Environmental and genetic contributions to ecogeographic rules in house mice

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Running title: Allen's rule and Bergmann's rule in house mice

Abstract (200 words)

Introduction

Materials and Methods

Results

1. Stonger evidence for Bergmann's rule (Figure 1A) than Allen's rule (Figure 1B) in wild-caught American house mice.

2. Clear genetic basis for Bergmann's rule (Figure 2A) but not Allen's rule (Figure 2B) in New York and Brazil house mice.

3. Developmental plasticity plays a signficant role in "shaping" Allen's rule (Figure 3B) in American house mice.

4. Evidence for adaptive plasticity in tail length (Figure 4B).

Discussion

Figures & Tables

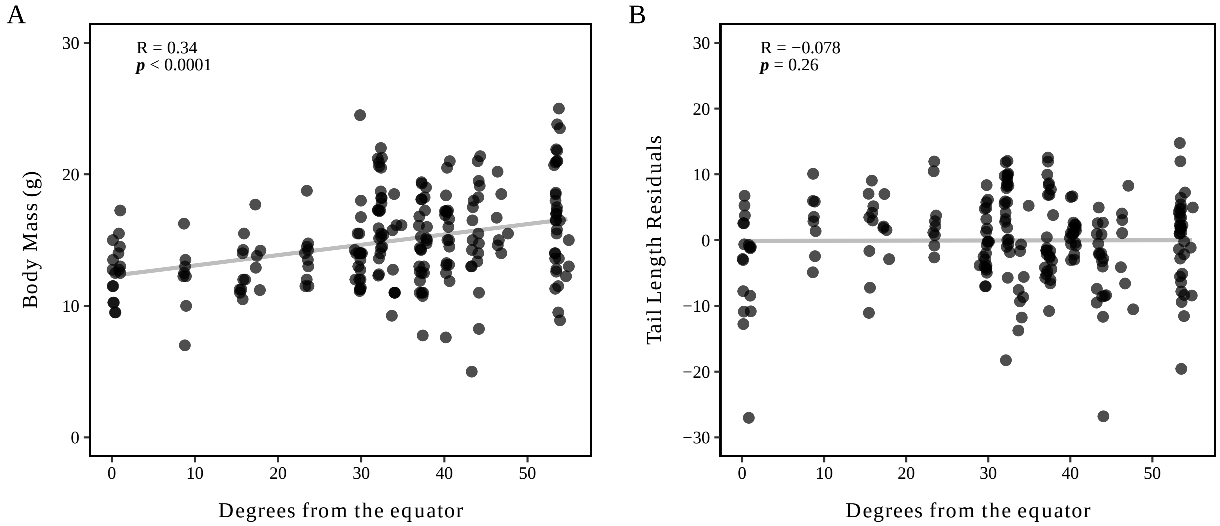

Figure 1. The relationship between body weight, tail length, and absolute latitude in North and South American house mice. Significant coorelation between body mass (A) and latitude, but not tail length (B) and latitude in wild-caught house mice. Tail length residuals were calculated by regressing tail length from body mass. Both plots include males and females, with individuals represented as individual point. Results from Spearman correlations are presented in each plot. Sample sizes: (A) n = 215; (B) n = 212.

