Multivariate analyses of cranial morphology inform the taxonomy and evolution of geomyoid rodents

DEPARTMENT OF EVOLUTION, ECOLOGY, & ORGANISMSAL BIOLOGY

Introduction

Lily Noftz, Calede Lab, The Ohio State University

Hypothesis

(1) There are statistically significant differences in cranial shape and size between families, genera, and species of geomyoid rodents (the group that includes Geomyidae and Heteromyidae).

(2) Cranial morphology is effective at categorizing specimens into taxonomic units.

Material & Methods

Landmarks on the dorsal, ventral, lateral, and occlusal views of the skull, used for 815 specimens

Results

Results for the principal component analyses at the family, genus, and species levels

Discussion

- The main axis of variation (PC1) differentiates between the two families with no overlap.
- Heteromyidae had high PC1 scores for MAW, RW, and MRD, while Geomyidae had high scores for MANL, DM2, DMND, LD, and LDL.
- The family Heteromyidae shows more variation along PC2 than the family Geomyidae.
- The seven genera of Geomyidae overlap more than the Heteromyidae do.
- Heteromyidae genera have overlapping DM2 PCA scores, whereas Geomyidae have overlapping PCA scores for RW, and MANL.
- The PC1 scores for the species within the two families are significantly different.
- Family-level identifications correct nearly 100% of the time.
- Geomyid genera have lower classification percentages than heteromyid genera. Within geomyids, Zygogeomys is most often correctly identified.
- Within Heteromyidae, Dipodomys is the most accurately classified genus.
- CVA shows that cranial morphology can differentiate between the species, within both families.
- Multivariate coefficients of variation show more variation among Heteromyidae than Geomyidae.

Future Work

- Further collection of dataset
- Assessing allometric patterns using phylogenetic generalized least squares analysis
- Identify size, shape, and allometric patterns
- Conover’s squared ranks test, finding differences in multiCV values at the family, genus, and species level
- Work towards publication

References