

Agreement No. CE 18/2002 (EP)
**Construction of Helipads at Peng Chau and Yung Shue Wan,
Lamma Island**



**Report for
Coral Monitoring Surveys (October 2007)**

2nd November 2007



miniprojects co. Ltd.

Agreement No. CE 18/2002 (EP)
Construction of Helipads at Peng Chau and Yung Shue Wan,
Lamma Island

Report for
Two Coral Monitoring Surveys
at Yung Shue Wan in October 2007

Prepared by:
miniprojects co. Ltd.
Cinotech Consultants Limited

Contents

1	INTRODUCTION	2
	1.1 Project Background	2
2	METHODOLOGY	3
	2.1 Impact Monitoring Surveys - Locations	3
	2.2 Survey Methods	3
	2.3 Coral Monitoring Frequency	3
	2.4 Actions on Exceedance of Action & Limit Levels	3
3	RESULTS	7
	3.1 Impact Monitoring Surveys - October 2007	7
4	SUMMARY AND CONCLUSION	9
	4.1 Summary – Monitoring Surveys.....	9
	4.2 Compliance / Event Action Plan.....	9

APPENDIX

Appendices I a and b Photographs of the tagged corals at IMS and CMS (14th Oct 2007)
Appendices II a and b Photographs of the tagged corals at IMS and CMS (28th Oct 2007)

List of Figures

- 2.1 Map Showing the Locations of the Impact Monitoring Station (IMS) and Control Monitoring Station (CMS)

List of Tables

- 2.1 Action and Limit Level for Coral Monitoring.
- 3.1 IMS and CMS – Physical Conditions.
- 3.2 IMS and CMS – Code, Species Name, Area, Percentage of Sedimentation, Bleaching and Mortality of the Tagged Coral Colonies in Initial Coral Survey (21st July 2007), 2 previous (23rd and 29th September 2007) and 2 present monitoring surveys (14th and 28th October 2007).
- 4.1 Evaluation of Monitoring Results against Action and Limit Levels for Coral Monitoring Surveys.

1 INTRODUCTION

1.1 Project Background

- 1.1.1 Cinotech Consultants Limited has been appointed to formulate a Coral Survey Team to conduct the Marine Ecology Survey for Construction of Helipads at Yung Shue Wan, Lamma Island, Agreement No. CE 18/2002 (EP).
- 1.1.2 miniprojects Company Limited (miniprojects co. Ltd.) have been commissioned by Cinotech Consultants Limited to undertake Coral Monitoring Survey on the tagged hard coral colonies at one Impact Monitoring Station (IMS) and one Control Monitoring Station (CMS).
- 1.1.3 As required by the EM&A manual, frequency of Coral Monitoring Survey is,
- Twice a week for the first two weeks of works affecting seabed
 - Once a week for the following two weeks if no exceedance is detected
 - Once every two weeks for the 2nd and 3rd months if no exceedance is detected
 - Once a month after the 3rd until completion of the construction works if not exceedance is detected
- 1.1.4 This is the monthly report presenting the results of the biweekly (i.e. 7th and 8th) Coral Monitoring Surveys undertaken in the 2nd month (i.e. October 2007) after the commencement of the construction work.

2 METHODOLOGY

2.1 Impact Monitoring Surveys - Locations

2.1.1 The Impact Monitoring Station (IMS) was located at Yung Shue Wan, close to the seabed construction area (Fig. 2.1). In order to identify background environmental perturbations that are not associated with the construction, Sham Wan, which is away from the impact area, was designated as the Control Monitoring Station (CMS; Fig. 2.1). Locations (GPS coordinates) of IMS and CMS, as well as the conditions during monitoring surveys are summarized in Table 3.1.

2.2 Survey Methods

2.2.1 At both IMS and CMS, 10 hard coral colonies were tagged for continuous monitoring over the course of construction phase. Dive surveys were conducted to record the health status of the tagged corals, including percentage area of sedimentation, bleaching and partial mortality.

2.2.2 The condition of each tagged coral colony was recorded by taking photographs that best represents the entire colony. General physical parameters were recorded for each survey site, including visibility, weather, tidal conditions and water current.

2.2.3 The results of the impact monitoring surveys were reviewed with reference to finding of the Initial Coral Survey and the data from CMS collected during the monitoring.

2.3 Coral Monitoring Frequency

2.3.1 Monitoring on the tagged corals for degree of sedimentation and area of bleaching shall be conducted at the frequencies indicated below during works affecting the seabed.

- During the first two weeks of works affecting seabed: twice a week.
- If no exceedance detected for the first 2 weeks of monitoring: once a week for the following 2 weeks.
- If no exceedance detected for the first 4 weeks of monitoring: once every two weeks for the 2nd and 3rd months (i.e. Oct and Nov 2007, respectively).
- If no exceedance in the 3rd month of monitoring, coral monitoring shall be conducted once per month until completion of the construction works.

2.4 Actions on Exceedance of Action & Limit Levels

2.4.1 Where the coral survey indicates the health conditions of the corals exceed the AL levels, the Engineer may direct more frequent monitoring to be carried out until exceedance stops. The action and limit level of coral monitoring is shown in Table 2.1.

