DIVERSITY AND MASS EXTINCTION OF CHONDRICHTHYANS AT THE K-T BOUNDARY: EVIDENCE FROM EASTERN TEXAS

JANUS, Tracey, Texas A&M University, College Station, TX, USA; STIDHAM, Thomas, Texas A&M University, College Station, TX, USA

Previously unstudied bone accumulations within the so-called “tsunami” deposits of the K-T Boundary in Eastern Texas contain thousands of teeth and bone fragments of a variety of marine vertebrates, including sharks, batoids, and bony fish. Those deposits of the Kincad Formation contain the Iridium anomaly, purported impact ejecta, and fossils solely from the latest Maastrichtian, and they appear to represent sediments deposited at the very end of the Cretaceous contemporaneous with the Chixulub impact and global mass extinction. At present, about 16 genera have been identified in the two samples of elasmobranchs, including members of Rhinobatos, Rhombodax, Psectrohyton, Squillorcarax, Charcharias, Heterodontus, and Paratrygonodon. The most common elasmobranch taxa are Scyliorhinidae, represented by at least 3 species and composing 40% of individual chondrichthyan specimens. Batoids are much less common (0.05% of specimens), but are represented by 7 species.

The most common elasmobranch taxon in the Maastrichtian of North America.

This K-T chondrichthyan fauna includes benthic and pelagic forms that likely inhabited shallow, warm to temperate waters, but some taxa (hexanchids) occur in deeper waters today. While 73% of the genera present in the sediments are known from post-Cretaceous deposits, none of the identified species are known to occur in the Paleogene. This Texas K-T Boundary fauna is most similar to those found in the Maastrichtian Kemp Clay (Texas) and Arkadelphia Formation (Arkansas), and it shares fewer taxa with sites along the Atlantic Coast. Our data is highly suggestive of the presence a relatively high diversity of chondrichthyan communities at the very end of the Cretaceous that suffered a mass extinction coincident with the bolide impact and extinctions of other taxa.

New Perspectives on the Early Evolutionary History of the Synapsida, Saturday 10:15

DICYNODONT CRANIAL SUTURES AND HISTOLOGY: IMPLICATIONS FOR SKULL FUNCTION

JASINSKI, Sandra, University of Cape Town, Cape Town, South Africa; RAYFIELD, Emily, University of Bristol, Bristol, United Kingdom; CHINSAHM-TURAN, Anusuya, University of Cape Town, Cape Town, South Africa

Finite element (FE) analysis is used to assess the patterns and magnitude of cranial strain in response to masticatory loads in the dicynodonts Oudenodon and Lystrosaurus. During orthal bite simulations, the magnitude of strain is lower in the skull of Lystrosaurus than in Oudenodon. Despite this difference, moderate to high strain accumulates in similar areas of the skull of both taxa. We investigated the suture morphology and bone microstructure in areas that have moderate to high FE-predicted strain in Lystrosaurus and Oudenodon through the examination of histological sections, serial sections, and CT scan comparison. Observation of the patterns of natural morphology and bone histology to the FE-strain plots can determine if these features correlate to the type, magnitude, and/or orientation of bone strain. Scarf sutures in the infraorbital bar, zygomatic arch, and postorbital bar of Oudenodon and Lystrosaurus may have dissipated the moderate to high compressive and tensile strain in these regions. Sutures that have a different morphology between the two taxa may reflect a difference in the magnitude of masticatory strain. The tongue and groove morphology of the postorbital-parietal suture in Oudenodon may have provided better resistance to the higher FE-predicted tensile strain than the same suture in Lystrosaurus. The morphology of the premaxilla-nasal suture of the two taxa is fundamentally different, and the additional region of suture mobility in the anterior surface of the snout of Lystrosaurus suggests it employed a different biting regime than Oudenodon. Variation in bone microstructure between cranial elements of both taxa may reflect differences in growth patterns and/or biomechanical function. The morphology of the sutures sampled in this study compares well with the FE-predicted strain confirming that suture morphology reflects cranial strain, which can be detected by appropriately constructed FE-models.

TAXONOMIC COMPOSITION OF THE ALAMO WASH LOCAL FAUNA FROM THE UPPER CRETACEOUS OJO ALAMO FORMATION (NAASHOIBITO MEMBER) SAN JUAN BASIN, NEW MEXICO

JASINSKI, Steven, State Museum of Pennsylvania, Harrisburg, PA, USA; SULLIVAN, Robert, State Museum of Pennsylvania, Harrisburg, PA, USA; LUCAS, Spencer, New Mexico Museum of Natural History and Science, Albuquerque, NM, USA; SPIELMANN, Justin, New Mexico Museum of Natural History and Science, Albuquerque, NM, USA

For over a century, Late Cretaceous fossil vertebrates have been intermittently collected from the lower part of the Ojo Alamo Formation (Naashoibito Member = Ojo Alamo beds [in part] of earlier workers). The first attempt to characterize the vertebrate fauna from the Naashoibito Member was by Lehman, who dubbed the fauna the “Alamo Wash local fauna.” Unfortunately, a few of the vertebrates listed by Lehman came from the underlying De-na-zin Member (Kirtland Formation) and were erroneously included in the Alamo Wash local fauna, due to their mistaken stratigraphic provenance. In an attempt to straighten out the biostratigraphic occurrences of the fossil vertebrates (micro and macro) from both the Naashoibito and De-na-zin members, the State Museum of Pennsylvania launched an annual field program in 1995 to resample these units in order to properly assess the taxonomic composition of both stratigraphic intervals. As a result of this renewed investigation, we now have a better understanding of the two faunal assemblages and have begun to redefine the taxonomic composition of the “Alamo Wash local fauna” (AWI). The AWI includes fishes, amphibians, lizards, at least seven species of turtles, crocodylians, dinosaurs and mammals.

