MARINE SURVEY OF SAIPAN LAGOON

A Preliminary Coral Survey of Saipan Lagoon

by

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ENVIRONMENTAL SURVEY REPORT

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Introduction

On June 6, 7, and 8, 1974, observations and measurements of coral species in the leeward lagoon of Saipan were made. This report summarizes the findings.

The following stations were visited during this study and can be located by their numbers on the accompanying map (Fig. 1).

1. The north end of the lagoon from the outer barrier reef flat less than a meter deep to the deeper lagoon areas up to five meters in depth.
2. A shallow bed of staghorn Acropora on the shoreward side of the north part of the lagoon.
3. A coral patch reef just west of Managaha Island and close to the inner edge of the barrier reef.
4. The steep inner edge of the barrier reef just west of Managaha Island.
5. A shallow patch reef off Micro Beach and adjacent to the deeper ship channel leading to the port.
6. Area of scattered staghorn Acropora colonies just north of the Royal Taga Hotel and on the inner border of the barrier reef.
7. A patch reef outside the barrier reef near the harbor entrance rising to within 5 m of the surface from a bottom of about 30 m.

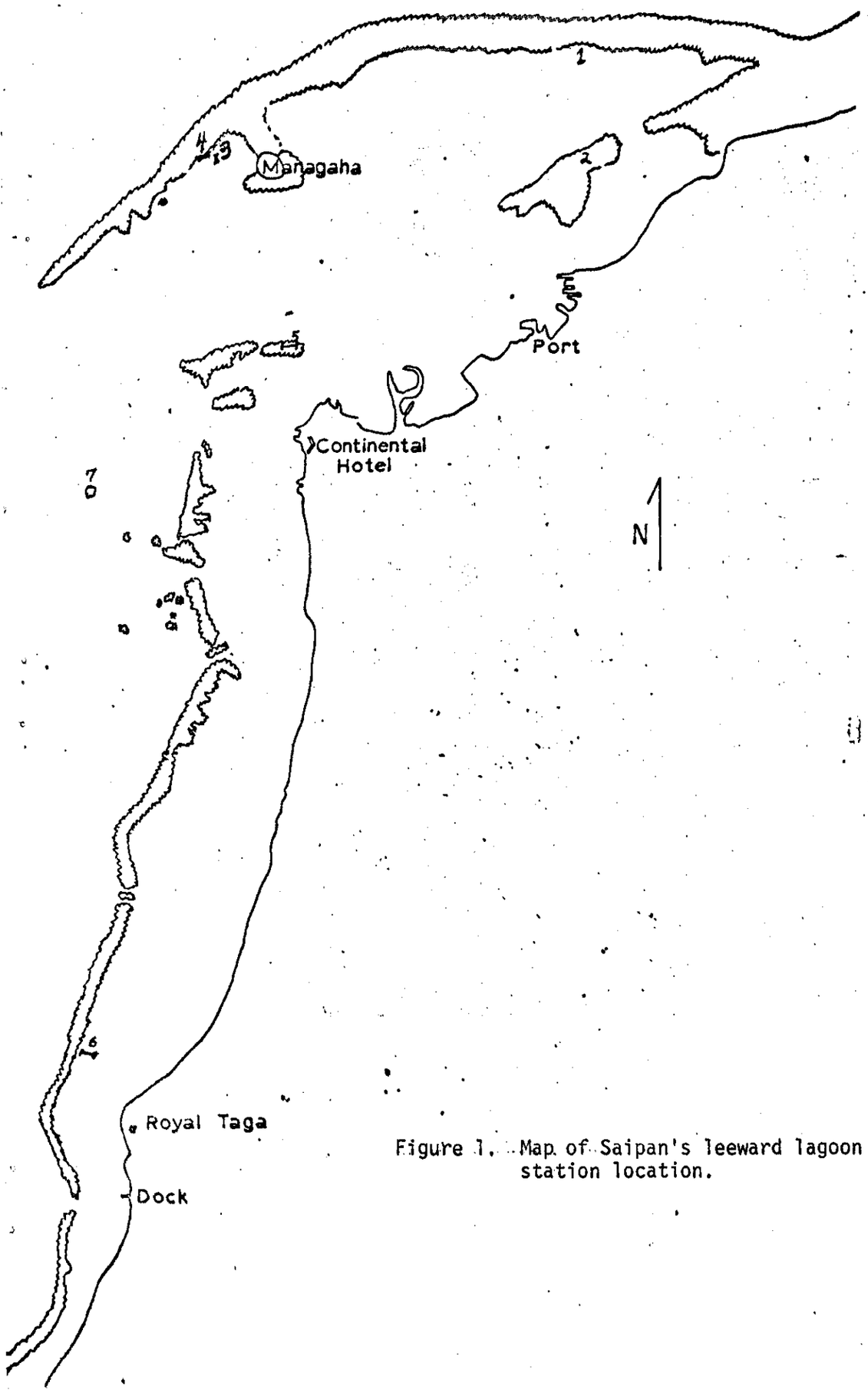

Figure 1. Map of Saipan's leeward lagoon showing station location.

Methodology

Quantitative coral transects, each 100 meters in length, were made at stations 3, 4, 5, and 6 using a point-centered quarter technique (Cottam et al., 1953). For this technique, a series of 10 points, 10 m apart, were selected along a transect line laid on the substrate. The area around each transect point was divided into four equal quadrants. The coral nearest the transect point in each quadrant was located and its specific name, diameter, and distance from the center of the corallum to the transect point were recorded.

Coral density, dominance of substrate by living corals, and frequency of occurrence were then determined from the above data. By summing the relative value of each of these parameters, an overall Importance Value was assigned to each transect species (Table 1). Furthermore, species seen near the transect line during a twenty minute search were included in the checklist (Table 2).

