

## 1. INTRODUCTION

Heron Island is located in the Capricorn Group of reefs, which together with the Bunker Group, form the southernmost part of the Great Barrier Reef Marine Park (Figure 1). In this region the Reef consists of a series of isolated platform reefs, many of which have small vegetated islands (coral cays).

Heron Reef is about 9km long and 4km wide at its widest point. It has a lagoon and Heron Island is situated on the leeward side of the western end of the reef platform. The island itself, which is formed of calcareous material, mainly sand, is 830m long and 300m wide and is approximately elliptical in outline. It is aligned with its long axis in the direction eastsoutheast - westnorthwest. Its maximum height is 8m above low water datum. Sandy beaches surround the cay although on both the northern and southern sides there are substantial outcrops of beachrock. The processes whereby cays such as Heron Island are formed have been reviewed elsewhere (Gourlay 1988).

The island is one of the most visited reef islands, being one of the three coral cays in the Great Barrier Reef Marine Park with tourist resorts. It also is the location for a marine research station and a substantial part of the island is a national park. Activities associated with these uses generate a considerable number of passenger journeys between the island and the mainland by either boat or helicopter as well as many boat journeys locally. The need to provide upgraded facilities to handle the boat traffic necessitated the expansion of the capacity and facilities associated with the boat harbour.

During September to November 1987 the boat harbour at Heron Island was enlarged and dredged. Material was removed by excavator and by suction dredge. The majority of the spoil from this work was dumped on the beach south of the helipad. The existing beach material was pushed aside to allow dredged material to be pumped into a ponding area.

Concern has been expressed over the quantity of fine material which emanated from this exercise, both during the initial dredging and subsequently from the dumped material on the beach. There are three aspects to the concern about the presence of fine material on the reef:

- (i) the presence of fine material in the sea water may affect the light available to marine organisms;
- (ii) the fine material may settle onto the organisms and adversely affect their life processes;
- (iii) the fine material may form an anoxic layer on the reef detrimental to the infauna.

Following a request from the Executive Officer of the Great Barrier Reef Marine Park Authority the authors made a preliminary inspection of the dredge spoil dump in May 1988 and submitted a report on its condition together with a proposal for short term monitoring of it for a period of twelve months (Gourlay and Jell 1988). The monitoring programme included the following activities:

- (i) Assessment of the nature and quantity of material within the spoil dump.
- (ii) Monitoring of the stability of the spoil dump.
- (iii) Monitoring of conditions affecting the spoil dump.
- (iv) Determination of nature and concentration of material forming silt plumes.
- (v) Extent and rate of lithification of the spoil dump material.
- (vi) Monitoring of reef flat sediments.
- (vii) Monitoring of beach rock.

After some administrative delays the contract for the short term monitoring programme was finalised in November 1988 and work began in December 1988. Subsequently arrangements were made to extend short term monitoring activities initially to June 1990 and later to 30 April 1991.

This report first reviews the events associated with the construction of the boat harbour. It then outlines the investigations made for the monitoring programme. The results of the analyses of the data collected during these investigations are discussed in detail. Finally the overall situation is assessed, conclusions stated and recommendations for further action and long term monitoring are made.

Because of the extensive and repetitive nature of much of the experimental data, only the more significant parts of it are presented in this report.

A summary of the monitoring programme and its results up to 30 April 1990 has been presented separately (Gourlay 1991b). The nature of the coastal observations made during the monitoring programme, together with some typical results, are reviewed in Gourlay (1991a).

The scope of this investigation was limited to geomorphological and sedimentological aspects of the spoil dump and its environmental impact. The impact of the spoil dump upon the biology of the reef adjoining the boat harbour and the island has been investigated separately. Fisk (1990, 1991) has reported on the implementation of a monitoring programme for reef flat benthos. Catterall et al. (1990) have investigated the impact of dredging upon one benthic species, the volute *Cymbiolacca pulchra*, and its environment, using data from annual surveys made predredging (1984 to 1986), during dredging (1987) and postdredging (1988 and 1989). A study by Heron Island Research Station (HIRS) over a three year period subsequent to dredging has monitored coral and other benthic communities on the beach rock, the nutrient regime of water surrounding the cay under various conditions, and the average rates of sediment deposition at various stations on the reef flat around the island at two monthly intervals. Results of the HIRS study are not yet available (November 1991).