

## INTRODUCTION

Great Adventures (then Hayles) installed a pontoon and began running daily tourist trips to Norman Reef in 1987. This small reef, which is located about 60 km north of Cairns (figure 1), was attractive to the tourist industry due to its rich coral communities, clear water, and proximity to Cairns. We previously set up a monitoring program, based on permanent 20 m line intersect transects, to look at the effect on the reef community of the first 12 months of operation of that facility (Ayling and Ayling 1989).

During the first year of operation of the original pontoon (April 1987-June 1988) almost 10% of the coral cover beneath the pontoon was destroyed either by shading or mooring chain abrasion (a 4.3% reduction against the 4.6% increase in both control sites). Coral height was also significantly reduced beneath the pontoon from a mean of 26.4 cm to 20 cm per colony. There were no detectable effects of diver activity damage, either on coral cover or colony height over the first 12 months. Similarly, semi-sub operation had not caused any significant decrease in coral cover or colony height.

In June 1992 Great Adventures installed a new, larger pontoon in the same location as the original operation. As part of the Great Barrier Reef Marine Park Authority's permit assessment process, we set up a new monitoring program, based on the original permanent transects where possible, to look at the effects of the pontoon change over and the first 12 months of operation of the new pontoon.

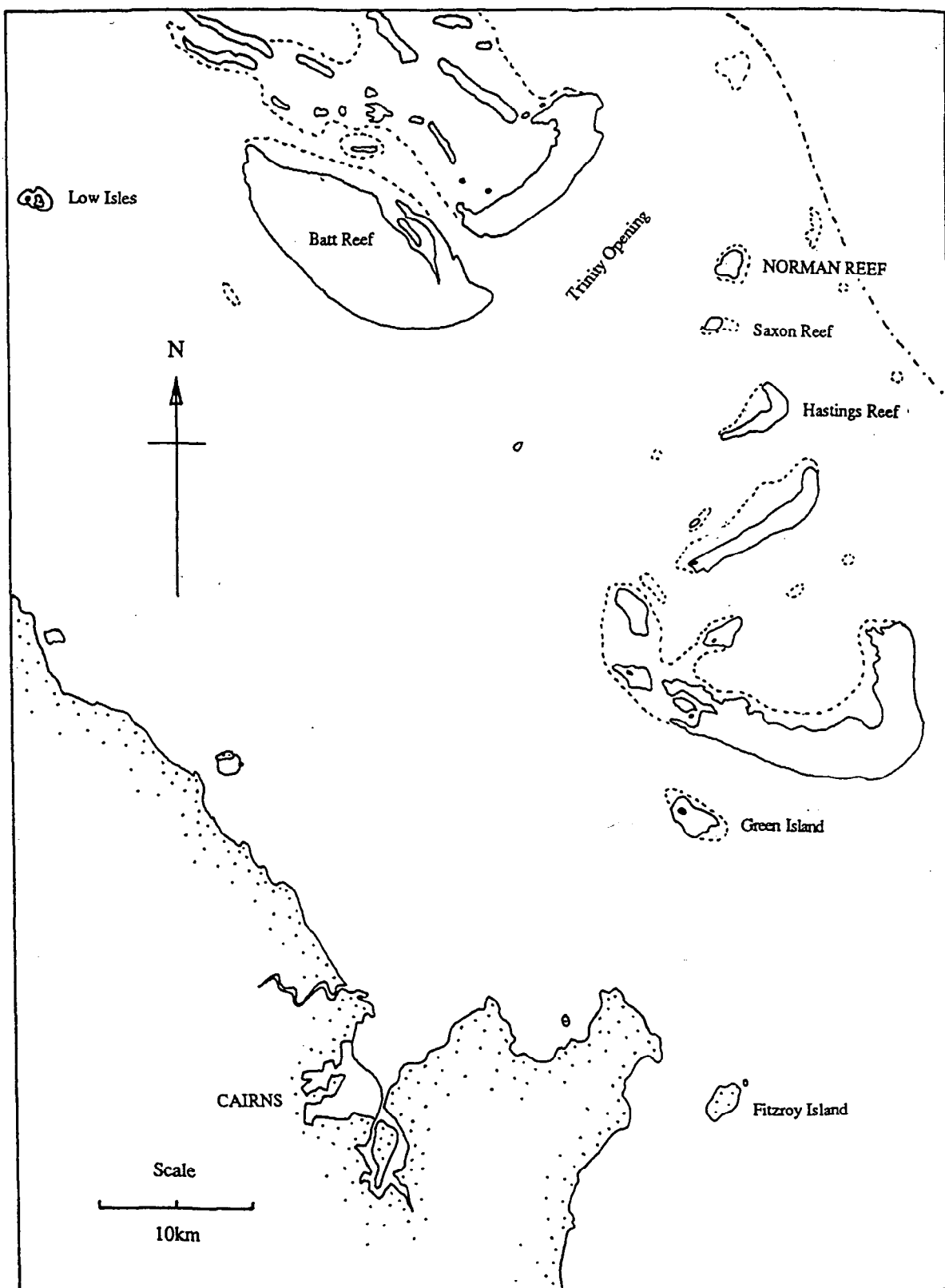
Neither tourist snorkelling activities nor inexperienced resort divers, had any effect on coral cover, coral heights or rates of colony damage (Ayling and Ayling 1994a). Coral cover and coral colony height continued to decrease under the pontoon, due to shading and chain abrasion. Overall coral cover had reduced from 61% in 1987 to 49% in 1993, while average coral colony height fell from 26.3 to 14 cm over the same period.

The major influence on coral communities in this area was not the tourist operations but the large waves generated by cyclones Ivor and Joy in 1990. They caused a reduction in coral height in all groups of transects between 1988 and 1992, and gave rise to a marked reduction in coral cover along exposed transects. The five transects set up in 1987 to monitor semi-sub activity were most exposed to these cyclone waves and suffered a 50% reduction in coral cover between 1988 and 1992 (Ayling and Ayling 1994a).

In late March 1997 the passage of cyclone Justin along a path about 20 km east of Norman Reef gave rise to a northerly wind of around 50 knots that broke the Great Adventures pontoon from its moorings. The pontoon was then driven onto the reef flat for a distance of 240 m before it came to rest. This created a damage scar an average of 13 m wide that affected an area of reef flat of 2200 sq m (personal communications from Marine Parks). The break-off also caused some damage at the pontoon site as chains and blocks were dragged over coral communities, and the pontoon broke off the top of the bommie immediately in front of the viewing chamber.

It was agreed during discussions between Sea Research, Great Adventures, Marine Parks and the Great Barrier Reef Marine Park Authority that a resurvey of all permanent transects from the 1992-93 monitoring program should be carried out as a prelude to repositioning the pontoon. This would establish the extent of damage that had occurred, both due to the pontoon break-off, and to the effects of the cyclonic waves themselves. It was also decided that a quantitative survey should be made of the drag scar on the reef flat, and of surrounding reef benthic communities to determine the extent of damage that had occurred due to the pontoon grounding. This survey was carried out between the 18-22 April, almost a month after the passage of the cyclone.

This report presents a brief summary of the results of the Norman Reef re-survey, and reef flat damage survey, and a comparison with results from the previous two monitoring programs.



**Figure 1.** Map of the Cairns local area showing the location of Norman Reef