

Contract No. HY/2012/07
Tuen Mun – Chek Lap Kok Link –
Southern Connection Viaduct Section

Detailed Coral Translocation Report

25 February 2014

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Detailed Coral Translocation Report

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Client: Gammon		Project No: 0215660			
Summary: This document presents the Detailed Coral Translocation Report for Tuen Mun – Chek Lap Kok Link Southern Connection Viaduct Section.		Date: 25 February 2014			
		Approved by: 			
		Mr Craig Reid Partner			
		Certified by: 			
		Mr Jovy Tam ET Leader			
V0	Detailed Coral Translocation Report	CL	JT	CAR	25/02/14
Revision	Description	By	Checked	Approved	Date
<p>This report has been prepared by Environmental Resources Management the trading name of 'ERM Hong-Kong, Limited', with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.</p> <p>We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.</p>		<p>Distribution</p> <input type="checkbox"/> Internal <input checked="" type="checkbox"/> Public <input type="checkbox"/> Confidential		 	

Ref.: HYDHZMBEEM00_0_1721L.14

28 February 2014

AECOM
Supervising Officer Representative's Office
6 Hoi Kok Street,
Tsuen Wan, N.T.

By Fax (2492 2057) and By Post

Attention: Mr. Daniel Ip

Dear Sir,

**Re: Agreement No. CE 48/2011 (EP)
Environmental Project Office for the
HZMB Hong Kong Link Road, HZMB Hong Kong Boundary Crossing Facilities,
and Tuen Mun-Chek Lap Kok Link – Investigation**

**Contract No. HY/2012/07 TM-CLKL Southern Connection Viaduct Section
Detailed Coral Translocation Report**

Reference is made to the submission of a Detailed Coral Translocation Report certified by the ET Leader (ERM's reference: 0215660_Detailed Coral Translocation Report_Southern_v1_2014_02_25.pdf dated on 25 February 2014) provided to us via email on 25 February 2014.

We are pleased to inform you that we have no adverse comments on the captioned Detailed Coral Translocation Report.

Thank you for your kind attention. Please do not hesitate to contact the undersigned or the ENPO Leader Mr. Y H Hui should you have any queries.

Yours sincerely,



Tony Cheng
Independent Environmental Checker
Tuen Mun – Chek Lap Kok Link

c.c. HyD – Mr. Stephen Chan (By Fax: 3188 6614)
HyD – Mr. Matthew Fung (By Fax: 3188 6614)
AECOM – Mr. Conrad Ng (By Fax: 3922 9797)
ERM – Mr. Jovy Tam (By Fax: 2723 5660)
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Internal: DY, YH, PL, ENPO Site

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1.1**BACKGROUND**

According to findings of the Northwest New Territories (NWNT) Traffic and Infrastructure Review conducted by the Transport Department, Tuen Mun Road, Ting Kau Bridge, Lantau Link and North Lantau Highway would be operating beyond capacity after 2016. This forecast has been based on the estimated increase in cross boundary traffic, developments in the NWNT, and possible developments in North Lantau, including the Airport developments, the Lantau Logistics Park (LLP) and the Hong Kong – Zhuhai – Macao Bridge (HZMB). In order to cope with the anticipated traffic demand, two new road sections between NWNT and North Lantau – Tuen Mun – Chek Lap Kok Link (TM-CLKL) and Tuen Mun Western Bypass (TMWB) are proposed.

An Environmental Impact Assessment (EIA) of TM-CLKL was prepared in accordance with the EIA Study Brief (No. ESB-175/2007) and the *Technical Memorandum of the Environmental Impact Assessment Process (EIAO-TM)*. The EIA Report was submitted under the Environmental Impact Assessment Ordinance (EIAO) in August 2009. Subsequent to the approval of the EIA Report (EIAO Register Number AEIAR-145/2009), an Environmental Permit (EP-354/2009) for TM-CLKL was granted by the Director of Environmental Protection (DEP) on 4 November 2009, and EP variation (EP-354/2009A) was issued on 8 December 2010. Another application for variation of environmental permit (VEP) (EP-354/2009/B) was granted on 28 January 2014.

Pursuant to *Condition 2.6* of the EP, a detailed coral translocation methodology has been submitted and approved by the authorities for this Contract. In accordance with the *EM&A Manual*, coral translocation should be undertaken for the coral colonies at Tai Ho Wan prior to construction of the temporary staging in order to reduce the potential marine ecological impacts.

1.2**OBJECTIVES OF CORAL TRANSLOCATION**

According to the approved EIA Report of the TM-CLKL, no corals were recorded in the southern reclamation location and that the existing coral colonies on the seawall in the southern landing area at Tai Ho Wan are far away (>10m) from the proposed reclamation area and from either side of the viaduct piers. No direct impact on corals was thus anticipated in the location of the southern viaduct landing area. However, during the design and construction stage of the Southern Connection Viaduct Section, it became apparent that the water depth in the vicinity of bridge structures south of the Tung Chung Navigation Channel is too shallow. This constraint will prohibit transportation of piling rigs and related plant by flat barges being towed by tug boats to the piling locations. Therefore, temporary staging platforms with associated extension from the existing navigation channel/land would be required.

The construction of temporary staging would involve the removal of about 25 m rock armor at each landing position (ie a total of three landing positions). According to the coral survey in the approved EIA, coral colonies are identified at certain locations (for example, survey station C7 as shown in *Figure 1.1*) along the seawall of the North Lantau Highway section at Tai Ho Wan. Potential direct impact to the coral communities at the affected seawall may thus arise.

In relation to the above, the purpose of this coral translocation exercise is to translocate the potentially affected coral colonies at the landing points along the seawall of the North Lantau Highway section at Tai Ho Wan to the receptor site, Yam Tsai Wan, prior to construction of the temporary staging in order to reduce the potential marine ecological impacts to corals.

1.3 ***PURPOSE OF THIS REPORT***

The purpose of this *Detailed Coral Translocation Report* is to report findings of the coral translocation exercise under which movable coral colonies which may potentially be affected by the construction of temporary staging and the Southern Connection Viaduct Section are translocated from the donor site at Tai Ho Wan to the receptor site at Yam Tsai Wan. Findings of the pre-translocation survey undertaken at both the donor and receptor sites are also presented in this report.

1.4 ***STRUCTURE OF THIS REPORT***

The remainder of the report is structured as follows:

Section 2: Coral Translocation – Details the methodology and results of the pre-translocation survey and coral translocation exercise.

Section 3: Post-translocation Monitoring – Presents details of the post-translocation monitoring for this Contract.

