

THE FRINGING REEFS OF MAGNETIC ISLAND:

BENTHIC BIOTA AND SEDIMENTATION

A BASELINE SURVEY

EXECUTIVE SUMMARY

Introduction

The Magnetic Quay development, at Nelly Bay on Magnetic Island, Queensland, is the first major development to impinge on marine environment around Magnetic Island. Insofar as the development may affect areas of the Great Barrier Reef Marine Park, it comes under the auspices of the Great Barrier Reef Marine Park Authority. The GBRMPA stipulated in 1988 that the construction of Magnetic Quay was conditional *inter alia* on the funding, by the developers, of baseline and environmental impact studies. This document is the report of the baseline study of the benthic biota and sedimentation on the fringing reefs along the south-east coast of Magnetic Island, including the reefs in Nelly Bay.

Methods

The baseline study was done between December 15, 1988 and February 23, 1989. Reefs were sampled in Picnic, Nelly, Geoffrey, Arthur, and Florence Bays. Within bays, fauna were sampled at 'stations' comprising two sites on the reef flat and two sites on the reef slope. Abundances of sessile biota (hard and soft corals, sponges, ascidians, and macroscopic algae) were estimated using four 20m fixed line intercept transects at each site. Sedimentation was measured using cylindrical sediment traps. Nine hundred corals of three genera were individually tagged and photographed as record of their condition prior to the commencement of the development. Algae were collected and weighed wet to estimate standing biomass of algae on the reefs.

Sampling sites were divided into those considered to be likely to be subject to any impact of the development and those expected to be immune from impact. All areas in Nelly Bay and those at the southern end of Geoffrey Bay (a total of six stations) were considered impact areas; six of the remaining stations were considered control areas, with the seventh (mid-way along Geoffrey Bay) being of uncertain status. Data were analysed by mixed-model analyses of variance and cluster analyses.

Results

Most corals were consistently significantly more abundant on reef slopes than on reef flats and algae were more abundant on flats than on slopes. Within reef flats, control and impact stations were generally similar, although two genera of corals (*Turbinaria* and *Montipora*) were more abundant at impact stations than at control stations. On the reef slopes, the designated impact stations differed significantly from the control stations in terms of percent coverage by corals and algae. Whilst some corals were more abundant at impact stations than at control stations, these were not rare species, and all were also relatively abundant at control stations. Several other corals were significantly more abundant at control stations than impact stations.

In general, overall coverage by corals was less on the reef slopes of impact stations than those of control stations. Within Nelly Bay, coverage by most coral taxa was less at the northern end of the bay than at the southern end.

Six taxa were found almost exclusively in Nelly Bay, two algae and four corals. The algae were relatively abundant locally, but the four corals were extremely rare even within Nelly Bay. By contrast, 19 taxa were unique to control stations, five of them in reasonable abundances.

Sedimentation was greater in Nelly Bay than elsewhere, particularly on the reef slopes. Sedimentation was extremely labile, mostly dependent on prevailing weather conditions. On the reef slopes, rates of sedimentation were at times among the highest recorded for fringing coral reefs.

We also analysed the power of the sampling design used during the baseline study (and those suggested since) to detect, with reasonable certainty (90%), changes in abundances of corals during the development of Magnetic Quay. These analyses suggested that in the event of the development causing an environmental impact, we should be able to detect that impact if it resulted in changes in abundances as little as 20% or less for most groups of taxa analysed. We expect that effects of this magnitude would be detected whether such an impact affected Nelly Bay generally and the southern end of Geoffrey Bay, or was restricted to only the northern end of Nelly Bay.

Conclusions and Recommendations

We found no features of the biota of Nelly Bay that were unique among the reefs we surveyed. The greater abundances of some corals in Nelly Bay was not indicative of cause for special concern because those corals were also abundant in other (control) bays. Of all the stations surveyed, those at the north end of Nelly Bay were, with few exceptions, characterised by the lowest abundances of all taxa and, therefore, perhaps the least in need of special conservation measures.

We strongly recommend that the status of the biota be carefully monitored throughout construction and the early years of operation of Magnetic Quay. The GBRMPA is particularly concerned about the potential for enhanced sedimentation to deleteriously affect the corals in Nelly Bay during the construction phase. We stress that such effects will be minimised if every effort is made to avoid increasing natural sediment loads during calm weather. We have suggested the levels of sedimentation that, on the basis of the limited data available, should not be exceeded, but stress that these figures should be viewed as, at best, guestimates. Further baseline monitoring to improve the basis from which such recommendations are derived is strongly recommended.