Scientists reveal the braincase anatomy of the late Cretaceous tyrannosaurid Alioramus

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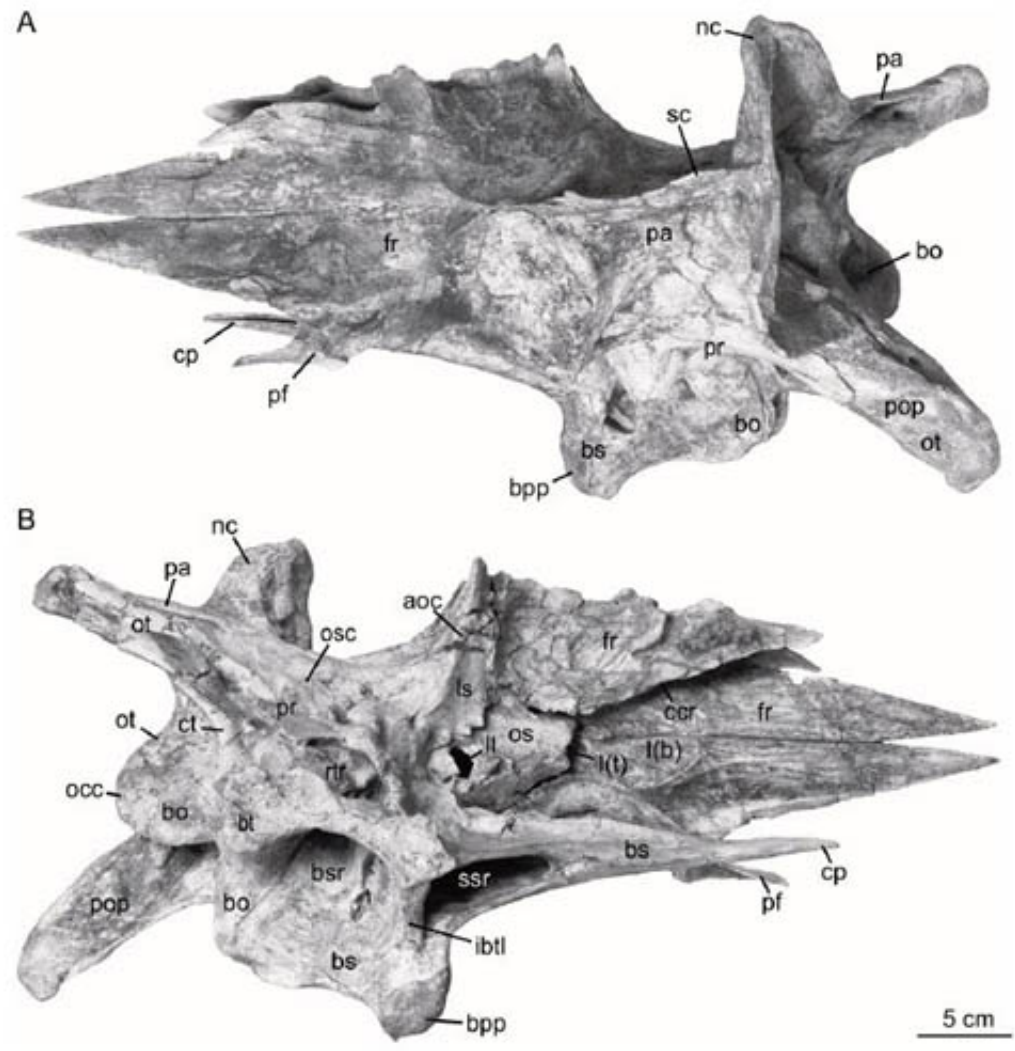

Fig.1. Dorsal (A) and ventral (B) views of the articulated braincase of Alioramus altai. Credit: BAMNH

The late Cretaceous tyrannosaurid Alioramus altai is known from a single specimen whose articulated braincase exhibits a nearly unique combination of preservational quality, subadult stage of growth, and morphological complexity. An international team, including Dr. XU Xing, Institute of Vertebrate Paleontology and Paleoanthropology (IVPP), Chinese Academy of Sciences, use a detailed physical preparation combined with high-resolution computed tomography to provide an expanded description of this braincase that includes details of the neurocranium and its dermal roof, pneumatic recesses and sinuses, cranial endocast, and inner ear cavities. The Study published in the *Bulletin of the American Museum of Natural History* 376 (1) increases our understanding of dinosaur biology, and may further contribute to better understanding of tyrannosauroid relationships.

