EGU Galileo Conferences
GC5-Mass-27, 2019
Mass extinctions, recovery and resilience

Death defying morphologies: mass extinction and disparity in the order Harpetida

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This study seeks to better understand the phylogenetic relationships within the trilobite order Harpetida, with a view towards using this group to explore the relationship between extinction intensity and disparity. The harpetid response to the Late Ordovician mass extinction is of particular interest. A discrete morphological character matrix was created from the formal descriptions of harpetids in the published trilobite literature, and refined using first-hand observations of harpetid fossils. The final matrix consists of 76 discrete characters, including 69 cephalic characters, three thoracic characters, and four pygidial characters. This matrix is the first attempt of its kind to characterize the morphology of Harpetida as a whole, rather than focusing on individual harpetid genera.

Exemplar species from a broad selection of harpetid genera, along with ptychopariid and redlichiid out groups, are included in the matrix, coded according to published figures and direct observation of specimens held in the collections of the Yale Peabody Museum of Natural History. The matrix was used to generate a hypothetical tree of harpetid phylogenetic relationships, the topology of which indicates support for harpetid monophyly but throws doubt onto the previous hypotheses of the internal relationships of the group.

Disparity analysis of the group reveals a significant decline in morphological diversity across the Late Ordovician mass extinction boundary, with slow recovery beginning in the Silurian and continuing into the Devonian.