Agreement No. CE 56/2008(CE)

Site Formation for Kai Tak Cruise Terminal Development - Design and Construction

Third Post-Translocation Coral Monitoring Report

Deliverable ID: D30

May 2010

Issue	Description	Prepared by	Checked by	Approved by	Date
0	Third Post-translocation Coral Monitoring Report	Samantha Lee and Dr Denise McCorry (ERM)	Frank Wan (ERM)	Ian Muir	
Signature		Denise McCorry			7 May 10
Letter Ref: 08290/335190 Date of Issue: 7 May 2010					

Scott Wilson Ltd　ERM Hong Kong Ltd　CEDD 土木工程拓展署 Civil Engineering and Development Department

CONTENTS

PAGE

TABLES

FIGURES

ANNEX

LIST OF ABBREVIATIONS

AFCD	Agriculture, Fisheries and Conservation Department
ArchSD	Architectural Services Department
CEDD	Civil Engineering and Development Department
DEP	Director of Environmental Protection
EIA	Environmental Impact Assessment
EM&A	Environmental Monitoring and Audit
EP	Environmental Permit

1 INTRODUCTION

1.1 General

The main purpose of this Report is to document the field activities, results and findings of the Third Post-translocation Coral Monitoring Survey conducted on 26 March 2010. The health, condition and size of translocated plus reference *Oulastrea crispata* colonies located within and adjacent to the coral recipient site at Tseung Kwan O were individually assessed. The findings of the Third Post-translocation Coral Monitoring Survey are presented with comparison of the Baseline, First and Second Post-translocation results. This Third Post-translocation Coral Monitoring was completed successfully in accordance with the Final Detailed Coral Translocation Plan [(1)] and the detailed mitigation measures documented in the approved EIA Report, Environmental Monitoring and Audit (EM&A) Manual (EIA 138/2007) and Environmental Permit and variation (EP-328/2009 and VEP-289/2009).

1.2 Description of the Project

1.2.1 Civil Engineering and Development Department (CEDD) have commissioned Scott Wilson Ltd under Agreement No. CE 56/2008(CE) to undertake design and construction supervision for the site formation works for Kai Tak Cruise Terminal Development at the former Kai Tak Airport in the southeastern region of Kowloon Peninsula (the Project). After closure in 1998, the disused airport site has been occupied by various temporary uses, including a golf driving range and has been subjected to a number of proposals to redevelop the site with change usage.

1.2.2 The Project comprises the following key components.

(a) Site Formation Works

- demolition of the existing seawall;
- construction of Edge Structures and Transition Edge Structures;
- formation and construction of an Apron Area, including the provision of trough & pit systems for installation of Apron Facilities by others;
- formation of the Designated Areas including provision of piled quay deck structures and upgrading of existing seawalls;
- installation of fender and mooring facilities, navigation aids and apron drainage; and,
- dredging of seabed and fairways.

(b) Environmental monitoring and implementation of mitigation measures in association with the above.

1.2.3 In the original Project Brief, Temporary Infrastructure will be required to facilitate the operation of the Phase I Berth in mid 2013. However, based on the current programme and development, Architectural Services Department (ArchSD) will bring forward the

(1) Scott Wilson Ltd and ERM (2009). Detailed Coral Translocation Plan for Site Formation for Kai Tak Cruise Development - Design and Construction.

construction programme for the Cruise Terminal Building such that the required facilities for the operation of the Phase I Berth will be provided by the newly constructed Cruise Terminal Building. As a result of this, the provision of the Temporary Infrastructure will not be required and the design of the site formation works including the edge structures and seawalls will be carried out on this basis.

1.2.4 The development layout plans are presented in *Figure 1.1*.

1.2.5 A number of environmental studies have been carried out at the site as part of the masterplanning and Environmental Impact Assessments required under the Environmental Impact Assessment Ordinance (EIAO). These include:

- The Environmental Appraisal Report for the Cruise Terminal;
- EIA report (*EIA-139/2007*) for the decommissioning of the Former Kai Tak Airport other than the North Apron – approved on 19 December 2007;
- EIA report (*EIA-138/2007*) for Dredging Works for the Proposed Cruise Terminal at Kai Tak – approved on 19 December 2007; and,
- EIA Report (*EIA-157/2008*) for the Kai Tak Development – approved without conditions on 4 March 2009.

1.2.6 An Environmental Permit (EP) has been obtained by CEDD for Dredging Works for the Proposed Cruise Terminal (EP-328/2009), which links directly to the EM&A measures set out and agreed in the approved EIA-138/2007.

1.2.7 The marine ecological impacts associated with the Project identify the potential for direct loss of habitat and associated marine life due to the dredging activities and demolition of the existing seawall required for the formation of the new cruise terminal. With respect to the mitigation of potential impacts, a specific requirement of the approved EIA-138/2007 is the need to undertake coral translocation from the impacted area to an identified site in Tseung Kwan O. The requirements for coral translocation have also been set down in the Environmental Permit for Dredging Works and the subsequent variation (EP-328/2009 and VEP-289/2009).

1.2.8 As required under Agreement No. CE 56/2008 (CE) and Environmental Permit No. EP-328/2009, the coral translocation works comprise three phases of works:

i. Preparation of a detailed Coral Translocation Plan, including the results of a pre-translocation surveys for the Kai Tak (donor site) and proposed coral recipient site (Tseung Kwan O);

ii. Execution and documentation of the coral translocation exercise; and

iii. The implementation and documentation of a post-translocation coral monitoring programme over a period of 12 months.

1.3 Objectives for the Third Post-translocation Coral Monitoring Survey

1.3.1 The objective of the Third Post-translocation Coral Monitoring Survey was to document and assess the health and condition of the coral colonies moved from Kai Tak to Tseung Kwan O at quarterly intervals and this survey following on the First and Second Post-Translocation Coral Monitoring Survey which were completed in September and December 2009,

respectively. Data from this Third Post-translocation Coral Monitoring Survey were collected for two purposes:

- To assess translocated coral health condition nine months after the translocation works; and,
- To collect a robust dataset to track the temporal status of the translocated and reference coral colonies (*Oulastrea crispata*) in terms of health dynamics. Reference to the Baseline (immediately following the coral move), First and Second Monitoring Survey results and the condition of the surrounding environment are made.

1.4 Structure of the Report

1.4.1 Following this introductory section (Section 1), the remainder of this Third Post-translocation Coral Monitoring Report is structured as follows:

Section 2: Detailed description of the coral monitoring approach and methodology utilised for this specific survey.

Section 3: Presentation of the findings for the Third Post-translocation Coral Monitoring Survey including the health status, condition and size of the translocated and reference coral colonies assessed in March 2010.

Section 4: A summary and discussion of the key results of the Third Post-translocation Coral Monitoring Survey and the schedule for the next (final) survey assessment.

