

CONTENTS

OVERVIEW	viii
INTRODUCTION	1
MATERIALS AND METHODS	10
Sampling Design	10
Field Work	13
Benthic Fauna and Flora	13
Percentage Cover by Sessile Organisms	13
Biomass of Algae	14
Tagged Corals	14
Demersal Fish	15
Sedimentation	16
Relation Between Turbidity and Sedimentation	16
Timetable	18
Analysis of Data	18
Benthic Cover	18
Multi-variate Descriptive Analyses	18
Univariate Analyses	20
Algal Biomass and Sedimentation	20
RESULTS	27
Benthic Fauna and Flora	27
Transect Length	27
Structure of Fringing Reefs in Profile	27
Classification of Sites from Profile Surveys	27
Classification of Profiles by Habitat	33
Classification of Sites from all Bays	33
Classification of Sites by Habitat	38
Classification of Sites by Bay	38
Summary	40
Analyses of Abundance	40
Hard Corals	42
All Hard Corals	42
Acroporidae, Pocilloporidae	45
<i>Acropora willisae</i>	45
<i>Montipora</i> spp.	45
Poritidae	48
Faviidae	48
<i>Cyphastrea</i> spp.	51
Fungiidae, Agariciidae, Siderastreidae, Pectiniidae, and Mussidae	51
<i>Turbinaria</i> spp.	51
Soft Corals	53
Sponges	53
Percent Coverage by Algae	53
<i>Sargassum</i> spp.	55
<i>Lobophora</i> spp.	55
Biomass of Algae	57
Rates of Sedimentation	57
Relation Between Turbidity and Sedimentation	63

DISCUSSION	67
Benthic Biota	67
Assessment of Impact on Corals	71
Assessment of Impact on Algae	75
Sedimentation	75
Instantaneous Measures of Sedimentation	80
SUMMARY	80
 ADDENDUM: RESPONSE TO REVIEWERS' COMMENTS	82
Anova Models	82
Attributes of Reefs - Analyses of Size-frequency and 'Runs'	85
Attributes of Reefs - Quality of Reefs	88
Qualitative Evaluation of Assemblages	89
Nelly Bay	89
Bright Point	90
Geoffrey Bay	90
Florence Bay and Arthur Bay	90
Picnic Bay	90
Pooling of Taxa	91
Status of Nelly Bay	91
Suitability of Control Stations	92
Assumptions of Proposed Analysis of Proportional Change	94
Sedimentation	95
Answers to Specific Comments	97
 COMMENTS BY THE GBRMPA AND REVIEWERS	98
The Great Barrier Reef Marine Park Authority	98
Report Structure	99
Anova Models	99
Attributes	99
Evaluation of Nelly Bay	99
Cluster Analysis	100
Comparative Abundances	100
Sedimentation Levels	100
Pooling of Taxa	100
Pre-construction Monitoring	101
Reactive Monitoring Strategy	101
Proposed Monitoring Programme	102
Sampling of Sediment Traps	102
Experimental Study Payment by Developer	102
Reviewer 1	103
Baseline Study for Impact Assessment	103
Control vs Impact	103
Attributes	103
Evaluation of Nelly Bay Reef	104
Conclusion	104
Specific Comments	105

Reviewer 2	106
Introduction	106
The Degree to which the Aims of the Baseline Study Have Been Fulfilled	107
General Remarks	110
Critical Level of Sedimentation	110
Pooling of Taxa	110
Tagged Corals	111
Guidelines	111
The Emphasis on Statistics	111
Details of Report Presentation	112
 APPENDICES	 114
A Results of Analyses of Variance	115
B Review of Effects of Sedimentation on Corals	117
C Outline of Design for Impact Assessment	126
 REFERENCES	 131

BOXES

1 Scope of the Baseline Study	4
2 Impact Assessment	7
3 Type I & Type II Errors	8
4 Clustering Procedures	19
5 Optimum Analyses for Impact Assessment	24
6 Resolving Power of Statistical Tests	68
7 Power of Analyses of Proportional Change in Abundance	74
8 When Has An Impact Occurred	79

TABLES

1 Timetable	5
2 Designs of analyses of variance	21
3 Precision & cost of 30m & 20m transects	28
4 List of taxa and their distribution by habitat	29
5 Cluster analysis of profile sites	36
6 Cluster analysis of sites from all bays	37
7 Summary results of analyses of variance - benthic biota	41
8 Summary results of analyses of variance - sedimentation	58
9 Relations between turbidity and sedimentation	62
10 Power of analytical design - Benthic biota and sedimentation	69
11 Number of sites required for Power = 0.9 - Benthic biota & sedimentation	70
12 Detectable differences in proportional abundance data	73
13 Power and design of sediment sampling programme	78
R1 Revised Model 4 ANOVA	83
R2 Detectable differences in proportional abundance data for Alternative Models	86
R3 Distribution of Taxa by Treatment (Impact vs Control)	93

FIGURES

1 Site of the proposed marina	2
2 Magnetic Island and design of sampling programme	11
3 A sediment trap	17
4 Tree diagram of design of analyses of variance	23
5 Profiles of fringing reefs in Nelly and Geoffrey Bay	25
6 Dendrograms resulting from cluster analyses	34
7 Percentage cover of sessile biota in all bays	39
8 Percentage cover of all hard corals	44
9 Percentage cover of Acroporidae + Pocilloporidae and <i>Acropora willisae</i>	46
10 Percentage cover of <i>Montipora</i> spp. and Poritidae	47
11 Percentage cover of Faviidae and <i>Cyphastrea</i> spp.	49
12 Percentage cover of Fungiidae + Agariciidae + Siderastreidae + Mussidae + Pectiniidae and <i>Turbinaria</i> spp.	50
13 Percentage cover of Soft Corals and Sponges	52
14 Percentage cover and biomass of all algae	54
15 Percentage cover of <i>Sargassum</i> spp. and <i>Lobophora</i> spp.	56
16 Rates of sedimentation	59
17 Relation between measures of turbidity and sedimentation	64