

**TOWARDS SUSTAINABLE
WILDLIFE TOURISM EXPERIENCES
FOR CERTIFIED SCUBA DIVERS
ON CORAL REEFS**

Thesis submitted by

Dean Kevin Miller B.Sc. (Hons)

15th December 2005

For the degree of Doctor of Philosophy

In the Schools of Business and Tropical Environmental Studies and Geography

James Cook University

ELECTRONIC COPY

I, the undersigned, the author of this work, declare that the electronic copy of this thesis provided to the James Cook University Library, is an accurate copy of the print thesis submitted, within the limits of the technology available.

Signature

Date

STATEMENT OF ACCESS

I, Dean Kevin Miller, author of this work, understand that James Cook University will make my thesis available for use within the University Library and via the Australian Digital Thesis network, for use elsewhere.

I understand that, as an unpublished work, a thesis has significant protection under the Copyright Act and;

I do not wish to place any further restriction on access to this work

Dean Kevin Miller

Date

STATEMENT OF SOURCES

DECLARATION

I declare that this thesis is my own work and has not been submitted in any form or another degree or diploma at any university or other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

Dean Kevin Miller

Date

DECLARATION OF ETHICS

The research presented and reported in this thesis was conducted within the guidelines for research ethics outlined in the *National Statement on Ethics Conduct in Research Involving Human* (1999), the joint *NHMRC/AVCC Statement and Guidelines on Research Practice* (1997), the *James Cook University policy on Experimental Ethics. Standard Practices and Guidelines* (2001), and the *James Cook University Statement and Guidelines on Research Practice* (2001). The proposed research methodology received clearance from the James Cook University Experimentation Ethics Review Committee (approval number H1495).

Dean Kevin Miller

Date

ACKNOWLEDGEMENTS

First, I would like to thank my family and friends, but especially my parents. Throughout my life these people have never doubted my potential to accomplish what I had said I would. Their unconditional support and faith in my ability was my driving force in always achieving the possible.

Next I would like to thank my supervisors, Dr Alastair Birtles and Assoc. Prof. Peter Valentine. The initiation of this project, and therefore my collaboration with both Alastair and Peter, was the need to establish some level of protection for high quality dive sites and particular species that were thought to be significant to divers' experiences and thus the diving industry. At the onset of this project, many of the dive sites that were frequented by diving operators had very little protection from extractive activities. This meant that some of the more interesting features at several dive sites were either removed by commercial fishers, or collected as ornamental species for the aquarium trade. This was a matter of considerable concern to us and the industry, and was one of the driving forces for the need to undertake this research. This project forms part of ongoing research on the ecologically sustainable management of marine wildlife tourism by Alastair and Peter, and has been based on their successful work with the Minke Whale Project. Their knowledge and experience ensured that the course I set remained true. Their wisdom, ideas, and contributions were invaluable, not only to the research undertaken, but to my personal development as a scientist. I can only hope to achieve as much, and gain as much respect among my peers, as either of these two men.

In addition to my supervisors, I also wish to acknowledge the contributions, patience, and time taken by Matt Curnock in assisting with all aspects of the PhD process. Matt was my grounding force on many occasions and provided knowledge, insight, and humour when it was required. I wish him all the best for his own PhD.

Next I would like to acknowledge the *Undersea Explorer* staff and crew, most notably Andy Dunstan and John Rumney. Both of these men have an amazing ability to inspire and encourage. They must be commended for their love for the Reef and their efforts to

do all that is possible to protect it. I also wish to thank them for providing the in-kind support that was essential in getting this research underway.

In addition, I would also like to thank the Cod Hole and Ribbon Reef Operators Association (CHARROA) and its members who were involved in this research. These are in alphabetical order: *Explorer Ventures (Nimrod Explorer)*, *Mike Ball Dive Expeditions (Supersport)*, *Quicksilver Dive (Diversity)*, *TAKA dive*, *TUSA dive (Spirit of Freedom)*, and *Undersea Explorer*. The support, assistance, and enthusiasm shown by staff and crews in administering and collecting questionnaires, as well as providing in-kind berth spaces was a crucial component of this research, and without their help this would have never been possible. Their role in this research should be an example of how researchers and industry are able to work together toward a common goal, and this type of relationship should be encouraged wherever possible. It was a truly enriching experience.