Table 2.1. Action and Limit Level for Coral Monitoring

Parameter	Action Level Definition	Limit Level Definition
Sedimentation	If during Coral Monitoring a 15% increase in the percentage of sediment cover on hard corals occurs at more than 20% of the tagged coral at any one Coral Monitoring Site that is not recorded at the Control Site, then the Action Level is exceeded.	If during Coral Monitoring a 25% increase in the percentage of sediment cover on hard corals occurs at more than 20% of the tagged coral at any one Coral Monitoring Site that is not recorded at the Control Site, then the Limit Level is exceeded.
Bleaching	If during Coral Monitoring a 15% increase in the percentage of bleaching (bleached white) on hard corals occurs at more than 20% of the tagged coral at any one Coral Monitoring Site that is not recorded at the Control Site, then the Action Level is exceeded.	If during Coral Monitoring a 25% increase in the percentage of bleaching (bleached white) on hard corals occurs at more than 20% of the tagged coral at any one Coral Monitoring Site that is not recorded at the Control Site, then the Limit Level is exceeded.

2.4.2 The Contractor shall take all necessary steps to ensure that the actions of the Contractor are not contributing to the deterioration. These steps shall include, but not be limited to the following:

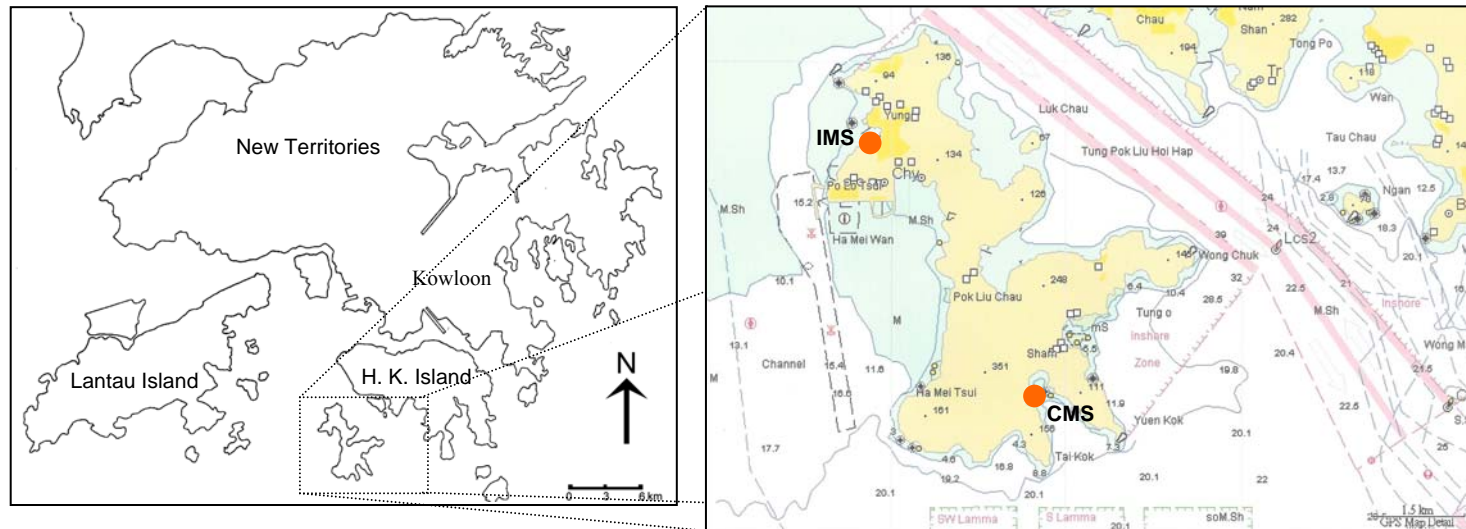
- Checking of water quality monitoring data;
- Checking of all marine plant and equipment; maintenance or replacement of any marine plant or equipment contributing to the deterioration;
- Checking and maintenance of silt curtains;
- Review of all working methods; and
- Reduced construction rate.

2.4.3 Upon action level being exceeded and after agreement from the Environmental Specialist and AFCD has been obtained regarding the most appropriate method for reducing the adverse impacts during works affecting the seabed, this mitigated method should then be enacted on the next working day.

2.4.4 Upon limit level being exceeded, the Contractor shall suspend all works affecting the seabed until an effective solution is identified. Once the solution has been identified and agreed with the Environmental Specialist and AFCD, construction works affecting seabed may recommence.

- 2.4.5 The Engineer and AFCD shall be kept informed of all steps taken; and written reports and proposals for action shall be passed to the Engineer and AFCD by the Contractor whenever the coral survey shows any adverse impact upon the corals.
- 2.4.6 After the Contractor have implemented the agreed mitigating measures, if the coral surveys indicate the coral condition is unacceptable, additional mitigation measures should be recommended by the Contractor after consulting the Environmental Specialist for the approval of the Engineer and AFCD to rectify the situation. The Engineer can temporarily suspend the site activities until the problem is under control and an acceptable coral condition is restored.
- 2.4.7 In case the Contractor fails to implement the agreed mitigation measures, the Engineer can direct the Contractor to slow down or suspend his work until the Engineer and AFCD is convinced that the mitigation measures have restored the corals to an acceptable condition.
- 2.4.8 The Environmental Specialist shall assess the effectiveness and efficiency of the proposed mitigation measures and/or remedial actions for construction activities affecting the seabed. The performance of the Environmental Monitoring and Audit Programme shall be reviewed and audited by the Environmental Specialist on a quarterly basis. The findings of this review shall be included in the quarterly EM&A summary reports, together with any recommendations to improve the performance of the Environmental Monitoring and Audit Programme.

