MEMO

From	Director of Agriculture, Fisheries and Conservation	To	Director of Environmental Protection
Ref.	in AF EA 034/06	(Attn.	Mable CHAN)
Tel No.	2150 6891	Your Ref.	(9) in EP2/H16/O/05 Pt.5
Fax No.	2377 4427	dated	28.6.07 Fax No. 2591 0558
Date	18 July 2007	Total Pages	1

Repositioning and Long Term Operation Plan of Ocean Park
Environmental Permit No. EP-249/2006A

Baseline Coral Survey

I refer to your memo of 28 June 2007 concerning the Baseline Coral Survey of the above project and we have the following comments:-

Paragraph 5.1.3, line 6, page 20
Table 4.4 should be Table 5.1. Please check and amend.

Table 4.4.f, page 19
Please advise why 2 coral species are tagged (as marked as F08) in Control Site C.

(Dr. Khaki CHAN)
for Director of Agriculture, Fisheries and Conservation

Dragages-Bouygues JV 寶嘉–布依格聯營	Ocean Park Master Redevelopment Project Contract No. CI05 – Site Formation, Funicular Tunnel and Miscellaneous Works	Submission Review Record

Contractor's Submission Reference No. OPE/DBJV/CSF/20085/A – Project Baseline Coral Survey						For MCAL Use		
Item No	**Review By**	**Document / Drawing Reference**	**Reply Code**	**PMR's Comments**	**DBJV's Response**	**Action**	**Action Date**	**Closed Date**
1	AFCD	Para 5.1.3 line 6, page 20		Table 4.4 should be Table 5.1. Please check and amend.	Noticed and amended. Thanks for the correction.			
2	AFCD	Table 4.4f, page 19		Please advise why 2 coral species are tagged (as marked as F08) in Control Site C.	The F08 colony was found to be suitable as monitoring colony in terms of size and condition. It is composed of two species growing together. Data of the two species were collected separately. For clarity, the two species will be reported (as F08a and F08b) and analyzed independently in the subsequent monitoring reports.			

Reply Code: A- Comment must be incorporated into a resubmission. B - Comment to be noted and implemented but does not require resubmission.
C – PMR preferred solution, to be incorporated if possible. D - For information only. E - New requirement to be incorporated - variation may be required.

Ocean Park Master Redevelopment Project

Contract No. CI 05

EP-249/2006/A – Condition 3.3, Baseline Coral Survey Report (Rev. A)

Submitted by DBJV on 1-Jun-07

Certified by _____ **on** 3-Jun-07
Terence Kong
Project Environmental Team Leader

Verified by Independent Environmental Checker **on** 4-Jun -07
IEC Certificate attached in the submission? Yes

Submitted to Ocean Park on 15-Jun-07

MAUNSELL | AECOM

Ocean Park Master Redevelopment Project

Environmental Permit No. EP-249/2006/A - Condition 3.3

Baseline Coral Survey Report

Submitted by Dragages-Bouygues JV on 01-06-2007

This is to verify that

Baseline Coral Survey Report

Submitted by Dragages-Bouygues JV

On 01-06-2007

Has been verified by the undersigned.

Signed

Dr Anne F Kerr
Independent Environmental Checker (IEC)
Retained by Ocean Park Corporation
pursuant to Environmental Permit No. EP-249/2006/A

Date 4 June 2007

OCEAN PARK CORPORATION MASTER REDEVELOPMENT PROJECT

CONTRACT NO. CI05

SITE FORMATION, FUNICULAR TUNNEL AND MISCELLANEOUS WORKS

CORAL SURVEY – BASELINE REPORT

CLIENT:

Dragages-Bouygues Joint Venture

Ocean Park
Aberdeen
Hong Kong

CHECKED BY:

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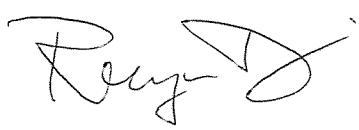


Raymond Dai
Project Manager

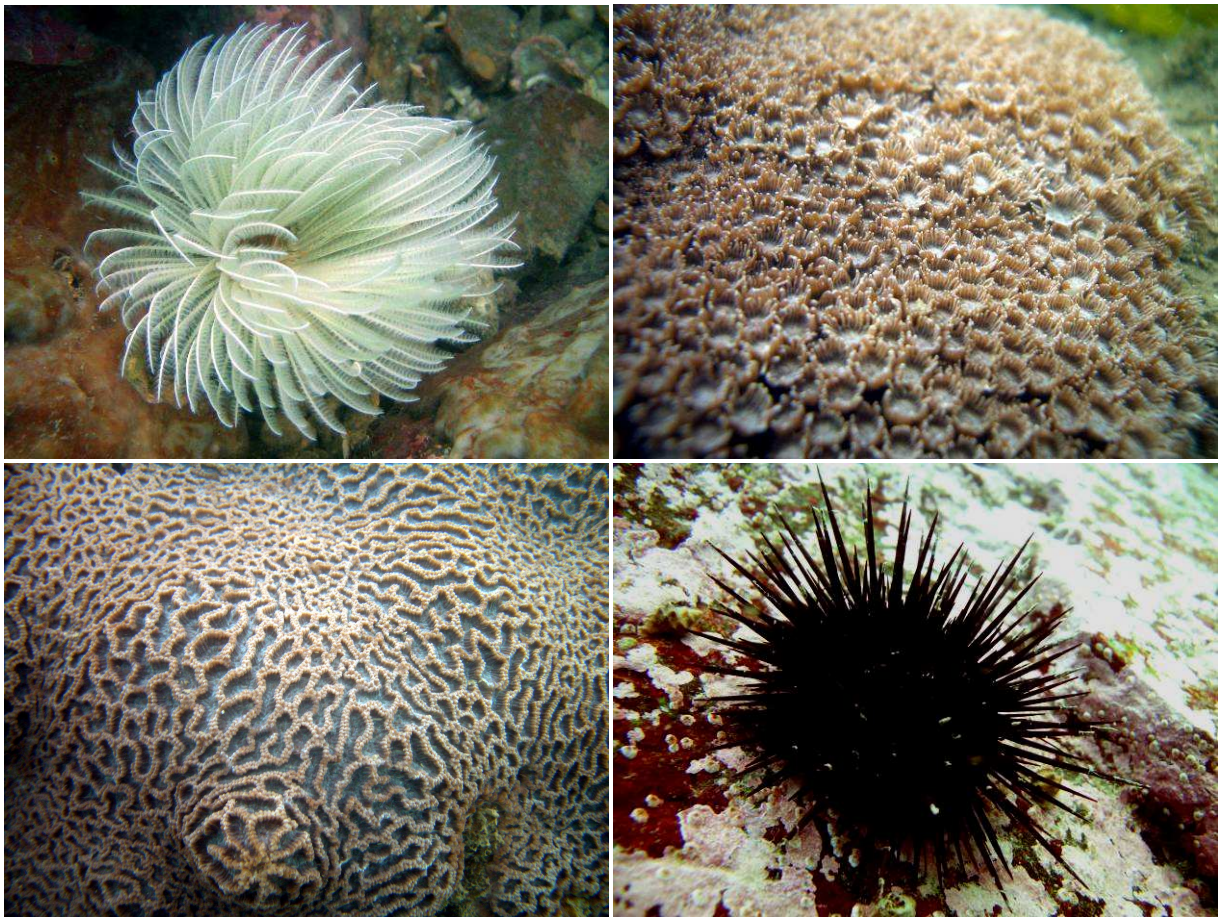
DATE:

1 Jun 2007

Ocean Park Corporation Master Redevelopment Project

Contract No. C105

Site Formation, Funicular Tunnel and Miscellaneous Works



Report for

Initial Coral Survey and Coral Tagging Exercise

27 April 2007

miniprojects co. Ltd.

Ocean Park Corporation Master Redevelopment Project

Contract No. C105

Site Formation, Funicular Tunnel and Miscellaneous Works

Report for

Initial Coral Survey and Coral Tagging Exercise

27 April 2007

Prepared by:

miniprojects co. Ltd.

Lam Laboratories Limited

Contents

1 INTRODUCTION

1.1 Project Background

1.1.1 Ocean Park planned to upgrade and expand the existing area to meet the anticipated visitor demands and to position Ocean Park as a premium tourist attraction and a regional leader in the themed recreational and educational park experience.

1.1.2 Lam Laboratories Limited (LAM) has been appointed to formulate a Coral Survey Team to conduct the Marine Ecology Survey for Ocean Park Corporation Master Redevelopment Project Contract No. C105 – Site Formation, Funicular Tunnel and Miscellaneous Works.

1.1.3 miniprojects Company Limited (miniprojects co. Ltd.) have been commissioned by LAM to undertake coral surveys and tagged coral monitoring at five monitoring sites around the construction site and one control site for captioned project. This report presents the results of the initial coral surveys conducted in April 2007.

1.1.4 Monitoring surveys of the coral community for the marine ecological EM&A were required in accordance with the EM&A manual. Monitoring requirement for initial coral survey and coral tagging exercise are presented in Appendix I.

1.1.5 This report presents the findings of,

- Initial coral survey at six sites (five monitoring and one control)
- Tagging of hard coral colonies at the six sites for monitoring during the construction works

1.1.6 As background to this initial survey, a brief review of previous subtidal survey findings has been included and is presented in Section 2 of this report. The report then goes on to describe the survey methodology (Section 3) and results (Section 4) for both the initial survey and tagged coral study at the six sites.

2 PREVIOUS SURVEY FINDINGS

2.1 Repositioning and Long Term Operation Plan of Ocean Park – Environmental Impact Assessment Study – Maunsell Consultant Asia Ltd.

2.1.1 The only available previous information on coral community around the construction area is from the dive survey conducted in 2005 for the EIA Ocean Park development.

2.1.2 The five survey sites in the 2005 report correspond to Sites 1 to 5 of the present survey. Data were collected using the semi-quantitative Rapid Ecological Assessment (REA) method that provided general information on the biological and ecological attributes of the study areas. The existing data are summarized in Table 2.1.

Table 2.1 Summary of Site Description for the 5 Coral Survey Sites in 2005 Survey.

		Site 1	Site 2	Site 3	Site 4	Site 5
Shallow	**Substrate Type**	Large boulder	Continuous pavement	Continuous pavement	Continuous pavement	Artificial Seawall
	Hard Coral Cover (%)	10	5	5	1	1
	Soft Coral Cover (%)	0	0	1	1	0
Middle	**Substrate Type**	Small blocks & sand	Sand	Large boulder & small block	Continuous pavement	Large boulder
	Hard Coral Cover (%)	5	1	1	1	0
	Soft Coral Cover (%)	0	0	5	3	0
Deep	**Substrate Type**	Sand	Sand	Sand & large boulder	Large boulder	Sand
	Hard Coral Cover (%)	0	0	0	1	0
	Soft Coral Cover (%)	0	0	3	3	1
Number of Hard Coral Species		16	13	8	7	1
Number of Soft Coral Taxa		0	0	9	7	1

2.1.3 In the 2005 survey, the shallow zone at Sites 1 and 2 had the highest total species (including hard and soft coral and other benthic organisms) recorded, 17 and 18, respectively. The lowest total species was recorded from the deep zone of Site 2 with only one taxon observed. The highest diversity was recorded from the shallow zone of Sites 1 and 2. Furthermore, Site 5 had a low diversity and species richness from all zones, i.e., shallow, middle and deep. The highest hard coral cover was recorded at Site 1 and was estimated at 10% in the shallow zone. Soft coral cover was highest for the middle zone at Site 3 and was estimated at 5%.

3 METHODOLOGY

3.1 Initial Coral Survey

3.1.1 Initial coral survey was conducted at the five monitoring sites (Sites 1, 2, 3, 4 and 5) and one control site (Control Site C) from 5th to 12th April 2007.

3.1.2 The purpose of initial coral survey is to verify the status of coral community in the 6 sites in terms of species composition, abundance, cover and healthiness before the commencement of the construction. Baseline data collected in this survey serve as reference materials for post-construction survey to evaluate the possible impact of the construction on the marine environment. Quantitative data on substrate characteristics and coral community status were collected using random transect (line and bell) method.

3.1.3 At each site, 3 x 30 m transects were laid randomly and parallel to the coastline at the depth between 3 and 9 m where corals are commonly located. Locations of the starting and ending points of each transect were recorded by GPS (GPSmap 60CS, Garmin).

3.1.4 General physical parameters were recorded for each survey site, including substrate characteristics, visibility, weather, tidal conditions and water current. Common benthic flora and fauna were also described.

3.1.5 Quantitative data on the substrate type were examined along the transect lines. The substrate and sessile organisms were classified into 12 categories; type of substrate was recorded at 0.5 m intervals on each transect. Percentage cover of each category was computed for each survey site. The 12 substrate types are listed as below,

- Bare rock
- Sand and shell debris
- Silt
- Sponge
- Macroalgae
- Encrusting algae
- Coralline algae
- Bryozoan
- Barnacles
- Hard coral
- Soft coral
- Sea anemone

3.1.6 Quantitative data on coral community were inspected by belt transect method. A belt transect of 2 m wide, i.e. 1 m on either side of the transect line, was surveyed for any coral colony exist within the swath. Each coral colony was identified to species level, the colony size, the percentage area of sedimentation on colony surface, the percentage area of bleaching and recent mortality were recorded. Photographs were taken for representative colonies.

3.1.7 Abundance (number of colonies), number of species (S), and Shannon-Weiner diversity (H') (Shannon and Weaver 1963) were computed for each survey site. Multivariate analyses were performed to determine spatial variations in the substrate composition (relative % of 12 substrate types from 6 sites, n = 3 transects for each site). All multivariate analyses were based on Bray-Curtis dissimilarity matrices calculated from non-transformed data. To visualize multivariate patterns, non-metric multi-dimensional scaling (nMDS) ordination was performed using PRIMER 6 (Clarke and Gorley 2006). Analysis of Similarity (ANOSIM) was used to test the significance of the spatial patterns shown in the nMDS ordination. Similarity percentage (SIMPER) procedure in PRIMER was used to identify the substrate types or coral species, which contributed to the observed patterns.

3.2 Coral Tagging Exercise

3.2.1 At each site, at least 10 hard coral colonies were identified to species level (if possible) and tagged for impact monitoring during the construction works. Corals were tagged giving priority to the largest, undamaged colonies since damage to these colonies would be more evident compared to smaller colonies or corals with existing damage. Corals were also selected for tagging based on the most suitable coral species and growth forms. As far as possible, tagging of hard coral species with tall polyps were avoided due to their higher tolerance of sedimentation.

3.2.2 The selected colonies were tagged using two-level marking,

- A numbered stone, painted in bright yellow, was placed next to each tagged colony,
- A numbered plastic tag was nailed into an adjacent piece of hard substrate.

3.2.3 For each tagged coral, specific detailed information was collected including species identification, size, growth form, depth and general condition for immediate surroundings. The health status of each tagged coral colony was carefully recorded, including information on existing surface area with partial mortality and bleached area. Sediment cover was recorded including percentage cover, texture and approximate thickness of sediment on the colony. Any contiguous patches of sediment cover >10% should be counted. The condition of each tagged coral colony was recorded by taking a photograph from an angle and distance that best represents the entire colony.

4 RESULTS

4.1 Initial Coral Survey

4.1.1 Geographic location of each transect in each survey site was recorded by GPS (Table 4.1) and illustrated in Fig. 4.1. Physical parameters at each site, including depth of transects, level of sedimentation on rock surface, visibility, tidal condition and water current are recorded and summarized in Table 4.1.

4.1.2 Percentage cover of the 12 substrate types was computed and illustrated in Figs. 4.2a-c. Summary of physical environment and coral cover was shown in Table 4.2.

4.1.3 Recorded of individual coral colonies, area of sediment, bleaching and mortality for each transect of the 6 survey sites are presented in Appendix II. Summary of coral community for each site is shown in Table 4.2, and record of hard coral species is listed in Table 4.3.

4.1.4 Among the 5 monitoring sites, the subtidal environment showed different level of variation in physical and biological characteristics. Sites 1 and 2, located at east coast of Nam Long Shan, are relatively sheltered, with gentler slope and mainly covered with boulders and rubbles. Higher abundance of hard corals was observed and colonies mainly reside on the boulder surfaces. Sites 3 and 4 at the south coast are more exposed to wave action and tidal current from the East Lamma Channel. The substrate profile is steeper and composed mainly of bedrock. Lower abundance of corals was found, encrusted on the bedrock surface. Site 5 was a sheltered bay at the west coast, but the site is affected by relatively potent tidal current. Hard corals were scarcely observed on boulder surfaces. The Control Site C was situated in St. Stephen's Beach where is a sheltered bay covered mainly by boulders, sand, high abundance and diversity of hard corals.

4.1.5 The substrate compositions at Site 1, Site 2 and Control Site C were clearly separated from the other sites in nMDS ordinations, in which the groups with shorter distance are more similar (Fig. 4.3). These site differences were confirmed by ANOSIM ($R = 0.885$, $p < 0.001$), which revealed significant site differences in substrate compositions. Samples from Control Site C were significantly separated from samples collected at Sites 1 and 2, which were similar to each other (Fig. 4.3). SIMPER showed that higher average dissimilarity (ADS) was found between Control Site C and Sites 3 (78.2 %), 4 (69.1 %) and 5 (75.7 %) than between Control Site C and Sites 1 (47.6 %) and 2 (46.3 %). Control Site C was characterized by higher percentage covers of coral (mean of 3 transects, 23.3 % vs. 2.2 – 12.8 % at other sites), barnacles (31.3 %) and coralline algae (13.9 %) (Fig. 4.2c). Sites 1 and 2 exhibited higher percentage cover of macroalgae (27.3 and 25.0 %, respectively; Fig. 4.2a), whilst Sites 3 and 4 were dominated by encrusting algae (56.1 and 39.43 %, respectively; Fig. 4.2b), and the substrates of Site 5 was mostly covered by silt layer (43.9 %) (Fig. 4.2c).

Table 4.1 Coral Survey Sites and Conditions.