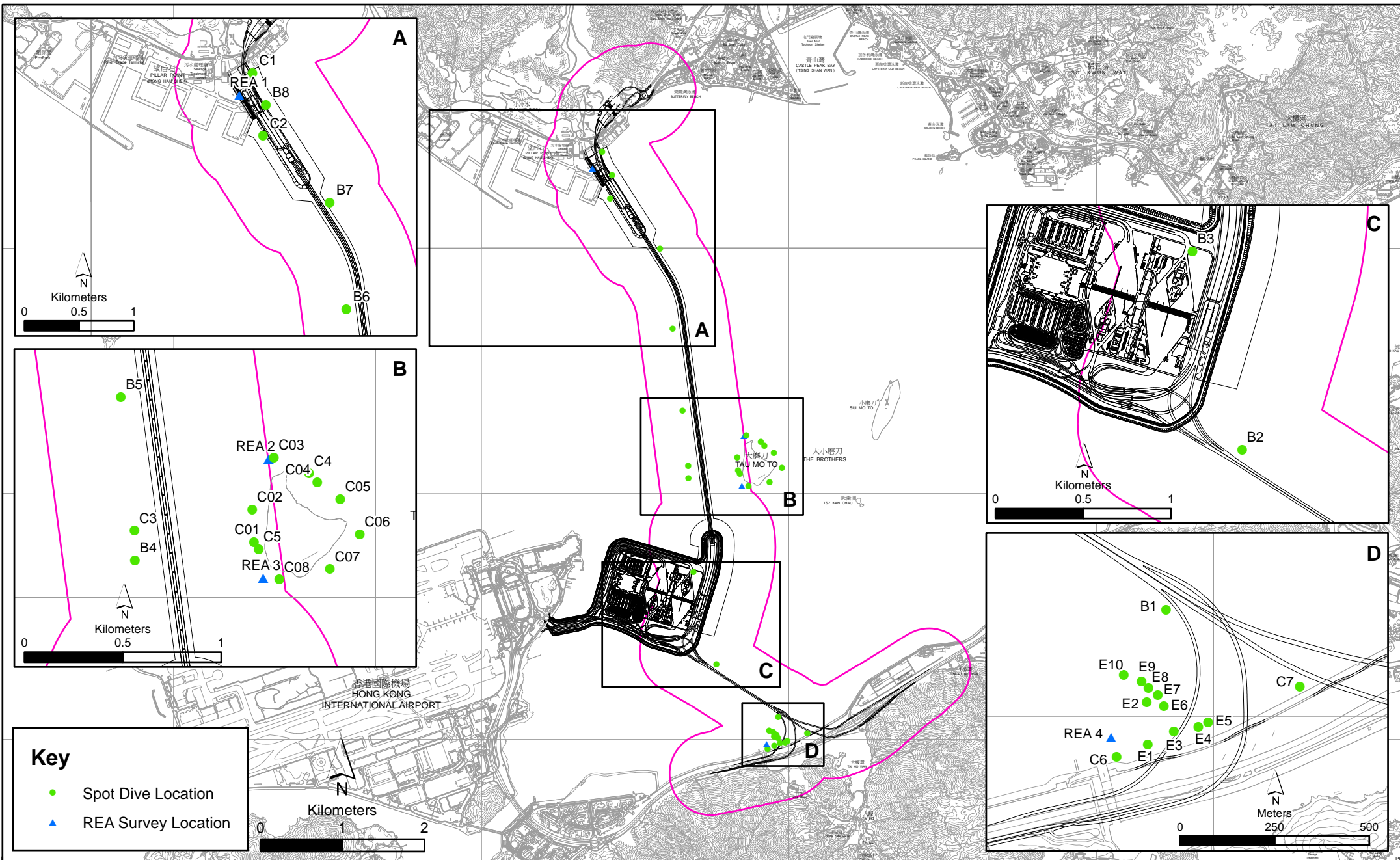


Figure 1.1

Survey Stations for Coral (Spot Dive and REA) Survey under TM-CLKL Study (2008-2009)

2.1 INTRODUCTION

The pre-translocation survey at the receptor site, Yam Tsai Wan, was carried out on 19 October 2013. The pre-translocation survey at the donar site at Tai Ho Wan, coral translocation from the donor site to the receptor site as well as the audit survey at the donar site were carried out on 24 October 2013. The weather conditions during the period concerned above were summarized in *Table 2.1*.

Table 2.1 *Weather Conditions during the Pre-translocation Survey, Coral Translocation and Audit Survey*

Date	Location	Condition	Underwater Visibility
19 October 2013	Receptor site: Yam Tsai Wan	Northeast force 4 to 5 Sunny periods	Less than 0.5 m
24 October 2013	Donor site: Tai Ho Wan Receptor site: Yam Tsai Wan	Northeast force 4 to 5 Sunny periods	Both donor and receptor sites: Less than 0.2 m

2.2 METHODOLOGY

2.2.1 *Pre-translocation Survey at Receptor Site*

Pre-translocation survey was conducted at the proposed receptor site, Yam Tsai Wan (*Figure 2.1*), to ensure its suitability before the translocation of corals commenced at the donor site of Tai Ho Wan. A spot-check dive was conducted at the proposed receptor site and its vicinity to check for the presence of coral colonies including the hard coral *Balanophyllia* sp. and gorgonian *Guaiaigorgia* sp. which were observed in previous surveys and were the identified coral species for translocation from the donar site.

Following the spot-check dive, the substrate type and taxonomic composition of the receptor site was assessed using REA method. The REA survey was performed along a 100 m transect parallel to the coastline (based on the preliminary results from the spot-check dive). The location of the REA transect was recorded on-site using a handheld GPS unit. The GPS coordinates of the starting and ending points and maximum depth of the REA transects are shown in *Table 2.2*.

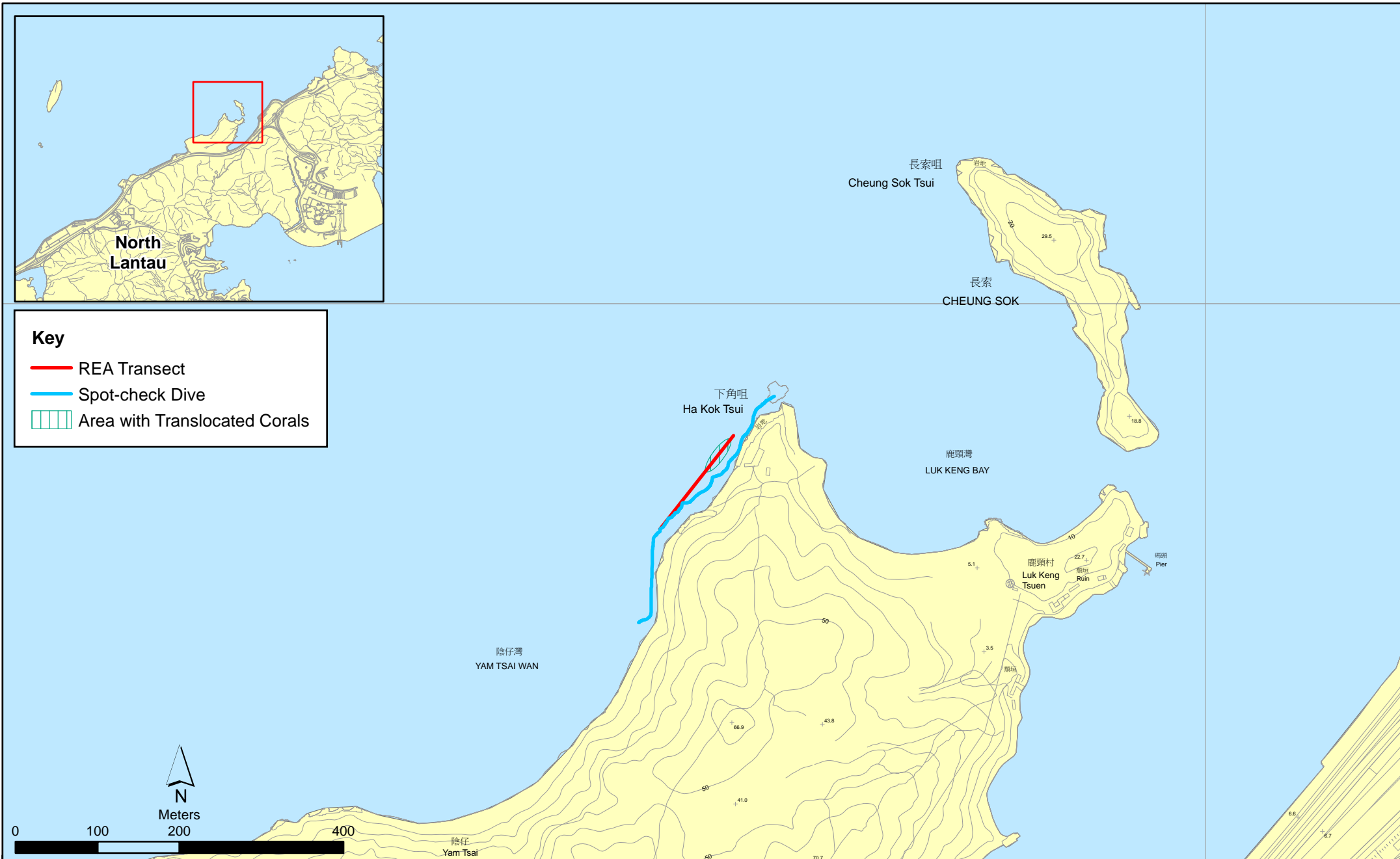


Figure 2.1

Area with Translocated Coral under both Contract No. HY/2012/07 and HY/2012/08

Table 2.2 *GPS Coordinates of REA Transect Starting and Ending Points and Maximum Depth of the Receptor Site, Yam Tsai Wan*

Date	GPS Location at Starting Point	GPS Location at Ending Point	Maximum Depth (-mCD)
19 October 2013	819928.99mE 821387.85mN	819979.74mE 821477.31mN	3.5 m

The substrate type along the length of the transect was recorded at 1 m intervals. The number of colonies, sizes and types of corals as well as their abundance, depth and health status were recorded. Photographs of representative taxa along the transect were also taken during the surveys.

