(*Coluber constrictor*) or whip snakes (*Masticophis* sp.), garter snakes (*Thamnophis* sp.) or water snakes (*Nerodia* sp.), and Baird's rat snake (*Elaphe bairdi*). Mammalian species in the site are harvest mice (*Reithrodontomys* sp.), voles (*Microtus* sp.), southern bog lemmings (*Synaptomys cooperi*), pocket gophers (*Geomys* sp.), black-tailed jackrabbit (*Lepus californicus*), shrews (*Blarina* and *Sorex* sp.), and a bat. All of the snake taxa are present in the area today, but some of the mammals no longer occur in Texas. This site is unique in the very large number of snake fossils (84% of specimens) compared to the mammalian fossils (16%, MNI 14) collected. Snake elements are consistently the dominant type of fossil throughout the deposit, while the mammalian remains are clustered (likely from the dissociation of a single individuals). All of the snake species found in the site form hibernacula today. Given the very high percentage and high density of snake elements relative to mammals across the site, the presence of hibernaculum-forming snake taxa (of 3+ spp.), and the presence of articulated snake material, it seems likely that this cave site is a strong candidate to be the world's first fossil multispecies snake hibernaculum ever discovered. Today, those types of hibernacula occur much further to the north, and the data from this site appear to support the idea of a behavioral response by snakes to warming since the end of the Pleistocene.

Technical Session XVIII, Saturday 3:45

TESTING HYPOTHESES OF FEEDING BEHAVIOR IN *DIPLODOCUS LONGUS* USING THE FINITE-ELEMENT METHOD

YOUNG, Mark, University of Bristol, Bristol, United Kingdom; RAYFIELD, Emily, University of Bristol, Bristol, United Kingdom; HOLLIDAY, Casey, University of Missouri, Columbia, MO, USA; BARRETT, Paul, Natural History Museum, London, United Kingdom; WITMER, Lawrence, Ohio University, Athens, OH, USA

Sauropod dinosaurs include some of the most bizarre animals ever to have existed. Determining how they fueled their multi-tonne bodies on a nutrient-poor diet of fibrous plants challenges our understanding of both extinct and extant biological systems. Among sauropods, *Diplodocus* has one of the most unusual craniodental morphologies (elongate rostrum, dentition restricted to anterior margin of jaws, and fragile 'peg-like'; teeth with oblique labial wear facets). Previous studies focusing on craniodental morphology have postulated different feeding behaviors for *Diplodocus*, including precision biting, branch-stripping and bark-stripping. Based on CT scan data of a *Diplodocus longus* skull (CM 11161), these feeding hypotheses were evaluated quantitatively using finite element analysis (FEA). Adductor muscle loads were applied to the FE-models, based upon detailed reconstructions from osteological correlates. Models were constrained at the jaw joint and the tooth row. Simulations of the various feeding hypotheses resulted in similar patterns and magnitudes in Von Mises stresses for the precision biting and branch-stripping models. The primary departure is that during branch-stripping, there is a localized peak of high stress in the dentigerous region of the upper jaw adjacent to the loaded teeth. In all simulations, regions of peak stress are situated on the: 1) caudomedial face of the quadrates; 2) ventromedial face of the pterygoids; 3) pterygoid midline; 4) rostral-edge of the palatines; and 5) rostral-region of the postorbital-squamosal contact. During bark-stripping, stress in the dentigerous region of the upper jaw is exceptionally high and widespread, with the teeth subjected to levels of stress that would have shattered them in vivo. Additionally, widespread low-level stress occurs across the snout, with moderately high stress along the ventral margin of the maxillae and quadratojugals. Quantitative modelling using FEA supports the hypothesis that *Diplodocus* could both strip leaves from branches and perform adductor-driven biting behavior, and allows us to conclusively discard bark-stripping as a viable feeding hypothesis.

Poster Session II, (Thursday)

A NEARLY COMPLETE SKELETON OF *SPHENISCUS URBINAI* STUCCHI (AVES SPHENISCIFORMES) IN THE BAHIA INGLESA FORMATION (MIOCENE-PLIOCENE) ATACAMA DESERT, CHILE.

YURY-YAÑEZ, Roberto, Universidad de Chile, Santiago, Chile; SOTO-ACUÑA , Sergio, Universidad de Chile, Santiago, Chile; GUTSTEIN, Carolina, Universidad de Chile, Santiago, Chile; RUBILAR-ROGERS, David, Museo Nacional de Historia Natural de Chile, Santiago, Chile

