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Coral and Reef-Fish Assessment of the Fagatele Bay National Marine Sanctuary

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Abstract

A quantitative survey of the coral communities in Fagatele Bay National Marine Sanctuary was made using the point-quarter method to assess size distribution, abundance, and surface cover by each of the scleractinian species. The 22 transects in this survey of 1988 were at the same sites as the transects of 1985, i.e., in 6 sets evenly distributed across the Marine Sanctuary, with transects at each of 5 depths. It was found that there has been a general increase in abundance of coral colonies (number per m^2) and surface cover by living coral, but the coral community in the bay was still occupied to a large extent by benthic algae. The corals were recovering most rapidly in deep water at the central region of the bay. The coral communities were initially damaged to a lesser extent by Acanthaster planci in the shallow regions and outer margins of the bay because of protection by stronger wave action in these regions. Therefore, we found more corals in shallow water, but a greater recovery rate in deeper water. The colonies were still generally small, but they were becoming numerous, probably as a result of frequent recruitment. Colony size and surface cover have not been increasing as rapidly as has the abundance. Although the number of small recruits has been increasing, the surface area occupied by corals has not been increasing rapidly to April 1988, but now that corals are abundant, each colony will be increasing in size and we predict that the surface cover by living corals will appear to increase relatively suddenly. Although the community in Fagatele Bay looked poor, our survey showed that there were actually many colonies present. We predict that by 1992-1994 the reef community may be recovered to approximately the state it was in terms of surface coverage and species richness prior to the 1978-1979 outbreak of Acanthaster planci. Mean colony size may still be smaller, and because of natural variability in space and time we cannot expect natural communities to be identical in all aspects.

We also quantitatively surveyed the coral communities around Tutuila at 12 sites that we had previously surveyed in 1982 and in 1985. The areas with the heaviest initial damage from the Acanthaster planci outbreak showed the greatest rates of recovery. The areas missed by the A. planci outbreaks did not change much. The reef at the Rainmaker Hotel was the only area we found in which the coral community was actually decreasing from effects of pollution and sedimentation on juveniles. The most rapid recovery was in the areas in which the initial reduction in coral cover was the most severe. For example, at Aunu'u Island, the abundance of coral colonies (m^{-2}) increased from 0.5 (in 1982) to 4.43 (1985) to 27.82 (1988). The surface cover occuppied by living coral increased even more rapidly, from 0.06% (1982) to 1.83% (1985) to 17.8% (1988). The association of severe initial reduction in cover with rapidity of recovery may partly result from the favored prey of Acanthaster planci being the faster-growing corals.

The coral community near the Rainmaker Hotel showed opposite trends to all the other communities around the island. There has been a spectacular decrease in coral abundance (11.58 colonies m^{-2} in 1982, 0.84 in 1985, and 0.25 in 1988), a decrease in coral cover (27.7% in 1982, 19.2% in 1985, and 18.7% in 1988), and a major increase in mean colony size (12 cm diameter in 1982, 22 cm in 1985, and 41 cm in 1988). Sedimentation differentially affects small colonies and inhibits recruitment.

The fish communities in Fagatele Bay were more diverse and abundant in deeper areas than in shallow water. As would be expected, the abundances of coral-eating fishes declined after the corals were devastated by the outbreak A. planci. The corallivorous fishes were still scarce in 1988, probably because the cover of living coral was still low. The herbivorous fishes became abundant when the coral was replaced by algae, but the abundance of herbivorous fishes had declined by 1988.

INTRODUCTION

In April of 1985, a survey was made of the coral and fish communities in Fagatele Bay and 12 other sites around Tutuila, American Samoa, following a major outbreak of the coral-predator Acanthaster planci in 1978-1979. In order that changes in the coral and fish communities could be monitored along the transects in Fagatele Bay, a series of permanent transect markers were established. Six transects were established in Fagatele Bay at approximately even intervals between the east and west borders of the marine sanctuary, running perpendicular to shore from the reef margin to a depth of 12 m. Detailed descriptions of the physiography of the marine habitats, the coral communities, the locations of the transects, and vertical profiles along the six transects in Fagatele Bay National Marine Sanctuary are presented in Birkeland et al. (1987). Detailed descriptions were also provided for the reef-flat platform, reef margin, and forereef slope zones.

In April of 1988, a follow-up survey was done along the same transects in Fagatele Bay and at the other 12 sites previously surveyed around Tutuila Island. A total of 22 coral transects and 20 fish-count transects were completed along isobaths (1 m, 3 m, 5 m, 9 m, and 12 m) from the six permanent transects in Fagatele Bay National Marine Sanctuary. Strong swells were present throughout our work and so shallow transects were impossible at three of the sites, but we were nevertheless able to accomplish the deeper transects at all sites. Twenty-two of the 24 transects at other locations around Tutuila were also resurveyed. Amesbury was able to resurvey the 100-m fish-count transects established by R.C. Wass in previous years at Fagatele Bay, Sita Bay and Cape Larsen.

In this report we present the results of our surveys of 1988. We found that the patterns of recovery or change in the coral communities differed among sites in ways that might be explained by the past histories in combination with the present conditions of the areas. The results of the survey of fishes showed that the crown-of-thorns starfish had second- and third-order effects on the marine communities. The coral-eating fishes became scarce because of the disappearance of corals, while the herbivorous fishes became more common because of the increased food supply of benthic algae.

METHODS

The corals were surveyed using the point-quarter method as described in detail in the previous report on Fagatele Bay National Marine Sanctuary (Birkeland et al. 1987). An advantage of the point-quarter method over the quadrat method is that when the individual colonies are scattered widely, the point-quarter method allows the investigator to measure precisely the abundances of the corals whereas only zeroes are collected by the quadrat method. If only zeroes are collected, we might not have

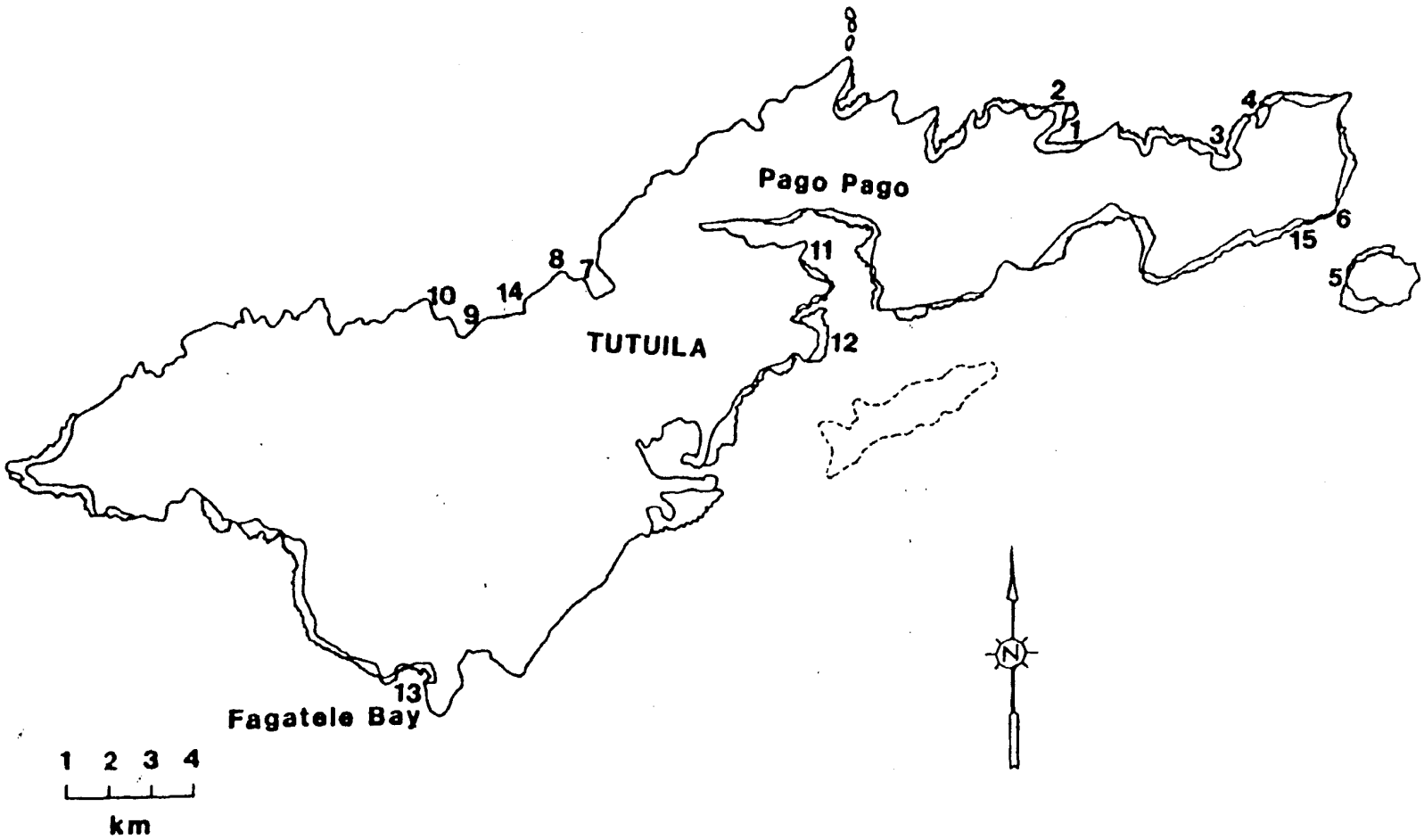

Fig. 1. Map of locations of study sites around Tutuila Island: 1- inside Masefau Bay, 2- outside Masefau Bay (Asaga Strait), 3- Aoa Bay, 4- Onenoa Bay, 5- Aunu'u Island, 6- Matuli Point, 7- Fagasa Bay, 8- Cape Larsen, 9- Fagafue Bay, 10- Massacre Bay, 11- Rainmaker Hotel, 12- Fatu Rock, 13- Fagatele Bay, 14- Sita Bay, 15-Auasi.

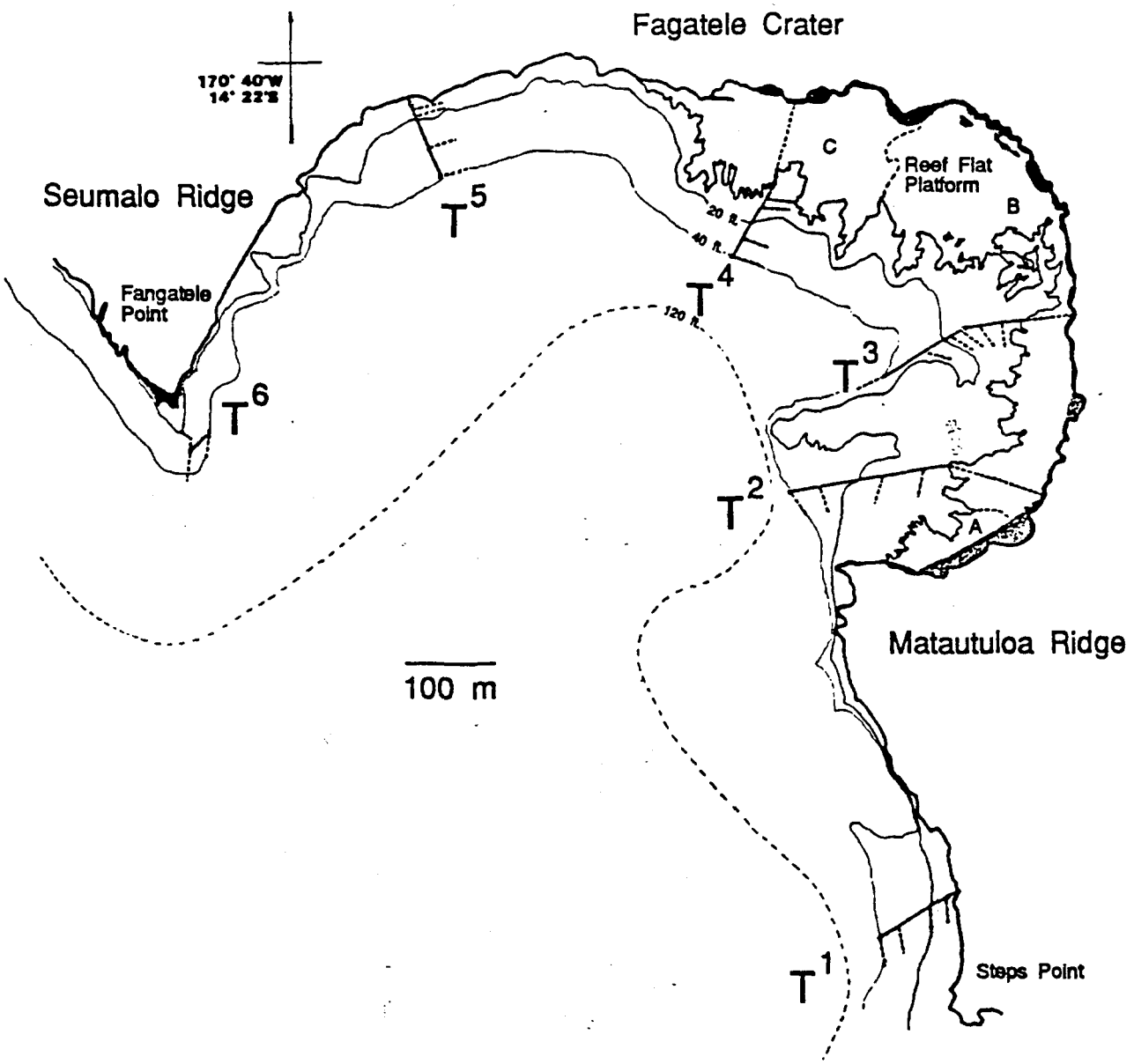

Fig. 2. Locations of the permanent Transects 1-6 (T^1-T^6, solid lines) in Fagatele Bay National Marine Sanctuary and the 30-m survey transects (dotted lines). The boundaries of A- the intertidal reef platform veneered with loose rubble, B- the subtidal reef platform with abundant corals, and C- the intertidal volcanic bench are indicated by dashed lines.

any idea of the order of magnitude of the scarcity of a species. The quadrat method may become adequate in future years after the corals become abundant, but it would not have been satisfactory during the 1982, 1985 and 1988 surveys. For monitoring, it is important that we continue with the same survey methods because changing survey methods between years makes statistical analyses improper.

The recent development of the extremely precise, small, and relatively inexpensive portable satellite location finder will make future surveys much more efficient and less time-consuming. The greatest problem in the surveys of Fagatele Bay to date has been in finding the permanent transect markers. Although the permanent markers are large, galvanized, 1.9 cm (3/4 inch) diameter spikes, the 0.65 km^2 (163 acre) area of Fagatele Bay is also very large. The slope of the coral reef in Fagatele Bay is gradual enough that the isobaths extend over a large area. To date, the markers have been found by triangulation from fixed points on the map and on the shoreline (cf. the diagrammatic view of the coastline given for this purpose in Figure 4 in Birkeland et al. 1987) with a hand-bearing compass. The hand-bearing compass is open to variance from movements of the boat on the waves and in variation in angle of the compass with the eye of the observer. Our experience has shown that the Magellan portable satellite location finder is accurate to within 15 m.

We highly recommend that the Fagatele Bay National Marine Sanctuary obtain a portable satellite location finder for monitoring the sanctuary. Several brands are available for just over $2000, including postage.

RESULTS

Data on the size distributions (geometric mean diameters, standard deviations, and ranges in diameters), abundances of colonies (per m^2 and relative percentage), and cover of the reef substratum (per m^2 and relative percentages) are given in Tables 1a-1v for each of the species of corals along each of the 22 transects surveyed in Fagatele Bay in April 1988. Comparable data for the same transects surveyed in April 1985 are given in Tables 3a-3y in Birkeland et al. (1987).

Likewise, data on the size distributions (geometric mean diameters, standard deviations, and ranges in diameters), abundances of colonies (per m^2 and relative percentage), and cover of the reef substratum (per m^2 and relative percentages) are given in Tables 2a-2v for each of the species of corals along transects at each of two depths at 12 sites around Tutuila in April 1988. Comparable data for the same transects surveyed in April 1985 are given in Tables 4 - 15 in Birkeland et al. (1987).

The abundances of coral colonies are compared among 5 depths along each of the six transects in Fagatele Bay in April 1985 and April 1988 in Table 2. The results of the April 1985 and April

1988 surveys for the percent cover of substrata by corals at 5 depths along each of the six transects in Fagatele Bay are given in Table 3. Table 4 presents the mean colony diameters for corals at the 5 depths along the 6 transects in Fagatele Bay in April 1985 and in April 1988.

Summary statistics are given for the abundances, percent cover, and mean colony sizes in Tables 6, 7, and 8, respectively, for corals along two depth contours at 12 sites around Tutuila. The mean values are given for two depths (2-3 m and 6 m) for the month of April in three years (1982, 1985, 1988).

Because of the remarkable lack of holothuroids in our detailed survey of 1985 (1140-m^2 of transects plus hours of searching outside the transects), we were constantly on the look-out and made a determined effort to find any holothuroids in Fagatele Bay in 1988. In our (Birkeland, Randall, Amesbury) combined (33 man-days) of field-work, not a single holothuroid or Acanthaster planci was observed.

DISCUSSION

The coral communities have generally been recovering around American Samoa. There was a general increase in abundances of coral colonies and in the percent of substratum covered by living coral from 1982 to 1985 and further to 1988 in the areas all around Tutuila (Tables 6 and 7) in which the coral communities had been severely reduced by the outbreak of Acanthaster planci in 1978-1979.

The most rapid recovery was in the areas in which the initial reduction in coral cover was the most severe. For example, at Aunu'u Island, the abundance (Table 6) of coral colonies (m^{-2}) increased from 0.5 (in 1982) to 4.43 (1985) to 27.82 (1988). The surface cover occuppied by living coral (Table 7) increased even more rapidly, from 0.06% (1982) to 1.83% (1985) to 17.8% (1988). The association of severe initial reduction in cover with rapidity of recovery may partly result from the favored prey of Acanthaster planci being fast-growing corals. Acropora were predominant at Aunu'u, and so the reef around Aunu'u was especially severely affected by the outbreak of A. planci. However, Acropora is the fastest growing coral, and so the increases in abundance and surface cover occurred most rapidly at Aunu'u.

In Fagatele Bay (Tables 3 and 4), the increases in abundance and surface cover of the coral community occurred in the center of the bay (Transects 2 - 4), and less obviously at the margins (Transects 1 and 6). The coral communities along Transects 1 and 6 were less severely impacted by predation by Acanthaster planci, probably because of the strong wave action in these areas. A. planci is not well adapted to holding onto the substratum in strong surf conditions (Birkeland and Lucas 1990). In 1988, the

greatest abundance and surface cover of coral in Fagatele Bay was in the center (Transect 3), and generally decreased towards the margins of the bay.

The influence of heavy wave action was also greater in shallow-transect areas of Fagatele Bay, and so the shallow regions were affected less severely than deeper regions along the transects (Tables 3 and 4). There was found to be greater surface cover in shallow regions of Fagatele Bay because of less inital mortality, but the increases in abundance and surface cover were occurring more rapidly in deeper regions along the transects.

The abundance, surface cover, and mean colony size did not substantially change among 1982-1985-1988 in areas which were missed by the outbreak of Acanthaster planci (Fagafue Bay and Massacre Bay). Where there was little damage, there was little recovery (Tables 6 - 8).

The mean colony sizes showed a general increase on 15 out of 22 transects in Fagatele Bay from 1985 to 1988 (Table 5). The reason that the mean size often did not change much and sometimes decreased was that there was substantial recruitment of new recruits, especially following heavy mortality from the crown-of-thorns outbreak.

The coral community near the Rainmaker Hotel showed opposite trends to all the other communities around the island (Tables 6, 7, and 8). There has been a spectacular decrease in coral abundance (11.58 colonies m^{-2} in 1982, 0.84 in 1985, and 0.25 in 1988), a decrease in coral cover (27.7% in 1982, 19.2% in 1985, and 18.7% in 1988), and a major increase in mean colony size (12 cm diameter in 1982, 22 cm in 1985, and 41 cm in 1988). The cause might be pollution and sedimentation. Sedimentation differentially affects small colonies and inhibits recruitment. Therefore, what might be happening is that the larger colonies are surviving, but small colonies are dying and there has been essentially no recruitment. The coral community at the Rainmaker Hotel is slowly dying, while the communities at other sites around Tutuila, including Fagatele Bay, are recovering.

In summary, the coral community in Fagatele Bay has been making substantial progress towards recovery. New recruits have been accumulating in the community, and so the colony size and surface cover have not been increasing as rapidly as has the abundance (number of colonies m^{-2}). We predict that with the number of small recruits increasing, the surface area occupied by corals has not been increasing rapidly to April 1988, but now that corals are abundant, each colony will be increasing in size and we predict that the surface cover by living corals will appear to increase relatively suddenly. Although the community in Fagatele Bay looked poor, our survey showed that there were actually many colonies present. We predict that by 1992-1994 the reef community may be recovered to approximately the state it was in terms of surface coverage and species richness prior to the 1978-

1979 outbreak of Acanthaster planci. Mean colony size may still be smaller, and because of natural variability in space and time we cannot expect natural communities to be identical in all aspects.

The recovery of the Fagatele Bay coral community appears to involve a diverse array of species, and the predominant species on each transect appear to be representative of what was there before. We suspect that any effort to enhance recovery by transplantation would be very time-consuming and expensive, and would have a negligible effect compared with the natural recovery processes.

Acknowledgements

As always, we had complete support from OMWR personnel, thanks to the Director, Raymond Tulafono. In particular, Dave Itano and Fa'asega "Stu" Kuresa not only took care of logistics, but they were essential help in the field. They located and marked the permanent transects in Fagatele Bay. We realize now that we would not have had time to resurvey all the transects if we had to locate and mark the transects first. Mrs. Nancy Daschbach participated in most of the fieldwork and helped us greatly in making logistic arrangements. Troy Buckley also handled the boat for us and Fale Tuilaga took care of trucking us across the island and launching the Boston Whaler. We operated with full support from the staff of OMWR even on the weekend. In view of the importance of weekends in Samoan culture, and especially in consideration of the approaching Flag Day, the support we received was outstanding.