2 SECOND POST-TRANSLOCATION CORAL MONITORING METHODOLOGY

2.1 General

2.1.1 The main objective of the post-translocation coral monitoring programme was to track the health and condition of the translocated corals at the Tseung Kwan O recipient site once every three months over a period of one year [1]. The Third Post-translocation Coral Monitoring Survey was carried out on 26 March 2010. The baseline assessment was conducted on 19 June 2009, immediately following the translocation works, ie the removal and transfer of corals from Kai Tak and their placement at Tseung Kwan O. Routine quarterly coral monitoring of the translocated corals (for a period of one year) is now underway with the First and Second Post-translocation Coral Monitoring Surveys completed in September and December 2009, respectively, followed by the Third Monitoring Survey in March 2010. The Fourth and Final Monitoring Survey will be conducted in June 2010.

2.1.2 The corals removed from the seawall of the Former Kai Tak Runway and transferred to Tseung Kwan O were placed within the established recipient site located as shown in *Figure 2.1*. A total of 72 boulders containing 157 colonies of *Oulastrea crispata* were placed inside a pre-established underwater rope grid (1 m^2 grid cells) secured with metal bars on two sides. The condition of each translocated coral was assessed during the Baseline Coral Translocation Survey and the majority of *O. crispata* colonies were in good condition exhibiting no stress or damage attributed to the translocation works. The occurrence and percentage cover of partial mortality per coral colony was generally low for both the translocated and reference *O. crispata* colonies.

2.1.3 The set-up of the underwater grid reference was found destroyed by typhoons in the September 2009 survey. As such, the majority boulders with corals, ie Kai Tak derived boulders that had been disturbed, were re-orientated and re-positioned in small aggregations within the recipient site at the time of the First and Second Monitoring Surveys. No further movement or repositioning of the boulders took place during the Third Post-translocation Monitoring Survey in March 2010. The approximate location of all 72 boulders/rocks with corals in the recipient area is presented in *Figure 2.2*.

2.1.4 The condition and health status of each translocated and reference coral were re-assessed nine months after the translocation work as the main focus of the third coral monitoring survey. Representative photographs were taken of each living coral colony and used to estimate the size of individual coral colonies for the post-translocation assessment and monitoring. Full details of the field methodology are presented in the following sub-sections.

2.2 Monitoring of Coral Health Status

2.2.1 All coral colonies for each recovered boulder were assessed visually and notes were recorded on the standard parameters measured. The following standard coral health parameters were recorded *in-situ* for each translocated coral colony (as detailed in the EM&A Manual (EIA-138/2007) and the Final Detailed Coral Translocation Plan):

- The number and size of all hard coral colonies for each translocated boulder/rock.
- The existing surface area (percentage cover) of each coral colony that exhibited partial mortality.

(1) Scott Wilson 2009. Final Detailed Coral Translocation Plan. Prepared by ERM for CE 56/2008 (CE) Site Formation for Kai Tak Cruise Terminal Development - Design and Construction.

- The existing coral surface area bleached of which two categories were recorded: a. blanched (ie pale) and b. bleached (ie whitened) with the bleaching parameter recorded as a percentage cover estimate of the total coral colony area.

- Each coral colony was also assessed for sediment cover including the percentage cover of the colony affected and the colouration, texture and approximate thickness of sediment on the coral colony and adjacent substrate. Any contiguous patches of sediment cover >10 % were recorded.

2.3 Monitoring of Growth and Change in Cover of *Oulastrea crispata*

2.3.1 The coral monitoring survey programme established the additional collection of data allowing the growth and change in coral size of individual *Oulastrea crispata* colonies to be tracked over the 12 month period of post-translocation monitoring. Photographs at a standardised height from each coral colony were taken at the time of the Baseline Post-translocation Survey. Due to poor visibility conditions during the First and Second Post-translocation Coral Monitoring Survey a series of close-up photographs of the individual coral colonies were recorded with a scale bar included in all photographs. Despite much improved underwater visibility during this Third Post-translocation Coral Monitoring Survey the close-up photographic capture approach was maintained.

2.3.2 The coral images were then digitally analysed post-survey using the Coral Point Count (CPCe) software (http://www.nova.edu/ocean/cpce/). The health parameter data collected in the field was verified with the examination of the individual photographs. In addition, the size (maximum diameter and area) of each coral colony was extracted from the coral images after scale calibration for each image had been carried out.

2.4 Reference Corals

2.4.1 To distinguish natural variation in the health status and the general condition of the *Oulastrea crispata* colonies as opposed to stress possibly induced by the translocation works, a random suite of *O. crispata* colonies within and adjacent to the recipient site were also included in the monitoring programme. A total of 40 randomly selected *O. crispata* colonies referred to as 'reference corals' were monitored using the same approach as for the translocated colonies to assess their health status (ie partial mortality, bleaching and sediment cover) and photographs of each individual colony for verification of the condition of the corals and size estimation of individual colonies.

2.4.2 Coral health data obtained for the reference colonies will be collected on each post-monitoring survey occasion and used to compare with the coral condition of the translocated coral colonies. It is expected that the general health condition of the translocated and reference *Oulastrea crispata* colonies will be similar.

3 RESULTS AND FINDINGS

3.1 Introduction

3.1.1 The Third Post-translocation Coral Monitoring Survey was conducted on 26 March 2010. The survey objective was to repeat the translocation monitoring (as conducted for the Baseline, First and Second Post-translocation Coral Monitoring) to assess the health and condition of the corals moved from Kai Tak in June 2009.

3.1.2 On 26 March 2010, the prevailing weather was sunny and cool with fair sea conditions. There was a fresh easterly wind (Force 5) with low-moderate current and swell, increasing in the early afternoon. Underwater visibility was moderate (~ 2 m) and sufficient for the survey. The dive survey work was carried out during a flood tide [(1)] period.

3.2 Coral Results

General

3.2.1 All 72 translocated boulders/rocks were relocated and a thorough examination of each boulder/rock for the *Oulastrea crispata* colonies translocated from Kai Tak was carried out. The results are presented in relation to the four surveys completed to date, ie Baseline, First, Second and Third Post-Translocation Monitoring Survey. All *O. crispata* colonies (ie 157 coral colonies as recorded in the Baseline Post-translocation Coral Monitoring Survey) were accounted for (living or dead) and an additional seven *O. crispata* coral recruits were recorded in March 2010. Note that three and ten recruits were recorded in September and December, 2009, respectively (*Table 1* and *2)*. In addition, a total of 40 reference *O. crispata* colonies were randomly selected and assessed, 20 of which where located within the recipient site and 20 colonies along the area of the reference transect. All coral colonies were photographed (as described in *Section 2.3.1*) and these images are presented in *Annex A*.

Translocated Coral Health and Condition

3.2.2 In March 2010, of the 157 coral colonies (as recorded for the Baseline Monitoring Survey), representing the original collection of translocated corals moved from Kai Tak in June 2009, a total of 98 (62 %) corals were alive and 59 (38 %) corals were recorded as dead. Translocated coral survivorship of 62 % was considered similar to that (64 % survivorship) recorded in December 2009 (*Table 3*).

