

Saturday 3:45

DATA QUALITY, SIGNAL DETECTION, AND METHODOLOGICAL ROBUSTICITY IN THE ANALYSIS OF LARGE FOSSIL DATASETS

FORTELIUS, Mikael, University of Helsinki, Helsinki, Finland; PUOLAMÄKI, Kai, Helsinki University of Technology, Espoo, Finland; JERNVALL, Jukka, MANNILA, Heikki, GIONIS, Aristides, Univ. of Helsinki, Helsinki, Finland

The development and increasing use of public fossil databases in paleontological research draws attention to issues of data quality, detection of signals in noisy datasets, and robusticity of results with respect to analytical methods employed. Here we address issues arising in the analysis of fossil data compiled from disparate sources, using examples drawn from the NOW database of Old World Neogene land mammals (<http://www.helsinki.fi/science/now/>).

In the NOW data, several of the main spatial and temporal patterns were already detectable in a small dataset (1996, 511 locs) and have subsequently been found in analyses using updated and eventually much larger datasets (1753 locs for the same area in 2006). Among these robust patterns are the development in the Middle Miocene of Europe a contrast between a humid West and a dry East, the confinement of the abrupt turnover of the Vallesian Crisis in the early late Miocene to western Europe, and several trends involving trophic level, body size and ecomorphology. However, increased sampling and improved methodology has also revealed significant additional detail as well as general trends not originally detected.

One of the main issues in the analysis of fossil data concerns stratigraphic resolution and correlation between local zonation. Recent work on computational biostratigraphy has revealed that techniques based on entirely different principles, such as Appearance Event Ordination, Spectral Ordering, Monte Carlo Markov Chain methods, and Finding Partial Order, all generate broadly similar temporal patterns based on taxon occurrence alone, especially when only the most common taxa are included. The results correspond well to those based on recorded 'database age', derived from subjective assignment to time units or direct geochronology, but appear to have somewhat better time resolution. As an example we present a detailed study of how soon extinction of a taxon follows a decline in its observed commonness, using multiple, independently computed chronologies and two different versions of the NOW data.

Wednesday 11:00

MICROVERTEBRATE SITES IN THE MORRISON FORMATION (UPPER JURASSIC) OF THE WESTERN UNITED STATES: DEFINITION OF TAPHONOMIC MODES

FOSTER, John, Museum of Western Colorado, Grand Junction, CO; CARRANO, Matthew, Smithsonian Institution, Washington, DC; TRUJILLO, Kelli, Univ. of Wyoming Geological Museum, Laramie, WY; MADSEN, Scott, Dinosaur National Monument, Jensen, UT

In the Morrison Formation of western North America (Late Jurassic), microvertebrate specimens are known from a number of localities, but nine sites in particular have yielded abundant fossils. These nine sites combine for a vertebrate sample of 5000+ specimens and range in represented diversity from as few as 10 to as many as 45 taxa. The taphonomic and lithologic characteristics of some sites and their fossil material seem to be consistent and define three taphonomic modes of microvertebrate occurrence: Type I, characterized by thin, dense accumulations of abundant disarticulated microvertebrate remains in relatively hard green-gray siltstones and claystones; Type II, characterized by thicker layers of sparse accumulations of articulated to disarticulated microvertebrates in light gray to gray claystones (sometimes with minor silt); and Type III, characterized by thick layers of moderately dense accumulations of disarticulated microvertebrates in soft green-gray claystones that screen-wash to produce abundant fragmentary remains. Type I deposits are exemplified by Quarry 9 at Como Bluff, the Little Houston Quarry, and the Small Quarry; Type II by the Fruita Paleontological Area sites, Rainbow Park 96, and the Wolf Creek Quarry; and Type III by Ninemile Hill and Mile 175. Rainbow Park 94 may be a Type II/III locality. The differences in frequency of articulation and in bone deposit density between deposits of Types I and II are striking. One likely would never mistake matrix with bone from Quarry 9, Small, or Little Houston as coming from the Fruita Paleo Area or Wolf Creek, for example; and in fact, in hand sample, matrix from Little Houston and the Small Quarry can be literally indistinguishable. Environments of preservation for the different modes include abandoned channels and levee/splays for Type I, and overbank deposits for II and III. These modes suggest possible lithologies in which to find new microvertebrate sites and, along with environmental interpretations, may provide clues as to the reasons for preservation of microvertebrates in certain conditions at different sites.

Poster Session III

TERRESTRIAL LATE CRETACEOUS STRATIGRAPHY OF NORTH AMERICA AND THE UTILITY OF CERATOPSIDS IN BIOSTRATIGRAPHY

FOWLER, Denver, Stockport, United Kingdom

A comprehensive stratigraphy is presented for the terrestrial Late Cretaceous units of North America. This combines published radiometric dates, magnetostratigraphy, and reviews ranges of known taxa, paying particular attention to ceratopsids. While the stratigraphic relationships of Campanian strata are well constrained, the majority of the Maastrichtian is still largely unresolved. In the Campanian, integrity of the recently proposed Kirtlandian age is maintained. Uppermost deposits of the Two Medicine Fm, Montana, are demonstrated as early Kirtlandian in age. Purported north-south provinciality of dinosaurs is shown to

