

## Changes in palaeoenvironmental conditions in Late Devonian reef systems from the Canning Basin, WA: A biomarker and stable isotope approach

Svenja TULIPANI<sup>1</sup>, Kliti GRICE<sup>1</sup>, Paul F. GREENWOOD<sup>1,2</sup>, Peter HAINES<sup>3</sup>, Roger E. SUMMONS<sup>4</sup>, Michael E. BÖTTCHER<sup>5</sup>, Clinton B. FOSTER<sup>6</sup>, Martijn WOLTERING<sup>1</sup>, Ted PLAYTON<sup>7</sup>

<sup>1</sup>WA Organic and Isotope Geochemistry Centre, Department of Chemistry, Curtin University, Perth, Western Australia, [s.tulipani@curtin.edu.au](mailto:s.tulipani@curtin.edu.au);

<sup>2</sup>Centres for Exploration Targeting and Biogeochemistry Centre, The University of Western Australia, Perth, Western Australia

<sup>3</sup>Geological Survey of Western Australia, Perth, Western Australia

<sup>4</sup>Department of Earth, Atmospheric and Planetary Sciences, MIT, Boston, USA

<sup>5</sup>Leibniz-Institute for Baltic Sea Research, Warnemünde, Germany

<sup>6</sup>Geoscience Australia, Canberra, Australian Capital Territory

<sup>7</sup>Chevron Energy Technology Company, Houston, Texas, USA

During the Late Devonian one of the biggest mass extinctions in Earth's history wiped out the extensive reef systems prominent in that era. The most severe loss of species occurred at the Frasnian–Famennian (F-F) boundary; however also the Givetian and Famennian time periods were closed by major extinctions. Cause and nature (distinct events or several smaller pulses) of the extinctions continue to be debated. Hypotheses range from bolide impacts to climate change and anoxia/eutrophication in the oceans linked to the rise of terrestrial vegetation. The current study includes stable isotope ( $\delta^{13}\text{C}$ : carbonates, organic matter;  $\delta^{34}\text{S}$ ; C-CSIA) and biomarker analyses combined with palynology in two sample sets (Frasnian and potentially Givetian) from the Canning Basin to investigate palaeoenvironmental conditions in marine settings associated with reef systems prior to the F-F boundary. Evidence of photic zone euxinia (PZE) in combination with a stratified water column (freshwater incursions over saline bottom waters) was found in an interval of the Gogo formation, the source rock yielding the high quality oils of the Canning Basin. In contrast the other sediment set was deposited under oxic conditions with no signs of hypersalinity or stratification indicating that extensive biotic crises only occurred periodically throughout the Frasnian. Furthermore, biomarkers originating from early landplants and combustion sources were identified and will be correlated with the palynological results. Our findings are in agreement with other studies reporting globally occurring (periodic) PZE throughout the Late Devonian which likely contributed to the mass extinctions.