I would like to thank those who provided financial and academic support. These include: CRC Reef (special thanks to David Williams and Tim Harvey), Sustainable Tourism CRC (STCRC) (special thanks to Jane Malady and Leo Jago), James Cook University (special thanks to the academic and general staff in the Schools of Business and TESAG, especially Robyn Yesberg; also thanks to Adella Edwards of TESAG for maps), Association of Marine Park Tour Operators (AMPTO) (special thanks to Bob Thomas and Col McKenzie), MARES dive equipment and Cape Byron Imports (CBI), SCUBA Schools International (SSI), and the Great Northern Hotel, Townsville. Without their support, the PhD experience would not have been as enjoyable as it was.

Thank you to all the other people I met along the way, making the PhD journey one of the greatest times in my life. Most notable of these are the Woodies crew, who provided many, many, stress relieving hours among what can only be described as the most amazing company one could hope for during a time like this.

Lastly, thanks to the 651 divers who filled out the questionnaire. Your comments will aid in the protection of coral reef environments and their inhabitants worldwide.

ABSTRACT

The economic opportunities created by SCUBA diving tourism are significant to reef-based communities, as are the potentials for positive outcomes for coral reef environments such as preservation and conservation. These potentials are largely dependent on the quality of the reefs and the marine life that occur there. However, this is rapidly being compromised worldwide by natural (e.g. cyclones, crown-of-thorns), anthropogenic (e.g. extractive fishing and collecting activities, tourism, deteriorating water quality), and global (e.g. coral bleaching) impacts. These impacts have the potential to damage and/or remove the biophysical attributes of coral reef sites most significant to divers' experiences, and are therefore likely to have a negative affect on the demand and visitation for dive sites and locations.

The purpose of this study was to investigate how the biophysical attributes that occur at coral reef dive sites influence certified SCUBA divers' experiences, and whether variations, measured using experience-based theoretical approaches, can be explained by participants' level of Diving and Coral Reef History (DACRH) using the recreational specialization construct. To address the research objectives, a multidisciplinary methodology was developed that described the certified SCUBA diving opportunity in a Recreational Opportunity Spectrum (ROS) and Limits of Acceptable Change (LAC) experience-based framework. This required natural science methodologies to measure, describe, and understand the biophysical attributes that occur at tourism sites, and social science techniques to describe and understand the divers, and the experiences they were having. To achieve this, a four-study research program was designed.

Study One assessed certified SCUBA divers participating in live-aboard diving trips visiting selected Great Barrier Reef (GBR) and Coral Sea dive sites. Based on divers' levels of participation, training and associated skills, and coral reef setting history, they were separated into four recreational specialization groups: 'beginner' (n=46), 'intermediate' (n=236), 'enthusiast' (n=246), and 'specialist' (n=52). Each group was found to be distinct from the others in terms of previous diving and coral reef history measurements, ownership of SCUBA related equipment, and the levels of coral reef interest and knowledge.

Study Two was an assessment of the biophysical attributes that occur on selected coral reef dive sites from the GBR and Coral Sea, and aimed to determine what visiting certified SCUBA divers were most likely to encounter while diving on the specific sites. This study found that differences in the biophysical attribute measurements at each site characterised the main differences between the sites, and thus the diving opportunities.

Study Three analysed the coral reef SCUBA diving experiences for divers on these trips and showed that divers had very high quality experiences on the dive sites, with some sites providing more enjoyable experiences than others. Divers were also having a wide range of experiences, and these were closely linked to the biophysical attributes identified in Study Two. However, some attributes, such as reef sharks and coral quality, were much more important to experiences than other attributes such as small fish life.

Finally, Study Four examined divers' experiences in the context of their degree of recreational specialization. This study found that diving experiences are modified by specialization, with higher specialization resulting in a wider diversity and richness of best experiences, but lower reported levels of enjoyment and evaluations of quality. More specialized divers also perceived a greater number and diversity of environmental impacts than less specialized divers, and these negatively influenced their experiences.

