated.
- At-risk.
- Adorable.



Current Project Components

- 2-year project
  - culminate in a Threat Assessment
  - 2024 - 2025
- Collect information on *C. p. sobrinus*:
  - Population Monitoring and Habitat Characterization
  - Physiological Resilience to Climate Change

Demographics and Habitat of *C. p. sobrinus*

Goals/Objectives

- Quantify population demographics of *C. p. sobrinus* and relate finding to habitat variables at two sites
  - Understand natural population density and cycles, longevity, and survival
  - Identify key habitat features for managing/restoration
  - Provide additional habitat info for enhancing models/predictive mapping

- Measure the physiological impact of future climate change
  - Understand the impact of increased temperature and drought will affect energy and water budgets
  - Identify cellular response of different tissues to heat and water stress
  - Determine the risk of realistic climate scenarios

Study Area

- The study area includes portions of the Riparian Corridor along the Virgin River.
- Two locations were chosen to conduct both the Population Monitoring and Habitat Assessment Studies.

Methods - Trapping

- Fall of 2024 – Fall 2025.
- Robust Design Capture-Mark-Recapture method
- Each Site consisted of 200 Sherman-live traps
  - 10 transects,10 stations, 10 meters, 2 traps
  - Effective areas of 1 hectare
- Trap up to 4 consecutive nights

- Target individuals were pit tagged and released
- Data was collected using ArcGIS Survey123.

Methods

- Spring of 2025.
- Measured parameters:
  - Perennial vegetation species composition
  - Vegetative vertical density
  - Canopy coverage
  - Canopy height
  - Soil cover
- Centered at each trap station, two 2-meter transects
- Line-point intercept data collected every 20 centimeters
  - canopy cover, canopy height, percent bare ground, and percent litter.
- Vertical density up to 1 m estimated using a cover board at ends
- Temp and Humidity loggers at different levels in soil
- Data and habitat photos were collected using ArcGIS Survey123.

Results - Demographics

- Preliminary data from Bunkerville East
  - 5 primary occasions
    - 3 Fall 2024
    - 2 Spring 2025
- Best Model (AICc) - relatively simple
  - Statistically better than no movement
  - γ’= γ’’ varied over season
    - higher in Fall 0.79 ±0.49se
    - lower over Winter 0.54 ±0.21se
  - c=p = 0.56 ± 0.03se
  - S = 0.754 ± 0.05se

Results - Demographics

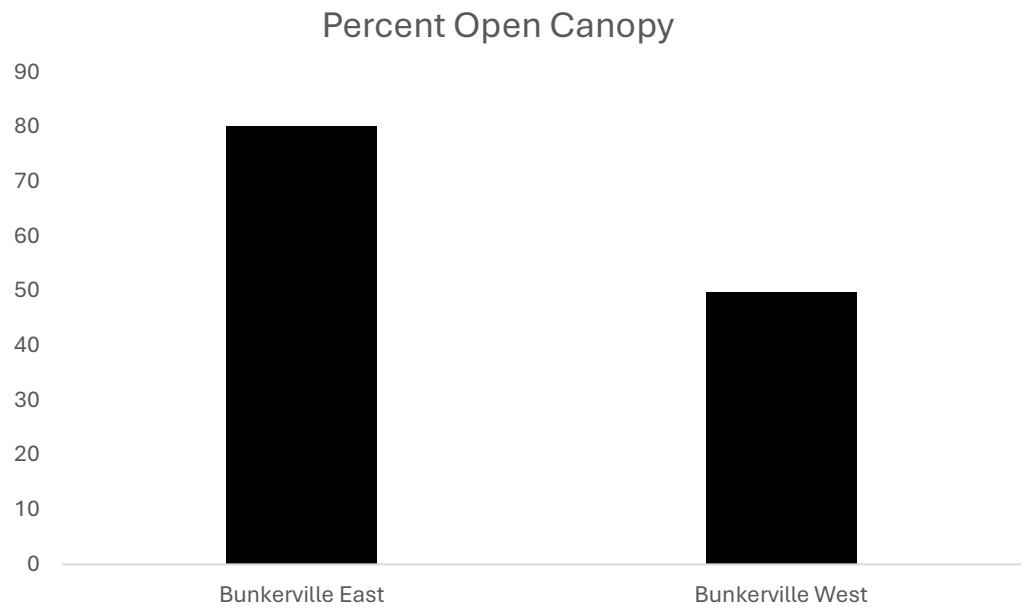
- Population Size Fluctuated:

Month	95% CI for Pop Est
October 24	23-26
November 24	7-10
December 24	3-6
March 25	11-14
April 25	27-30

Reflects activity (not survival)

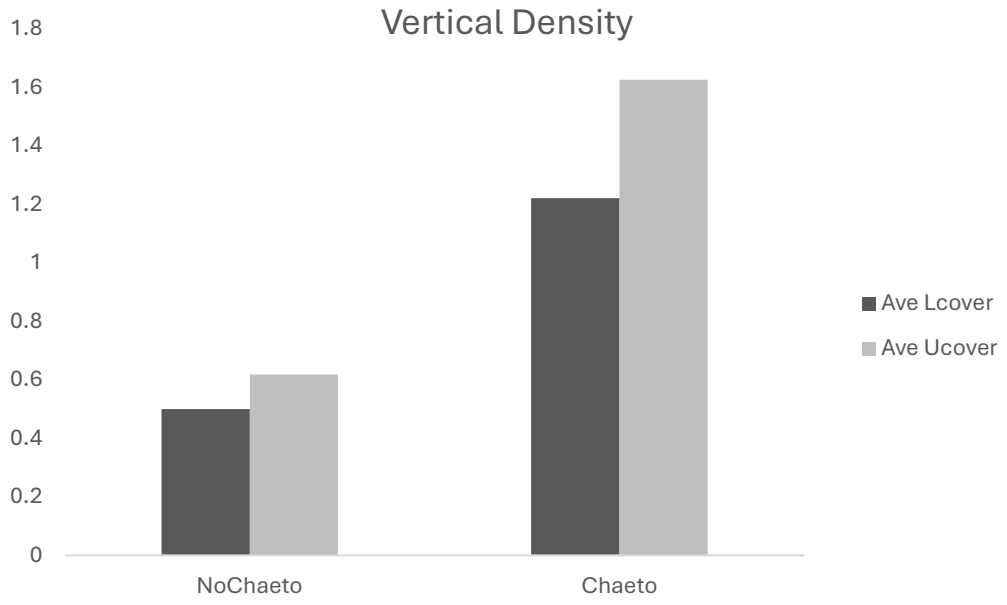
Results - Habitat

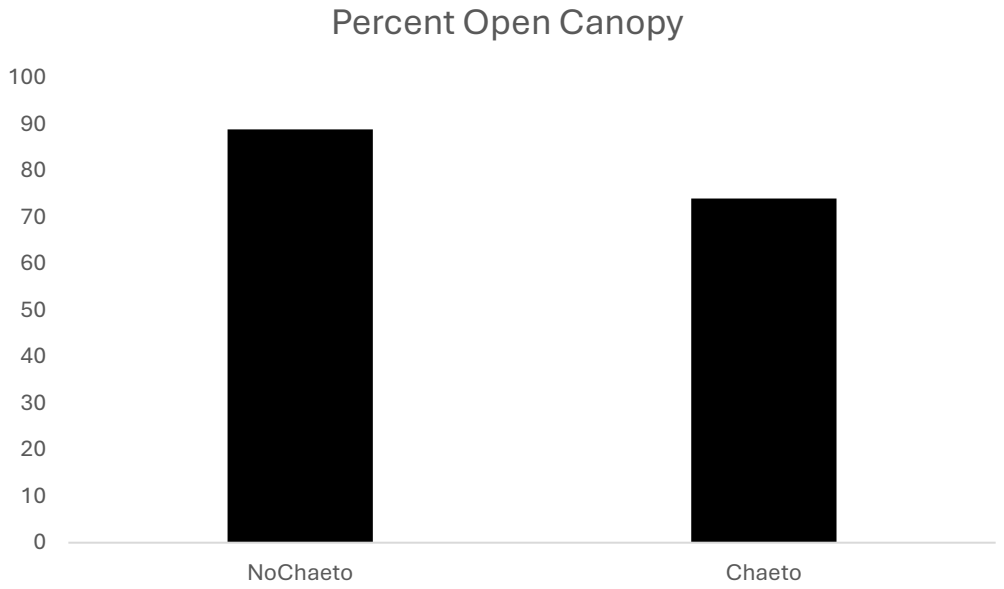
- Difference between sites



Results - Habitat

- Differences between used and not used stations at Bunkerville East
- Within the site *sobrinus* uses areas that are denser in vegetation





