New Insights from the Prees-2 core into marine microfossil diversity following the end-Triassic mass-extinction

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Abstract

The end-Triassic mass-extinction (ETME; 201 Ma) is commonly linked to the emplacement of the Central Atlantic Magmatic Province, triggering extreme environmental changes, and affecting both marine and terrestrial ecosystems. Marine phytoplankton groups were severely impacted by the ETME. Cyst-producing dinoflagellates and calcareous phytoplankton show high extinction rates. Instead, Early Jurassic epicontinental seas appear to have been populated by green algae (Prasinophycae) and enigmatic acritarchs, essentially holdovers from Paleozoic plankton communities. Here, we focus on the acritarch assemblages that become dominant during the Hettangian but have been largely ignored since the seminal work in the 1960s by David Wall. This research aims to understand how oscillations in acritarch, and dinoflagellate cyst diversity may reflect continued adverse conditions in the oceans following a major mass-extinction event. We use the recently drilled Prees-2 core, recovered in the UK's Cheshire Basin as part of the JET ICDP project. The samples were collected at one-meter intervals from the Redcar Mudstone Formation of the Lias Group. The unit consists of monotonous dark grey massive to faintly laminated mudstone and marl with sparse carbonate concretions. The dinocyst *Dapcodinium priscum* is the most abundant and prevalent marine micro-organism in the *tilmanni* chronozone, *i.e.*, the post extinction zone. However, in the ensuing *planorbis* Chronozone, associated with the "main negative excursion" in bulk organic carbon isotopes, *D. priscum* is replaced by *Beaumontella langii* together with a suite acritarch taxa from the Acantomorphitae subgroup. At the base of the middle Hettangian *liasicus* Chronozone dinocyst diversity further declines, and acritarchs from the Polygonomorphitae subgroup increase in abundance. Alternating cycles of dinocysts versus Polygonomorphitae acritarchs continue towards the top of the Hettangian. Future work, including inorganic geochemical analyses, will aid to understand how acritarchs took advantage of ecological opportunities to dominate the environment and fill the available econiches and how their diversification may have been a response to these geochemical changes. The observed polymorphism in acritarchs may be biologically and mechanistically related to the development of teratologies, linked to, for instance, metal poisoning.

Keywords: Hettangian, Acritarchs, Palynology, ETME

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