

Is a ‘one size fits all’ taphonomic model appropriate for the Mazon Creek Lagerstätte?

Thomas Clements, Mark Purnell, and Sarah Gabbott

University of Leicester, Geology - Palaeobiology, Leicester, United Kingdom (tc195@le.ac.uk)

The Late Carboniferous Mazon Creek Lagerstätte (Illinois, USA) is a world renowned fossil deposit with a huge diversity of preserved flora and fauna. It is widely considered to represent the most complete Late Carboniferous river delta ecosystem because researchers have identified that the deposit preserves organisms from multiple habitats including coastal swamps, brackish lagoons and oceanic environments. Often these fossils have exquisite soft tissue preservation yielding far more information than the ‘normal’ skeletal fossil record, while some soft bodied animals, such as the notorious Tully Monster (*Tullimonstrum gregarium*), are only known from this locality.

However, constraining a ‘one-size fits all’ taphonomic model for the Mazon Creek is difficult because of our poor understanding of sideritic concretionary formation or preservation (i.e. the presence of large numbers of unfossiliferous concretions), the large geographical area, the influences of fresh, brackish and saline waters during burial and the subsequent complicated diagenetic processes.

To determine the preservational pathways of Mazon Creek fossils, we have compiled data of the mode of preservation of morphological characters for all major groups of fossil organisms found in this Lagerstätte. This data can be used to test for variance in mode of preservation between taxa and also between specific tissue types. Furthermore, experimental decay data is used to constrain the impact of decay prior to fossilisation.

Our analysis indicates that there are variations in preservation potential of specific characters shared by taxa. Modes of preservation, however, seem to be consistent across the majority of taxa dependant on locality. This quantitative approach is being utilised as part of a larger ongoing investigation which combines taphonomy with geochemical analysis of siderite concretions from across the vast geographical area of the Mazon Creek. Together this approach will allow us to elucidate the preservation pathways of organisms and will lead to better understanding of taphonomic biases operating in this Lagerstätte.