

A MULTIDISCIPLINARY APPROACH TO ELUCIDATING THE EFFECTS OF SAMPLING BIASES ON DIVERSITY: IMPLICATIONS FOR SAUROPODOMORPH DINOSAURS

MANNION, Philip, University College London, London, United Kingdom

Deducing diversity patterns is an important element in understanding the macroevolutionary history of a group of organisms. However, there is increasing evidence suggesting observed diversity merely mirrors fluctuations in the rock record; thus, any patterns we see may purely reflect sampling biases. In order to test this, sauropodomorph dinosaurs have been used as a case study. These were an important component of Mesozoic terrestrial ecosystems and their evolutionary relationships are well understood. A taxic diversity curve has been produced for all valid sauropodomorph genera, as well as five phylogenetically corrected curves. These have been compared statistically with several sampling proxies, including a new completeness metric. Models that are perfect predictors of diversity have been created using these proxies, then subtracted from diversity to leave a residual diversity signal that cannot be explained in terms of sampling biases. Numbers of dinosaur collections show a strong correlation with Mesozoic diversity, while Cretaceous diversity is also correlated with sea-level and dinosaur-bearing formations. Additionally, individual-based rarefaction has been implemented to correct for sample size; this is the first time this has been carried out for dinosaurs. After correcting for biases, sauropodomorph diversity appears to be genuinely high in the Pliensbachian-Toarcian, Bajocian-Callovian, Kimmeridgian-Tithonian and Aptian, while low diversity levels are recorded for the Oxfordian and Berriasian-Barremian, with the J/K boundary seemingly representing a real diversity crash. Diversity in the remaining Triassic-Jurassic Stages appears to be largely controlled by sampling biases. Late Cretaceous diversity is difficult to elucidate and it is possible that this Epoch remains relatively under-sampled. Although distorted by sampling biases, much of sauropodomorph diversity is a reflection of a genuine biological signal. This study illustrates that use of a number of proxies is imperative in any attempt to tease apart genuine diversity from the biases of an uneven rock record, and it is hoped that similar methods will be applied to other taxonomic groups.

Technical Session IX, Thursday 3:45

THE TAPHONOMY OF TWO MICROFAUNAL FOSSIL ASSEMBLAGES FROM NORTHWESTERN KENYA

MANTHI, Fredrick, Kenya National Museum, Nairobi, Kenya

A key question in paleontology concerns the processes through which faunal assemblages would have accumulated. Taphonomic studies have been carried out on assemblages of microfauna from two Pliocene localities in north-western Kenya, in order to understand the agent/s responsible for their accumulation and the taphonomic processes that have influenced the assemblages. Characteristics of the assemblages such as the high representation of nearly all skeletal elements suggest that the faunal assemblages accumulated by way of predation. The intention of this presentation is to highlight work in the two Kenyan sites, and to underline the importance of taphonomic studies in understanding the different process that affect faunal assemblages.

Poster Session IV, (Saturday)

MULTIVARIATE ANALYSIS AND MORPHOLOGICAL DESCRIPTION OF THE CERVICAL COLUMN OF *MAIACETUS INUUS*: IMPLICATIONS FOR HEAD AND NECK MOVEMENT IN A PROTOCETID CETACEAN FROM PAKISTAN

MANZ, Carly, University of Michigan, Ann Arbor, MI, USA; BEBEJ, Ryan, University of Michigan, Ann Arbor, MI, USA; GINGERICH, Philip, University of Michigan, Ann Arbor, MI, USA

Semiaquatic protocetid whales possessed skeletal morphologies intermediate between those of their terrestrial ancestors and modern, fully aquatic Cetacea. Understanding how their morphology enabled them to negotiate contrasting environments is vital for documenting this transition from land to sea. Movements of the head and neck are facilitated or restricted by the cervical column. *Maiacetus inuus*, a recently described protocetid from the Habib Rahi Formation of Pakistan, was chosen for a detailed study of the cervical column because it is one of the most complete archaeocetes known and its neck can be examined in the context of other important semiaquatic features of the body. A principal components analysis (PCA) of cervical measurements of *M. inuus* and 20 extant terrestrial to fully aquatic mammals, reduces the variation in these taxa to two main principal components. While PC1 differentiates taxa based on size, PC2 adequately orders extant species by the degree of their aquatic habits. *M. inuus* clearly fell in the semiaquatic range on PC2, plotting closer to completely aquatic taxa. It has relatively wide vertebrae that could distribute compressional forces or stabilize the head against lateral movements while it was swimming, needs that are accomplished in modern Cetacea by further widening and compression and fusion of the cervical column. While the vertebrae of *M. inuus* are relatively short compared to other semiaquatic mammals, they are long enough to have allowed independent head and neck movements while on land. *M. inuus* has eccentric vertebral body articulations and flat, oblique zygapophyses that are consistent with considerable mobility of the neck. Large spinous and transverse processes indicate connections to powerful muscles that would allow *M. inuus* to move its head and neck freely on land and in the water while hunting, but could also be used during swimming to stabilize the head. The neck of *M. inuus* is congruent with

other aspects of the skeleton in exhibiting a morphological compromise, allowing efficiency in its dual terrestrial and aquatic environments.