The large-bodied theropod dinosaur Alioramus has long been a mysterious taxon, as it was established based on a single, incomplete, and generally poorly preserved specimen from the Late Cretaceous of Mongolia. Recently, the discovery of a second specimen, a remarkably preserved skeleton collected by the 2001 joint American Museum–Mongolian Academy of Science expedition to the Gobi Desert and established as the holotype of a new species (A. altai), has helped clarify the anatomy and phylogenetic position of Alioramus (IGM 100/1844).

The preservational quality of IGM 100/1844, combined with its relatively young ontogenetic age and hypothesized phylogenetic position, emphasizes the potential of this specimen for informing patterns of growth, development, and evolution within Tyrannosauroidea, a broader group that includes the derived tyrannosaurids and their closest smaller-bodied relatives and is now known to have had a complex evolutionary history lasting over 100 million years.

Researchers observed a few notable anatomical features, including a

highly developed rostral tympanic recess marked by three pneumatic fenestrae, a highly pneumatic paroccipital process with both rostral and caudal pneumatic foramina, a prootic fossa housing external foramina for the trigeminal and facial nerves, a well-developed superficial lamina of the prootic, an expanded vestibular cavity, and an osseous labyrinth that is plesiomorphic in appearance. "These observations, set within the currently available comparative context, elucidate numerous neuroanatomical transformations within Tyrannosauroidea and clarify where more data and work are needed", said lead author Dr. Gabe S. Bever, American Museum of Natural History.

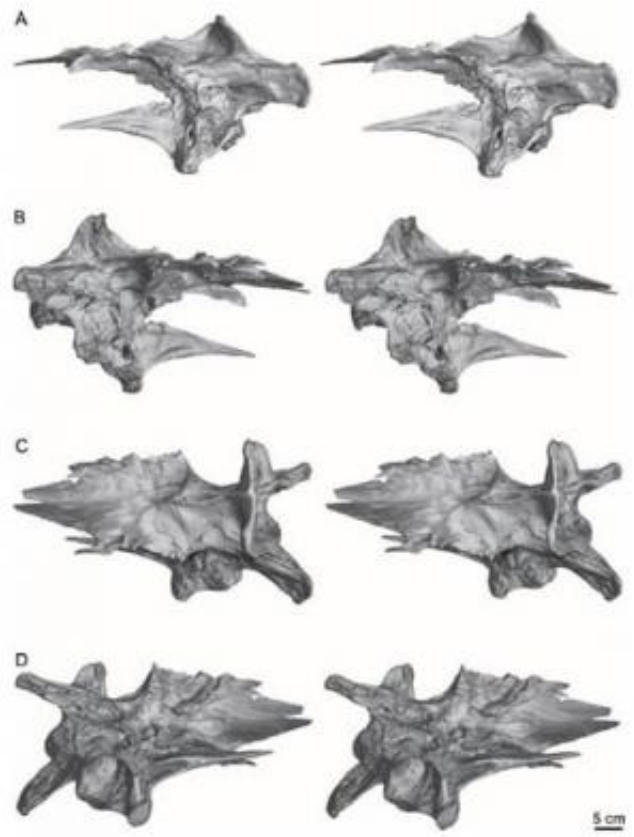

Fig.2. Stereopairs of the articulated braincase of Alioramus altai in left lateral (A), right lateral (B), dorsal (C), and ventral (D) views. Images are reconstructed from CT data. Credit: BAMNH

"Our research efforts were greatly facilitated by the use of high-resolution CT data, which among other things, allowed us to study in detail the complex anatomy of the various endocranial spaces, including that which housed the brain. These spaces are a potentially rich source of information for understanding everything from sensory capabilities, to behavior, to phylogenetic relationships", said study coauthor Dr. Stephen L. Brusatte, American Museum of Natural History.

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Provided by Institute of Vertebrate Paleontology and Paleoanthropology