Results and Discussion

At the time of this study, Station 1 and the area along the barrier reef at the north end of the lagoon had the clearest water and best underwater visibility of the entire lagoon. This was due to the current washing over the barrier reef from the north into the lagoon. This current continued southwesterly to the deeper and murkier parts of the lagoon. Certain indicator species such as Distichopora violacea found at Station 1 suggest that this flow of clean water from the depths outside the barrier reef is a regular constant feature of the lagoon. In fact, this flow was even observed shortly before low tide, showing that the lagoon waters don't exit over the reef at Station 1 during lowering of tide.

With such favorable conditions, the reef should show extensive healthy coral growth. However, the dominant featuresof Station 1 are broken and dead coral heads and rubble covered with dark, fine, slimy blue-green algae. Some type of stress on the reef seemed to have interfered with coral growth although there were a few scattered pockets of luxuriant coral growth. Perhaps the use of bleach and explosives which are extensively employed to harvest fish here caused the destruction of healthy coral. A large diverse population of sea urchins(Echinoidea) and sea cucumbers (Holothuria) exists on this section of the barrier reef flat.

Lagoonward from Station 1, the coral reef rock grades at a gentle angle into the sandy lagoon bottom. Scattered mounds of living and dead massive corals occur on this sandy bottom. Among these mounds at depths of one to four meters are clean sand areas lacking macroscopic marine plants.

These coral mounds are lacking in the area one half way between the barrier reef crest and the shore. Two thirds of the way to the shore from Station 1, the lagoon bottom becomesshallow and gives rise to patches of corals in one to two meters of water. These are predominantly staghorn Acropora corals (Table 2,Station 2). Areas from the middle of the lagoon toward the shore which don't have this coral development often are covered with sea grasses or are covered with rubble from branched Acropora.