Health status of coral was assessed by the following criteria:

- Gorgonian coral: Percentage of branches exhibiting partial mortality and secretion of mucus.
- Hard coral: Percentage of surface area exhibiting partial mortality and blanched/ bleached area using specially designed Coral Health Monitoring Chart (*Appendix A*).

The benthic cover (Tier I) and taxon abundance (Tier II) of the transect were assessed in a swathe 2 m wide, 1 m either side of the transect. Two assessment categories (Tiers) were used in the surveys, as follows:

Tier I – Categorization of Benthic Cover

Upon the completion of each transect, ecological and substratum attributes (*Table 2.3*) were assigned to standard ranked ordinal categories (*Table 2.4*).

Table 2.3 *Tier I Benthic Attribute Categories*

Ecological Attributes	Substratum Attributes
Hard Coral	<u>Hard Substrata</u>
Dead Coral	Bedrock/ Continuous Pavement
Octocoral (Soft Corals and Gorgonians)	Boulder blocks (diam. >50cm)
Anemone Beds	Boulder blocks (diam. <50cm)
Dead Standing Corals	Rubble
Other Benthos (sponges, zoanthids, ascidians and bryozoans)	Other
Macroalgae	<u>Soft Substrata</u>
	Sand
	Silt
	Mud

Table 2.4 Tier I Ordinal Ranks of Percentage Cover of Benthic Attributes

Rank	Percentage Cover
0	None Recorded
1	1-5%
2	6-10%
3	11-30%
4	31-50%
5	51-75%
6	76-100%

For substratum attributes, it is preferable to record actual estimates of cover. The percentage of hard substrata vs. soft substrata can be provided (eg 80% and 20% respectively). The percentage cover of the types of hard or soft substrata could also then be presented (eg bedrock pavement 60%, rubble 20%, sand 15%, mud / silt 5%). Similarly, recording and presenting actual estimates of, for instance, hard and soft coral cover may be more informative (eg <1%).

Tier II – Taxonomic Inventories to Define Types of Benthic Communities

An inventory of benthic taxa along each transect was compiled during the survey. Taxa were identified *in situ* to the following levels:

- Hard corals to species, where possible;
- Soft corals, anemones and conspicuous macroalgae to genus level, where possible;
- Other benthos (including sponges, zoanthids, ascidians and bryozoans) to genus level, where possible.

For each transect, each taxon in the inventory was ranked in terms of abundance in the community (Table 2.5). The taxon categories were ranked in terms of relative abundance of individuals, rather than the contribution to benthic cover along each transect. The ranks are visual assessments of abundance, rather than quantitative counts of each taxon. Representative photos of organisms were taken.

Table 2.5 Ordinal Ranks of Taxon Abundance

Rank	Relative Abundance
0	Absent
1	Sparse
2	Uncommon
3	Common
4	Abundant
5	Dominant

In order to distinguish the natural variation in health status of corals and the effects to health status due to coral translocation, a total of 10 natural coral colonies of the same species as those translocated from the donor site within

and adjacent to the receptor site were randomly selected and tagged. Baseline information was collected for these tagged coral colonies before translocation and the type of information collected would be the same as those collected for the coral colony during the baseline survey at the donor site. The baseline information collected would be used for the purpose of post-translocation monitoring.

2.2.2 *Pre-translocation Survey and Coral Translocation at the Donor Site*

A coral mapping survey was conducted at the donor site at Tai Ho Wan as part of the pre-translocation coral survey. The location of the donor site is shown in *Figure 2.2*. Since the underwater visibility at the donor site is very low (<0.2m), photo taking and relocating of all tagged coral colonies after coral mapping is almost impossible. Therefore, coral translocation was undertaken concurrently after locating the movable coral colonies.

The locations of any hard corals and gorgonians encountered were mapped. The size and health condition (including percentage cover of bleaching, mortality, degree of sedimentation) of the corals were recorded. The feasibility of translocation of coral colonies including but not limited to those of conservation importance were also assessed.

The following procedures were performed during coral translocation to minimize stress and prevent damage to corals, as far as possible.

- All tagged movable boulder (with diameter <50 cm) supporting coral colony which was selected for translocation would be moved entirely as a whole object, lifted from the sea bottom and loaded to ship/boat with lifting bag.
- The coral colonies transferred onto the vessel were fully submerged in seawater tanks of suitable size with continuous aeration onboard. Each seawater tank held no more than four boulders to avoid overcrowding.
- Ambient water quality parameters such as sea surface water temperature and dissolved oxygen were measured once (with at least three replicates) at the coral donor site on the day of coral translocation. The seawater quality in the tanks was checked every 10 minutes to ensure no fluctuation above 10% of ambient occurs to the seawater in which the coral colonies were submerged.
- Corals were transported to the receptor site as soon as possible on the same day following the removal. The vessel progressed in a slow and steady speed (<5 knots) when approaching close to the receptor site.
- When arriving at the coral receptor site, SCUBA divers, under the supervision of marine biologist with relevant experience, carefully placed the boulders with coral colonies one by one to the seabed in order to minimize disturbance to the seabed and/or sediment. The coral colonies were positioned to similar depths and orientations as their previous locations at the donor site as far as possible.

Setting Out Point for Transect					
Point	Easting	Northing	Point	Easting	Northing
C1	814778.2430	818276.7233	C18	815093.1725	818357.7636
C2	814973.2643	818356.5572	C19	815008.3556	818326.5015
C3	814812.6523	818202.1347	C20	815224.7779	818331.0124
C4	814841.6066	818128.1756	C21	815245.1437	818268.1515
C5	815027.7108	818209.2946	C22	815067.1009	818185.9498
C6	814869.0921	818055.5278	C23	815282.6338	818194.9486
C7	815058.8681	818141.3413	C24	815095.6903	818115.2196
C8	814896.1580	817983.1422	C25	815115.5439	818079.1842
C9	815091.2580	818069.7164	C26	815292.1803	818160.4868
C10	815095.2707	818033.9695	C27	815289.4314	818237.4912
C11	814909.7958	817951.4604	C28	815401.0742	818296.0613
C12	814880.4220	817942.9105	C29	815319.0626	818177.7964
C13	814693.1637	817897.9056	C30	815446.1570	818244.8841
C14	814878.4288	817973.3335	C31	815111.5312	818040.1589
C15	814781.0755	817938.8192	C32	815289.9773	818128.9099
C16	814766.0738	817973.3335	C33	815310.5128	818136.9353
C17	814862.4830	818008.5821	C34	815495.5680	818242.7860

Key

- ▲ Area with Immovable and Non-Translocated Coral Colonies
- Area with Movable and Translocated Coral Colonies
- REA Transects
- Spot check dive transect