The avian fossil record in the Bahía Inglesa Formation, Atacama Desert, is composed by different seabirds such as prions, albatrosses, cormorants, shearwaters, boobies, pseudodontorns and penguins. Among these birds, the Sphenisciformes (penguins) are the most studied and best represented group. To date, the majority of the fossils studied come from a phosphatic "bonebed" (not younger than Tortonian based in Sr/Sr data from an upper level) described as a reworked layer from older strata and characterized by disarticulated and mostly fragmentary remain, but abundant in number. The penguin remains from the "bonebed" are characterized by the strong presence of the crown group Spheniscidae, particularly the extinct species from the Pisco Formation (Peru) *S. megaramphus* and *S. urbinai*, both species known from isolated cranial and appendicular remains. Here we present the first record of a semi-articulated skeleton of *S. urbinai* from a new locality, older than the "bonebed", known as "El Morro". The fossil (MPC 12002) preserves the neurocranium and rostrum, humeri, coracoids, femora and tibiotarsi, sternum, synsacrum, ilia and ischia. As the holotype, the specimen is 25% bigger than the actual species of the genus and with a proportionally bigger and dorsoventraly curved rostrum. This fossil represents the first articulated remains of a bird from the Bahía Inglesa Formation, and the most complete bird record from Chile. This finding extends the stratigraphic record of the species in the Bahia Inglesa Formation and *S. urbinai* becomes the best represented species in the Miocene of the Southeast Pacific. In Peru *S. urbinai* has been described from strata older (Messinian) than Montemar level that is Tortonian in age, all the remains of its sister species *S. megaramphus* come from the last one. Previous records of *S. urbinai* have been suggested as a confirmation of the Tortonian age of the "bonebed" level where both species are found, due to the taphonomical reworked nature of this layer. The presence of both species makes impossible to confirm more precise ages for the "bonebed" and the level from where the articulated *S. urbinai* remains comes.

Technical Session III, Wednesday 1:45

POSTCRANIAL MORPHOLOGY OF THE AUSTRALIAN CRETACEOUS ICHTHYOSAUR *PLATYPTERYGIUS LONGMANI*

ZAMMIT, Maria, University of Adelaide, Adelaide, Australia

The swimming styles of highly derived post-Triassic ichthyosaurs have been inferred from various modern analogues including cetaceans, fast-swimming fish (tuna), and sharks. These comparisons were based mainly on Jurassic specimens that preserved spectacular carbonized body outlines indicating a thunniform bauplan. Under this model the flipper-like limbs are assumed to have served primarily as stabilizers during axial propulsion. In contrast, evidence of body shape and swimming modes in Cretaceous ichthyosaurs is virtually unknown largely because the recovered specimens are typically fragmentary. The recent discovery of prolific amounts of exceptionally preserved remains in the Early Cretaceous (upper-most Albian) ichthyosaur *Platytperygius longmani* from Australia have thus, for the first time, permitted a detailed appraisal of body form and functional morphology in one of the stratigraphically youngest known ichthyosaur taxa. Axial and particularly appendicular elements of *P. longmani* were compared with a selection of extant marine tetrapods to assess swimming style - dugongs and cetaceans (caudal propulsion), otariid seals, penguins, and sea turtles (forelimb propulsion), and phocid seals (hind limb propulsion). Principal component analysis (PCA) was used to distinguish functional morphs. The limb elements of *P. longmani* were found to have greatest similarity with those of cetaceans, especially in the structure of the propodials and hyperphalangy. This suggeststhat the fore and hind limbs were probably capable of maneuvering, stabilization, and propulsion at low speeds. In addition, the very large surface area of the fore limb may have played a role in improving acceleration as observed in some fish today.

Poster Session IV, (Saturday)

A NEW TROODONTID (THEROPODA: PARAVES) SPECIMEN FROM THE UPPER CAMPANIAN KAIPAROWITS FORMATION, SOUTHERN UTAH: ESTIMATING THE TAXONOMIC DIVERSITY OF NORTH AMERICAN TROODONTIDAE

ZANNO, Lindsay, The Field Museum, Chicago, IL, USA; VARRICCHIO, David, Montana State University, Bozeman, MT, USA; TITUS, Alan, Bureau of Land Management, Kanab, UT, USA; WILKINS, Natalia, Lake Forest College, Lake Forest, IL, USA; KNELL, Michael, Montana State University, Bozeman, MT, USA

Despite widespread recognition across much of Laurasia, troodontid theropods are among the rarest dinosaur remains. To date, the taxonomic diversity of the clade is almost exclusively confined to Asia, where exceptional preservation permits the documentation of at least 10 species. In contrast, the diversity of Cretaceous North American (**NA**) troodontids is currently restricted to a single recognized species—*Troodon formosus*. Materials referred to *T. formosus* have been recovered from the Ferris, Lance, Edmonton, Judith River, Dinosaur Park, Belly River, Hell Creek, Two Medicine, and Prince Creek formations of western NA. Thus, *T. formosus* has been reported from sediments extending over 4000 kilometers and encompassing a temporal range of 20 million years, suggesting the taxonomic diversity of Cretaceous troodontids in NA is presently underestimated. Here we report discovery of a new troodontid specimen from the Upper Cretaceous Kaiparowits Formation, Grand Staircase-Escalante National Monument, southern Utah, USA, just below a horizon radiometrically dated at 75 mya. The specimen represents a single individual and includes fragmentary portions of the dorsal, sacral, and caudal axial column, left ulna and additional forelimb fragments, a partial pelvis, and partial left and right hind limbs, rendering it the most complete maniraptoran specimen recovered from the formation to date. Additional troodontid materials from the Kaiparowits Fm. that may be referable to this taxon include an isolated distal caudal vertebra, numerous isolated teeth, a previously reported isolated left frontal (UMNH VP 16303), and a partial skeleton collected by the University of California Museum of Paleontology (UCMP 143270). The following features suggest this specimen is distinguishable from *Troodon formosus*: ischiadic shaft straight, lacking proximodistal tubercle; astragalus lacking distal groove; medial distal condyle of pedal phalanx II-2 markedly asymmetrical, dorsal aspect flattened; and ventral margin of pedal phalanx II-2 straight in lateral view. However, additional study is needed to determine if these differences reflect ontogentic and/or individual variation or represent an expansion of the known taxonomic diversity of NA troodontids.