

Growth series of one: case studies in time-transgressive morphology

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The study of ontogeny in the fossil record is complicated by two main factors: growth series are not available for many taxa, and correctly assigning juveniles and adults to the same taxon is often difficult, especially where several related taxa coexisted.

Ontogenetic change can also be revealed in single individuals whose morphology records characters from multiple ontogenetic stages. A snail shell is an intuitive example: the shell grows by accretion at its margin, starting from the larval shell (protoconch), and moving outward. Larval shell shape varies predictably between planktotrophic and non-planktotrophic lineages; and since the protoconch is embedded in the adult shell, larval ecology can be inferred in adults from the size and morphology of the retained protoconch.

In many extinct lagomorphs, the occlusal surface of the molars changed markedly over the lifespan of an individual, as features such as enamel ridges were revealed and then obliterated by wear. In this case, the complete ‘stack’ of potential occlusal morphologies was present in the adult tooth as soon as it was done mineralizing, and further change progressively erased the ontogenetically early character states.

In sauropodomorph dinosaurs, morphological complexity of the vertebrae increases along the cervical series. The simple morphology of anterior cervicals reflects both earlier ontogenetic stages and more primitive character states. More posterior vertebrae reveal the sequential formation of complex structures.

Individuals that record multiple ontogenetic stages can help solve palaeobiological problems, such as inferring life histories, assessing ranges of variation, and determining the origin of complex morphological characters.