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Using the Stress Response Along an Elevational Gradient to Understand Habitat Suitability of the Southern Gray-cheeked Salamander, Plethodon metcalfi

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A Question of Climate

Does stress vary predictability with environmental variables?

Introduction

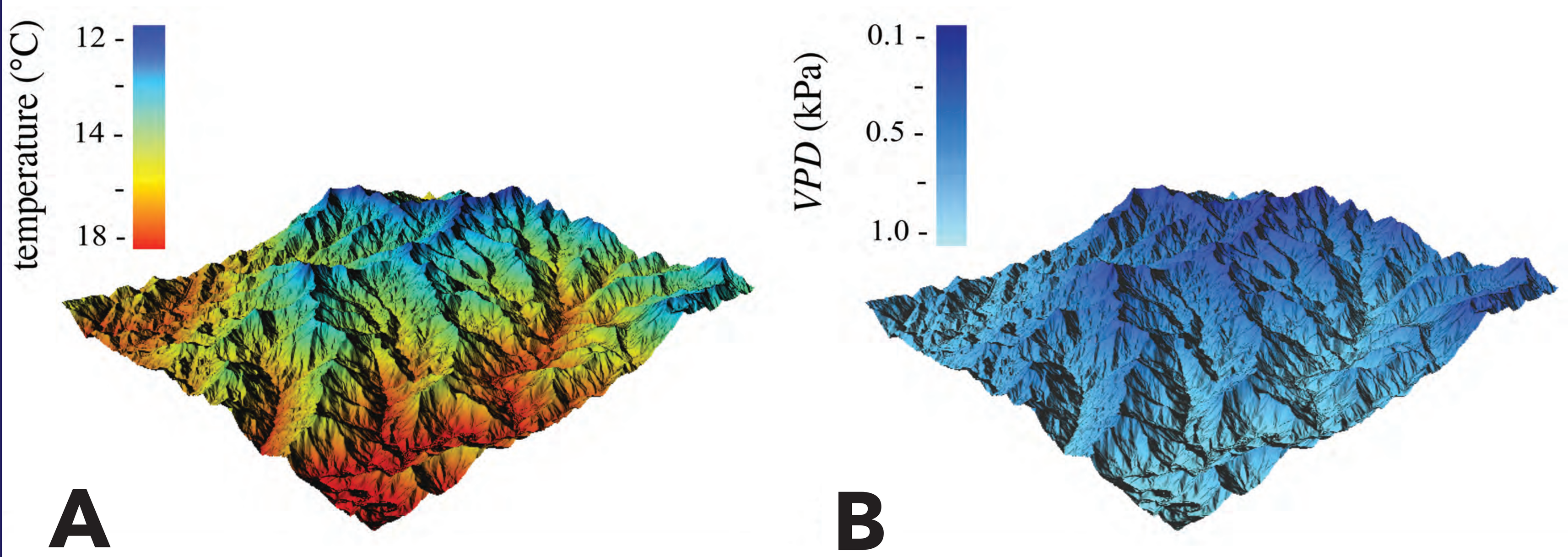


Figure 1. Temperature decreases with elevation (A), and vapor pressure deficit (VPD) decreases with elevation (B)

- Temperature and humidity (vpd) interact to determine the amount of time a salamander can be active

- Stress responses may mediate how organisms react to their environments

- Plethodontid salamanders obtain oxygen through cutaneous respiration

- Gas exchange must occur across a moist barrier

- Terrestrial salamanders seek moist micro-habitats

- We performed a reciprocal transplant study to analyze how stress varies along natural hydrothermal gradients