Site	Transact Replicate	GPS Coordinates		Depth (m)	Sedimentation on Rocks Surface (mm)	Visibility (m)	Weather	Tide	Current (knot)
1	T1	Start	N 22º14'34.2" E 114º10'43.1"	3.6-4.8	0-1	1-1.5	calm, cloudy	ebb	0-0.5
		End	N 22º14'33.3" E 114º10'43.0"						
	T2	Start	N 22º14'33.1" E 114º10'43.0"	3.6-3.9	0-1				
		End	N 22º14'32.3" E 114º10'42.6"						
	T3	Start	N 22º14'32.1" E 114º10'42.5"	3.3-4.5	0-1				
		End	N 22º14'31.4" E 114º10'41.8"						
2	T1	Start	N 22º14'25.5" E 114º10'36.6"	3.6-3.9	0-1	1-1.5	calm, cloudy	ebb	0-0.5
		End	N 22º14'24.6" E 114º10'36.6"						
	T2	Start	N 22º14'24.5" E 114º10'36.5"	4.2-4.5	0-2				
		End	N 22º14'23.7" E 114º10'36.4"						
	T3	Start	N 22º14'23.6" E 114º10'36.4"	3.6-3.9	0-1				
		End	N 22º14'22.8" E 114º10'35.9"						
3	T1	Start	N 22º13'49.5" E 114º10'14.1"	5.5-6.7	0-2	0.8-1.3	calm, cloudy	ebb	0.5-1.0
		End	N 22º13'49.9" E 114º10'13.2"						
	T2	Start	N 22º13'49.7" E 114º10'13.2"	5.5-7.6	0-2				
		End	N 22º13'50.3" E 114º10'12.4"						
	T3	Start	N 22º13'50.2" E 114º10'12.2"	5.5-6.7	0-2				
		End	N 22º13'50.7" E 114º10'11.4"						
4	T1	Start	N 22º13'52.3" E 114º10'07.7"	8.2-9.4	1-4	0.7-1.2	calm, sunny	ebb	0.5-1.0
		End	N 22º13'53.0" E 114º10'06.9"						
	T2	Start	N 22º13'53.2" E 114º10'06.8"	5.8-9.1	0-4				
		End	N 22º13'53.6" E 114º10'05.9"						
	T3	Start	N 22º13'53.7" E 114º10'05.7"	5.8-7.3	0-2				
		End	N 22º13'54.1" E 114º10'04.8"						
5	T1	Start	N 22º13'59.3" E 114º09'57.5"	5.2-6.1	2-5	0.7-1.2	calm, cloudy	ebb	0.5-1.0
		End	N 22º14'00.3" E 114º09'57.6"						
	T2	Start	N 22º14'00.7" E 114º09'58.0"	6.4-6.7	2-5				
		End	N 22º14'01.3" E 114º09'58.7"						
	T3	Start	N 22º14'01.8" E 114º09'58.5"	6.1-7.0	2-5				
		End	N 22º13'50.7" E 114º09'58.4"						
C	T1	Start	N 22º12'48.6" E 114º12'50.6"	2.7-4.5	0-1	0.7-1.2	calm, sunny	ebb	0-0.5
		End	N 22º12'49.5" E 114º12'50.4"						
	T2	Start	N 22º12'49.2" E 114º12'50.1"	2.4-3.6	0-1				
		End	N 22º12'50.1" E 114º12'49.8"						
	T3	Start	N 22º12'50.1" E 114º12'50.1"	4.8-5.5	0-1				
		End	N 22º12'50.7" E 114º12'50.7"						

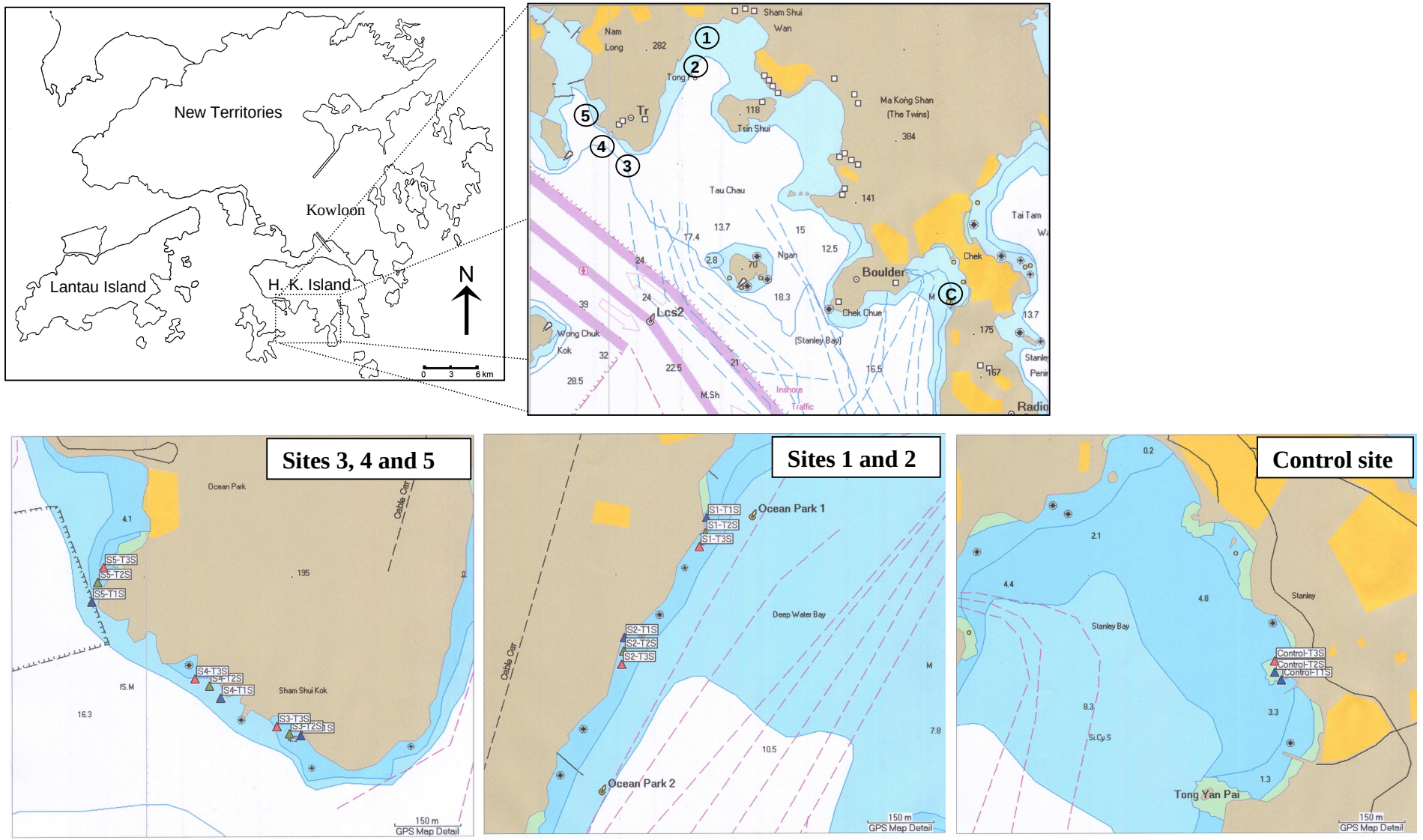


Fig. 4.1 Map Showing the Positions of the Transects (Only Starting Points are Shown) at the 6 Survey Sites.

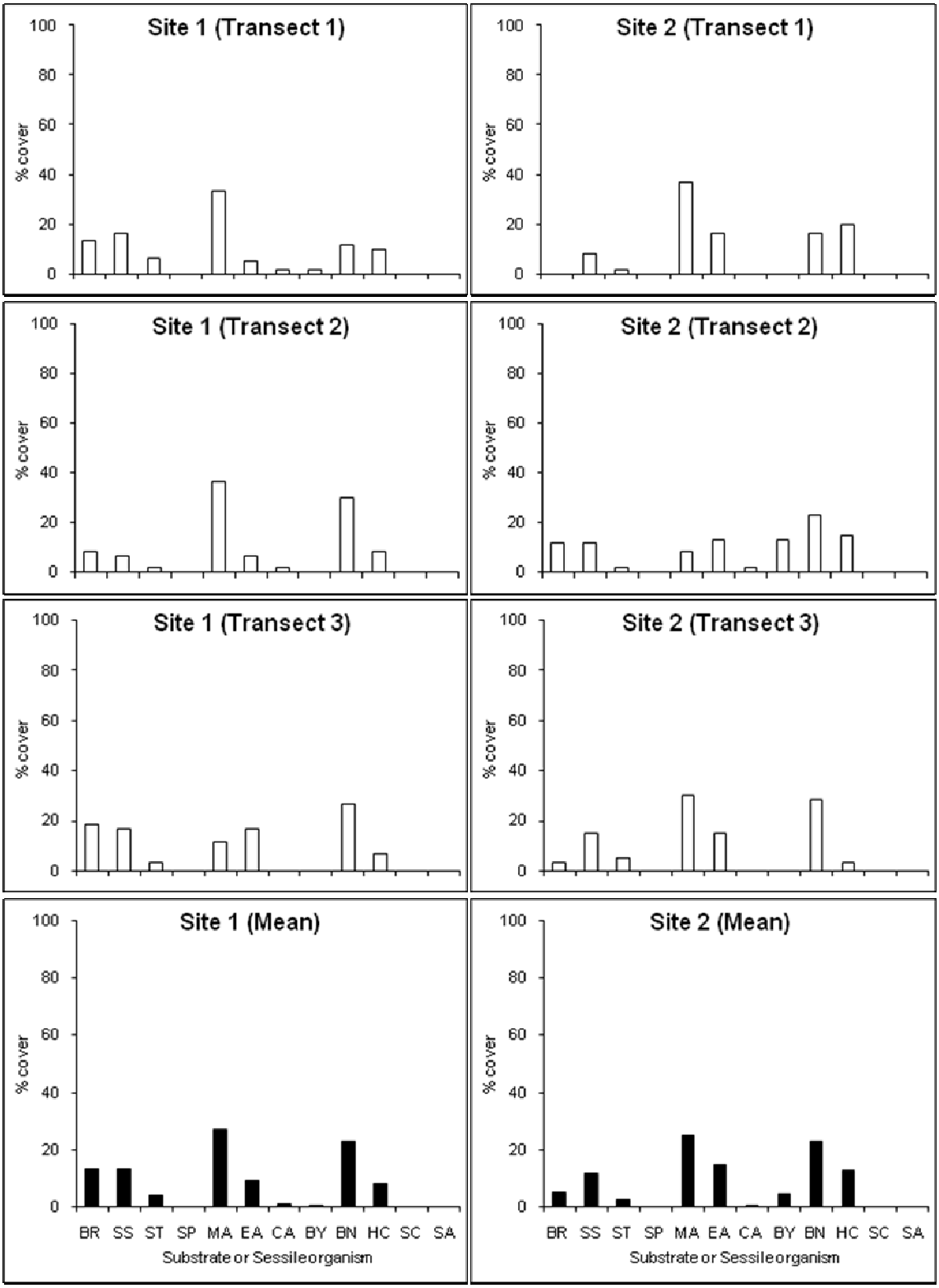


Fig. 4.2a Percentage Cover for Substrate or Sessile Organism Recorded in Each of the Three Transects and Mean for Sites 1 and 2 in April 2007 . BR, bare rock; SS, sand and shell debris; ST, silt; SP, sponge; MA, macroalgae; EA, encrusting alage; CA, coralline algae; BY, bryozoan; BN, barnacle; HC, hard coral; SC, soft coral; SA, sea anemone.

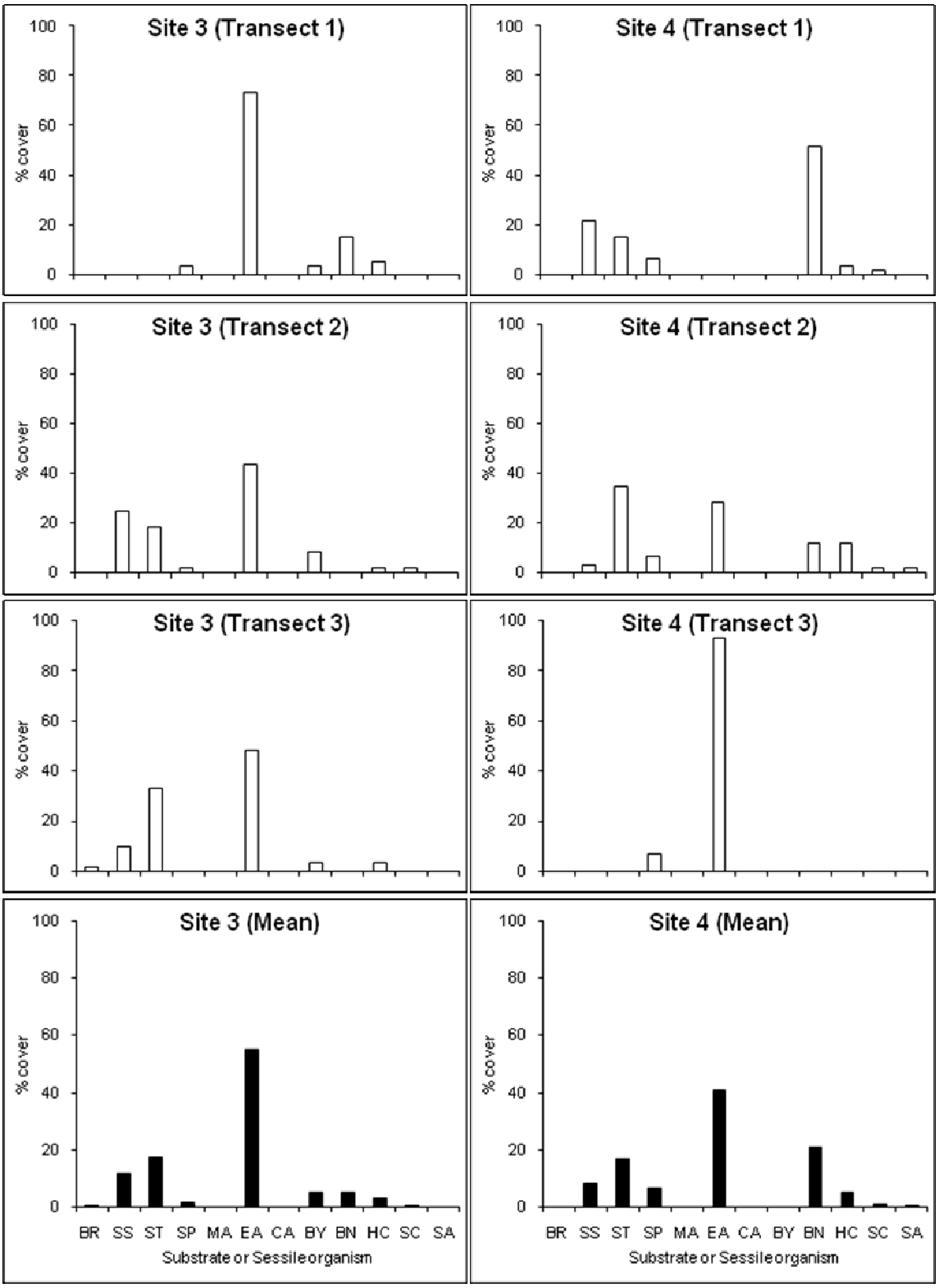


Fig. 4.2b Percentage Cover for Substrate or Sessile Organism Recorded in Each of the Three Transects and Mean for Sites 3 and 4 in April 2007 . BR, bare rock; SS, sand and shell debris; ST, silt; SP, sponge; MA, macroalgae; EA, encrusting alage; CA, coralline algae; BY, bryozoan; BN, barnacle; HC, hard coral; SC, soft coral; SA, sea anemone.

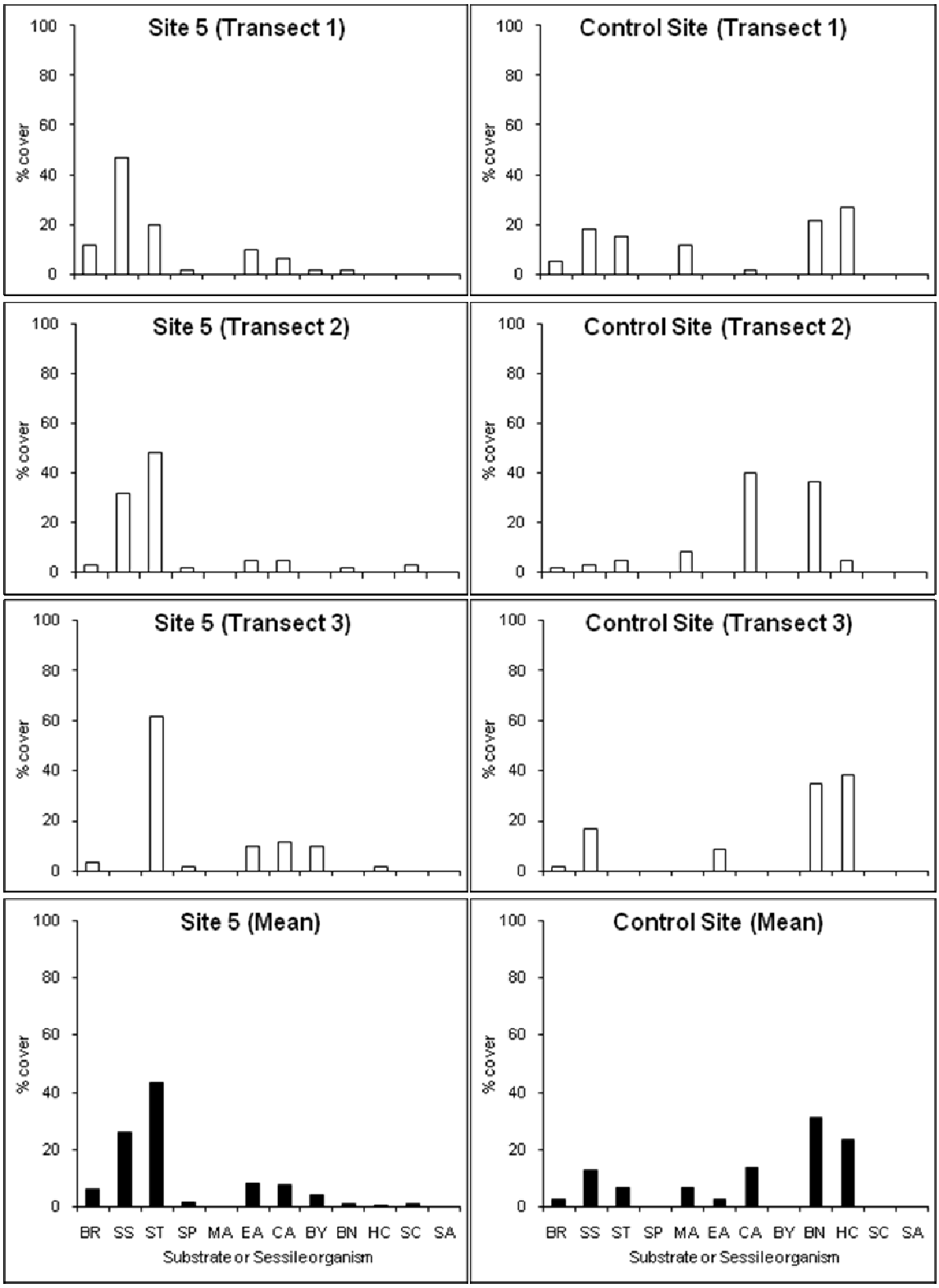


Fig. 4.2c Percentage Cover for Substrate or Sessile Organism Recorded in Each of the Three Transects and Mean for Site 5 and Control Site C in April 2007. BR, bare rock; SS, sand and shell debris; ST, silt; SP, sponge; MA, macroalgae; EA, encrusting alage; CA, coralline algae; BY, bryozoan; BN, barnacle; HC, hard coral; SC, soft coral; SA, sea anemone.

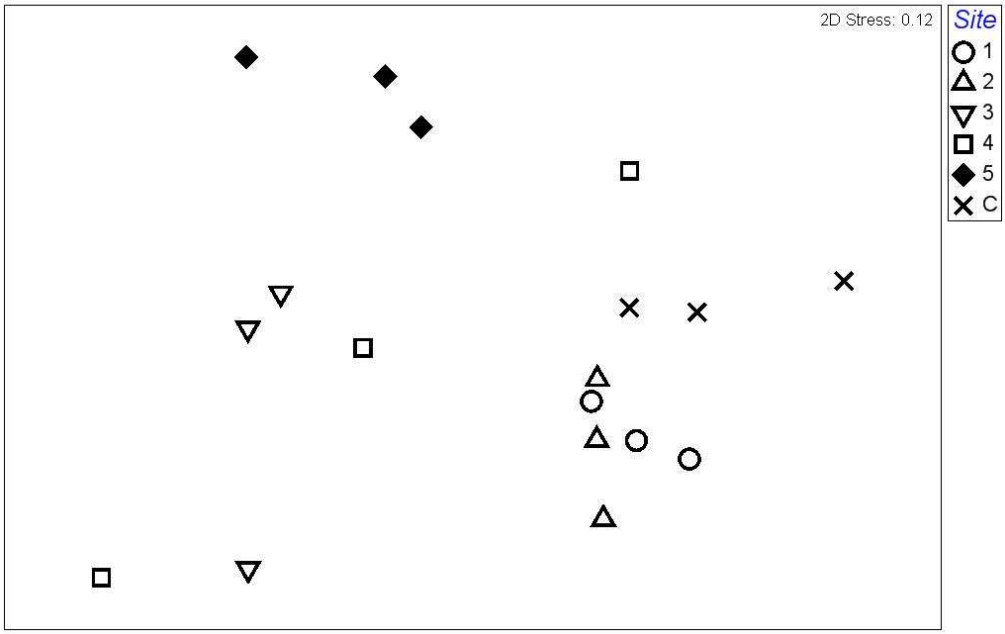


Fig. 4.3 nMDS Ordinations of Substrate Compositions at the 6 Survey Sites Based on Non-transformed Bray Curtis Similarity Matrix.

Table 4.2 Summary of Survey Site Habitat and Coral Community

		Site 1	Site 2	Site 3	Site 4	Site 5	Control Site C
	Substrate Type	Boulder & sand	Boulder & sand	Bedrock & boulder	Bedrock & sand	Bedrock & boulder	Boulder & sand
Line Transect	**Hard Coral - Mean % Cover**	8.3	12.8	3.3	5.0	0.6	23.3
	Soft Coral - Mean % Cover (%)	0	0	0.6	1.1	1.1	0
Bell Transect	**Hard Coral - Total Number of Colony**	61	79	45	65	9	137
	Hard Coral - Total Area (cm^2)	18,420	23,220	13,880	10,300	1,330	51,080
	Hard Coral - Colony Size Range (cm^2)	30-2,300	40-1,450	20-1,600	10-600	90-220	40-3,000
	Hard Coral - Number of Species	12	15	14	7	4 + 3*	19 + 1*
	Shannon Diversity Index (H')	1.00	1.11	1.07	0.78	0.48	1.23
	Hard Coral - Mean % Area sediment	0.98	1.86	1.22	1.30	2.66	0.98
	Hard Soral - Mean % Area Bleaching	0	0.09	0	0	0	0
	Hard Coral - Mean % Area Mortality	0.13	0.14	0.29	0.08	0.33	0.77
	Soft Coral - Total Number of Colony	0	0	10	27	15	0
	Soft Coral - Number of Species	0	0	3	3	2	0

* off transect record

Table 4.3 List of Hard and Soft Coral Species Recorded in the 6 Survey Sites.