Fig. 2.1 Map Showing the Locations of the Impact Monitoring Station (IMS) and Control Monitoring Station (CMS)



3 RESULTS

3.1 Monitoring Surveys in October 2007

3.1.1 In October 2007 (the 2nd month of the construction work), two surveys were conducted at both IMS and CMS. The dates of the surveys and physical conditions of each site are summarized in Table 3.1

Table 3.1 IMS and CMS – Physical Conditions.

	IMS (Yung Shue Wan)		CMS (Sham Wan)	
GPS Coordinates	N 22°13'28.4 E 114°06'30.6		N 22°11'15.0 E 114°08'04.0	
Date	14 Oct 07	28 Oct 07	14 Oct 07	28 Oct 07
Sedimentation on Rock surfaces (mm)	2 to 3	3 to 5	2 to 3	2 to 3
Visibility (m)	< 0.5	0.5 to 1.0	1.0 to 1.5	1 to 1.5
Weather	Windy, Sunny	Windy, Cloudy	Windy, Sunny	Windy, Cloudy
Tide	Ebb	Ebb	Ebb	Ebb
Current (Knot)	0.5 to 1.0	0.5 to 1.0	1.5 to 2.0	0.5 to 1.0
Remark	East wind	East wind	East wind	East wind

3.1.2 Percentages of sedimentation, bleaching and mortality of each tagged colony are presented in Table 3.2. Photographs of each tagged coral in the two surveys are illustrated in Appendices I (14th Oct 2007) and II (28th Oct 2007).

IMS

3.1.3 In the two surveys conducted in October 2007, sedimentation on the tagged coral colonies varied from +5% to -3% when compared with the baseline level in July 2007. Increment was generally observed in five colonies (A02, A04, A05, A06 and A07). Colonies A02 and A05, which were recorded with relative consistent sediment increment during the September surveys, showed no further elevation and reduction in sedimentation level, respectively. Increase in bleaching was recorded on 3 colonies (A03, A05 and A09) by 1%. No sign of mortality was observed. The colony A08 we recorded with increased bleaching (+1%) and partially mortality (+2%) from 11 September, the level remained steady in the subsequent surveys (Table 3.2).

CMS

3.1.4 When compared with baseline data in July 2007, sedimentation level on tagged corals in CMS varied in the range of +8% to -1%. Increment was observed in 4 colonies (B02, B03, B06 and B10), in which more consistent elevation occurred in colonies B02 (from 1% to 5%) and B10 (from 0% to 5%). Some colonies experienced both increase and decrease in sediment cover over the monitoring period of October. Bleaching and mortality was not recorded except for colony B05, in which 2% bleaching was observed in 29 September survey (Table 3.2). No further increase in bleaching area was observed in the colony in the October surveys.

Table 3.2 IMS and CMS – Code, Species Name, Area, Percentage of Sedimentation, Bleaching and Mortality of the Tagged Coral Colonies in Initial Coral Survey (21 July 2007), 2 previous surveys in September 2007 and 2 present monitoring surveys in October 2007. “▲” and “▼” indicate increased and decreased in percentage, respectively, when compared with the Initial Coral Survey.

IMS (Yung Shue Wan)

Code	Coral Species	Area (cm ²)	Sedimentation (%)					Bleaching (%)					Mortality (%)					
			21 Jul 07 (Baseline)	23 Sept	29 Sept	14 Oct	28 Oct	21 Jul 07 (Baseline)	23 Sept	29 Sept	14 Oct	28 Oct	21 Jul 07 (Baseline)	23 Sept	29 Sept	14 Oct	28 Oct	
A01	<i>Favites pentagona</i>	110	1	2 ▲	1	1	1	0	0	0	0	0	0	0	0	0	0	0
A02	<i>Favia rotumana</i>	220	0	4 ▲	5 ▲	4 ▲	5 ▲	0	0	0	0	0	0	0	0	0	0	0
A03	<i>Platygyra carnosus</i>	430	0	0	0	0	0	0	0	0	1 ▲	1 ▲	0	0	0	0	0	0
A04	<i>Favia rotumana</i>	570	0	4 ▲	3 ▲	3 ▲	3 ▲	0	0	0	0	0	0	0	0	0	0	0
A05	<i>Cyphastrea serailia</i>	330	3	5 ▲	8 ▲	5 ▲	5 ▲	0	0	0	1 ▲	1 ▲	0	0	0	0	0	0
A06	<i>Cyphastrea serailia</i>	190	0	2 ▲	2 ▲	5 ▲	5 ▲	0	0	0	0	0	0	0	0	0	0	0
A07	<i>Favites pentagona</i>	200	0	4 ▲	3 ▲	2 ▲	2 ▲	0	0	0	0	0	0	0	0	0	0	0
A08	<i>Porites sp</i>	440	3	1 ▼	1 ▼	1 ▼	1 ▼	0	1 ▲	1 ▲	1 ▲	1 ▲	0	2 ▲	2 ▲	2 ▲	2 ▲	2 ▲
A09	<i>Favites pentagona</i>	300	0	1 ▲	0	0	0	0	0	0	1 ▲	1 ▲	0	0	0	0	0	0
A10	<i>Porites sp.</i>	300	3	2 ▼	1 ▼	1 ▼	0 ▼	0	0	0	0	0	0	0	0	0	0	0

CMS (Sham Wan)