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Table 1. Coral community at Fagatele Bay National Marine Sanctuary. Results of a quantitative survey of 22 transects in April 1988.

a. Transect 1 - 9 m depth

b. Transect 1 - 12 m depth

c. Transect 2 - 1 m depth

d. Transect 2 - 3 m depth

e. Transect 2 - 5 m depth

f. Transect 2 - 9 m depth

g. Transect 2 - 12 m depth

h. Transect 3 - 1 m depth

i. Transect 3 - 3 m depth

j. Transect 3 - 5 m depth

k. Transect 3 - 9 m depth

l. Transect 3 - 12 m depth

m. Transect 4 - 3 m depth

n. Transect 4 - 5 m depth

o. Transect 4 - 9 m depth

p. Transect 4 - 12 m depth

q. Transect 5 - 3 m depth

r. Transect 5 - 5 m depth

s. Transect 5 - 9 m depth

t. Transect 5 - 12 m depth

u. Transect 6 - 5 m depth

v. Transect 6 - 12 m depth

Bay: Fagatele Transect: 1 Depth: 9 m Date: 13 April 1988	Size Distribution (colony diameters in cm)				Density	relative density	% cover	relative % cover
	N	$\bar{Y}$	S	W				
Pocillopora elegans	9	19.0	6.62	8.4 - 28.5	2.45	20.5	7.7	24.4
Acropora crateriformis	4	23.1	3.63	18.9 - 26.7	1.09	9.1	4.7	14.8
Pocillopora eydouxi	5	17.8	7.20	11.5 - 26.8	1.36	11.4	3.8	12.3
Montipora ehrenbergii	4	20.7	4.09	15.5 - 24.8	1.09	9.1	3.8	12.1
Coscinaraea columna	3	21.3	14.2	4.9 - 30.3	0.81	6.8	3.8	12.1
Montipora berryi	2	24.7	6.10	20.4 - 29.0	0.54	4.5	2.7	8.5
Astreopora sp.1	3	15.6	6.76	7.8 - 19.5	0.81	6.8	1.8	5.6
Porites lutea	1	25.7			0.27	2.3	1.5	4.5
Porites (P.) sp.2	6	6.9	2.94	3.9 - 10.8	1.62	13.6	0.7	2.2
Favia rotumana	1	17.6			0.27	2.3	0.7	2.1
Coscinaraea sp.1	4	5.8	2.55	3.9 - 9.5	1.09	9.1	0.3	1.1
Acropora hyacinthus	1	6.0			0.27	2.3	0.1	0.2
Cyphastrea serailia	1	3.2			0.27	2.3	0.02	0.07
Sinularia	3	6.0	3.52	3.5 - 10.0	0.72	5.9	0.4	0.9
Lobophytum	2	5.2	1.64	4.0 - 6.3	0.48	3.9	0.1	0.4
Palythoa	2	3.9	2.01	2.4 - 5.3	0.48	3.9	0.1	0.2

Total scleractinians	44	15.9		2.4 - 30.3	11.9		31.6	

Bay: Fagatele Transect: 1 Depth: 12 m Date: 13 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Montipora eydouxi	4	12.2	10.25	2.4 - 26.8	0.99	13.8	1.9	16.7
Pocillopora eydouxi	1	30.0			0.24	3.4	1.7	15.8
Acropora crateriformis	1	27.5			0.24	3.4	1.4	13.3
Pocillopora elegans	1	24.5			0.24	3.4	1.1	10.5
Coscinaraea columna	1	21.9			0.24	3.4	0.9	8.4
Montipora verrilli	3	9.4	10.25	3.0 - 21.2	0.74	10.3	0.9	8.3
Astreopora sp.1	3	10.2	6.42	2.8 - 14.7	0.74	10.3	0.8	6.9
Montipora ehrenbergii	1	15.0			0.24	3.4	0.4	4.0
Pavona maldivensis	1	14.9			0.24	3.4	0.4	3.9
Porites (P.) sp.2	3	6.6	5.05	1.4 - 11.5	0.74	10.3	0.4	3.2
Montastrea curta	1	12.0			0.24	3.4	0.3	2.5
Cyphastrea serailia	1	11.0			0.24	3.4	0.2	2.1
Leptastrea purpurea	2	6.5	2.0	5.1 - 7.9	0.50	6.9	0.2	1.6
Favia rotumana	2	6.4	0.5	6.0 - 6.7	0.50	6.9	0.2	1.4
Coscinaraea sp.1	2	5.0	2.8	3.0 - 6.9	0.50	6.9	0.1	1.0
Acropora digitifera	1	3.2			0.24	3.4	0.02	0.2
Platygyra daedalea	1	3.0			0.24	3.4	0.02	0.2

Lobophytum	1	12.6			0.23	3.0	0.3	2.7
Palythoa	3	4.5	2.50	2.0 - 7.0	0.68	9.1	0.1	1.2
Total scleractinians	29	11.2		1.4 - 26.8	7.11		10.9	

Bay: Fagatele Transect: 2 Depth: 1 m Date: 5 April 1988	Size Distribution (colony diameters in cm)				Density	relative density	% cover	relative % cover
	N	$\overline{Y}$	S	W				
Porites lutea	7	10.5	7.8	3.9 - 22.0	0.41	11.7	0.5	14.9
Acropora cf. gemmifera	2	23.4	5.1	19.8 - 27.0	0.12	3.3	0.5	14.6
Porites (S.) rus	6	11.4	7.3	4.2 - 20.4	0.35	10.0	0.5	13.8
Porites (P.) sp. 2	17	5.5	2.9	2.0 - 13.7	1.00	28.3	0.3	8.3
Goniastrea retiformis	1	23.6			0.06	1.7	0.3	7.4
Pavona divaricata	3	11.1	7.0	3.0 - 15.9	0.18	5.0	0.2	6.0
Pocillopora verrucosa	3	11.5	4.8	8.0 - 17.0	0.18	5.0	0.2	5.7
Montipora elschneri	1	20.5			0.06	1.7	0.2	5.4
Pocillopora eydouxi	1	18.5			0.06	1.7	0.2	4.6
Acropora crateriformis	1	18.0			0.06	1.7	0.2	4.3
Pocillopora meandrina	2	11.5	6.3	7.0 - 15.9	0.12	3.3	0.1	4.0
Pocillopora setchelli	2	8.5	7.8	3.0 - 14.0	0.12	3.3	0.1	2.6
Acropora hyacinthus	1	14.0			0.06	1.7	0.1	2.6
Millepora tuberosa	1	11.2			0.06	1.7	0.1	1.7
Acropora digitifera	1	9.4			0.06	1.7	0.04	1.2
Lobophyllia hemprichii	1	8.8			0.06	1.7	0.04	1.2
Leptastrea purpurea	4	3.2	1.4	1.6 - 4.5	0.23	6.7	0.02	0.6
Stylophora mordax	1	6.3			0.06	1.67	0.02	0.6

Fungia scutaria	3	2.3	1.5	1.0 - 4.0	0.18	5.0	0.01	0.3
Stylocoeniella armata	2	2.8	0.6	2.4 - 3.2	0.12	3.3	0.01	0.3
Total scleractinians	60	9.1	6.7	1.0 - 27.0	3.55		3.5	

Bay: Fagatele Transect: 2 Depth: 3 m Date: 5 April 1988	Size Distribution (colony diameters in cm) N	$\overline{Y}$	S	W	Density	relative density	% cover	relative % cover
Pocillopora verrucosa	10	11.6	3.6	6.5 - 16.0	1.33	16.7	1.5	21.0
Galaxea fascicularis	15	8.1	2.9	4.6 - 14.0	2.00	25.00	1.2	15.9
Lobophyllia hemprichii	5	11.7	8.2	4.9 - 24.3	0.66	8.3	1.0	13.6
Porites (P.) sp. 2	12	7.2	2.9	3.9 - 12.0	1.60	20.00	0.8	11.4
Goniastrea retiformis	4	13.4	4.3	7.4 - 17.0	0.53	6.7	0.8	11.1
Favites complanata	1	27.8			0.13	1.7	0.8	11.1
Acropora hyacinthus	2	13.2	8.1	7.5 - 18.9	0.27	3.3	0.4	5.9
Acropora cf. gemmifera	1	16.5			0.13	1.7	0.3	3.8
Pocillopora setchelli	3	7.2	2.9	3.9 - 9.4	0.40	5.0	0.2	2.5
Acropora azurea	3	7.1	2.1	5.0 - 9.2	0.40	5.0	0.2	2.3
Echinopora hirsuitissima	1	6.5			0.13	1.7	0.03	0.4
Montipora caliculata	1	5.5			0.13	1.7	0.03	0.4
Porites lichen	1	3.0			0.13	1.7	0.01	0.1
Total scleractinians	60	9.4	5.1	3.0 - 27.8	7.97		7.3	

Bay: Fagatele Transect: 2 Depth: 5 m Date: 5 April 1988	Size Distribution (colony diameters in cm)				Density	relative density	% cover	relative % cover
	N	$\bar{Y}$	S	W				
Acropora azurea	28	6.0	4.1	2.0 - 14.0	1.58	46.7	0.6	28.2
Pocillopora verrucosa	8	8.5	4.8	4.2 - 16.0	0.45	13.3	0.3	14.5
Acropora crateriformis	3	13.7	6.0	7.5 - 19.4	0.17	5.0	0.3	13.2
Millepora tuberosa	1	24.3			0.06	1.7	0.3	11.4
Pavona sp. 1	1	21.5			0.06	1.7	0.2	9.2
Pocillopora eydouxi	1	19.5			0.06	1.7	0.2	7.5
Galaxea fascicularis	8	6.4	1.7	4.9 - 9.8	0.45	13.3	0.2	6.6
Acropora digitifera	5	6.7	4.9	3.0 - 15.3	0.28	8.3	0.1	6.2
Pocillopora setchelli	2	6.3	1.4	5.3 - 7.3	0.11	3.3	0.03	1.3
Millepora platyphylla	1	6.5			0.06	1.7	0.02	0.9
Acropora squarrosa	1	3.9			0.06	1.7	0.01	0.4
Porites (P.) sp. 2	1	5.3			0.06	1.7	0.01	0.4
Total scleractinians	60	7.6	5.3	2.0 - 24.3	3.40		2.3	

Bay: Fagatele Transect: 2 Depth: 9 m Date: 5 April 1988	Size Distribution (colony diameters in cm)				Density	relative density	% cover	relative % cover
	N	$\overline{Y}$	S	W				
Pocillopora elegans	19	11.9	5.32	2.7 - 25.7	1.33	24.0	1.75	45.5
Porites (P.) sp. 2	33	4.9	2.30	1.7 - 12.4	2.30	41.8	0.5	13.7
Pocillopora verrucosa	2	15.9	12.1	7.4 - 24.5	0.14	2.5	0.4	9.3
Acropora hyacinthus	7	8.5	4.81	2.7 - 16.9	0.49	8.9	0.4	9.1
Montipora berryi	7	7.8	5.8	2.8 - 19	0.49	8.9	0.3	8.8
Galaxea fascicularis	5	9.2	3.0	4.9 - 12.6	0.37	6.6	0.3	6.5
Acropora tenuis	1	14.4			0.07	1.3	0.1	3.0
Coscinaraea columna	1	11.4			0.07	1.3	0.1	1.8
Goniastrea retiformis	1	9.5			0.07	1.3	0.05	1.3
Astreopora sp. 1	1	6.7			0.07	1.3	0.02	0.6
Pocillopora damicornis	1	4.0			0.07	1.3	0.01	0.2
Pavona varians	1	3.0			0.07	1.3	0.005	0.1
Sinularia	3	6.9	4.83	1.5 - 10.8	0.21	3.7	0.2	2.6
Total scleractinians	79	8.0		1.7 - 25.7	5.5		3.9	

Bay: Fagatele Transect: 2 Depth: 12 m Date: 5 April 1988	Size Distribution (colony diameters in cm)				Density	relative density	% cover	relative % cover
	N	$\overline{Y}$	S	W				
Porites (P.) sp. 2	25	5.66	2.56	1.73 - 12.25	10.05	56.8	3.0	41.8
Pocillopora elegans	2	12.24	8.83	6.00 - 18.49	0.80	4.5	1.2	16.5
Pavona varians	3	10.55	1.00	9.54 - 11.53	1.20	6.8	1.1	14.7
Galaxea fascicularis	3	5.73	4.22	2.45 - 10.49	1.20	6.8	0.4	5.8
Montipora ehrenbergii	2	6.93	4.06	4.06 - 9.80	0.80	4.5	0.4	4.9
Platygyra daedalea	1	10.58			0.41	2.3	0.4	4.9
Pocillopora verrucosa	1	8.94			0.41	2.3	0.4	4.9
Favites complanata	1	7.75			0.41	2.3	0.2	2.6
Montastrea curta	1	7.48			0.41	2.3	0.2	2.4
Acropora hyacinthus	2	3.37	0.89	2.74 - 4.00	0.80	4.5	0.1	1.0
Acropora tenuis	1	4.24			0.41	2.3	0.1	0.8
Stylocoeniella armata	1	4.24			0.41	2.3	0.1	0.8
Goniastrea retiformis	1	2.45			0.41	2.3	0.02	0.3
Sinularia	1	8.49			0.18	2.2	0.1	3.0
Total scleractinians	44	6.4		1.73 - 18.49	17.72		7.2	

Bay: Fagatele Transect: 3 Depth: 1 m Date: 4 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Porites cylindrica	5	31.0	12.0	13.9 - 43.9	2.12	8.3	17.9	41.2
Porites (S.) rus	7	12.7	11.8	4.6 - 38.0	2.97	11.7	6.6	15.1
Pavona divaricata	10	12.0	5.1	4.6 - 20.1	4.24	16.7	5.6	12.9
Acropora crateriformis	3	23.1	1.6	21.5 - 24.7	1.27	5.0	5.3	12.2
Porites (P.) sp. 2	21	5.5	2.2	2.4 - 11.5	8.90	35.0	2.5	5.7
Pocillopora verrucosa	2	10.0	12.1	1.4 - 18.5	0.85	3.3	1.1	2.6
Fungia scutaria	5	2.5	0.8	1.4 - 3.5	2.12	8.3	0.1	0.2
Leptastrea purpurea	2	3.5	0.7	3.0 - 4.0	0.85	3.3	0.1	0.2
Alveopora viridis	1	4.5			0.42	1.7	0.1	0.2
Stylocoeniella armata	1	2.4			0.42	1.7	0.02	0.05
Total scleractinians	60	9.9	10.1	1.4 - 43.9	25.43		43.4	

Bay: Fagatele Transect: 3 Depth: 3 m Date: 4 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Porites (P.) sp. 2	43	7.3	4.5	2.0 - 22.4	23.95	71.7	13.6	42.9
Pocillopora meandrina	1	33.0			0.56	1.7	4.8	15.0
Pocillopora verrucosa	4	14.8	2.5	11.8 - 18.0	2.23	6.7	3.9	12.3
Acropora palifera	1	25.0			0.56	1.7	2.8	8.6
Montipora ehrenbergii	1	23.0			0.56	1.7	2.3	7.3
Acropora crateriformis	1	18.3			0.56	1.7	1.5	4.6
Acropora hyacinthus	1	17.9			0.56	1.7	1.46	4.4
Pocillopora setchelli	1	13.4			0.56	1.7	0.8	2.5
Psammocora sp. 1	1	10.6			0.56	1.7	0.5	1.5
Total scleractinians	60	8.6	6.6	1.4 - 23.0	33.43		31.8	

Bay: Fagatele Transect: 3 Depth: 5 m Date: 4 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Porites (S.) rus	9	19.2	8.3	8.4 - 32.0	3.78	15.0	12.7	39.4
Porites lutea	1	48.5			0.42	1.7	7.8	24.0
Porites (P.) sp. 2	30	6.1	3.6	2.0 - 17.1	12.61	50.0	4.9	15.1
Pocillopora verrucosa	8	8.9	4.7	3.5 - 16.4	3.36	13.3	2.6	8.1
Acropora robusta	1	27.9			0.42	1.7	2.6	8.0
Stylophora mordax	2	12.2	10.2	5.0 - 19.0	0.84	3.3	1.3	4.1
Acropora hyacinthus	1	6.0			0.42	1.7	0.1	0.4
Alveopora viridis	2	4.1	0.2	3.9 - 4.2	0.84	3.3	0.1	0.3
Stylocoeniella armata	3	2.5	1.0	1.6 - 3.5	1.26	5.0	0.1	0.2
Fungia scutaria	2	2.7	0.4	2.4 - 3.0	0.84	3.3	0.05	0.2
Cyphastrea chalcidicum	1	4.9			0.42	1.7	0.1	0.2
Total scl[illegible]actinians	60	9.3	8.8	1.6 - 48.5	25.21		32.4	

Bay: Fagatele Transect: 3 Depth: 9 m Date: 4 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Porites (P.) sp. 2	45	6.23	4.17	1.58 - 22	9.98	65.2	4.6	66.2
Pocillopora verrucosa	5	8.39	9.11	2.0 - 23.5	1.10	7.2	0.5	7.4
Acropora hyacinthus	5	7.47	1.82	4.47 - 9.38	1.10	7.2	0.5	7.4
Pocillopora elegans	4	7.98	1.79	7.48 - 9.90	0.89	5.8	0.4	5.9
Montipora caliculata	3	7.55	3.43	4.47 - 11.25	0.67	4.3	0.3	4.5
Porites lichen	2	10.47	5.64	6.48 - 14.46	0.45	2.9	0.2	2.9
Acropora digitifera	2	4.89	2.02	3.46 - 6.32	0.45	2.9	0.2	2.9
Echinopora hirsuitissima	1	23.47			0.22	1.4	0.1	1.4
Favia favus	1	11.96			0.22	1.4	0.1	1.4
Porites (S.) rus	1	209.0			0.22	1.4	(76.0)*	(91.8)*
Acropora nobilis	+							
Sinularia	3	6.4	4.4	2.0 - 10.9	0.7	4.2		
Total scleractinians	69	10.0		1.6 - 23.5	15.3		6.9	

Bay: Fagatele Transect: 3 Depth: 12 m Date: 4 April 1988	Size Distribution (colony diameters in cm)				Density	relative density	% cover	relative % cover
	N	$\overline{Y}$	S	W				
Porites (P.) sp. 2	28	5.46	3.64	1.4 - 15.3	6.88	46.7	1.6	30.3
Pocillopora elegans	2	15.20	13.9	5.3 - 25	0.44	3.3	0.9	16.8
Pavona varians	2	14.07	9.5	7.4 - 20.8	0.44	3.3	0.7	14.4
Porites (S.) rus	10	5.53	3.41	1.4 - 11.7	2.49	16.7	0.6	11.1
Galaxea fascicularis	4	6.12	1.70	4 - 7.5	1.02	6.7	0.3	5.5
Acropora digitifera	1	11			0.29	1.7	0.2	4.4
Leptastrea purpurea	2	7.07		7.07 - 7.07	0.44	3.3	0.2	3.6
Coscinaraea sp. 1	1	10			0.29	1.7	0.2	3.6
Pavona sp. 3	2	6.75	5.30	3 - 10.5	0.44	3.3	0.2	3.3
Montipora caliculata	3	4.79	2.24	3.16 - 7.35	0.73	5.0	0.1	2.5
Acropora hyacinthus	3	4.13	1.54	2.45 - 5.48	0.73	5.0	0.1	1.9
Stylophora mordax	1	6.48			0.29	1.7	0.08	1.5
Porites (P.) sp. 3	1	5			0.29	1.7	0.05	0.9
Sinularia	1	1.7			0.29	1.6	0.05	0.1
Total scleractinians	60	6.3		1.4 - 25	14.77		5.2	

Bay: Fagatelle Transect: 4 Depth: 3 m Date: 6 April 1988	Size Distribution (colony diameters in cm)				Density	relative density	% cover	relative % cover
	N	$\overline{Y}$	S	W				
Pocillopora elegans	1	34.5			0.10	1.7	1.0	15.9
Millepora platyphylla	2	22.0	4.9	18.5 - 25.4	0.21	3.3	0.8	13.0
Galaxea fascicularis	15	7.5	2.1	3.5 - 10.2	1.54	25.0	0.7	12.2
Acropora hyacinthus	5	10.3	7.9	6.0 - 24.4	0.51	8.3	0.6	10.4
Montipora sp. 1	3	15.6	2.6	13.4 - 18.5	0.31	5.0	0.6	9.9
Pavona sp. 1	1	22.4			0.10	1.7	0.4	6.8
Pocillopora verrucosa	9	6.4	3.3	3.0 - 12.5	0.92	15.0	0.4	6.1
Goniopora sp. 1	1	17.1			0.10	1.7	0.2	4.0
Acropora crateriformis	5	7.1	2.9	4.5 - 11.8	0.51	8.3	0.2	3.8
Leptoria phrygia	2	12.0	0.7	11.5 - 12.5	0.21	3.3	0.2	3.8
Pocillopora setchelli	2	8.3	6.7	3.5 - 13.0	0.21	3.3	0.2	2.5
Goniastrea retiformis	2	8.2	4.0	5.3 - 11.0	0.21	3.3	0.1	2.0
Coscinaraea sp. 1	1	12.0			0.10	1.7	0.1	2.0
Acropora nasuta	1	11.4			0.10	1.7	0.1	1.6
Favites complanata	1	9.9			0.10	1.7	0.1	1.3
Millepora tuberosa	1	9.9			0.10	1.7	0.1	1.3
Montastrea curta	2	5.3	1.8	4.0 - 6.5	0.21	3.3	0.05	0.8
Montipora verrilli	1	7.0			0.10	1.7	0.04	0.7
Pocillopora eydouxi	1	6.9			0.10	1.7	0.04	0.7

Favia pallida	1	5.7			0.10	1.7	0.03	0.5
Acropora robusta	1	4.9			0.10	1.7	0.02	0.3
Porites (P.) sp. 2	1	5.3			0.10	1.7	0.02	0.3
Stylocoeniella armata	1	1.7			0.10	1.7	0.002	0.03
Total scleractinians	60	9.4	6.1	1.7 - 34.5	6.15		6.1	

Bay: Fagatele Transect: 4 Depth: 5 m Date: 6 April 1988	Size Distribution (colony diameters in cm)				Density	relative density	% cover	relative % cover
	N	$\overline{Y}$	S	W				
Merulina vaughani	2	39.2	25.0	21.5 - 56.9	0.09	3.3	1.2	31.0
Pocillopora eydouxi	5	21.9	11.3	7.0 - 37.3	0.21	8.3	1.0	24.5
Pocillopora verrucosa	20	7.9	5.1	2.4 - 19.0	0.86	33.3	0.6	14.8
Acropora hyacinthus	12	6.6	3.0	3.5 - 15.0	0.52	20.0	0.2	5.2
Millepora tuberosa	1	23.1			0.04	1.7	0.2	4.5
Acropora cf. gemmifera	2	13.7	7.5	8.4 - 19.0	0.09	3.3	0.2	3.8
Goniastrea retiformis	1	19.5			0.04	1.7	0.1	3.2
Acropora sp. 1	4	7.9	5.9	3.0 - 16.3	0.17	6.7	0.1	3.0
Porites (P.) sp. 2	4	8.1	4.3	4.6 - 13.9	0.17	6.7	0.1	2.8
Acropora paxilligera	1	16.5			0.04	1.7	0.1	2.2
Acropora digitifera	2	8.4	1.6	7.3 - 9.5	0.09	3.3	0.05	1.2
Galaxea fascicularis	1	12.1			0.04	1.7	0.05	1.2
Acropora nasuta	1	11.0			0.04	1.7	0.04	1.0
Pocillopora setchelli	1	9.4			0.04	1.7	0.03	0.8
Montastrea curta	2	8.4	3.5	5.9 - 10.9	0.09	3.3	0.02	0.5
Leptoria phrygia	1	6.0			0.04	1.7	0.01	0.2
Total scleractinians	60	10.8	9.2	2.4 - 56.9	2.57		4.0	