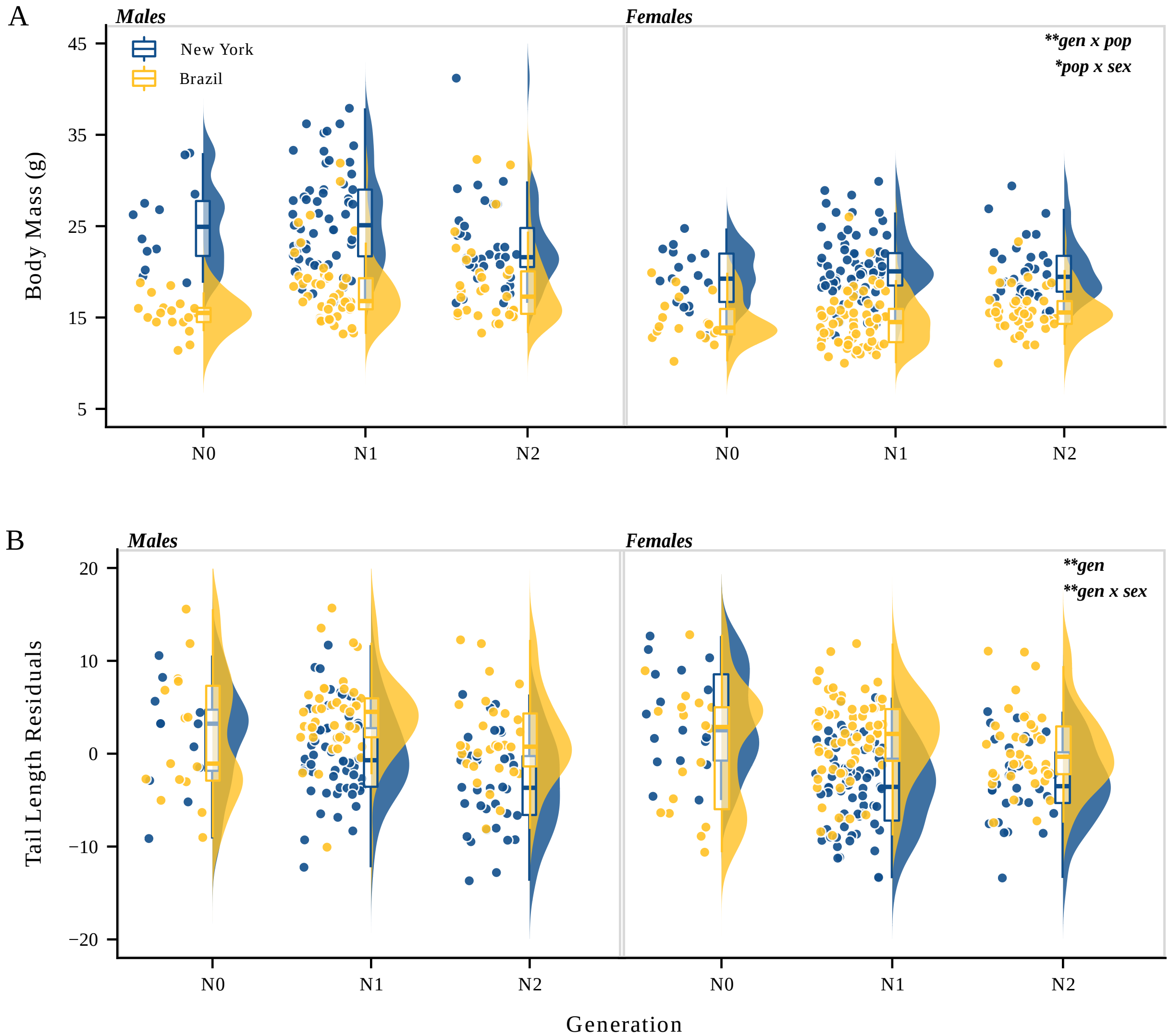

Figure 2. Body mass and tail length differences between populations and across generations in a common lab environment. Body mass differences among populations persist over two generations in lab (A), indicating a genetic basis. No clear differences in tail length (B) are seen between populations, suggesting the inherent "plastic"/"noisy" nature of tail length. Tail length residuals were calculated by regressing tail length from body mass. Population-level data are depticted as boxplots overlayed on density plots, with boxplot vertical lines denoting 1.5x the inerquartile range. Individuals are represented as individual points. Results from linear mixed models are presented in each plot. Only signifiant interactions are depicted in (A). Sample sizes: (A) n = 438; (B) n = 427. **P*<0.05, ****P* <0.01.

