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Society of Vertebrate Paleontology
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Fossils and the Evolutionary Patterns of Ostariohysans, One of the Largest Vertebrate Clades, Saturday 10:15

**FOSSIL RECORD OF THE NEOTROPICAL SERRASALMIDAE (OSTARIOPHYI, CHARACIFORMES)**

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Serrasalmid species are a prominent lineage of characiform fishes containing 16 genera and approximately 75 species distributed in the major lowland drainages of cis-Andean and northwestern South America. Serrasalmids are well known for their diversity of feeding habits, including the flesh- and fin-biting piranhas (*Serrasalmus, Pygocentrus*), scale-eating false piranhas (*Caturpin, Acodon*), and fruit- and seed-eating pacus (*Mesoplatystoma, Paraplatystoma, Colossoma*). Isolated teeth and fragmentary jaw elements identified as serrasalmid are known from the fossil record of South America spanning most of the Cenozoic and Upper Cretaceous. The serrasalmid fossil record, including description of a new genus and species, is discussed in light of recent phylogenetic analyses of their relationships. The diversity of feeding behaviors in the family is reflected in taxonomically variable tooth and jaw morphologies, and the characters that are useful for fossil identification are outlined. The earliest fossils, from the Upper Cretaceous to Paleocene of Bolivia, belong to the pacu clade, and *Colossoma macropomum* is known from throughout the Neogene of South America. *Mylossoma* is known from the upper Miocene, and isolated teeth indistinguishable from modern true piranhas are known from the Miocene. My recent phylogenetic analyses based on morphological and molecular data recover a basal pacu clade that is sister to all other serrasalmids. This topology is consistent with the earlier appearance of penguins with respect to piranhas in the fossil record. The new genus and species of serrasalmid from the upper Miocene of Argentina based on a large, partially toothed premaxilla is described. The pattern of tooth placement exhibited by the new species is intermediate between the double-row condition of pacus and the single-row condition of piranhas, and is suggestive of how the double row of teeth may have been rearranged into a single row in the evolution of piranhas. Results from a new phylogenetic analysis including tooth and premaxillary characters aimed to determine the phylogenetic position of the new species are presented.

**Technical Session IV, Wednesday 3:15**

**WHAT CAN SEDIMENT PATTERNS TELL US ABOUT SOFT TISSUE?: AN ACTUALISTIC TAPHONOMIC STUDY OF OSTRICH HEADS DURING AND POST-BURIAL**

Daniel, Joseph, Ohio University, Athens, OH, USA; Witmer, Lawrence, Ohio University, Athens, OH, USA

CT scans of fossil skulls often show radiological density variations within the encasing rock. These variations may correspond to differential sediment sorting by soft tissue during burial. To test this hypothesis, we built two flumes to model deposition in (1) deep, slow-moving water (pools) and (2) shallow, fast-moving water (sand bars). Ostrich heads were buried in each flume under varying decompositional states (fresh, desiccated, rotten, clean skulls), then CT scanned and sectioned to obtain sediment samples for comparison with sediment scans created from the CT scans. Marked contrasts were seen between flow regimes and among decompositional states. Sediment drapes covered the heads retaining feathers in the shallow flume. No drapes appeared on the clean skulls nor on any head buried in the deep flume except after extensive decomposition dispersed organics into the surrounding water. Drapes may be a useful indicator of integumental coverings such as feathers or hair as well as water flow indicators. Only heads in the shallow flume showed any sediment sorting, as corroborated by grain-size analysis, filling the oral cavity and pharynx. The nasal cavity and large paranasal sinuses were extensively filled only in rotten specimens buried in the shallow flume. Nevertheless, in all cases the rostralmost nasal conchae were sufficiently covered, suggesting that evidence of conchae may be preserved in the sediment, even when not in the fossil itself. Over 30% of the initial air remained in all heads with soft tissue in the deep flume, whereas over 65% remained in fresh heads in the shallow flume, but decomposition rapidly led most air escape. Even in clean skulls, some air remained, suggesting that some fossil void spaces may be primary and were never sediment-filled. Continued decay after burial affects these patterns depending on the post-burial environment, most notably in the fresh heads, less so in the clean skulls. Such sediment patterns may provide additional anatomical information from CT scans of matrix-filled fossils, as well as identifying optimal preservational environments, allowing field workers to target promising rock units.