The research presented in this thesis has demonstrated that taking an experience-based approach to understanding the biophysical attributes that occur at tourism sites, as well as understanding the visitors and the experiences they are having, can play a critical role in managing natural areas for their ecologically sustainable use by tourism. This is achieved by identifying those biophysical attributes most significant to a wide range of divers' experiences. This level of understanding will be essential to the maintenance and protection of quality experiences for visitors. This is because many of the attributes significant to divers' experiences identified in this research are also at high risk of being impacted by the activities of extractive users, tourism operators and tourists, and also the affects of natural events and global scale processes. Finally, recommendations are made concerning the management of those biophysical attributes most at risk from damage and/or removal.

TABLE OF CONTENTS

CHAPTER 1.....	1
GENERAL INTRODUCTION: CERTIFIED SCUBA DIVING AND THE WILDLIFE TOURISM EXPERIENCE	1
1.1 INTRODUCTION.....	1
1.1.1 SCUBA diving and marine wildlife tourism.....	3
1.2 CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW	5
1.2.1 Experience-based approaches to measuring the certified SCUBA diving wildlife tourism experience.....	6
1.2.2 Applying the Limits of Acceptable Change process to measure and describe the certified SCUBA diving wildlife tourism experience.....	14
1.2.3 Measuring the SCUBA diving wildlife tourism experience.....	16
1.2.4 Recreational specialization construct	23
1.3 PURPOSE AND OBJECTIVES	25
1.4 THESIS OUTLINE	27
CHAPTER 2.....	29
METHODS FOR INVESTIGATING THE CERTIFIED SCUBA DIVING WILDLIFE TOURISM EXPERIENCE.....	29
2.1 SELECTION OF SCUBA DIVING OPERATORS.....	29
2.2.1 Description of the live-aboard diving operations used for this study.....	31
2.2 SELECTION OF STUDY SITES	34
2.2.1 Brief description of study sites	39
2.3 RESEARCH DESIGN	45
2.3.1 Study One – Understanding certified SCUBA divers: An application of the recreational specialization construct (Chapter Three)	47
2.3.2 Study Two – Assessment of the biophysical attributes that occur on selected coral reef dive sites (Chapter Four)	48
2.3.3 Study Three – The influence of coral reef biophysical attributes on divers’ experiences (Chapter Five)	50
2.3.4 Study Four – The influence of Diving and Coral Reef History (DACRH) Specialization on divers’ experiences.....	51

CHAPTER 3.....	53
UNDERSTANDING CERTIFIED SCUBA DIVERS: AN APPLICATION OF THE RECREATIONAL SPECIALIZATION CONSTRUCT.....	53
3.1 INTRODUCTION.....	53
3.1.1 Measuring recreational specialization in the interest of Diving and Coral Reef History (DACRH) Specialization.....	55
3.2 OBJECTIVES.....	57
3.3 METHODS.....	58
3.3.1 Sampling technique.....	58
3.3.2 Questionnaire design.....	59
3.3.3 Questionnaire Content.....	60
3.3.4 Diving and Coral Reef History (DACRH) specialization groups.....	62
3.3.5 Sample.....	63
3.4 ANALYSIS.....	67
3.5 RESULTS.....	68
3.5.1 Demographics.....	69
3.5.2 Previous SCUBA diving history.....	71
3.5.3 Previous history of SCUBA diving in coral reef environments.....	73
3.5.4 Level of coral reef interest and knowledge.....	74
3.5.5 Cluster analysis specialization groups.....	76
3.5.6 Diving and Coral Reef History (DACRH) specialization groups.....	76
3.6 DISCUSSION.....	90
3.6.1 Diving and Coral Reef History (DACRH) specialization groups.....	90
3.6.2 Demographics.....	93
3.6.3 Previous SCUBA diving history.....	94
3.6.4 Ownership of SCUBA related equipment.....	95
3.6.5 Previous history of SCUBA diving in coral reef environments.....	95
3.6.6 Level of coral reef interest and knowledge.....	96
3.6.7 Summary.....	98
CHAPTER 4.....	99
ASSESSMENT OF THE BIOPHYSICAL ATTRIBUTES THAT OCCUR ON SELECTED CORAL REEF DIVE SITES.....	99
4.1 INTRODUCTION.....	99
4.1.1 Biophysical attributes of coral reef sites.....	99
4.1.2 Biophysical attributes influencing visitor experiences.....	101
4.1.3 Assessing the environmental attributes.....	105
4.2 OBJECTIVES.....	108
4.3 METHODS.....	108
4.3.1 Determining the typical swim behaviour of divers at each of the study sites.....	109

