

# Morphology and Development of the Cape Tribulation Fringing Reefs, Great Barrier Reef, Australia

## 1 INTRODUCTION

The Great Barrier Reef System of northeastern Queensland, Australia encompasses an area of 230 000 km<sup>2</sup> and is made up of more than 2 500 reefs and numerous cays and high islands (Hopley *et al*, 1989). The reefs are distributed along a 2 000 km section of the Queensland continental shelf between 9°15' and 24°07' south latitude. The outer and middle shelf reefs are separated from the mainland by open water that attains depths of 50 m and varies from 23 to 260 km in width (Hopley, 1982; Johnson *et al*, 1986). Modern reef growth was initiated less than 10 000 years ago. In some locations Holocene reefs cover remnants of older Pleistocene and Miocene reefs (Hopley, 1982; Marshall, 1983) or clastic sedimentary deposits (Hopley *et al*, 1983; Johnson and Risk, 1987).

The Cape Tribulation fringing reefs (Fig 1) are of particular interest because they exist in turbid waters and in close proximity to a high-relief continental shoreline that is subject to high rainfall. The Cape Tribulation area shoreline is characterised by steep-gradient streams that, during episodic periods of high discharge following storms, deliver large volumes of sediment-laden fresh water to the otherwise normally saline marine waters surrounding the Cape Tribulation fringing reefs (Hoyal, 1986). Reef organisms, especially coral, are generally thought to require clear sea water and to be intolerant of fresh, hyposaline or turbid water (Wells, 1957). Despite the apparently adverse conditions in which the Cape Tribulation fringing reefs exist, the living coral zone of these reefs constitutes one of the most taxonomically diverse coral communities in the Great Barrier Reef System (Ayling and Ayling, 1985).

The fringing reefs of Cape Tribulation are also of interest because they represent a pioneer reef type that colonised the continental shelf of northeastern Australia during the latter part of the post-glacial rise in sea level (Hopley and Partain, 1987). The accessibility and relatively small size of the Cape Tribulation reefs provide a unique opportunity to study the Holocene development of mainland fringing coral reefs in the Great Barrier Reef Province.

Several investigators (Bird, 1971; Hopley, 1978; Slocombe, 1981; Hopley *et al*, 1982; Barnes, 1984; Hopley and Barnes, 1985; Johnson and Risk, 1987) have previously studied the age, evolution and structure of a number of fringing reefs in the Great Barrier Reef region. However, apart from the research contemporaneous with this study by Johnson and Carter (1987) which concentrated on the immediate offshore sedimentary environment and by Hoyal (1986) on the sedimentation patterns, there has been no previous study of the geologic history of the Cape Tribulation fringing reefs, or the coastal depositional environments and lithofacies associated with them.

The purpose of this study is to:

- Determine the age and growth rates of the reefs
- Investigate the possible influence of sea level fluctuations on the development of these reefs
- Describe the morphology and development of the reefs and the lithofacies associated with them.

The study area is located along a 10 km section of shoreline in northeastern Queensland, Australia (Fig 2). It is situated in the Cairns section of the Great Barrier Reef Marine Park. Adjacent to the study area is a portion of the Daintree tropical rainforest. The nearest major rivers that empty into the sea near the study area are the Bloomfield River, 21 km to the north, and the Daintree River, 24 km to the south. The study area ranges from latitudes 16°02'00"S to 16°08'00"S and longitudes 145°27'30"E to 145°28'30"E.

