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PALEOBIOGEOGRAPHY OF EARLY PALEOZOIC ECHINODERMS

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The Cambrian is a critical time in Earth's history for understanding the development of animal phyla and how that development affected the evolutionary trajectories each have taken through the Phanerozoic. Many of the taxonomic classes within Echinodermata, a morphologically disparate clade, first appeared in the fossil record during the Cambrian. Historically, Cambrian-age articulated echinoderms are not commonly preserved, which has limited paleobiologists' ability to quantify diversity and evolutionary patterns. Over the past few decades, more Cambrian echinoderms have been found and described from a few dozen localities globally, opening new avenues of research. This study leverages specimens from these new localities to focus on quantifying diversity and evolutionary patterns of eocrinoids, an extinct grouping of blastozoan echinoderms that are linked by their single pore respiratory structures, polyplated thecal bodies, a stem or stalk, and erect, biserial brachiole feeding appendages. We inferred phylogenetic hypotheses of Cambrian eocrinoids to reconstruct ancestral biogeographic histories and dispersal pathways in the Cambrian to determine potential drivers of evolution and dispersal. We use a fully bifurcating time-stratified phylogenetic tree and the R package BioGeoBEARS to estimate ancestral ranges within this phylogenetic hypothesis to identify speciation events and types. The number and type of dispersal events was estimated using Biogeographic Stochastic Mapping (BSM) within BioGeoBEARS. This study fills an important information gap by identifying the evolutionary relationships and speciation pathways of eocrinoids, a grouping that is hypothesized to be ancestral to many post- Cambrian blastozoan echinoderms. This study also adds to a growing body of research of phylogenetically-informed biogeographic studies focused on Paleozoic echinoderms; herein, we compare the results of this study using eocrinoids to the speciation and dispersal patterns that have been uncovered in other taxonomic groups across the Paleozoic.

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