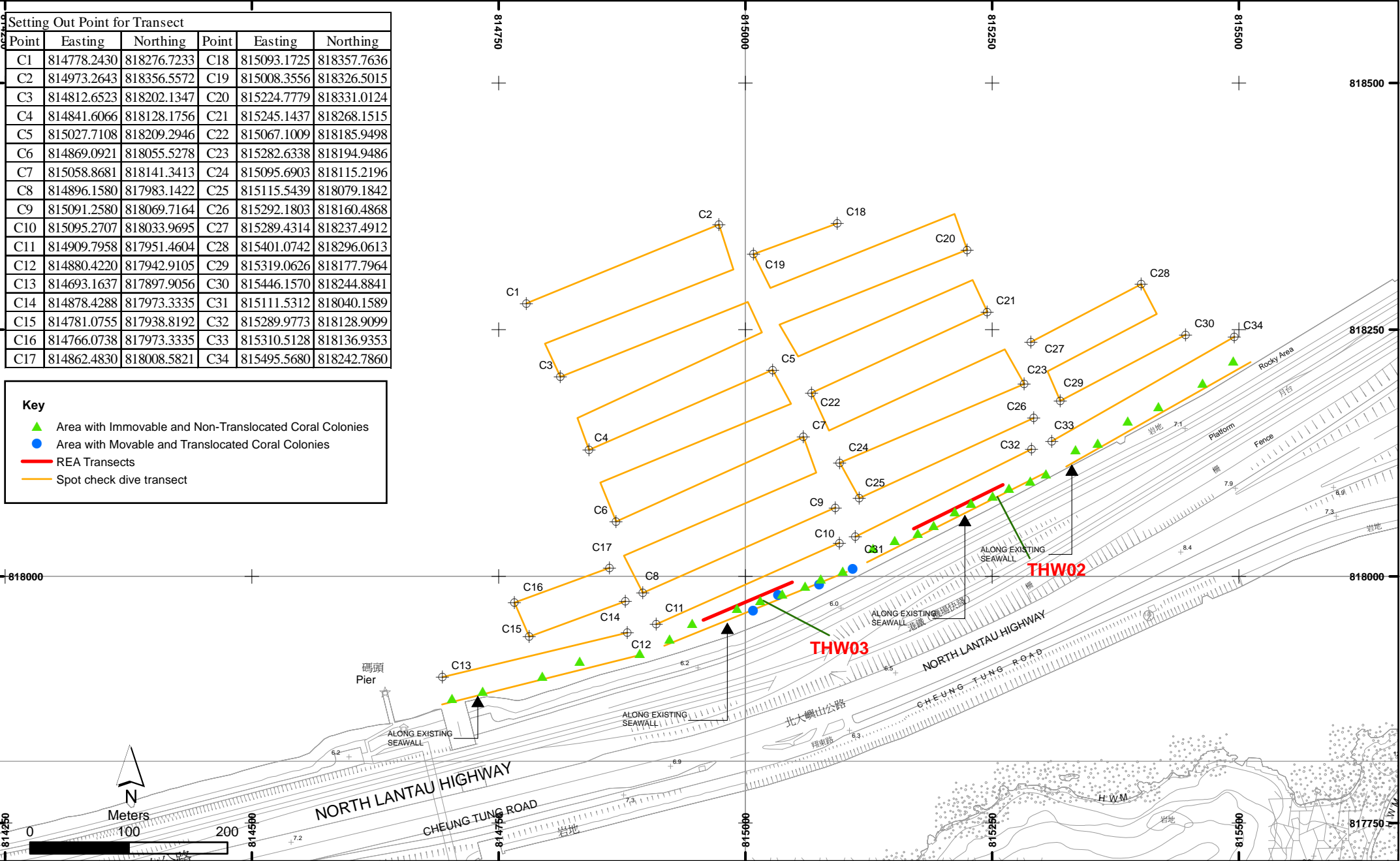


Figure 2.2
Indicative Locations of Movable and Immovable Corals at Donor Site, Tai Ho Wan

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Date: 17/12/2013

- Divers would tag translocated colonies at the receptor site with small plastic labels (e.g. with colony number) anchored or attached on nearby hard substratum using epoxy without touching the corals. All tags were anchored in vicinity of the coral colonies at distances not so close to interfere with the potential growth. This would allow the revisit of the coral colonies during the post-translocation monitoring.
- Divers would record the size, location, health conditions (percentage of mortality and bleaching), percentage cover of sediment of each translocated coral colony after the completion of translocation works using the same methodologies adopted in the pre-translocation coral survey. Photographs of each translocated coral upon completion of translocation would be taken and used as a baseline for future monitoring.
- After translocation was completed, an audit survey was carried out on the same day at donor site to determine if all movable corals have been translocated.

2.3 RESULTS

2.3.1 Pre-translocation Survey at Receptor Site

Results of Spot-check Dive

Result of qualitative spot-check dive confirmed that the seabed of the proposed receptor site at Yam Tsai Wan was composed of natural bedrock and boulders. The cover of hard corals and octocorals was less than 1% with three coral species (*Oulastrea crispata*, *Balanophyllia* sp. and *Guaiagorgia* sp.) recorded (Table 2.6).

Table 2.6 *Coral Species Recorded during Spot-check Dive at Receptor Site, Yam Tsai Wan*

Taxon	Family	Species
Hermatypic Hard Coral Species	Faviidae	<i>Oulastrea crispata</i>
Ahermatypic Coral Species	Dendrophyllidae	<i>Balanophyllia</i> sp.
Octocoral	Gorgoniidae	<i>Guaiagorgia</i> sp.

Results of REA Survey

A 100 m transect was surveyed at the receptor site, Yam Tsai Wan. Location of REA survey is presented in Figure 2.1.

The seabed at the REA survey area of Yam Tsai Wan was predominately composed of natural bedrock and boulders down to water depth of -4mCD whilst sand was the main substrate type beyond -4mCD.

Cover of hard corals and octocorals were only about 1% along the REA transect with only one hermatypic hard coral species (*Oulastrea crispata*), one ahermatypic coral species (*Balanophyllia* sp.) and one octocoral species

(*Guaiaorgia* sp.) recorded. Results of Tier I showing seabed attributes along the REA transect are presented in *Table 2.7*. Results of Tier II showing ordinal rank of taxon abundance are presented in *Table 2.8*. All coral species recorded are common and have a widespread distribution throughout Hong Kong's nearshore waters.

Table 2.7 *Seabed Attributes along the Semi-Quantitative Survey Transect*

Zone	Rank
Seabed attributes ^(a)	
<u>Hard Substrata</u>	
Bedrock/ Continuous Pavement	4
Boulders blocks (diam. >50cm)	3
Boulders blocks (diam. <50cm)	1
Rubble	0
<u>Soft Substrata</u>	
Sand	1
Mud/Silt	0
Mud	0
Ecological attributes ^(a)	
Hard coral	1
Dead coral	0
Octocoral (Soft Corals and Gorgonians)	1
Anemone Beds	0
Dead Standing Corals	0
Other Benthos (sponges, zoanthids, ascidians and bryozoans)	0
Macroalgae	0
Notes: (a) 0= None Recorded, 1=<5% Cover, 2= 6-10% Cover, 3 = 11-30% Cover, 4 = 31-50% Cover, 5 = 51-75%, Cover, 6 = 76-100% Cover.	

Table 2.8 *Tier II Results - Ordinal Rank of Taxon Abundance*

Type	Taxon/Family	Species	Ordinal Rank ^(a)
Hermatypic Hard Coral	Faviidae	<i>Oulastrea crispata</i>	1
Ahermatypic Coral	Dendrophyllidae	<i>Balanophyllia</i> sp.	1
Octocoral	Gorgoniidae	<i>Guaiaorgia</i> sp.	1
Other Benthos	Muricidae	<i>Thais luteostoma</i>	1
	Mytillidae	<i>Septifer virgatus</i>	1
	Echinometridae	<i>Anthocidaris crassispina</i>	1
Note: (a) 0 = Absent, 1 = Sparse, 2 = Uncommon, 3 = Common, 4 = Abundant, 5 = Dominant.			

A total of 69 coral colonies (16 colonies of *Oulastrea crispata*, 31 colonies of *Guaiaorgia* sp. and 22 colonies of *Balanophyllia* sp.) were recorded along the REA transect ⁽¹⁾. In general, the health conditions of all coral colonies observed were in fair condition. Species, size and health conditions of coral colonies observed along the REA transect are presented in *Table 2.9*. Representative photographs taken during the pre-translocation survey at Yam Tsai Wan are shown in *Appendix B*. The substrate type along the 100 m transect was also recorded at 1 m intervals and results are shown in *Table 2.10*.

⁽¹⁾ Number of the solitary ahermatypic coral *Balanophyllia* sp. was not counted during the REA survey due to its small size and high abundance.