Bay: Fagatele Transect: 4 Depth: 9 m Date: 6 April 1988	Size Distribution (colony diameters in cm) N	$\overline{Y}$	S	W	Density	relative density	% cover	relative % cover
Pocillopora elegans	6	15.4	5.0	6.5 - 21.0	0.32	9.5	0.6	23.4
Porites sp.2	27	5.6	3.8	0.5 - 22.2	1.46	42.9	0.5	18.3
Acropora palifera	1	34.0			0.05	1.6	0.5	17.5
Acropora cf. gemmifera	4	12.0	9.8	4.0 - 26.4	o.22	6.3	0.4	13.1
Montipora sp. 1	4	8.6	5.7	2.6 - 15.9	0.22	6.3	0.2	5.9
Porites (S.) rus	1	19.0			0.05	1.6	0.1	5.4
Cyphastrea chalcidicum	1	18.4			0.05	1.6	0.1	5.1
Montastrea curta	3	7.3	4.2	2.5 - 10.0	0.16	4.8	0.1	3.0
Acropora hyacinthus	5	5.9	2.0	3.0 - 7.9	0.27	7.9	0.1	2.9
Montipora verrucosa	2	8.2	0.3	7.9 - 8.4	0.11	3.2	0.1	2.0
Platygyra daedalea	1	10.5			0.05	1.6	0.04	1.7
Poritea lutea	2	4.3	0.1	4.2 - 4.4	0.11	3.2	0.02	0.6
Acropora digitifera	2	3.2	1.8	2.0 - 4.5	0.11	3.2	0.01	0.4
Montipora verrilli	1	4.5			0.05	1.6	0.01	0.3
Acropora nasuta	1	3.7			0.05	1.6	0.005	0.2
Stylocoeniella armata	1	2.7			0.05	1.6	0.003	0.1
Montipora elschneri	1	3.0			0.05	1.6	0.004	0.1
Hydnophora microconos	+							

Sinularia	3	3.2	1.13	2.2 - 4.5	0.15	4.4	0.01	0.2
Palythoa	1	2.1			0.05	1.5	0.02	0.03
Lobophytum	+							
Total scleractinians	63	8.0		0.5 - 26.4	3.38		2.8	

Bay: Fagatele Transect: 4 Depth: 12 m Date: 6 April 1988	Size Distribution (colony diameters in cm)				Density	relative density	% cover	relative % cover
	N	$\overline{Y}$	S	W				
Pavona varians	6	12.3	8.16	3.0 - 26.3	1.44	9.8	2.3	35.9
Stylophora mordax	7	6.5	11.49	1.0 - 32.1	1.68	11.5	2.0	31.5
Porites sp.2	30	4.6	2.28	1.4 - 12.0	7.21	49.2	1.5	22.5
Montipora sp. 1	2	6.0	3.56	3.5 - 8.5	0.48	3.3	0.2	2.4
Goniastrea retiformis	1	8.9			0.23	1.6	0.1	2.3
Acropora hyacinthus	2	5.2	3.29	2.8 - 7.5	0.48	3.3	0.1	1.9
Porites lutea	6	2.3	0.65	1.4 - 2.8	1.44	9.8	0.1	1.0
Millepora platyphylla	1	4.7			0.23	1.6	0.04	0.7
Montipora verrucosa	1	4.5			0.23	1.6	0.04	0.6
Acropora nobilis	1	3.5			0.23	1.6	0.02	0.3
Stylocoeniella armata	1	1.7			0.23	1.6	0.01	0.1
Leptastrea purpurea	1	1.7			0.23	1.6	0.01	0.1
Montipora elschneri	1	4.5			0.23	1.6	0.04	0.01
Montipora verrilli	1	3.5			0.23	1.6	0.02	0.003
Total scleractinians	61	5.4		1.0 - 32.1	14.67		6.5	

Bay: Fagatele Transect: 5 Depth: 3 m Date: 6 April 1988	Size Distribution (colony diameters in cm)				Density	relative density	% cover	relative % cover
	N	$\overline{Y}$	S	W				
Millepora platyphylla	11	18.2	9.0	4.5 - 36.6	1.84	18.3	5.8	37.0
Echinopora hirsuitissima	2	22.1	12.2	13.4 - 30.7	0.33	3.3	1.5	9.3
Acropora azurea	10	9.3	3.7	5.0 - 15.9	1.67	16.7	1.3	8.1
Acropora sp. 1	1	30.5			0.17	1.7	1.2	7.7
Lobophyllia corymbosa	1	28.9			0.17	1.7	1.1	7.0
Goniastrea retiformis	1	28.5			0.17	1.7	1.1	6.8
Galaxea fascicularis	11	7.3	2.5	4.5 - 13.0	1.84	18.3	5.3	
Favites complanata	3	14.0	1.4	12.4 - 15.1	0.50	5.0	0.8	4.9
Acropora cf. gemmifera	2	14.4	6.4	9.9 - 18.9	0.33	3.3	0.6	3.8
Cyphastrea chalcidicum	3	10.1	2.0	7.9 - 11.8	0.50	5.0	0.4	2.6
Acropora symmetrica	1	16.0			0.17	1.7	0.3	2.2
Pocillopora eydouxi	3	8.2	1.0	7.0 - 9.0	0.50	5.0	0.3	1.7
Pocillopora elegans	3	6.9	3.0	4.0 - 9.9	0.50	5.0	0.2	1.3
Pocillopora setchelli	1	9.9			0.17	1.7	0.1	0.8
Porites (P.) sp. 2	2	5.3	2.5	3.5 - 7.0	0.33	3.3	0.1	0.5
Pocillopora verrucosa	3	3.8	0.8	3.0 - 4.5	0.50	5.0	0.1	0.4
Pavona varians	1	6.3			0.17	1.7	0.05	0.3
Pavona sp. 3	1	5.3			0.17	1.7	0.04	0.2

Total scleractinians	60	11.9	7.8	3.0 - 36.6	10.3		15.8	

Bay: Fagatele Transect: 5 Depth: 5 m Date: 6 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Acropora irregularis	1	99.0			0.09	1.7	6.8	38.1
Acropora nana	1	50.6			0.09	1.7	1.8	9.8
Acropora crateriformis	6	19.5	6.4	10.4 - 28.9	0.52	10.0	1.7	9.4
Pocillopora elegans	2	29.6	16.0	20.9 - 40.9	0.17	3.3	1.4	7.6
Pocillopora verrucosa	10	11.7	7.1	4.0 - 22.4	0.87	1.7	1.2	7.0
Pocillopora eydouxi	6	15.2	7.5	7.5 - 25.4	0.52	10.0	1.1	6.4
Acropora squarrosa	1	36.9			0.09	1.7	0.9	5.2
Pocillopora meandrina	2	24.9	5.7	20.8 - 28.9	0.17	3.3	0.9	4.8
Porites (P.) sp. 2	21	5.9	1.5	3.7 - 8.5	1.82	35.0	0.5	3.0
Montipora verrilli	3	12.7	10.2	2.6 - 23.0	0.26	5.0	0.5	2.6
Montipora sp. 1	1	21.4			0.09	1.7	0.3	1.7
Acropora symmetrica	1	20.0			0.09	1.7	0.3	1.5
Goniastrea retiformis	1	15.9			0.09	1.7	0.2	1.0
Acropora ocellata	1	13.7			0.09	1.7	0.1	0.7
Montipora foveolata	1	13.7			0.09	1.7	0.1	0.7
Acropora humilis	1	10.8			0.09	1.7	0.08	0.4
Galaxea fascicularis	1	5.9			0.09	1.7	0.02	0.1
Total scleractinians	60	14.7	15.0	2.6 - 99.9	5.23		17.9	

Bay: Fagatele Transect: 5 Depth: 9 m Date: 6 April 1988	Size Distribution (colony diameters in cm) N	$\overline{Y}$	S	W	Density	relative density	% cover	relative % cover
Pocillopora elegans	10	14.7	10.26	1.7 - 33.5	1.60	16.7	3.9	51.4
Acropora palifera	2	21.0	1.27	20.1 - 21.9	0.32	3.3	1.1	14.6
Acropora nobilis	6	9.7	4.73	4.9 - 16.6	0.96	10.0	0.8	11.1
Porites (P.) sp. 2	30	3.8	1.85	9.0 - 9.2	4.78	50.0	0.7	8.8
Acropora hyacinthus	7	8.6	1.51	6.5 - 11.0	1.12	11.7	0.7	8.8
Platygyra daedalea	1	10.0			0.16	1.7	0.1	1.6
Galaxea fascicularis	1	9.8			0.16	1.7	0.1	1.6
Acropora nasuta	1	8.9			0.16	1.7	0.1	1.3
Montipora ehrenbergii	1	4.9			0.16	1.7	0.03	0.4
Coscinaraea sp. 1	1	4.6			0.16	1.7	0.03	0.3
Total scleractinians	60	7.7		1.7 - 33.5	9.58		7.6	

Bay: Fagatele Transect: 5 Depth: 12 m Date: 6 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Pocillopora elegans	9	11.8	10.34	2.8 - 31.0	0.87	14.8	1.6	28.3
Galaxea fascicularis	7	10.8	10.00	3.0 - 29.0	0.67	11.5	1.1	19.0
Acropora nasuta	2	17.7	15.91	6.5 - 29.0	0.19	3.3	0.7	11.8
Montipora verrucosa	5	10.4	8.11	4.6 - 24.5	0.48	8.2	0.6	10.8
Montipora ehrenbergii	9	8.3	4.74	3.2 - 16.5	0.87	14.8	0.6	10.6
Montipora berryi	1	21.4			0.09	1.6	0.3	6.2
Porites sp. 2	16	3.9	1.99	0.7 - 8.4	1.53	26.2	0.2	4.0
Acropora hyacinthus	5	6.3	3.99	2.2 - 13.0	0.48	8.2	0.2	3.5
Platygyra daedalea	1	12.0			0.09	1.6	0.1	1.9
Montastrea curta	1	11.0			0.09	1.6	0.1	1.6
Coscinaraea sp. 1	1	9.5			0.09	1.6	0.1	1.2
Stylophora mordax	1	5.5			0.09	1.6	0.02	0.4
Acropora [illegible]bilis	1	4.7			0.09	1.6	0.02	0.3
Goniastrea retiformis	2	3.0	1.41	2.0 - 4.0	0.19	3.3	0.01	0.2
Sinularia	5	4.5	2.54	1.7 - 7.9	0.41	7.4	0.1	1.7
Palythoa	2	2.1	0.51	1.7 - 2.4	0.16	2.9	0.01	0.1
Total scleractinians	61	8.3		0.7 - 31.0	5.82		5.6	

Bay: Fagatele Transect: 6 Depth: 5 m Date: 11 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Acropora monticulosa	1	104.8			0.21	2.5	17.9	47.6
Pocillopora eydouxi	11	13.9	8.4	4.9 - 33.2	2.28	27.5	4.6	12.3
Acropora hyacinthus	2	29.3	32.2	6.5 - 52.0	0.42	5.0	4.5	11.9
Pocillopora verrucosa	9	13.7	9.4	1.4 - 26.8	1.87	22.5	3.9	10.3
Montipora verrilli	1	34.1			0.21	2.5	1.9	5.0
Favia stelligera	3	17.9	3.4	14.7 - 21.4	0.62	7.5	1.6	4.3
Montastrea curta	3	14.0	14.0	4.5 - 30.0	0.62	7.5	1.6	4.2
Pocillopora elegans	1	20.8			0.21	2.5	0.7	1.9
Acropora digitifera	2	8.0	0.0	8.0 - 8.0	0.42	5.0	0.2	0.6
Pocillopora meandrina	1	11.0			0.21	2.5	0.2	0.5
Leptoria phrygia	1	10.8			0.21	2.5	0.2	0.5
Porites murrayensis	1	8.5			0.21	2.5	0.1	0.3
Goniastrea retiformis	1	6.9			0.21	2.5	0.1	0.2
Cyphastrea serailia	1	6.5			0.21	2.5	0.1	0.2
Total scleractinians	40	16.2	17.7	1.4 - 104.8	8.33		37.6	

Bay: Fagatele Transect: 6 Depth: 12 m Date: 11 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Montipora verrilli	4	15.6	15.43	1.7 - 31.5	0.67	8.3	2.2	20.6
Montipora verrucosa	3	19.5	5.53	14.3 - 25.3	0.50	6.2	1.6	14.7
Pocillopora eydouxi	4	13.8	9.98	6.0 - 28.5	0.67	8.3	1.4	12.9
Porites lutea	1	28.3			0.17	2.1	1.1	9.8
Montipora berryi	1	26.1			0.17	2.1	0.9	8.3
Acropora crateriformis	4	11.5	6.87	4.6 - 21.0	0.67	8.3	0.9	8.2
Acropora hyacinthus	3	12.4	8.75	6.5 - 22.49	0.50	6.2	0.8	7.5
Pocillopora elegans	1	20.6			0.17	2.1	0.6	5.2
Astreopora sp. 1	1	19.9			0.17	2.1	0.5	4.8
Coscinaraea sp. 1	6	4.7	2.49	1.8 - 8.8	1.00	12.5	0.2	2.0
Montastrea curta	3	6.13	3.37	2.5 - 9.2	0.50	6.2	0.2	1.6
Montipora ehrenbergii	1	11.6			0.17	2.1	0.2	1.6
Montipora sp. 3	1	8.7			0.17	2.1	0.1	0.9
Pocillopora verrucosa	9	2.4	1.11	1.0 - 3.9	1.51	18.8	0.1	0.7
Acropora palmerae	2	3.6	2.65	1.7 - 5.5	0.34	4.2	0.04	0.4
Leptoria phrygia	1	6.0			0.17	2.1	0.05	0.4
Leptastrea purpurea	2	2.7	0.71	2.2 - 3.2	0.34	4.2	0.02	0.2
Porites (P.) sp. 2	1	2.0			0.17	2.1	0.005	0.05

Sinularia	10	3.5	1.45	2.0 - 5.9	1.55	17.2	0.7	6.5
Total scleractinians	48	9.7		1.0 - 28.5	8.06		10.9	

Table 2. Coral communities at 12 locations around Tutuila, American Samoa, based on 22 quantitative transect surveys done in April 1988.

a.	Inside Masefau Bay	-	2 - 3 m depth
b.	Inside Masefau Bay	-	6 m depth
c.	Outside Masefau Bay	-	2 - 3 m depth
d.	Outside Masefau Bay	-	6 m depth
e.	Aoa Bay	-	1 - 2 m depth
f.	Aoa Bay	-	6 m depth
g.	Onenoa Bay	-	1 - 2 m depth
h.	Onenoa Bay	-	6 m depth
i.	Aunu'u Island	-	6 m depth
j.	Auasi	-	6 m depth
k.	Fagasa	-	2 - 3 m depth
l.	Fagasa	-	6 m depth
m.	Cape Larsen	-	2 - 3 m depth
n.	Cape Larsen	-	6 m depth
o.	Fagafue	-	1 - 2 m depth
p.	Fagafue	-	6 m depth
q.	Massacre Bay	-	1 - 2 m depth
r.	Massacre Bay	-	6 m depth
s.	Rainmaker Hotel	-	0.5-1.5 m depth
t.	Rainmaker Hotel	-	6 m depth
u.	Fatu Rock	-	2 - 4 m depth
v.	Fatu Rock	-	6 m depth

Bay: Inside Masefau Transect: Depth: 2 - 3 m Date: 9 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Porites cylindrica	10	22.0	29.3	1.7 - 98.8	0.70	16.7	6.9	79.3
Pavona sp. 3	1	26.7			0.07	1.7	0.4	4.5
Acropora crateriformis	4	12.2	3.8	8.5 - 17.3	0.28	6.7	0.4	4.0
Pocillopora verrucosa	7	7.0	3.0	3.0 - 11.2	0.49	11.7	0.2	2.5
Porites (P.) sp. 2	21	3.6	1.7	2.0 - 7.5	1.47	35.0	0.2	2.1
Acropora nobilis	2	12.0	2.7	10.1 - 13.9	0.14	3.3	0.2	1.8
Montipora caliculata	1	16.4			0.07	1.7	0.2	1.7
Porites (S.) rus	4	7.0	3.8	3.5 - 12.4	0.28	6.7	0.1	1.5
Millepora tuberosa	2	7.8	5.4	4.0 - 11.6	0.14	3.3	0.1	0.9
Montipora sp. 3	1	10.5			0.07	1.7	0.1	0.7
Pocillopora eydouxi	2	6.3	0.4	6.0 - 6.5	0.14	3.3	0.04	0.5
Millepora dichotoma	1	7.9			0.07	1.7	0.03	0.3
Alveopora sp. 1	2	3.5	0.7	3.0 - 4.0	0.14	3.3	0.01	0.1
Pocillopora setchelli	1	3.5			0.07	1.7	0.01	0.1
Pocillopora damicornis	1	1.0			0.07	1.7	0.001	0.01
Total scleractinians	60	9.1	13.6	1.0 - 98.8	4.20		8.7	

Bay: Inside Masefau Transect: Depth: 6 m Date: 9 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Porites (P.) sp.2	53	4.0	3.36	0.7 - 18.7	10.95	88.3	2.3	81.6
Fungia scutaria	2	8.4	7.04	3.5 - 13.4	0.41	3.3	0.3	10.9
Montipora ehrenbergii	1	7.4			0.21	1.7	0.09	3.1
Acropora hyacinthus	1	6.5			0.21	1.7	0.07	2.4
Coscinaraea sp. 1	1	3.9			0.21	1.7	0.02	0.9
Montipora verrilli	1	3.5			0.21	1.7	0.02	0.7
Acropora nobilis	1	3.0			0.21	1.7	0.01	0.5
Total scleractinians	60	4.2		0.7 - 18.7	12.41		2.8	

Bay: Outside Masefau Transect: Depth: 2.5 - 3.5 m Date: 9 April 1988	Size Distribution (colony diameters in cm) N	$\overline{Y}$	S	W	Density	relative density	% cover	relative % cover
Galaxea fascicularis	32	6.5	2.4	3.0 - 13.3	13.05	53.3	5.1	33.0
Montipora verrilli	4	12.3	6.9	4.6 - 20.8	1.63	6.7	2.4	15.2
Montipora elschneri	1	25.5			0.41	1.7	2.1	13.4
Pocillopora meandrina	1	19.4			0.41	1.7	1.2	7.8
Acropora crateriformis	2	11.1	10.2	3.9 - 18.3	0.81	3.3	1.1	7.2
Acropora hyacinthus	5	7.5	3.1	5.9 - 13.0	2.04	8.3	1.0	6.5
Favites complanata	1	15.5			0.41	1.7	0.8	5.0
Montastrea curta	2	9.7	6.7	4.9 - 14.4	0.81	3.3	0.7	4.8
Pocillopora verrucosa	6	4.2	2.7	2.0 - 9.5	2.45	10.0	0.5	3.0
Porites (P.) sp.2	4	4.6	1.0	3.5 - 5.9	1.63	6.7	0.3	1.8
Pocillopora setchelli	1	8.8			0.41	1.7	0.2	1.6
Favia rotumana	1	6.9			0.41	1.7	0.2	1.0
Total scleractinians	60	7.6	4.7	2.0 - 25.5	24.47		15.6	

Bay: Outside Masefau Transect: Depth: 6 m Date: 9 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Pocillopora eydouxi	3	33.3	26.47	7.4 - 60.3	0.72	4.8	8.9	38.2
Montipora verrilli	3	25.2	10.02	14.3 - 33.9	0.72	4.8	4.0	17.0
Montastrea curta	4	12.5	5.25	8.0 - 19.8	0.96	6.4	1.3	5.7
Acropora nasuta	2	17.2	11.03	9.4 - 25.0	0.48	3.2	1.3	5.7
Acropora hyacinthus	4	10.4	8.02	3.7 - 22.0	0.96	6.4	1.2	5.1
Acropora craterifornis	1	22.08			0.24	1.6	0.9	3.9
Porites (P.) sp. 2	15	4.6	2.43	1.5 - 10.2	3.60	24.0	0.7	3.2
Favia rotumana	3	10.9	3.58	7.0 - 14.0	0.72	4.8	0.7	3.1
Pocillopora elegans	4	7.2	7.39	2.0 - 18.0	0.96	6.4	0.7	3.0
Goniastrea retiformis	2	13.1	0.49	12.7 - 13.4	0.48	3.2	0.6	2.8
Pavona varians	1	16.5			0.24	1.6	0.5	2.2
Cyphastrea serailia	1	15.0			0.24	1.6	0.4	1.8
Montipora sp. 3	1	14.3			0.24	1.6	0.4	1.6
Pocillopora meandrina	3	7.5	3.57	5.0 - 11.6	0.72	4.8	0.4	1.6
Favia favus	1	10.4			0.24	1.6	0.2	0.9
Alveopora viridis	7	3.5	1.80	1.4 - 6.9	1.68	11.2	0.2	0.8
Platygyra daedalea	2	6.9	3.25	4.6 - 9.2	0.48	3.2	0.2	0.8
Favites halicora	1	9.8			0.24	1.6	0.2	0.8

Pavona decussata	1	9.5			0.24	1.6	0.2	0.7
Galaxea fascicularis	2	5.2	3.61	2.6 - 7.8	0.48	3.2	0.1	0.5
Acropora nana	1	6.5			0.24	1.6	0.1	0.3
Porites lichen	1	3.9			0.24	1.6	0.03	0.1
Sinularia	++							
Total scleractinians	63	10.1		1.4 - 60.3	15.0		23.2	

Bay: Aoa Transect: Depth: 1.5 - 2.5 m Date: 7 April 1988	Size Distribution (colony diameters in cm)				Density	relative density	% cover	relative % cover
	N	$\overline{Y}$	S	W				
Acropora hyacinthus	7	16.2	6.2	6.0 - 21.4	1.42	11.7	3.3	16.8
Montipora verrilli	6	15.9	8.1	4.7 - 25.0	1.21	10.0	2.9	15.1
Pocillopora eydouxi	5	14.2	10.4	5.7 - 31.2	1.01	8.3	2.3	11.7
Pocillopora verrucosa	7	12.4	6.6	4.9 - 21.9	1.42	11.7	2.1	11.0
Porites (P.) sp.2	17	6.2	4.2	2.0 - 16.5	3.44	28.3	1.5	7.6
Acropora digitifera	1	29.5			0.20	1.7	1.4	7.2
Acropora cf. gemmifera	4	12.0	5.1	4.5 - 15.4	0.81	6.7	1.0	5.4
Millepora platyphylla	1	25.0			0.20	1.7	1.0	5.1
Acropora humilis	1	24.5			0.20	1.7	1.0	5.0
Pavona sp. 3	2	12.6	8.3	6.7 - 18.4	0.40	3.3	0.6	3.2
Pocillopora meandrina	1	19.9			0.20	1.7	0.6	3.2
Acropora azurea	1	17.5			0.20	1.7	0.5	2.5
Goniastrea retiformis	1	16.4			0.20	1.7	0.4	2.2
Acropora cytherea	1	12.0			0.20	1.7	0.2	1.2
Acropora nasuta	1	10.5			0.20	1.7	0.2	0.9
Montipora elschneri	1	10.5			0.20	1.7	0.2	0.9
Acropora sp.1	1	7.4			0.20	1.7	0.1	0.5
Pocillopora elegans	1	6.5			0.20	1.7	0.1	0.4

Montastrea curta	1	3.5			0.20	1.7	0.02	0.1
Total scleractinians	60	12.1	4.2	2.0 - 31.2	12.11		19.4	

