Agreement No. CE 18/2002 (EP)

Construction of Helipads at Peng Chau and Yung Shue Wan, Lamma Island




Report for

Coral Monitoring Survey (February 2008)

28th February 2008

miniprojects co. Ltd.

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Construction of Helipads at Peng Chau and Yung Shue Wan, Lamma Island

Report for
Coral Monitoring Survey
at Yung Shue Wan in February 2008

Prepared by:
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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

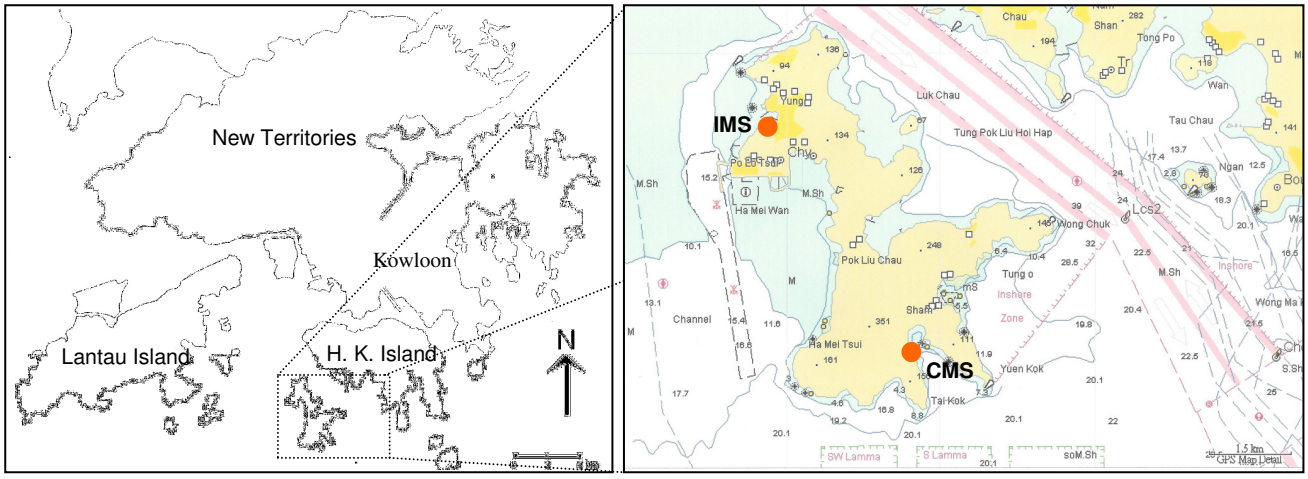
1.1.4 This is the monthly report presenting the results of the monthly Coral Monitoring Survey (i.e. 13th) conducted in the 6th month (i.e. February 2008) after the commencement of the construction work.

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.

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



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. October and November 2007, respectively).
- If no exceedance in the 3rd month of monitoring, coral monitoring shall be conducted once per month (i.e. since December 2007) 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 action and limit 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.

3 RESULTS

3.1 Monitoring Surveys in February 2008

3.1.1 In February 2008 (i.e. the 6th month after the start of the construction work), both IMS and CMS were surveyed. The date of the survey and physical conditions of each sites are summarized in Table 3.1

Table 3.1 IMS and CMS – Physical Conditions.

	IMS (Yung Shue Wan)	CMS (Sham Wan)
GPS Coordinates	N 22º13'28.4 E 114º06'30.6	N 22º11'15.0 E 114º08'04.0
Date	16 Feb 08	16 Feb 08
Sedimentation on Rock surfaces (mm)	1 to 2	0 to 1
Visibility (m)	1.0 to 1.5	0.5 to 1.0
Weather	Beaufort Force 3-4 (Northeast) Sunny	Beaufort Force 3-4 (Northeast) Sunny
Tide	Neap	Neap
Current (Knot)	0.5 to 1.0	1.0 to 1.5
Remark	Cold water temperature (~13-14°C) in the last 3 weeks	

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 surveys are illustrated in Appendices Ia and Ib.