4.3.2	Survey techniques	126
4.3.3	Survey 1 – Broad-scale site descriptions.....	128
4.3.4	Survey 2 – Roving Diver Diversity (RDD) of coral	136
4.3.5	Survey 3 – Roving Diver Diversity (RDD) of marine organisms.....	137
4.3.6	Survey 4 – Standard and specific marine organism presence/absence and relative abundance monitoring	137
4.4	ANALYSIS	142
4.4.1	Broad-scale site descriptions.....	142
4.4.2	Roving Diver Diversity	143
4.4.3	Size of fish and other marine organisms	143
4.4.4	Sighting Frequency (SF) and relative mean abundance	144
4.4.5	Horizontal visibility.....	145
4.4.6	Distinctive biophysical attributes	145
4.5	RESULTS	147
4.5.1	Biophysical attributes within and between sites	147
4.5.2	Distinctive attributes	156
4.6	DISCUSSION.....	161
4.6.1	Attributes measured at the sites	161
4.6.2	Distinctive biophysical attributes	166
4.6.3	The Modified Roving Diver Technique (MRDT).....	170
4.6.4	Summary.....	170
CHAPTER 5.....	172
THE INFLUENCE OF CORAL REEF BIOPHYSICAL ATTRIBUTES ON DIVERS’ EXPERIENCES	172
5.1	INTRODUCTION.....	172
5.1.1	Measuring visitors’ experiences	173
5.2	OBJECTIVES	178
5.3	METHODS.....	178
5.3.1	Data collection.....	179
5.3.2	Questionnaire design.....	180
5.3.3	Questionnaire content.....	181
5.4	ANALYSIS	185
5.4.1	Open-ended responses.....	185
5.4.2	Scalar responses	185
5.4.3	Gap-analysis	186
5.4.4	Animal Importance Index (AII).....	187
5.4.5	Distinctive attributes	189
5.4.6	Roving diver diversity (RDD) of marine life and best experiences	189
5.4.7	Size of fish and other marine organisms (excluding coral) and best experiences	189

5.4.8	Pre-dive briefing and best experiences.....	190
5.5	RESULTS	190
5.5.1	Pre-trip expectations.....	191
5.5.2	Site-specific diving experiences	197
5.5.3	Post-trip perceptions and evaluations	219
5.6	DISCUSSION.....	225
5.6.1	Pre-trip expectations.....	226
5.6.2	Site-specific experiences.....	228
5.6.3	Post-trip perceptions and evaluations	243
CHAPTER 6.....	246
THE INFLUENCE OF DIVING AND CORAL REEF HISTORY (DACRH) SPECIALIZATION		
ON DIVERS' EXPERIENCES		
6.1	INTRODUCTION.....	246
6.1.1	Satisfaction and expectations.....	247
6.1.2	Knowledge, interest, and perceptions.....	247
6.2	OBJECTIVES	249
6.3	METHODS.....	249
6.3.1	Data collection.....	249
6.4	ANALYSIS	253
6.5	RESULTS	253
6.5.1	Pre-trip expectations.....	254
6.5.2	Site specific diving experiences.....	261
6.5.3	Post-trip perceptions and evaluations	271
6.6	DISCUSSION.....	275
6.6.1	Pre-trip expectations.....	275
6.6.2	Actual experiences	278
6.6.3	Post-trip Perceptions and evaluations.....	280
CHAPTER 7.....	283
SUMMARY AND CONCLUSIONS: DIVERS' EXPERIENCES ON CORAL REEFS.....		
7.1	INTRODUCTION.....	283
7.2	SIGNIFICANCE OF FINDINGS	285
7.2.1	The biophysical attributes at the study sites.....	285
7.2.2	Certified SCUBA divers	287
7.2.3	Certified SCUBA divers' experiences.....	290
7.2.4	Application of findings in a Limits of Acceptable Change (LAC) planning approach.....	295
7.3	MANAGEMENT IMPLICATIONS AND RECOMMENDATIONS.....	296
7.3.1	Extractive users	297
7.3.2	Non-extractive users.....	300

