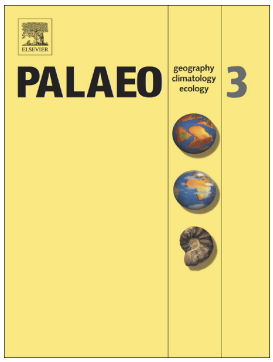

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PII: S0031-0182(17)30806-4
DOI: doi:10.1016/j.palaeo.2018.05.010
Reference: PALAEO 8766

To appear in: *Palaeogeography, Palaeoclimatology, Palaeoecology*

Received date: 2 August 2017
Revised date: 8 May 2018
Accepted date: 8 May 2018

Please cite this article as: Srilak Nilmani Perera, Alycia L. Stigall , Identifying hierarchical spatial patterns within paleocommunities: An example from the Upper Pennsylvanian Ames limestone of the Appalachian Basin. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Palaeo(2018), doi:10.1016/j.palaeo.2018.05.010

Identifying hierarchical spatial patterns within paleocommunities: An example from the Upper Pennsylvanian Ames Limestone of the Appalachian Basin

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Abstract

Identifying ecological mechanisms that produce hierarchically arrayed spatial variation in community structure can be difficult in the fossil record due to conflation of spatial and temporal patterns. However, this difficulty can be mediated by minimizing the temporal duration of deposition within the unit examined. In this study, the fauna of the Upper Pennsylvanian Ames Limestone (Conemaugh Group) was analyzed to explore whether Ames paleocommunities exhibited hierarchical structure in a spatial dimension. This widespread carbonate unit was deposited during the maximum flooding interval of a glacio-eustatically influenced fifth order sea level cycle, and preserved taxa are contemporaneous within only a few thousand years. Paleocommunity structure and variability was assessed at multiple spatial scales using samples collected from seven outcrops of the Ames Limestone throughout southeastern Ohio which form a northeast to southwest trending transect parallel to the paleoshoreline. Abundance data were collected using quadrat sampling for brachiopods, bivalves, gastropods, bryozoa, corals, crinoids, echinoids, trilobites and foraminifera. Paleocommunity structure was analyzed via cluster, ordination, guild, and abundance analyses at multiple spatial scales (within a single locality, among localities and within the total study area) to provide insight on geographic partitioning of paleocommunity variation. Multiple levels of paleocommunity organization were recovered within the Ames fauna. All levels exhibited spatial