

well as some metapodial elements and many phalanges, mostly preserved at their epiphysal ends. Despite the badly conserved conditions, this is the most complete plesiosaur material from James Ross Island. Also, this is the first registered specimen from the stratigraphically older North-Western portion of that island. Thus, we hope this work will enable future findings on James Ross Island to be compared with this new material, contributing to further taxonomic knowledge and temporal distribution of Antarctica's past vertebrate marine life.

Poster Session II, (Monday)

#### **ANKYLOSAUR FOOT MORPHOLOGY AND FUNCTION**

SISSONS, Robin, University of Alberta, Edmonton, AB, Canada

Aspects of biology and functional morphology of fore and hind limbs of ankylosaur dinosaurs are explored and analyzed using comparative morphology and finite element analysis. Reconstruction of the forelimb and posture of *Pinacosaurus grangeri* matches well with trackways attributed to ankylosaurs. The humerus is flexed and the elbow angled away from the body. The radius and ulna articulate perpendicular to one another, with little to no cross-over. The metacarpus is upright and forms an arch at the proximal articular surface, resulting in a crescent configuration of the manus, and a semi-supinated posture relative to the main axis of the body. Ankylosaur hind limbs were adapted for bearing large amounts of weight, and finite elements analysis demonstrates that ankle morphology is derived. The ankylosaurid metatarsus has a twisted proximal articular surface, and metatarsals are optimally adapted for bearing weight at increasing angles from medial to lateral. Finite element analysis results, in conjunction with the twisted proximal articular surface, and other morphological features, suggest a rolling motion in the foot while pushing off in the locomotory cycle. This is perhaps an adaptation to cope with the wide hips associated with derived ankylosaurids, bringing the pes closer to the midline of the animal during locomotion to increase maneuverability.

Poster Session I, (Sunday)

#### **REFINING ECOLOGICAL DIVERSITY ANALYSIS IN A PALEOECOLOGICAL RECONSTRUCTION OF OLDUVAI GORGE BED II**

SLEPKOV, Rebecca, University of Minnesota, Minneapolis, MN, USA; KOVAROVIC, Kris, Durham University, Durham, United Kingdom; MCNULTY, Kieran, University of Minnesota, Minneapolis, MN, USA

Ecological diversity analysis is a comparative method of paleoecological reconstruction that identifies similarities in the mammal community structure of modern and fossil assemblages. Community structure is quantified by the frequency of niche components such as positional repertoire, dietary adaptation, and body size. Difficulties with this technique center on eliminating taphonomic bias and determining appropriate methods of quantifying the similarities and differences within the comparative sample. We use a number of multivariate statistical tools to refine this type of analysis including multiple methods of ordination for principal components analysis as well as correspondence analysis, discriminant function analysis, and hierarchical cluster analysis. These methods were tested in a reconstruction of the paleoenvironment represented by assemblages from Lower Bed II (1.79-1.74 ma) and Upper Bed II (1.74-1.2 ma) at Olduvai Gorge, Tanzania. By computing the eigendecomposition using the modern assemblages and applying this ordination to both the modern and the fossil data, taphonomic bias from the latter groups was minimized. The removal of small-bodied taxa from both the fossil and comparative sample limited the influence of preservation and collection biases against micromammals. Results from this research suggest that the Lower Bed II assemblage at Olduvai Gorge was a tropical arid bushland or mixed woodland/grassland. Upper Bed II is best reconstructed as a grassland. These results diverge from previous studies, which suggested a wooded habitat in Lower Bed II comparable to the more closed environment of Bed I. This implies that paleoecological reconstructions relying on single taxonomic groups, as opposed to the entire community structure, may miss significant components of the overall habitat.

Technical Session X, Tuesday 11:00

#### **COMBINED PHYLOGENETIC ANALYSIS OF PAN-ALCIDAE (AVES, CHARADRIIFORMES): THE CONTRIBUTION OF FOSSILS TO THE RESOLUTION OF AVIAN SYSTEMATIC RELATIONSHIPS AND DIVERGENCE ESTIMATION**

SMITH, Adam, University of Texas Austin, Austin, TX, USA

Pan-Alcidae have the richest fossil record among Charadriiformes; however, previous phylogenetic analyses of alcid relationships have been overwhelmingly restricted to extant taxa. Evaluation of 25 extinct alcid species along with 52 extant species of alcids and charadriiform outgroup taxa represents the most inclusive taxon sampling of this clade. Systematic relationships were estimated through combined phylogenetic analyses of morphological characters (i.e., osteological, myological, integumentary, behavioral) integrated with mitochondrial and nuclear DNA sequence data (i.e., ND2, ND5, ND6, COI, cyt-b, 12S, 16S, RAG-1), and the results of different methods of phylogeny estimation (i.e., parsimony, Bayesian) were compared. Dense sampling of morphologic characters and extinct taxa resulted in a well-resolved phylogenetic tree that represents the most inclusive hypothesis of alcid relationships to date. The results of this analysis indicate that incongruence between previous analyses of alcid relationships is partly due to the exclusion of extinct taxa. Although many extinct alcid species are known from isolated skeletal elements, inclusion of

these species facilitates investigation of the timing and sequence of morphological character changes, and demonstrates the potential of fossils for resolving contentious phylogenetic relationships. Additionally, the timing of cladogenetic events in Pan-Alcidae was estimated with a newly developed set of rigorously evaluated fossil calibration points for Charadriiformes. Calibrated molecular divergence estimates and comparison of minimum cladogram fit to the fossil record allowed for evaluation of previous hypotheses regarding extinction and radiation within Pan-Alcidae. Congruence between the estimated timing of cladogenetic events in Pan-Alcidae and the timing of Cenozoic climatic and geologic events was used a metric to evaluate the likelihood of causal relationships between these events.