Hard Coral	**Site 1**	**Site 2**	**Site 3**	**Site 4**	**Site 5**	**Control Site C**
Siderastreidae						
Psammocora profundacella				✓		✓
Psammocora superficialis	✓	✓	✓	✓	✓*	✓
Acroporidae						
Montipora cf. turgescens			✓	✓	✓	
Montipora peltiformis.		✓	✓			✓
Agariciidae						
Pavona decussata.	✓	✓	✓			✓
Faviidae						
Favia favus						✓
Favia lizardensis	✓					
Favia rotumana	✓	✓				✓
Favia speciosa		✓	✓	✓		✓
Favites abdita	✓	✓	✓			✓
Favites pentagona	✓	✓				✓
Platygyra acuta	✓	✓	✓			✓
Platygyra carnosus	✓	✓	✓			✓
Montastrea magnistellata				✓		
Plesiastrea versipora	✓	✓	✓		✓*	✓
Cyphastrea serailia.	✓	✓	✓		✓	✓
Goniastrea aspera.		✓	✓			✓
Goniastrea favulus						✓*
Leptastrea pruinosa	✓	✓			✓	✓
Poritidae						
Goniopora stutchburyi			✓	✓	✓	✓
Porites sp.	✓	✓	✓	✓	✓*	✓
Merulinidae						
Hydnophora exessa		✓				✓
Dendronphylliidae						
Turbinaria peltata			✓			✓
Total Number of Hard Coral Species	**12**	**15**	**14**	**7**	**4 + 3***	**19 + 1***
Soft Coral						
Alcyoniidae						
Lobophytum depressum.					✓	
Nephtheidae						
Dendronephthya sp.			✓	✓		
Plexauridae						
Euplexaura sp.			✓	✓	✓	
Echinomuricea sp.			✓	✓		
Total Number of Soft Coral Species	**0**	**0**	**3**	**3**	**2**	**0**

* off transect record

Site 1

4.1.6 In Site 1, the sea bottom run from onshore to offshore in a gentle slope. The bedrock is replaced by boulders and sand at depth of around 3 m. The rock surface was mainly covered by seasonal macroalgae (27.2%), barnacle (22.8%) or bare rock (13.3%) (Fig. 4.2a). Hard coral cover (8.3%) was the second highest among the 5 monitoring sites (Table 4.2). Colonies were mainly observed at 3 to 6 m. From the bell transects, a total of 61 hard coral colonies from 12 species and 4 families was recorded (Tables 4.2 and 4.3). Shannon diversity index (H') was 1.00. The common species include the brain coral *Platygyra carnosus* and *Favites abdita*, both belong to family Faviidae and are common species in shallow waters of Hong Kong. Health status of the colonies was generally normal; low level of sedimentation (0.98), bleaching (0%) and mortality (0.13%) was recorded.

Site 2

4.1.7 The substratum character of Site 2 is similar to Site 1; sea bottom are mainly composed of boulders and sand, the rock surface was mainly covered by seasonal macroalgae (25%), barnacle (22.8%) and encrusting algae (15%) (Fig. 4.2a). Hard coral cover (12.8%) was the highest among the 5 monitoring sites (Table 4.2) and corals mainly inhabit the depth from 3 to 6 m. Bell transect data recorded a total of 79 hard coral colonies from 15 species from 5 families (Tables 4.2 and 4.3). Common species include *Favites pentagona* and *Platygyra carnosus*. Shannon diversity index (H') was higher than the other 4 monitoring sites (1.11). Heath of the existing coral was generally good, sedimentation (1.86%) and mortality (0.14%) was low. Bleaching (0.09%) was observed on few *Porites sp*. colonies but the portion is minor.

Site 3

4.1.8 Site 3 is a more exposed shore, the bottom is mainly covered with bedrock that extends down to about 6 m before replaced by boulders, sand and silt. The bedrock and boulder surface was mainly inhabited with encrusting algae (55%) (Fig. 4.2b). Macroalgae was not recorded due to the unfavourable exposed environment. Hard coral cover (3.3%) was lower than Site 1 and 2 (Table 4.2) and were mainly found at 4 to 9 m. A total of 50 hard coral colonies was recorded in the bell transect which was composed of 14 species from 5 families (Tables 4.2 and 4.3). Different from Site 1 and 2, the common hard coral species include *Goniopora stutchburyi* and *Montipora cf. turgescens*. The former is the common species usually found in deeper community, while *Montipora cf. turgescens* is an uncommon species that is associated with deeper and wavy habitat (Chan et al. 2005). Shannon diversity index (H') was relatively high in context (1.07). Sedimentation (1.22%) and mortality (0.29%) was low, and no bleaching was observed on the standing hard corals. Three species of soft coral were also recorded at the deeper portion of transect 2 and 3 (Table 4.3; Appendix II), no apparent mortality was evidenced in these colonies.

Site 4

4.1.9 Site 4 shares some substratum properties with Site 3 that bedrock runs down in steep profile to about 6 to 9 m and connect to boulder or sand substrate. Due to the non-uniform topography, the 3 transects varied in depth and hence their associated flora and fauna. Transect 1 was located at greater depth where is mainly bedrock and sand, the rock surface was mainly covered by barnacle (51.7%) but no algae (Fig. 4.2b). Transect 2 transited from deeper to shallower water and transect 3 was mainly boulder at shallower water where encrusting algae (93.3%) is the major covering organism on the rock surface. Hard coral cover (5.0%) was similar to Site 3 (Table 4.2). The species composition and distribution, however, was highly biased. A total of 67 hard coral colonies was recorded on the bell transects, which was composed of only 7 species from 3 families (Tables 4.2 and 4.3). Moreover, over 80% (55 out of 67 colonies) of the record was occupied by a single species *Goniopora stutchburyi* at the deeper portion of the transects. The Shannon diversity index (H') was highly reduced (0.78) due to the bias in hard coral composition. Health condition was generally good, little sedimentation (1.30%), no bleaching and low mortality (0.08%) was observed. Soft corals were also recorded at deeper region and species composition was similar to Site 3 (Table 4.3; Appendix II).

Site 5

4.1.10 Site 5 is relatively limited in hard substratum, boulders and rubbles extend to about 4 to 5 m and become scattered on sand (26.1%) or silt (43.3%). Rock surface was either bare (6.1%) or covered with encrusting algae (8.3%), coralline algae (7.8%) (Fig. 4.2c). Hard coral cover (0.6%) was the lowest of all survey sites. Only 9 hard coral colonies from 4 species and 3 families were found on the bell transects (Tables 4.2 and 4.3). Three more species were observed away from the transects, the colonies were scattered. The record was dominated by *Goniopora stutchburyi* (7 of 9 colonies). The Shannon diversity index (H') was low (0.48). Sedimentation (2.66%) was higher than the other sites but still in low level. Little mortality (0.33%) and no bleaching were observed in the standing colonies. Two taxa of soft coral was found in the deeper region, both taxa are common record in local waters and no mortality was observed in the community (Table 4.3; Appendix II).

Control Site C

4.1.11 The Control Site C at St. Stephen's Beach is, similar to Site 1 and 2, a sheltered bay covered mainly by boulders and sand. The hard substratum was mainly inhabited by barnacle (31.1%), hard coral (23.3%) and coralline algae (13.9%) (Fig. 4.2c). Site 5 had higher values than the 5 monitoring sites in terms of hard coral cover (23.3%), number of colonies on bell transect (137), number of species (19) and Shannon diversity index (1.23) (Table 4.2). Common species included *Favia rotamana*, *Favites pentagona*, *Plesiastrea versipora* and *Favia specios* (Table 4.3; Appendix II). Level of sedimentation was low (0.98%) (Table 4.2). Higher mean mortality (0.77%) was recorded due to contribution from a 50%-mortality colony (*Favites pentagona)* in transect 3 (Appendix II).

The mortality was caused by abrasion like physical damage and no sign of infection or sickness was witnessed. All other colonies were normal in their health condition, and hence the site is suitable as a control site for monitoring survey.

4.1.12 Photographs of benthic organisms found at the Survey Sites are shown in Appendix III.

4.2 Coral Tagging Exercise

4.2.1 The code, species name, area, sedimentation level, and percentage of bleaching and mortality of the tagged coral colonies at each site were summarized in Tables 4.4a-f. Photographs of the colonies were shown in Appendices IVa-f. The survey team had tried to take photographs of the corals from an angle and distance that best represented the colonies but difficulties sometimes occurred as a result of low water visibility during the surveys.

4.2.2 Tagging of hard coral species with tall polyps had been avoided. Few colonies of *Goniopora stutchburyi* had been, however, tagged in Sites 4 and 5 as the number of coral colonies that could be tagged were limited.

4.2.3 In general, the healthy status of the tagged coral colonies was normal, with low levels of sedimentation, bleaching and morality.

Table 4.4a Code, Species Name, Percentage of Sedimentation, Bleaching and Mortality of the Tagged Coral Colonies at Site 1.

Code	Coral Species	Area (cm^2)	Sedimentation (%, mm)	Bleaching (%)	Mortality (%)
A01	*Platygyra carnosus*	1000	0, 0	0	0
A02	*Platygyra carnosus*	2000	0, 0	0	0
A03	*Favites pentagona*	200	0, 0	0	0
A04	*Leptastrea pruinosa*	400	5, 1	0	0
A05	*Platygyra carnosus*	1200	0, 0	0	5
A06	*Platygyra carnosus*	1600	0, 0	0	0
A07	*Favia rotumana*	800	5,1	0	0
A08	*Platygyra carnosus*	1000	0, 0	0	0
A09	*Platygyra carnosus*	350	0, 0	0	0
A10	*Platygyra carnosus*	700	0, 0	0	0

Table 4.4b Code, Species Name, Percentage of Sedimentation, Bleaching and Mortality of the Tagged Coral Colonies at Site 2.

Code	Coral Species	Area (cm^2)	Sedimentation (%, mm)	Bleaching (%)	Mortality (%)
B01	*Platygyra carnosus*	450	0, 0	0	0
B02	*Plesiastrea versipora*	300	0, 0	0	0
B03	*Psammocora superficialis*	1000	5, 1	0	0
B04	*Favia speciosa*	300	4, 1	0	0
B05	*Plesiastrea versipora*	900	3, 1	0	0
B06	*Platygyra carnosus*	600	0, 0	0	0
B07	*Cyphastrea serailia*	700	0, 0	0	0
B08	*Plesiastrea versipora*	1200	0, 0	0	0
B09	*Favites pentagona*	600	0, 0	0	0
B10	*Favites pentagona*	400	0, 0	0	0

Table 4.4c Code, Species Name, Percentage of Sedimentation, Bleaching and Mortality of the Tagged Coral Colonies at Site 3.

Code	Coral Species	Area (cm^2)	Sedimentation (%, mm)	Bleaching (%)	Mortality (%)
C01	*Platygyra acuta*	2000	0, 0	0	0
C02	*Platygyra carnosus*	1000	0, 0	0	0
C03	*Porites* sp.	400	5, 1	0	1
C04	*Cyphastrea serailia*	600	4, 1	0	0
C05	*Pavona decussata*	600	0, 0	0	0
C06	*Pavona decussata*	1200	0, 0	0	0
C07	*Montipora cf. turgescens*	200	2, 1	0	0
C08	*Favia favus*	600	4, 1	0	4
C09	*Favites pentagona*	150	1, 1	0	0
C10	*Montipora peltiformis*	300	0, 0	0	0

Table 4.4d Code, Species Name, Percentage of Sedimentation, Bleaching and Mortality of the Tagged Coral Colonies at Site 4.

Code	Coral Species	Area (cm^2)	Sedimentation (%, mm)	Bleaching (%)	Mortality (%)
E01	*Goniopora stutchburyi*	300	0, 0	0	0
E02	*Goniopora stutchburyi*	200	0, 0	0	0
E03	*Goniopora stutchburyi*	150	0, 0	0	0
E04	*Porites* sp.	400	5, 1	0	0
E05	*Goniopora stutchburyi*	300	0, 0	0	0
E06	*Goniopora stutchburyi*	450	0, 0	0	0
E07	*Favia speciosa*	600	10, 1	0	0
E08	*Porites* sp.	150	2, 1	0	4
E09	*Porites* sp.	200	8, 1	0	4
E10	*Porites* sp.	500	0, 0	3	0

Table 4.4e Code, Species Name, Percentage of Sedimentation, Bleaching and Mortality of the Tagged Coral Colonies at Site 5.

Code	Coral Species	Area (cm^2)	Sedimentation (%, mm)	Bleaching (%)	Mortality (%)
D01	*Psammocora* sp.	600	10, 1	0	0
D02	*Montipora cf. turgescens*	100	6, 1	0	0
D03	*Goniopora stutchburyi*	400	0, 0	0	0
D04	*Leptastrea pruinosa*	500	4, 1	0	0
D05	*Porites* sp.	400	5, 1	1	4
D06	*Plesiastrea versipora*	1000	0, 0	0	5
D07	*Leptastrea pruinosa*	800	0, 0	0	0
D08	*Plesiastrea versipora*	100	0, 0	0	0
D09	*Cyphastrea* sp.	150	5, 1	0	0
D10	*Montipora cf. turgescens*	200	0, 0	0	0

Table 4.4f Code, Species Name, Percentage of Sedimentation, Bleaching and Mortality of the Tagged Coral Colonies at Control Site C.

Code	Coral Species	Area (cm^2)	Sedimentation (%, mm)	Bleaching (%)	Mortality (%)
F01	*Favia speciosa*	900	0, 0	0	0
F02	*Favites pentagona*	1000	4, 1	0	0
F03	*Favites pentagona*	800	0, 0	0	0
F04	*Porites* sp.	800	5, 1	4	4
F05	*Cyphastrea serailia*	800	4, 1	0	1
F06	*Psammocora* sp.	1800	0, 0	0	0
F07	*Plesiastrea versipora*	3000	0, 0	0	0
F08a	*Favia speciosa*	150	0, 0	0	0
F08b	*Goniastrea favulus*	300	0,0	0	0
F09	*Favites pentagona*	1800	10, 1	0	0
F10	*Platygyra carnosus*	2800	0, 0	0	0

5 SUMMARY AND CONCLUSION

5.1 Summary – Coral Community

5.1.1 The present survey recorded 23 hard coral species from the 5 monitoring and 1 control sites (Tables 4.2 and 4.3). Number of species at each site ranged from 7 to 20. Hard coral cover ranged from 0.6% to 23.3%. A total of 402 hard coral colonies was observed on the bell transects, ranged from 9 to 137 for the 6 sites. Sizes of coral colonies ranged from 10 to 3,000 cm^2. Diversity index (H') ranged from 0.48 to 1.23. Mean sediment cover on corals (range 0.98 to 2.66%), mean bleaching area (range 0 to 0.09%) and mean mortality area (range 0.08 to 0.77) were low for all the six sites.

5.1.2 On site bases, Site 1, Site 2 and Control Site C had higher coral abundance and diversity, species composition was typical for southern shallow waters of Hong Kong. Similar communities had been reported at other locations such as Lamma Island and Stanley (MEMCL 2000; Hyder 2002). For Site 3, Site 4 and Site 5, corals were mainly located at greater depth, cover and abundance were lower and were composed of deeper water species.

5.1.3 In Hong Kong context, however, the values of coral cover, species composition and diversity were not high for all the 6 sites. Territory-wide information on local coral communities has been obtained in different surveys (OCL 2003, AFCD 2006), well developed coral communities were mainly located at Northeastern waters such as Hoi Ha Wan, Tung Ping Chau. Some of the representative sites are shown in Table 5.1, coral cover and number of coral species were much higher.

Table 5.1 Summary of the Coral Cover and Diversity of the 6 Survey Sites and Representative Communities in Hong Kong.

Site	% Coral Cover	Species Diversity (no. of species)	Shannon Diversity Index
Tung Ping Chau	69 [1]	47 [2]	2.24 [2]
Hoi Ha Wan	70 [1]	38 [2]	1.60 [2]
Bluff Island	63 [1]	43 [2]	2.06 [2]
Chek Chau	62 [1]	45 [2]	1.41 [2]
Long Ke Wan	59 [1]	44 [2]	1.84 [2]
Present Survey			
Site 1	8.3	12	1.00
Site 2	12.8	13	1.11
Site 3	3.3	13	1.07
Site 4	5.0	6	0.78
Site 5	0.6	3	0.48
Control Site C	23.3	18	1.23

[1] Data from Reef Check 2006 (AFCD 2006)
[2] OCL 2003

5.1.4 In overall, although abundance and richness was not high, the communities in all sites were generally in good conditions with low level of sedimentation,

bleaching and mortality. Monitoring of the communities during the course of construction is necessary in order to avoid adverse impact to the standing corals.

6 REFERENCES

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APPENDICES

Appendix I Monitoring Requirements

1.1 The construction phase coral monitoring programme should comprise an Initial Survey with coral tagging exercise, Impact Monitoring Surveys and a Post-Construction Monitoring Survey.

1.2 Coral monitoring work should be conducted by a qualified marine biologist with specialist knowledge of corals and sound experience at identifying corals in the field. To ensure consistency, it is recommended that the same coral specialist should be used on each dive survey. The coral specialist should be approved by AFCD prior to the commencement of the monitoring programme.

Initial Survey / Coral Tagging Exercise

1.3 A initial survey and coral tagging exercise at all 5 coral impact sites and one control site should be conducted preferably no more than one month before commencement of construction works. Tagging of a minimum of 10 hard coral colonies at each coral monitoring site is considered appropriate. Corals should be tagged giving priority to the largest, undamaged colonies since damage to these colonies would be more evident compared to smaller colonies or corals with existing damage. Corals should also be selected for tagging based on the most suitable coral species and growth forms. As far as possible, tagging of hard coral species with tall polyps should be avoided due to their higher tolerance of sedimentation.

1.4 Coral colonies should be tagged using small brightly coloured (e.g. orange or green) stones marked with labeled tags. For each tagged coral, specific detailed information should be collected including location, size, depth and general condition of their immediate surroundings. Tagged coral colonies should also be identified to species level.

1.5 The health status of each tagged coral colony should be carefully recorded, including information on existing surface area with partial mortality and bleached area. For each tagged hard coral colony, sediment cover should be recorded including percentage cover, colouration, texture and approximate thickness of sediment on the colony itself and on adjacent hard substrate. Any contiguous patches of sediment cover >10% should be counted. The condition of each tagged coral colony should also be recorded by taking a photograph from an angle and distance that best represents entire colony. The information of selected corals collected during the Baseline Survey should be submitted to AFCD for approval.

Appendix II List of Hard and Soft Coral Colonies, Percentage Sedimentation, Bleaching and Mortality in Bell Transect Survey.