3.2.3 In general, just less than half of the living translocated *Oulastrea crispata* colonies (44 out of 98 live coral colonies (45 %)) were in good condition showing no visual signs of damage or stress in March 2010 (*Table 4*). Of the remaining 54 *O. crispata* coral colonies, the majority were affected by sediment with 5-30 % of the total surface area covered in sediment (33 % of the 98 corals examined). Twelve percent of the living corals examined were affected by sedimentation and had < 50 % partial mortality. Ten percent exhibited partial mortality with 7 % low partial mortality (<50 %) and 3 % with high partial mortality (>50 %). These were the lowest records of partial mortality recorded to date. The most notable observation for the March 2010 survey was the high number of translocated *O. crispata* colonies affected by sediment.

(1) http://www.weather.gov.hk/tide/cQUBtide.htm. Accessed on 22 March 2010.

Overall Coral Health and Condition

3.2.4 In March 2010 (ie the Third Monitoring Survey) the health and condition of 177 coral colonies (representing the original translocated colonies (157) plus recruits recorded in preceding monitoring surveys (13 from September and December 2009)) were assessed and detailed records of their health status were made for the live coral colonies (ie % partial mortality, bleaching and sediment cover). The results are summarised in *Table 2* and show that at the time of the Third Monitoring Survey there were 111 colonies (63 %) of *Oulastrea crispata* alive (including seven coral recruits recorded in Third Monitoring Survey, *Figure 3.1*) and 66 colonies (37 %) had died. These included 19 colonies which exhibited total mortality at the time of the Second Monitoring Survey and are now considered as permanently lost (ie no potential to recover due to being completely overgrown by turf and coralline algae, and fouling organisms) and 14 colonies (including six recruits detected in December 2009) which had died between December 2009 and March 2010 (*Table 2*). It was noted that five boulders (Tags 5, 9 18, 25 and 40B) from which records of corals having died were made now had new coral colonies at the time of the March 2010 survey.

Focused Explanation on Translocated Coral Colonies Exhibiting Reduced Partial Mortality in March 2010

3.2.5 Four out of 36 (11 %) translocated coral colonies with partial mortality (as recorded in December 2009, *Table* 4) had fully recovered, showing no signs of damage or stress in March 2010. Twenty-three out of 36 (64 %) translocated coral colonies that had exhibited partial mortality in December 2009 showed partial recovery, ie a reduction in the percentage partial mortality when examined, in March 2010 (refer to *Table 4*). The remaining 25 % (9 colonies) were part of the increased number of coral colonies covered in sediment and recovery from partial mortality could not be examined.

Focused Explanation on the Fate of Healthy Coral Colonies and New Recruits between December 2009 and March 2010

3.2.6 It was also noted that a total of 30 out of 58 coral colonies (ie 48 translocated coral colonies plus ten new recruits) recorded as healthy in December 2009 remained in good condition in March 2010. Of the remaining 28 corals the following records for March 2010 were made:

- Seven coral colonies had suffered total mortality in the period between December 2009 and March 2010, of which six were coral recruits recorded in December 2009 (with a maximum diameter <0.9 cm).

- A further 21 coral colonies exhibited different degrees of partial mortality and/or sedimentation. Two corals exhibited partial mortality of 45 % and 50 %, respectively. Thirteen of the 21 colonies were affected by sedimentation (ranging from 5-10 %) with approximately half of these coral colonies (46 %) with a low sediment coverage (estimated 5 %) and six colonies exhibited both partial mortality (an estimated 5-35 %) and sedimentation (~5-30 %).

Focused Explanation on the Condition of the Coral Colonies that had Suffered Total Mortality between December 2009 and March 2010

3.2.7 Of the 14 dead *Oulastrea crispata* colonies recorded in March 2010, 43 % (six corals) were identified as new recruits detected in December 2009, 36 % (five colonies) exhibited partial mortality (with two colonies with >40 % records) and/ or some level of sediment cover and 21 % (three colonies) did not exhibit partial mortality at the time of the December 2009 survey.

3.2.8 The health status of the individual *Oulastrea crispata* coral colonies is detailed in *Table 5*. *Figure 3.2* shows a set of representative photographs of *O. crispata* coral colonies for all recording periods, ie, as recorded for the Baseline Survey immediately following the translocation works (June 2009), and the First (September 2009), Second (December 2009) and Third (March 2010) Post-translocation Coral Monitoring Surveys. Details for each translocated coral colony, ie size and health condition, recorded from all the translocated and tagged boulders/rocks for the Baseline Post-translocation Survey (June 2009) are presented in *Annex B* for the readers' reference.

Reference Coral Health and Condition

3.2.9 A total of 40 reference corals were assessed using the same indicators of health and condition status. These coral colonies showed a low of partial mortality occurrence with only 10 % of the recipient site reference corals affected in March 2010 (*Table 6*). Two coral colonies affected had partial mortality of 10 % and 45 %, respectively). Sixty-five and fifty-five percent of the assessed *Oulastrea crispata*, within and outside the recipient site, respectively, exhibited sediment cover (with varying levels ranging from 5 to 65 %). The low levels of partial mortality were comparable to the reduced partial mortality levels recorded for the translocated coral colonies within the recipient site. Sedimentation levels were also similar to that observed for the translocated corals.

Number and Size of Oulastrea crispata *Colonies*

3.2.10 The estimated size of individual translocated coral colonies are presented in *Table 5*. The diameter of *Oulastrea crispata* ranged from 0.3 to 12.5 cm and the estimated total area of individual coral colonies ranged from 0.1 to 68.4 cm^2, a size spectrum representing possible recruits to adult colonies. The average size (area estimate) of the translocated coral colonies was 4.8±0.8 cm^2.

3.2.11 The size of the reference *Oulastrea crispata* coral colonies are presented in *Table 7*. The size of the reference colonies within the recipient site and along the reference transect ranged from 0.5 to 6.3 cm in diameter with average size (estimated area) of 2.9±0.7 cm^2 (ranging from 0.2 to 30.1 cm^2).

Brief Comparative Analyses of the Results for the Second and Third Post-Translocation Coral Monitoring Surveys

3.2.12 The health and condition status of the living translocated *Oulastrea crispata* as recorded in December 2009 and March 2010 were compared (refer to *Table 4* and *Figure 3.3*). A number of key observations were made as follows:

- The percentage of healthy coral colonies (ie, corals showing no stress signals such as partial mortality) remained relatively similar, with 45 % healthy coral colonies recorded in March 2010 as compared to 48 % in December, 2009;
- The level of estimated partial mortality (<50 %) exhibited by the living coral colonies showed a large reduction, with 17 % less coral colonies (ie 24 % to 7 %) observed with dead coral areas between December 2009 and March 2010.
- The level of estimated partial mortality (≥ 50 %) exhibited by the living coral colonies remained similar from December 2009 (5 %) to March 2010 (3 %);
- For the translocated corals, ie those located inside the recipient site, the number of coral colonies with surface areas affected by sediment practically doubled (from 17 % in December 2009 to 33 % in March 2010). Similar, results were recorded for the

reference corals with 65 % and 55 % sediment affected corals located inside the recipient site and along reference transect, respectively).