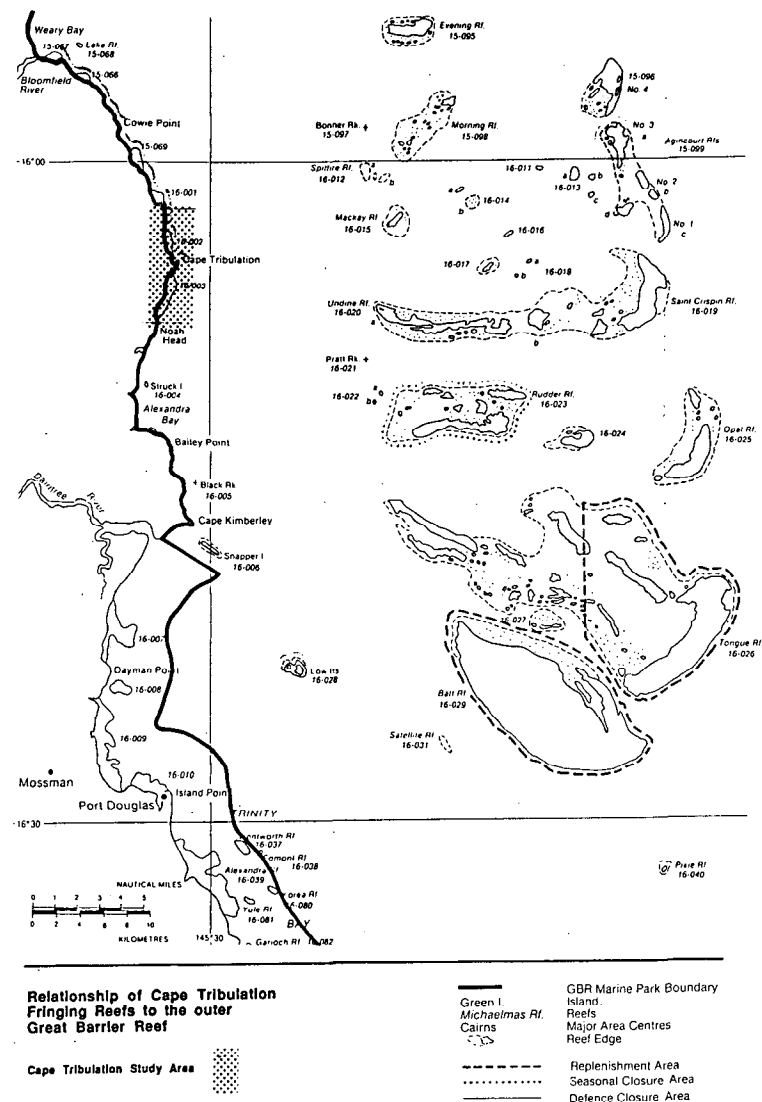


Figure 1. General location of the Cape Tribulation area.

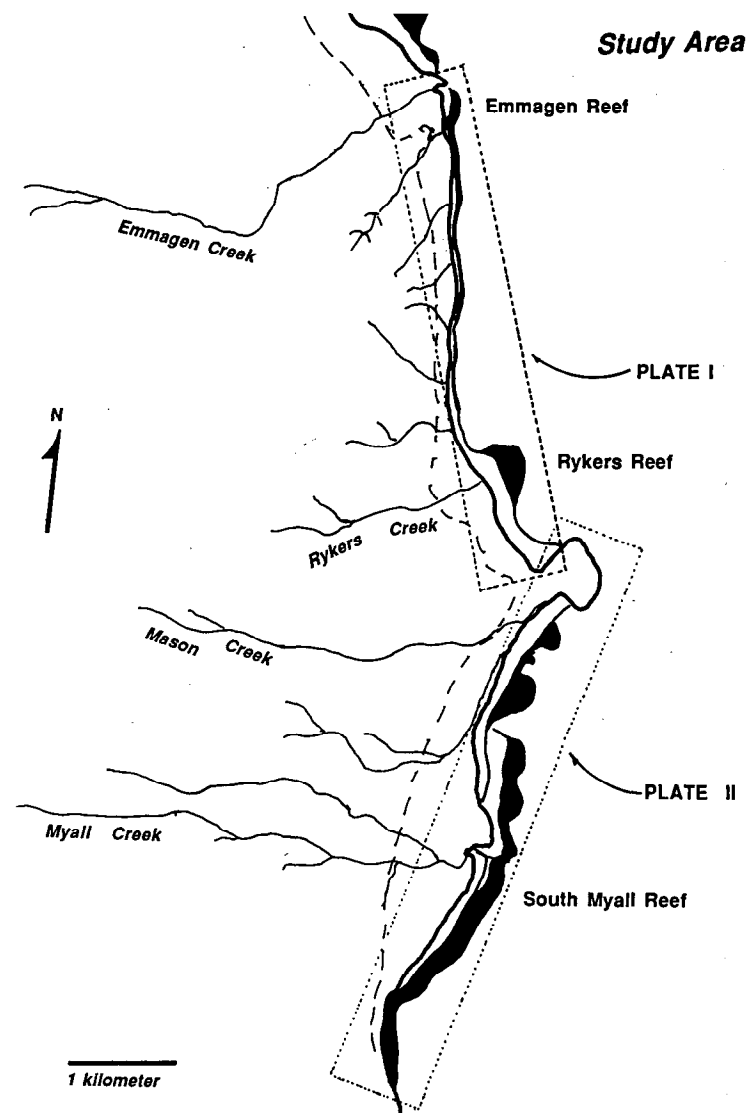


Figure 2. Location of Emmagen, Rykers and South Myall Reefs.