Site 1

	Transect 1					Transect 2					Transect 3				
	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)
1	*Leptastrea pruinosa*	200	0	5	0	*Favites abdita*	30	0	4	0	*Favites pentagona*	120	0	0	0
2	*Favites pentagona*	280	0	1	0	*Favites abdita*	110	0	2	0	*Favia rotumana*	100	0	0	0
3	*Pavona decussata*	260	0	0	0	*Platygyra carnosus*	140	0	3	0	*Favia rotumana*	130	0	0	0
4	*Pavona decussata*	90	0	0	0	*Favia rotumana*	160	0	10	0	*Favia rotumana*	140	0	1	0
5	*Favites pentagona*	110	0	1	0	*Favites abdita*	220	0	4	0	*Platygyra acuta*	220	0	0	0
6	*Platygyra carnosus*	40	0	0	0	*Favites abdita*	250	0	0	0	*Favites abdita*	290	0	3	0
7	*Favites abdita*	100	0	3	0	*Platygyra carnosus*	130	0	4	0	*Platygyra carnosus*	150	0	1	0
8	*Platygyra carnosus*	1300	0	0	0	*Platygyra acuta*	130	0	8	0	*Platygyra carnosus*	280	0	0	0
9	*Favites pentagona*	530	0	1	0	*Favites pentagona*	200	0	4	0	*Platygyra carnosus*	150	0	0	0
10	*Favites pentagona*	500	0	0	0	*Plesiastrea versipora*	400	0	1	0	*Favites abdita*	130	0	3	0
11	*Favia rotumana*	280	0	3	0	*Favites abdita*	480	3	5	0	*Favites abdita*	180	0	5	0
12	*Platygyra acuta*	470	0	2	0	*Favites abdita*	100	0	1	0	*Platygyra acuta*	200	0	4	0
13	*Favites abdita*	330	0	2	0	*Favites abdita*	130	0	0	0	*Favia lizardensis*	200	5	5	0
14	*Platygyra acuta*	490	0	0	0	*Favia rotumana*	100	0	2	0	*Favia rotumana*	220	0	3	0
15	*Platygyra acuta*	250	0	0	0	*Platygyra carnosus*	160	0	1	0	*Favia rotumana*	180	0	2	0
16	*Favites pentagona*	260	0	0	0	*Cyphastrea serailia*	170	0	0	0	*Platygyra carnosus*	120	0	1	0
17	*Favites abdita*	330	0	0	0										
18	*Platygyra acuta*	230	0	1	0										
19	*Platygyra carnosus*	2300	0	0	0										
20	*Favites pentagona*	360	0	2	0										
21	*Plesiastrea versipora*	390	0	2	0										
22	*Psammocora superficialis*	400	0	3	0										
23	Psammocora superficialis	130	0	1	0										

Site 1 (con't)															
	Transect 1					Transect 2					Transect 3				
	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)
24	*Porites sp.*	180	0	0	0										
25	*Psammocora superficialis*	190	0	0	0										
26	*Porites sp.*	220	0	0	0										
27	*Platygyra carnosus*	1800	0	1	0										
28	*Psammocora superficialis*	350	0	2	0										
29	*Porites sp.*	330	0	0	0										

Site 2															
	Transect 1					Transect 2					Transect 3				
	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)
1	*Cyphastrea serailia*	130	0	0	0	*Porites sp.*	250	0	4	3	*Montipora peltiformis*	200	0	0	0
2	*Cyphastrea serailia*	220	0	0	0	*Platygyra carnosus*	320	0	0	0	*Platygyra carnosus*	290	0	0	0
3	*Cyphastrea serailia*	250	0	0	0	*Platygyra acuta*	100	0	0	0	*Platygyra carnosus*	160	0	0	0
4	*Platygyra acuta*	280	0	1	0	*Montipora peltiformis*	320	0	0	0	*Montipora peltiformis*	210	0	0	0
5	*Platygyra carnosus*	140	0	0	0	*Plesiastrea versipora*	120	0	2	0	*Favites abdita*	240	0	1	0
6	*Cyphastrea serailia*	40	0	0	0	*Goniastrea aspera*	80	0	0	0					
7	*Cyphastrea serailia*	850	0	4	0	*Plesiastrea versipora*	300	0	0	0					
8	*Favites abdita*	200	0	1	0	*Favia rotumana*	150	0	2	0					
9	*Platygyra carnosus*	230	0	0	0	*Favites pentagona*	400	0	0	0					
10	*Favites pentagona*	190	0	1	0	*Leptastrea pruinosa*	350	0	0	0					
11	*Platygyra acuta*	250	0	1	0	*Plesiastrea versipora*	550	2	2	0					
12	*Favites pentagona*	180	0	0	0	*Pavona decussata*	250	0	3	0					
13	*Favites pentagona*	300	0	2	0	*Plesiastrea versipora*	1450	0	3	0					
14	*Cyphastrea serailia*	130	0	0	0	*Favites pentagona*	320	0	0	0					
15	*Cyphastrea serailia*	100	0	0	0	*Platygyra carnosus*	200	0	2	0					
16	*Porites sp.*	340	0	3	2	*Favites pentagona*	150	0	0	0					
17	*Favites abdita*	230	0	3	0	*Favites pentagona*	780	0	2	0					
18	*Favites abdita*	200	0	0	0	*Hydnophora exesa*	500	0	0	0					
19	*Platygyra carnosus*	1050	0	2	0										
20	*Favites abdita*	100	0	1	0										
21	*Leptastrea pruinosa*	240	0	2	0										
23	*Favites pentagona*	130	0	1	0										
24	*Favites pentagona*	150	0	1	0										
25	*Platygyra acuta*	380	0	2	0										
26	*Favites pentagona*	120	0	0	0										

Site 2 (con't)															
	Transect 1					Transect 2					Transect 3				
	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)
27	*Psammocora superficialis*	1100	2	8	0										
28	*Platygyra carnosus*	600	0	3	0										
29	*Favites pentagona*	400	0	2	0										
30	*Favites pentagona*	200	0	0	0										
31	*Favites pentagona*	100	0	0	0										
32	*Favites pentagona*	150	0	0	0										
33	*Favia rotumana*	210	0	2	0										
34	*Platygyra carnosus*	350	0	0	0										
35	*Platygyra carnosus*	330	1	2	0										
36	*Favites pentagona*	220	0	0	0										
37	*Plesiastrea versipora*	310	0	3	0										
38	*Favites pentagona*	230	0	1	0										
39	*Psammocora superficialis*	200	0	10	0										
40	*Montipora peltiformis*	100	0	0	0										
41	*Montipora peltiformis*	60	0	0	0										
42	*Montipora peltiformis*	80	0	0	0										
43	*Montipora peltiformis*	60	0	1	0										
44	*Favites pentagona*	300	0	0	0										
45	*Favites abdita*	120	0	1	0										
46	*Favites pentagona*	550	0	3	0										
47	*Favites pentagona*	150	0	0	0										
48	*Platygyra acuta*	280	0	3	0										
49	*Favia speciosa*	230	0	2	0										
50	*Plesiastrea versipora*	900	0	2	0										
51	*Platygyra carnosus*	250	0	2	0										

Site 2 (con't)															
	Transect 1					Transect 2					Transect 3				
	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)
52	*Favia rotumana*	200	0	1	0										
53	*Favia rotumana*	220	1	3	0										
54	*Favites pentagona*	450	0	0	0										
55	*Porites sp.*	350	0	3	2										

Site 3															
	Transect 1					Transect 2					Transect 3				
	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)
1	*Porites sp.*	130	3	0	0	*Montipora peltiformis*	40	0	0	0	*Platygyra carnosus*	650	0	2	0
2	*Montipora cf. turgescens*	70	0	0	0	*Montipora cf. turgescens*	260	0	1	0	*Goniopora stutchburyi*	210	0	4	0
3	*Goniopora stutchburyi*	210	0	0	0	*Montipora cf. turgescens*	250	0	0	0	*Plesiastrea versipora*	80	0	2	0
4	*Goniopora stutchburyi*	180	0	0	0	*Montipora cf. turgescens*	100	0	0	0	*Psammocora superficialis*	920	0	5	0
5	*Goniopora stutchburyi*	60	0	0	0	*Goniopora stutchburyi*	160	0	0	0	*Goniastrea aspera*	410	0	3	0
6	*Montipora cf. turgescens*	100	0	0	0	*Goniopora stutchburyi*	80	0	0	0	*Plesiastrea versipora*	500	0	1	0
7	*Montipora cf. turgescens*	310	0	3	0	*Goniopora stutchburyi*	30	0	0	0	*Goniopora stutchburyi*	180	0	2	0
8	*Montipora cf. turgescens*	180	0	3	0	*Porites sp.*	30	0	0	0	*Goniopora stutchburyi*	200	0	0	0
9	*Montipora cf. turgescens*	20	0	0	0	*Favia speciosa*	300	0	0	0	*Goniopora stutchburyi*	210	0	1	0
10	*Porites sp.*	150	0	1	0	*Porites sp.*	280	6	0	0	*Goniopora stutchburyi*	150	0	3	0
11	*Porites sp.*	110	0	0	0	*Favites abdita*	270	0	0	0	*Goniopora stutchburyi*	300	0	2	0
12	*Montipora cf. turgescens*	100	0	0	0	*Porites sp.*	180	0	2	0	*Goniopora stutchburyi*	120	0	0	0
13	*Montipora cf. turgescens*	70	0	0	0	*Pavona decussata*	780	0	0	0	*Turbinaria peltata*	270	0	0	0
14	*Porites sp.*	100	0	0	0						*Psammocora superficialis*	330	0	2	0
15	*Montipora peltiformis*	320	6	1	0						*Goniopora stutchburyi*	220	0	3	0
16	*Goniopora stutchburyi*	90	0	0	0										
17	*Cyphastrea serailia*	410	0	2	0										
18	*Porites sp.*	300	0	0	0										
19	*Goniopora stutchburyi*	280	0	3	0										
20	*Goniopora stutchburyi*	180	0	1	0										
21	*Platygyra acuta*	430	0	0	0										
22	*Platygyra acuta*	1600	0	0	0										
23	*Platygyra carnosus*	970	0	1	0										

Site 3 (con't)

	Transect 1					Transect 2					Transect 3				
	Soft Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Soft Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Soft Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)
1						*Euplexaura sp.*	NA	0	NA	NA	*Euplexaura sp.*	NA	0	NA	NA
2						*Dendronephthya sp.*	NA	0	NA	NA	*Euplexaura sp.*	NA	0	NA	NA
3						*Echinomuricea sp.*	NA	0	NA	NA	*Euplexaura sp.*	NA	0	NA	NA
4						*Euplexaura sp.*	NA	0	NA	NA					
5						*Echinomuricea sp.*	NA	0	NA	NA					
6						*Echinomuricea sp.*	NA	0	NA	NA					

Site 4															
	Transect 1					Transect 2					Transect 3				
	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)
1	*Goniopora stutchburyi*	10	0	0	0	*Goniopora stutchburyi*	450	0	1	0	*Goniopora stutchburyi*	300	0	0	0
2	*Goniopora stutchburyi*	100	0	1	0	*Goniopora stutchburyi*	430	0	3	0	*Goniopora stutchburyi*	170	0	4	0
3	*Psammocora profundacella*	150	0	1	0	*Goniopora stutchburyi*	180	0	2	0	*Montipora cf. turgescens*	150	0	3	0
4	*Psammocora profundacella*	130	0	0	0	*Goniopora stutchburyi*	220	0	1	0					
5	*Goniopora stutchburyi*	70	0	0	0	*Goniopora stutchburyi*	250	0	2	0					
6	*Goniopora stutchburyi*	50	0	0	0	*Goniopora stutchburyi*	70	0	0	0					
7	*Goniopora stutchburyi*	70	0	0	0	*Goniopora stutchburyi*	250	0	0	0					
8	*Goniopora stutchburyi*	120	0	0	0	*Goniopora stutchburyi*	90	0	0	0					
9	*Goniopora stutchburyi*	100	0	0	0	*Goniopora stutchburyi*	40	0	0	0					
10	*Goniopora stutchburyi*	60	0	0	0	*Goniopora stutchburyi*	30	0	0	0					
11	*Goniopora stutchburyi*	130	0	0	0	*Goniopora stutchburyi*	120	0	0	0					
12	*Goniopora stutchburyi*	100	0	1	0	*Goniopora stutchburyi*	80	0	0	0					
13	*Goniopora stutchburyi*	70	0	0	0	*Goniopora stutchburyi*	110	0	0	0					
14	*Goniopora stutchburyi*	200	0	0	0	*Goniopora stutchburyi*	60	0	0	0					
15	*Goniopora stutchburyi*	60	0	1	0	*Goniopora stutchburyi*	110	0	0	0					
16	*Goniopora stutchburyi*	180	0	0	0	*Goniopora stutchburyi*	100	1	0	0					
17						*Goniopora stutchburyi*	70	0	0	0					
18						*Goniopora stutchburyi*	30	0	0	0					
19						*Goniopora stutchburyi*	120	0	0	0					
20						*Goniopora stutchburyi*	70	0	0	0					
21						*Goniopora stutchburyi*	110	0	0	0					
22						*Goniopora stutchburyi*	60	0	0	0					
23						*Goniopora stutchburyi*	130	0	1	0					
24						*Goniopora stutchburyi*	60	0	0	0					

Site 4 (con't)

	Transect 1					Transect 2					Transect 3				
	Hard Coral	**Area (cm^2)**	**Mortality (%)**	**Sediment (%)**	**Bleaching (%)**	**Hard Coral**	**Area (cm^2)**	**Mortality (%)**	**Sediment (%)**	**Bleaching (%)**	**Hard Coral**	**Area (cm^2)**	**Mortality (%)**	**Sediment (%)**	**Bleaching (%)**
25						*Goniopora stutchburyi*	40	0	0	0					
26						*Goniopora stutchburyi*	40	0	0	0					
27						*Goniopora stutchburyi*	120	0	0	0					
28						*Goniopora stutchburyi*	100	0	0	0					
29						*Goniopora stutchburyi*	80	0	0	0					
30						*Goniopora stutchburyi*	300	0	0	0					
31						*Goniopora stutchburyi*	400	0	0	0					
32						*Goniopora stutchburyi*	450	0	1	0					
33						*Goniopora stutchburyi*	200	0	0	0					
34						*Goniopora stutchburyi*	120	0	0	0					
35						*Goniopora stutchburyi*	230	0	0	0					
36						*Goniopora stutchburyi*	180	0	0	0					
37						*Goniopora stutchburyi*	240	0	0	0					
38						*Goniopora stutchburyi*	350	0	1	0					
39						*Goniopora stutchburyi*	270	0	0	0					
40						*Porites sp.*	50	0	0	0					
41						*Psammocora superficialis*	330	0	2	0					
42						*Porites sp.*	320	0	2	0					
43						*Porites sp.*	160	2	3	0					
44						*Porites sp.*	90	5	0	0					
45						*Montastrea magnistellata*	200	0	2	0					
46						*Favia speciosa*	600	0	10	0					
	Soft Coral	**Area (cm^2)**	**Mortality (%)**	**Sediment (%)**	**Bleaching (%)**	**Soft Coral**	**Area (cm^2)**	**Mortality (%)**	**Sediment (%)**	**Bleaching (%)**	**Soft Coral**	**Area (cm^2)**	**Mortality (%)**	**Sediment (%)**	**Bleaching (%)**
1	*Euplexaura sp.*	NA	0			*Echinomuricea sp.*	NA	0							
2	*Echinomuricea sp.*	NA	0			*Euplexaura sp.*	NA	0							

Site 4 (con't)

	Transect 1					Transect 2					Transect 3				
	Soft Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Soft Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Soft Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)
3	*Euplexaura sp.*	NA	0			*Echinomuricea sp.*	NA	0							
4	*Euplexaura sp.*	NA	0			*Dendronephthya sp.*	NA	0							
5	*Echinomuricea sp.*	NA	0			*Echinomuricea sp.*	NA	0							
6	*Echinomuricea sp.*	NA	0			*Echinomuricea sp.*	NA	0							
7	*Echinomuricea sp.*	NA	0			*Echinomuricea sp.*	NA	0							
8	*Echinomuricea sp.*	NA	0			*Echinomuricea sp.*	NA	0							
9	*Euplexaura sp.*	NA	0			*Euplexaura sp.*	NA	0							
10	*Euplexaura sp.*	NA	0			*Echinomuricea sp.*	NA	0							
11	*Euplexaura sp.*	NA	0			*Echinomuricea sp.*	NA	0							
12	*Echinomuricea sp.*	NA	0			*Euplexaura sp.*	NA	0							
13						*Echinomuricea sp.*	NA	0							
14						*Echinomuricea sp.*	NA	0							

Site 5															
	Transect 1					**Transect 2**					**Transect 3**				
	Hard Coral	**Area (cm^2)**	**Mortality (%)**	**Sediment (%)**	**Bleaching (%)**	**Hard Coral**	**Area (cm^2)**	**Mortality (%)**	**Sediment (%)**	**Bleaching (%)**	**Hard Coral**	**Area (cm^2)**	**Mortality (%)**	**Sediment (%)**	**Bleaching (%)**
1	*Cyphastrea serailia*	90	0	1	0	*Goniopora stutchburyi*	110	0	5	0	*Goniopora stutchburyi*	170	0	3	0
2	*Leptastrea pruinosa*	220	2	2	0						*Goniopora stutchburyi*	120	0	2	0
3											*Goniopora stutchburyi*	210	0	4	0
4											*Goniopora stutchburyi*	180	0	3	0
5											*Goniopora stutchburyi*	130	0	1	0
6											*Montipora cf. turgescens*	100	0	2	0
	Soft Coral	**Area (cm^2)**	**Mortality (%)**	**Sediment (%)**	**Bleaching (%)**	**Soft Coral**	**Area (cm^2)**	**Mortality (%)**	**Sediment (%)**	**Bleaching (%)**	**Soft Coral**	**Area (cm^2)**	**Mortality (%)**	**Sediment (%)**	**Bleaching (%)**
1						*Lobophytum depressum*	NA	0			*Euplexaura sp.*	NA	0		
2						*Lobophytum depressum*	NA	0			*Euplexaura sp.*	NA	0		
3						*Lobophytum depressum*	NA	0			*Euplexaura sp.*	NA	0		
4						*Lobophytum depressum*	NA	0							
5						*Lobophytum depressum*	NA	0							
6						*Lobophytum depressum*	NA	0							
7						*Lobophytum depressum*	NA	0							
8						*Lobophytum depressum*	NA	0							
9						*Lobophytum depressum*	NA	0							
10						*Lobophytum depressum*	NA	0							
11						*Lobophytum depressum*	NA	0							
12						*Lobophytum depressum*	NA	0							

Control Site C

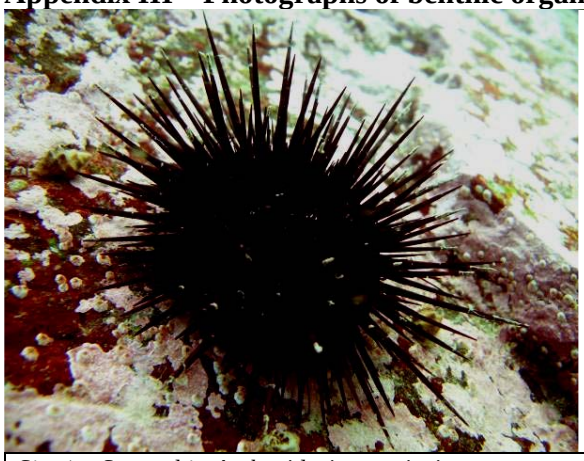
	Transect 1					Transect 2					Transect 3				
	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)
1	*Favia rotumana*	150	0	0	0	*Favia rotumana*	190	0	0	0	*Favia rotumana*	450	0	2	0
2	*Favia rotumana*	240	0	1	0	*Platygyra acuta*	120	0	1	0	*Favia rotumana*	280	0	0	0
3	*Platygyra acuta*	180	0	0	0	*Platygyra acuta*	90	0	0	0	*Favia speciosa*	280	0	1	0
4	*Platygyra carnosus*	240	0	0	0	*Favia rotumana*	210	0	0	0	*Favites pentagona*	90	0	0	0
5	*Platygyra carnosus*	400	0	0	0	*Favia rotumana*	360	0	0	0	*Favites pentagona*	670	0	0	0
6	*Cyphastrea serailia*	200	0	0	0	*Favites pentagona*	420	0	0	0	*Cyphastrea serailia*	190	0	0	0
7	*Favia rotumana*	210	0	0	0	*Favia rotumana*	380	0	0	0	*Porites sp.*	450	0	4	0
8	*Favia rotumana*	320	0	0	0	*Favia rotumana*	80	0	0	0	*Favia rotumana*	190	0	0	0
9	*Goniastrea aspera*	400	0	2	0	*Favites abdita*	400	5	1	0	*Favia rotumana*	210	0	0	0
10	*Favia rotumana*	200	0	0	0	*Favia rotumana*	280	0	0	0	*Favia rotumana*	40	0	0	0
11	*Favia rotumana*	500	0	0	0	*Favia rotumana*	280	3	0	0	*Favia rotumana*	200	7	3	0
12	*Favia rotumana*	300	0	0	0	*Favia rotumana*	350	0	0	0	*Goniastrea aspera*	500	0	4	0
13	*Porites sp.*	300	3	5	0	*Favites abdita*	240	2	0	0	*Pavona decussata*	130	0	0	0
14	*Platygyra carnosus*	560	0	1	0	*Leptastrea pruinosa*	330	0	0	0	*Pavona decussata*	50	0	0	0
15	*Favia rotumana*	250	0	0	0	*Favia rotumana*	400	0	0	0	*Favites pentagona*	1400	0	3	0
16	*Favites pentagona*	380	0	0	0	*Favia rotumana*	200	0	0	0	*Favites pentagona*	250	0	2	0
17	*Favites pentagona*	280	0	0	0	*Platygyra acuta*	120	0	0	0	*Psammocora superficialis*	800	0	5	0
18	*Favia rotumana*	190	0	0	0	*Favites pentagona*	130	0	0	0	*Plesiastrea versipora*	60	0	3	0
19	*Favia rotumana*	350	0	0	0	*Favites abdita*	140	2	0	0	*Favia speciosa*	60	0	2	0
20	*Favia rotumana*	300	0	0	0	*Favia rotumana*	200	0	0	0	*Favia speciosa*	240	0	2	0
21	*Favia rotumana*	280	5	0	0	*Porites sp.*	420	0	3	0	*Porites sp.*	190	0	4	0
23	*Favites abdita*	200	0	3	0	*Favia rotumana*	330	0	0	0	*Favia rotumana*	290	0	3	0
24	*Favites abdita*	260	0	0	0	*Cyphastrea serailia*	290	0	3	0	*Favia rotumana*	350	0	2	0
25	*Cyphastrea serailia*	260	3	0	0	*Platygyra carnosus*	120	0	0	0	*Favites pentagona*	60	0	2	0
26	*Favia speciosa*	430	0	1	0	*Favia rotumana*	500	0	0	0	*Favia rotumana*	120	0	0	0

