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Using coral-based records to assess the effects of terrestrially-derived sediments on reef development at the community and skeletal microarchitectural level.

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Increased terrestrial sediment and nutrient yields, linked to anthropogenic modification of coastal catchments, are widely regarded as one of the most significant threats to coral reef 'health'. This view stems from the perception that such inputs can increase inner-shelf turbidity and/or sedimentation rates, as well as nutrient concentrations, to levels that are detrimental to coral growth and reef development. In this context a number of studies have utilised various proxy data obtained from coral skeletons (density banding, fluorescent banding and isotopic ratios) to interpret both the frequency and intensity of fluvial inputs to nearshore environments. In addition, a number of studies have examined spatial variations in rates of coral growth and calcification across gradients of fluvial freshwater and sediment input. The often successful application of these skeletal-based proxy records from recent corals raises the intriguing possibility of establishing detailed, long-term ($>10^3$ year timescale) records of coral community development, coral growth and skeletal calcification.

Such approaches have particular significance within turbid, nearshore marine settings where a number of recent studies have reported significant reef development in environments subject to naturally high rates of terrigenoclastic sediment accumulation and high turbidity (including studies in Thailand, Mozambique and a number of localities along the nearshore coast of the Great Barrier Reef). Active reef development

demonstrates the potential for both the persistence of coral communities and for reef-building in these settings – points that raise intriguing questions about rates and styles of coral carbonate production. Firstly, are these coral communities able to produce reefs, despite prolonged fine-grained terrigenoclastic sediment accumulation, because of particularly high coral growth and calcification rates ? and, secondly, have these rates been consistent as the reefs have grown to sea-level?

Here we present recent and on-going research aimed at developing detailed records of coral community development (at the coral colony level) and coral skeletal calcification (at the microarchitectural level) within such nearshore marine settings. High resolution records of coral species assemblages (using exquisitely preserved coral specimens) have, to-date, been established for two inner-shelf nearshore reefs (Paluma Shoals and Lugger Shoal) from the central GBR. Core data demonstrates that these reefs have been under terrigenoclastic sediment influence since reef initiation ($\sim$1200 years BP at Paluma Shoals, $\sim$800 years BP at Lugger Shoal), and that both sites contain a relatively depauperate, but temporally persistent, suite of corals – dominated by *Acropora pulchra*, *Montipora mollis* and (at Paluma Shoals) *Turbinaria frondens,* and (at Lugger Shoal) *Galaxea fascicularis* and *Astreopora* sp. Although the relative abundance of coral species varies between cores, there are no significant differences between overall species composition or the identities of dominant framework contributors during reef accretion. The largest changes in community structure occurred as reefs reached sea-level and reef-flat communities developed, changes driven by intrinsic rather than extrinsic factors. This work is presently being extended to develop, using a combination of standard Scanning Electron Microscopy and novel CT-Scanner technologies, high-resolution records of temporal variations in coral calcification and microskeletal development. These approaches will permit, 1) an assessment of changes in reef characteristics over time, data that is lacking from previous spatial gradient approaches, and 2) paleoecological data to be obtained from an entire suite of specimens making up the coral community rather than focusing on one specimen from a given site.