Table 2.9 Coral Species, Size and Health Conditions of Corals along the REA Transect

Number		Size (cm, Height /Diameter)	% Partial Mortality	% Bleaching	Coral Watch	% Mucus
1	<i>Oulastrea crispata</i>	10	0	0	4.5	0
2	<i>Oulastrea crispata</i>	5	0	0	5	0
3	<i>Oulastrea crispata</i>	15	0	0	4.5	0
4	<i>Oulastrea crispata</i>	10	0	0	4.5	0
5	<i>Oulastrea crispata</i>	7	0	0	5	0
6	<i>Oulastrea crispata</i>	10	0	0	5	0
7	<i>Oulastrea crispata</i>	9	0	0	5	0
8	<i>Oulastrea crispata</i>	6	0	0	5.5	0
9	<i>Oulastrea crispata</i>	11	0	0	5	0
10	<i>Oulastrea crispata</i>	5	0	0	5	0
11	<i>Oulastrea crispata</i>	3	0	0	5	0
12	<i>Oulastrea crispata</i>	15	0	0	5.5	0
13	<i>Oulastrea crispata</i>	10	0	0	5	0
14	<i>Oulastrea crispata</i>	9	0	0	5.5	0
15	<i>Oulastrea crispata</i>	7	0	0	5	0
16	<i>Oulastrea crispata</i>	11	0	0	5	0
17	<i>Guaiagorgia</i> sp.	15	15	N/A	N/A	5
18	<i>Guaiagorgia</i> sp.	20	20	N/A	N/A	0
19	<i>Guaiagorgia</i> sp.	22	15	N/A	N/A	0
20	<i>Guaiagorgia</i> sp.	9	0	N/A	N/A	0
21	<i>Guaiagorgia</i> sp.	10	0	N/A	N/A	0
22	<i>Guaiagorgia</i> sp.	18	35	N/A	N/A	0
23	<i>Guaiagorgia</i> sp.	22	30	N/A	N/A	5
24	<i>Guaiagorgia</i> sp.	25	10	N/A	N/A	0
25	<i>Guaiagorgia</i> sp.	17	15	N/A	N/A	0
26	<i>Guaiagorgia</i> sp.	14	10	N/A	N/A	0
27	<i>Guaiagorgia</i> sp.	23	15	N/A	N/A	0
28	<i>Guaiagorgia</i> sp.	26	25	N/A	N/A	0
29	<i>Guaiagorgia</i> sp.	32	40	N/A	N/A	5
30	<i>Guaiagorgia</i> sp.	16	10	N/A	N/A	0
31	<i>Guaiagorgia</i> sp.	23	55	N/A	N/A	10
32	<i>Guaiagorgia</i> sp.	25	15	N/A	N/A	0
33	<i>Guaiagorgia</i> sp.	18	25	N/A	N/A	0
34	<i>Guaiagorgia</i> sp.	16	30	N/A	N/A	0
35	<i>Guaiagorgia</i> sp.	23	35	N/A	N/A	5
36	<i>Guaiagorgia</i> sp.	29	40	N/A	N/A	5
37	<i>Guaiagorgia</i> sp.	16	15	N/A	N/A	0
38	<i>Guaiagorgia</i> sp.	27	25	N/A	N/A	0
39	<i>Guaiagorgia</i> sp.	19	20	N/A	N/A	0
40	<i>Guaiagorgia</i> sp.	14	5	N/A	N/A	0
41	<i>Guaiagorgia</i> sp.	21	10	N/A	N/A	0
42	<i>Guaiagorgia</i> sp.	16	0	N/A	N/A	0
43	<i>Guaiagorgia</i> sp.	15	0	N/A	N/A	0
44	<i>Guaiagorgia</i> sp.	35	25	N/A	N/A	0
45	<i>Guaiagorgia</i> sp.	32	35	N/A	N/A	10
46	<i>Guaiagorgia</i> sp.	28	50	N/A	N/A	5
47	<i>Guaiagorgia</i> sp.	38	60	N/A	N/A	10
48	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
49	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
50	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
51	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
52	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
53	<i>Balanophyllia</i> sp.	0.5	0	0	4.5	0

Number		Size (cm, Height /Diameter)	% Partial Mortality	% Bleaching	Coral Watch	% Mucus
54	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
55	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
56	<i>Balanophyllia</i> sp.	0.5	0	0	5.5	0
57	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
58	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
59	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
60	<i>Balanophyllia</i> sp.	0.5	0	0	4.5	0
61	<i>Balanophyllia</i> sp.	0.5	0	0	5.5	0
62	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
63	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
64	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
65	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
66	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
67	<i>Balanophyllia</i> sp.	0.5	0	0	4.5	0
68	<i>Balanophyllia</i> sp.	0.5	0	0	5	0
69	<i>Balanophyllia</i> sp.	0.5	0	0	5	0

Table 2.10 Substrate Type recorded along REA Transect at Receptor Site, Yam Tsai Wan

Meter	Substratum along REA at 1 Meter interval	Meter	Substratum along REA at 1 Meter interval	Meter	Substratum along REA at 1 Meter interval	Meter	Substratum along REA at 1 Meter interval
1	Bedrock	26	Bedrock	51	Bedrock	76	Boulder
2	Bedrock	27	Bedrock	52	Bedrock	77	Cobble
3	Bedrock	28	Cobble	53	Bedrock	78	Bedrock
4	Bedrock	29	Cobble	54	Bedrock	79	Bedrock
5	Bedrock	30	Cobble	55	Bedrock	80	Bedrock
6	Boulder	31	Cobble	56	Sand	81	Bedrock
7	Boulder	32	Boulder	57	Bedrock	82	Boulder
8	Boulder	33	Boulder	58	Bedrock	83	Bedrock
9	Bedrock	34	Boulder	59	Boulder	84	Bedrock
10	Bedrock	35	Boulder	60	Boulder	85	Bedrock
11	Boulder	36	Boulder	61	Boulder	86	Cobble
12	Boulder	37	Bedrock	62	Boulder	87	Cobble
13	Bedrock	38	Bedrock	63	Bedrock	88	Cobble
14	Bedrock	39	Boulder	64	Bedrock	89	Bedrock
15	Boulder	40	Boulder	65	Boulder	90	Bedrock
16	Bedrock	41	Boulder	66	Boulder	91	Bedrock
17	Bedrock	42	Boulder	67	Sand	92	Bedrock
18	Bedrock	43	Boulder	68	Sand	93	Bedrock
19	Boulder	44	Boulder	69	Sand	94	Bedrock
20	Boulder	45	Boulder	70	Boulder	95	Bedrock
21	Boulder	46	Bedrock	71	Boulder	96	Bedrock
22	Boulder	47	Bedrock	72	Boulder	97	Bedrock
23	Cobble	48	Bedrock	73	Boulder	98	Bedrock
24	Bedrock	49	Bedrock	74	Bedrock	99	Bedrock
25	Bedrock	50	Bedrock	75	Bedrock	100	Bedrock

Ten (10) coral colonies of *Guaiagorgia* sp. were tagged at the receptor site. Health conditions of the tagged colonies are summarized in Table 2.11. These data will be used for the purpose of post-translocation monitoring. Photos of the tagged coral colonies are shown in Appendix C.

Table 2.11 *Sizes, Mortality, Bleaching and Sediment of Tagged Coral Colonies at Receptor Site, Yam Tsai Wan* ⁽¹⁾

Coral #	Species	Size (cm) – Max. Diameter/Height	Mortality (%)	Bleaching (%)	Sediment (%)
1	<i>Guaiaigorgia</i> sp.	25	5	N/A	0
2	<i>Guaiaigorgia</i> sp.	32	35	N/A	0
3	<i>Guaiaigorgia</i> sp.	28	15	N/A	0
4	<i>Guaiaigorgia</i> sp.	38	25	N/A	0
5	<i>Guaiaigorgia</i> sp.	27	40	N/A	0
6	<i>Guaiaigorgia</i> sp.	28	25	N/A	0
7	<i>Guaiaigorgia</i> sp.	21	10	N/A	0
8	<i>Guaiaigorgia</i> sp.	26	30	N/A	0
9	<i>Guaiaigorgia</i> sp.	19	50	N/A	0
10	<i>Guaiaigorgia</i> sp.	35	35	N/A	0

Overall, it is considered that the proposed receptor site, Yam Tsai Wan, would have sufficient space to receive all translocated coral colonies from donor site, Tai Ho Wan. Therefore, Yam Tsai Wan is considered to be a suitable receptor site for coral translocation for this Contract.