Control Site C (con't)

	Transect 1					Transect 2					Transect 3				
	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)
27	*Plesiastrea versipora*	220	0	0	0	*Favia rotumana*	100	0	0	0	*Goniopora stutchburyi*	220	0	0	0
28	*Goniastrea aspera*	190	0	0	0	*Porites sp.*	130	0	0	0	*Favia speciosa*	370	0	0	0
29	*Turbinaria peltata*	90	0	0	0	*Porites sp.*	350	0	0	0	*Montipora peltiformis*	280	0	1	0
30	*Goniastrea aspera*	120	0	0	0	*Favia rotumana*	60	0	0	0	*Plesiastrea versipora*	500	0	3	0
31	*Goniastrea aspera*	750	0	0	0	*Favia rotumana*	90	0	0	0	*Goniopora stutchburyi*	450	0	5	0
32	*Favites pentagona*	700	0	0	0						*Favia speciosa*	490	0	2	0
33	*Favia rotumana*	320	0	0	0						*Plesiastrea versipora*	280	0	1	0
34	*Favites pentagona*	650	0	1	0						*Plesiastrea versipora*	50	0	1	0
35	*Porites sp.*	400	0	1	0						*Plesiastrea versipora*	300	0	1	0
36	*Porites sp.*	200	0	1	0						*Hydnophora exesa*	210	0	0	0
37	*Favia speciosa*	500	0	0	0						*Favia speciosa*	350	0	2	0
38	*Psammocora profundacella*	200	0	0	0						*Plesiastrea versipora*	1500	0	2	0
39	*Platygyra acuta*	390	0	0	0						*Favia speciosa*	220	0	1	0
40											*Porites sp.*	500	6	2	0
41											*Plesiastrea versipora*	140	0	0	0
42											*Goniopora stutchburyi*	480	0	3	0
43											*Plesiastrea versipora*	500	0	0	0
44											*Psammocora superficialis*	130	0	0	0
45											*Plesiastrea versipora*	60	0	0	0
46											*Plesiastrea versipora*	3000	0	0	0
47											*Plesiastrea versipora*	200	0	0	0
48											*Plesiastrea versipora*	580	0	0	0
49											*Favia speciosa*	170	0	0	0
50											*Cyphastrea serailia*	160	0	0	0
51											*Goniopora stutchburyi*	180	0	0	0

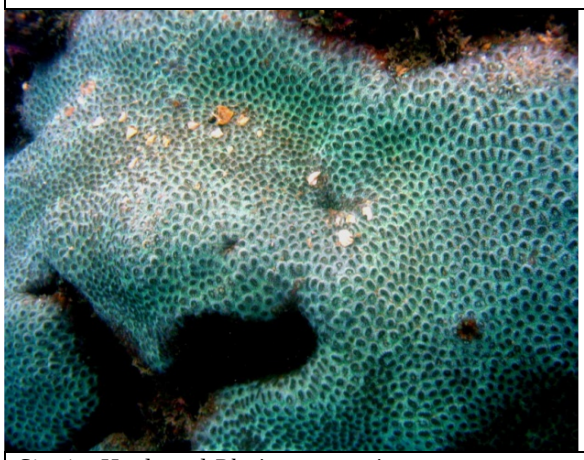
Control Site C (con't)															
	Transect 1					Transect 2					Transect 3				
	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)	Hard Coral	Area (cm^2)	Mortality (%)	Sediment (%)	Bleaching (%)
52											*Psammocora superficialis*	500	0	2	0
53											*Psammocora superficialis*	500	8	2	0
54											*Plesiastrea versipora*	2200	0	1	0
55											*Favia speciosa*	220	0	2	0
56											*Psammocora superficialis*	850	6	1	0
57											*Favia rotumana*	250	0	2	0
58											*Favia rotumana*	250	8	1	0
59											*Favia favus*	350	0	1	0
60											*Psammocora profundacella*	250	6	1	0
61											*Montipora peltiformis*	200	0	3	0
62											*Psammocora superficialis*	300	0	3	0
63											*Cyphastrea serailia*	320	0	1	0
64											*Favia speciosa*	250	0	1	0
65											*Psammocora superficialis*	580	4	1	0
											Platygyra carnosus	2600	0	0	0
											Platygyra carnosus	1400	0	1	0

Appendix III Photographs of benthic organisms at the survey sites.



Site 1 – Sea urchin *Anthocidaris crassispina*

Site 1 – Macroalgae *Colpomenia sinuosa* (front)
Hard coral *Platygyra carnosus* (back)

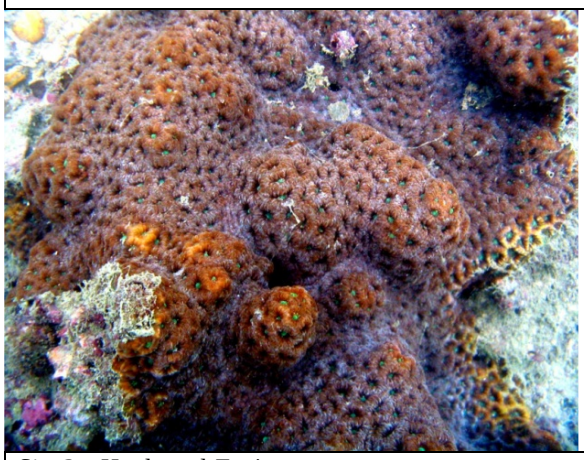


Site 1 – Hard coral *Plesiastrea versipora*

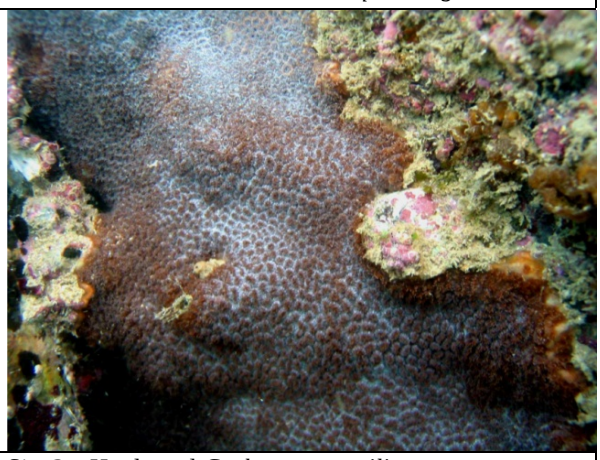
Site 1 – Hard coral *Favites abdita*

Site 1 – Hard coral *Pavona decussata*

Site 2 – Sea cucumber *Colochirus quadrangularis*

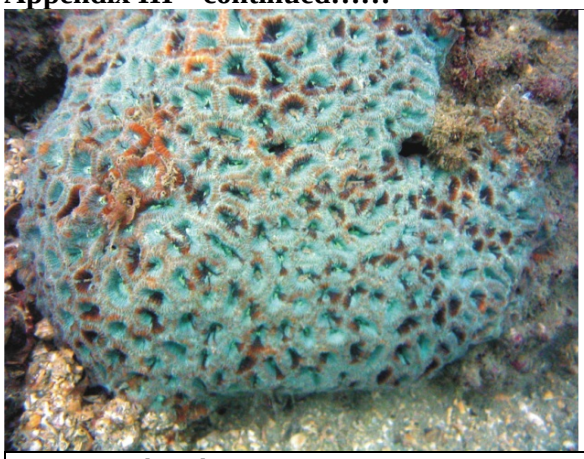


Site 2 – Hard coral *Favites pentagona*



Site 2 – Hard coral *Cyphastrea serailia*

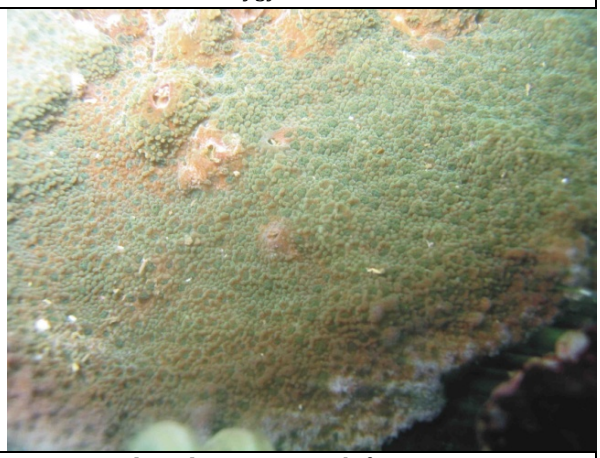
Appendix III continued……



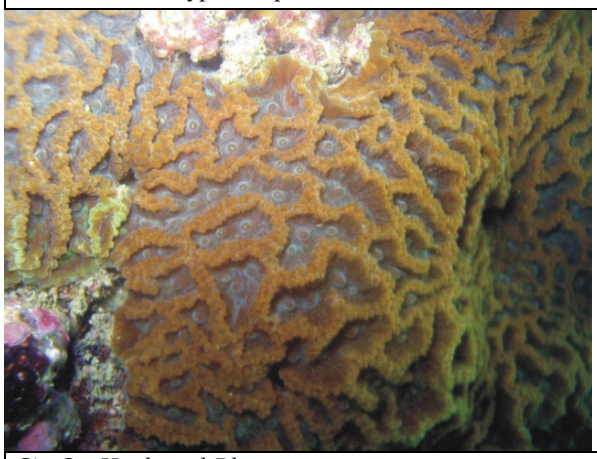
Site 2 – Hard coral *Favia speciosa*

Site 2 – Hard coral *Platygyra acuta*

Site 3 – Cowie *Cypraea sp.*

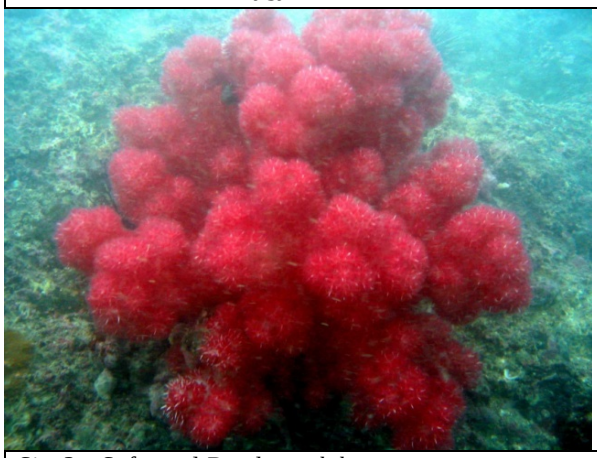


Site 3 – Hard coral *Montipora peltiformis*



Site 3 – Hard coral *Platygyra carnosus*

Site 3 – Hard coral *Turbinaria peltata*

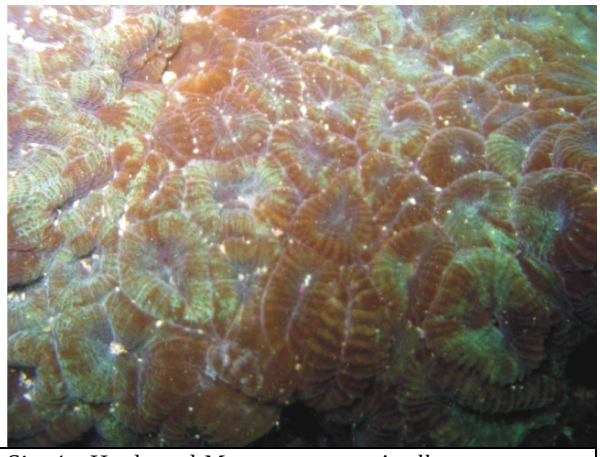


Site 3 – Soft coral *Dendronephthya sp.*

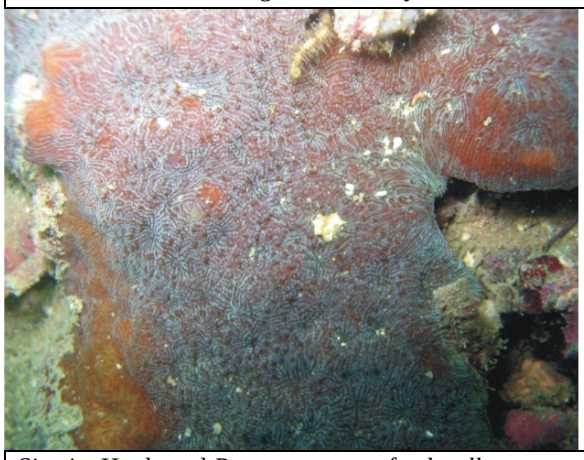
Site 3 – Sea whip *Euplexaura sp.*

Appendix III continued……

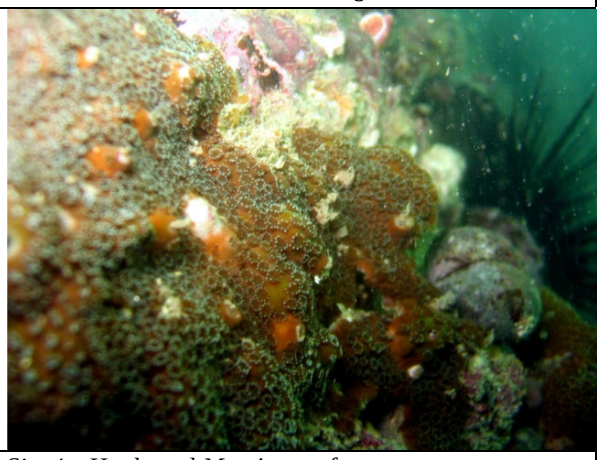
Site 4 – Fanworm belongs to the family Sabellidae



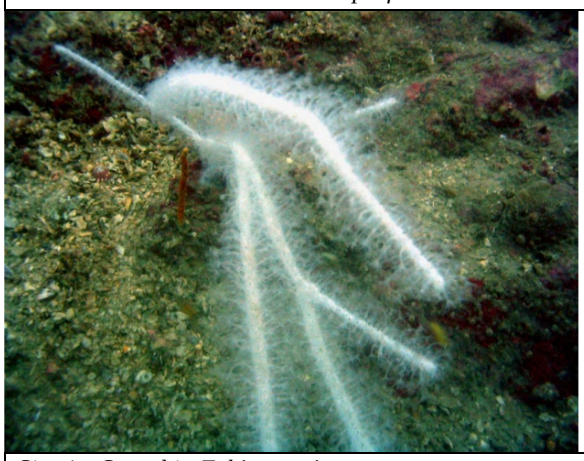
Site 4 – Hard coral *Montastrea magnistellata*



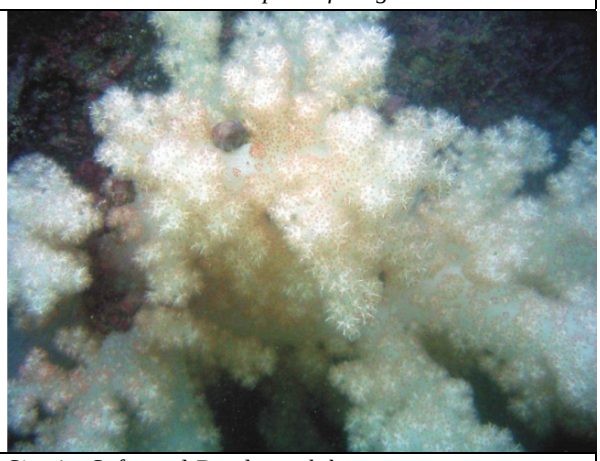
Site 4 – Hard coral *Psammocora profundacella*



Site 4 – Hard coral *Montipora cf. turgescens*

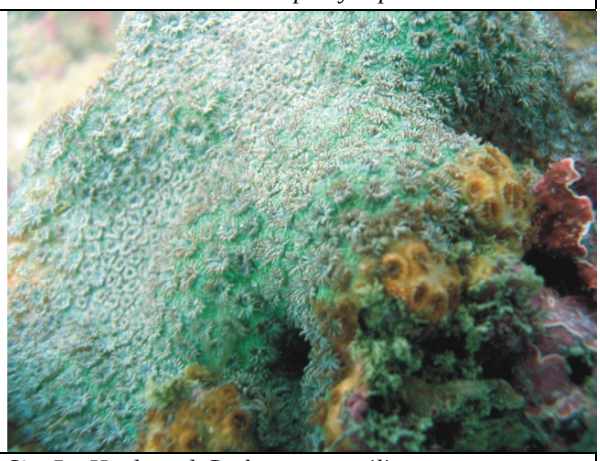


Site 4 – Sea whip *Echinomuricea sp.*



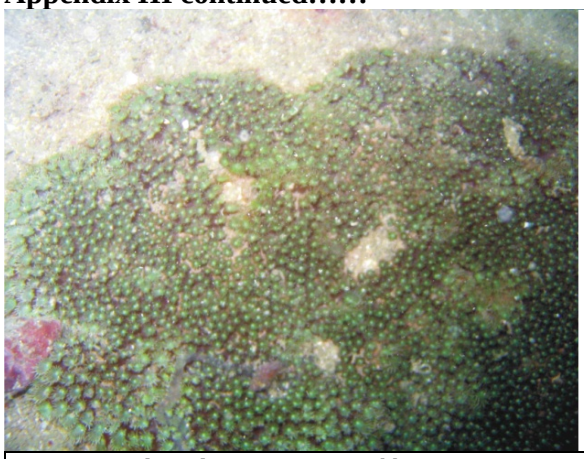
Site 4 – Soft coral *Dendronephthya sp.*

Site 5 – Sea urchin *Salmacis sphaeroides*

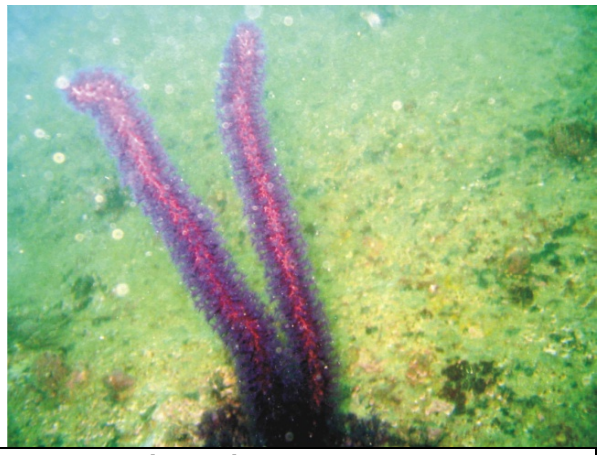


Site 5 – Hard coral *Cyphastrea serailia*

Appendix III continued……



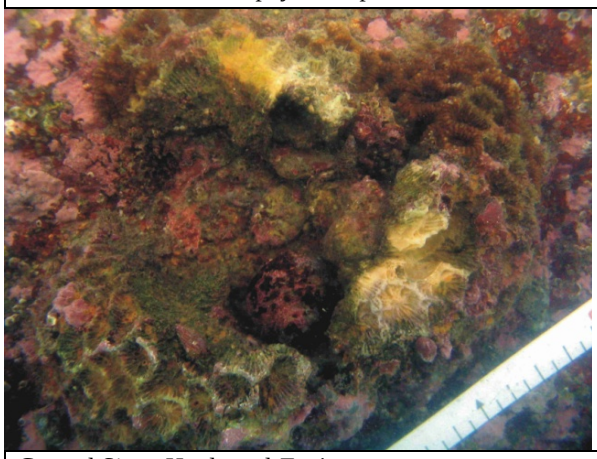
Site 5 – Hard coral *Goniopora stutchburyi*



Site 5 – Sea whip *Euplexaura sp.*

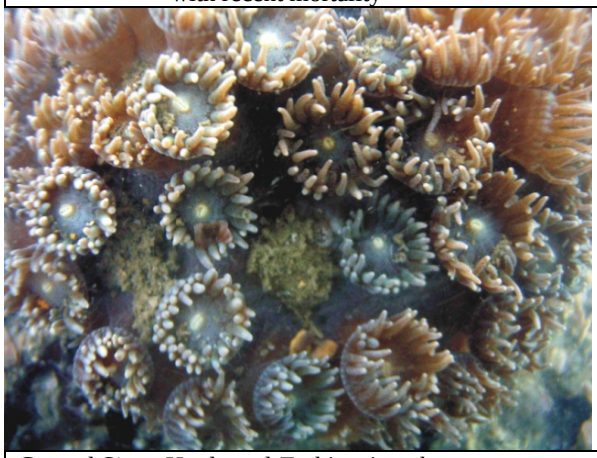
Site 5 – Soft coral *Lobophytum depressum*