3.1.3 In the present survey, abnormal status was recorded in colonies of *Porites sp*. in both IMS and CMS. Two (A08 and A10) and one (B02) *Porites sp*. colonies were tagged in IMS and CMS for monitoring purpose, respectively. All the three colonies exhibited paleness, partial beaching and covering by algae. The symptoms were also observed in other, untagged *Porites* colonies, but not in other species in both sites. The observation may be related to the prolonged period of low water temperature prior to the survey.

3.1.4 The algal overgrowth on the 3 tagged *Porites* colonies prevented the estimation of mortality level as the living status under the overgrowth is unknown. Further observation in the next monitoring survey (March 2008) will confirm the level of mortality of these colonies.

IMS

3.1.5 In the survey conducted in February 2008, sedimentation on the tagged coral colonies varied from +2% to -0% when compared with the baseline level in July 2007. Increment in sedimentation level was observed in 4 colonies (A02, A04, A06 and A07). Lower sedimentation was found in 3 colonies (A05, A08 and A10). Bleaching was recorded in 2 colonies (A08 and A10). The bleaching in colonies A05 and A09 observed in previous surveys was not evidenced in the present survey. Partial mortality in 1 colony (A08) found December 2007 survey

did not further increase (Table 3.2; Appendix Ia). Mortality level of A08 and A10 will be evaluated in the next monitoring survey.

CMS

3.1.6 When compared with the baseline data in July 2007, level of sediment on the colonies was low in general (Table 3.2). Sedimentation varied from +1% to -0%; decreased in 6 colonies (B01, B05, B06, B07, B08 and B09), and slightly increased in 1 colony (B10). Bleaching was recorded in 1 colony (B02) (Table 3.2). New partial mortality was found in 1 colony, B05 by 2%, with 1 colony (B06) did not further increase (Appendix Ib). Mortality level of B02 will be evaluated in the next monitoring survey.

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 (21st July 2007), 2 previous (15th December 2007 and 20th January 2008) and 1 present monitoring surveys (16th February 2008). "▲" 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 (%)				Remark
			21 Jul 07 (Baseline)	15 Dec 07	20 Jan 08	16 Feb 08	21 Jul 07 (Baseline)	15 Dec 07	20 Jan 08	16 Feb 08	21 Jul 07 (Baseline)	15 Dec 07	20 Jan 08	16 Feb 08	
A01	*Favites pentagona*	110	1	1	1	1	0	0	0	0	0	0	0	0	
A02	*Favia rotumana*	220	0	1 ▲	1 ▲	1 ▲	0	0	0	0	0	0	0	0	
A03	*Platygyra carnosus*	400	0	0	0	0	0	0	0	0	0	0	0	0	
A04	*Favia rotumana*	570	0	3 ▲	7 ▲	2 ▲	0	0	0	0	0	0	0	0	
A05	*Cyphastrea serailia*	330	3	8 ▲	5 ▲	0 ▼	0	1▲	0	0	0	0	0	0	
A06	*Cyphastrea serailia*	190	0	2 ▲	2 ▲	2 ▲	0	0	0	0	0	0	0	0	
A07	*Favites pentagona*	200	0	2 ▲	2 ▲	2 ▲	0	0	0	0	0	0	0	0	
A08	*Porites sp*	440	3	1 ▼	1 ▼	0 ▼	0	1▲	1▲	2 ▲	0	2 ▲	2 ▲	?	Paleness; 7% algal overgrowth
A09	*Favites pentagona*	300	0	0	0	0	0	1▲	0	0	0	0	0	0	
A10	*Porites sp.*	300	3	1 ▼	0 ▼	0 ▼	0	0	0	6▲	0	0	0	?	Paleness; 80% algal overgrowth

CMS (Sham Wan)