- These above results for the specific health and condition parameters indicate that despite the further low level of total mortality recorded the translocated corals (plus new recruits) within the recipient site at Tseung Kwan O are exhibiting an overall improvement in condition with respect to partial mortality as compared to the post-typhoon condition (first survey in September 2009). Sediment loading within this site at Tseung Kwan O appeared higher than observed in the past as reflected in the number of *Oulastrea crispata* colonies with sediment settlement.

4 SUMMARY AND DISCUSSION

4.1.1 All 72 translocated boulders/rocks were relocated and all 157 *Oulastrea crispata* colonies (as recorded for the Baseline Monitoring Survey) plus the additional coral recruits (including those recorded for the Third Monitoring Survey) were individually assessed during the Coral Monitoring Survey conducted on 26 March 2010. Of the original 157 translocated *O. crispata* coral colonies 98 (62 %) were recorded alive and 59 (38 %) had died. Just less than half of the living translocated *O. crispata* colonies (48 %, 44 out of 98 live coral colonies) were in good condition showing no visual signs of damage or stress (*Table 4*). The remaining 54 *O. crispata* coral colonies exhibited low partial mortality occurrence and colonies showed varying but generally low levels of partial mortality (ranging from 5 to >50 %). The occurrence of coral colonies with sediment covered coral surfaces was higher than for partial mortality (representative photographs of the underwater environment on 26 March 2010 are presented in *Figure 3.4*).

4.1.2 A summary of the key findings on the coral mortality and recovery records for the Third Post-translocation Coral Monitoring is presented below:

- Coral survivorship of 157 translocated corals from Kai Tak was 62 % in March 2010, exhibiting a relatively stable period of coral survivorship since December 2009 (when 64 % survivorship was recorded).
- Of the 98 living coral colonies (original Kai Tak corals), 44 were recorded as healthy, ie, no visual signs of stress. It was noted that four of these colonies exhibited partial mortality in December 2009 showed full recovery by March 2010.
- A key observation made in March 2010 was the reduction in partial mortality affected coral colonies (including records of < 50 % and > 50 % and with sedimentation, refer to *Table 4*). In March 2010, a record low of 22 % was made, and was greatly reduced from previous records, ie, 36 % in December 2009 and 64 % in September 2009.
- There was a recorded decrease in estimated percentage partial mortality of individual coral colonies (% estimate of surface area) from 30 % of surface area (for the majority of coral colonies) recorded in December 2009 to 5 – 10 % in March 2010.
- Five new coral colonies on five different boulders growing in the same location as colonies previously recorded and noted as dead were recorded for the March 2010 survey.
- Seven new *Oulastrea crispata* colonies (recruits) were recorded within the recipient site and on the boulders moved from Kai Tak in March 2010.
- Results for the specific health and condition parameters indicate that the translocated corals (plus new recruits) within the recipient site at Tseung Kwan O show a stabilisation in condition, however, the sedimentation observed may lead to the eventual occurrence of partial mortality to those sediment affected colonies.

4.1.3 The health and condition of the 40 reference corals which were located within the recipient site and along the reference transect were assessed, showing a slightly lower occurrence in partial mortality estimates and higher occurrence in estimated sediment cover. The majority of reference *Oulastera crispata* colonies, inside the recipient site, (65 %) were recorded with low levels of partial mortality (~5 %) and generally much higher levels of estimated sediment cover (ranging 5 to 65 % per colony). The general health condition of the

translocated and reference *O. crispata* colonies recorded from Tseung Kwan O in March 2010 was considered similar.

4.1.4 Compared to the results of the First and Second Post-translocation Coral Monitoring Survey, a decreased number of translocated *Oulastrea crispata* colonies exhibited partial mortality at the time of the Third Monitoring Survey. Total mortality levels were similar for the Second and Third Monitoring Surveys indicating a period of relatively stable coral survivorship. Possibly indicating a period of recovery after the physical disturbance stemming from the spate of typhoons in the late summer of 2009. It was noted, however, that a higher number colonies and a higher coverage of individual colonies were affected by sedimentation, both for the translocated and reference corals. As noted previously, corals occurring naturally within the recipient site also exhibited partial mortality and sediment settlement such as the *Turbinaria peltata* colony shown in *Figure 3.4B*.

4.1.5 Active colonisation and overgrowth of coralline algae, sponges, bryozoans on bedrock and boulder surfaces (*Figure 3.4C and D*) provides an insight into the continuing population dynamics, including competition, within the benthic communities. These processes affect the survivorship of the coral colonies within the recipient site of Tseung Kwan O and though not quantified may be a primary driver in the maintenance of coral condition process. It should be noted that the translocated coral health status was comparable to that of the reference corals. Furthermore, a total of 20 new coral colonies have colonised on the boulders moved from Kai Tak indicating that the Tseung Kwan O site conditions are optimal for coral colonisation and growth of *Oulastrea crispata*.

4.1.6 The last survey over the full 12 month period since the coral translocation will take place in June 2010. The survey will consist of monitoring and site maintenance that will require the removal of the underwater grid and boulder tags (as per the EM&A). A minimum of 20 coral colonies within, and adjacent to, the recipient site will be assessed at the same time as the corals translocated from Kai Tak. An extension of the post-translocation coral monitoring may still be a consideration if required to justify that the observations of coral mortality in the summer time were due to the typhoon. Further monitoring would permit a better insight in to what is seen as a stability in mortality rates for these translocated corals, the impact of natural perturbations affecting this particular coral species (eg sedimentation) and the general and longer term dynamics of this common coral species.

4.1.7 The data collected from the Third Post-translocation Coral Monitoring Survey will serve as the fourth of the temporal monitoring datasets to be collected during the 12 month post-translocation monitoring programme. The condition of the translocated corals will be further assessed in the final survey to be carried out in June 2010.

Tables

Table 1: Summary Table of *Oulastrea crispata* Colonies recorded on the 72 Boulders/ Rocks during the Pre-translocation Survey (April 2009), immediately following the Coral Translocation Works (Baseline June 2009), First Post-Translocation Survey (September 2009), Second Post-Translocation Survey (December 2009) and Third Post-Translocation Survey (March 2010).

Tag Number	No. of Live Coral(s) Recorded in Pre-Translocation Survey - April 2009	No. of Live Coral(s) Recorded during Coral Translocation (Baseline Survey - June 2009)	No. of Live Coral(s) Recorded during Coral Translocation (1st Monitoring - September 2009)	No. of Live Coral(s) Recorded during Coral Translocation (2nd Monitoring - December 2009)	No. of Live Coral(s) Recorded during Coral Translocation (3rd Monitoring – March 2010)
1	2	1	1	1	1
2	1	1	1	0	0
3	1	3	2	1	1
4	1	1	1	1	1
5	1	2	1	0	1
6	1	2	1	1	1
7	1	1	1	0	0
8	2	2	2	2	2
9	2	2	2	1	2
10	1	1	1	1	1
11	1	5	5	6	5
12	1	1	1	1	1
13	1	1	1	2	2
14	2	3	2	4	2
15	3	3	3	3	2
16	1	1	0	0	2
17	3	3	2	0	0
18	1	1	1	0	1
19	1	1	1	1	1
20	1	1	1	1	1
21	1	1	1	0	0
22	2	2	2	1	1
23	2	4	4	4	4
24	2	3	2	2	2
25	2	2	0	0	1
26	2	2	1	1	1
27	1	4	5	5	4
28	1	1	0	1	1
29	1	1	1	1	1
30	1	3	3	2	2
31	3	5	5	5	4