Code	Coral Species	Area (cm ²)	Sedimentation (%)					Bleaching (%)					Mortality (%)						
			21 Jul 07 (Baseline)	23 Sept	29 Sept	14 Oct	28 Oct	21 Jul 07 (Baseline)	23 Sept	29 Sept	14 Oct	28 Oct	21 Jul 07 (Baseline)	23 Sept	29 Sept	14 Oct	28 Oct		
B01	<i>Favia lizardensis</i>	360	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
B02	<i>Porites sp.</i>	370	1	1	4 ▲	3 ▲	5 ▲	0	0	0	0	0	0	0	0	0	0	0	0
B03	<i>Psammocora profundacella</i>	440	2	8 ▲	2	10 ▲	5 ▲	0	0	0	0	0	0	0	0	0	0	0	0
B04	<i>Cyphastrea serailia</i>	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B05	<i>Favites abdita</i>	650	2	1 ▼	1 ▼	5 ▲	2	0	0	2 ▲	2 ▲	2 ▲	0	0	0	0	0	0	0
B06	<i>Leptastrea pruinosa</i>	450	1	1	1	1	2 ▲	0	0	0	0	0	0	0	0	0	0	0	0
B07	<i>Platygyra acuta</i>	350	1	0 ▼	0 ▼	1	0 ▼	0	0	0	0	0	0	0	0	0	0	0	0
B08	<i>Leptastrea pruinosa</i>	690	2*		2*	5 ▲	2	0*		0*	0	0	0*		0*	0	0	0	0
B09	<i>Leptastrea pruinosa</i>	400	2	3 ▲	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0
B10	<i>Favites pentagona</i>	130	0	2 ▲	3 ▲	5 ▲	5 ▲	0	0	0	0	0	0	0	0	0	0	0	0

*A new colony of B08 (*Leptastrea pruinosa*) was tagged for subsequent monitoring survey on 29 Sept 2007 to replace the old broken colony.

4 SUMMARY AND CONCLUSION

4.1 Summary – Monitoring Surveys

- 4.1.1 In the monitoring surveys conducted in October 2007 in IMS, sedimentation increased in 5 of the 10 tagged coral colonies by 2 to 5%, sedimentation decreased in 2 colonies by 2 to 3%. Bleaching increased in 4 colonies by 1%. Partial mortality increased in 1 colony by 2%.
- 4.1.2 Two of the colonies in IMS (A02 & A05) were observed with relatively consistent increase in sedimentation in September surveys, but the trend was not recorded in the October surveys. No other patterned change in sedimentation level was evidenced for both IMS and CMS. Three new observations (all by 1%) of bleaching were recorded in October at IMS, further monitoring in the subsequent survey is necessary to evaluate if the effect persist.
- 4.1.3 In both survey sites, level of sedimentation on the tagged corals varied within a small range ($\leq 10\%$). The variation was believed to be contributed by combined environmental factors such as monsoonal wind, tidal current, peripheral transports, etc. The low level of increment in bleaching and partial suggested minor/no adverse effect was caused by the observed sedimentation variation.
- 4.1.4 The data from the monitoring surveys showed no significant enhancement in sedimentation, bleaching or mortality in IMS when compared with the CMS. Hence, no adverse impact by the construction activity on the coral community was evidenced.

4.2 Compliance / Event Action Plan

- 4.2.1 The monitoring results were evaluated against the Action and Limit Levels as defined in the EM&A manual (Table 2.1), and is summarized in Table 4.1
- 4.2.2 Overall, the healthy status of the tagged coral colonies was normal, with low to medium levels of sedimentation. Low levels of bleaching and mortality were observed in both Monitoring and Control Sites. Neither action/limit level of sedimentation, bleaching or mortality was exceeded in both monitoring surveys conducted in October 2007.

Table 4.1 Evaluation of Monitoring Results against Action and Limit Level for Coral Monitoring Surveys. Note Definition of Action/Limit levels are listed in Table 2.1. “No” indicates NO exceedance.

14 Oct 2007

Site \ Exceedance	Sedimentation		Bleaching		Mortality	
	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level
IMS	No	No	No	No	No	No
CMS	No	No	No	No	No	No

28 Oct 2007

Site \ Exceedance	Sedimentation		Bleaching		Mortality	
	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level
IMS	No	No	No	No	No	No
CMS	No	No	No	No	No	No

APPENDIX

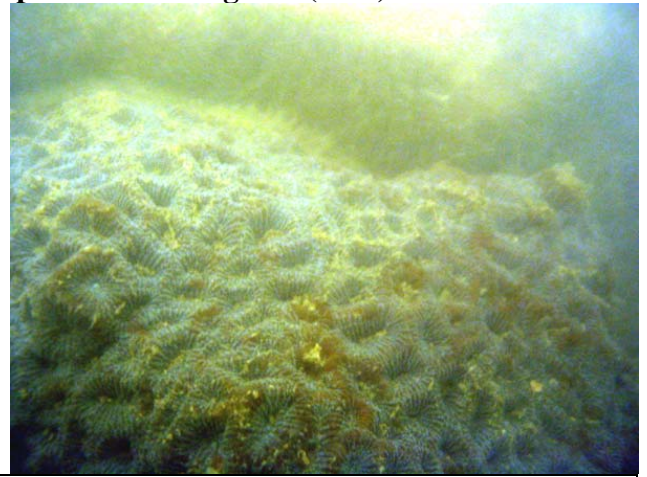
Appendices I a and b
Photographs of the tagged corals at IMS and CMS (14th Oct 2007)

