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Paper No. 12-5

Presentation Time: 2:30 PM

EXAMINING EVOLUTIONARY RATE IN XIPHOSURA THROUGH TIME

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Xiphosura, colloquially known as horseshoe crabs, are a clade of aquatic chelicerates with a fossil record dating back to the Late Ordovician. The xiphosurans are often recognized as displaying relatively low morphological disparity throughout their evolutionary record, and as such, have been deemed “living fossils”. The term “living fossil” is often applied to clades like Xiphosura that display high morphological similarity between ancient and modern representatives, often with the implication that little evolutionary change has occurred through millennia. This term is now seen as incorrect; however, it is still widely speculated that groups termed “living fossils” experience lowered rates of evolutionary change, which accounts for perceived low morphological disparity. Methodological advances have allowed for the assessment of all fossil clades to examine the validity of these claims using an inferred phylogeny as a framework.

Herein, a consensus phylogeny of Xiphosura was generated using a discrete character matrix composed of 257 characters coded for 155 taxa, including 55 xiphosurids ranging in age from the Devonian to modern horseshoe crab species. Tree inference was performed using Bayesian techniques implemented in the software MrBayes. Subsequently, evolutionary rates were calculated using the R package Claddis and heterogeneity significance tests were conducted using the R libraries paleotree and ape following previous literature. The results showed that rates are heterogeneous across Xiphosura both temporally and taxonomically. This work provides further insight into overall variation of evolutionary rates within a single taxon and provides clarity about rates within clades that display low rates of morphological change through large spans of geological time.

Session No. 12

[T64. Future Leaders in Paleontology](#)

Monday, 26 October 2020: 1:30 PM-5:30 PM

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[Back to: T64. Future Leaders in Paleontology](#)

[<< Previous Abstract](#) | [Next Abstract >>](#)