be mostly an artefact of stratigraphic incongruence. Exceptions are two biogeographically distinct chasmosaurine lineages present in the Judithian, and the presence of sauropods in the south, but not the north during the Edmontonian. Contrary to much recent work, stratigraphy and new material tentatively supports a single anagenetic lineage for centrosaurines. Most Late Cretaceous sauropod material from North America is attributed to *Alamosaurus sanjuanensis* and this has been used to infer same-age relationships for *Alamosaurus*-bearing strata. There is little evidence to support this. The form taxon *Alamosaurus* is unknown before the Maastrichtian, but is otherwise shown to be stratigraphically uninformative. We should not expect all ceratopsids found in formations bearing *Alamosaurus* to be the same taxon. If the pattern of speciation seen in the Campanian is followed, it is likely that many more species of chasmosaurine remain to be discovered from 70.5-66Ma. Rapid stepwise acquisition of characters in ceratopsids suggests that careful analysis of ceratopsid taxonomy and distribution presents them as the best biostratigraphic markers to be used where radiometric dates are not available.

Friday 8:45

CARBON AND NITROGEN ISOTOPIC RECONSTRUCTION OF TROPHIC RELATIONSHIPS BETWEEN HERBIVOROUS MAMMALS FROM SALTVILLE, VIRGINIA

FRANCE, Christine, Univ. of Maryland, College Park, MD; ZELANKO, Paula, Lehigh Univ., Bethlehem, PA; KAUFMAN, Alan, HOLTZ, Thomas, Univ. of Maryland, College Park, MD

Stable isotopic data from terrestrial herbivores in the Saltville Quarry, Virginia (late Rancholabrean) indicates a range of potential feeding strategies and digestive mechanisms. Nitrogen isotopic values of bone collagen are used to indicate trophic relationships while carbon isotopic values examine partitioning between browsers and grazers. Observations include a range of $\delta^{15}\text{N}$ values with the two most common herbivorous digestive mechanisms (i.e. ruminants and non-ruminants) clustering in two groups. A giant ground sloth exhibits isotopic values indicative of a non-ruminant herbivorous feeding strategy as opposed to alternate hypotheses of carnivorous or omnivorous strategies. A mammoth juvenile exhibited a relatively high $\delta^{15}\text{N}$ value which may be due to the previously noted nitrogen isotopic enrichment of mammalian milk. The $\delta^{13}\text{C}$ values indicate a dominance of C-3 plant browsers which may imply the absence of extensive or open C-4 grasslands in this region. This study, combined with currently ongoing analyses of Pliocene and Pleistocene specimens from Florida and California, will be used to examine trophic collapse at the end of the Pleistocene. The larger data set produced by these additional sites in conjunction with the Saltville data will provide new insight into the end Pleistocene mass extinction and the controversy between the human-driven versus the climate-driven hypotheses governing this event.

Poster Session II

THE FIRST RECORD OF *COAHOMASUCHUS* (ARCHOSAURIA: STAGNOLEPIDIDAE) FROM THE CARNIAN OF EASTERN NORTH AMERICA

FRASER, Nicholas, Virginia Museum of Natural History, Martinsville, VA; HECKERT, Andrew, Appalachian State Univ., Boone, NC; LUCAS, Spencer, New Mexico Museum of Natural History, Albuquerque, NM; SCHNEIDER, Vincent, North Carolina Museum of Natural Sciences, Raleigh, NC

A partial, articulated aetosaur that preserves a large portion of the bony armor, and more than 20 isolated osteoderms from a quarry in the Pekin Formation, (Carnian) of the Deep River basin of North Carolina most closely resemble the Carnian aetosaur *Coahomasuchus*. This genus was previously described from a single specimen from the Colorado City Formation (Otischalkian) of Texas. The sculpturing pattern in the new material is similar to *Coahomasuchus*, particularly in the largest paramedians, and exhibits a pattern of faint, sub-parallel grooves on the anterior dorsal paramedians and a better-developed "star-burst" radiating pattern of pits and grooves on more posterior osteoderms. The overall proportions of the new osteoderms, the absence of spikes on the lateral osteoderms and the lack of prominent bosses on the paramedian osteoderms, are also consistent with *Coahomasuchus*. Further preparation needs to be performed on the articulated specimen before a definitive species diagnosis is possible, so the North Carolina material is referred to *Coahomasuchus* sp. A second taxon is represented by a handful of associated caudal osteoderms, and they are referred to *Longosuchus*. Finally a caudal paramedian and a caudal lateral osteoderm with prominent bosses and a pitted ornamentation most closely resemble *Stagonolepis wellsi*. All fossils were recovered from spoils of a mining operation, but the *Longosuchus* and *Coahomasuchus* material were found in a different sediment type to that of the possible *S. wellsi* fossils. *Longosuchus* (including "*Lucasuchus*") has previously been reported from the Deep River Basin and is an index taxon of Otischalkian (Carnian) age. *Coahomasuchus* now co-occurs with *Longosuchus* in both the Chinle of Texas and the Pekin Formation of North Carolina and thus may be an index taxon of Otischalkian age.

Poster Session I

FAUNAL TURNOVER DETERMINED USING TAPHONOMICALLY EQUIVALENT ELEMENTS FROM MICROVERTEBRATE ACCUMULATIONS IN THE JUDITH RIVER (CAMPANIAN) AND HELL CREEK (MAASTRICHTIAN) FORMATIONS OF MONTANA

FREEDMAN, Elizabeth, WILSON, Laura, Museum of the Rockies, Bozeman, MT

Microvertebrate accumulations have historically been used for comparing paleoecomi-