# TABLE OF CONTENTS

**ABSTRACT** .................................................................................................................. III

**EXECUTIVE SUMMARY** ............................................................................................. IV

**SECTION I: WORKSHOP HISTORY** ............................................................................. 1

**SECTION II: WORKSHOP PRESENTATIONS** ............................................................... 3

**PHYSICAL AND BIOLOGICAL CONSIDERATIONS** .................................................. 3

- Oceanography, waves, and mechanical damage by Scott Heron .................................. 3
- Vulnerability of coral reefs in a changing climate by Ove Hoegh-Guldberg ...................... 4
- The zooxanthellae story by Ray Berkelmans .................................................................. 8
- Monitoring the biological state of coral reefs by Hugh Sweatman ................................. 9
- Coral vulnerability and resilience by Roberto Prieto-Iglesias ........................................ 11
- Modeling bleaching, climate change, and coral vulnerability by Sophie Dove ............... 12
- Water quality and coral bleaching thresholds by Scott Wooldridge ............................ 14
- *In situ* monitoring of environmental coral stress by Al Strong ...................................... 15

**TECHNICAL CONSIDERATIONS** .............................................................................. 17

- Satellites and remote sensing by William Skirving ....................................................... 17
- Remote sensing coral reef environmental stress by Mark Eakin ................................. 17
- Thermal stress links with coral bleaching and infectious diseases by Scott Heron ............ 20
- Combining heat stress and light to produce a new bleaching product by William Skirving .......................................................... 21
- Monitoring coral surface UV & visible solar radiation from space by Kelvin Michael ........ 22
- Water quality by Arnold Dekker .................................................................................. 23
- Ocean colour over coral reefs by Scarla Weeks ............................................................ 29
- Utility of seagrasses for satellite monitoring of coral reef condition by Susana Enríquez .... 31
- The future of ocean colour products on coral reefs by Peter Fears ............................... 33
- Use of climate models to predict coral reef vulnerability by Claire Spillman ............... 35
- Integrating remote sensing data into ecosystem models by Mark Eakin ....................... 37
- Machine learning and data mining by Vitaliy Ciesielski .............................................. 41
- Web-based delivery of NOAA Coral Reef Watch products by Gang Liu ..................... 44
- Delivering tools and products to managers through trainings and workshops by Britt Parker .......................................................... 47
- Information sharing, integration and quality control for coral reef datasets by Jane Hunter .......................................................... 49

**MANAGEMENT CONSIDERATIONS** ....................................................................... 52

- Managing Coral Reefs 101 by Randy Kosaki ............................................................... 52
- Managing coral reefs in a changing climate by Billy Causey ..................................... 53
- U.S. coral reef managers’ requests for remote sensing products by Jessica Morgan ........ 56
- Use of coral stress monitoring for management by Billy Causey ............................... 59
- Key environmental variables for management by Randy Kosaki ............................... 61
- Aspects other than those directly related to corals by Billy Causey ............................ 63
SECTION III: WORKSHOP DISCUSSIONS

“Brainstorming for ideas for new remote sensing products” .................................................. 66
“Integrating in situ monitoring with remote sensing to provide tools for management” .......... 67
“How can the use of remote sensing in models improve management of coral reefs?” .......... 69
“Improving links between science and management” ......................................................... 70
“Use of water quality and light over coral reefs for future management products” ............ 72
“What novel uses of any environmental variables can assist management of coral reefs?” ...... 74
“Is there too much emphasis placed on corals and coral health?” ................................... 76
“From the management perspective, what are examples of good product delivery?” ........... 77
“What issues are managers having to respond to?” ......................................................... 79
“What other variables, tools, and information would be useful for managing coral reefs?” ...... 80

SECTION IV: SUMMARY AND FUTURE DIRECTIONS ......................................................... 83

APPENDIX A: LAMINGTON WORKSHOP AGENDA ............................................................... A1
APPENDIX B: PARTICIPANT LIST ...................................................................................... B1
APPENDIX C: DISCUSSION BOARD NOTES ..................................................................... C1
APPENDIX D: WORKS CITED ............................................................................................. D1
APPENDIX E: ACRONYMS AND ABBREVIATIONS ......................................................... E1