

Internal Structure and Holocene Evolution of One Tree Reef, Southern Great Barrier Reef

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Summary. Analysis of core from six drill holes and ten vibrocores from One Tree Reef has delineated five major biosedimentological facies: algal pavement, coral head facies, branching coral facies, reef flat rubble facies and sand facies. Holocene growth began around 8,000 years B.P. with a high energy coral head facies on windward margins and a lower energy branching coral facies on patch reefs and on leeward margins. Vertical accumulation rates for these two principal facies are not greatly different; the coral head facies grew at 1.8–7.3 m/1,000 years and the branching coral facies at 0.6–8.3 m/1,000 years. Growth was initially much slower than the rate of sea level rise, a situation which changed only after sea level stabilized around 6,200 years B.P. A facies evolution model with rigidly imposed time constraints divides growth into three phases, i.e. vertical growth to sea level, transitional adjustment of biofacies at sea level, and leeward progradative phases.

through the Holocene section of the reef. The depth of the holes varied between 8.5 and 23.0 m and three of the holes penetrated the entire Holocene sequence at depths of between 13–14 m. Recovery depended upon the type of framework and abundance of cavities and varied from 25%–95%. The drill system also converted to a vibrocorer, and ten cores of lagoonal sediments, up to 5 m long, were obtained.

Modern Reef Morphology and Zonation

The morphological variation of One Tree Reef (Fig. 1) has been described in detail previously (Davies et al. 1976). The following is a summary. One Tree Reef is 20 km from the shelf edge, 70 km from land, and is surrounded by water depths of approximately 60 m. The windward reef slope is generally steep with a near-vertical Pleistocene wall along the southern margin (Davies and Marshall 1979). Spurs and grooves are prominent along the eastern and southeastern margins. The leeward slope is gentle and supports abundant and luxurious coral growth. The reef top exhibits the classical reef zonation of coralling algal rim