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GSA Connects 2021 in Portland, Oregon

Paper No. 237-11

Presentation Time: 4:15 PM

A MORPHOMETRIC APPROACH TO HORSESHOE CRAB EVOLUTION

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Xiphosura, the horseshoe crabs, are a group of chelicerate arthropods known for their remarkable morphological conservatism through large periods of geological time. This has earned them the controversial title of “living fossils,” and is often attributed to a homogeneously low rate of morphological evolution, or “evolutionary stasis”, throughout their 470 million year long fossil record. Further examination of the horseshoe crab fossil record, however, reveals aberrant morphologies and the exploration of freshwater niches in some extinct clades, indicating a varied evolutionary history and possibly a heterogeneous rate of evolution both taxonomically and temporally. This was supported by previous calculations of evolutionary rate using discrete characters.

Here, a geometric morphometric approach was used to calculate shape change through time as an estimate of evolutionary rate. 2D landmark and semi-landmarks spanning the entire organism were chosen, although the number used per individual specimen fluctuated due to variable preservation in fossil taxa. The R package geomorph was used to place these landmarks and semi-landmarks on photographs of 56 species of fossil and extant xiphosurids, ranging from the earliest true horseshoe crab, the Ordovician *Lunataspis aurora*, to the four modern representatives of Xiphosura. A Generalized Procrustes Analysis was applied to these data. This transformation allowed for analysis of shape change through time as a proxy for evolutionary rate, which was examined both temporally and phylogenetically. The resulting estimation of shape change through time indicated a heterogeneous evolutionary rate in Xiphosura that varies through time as well as between clades, supporting previous work.

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Wednesday, 13 October 2021: 1:30 PM-5:30 PM

E141/E142 (Hybrid Room) (Oregon Convention Center)

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