Code	Coral Species	Area (cm^2)	Sedimentation (%)				Bleaching (%)				Mortality (%)				Remark
			21 Jul 07 (Baseline)	15 Dec 07	20 Jan 08	16 Feb 08	21 Jul 07 (Baseline)	15 Dec 07	20 Jan 08	16 Feb 08	21 Jul 07 (Baseline)	15 Dec 07	20 Jan 08	16 Feb 08	
B01	*Favia lizardensis*	360	1	1	0 ▼	0 ▼	0	0	0	0	0	0	0	0	
B02	*Porites sp.*	370	1	1	1	1	0	0	0	2 ▲	0	0	0	?	Paleness; 5% algal overgrowth
B03	*Psammocora profundacella*	440	2	1 ▼	1 ▼	2	0	0	0	0	0	0	0	0	
B04	*Cyphastrea serailia*	220	0	0	0	0	0	0	0	0	0	0	0	0	
B05	*Favites abdita*	650	2	1 ▼	1 ▼	0 ▼	0	2 ▲	2 ▲	0	0	0	0	2 ▲	
B06	*Leptastrea pruinosa*	450	1	1	2 ▲	0 ▼	0	0	0	0	0	0	2 ▲	2 ▲	
B07	*Platygyra acuta*	350	1	0 ▼	0 ▼	0 ▼	0	0	0	0	0	0	0	0	
B08	*Leptastrea pruinosa*	690	2	1 ▼	0 ▼	1 ▼	0	0	0	0	0	0	0	0	
B09	*Leptastrea pruinosa*	400	2	1 ▼	3 ▲	0 ▼	0	0	0	0	0	0	0	0	
B10	*Favites pentagona*	130	0	0	0	1 ▲	0	0	0	0	0	0	0	0	

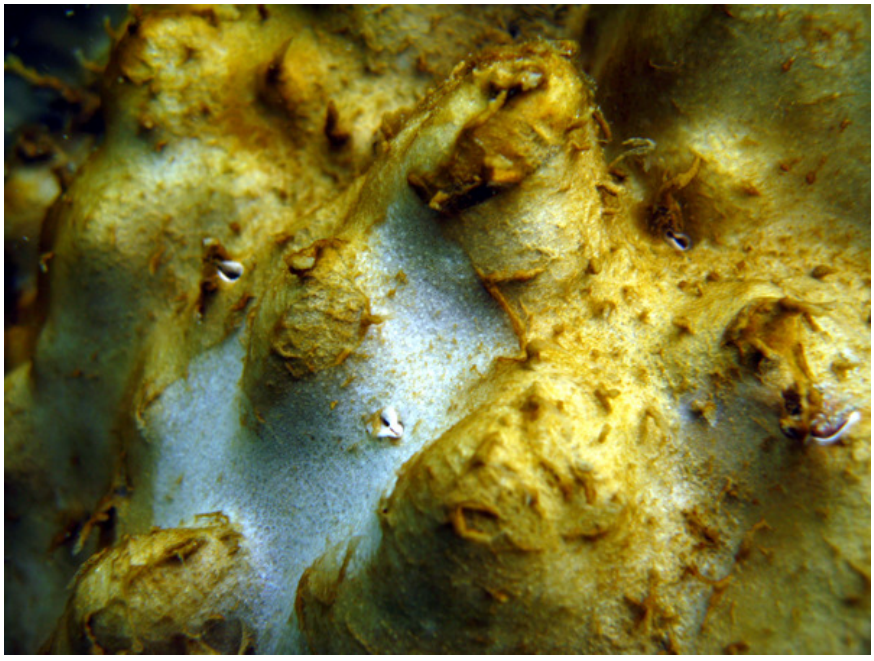
4 SUMMARY AND CONCLUSION

4.1 Summary – Monitoring Surveys

4.1.1 In the monitoring surveys conducted in February 2008, the increase of sedimentation level was ≤2% compared to the baseline levels in July 2007 in both IMS and CMS. Bleaching was recorded in 3 colonies (all *Porites* sp.) with 2-6%; 2 in IMS (A08 and A10) and 1 in CMS (B02). Partial mortality was recorded in colony B05 in CMS by 2%, derived from the bleaching recorded in the previous surveys, and in B06, caused by physical damage of unknown source in January 2008 survey (Table 3.2).

4.1.2 Three of the tagged colonies (2 in IMS and 1 in CMS) belong to *Porites sp*. showed abnormal status with symptoms of paleness polyps, production of a mucus layer on colony surface and overgrowth of microalgae on the mucus layer. These symptoms were only observed in *Porites sp*.. Similar phenomenon was also recorded in the eastern and southern waters in the same period (see Fig. 4.1). The phenomenon has never been reported in Hong Kong before. The symptom is believed not to be caused by construction work, as no apparent increment of sediment is recognised, and the observation is not limited to the IMS.