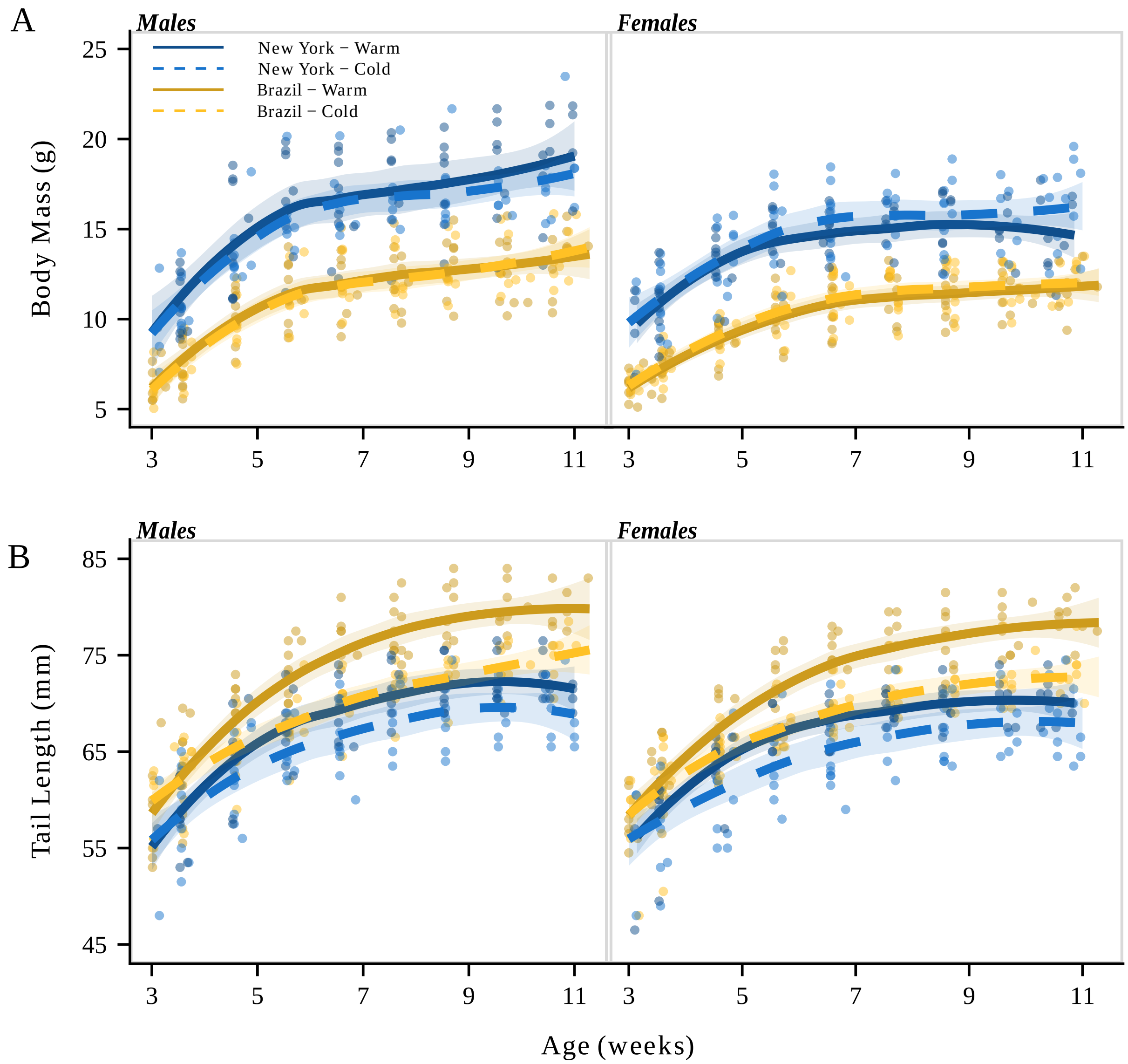

Figure 3. Body mass and tail length growth trajectories across environments. Cold temperatures have very little influence on overall body mass in New York and Brazil house mice (A). Tail length is highly influenced by cold temperatures, with cold-housed mice growing shorter tails compared to warm-housed mice (B). Both New York and Brazil house mice show plasticity in tail length across development. Individuals are represented as individual points (n = 80), with population means depicted as smoothed regression fits, with standard error shading.

