Paper Number: 3037

Impoverished hard substrate biotas in the aftermath of the end-Permian mass extinction: evidence from East Greenland

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The end-Permian mass extinction was the most severe biotic event in Phanerozoic Earth history, affecting ~90% of all marine species. Despite this, the post-extinction recovery phase is known to have begun rapidly, at least within 1-3 Myr of the dawning of the Early Triassic [1]. Various individual taxa or ecological groups of organisms, however, seem to have responded differently, with survival and re-diversification patterns of nectonic (ammonoids, conodonts) and shelly soft substrate macrobenthos (molluscs, brachiopods) being particularly well documented. In contrast, the recovery scenario for hard substrate biotas (encrusters and borers), which are a major component of marine ecosystems today, is still obscure. Recent data from Western Pangaea (USA) [2] and South China block [3] show that post-extinction (Griesbachian) encrusting communities were exclusively dominated by microconchid tubeworms; these inhabited shelly and microbialite substrates in both shallow and deeper water palaeoenvironments. Borers were numerically much scarcer and represented by a single ichnotaxon (*Talpina*) [2]. Yet this perspective is palaeogeographically limited within lower palaeolatitudes, and more detailed information from higher palaeolatitude communities is necessary to test for global system patterns. Systematic field excavations taking place in East Greenland have provided significant new data with which to fill this gap. Inspection of shells (bivalves), microbialites and host deposit from the lowermost Triassic (Griesbachian and lower Dienerian) interval at Kap Stosch on the Hold with Hope peninsula [4] has showed that substrates were occupied by abundant microconchids. Our new findings augment this by revealing two distinct microconchid morphotypes in the Griesbachian, spirally coiled on shells and helically-uncoiled in microbialites, but these likely represent the same species adopting contrasting life strategies for different habitat settings. However, in the lower Dienerian a completely unique species with straighter and trumpet-like tube morphology, most probably also adapted to microbialite habitat, appeared. A few, *Entobia*-like borings have also been noticed on a single rock substrate. This suggests that Early Triassic post-extinction hard substrate assemblages were characterised by scarcity of borers but dominated by successive radiations of microconchid tubeworms that occupied multiple shelly and microbialite substrate ecosystems within both low and high palaeolatitude environments. Survival and empty niche occupation by encrusters therefore had a globally concurrent pattern, and can be used to track P-T boundary marine faunas via a ubiquitous low diversity signature.

References:

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