Sacha Sides

FMUIP – End of Semester Internship Report

Vertebrate Paleontology

Project overview:

This semester, Dr. Bruce MacFadden and Rachel Narducci served as my mentors within the Vertebrate Paleontology department. When I began the FMUIP, I had no experience in paleontology or museum work. I knew I was passionate about research when I began the FMUIP, but I had previously only participated in wet laboratories or worked with imaging data. I wanted to understand vertebrate paleontology, both from a professional (i.e. career opportunities, day-to-day work) and academic (i.e. research topics and methods) sense. I wanted to take advantage of the immense number of resources available through the Florida Museum, and to see how the work of curatorial and collections staff culminated into the public-facing side that I was familiar with.

During the first week of classes, I met with my mentors and discussed my goals and questions about the program. When asked about my research interests, I expressed interest in studying functional morphology and evolutionary anatomy after completing my bachelor's. Together, we developed my project for the semester, which would utilize my past coursework in osteology to explore my research interests within a museum setting. For my project, I would help advance the VP collections by identifying the incoming and past-accumulated fossils so they may be accessioned properly into the system. I would identify these fossils by discerning their bony element and region (e.g. "femur, proximal" or "radius, distal"), side (right or left), taxon, and any additional

information that I may have noted during my examination (e.g. pathologies or juvenile epiphyses). Collectively, we decided that I would spend an estimated 60% of my time during my internship working on this project. I had also hoped to learn about the museum setting itself, and to gain a proper understanding of curatorial processes and day-to-day tasks of museum staff. We decided that the other 40% of my time during my internship would be dedicated for me to develop new skills and learn more about collections practices. This could include time spent studying the Nebraska collection itself, or being trained on different tasks that are performed by curators for museum upkeep. At the conclusion of my internship, I wanted to be able to describe the story of a fossil, beginning immediately post-excavation and continuing all the way through to their physical entry into the collections.

Summary of activities:

When working on my project, I learned how to perform comparative osteology to identify and label new fossils for their entrance into the collections. I would begin this by pulling out the tray of fossils that I had been working on at the end of the previous workday, or by checking in with my mentors to see if they had new trays for me. I would go through the fossils on them one by one, and first identify what bone or bone fragment I was looking at. For long bones, scapulae, and vertebrae, this was typically an easy task. This first step quickly became more challenging when looking at the morphologically diverse small bones of the wrist and ankle. These carpal and tarsal bones demonstrated immense variety in size and shape, with many sporting entirely new articular facets or oddly-shaped processes that made them difficult to identify – especially fragmented.

Once I had guessed the element (e.g. "[promixal/distal/shaft] Radius," I would then attempt to discern what taxon – or range of taxa – the fossil could fit. For example, medium-large sized animal bones would typically suggest to me that the fossil might be from the *Merycoidodontidae*, or oreodont, family. If the bones seemed to fit Artiodactyla (even-toed ungulates), but were significantly smaller than those of the oreodonts, I might begin by comparing the element with *Leptomeryx* (a smaller, deer-like animal). Tiny bones would typically match within Rodentia (rodents) or *Palaeolagus* (lagomorphs). I would confirm my hypotheses regarding the taxon/element of my unidentified fossil by pulling comparative materials from the collections. Size was certainly a useful tool for narrowing down my list of potential specimens for each fossil, but it did not tell the whole story. I could not rely on it to accurately reflect or discern individual variation. It was more important for me to compare anatomical features, like the shape of articular facets or the presence of fusion(s) at tibiofibular/cubonavicular/metapodial/phalangeal joints, to complete my assessment. Once I had confirmed the taxon of my fossil by using a comparative reference, I would side the element and record all this information beside the specimen.

Outside of my project, I gained many new skills in labeling, preparing, and organizing fossil collections. I learned how to properly write on specimens, so they do not get lost within the collection – even if they get mistakenly separated from their box. I learned about how archival standards have changed over time, and reorganized many specimens into standard-grade boxes to help preserve them. Additionally, I learned about the collection itself, and became familiar with paleontological literature regarding the geologic periods and the species I was encountering.

I also worked on organizing and sorting the Nebraska collection, which had previously been organized by geologic period (each taxon being separated into Chadronian, Orellan, or Whitneyan elements). This was a less efficient method of organization, and made it far more time-consuming to access the fossils and navigate the collection. The goal over the course of the semester was to attempt to re-organize this system simply by taxonomic classification. Significant progress was made, primarily due to the time contributions of my peers, museum volunteers, and myself. It seems likely that the collection will be completed up to 2021 by the end of the year. I was also able to use my experiences in navigating the collections (for my project) to inform the new layout decisions, which felt very rewarding.