2.3.2 *Pre-translocation Survey and Coral Translocation at Donor Site*

Thirteen (13) *Guaiaigorgia* sp. colonies in Tai Ho Wan were successfully translocated to the receptor site at Yam Tsai Wan on 24 October 2013. Areas at the donor site with movable coral colonies were marked in *Figure 2.2* and area at the receptor site within which translocated coral colonies were placed was shown in *Figure 2.1* with relevant information (ie location, depth, substrate) presented in *Table 2.12*. The general health conditions (size, mortality, bleaching and sediment) of translocated corals from Tai Ho Wan were recorded and summarized in *Table 2.13* while conditions of coral which were not translocated were presented in *Table 2.14*. Photos of the translocated coral colonies from donor site are shown in *Appendix C*.

An audit survey was carried out at Tai Ho Wan on 24 October 2013 after coral translocation was completed and it is confirmed that all movable coral colonies that may potentially be affected by the construction works were translocated to Yam Tsai Wan.

Table 2.12 *GPS Coordinates, Average Depth and Bottom Substrate of Translocated Corals in Receptor Site, Yam Tsai Wan*

Date	GPS Location	Average Depth (-mCD)	Bottom Substrate
24 October 2013	819970.235 mE 821491.654 mN	2.5 m	Natural bedrock and boulders

(1) Please note that *Guaiaigorgia* sp., *Balanophyllia* sp. and *Oulastrea crispata* were tagged for the coral translocation excise of HY/2012/08 and were presented in the coral translocation report under HY/2012/08. For the current contract HY/2012/07, only *Guaiaigorgia* sp. colonies were translocated as such data of tagged *Guaiaigorgia* sp. colonies were reported in *Table 2.11* for HY/2012/07 which were considered relevant for the current contract.

Table 2.13 *Size, Mortality, Bleaching and Sediment Cover of Translocated Coral Colonies from Donor Site, Tai Ho Wan*

Coral #	Species	Size (cm) – Max Height	Mortality (%)	Bleaching (%)	Sediment (%)
Tai Ho Wan					
1	<i>Guaiagorgia</i> sp.	7	0	N/A	0
2	<i>Guaiagorgia</i> sp.	9	0	N/A	0
3	<i>Guaiagorgia</i> sp.	5	0	N/A	0
4	<i>Guaiagorgia</i> sp.	8	0	N/A	0
5	<i>Guaiagorgia</i> sp.	13	10	N/A	0
6	<i>Guaiagorgia</i> sp.	8	70	N/A	0
7	<i>Guaiagorgia</i> sp.	6	0	N/A	0
8	<i>Guaiagorgia</i> sp.	7	0	N/A	0
9	<i>Guaiagorgia</i> sp.	19	50	N/A	0
10	<i>Guaiagorgia</i> sp.	15	35	N/A	0
11	<i>Guaiagorgia</i> sp.	22	55	N/A	0
12	<i>Guaiagorgia</i> sp.	14	20	N/A	0
13	<i>Guaiagorgia</i> sp.	16	45	N/A	0

Table 2.14 *Size, Mortality, Bleaching and Sediment Cover of Coral Colonies at Donor Site, Tai Ho Wan, which were not Translocated under the Coral Translocation Exercise*

Coral	Species	Size (cm) – Max. Diameter/Height	Mortality (%)	Bleaching (%)	Sediment (%)
1	<i>Guaiagorgia</i> sp.	15	10	N/A	0
2	<i>Guaiagorgia</i> sp.	10	0	N/A	0
3	<i>Guaiagorgia</i> sp.	11	0	N/A	0
4	<i>Guaiagorgia</i> sp.	14	0	N/A	0
5	<i>Guaiagorgia</i> sp.	15	5	N/A	0
6	<i>Guaiagorgia</i> sp.	12	0	N/A	0
7	<i>Guaiagorgia</i> sp.	13	0	N/A	0
8	<i>Guaiagorgia</i> sp.	17	25	N/A	0
9	<i>Guaiagorgia</i> sp.	13	0	N/A	0
10	<i>Guaiagorgia</i> sp.	14	0	N/A	0
11	<i>Guaiagorgia</i> sp.	12	0	N/A	0
12	<i>Guaiagorgia</i> sp.	14	50	N/A	0
13	<i>Guaiagorgia</i> sp.	9	15	N/A	0
14	<i>Guaiagorgia</i> sp.	13	20	N/A	0
15	<i>Guaiagorgia</i> sp.	21	20	N/A	5
16	<i>Guaiagorgia</i> sp.	15	15	N/A	0
17	<i>Guaiagorgia</i> sp.	15	15	N/A	0
18	<i>Guaiagorgia</i> sp.	13	0	N/A	0
19	<i>Guaiagorgia</i> sp.	15	0	N/A	0
20	<i>Guaiagorgia</i> sp.	15	0	N/A	0
21	<i>Guaiagorgia</i> sp.	13	0	N/A	0
22	<i>Guaiagorgia</i> sp.	17	25	N/A	5
23	<i>Guaiagorgia</i> sp.	15	0	N/A	0
24	<i>Guaiagorgia</i> sp.	19	15	N/A	0
25	<i>Guaiagorgia</i> sp.	15	10	N/A	0
26	<i>Guaiagorgia</i> sp.	11	0	N/A	0
27	<i>Guaiagorgia</i> sp.	14	0	N/A	0
28	<i>Guaiagorgia</i> sp.	12	0	N/A	0
29	<i>Guaiagorgia</i> sp.	15	0	N/A	0
30	<i>Guaiagorgia</i> sp.	15	20	N/A	0
31	<i>Guaiagorgia</i> sp.	12	25	N/A	0
32	<i>Guaiagorgia</i> sp.	23	15	N/A	10
33	<i>Guaiagorgia</i> sp.	25	0	N/A	15
34	<i>Guaiagorgia</i> sp.	15	15	N/A	0
35	<i>Guaiagorgia</i> sp.	16	10	N/A	10
36	<i>Guaiagorgia</i> sp.	14	0	N/A	0
37	<i>Guaiagorgia</i> sp.	7	0	N/A	0
38	<i>Guaiagorgia</i> sp.	13	5	N/A	0
39	<i>Guaiagorgia</i> sp.	16	5	N/A	0
40	<i>Guaiagorgia</i> sp.	11	0	N/A	0
41	<i>Guaiagorgia</i> sp.	16	0	N/A	0
42	<i>Guaiagorgia</i> sp.	25	25	N/A	35
43	<i>Guaiagorgia</i> sp.	25	50	N/A	30
44	<i>Guaiagorgia</i> sp.	26	55	N/A	35
45	<i>Guaiagorgia</i> sp.	13	0	N/A	5
46	<i>Guaiagorgia</i> sp.	15	10	N/A	0
47	<i>Guaiagorgia</i> sp.	15	25	N/A	0
48	<i>Guaiagorgia</i> sp.	14	25	N/A	0
49	<i>Guaiagorgia</i> sp.	16	0	N/A	0
50	<i>Guaiagorgia</i> sp.	9	0	N/A	0
51	<i>Guaiagorgia</i> sp.	10	5	N/A	0
52	<i>Guaiagorgia</i> sp.	15	5	N/A	0