Control Site – Hard coral *Favia rotumana*

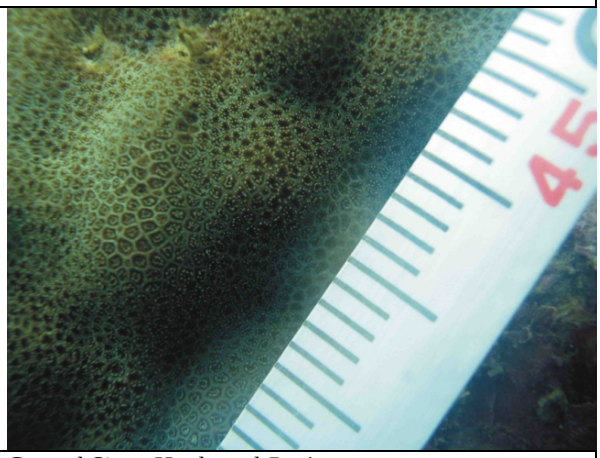


Control Site – Hard coral *Favites pentagona* with recent mortality

Control Site – Hard coral *Hydnophora exesa*

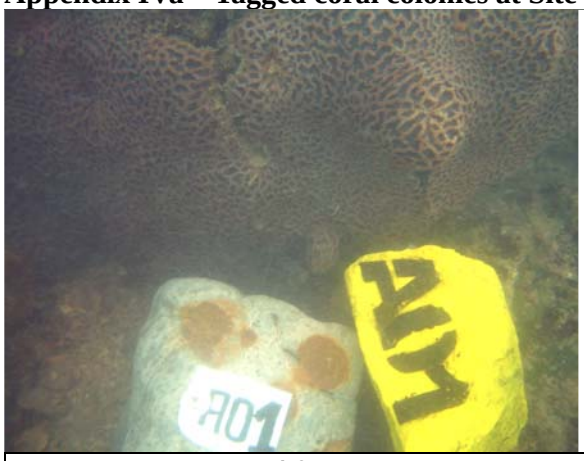


Control Site – Hard coral *Turbinaria peltata*

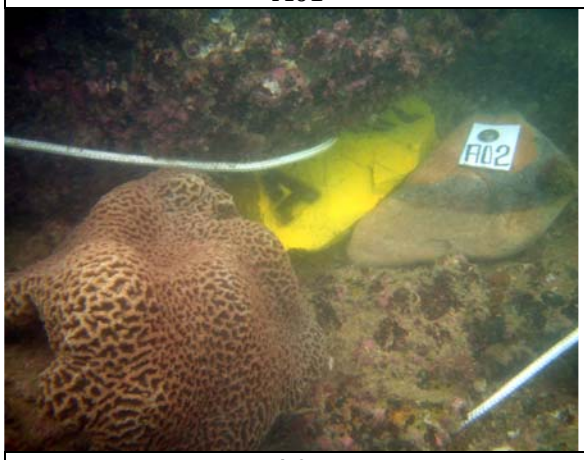


Control Site – Hard coral *Porites sp.*

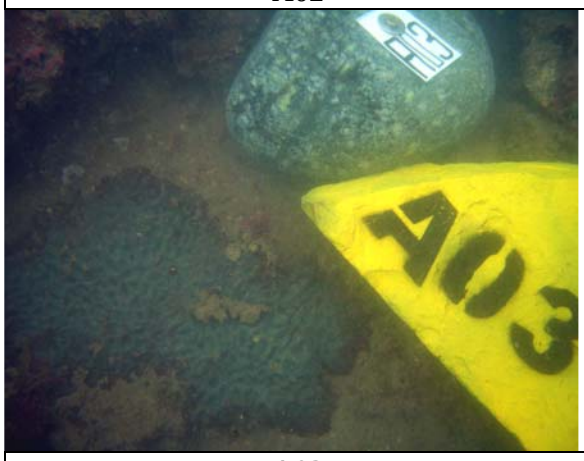
Appendix IVa Tagged coral colonies at Site 1.



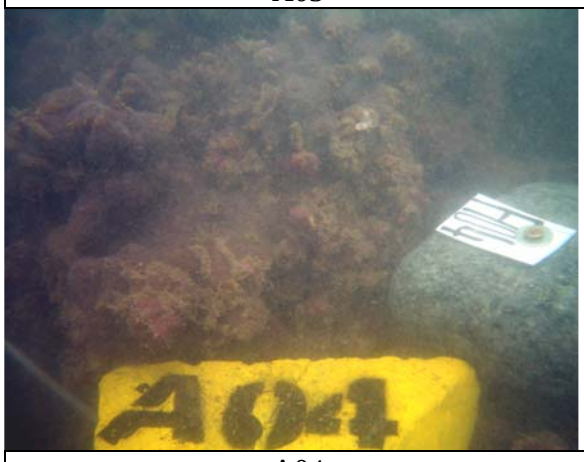
A01	*Platygyra carnosus*

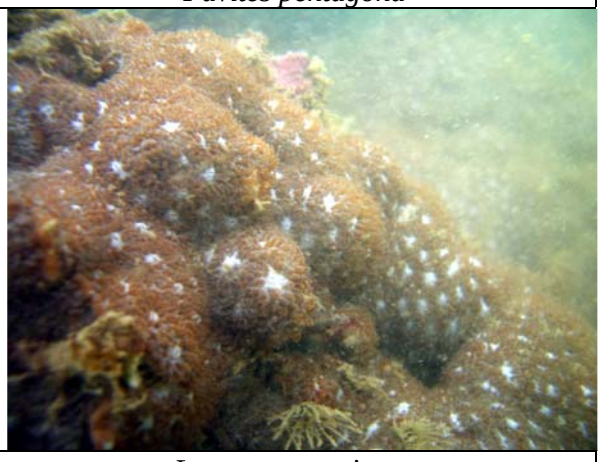


A02	*Platygyra carnosus*



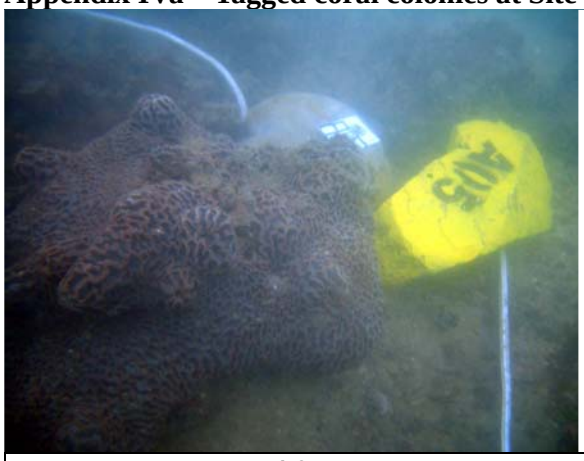
A03	*Favites pentagona*

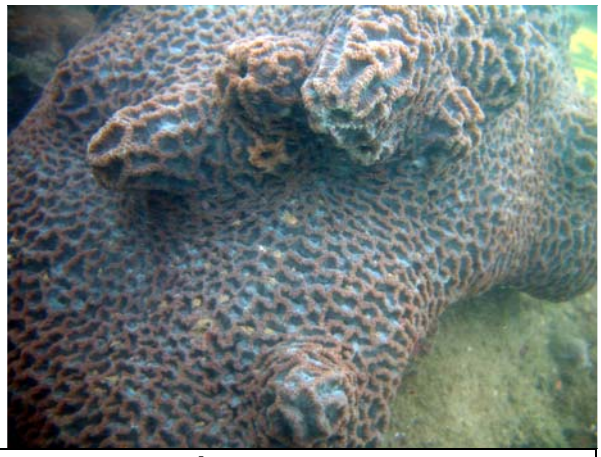




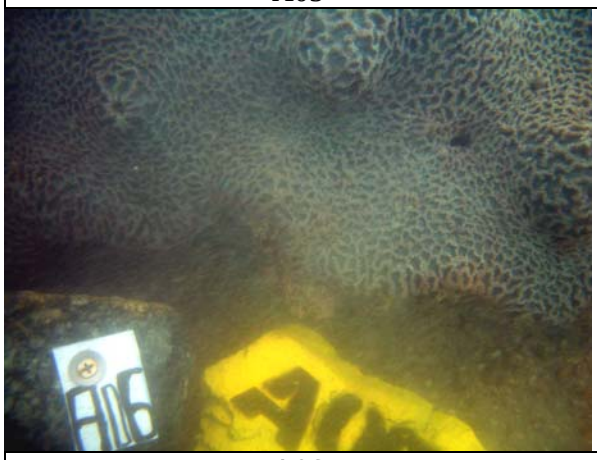
A04	*Leptastrea pruinosa*

Appendix IVa Tagged coral colonies at Site 1……continued.

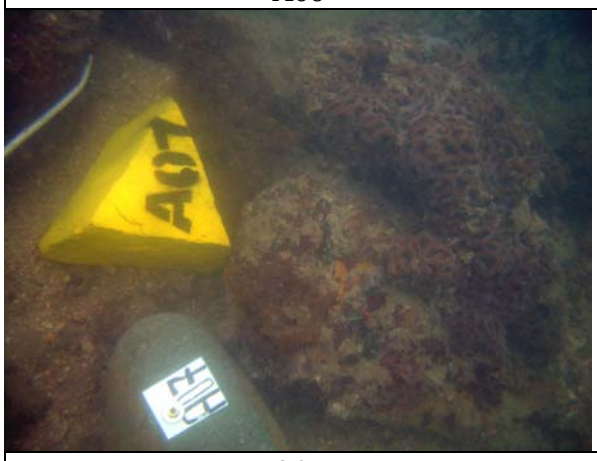




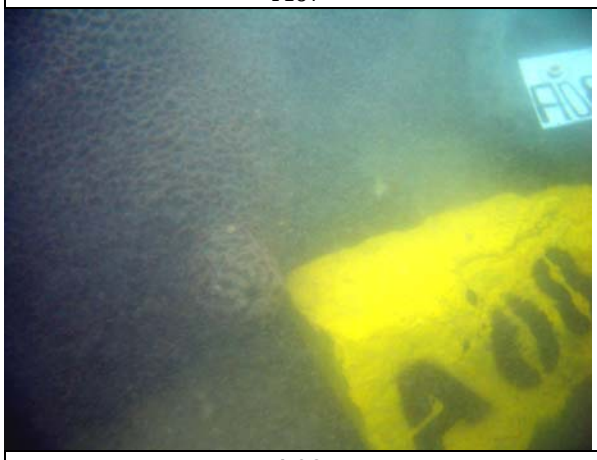
A05 *Platygyra carnosus*



A06 *Platygyra carnosus*

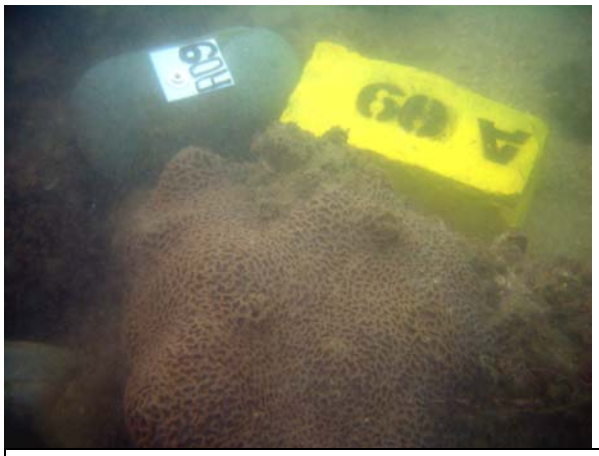


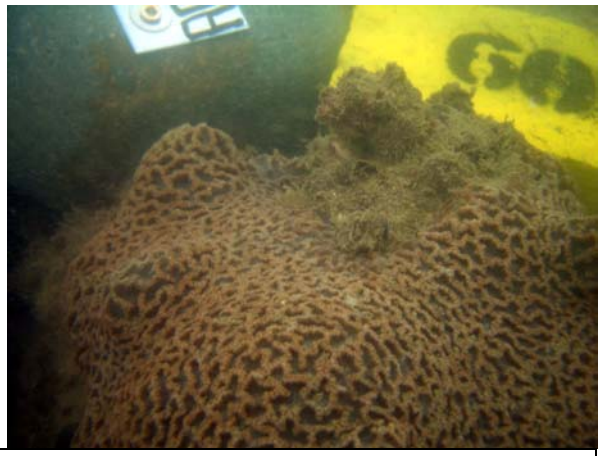
A07 *Favia rotumana*



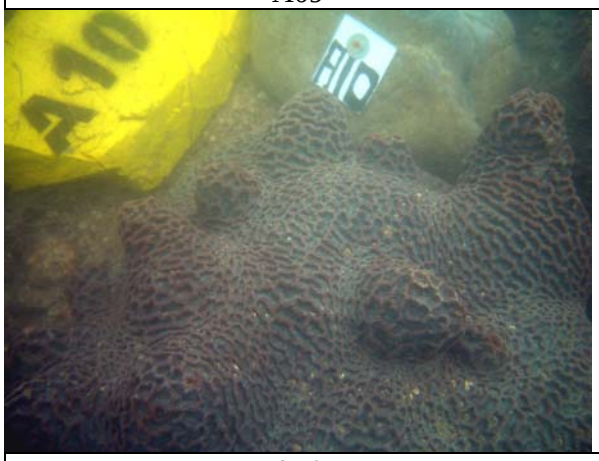
A08 *Platygyra carnosus*

Appendix IVa Tagged coral colonies at Site 1……continued.



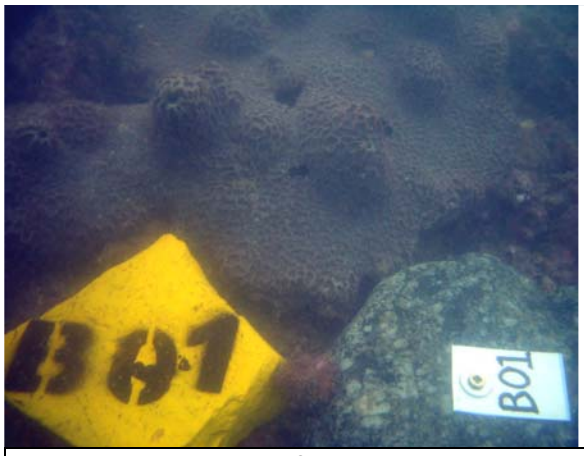


A09 *Platygyra carnosus*

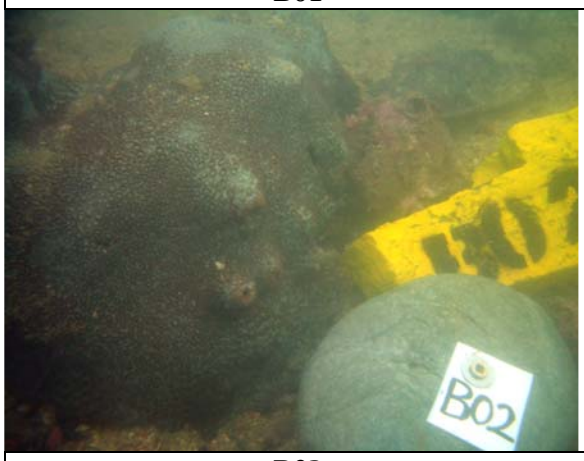


A10 *Platygyra carnosus*

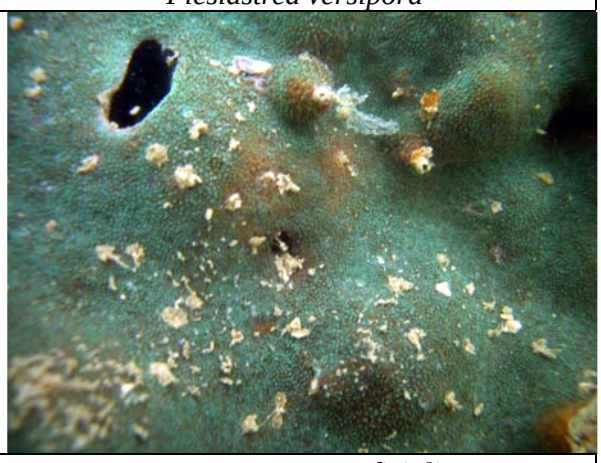
Appendix IVb Tagged coral colonies at Site 2.



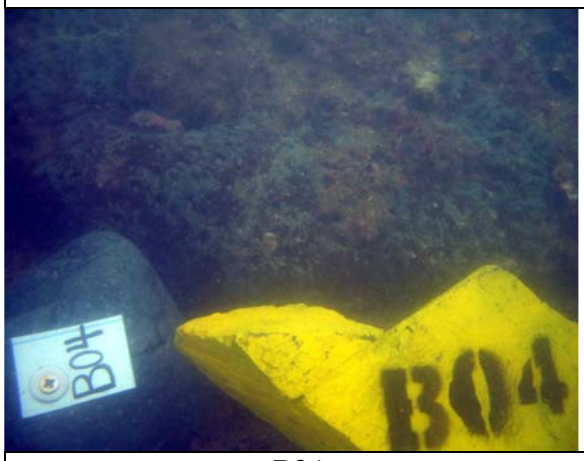
B01	*Platygyra carnosus*



B02	*Plesiastrea versipora*

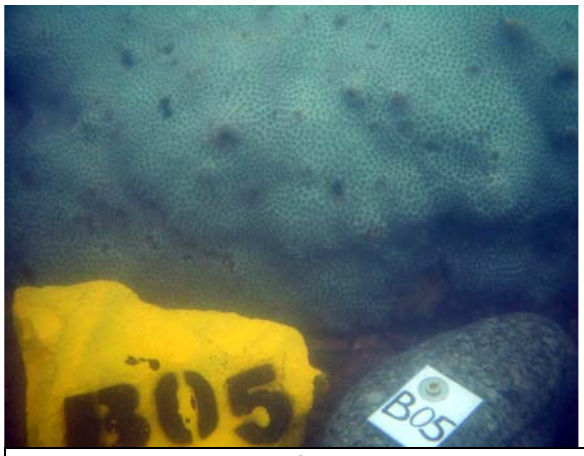


B03	*Psammocora superficialis*



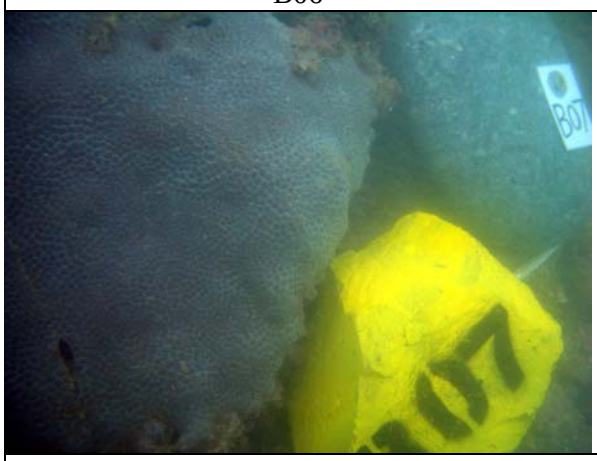
B04	*Favia speciosa*

Appendix IVb Tagged coral colonies at Site 2……continued.