Continuing through Fall

- Finish Fall field mark recapture
- Analyze complete vegetation data

- Compare demographics between sites
  - Does survival or population size differ?
  - Can we use these data to inform restoration and modelling?

Physiological Resilience to Climate Change

We can make habitat!

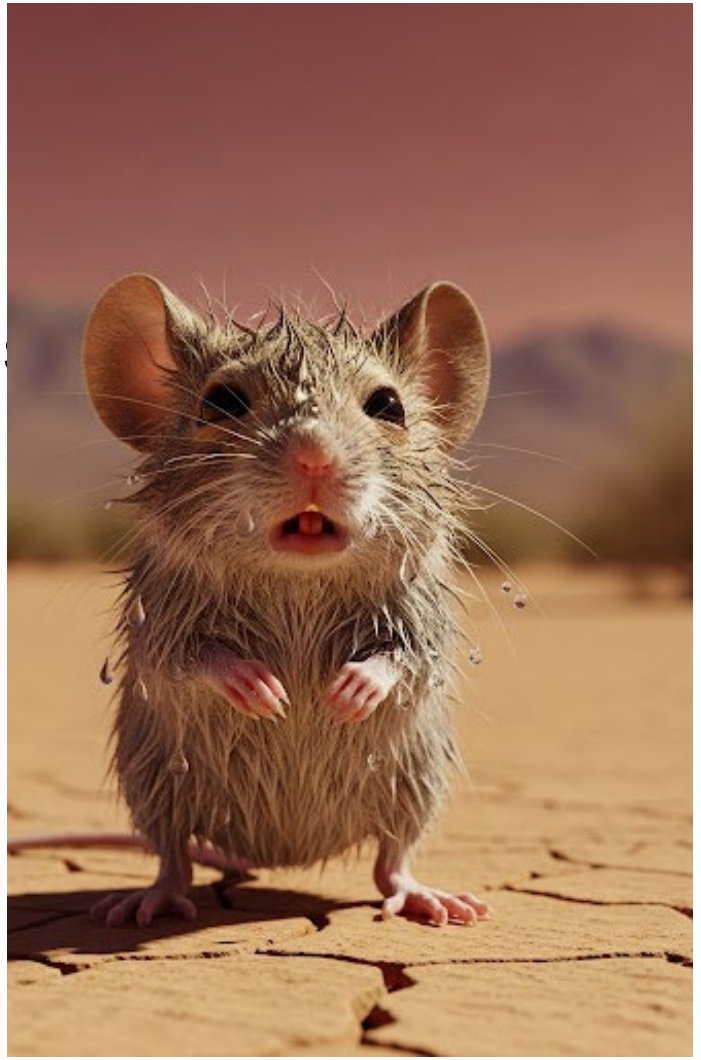
but we can’t control the weather…

- So what happens if conditions change?

Living in the Desert poses 2 big problems for mammals

- Hot – homeotherms defend body temp
- Dry – water is essential for life
- Temperature Regulation is largely through water lo

- Two approaches to deal with desert climate:
  - 1. Head-on
    - some “cool” examples
  - 2. Avoidance
    - most desert rodents, including sobrinus



Desert Pocket Mouse

- Grainivorous
- Don’t drink water
- Concentrated urine
- Nocturnal
- Lots of other Behavioral and Physiological mechanisms

- Probably limited physiologically which is why they avoid
  - Could explain the spotty distribution in Mojave Desert

Recall why we care

What do you do if conditions change for the worse?

