The Society of Vertebrate Paleontology 80th Annual Meeting · Virtual 2020

October 12-16 2020

Conference Program

www.vertpaleo.org

SVP
SOCIETY OF VERTEBRATE PALEONTOLOGY

slightly below the size range of *Equus scotti* (previously reported from the Pauba Formation) and the late Pleistocene species *E. occidentalis*. The smaller horse morphotype compares favorably in size with small horse fossils from San Josecito Cave, Nuevo León, Mexico.
Large mammals identified in association with horses from the Pauba Formation include *Paramylodon*, *Odocoileus*, and *Hemiauchenia*. Large mammals exclusive of horses in the younger Rancholabrean assemblage include *Bison*, *Mammuthus*, *Hemiauchenia*, *Odocoileus*, and cf. *Antilocapra*. The faunal assemblage in the younger unit suggests that the Temecula Valley may have shifted to a more open and drier habitat at the onset of the late Pleistocene with the appearance of *Bison*. A detailed quantitative study of specimens from multiple localities across the southwest U.S.A. and northern Mexico is underway to more fully explore changes in megafaunal biogeography through time in this region.

Mesozoic Herpetology

AN ASSESSMENT OF CLIMATE AND ENVIRONMENTAL CHANGES OF THE HELL CREEK FORMATION USING THE BIOSTRATIGRAPHY OF SIX TURTLE TAXA

Holbach, Brady P.
Biology, Carthage, Kenosha, Wisconsin, U.S.A.

The Hell Creek Formation (HCF) preserves an array of fossil fauna and flora, including *Tyrannosaurus, Triceratops, Edmontosaurus,* and a variety of turtles. The goal of this study was to determine whether changes in turtle biostratigraphy (i.e., relative placement of taxa in the strata) correlated with changes in plant biostratigraphy uncovered by previous studies. The biostratigraphy of turtles was also used to assess possible changes in the HCF environment over time. Turtles are sensitive to changes in temperature and require specific niches to survive. No previous study has compared the biostratigraphy of turtles from multiple localities of the HCF in an attempt to find changes in distribution or diversity.
This work included turtle specimens belonging to: Adocidae, Baenidae, Chelydroidae, Compsemydidae, Macrobaenidae, and Trionychidae; individual specimens were identified to the lowest taxonomic group. Presence-absence graphs were constructed or obtained from the literature and were used to assess changes in turtle diversity from individual HCF localities over time. These localities were then compared to each other for changes in presence or absence of taxa across the HCF in eastern Montana and western North and South Dakota. No significant difference was seen between the changes in diversity of plant taxa and turtle taxa.
The presence-absence graphs revealed that the presence and relative abundance of most turtle taxa studied remained stable both over time and across the different HCF localities. However, in southeastern Montana, the marine turtles, Macrobaenidae, were absent below 37 meters below the K/Pg boundary, while Basilmyes, a terrestrial turtle, was primarily found above this point, suggesting a transition from a coastal marine environment to forested environment at 37 meters below the K/Pg boundary in this region. A complete absence of turtle fossils was found between 55 and 50 meters below the K/Pg boundary in all localities suggesting a period of rapid sediment deposition.

Mesozoic & Early Cenozoic Mammalian Evolution

PHYLOGENETIC POSITION OF *OLBITHERIUM* (MAMMALIA, PERISSODACTYLA) BASED ON NEW MATERIAL FROM THE EARLY EOCENE WUTU FORMATION

Holbrook, Luke T.[1], Li, Cheng-Sen[2], Yang, Jian[2], Smith, Thierry[3]
[1]Biological Sciences, Rowan University, Glassboro, New Jersey, U.S.A., [2]Chinese Academy of Sciences, Beijing, China, [3]Royal Belgian Institute of Natural Sciences, Brussels, Belgium

The genus *Olbitherium* was originally described in 2004 from the early Eocene of the Wutu Formation in China as a 'perissodactyl-like' archaic ungulate. Described material of *Olbitherium* consists of partial dentaries with lower cheek teeth, isolated upper molars, and an isolated upper premolar. Subsequent collaborative fieldwork by Belgian and Chinese researchers discovered new material including a partial skull, the anterior portion of the dentary, and associated postcrania. In their general form, the skull and postcrania are similar to those of early perissodactyls. The new material provides a more complete picture of the upper dentition, and the anterior dentary demonstrates the presence of three lower incisors and a large canine, both ancestral features for perissodactyls. A phylogenetic analysis was conducted to test the affinities of *Olbitherium*, using a matrix of 321 characters and 72 taxa of placental mammals emphasizing perissodactyls and other ungulates. The results produced four shortest trees of 1981 steps. In all four trees, *Olbitherium* is the sister-taxon to all perissodactyls except *Ghazijhippus*. In contrast, when scoring was restricted to the originally described material, the results produced 16 shortest trees of 1970 steps, and *Olbitherium* nests well within Perissodactyla as sister-taxon to a clade including *Lambdotherium* and the brontotheriids *Eotitanops* and *Palaeosyops*. The new material not only supports the identification of *Olbitherium* as a perissodactyl, but it also suggests that it is significant for understanding the ancestral perissodactyl morphotype.

