

and ophidiids also agree with the paleoecological assessment. Especially significant is the evolutionary data obtained from the otolith assemblage. Maastrichtian otoliths indicate the dramatic radiation of perciforms began in the Late Cretaceous rather than the Early Tertiary as previously reported. This study is the first report of the range extension of the taxon "genus *Trachichthydarum*" *stringeri* into the Cretaceous Period and also reveals many taxa that belong to Recent families in the Order Perciformes (several species of apogonids, percoids, and caristiids). This study provides further evolutionary evidence of perciforms in the Cretaceous and allows for perhaps 40-50 million years for the modern genera to evolve rather than the 20 million years allowed by an Early Tertiary development.

Carnivora: Phylogeny, Form and Function Symposium, Saturday 12:00  
**FINITE ELEMENT MODELING OF FEEDING BEHAVIOR IN THE THYLACINE AND WOLF: A NOVEL TEST FOR CONVERGENCE**

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There is perhaps no more iconic example of phenotypic convergence than that of the marsupial thylacine (*Thylacinus cynocephalus*) and placental gray wolf (*Canis lupus*). However, form-function analyses of various character systems have led to conflicting conclusions, suggesting specialization in the thylacine toward either relatively small or large prey, and the degree to which resemblance between the marsupial and placental was superficial has remained uncertain. Here we apply three dimensional finite element analysis to examine convergence in mechanical behavior between skulls of the thylacine and wolf subspecies widely implicated in its extinction from mainland Australia, the dingo (*C. l. dingo*). Our modeling protocols represent a number of advances over previous simulations of the vertebrate skull in that they 1, incorporate multiple material properties for bone, 2, treat the mandible and skull as a single articulated unit and, 3, describe the 3-D architecture of jaw adducting musculature. Analysis of stress distributions reveals considerable similarity between the two taxa, but also informative differences. The thylacine's mandible performs relatively poorly where only the actions of the jaw muscles (intrinsic) are considered and stresses are comparatively high in the posterior of the cranium under loads simulating forces generated by the prey itself (extrinsic). Previous FE analyses, considering intrinsic forces only, have concluded that much of the mammalian skull is not optimized for feeding. Consideration of extrinsic forces suggests that this may not be so, at least for predatory species. We find that relative prey size in the thylacine and dingo may have been comparable where both species acted as solitary hunters, but the dingo is better adapted to withstand the higher extrinsic loads likely to accompany social hunting of large prey. When differences in body mass are considered it is probable that there was considerable ecological overlap.

Technical Session VII, Thursday 2:30

**EARLY TRIASSIC FRESHWATER FISHES FROM NORTHERN GANSU PROVINCE, CHINA, AND THE AGE OF THE BEISHAN BEDS**

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Along with well-preserved tetrapod fossils, the Lower Triassic deposits exposed in Beishan area, Gansu Province, China yielded several thousand specimens representing a taxonomically diverse fish assemblage, including a new hybodont, five actinopterygians (*Eochondrosteus*, *Boresomus*, *Perleidus* and two new palaeonisciforms), and a coelacanth. The coexistent amphibians, reptiles and plants indicate a fresh water depositional environment and the Triassic age of the fossil beds. The hybodont material shows exceptional preservation of whisker-like nostril and mouth barbells, large liver, digestive tract, and numerous dermal denticles; and another specimen even preserved claspers, indicating a male individual. The actinopterygian *Eochondrosteus*, similar to *Birgeria* from the Lower Triassic of East Greenland, Spitzbergen, Madagascar, and North America, bears a largely naked body with remnant rhomboidal scales in the upper lobe of the caudal fin. *Boresomus* is for the first time found in freshwater deposits. *Perleidus* has derived characters of the upright propercle and the strongly abbreviated heterocercal tail (with presence of one or two epaxial rays). Of the two new palaeonisciforms, one closely resembles the Triassic genus *Pteronisculus*, referring to the Palaeoniscidae, and the other is referable to the Scanilepididae with a great extension of the dorsal fin and unforked dorsal fin rays. Most these fossil fish taxa and their close relatives are found in the Triassic. Of them, *Boresomus* and *Perleidus* are only known from the Triassic worldwide, and *Boresomus* strictly exists in the Early Triassic. Thus, the study of the fish assemblage supports the age assessment of the fossil beds being Triassic as derived from other vertebrate fossils.