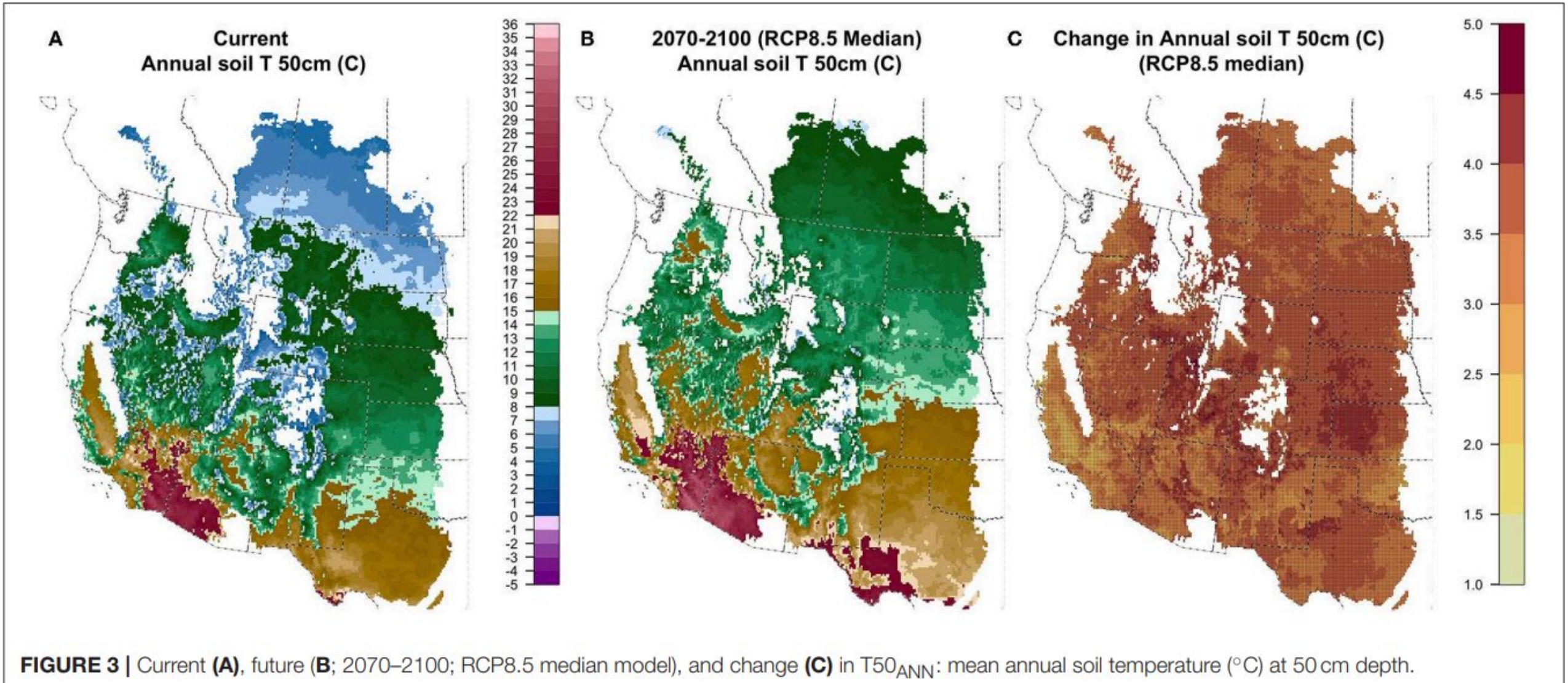


FIGURE 3 | Current **(A)**, future (**B**; 2070–2100; RCP8.5 median model), and change **(C)** in $T50_{ANN}$: mean annual soil temperature (°C) at 50 cm depth.

