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Palaeobiological insights from fossil bones

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All that generally remains of extinct vertebrates are their fossilized bones and teeth. Thus, reconstructing the biology of extinct animals often relies on indirect assessments from the fossil record. However, since the microscopic structure of fossil bone remains intact even after millions of years of fossilization, it is increasingly recognized as a valuable tool to directly assess various aspects of the biology of extinct vertebrates.

A host of experimental studies of modern bone suggest that bone is a plastic tissue that is highly responsive to its environment. From such studies it is evident that the microscopic structure of bone is affected by a variety of factors such as the actual rate at which it forms, the biomechanical functioning of the particular element within the skeleton, the ontogenetic age of the individual, disease, etc. Comparisons of the preserved bone microstructure of various extinct animals with that of modern bones have permitted valuable insight into various aspects of the biology and life history of several extinct taxa.

During ontogeny, morphological and allometric changes are well documented for several dinosaur taxa: for example, a decrease in relative orbital size, an increase in tooth counts, and increase or decrease in robusticity of limb elements, and the development of secondary sexual characteristics such as, horns and frills. Since the rate of osteogenesis also changes during ontogeny, with distinctive patterns of bone tissue forming at different stages of growth, the microscopic structure of fossil bone provides reliable information regarding ontogenetic age, as well as insight about the processes that affected growth.

This talk will briefly outline some of the histological studies that have been conducted on fossil bones in order to unravel aspects of the biology of extinct animals. For example, studies of non-avian and avian dinosaurs have permitted an understanding of the evolution of growth patterns among the Dinosauria. In addition research on different ontogenetic stages of *Pterodaustro*, an unusual filter feeding pterosaur from Argentina, have permitted an assessment of their growth trajectory. Recent studies comparing dinosaur taxa at high and lower latitudes have provided fresh insight into the adaptations of dinosaurs living well within the Arctic circle.

It has become increasingly recognized that to better understand the nature of bone tissues preserved in fossil vertebrates, it is imperative that more research is conducted on modern taxa to better understand the factors that affect bone growth and development.