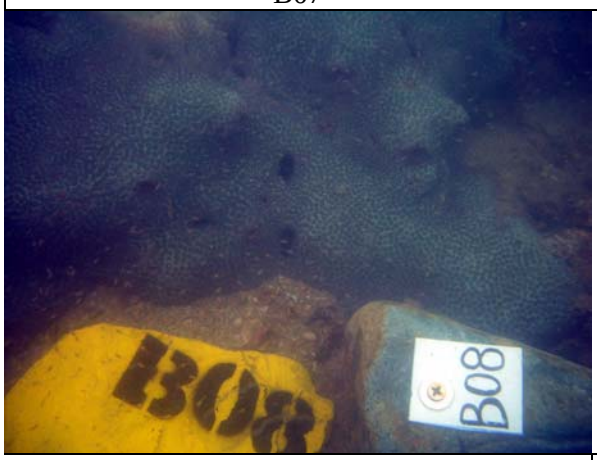


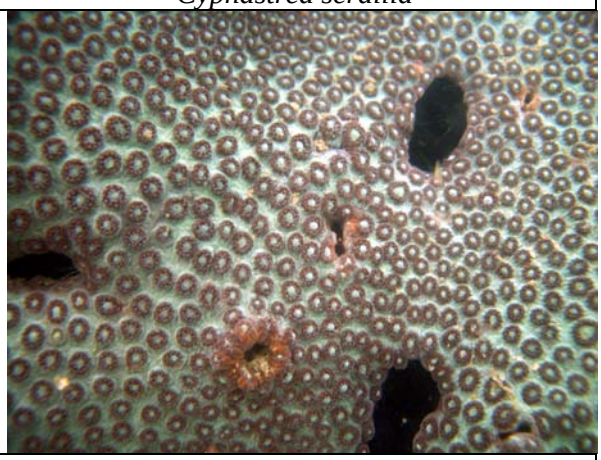
B05	*Plesiastrea versipora*

B06	*Platygyra carnosus*



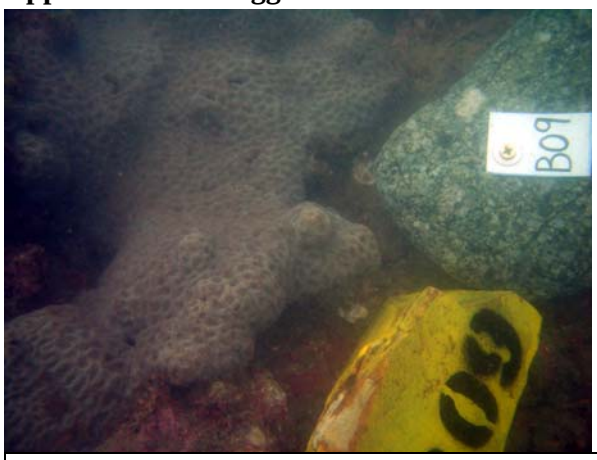
B07	*Cyphastrea serailia*



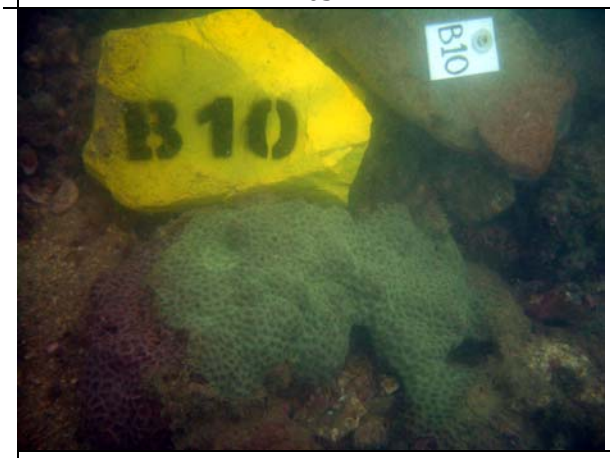


B08	*Plesiastrea versipora*

Appendix IVb Tagged coral colonies at Site 2……continued.

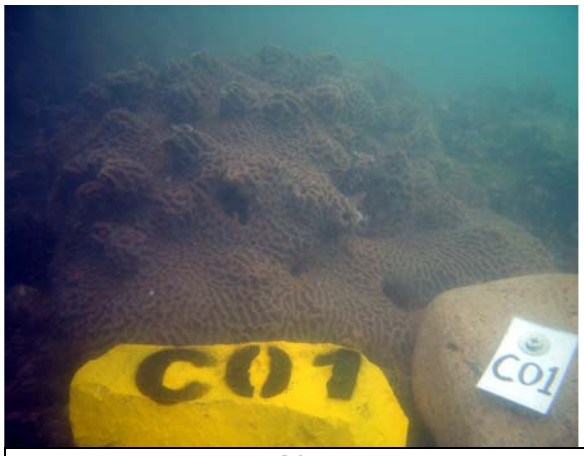


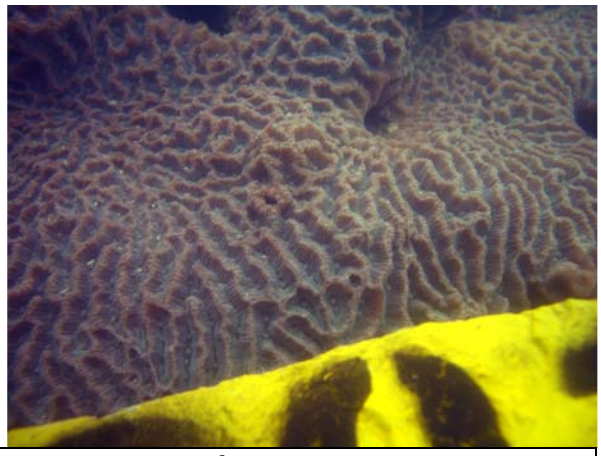
B09	*Favites pentagona*



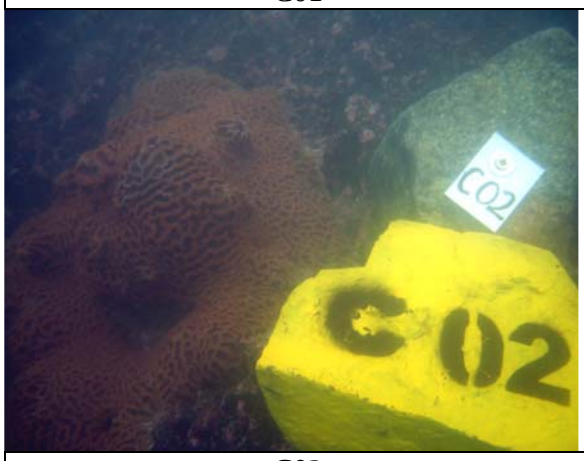
B10	*Favites pentagona*

Appendix IVc Tagged Coral Colonies at Site 3.

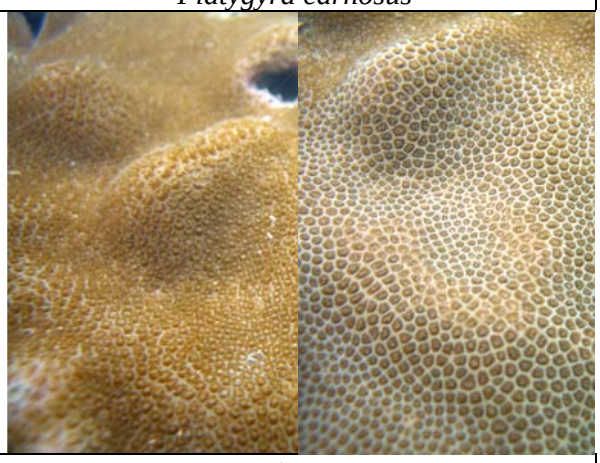




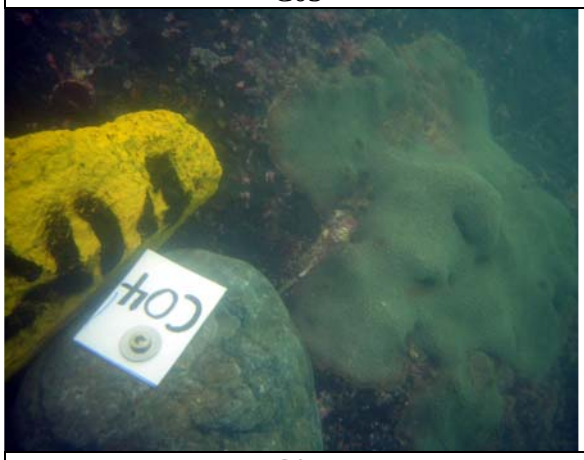
C01 *Platygyra acuta*

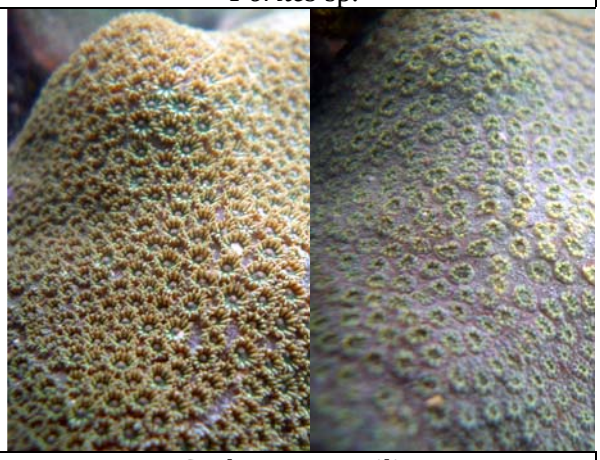


C02 *Platygyra carnosus*



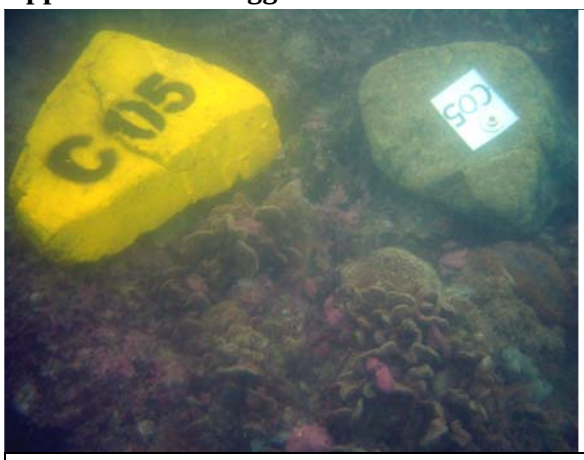
C03 *Porites* sp.



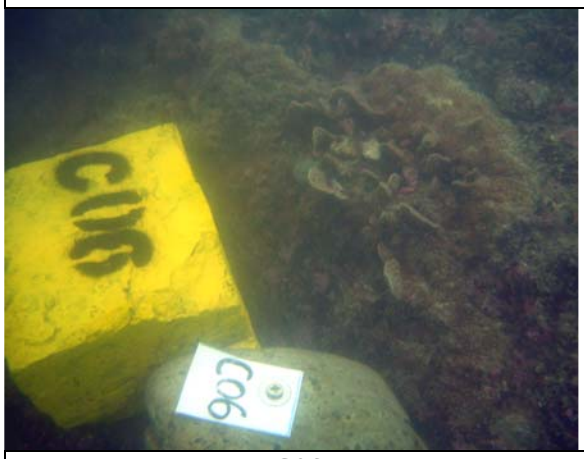


C04 *Cyphastrea serailia*

Appendix IVc Tagged Coral Colonies at Site 3……continued.

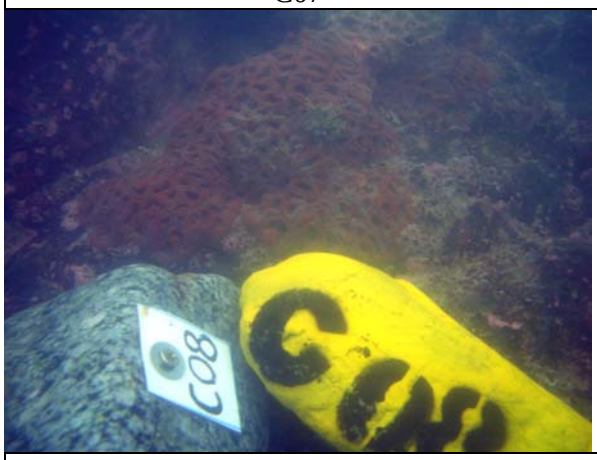


C05	*Pavona decussata*



C06	*Pavona decussata*

C07	*Montipora cf. turgescens*



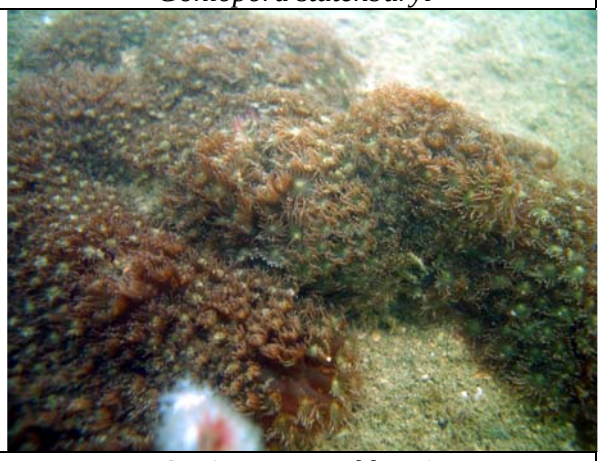
C08	*Favia favus*

Appendix IVc Tagged Coral Colonies at Site 3……continued.

	
C09	*Favites pentagona*
	
C10	*Montipora peltiformis*

Appendix IVd Tagged Coral Colonies at Site 4.

E01 *Goniopora stutchburyi*

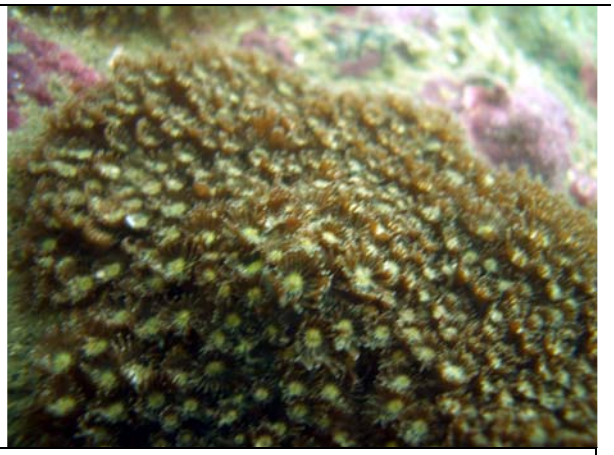


E02 *Goniopora stutchburyi*

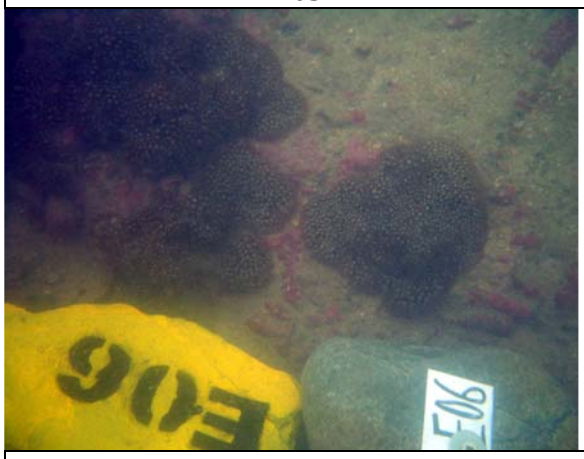
E03 *Goniopora stutchburyi*

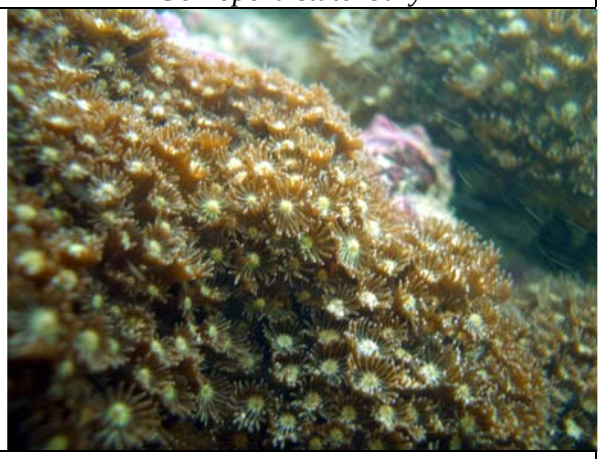
E04 *Porites* sp.

Appendix IVd Tagged Coral Colonies at Site 4……continued.

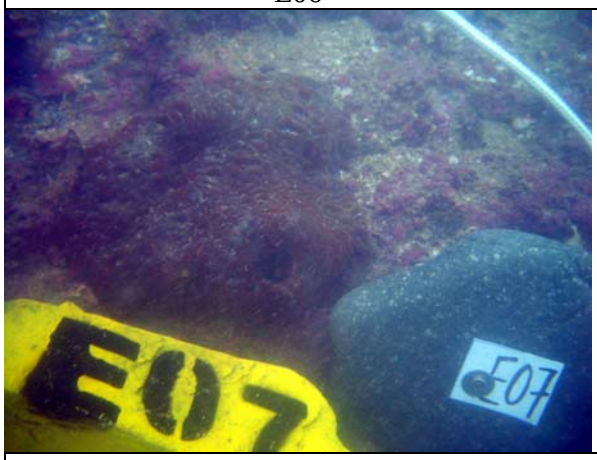


E05 *Goniopora stutchburyi*





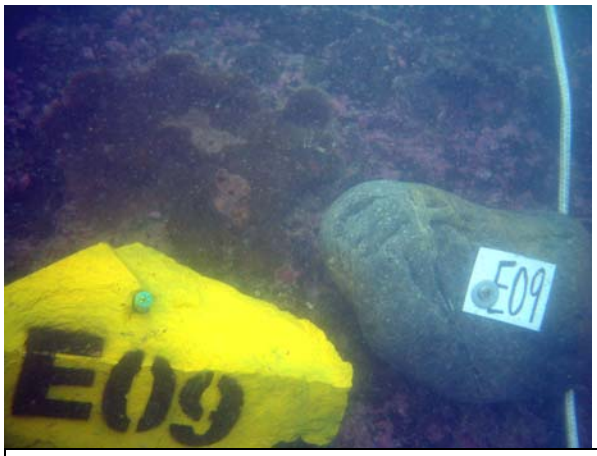
E06 *Goniopora stutchburyi*



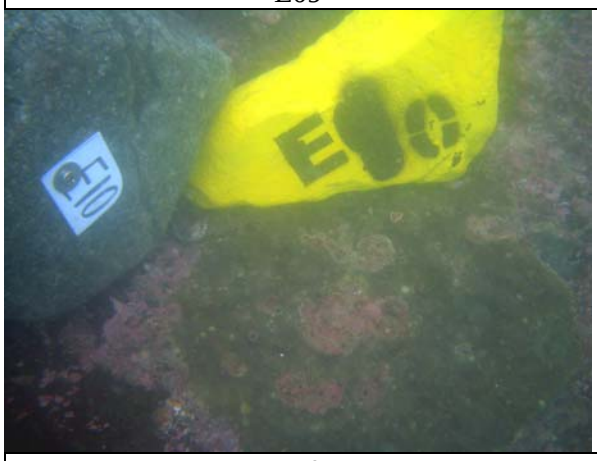
E07 *Favia speciosa*

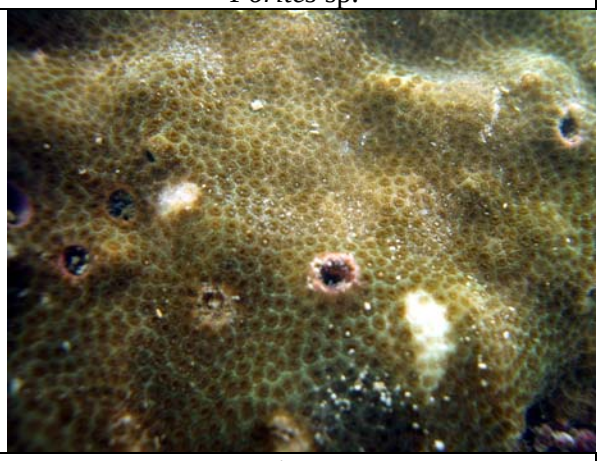
E08 *Porites* sp.

Appendix IVd Tagged Coral Colonies at Site 4……continued.



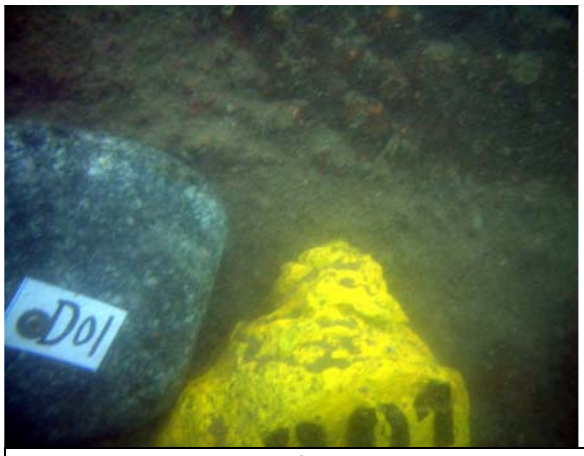
E09	*Porites* sp.





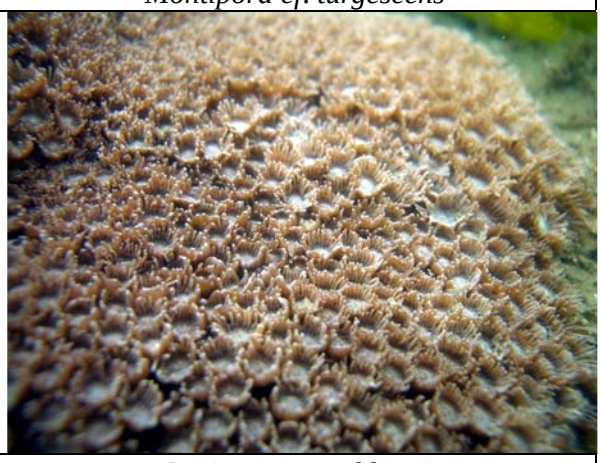
E10	*Porites* sp.