Bradford et al 2019

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Methods

- Respirometry
  - Measure VO2,VCO2, and WV
  - Different Temp and Humidity
- Behavioral Experiments
  - Burrow chambers
- Transcriptomics
  - Cellular response to water and temp stress

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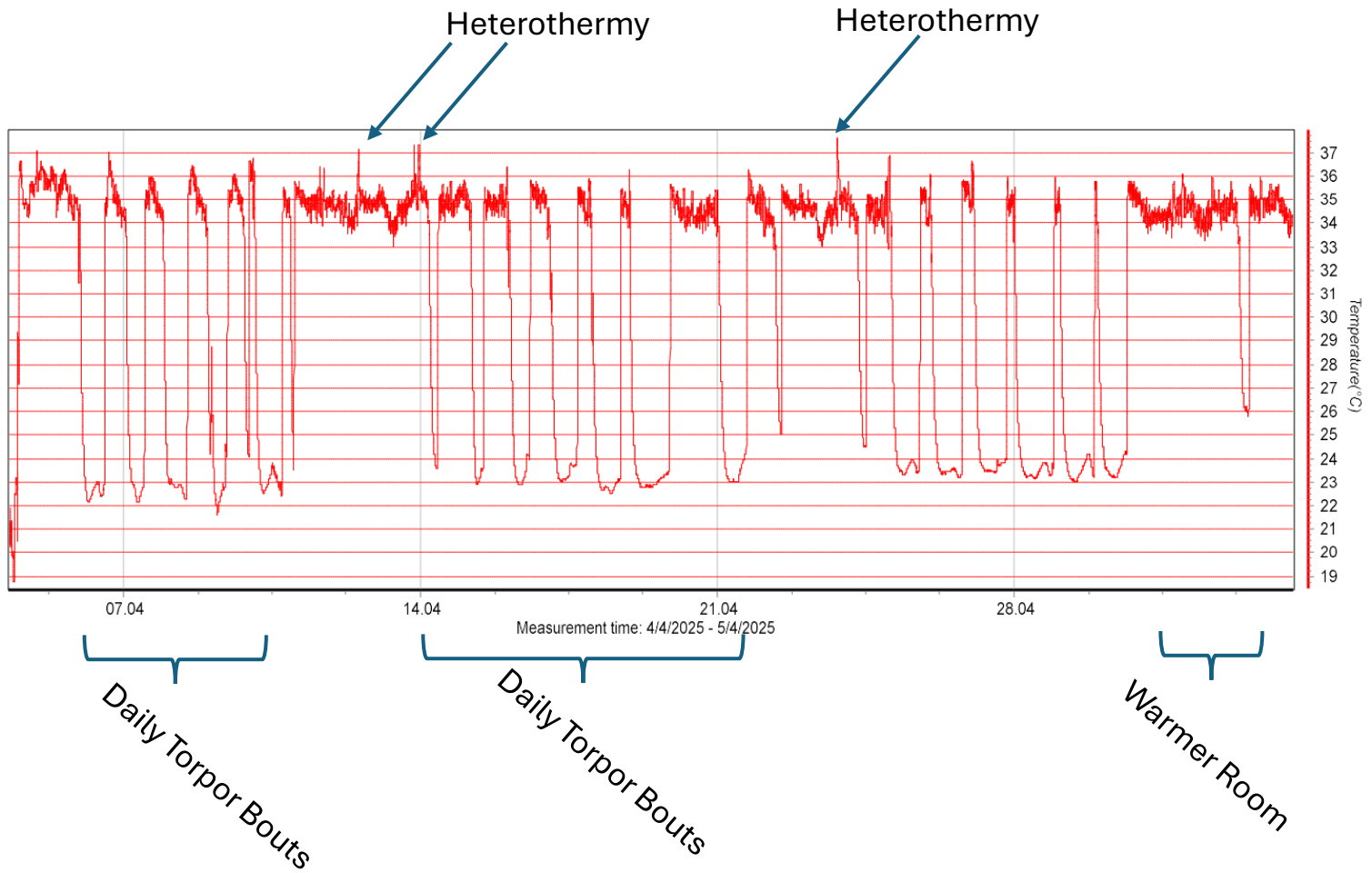
Methods

