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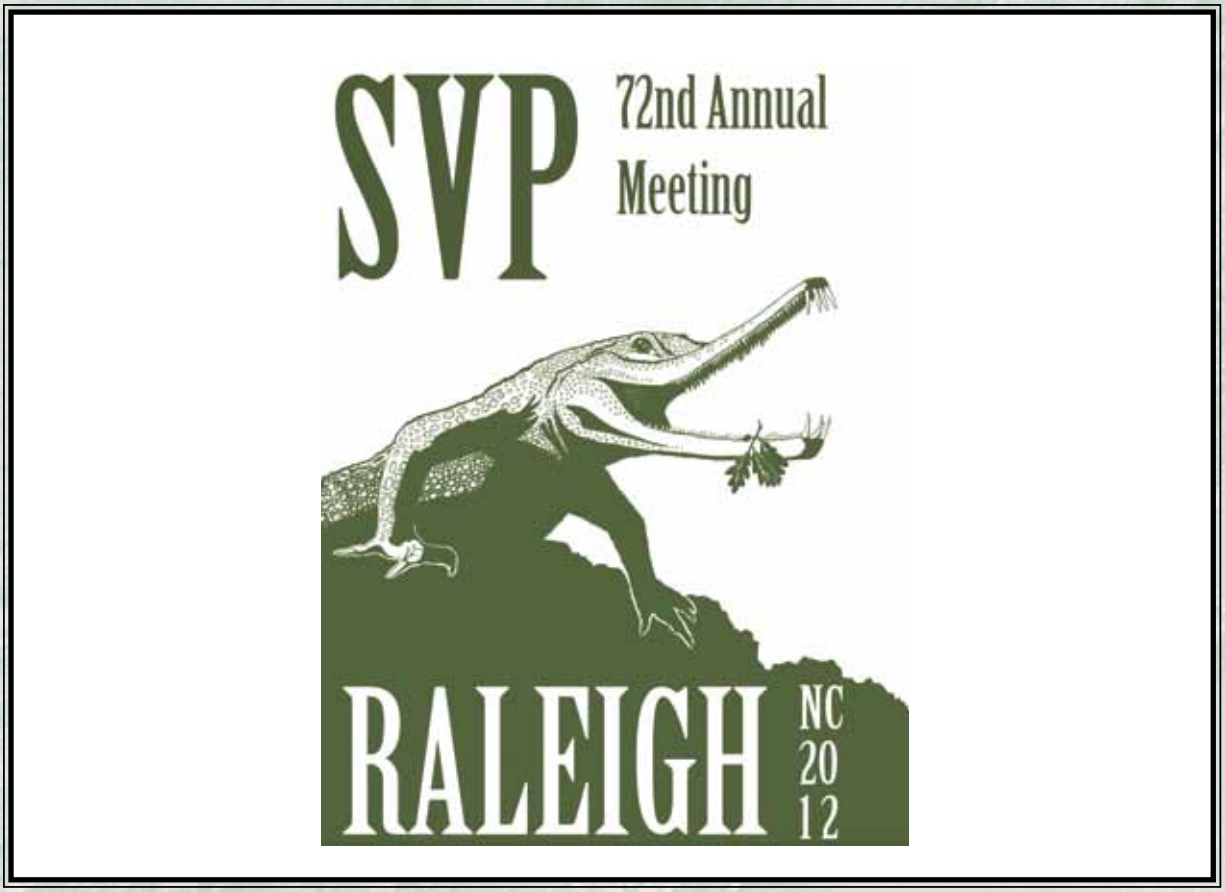
SOCIETY OF VERTEBRATE PALEONTOLOGY

Supplement to the online Journal of Vertebrate Paleontology

October 2012

Program and Abstracts



72nd Annual Meeting
Society of Vertebrate Paleontology

Raleigh Convention Center
Raleigh, NC, USA
October 17 – 20, 2012

Society of Vertebrate Paleontology

ISSN 1937-2809

further modifications can easily be deduced. In lemuroids the second toe was separated as a grooming claw, while the lateral distal phalanges became scutiform. This most probably was related to a specific way of grasping. In adapoids a similar - if not the same - differentiation occurred represented in two different evolutionary stages by *Notharctus* and *Europolemur.* In the haplorhine clade, tarsioids evolved a functionally similar pattern, but it is significantly different in shape and position, thus not homologous. Among anthropoids columniform distal phalanges with flat nails on the lateral toes are widespread. This has to be regarded as the primitive condition for ceboids and cercopithecids. In ceboids the callithrichines evolved claws but the hallux retained its scutiform shape. *Aotus* has a grooming claw like structure. In the cercopithecine and hominin clades the columniform distal phalanges were mostly preserved as in, e.g., *Cercopithecus, Macaca*, and *Pan.* Only in humans the distal phalanges were modified to have very irregular distal tuberosites. This hypothesis postulates several cases of parallel evolution, but no evolutionary reversals and loss of specialized structures are required.