Tag Number	No. of Live Coral(s) Recorded in Pre-Translocation Survey - April 2009	No. of Live Coral(s) Recorded during Coral Translocation (Baseline Survey - June 2009)	No. of Live Coral(s) Recorded during Coral Translocation (1st Monitoring - September 2009)	No. of Live Coral(s) Recorded during Coral Translocation (2nd Monitoring - December 2009)	No. of Live Coral(s) Recorded during Coral Translocation (3rd Monitoring – March 2010)
32	2	1	1	1	1
33	1	1	1	1	1
34	1	1	1	1	1
35	1	1	1	0	1
36	2	2	1	1	1
37	2	2	1	0	0
38	1	3	3	2	2
39	1	1	1	1	1
40	3	3	2	2	2
41	2	2	2	1	2
42	2	2	3	0	0
43	2	2	0	0	1
44	2	2	1	2	1
45	4	4	4	2	2
46	2	2	1	2	2
47	1	1	1	1	1
48	3	3	4	4	3
49	1	1	1	1	1
50	1	1	1	1	1
51	1	1	1	1	1
52	2	5	2	2	2
53	1	2	1	2	2
54	4	7	2	2	2
55	1	1	1	1	1
56	2	2	2	2	1
57	1	1	1	2	2
58	1	2	2	3	2
59	2	2	2	1	1
60	1	1	1	0	0
61	2	2	2	2	2
62	2	2	1	2	2
63	2	3	2	3	3
64	2	2	1	1	1
65	1	1	1	1	1
66	4	5	2	2	3
67	5	5	3	3	3

Tag Number	No. of Live Coral(s) Recorded in Pre-Translocation Survey - April 2009	No. of Live Coral(s) Recorded during Coral Translocation (Baseline Survey - June 2009)	No. of Live Coral(s) Recorded during Coral Translocation (1st Monitoring - September 2009)	No. of Live Coral(s) Recorded during Coral Translocation (2nd Monitoring - December 2009)	No. of Live Coral(s) Recorded during Coral Translocation (3rd Monitoring – March 2010)
68	1	1	1	1	0
69	2	2	2	2	2
70	3	3	3	5	3
23B	-	4	3	3	3
40B	-	4	1	1	2
Total	**120**	**157**	**121**	**113**	**111**

Table 2: A Summary Table of the Translocated *Oulastrea crispata* Colonies during the Baseline, First and Second Coral Post-Translocation Surveys (completed in 2009).

Survey	# Live Corals	# New Coral Recruits	# Dead Coral Records	# Recently Dead Coral Records	Total	Coral Survivorship *
Baseline Monitoring (June 09)	157	-	-	-	**157**	**100 %**
First Monitoring (September 09)	118	3	-	39	**160**	**75 %**
Second Monitoring (December 09)	103	10	35	22	**170**	**66 %**
Third Monitoring (March 10)	104	7	52**	14***	**177**	**63 %**

*Percentage estimate calculated using the number of live corals plus the new coral recruit data.
**In December 2009, five corals out of the 57 recorded as dead (Dead and Recently Dead coral records combined) in preceding surveys had partially recovered.
***Note of the 14 dead coral colonies six colonies were coral recruits first recorded in December 2009.

Table 3: A Summary Table of the fate of the Translocated *Oulastrea crispata* Colonies (157) Recorded during the Baseline, First and Second Coral Post-Translocation Surveys (completed in 2009).

Survey	# Live Corals	# Dead Coral Records	Total Number	Coral Survivorship
Baseline Monitoring (June 09)	157	-	**157**	**100 %**
First Monitoring (September 09)	118	39	**157**	**75 %**
Second Monitoring (December 09)	101	56	**157**	**64 %**
Third Monitoring (March 10)	98	59	**157**	**62 %**

Table 4: A Summary Table of the Health and Condition of the Living Translocated *Oulastrea crispata* Colonies as recorded for the First, Second and Third Coral Post-Translocation Surveys (September 2009, December 2009 and March 2010).

Living Coral Assessed (number of colonies and relative percentage)		Healthy Coral showing no sign of stress	Coral with partial mortality (< 50 % cover)	Coral with partial mortality (>= 50% cover)	Affected by sediment	Coral with partial mortality (< 50 % cover) and affected by sediment	Coral with partial mortality (>= 50 % cover) and affected by sediment
1st Monitoring							
Colony Number	118	41	26	28	12	10	1
Percentage	100%	35%	22%	24%	10%	8%	1%
2nd Monitoring							
Colony Number	101	48	24	5	17	7	0
Percentage	100%	48%	24%	5%	17%	7%	0%
3rd Monitoring							
Colony Number	98	44	7	3	32*	12**	0
Percentage	100 %	45%	7%	3%	33%	12%	0%

*** Thirteen of which exhibited low level of sediment cover (< 5 %).**
**** Five of which exhibited low level of sediment cover (< 5 %).**

Table 5: Summary Table of the *Oulastrea crispata* Colony Health Status for each Tagged Boulder/Rock for the Second (December 2009) and Third (March 2010) Post-Translocation Coral Monitoring Assessment.

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at 2nd Post-Translocation (cm)	Health Status					Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
1	1	1.5	-	-	-	-	Recovered	1	-	10	-	-	-
2	2	0	100	-	-	-	-	0	100	-	-	-	-
3	3	0	100	-	-	-	-	0	100	-	-	-	-
3	4	1.4	-	-	-	-	Recovered	1.5		-	-	-	-
3	5	0	100	-	-	-		0	100	-	-	-	-
4	6	3.5	5	20	-	-	Partially Recovered	3.6	-	30	-	-	Recovering
5	7	0	100	-	-	-	-	1.5	-	-	-	-	New coral recorded
5	8	0	100	-	-	-	-	0	100	-	-	-	-
6	9	0	100	-	-	-	-	0	100	-	-	-	-
6	10	1.3	20	-	-	-	-	0	100	-	-	-	-
7	12	0	100	-	-	-	-	0	100		-	-	-
8	13	6.2	-	-	-	-	-	6.2	10	30	-	-	-
8	14	3.2	-	-	-	-	-	2.4	5	10	-	-	-
9	15	7.6	-	30	-	-	Partially Recovered	5.8	-	30	-	-	Recovering
9	16	0	100	-	-	-	-	2.1	-	10	-	-	New coral recorded