Bay: Aoa Transect: Depth: 6 m Date: 7 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Montipora berryi	6	19.4	11.26	4.2 - 35.4	0.94	10.0	3.5	34.7
Pavona divaricata	2	20.3	8.38	14.4 - 26.3	0.31	3.3	1.1	10.8
Pocillopora elegans	6	8.6	8.20	2.7 - 24.5	0.94	10.0	1.0	9.4
Porites (P.) sp. 2	17	5.7	3.37	1.4 - 12.7	2.66	28.3	0.9	8.8
Goniastrea retiformis	4	12.2	5.75	5.5 - 19.5	0.63	6.7	0.9	8.4
Montipora verrucosa	6	10.3	3.37	6.3 - 14.5	0.94	10.0	0.8	8.3
Pavona varians	2	13.5	12.13	5.0 - 22.0	0.31	3.3	0.6	6.1
Coscinaraea sp. 1	3	9.4	2.47	7.9 - 12.2	0.47	5.0	0.3	3.3
Cyphastrea microphthalma	2	10.9	4.13	7.9 - 13.8	0.31	3.3	0.3	3.0
Montastrea curta	1	11.0			0.16	1.7	0.2	1.4
Montipora verrilli	3	5.8	1.72	4.6 - 7.8	0.47	5.0	0.1	1.3
Acropora nasuta	1	9.8			0.16	1.7	0.1	1.2
Galaxea fascicularis	1	8.8			0.16	1.7	0.1	0.9
Favia favus	1	8.2			0.16	1.7	0.09	0.8
Porites lutea	1	6.3			0.16	1.7	0.05	0.5
Acropora nobilis	1	6.7			0.16	1.7	5.7	0.5
Acropora cf. gemmifera	1	4.0			0.16	1.7	0.02	0.2
Acropora hyacinthus	1	4.5			0.16	1.7	0.03	0.2
Favites flexuosa	1	2.6			0.16	1.7	0.009	0.08

Palythoa	2	1.9	0.19	1.7 - 2.0	0.43	4.8	0.01	0.08
Total scleractinians	60	9.5		1.4 - 35.4	9.42		15.8	

Bay: Onenoa Transect: Depth: 1 - 2.5 m Date: 7 April 1988	Size Distribution (colony diameters in cm)				Density	relative density	% cover	relative % cover
	N	$\bar{Y}$	S	W				
Acropora hyacinthus	9	17.1	12.4	5.3 - 39.8	1.61	15.0	5.4	19.6
Acropora sp. 2	6	23.4	8.7	13.0 - 36.9	1.08	10.0	5.2	18.7
Acropora cf. gemmifera	6	22.8	3.7	11.5 - 29.0	1.08	10.0	3.8	13.7
Acropora digitifera	3	22.9	9.2	12.4 - 29.4	0.54	5.0	2.5	8.9
Acropora samoensis	2	21.5	12.8	12.4 - 30.5	0.36	3.3	1.5	5.5
Pocillopora verrucosa	3	16.8	3.3	14.0 - 20.5	0.54	5.0	1.2	4.4
Pocillopora eydouxi	2	18.3	0.5	17.9 - 18.6	0.36	3.3	1.0	3.4
Montipora ehrenbergii	2	17.7	3.8	15.0 - 20.4	0.36	3.3	0.90	3.3
Millepora platyphylla	1	24.7			0.18	1.7	0.9	3.1
Hydnophora microconos	1	24.5			0.18	1.7	0.8	3.1
Montipora caliculata	1	23.9			0.18	1.7	0.8	2.9
Cyphastrea chalcidicum	1	22.8			0.18	1.7	0.7	2.6
Acropora crateriformis	6	6.7	5.8	2.4 - 18.0	1.08	10.0	0.6	2.2
Montipora verrilli	1	18.5			0.18	1.7	0.5	1.7
Acropora nasuta	2	12.0	0.6	11.5 - 12.4	0.36	3.3	0.4	1.5
Porites (P.) sp. 2	4	7.9	1.4	6.6 - 9.4	0.72	6.7	0.4	1.3
Pocillopora setchelli	2	9.2	4.6	5.9 - 12.4	0.36	3.3	0.3	1.0
Favites complanata	1	14.3			0.18	1.7	0.3	1.0
Pocillopora elegans	1	11.5			0.18	1.7	0.2	0.7

Acropora azurea	2	7.4	3.5	4.9 - 9.9	0.36	3.3	0.2	0.6
Acropora nobilis	1	10.4			0.18	1.7	0.2	0.5
Alveopora virdis	3	3.0	1.3	2.0 - 4.5	0.54	5.0	0.04	0.1
Total scleractinians	60	15.9	9.2	2.0 - 36.9	10.79		27.6	

Bay: Onenoa Transect: Depth: 6 m Date: 7 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Acropora hyacinthus	21	25.0	29.3	2.1 - 101.2	2.46	32.4	27.9	72.8
Montipora berryi	5	30.0	2.91	26.8 - 33.5	0.58	7.7	4.0	10.4
Montipora sp. 3	4	27.5	5.93	19.4 - 33.4	0.47	6.2	2.9	7.5
Pocillopora verrucosa	9	8.3	7.8	2.0 - 27.9	1.05	13.8	1.0	2.6
Montipora verrilli	2	15.1	18.8	1.7 - 28.4	0.24	3.1	0.8	2.1
Pocillopora meandrina	1	25.0			0.11	1.5	0.6	1.6
Acropora nasuta	3	11.0	5.48	5.5 - 16.4	0.35	4.6	0.4	1.0
Porites (P.) sp. 2	9	4.2	3.21	1.0 - 11.6	1.05	13.8	0.2	0.5
Acropora sp. 2	2	9.4	4.19	6.5 - 12.4	0.2	3.1	0.2	0.5
Platygyra daedalea	1	11.6			0.11	1.5	0.1	0.3
Montipora verrucosa	1	11.0			0.11	1.5	0.1	0.3
Acropora palifera	1	10.4			0.11	1.5	0.1	0.3
Leptastrea purpurea	3	2.8	0.5	2.2 - 3.2	0.35	4.6	0.02	0.05
Montastrea curta	1	4.6			0.11	1.5	0.02	0.05
Montipora minuta	1	3.9			0.11	1.5	0.01	0.03
Coscinaraea columna	1	2.7			0.11	1.5	0.01	0.03
Sinularia	3	7.2	2.7	4.5 - 9.8	0.33	4.4	0.1	3.1

Total scleractinians	65	16.3			8.05		38.4	

Bay: Aunu'u Transect: Depth: 6 m Date: 14 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Pocillopora eydouxi	4	15.8	12.86	4.0 - 28.5	2.42	8.7	7.1	40.2
Porites (P.) sp. 2	33	5.1	2.74	1.2 - 12.3	19.95	71.7	5.2	29.2
Acropora hyacinthus	2	19.2	8.81	13.0 - 25.5	1.20	4.3	3.9	21.9
Acropora nasuta	1	11.2			0.61	2.2	0.6	3.4
Pavona varians	1	11.0			0.61	2.2	0.6	3.2
Galaxea fascicularis	1	4.6			0.61	2.2	0.1	0.6
Montastrea curta	1	4.6			0.61	2.2	0.1	0.6
Coscinaraea columna	2	2.6	1.74	1.4 - 3.9	1.20	4.3	0.1	0.5
Pocillopora elegans	1	4.0			0.61	2.2	0.1	0.4
Sinularia	1	5.7			0.59	2.1	0.2	0.9
Palythoa	+							
Total scleractinians	46	6.8		1.2 - 28.5	27.82		17.8	

Bay: Auasi Transect: Depth: 6 m Date: 14 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Acropora irregularis	1	74.1			0.10	1.5	4.3	41.4
Acropora nobilis	8	15.0	21.30	4.0 - 67.1	0.84	12.3	4.1	37.5
Porites (P.) sp. 2	44	4.7	3.47	1.0 - 16.7	4.63	67.7	1.2	11.3
Acropora crateriformis	1	26.4			0.10	1.5	0.5	5.3
Pocillopora elegans	4	7.3	1.32	5.3 - 7.9	0.42	6.2	0.2	1.6
Acropora cf. gemmifera	1	10.5			0.10	1.5	0.1	0.8
Platygyra daedalea	1	10.5			0.10	1.5	0.004	0.8
Pocillopora eydouxi	2	5.7	3.17	3.5 - 7.9	0.21	3.1	0.1	0.6
Montipora verrilli	1	8.9			0.10	1.5	0.1	0.6
Pocillopora damicornis	1	2.4			0.10	1.5	0.09	0.04
Porites lutea	1	2.4			0.10	1.5	0.005	0.04
Sinularia	3	5.5	1.74	3.5 - 6.5	0.30	4.3	0.08	0.7
Palythoa	1	2.0			0.98	1.4	0.003	0.03
Total scleractinians	65	7.7		1 - 67.1	6.80		10.7	

Bay: Fagasa Transect: Depth: 2 - 3 m Date: 10 April 1988	Size Distribution (colony diameters in cm)				Density	relative density	% cover	relative % cover
	N	$\bar{Y}$	S	W				
Montipora verrilli	8	24.6	13.9	8.5 - 52.7	2.21	13.3	13.4	21.9
Acropora paxilligera	1	63.7			0.28	1.7	8.8	14.4
Pocillopora eydouxi	1	58.6			0.28	1.7	7.5	12.2
Goniastrea retiformis	2	40.3	4.2	37.3 - 43.3	0.55	3.3	7.1	11.6
Montipora sp. 3	1	46.0			0.28	1.7	4.6	7.5
Pocillopora verrucosa	15	10.4	5.4	3.5 - 19.0	4.15	25.0	4.4	7.2
Acropora cf. gemmifera	2	24.7	14.4	14.5 - 34.9	0.55	3.3	3.1	5.1
Montipora elschneri	2	23.4	13.9	13.5 - 33.2	0.55	3.3	2.8	4.6
Acropora humilis	1	32.6			0.28	1.7	2.3	3.8
Astreopora myriophthalma	2	19.7	15.4	8.8 - 30.6	0.55	3.3	2.2	3.6
Millepora platyphylla	3	12.4	6.8	5.2 - 18.8	0.88	5.0	1.2	2.0
Pavona varians	4	10.3	5.3	5.5 - 15.7	1.11	6.7	1.1	1.8
Pocillopora setchelli	8	6.3	3.6	1.7 - 12.5	2.21	13.3	0.9	1.4
Montipora ehrenbergii	2	13.4	1.3	12.5 - 14.3	0.55	3.3	0.8	1.3
Acropora azurea	4	8.6	2.7	4.5 - 10.2	1.11	6.7	0.7	1.1
Acropora digitifera	1	9.9			0.28	1.7	0.2	0.3
Acropora ocellata	1	6.5			0.28	1.7	0.1	0.2
Acropora crateriformis	1	6.0			0.28	1.7	0.1	0.1
Porites (P.) sp. 2	1	3.2			0.28	1.7	0.02	0.03

Total scleractinians	60	16.4	14.3	1.7 - 63.7	16.61		61.3	

Bay: Fagasa Transect: Depth: 6 m Date: 10 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Montipora ehrenbergii	8	40.5	24.52	9.2 - 87.0	1.02	13.1	17.4	33.7
Montipora elschnerl	4	55.5	14.17	43.9 - 76.0	0.51	6.6	12.9	25.1
Acropora nobilis	10	23.0	15.91	3.5 - 54.9	1.28	16.4	7.6	14.8
Pocillopora eydouxi	5	24.4	31.25	6.7 - 80.0	0.64	8.2	6.9	13.4
Porites lutea	1	47.6			0.12	1.6	2.1	4.4
Favia matthaii	1	31.0			0.12	1.6	0.9	1.9
Platygyra daedalea	2	20.2	7.77	14.7 - 25.7	0.26	3.3	0.9	1.7
Porites (P.) sp. 2	12	6.0	4.06	1.5 - 14.8	1.53	19.7	0.6	1.2
Montastrea curta	2	16.6	6.78	11.8 - 21.4	0.26	3.3	0.6	1.2
Montipora sp. 3	1	24.3			0.12	1.6	0.6	1.2
Pocillopora verrucosa	1	16.0			0.12	1.6	0.2	0.5
Pocillopora setchelli	7	4.5	2.75	1.0 - 8.5	0.90	11.5	0.2	0.4
Montipora caliculata	3	7.3	2.99	4.6 - 10.5	0.38	4.9	0.2	0.3
Pavona decussata	2	5.4	1.58	4.2 - 6.5	0.26	3.3	0.1	0.1
Millepora platyphylla	1	7.2			0.12	1.6	0.05	0.1
Galaxea fascicularis	1	6.9			0.12	1.6	0.05	0.1
Total scleractinians	61	20.3		1.0 - 80.0	7.76		51.3	

Bay: Cape Larsen Transect: Depth: 2 - 3 m Date: 10 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Montipora verrilli	13	18.3	12.1	3.5 - 36.8	3.05	21.7	11.3	32.5
Acropora sp. 1	4	21.8	2.1	19.0 - 23.6	0.94	6.7	3.5	10.1
Montipora sp. 3	4	21.7	1.8	19.3 - 23.3	0.94	6.7	3.5	10.0
Leptoria phyrygia	3	19.3	19.8	6.7 - 42.1	0.70	5.0	3.5	10.0
Pocillopora eydouxi	4	17.8	13.2	9.9 - 37.5	0.94	6.7	3.3	9.5
Porites lobata	1	33.2			0.24	1.7	2.0	5.9
Acropora crateriformis	4	10.7	9.2	4.9 - 24.4	0.94	6.7	1.3	3.8
Pocillopora elegans	2	17.2	2.6	15.3 - 19.0	0.47	3.3	1.1	3.2
Montipora caliculata	2	16.7	4.6	13.4 - 19.9	0.47	3.3	1.1	3.0
Acropora samoensis	1	19.4			0.24	1.7	0.7	2.0
Porites lutea	1	19.4			0.24	1.7	0.7	2.0
Acropora digitifera	2	12.7	1.0	12.0 - 13.4	0.47	3.3	0.6	1.7
Leptastrea purpurea	1	15.0			0.24	1.7	0.4	1.2
Acropora azurea	5	6.0	2.4	3.9 - 9.4	1.17	8.3	0.4	1.1
Montipora elschneri	1	13.1			0.24	1.7	0.3	0.9
Favia pallida	1	11.2			0.24	1.7	0.2	0.7
Favites complanata	1	9.9			0.24	1.7	0.2	0.5
Favia stelligera	1	9.9			0.24	1.7	0.2	0.5
Galaxea fascicularis	3	4.0	0.0	4.0 - 4.0	0.70	5.0	0.1	0.3

Hydnophora microconos	1	8.1			0.24	1.7	0.1	0.3
Pocillopora Verrucosa	1	8.0			0.24	1.7	0.1	0.3
Goniastrea retiformis	1	7.4			0.24	1.7	0.1	0.3
Alveopora sp. 1	3	3.0	1.3	2.0 - 4.5	0.70	5.0	0.05	0.1
Total scleractinians	60	14.7	10.0	2.0 - 42.1	14.13		34.8	

Bay: Cape Larsen Transect: Depth: 6 m Date: 10 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Pocillopora eydouxi	3	31.9	17.24	21.0 - 51.8	0.58	4.8	5.5	18.7
Porites (S.) rus	2	33.8	3.20	31.5 - 36.0	0.39	3.2	3.5	11.7
Montipora elschneri	2	31.0	0.64	30.6 - 31.5	0.39	3.2	3.0	9.9
Pavona varians	7	13.9	9.20	3.0 - 31.8	1.36	11.3	2.8	9.5
Montipora verrilli	8	11.8	7.45	3.0 - 23.9	1.55	12.9	2.3	7.7
Montipora berryi	3	21.4	5.05	17.9 - 27.2	0.58	4.8	2.2	7.3
Montipora sp. 3	3	18.4	13.78	3.5 - 30.8	0.58	4.8	2.1	7.1
Acropora cytherea	2	22.2	1.46	21.2 - 23.2	0.39	3.2	1.5	5.1
Goniastrea retiformis	2	13.6	15.67	2.5 - 24.7	0.39	3.2	0.9	3.1
Acropora digitifera	2	16.2	0.71	15.7 - 16.7	0.39	3.2	0.8	2.7
Montastrea curta	1	21.9			0.19	1.6	0.7	2.5
Acropora azurea	1	21.4			0.19	1.6	0.7	2.4
Astreapora myriothalma	3	10.1	8.33	3.5 - 19.4	0.58	4.8	0.7	2.3
Coscinaraea sp. 1	2	11.2	9.52	4.5 - 17.9	0.39	3.2	0.5	1.8
Goniastrea pectinata	1	17.2			0.19	1.6	0.4	1.5
Leptastrea purpurea	2	11.4	3.44	9.0 - 13.9	0.39	3.2	0.4	1.4
Favia pallida	1	15.9			0.19	1.6	0.4	1.3
Acropora crateriformis	1	14.4			0.19	1.6	0.3	1.1
Pavona venosa	1	14.4			0.19	1.6	0.3	1.1

Porites lutea	2	8.4		8.4 - 8.4	0.39	3.2	0.2	0.7
Acropora hyacinthus	4	4.8	1.72	3.0 - 6.9	0.78	6.5	0.2	0.5
Cyphastrea serailia	1	6.2			0.19	1.6	0.1	0.2
Pavona duerdeni	1	6.5			0.19	1.6	0.1	0.2
Galaxea fascicularis	1	5.5			0.19	1.6	0.04	0.2
Porites (P.) sp. 2	3	2.3	0.77	1.4 - 2.7	0.58	4.8	0.03	0.09
Alveopora sp. 1	2	2.6	0.27	2.4 - 2.8	0.39	3.2	0.02	0.07
Pocillopora elegans	1	2.4			0.19	1.6	0.03	0.03
Total scleractinians	62	14.4		1.4 - 51.8	12.0		29.7	

Bay: Fagafue Transect: Depth: 1.5 - 2.0 m Date: 12 April 1988	Size Distribution (colony diameters in cm)				Density	relative density	% cover	relative % cover
	N	$\bar{Y}$	S	W				
Acropora hyacinthus	10	24.4	18.8	7.5 - 70.9	1.69	16.7	12.1	31.9
Montipora verrilli	6	21.3	16.4	9.8 - 53.8	1.01	10.0	5.4	14.3
Acropora digitifera	2	42.7	2.6	40.8 - 44.5	0.34	3.3	4.8	12.7
Acropora crateriformis	3	23.1	11.0	12.0 - 33.9	0.51	5.0	2.4	6.5
Acropora sp. 1	1	42.7			0.17	1.7	2.4	6.4
Favites complanata	1	38.8			0.17	1.7	2.0	5.3
Acropora paxilligera	1	31.7			0.17	1.7	1.3	3.5
Cyphastrea serailia	2	21.4	3.5	18.9 - 23.8	0.34	3.3	1.2	3.2
Leptoria phrygia	2	20.6	3.2	18.3 - 22.8	0.34	3.3	1.1	3.0
Porites (P.) sp. 2	15	6.3	2.4	3.0 - 10.4	2.54	25.0	0.9	2.4
Montipora elschneri	1	26.4			0.17	1.7	0.9	2.4
Montastrea curta	2	17.2	2.1	15.7 - 18.7	0.34	3.3	0.8	2.1
Acropora azurea	2	15.1	2.3	13.5 - 16.7	0.34	3.3	0.6	1.6
Acropora nasuta	2	13.4	0.5	13.0 - 13.7	0.34	3.3	0.5	1.2
Pavona maldivensis	2	12.8	1.8	11.5 - 14.0	0.34	3.3	0.4	1.1
Montipora ehrenbergii	1	14.9			0.17	1.7	0.3	0.8
Pavona varians	2	8.7	1.7	7.5 - 9.9	0.34	3.3	0.2	0.6
Acropora samoensis	2	7.2	3.8	4.5 - 9.9	0.34	3.3	0.2	0.4
Galaxea fascicularis	1	10.2			0.17	1.7	0.1	0.4

Pocillopora verrucosa	1	5.3			0.17	1.7	0.04	0.1
Leptastrea purpurea	1	2.0			0.17	1.7	0.01	0.03
Total scleractinians	60	17.1	13.7	2.0 - 70.9	10.17		32.9	

Bay: Fagafue Transect: Depth: 6 m Date: 12 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Acropora irregularis	1	146.5			0.21	1.7	35.4	37.0
Acropora nobilis	3	38.6	37.06	6.0 - 78.9	0.61	5.0	11.5	12.5
Acropora hyacinthus	5	29.2	23.64	10.5 - 69.0	1.01	8.3	10.3	11.2
Pavona varians	5	26.1	12.49	14.1 - 44.4	1.01	8.3	6.4	6.9
Montipora ehrenbergii	9	18.2	9.75	3.9 - 30.5	1.83	15.0	6.0	6.5
Cyphastrea serailia	2	36.0	25.38	18.0 - 53.9	0.40	3.3	5.1	5.6
Montipora berryi	2	38.0	11.10	30.2 - 45.9	0.40	3.3	4.7	5.2
Acropora cf. gemmifera	2	37.9	7.18	32.8 - 43.0	0.40	3.3	4.6	5.0
Acropora cytherea	1	38.6			0.21	1.7	2.5	2.6
Porites lutea	2	20.7	15.19	10.0 - 31.4	0.40	3.3	1.7	1.9
Astreopora sp. 1	2	20.0	16.24	8.5 - 31.5	0.40	3.3	1.7	1.8
Pocillopora elegans	2	17.7	2.28	16.1 - 19.3	0.40	3.3	1.0	1.1
Favites halicora	1	25.5			0.21	1.7	1.1	1.1
Porites (P.) sp. 2	7	5.5	3.53	1.4 - 10.6	1.43	11.7	0.5	0.5
Montastrea curta	5	6.1	2.77	2.8 - 9.8	1.01	8.3	0.3	0.4
Montipora verrilli	1	11.8			0.21	1.7	0.2	0.2
Pocillopora meandrina	1	11.3			0.21	1.7	0.2	0.2
Coscinaraea sp. 1	2	4.9	0.54	4.5 - 5.2	0.40	3.3	0.1	0.1
Pocillopora verrucosa	3	4.6	1.28	3.5 - 4.5	0.61	5.0	0.1	0.1

Alveopora sp. 1	2	3.5	1.43	2.4 - 4.5	0.40	3.3	0.04	0.04
Leptastrea purpurea	1	3.0			0.21	1.7	0.01	0.02
Platygyra daedalea	1	3.5			0.21	1.7	0.02	0.02
Total scleractinians	60	20.6		1.4 - 78.9	12.17		93.5	

Bay: Massacre Bay Transect: Depth: 1.5 - 2 m Date: 12 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Acropora hyacinthus	4	35.1	23.7	7.9 - 57.5	0.99	6.7	10.0	22.1
Acropora nobilis	9	16.7	9.1	3.5 - 29.5	2.22	15.0	6.1	13.4
Acropora sp. 1	2	35.3	0.4	35.0 - 35.5	0.49	3.3	4.8	10.6
Acropora samoensis	5	18.4	13.3	5.3 - 37.1	1.23	8.3	4.6	10.2
Acropora digitifera	5	20.1	6.5	14.4 - 27.5	1.23	8.3	4.2	9.3
Acropora paxilligera	2	26.8	7.6	21.4 - 32.2	0.49	3.3	2.9	6.4
Montipora caliculata	1	35.7			0.25	1.7	2.5	5.4
Acropora squarrosa	1	31.5			0.25	1.7	1.9	4.2
Acropora cf. gemmifera	1	30.8			0.25	1.7	1.8	4.0
Acropora azurea	5	12.1	3.6	8.5 - 16.4	1.23	8.3	1.5	3.4
Porites (P.) sp. 2	11	6.8	2.6	4.5 - 13.3	2.71	18.3	1.1	2.4
Montipora verrilli	2	14.9	3.5	12.4 - 17.3	0.49	3.3	0.9	1.9
Pocillopora verrucosa	3	9.4	6.4	3.0 - 15.8	0.74	5.0	0.7	1.5
Acropora crateriformis	1	18.8			0.25	1.7	0.7	1.5
Montipora sp. 3	1	18.8			0.25	1.7	0.7	1.5
Favia favus	1	13.7			0.25	1.7	0.4	0.8
Acropora nasuta	2	8.4	1.4	7.4 - 9.4	0.49	3.3	0.3	0.6
Montastrea curta	1	9.8			0.25	1.7	0.2	0.4
Galaxea fascicularis	1	6.5			0.25	1.7	0.1	0.2