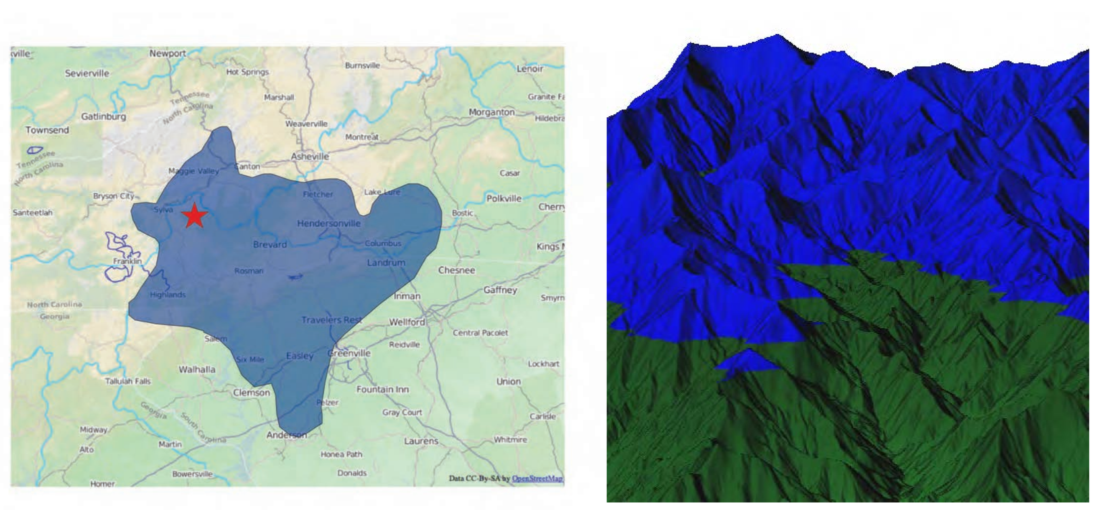
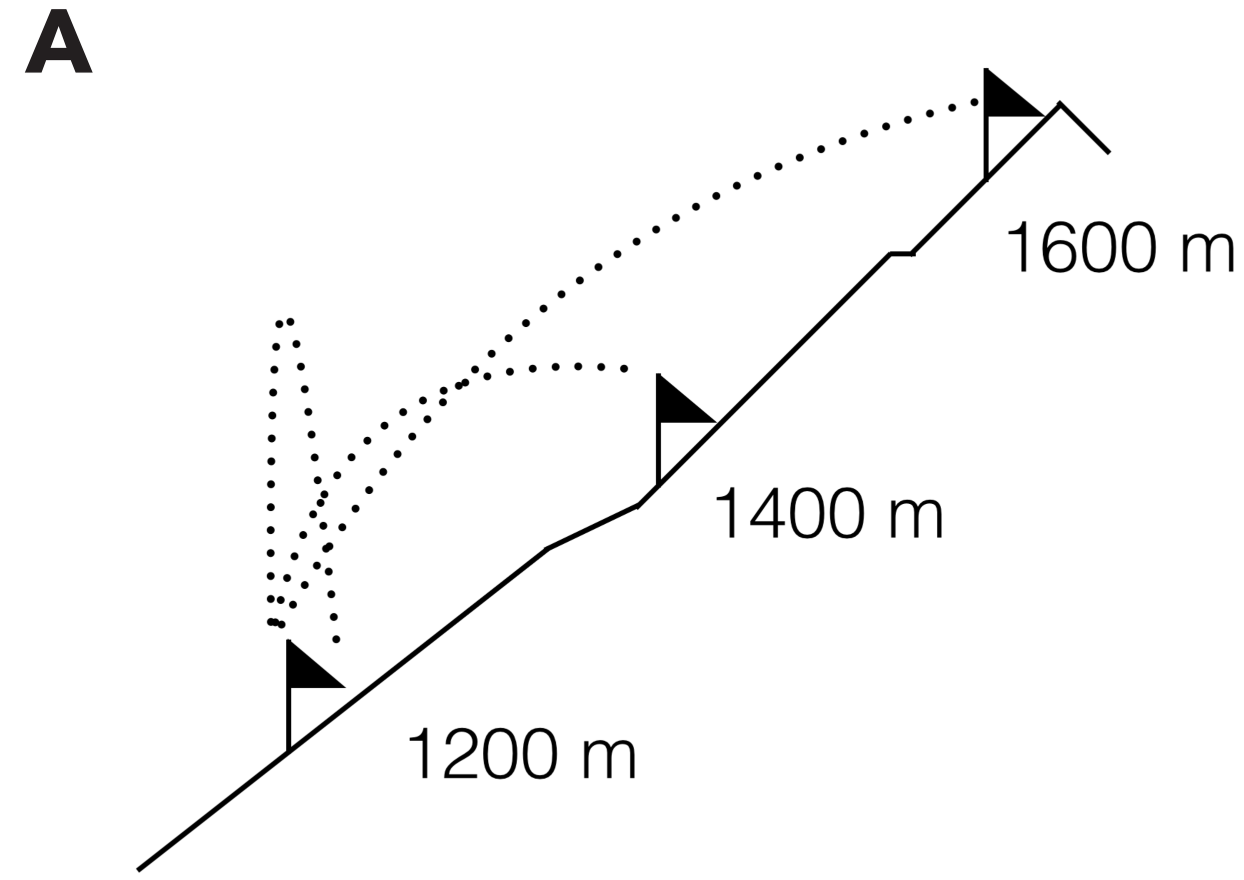