Coral	Species	Size (cm) – Max. Diameter/Height	Mortality (%)	Bleaching (%)	Sediment (%)
63	<i>Guaiagorgia</i> sp.	34	25	N/A	0
64	<i>Guaiagorgia</i> sp.	12	0	N/A	0
55	<i>Guaiagorgia</i> sp.	26	0	N/A	55
56	<i>Guaiagorgia</i> sp.	23	5	N/A	60
57	<i>Guaiagorgia</i> sp.	17	0	N/A	10
58	<i>Guaiagorgia</i> sp.	13	0	N/A	0
59	<i>Guaiagorgia</i> sp.	14	10	N/A	0
60	<i>Guaiagorgia</i> sp.	13	10	N/A	0
61	<i>Balanophyllia</i> sp.	<0.5	0	0	0
62	<i>Balanophyllia</i> sp.	<0.5	0	0	0
63	<i>Balanophyllia</i> sp.	<0.5	0	0	0
64	<i>Balanophyllia</i> sp.	0.5	0	0	0
65	<i>Balanophyllia</i> sp.	<0.5	0	0	0
66	<i>Balanophyllia</i> sp.	<0.5	0	0	0
67	<i>Balanophyllia</i> sp.	<0.5	0	0	0
68	<i>Balanophyllia</i> sp.	0.5	0	0	0
69	<i>Balanophyllia</i> sp.	<0.5	0	0	0
70	<i>Balanophyllia</i> sp.	<0.5	0	0	0
71	<i>Balanophyllia</i> sp.	0.5	0	0	0
72	<i>Balanophyllia</i> sp.	<0.5	0	0	0
73	<i>Balanophyllia</i> sp.	<0.5	0	0	0
74	<i>Balanophyllia</i> sp.	<0.5	0	0	0
75	<i>Balanophyllia</i> sp.	<0.5	0	0	0
76	<i>Balanophyllia</i> sp.	0.5	0	0	0
77	<i>Balanophyllia</i> sp.	0.5	0	0	0
78	<i>Balanophyllia</i> sp.	0.5	0	0	0
79	<i>Balanophyllia</i> sp.	0.5	0	0	0
80	<i>Balanophyllia</i> sp.	<0.5	0	0	0
81	<i>Balanophyllia</i> sp.	<0.5	0	0	0
82	<i>Balanophyllia</i> sp.	<0.5	0	0	0
83	<i>Balanophyllia</i> sp.	<0.5	0	0	0
84	<i>Balanophyllia</i> sp.	0.5	0	0	0
85	<i>Balanophyllia</i> sp.	0.5	0	0	0
86	<i>Balanophyllia</i> sp.	0.5	0	0	0
87	<i>Balanophyllia</i> sp.	<0.5	0	0	0
88	<i>Balanophyllia</i> sp.	<0.5	0	0	0
89	<i>Balanophyllia</i> sp.	<0.5	0	0	0
90	<i>Balanophyllia</i> sp.	0.5	0	0	0
91	<i>Balanophyllia</i> sp.	<0.5	0	0	0
92	<i>Balanophyllia</i> sp.	<0.5	0	0	0
93	<i>Balanophyllia</i> sp.	0.5	0	0	0
94	<i>Balanophyllia</i> sp.	0.5	0	0	0
95	<i>Balanophyllia</i> sp.	0.5	0	0	0
96	<i>Balanophyllia</i> sp.	<0.5	0	0	0
97	<i>Balanophyllia</i> sp.	<0.5	0	0	0
98	<i>Balanophyllia</i> sp.	<0.5	0	0	0
99	<i>Balanophyllia</i> sp.	<0.5	0	0	0
100	<i>Balanophyllia</i> sp.	<0.5	0	0	0
101	<i>Balanophyllia</i> sp.	<0.5	0	0	0
102	<i>Balanophyllia</i> sp.	0.5	0	0	0
103	<i>Balanophyllia</i> sp.	0.5	0	0	0

Thirteen (13) movable coral colonies of *Guaiaogorgia* sp., which may potentially be affected by the construction of temporary staging and Southern Connection Viaduct Section of TM-CLK Link Project, were successfully translocated from the existing seawall at Tai Ho Wan to the receptor site, Yam Tsai Wan. Following the translocation, the translocated coral colonies as well as the tagged natural coral colonies at the receptor site will be monitored once every three (3) months for a period of 12 months in order to track the health status of the translocated corals.

The tentative schedule of the quarterly post-translocation monitoring is provided in *Table 3.1* below. A Post-Translocation Monitoring Report will be submitted to EPD and AFCD two weeks after completion of each quarterly survey.

Table 3.1 *Schedule of Quarterly Post-Translocation Monitoring*

Post-Translocation Monitoring Survey	Timing
1 st Quarterly Monitoring	January 2014 3 months after the translocation works
2 nd Quarterly Monitoring	April 2014 6 months after the translocation works
3 rd Quarterly Monitoring	July 2014 9 months after the translocation works
4 th Quarterly Monitoring	October 2014 12 months after the translocation works

Post-translocation monitoring results will be evaluated against Action and Limit Levels which will be based on recorded changes in percentage of partial mortality of the corals (*Table 3.2*). If the defined Action Level or Limit Level for coral monitoring is exceeded, the actions as set out in *Table 3.3* will be implemented.

Table 3.2 *Action and Limit Levels for Post-Translocation Coral Monitoring*

Parameter	Action Level Definition	Limit Level Definition
Mortality	If during Impact Monitoring a 15% increase in the percentage of partial mortality on the corals occurs at more than 20% of the translocated coral colonies that is not recorded on the original corals at the receptor site, then the Action Level is exceeded.	If during Impact Monitoring a 25% increase in the percentage of partial mortality on the corals occurs at more than 20% of the translocated coral colonies that is not recorded on the original corals at the receptor site, then the Limit Level is exceeded.

Table 3.3 Event and Action Plan for Post-Translocation Monitoring

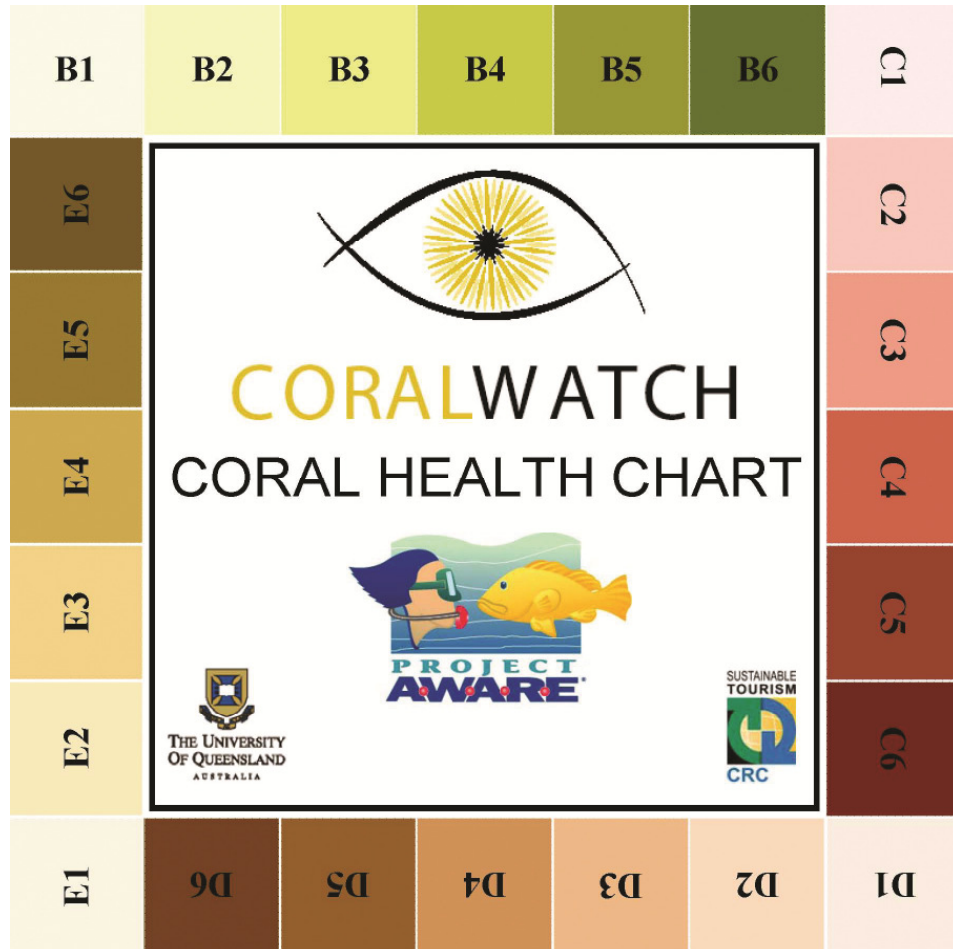
Event	Action			
	ET Leader	IEC	SOR	Contractor
Action Level Exceedance	<ol style="list-style-type: none"> 1. Check monitoring data 2. Inform the IEC, SOR and Contractor of the findings; 3. Increase the monitoring to at least once a month to confirm findings; 4. Propose mitigation measures for consideration 	<ol style="list-style-type: none"> 1. Discuss monitoring with the ET and the Contractor; 2. Review proposals for additional monitoring and any other measures submitted by the Contractor and advise the SOR accordingly. 	<ol style="list-style-type: none"> 1. Discuss with the IEC additional monitoring requirements and any other measures proposed by the ET; 2. Make agreement on the measures to be implemented. 	<ol style="list-style-type: none"> 1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the SOR; 3. Implement the agreed measures.
Limit Level Exceedance	<ol style="list-style-type: none"> 1. Undertake Steps 1-4 as in the Action Level Exceedance. If further exceedance of Limit Level, propose enhancement measures for consideration. 	<ol style="list-style-type: none"> 1. Discuss monitoring with the ET and the Contractor; 2. Review proposals for additional monitoring and any other measures submitted by the Contractor and advise the SOR accordingly. 	<ol style="list-style-type: none"> 1. Discuss with the IEC additional monitoring requirements and any other measures proposed by the ET; 2. Make agreement on the measures to be implemented. 	<ol style="list-style-type: none"> 1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the SOR; 3. Implement the agreed measures.