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at 2nd Post-Translocation (cm)	Health Status					Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
10	17	3.4	-	-	-	-	-	2.5	20	10	-	-	-
11	18	1.5	-	-	-	-	-	1.3	-	-	-	-	-
11	19	1.9	-	-	-	-	Recovered	1.5	-	-	-	-	-
11	20	3.4	5	-	-	-	-	1.8	-	5	-	-	-
11	21	1.4	-	-	-	-	-	1	-	-	-	-	-
11	22	3	-	-	-	-	-	1	-	-	-	-	-
12	24	4.2	5	-	-	-	-	3	-	70	-	-	-
13	25	2.2	10	-	-	-	Partially Recovered	1.5	-	-	-	-	-
14	27	3.2	-	5	-	-	-	4	60	-	-	-	-
14	28	4.9	10		-	-	-	3.8	-	5	-	-	-
14	29	3.4	40	20	-	-	-	0	100	-	-	-	-
15	31	4.6	-	-	-	-	Recovered	3.9	-	5	-	-	-
15	32	2	-	-	-	-	-	0	100	-	-	-	-
15	33	2.6	-	-	-	-	-	1.6	-	-	-	-	-
16	34	0	100	-	-	-	-	0	100	-	-	-	-
17	37	0	100	-	-	-	-	0	100	-	-	-	-
17	38	0	100	-	-	-	-	0	100	-	-	-	-
17	39	0	100	-	-	-	-	0	100	-	-	-	-

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at 2nd Post-Translocation (cm)	Health Status					Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
18	40	0	100	-	-	-	-	6.1	10	-	-	-	New coral recorded
19	41	3.6	-	-	-	-	-	3.6	-	-	-	-	-
20	42	2.4	40	-	-	-	-	2.3	10	-	-	-	-
21	43	0	100	-	-	-	-	0	100	-	-	-	-
22	44	0	100	-	-	-	-	0	100	-	-	-	-
22	45	2.7	5	30	-	-	-	2.5	30	-	-	-	-
23	46	3.5	-	-	-	-	-	0.5	50	-	-	-	-
23	47	3.1	40	-	-	-	-	1.7	-	5	-	-	-
23	48	1.3	-	-	-	-	-	0.8	-	-	-	-	-
23	49	4.8	-	-	-	-	-	4	45	-	-	-	-
24	50	2.1	20*	-	-	-	-	1.5	-	-	-	-	-
24	51	3	20	10	-	-	-	1	-	-	-	-	-
24	52	0	100	-	-	-	-	0	100	-	-	-	-
25	53	0	100	-	-	-	-	0	100	-	-	-	-
25	54	0	100	-	-	-	-	1.8	-	-	-	-	New coral recorded
26	55	8.2	-	5	-	-	-	6.3	-	5	-	-	-
26	56	0	100	-	-	-	-	0	-	-	-	-	-
27	57	6.2	-	-	-	-	Recovered	4.2	-	-	-	-	-

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at 2nd Post-Translocation (cm)	Health Status					Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
27	58	3.8	-	10	-	-	-	3.6	-	25	-	-	-
27	59	1.6	10	-	-	-	-	0	100	-	-	-	-
27	60	2.7	*	-	-	-	-	2.8	-	10	-	-	-
28	62	4.8	10	-	-	-	Recovered from totally mortality	4.8	10	5	-	-	Recovering
29	63	2.9	40	-	-	-	-	2.7	20	-	-	-	-
30	64	4.9	-	-	-	-	-	4	-	25	-	-	-
30	65	0	100	-	-	-	-	0	100	-	-	-	-
30	66	2.1	-	-	-	-	Recovered	1.7	-	-	-	-	-
31	67	2.3	90	-	-	-	-	2.2	-	-	-	-	-
31	68	5.2	90	-	-	-	-	0.3	-	-	-	-	-
31	69	1.2	60	-	-	-	-	1.1	-	-	-	-	-
31	70	0.5	*	-	-	-	-	0.3	-	-	-	-	-
31	71	0	100	-	-	-	-	0	100	-	-	-	-
32	73	2.2	-	-	-	-	-	1.9	-	-	-	-	-
33	74	1.7	30	10	-	-	Partially Recovered	0.7	-	-	-	-	-
34	75	4.8	50	-	-	-	-	4.2	20	-	-	-	-
35	76	0	100	-	-	-	-	0	100	-	-	-	-

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at 2nd Post-Translocation (cm)	Health Status					Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
36	78	0	100	-	-	-	-	0	100	-	-	-	-
36	79	2.1	-	-	-	-	Recovered	2.2	-	5	-	-	-
37	80	0	100	-	-	-	-	0	100	-	-	-	-
37	81	0	100	-	-	-	-	0	100	-	-	-	-
38	82	2.2	-	-	-	-	-	2.2	-	-	-	-	-
38	83	0	100	-	-	-	-	0	100	-	-	-	-
38	84	1.9	-	-	-	-	-	1.9	-	-	-	-	-
39	85	4.7	*	-	-	-	-	3.4	*	-	-	-	-
40	86	5.8	-	-	-	-	Recovered	4.2	35	5	-	-	-
40	87	3.7	30	-	-	-	-	2.4	10	5	-	-	-
40	88	0	100	-	-	-	-	0	100	-	-	-	-
41	89	3.8	5	-	-	-	Partially Recovered	3.4	5	5	-	-	-
41	90	0	100	-	-	-	-	0	100	-	-	-	-
42	92	0	100	-	-	-	-	0	100	-	-	-	-
42	93	0	100	-	-	-	-	0	100	-	-	-	-
43	95	0	100	-	-	-	-	0	100	-	-	-	-
43	96	0	100	-	-	-	-	0	100	-	-	-	-
44	98	8.2	10	-	-	-	-	0.7	90	-	-	-	-

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at 2nd Post-Translocation (cm)	Health Status					Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
44	99	1.4	-	-	-	-	Recovered from totally mortality	0	100	-	-	-	-
45	100	0	100	-	-	-	-	0	100	-	-	-	-
45	101	0	100	-	-	-	-	0	100	-	-	-	-
45	102	3.4	-	-	-	-	-	3.8	-	-	-	-	-
45	103	4.3	-	-	-	-	-	4.5	-	-	-	-	-
46	104	4.3	-	-	-	-	Recovered	3.8	20	30	-	-	-
46	105	3	80	-	-	-	Recovered from totally mortality	0.8	-	-	-	-	-
47	106	9.8	30	-	-	-	Partially Recovered	8.5	10	30	-	-	-
48	107	2.6	-	-	-	-	-	2.2	-	10	-	-	-
48	108	1.1	-	5	-	-	-	0	100	-	-	-	-
48	109	3.6	-	15	-	-	-	3.2	-	-	-	-	-
49	111	4.8	-	20	-	-	Partially Recovered	4	-	15	-	-	-
50	112	4	-	-	-	-	-	7.4	-	-	-	-	-
51	113	3	-	-	-	-	Recovered	2.4	-	5	-	-	-
52	114	12.7	-	10	-	-	-	12.5	-	30	-	-	-

