Documentation of Hadrosaurid Humeri from the Liscomb Bonebed, North Slope, Alaska Prior to Histological Sectioning

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INTRODUCTION

Proper documentation of research specimens is a crucial component that must be completed prior to histological sectioning. Since specimens are unique and irreplaceable, documentation provides information that may later be unobtainable after sectioning, due to the inherent nature of the technique having to permanently alter the specimen. The hadrosaurid dinosaur, the *Edmontosaurus,* has an abundant fossil record, which can be partly attributed to being gregarious, and therefore preserves multiple monodominant bonebeds and several dozen associated skeletons across North America. This makes *Edmontosaurus* an ideal taxon to use for life history studies.

However, previous *Edmontosaurus* bonebeds have only preserved specimens of size classes that were two years of age or older (Wosik et al., 2020; Wosik & Evans, 2022). The Liscomb Bonebed from the Prince Creek Formation of the North Slope of Alaska provides a potential avenue to help complete this early ontogenetic gap. This bonebed preserves individuals that align with the hypothesized yearling size class (Wosik et al., 2020; Wosik & Evans, 2022), and provide a rare opportunity to study the early ontogeny of *Edmontosaurus.*

The aim of this project is to record the specimens chosen for histological sectioning. After documentation, these specimens will undergo histological sectioning to analyze their bone microstructure. This analysis aims to yield individual age data for each specimen, contributing to testing the hypothesis of the Liscomb Bonebed preserving yearling-aged individuals.

OBJECTIVE

- The task was to model *Edmontosaurus* humeri, documenting the specimens prior to histological sectioning as they will be permanently altered.

QUESTION

- Does photogrammetry accurately convey the characteristics and dimensions of a specimen, providing appropriate documentation?

BACKGROUND

In a collection of bonebeds along the ocean point area of artic Alaska, exists the Liscomb Bonebed. This bonebed is in the Prince Creek Formation of the North Slope, Alaska (Gangloff & Fiorillo, 2010).

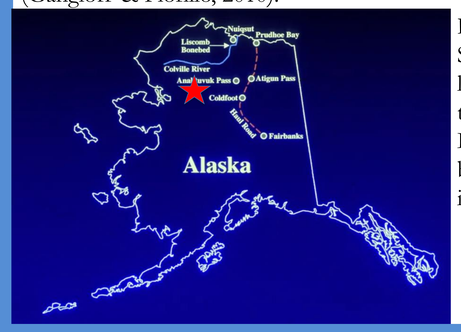

Figure 1. Specific location of the Liscomb bone bed in Alaska

MATERIALS AND METHODS

- Nikon Camera
- Adobe Photoshop
- Angisoft PhotoScan
- *Edmontosaurus* humeri (4)

Figure 2. Dorsal view of DMNH 2014-12-450

Figure 3. Ventral view of DMNH 2014-12-450

Figure 4. Distal view of DMNH 2014-12-450

Took multiple photos of specimens → Edited photos in Adobe Photoshop → Edited photos in Angisoft PhotoScan and created masks → Combined masks to create various model types

RESULTS

By creating masks, various tests were enabled to be run. In sequential order, tests consisted of sparse cloud, dense cloud, mesh, and finally texture as the final product. The sparse cloud aligned numerous specimen photos of varying views through the connection of points from these photos. The dense cloud filled in the gaps of the specimen in the sparse cloud. The mesh covered any holes and prepped the run of the texture test. The texture test depicted the visual surface features of the specimen including raised texture and areas of depression.

Figure 5. Cropped image of *Edmontosaurus* humeri

Figure 6. Mask of *Edmontosaurus* humeri

Figure 7. Sparse cloud of *Edmontosaurus* humeri

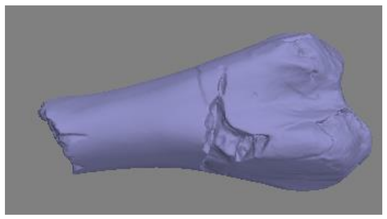

Figure 8. Mesh of *Edmontosaurus* humeri

Figure 9. Dense cloud of *Edmontosaurus* humeri

Figure 10. Texture implication on *Edmontosaurus* humeri as a final result

DISCUSSION

Photogrammetry is suitable for effectively recreating fossil specimens in a 3-dimensional form. It displays multiple characterics of the original specimens, allowing this method to be ideal for documentation. It captures the specimen's dimensions, accurately copying its structured formation. Measurements of the model can be collected through scaling factors added into Agisoft PhotoScan, correlating with the dimensions of the physical specimen. Although Angisoft Photoscan captures most features, some areas had issues in the recreation of complex features. There were problems with the overlap of surfaces, not depicting the entire structure and leaving holes. These issues were mitigated with additional photos, providing increased points of connection for the software's formation of the model. Minute, fine detailed surface features that were not depicted through photogrammetry, can be obtained from the publication photos as seen in Figures 2-4.

Due to the photogrammetry model, and publication photos, specimen information is readily accessible. Increased studies can therefore be performed after the specimen is permanently altered. Specimen data can be shared and sent to others without access to the physical specimen as well.

- Yes, photogrammetry displays most of the features of a specimen, outlining numerous details and depicting its dimensions. Documentation of specimens can therefore be completed as photogrammetry creates copies of the specimens.

FUTURE RESEARCH

- Histologically section *Edmontosaurus* humeri
- Assess bone structure and features
- Compare yearling-sized *Edmontosaurus* growth data with those *Edmontosaurus* of other ages, providing evidence that these specimens are truly those of *Edmontosaurus* yearlings
- Classify hadrosaur yearlings, placing them into the ontogenetic sequence of *Edmontosaurus*

ACKNOWLEDGEMENTS

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