Fig. 4.1 Symptoms showing by *Porites* colonies. Paleness polyps, production of a mucus layer on colony surface and algal overgrowth on the mucus layer.



4.1.3 The prolong (~3 weeks), extremely low water temperature (13-15ºC) has been recorded from late January to late February 2008 in Hong Kong waters (Hong Kong Observatory). As mean winter water temperature in Hong Kong is usually ~17ºC, the below-average water temperature in this winter is believed to have adverse effect on the survival of tropical marine communities in Hong Kong waters, in particular the hard coral species including the *Porites* colonies.

4.1.4 Further observation is necessary in order to evaluate the mortality status of the tagged *Porites* colonies (A08, A10 and B02). If the symptoms persist, or mortality increase due to factors other than the construction sources (as indicated by co-occurrence in both IMS and CMS), the colonies will be considered not suitable for monitoring purpose and new colonies of other species will be tagged to accomplish the objective.

4.1.5 In both survey sites, level of sedimentation on the tagged corals varied within a small range (≤2%). The variation was believed to be contributed by combined environmental factors such as monsoonal wind, tidal current, peripheral transports, etc. During the dry season, the two survey sites were less affected by the prevailing North-eastern monsoonal wind, which may be a factor for the lower sedimentation levels. The increment in bleaching and partial mortality suggested minor/no adverse effect was caused by the observed sedimentation variation.

4.1.6 The data from the monitoring surveys showed no significant enhancement in sedimentation, bleaching or mortality in IMS when compared with the CMS.

4.1.7 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 morality were observed in both Monitoring and Control Sites. Neither action/limit level of sedimentation, bleaching or mortality was exceeded in both monitoring survey conducted in February 2008.

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.

16th Feb 2008

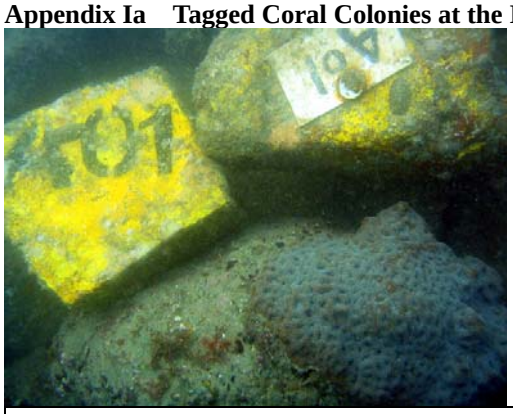
Exceedance / Site	Sedimentation		Bleaching		Mortality	
	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level
IMS	No	No	No	No	No	No
CMS	No	No	No	No	No	No

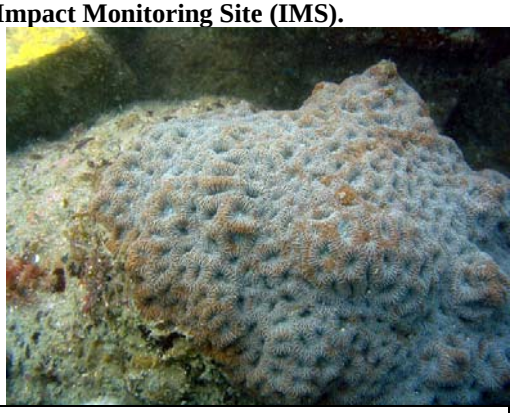
APPENDIX

Appendices Ia Photographs of the tagged corals at IMS (16th Feb 2008)

Appendices Ib Photographs of the tagged corals at CMS (16th Feb 2008)

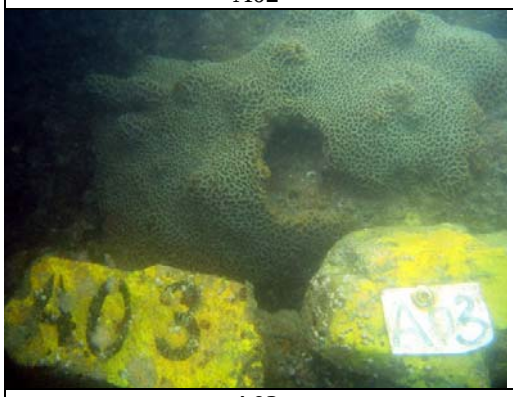
Appendix Ia Tagged Coral Colonies at the Impact Monitoring Site (IMS).