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at 2nd Post-Translocation (cm)	Health Status					Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
52	115	0	100	-	-	-	-	0	100	-	-	-	-
52	116	0	100	-	-	-	-	0	100	-	-	-	-
52	117	0	100	-	-	-	-	0	100	-	-	-	-
52	118	3.7	-	-	-	-	Recovered	4.5	-	-	-	-	-
53	119	4.7	-	60	-	-	-	4.2	-	40	-	-	-
53	120	0	100	-	-	-	-	0	100	-	-	-	-
54	122	4.5	20	-	-	-	Partially Recovered	1.8	*	40	-	-	-
54	123	2.1	-	40	-	-	-	1.7	-	10	-	-	-
54	124	0	100	-	-	-	-	0	100	-	-	-	-
54	125	0	100	-	-	-	-	0	100	-	-	-	-
54	126	0	100	-	-	-	-	0	100	-	-	-	-
54	127	0	100	-	-	-	-	0	100	-	-	-	-
54	128	0	100	-	-	-	-	0	100	-	-	-	-
55	129	3	-	20	-	-	Partially Recovered	2.8	-	5	-	-	Recovering
56	130	1.2	10	-	-	-	-	0	100	-	-	-	-
56	131	0.9	-	10	-	-	Partially Recovered	0.6	-	-	-	-	-
57	132	2.8	*	-	-	-	-	3.1	-	-	-	-	-

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at 2nd Post-Translocation (cm)	Health Status					Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
58	134	9.5	10	-	-	-	Partially Recovered	8.5	5	20	-	-	-
58	135	1.1	-	-	-	-	-	2.8	-	5	-	-	Recovering
59	137	4.4	-	5	-	-	-	4.6	-	15	-	-	-
59	138	0	100	-	-	-	-	0	100	-	-	-	-
60	139	0	100	-	-	-	-	0	100	-	-	-	-
61	140	3.9	*	-	-	-	-	2.7	-	5	-	-	-
61	141	1.8	-	-	-	-	-	1.9	-	5	-	-	-
62	142	3.2	30	30	-	-	-	3.2	10	10	-	-	-
62	143	4	10	-	-	-	Recovered from totally mortality	4	-	-	-	-	Recovering
63	144	7.1	40	-	-	-	Partially Recovered	5.6	30	-	-	-	-
63	145	0	100	-	-	-	-	0	100	-	-	-	-
63	146	2.8	-	-	-	-	-	2.6	-	-	-	-	-
64	148	3	10	20	-	-	Partially Recovered	1.6	-	-	-	-	-
64	149	0	100	-	-	-	-	0	100	-	-	-	-
65	150	3.8	-	-	-	-	Recovered	2.3	*	25	-	-	-
66	151	0	100	-	-	-	-	0	100	-	-	-	-

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at 2nd Post-Translocation (cm)	Health Status					Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
66	152	3.6	30	-	-	-	-	4	-	5	-	-	-
66	153	0	100	-	-	-	-	0	100	-	-	-	-
66	154	3.4	25	-	-	-	-	2.3	-	-	-	-	-
66	155	0	100	-	-	-	-	0	100	-	-	-	-
67	157	3.5	-	30	-	-	-	3.4	-	30	-	-	-
67	158	0	100	-	-	-	-	0	100	-	-	-	-
67	159	0	100	-	-	-	-	0	100	-	-	-	-
67	160	1.6	-	-	-	-	-	1.8	-	-	-	-	-
67	161	3	-	-	-	-	-	3.9	-	25	-	-	-
68	162	2.4	40	-	-	-	-	0	100	-	-	-	-
69	163	1.7	10	-	-	-	-	1.4	-	-	-	-	-
69	164	3.5	-	5	-	-	-	3.5	-	5	-	-	-
70	165	5.5	-	-	-	-	Recovered	4.9	*	10	-	-	-
70	166	2.6	-	-	-	-	-	2.1	-	-	-	-	-
70	167	3.2	-	-	-	-	-	3.2	-	-	-	-	-
23B	170	2.1	-	5	-	-	-	2.1	-	-	-	-	-
23B	171	1.5	-	-	-	-	Recovered	1.6	-	-	-	-	-
23B	172	0	100	-	-	-	-	0	100	-	-	-	One cup coral
23B	173	3.4	-	5	-	-	-	3.6	-	-	-	-	-

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at 2nd Post-Translocation (cm)	Health Status					Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
40B	174	0	100	-	-	-	-	0	100	-	-	-	-
40B	175	0	100	-	-	-	-	0	100	-	-	-	-
40B	176	1.4	-	-	-	-	Recovered	1.2	10	5	-	-	-
40B	177	0	100	-	-	-	-	1	-	-	-	-	New coral recorded

Notes: 1) 100 % Partial Mortality = whole coral colony died (total mortality).
2) * denotes a possible underestimate of % Partial Mortality. Percentage partial mortality of the coral colony was possibly underestimated as a portion of the coral skeleton was covered in sediment and/or overgrown by fouling organisms.

Coral permanently lost

Coral had died since the September 2009 survey

Coral had died since the December 2009 survey

Table 6: A Summary Table of the Overall Health and Condition of the Reference *Oulastrea crispata* Corals Assessed in March 2010.

Corals assessed (number of colonies)		Healthy Coral showing no sign of stress	Coral with partial mortality (< 50% cover)	Coral with partial mortality (≥ 50% cover)	Affected by sediment	Coral with partial mortality (< 50 % cover) and affected by sediment
Inside Recipient Site	**20**	5	0	0	13	2
Percentage	**100%**	25%	0%	0%	65%	10%
Reference Transect (outside recipient site)	**20**	9	0	0	11	0
Percentage	**100%**	45%	0%	0%	55%	0%

Table 7: Summary Table of the Results of the Reference *Oulastrea crispata* Assessment in March 2010.

Running Count of *Oulastrea* Colonies	Coral Diameter (cm)	Coral Size (cm^2)	Health Status			
			Partial Mortality (% Affected)	Sediment (% affected)	Blanched (% Affected)	Bleached (% Affected)
Inside Recipient Site						
1	2.5	2.8	-	60	-	-
2	1.2	0.7	-	35	-	-
3	2.7	3.9	-	15	-	-
4	1.8	1.8	-	5	-	-
5	1.1	0.6	-	5	-	-
6	1.6	1.5	-	5	-	-
7	0.9	0.5	-		-	-
8	0.6	0.2	-		-	-
9	2.4	3.7	-	45	-	-
10	3.2	6.7	-		-	-
11	2.4	3	-	65	-	-
12	6.3	30.1	-	20	-	-
13	1	0.8	-		-	-
14	2.8	2.4	-		-	-
15	1.4	1.1	-	5	-	-
16	2.9	5	-	5	-	-
17	2.7	3.1	-	5	-	-
18	1.2	0.7	-	5	-	-
19	3.6	6.9	40	10	-	-
20	2.8	4.9	10	10	-	-
Along Reference Transect						
1	2.9	3	-	10	-	-
2	2	2.6	-	50	-	-
3	1.7	2	-	-	-	-
4	0.9	0.4	-	-	-	-

Running Count of *Oulastrea* Colonies	Coral Diameter (cm)	Coral Size (cm^2)	Health Status			
			Partial Mortality (% Affected)	Sediment (% affected)	Blanched (% Affected)	Bleached (% Affected)
5	2	3	-	15	-	-
6	2.4	3.3	-	20	-	-
7	2.2	3.2	-	-	-	-
8	2.6	3.7	-	-	-	-
9	1.6	2	-	5	-	-
10	1.8	2.2	-	5	-	-
11	1.6	1.1	-	10	-	-
12	0.5	0.2	-	-	-	-
13	1	0.4	-	-	-	-
14	1.1	0.9	-	5	-	-
15	1.9	1.5	-	10	-	-
16	1.5	1.2	-	5	-	-
17	1	0.5	-	-	-	-
18	1.4	1.2	-	5	-	-
19	2.7	4	-	-	-	-
20	1.2	0.6	-	-	-	-