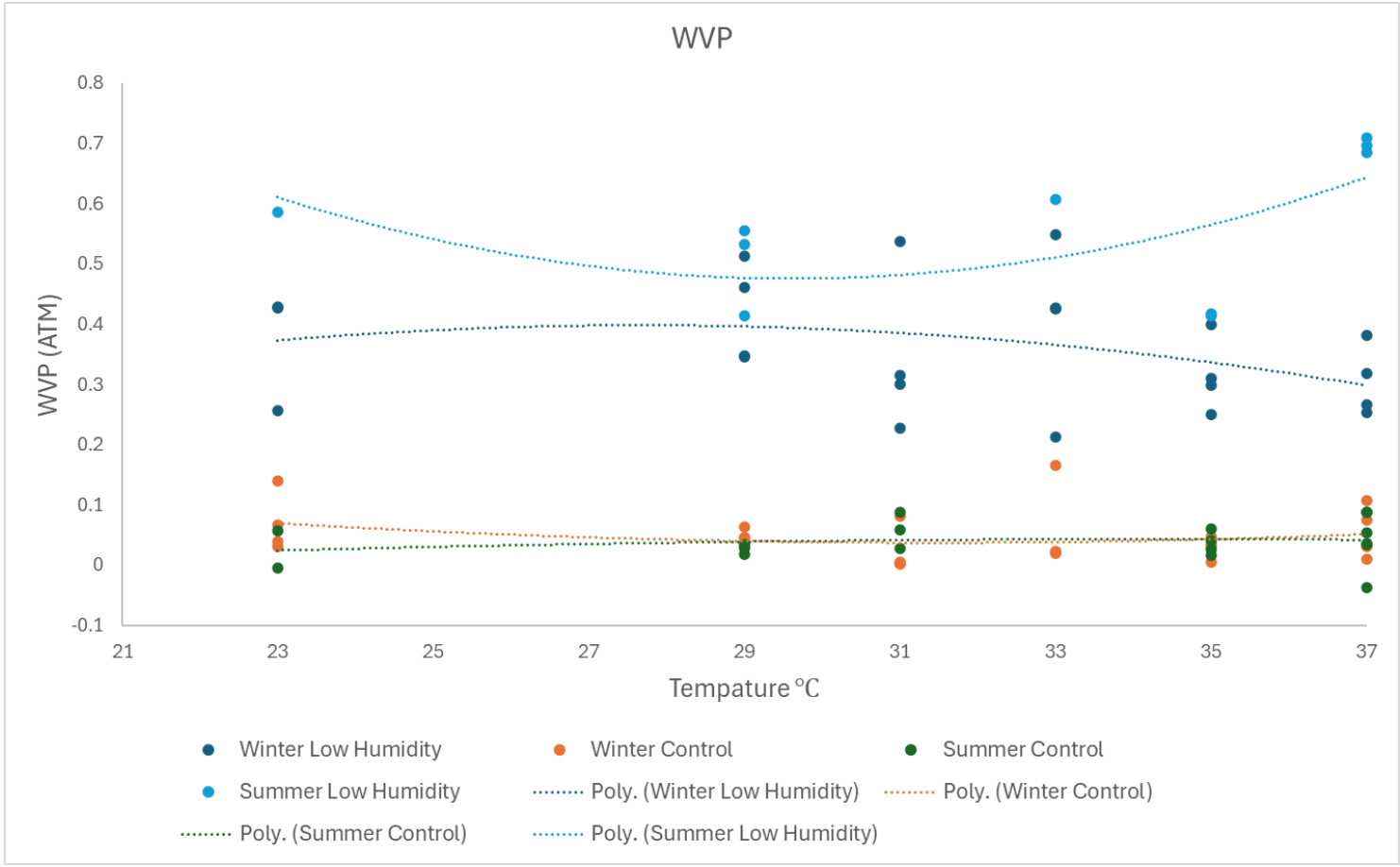
- Animals were implanted with body temperature loggers
- Respirometry was conducted at 2C temperature increments
  - High and low humidity
  - At least one day rest between experiments
- Total of 12 individuals from 2 cohorts
  - summer and winter acclimated