Alveopora sp. 1	2	3.7	1.8	2.4 - 4.9	0.49	3.3	0.1	0.1
Total scleractinians	60	16.5	12.1	2.4 - 57.5	14.80		45.4	

Bay: Massacre Bay Transect: Depth: 6 m Date: 12 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Acropora hyacinthus	4	48.4	43.05	7.0 - 101.8	1.42	9.1	41.6	33.2
Acropora samoensis	1	96.1			0.36	2.3	26.1	20.5
Acropora nobilis	8	28.9	14.86	6.2 - 51.0	2.83	18.2	22.8	18.2
Pavona clavus	1	60.3			0.36	2.3	10.3	8.1
Porites (P.) sp. 2	13	9.5	13.91	1.4 - 54.1	4.59	29.5	9.7	7.8
Porites (S.) rus	6	15.4	4.92	8.1 - 22.0	2.12	13.6	5.7	3.4
Montipora ehrenbergii	3	20.1	3.39	17.3 - 23.9	1.06	6.8	3.4	2.7
Montipora berryi	1	32.6			0.36	2.3	3.0	2.4
Acropora cytherea	1	26.5			0.36	2.3	2.0	1.6
Pavona decussata	2	14.4	8.57	8.4 - 20.5	0.70	4.5	1.3	1.1
Coscinaraea sp. 1	1	14.5			0.36	2.3	0.6	0.5
Millepora platyphylla	2	9.1	3.90	6.3 - 11.8	0.70	4.5	0.5	0.4
Montipora verrilli	1	6			0.36	2.3	0.1	0.1
Sinularia	1	5.92			0.36	2.2	0.1	0.1
Total scleractinians	44	22.4		1.4 - 101.8	15.57		127.1	

Bay: Rainmaker Hotel Transect: Depth: 0.5 - 1.5 m Date: 8 April 1988	Size Distribution (colony diameters in cm)				Density	relative density	% cover	relative % cover
	N	$\bar{Y}$	S	W				
Pocillopora danae	34	5.4	3.5	1.0 - 15.9	4.27	56.7	1.4	42.1
Pavona divaricata	8	8.6	1.8	4.9 - 10.4	1.00	13.3	0.6	18.6
Millepora platyphylla	6	8.9	3.3	4.6 - 14.1	0.75	10.0	0.5	16.1
Pavona decussata	3	11.1	2.4	9.5 - 13.9	0.38	5.0	0.3	9.3
Pocillopora damicornis	3	7.3	3.8	3.0 - 10.0	0.38	5.0	0.2	5.9
Porites lutea	1	12.7			0.13	1.7	0.2	5.0
Leptastrea purpurea	4	4.0	0.4	3.5 - 4.5	0.50	6.7	0.1	1.9
Psammocora contigua	1	6.0			0.13	1.7	0.04	1.2
Total scleractinians	60	6.6	3.6	1.0 - 15.9	7.54		3.2	

Bay: Rainmaker Hotel Transect: Depth: 6 m Date: 8 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Diploastrea heliopora	5	252.9	138.4	63.5 - 442.5	0.03	11.4	18.1	96.3
Millepora excesa	2	49.2	53.67	11.2 - 87.1	0.01	4.5	0.3	1.9
Millepora platyphylla	2	33.3	4.24	30.3 - 36.3	0.01	4.5	0.1	0.5
Pavona decussata	4	15.3	9.73	4.2 - 26.9	0.02	9.1	0.05	0.3
Pocillopora damicornis	7	8.3	5.06	3.9 - 19.0	0.04	15.9	0.03	0.2
Acropora hyacinthus	4	11.8	6.84	5.0 - 20.8	0.02	9.1	0.03	0.2
Porites lichen	2	20.1	11.63	11.8 - 28.3	0.01	4.5	0.04	0.2
Pocillopora danae	5	8.4	3.30	4.9 - 13.9	0.03	11.4	0.02	0.1
Pavona varians	2	14.4	2.94	12.3 - 16.5	0.01	4.5	0.02	0.1
Pavona divaricata	1	16.3			0.006	2.3	0.01	0.1
Fungia scutaria	2	10.2	5.32	6.5 - 14.0	0.01	4.5	0.01	0.06
Leptastrea purpurea	1	11.4			0.006	2.3	0.006	0.03
Acropora nobilis	1	11.0			0.006	2.3	0.006	0.03
Pocillopora meandrina	1	8.5			0.006	2.3	0.003	0.02
Psammocora contigua	1	9.2			0.006	2.3	0.004	0.02
Pavona frondosa	2	3.7	0.29	3.5 - 3.9	0.01	4.5	0.001	0.01
Pavona venosa	1	5.9			0.006	2.3	0.002	0.01
Millepora dichotoma	1	2.0			0.006	2.3	0.0002	0.001

Lobophytum	4	29.6	14.5	8.8 - 42.7	0.027	7.5	0.2	1.0
Corallimorpharian	4	3.4	1.55	2.4 - 5.7	0.027	7.5	0.003	0.01
Palythoa	1	3.2			0.007	1.9	0.001	0.002
Tethya	5	5.8	2.47	3.5 - 9.5				
Total scleractinians	44	40.6		3.5 - 442	0.25		18.7	

Bay: Fatu Rock Transect: Depth: 2.5 - 4 m Date: 8 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Acropora azurea	25	8.4	4.6	2.0 - 20.5	8.77	41.7	6.2	20.5
Acropora hyacinthus	4	20.5	13.6	5.7 - 38.5	1.40	6.7	6.1	20.3
Acropora nobilis	2	31.5	8.8	25.3 - 37.7	0.70	3.3	5.7	18.7
Pocillopora setchelli	12	9.0	6.1	2.0 - 18.4	4.21	20.0	3.8	12.6
Millepora platyphylla	1	32.4			0.35	1.7	2.9	9.6
Montipora verrilli	2	19.1	11.7	10.8 - 27.4	0.70	3.3	2.4	7.9
Montipora sp. 1	1	22.0			0.35	1.7	1.4	4.5
Acropora ocellata	2	10.6	0.3	10.4 - 10.8	0.70	3.3	0.6	2.0
Montipora elschneri	1	13.7			0.35	1.7	0.5	1.7
Porites (P.) sp. 2	6	3.9	0.8	3.0 - 5.0	2.10	10.0	0.3	0.9
Galaxea fascicularis	2	7.0	1.5	5.9 - 8.0	0.70	3.3	0.3	0.9
Pocillopora verrucosa	2	4.7	0.9	4.0 - 5.3	0.70	3.3	0.1	0.4
Total scleractinians	60	10.6	8.5	2.0 - 38.5	21.0		30.3	

Bay: Fatu Rock Transect: Depth: 6 m Date: 8 April 1988	Size Distribution (colony diameters in cm) N	$\bar{Y}$	S	W	Density	relative density	% cover	relative % cover
Acropora irregularis	1	52.9			0.28	1.5	6.2	27.2
Montipora berryi	2	26.9	5.20	23.2 - 30.6	0.58	3.1	3.4	14.3
Acropora cf. gemmifera	1	37.1			0.28	1.5	3.0	13.3
Pocillopora verrucosa	12	8.7	4.78	2.2 - 15.4	3.47	18.5	2.6	11.2
Porites (P.) sp. 2	34	4.2	1.92	1.4 - 8.9	9.81	52.3	1.6	6.8
Montipora verrilli	5	10.2	5.48	4.9 - 19.0	1.44	7.7	1.5	6.2
Acropora crateriformis	1	23.0			0.28	1.5	1.2	5.1
Acropora cytherea	1	22.2			0.28	1.5	1.1	4.8
Montipora verrucosa	1	21.9			0.28	1.5	1.1	4.7
Acropora nobilis	4	8.9	4.31	4.5 - 14.1	1.16	6.2	0.8	3.6
Porites (S.) rus	1	14.8			0.28	1.5	0.5	2.1
Porites cylindrica	1	6.9			0.28	1.5	0.1	0.5
Leptastrea purpurea	1	4.9			0.28	1.5	0.05	0.2
Sinularia	15	5.9	1.92	2.5 - 9.2	0.18	17.9	0.05	5.1
Palythoa	3	6.7	8.89	1.4 - 17.0	0.04	3.6	0.03	2.6
Zoanthus	1	9.8			0.01	1.2	0.01	0.9
Total scleractinians	65	8.8		1.4 - 30.6	18.70		23.2	

Table 3. Abundance of hermatypic corals (colonies per m^2) in Fagatele Bay National Marine Sanctuary in April 1985 and April 1988.

Depth	Permanent Transect Number					
	1	2	3	4	5	6
Reef Flat						
1985		7.2	9.1	8.8		
1988		3.6	25.4			
3 m						
1985		2.0	23.3	3.2	15.4	
1988		8.0	33.4	6.2	10.3	
5 m						
1985	6.8	2.5	34.5	1.4	3.7	20.4
1988		3.4	25.2	2.6	5.2	8.3
9 m						
1985	10.0	3.3	9.3	3.2	6.7	5.7
1988	11.9	5.5	15.3	3.4	9.6	
12 m						
1985	10.4	2.6	2.3	2.3	3.2	7.1
1988	7.1	17.7	14.8	14.7	5.8	8.1

Table 4. Percent cover of substrata by corals in Fagatele Bay National Marine Sanctuary in April 1985 and April 1988.

Depth	Permanent Transect Number					
	1	2	3	4	5	6
Reef Flat						
1985		4.0	45.2	6.6		
1988		3.5	43.4			
3 m						
1985		1.1	25.6	2.2	46.2	
1988		7.3	31.8	6.1	15.8	
5 m						
1985	17.1	1.2	11.8	0.9	12.9	20.2
1988		2.3	32.4	4.0	17.9	37.6
9 m						
1985	10.5	64.4	2.3	2.4	11.7	4.5
1988	31.6	3.9	6.9	2.8	7.6	
12 m						
1985	10.7	0.9	0.8	1.0	1.3	8.4
1988	10.9	7.2	5.2	6.5	5.6	10.9

Table 5. Mean hermatypic coral colony diameter (cm) in Fagatele Bay National Marine Sanctuary in April 1985 and April 1988.

Depth	Permanent Transect Number					
	1	2	3	4	5	6
Reef Flat						
1985		6.4	14.4	8.6		
1988		9.1	10.9			
3 m						
1985		7.0	8.2	8.4	14.4	
1988		9.5	8.8	9.5	11.8	
5 m						
1985	11.9	6.3	5.2	7.7	15.7	9.1
1988		7.6	9.3	10.8	14.8	16.2
9 m						
1985	8.3	18.9	5.1	7.1	10.8	8.7
1988	16.2	8.0	10.0	8.0	7.7	
12 m						
1985	10.3	5.4	5.3	6.0	6.5	11.0
1988	11.2	6.4	6.3	5.4	8.3	9.7

Table 6. Abundance (number per m^2) of hermatypic coral colonies at 12 sites around Tutuila Island in April 1982, April 1988, and April 1991 at two depths at each site.

Location	Depth	Year	Number of coral colonies per m^2
Inside Masefau Bay	2-3 m	1982	2.89
		1985	3.51
		1988	4.20
	6 m	1982	5.93
		1985	8.14
		1988	12.41
Outside Masefau Bay	2-3 m	1982	30.62
		1985	33.94
		1988	24.47
	6 m	1982	2.68
		1985	5.30
		1988	15.00
Aoa Bay	2-3 m	1982	3.00
		1985	18.62
		1988	12.11
	6 m	1982	1.14
		1985	3.63
		1988	9.42
Onenoa Bay	2-3 m	1982	5.97
		1985	9.01
		1988	10.79
	6 m	1982	2.23
		1985	7.75
		1988	8.05
Aunu'u Island	2-3 m	1982	0.41
		1985	2.51
	6 m	1982	0.51
		1985	4.43
		1988	27.82
Matuli Point	2-3 m	1982	10.76
		1985	13.68
	6 m	1982	2.54
		1985	11.69
		1988	6.80

Fagasa Bay	2-3 m	1982	7.98
		1985	4.29
		1988	16.61
	6 m	1982	3.13
		1985	5.60
		1988	7.76
Cape Larsen	2-3 m	1982	7.88
		1985	7.81
		1988	14.13
	6 m	1982	7.57
		1985	12.17
		1988	12.00
Fagafue Bay	2-3 m	1982	8.00
		1985	12.40
		1988	10.17
	6 m	1982	5.41
		1985	13.88
		1988	12.17
Massacre Bay	2-3 m	1982	11.92
		1985	28.83
		1988	14.80
	6 m	1982	5.93
		1985	18.23
		1988	15.57
Rainmaker Hotel	2-3 m	1982	4.69
		1985	8.25
		1988	7.54
	6 m	1982	11.58
		1985	0.84
		1988	0.25
Fatu Rock	2-3 m	1982	22.19
		1985	18.79
		1988	21.00
	6 m	1982	19.66
		1985	17.41
		1988	18.70

Table 7. Percent cover of substrata by hermatypic coral colonies at 12 sites around Tutuila Island in April 1982, April 1988, and April 1991 at two depths at each site.

Location	Depth	Year	Percent cover by coral colonies
Inside Masefau Bay	2-3 m	1982	12.31
		1985	3.69
		1988	8.7
	6 m	1982	32.85
		1985	66.08
		1988	2.8
Outside Masefau Bay	2-3 m	1982	41.94
		1985	28.44
		1988	15.6
	6 m	1982	2.59
		1985	3.30
		1988	23.2
Aoa Bay	2-3 m	1982	3.12
		1985	11.52
		1988	19.4
	6 m	1982	0.78
		1985	1.80
		1988	15.8
Onenoa Bay	2-3 m	1982	2.68
		1985	11.54
		1988	27.6
	6 m	1982	3.13
		1985	9.22
		1988	38.4
Aunu'u Island	2-3 m	1982	1.65
		1985	1.56
	6 m	1982	0.06
		1985	1.83
		1988	17.8
Matuli Point	2-3 m	1982	23.68
		1985	11.72
	6 m	1982	7.89
		1985	41.49
		1988	10.7

Fagasa Bay	2-3 m	1982	16.77
		1985	1.93
		1988	61.3
	6 m	1982	2.48
		1985	21.33
		1988	51.3
Cape Larsen	2-3 m	1982	10.65
		1985	14.25
		1988	34.8
	6 m	1982	7.35
		1985	22.34
		1988	29.7
Fagafue Bay	2-3 m	1982	80.14
		1985	85.50
		1988	32.9
	6 m	1982	115.44
		1985	98.43
		1988	93.5
Massacre Bay	2-3 m	1982	59.99
		1985	88.69
		1988	45.4
	6 m	1982	60.63
		1985	91.68
		1988	127.1
Rainmaker Hotel	2-3 m	1982	6.65
		1985	11.38
		1988	3.2
	6 m	1982	27.72
		1985	19.19
		1988	18.7
Fatu Rock	2-3 m	1982	17.34
		1985	61.49
		1988	30.3
	6 m	1988	23.2

Table 8. Mean diameter (cm) of hermatypic coral colonies at 12 sites around Tutuila Island in April 1982, April 1988, and April 1991 at two depths at each site.

Location	Depth	Year	Y diameter of coral colonies
Inside Masefau Bay	2-3 m	1982	13.2
		1985	8.9
		1988	9.1
	6 m	1982	14.9
		1985	30.6
		1988	4.2
Outside Masefau Bay	2-3 m	1982	9.1
		1985	8.2
		1988	7.7
	6 m	1982	5.6
		1985	7.5
		1988	10.1
Aoa Bay	2-3 m	1982	7.2
		1985	7.3
		1988	11.3
	6 m	1982	5.2
		1985	7.1
		1988	9.5
Onenoa Bay	2-3 m	1982	6.9
		1985	11.0
		1988	15.6
	6 m	1982	5.8
		1985	10.1
		1988	16.3
Aunu'u Island	2-3 m	1982	14.9
		1985	7.4
	6 m	1982	3.6
		1985	6.2
		1988	6.8
Matuli Point	2-3 m	1982	11.8
		1985	19.5
	6 m	1982	9.2
		1985	19.5
		1988	7.7

Fagasa Bay	2-3 m	1982	10.9
		1985	6.3
		1988	16.4
	6 m	1982	6.6
		1985	15.2
		1988	20.3
Cape Larsen	2-3 m	1982	8.9
		1985	12.3
		1988	14.7
	6 m	1982	7.7
		1985	11.9
		1988	14.4
Fagafue Bay	2-3 m	1982	28.0
		1985	22.1
		1988	17.2
	6 m	1982	32.4
		1985	20.1
		1988	20.6
Massacre Bay	2-3 m	1982	17.4
		1985	14.7
		1988	16.5
	6 m	1982	26.0
		1985	21.8
		1988	22.4
Rainmaker Hotel	2-3 m	1982	8.8
		1985	9.3
		1988	6.6
	6 m	1982	11.9
		1985	22.4
		1988	40.6
Fatu Rock	2-3 m	1982	9.8
		1985	11.4
		1988	10.6
	6 m	1982	8.3
		1985	19.2
		1988	8.8

FISH COMMUNITIES OF AMERICAN SAMOA

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INTRODUCTION

Fagatele Bay on the island of Tutuila, American Samoa, was officially designated a Marine Sanctuary by the National Oceanographic and Atmospheric Administration of the U. S. Department of Commerce in April 1985. At that time a thorough assessment of the marine biota in the Bay was made by a team of biologists from the University of Guam Marine Laboratory (Birkeland et al., 1987). This report details the results of a follow-up survey of the Sanctuary carried out in April 1988, three years after the original survey. At the same time, two other survey projects were carried out on Tutuila:

1) a survey of three sites which had been surveyed prior to and subsequent to a major outbreak of the crown-of-thorns starfish Acanthaster planci in 1978/79 (Birkeland et al., 1987); two of the sites were heavily damaged by the starfish, while the other one was spared starfish damage, and

2) a survey of twelve sites, six in exposed and six in protected locations, which were recovering from Acanthaster damage; coral communities at these sites had previously been surveyed (Birkeland et al., 1987), but this was the first time that fish communities had been surveyed at these locations.

MATERIALS AND METHODS

The resurvey of the Fagatele Bay Marine Sanctuary was performed by doing fish surveys along 30-m transects set up at various depths at each of six survey locations within the Bay. The transects were established as close as possible to the transect locations used during the previous surveys of the Bay. Four transect depths from 3 m to 12 m were established at sites 2 through 5, but rough water conditions at sites 1 and 6 made it impossible to run fish transects at the shallower depths.

The monitoring of fish community response to the 1978-79 outbreak of Acanthaster planci involved the resurveying of three sites which had been surveyed prior to and after the Acanthaster coral kill. Two of these sites were heavily impacted by the Acanthaster outbreak (Fagatele Bay and Cape Larsen) and one (Sita Bay) was largely untouched by the predatory starfish. At each of these three sites, 100-m transects were established in the same locations as previous fish survey transects.

A third subproject was the survey of fishes along 30-m transects at twelve locations around Tutuila at which coral communities had previously been surveyed. The twelve locations consisted of pairs of nearby sites which had suffered Acanthaster damage and which represented, respectively, exposed and protected reefs. At eleven of the twelve locations, two transects at different depths were run (rough water conditions precluded running the shallower transect at Aunuu).

The transect censuses, in each case, were carried out by a diver using scuba gear who swam the length of the transect line (30 or 100 m, as appropriate) enumerating fishes by species which were observed within one meter of either side of the transect line. After the enumeration, the investigator spent approximately 10 minutes swimming in the immediate vicinity of the transect line recording species which were not observed during the transect enumeration. Both the transect enumeration and the additional species list were recorded by the investigator on an underwater slate.

During the 1988 survey, a different investigator (Amesbury) carried out the fish censuses than had carried them out during previous years (Wass). Comparison of the data collected by these different investigators suggests that having different individuals perform the censuses introduced an additional source of variability. The 1988 censuses recorded fewer fish species and lower counts of fish individuals than did the 1985 censuses on almost all transects. Because these differences are so consistent among transects and among fish groups, it appears to reflect differences in the performance of the transect surveys by the two investigators. The differences may be attributed to different estimates of the width of the 2-m corridor which was censused along the transect line or by different lengths of time spent by the two investigators in running the line. Another possible source of the difference between the censuses of the two investigators was that Wass used an underwater tape recorder for the transect counts, while Amesbury recorded the counts on an underwater slate.

A second source of variation was the occurrence of large numbers of small, presumably newly recruited, individuals of the surgeonfish Ctenochaetus striatus during the 1985 survey. Small individuals of this species were not seen during the 1988 survey. To correct for this source of variation, some of the year-to-year comparisons eliminate consideration of this species.

RESULTS AND DISCUSSION

Assessment of Fish Communities in Fagatele Bay

A total of twenty 30-meter transects were censused at the six survey sites in Fagatele Bay (Table 1). Fish density ranged from 25 to 119 per transect (60 m^2), and the number of species per transect location ranged from 17 to 56. In general, more

species of fish and a greater abundance of fish were observed at the deeper transects than at the shallower ones (Figures 1 and 2).

During the 1988 surveys, overall fish counts on the transects were approximately half those of 1985 (excluding counts of Ctenochaetus striatus which were unusually abundant during a recruitment event in 1985). However, fish counts were not consistently lower at all transects during 1988, and at some transects (the 12-m transects at sites 3 and 4), the 1988 counts were higher. In fact, if 1985 and 1988 fish counts are compared for the eleven transects which were surveyed in both years, there is no significant correlation between counts at the various transects in the two years ($r=-.13247$, $d.f.=9$, n.s.). It seems likely that several factors, including different survey personnel, different placement of the transect line, natural variability in the occurrence of fishes within the area of the relatively short 30-m line, and differences in environmental and sea conditions all contribute to the lack of correlation between survey counts in the two years.

Recovery from Acanthaster Damage

Three 100-meter transects were censused (Table 2) to monitor the response of reef fish communities to reef destruction caused by the crown-of-thorns starfish Acanthaster planci in 1979.

Fish counts and number of fish species observed were, with the exception of fish abundance at the Fagatele Bay transect, all less in 1988 than in previous years. This may be more a result of differences in the censusing procedures (as discussed above) than in changes in the fish communities, but consideration of various trophic groups of fish which may be directly influenced by environmental changes resulting from the Acanthaster outbreak in 1979 indicates that changes in community composition may have taken place over the years of the survey program.

Prior to the 1979 Acanthaster outbreak, corallivorous fishes made up between 2.9 and 8.1% of the fish communities at Fagatele Bay, Cape Larsen, and Sita Bay; herbivorous fishes made up a somewhat larger proportions, 7.3 to 13.3% (Table 3; Figure 3). By 1985, six years after the starfish outbreak, coral-eating fishes had decreased to 0 to 0.6% of the fish communities at Fagatele and Cape Larsen, which were heavily damaged by Acanthaster, while remaining relatively unchanged at 4.7% at Sita, which was not impacted by the starfish. Herbivorous fishes at Fagatele and Cape Larsen increased greatly in abundance to comprise 35.5 to 39.2% of the fish communities in 1985; at Sita the increase of herbivorous fishes was considerably less.