7.3.3	Natural events.....	302
7.3.4	Global scale processes.....	303
7.3.5	Implications for tour operators	304
7.4	LIMITATIONS OF THE STUDY	306
7.5	RECOMMENDATIONS FOR FUTURE RESEARCH	307
7.6	CONCLUSIONS.....	310
	REFERENCES.....	311
	APPENDIX A	329
	APPENDIX B.....	331
	APPENDIX C	337
	APPENDIX D	341
	APPENDIX E.....	346
	APPENDIX F	349
	APPENDIX G	350
	APPENDIX H	351
	APPENDIX I.....	352
	APPENDIX J	353

TABLE OF FIGURES

FIGURE 1.1. Limits of acceptable change planning model (source: Stankey et al., 1985).....	11
FIGURE 1.2. Activities guide detailing the allowable use in each seven of the conservation zones used in the GBRMP (source: GBRMPA RAP zoning, Maps, May 18, 2004).	13
FIGURE 2.1. Map of Cairns to Lizard Island showing the location of the Ribbon Reefs on the Great Barrier Reef and Osprey Reef in the Coral Sea, as well the general trip routes taken by the live-aboard diving operators used in this study.	30
FIGURE 2.2. Map of the northern Ribbon Reefs showing the position of the three study sites at this location.	37
FIGURE 2.3. Map of Osprey Reef in the Coral Sea highlighting the two study sites at this location (depths are given in metres).	38
FIGURE 2.4. Four-study research design used to define and describe the certified SCUBA diving opportunity class in this thesis.	47
FIGURE 3.1. Distribution of completed questionnaires by month during 2003 to 2004 sampling period (n=640).	66
FIGURE 3.2. The minimum and maximum number of total dives, and thus range, for each SCUBA certification level.	72
FIGURE 3.3. Percentage of respondents in each DACRH group that visited either the Ribbon Reef locations only, or both the Ribbon Reefs and Osprey Reef locations in the one trip.	90
FIGURE 4.1. Cross section site map of Steve’s Bommie (South aspect).	110
FIGURE 4.2. Cross section site map of Pixie Pinnacle (South aspect).	113
FIGURE 4.3. Plan view site map of the Cole Hole.	116
FIGURE 4.4. Plan view site map of Admiralty Anchor.	119
FIGURE 4.5. Plan view North Horn.	122
FIGURE 4.6. Roving Diver Diversity (RDD) of corals surveyed at the five dive sites, examined by family, genera, and species.	150
FIGURE 4.7. Roving Diver Diversity (RDD) of fish (including shark and rays) for the five dive sites by family, genera, and species.	151
FIGURE 4.8. Roving Diver Diversity (RDD) of other marine organisms for the five dive sites by family, genera, and species.	155
FIGURE 5.1. Size class distribution of fish and other marine organisms from Roving Diver Diversity surveys and best animal experiences (all sites; n=445)	214

FIGURE 5.2. The percentage of respondents that checked at least one social and/or negative impact at each of the dive sites.	216
FIGURE 5.3. Mean difference scores between how common 19 coral reef features were expected to be at the start of the trip, and how common they were perceived to be at the end of the trip (n=486).	221
FIGURE 6.1. Distribution of best experiences grouped into major attribute themes for each DACRH specialization group.	265
FIGURE 6.2. Size class distribution of specifically named organisms DACRH specialization groups listed as best experiences.	267
FIGURE 6.3. Distribution of best experience comments for specifically named organisms at the study sites classed as either mentioned or not mentioned within the pre-dive briefing for each DACRH specialization group.	268
FIGURE 6.4. The percentage of respondents from each DACRH specialization group that perceived at least one negative social and/or environmental impact on the study sites 5that detracted from their experience.	269
FIGURE 7.1. Factors affecting the environmental quality and biophysical attributes of natural areas that tourism depends on for the attraction of visitors and the experiences they have.	297