A01 *Favites pentagona*

A02 *Favia rotumana*



A03 *Platygyra carnosus*

A04 *Favia rotumana*

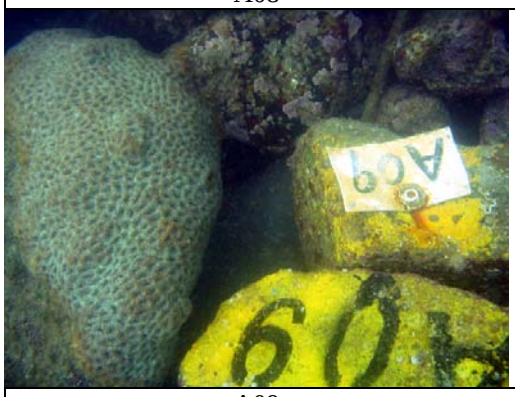
A05 *Cyphastrea serailia*

Appendix Ia ……continued.

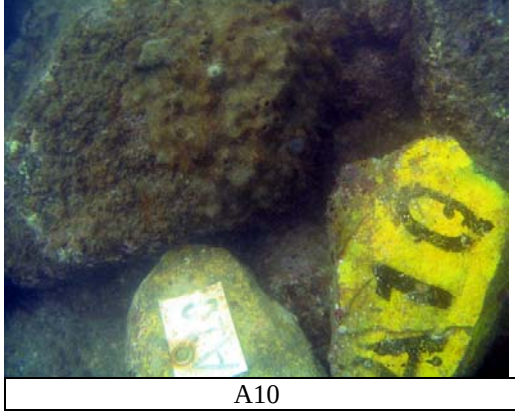
A06	*Cyphastrea serailia*

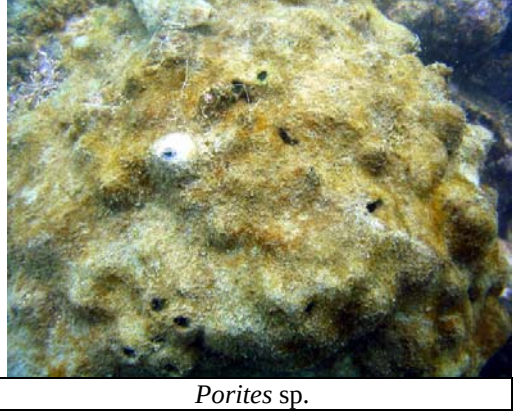
A07	*Favites pentagona*

A08	*Porites* sp.