In 1988, the abundance of corallivorous fishes has remained low at Fagatele Bay and Cape Larsen (0.7 to 1.6%), and has remained relatively high at Sita (6.7%). Herbivorous fishes have declined notably from their 1985 high at Fagatele and Cape Larsen

(down to 13.9 to 18.5%), while remaining high (30.8%) at Sita. The year-to-year patterns in trophic group abundance are relatively consistent whether seen as proportions of the total fish community or absolute numbers (Figure 4), indicating that these changes are not merely the results of different census techniques in different years.

The changes in the trophic composition of the fish communities at Fagatele Bay and Cape Larsen are the kinds of changes one would expect to result from crown-of-thorns damage; the death of corals leads to a reduction in the abundance of those species that depend upon coral for food. Coral death permits the settlement and growth of benthic algae and so should lead to an increase in the abundance of herbivorous fishes. In subsequent years, as the coral communities recover and the proportion of substrate covered by living corals increases at the expense of the algae, the abundance of herbivorous fishes should decline while the abundance of corallivorous fishes should increase. These changes were observed at the two sites heavily damaged by Acanthaster but were not observed at Sita which was not damaged by the starfish.

Other Surveys Around Tutuila

Fish surveys were carried out along 30-m transects at twelve additional sites around Tutuila (Table 4). At each site (except for Aunuu Island where difficult sea conditions made it impossible to carry out a shallow transect survey), transects were run at two depths, shallow (3 to 5 meters) and deeper (6 to 7 meters). Sites were paired to represent protected and exposed reefs at nearby locations around the island.

Comparisons among these various conditions (Table 5) indicate that fish are more numerous at protected locations and at greater depth. Species richness is approximately the same at both protected and exposed locations, and it is greater at the deeper transects (Table 6). Two-way anova failed to show statistical significance in these general trends, however. Nineteen eighty-eight was the first year that fishes had been surveyed at these sites (although coral communities have been surveyed at these sites in previous years), and so no year-to-year comparisons can be made.

LITERATURE CITED

Birkeland, C. E., R. H. Randall, R. C. Wass, B. Smith, and S. Wilkens. 1987. Biological resource assessment of the Fagatele Bay National Marine Sanctuary. NOAA Technical Memorandum NOS MEMD 3, U.S. Department of Commerce. 232p.

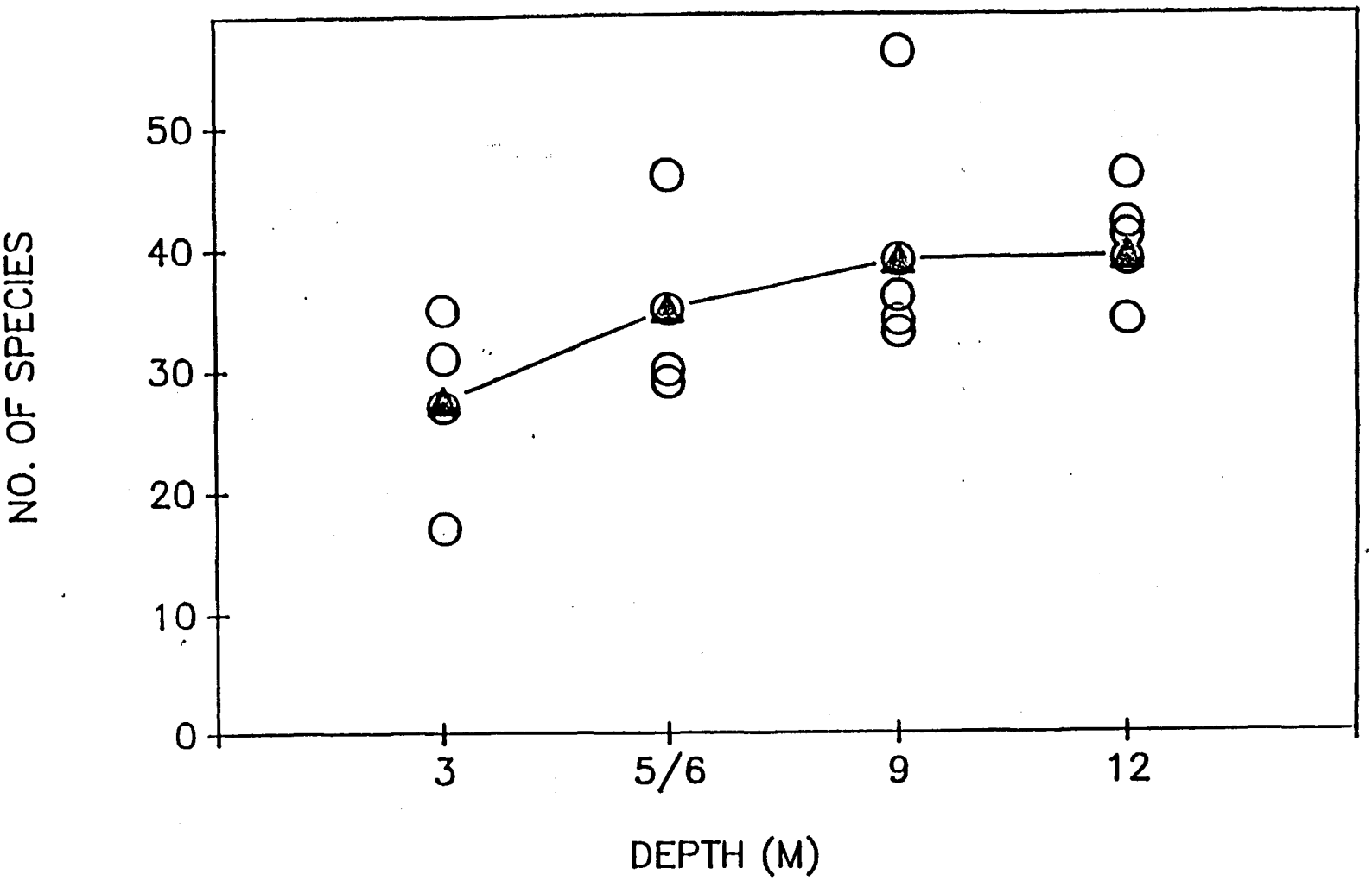

Figure 1. Number of fish species per transect for transects at different depths. Individual transect counts indicated by circles; means for depths indicated by triangles.

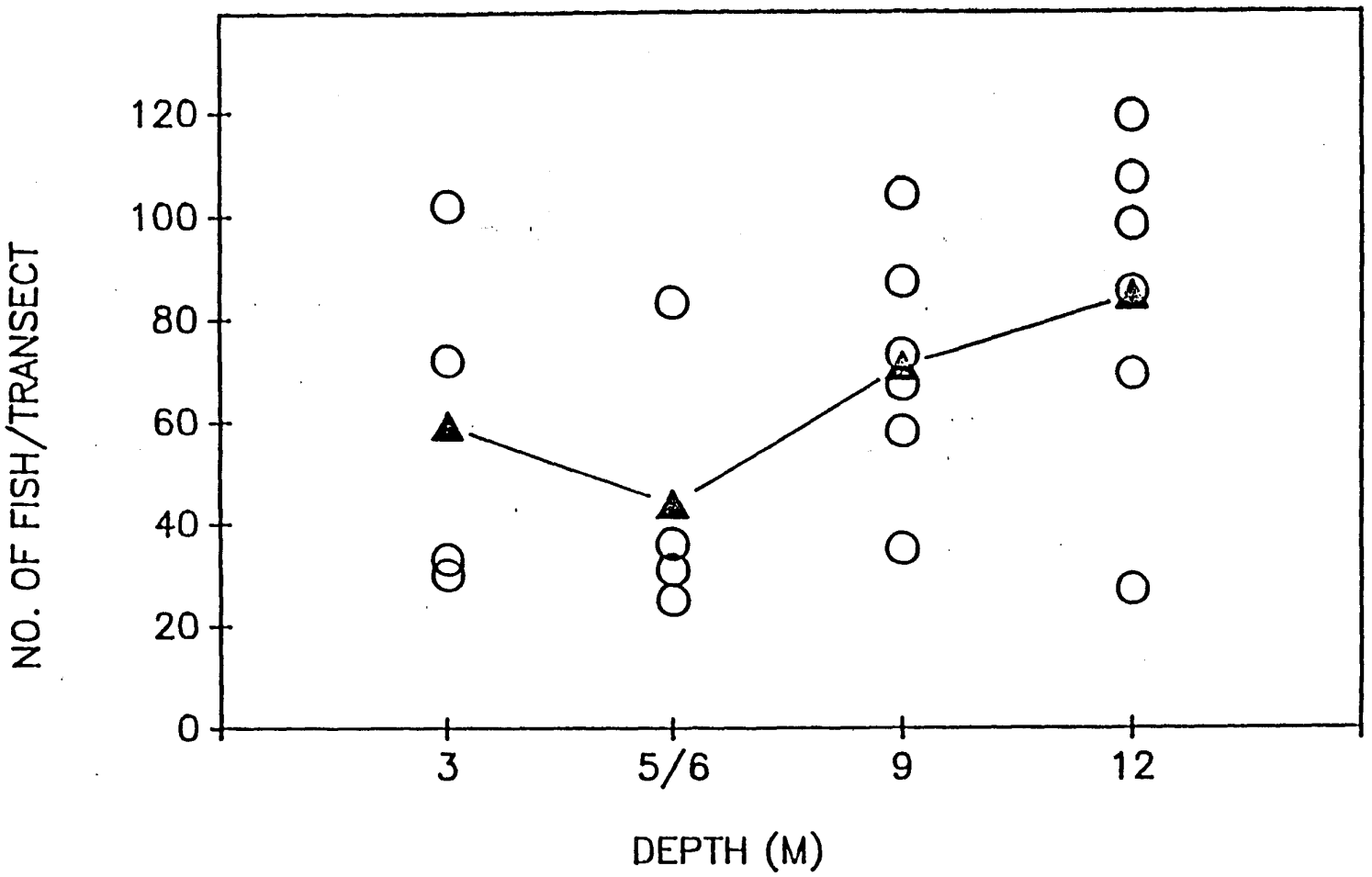

Figure 2. Number of fish counted per transect for transects at different depths. Individual transect counts indicated by circles; means for depths indicated by triangles.

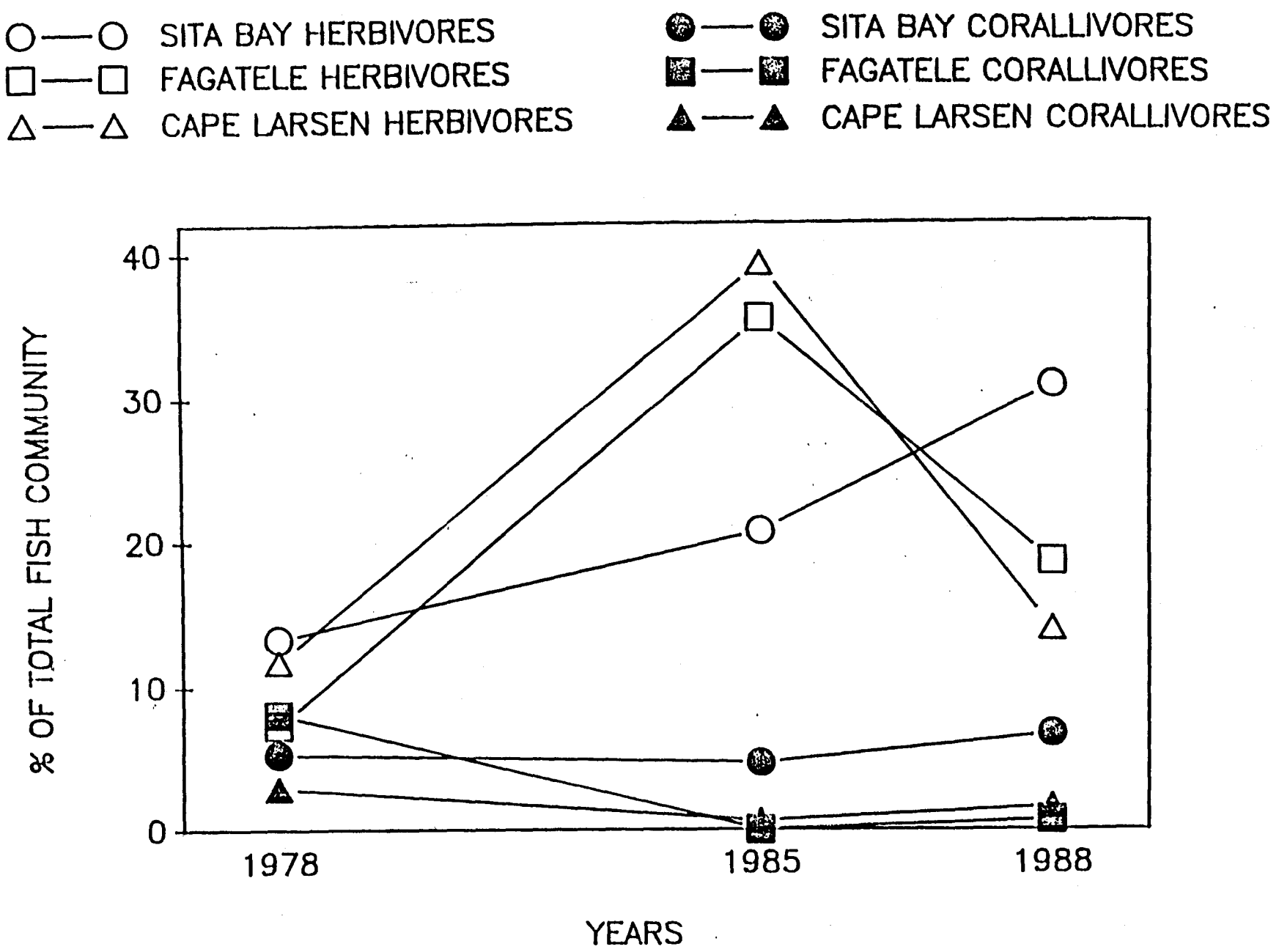

Figure 3. Change in trophic composition of fish communities at Sita Bay, Fagatele Bay, and Cape Larsen over 1978-1988 period.

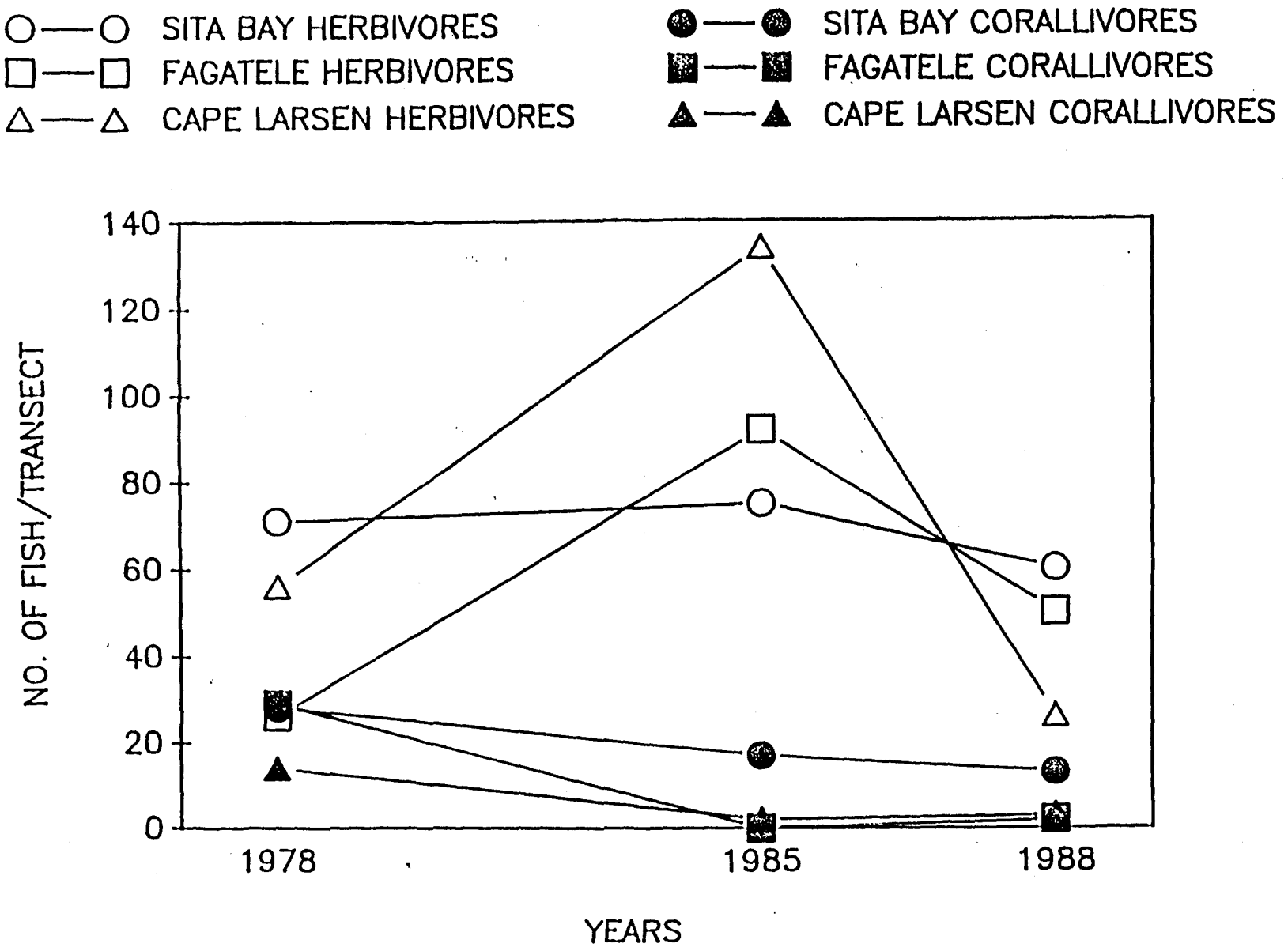

Figure 4. Changes in abundance of herbivores and corallivores at Sita Bay, Fagatele Bay, and Cape Larsen over 1978-1988 period.

Table 1a. Fishes censused on the Fagatele Bay transects. Numbers indicate the number of fish counted on the transects; the letter P indicates the presence of species in the immediate vicinity of the transect line.

	Site 1		Site 2			
	9-m	12-m	3-m	5-m	9-m	12-m
ACANTHURIDAE						
Acanthurus achilles						
A. glaucopareius	2	2	P	P	1	2
A. guttatus			P			
A. lineatus	P	P	P			
A. nigrofuscus	2		4	P	4	4
A. olivaceus						
A. triostegus						
A. xanthopterus		P				
Ctenochaetus striatus	13	4	7	3	58	36
Ctenochaetus sp.	2	P				P
Naso lituratus	P	P		P	P	P
Zebrasoma scopas				P	5	6
Z. veliferum						
juveniles					P	2
APOGONIDAE						
Cheilodipterus macrodon						
AULOSTOMIDAE						
Aulostomus chinensis					P	
BALISTIDAE						
Balistapus undulatus	P					
Melichthys niger	P					
M. vidua	P	P		P	P	
Rhinecanthus rectangulus						
Sufflamen bursa	P	P				
BLENNIIDAE						
Meiacanthus atrodorsalis						
unidentified blenniids					P	1
CAESIONIDAE						
Caesio caerulaureus		P				
C. xanthonotus						
Pterocaesio chrysozona						
P. tile						
CHAETODONTIDAE						
Chaetodon bennetti						
C. citrinellus				P		
C. ephippium				P		
C. lunula	1					
C. melannotus						
C. ornatissimus	P					
C. quadrimaculatus						

Table 1a. Continued

	Site 1		Site 2			
	9-m	12-m	3-m	5-m	9-m	12-m
Chaetodon rafflesi						
C. reticulatus	P	P			P	
C. semeion						
C. trifasciatus	P		P			
C. ulietensis						
C. unimaculatus	P	P				
C. vagabundus	P					
Forcipiger flavissimus						
F. longirostris		P				
Hemitaurichthys polylepis	P	P				
Heniochus chrysostomus						
Megaprotodon trifascialis			P			
CIRRHITIDAE						
Paracirrhites arcatus	2	2				
P. forsteri	P				P	
GOBIIDAE						
Ptereleotris evides						
HAEMULIDAE						
Plectorhynchus orientalis						
HOLOCENTRIDAE						
Myripristis berndti						
Neoniphon opercularis						
N. sammara						
Sargocentron diadema	P					
S. spiniferum	1					
KYPHOSIDAE						
Kyphosus cinerascens						
LABRIDAE						
Anampses caeruleopunctatus						
A. meleagrides						P
A. twisti	P	P			1	P
Bodianus axillaris						
Cheilinus diagrammus	P	P				P
C. oxycephalus						P
Coris aygula	P	P				
C. gaimard		P				
Epibulus insidiator						
Gomphosus varius	P	P			1	1
Halichoeres hortulanus	1	P				
H. marginatus			P			
H. melanurus		1				
Hemigymnus fasciatus	P	P		P	P	
H. melapterus						
Labrichthys unilineata						P

Table 1a. Continued

	Site 1		Site 2			
	9-m	12-m	3-m	5-m	9-m	12-m
Labroides bicolor	P				P	1
L. dimidiatus						
L. rubrolabiatus	1	P				P
Labropsis xanthonota		P				P
Macropharyngodon meleagris		P				
Pseudocheilinus hexataenia						P
Stethojulis bandanensis		P		P		
S. trilineata						
Thalassoma fuscum			P	P		
T. hardwicki				P	2	
T. lutescens		1			1	2
T. purpureum						
T. quinquevittata	P	1	P	4		
unidentified labrids						
juveniles				3		
LETHRINIDAE						
Gnathodentex aureolineatus	P					
Monotaxis grandoculis						
LUTJANIDAE						
Aphareus furcatus		P			P	
Lutjanus fulvus						
L. monostigma						
Macolor niger						
MONACANTHIDAE						
Amanses scopas						P
Cantherhines dumerili						
C. pardalis						
Oxymonacanthus longirostris						
MUGILOIDIDAE						
Parapercis cephalopunctata				1		
MULLIDAE						
Mulloides flavolineatus						
M. vanicolensis					3	
Parupeneus bifasciatus	P					
P. chryseredros	P			P		
P. pleurostigma						
P. trifasciatus	P	P				
OSTRACIONTIDAE						
Ostracion meleagris				P		
PEMPHERIDAE						
Pempheris oualensis					P	

Table 1a. Continued

	Site 1		Site 2			
	9-m	12-m	3-m	5-m	9-m	12-m
POMACANTHIDAE						
Apolemichthys trimaculatus	P					
Centropyge bispinosus						P
C. flavissimus	P					P
C. loriculus		P				
Pygoplites diacanthus	P	P			3	
POMACENTRIDAE						
Abudefduf saxatilis			P			
A. sexfasciatus						
Amphiprion chrysopterus	P					
A. melanopus						
Chromis acares					P	4
C. agilis						
C. amboinensis						7
C. iomelas	1	P				6
C. margaritifer	1	6				
C. vanderbilti	P					
C. xanthura	P	1			P	P
Chrysiptera cyanea			1	1		
C. leucopomus			6	12		
Dascyllus reticulatus						
D. trimaculatus	P				P	1
Lepidozygus tapeinosoma		P				
Neopomacentrus metallicus						
Plectroglyphidodon dickii	7		1	P		
P. johnstonianus	P	1				1
P. lacrymatus	4			P	13	14
P. leucozona						
Pomacentrus brachialis	11	1	2		7	5
P. vaiuli	4	7			1	4
Pomachromis richardsoni						
Stegastes fasciolatus			3			
S. nigricans				1		
unidentified pomacentrids						
SCARIDAE						
Cetoscarus bicolor		P				
Hipposcarus longiceps				P		
Scarus brevifilis					P	
S. frenatus	P	P		P	P	
S. gibbus	P	P				
S. japanensis						
S. niger	P					
S. oviceps					P	
S. psittacus		P				
S. rubroviolaceus	P					
S. schlegeli				P		
S. spinus		P		P	P	P
S. sordidus	P		P	P	P	P

Table 1a. Continued

	Site 1		Site 2			
	9-m	12-m	3-m	5-m	9-m	12-m
Scarus tricolor					P	P
juveniles	1					
SERRANIDAE						
Anthias pascalus						
Cephalopholis argus					P	
C. urodelus				P		
Epinephelus tauvina						
E. hexagonatus						
V. louti		P				
SIGANIDAE						
Siganus argenteus						
SPHYRAENIDAE						
Sphyraena barracuda	P					
SYNODONTIDAE						
Synodus sp.						
TETRAODONTIDAE						
Arothron nigropunctatus						
ZANCLIDAE						
Zanclus cornutus	P	P		P		
Total No. Species	56	46	17	29	34	34
On-Transect Species	17	11	9	7	16	18
On-Transect Individuals	58	27	30	25	104	98

Table 1b. Fishes censused on the Fagatele Bay transects. Numbers indicate the number of fish counted on the transects; the letter P indicates the presence of species in the immediate vicinity of the transect line.