Technical Sesssion XII (Friday, October 19, 2:30 pm)

A NEW RECONSTRUCTION OF THE HIP IN HYDROPEDAL MOSASAURS (SQUAMATA, MOSASAURIDAE): FROM ATTACHED TO DETACHED
KONISHI, Takuya, Royal Tyrrell Museum of Palaeontology, Drumheller, AB, Canada

A pelvic girdle maintaining the symphyseal articulation between ischia is preserved on the recently described specimen of *Prognathodon overtoni* (Mosasauridae, Mosasaurinae), TMP 2007.034.0001. This, along with comparison of the specimen to other aquatic tetrapods allows the position of the pelvis in this animal to be re-evaluated. Using the articulated ischia, the maximum distance between the acetabula of this specimen is 24.5 cm. If the ilia are distally connected with the vertebra, the circumference of the space surrounded by the pelvic girdle and the vertebral column is slightly less than 85 cm, or only 15% of the estimated total body length of this mosasaur at 6 m. With respect to the posteriorly tapering (i.e., streamlined) torso hypothesized for hydropedal (derived) mosasaurs, this suggests at least three possibilities: (1) given that mosasaurs utilized their muscular tails as a main means of underwater propulsion, only the base of the tail of this mosasaur was abruptly constricted to become 15% of the body length in circumference; (2) the maximum girth of the tail was not significantly greater than 15% of the body length, showing an abrupt decrease in circumference at the posterior end of the animal's trunk; and (3) the tail attained its maximum girth at the base at a much greater dimension than 15% of the total body length, more or less continuous with the posterior trunk region in dimensions. The third scenario is preferred, as the first two imply a hydrodynamically less efficient body outline by creating turbulence at the tail-body interface. The second scenario also indicates that the total tail muscle mass would be insufficient to provide and maintain propulsion strong enough for a 6-m animal. At the same time, in order to achieve the third condition, the pelvic girdle in mosasaurs must be free of ilio-vertebral articulation so as to position it further ventrally, a view contrary to the long-standing hypothesis that the hipbone in these large seagoing lizards contacted distal ends of the transverse processes on the first caudal vertebra. Further osteological support for the new hypothesis constitutes: (1) the notable absence of articular facets at distal ends of any transverse processes in the caudal series; (2) the lack of changes in orientation of the transverse processes near the base of the tail unlike in sauropterygians, where a group of transverse processes on each side of the sacral vertebrae converge distally to meet at a point of ilio-vertebral articulation; and (3) the simple rod-like morphology of the ilium. These features found in hydropedal mosasaurs are shared with derived ichthyosaurs, which are reconstructed to show separation between the pelvis and the vertebral column. Based on those lines of evidence and comparison, I conclude that pelvic girdles in hydropedal mosasaurs most likely lacked direct contact with the axial skeleton.

Technical Session VII (Thursday, October 18, 3:15 pm)

RESOLVING THE HOMOLOGY AND MIXED EMBRYONIC ORIGIN OF A MAMMALIAN SKULL BONE: THE IDENTITY OF THE INTERPARIETAL BASED ON PALEONTOLOGICAL AND DEVELOPMENTAL DATA
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The mammalian interparietal is a dermal bone situated between the parietal and supraoccipital. Its presence, development, terminology and homology across living and fossil synapsids are yet poorly known and largely undocumented, with contradictory statements in literature. Furthermore, the interparietal is a critical and problematic element in embryonic studies of the head because of its reported mixed embryonic tissue origin. To solve these issues, we conducted a comprehensive taxonomic and ontogenetic sampling across extinct and extant mammalian taxa, integrating embryonic evidence and fossil records.

There is reportedly no interparietal in monotremes, marsupials, xenarthrans, moles and soricids, and phocids. However, we confirmed its presence in all extant mammalian "orders". The presence of this bone has been often overlooked because of bone fusion around birth. Our investigation of mammalian embryos demonstrates that the interparietal consists of four elements and not by two as in Goodrich's paradigm and textbook knowledge. Since the lateral interparietal pair quickly fuses to the medial interparietal at embryonic stage in many taxa, this makes it critically difficult to identify the lateral interparietal pair. Although it is generally assumed that the tabular bone is lost in modern mammals, given the presence of the lateral interparietal element in extant taxa, we hypothesize that the postparietal of basal tetrapods is homologous to the medial interparietal elements of mammals and that tabulars are retained within the mammalian interparietal rather than being lost. If the medial and lateral extrascapulars of osteolepiform fishes are respectively homologous to the postparietal and tabular of basal tetrapods, the medial and lateral extrascapulars of osteolepiform fishes are presumably still conserved as the four elements constituting the interparietal of mammals.

