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Re-evaluating the GOE record in Western Australia's northern Capricorn Orogen.

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The Paleoproterozoic Era (2.5 – 1.6 Ga) was a pivotal interval in Earth's history, marked by profound environmental, tectonic, and biological change. This era encompasses global glaciations, large-scale disturbances to the carbon cycle, and the Great Oxidation Event (GOE). Establishing precise chronological constraints and a robust stratigraphic framework is essential for understanding the sequence, context, and potential causality and interdependence among these global environmental changes, tectonic processes, and biological innovations.

In Western Australia's northern Capricorn Orogen, successions preserve a globally significant record of these events, and of a co-evolving biosphere including abundant microbialites and microfossils. A fault-bounded ridge located approximately 5 km east of Mount Berry has been the subject of extensive geobiological investigation. It was previously assigned to the 2.4 – 2.2 Ga Turee Creek Group, implying deposition coeval with the GOE. However, its lithostratigraphic assignment has remained contentious due to the presence of a distinctive microbialite assemblage, characteristic of the younger 2.0 – 1.8 Ga Duck Creek Dolomite.

Here we reassess the stratigraphic assignment of the fault bounded succession. Integrating four newly measured sections with regional microbialite biostratigraphy and three new U–Pb SHRIMP dates, we refine the age of deposition and correlation of the unit regionally. We also document a newly recognised microfossil locality and evaluate its regional significance. The combined sedimentological, paleobiological, and geochronological evidence indicates that the ridge is demonstrably a faulted slice of the Duck Creek Dolomite rather than the Turee Creek Group, postdating the GOE by at least 500 million years. This reinterpretation resolves a long-standing stratigraphic debate, refining regional stratigraphic correlation and enhancing our understanding of Paleoproterozoic biological and environmental evolution.