	Site 3				Site 4			
	3-m	5-m	9-m	12-m	3-m	5-m	9-m	12-m
ACANTHURIDAE								
Acanthurus achilles					P			
A. glaucopareius	P	P	P	1	P	P	P	P
A. guttatus					P			
A. lineatus	P				P	P	P	
A. nigrofuscus		3	9	7	1	P	6	10
A. olivaceus								
A. triostegus	P	P				P		
A. xanthopterus								
Ctenochaetus striatus	6	42	32	21	P	19	14	15
Ctenochaetus sp.				14			P	14
Naso lituratus	P	P	P	P		P	P	
Zebrasoma scopas	3	4	P	2	P	P	2	P
Z. veliferum						P		
juveniles				2			1	
APOGONIDAE								
Cheilodipterus macrodon							1	
AULOSTOMIDAE								
Aulostomus chinensis							1	
BALISTIDAE								
Balistapus undulatus				P			P	
Melichthys niger								
M. vidua		P	P			P		
Rhinecanthus rectangulus								
Sufflamen bursa								
BLENNIIDAE								
Meiacanthus atrodorsalis							P	P
unidentified blenniids	P			P	1	P	P	2
CAESIONIDAE								
Caesio caerulaureus								
C. xanthonotus								P
Pterocaesio chrysozona								
P. tile			P					
CHAETODONTIDAE								
Chaetodon bennetti	P							
C. citrinellus					P			
C. ephippium						P		
C. lunula							P	
C. melannotus		P						
C. ornatissimus		P						
C. quadrimaculatus								

Table 1b. Continued

	Site 3				Site 4			
	3-m	5-m	9-m	12-m	3-m	5-m	9-m	12-m
C. rafflesi		P	P			P		
C. reticulatus	P	P	P		P	P	P	
C. semeion								
C. trifasciatus	2	3						
C. ulietensis		P						
C. unimaculatus								
C. vagabundus		P	P			P		
Forcipiger flavissimus								
F. longirostris								
Hemitaurichthys polylepis								
Heniochus chrysostomus	P							
Megaprotodon trifascialis		P			P			
CIRRHITIDAE								
Paracirrhites arcatus				P	P	2		
P. forsteri	P	2		P		P		P
GOBIIDAE								
Ptereleotris evides								
HAEMULIDAE								
Plectorhynchus orientalis								
HOLOCENTRIDAE								
Myripristis berndti		P					1	
Neoniphon opercularis		P						
N. sammara					P			
Sargocentron diadema								
S. spiniferum								
KYPHOSIDAE								
Kyphosus cinerascens								
LABRIDAE								
Anampses caeruleopunctatus								
A. meleagrides								
A. twisti		P		P		P	P	
Bodianus axillaris								
Cheilinus diagrammus		P			P	P	1	1
C. oxycephalus				P			P	P
Coris aygula								
C. gaimard								
Epibulus insidiator				P				
Gomphosus varius	P	1	1	P	P	1	P	P
Halichoeres hortulanus	P			P				P
H. marginatus								
H. melanurus								
Hemigymnus fasciatus	P	P	P	P	P			P
H. melapterus								
Labrichthys unilineata								

Table 1b. Continued

	Site 3				Site 4			
	3-m	5-m	9-m	12-m	3-m	5-m	9-m	12-m
Labroides bicolor	P			1			P	
L. dimidiatus	1	P			P			P
L. rubrolabiatus		1	1	1		1	P	P
Labropsis xanthonota				P				P
Macropharyngodon meleagris								
Pseudocheilinus hexataenia		P	1	3			1	1
Stethojulis bandanensis								
S. trilineata								
Thalassoma fuscum			P		P			
T. hardwicki	1	P	1	P	1	P	P	1
T. lutescens								P
T. purpureum	P							
T. quinquevittata	2		P		8			
unidentified labrids								P
juveniles	1			P		2		
LETHRINIDAE								
Gnathodentex aureolineatus								
Monotaxis grandoculis								
LUTJANIDAE								
Aphareus furcatus		P	P	P		P	P	P
Lutjanus fulvus		P						
L. monostigma		P						
Macolor niger		P						
MONACANTHIDAE								
Amanses scopas						1		
Cantherhines dumerili								
C. pardalis		P						
Oxymonacanthus longirostris	P							
MUGILOIDIDAE								
Parapercis cephalopunctata					P			
MULLIDAE								
Mulloides flavolineatus								P
M. vanicolensis								
Parupeneus bifasciatus		P				P		
P. chryseredros		P				P		
P. pleurostigma								
P. trifasciatus								P
OSTRACIONTIDAE								
Ostracion meleagris		P						
PEMPHERIDAE								
Pempheris oualensis								

Table 1b. Continued

	Site 3				Site 4			
	3-m	5-m	9-m	12-m	3-m	5-m	9-m	12-m
POMACANTHIDAE								
Apolemichthys trimaculatus								
Centropyge bispinosus								1
C. flavissimus	P	P	P	P				
C. loriculus								
Pygoplites diacanthus							1	P
POMACENTRIDAE								
Abudefduf saxatilis								
A. sexfasciatus								P
Amphiprion chrysopterus								P
A. melanopus		P						
Chromis acares			P	17		P		16
C. agilis								
C. amboinensis				7				4
C. iomelas			P	9				20
C. margaritifer								P
C. vanderbilti								
C. xanthura							P	
Chrysiptera cyanea	3	6			15			
C. leucopomus	P				27			
Dascyllus reticulatus								
D. trimaculatus				1			P	
Lepidozygus tapeinosoma								
Neopomacentrus metallicus								
Plectroglyphidodon dickii	P	1	2		P	P		
P. johnstonianus	P	P	3	1				
P. lacrymatus	2	18	14	14		3	P	8
P. leucozona								
Pomacentrus brachialis			15	11		P	3	3
P. vaiuli	1	2	6	6	P	1	2	10
Pomachromis richardsoni								
Stegastes fasciolatus	3				19			
S. nigricans	7					1		
unidentified pomacentrids			P					
SCARIDAE								
Cetoscarus bicolor								
Hipposcarus longiceps								
Scarus brevifilis								
S. frenatus								
S. gibbus								
S. japanensis							P	
S. niger								
S. oviceps	P	P	P					
S. psittacus								
S. rubroviolaceus								
S. schlegeli								
S. spinus		P	P			P		
S. sordidus	1	P	P	1		P	P	P

Table 1b. Continued

	Site 3				Site 4			
	3-m	5-m	9-m	12-m	3-m	5-m	9-m	12-m
S. tricolor			P			P		P
juveniles		P						
SERRANIDAE								
Anthias pascalus								
Cephalopholis argus			P					
C. urodelus	p		1					1
Epinephelus tauvina							P	
E. hexagonatus							P	
V. louti								P
SIGANIDAE								
Siganus argenteus		P						
SPHYRAENIDAE								
Sphyraena barracuda								
SYNODONTIDAE								
Synodus sp.							1	
TETRAODONTIDAE								
Arothron nigropunctatus								
ZANCLIDAE								
Zanclus cornutus	P							
Total No. Species	35	46	33	34	27	35	36	39
On-Transect Species	13	11	13	18	7	9	13	15
On-Transect Individuals	33	83	87	119	72	31	35	107

Table 1c. Fishes censused on the Fagatele Bay transects. Numbers indicate the number of fish counted on the transects; the letter P indicates the presence of species in the immediate vicinity of the transect line.

	Site 5				Site 6	
	3-m	6-m	9-m	12-m	9-m	12-m
ACANTHURIDAE						
Acanthurus achilles						
A. glaucopareius	19	1	1	P	1	P
A. guttatus						
A. lineatus	6	P			P	
A. nigrofuscus		1	7	2	P	P
A. olivaceus					P	P
A. triostegus						
A. xanthopterus						
Ctenochaetus striatus	15	5	28	16	P	10
Ctenochaetus sp.				4		
Naso lituratus	15	P		P	P	P
Zebrasoma scopas			P	P		
Z. veliferum						
juveniles			P	P		
APOGONIDAE						
Cheilodipterus macrodon						
AULOSTOMIDAE						
Aulostomus chinensis						
BALISTIDAE						
Balistapus undulatus	P		P	P		P
Melichthys niger						
M. vidua				P		P
Rhinecanthus rectangulus		P			P	
Sufflamen bursa				P	P	P
BLENNIIDAE						
Meiacanthus atrodorsalis						
unidentified blenniids		P	2	3		
CAESIONIDAE						
Caesio caerulaureus						
C. xanthonotus						P
Pterocaesio chrysozona				P		
P. tile						
CHAETODONTIDAE						
Chaetodon bennetti						
C. citrinellus					P	P
C. ephippium		P				
C. lunula	P	P			P	
C. melannotus			P			
C. ornatissimus	P	P				
C. quadrimaculatus	P					P

Table 1c. Continued

	Site 5				Site 6	
	3-m	6-m	9-m	12-m	9-m	12-m
C. rafflesi	P					
C. reticulatus	P	P	P	P	1	
C. semeion			P		P	
C. trifasciatus	2					
C. ulietensis				P		
C. unimaculatus						P
C. vagabundus	P					
Forcipiger flavissimus					P	P
F. longirostris						
Hemitaurichthys polylepis						
Heniochus chrysostomus						
Megaprotodon trifascialis						
CIRRHITIDAE						
Paracirrhites arcatus				3	12	3
P. forsteri				P		
GOBIIDAE						
Ptereleotris evides						
HAEMULIDAE						
Plectorhynchus orientalis						
HOLOCENTRIDAE						
Myripristis berndti						
Neoniphon opercularis						
N. sammara						
Sargocentron diadema						
S. spiniferum					P	
KYPHOSIDAE						
Kyphosus cinerascens	P					
LABRIDAE						
Anampses caeruleopunctatus		1				
A. meleagrides						
A. twisti			P	P		
Bodianus axillaris						
Cheilinus diagrammus			P			P
C. oxycephalus			P			
Coris aygula						
C. gaimard						P
Epibulus insidiator						
Gomphosus varius		1	1	P		P
Halichoeres hortulanus	1	1			P	1
H. marginatus	P					
H. melanurus						P
Hemigymnus fasciatus	P	P	P	P	P	
H. melapterus	P	P		P		
Labrichthys unilineata						

Table 1c. Continued

	Site 5				Site 6	
	3-m	6-m	9-m	12-m	9-m	12-m
Labroides bicolor						
L. dimidiatus	P		P	P		
L. rubrolabiatus		1	P			
Labropsis xanthonota				P		P
Macropharyngodon meleagris						1
Pseudocheilinus hexataenia				1		
Stethojulis bandanensis						P
S. trilineata						
Thalassoma fuscum		P			P	
T. hardwicki	1		P			
T. lutescens			1	2	P	
T. purpureum						
T. quinquevittata	4	1			16	5
unidentified labrids juveniles		1		P	9	1
LETHRINIDAE						
Gnathodentex aureolineatus						
Monotaxis grandoculis				P		
LUTJANIDAE						
Aphareus furcatus	P		P		P	
Lutjanus fulvus						
L. monostigma						
Macolor niger				P		
MONACANTHIDAE						
Amanses scopas			P			
Cantherhines dumerili						P
C. pardalis	P		P		P	P
Oxymonacanthus longirostris						
MUGILOIDIDAE						
Parapercis cephalopunctata		2			1	P
MULLIDAE						
Mulloides flavolineatus						
M. vanicolensis						
Parupeneus bifasciatus	P					
P. chryseredros	1					
P. pleurostigma						
P. trifasciatus				P		P
OSTRACIONTIDAE						
Ostracion meleagris			P		P	
PEMPHERIDAE						
Pempheris oualensis		P				

Table 1c. Continued

	Site 5				Site 6	
	3-m	6-m	9-m	12-m	9-m	12-m
POMACANTHIDAE						
Apolemichthys trimaculatus						
Centropyge bispinosus						
C. flavissimus			P	P	P	2
C. loriculus						
Pygoplites diacanthus						
POMACENTRIDAE						
Abudefduf saxatilis		P				
A. sexfasciatus						
Amphiprion chrysopterus						
A. melanopus						
Chromis acares			P	20	13	15
C. agilis						
C. amboinensis						
C. iomelas				2		
C. margaritifer					P	P
C. vanderbilti						
C. xanthura			P	P		
Chrysiptera cyanea	1	1				P
C. leucopomus	3	5			1	1
Dascyllus reticulatus						
D. trimaculatus						
Lepidozygus tapeinosoma						
Neopomacentrus metallicus	30					
Plectroglyphidodon dickii		P	5		2	P
P. johnstonianus			2	P	1	2
P. lacrymatus			8	3		
P. leucozona						
Pomacentrus brachialis						
P. vaiuli			2	7		P
Pomachromis richardsoni						38
Stegastes fasciolatus	2	13	13	6	10	3
S. nigricans						
unidentified pomacentrids			1			
SCARIDAE						
Cetoscarus bicolor						
Hipposcarus longiceps						
Scarus brevifilis						
S. frenatus			P	P	P	
S. gibbus						
S. japanensis						
S. niger						
S. oviceps		P	P			
S. psittacus						
S. rubroviolaceus						P
S. schlegeli						
S. spinus			P	P		
S. sordidus	P	P	P	P	P	2

Table 1c. Continued

	Site 5				Site 6	
	3-m	6-m	9-m	12-m	9-m	12-m
S. tricolor juveniles	P		P	P		
SERRANIDAE						
Anthias pascalus						
Cephalopholis argus			1			
C. urodelus		2	P		P	1
Epinephelus tauvina						
E. hexagonatus						
V. louti						
SIGANIDAE						
Siganus argenteus						
SPHYRAENIDAE						
Sphyraena barracuda						
SYNODONTIDAE						
Synodus sp.						
TETRAODONTIDAE						
Arothron nigropunctatus						
ZANCLIDAE						
Zanclus cornutus	1			P	P	P
Total No. Species	31	30	39	41	36	42
On-Transect Species	15	14	14	12	11	14
On-Transect Individuals	102	36	73	69	67	85

Table 2. Fishes censused along 100-m transects at Fagatele Bay, Sita, and Cape Larsen. Numbers indicate the number of fish counted on the transects; the letter P indicates the presence of species in the immediate vicinity of the transect line.

	Fagatele Bay	Sita	Cape Larsen
ACANTHURIDAE			
Acanthurus achilles		P	
A. glaucopareius	2	4	2
A. guttatus		P	
A. lineatus	4	P	P
A. nigrofuscus	5	25	19
Ctenochaetus striatus	36	35	5
C. strigosus		1	
C. binotatus	17		2
Naso lituratus	3	P	P
Zebrasoma scopas	4	P	
BALISTIDAE			
Balistapus undulatus		P	
Melichthys vidua	P	P	1
Sufflamen bursa	P		P
BLENNIIDAE			
Meiacanthus atrodorsalis	8		P
unidentified blenniids			2
CAESIONIDAE			
Caesio caerulaureus	P		
Pterocaesio chrysozona	P		
P. tile	28		
CHAETODONTIDAE			
Chaetodon citrinellus		2	P
C. lunula		P	P
C. melannotus		P	
C. ornatissimus	P	P	
C. pelewensis		3	
C. reticulatus	1	3	P
C. semeion		P	
C. trifasciatus		1	
C. ulietensis	P		
C. unimaculatus		P	P
C. vagabundus	P		
Forcipiger longirostris	P		
Heniochus varius		P	
Megaprotodon trifascialis		P	
CIRRHITIDAE			
Cirrhitichthys falco			1
Paracirrhites arcatus	3	3	5
P. forsteri	P	1	

Table 2. Continued

	Fagatele Bay	Sita	Cape Larsen
FISTULARIIDAE			
Fistularia commersonii		P	
GOBIIDAE			
Nemateleotris magnifica			1
Ptereleotris evides	P		1
HAEMULIDAE			
Plectorhynchus orientalis		P	1
HOLOCENTRIDAE			
Myripristis berndti			1
Neoniphon sammara		1	
Sargocentron diadema			P
KYPHOSIDAE			
Kyphosus cinerascens	P	P	
LABRIDAE			
Anampses twisti	2		P
Bodianus axillaris	6	P	2
Cheilinus unifasciatus	P		P
Coris gaimard	P		P
Epibulus insidiator	1		
Gomphosus varius	P	P	P
Halichoeres hortulanus	1	3	2
H. margaritaceus			P
Hemigymnus fasciatus	P	P	
Labroides bicolor		P	
L. dimidiatus			2
L. rubrolabiatus	1	1	P
Macropharyngodon meleagris		P	P
Pseudocheilinus hexataenia		2	2
Stethojulis trilineata	P		P
Thalassoma fuscum			P
T. hardwicki	P	1	
T. quinquevittata		P	5
juveniles	2	P	2
LETHRINIDAE			
Monotaxis grandoculis	P	P	
LUTJANIDAE			
Aphareus furcatus	P	P	P
Lutjanus bohar	P		
L. fulvus			
Macolor niger	P		
MONACANTHIDAE			
Amanses scopas	P	P	

Table 2. Continued

	Fagatele Bay	Sita	Cape Larsen
Cantherhines dumerili		P	
MULLIDAE			
Mulloides vanicolensis	P		
Parupeneus bifasciatus		P	P
P. chryseredros		P	
P. pleurostigma	P		
P. trifasciatus		4	P
PEMPHERIDAE			
P. oualensis		1	
POMACANTHIDAE			
Apolemichthys trimaculatus		P	
Centropyge bispinosus	2		
C. flavissimus	1	1	2
C. loriculus	1		
Pygoplites diacanthus	3	2	1
POMACENTRIDAE			
Amphiprion chrysopterus	P		
Chromis acares	45	P	24
C. agilis		2	
C. iomelas	23	3	4
C. margaritifer	6	5	39
C. xanthura	2	12	4
Chrysiptera cyanea		6	14
C. leucopoma			1
Dascyllus reticulatus	P		1
D. trimaculatus	3		
Neopomacentrus metallicus			1
Plectroglyphidodon dickii	4	10	3
P. johnstonianus	2	12	3
P. lacrymatus	12	29	3
Pomacentrus brachialis	15	31	19
P. vaiuli	56	22	19
Pomachromis richardsoni		P	
SCARIDAE			
Scarus brevifilis	1		P
S. frenatus	P	P	P
S. niger	P	P	P
S. psittacus		P	
S. rubroviolaceus		P	P
S. sordidus	1		
S. spinus		P	P
S. tricolor	1	1	P
SERRANIDAE			
Anthias pascalus	P		

Table 2. Continued

	Fagatele Bay	Sita	Cape Larsen
Cephalopholis urodelus		1	P
unidentified serranid		1	
TETRAODONTIDAE			
Arothron meleagris			P
A. nigropunctatus	P		
Canthigaster solandri		2	
ZANCLIDAE			
Zanclus cornutus	1	P	
Total No. Species	70	70	60
On-Transect Species	37	33	32
On-Transect Individuals	307	230	192

Table 3. Comparison of 100-m transect fish counts from 1977-78 to 1988. All numbers and percentage values exclude the surgeonfish Ctenochaetus striatus.

	1977-78	1985	1988
FAGATELE BAY			
total fish (exc. C. striatus)	358 (100%)	259 (100%)	271 (100%)
corallivores	29 (8.1%)	0 (0%)	2 (0.7%)
herbivores (exc. C. striatus)	26 (7.3%)	92 (35.5%)	50 (18.5%)
SITA BAY			
total fish (exc. C. striatus)	533 (100%)	363 (100%)	195 (100%)
corallivores	28 (5.3%)	17 (4.7%)	13 (6.7%)
herbivores (exc. C. striatus)	71 (13.3%)	75 (20.7%)	60 (30.8%)
CAPE LARSEN			
total fish (exc. C. striatus)	477 (100%)	342 (100%)	187 (100%)
corallivores	14 (2.9%)	2 (0.6%)	3 (1.6%)
herbivores (exc. C. striatus)	56 (11.7%)	134 (39.2%)	26 (13.9%)

Table 4a. Fishes censused on transects at various sites around Tutuila island in April 1988. Numbers indicate the number of fish counted on the transects; the letter P indicates the presence of species in the immediate vicinity of the transect line.