Appendices II a and b
Photographs of the tagged corals at IMS and CMS (28th Oct 2007)

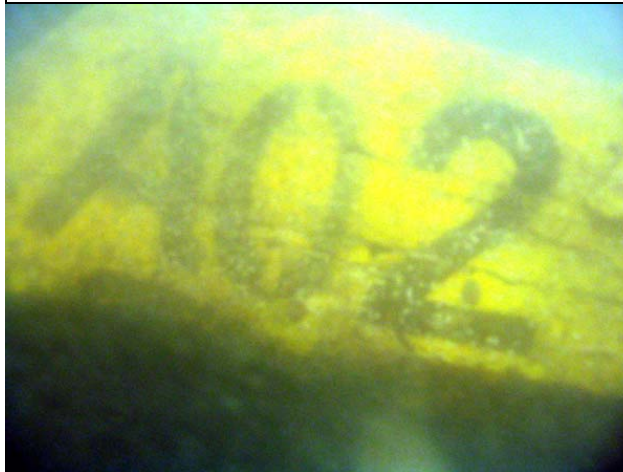
Appendix Ia Tagged Coral Colonies at the Impact Monitoring Site (IMS).



A01



Favites pentagona



A02



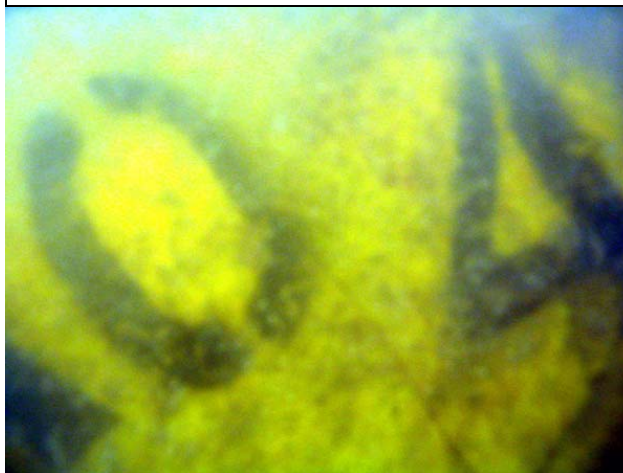
Favia rotumana



A03



Platygyra carnosus



A04



Favia rotumana

Appendix Ia Tagged Coral Colonies at the Impact Monitoring Site (IMS).....continued.



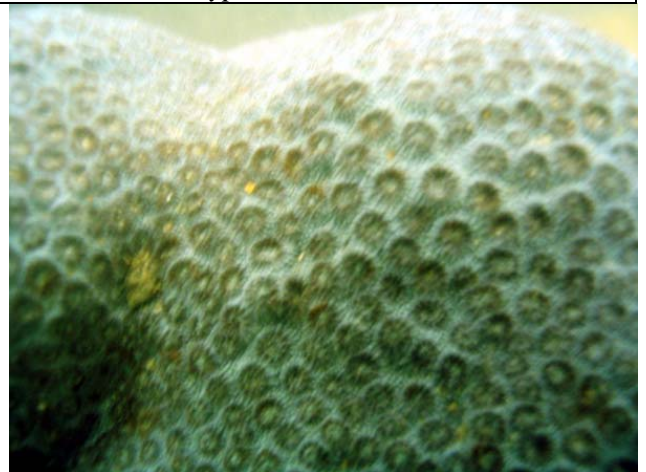
A05



Cyphastrea serailia



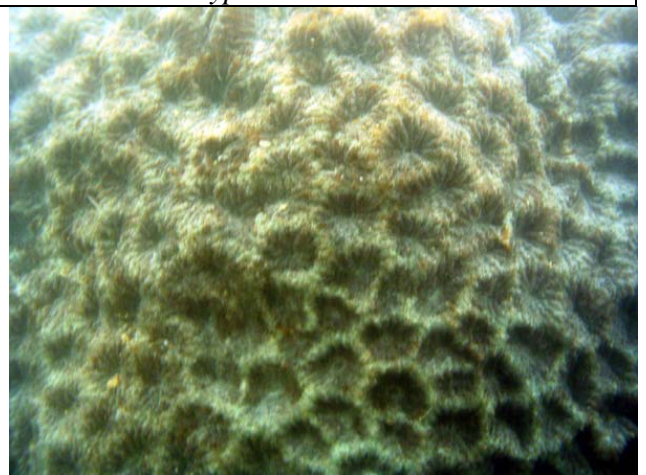
A06



Cyphastrea serailia



A07



Favites pentagona



A08



Porites sp.

Appendix Ia Tagged coral colonies at the Impact Monitoring Site (IMS).....continued.



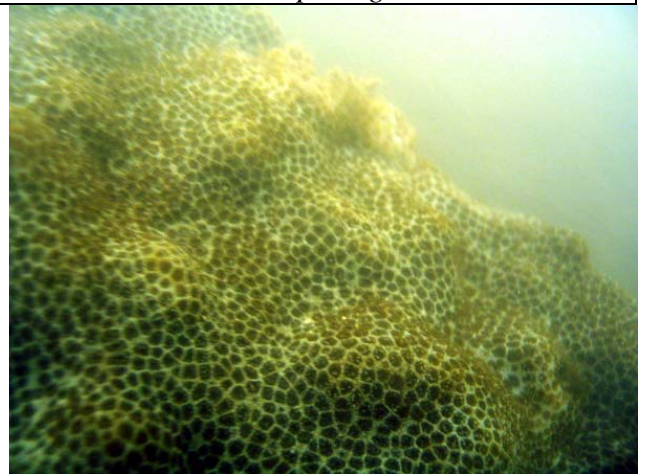
A09



Favites pentagona



A10



Porites sp.

