

# TABLE OF CONTENTS

## LIST OF ABBREVIATIONS

## EXECUTIVE SUMMARY

HISTORY & MISSION OF CRED	1
THE MARIANA ARCHIPELAGO	3
METHODS OVERVIEW	7
SOUTHERN VS. NORTHERN ISLANDS	10
CORAL REEFS OF THE SOUTHERN ISLANDS	21
REMOTE REEF AREAS	25

## 1 INTRODUCTION

1.1 MARIANA ARCHIPELAGO	1
1.2 CORAL REEF MANAGEMENT	6
1.3 ECOSYSTEM APPROACH TO MANAGEMENT	10
1.4 PACIFIC REEF ASSESSMENT & MONITORING PROGRAM	11
1.5 STRUCTURE OF THIS MONITORING REPORT	15

## 2 METHODS & OPERATIONAL BACKGROUND

2.1 OPERATIONAL BACKGROUND	2
2.2 BENTHIC HABITAT MAPPING & CHARACTERIZATION	3
2.3 OCEANOGRAPHY AND WATER QUALITY	12
2.4 REEF SURVEYS: CORALS, ALGAE, MACROINVERTEBRATES, FISHES & SUBSTRATES	20
2.5 ECOSYSTEM INTEGRATION: CORAL REEF CONDITION INDEX	40
2.6 GEOGRAPHIC INFORMATION SYSTEM PRODUCTS	41

## 3 ARCHIPELAGIC COMPARISONS

3.1 GEOPOLITICAL CONTEXT	1
3.2 BENTHIC HABITAT MAPPING & CHARACTERIZATION	7
3.3 OCEANOGRAPHY AND WATER QUALITY	11
3.4 CORALS & CORAL DISEASE	23
3.5 ALGAE & ALGAL DISEASE	31
3.6 BENTHIC MACROINVERTEBRATES	39
3.7 REEF FISHES	48
3.8 SPECIES OF CONCERN	51
3.9 MARINE DEBRIS	53
3.10 ECOSYSTEM INTEGRATION	55
3.11 SUMMARY	60

## 4 GUAM & ADJACENT REEFS

4.1 INTRODUCTION	1
4.2 SURVEY EFFORT	9
4.3 BENTHIC HABITAT MAPPING & CHARACTERIZATION	13
4.4 OCEANOGRAPHY & WATER QUALITY	28
4.5 CORALS & CORAL DISEASE	39
4.6 ALGAE & ALGAL DISEASE	52
4.7 BENTHIC MACROINVERTEBRATES	61
4.8 REEF FISHES	72
4.9 MARINE DEBRIS	77
4.10 REEFS & BANKS	79
4.11 ECOSYSTEM INTEGRATION	99
4.12 SUMMARY	106

## 5 ROTA

5.1 INTRODUCTION	1
5.2 SURVEY EFFORT	7
5.3 BENTHIC HABITAT MAPPING & CHARACTERIZATION	11
5.4 OCEANOGRAPHY & WATER QUALITY	21
5.5 CORALS & CORAL DISEASE	31
5.6 ALGAE & ALGAL DISEASE	43
5.7 BENTHIC MACROINVERTEBRATES	51
5.8 REEF FISHES	61
5.9 MARINE DEBRIS	67
5.10 ECOSYSTEM INTEGRATION	69
5.11 SUMMARY	74

## 6 AGUIJAN

6.1 INTRODUCTION	1
6.2 SURVEY EFFORT	4
6.3 BENTHIC HABITAT MAPPING & CHARACTERIZATION	8
6.4 OCEANOGRAPHY & WATER QUALITY	11
6.5 CORALS & CORAL DISEASE	19
6.6 ALGAE & ALGAL DISEASE	28
6.7 BENTHIC MACROINVERTEBRATES	35
6.8 REEF FISHES	43
6.9 MARINE DEBRIS	47
6.10 ECOSYSTEM INTEGRATION	49
6.11 SUMMARY	51

## 7 TINIAN & TATSUMI REEF

7.1 INTRODUCTION	1
7.2 SURVEY EFFORT	6
7.3 BENTHIC HABITAT MAPPING & CHARACTERIZATION	10
7.4 OCEANOGRAPHY & WATER QUALITY	19
7.5 CORALS & CORAL DISEASE	29
7.6 ALGAE & ALGAL DISEASE	42
7.7 BENTHIC MACROINVERTEBRATES	49
7.8 REEF FISHES	60
7.9 MARINE DEBRIS	65
7.10 ECOSYSTEM INTEGRATION	67
7.11 SUMMARY	70

## 8 SAIPAN

8.1 INTRODUCTION	1
8.2 SURVEY EFFORT	8
8.3 BENTHIC HABITAT MAPPING & CHARACTERIZATION	12
8.4 OCEANOGRAPHY & WATER QUALITY	24
8.5 CORALS & CORAL DISEASE	38
8.6 ALGAE & ALGAL DISEASE	50
8.7 BENTHIC MACROINVERTEBRATES	59
8.8 REEF FISHES	69
8.9 MARINE DEBRIS	75
7.10 ECOSYSTEM INTEGRATION	76
8.11 SUMMARY	82

## 9 ANATAHAN

9.1 INTRODUCTION	1
9.2 SURVEY EFFORT	4
9.3 BENTHIC HABITAT MAPPING & CHARACTERIZATION	7
9.4 OCEANOGRAPHY & WATER QUALITY	12
9.5 CORALS & CORAL DISEASE	21
9.6 ALGAE & ALGAL DISEASE	24
9.7 BENTHIC MACROINVERTEBRATES	27
9.8 REEF FISHES	31
9.9 MARINE DEBRIS	33
9.10 ECOSYSTEM INTEGRATION	33
9.11 SUMMARY	36