West of Managaha Island the barrier reef doesn't slope gradually into the lagoon as it does to the north east but instead drops almost vertically from the shallow inner reef flat to a sandy bottom deeper than 5 meters. A transect along this steep slope or cliff shows the high density, dominance, and frequency of both Acropora palifera and Montipora sp. (cf. M. ehrenbergii) (Table 1, Transect 2). The Acropora

forms thick heavy branches often one meter tall while the reef rock around the bases and between the colonies of Acropora are largely covered with the encrusting Montipora. The amount and diversity of coral seems to increase towards the south western tip of the barrier reef which forms one side of the harbor entrance.

Close to this same section of the barrier reef are several patch reefs with similar coral populations to those observed on the edge of the barrier reef. Transect 1 (Table 1) was made on one of these patch reefs. It crossed some areas that were shallower than those of Transect 2. This probably explains why more species were observed on Transect 1 than Transect 2. Also Transect 2 passed over some sandy bottom areas lacking corals, while Transect 1 was always in good coral habitat and therefore registered a greater overall coral density.

The shallow elongated patch reef off Micro Beach and just south of the deep ship channel was investigated at Transect 3 (Table 1). There are numerous colonies of diverse species but most of these are small, forming a coral community. Millepora platyphylla colonies seem to be the only large structural growths on this reef. The living coral colonies have grown to the low-tide sea level. The solid base on which they are attached is not exposed even at its highest point. However, a wrecked ship sits on a similar reef in line with this one and the wreckage is exposed at all times. Coral colonies are growing well on many submerged wrecks of World War II in the Saipan lagoon. Amphibious vehicles as well as ships and airplanes now serve as substrate for coral growth, e.g. three half-submerged tanks near the Royal Taga Hotel have developed coral growths.

A fourth transect was made in the area near these tanks. This was done on the inner part of the barrier reef flat area. There are wide-

spread staghorn Acropora patches here of varying density and with different proportions of live and dead corals from place to place. These colonies are generally surrounded by a thin layer of sand over the reef rock.

With only 13 species on the checklist, this station was the most depauperate one used for transect surveys. In contrast, Transects 1, 2, and 3 had 23, 24, and 25 species, respectively, in their checklists. Stations 1 and 7 have greater numbers of species than the transect areas and also have better underwater visibility with cleaner water. Perhaps they are the most attractive areas for divers. At a future date they should also be described by similar transects. Other areas that should be looked at are the southern end of Garapan Lagoon, inside and outside the barrier reef flat closest to the Continental Hotel, and the barrier reef flat adjacent to Managaha Island.

In this superficial view of the leeward lagoon of Saipan, one notes some attractive areas of coral growth. The best areas seen require only small boats for access, or in the case of the northern end of the lagoon, no boats at all.

Improvement of the marine environment should be carried out by strict enforcement of the laws preventing the use of bleach and explosives in catching fish.

Acknowledgments

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Table 1. Living coral density, dominance, and frequency of occurrence. Importance Value is the sum of the above relative parameters. Corals are arranged in order of their Importance Value.

Transect 1	Density/M2	Relative Density	Dominance	Relative Dominance	Frequency of Occurrence	Relative Frequency of Occurrence	Importance Value
Pavona (Polyastra) sp.	3.04	7.50	5278.99	65.42	0.3	9.38	82.30
Montipora ehrenbergii	5.07	12.50	1133.25	14.04	0.4	12.50	39.04
Seriatopora crassa	7.10	17.50	185.54	2.30	0.5	15.62	35.42
Montipora foveolata	5.07	12.50	628.27	7.79	0.3	9.38	29.67
Acropora palifera	4.06	10.00	91.67	1.14	0.3	9.38	20.52
Montipora sp. #2	2.03	5.00	231.18	2.86	0.2	6.25	14.11
Favites favosa	2.03	5.00	27.10	0.34	0.2	6.25	11.59
Favia stelligera	2.03	5.00	23.10	0.29	0.2	6.25	11.54
Psammocora nierstraszi	2.03	5.00	134.71	1.67	0.1	3.12	9.79
Heliopora coerulea	2.03	5.00	70.93	0.88	0.1	3.12	9.00
Montipora verrilli	1.01	2.50	79.32	0.98	0.1	3.12	6.60
Goniastrea parvistella	1.01	2.50	64.24	0.80	0.1	3.12	6.42
Fungia scutaria	1.01	2.50	50.76	0.63	0.1	3.12	6.25
Pocillopora damicornis	1.01	2.50	28.55	0.35	0.1	3.12	5.97
Stylophora mordax	1.01	2.50	28.55	0.35	0.1	3.12	5.97
Porites lutea	1.01	2.50	12.70	0.16	0.1	3.12	5.78
Total Species	16						
Total Genera	13						
Overall Density	2.54/m2						