TABLE OF TABLES

TABLE 1.1. Day-trip visitor perceptions of the influence of 24 conditions on their coral reef experience while visiting the GBRMP (Source: Shafer et al., 1998).....	15
TABLE 1.2. Live-aboard dive trip participants best experiences on the GBR and Coral Sea dive sites by major themes (Source: Birtles et al., in prep).....	19
TABLE 2.1. Description of the six live-aboard diving vessels used in this study and their typical trip itineraries.	32
TABLE 2.2. The level of use of the five selected study sites by the six live-aboard diving vessels used in this study expressed as the number of dives undertaken by passengers per year.....	36
TABLE 3.1. Total response rate and sample size for August 2003 to May 2004 sampling period.....	65
TABLE 3.2. Certified SCUBA divers' demographics and SCUBA diving history.....	70
TABLE 3.3. Respondents' previous history of SCUBA diving in coral reef environments.....	74
TABLE 3.4. Respondents' ratings of their coral reef interest and knowledge.....	75
TABLE 3.5. Comparisons of previous diving and coral reef history between cluster specialization groups.....	76
TABLE 3.6. Distribution of years diving history for the sample.....	78
TABLE 3.7. Distribution of total number of dives for the sample.....	78
TABLE 3.8. Distribution of diving certification levels for the sample.....	79
TABLE 3.9. Distribution of maximum diving depths for the sample.....	79
TABLE 3.10. Distribution of total dives on coral reefs for the sample.....	80
TABLE 3.11. Divisions of the five diving and coral reef history variables used construct the DACRH Specialization index.....	81
TABLE 3.12. Comparisons of demographics between DACRH specialization groups.....	81
TABLE 3.13. Comparisons of previous diving history between DACRH specialization groups.....	83
TABLE 3.14. Comparison of SCUBA diving history in coral reef environments between DACRH specialization groups.....	87
TABLE 3.15. Mean scores and test results indicating significant differences between DACRH specialization groups for self-ratings of coral reef interest and knowledge items.....	89
TABLE 4.1. Standard organisms monitored at each of the five study sites between 16 August 2003 and 29 May 2004.....	139
TABLE 4.2. Specific organisms monitored at each of the five study sites between 16 August 2003 and 29 May 2004.....	140

TABLE 4.3. Summary of the biophysical attributes surveyed at each of the five study sites from the Ribbon Reef and Osprey Reef locations between July 2003 and November 2003.	148
TABLE 4.4. Sighting frequency (SF) and relative mean abundance statistics for ‘standard’ and ‘specific’ organisms monitored at all sites between 16 August 2003 and 29 May 2004.....	152
TABLE 4.5. Sighting probability distributions of ‘standard’ and ‘specific’ organisms monitored at each of the study sites between 16 August 2003 and 29 May 2004.	153
TABLE 4.6. Descriptions of distinctive attributes identified for each quality factor at the study sites.....	157
TABLE 5.1. Summary of previous research highlighting potential indicators of environmental quality that contribute or detract from visitors’ experiences in coral reef environments.	176
TABLE 5.2. Characteristics respondents used to define high and low coral quality.	192
TABLE 5.3. Attributes that respondents most enjoy seeing while diving on coral reefs.....	194
TABLE 5.4. Animals that respondents most wanted to see on this trip.....	195
TABLE 5.5. Respondents’ expectations of how common specific features will be on dive sites during the trip.	196
TABLE 5.6. Mean ratings and Kruskal-Wallis Means-Test results for how much respondents enjoyed each of the five study sites.	197
TABLE 5.7. Mean ratings and Kruskal-Wallis Means-Test results for how well each of the five study sites met respondents’ expectations at each of the five study sites.	198
TABLE 5.8. Descriptive statistics and Kruskal-Wallis Means-Test results for the levels of reported enjoyment according to how well dive sites met respondents’ expectations.....	198
TABLE 5.9. Ten most important coral reef features that contributed to respondents’ enjoyment at each of the sites.	200
TABLE 5.10. Biophysical attributes that respondents listed as best experiences at all sites	202
TABLE 5.11. Top ten biophysical attributes that respondents listed as best experiences at each of the five study sites.	203
TABLE 5.12. Animals most important to respondents’ experiences according to the Animal Importance Index (AII).....	207
TABLE 5.13. Animals most important to experiences at each of the five study sites according to the Animal Importance Index (AII).....	209
TABLE 5.14. Respondents’ reasons why biophysical attributes were a best experience at the dive sites presented as percentage of total comments for each attribute (n=445).....	212
TABLE 5.15. Reasons why attributes were best experiences according to factors that relate to characteristics of an attribute, or aspects of an experience with an attribute (n=445).....	213

