Evolution of tooth morphology in Mylagaulidae

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1. Introduction

Mylagaulidae:

- Characteristic of Miocene faunas
- Burrowing rodents
- Hypsodont (high-crowned) teeth like horses
- Include the only horned rodents

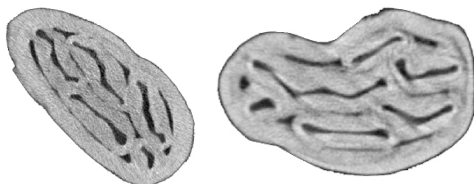- Wear of the teeth leads to enamel lakes on the surface

National Museum of Nature and Science, Tokyo
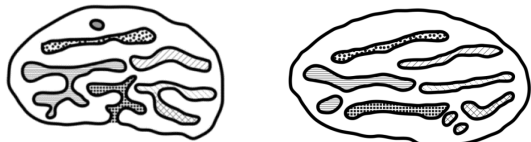
Hypothesis:

We will see changes in tooth morphology, in particular increased amounts of enamel with drier environments.

2. Materials and Methods

X-ray micro-computed tomography:

- Used to view changes in tooth morphology.
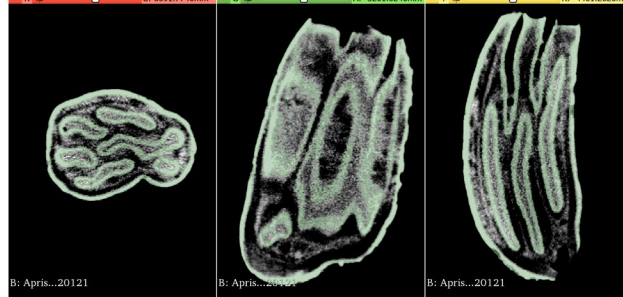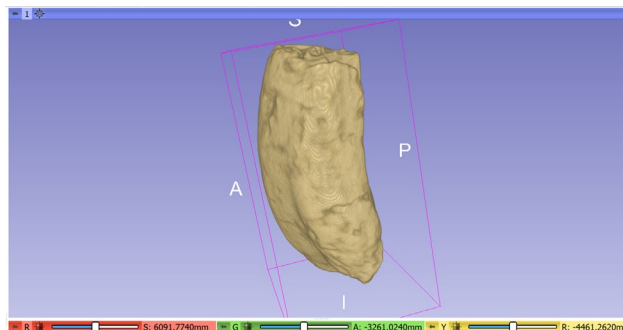- Can view the entire tooth without damaging it.

NRRD Files:

- Use the x-ray micro-computed tomography images in a program called Fiji to make NRRD Files.
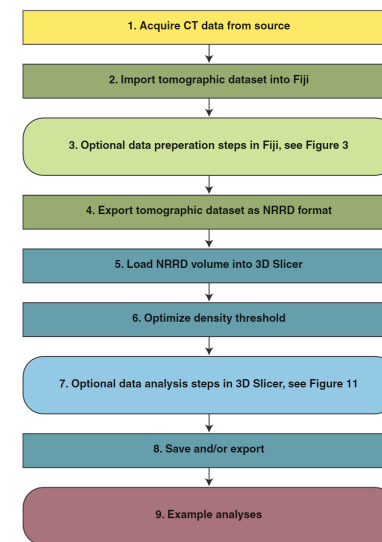- A total of 53 NRRD files made so far.

3. 3D Slicer Program

- Enables us to make 3D models of x-ray micro-computed NRRD files.
- We use these 3D models to view the entire tooth and see the shape.
- Shown below is a view of a 3D image in slicer. The images on the bottom are images of the scans used to make the 3D model. These scans are edited to allow us to improve the quality of the 3D model.
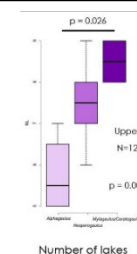

4. Summary

Below is a good summary of the process used in making a single 3D model.

1. Acquire CT data from source
2. Import tomographic dataset into Fiji
3. Optional data preperation steps in Fiji, see Figure 3
4. Export tomographic dataset as NRRD format
5. Load NRRD volume into 3D Slicer
6. Optimize density threshold
7. Optional data analysis steps in 3D Slicer, see Figure 11
8. Save and/or export
9. Example analyses

(Buser et al. 2020)

5. Preliminary Results

With the given research so far, evidence shows that an increase in the number of lakes as well as volume, thickness, and complexity of enamel are consistent with an increasingly open

Number of lakes

6. Acknowledgments and References

Buser, T.J., Boyd, O.F., Cortes, A., Donatelli, C.M., Kolmann, M.A., Luparell, L.J., Pfeiffenberger, J.A., Sidlauskas, B.L., Summers, A.P. (2020) The Natural Historian's Guide to the CT Galaxy: Step-by-Step Instructions for Preparing and Analyzing Computed Tomographic (CT) Data Using Cross-Platform, Open Access Software. *Integrative Organismal Biology.* 1-28.