Poster Session II, (Thursday)

A NEW GENUS AND SPECIES OF ADAPIDAE (MAMMALIA, PRIMATES) FROM THE MIDDLE EOCENE OF MAZATERÓN (ALMAZÁN BASIN, SORIA, SPAIN)

MARIGÓ, Judit, Institut Català De Paleontologia, Universitat Autònoma De Barcelona, Cerdanyola Del Vallès, Spain; MINWER-BARAKAT, Raef, Institut Català De Paleontologia, Universitat Autònoma De Barcelona, Cerdanyola Del Vallès, Spain; MOYÀ-SOLÀ, Salvador, Icrea At Institut Català De Paleontologia And Bave Department, Universitat Autònoma De Barcelona, Cerdanyola Del Vallès, Spain; CUESTA, Miguel Ángel, Departamento De Geología, Facultad De Ciencias, Universidad De Salamanca, Salamanca, Spain

In this work we report the discovery of a new adapid primate from the Robiacian (middle Eocene) site of Mazaterón (Soria, Spain). For this new genus and species, assigned to the Tribe Anchomomyini, more than 60 dental pieces have been recovered, and almost all the dental elements are represented.

This new genus shows clear morphological and biometrical differences with the other Anchomomyini (*Anchomomys*, *Periconodon* and *Buxella*). In particular it shows extremely mediolaterally compressed P/3 and P/4, with the P/3 larger than the P/4, highly imbricated premolars, with overlapping crowns and continuous basal cingula. It differs from *Periconodon* in lacking a pericone, in the considerably reduced hypocone, in lacking a metaconule, in having the hypoconulid lobe more lingually placed on the M/3 and in the better-developed protocone in the upper molars. It can be also distinguished from *Buxella* in lacking a pericone, in the much more reduced hypocone, in the more buccal cristid obliqua, in the more lingual hypoconulid lobe, and in lacking a paraconid and a well-developed premetacristid.

It is more similar to *Anchomomys* sharing relative small hypocone, absence of metaconule and pericone, reduction or absence of paraconid and triangular upper molar shape. However it differs from the species of this genus in the peculiar morphology of the lower premolars described previously, in the very reduced metacone and hypocone of the upper molars, in the presence of a single root in the P2/ and in its large size.

The new primate taxon discovered in the site of Mazaterón (Soria, Spain), reinforces the endemic nature of the Western Iberian Bioprovince during the Middle Eocene and its isolated situation from the southern Pyrenees and the rest of Europe.

Poster Session IV, (Saturday)

A CLOSER LOOK AT THREE PUBLISHED DATA MATRICES REVEALS SUPPORT FOR THE "LEPOSPONDYL HYPOTHESIS" ON THE ORIGIN OF EXTANT AMPHIBIANS

MARJANOVIĆ, David, CNRS UMR 7207, Paris, France; LAURIN, Michel, UMR 7207, Paris, France

Despite decades of intensive research, the origin of the extant amphibians remains controversial. Of the morphological phylogenetic analyses of limbed vertebrates published in the last few years, some have found a monophyletic Lissamphibia nested in the temnospondyls (the "temnospondyl hypothesis"/TH), some have found the same nested in the lepospondyls (the "lepospondyl hypothesis"/LH), and some have found some extant amphibians to be lepospondyls and others to be temnospondyls (the "polyphyly hypothesis"/PH). We have tested the accuracy of three recently published data matrices, two of which supported the PH and one of which supported the TH, and disagree with the scoring of many cells; this includes a spectrum from differences of interpretation of how to delimit character states or whether to split or merge characters, over cases where states of ontogeny-related characters in immature or paedomorphic specimens were taken at face value instead of scored as unknown, all the way to (numerous) unambiguous mistakes that are best explained as typographic errors. We have also ordered all potentially continuous multistate characters. In one of the matrices that supported the PH, we disagree with the scoring of 35% of the cells; when these are changed, the TH results, and when the lepospondyl *Brachydectes* and the temnospondyl *Gerobatrachus* are added or *Doleserpeton* is considered morphologically immature, the LH results. The second such matrix, which accompanied the description of *Gerobatrachus*, strongly supports the LH. Preliminary work on the largest matrix that supported the TH similarly finds support for the LH to be highest. We thus confirm the previous finding that errors in data matrices have a large impact on the results of phylogenetic analyses. We further offer new interpretations of the skull roof of *Brachydectes* and the teeth and tarsus of *Gerobatrachus* and suggest, based on (in part recent) literature, that pedicellate teeth could be more widespread than usually thought. Finally, as occasionally suggested in the literature, Albanerpetontidae could be the sister-group of Lissamphibia rather than a member of it.