TABLE 5.16. Perceived social and environmental impacts that detracted from respondents’ experiences at the study sites.	215
TABLE 5.17. Perceived negative social impacts that detracted from respondents’ experiences at each of the five study sites.	218
TABLE 5.18. Perceived negative environmental impacts that detracted from respondents’ experiences at each of the five study sites.	218
TABLE 5.19. Descriptive statistics and Kruskal-Wallis Means-Test results for the levels of reported enjoyment according to how well dive sites met respondents’ expectations.....	220
TABLE 5.20. Respondents’ mean ratings for perceptions of how common specific features were on dive sites during the trip.....	220
TABLE 5.21. Descriptive statistics and One-Way Analysis of Variance test results for the mean difference scores (sum of post-trip perceptions – sum of pre-trip expectations) according to how well dive sites met respondents’ expectations.....	222
TABLE 5.22. Biophysical attributes contributing to respondents’ best experiences during the trip (n=434).	223
TABLE 5.23. The mean ratings and test results of environmental quality, coral quality, fish quality, human impacts, and natural beauty for the Ribbon reef and Osprey Reef locations.....	224
TABLE 5.24. Wilcoxon Signed-Rank Test for difference between ratings of perceived environmental attributes and ratings of expected environmental attributes of Ribbon Reef and Osprey Reef dive sites...	225
TABLE 6.1. Comparison of DACRH specialization group profiles for respondents that visited both the Ribbon Reef and Osprey Reef locations in the one trip.	251
TABLE 6.2. Mean scores and test results for DACRH specialization groups for self-perceived rating of coral reef knowledge and coral reef interest and knowledge items for respondents that visited both the Ribbon Reef and Osprey Reef locations in the one trip.	252
TABLE 6.3. Comparison of the characteristics that DACRH specialization groups use to define high coral quality.	256
TABLE 6.4. Comparison of the characteristics that DACRH specialization groups use to define low coral quality.	256
TABLE 6.5. Comparisons of the features of coral reefs DACRH specialization groups most enjoy seeing.	258
TABLE 6.6. Comparisons of the animals that ‘lower’ and ‘upper’ level DACRH specialization groups most wanted to see whilst diving on this trip.....	260
TABLE 6.7. Descriptive statistics and Kruskal-Wallis Means-Test results for enjoyment ratings at sites, ratings for expectations being met at sites, maximum diving depth at sites (m), perceived visibility, pre-	

dive briefing content, coral quality ratings, and fish quality ratings for each DACRH specialization group.	262
TABLE 6.8. Means and Kruskal-Wallis Means-Test results for the importance of features contributing to DACRH specialization groups’ enjoyment at the study sites.....	264
TABLE 6.9. Top ten biophysical attributes that DACRH specialization groups listed as best experiences at the study sites.	266
TABLE 6.10. Perceived negative social impacts that detracted from DACRH groups’ experiences at the study sites.	270
TABLE 6.11. Perceived negative environmental impacts that detracted from DACRH groups’ experiences at the study sites.	270
TABLE 6.12. Descriptive statistics and Mann-Whitney U-Test results for ratings of satisfaction with dive sites and expectations being met for ‘lower’ and ‘upper’ DACRH specialization groups.....	271
TABLE 6.13. Comparisons of the biophysical attributes contributing most to best experiences for ‘lower’ and ‘upper’ level DACRH specialization groups.	273
TABLE 6.14. Descriptive statistics and Mann-Whitney U Test results for mean ratings (\pm 1 SE) of environmental quality, coral quality, fish quality, human impacts, and natural beauty for the Ribbon Reef and Osprey Reef locations by ‘lower’ and ‘upper’ level DACRH specialization groups.....	274

TABLE OF PLATES

PLATE 4.1. Photos from Steve's Bommie.....	112
PLATE 4.2. Photos from Pixie Pinnacle.....	115
PLATE 4.3. Photos from the Cod Hole.....	118
PLATE 4.4. Photos from Admiralty Anchor.....	121
PLATE 4.5. Photos from North Horn.....	125