Transect 2 (Station 4)	Density/m^2	Relative Density	Dominance	Relative Dominance	Frequency of Occurrence	Relative Frequency of Occurrence	Importance Value
Montipora sp. (cf. M. ehrenbergii)	1.13	62.5	214.96	49.62	1.0	41.7	153.82
Acropora palifera	.27	15.0	200.38	46.25	0.5	20.8	82.0
Favia pallida	.90	5.0	1.77	.41	0.2	8.3	13.7
Porites reticulosa	.04	2.5	5.97	1.38	0.1	4.2	8.1
Montipora foveolata	.04	2.5	4.28	0.99	0.1	4.2	7.7
Leptastrea purpurea	.04	2.5	3.53	0.81	0.1	4.2	7.5
Favites favosa	.04	2.5	.88	0.20	0.1	4.2	6.9
Goniastrea retiformis	.04	2.5	.56	0.13	0.1	4.2	6.8
Psammocora nierstraszi	.04	2.5	.32	.07	0.1	4.2	6.8
Stylophora mordax	.04	2.5	.56	.13	0.1	4.2	6.8

Total Species 10
Total Genera 7
Overall Density 1.81/m^2

Transect 3 (Station 5)	Density/m^2	Relative Density	Dominance	Relative Dominance	Frequency of Occurrence	Relative Frequency of Occurrence	Importance Value
Pocillopora damicornis	0.168	40.0	11.100	46.3	0.8	34.78	121.08
Montipora sp.#1	0.084	20.0	4.354	18.1	0.4	17.39	55.49
M. ehrenbergii	0.010	2.5	4.909	20.4	0.1	4.35	27.25
M. foveolata	0.032	7.5	1.692	7.0	0.2	8.70	23.20
Millepora dichotoma	0.032	7.5	.184	0.8	0.3	12.04	21.34
Montipora elschneri	0.021	5.0	.742	3.1	0.2	8.70	16.80
Porites lutea	0.021	5.0	.148	0.6	0.1	4.35	9.95
Acropora surculosa	0.010	2.5	.385	1.6	0.1	4.35	8.45
Acrhelia horrescens	0.010	2.5	.283	1.2	0.1	4.35	8.05
Acropora nasuta	0.010	2.5	.126	0.5	0.1	4.35	7.35
Stylocoeniella armata	0.010	2.5	.071	0.3	0.1	4.35	7.15
	.408		23.994	2.5			

Total Species 11

Total Genera 7

Overall Density 0.41/m^2

Transect 4	Density/m^2	Relative Density	Dominance	Relative Dominance	Frequency of Occurrence	Relative Frequency of Occurrence	Importance Value
Pocillopora damicornis	1.22	47.50	183.56	36.04	0.8	47.06	130.60
Acropora terres	1.08	42.50	297.72	58.46	0.5	29.41	130.37
Favia pallida	0.13	5.00	18.89	3.71	0.2	11.76	20.47
Montipora foveolata	0.06	2.50	6.79	1.33	0.1	5.88	9.71
Montipora (tuberculate cf. M. ehrenbergii)	0.06	2.50	2.31	0.45	0.1	5.88	8.83

Total Species 5

Total Genera 4

Overall Density 2.55/m^2

Table 2. Checklist of corals observed or collected at the seven stations visited. (Station 7 actually has the greatest number of species but was only observed long enough to record a small number of them).