Preliminary Results



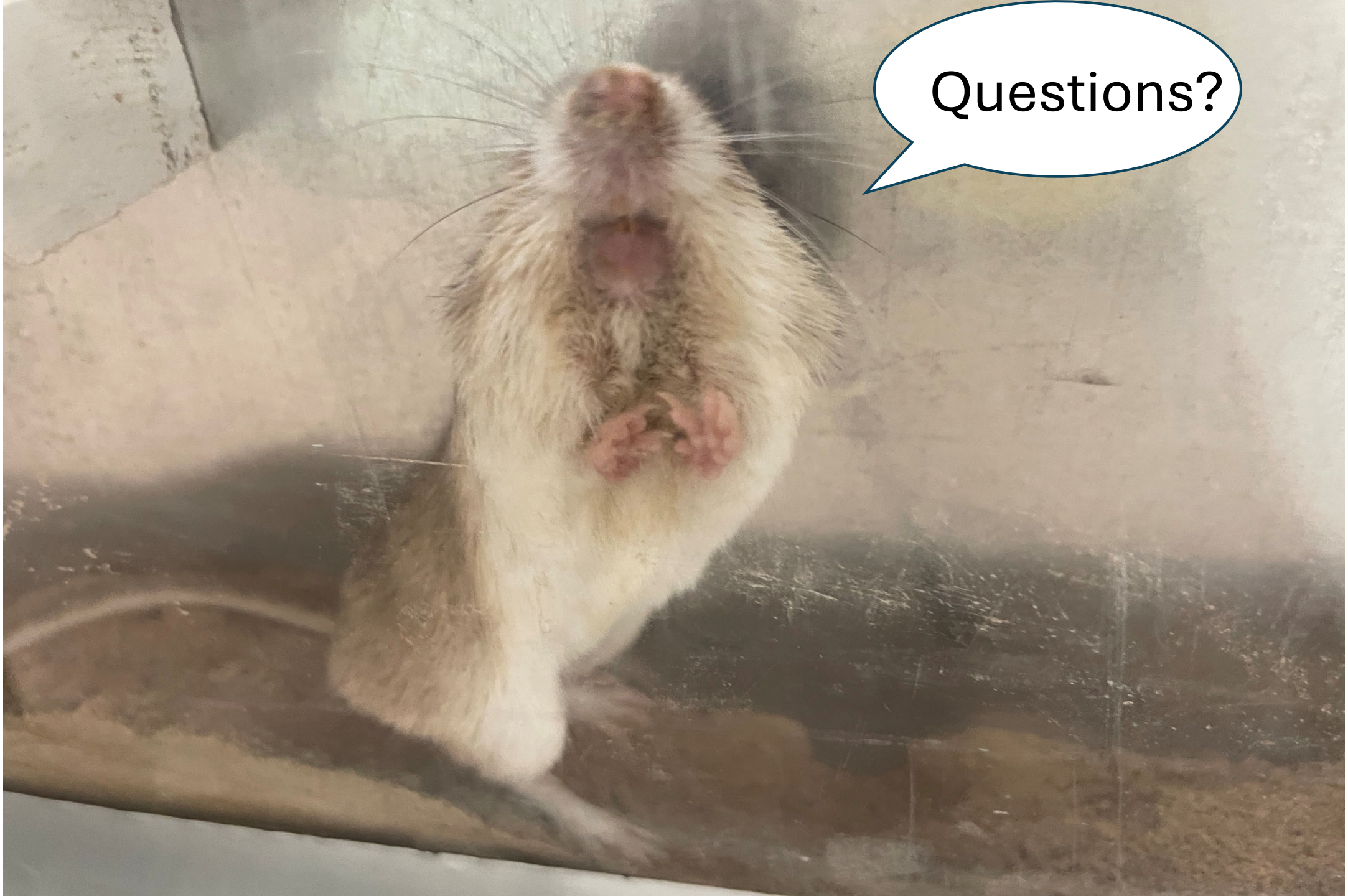
Preliminary Results

- At low humidity water loss is significant especially at higher temps



Discussion

- Energetic costs
  - Upper critical temp ~35C
    - Above this they spend energy and water trying to thermoregulate
  - At 37C see physiological signs of heat stress
    - Begin hyperthermia within 1hr
  - At low temps animals regularly use torpor
    - This can save energy and water
- Future
  - Connect lab measurements to field
  - Integrate body temp, VCO_2, and WVP
  - Calculate cost and risk of different future predictions


Questions?