

Analysis of *Tyrannosaurus* representations in cinema

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Background and Objectives

Dinosaurs have been the subject of numerous films (Debus, 2016). Despite that nearly all films belong to the science fiction genre, their importance to the promotion of vertebrate palaeontology is rather significant. One of the most famous and frequently shown dinosaurs is *Tyrannosaurus rex*. In this contribution, we examine the accuracy of the *Tyrannosaurus* depictions in films. We do so by applying a geometric morphometric analysis of images from films and actual specimens.

Methods

The depictions of *Tyrannosaurus* used in this analysis are profile images selected from 15 movies ranging from 1918 to 2018. Only images displaying a side profile of the head were selected. Some images were mirrored with Adobe Photoshop, in order to have the correct orientation. Those images were compared with photographs of *Tyrannosaurus* skulls seen from the lateral side. We selected a set of seven landmarks that could be identified both on the anatomical features of the skulls and on the film images. The landmarks on the skulls were the following: (1) most caudal point of the tooth row; (2) most rostral point of the tooth row; (3) point of maximum curvature of the rostral part of the premaxilla; (4) the most ventral point of the nasals; (5) highest point of the postorbital bone; (6) highest point of parietal bone; (7) center of the orbit. The landmarks of the tooth row (landmarks 1 and 2) could be easily identified on most film images. For landmarks 3 to 6, we assumed a negligible thickness of soft tissues covering the skull at those points. Because the eye is filling approximately 65% of the orbit (Stevens, 2006), the eye is considered here as the homologous landmark of center of the orbit (landmark 7). Because in the available film images the mouth is opened at various degrees, we did not collect any landmark on the mandible. Landmark coordinates were digitized using tpsDig2 v.2.17 (Rolf, 2015). For the general Procrustes analysis, principal component analysis, and visualization of shape variation along principal components, we used MorphoJ software (Klingenberg, 2011).

Results and Conclusions

The representation of *Tyrannosaurus* in films has changed over time. From 1918 till the 1980s the cinematographic head of *Tyrannosaurus* had an outline which was, unlike actual *Tyrannosaurus*, high over the antorbital fenestra. Despite the fact that the cranial anatomy of *Tyrannosaurus* was well known since 1908, film makers delayed in applying this knowledge into their creations. As a matter of fact, only after the 1990s, films presented a more realistic depiction of the *Tyrannosaurus* head. Although some recent dinosaur movies present outdated representations of dinosaurs, the last decade's trend indicates that as paleontologists continue to make new discoveries about dinosaurs, the way we see them in the cinema will also change.

References

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