

## A highly diverse ichnofauna in Late Triassic deep-sea fan deposits of Oman

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### ABSTRACT

We encountered a highly diverse ichnofauna within the deep-sea fan deposits of the Upper Triassic Al Ayn Formation in Oman. It comprises 32 ichnogenera: 18 ichnogenera represent predepositional graphoglyptids and other trace fossils that are preserved as casts on turbidite soles, and 14 ichnogenera represent postdepositional trace fossils that penetrate turbidite beds. The relatively large size of the area studied certainly favors encountering a high number of ichnogenera. The diversity we found approximately doubles the value that has often been stated in the literature and contradicts the paradigm that the Triassic represents a time of low ichnodiversity in the deep sea. Although the data are limited, in general the recovery of deep-sea tracemakers has been very slow owing to environmental disturbances that resulted from cold-bottom-water circulation after the Carboniferous–Permian glaciation. The high ichnodiversity in the Al Ayn Formation is explained by its paleogeographic position and locally formed warm bottom waters. The Al Ayn deposits accumulated adjacent to wide evaporitic and carbonate shelves, indicating continuous warm conditions. The Al Ayn clastic system was likely influenced by dense, salt-rich, warm water flowing back to the ocean from the carbonate and evaporitic shelf area. The downwelling water may have reduced the effects of cold water that formed during the Late Paleozoic glaciation and the Permian–Triassic anoxia, and, thus, it may have provided a refuge habitat. Despite the global trend of low-diversity deep-sea ichnocoenoses, refuge habitats may have been established in areas less affected by the otherwise harsh conditions.