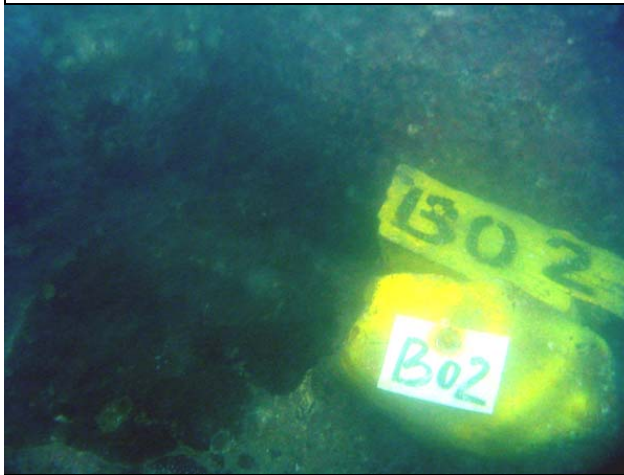
Appendix Ib Tagged Coral Colonies at the Control Monitoring Site (CMS).



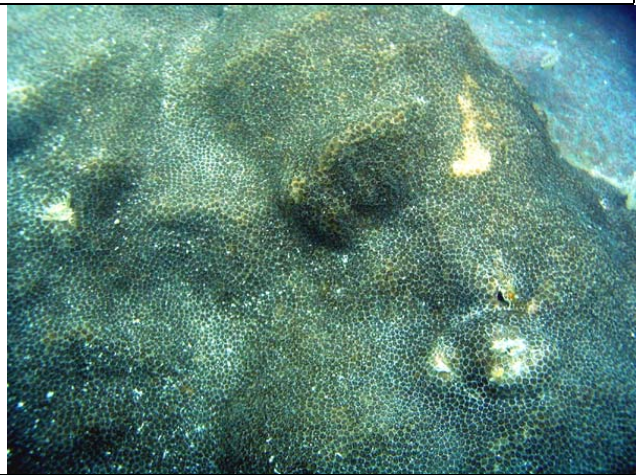
B01



Favia lizardensis



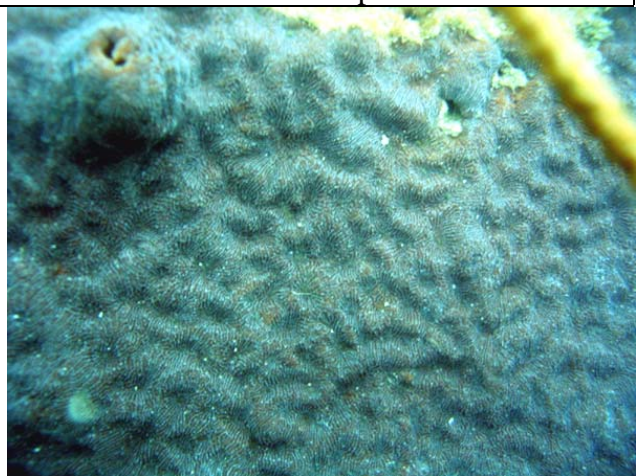
B02



Porites sp.



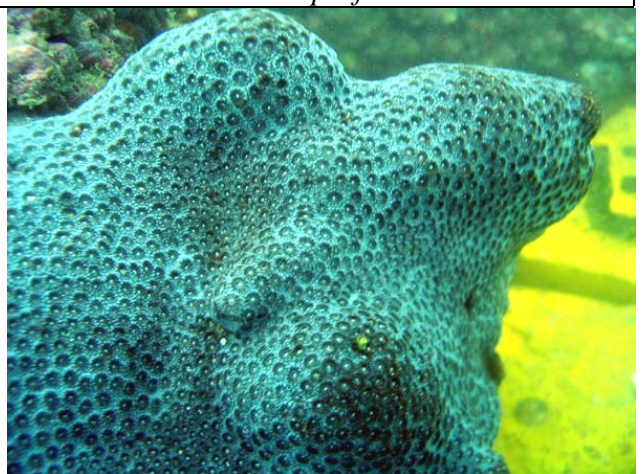
B03



Psammocora profundacella



B04



Cyphastrea serailia

Appendix Ib Tagged Coral Colonies at the Control Monitoring Site (CMS)...continued.



B05



Favites abdita



B06



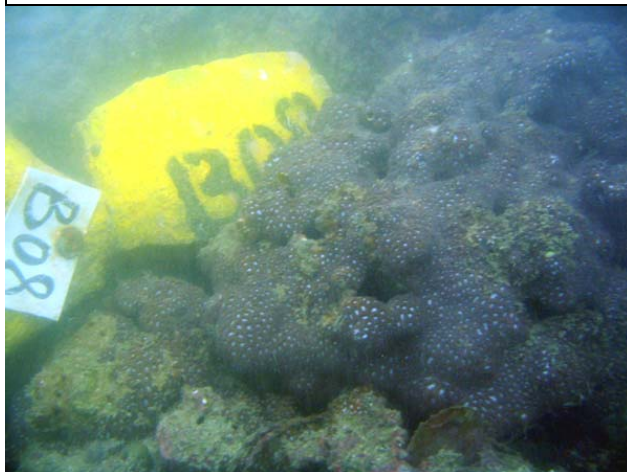
Leptastrea pruinosa



B07



Platygyra acuta



B08



Leptastrea pruinosa

Appendix Ib Tagged Coral Colonies at the Control Monitoring Site (CMS)...continued.