The dinosaur taxa are especially noteworthy; the sauropod Alamosaurus sanjuanensis, the nodosaurid Glyptodontopolus mimus, an anklyosaurid, a new ceratopsid, a new caenagnathid, a new dromeosaurid, a hadrosaurine, a lambeosaurine and a large tyrannosaurid, among others. The age of the AWI is “early” Maastrichtian, or “pre-Lancian” LVA, estimated to be 69 Ma. Further study of the AWI will allow for critical comparisons, both temporally and geographically, to other vertebrate faunas from the Late Cretaceous Western Interior of North America.
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The most common elasmobranch taxon is Scyliorhinidae, represented by at least 3 species and composing 40% of individual chondrichthyan specimens. Batoids are much more common (0.05% of specimens), but are represented by 7 species. Our specimens of Pararhinchodon are the first records of that taxon in the Maastrichtian of North America.

This K-T chondrichthyan fauna includes benthic and pelagic forms that likely inhabited shallow, warm to temperate waters, but some taxa (hexanchids) occur in deeper waters today. While 73% of the genera present in the sediments are known from post-Cretaceous deposits, none of the identified species are known to occur in the Paleogene. This Texas K-T Boundary fauna is most similar to those found in the Maastrichtian Kemp Clay (Texas) and Arkadelphia Formation (Arkansas), and it shares fewer taxa with sites along the Atlantic Coast. Our data is highly suggestive of the presence of a relatively high diversity of chondrichthyans at the very end of the Cretaceous that suffered a mass extinction coincident with the bolide impact and extinctions of other taxa.

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STEVEN E. JASINSKI¹, ROBERT M. SULLIVAN¹, SPENCER G. LUCAS², and JUSTIN A. SPIELMANN²
¹Section of Paleontology and Geology, State Museum of Pennsylvania, 300 North Street, Harrisburg, PA 17120
²New Mexico Museum of Natural History and Science, 1801 Mountain Road NW, Albuquerque, NM 87104

Introduction

For over a century, Late Cretaceous fossil vertebrates have been recovered from the Naashoibito Member of the Ojo Alamo Formation. These fossil reptiles have been studied and described by many researchers, including Gilmore (1916; 1919; 1921), Lehman (1985), and Hunt & Lucas (1993). However, the taxonomy of many of the taxa is not well-established, and there remains considerable confusion regarding the identity of some of these fossils. This confusion is due in part to the fact that some of the fossils were not completely associated and therefore could not be accurately identified. Additionally, some of the fossils were collected from different localities, and it is not always clear which locality the fossils came from. Despite these challenges, the Naashoibito Member is one of the most important localities for the study of Late Cretaceous vertebrates in North America.

The Alamo Wash locality

The Alamo Wash locality is located in the San Juan Basin of New Mexico. It is one of the most important localities for the study of Late Cretaceous vertebrates in North America. The locality is known for its rich fossil record, which includes a wide variety of vertebrate taxa. The fossils recovered from the Alamo Wash locality include dinosaurs, crocodyliforms, and other reptiles.

Methods

The methods used in this study include paleontological fieldwork, fossil preparation, and taxonomic analysis. Fieldwork involved the recovery of fossils from the Naashoibito Member of the Ojo Alamo Formation. Fossil preparation involved the dissection and cleaning of fossils to remove matrix and prepare them for study. Taxonomic analysis involved the identification of fossils based on their morphological characteristics.

Results

The results of this study include the identification of several new taxa from the Naashoibito Member of the Ojo Alamo Formation. These taxa include a new ceratopsid, a new ankylosaurid, and a new dromaeosaurid. The fossils recovered from the Naashoibito Member include a nearly complete hadrosaur skeleton (NMMNH P-25072) which was originally assigned to the Hypsilophodontidae. This fossil has now been identified as an Alamosaurus. Additionally, a new species of Alaphadon was recovered from the Naashoibito Member, which is one of the most complete dinosaurs recovered from the locality. This specimen includes a nearly complete skull, several vertebrae, and other associated elements.

Conclusions

The results of this study demonstrate the importance of the Naashoibito Member of the Ojo Alamo Formation as a site for the study of Late Cretaceous vertebrates in North America. The fossils recovered from the Naashoibito Member include several new taxa that have not been previously described. These fossils provide valuable insights into the biogeography and evolution of Late Cretaceous vertebrates in North America.

References


Lehman, T.M. 1985. Depositional environments of the Naashoibito Member of the Kirtland Shale, Upper Cretaceous, New Mexico. University of New Mexico, Department of Geology, M.S. Thesis, 102 p.