Figure 2. Map of species geographic and elevational range

Methods



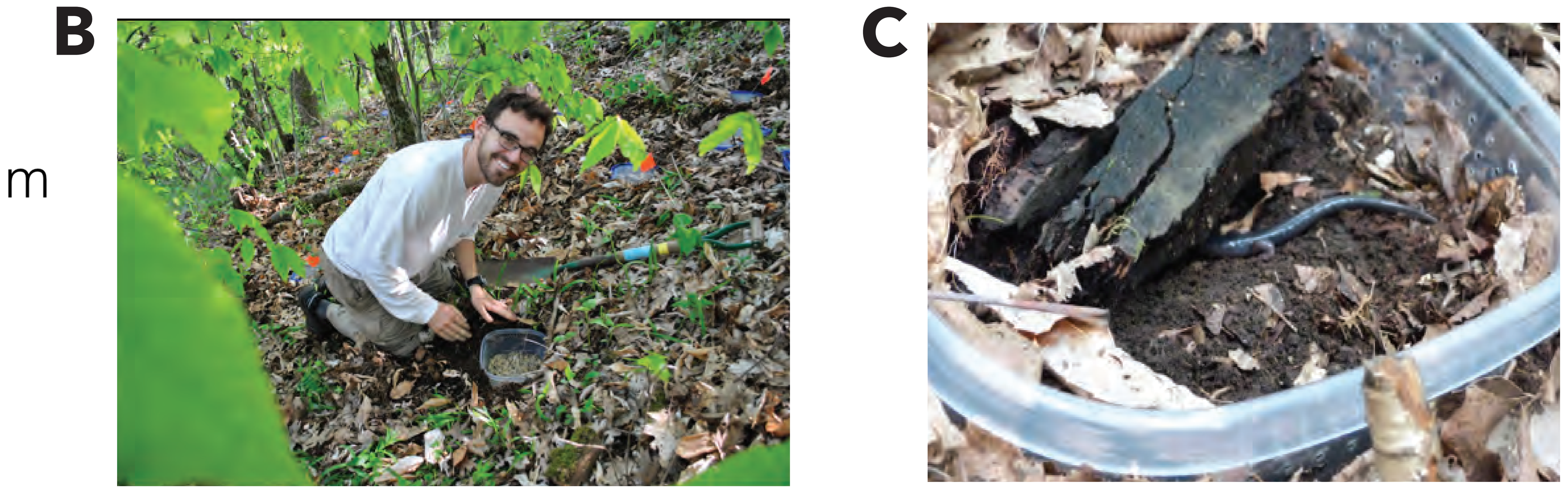


Fig 3. Diagram showing reciprocal transplant design (A), photo of enclosure placement in natural *Plethodon* habitat (B), photo of salamander enclosure (C).