**Poster Session II (Thursday)**

**REMOVING FOSSIL RIBS: THE THREAD TECHNIQUE**

Davidson, Amy, American Museum of Natural History, New York, NY, USA

Preparators often face the problem of extracting high priority pieces (e.g., cranial elements) from beneath ribs in jumbled vertebrate fossil skeletons. The thread technique was recently developed to address this situation in preparing dinosaur fossils; one from Ghost Ranch (New Mexico) and one from the Gobi Desert of Mongolia. Both blocks contain skeletons preserved as dense assemblages of disarticulated bones that must be separated and prepared as individual elements. Especially problematic are areas where multiple, fragile, fractured ribs are interwoven and overlying skull elements. In order to untangle and lift each rib, a piece of sewing thread is first adhered to the surface with a thick, temporary coating of Acryloid/Paraloid B72. This opens up a myriad of dietary niches, allowing modern groups to achieve far more morphological diversity than any previous mammalian clade. Mastication was improved by occlusion between a novel upper molar structure, the protocone, and a basining within the lower molar talonid. An examination of Middle Jurassic through Early Cretaceous material at the Natural History Museum in London reveals a morphological progression of lower molar evolution through early mammals, which correlates with the current phylogeny of pre-triosphenic groups. The talonids of otherwise derived groups such as sphaerochilids and dryolestids do not differ appreciably from that of archaic taxa, such as *Kuehneotherium*, in the possession of a single cusp placed lingually on a short heel. However, talonid morphology deviates significantly from this pattern across early zitherian lineages, and this has led to some inconsistencies in determining homology with the multi-cusped talonids of more derived groups. As the talonid and cistid obliqua are elongated, the single talonid cusp migrates lingually into a position consistent with the hypoconid. Under this interpretation, *Amphitherium* fits well between the plesiomorphic morphology, characterized by dryolestids, and more advanced single-cusped taxa such as the stem zitherian *Argiusmus*. The hypocoonid was added postlaterally to the hypoconid, both to take over molaro-molar interlocking, and to provide an additional shearing surface in correlation with lingual migration of the upper molar metacone (as demonstrated by the morphology exhibited by *Pernamur*). The single talonid cusp of early mammals is therefore most likely homologous with the hypoconid of modern groups. This has a bearing on consistent coding of molar morphology in early mammalian taxa, and on the interpretation of character evolution from phylogenetic analyses.

**Poster Session IV (Saturday)**

**EVOLUTION OF DEVELOPMENT IN RUMINANT HEADGEAR: POTENTIAL FOR PHYLGENETIC RESOLUTION**

Davis, Edward, University of Oregon DoGS and MNCH, Eugene, OR, USA; Lee, Andrew, Ohio University College of Osteopathic Medicine, Athens, OH, USA; Braakora, Katherine, UC Berkeley Dept of IB, UCMP, Berkeley, CA, USA

A great deal of recent work has been devoted to understanding the phylogenetic position of Cetacea within the context of the larger artiodactyl phylogeny. While extremely productive with respect to understanding whale ancestry, this effort has resulted in novel topologies for the relationships within the ruminants. Building on this Cetartiodactyla work and other work focused on the Ruminantia, we have begun to address ruminant relationships through an exploration of the phylogenetic information recorded in the developmental processes of ruminant headgear (ossicones, horns, antlers, and pronghorns) and an initial assessment of how that information can be diagnosed in fossil taxa. One of the goals of this analysis is to understand whether or not headgear development is controlled by a developmental homology within ruminants. There is extensive evidence that headgear evolved two or more times within the ruminants, but the coincidence of this parallel evolution may reflect a multi-taphonomic process. Developing this process of diversification through shared developmental constraints. Placing these characters in the context of existing molecular and combined analyses suggests novel character polarizations and/or convergences depending upon which topology is chosen. Future work will include more extensive histological studies of developmental series of extant ruminants and a more complete sampling of fossil taxa in a new combined analysis.

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**THE EOCENE LAKE OF MAHANGE (TANZANIA) AND ITS FOSSIL FISHES**

Davidson, Matthew, University of Kansas Natural History Museum and Biodiversity Research Center, Lawrence, KS, USA; Arratia, Gloria, University of Kansas Natural History Museum and Biodiversity Research Center, Lawrence, KS, USA; Kaiser, Thomas, University of Hamburg Biocentre Grindel and Zoological Museum, Hamburg, Germany

Recent excavations in the Eocene lake of Mahenge, Tanzania by a German/Tanzanian team recovered approximately 2,000 fossils including vertebrates, invertebrates (mainly arthropods), plants, and trace fossils, of which 51% are fishes and 36% are plants. Combined with the sedimentological data, the fossil flora indicates an overall dry climate with pronounced seasonality. Fishes that have been formally described from Mahenge include two osteoglossomorphs, one clupeomorph, one characiform, one siluriform, and dryolestids do not differ appreciably from that of archaic taxa, such as *Kuehneotherium*, in the possession of a single cusp placed lingually on a short heel. However, talonid morphology deviates significantly from this pattern across early zitherian lineages, and this has led to some inconsistencies in determining homology with the multi-cusped talonids of more derived groups. As the talonid and cistid obliqua are elongated, the single talonid cusp migrates lingually into a position consistent with the hypoconid. Under this interpretation, *Amphitherium* fits well between the plesiomorphic morphology, characterized by dryolestids, and more advanced single-cusped taxa such as the stem zitherian *Argiusmus*. The hypocoonid was added postlaterally to the hypoconid, both to take over molaro-molar interlocking, and to provide an additional shearing surface in correlation with lingual migration of the upper molar metacone (as demonstrated by the morphology exhibited by *Pernamur*). The single talonid cusp of early mammals is therefore most likely homologous with the hypoconid of modern groups. This has a bearing on consistent coding of molar morphology in early mammalian taxa, and on the interpretation of character evolution from phylogenetic analyses.