Three-dimensional morphological characterization of the trace fossil *Parahaentzschelinia ardelia*, Atoka Formation, Oklahoma, USA

SEAN M.C. MURPHY*

Department of Earth Sciences, Memorial University of Newfoundland, St. John's, Newfoundland and Labrador A1B 3X5

The value of trace fossils lies in their use as indicators of paleoenvironment and depositional setting; however, there remains an issue in that some ichnotaxa have been poorly and inadequately defined from their sample material. One such example is Parahaentzschelinia ardelia from the Atoka Formation (Oklahoma), the focus of this research. Trace fossil material discovered in the Winterhouse Formation (Newfoundland), while similar to P. ardelia, contains additional morphological features revealed through threedimensional reconstruction. This poses a taxonomic problem in that the type material is considered to be inadequately described. Revising ichnotaxonomic groups using modern methods and applications is one way of resolving this type of issue, in the hopes that taxonomic interpretations can be better implemented and regulated. A sample of the trace fossil P. ardelia was collected from an area south of Hartshorne, Oklahoma (N 34°76'47.59", W 95°57'91.71") relying on information reported during its original discovery in 1971. P. ardelia was obtained within a float rock from thinly bedded Pennsylvanian sandstones of the Atoka Formation, a 7620 m thick stratum dominated by greyblack shales with intermittent brown to light grey, thinly bedded guartz arenites. The sample exhibits both epirelief and full relief preservation, vertical upward branching burrows, and a highly weathered conical depression, similar to the trace fossil holotype. Burrow fill is primarily homogeneous mudstone with high colour contrast with the host rock. This topotype material was implemented with a three-dimensional approach to reconstructing and describing the fossil burrows using techniques developed at Memorial University of Newfoundland. Use of the serial grinding procedure with a Denford VMC 1300 3 axis CNC milling machine for the purpose of modeling threedimensional features has not previously been performed for Parahaentzschelinia. The objective of this research is to fully characterize the type material from Oklahoma with the purpose of relieving all taxonomic issues. This will allow for a comparison in the morphology from the paratype material to other fossil material described as Parahaentzschelinia. The resultant morphology can be further compared with modern vertical burrows to better understand the ethology. Only once this work is complete will Parahaentzschelinia become a meaningful name and concept.

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