Results

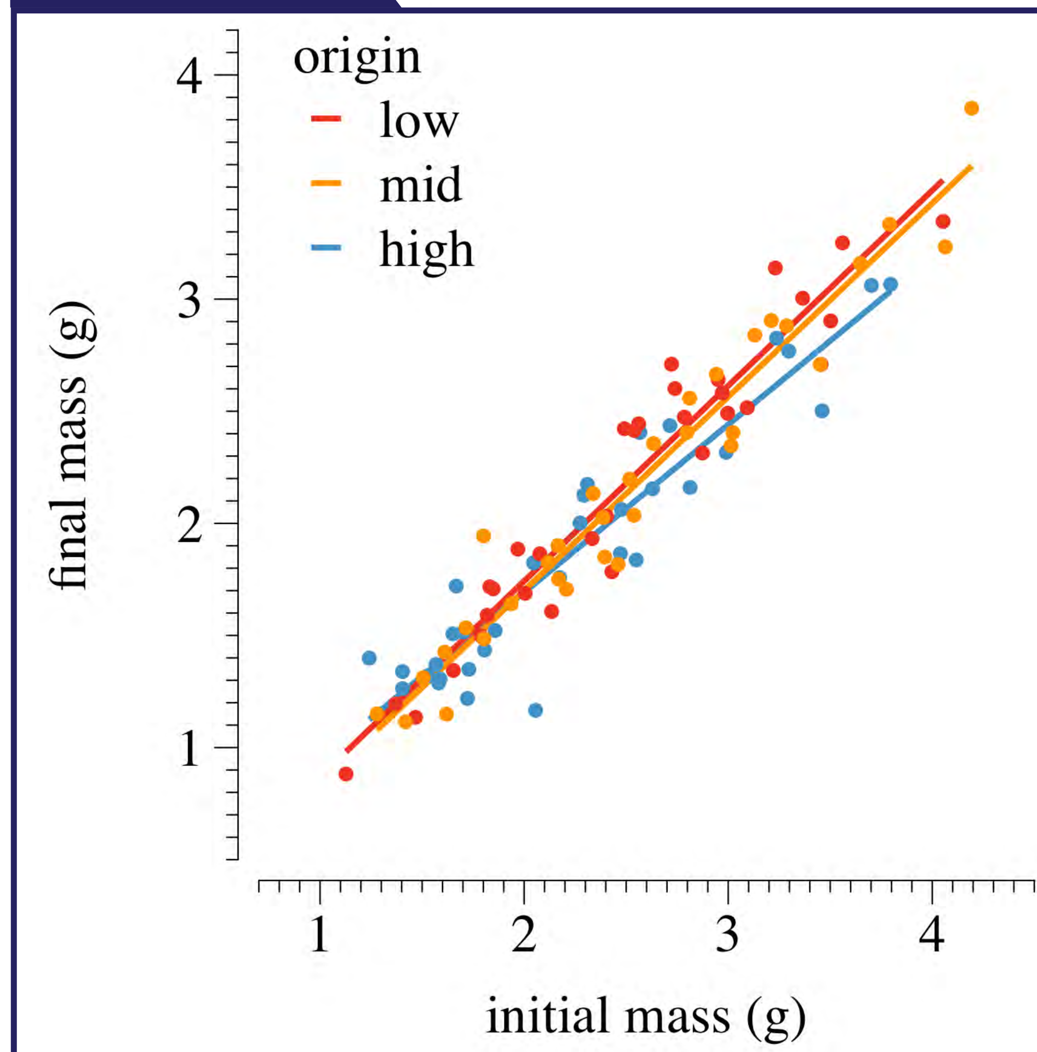


Figure 4. Individuals originating from high elevations lost the most mass (df = 2, p = 0.04, η^2 = 0.05).

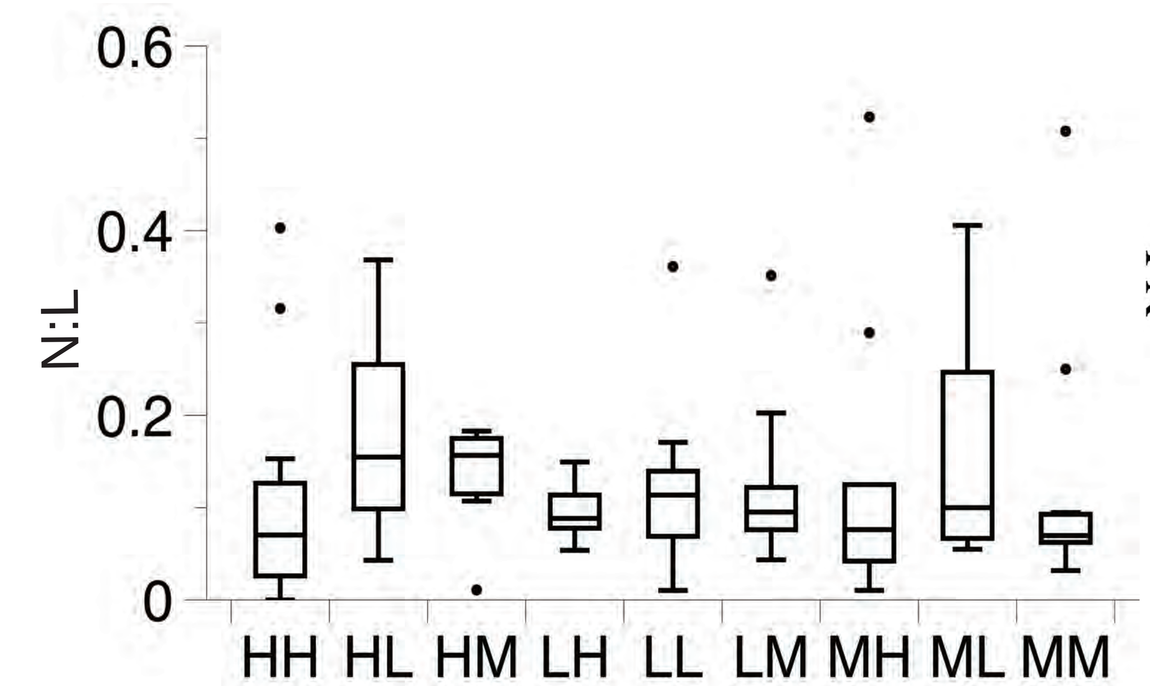


Figure 5. Increased variation of individuals moved to low elevation sites (df = 8, p = 0.8, η^2 = 0.05)