## 10 SARIGAN

10.1 INTRODUCTION	1
10.2 SURVEY EFFORT	4
10.3 BENTHIC HABITAT MAPPING & CHARACTERIZATION	8
10.4 OCEANOGRAPHY & WATER QUALITY	15
10.5 CORALS & CORAL DISEASE	24
10.6 ALGAE & ALGAL DISEASE	33
10.7 BENTHIC MACROINVERTEBRATES	39
10.8 REEF FISHES	47
10.9 MARINE DEBRIS	51
10.10 ECOSYSTEM INTEGRATION	53
10.11 SUMMARY	56

## 11 GUGUAN

11.1 INTRODUCTION	1
11.2 SURVEY EFFORT	4
11.3 BENTHIC HABITAT MAPPING & CHARACTERIZATION	8
11.4 OCEANOGRAPHY & WATER QUALITY	15
11.5 CORALS & CORAL DISEASE	23
11.6 ALGAE & ALGAL DISEASE	31
11.7 BENTHIC MACROINVERTEBRATES	37
11.8 REEF FISHES	45
11.9 MARINE DEBRIS	49
11.10 ECOSYSTEM INTEGRATION	50
11.11 SUMMARY	52

## 12 ALAMAGAN

12.1 INTRODUCTION	1
12.2 SURVEY EFFORT	4
12.3 BENTHIC HABITAT MAPPING & CHARACTERIZATION	8
12.4 OCEANOGRAPHY & WATER QUALITY	15
12.5 CORALS & CORAL DISEASE	23
12.6 ALGAE & ALGAL DISEASE	32
12.7 BENTHIC MACROINVERTEBRATES	38
12.8 REEF FISHES	44
12.9 MARINE DEBRIS	48
12.10 ECOSYSTEM INTEGRATION	50
12.11 SUMMARY	52

## 13 PAGAN

13.1 INTRODUCTION	1
13.2 SURVEY EFFORT	4
13.3 BENTHIC HABITAT MAPPING & CHARACTERIZATION	8
13.4 OCEANOGRAPHY & WATER QUALITY	17
13.5 CORALS & CORAL DISEASE	28
13.6 ALGAE & ALGAL DISEASE	40
13.7 BENTHIC MACROINVERTEBRATES	48
13.8 REEF FISHES	59
13.9 MARINE DEBRIS	64
13.10 ECOSYSTEM INTEGRATION	66
13.11 SUMMARY	68

## 14 AGRIHAN

14.1 INTRODUCTION	1
14.2 SURVEY EFFORT	4
14.3 BENTHIC HABITAT MAPPING & CHARACTERIZATION	8
14.4 OCEANOGRAPHY & WATER QUALITY	15
14.5 CORALS & CORAL DISEASE	23
14.6 ALGAE & ALGAL DISEASE	32
14.7 BENTHIC MACROINVERTEBRATES	38
14.8 REEF FISHES	46
14.9 MARINE DEBRIS	50
14.10 ECOSYSTEM INTEGRATION	52
14.11 SUMMARY	54

## 15 ASUNCION

15.1 INTRODUCTION	1
15.2 SURVEY EFFORT	4
15.3 BENTHIC HABITAT MAPPING & CHARACTERIZATION	8
15.4 OCEANOGRAPHY & WATER QUALITY	15
15.5 CORALS & CORAL DISEASE	22
15.6 ALGAE & ALGAL DISEASE	31
15.7 BENTHIC MACROINVERTEBRATES	37
15.8 REEF FISHES	45
15.9 MARINE DEBRIS	49
15.10 ECOSYSTEM INTEGRATION	51
15.11 SUMMARY	53

## 16 MAUG

16.1 INTRODUCTION	1
16.2 SURVEY EFFORT	4
16.3 BENTHIC HABITAT MAPPING & CHARACTERIZATION	8
16.4 OCEANOGRAPHY & WATER QUALITY	17
16.5 CORALS & CORAL DISEASE	28
13.6 ALGAE & ALGAL DISEASE	40
13.7 BENTHIC MACROINVERTEBRATES	48
13.8 REEF FISHES	58
13.9 MARINE DEBRIS	64
13.10 ECOSYSTEM INTEGRATION	66
13.11 SUMMARY	69

## 17 FARALLON DE PAJAROS

17.1 INTRODUCTION	1
17.2 SURVEY EFFORT	5
17.3 BENTHIC HABITAT MAPPING & CHARACTERIZATION	8
17.4 OCEANOGRAPHY & WATER QUALITY	14
17.5 CORALS & CORAL DISEASE	23
17.6 ALGAE & ALGAL DISEASE	31
17.7 BENTHIC MACROINVERTEBRATES	37
17.8 REEF FISHES	41
17.9 MARINE DEBRIS	45
17.10 ECOSYSTEM INTEGRATION	47
17.11 SUMMARY	49

## 18 REEFS & BANKS OF THE CNMI

18.1 INTRODUCTION	1
18.2 AHYI SEAMOUNT	2
18.3 SUPPLY REEF	4
18.4 ZEALANDIA BANK	11
18.5 MARPI BANK	14
18.6 ESMERALDA	16
18.7 STINGRAY SHOAL	18
18.8 PATHFINDER REEF	24
18.9 ARAKANE REEF	34
18.10 SUMMARY	44

## APPENDICES

## REFERENCES