Poster Session II, (Monday)

#### **A PLESIOSAUROID SKULL FROM THE TOARCIAN (LOWER JURASSIC) OF ALHADAS, PORTUGAL**

SMITH, Adam, National Museum of Ireland - Natural History, Dublin, Ireland; ARAÚJO, Ricardo, Southern Methodist University, Dallas, TX, USA; MATEUS, Octávio, Universidade Nova de Lisboa & Museu da Lourinhã, Lourinhã, Portugal

During the early days of geological exploration in Portugal, a plesiosauroid skull was discovered in the marine beds of the Toarcian age São Gião Formation in the Lusitanian Basin, Alhadas. The specimen (MG33) was studied by H.E. Sauvage who referred it to *Plesiosaurus* sp. This fossil has since been stored in the Geological Museum, Lisbon, where it has been largely forgotten by paleontologists for over a century. It consists of a partial isolated cranium with the premaxillary, suspensorium, and basicranium regions missing. The dorsal surface of the skull is highly abraded so few sutures are visible. The palate on the other hand is well preserved. There are presently four valid plesiosauroid genera known from the Toarcian stage: *Seeleyosaurus*, *Occitanosaurus*, *Hydrorion*, and *Microcleidus*. To assess the phylogenetic position of MG33, we coded it as an additional operational taxonomic unit in an existing data matrix and reran the cladistic analysis. In the resulting strict consensus of 15 equally parsimonious trees, MG33 forms an unresolved polytomy with *Hydrorion*, *Occitanosaurus* and *Microcleidus*. Further comparison of MG33 with these taxa indicates greater similarity to *Hydrorion*. MG33 has a flatparasphenoid between the posterior interpterygoid vacuities, whereas the parasphenoid in *Microcleidus* and *Occitanosaurus* is keeled. MG33 is a rare example of a plesiosaurian from Portugal and represents the westernmost occurrence of any European plesiosaurian.

Edwin H. and Margaret M. Colbert Poster Prize Competition (Monday)

#### **A MORPHOLOGICAL AND MORPHOMETRIC REDESCRIPTION OF TANYTRACHELOS AHYNIS**

SMITH, Amy, Virginia Tech, Blacksburg, VA, USA

*Tanytrachelos ahynis* is a small (approximately 21 cm long) aquatic protosauroid recorded from the Newark Supergroup. Most specimens are known from exposures of the Cow Branch Formation at the Solite Quarry on the Virginia-North Carolina border. Originally described on the basis of roughly 100 specimens, an additional 200 specimens have since been collected. The new material provides added insights into *Tanytrachelos*. Although the vast majority of specimens are impossible to mechanically or chemically prepare from the sediment matrix, Computed Tomography has allowed anatomical details otherwise obscured by sediment to be revealed. The use of quantitative morphometrics has also provided a more quantitative description. The in-depth study resulting from these resources allows for the suite of characters missing for *Tanytrachelos* in previous cladistic analyses of Protosauroida and Archosauromorpha to be added so that future reanalyses may take place. Three hundred and fourteen specimens and two CT scans of *Tanytrachelos* were studied to create a new qualitative description of its morphology. Additionally, 119 length measurements and four angle measurements of individual elements (from which seventeen variables were derived) were taken from these specimens for a quantitative description. The vertebral column of *Tanytrachelos* is comprised of thirteen cervicals, thirteen dorsals, two sacrals, and at least thirty-two caudals. The few preserved skulls show rows of homodont, pleurodont teeth and an orbit that consistently occupies 11%-13% of the lateral area of the skull. The carpus contains an ulnare, radiale, and two distal carpals, and the tarsus contains a calcaneum, astragalus, and distal tarsals 3 and 4. The fifth metatarsal is significantly short, with a hooked shape at its proximal end. Pairs of curved, unfused heterotopic bones are found in some specimens between caudal vertebrae 4 and 5. Traces of soft tissue are seen in a select few specimens, including a remarkable juvenile specimen (measuring approximately 3-4 centimeters in length), which displays a nearly complete body outline.

Technical Session II, Sunday 9:45

#### **THE TAXONOMIC DIVERSITY OF THE STEM MAMMAL MORGANUCODON (MORGANUCODONTA: MORGANUCODONTIDAE) FROM LATE TRIASSIC-EARLY JURASSIC FISSURE DEPOSITS OF GLAMORGANSHIRE, WALES, UK**

SMITH, Andrew, University of Bristol, Bristol, United Kingdom; GILL, Pamela, University of Bristol, Bristol, United Kingdom; RAYFIELD, Emily, University of Bristol, Bristol, United Kingdom; RUTA, Marcello, University of Bristol, Bristol, United Kingdom; HOOKER, Jerry, Natural History Museum, London, United Kingdom

Triassic-Jurassic fissure fills from Glamorganshire, Wales, UK, offer a unique window into the evolution of Mesozoic mammals. Among the many fissures of this region, diverse assemblages have yielded a wealth of fossil vertebrate material, including a number of isolated



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