

CHAPTER 5: SEDIMENTS: COMPLIANCE MONITORING

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Introduction

In addition to the compliance monitoring of water quality for the sewage discharge and lagoonal waters, part of the monitoring was designed to determine whether the hotel resulted in any detectable changes in the sediments in the vicinity of the hotel. The objectives of this study were:

- a. to obtain lagoonal sediment data of sufficient reliability to satisfy the permit requirements of GBRMPA;
- b. to provide a means of accurately monitoring any changes in indicative sediment parameters including organic loading and nutrient status; and
- c. to assess the significance of any observed changes in terms of the likely effects on the biota of the sediments.

Methods

Samples were obtained from a number of sites within the lagoon in the vicinity of the resort and at control sites. These sites corresponded to the treatment and control sites established for the biological monitoring program.

Samples were collected monthly from January to December 1988, and were obtained by hand-held corers. The sediments in the cores were analysed for:

sediment mineralogy and texture;
total organic matter;
total-Nitrogen; and
total-Phosphorus.

In addition, both sediments and sediment-inhabiting biota were analysed for heavy metals (including cadmium, zinc, copper and lead) and hydrocarbons. Standard analytical techniques were used for these parameters.

In August 1989, Graham Jones collected and analysed an additional sediment sample at the same time that he collected water samples, for a post-resort survey.

Conclusions

Of the various physical and chemical parameters measured in this project, only sediment composition, sediment texture, and copper concentrations showed any significant differences between samples collected near the resort and from control sites. The difference in sediment composition reflects the presence of small quantities of 'litter' near the resort. The biological impact of such litter was likely to be small.

Sediment textures near the resort were initially similar to those at the control site, but sediment near the resort became coarser and more poorly sorted, probably because the disruption of natural current flow across the lagoon by the resort caused locally increased turbulence and winnowing of nearby sediment. This was a localised effect and of little environmental consequence in the context of the lagoon as a whole. The increased turbulence and winnowing near the resort may have meant that any liquid or fine particulate matter added to lagoon waters as a consequence of the resort was diluted and dispersed more rapidly than initially anticipated.

Copper concentrations near the resort were initially slightly higher than at the control site but during the study period, the difference in copper concentrations at the resort and the control site generally decreased to the point where, by the end of the study, the difference between the two sites was not significant. Anomalous elevated copper and zinc concentrations detected in one sample from near the resort were attributed to traces of metallic litter found in the sample.

In the post-resort analysis by Graham Jones, copper and lead concentrations did not differ between control and resort sites, and copper concentrations were lower than the values reported during this study, but zinc concentrations were significantly higher at the Swing Circle site than at the control site.

Overall, the data obtained during this study indicate that the resort had a negligible impact on the lagoonal sediments nearby. In view of the absence of significant changes in lagoonal water quality, this conclusion is not unexpected.

Consequently, it was recommended that, had the monitoring program continued, the frequency of monitoring should be scaled down to about once every three months.

Monitoring of lagoonal sediment quality would consist of the following:

- a. sediment mineralogy should be determined by X-ray diffraction and microscope examination once every year and should be supplemented by three monthly inspections for 'litter' carried out by a diver and the yearly sampling should include one sample from the control site and three from near the resort;
- b. determinations of sediment texture should be continued to monitor the turbulence induced changes caused by the resort and this monitoring should involve the collection and examination of one sample from the control site and three samples from near the resort once every three months;
- c. determinations of nutrient element and organic carbon concentrations by chemical means should be replaced by three monthly inspections and documentation by divers of the extent of algal growth on the sediment surface near the resort; and
- d. determination of heavy metal loads should be limited to measurement of the copper, lead and zinc concentrations and should involve one sample from the control site and three samples from near the resort collected once every three months.