	1	2	3	4	5	6	7
Acanthastrea echinata (Dana)				X			
Acrhelia horrescens (Dana)							
Acropora formosa (Dana)	X	X				X	
A. humilis (Dana)					X		
A. nasuta (Dana)					X		
A. palifera (Lamarck)	X		X	X	X		
A. surculosa (Dana)					X		
A. syringodes (Brook)					X		
A. teres (Verrill)	X					X	
A. sp. (c.f. A. hebes)				X			
Alveopora sp.	X						
Astreopora myriophthalma (Lamarck)	X						
Coscinaraea columna (Dana)							X
Leptastrea bottae Milne Edwards & Haime	X		X				
Distichopora violacea (Pallas)	X						
Echinopora lamellosa (Esper)	X		X				
Euphyllia glabrescens (Chamisso & Eisenhardt)						X	
Favia favus (Forskal)	X						
F. pallida (Dana)	X			X	X		
F. stelligera (Dana)	X		X				X
Favites favosa (Ellis & Solander)			X	X		X	
F. palauensis Yabe						X	
Fungia fungites (Linnaeus)	X	X					
F. scutaria Lamarck	X		X				
Galaxea fascicularis (Linnaeus)					X		
G. hexagonalis Milne Edwards & Haime				X			
Goniastrea parvistella (Dana)	X		X			X	
G. pectinata (Ehrenberg)	X						
G. retiformis (Lamarck)				X		X	
Goniopora sp.	X						
Heliopora caerulea (Pallas)	X		X	X	X		
Herpolitha limax (Esper)							X
Leptastrea purpurea (Dana)	X		X	X			
Leptoria phrygia (Ellis & Solander)	X						
Lobophyllia costata (Dana)			X	X			
Lobophytum sp.				X			
Merulina sp.	X						
Millepora dichotoma Forskal	X				X		
M. exaesa Forskal		X			X	X	
M. platyphylla Hemprich & Ehrenberg					X		
Montipora caliculata Dana					X		
M. ehrenbergii Verrill	X	X	X	X	X		
M. elschneri Vaughan	X				X		

Table 2. (continued)

	1	2	3	4	5	6	7
M. foveolata (Dana)			X	X	X	X	
M. verrilli Vaughan			X				
M. sp. 1					X		
M. sp. 2			X	X	X	X	
Oulophyllia crispa (Lamarck)							X
Pavona (Pseudocolumnastrea) sp.							X
Pavona (Polyastra) sp.			X	X			
Platygyra lamellina (Ehrenberg)			X				
P. rustica (Dana)	X			X			
P. sinensis (Milne-Edwards & Haime)	X			X			
Plesiastrea versipora (Lamarck)	X						
Pocillopora damicornis (Linnaeus)	X		X		X	X	
P. elegans Dana					X		X
P. setchelli Hoffmeister					X		
Porites compressa Dana					X		
P. lutea Milne-Edwards & Haime	X	X	X		X		X
P. reticulosa (Dana)				X			
P. (Synaraea) iwayamaensis Eguchi				X			
Psammocora contigua (Esper)					X	X	
P. nierstraszi vander Horst			X	X	X		
P. stellata (Verrill)	X						
P. (Stephanaria) togianensis Umbgrove			X				
Sarcophyton sp.				X			
Scapophyllia cylindrica Milne-Edwards & Haime		x					
Seriatopora crassa Quelch			X	X			
S. hystrix Dana	X						
Stylocoeniella armata (Ehrenberg)	X		X	X	X	X	X
Stylophora mordax (Dana)	X		X	X			
Tubipora musica (Linnaeus)	X						
Total Species per station	33	6	23	24	25	13	inc.
Total Genera per station	25	6	19	19	10	8	inc.