last caudal vertebrae and then proceeds anteriorly from that point. These patterns seem to constitute a major difference between the reptilian and the synapsid lineages, the latter being more diverse with regard to the number of loci and direction of ossifications. Modes of neurocentral suture closure appear to vary substantially within the reptilian lineage, with marked differences between major clades, suggesting that this character may bear more evolutionary importance than previously thought. However, further research is necessary to refine our more detailed and deep-time understanding of the evolutionary history of these traits.

Cranial Ecomorphology of Odontocetes: a 3D-Evolutionary Approach

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The cranial morphology of toothed whales (Odontoceti) evolved under strong selective pressures. Extant odontocete species exhibit differences in feeding strategies, body size, diving adaptations, echolocation and brain size. These factors likely contributed to morphological diversification of the odontocete skull. Previous studies and experimental work on toothed whales confirmed that cranial anatomical features such as the number of teeth and mandibular bluntness correlate with feeding strategy, diet, and diving adaptations. Nevertheless, how overall skull size and shape vary between species in relation to feeding ecology and biosonar mode have yet to be tested in a phylogenetic context. In this study, we generated 3D-cranial models by using photogrammetry of 111 specimens representative of 60 (out of 72) odontocete species. We addressed the following questions: 1) what is the link between morphological variation and ecological adaptation in extant toothed whales? 2) Does morphological variation exhibit a strong phylogenetic signal? And 3) to what extent does such signal obscure our ability to detect ecomorphological adaptations? We found that skull morphology shows a significant phylogenetic signal, which is much stronger in terms of size than shape. After accounting for phylogeny, significant associations occur only between skull size and biosonar mode as well as other size parameters including body length and mass. Skull shape is only influenced by evolutionary allometry and no association with ecological parameters could be identified, suggesting that ecomorphological adaptations occur within major clades, which obscures functional anatomical adaptations across the entire Odontoceti clade.

Predicting Cochlear Frequencies Using Mechanical Properties of the Basilar Membrane

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Obtaining audiograms for most marine mammal species is not practical. Here, we show that audiograms can be estimated using measurements on post-mortem tissue combined with auditory models. A custom force probe was used to measure the mechanical stiffness at multiple points along the length of the basilar membrane in three land and five cetacean species (humans, gerbils, chinchilla, porpoises, dolphins, and beaked and baleen whales). Probe derived width and stiffness measurements were used to compute the center frequency of the measured location on the basilar membrane. The estimates were compared to known audiograms and basilar membrane frequency maps where available. The results from a diverse group of marine and terrestrial mammals suggest that mechanical measurements of the basilar membrane can be used to estimate the hearing range for species where a behavioral audiogram is not available, such as in mysticete whales.

Insight into the Development of the Avian Shoulder Girdle from a New Clade of Basal Pygostylian Birds

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Stemward Pygostylia (birds with a short tail ended in a compound bone pygostyle) are critical for understanding how the modern avian Bauplan evolved from the long-tailed most basal bird *Archaeopteryx*. However, the known diversity of early-branching pygostylians is obscured by limited fossil records. Recently, we described a new basal pygostylian *Jinguofortis perplexus* from the Early Cretaceous of China. Phylogenetic analysis recovers a clade uniting *Jinguofortis* and the enigmatic basal avialan *Chongmingia*, here named Jinguofortisidae, representing the second earliest diverging group of the Pygostylia. Jinguofortisids preserve a mosaic combination of plesiomorphic non-avian theropod features such as a fused scapulocoracoid and more derived flight-related morphologies including the earliest evidence of reduction in manual digits among birds. A fused scapulocoracoid in adult individuals independently evolved in Jinguofortisidae and Confuciusornithiformes. Its presence may relate to an accelerated osteogenic process during chondrogenesis. This, in turn, could be the result of a heterochronic process of peramorphosis by which these basal taxa retain the scapulocoracoid of the non-avian theropod ancestors, with the addition of flight-related modifications. With wings having a low aspect ratio and wing loading, *Jinguofortis* may have been adapted particularly to a dense forest environment. The discovery of *Jinguofortis* increases the known ecomorphological diversity of basal pygostylians, and highlights the importance of developmental plasticity for understanding the mosaic evolution in basal birds.

Components and Construction of the Thorax and Vertebral Column in Anthropoid Primates: Implications for Hominoid Evolution

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Primates exhibit perhaps the greatest diversity of positional repertoires among mammals, and the evolution of locomotor specializations is intertwined with the evolution of primate clades. Among extant anthropoids, thoracic shape varies with locomotor adaptation, which