

However, regular observations along several 800m long sections of reef slope on Davies Reef during recent surveys have suggested that it would be possible to reduce variance in counts of these groups by markedly increasing the size of the count area. A visual search of a previously marked 400-800m length of reef, recording all lethrinids and lutjanids in a 20m wide strip from the reef crest down the slope, could be made by 2 divers using a single scuba tank. Counts along such a large transect (between 1 and 1.6 ha in area) would probably encounter several clumps of each species and reduce variance to manageable levels. Four replicate counts of this size could be searched by two observers in a day.

## IMPLICATIONS FOR MANAGEMENT

The time series of strip transect counts of crown of thorns populations reported here have provided a detailed and useful picture of the history and severity of outbreaks on these reefs. If management requires more detailed estimates of the status of *Acanthaster* populations on any reef than the outbreak/non-outbreak level provided by manta tow surveys then strip transect surveys of this type can be used to provide the information.

Using this strip transect method differences in coral trout density between sites or reefs and changes in density through time can be documented. Using a suitably powerful sampling design a measured change in density of 21% was detected as significant. The length estimations that are part of this method also provide valuable data for management. For example, the number of successful recruits in a population can be recorded as well as changes in length structure of coral trout populations that may be caused by factors such as fishing pressure.

The implications for management of the ideas on carrying capacity for both juvenile and adult coral trout expressed in the discussion are worth considering. If adult coral trout density or recruit density on any reef is more dependent on the unique characteristics of the physical and biological environment of that particular reef than on the level of fishing pressure or availability of recruits then the level of this theoretical carrying capacity for each reef is an important consideration for management.

Fishing pressure is popularly supposed to have a dramatic effect on target species numbers. We have all heard how we should have seen the fish populations as they used to be before they were 'fished out'. However, at present it is impossible to get any quantitative data on the overall level of fishing on any reef so as to be able to relate this to measures of density and size of the target populations. The implementation of some form of detailed log book system for both commercial and recreational fishermen would give reef managers some real information on which to base decisions concerning changes in fish numbers and lengths.

The method used here to detect changes and differences in coral trout populations is not suitable for assessing abundance of lethrinids and lutjanids, at least in this area of the GBR. Previous surveys using similar sized transect counts in the Capricorn and Capricornia Section support this conclusion (Ayling and Ayling; 1986a). In view of the recent interest in lethrinids as possible predators of juvenile crown of thorns, the development of some method of assessing their population density would seem to be a priority for management. As has been suggested above some form of extra long strip transect count could probably be used to assess lethrinid populations, but some testing of this type of count needs to be carried out to confirm this.

It is our contention that counts of crown of thorns, coral trout and chaetodontids should be continued on these reefs annually, or at least every two years, preferably in a slightly expanded format. In the present design, where surveys are made within the same site approximately one kilometre long at each survey date, we are really only looking at differences between the individual survey sites not the reefs themselves. To get around this problem the design needs to be expanded to include at least two sites within each habitat,

within each reef. In such a design the number of replicates counted at each site could probably be reduced from ten to five.

Alternatively, an expanded design could be adopted that used this data set and data from some other reefs surveyed in this area in November 1984 as the basis for a more comprehensive monitoring program looking at zoning effects on the reefs off Townsville. This program would incorporate 6 reefs (including the 3 the are the subject of this report): 2 zoned general use (Lodestone and Keeper); 2 zoned Marine National Park A (John Brewer and Davies); and two zoned Marine National Park B (Yankee, and either Wheeler or Spoon). Counts of the above groups of organisms, and additional surveys of encrusting communities, could be carried out in two front reef and two back reef sites on each reef.