The evolving face of jawed vertebrates: a view from the fossil record

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Abstract.

The origin of jawed vertebrates (gnathostomes) remains one of the foremost problems in the study of vertebrate evolution. Gnathostomes are characterised by jaws, teeth, paired appendages and mineralised skeletal tissues. This suite of features forms the substrate upon which the much of modern gnathostome diversity is built, and their complexity makes the question of their origins a highly challenging problem. The fossil record of the earliest gnathostomes from the Paleozoic Era offers the potential to resolve many of the deep mysteries about the origin of key jawed vertebrate anatomical systems. However, without a clear phylogenetic understanding of the myriad enigmatic early gnathostome fossils, they are mute on the question of evolutionary transformation. In this talk, I will outline some of the recent progress on the question of early jawed vertebrate phylogeny and evolution. The introduction of large-scale numerical phylogenetic analyses has challenged assumptions about the monophyly of classic early gnathostome groupings. The effect has been to highlight a number of overlooked extinct groups which may supply information about ancestral anatomical conditions that were thought to be undocumented by fossils. In particular, the enigmatic placoderms—armoured early jawed fishes that went extinct at the end of the Devonian—have become central to the debate on the establishment of key gnathostome characters in the jawed vertebrate stem lineage. In this talk I will highlight how our revised thinking about placoderms (and other early gnathostome groups) has changed our perspective of what the earliest jawed vertebrates looked like, what the anatomical and ecomorphological context for the origin of jaws may have been, and preview new, unpublished data on Paleozoic fishes with tantalizing clues about the future of early jawed vertebrate research.