

# PROGRAM AND ABSTRACTS

**73<sup>rd</sup> MEETING**  
*Los Angeles, CA*



histology has been extensively applied to the diverse non-mammalian therapsids from the Karoo Basin of South Africa, few studies have been conducted on amphibians, which were fairly abundant in the Permo-Triassic ecosystems.

*Lydekkerina huxleyi*, a basal and small stereospondyl dominated the amphibian fauna of the South African Lower Triassic *Lystrosaurus* assemblage zone. Even though the anatomy of this amphibian has been described in detail, this taxon remains enigmatic in term of growth strategies and lifestyle habits. In previous studies, the uniformity in skeleton sizes has been attributed to a predominance of subadult and adult specimens recovered. Moreover, anatomical data suggest that the relatively small size of this species, compared to its Permo-Triassic relatives, could be linked to a shortened developmental period as an adaptation to maintain successful breeding populations under difficult environmental conditions. *Lydekkerina* has been described as either aquatic or mostly terrestrial. The latter hypothesis is controversial as Triassic stereospondyls are generally considered as aquatic or semi-aquatic animals.

The current study utilizes histological and microanatomical data to re-assess previous hypotheses pertaining to the biology and ecology of *Lydekkerina*. Bone microstructure of various skeletal elements of several specimens is analyzed to better understand its growth strategies, intra-skeletal variability and lifestyle adaptations.

Bone histology reveals that our sample comprises individuals at different ontogenetic stages, i.e., from juvenile to mature individuals. Our results confirm that these amphibians had a strategy of fast and sustained growth to reach sexual maturity quickly. The microanatomy of the long bones, with their thick bone walls and distinctive medullary cavity, suggests that *Lydekkerina* may have been amphibious with a tendency to be more terrestrial.

This study suggests that *Lydekkerina* employed a particular growth strategy and lifestyle, which may have enabled it to prosper during the harsh dry conditions of the Early Triassic.

Poster Session III (Friday, November 1, 2013, 4:15 - 6:15 PM)

#### NEW LIGHT ON THE EVOLUTIONARY RELATIONSHIPS BETWEEN "THORACOSAURS" AND MODERN GHARIALS: EVIDENCE FROM A NEW GAVIALOID FROM THE LATE CRETACEOUS OF CHIAPAS, MÉXICO

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The slender-snouted Campanian through Ypresian "thoracosaur" are currently viewed as early relatives of the living Indian gharial (*Gavialis gangeticus*), which is the focus of an unresolved phylogenetic conflict between morphological and molecular data sets. However, substantial stratigraphic and morphological gaps exist within thoracosaur and between them and more younger, derived gavialoids. A new crocodylian from the Ocozacoautla Formation (Maastrichtian, Late Cretaceous) of Chiapas, México, fills a morphological gap in the thoracosaur record. The new specimen consists of a partial skull and lower jaw, appendicular elements, vertebrae, and osteoderms preserving a unique combination of character states. Differences from the Cretaceous-early Paleocene thoracosaur *Eothoracosaurus* and *Thoracosaurus* include large, nearly circular supratemporal fenestrae with a linear medial margin separated by a very narrow interfenestral bar and a palatal premaxillary-maxillary contact extending to the second maxillary alveolus. The morphology of the skull table resembles that of Paleocene *Eosuchus*, and *Eosuchus* and the Chiapas form share a large external mandibular fenestra not found in other thoracosaur. However, the Chiapas form lacks the alveolar couplets of the dentary tooth row diagnostic of *Eosuchus*. It also lacks derived states linking *Eosuchus* with later gavialoids. A phylogenetic analysis places the Chiapas form as the sister lineage to a clade including *Eosuchus* and the more derived gavialoids that first appear in the latest Eocene. Our analysis continues to support a close relationship between thoracosaur and *Gavialis*, and it reinforces a marginal marine origin for a lineage currently restricted to fresh water, but the maxillary tooth counts of the Chiapas form and *Eosuchus* (21) are smaller than those of *Eothoracosaurus* (26) and *Thoracosaurus* (23), suggesting phyletic shortening of the snout that was reversed in later gavialoids.

Poster Session III (Friday, November 1, 2013, 4:15 - 6:15 PM)

#### CONFIRMATION OF LIFESTYLES OF EXTINCT FELIDS BASED ON COMPARISON OF HOMOLOGOUS CHARACTERS OF LIVING CATS

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Living and extinct felid morphology ranges from robust ambush predator to gracile-limbed cursor. Identification of similar osteological characters that correlate with locomotor habits in living forms allows estimation of lifestyle in extinct species of comparable morphology. Here, we examine forelimb characters of the living taxa *A. jubatus* and *P. leo* with homologous features in the extinct genera *S. fatalis* and *P. atrox* as a means of identifying factors that help predict habits.

We performed a geometric morphometric analysis (Generalized Procrustes Superimposition and Principal Components) of homologous features of the scapula, humerus, and ulna to allow identification of skeletal features that correlate with different lifestyles in extinct taxa.

PC1 accounted for 40.8% for the scapula, 43.6% for the humerus, and 76.6% for the ulna. *S. fatalis* had positive PC1 scores, and *A. jubatus* had negative PC1 scores. *P. atrox* and *P. leo* grouped together and were positioned in between the *A. jubatus* and *S. fatalis*. The Panthera group differed significantly from *S. fatalis* and *A. jubatus* ( $\alpha=0.05$ ).

