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# Preservation of foraminifera in tropical intertidal environments: implications for palaeoenvironmental studies

A. **Andrew Berkeley** (1), B. Chris Perry (1), C. Scott Smithers (2), D. Ben Horton (3)

(1) Manchester Metropolitan University, UK, (2) James Cook University, Australia (3) University of Pennsylvania, USA (a.berkeley@mmu.ac.uk / Fax: 00 44 161 247 6318 / Phone: 00 44 161 247 6203)

Saltmarsh foraminifera are abundant, widespread, occur in diverse populations, and can be well preserved in the fossil record. In addition, they have been shown to exhibit vertical zonation with respect to the tidal frame, making them a highly useful palaeoenvironmental tool for the reconstruction of Holocene sea-levels. The integrity of this application however is based on the assumption that modern foraminiferal assemblages are sufficiently similar to their buried fossil counterparts so as to make an extrapolation of present-day environmental information to fossil assemblages meaningful. Given that the majority of studies which document foraminifera in temperate saltmarshes sample only the top 1 cm of sediment in characterising modern distributions, this assumption may be inappropriate for two reasons: (1) The occurrence of subsurface dwelling individuals, or infauna, which may provide a contribution of tests to a fossil horizon that is 'hidden' when sampling the surface top 1 cm alone, and (2) Post-mortem taphonomic changes to faunal assemblages which may further alter the residual assemblages in the fossil record.

Although some of these issues are well documented from temperate saltmarshes, there is a paucity of data from their tropical counterparts, mangrove forests, which dominate the upper intertidal zone of tropical muddy coastlines. Since these regions are distant to the former centres of glaciation (far-field sites) they have experienced no isostatic rebound of the crust, and thus effectively isolate the post-glacial eustatic signal. In contrast to mangrove fauna, which is considered to exhibit wide variability in zona-

tional patterns, sediment-surface foraminifera from mangrove environments have been shown to be vertically zoned with respect to the tidal frame. It follows that mangrove foraminifera may have the potential to markedly improve tropical sea-level based reconstructions by providing a more highly resolved relative sea-level signal than those of floral based proxies such as pollen. However, with notable exceptions, sub-surface sediments in these settings have received little attention in the literature and the distribution of infaunal populations and preservation potential remains unclear. This project aims to test the applicability of tropical intertidal foraminifera to the reconstruction of Holocene sea-level change by assessing the impact of infauna and taphonomy on foraminiferal assemblages from a mangrove-mudflat system in northern Queensland.

Foraminifera have been sampled from a range of intertidal environments by collecting short cores (1 m) across a shore-normal transect during both wet and dry seasonal extremes. Samples were taken every centimetre from the first 10 cm of each core, then at the depths 11.5, 16, 20, 25, 30, 35, 40, 45, 50, 70 and 90 cm. Samples were then preserved in the field so as to limit any taphonomic bias associated with post-recovery oxidation of the sediment, and stained with Rose Bengal to allow the discrimination of live and dead specimens. Basic sedimentary units were identified and characterised in terms of grain size, organic content and carbonate content in order to provide a facies framework for the study, and a detailed analysis of downcore foraminiferal abundance was undertaken in order to determine the pathways from live to dead to fossil assemblages. Surface populations are characterised by a dominance of agglutinated species within the upper mangrove with a gradual increase in calcareous forms through the lower mangrove and eventual calcareous dominance on the mudflat. Preliminary findings however suggest a marked dichotomy in the preservational tendencies of mangrove and mudflat facies. Calcareous foraminifera appear to disappear very soon after death within the organic-rich mangrove muds whereas their abundance increases markedly beneath the surface in the silty-clay mudflat sediments. Perhaps more surprisingly, agglutinated foraminifera - which tend to dominate within the mangrove, also appear to be poorly preserved, declining significantly with depth below the sediment surface. This preservational pattern is likely to cause an under-representation of high-intertidal mangrove biofacies within the fossil record with direct implications for the use of surface foraminiferal distributions as palaeoenvironmental tools.