	Masefau Inside		Masefau Outside		Aoa Bay		Onenoa Bay	
	3-m	6-m	3-m	6-m	5-m	7-m	4-m	6-m
ACANTHURIDAE								
Acanthurus achilles				P	P			
A. glaucopareius	1	P	P	P	3	1	P	P
A. guttatus							P	P
A. lineatus	P		P	P	P		P	
A. nigricauda								
A. nigrofuscus	2	P	P		1	3	P	4
A. pyroferus								
A. thompsoni	P			P	P	3	P	6
A. triostegus					P			
A. xanthopterus							P	
Ctenochaetus binotatus								
C. striatus	3	11		P		3		P
Naso lituratus	P	P			P		P	P
Zebrasoma scopas	P	5			P			1
Z. veliferum		P						P
juveniles		1				P		
APOGONIDAE								
C. quinquelineata								
AULOSTOMIDAE								
Aulostomus chinensis		P						
BALISTIDAE								
Balistapus undulatus	P				P	P		
Balistoides viridescens								
Melichthys vidua			P	P	P	P		
Rhinecanthus rectangulus				P			P	
Sufflamen bursa								
BLENNIIDAE								
Meiacanthus atrodorsalis		P						P
Plagiotremus tapeinosoma								
unidentified blenniids						P		
CAESIONIDAE								
Caesio xanthonotus	P	P				P		
Pterocaesio chrysozona								
P. tile	P							
CARANGIDAE								
Caranx melampygus								

Table 4a. Continued

	Masefau Inside		Masefau Outside		Aoa Bay		Onenoa Bay	
	3-m	6-m	3-m	6-m	5-m	7-m	4-m	6-m
CHAETODONTIDAE								
Chaetodon auriga								
C. citrinellus					P		P	P
C. ephippium								
C. lunula				P	P			P
C. melannotus								
C. mertensii								
C. ornatissimus				P				
C. pelewensis								
C. quadrimaculatus				P				
C. reticulatus	P	P	P	P	P		P	P
C. semeion				P				
C. trifasciatus			P					
C. ulietensis				P				
C. unimaculatus					P			
C. vagabundus			P	P			P	P
Forcipiger flavissimus				P				
Hemitaurichthys polylepis								
Heniochus acuminatus								
H. monoceros								
H. varius								
Megaprotodon trifascialis							P	
CIRRHITIDAE								
Cirrhitus pinnulatus								
Paracirrhites arcatus	1			6	1	1	P	
P. forsteri			P	P			P	P
P. hemistictus								
GOBIIDAE								
Ptereleotris evides							P	
HAEMULIDAE								
Plectorhynchus orientalis								
HOLOCENTRIDAE								
Neoniphon sammara	P	P						P
Myripristis berndti								
Sargocentron diadema								
KYPHOSIDAE								
Kyphosus cinerascens					P	P	P	
LABRIDAE								
Anampses twisti								
Bodianus axillaris								
Cheilinus unifasciatus		P						
C. fasciatus				P				
Epibulus insidiator		P		P				

Table 4a. Continued

	Masefau Inside		Masefau Outside		Aoa Bay		Onenoa Bay	
	3-m	6-m	3-m	6-m	5-m	7-m	4-m	6-m
Gomphosus varius	P	P	P	P			P	
Halichoeres hortulanus	P			P	P		P	P
H. margaritaceus				P				
H. marginatus	P		2	P	7	1	4	
H. melanurus								
H. prosopeion								
Hemigymnus fasciatus	P							
H. melapterus								
Labroides bicolor			P	P				
L. dimidiatus		P	P		P		1	
L. rubrolabiatus	P	1		P	P	P	P	P
Labropsis xanthonota								P
Macropharyngodon meleagris	P	1	P	P				
Novaculichthys taeniourus								P
Pseudocheilinus hexataenia				1		1		
Stethojulis bandanensis	P		1	P			2	
S. trilineata			P					
Thalassoma fuscum	P							
T. hardwicki	1	P			P		1	P
T. janseni								P
T. lutescens		P						P
T. quinquevittata	P		11	3	4	1	6	2
unidentified labrids		P						
juveniles			P	2	2			1
LETHRINIDAE								
Gnathodentex aureolineatus		1						
Monotaxis grandoculis				P				P
LUTJANIDAE								
Aphareus furcatus								P
Lutjanus bohar				P				
L. fulvus		P	P	P		P		P
L. monostigmus						P		
Macolor niger								
MONACANTHIDAE								
Cantherhines dumerili			P	P				
C. pardalis					P			
Oxymonacanthus longirostris								
MUGILOIDIDAE								
Parapercis cephalopunctata				P				
MULLIDAE								
Mulloides vanicolensis		P						
Parupeneus bifasciatus	P			P	P		P	
P. chryseredros		P						P
P. pleurostigma								P
P. trifasciatus	P	P	P			P	P	

Table 4a. Continued

	Masefau Inside		Masefau Outside		Aoa Bay		Onenoa Bay	
	3-m	6-m	3-m	6-m	5-m	7-m	4-m	6-m
OSTRACIONTIDAE								
Ostracion meleagris							P	
PEMPHERIDAE								
Pempheris oualensis			P	P	P			
POMACANTHIDAE								
Centropyge flavissimus	P	1		P	P			P
Pygoplites diacanthus		P				P		P
POMACENTRIDAE								
Abudefduf saxatilis								
A. septemfasciatus								
A. sexfasciatus	P	P				P		
Amphiprion melanopus								
Chromis acares		P				40		P
C. agilis								
C. iomelas		P				1		P
C. margaritifer	P			3	1	6	P	1
C. vanderbilti								
C. xanthura		P				P		P
Chrysiptera biocellata								
C. cyanea			P	P	P	1	9	3
C. leucopoma	P		7	6	P		5	
Dascyllus trimaculatus								
Neopomacentrus metallicus					P			
Plectroglyphidodon dickii	1	1	2	P	P	P	1	P
P. johnstonianus				3	1	1		1
P. lacrymatus	27	25			2	3	P	2
P. leucozonus								
Pomacentrus brachialis	19	11		2		7		3
P. vaiuli	1	3		P		3	P	8
Pomachromis richardsoni								
Stegastes albifasciatus								
S. fasciolatus	P		22	30	12		16	1
S. nigricans								
unidentified pomacentrids								
SCARIDAE								
Cetoscarus bicolor				P				
Scarus frenatus								P
S. gibbus								
S. globiceps		P						
S. niger						P		P
S. oviceps		P		P				
S. psittacus								
S. rubroviolaceus				P				P
S. sordidus		P		P	P		P	P
S. spinus				P				
S. tricolor	P		P	P				P

Table 4a. Continued

	Masefau Inside		Masefau Outside		Aoa Bay		Onenoa Bay	
	3-m	6-m	3-m	6-m	5-m	7-m	4-m	6-m
unidentified scarids juveniles		P		P				
SCORPAENIDAE								
Pterois volitans								
SERRANIDAE								
Anyperodon leucogrammicus								
Cephalopholis argus		P	P			P		
C. urodelus				P	P	2		P
SYNGNATHIDAE								
unidentified syngnathids								
TETRAODONTIDAE								
Arothron nigropunctatus								
Canthigaster solandri	P						1	
C. valentini								
ZANCLIDAE								
Zanclus cornutus				P	P			
Total No. Species	36	41	27	55	38	33	36	48
On-Transect Species	9	11	6	9	10	17	11	12
On-Transect Individuals	56	61	45	56	34	78	46	33

Table 4b. Fishes censused on transects at various sites around Tutuila island in April 1988. Numbers indicate the number of fish counted on the transects; the letter P indicates the presence of species in the immediate vicinity of the transect line.

	Aunuu Island	Matuli Point		Fagasa Bay		Cape Larsen	
	7-m	3-m	6-m	3-m	6-m	4-m	7-m
ACANTHURIDAE							
Acanthurus achilles	P			P	P		
A. glaucopareius	4	P	P		P	P	P
A. guttatus						P	
A. lineatus	P	P	P	1	P	1	
A. nigricauda			P				
A. nigrofuscus	3	P			6	P	9
A. pyroferus							
A. thompsoni	P					P	
A. triostegus				P		P	
A. xanthopterus							
Ctenochaetus binotatus			P				
C. striatus	7	P	2	P	4		2
Naso lituratus	P		P		P		P
Zebrasoma scopas			P				
Z. veliferum							
juveniles			P				
APOGONIDAE							
C. quinquelineata							
AULOSTOMIDAE							
Aulostomus chinensis							
BALISTIDAE							
Balistapus undulatus	P		P				
Balistoides viridescens							
Melichthys vidua	P			P		1	
Rhinecanthus rectangulus						P	
Sufflamen bursa						P	P
BLENNIIDAE							
Meiacanthus atrodorsalis							
Plagiotremus tapeinosoma							
unidentified blenniids			2		P		2
CAESIONIDAE							
Caesio xanthonotus	P						
Pterocaesio chrysozona	P						
P. tile							
CARANGIDAE							
Caranx melampygus						1	

Table 4b. Continued

	Aunuu Island	Matuli Point		Fagasa Bay		Cape Larsen	
	7-m	3-m	6-m	3-m	6-m	4-m	7-m
CHAETODONTIDAE							
Chaetodon auriga							
C. citrinellus				P		2	
C. ephippium							
C. lunula					P		
C. melannotus							
C. mertensii							
C. ornatissimus							
C. pelewensis							
C. quadrimaculatus						P	
C. reticulatus	P		P	P	P		2
C. semeion			P				
C. trifasciatus			P				
C. ulietensis							
C. unimaculatus							P
C. vagabundus						P	
Forcipiger flavissimus							P
Hemitaurichthys polylepis	P						
Heniochus acuminatus							
H. monoceros							
H. varius							
Megaprotodon trifascialis		P					
CIRRHITIDAE							
Cirrhitus pinnulatus							
Paracirrhites arcatus	P			2	2	P	2
P. forsteri			1		P		
P. hemistictus	P						
GOBIIDAE							
Ptereleotris evides			P				
HAEMULIDAE							
Plectorhynchus orientalis							
HOLOCENTRIDAE							
Neoniphon sammara							
Myripristis berndti							P
Sargocentron spinifer							1
KYPHOSIDAE							
Kyphosus cinerascens						P	
LABRIDAE							
Anampses twisti							
Bodianus axillaris							
Cheilinus unifasciatus	P						
C. fasciatus							
Epibulus insidiator							

Table 4b. Continued

	Aunuu Island	Matuli Point		Fagasa Bay		Cape Larsen	
	7-m	3-m	6-m	3-m	6-m	4-m	7-m
Gomphosus varius	P	1	2	P	P		P
Halichoeres hortulanus	P			P	1		1
H. margaritaceus						P	
H. marginatus		3	1	1	1		
H. melanurus							
H. prosopeion							
Hemigymnus fasciatus	P		P	P			
H. melapterus							
Labroides bicolor			P				
L. dimidiatus	P	P	2	P		P	
L. rubrolabiatus	2						1
Labropsis xanthonota							
Macropharyngodon meleagris					P		
Novaculichthys taeniourus					P		
Pseudocheilinus hexataenia							
Stethojulis bandanensis				P			
S. trilineata		1	P				
Thalassoma fuscum							P
T. hardwicki		P	P		P		
T. janseni							
T. lutescens	1						
T. quinquevittata	1	2	1	5		1	P
unidentified labrids	P						
juveniles	1	2	P		1	1	
LETHRINIDAE							
Gnathodentex aureolineatus							
Monotaxis grandoculis							
LUTJANIDAE							
Aphareus furcatus	P						
Lutjanus bohar							
L. fulvus					P		
L. monostigmus							
Macolor niger							
MONACANTHIDAE							
Cantherhines dumerili							P
C. pardalis	P	P					
Oxymonacanthus longirostris							
MUGILOIDIDAE							
Parapercis cephalopunctata							
MULLIDAE							
Mulloides vanicolensis							
Parupeneus bifasciatus				P			1
P. chryseredros			P	P		P	
P. pleurostigma							
P. trifasciatus			P		P	P	P

Table 4b. Continued

	Aunuu Island	Matuli Point		Fagasa Bay		Cape Larsen	
	7-m	3-m	6-m	3-m	6-m	4-m	7-m
Gomphosus varius	P	1	2	P	P		P
Halichoeres hortulanus	P			P	1		1
H. margaritaceus						P	
H. marginatus		3	1	1	1		
H. melanurus							
H. prosopeion							
Hemigymnus fasciatus	P		P	P			
H. melapterus							
Labroides bicolor			P				
L. dimidiatus	P	P	2	P		P	
L. rubrolabiatus	2						1
Labropsis xanthonota							
Macropharyngodon meleagris					P		
Novaculichthys taeniourus					P		
Pseudocheilinus hexataenia							
Stethojulis bandanensis				P			
S. trilineata		1	P				
Thalassoma fuscum							P
T. hardwicki		P	P		P		
T. janseni							
T. lutescens	1						
T. quinquevittata	1	2	1	5		1	P
unidentified labrids	P						
juveniles	1	2	P		1	1	
LETHRINIDAE							
Gnathodentex aureolineatus							
Monotaxis grandoculis							
LUTJANIDAE							
Aphareus furcatus	P						
Lutjanus bohar							
L. fulvus					P		
L. monostigmus							
Macolor niger							
MONACANTHIDAE							
Cantherhines dumerili							P
C. pardalis	P	P					
Oxymonacanthus longirostris							
MUGILOIDIDAE							
Parapercis cephalopunctata							
MULLIDAE							
Mulloides vanicolensis							
Parupeneus bifasciatus				P			1
P. chryseredros			P	P		P	
P. pleurostigma							
P. trifasciatus			P		P	P	P

Table 4b. Continued

	Aunuu Island	Matuli Point		Fagasa Bay		Cape Larsen	
	7-m	3-m	6-m	3-m	6-m	4-m	7-m
OSTRACIONTIDAE							
Ostracion meleagris							
PEMPHERIDAE							
Pempheris oualensis					P		P
POMACANTHIDAE							
Centropyge flavissimus	P		P				P
Pygoplites diacanthus	P		P				
POMACENTRIDAE							
Abudefduf saxatilis							
A. septemfasciatus				P			
A. sexfasciatus							
Amphiprion melanopus							
Chromis acares	5						1
C. agilis	P						
C. iomelas	P						
C. margaritifer	2						P
C. vanderbilti							
C. xanthura	P		P	P			P
Chrysiptera biocellata							
C. cyanea			P	1	20	2	3
C. leucopoma		3		P		18	
Dascyllus trimaculatus	P						
Neopomacentrus metallicus				P			P
Plectroglyphidodon dickii	P	1	5	7	7	P	3
P. johnstonianus	1				P		2
P. lacrymatus	3		3		1		2
P. leucozonus						2	
Pomacentrus brachialis	P		4				4
P. vaiuli			1		P		7
Pomachromis richardsoni							
Stegastes albifasciatus							
S. fasciolatus	P	23		13	8	1	5
S. nigricans	1		2				
unidentified pomacentrids							
SCARIDAE							
Cetoscarus bicolor							
Scarus frenatus	P						
S. gibbus	P						
S. globiceps							
S. niger							
S. oviceps		P	P				
S. psittacus							
S. rubroviolaceus					P		
S. sordidus	2	P	P				
S. spinus							
S. tricolor			P		P	P	

Table 4b. Continued

	Aunuu Island	Matuli Point		Fagasa Bay		Cape Larsen	
	7-m	3-m	6-m	3-m	6-m	4-m	7-m
unidentified scarids juveniles			1				
SCORPAENIDAE							
Pterois volitans							
SERRANIDAE							
Anyperodon leucogrammicus	P						
Cephalopholis argus	1						P
C. urodelus	1				P		P
SYNGNATHIDAE							
unidentified syngnathids							
TETRAODONTIDAE							
Arothron nigropunctatus							
Canthigaster solandri					P		
C. valentini							
ZANCLIDAE							
Zanclus cornutus			P				
Total No. Species	47	18	40	24	31	27	35
On-Transect Species	15	8	13	7	10	10	18
On-Transect Individuals	35	36	27	30	51	30	54

Table 4c. Fishes censused on transects at various sites around Tutuila island in April 1988. Numbers indicate the number of fish counted on the transects; the letter P indicates the presence of species in the immediate vicinity of the transect line.

	Fagafue Bay		Massacre Bay		Rainmaker Hotel		Fatu Rock	
	3-m	6-m	3-m	6-m	3-m	6-m	3-m	6-m
ACANTHURIDAE								
Acanthurus achilles								P
A. glaucopareius	P	P	1	P				P
A. guttatus			P	P			P	P
A. lineatus	P	P	P	P	P	P	1	P
A. nigricauda								
A. nigrofuscus		1	P	2	8	13		P
A. pyroferus						P		
A. thompsoni								
A. triostegus					P		P	
A. xanthopterus						P	P	P
Ctenochaetus binotatus								
C. striatus	P	4	3	5	1			3
Naso lituratus				P			P	
Zebrasoma scopas					P	P		P
Z. veliferum								
juveniles		P						
APOGONIDAE								
C. quinquelineata						1		
AULOSTOMIDAE								
Aulostomus chinensis					1			
BALISTIDAE								
Balistapus undulatus				P		P		P
Balistoides viridescens						P		
Melichthys vidua		P	P	P				
Rhinecanthus aculeatus						P	P	
Sufflamen bursa								
BLENNIIDAE								
Meiacanthus atrodorsalis		1			2	6		
Plagiotremus tapeinosoma		P						
unidentified blenniids	P		P					
CAESIONIDAE								
Caesio xanthonotus		P						
Pterocaesio chrysozona								
P. tile								
CARANGIDAE								
Caranx melampygus				P				

Table 4c. Continued

	Fagafue Bay		Massacre Bay		Rainmaker Hotel		Fatu Rock	
	3-m	6-m	3-m	6-m	3-m	6-m	3-m	6-m
CHAETODONTIDAE								
Chaetodon auriga				P				
C. citrinellus					P	5		
C. ephippium				P				P
C. lunula								
C. melannotus				P				
C. mertensii						2		
C. ornatissimus		P		P		P		
C. pelewensis		P			1	5		
C. quadrimaculatus								
C. reticulatus		P	1	2	P		P	3
C. semeion				P				
C. trifasciatus				P		P		
C. ulietensis								
C. unimaculatus					1			
C. vagabundus				P		2		P
Forcipiger flavissimus								P
Hemitaurichthys polylepis								
Heniochus acuminatus					1			
H. monoceros						P		
H. varius		P			1			
Megaprotodon trifascialis				P				
CIRRHITIDAE								
Cirrhitus pinnulatus							P	
Paracirrhites arcatus	3	2		1				1
P. forsteri		P	P	1			P	
P. hemistictus								
GOBIIDAE								
Ptereleotris evides						P		
HAEMULIDAE								
Plectorhynchus orientalis	P							
HOLOCENTRIDAE								
Neoniphon sammara			1	1				
Myripristis berndti								
Sargocentron diadema			1					
KYPHOSIDAE								
Kyphosus cinerascens		P			P			
LABRIDAE								
Anampses twisti		P						
Bodianus axillaris				1				
Cheilinus unifasciatus								
C. fasciatus								
Epibulus insidiator					1			

Table 4c. Continued

	Fagafue Bay		Massacre Bay		Rainmaker Hotel		Fatu Rock	
	3-m	6-m	3-m	6-m	3-m	6-m	3-m	6-m
Gomphosus varius	2	1	P	1			P	P
Halichoeres hortulanus	P	3		P	P			P
H. margaritaceus								
H. marginatus	P		P	P	2	P	1	
H. melanurus					6	5		
H. prosopeion						P		
Hemigymnus fasciatus								
H. melapterus					P	P		
Labroides bicolor	1	1		1				P
L. dimidiatus		1	P		P	P		P
L. rubrolabiatus	1	P	P	P				
Labropsis xanthonota								
Macropharyngodon meleagris				P				
Novaculichthys taeniourus								
Pseudocheilinus hexataenia				1				
Stethojulis bandanensis							P	
S. trilineata						P		
Thalassoma fuscum			P				P	
T. hardwicki	P	P	P	P	P	P		
T. janseni								
T. lutescens							P	P
T. quinquevittata	1	1	2		1		2	1
unidentified labrids		P						
juveniles	1	1	1		4	20	7	1
LETHRINIDAE								
Gnathodentex aureolineatus								
Monotaxis grandoculis						P		P
LUTJANIDAE								
Aphareus furcatus								
Lutjanus bohar								
L. fulvus					P	P	P	P
L. monostigmus								
Macolor niger								P
MONACANTHIDAE								
Cantherhines dumerili			P					
C. pardalis							P	P
Oxymonacanthus longirostris			P	2				
MUGILOIDIDAE								
Parapercis cephalopunctata								
MULLIDAE								
Mulloides flavolineatus	P							
M. vanicolensis		P						
Parupeneus bifasciatus	P						P	
P. chryseredros	P	P		P	P		P	
P. trifasciatus		P		P	1	1		

Table 4c. Continued

	Fagafue Bay		Massacre Bay		Rainmaker Hotel		Fatu Rock	
	3-m	6-m	3-m	6-m	3-m	6-m	3-m	6-m
OSTRACIONTIDAE								
Ostracion meleagris			P				P	
PEMPHERIDAE								
Pempheris oualensis					P	P		P
POMACANTHIDAE								
Centropyge flavissimus	P		1		P	1	P	2
Pygoplites diacanthus		P		1				P
POMACENTRIDAE								
Abudefduf saxatilis							P	P
A. septemfasciatus								
A. sexfasciatus					P	P		
Amphiprion melanopus					P			
Chromis acares		1	P	1			P	
C. agilis								
C. iomelas		P		P				
C. margaritifer		4		3				1
C. vanderbilti			3					
C. xanthura		P		P				P
Chrysiptera biocellata							3	
C. cyanea	P	7	P		22	13		P
C. leucopoma					P		18	
Dascyllus trimaculatus					P	3		
Neopomacentrus metallicus	3	P		45				
Plectroglyphidodon dickii	14	2	22	12	P		1	14
P. johnstonianus	1	10	3	5				1
P. lacrymatus	1	11		3	P	1		P
P. leucozonus							1	
Pomacentrus brachialis	3	13	P	9	6	3		4
P. vaiuli	P	4		2	4	15		
Pomachromis richardsoni		P	1					
Stegastes albifasciatus					1			
S. fasciolatus	2				P		22	
S. nigricans	10				24	9		
unidentified pomacentrids						P	2	
SCARIDAE								
Cetoscarus bicolor								
Scarus frenatus								
S. gibbus								
S. globiceps								
S. niger								
S. oviceps								
S. psittacus				P				
S. rubroviolaceus								
S. sordidus							P	
S. spinus								
S. tricolor				P				

Table 4c. Continued

	Fagafue Bay		Massacre Bay		Rainmaker Hotel		Fatu Rock	
	3-m	6-m	3-m	6-m	3-m	6-m	3-m	6-m
unidentified scarids juveniles		P			P			P
SCORPAENIDAE								
Pterois volitans					P			
SERRANIDAE								
Anyperodon leucogrammicus								
Cephalopholis argus	P							
C. urodelus	1	3					P	
SYNGNATHIDAE								
unidentified syngnathids					2			
TETRAODONTIDAE								
Arothron nigropunctatus					1			
Canthigaster solandri					3	P		
C. valentini					1	P		
ZANCLIDAE								
Zanclus cornutus				P	P	P	P	P
Total No. Species	29	44	30	47	47	42	33	38
On-Transect Species	14	19	12	20	23	17	10	10
On-Transect Individuals	44	71	40	99	95	105	58	31

Table 5. Fish abundance (no. per 60 m^2) at various sites around Tutuila. Protected sites are listed in leftmost column; exposed sites listed in rightmost column. Shallow transects are at depths of 3 to 5 m; deep transects are at 6 to 7 m.

Protected		Exposed		
Shallow	Deep	Shallow	Deep	
Masefau Inside	56	61	45	56	Masefau Outside
Aoa Bay	34	78	46	33	Onenoa Bay
Aunuu Island		35	36	27	Matuli Point
Fagasa Bay	30	51	30	54	Cape Larsen
Fagafue Bay	44	71	40	99	Massacre Bay
Rainmaker	95	105	58	31	Fatu Rock
Means	51.8	66.8	42.5	50.0	

Mean Protected Sites: 59.3 Mean Exposed Sites: 46.25

Mean Shallow Transects: 47.15 Mean Deep Transects: 58.4

Table 6. Fish species richness at various sites around Tutuila. Protected sites are listed in leftmost column; exposed sites listed in rightmost column. Shallow transects are at depths of 3 to 5 m; deep transects are at 6 to 7 m.

	Protected		Exposed		
	Shallow	Deep	Shallow	Deep	
Masefau Inside	36	41	27	55	Masefau Outside
Aoa Bay	38	33	36	48	Onenoa Bay
Aunuu Island		47	18	40	Matuli Point
Fagasa Bay	24	31	27	35	Cape Larsen
Fagafue Bay	29	44	30	47	Massacre Bay
Rainmaker	47	42	33	38	Fatu Rock
Means	34.8	39.7	28.5	43.8	

Mean Protected Sites: 37.25 Mean Exposed Sites: 36.15

Mean Shallow Transects: 31.65 Mean Deep Transects: 41.75