

## INTRODUCTION

Information on the distribution and density of significant reef organisms such as hard corals, crown of thorns and commercially utilised fishes are an important aid to realistic management of reefs on the GBR. Data on long-term changes through time in the population density of these species is a particularly powerful tool in the management arsenal.

There has been considerable interest, both by reef managers and the scientific community in the status of *Acanthaster* populations on the GBR. Widespread manta tow surveys have been made throughout the GBR by the Australian Institute of Marine Science but these can only reliably separate outbreak from non-outbreak reefs and can not be used to demonstrate patterns through time in any detail. Sea Research have used intensively searched replicate strip transect counts to estimate density of crown of thorns populations; a method better suited to the detection of temporal patterns.

With the increasing concern over the effect of fishing on target fish populations on the GBR there is a very real need for information on long term changes in the density of these populations.

The three reefs that were the subject of this study are mid-shelf reefs that are amongst the closest reefs to the city of Townsville. All three have been extensively used as study reefs for various projects by researchers from AIMS, with Davies Reef the most heavily used of the three. The reefs have been visited by recreational fishermen from Townsville for many years and recent discussions with commercial reef fishermen suggest that Davies is now receiving regular attention from Bowen based commercial fishermen. In addition John Brewer is regularly used as a daytime anchorage by prawn trawlers, with as many as 15 boats anchored off the back reef edge each day. John Brewer has been a heavily used tourist destination for many years, while Davies Reef is often used by recreational divers.

We have been surveying density of coral trout and crown of thorns stars on the GBR using replicate visual transect counts since 1982. Counts were first made on the back slope of John Brewer and Lodestone Reefs off Townsville in May 1983, although extensive diving observations were made on the front and back slopes of both reefs in October 1982. John Brewer was resurveyed in February 1984, and the front and back slope habitats of John Brewer, Lodestone and Davies Reefs were surveyed in November 1984. Both habitats of all three reefs were resurveyed by Sea Research in May 1986 as part of an AIMS project by D. McB. Williams looking at the long term effect of crown of thorns devastation on reef fish populations.

Of these three reefs John Brewer and Lodestone experienced an explosive crown of thorns outbreak in 1983/84 that reduced coral cover over the entire reef area to less than 5%. Crown of thorns population numbers then declined dramatically to almost zero by May 1986. In contrast, Davies Reef escaped this outbreak with the exception of very low numbers of crown of thorns in deep water on the front reef slope.

Coral trout density on these reefs during the November 1984 survey was within the range of 21-63 per ha recorded on 15 other mid-shelf reefs in the northern Central Section of the GBR Marine Park during the same period (Ayling and Ayling; 1985).

Surveys of chaetodontid density have been found to provide useful information on the status of coral populations on a reef and also to give a good indication of the type of water mass that usually surrounds a reef (see discussion by Ayling and Ayling; 1985, 1986a). Fishes in this family have been surveyed on these three reefs since November 1984 and have indicated the dramatic reduction in butterflyfish density caused by a crown of thorns

outbreak on a reef: numbers were much higher on Davies than on the devastated reefs John Brewer and Lodestone.

It was decided that a resurvey of crown of thorns, coral trout and chaetodontid density in the same sites on these three reefs in June 1989 would provide a considerable amount of useful information for reef managers. Such a survey would provide data on temporal patterns in the density of these organisms over a six year period. One important aspect on which information could be gained was the long term effect of crown of thorns devastation on coral trout and chaetodontid density. In light of the recent concern regarding the role of lethrinids in the development of crown of thorns outbreaks it was considered useful to try and get some idea of the present status of lethrinid and lutjanid populations on these reefs using the same methods employed for counting coral trout and chaetodontids.

It was also envisaged that a resurvey of sites that had been previously been censused at least twice over the previous 6 years would provide a good test of the power of visual transect data to detect change in the density of reef populations.