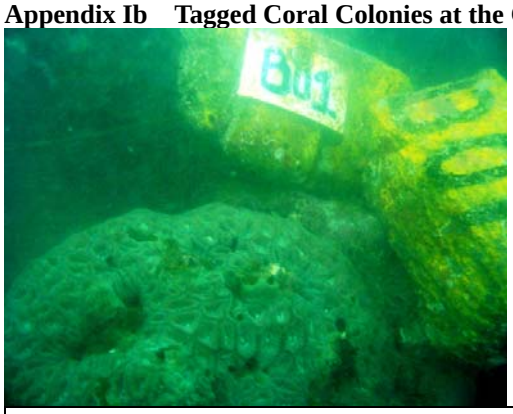
A09	*Favites pentagona*

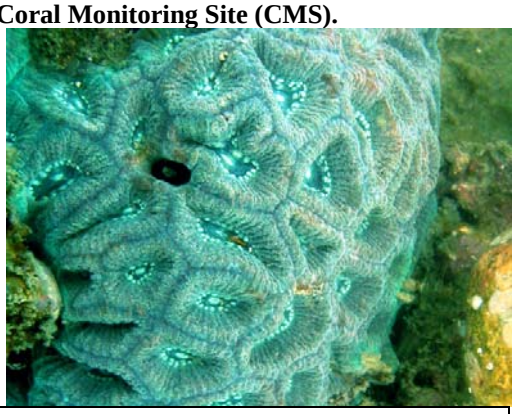




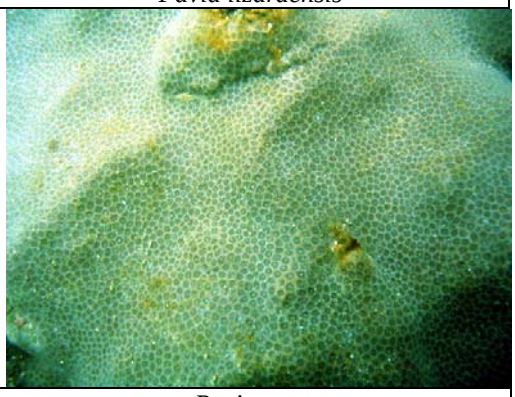
A10	*Porites* sp.

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

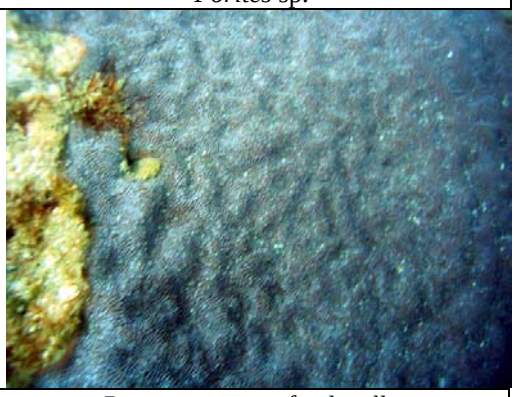




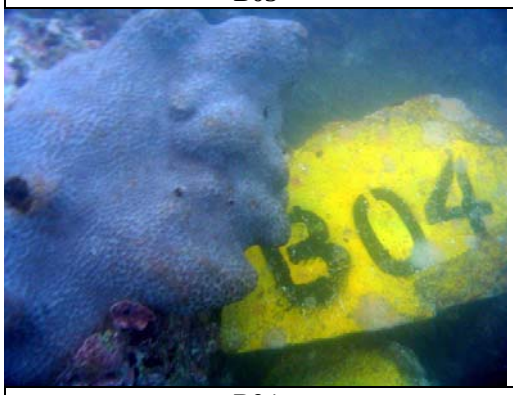
B01	*Favia lizardensis*



B02	*Porites* sp.



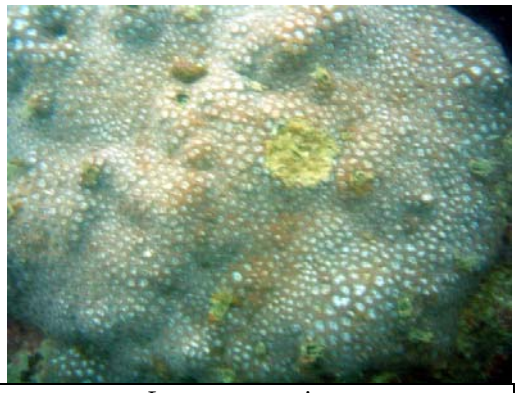
B03	*Psammocora profundacella*



B04	*Cyphastrea serailia*

B05	*Favites abdita*

Appendix Ib ……continued.

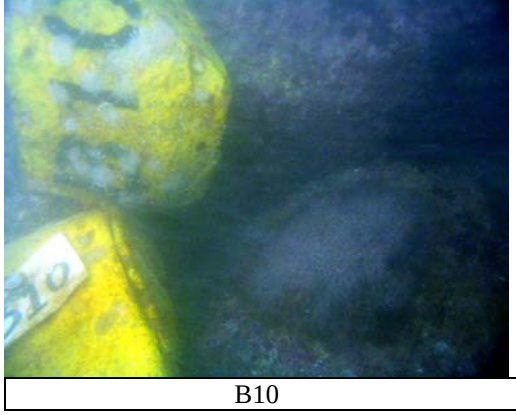


B06 *Leptastrea pruinosa*

B07 *Platygyra acuta*

B08 *Leptastrea pruinosa*

B09 *Leptastrea pruinosa*



B10 *Favites pentagona*