Among felids, the details of forelimb use dominate hunting style, from ambush to cursorial predator. The shape analysis methods reveal discrete characters that can predict lifestyles of extinct taxa based on comparison of homologous features observed among

living cats. Each species studied here shows a unique character suite, allowing further refinement of the predictions of the lifestyle and the most significant features that predict locomotor habits.

Poster Session I (Wednesday, October 30, 2013, 4:15 - 6:15 PM)

#### USING ONTOGENY AND PHYLOGENY TO TEST HYPOTHESES OF ANAGENESIS IN THE VERTEBRATE FOSSIL RECORD: A CASE STUDY OF THE SISTER GROUP RELATIONSHIP BETWEEN *DASPLETOSAURUS* AND *TYRANNOSAURUS* (DINOSAURIA, COELOSAURIA)

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The evolution of derived tyrannosaurine tyrannosaurids is well represented by a series of stratigraphically separate species. These include, in ascending chronological order: *Daspletosaurus torosus* (Oldman and Dinosaur Park Formations), a new taxon (upper Two Medicine Formation), and *Tyrannosaurus rex* (Hell Creek Formation and its lateral equivalents). This stratigraphic sequence of closely related species provides the opportunity to test the hypothesis that they are an anagenetic lineage. This study proposes a protocol for evaluating hypotheses of anagenesis based on a quantitative comparison of phylogenetic and ontogenetic patterns (i.e., sequences of homologous character transformations). To reach this end, a cladistic analysis of Tyrannosauroidae was executed that, for completeness, includes the recently named tyrannosaurine *Zhuchengtyrannus*. Growth series for *D. torosus*, the new taxon, *T. bataar*, *T. rex*, and outgroup taxa were recovered using cladistic analysis of morphological characters. This was done to compare the ontogenetic changes in each species with the phylogenetic character changes at each node from where they extend. The phylogenetic and biogeographic history of derived tyrannosaurines is complex, where (1) several Asian taxa separate *T. rex* phylogenetically from the earlier Laramidian species, and (2) multiple dispersal events occurred between Laramidia and Asia. These factors complicate a straightforward account of anagenesis in Laramidian tyrannosaurines during the Campo-Maastrichtian.

Symposium 1 (Wednesday, October 30, 2013, 11:15 AM)

#### FIRST DEFINITIVE ASSOCIATION BETWEEN EMBRYONIC *ALLOSAURUS* BONES AND *PRISMATOLITHUS* EGGS IN THE MORRISON FORMATION (UPPER JURASSIC, WYOMING, USA)

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Despite more than a century of collecting, resulting in one of the best-studied vertebrate fossil records anywhere in the world, the Upper Jurassic Morrison Formation has produced surprisingly few examples of dinosaur eggs associated with embryonic remains. Even more puzzling, none of these seem to pertain to the theropod *Allosaurus*, one of the most common and best-understood dinosaur taxa in the formation. Here we report on a dinosaur nest site that has produced both abundant prismatic eggshells and embryonic (or perinatal) bones of *Allosaurus* from Fox Creek, Wyoming. This represents the first such discovery for any theropod in the Jurassic of North America. The nest is heavily weathered but contains a few ellipsoid eggshell clusters that suggest an egg size of about 8 x 6.5 cm. Study of the eggshell morphology and microstructure confirms that a single egg type is present throughout, which is indistinguishable from *Prismatolithus coloradensis*. All of the identifiable embryonic materials pertain to theropods, and two premaxillae specimens show the five alveoli diagnostic for *Allosaurus* among Morrison theropods. This confirms the theropod origin of *Prismatolithus* eggs and implicates *Allosaurus* as the specific Morrison parent taxon. As a result, it is now possible to assign several previous discoveries of dinosaur eggs and potential nests to *Allosaurus*, including the isolated egg from the Cleveland-Lloyd Quarry. This discovery also calls into question prior assignments of *Prismatolithus* eggs to ornithomids, and suggests that more detailed study of such sites is warranted. *Prismatolithus* eggs are also associated with the Upper Jurassic theropod *Lourinhanosaurus* from Portugal, along with larger embryos that exhibit four premaxillary alveoli.

Poster Session III (Friday, November 1, 2013, 4:15 - 6:15 PM)

#### VARIATION OF OSTEODERM ANATOMY IN THE CARAPACE OF THE NORTH AMERICAN GLYPTODONT, *GLYPTOTHERIUM* (XENARTHRA, CINGULATA)

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Beginning in 1875 with the description of *Glyptodon mexicanus* Cuatáparo and Ramirez (= *Glyptotherium mexicanum*) from Pleistocene deposits in the Valley of Mexico, discoveries of glyptodonts have been common in Mexico, the United States and Central America. *Glyptotherium* includes *G. cylindricum* and *G. mexicanum* in Mexico; and *G. texanum*, *G. floridanum* and *G. arizonae* in North America. These species have been described mainly on the basis of osteoderm osteology, without reference to position in the carapace. The dorsal-sagittal region of the carapace includes the preiliac area, where the osteoderms are symmetrical hexagons, with the diameter of the central figure approximately 50% of the side-to-side diameter, and with 8-10 peripheral figures of uniform size and shape. Borders of peripheral figures are sometimes shared by adjoining osteoderms. Close to the cephalic area the osteoderms are hexagonal but elongated in the anteroposterior axis. Osteoderms of the lateral middle region retain the hexagonal shape but they are asymmetrical. Within the postiliac region, osteoderms range from asymmetrical hexagons to trapezoidal or rectangular, with the central figure occupying approximately 50% of the surface. Peripheral figures of the osteoderms in this area vary