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Extant benthic foraminiferal assemblages used in palaeocological interpretations on a high-latitude coral reef, South Africa

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South Africa's coral reefs are located at high latitude, but have high biodiversity and recreational value. Also being marginal, potentially they provide insight into future scenarios of global change for other sub-tropical and/or tropical reefs stimulated by human and climate change pressures. Sodwana Bay has a complex of reefs which are situated on a strongly wind-driven, high energy coastline also influenced significantly by the strong western boundary Agulhas Current. Our aim was to assess the impact of recent changes potentially due to climate change, on these reefs using foraminifera as a proxy for calcifying marine organisms. Limited foraminiferal research has been conducted in this region with none having a palaeoclimate focus. The palaeoclimate was analysed through the collection of three intact bioclastic sediment cores X, Y and Z, which were collected at a depth of 16m. Stable isotope data (δ^{18}O and δ^{13}C) together with down-core foraminiferal assemblage changes allowed for palaeocological interpretations. Sediment cores were collected adjacent to the most accessible part of the reef complex at Two-mile Reef, Sodwana Bay, with the concurrent collection of extant Large Benthic Foraminifera (LBF) using a spatial crossed design of different substrata and habitats.

Symbiont bearing LBF showed distinct zonation across the reef and reef associated habitats, with discrete assemblages found in sediment habitats and coral rubble. Distributions of these organisms were influenced by sediment grain size characteristics (% fine sand, % medium sand and % gravel) as well as water chemistry parameters (pH, salinity, temperature and total alkalinity). The living LBF were found predominately on reef rubble. The marginal nature of these reefs was also corroborated through carbonate analysis of water parameters (winter mean Ω_{Ar}: 3.00 $\pm$0.37SD; summer mean Ω_{Ar}: 3.54 $\pm$0.36SD). Radiocarbon dating from core X provided a calendar age of AD 680-920 (BP 1270 – 1030). Inferences into possible salinity changes in the environment over the last millennium were made, supplementing additional research on future effects of climate change on South Africa's coral reefs. Based on the extant and past foraminiferal distributions, it was deduced that turbulence was a major factor governing foraminiferal assemblage distribution across the study site. Turbulence in this setting also proved potentially detrimental in the preservation of the palaeoclimate record.