Funding Sources U.S. National Science Foundation (DEB1456826), Chinese Ministry of Science and Technology (2009DFA32210), and Belgian Science Policy Office (BL/36/C54).

Dinosaur Systematics, Diversity & Ecology

A JUVENILE LAMBEOSAURINE BONEBED FROM THE WAPITI FORMATION OF NORTHWESTERN ALBERTA, CANADA

Holland, Brayden[1], Campione, Nicolás E.[1], Bell, Phil[1], Fanti, Federico[2], Vavrek, Matthew J.[3], Sissons, Robin[4], Wang, Yan-Yin[4], Hamilton, Samantha[4], Sullivan, Corwin[4]
[1]University of New England, Armidale, New South Wales, Australia, [2]Alma Mater Studiorum - Università di Bologna, Bologna, Italy, [3]Cutbank Paleontological Consulting, Grande Prairie, Alberta, Canada, [4]University of Alberta, Edmonton, Alberta, Canada

Hadrosaurid dinosaur bonebeds are prevalent in Upper Cretaceous strata from the midwest of North America (especially southern Alberta, Canada, and Montana, U.S.A.), but are less documented from more northerly regions. In 2018, the Boreal Alberta Dinosaur Project (BADP) rediscovered a juvenile hadrosaurid bonebed, the Spring Creek Bonebed (originally discovered in 1988) within Unit 3 outcrops of the Wapiti Formation (upper Campanian, ~75 Ma ago) near the town of Grande Prairie in northwestern Alberta. During the 2018 and 2019 field seasons, excavation of Spring Creek Bonebed yielded >250 specimens, including the first cranial material from the site (maxilla, premaxilla, postorbital, quadrate, predentary, dentary) which are consistent with a Lambeosaurinae designation. A minimum number of eight individuals have so far been identified from right humeri and, given the consistent size and histology of like elements, we assign all remains hadrosaurid to a single, similarly-aged, lambeosaurine species. Histological analyses of eight humeri indicate that the lambeosaurines were late juveniles, still undergoing sustained growth at their time of death. Uniform lack of weathering, lack of preferential alignment, and the monodominant composition of the bonebed, suggest that the bonebed originated from a mass mortality event. The exclusive preservation of a seemingly discrete age class within the Spring Creek Bonebed indicates that age segregation was a possible life history strategy used by these animals to mitigate the negative effects of juveniles on the fitness of the herd. Age segregation was previously hypothesized based on other hadrosaurid bonebeds, and in other dinosaurs, and may relate to: 1) seasonal breeding and extended parental care, in which non-breeding individuals are excluded from the main herd, and/or 2) the reduced physical capacity of younger individuals to 'keep up' with the main herd, potentially requiring a different food source. Until now, our understanding of hadrosaurids from the Wapiti Formation was restricted to the hadrosaurine *Edmontosaurus regalis*, whilst bonebed research was limited to two *Pachyrhinosaurus* bonebeds. The description of the Spring Creek Bonebed marks the second unambiguous lambeosaurine occurrence in the Wapiti Formation, with the potential to provide a greater understanding of North American dinosaur diversity during the Late Cretaceous.
Funding Sources Australian Government's Research Training Program scholarship; Dinosaur Research Institute's student grant.

Biomechanics & Functional Morphology

MYOLOGY OF THE REPTILIA: 3D MODELING OF JAW MUSCLES AND ITS UTILITY IN PALEOBIOLOGY

Holliday, Casey, Wilken, Alec, Sullivan, Samuel, Verhulst, Conner, Sellers, Kaleb, Lessner, Emily, Fortner, John D., Middleton, Kevin
University of Missouri, Columbia, Missouri, U.S.A.

Sauropsid vertebrates (lepidosaurs, turtles, crocodilians and birds) have evolved a diversity of head shapes and feeding behaviors during their history. A key to understanding this great radiation of reptiles is the physiology of the jaw musculature that powers the feeding apparatus. However, we still know little about jaw muscle mechanics within lineages of reptiles or how this complicated musculoskeletal system has evolved to employ a variety of behaviors. New imaging and computational methods are now enabling an extraordinary view into the 3D anatomy and biomechanics of reptiles and other vertebrates. Here we illustrate several approaches to analyzing jaw muscle morphology and architecture using contrast imaging, 3D fiber tracking, biomechanical analysis, and data visualization methods that offer enormous potential for exploring the anatomy, function and evolution of jaw muscles. We first illustrate basic workflow of 3D jaw muscle visualization, morphometrics, and interpretation using crocodilian jaw muscle anatomy. Second, we show how homologous jaw muscle bellies evolve among lineages of different reptiles and birds to elicit different functional demands. Third, we show how the 3D architecture of small, deep protractor muscles correlate with different types of cranial kinesis among a sample of lizards and birds. Many of these muscles leave traceable osteological correlates in the fossil record of reptiles and other vertebrates that can better guide inferences of muscle functional anatomy. These new imaging and analytical approaches offer incredible potential for the quantification of soft tissue morphology