B09



Leptastrea pruinosa

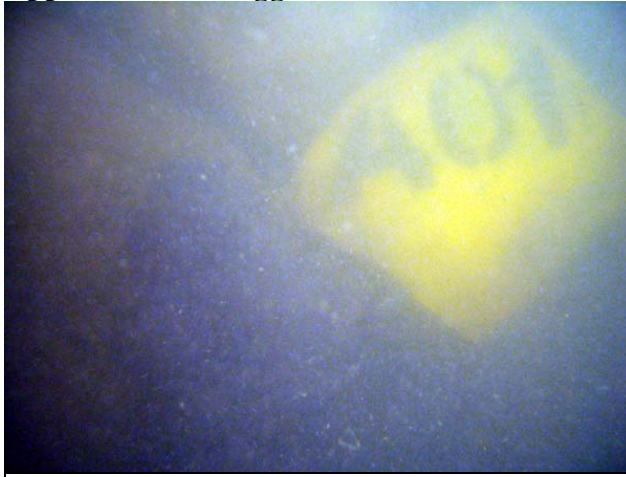


B10



Favites pentagona

Appendix IIa Tagged Coral Colonies at the Impact Monitoring Site (IMS).



A01



Favites pentagona



A02



Favia rotumana



A03



Platygyra carnosus



A04



Favia rotumana

Appendix IIa Tagged Coral Colonies at the Impact Monitoring Site (IMS).....continued.



A05



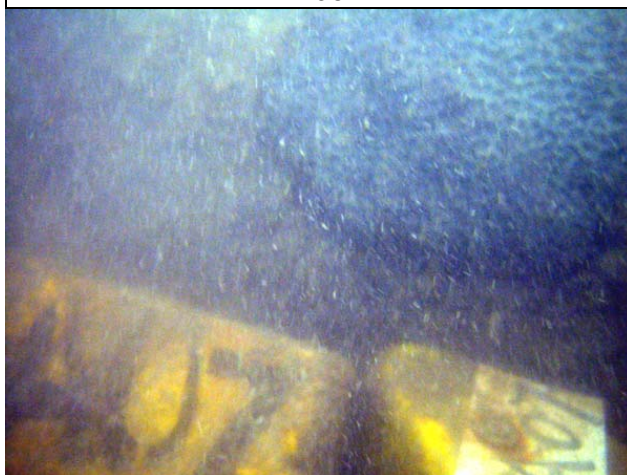
Cyphastrea serailia



A06



Cyphastrea serailia



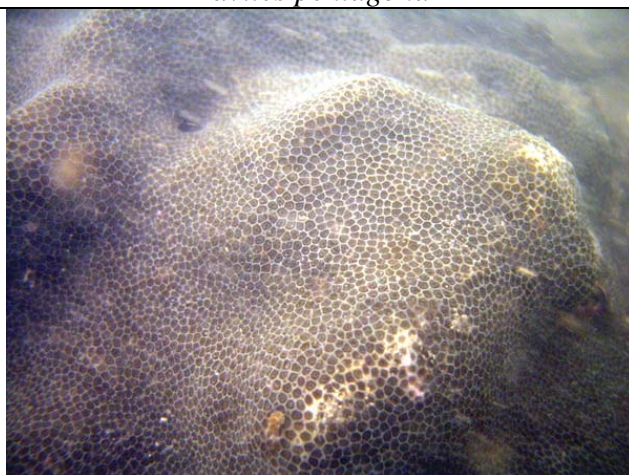
A07



Favites pentagona

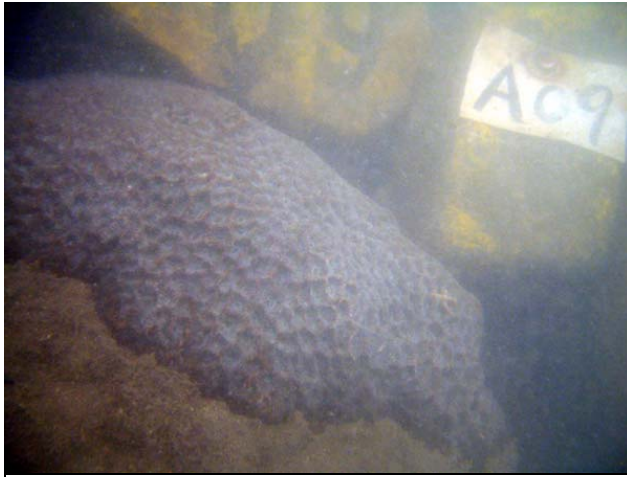


A08



Porites sp.