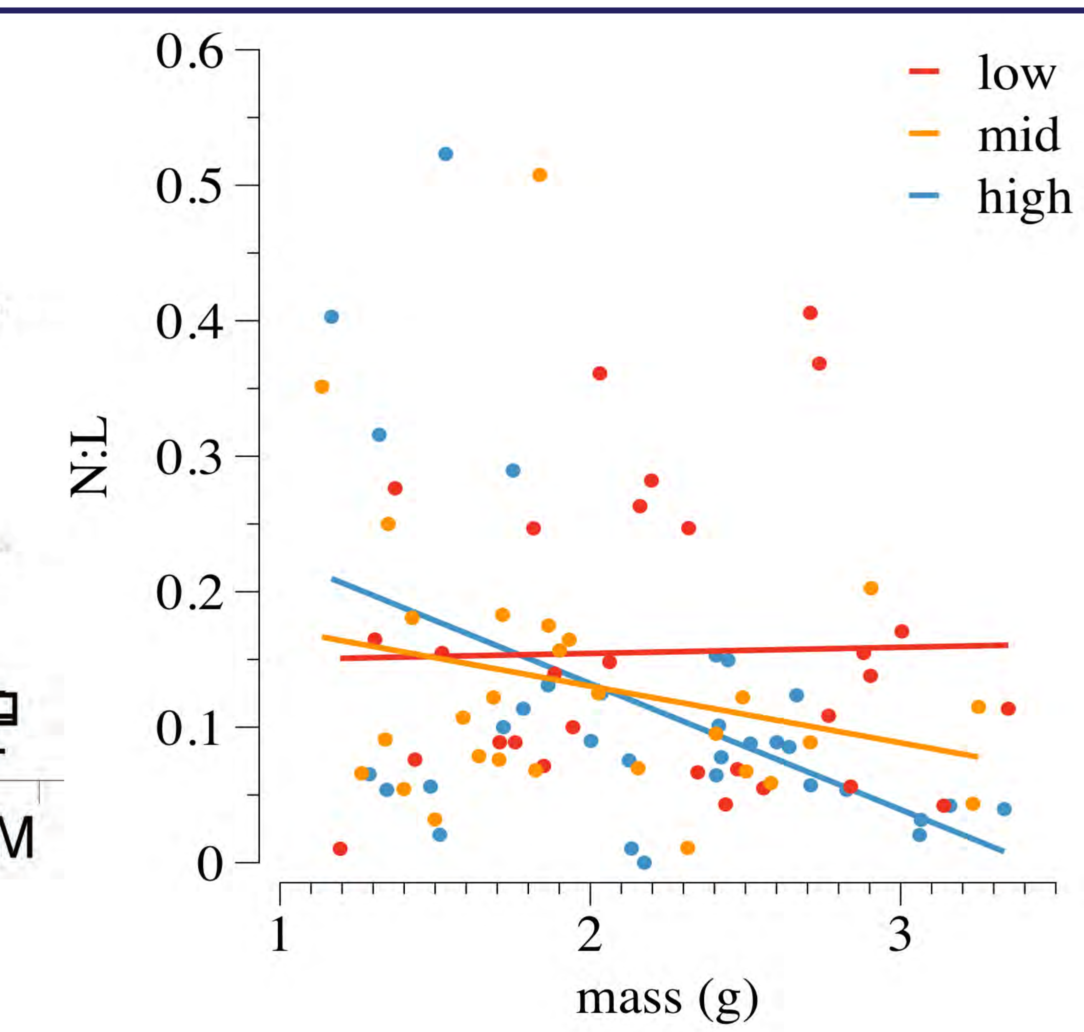


Figure 6. Large individuals were less stressed high elevations compared to low elevations (df = 2, p = 0.1, η^2 = 0.05).

- Changes in mass varied significantly depending on the elevation individuals were collected from, where individuals collected from high elevation sites lost the most mass.

- Stress and mass may interact where larger individuals are less stressed in more suitable habitats denoted by increases in elevation.

Conclusions and Future Directions

- Changes in mass differ significantly depending on initial collection site and treatment site, suggesting that energy allocation regimes may differ with the environment.

- Although we did not see any significant differences in stress responses, future studies may reveal relationships between stress and mass.

HIGHLANDS BIOLOGICAL STATION

CLEMSON UNDERGRADUATE RESEARCH