Osteological identification and morphological comparison of extant Sciurids

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INTRODUCTION

Different bone elements reveal varying characteristics, so it is best to analyze overlapping elements between and among taxa when drawing comparative conclusions. Fossorial animals generally present robust skeletons, strong scapular girdles, short fore- and hind limbs, and prominent attachment sites for muscles (Montoya-Sanhueza and Chinsamy 2016). Contrarily, cursorial animals present more gracile forelimbs to account for a relatively more biomechanically active terrestrial lifestyle (Elissamburu and De Santis 2011).

QUESTIONS

1. **What two taxa are present for morphological comparison?**

2. **How do their morphological structures differ in relation to their locomotory patterns?**

STUDY SYSTEMS

Rodents from the family Sciuridae were opportunistically collected (e.g., pre-deceased) from private land in Dallas, Pennsylvania during Summer-Fall 2022.

Figure 1. Geographic map of Pennsylvania denoting the location of Dallas.

Figure 2. *Tamias striatus* on the left and *Marmota monax* on the right.

Marmota monax (groundhog) and *Tamias striatus* (chipmunk) are the two taxa found in northeastern Pennsylvania. *Tamias striatus* is a cursorial and fossorial animal and *Marmota monax* is a fossorial animal.

MATERIALS AND METHODS

Mechanical Cleaning

Figure 3. The bones will be cleaned using manual tools (e.g., tweezers, toothbrush) and water to remove excess debris.

Fat Removal and Bleaching

Figure 4. To remove fat that is naturally stored in the yellow marrow cavities, the bones were degreased through a series of submersions using Dawn dish soap. These submersions lasted 24hours. Lastly, the bones underwent a bleaching treatment using hydrogen peroxide to increase clarity of exterior bone morphology. The hydrogen peroxide was at 3% concentration.

Identification

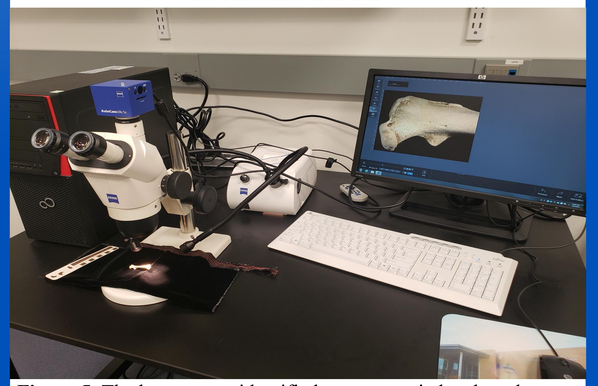

Figure 5. The bones were identified to taxonomic level on the basis of their external morphology using primary literature (France 2009, 2017). They were then evaluated under a microscope and captured as a photograph on a computer.

RESULTS

Femora

Figure 6. Microscopic imaging of femora. *Marmota monax* is on the left and *Tamias striatus* is on the right. The groundhog had larger trochanters on both femora relative to the chipmunk

Tibiae and Fibulae

Figure 7. Microscopic imaging of tibiae and fibulae. *Marmota monax* is on the left and *Tamias striatus* is on the right. The chipmunk exhibited fusion of its tibia and fibula distally.

Humeri

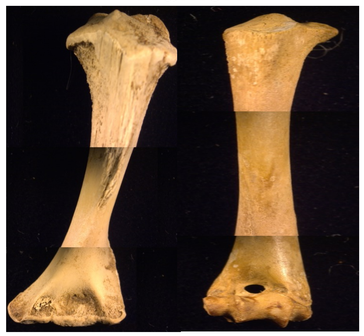

Figure 8. Microscopic imaging of humeri. *Marmota monax* is on the left and *Tamias striatus* is on the right. . The distal epiphysis of the groundhog were more robust and had more defined olecranon fossae.

DISCUSSION

1. What two taxa are present for morphological comparison?

Morphological identification revealed a species with more robust features and one with more gracile features demonstrating differentiating patterns consistent with fossorial and cursoriality lifestyles for the respective taxa. Another miscellaneous taxa was present in the sample and believed to be a *Peromyscus maniculatus* (deer mouse).

- **The two taxa present for morphological comparison are *Marmota monax* and *Tamias striatus.***

2. How do their morphological structures differ in relation to their locomotory patterns?

Robust limbs allow for the groundhog to better withstand biomechanical strains such as compression and bending. A robust limb is then less and will not deteriorate and fracture when undergoing more than intermittent digging. The limbs of cursorial animals are also elongated allowing for longer strides, which equates with faster sustained speeds. Additionally, the groundhog epiphyses were more porous than expected for an adult, perhaps indicating a juvenile nature.

- ***Marmota monax* showed more robust features and *Tamias striatus* showed more gracile features.**

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