Appendix A

Coral Health Monitoring Chart

CORAL HEALTH MONITORING CHART

The Coral Health Monitoring Chart has four sample colours and six degrees of darkness (Code 1 to 6) for each sample colour indicating different stages of coral health condition. Code 1 is the lightest (representing bleaching) and Code 6 has the dark colour (representing the healthiest). During the REA survey, the lightest and darkest areas of each coral will be selected, and the colour of areas will be matched to the categories on the chart.



Appendix B

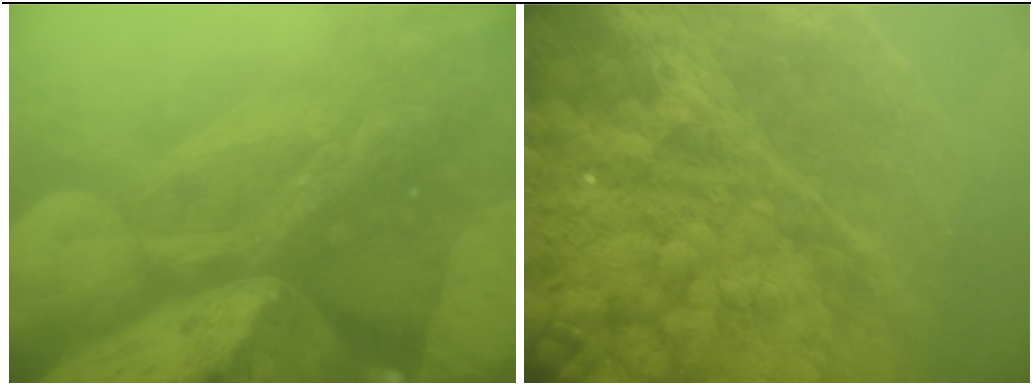
Photographic Records of
Pre-translocation Survey at
Receptor Site, Yam Tsai
Wan

Photographic Records taken during Pre-translocation Survey in Receptor Site, Yam Tsai Wan

Receptor Site, Yam Tsai Wan



Substratum – Bedrock and Boulders

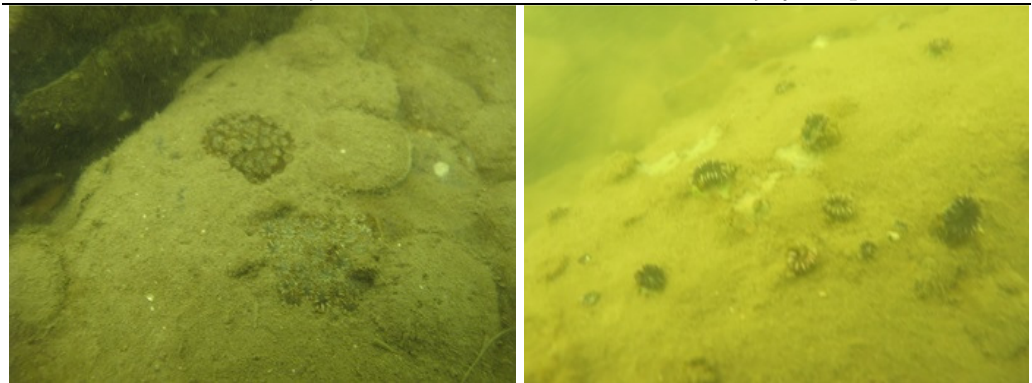


Guaiaagorgia sp.



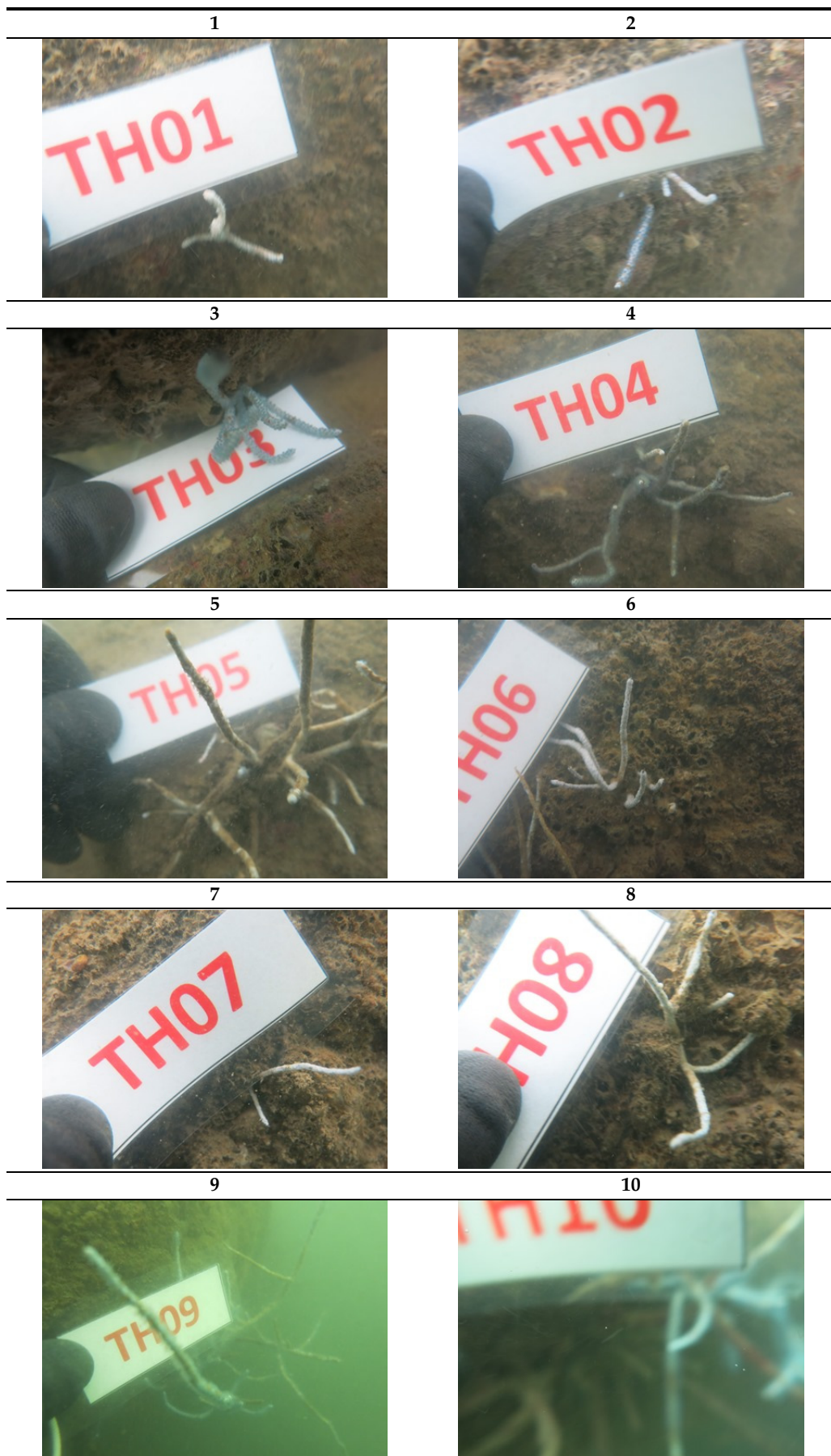
Oulastrea crispata

Balanophyllia sp.



Appendix C

Photographic Records of
Translocated and Tagged
Natural Coral Colonies



11



12



13