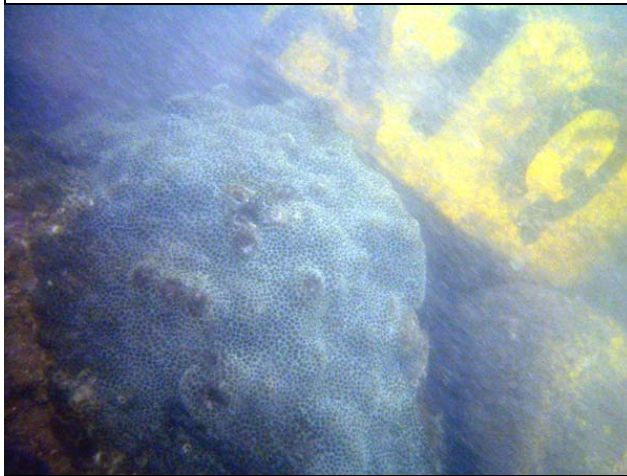
Appendix IIa Tagged coral colonies at the Impact Monitoring Site (IMS).....continued.



A09



Favites pentagona



A10



Porites sp.

Appendix IIb Tagged Coral Colonies at the Control Monitoring Site (CMS).



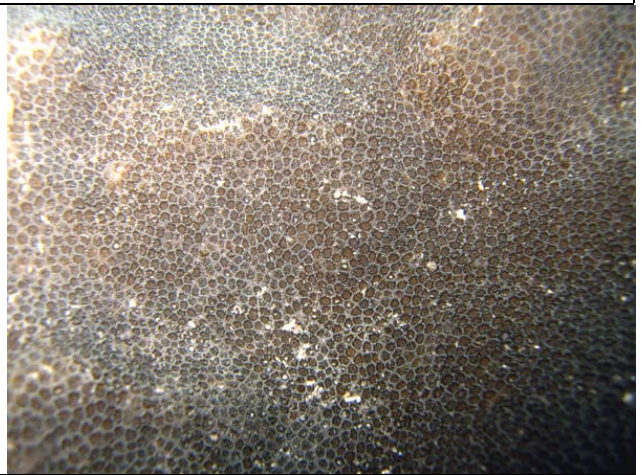
B01



Favia lizardensis



B02



Porites sp.



B03



Psammocora profundacella



B04



Cyphastrea serailia

Appendix IIb Tagged Coral Colonies at the Control Monitoring Site (CMS)...continued.



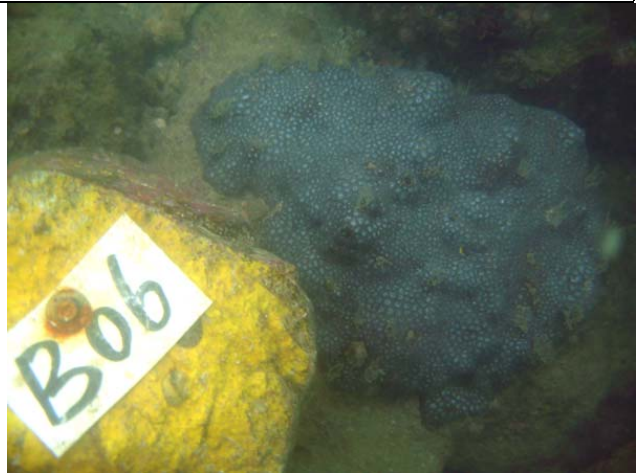
B05



Favites abdita



B06



Leptastrea pruinosa



B07



Platygyra acuta

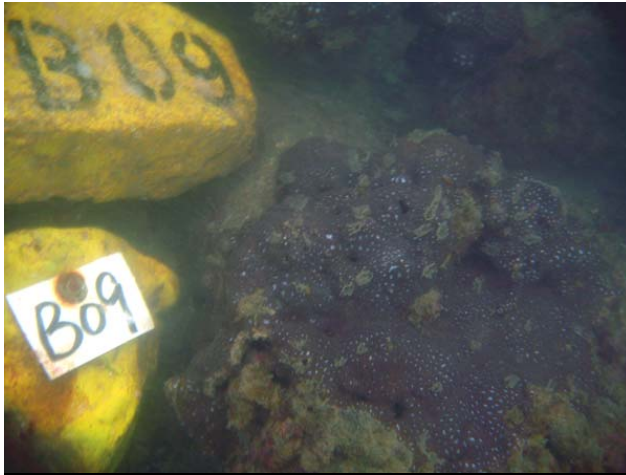


B08

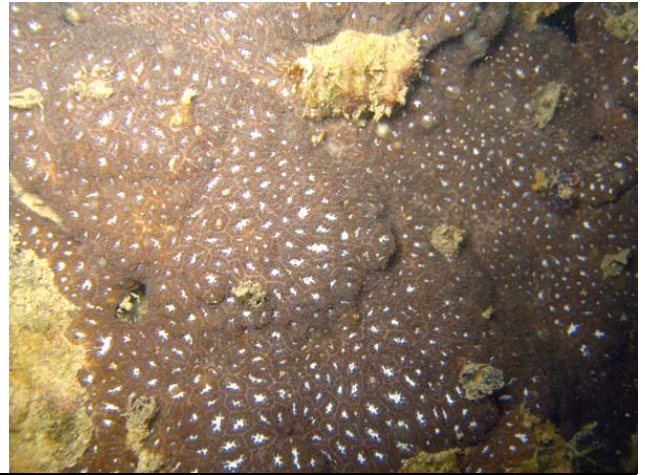


Leptastrea pruinosa

Appendix IIb Tagged Coral Colonies at the Control Monitoring Site (CMS)...continued.



B09



Leptastrea pruinosa



B10



Favites pentagona