Our four-element view for the interparietal provides a synthetic understanding of the dermal skull roof of mammals and hints a possible bridge between paleontology and developmental biology. Recent experimental study on the derivation of the mammalian skull reported a dual origin for the interparietal: the medial portion being neural crest cells derived and the lateral portion mesoderm derived. This suggests that the two medial interparietal elements are developmentally derived from the neural crest cells and the lateral elements from the mesoderm. If this is the case, the dual origin found for the mammalian interparietal could be regarded as the evolutionary consequence of the fusion between the crest derived "postparietal bones" and the mesoderm derived "tabular bones".

Technical Session X (Friday, October 19, 10:45 am)

THE FIRST CRANIAL REMAINS OF A GONDWANATHERIAN MAMMAL
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Gondwanatherian mammals are an enigmatic clade of Cretaceous and Paleogene mammals known from South America, Africa, Madagascar, India, and the Antarctic Peninsula. The six valid species, each belonging to a monotypic genus and the first of which was described only 26 years ago, are represented almost exclusively by isolated teeth; the only non-dental remains of gondwanatherian mammals consist of fragmentary dentaries attributed to *Sudamerica ameghinoi*, *Gondwanatherium patagonicum*, *Ferugliotherium windhauseni*, and an unnamed Tanzanian form. No cranial (i.e., skull exclusive of the mandible) or postcranial material has heretofore been assigned to the Gondwanatheria, a severe limitation that has precluded a comprehensive assessment of phylogenetic affinities. This limitation has resulted in controversy about the affinities of the clade, which was assigned first to the Xenarthra (Edentata), then to the Multituberculata (Allotheria), then to Mammalia incertae sedis, and most recently regarded as a sister group to Multituberculata within Allotheria. Here we describe the first cranial material of a gondwanatherian mammal. This material consists of a nearly complete and well-preserved cranium, recovered from the Upper Cretaceous (Maastrichtian) Maevarano Formation in the Mahajanga Basin of northwestern Madagascar. Salient features of the cranium include elongate, scimitar-like jugal flanges, a huge orbit, and a vaulted nuchal region. The preserved upper dentition consists of three molariform cheek teeth on one side and a single molariform on the other. The hypsodont nature of these molariform teeth, their oblique (dorsomedial-ventrolateral) implantation in the maxilla, their flat occlusal wear, and the presence of cementum-filled infundibula descending vertically into the crown and cementum-filled furrows on one side of the crown are features that serve to unequivocally identify the teeth, and therefore the cranium, as that of a gondwanatherian mammal. The alveoli demonstrate that, as for the dentary of *Sudamerica ameghinoi*, there were four molariform cheek teeth on each side. They also reveal, however, that there was a single, peg-like tooth mesial to the molariform cheek teeth and that the cheek tooth series on each side was separated from two large procumbent incisors by a large diastema. In that an associated upper dentition of a gondwanatherian mammal has never been known, we focus our presentation on these teeth. Nonetheless, this single specimen provides the first opportunity to include any gondwanatherian in a comprehensive phylogenetic database and more reliably assess the position of Gondwanatheria within Mammalia; a preliminary analysis indicates that gondwanatherians are not closely related to either the Multituberculata or the Allotheria.

Poster Session II (Thursday, October 18, 4:15 - 6:15 pm)

BODY MASS AND SHEARING QUOTIENTS OF MICROSYOPIDAE (MAMMALLIA, PRIMATES) FROM THE EARLY EOCENE, BIGHORN BASIN, WY (WASATCHIAN, NALMA): PALEOECOLOGICAL IMPLICATIONS FOR DIET
KRISTJANSON, Heather L., University of Toronto, Toronto, ON, Canada; PRUFROCK, Kristen A., University of Toronto, Toronto, ON, Canada; SILCOX, Mary T., University of Toronto, Scarborough, Toronto, ON, Canada

The Microsyopidae are extinct mammals from North America and Europe usually considered stem primates ("plesiadapiforms"). Large collections of the family are known from the Willwood Formation, Bighorn Basin, Wyoming (Early Eocene, Wasatchian North American Land Mammal Age). A well-documented mammalian faunal turnover event (Biohorizon A), associated with an increase in mean annual temperature (MAT), has been suggested to mark a considerable degree of change in the body mass of microsyopids. Previous work has shown an existing relationship between body mass and the dietary adaptations in extant primates. Here we investigate the shearing potential of a sample of Willwood microsyopids to examine whether a modification in dietary adaptation occurred along with a change in body mass. The lengths of shearing crests were measured, along with mesiodistal length and buccolingual width, in both upper and lower second molars. The shearing quotient (SQ), a measure of shearing potential, was used to infer change in diet. For the upper molars, this was based on a new study of variation in SQ in extant strepsirrhines. All specimens in the sample were categorized as utilizing insects as the primary source of protein in the diet. Body mass calculated from lower molars demonstrated a significant shift during Biohorizon