Appendix IVe Tagged Coral Colonies at Site 5.

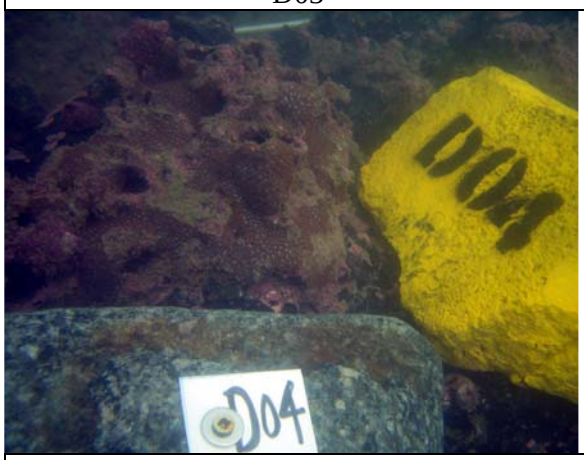


D01 *Psammocora* sp.

D02 *Montipora cf. turgescens*

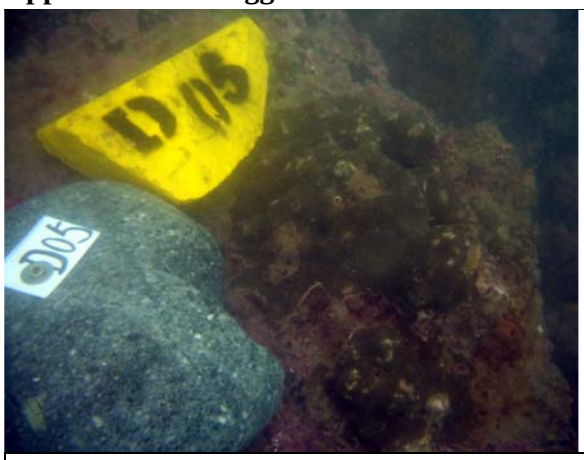


D03 *Goniopora stutchburyi*

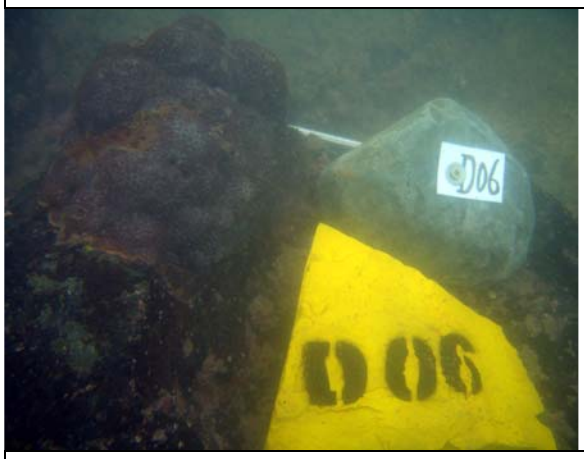


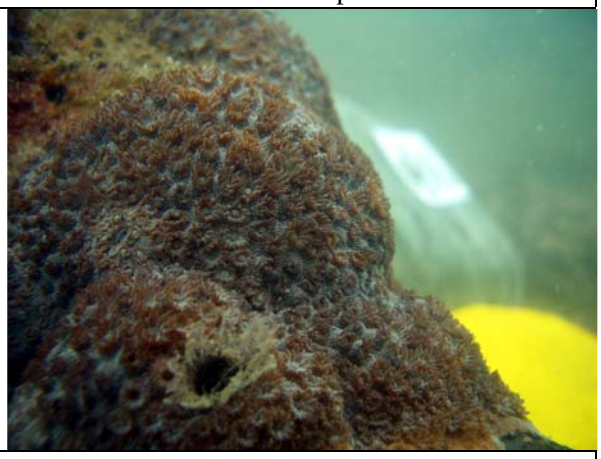
D04 *Leptastrea pruinosa*

Appendix IVe Tagged Coral Colonies at Site 5……continued.

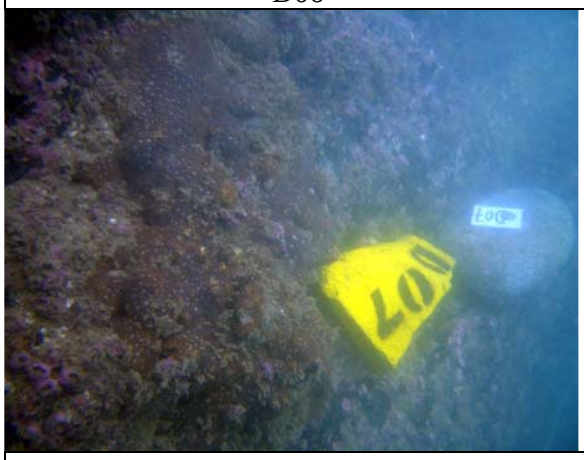


D05 *Porites* sp.

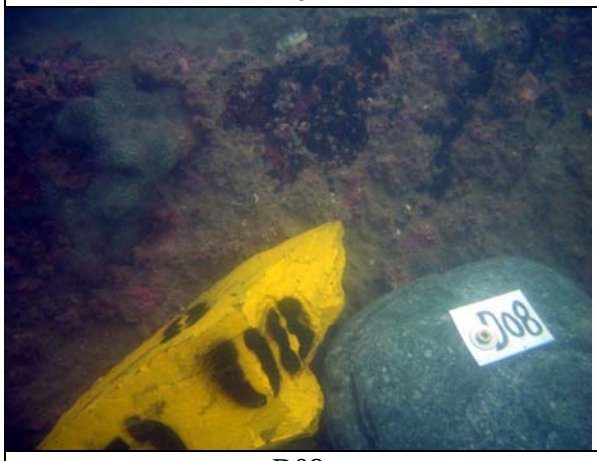


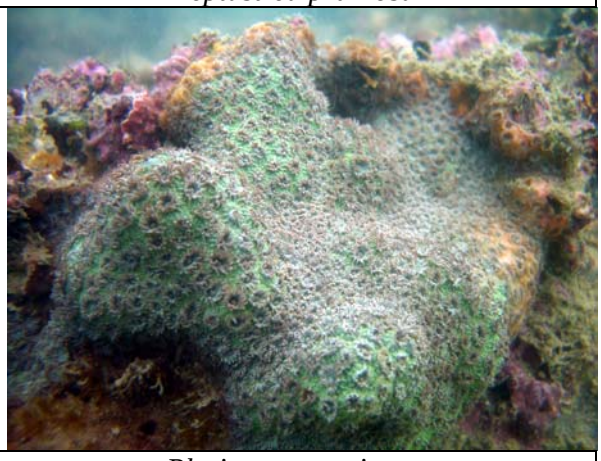


D06 *Plesiastrea versipora*



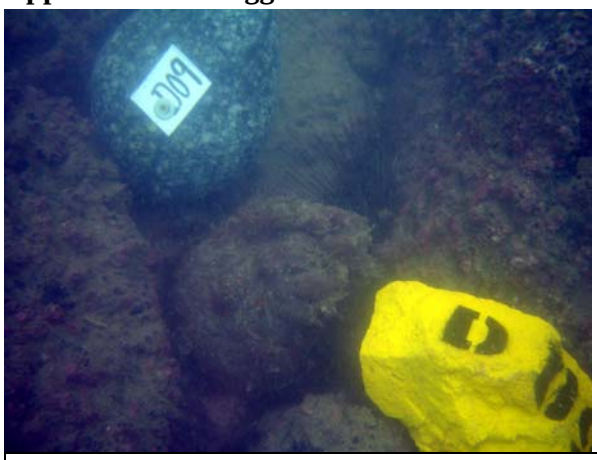
D07 *Leptastrea pruinosa*



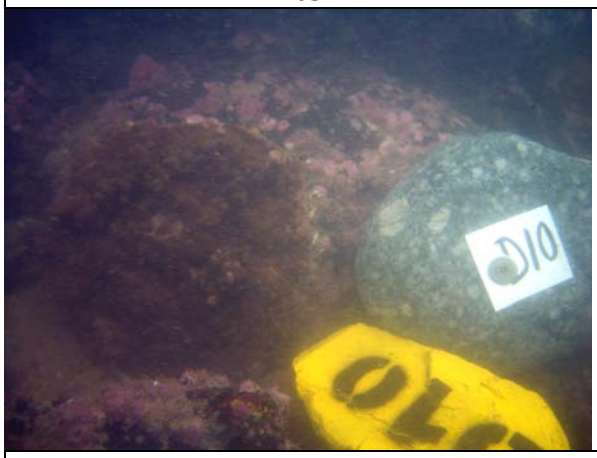


D08 *Plesiastrea versipora*

Appendix IVe Tagged Coral Colonies at Site 5……continued.



D09	*Cyphastrea* sp.



D10	*Montipora cf. turgescens*

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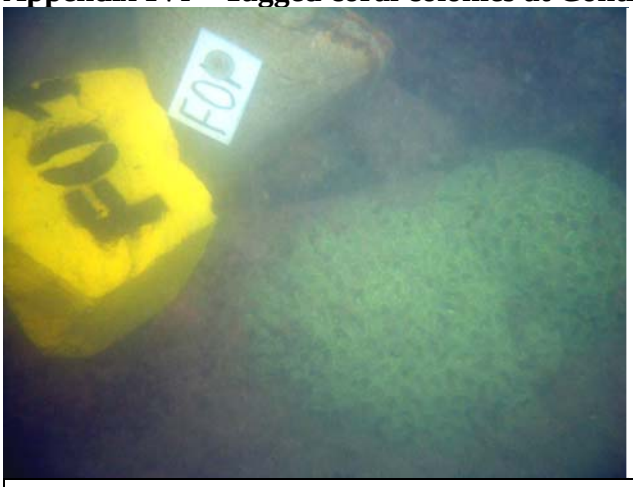
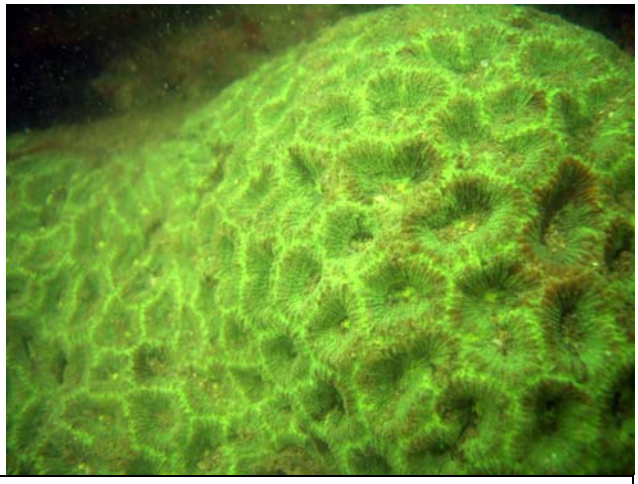
Appendix IVf Tagged coral colonies at Control Site.

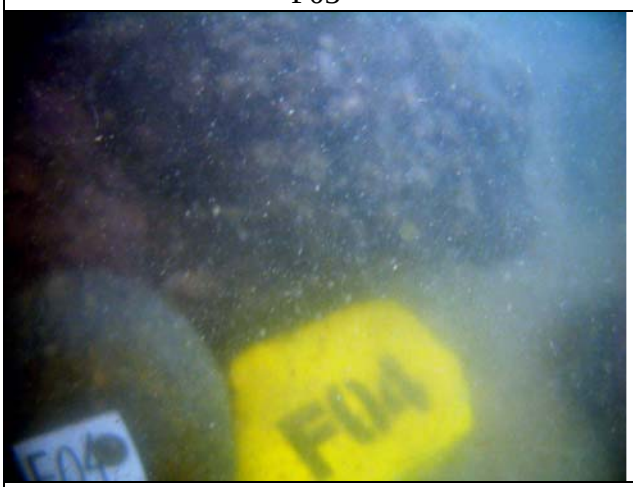


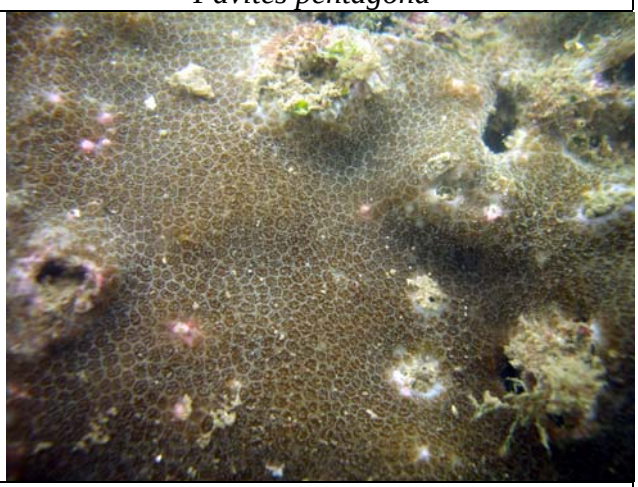


F01 *Favites speciosa*

F02 *Favites pentagona*

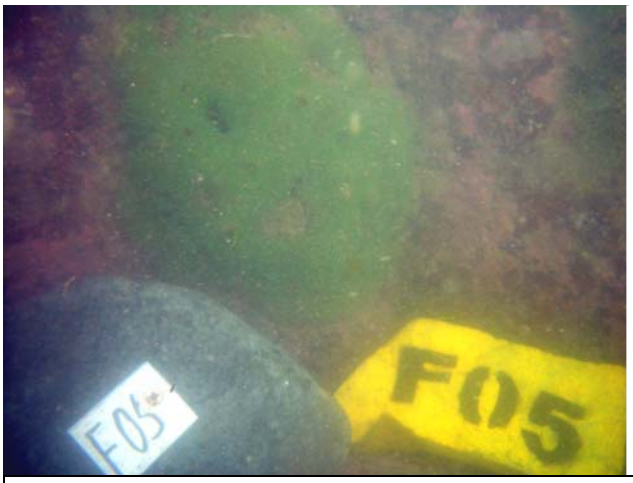
F03 *Favites pentagona*



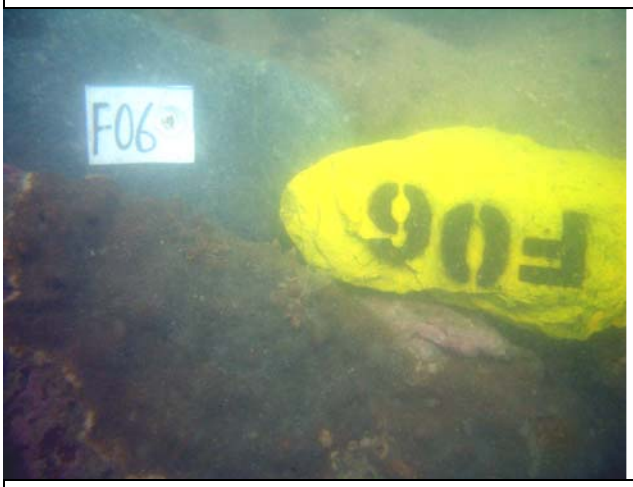


F04 *Porites* sp.

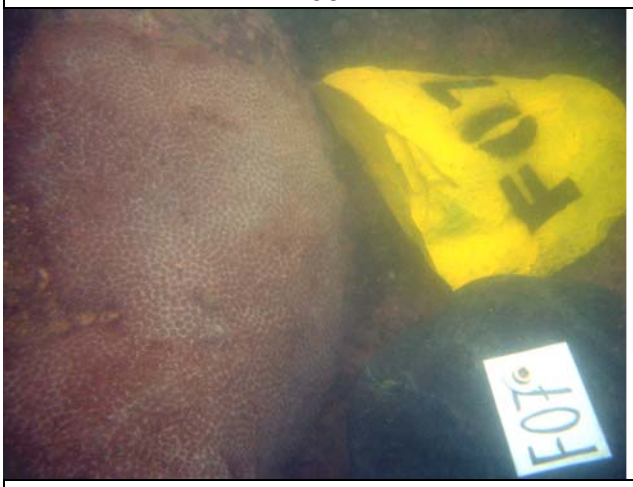
Appendix IVf Tagged coral colonies at Control Site……continued.

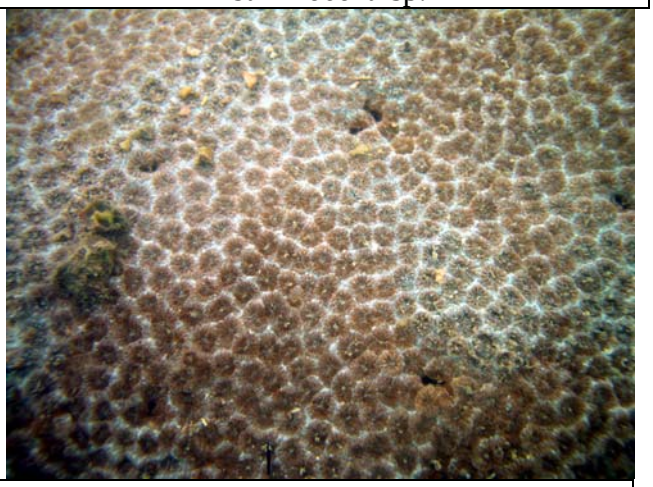


F05 *Cyphastrea serailia*

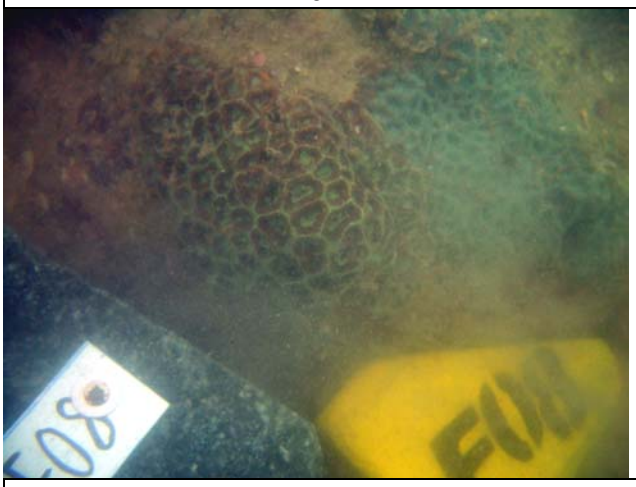


F06 *Psammocora* sp.



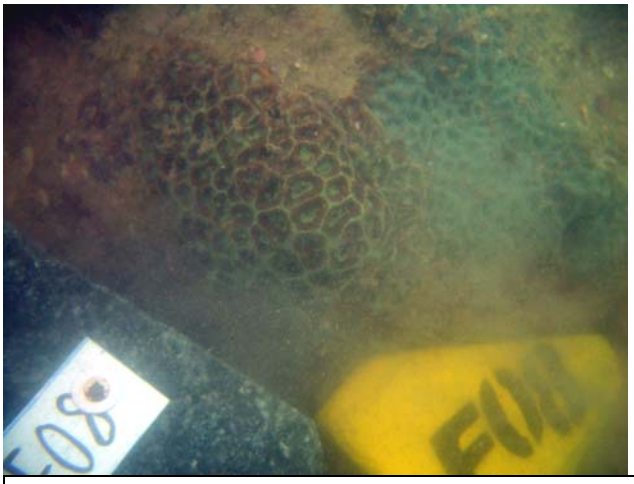


F07 *Plesiastrea versipora*



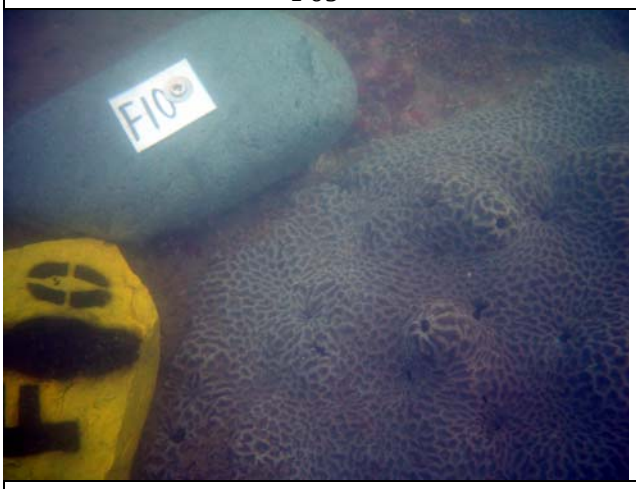
F08a *Favites speciosa* (left side)

Appendix IVf Tagged coral colonies at Control Site……continued.



F08b | *Goniastrea favulus* (right side)

F09 | *Favites pentagona*



F10 | *Platygyra carnosus*