Next steps

During my time spent working in the collection, I gained an appreciation for the morphological traits that were particularly diagnostic when identifying fossils. This was especially evident when studying bones contributing to the talocrural, or ankle, joint: the distal tibia and the astragalus (and rarely the distal fibula as well). This region is highly influenced by the locomotor behavior of the animal, with the shape of the articulating surfaces facilitating or restricting movements across different anatomical plans. Whereas taxonomic classification of a species might not be immediately possible when studying most bony elements, astragali can serve as immediate keys into a fossil's identity.

This semester, I am taking a course titled ZOO4926: CT for Biologists, which provides students with formal equipment training at the Nanoscale Research Facility and experience in 3D imaging methods. This course also assigns a final project, wherein students are expected to carry a specimen(s) through the full process of visualization –

from personally scanning materials all the way through the production of a 3D model. I was inspired by the materials of the Nebraska collection, and I chose to scan 5 astragali from 5 different Nebraskan species to scan and model for this project.

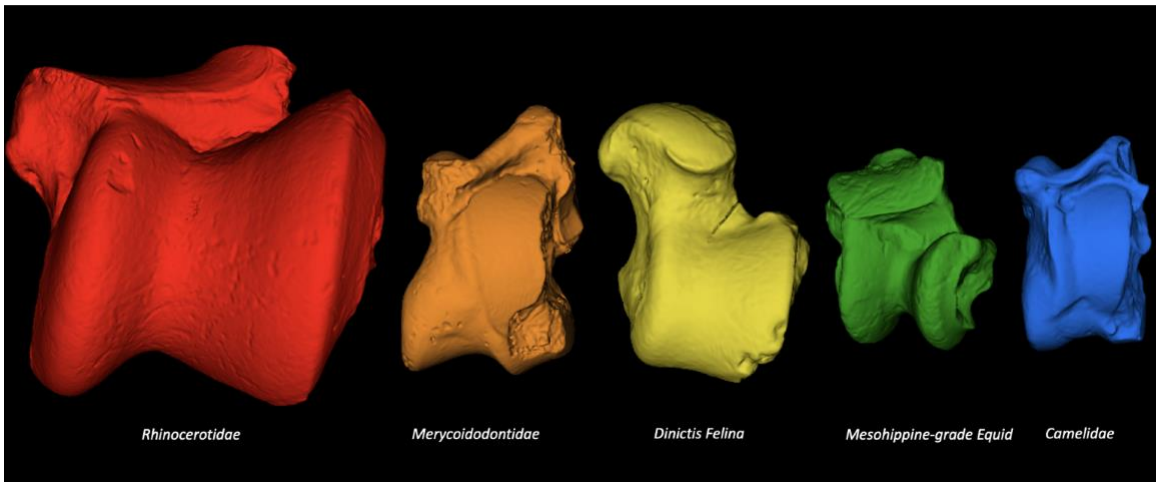

Image description: 5 scanned right astragali from the UFVP Nebraska collections.

Once these segmentations are smoothed, I plan to annotate them by labeling anatomical features and relevant information pertaining to these species, and upload them onto Sketchfab. When both this class project and my internship are completed, I hope to continue this work by creating more educational materials for successive interns or museum visitors.

Before my internship ends, I plan to continue my work in identifying and organizing the collection. I plan to help actualize our goals of fully updating the collection before the new year.

Photos of you conducting your research, photos of research, or any other photographic material about your internship

Image description: An example of a couple hours of work on my project.

Image description: One of our most common artiodactyls in the Nebraska collection, *Merycoidodon sp.*!

Image description: One of the common Carnivora from the Nebraska collection: *Hoplophoneus primaevus*!

Image description: A size comparison demonstrating the smaller end of the species diversity found in Nebraska. Seen above are many *Paleolagus* fossils (both cranial and postcranial).

Final thoughts:

I would like to express my gratitude to everyone who made my experience this past semester possible! I am sincerely thankful for everyone who contributed their time to organize the program, and provide mentorship to myself and my peers. I am so appreciative of both the academic side of this opportunity, and also the work that was directed into hosting and coordinating our social events. These let me see aspects of museum study that I had not ever been exposed to before, and made me feel excited to meet new faculty, staff, and students involved. Being given the opportunity to explore research and work in a museum setting was an invaluable experience that makes the prospect of continuing my education through grad school feel more attainable and less scary. My experience with the FMUIP makes me excited to continue future work in a museum setting, so thank you again for this opportunity!