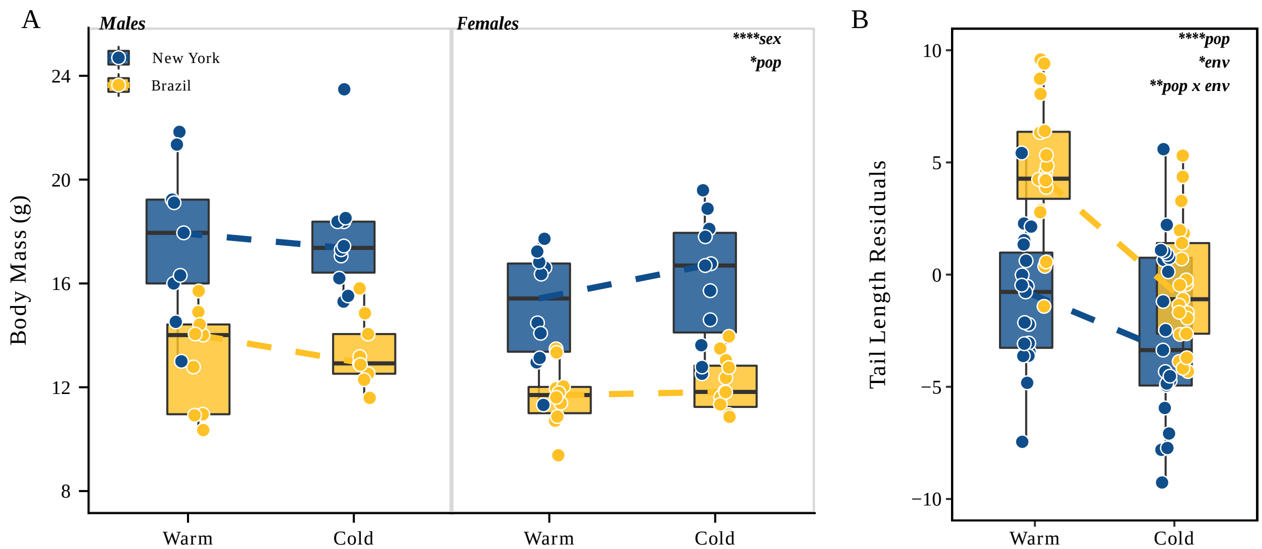

Figure 4. Evolved and plastic phenotypic variation among New York and Brazil house mice. Very little plasticity in body mass in New York and Brazil house mice (A). Tail length is highly plastic in both populations, with tails growing shorter in the cold (B). Brazil house mice show adaptive plasticity in tail length. Tail length residuals were calculated by regressing tail length from body mass. Vertical lines on boxplots denote 1.5x the interquartile range. Individuals are represented as individual points (n = 80). Results from linear mixed models are presented in each plot, with the following significance levels: *P<0.05, **P <0.01, ***P <0.001, ****P <0.0001

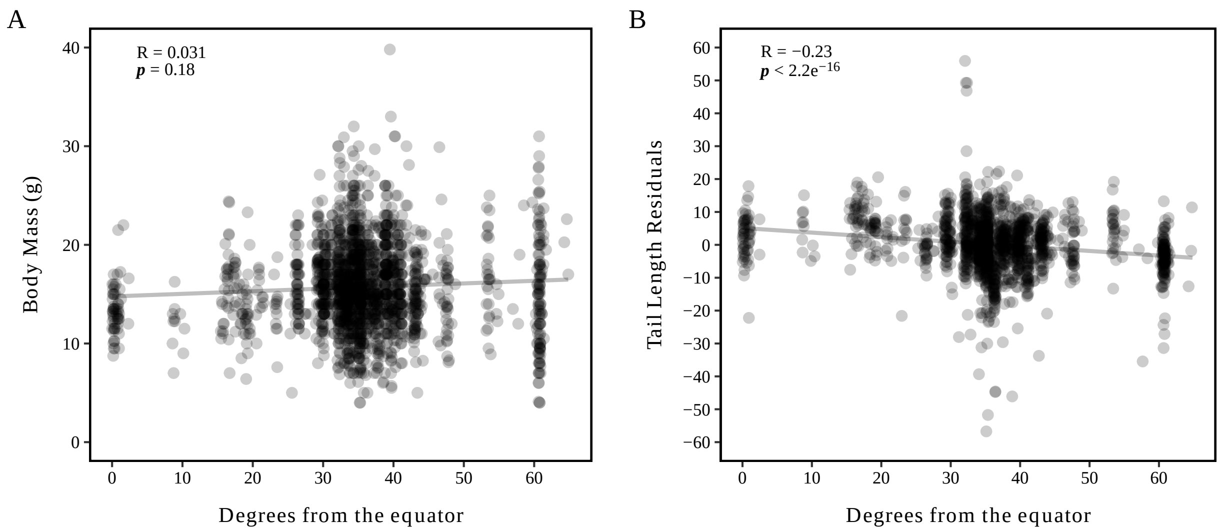

Figure S1. Bergmann's rule and Allen's rule using VertNet metadata.

Acknowledgements

References