Technical Session XIV, Saturday 11:00

**COELUROSAURIAN PHYLOGENY REVISITED: RECOVERING PHYLOGENETIC SIGNALS FROM SUBTLE MORPHOLOGICAL VARIATIONS**

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Significant advancements have been made on coelurosaurian phylogeny recently by the Theropod Working Group (TWiG). Interestingly two most recent analyses on TWiG's dataset produced some results significantly different from those of previous analyses in which some basal birds were shifted outside the Aves. In one analysis, the monophyly of the Aves was challenged with *Confuciusornis* posited within the Dromaeosauridae and in the other analysis *Rahonavis* was united with *Buitreraptor* and *Unenlagia* within a Gondwanan lineage of dromaeosaurids, both indicating separate origins of flight. These results have profound effect on the reconstruction of the evolution of the major avian characters. Such radical changes are probably caused by close morphological resemblances of basal taxa from three major paravian groups and insufficient appreciation of morphological variations among the paravians as well. Detailed comparisons revealed abundant subtle morphological variations unemployed in these analyses. Many of these variations are related to the evolution of avian locomotor system. Running analysis on TWiG's dataset with inclusion of new characters extracted from these subtle variations recovered conventional results in which *Archaeopteryx*, *Rahonavis*, and *Confuciusornis* lie at the base of the Aves and thus resulted in a relatively simple morphological evolutionary pattern along the line to birds. While subtle morphological variations are informative and could play a key role in reconstructing coelurosaurian phylogeny particularly in case of fine scaled analyses with dense taxonomical sampling, it is relatively subjective to define character states from these subtle and often continuous morphological variations and thus attention should be paid to this issue.

Technical Session IX, Friday 11:45

**A NEW DIVERSE DINOSAUR ASSEMBLAGE FROM THE EARLY JURASSIC OF SOUTH AFRICA**

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The Early Jurassic upper Elliot Formation (UEF) of South Africa has a well-known fauna dominated by the basal sauropodomorph *Massospondylus*. Its depositional environment was an arid floodplain crossed by small, ephemeral streams. Calcareous paleosols are common. An outcrop of the UEF at Spioenkop, Senekal District, is sedimentologically atypical. Paleosols are absent from the middle of the section and the bulk of the unit is formed by stacked channel sands, some from deeper, possibly permanent streams. Excavations over the past four years reveal that the fauna is also atypical. *Massospondylus* is apparently absent. Instead there is a diverse sauropodomorph fauna with three new taxa: a basal sauropodomorph; a basal sauropod similar to *Jingshanosaurus* (sauropod A); and a more advanced sauropod (sauropod B). The basal sauropodomorph differs from *Massospondylus* by its extensively denticulated teeth and the absence of a buccal emargination. It is diagnosed by a unique dorsal process on the postorbital. Sauropod A retains bipedal limb proportions but does show sauropod-like lateral plates and rugose tooth enamel. It can be diagnosed by: five premaxillary teeth; a straight posterior margin of the postorbital; and particularly stout pedal elements. Sauropod B is closer to Eusauropoda and shares with it the following derived character states: lingual concavities on the tooth crowns; very tall dorsal neural spines; and transversely compressed and laterally canted pedal unguals. It can be diagnosed by the anteroventral inclination of the anterior cervical centrum face. Also present are an *Allosaurus*-sized theropod, known from teeth and a possible thyreophoran known from osteoderms including stegosaur-like plates. The only typical UEF taxa found at Spioenkop are the small carnivores *Protosuchus* and *Coelophysis* (= *Syntarsus*). The unusual assemblage, with its diverse large herbivores, is interpreted as occupying a well-vegetated microenvironment on the UEF floodplain. The absence of the typical paleosols and the dominance of channel sands suggest that this environment was a riparian forest alongside one of the larger, more permanent streams crossing the floodplain.

Carnivora: Phylogeny, Form and Function Symposium, Saturday 10:45

**MODERN, HISTORICAL, AND FUTURE CARNIVORE COMMUNITIES IN SUB-SAHARAN AFRICA: IMPLICATIONS FOR CONSERVATION AND CLIMATE CHANGE**

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Sub-Saharan African ecosystems are distinguished by relatively large numbers of co-occurring carnivores. Traditional observational techniques, although vital for a detailed understanding of carnivore ecology, are typically expensive, fraught with observer bias, and site-specific, and they do not allow for quantitative temporal and spatial comparisons. Stable isotope analysis is poised to elucidate aspects of large-scale carnivore community structure through space and time, thereby allowing comparative relationships between species to be analyzed quantitatively. We aim to elucidate carnivore communi-