Figures

Figure 1.1 Cruise Terminal Development Layout Plan

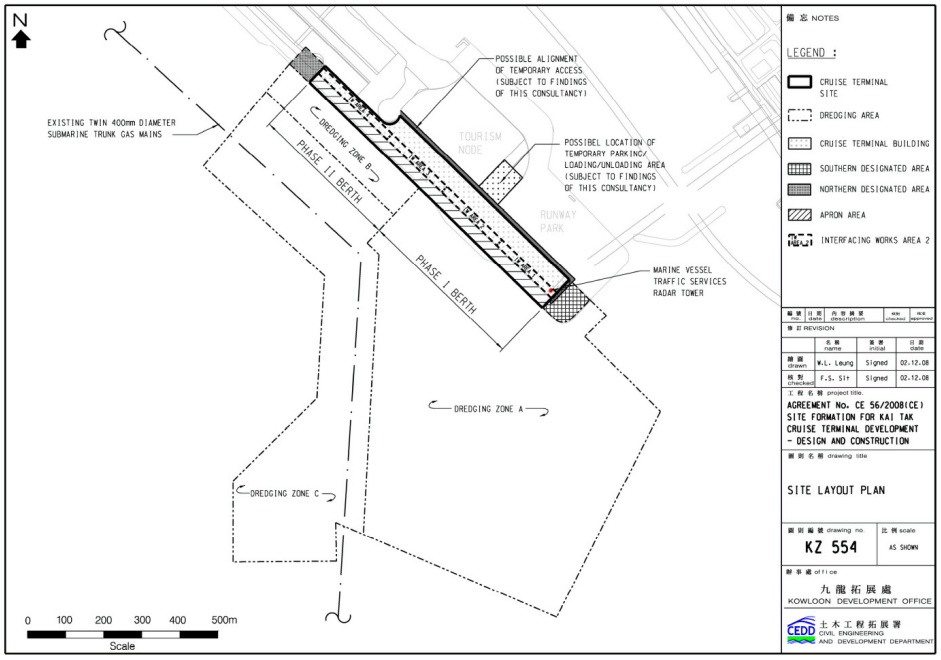


Figure 2.1 Location of the Approved Recipient Site at Tseung Kwan O

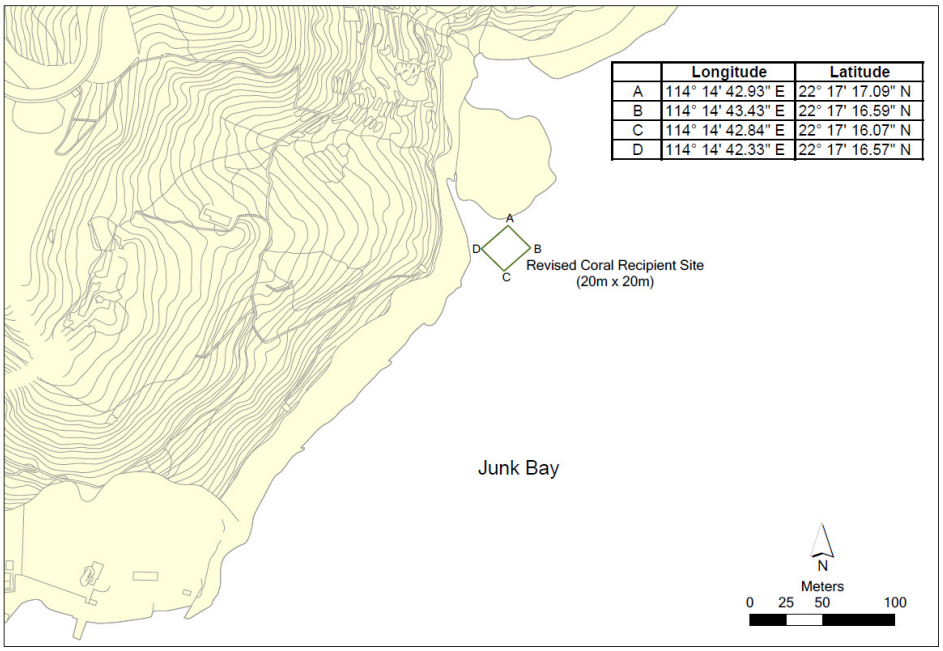


Figure 2.2 **Location Plan of Translocated Boulders/Rocks established during the Third Post-translocation Coral Survey. O - indicates boulder/rock with tag number (as in *Table 5*) in March 2010.**

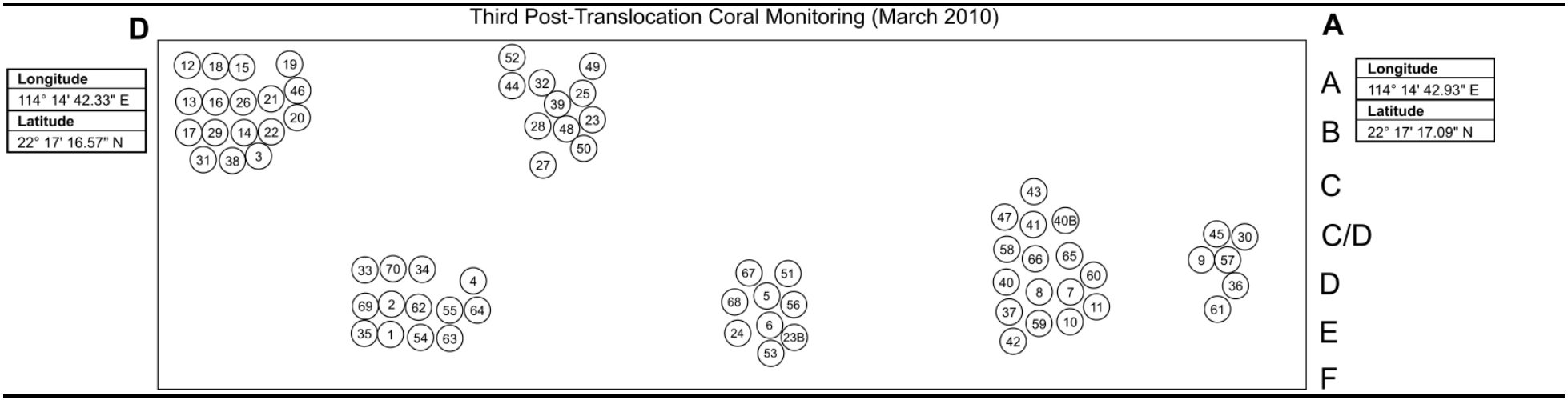


Figure 3.1 **Representative Photographs of some of the New *Oulastrea crispata* Coral Recruits (circled in red) Recorded From the Translocated Boulders/Rocks within the Recipient Site in March 2010.**

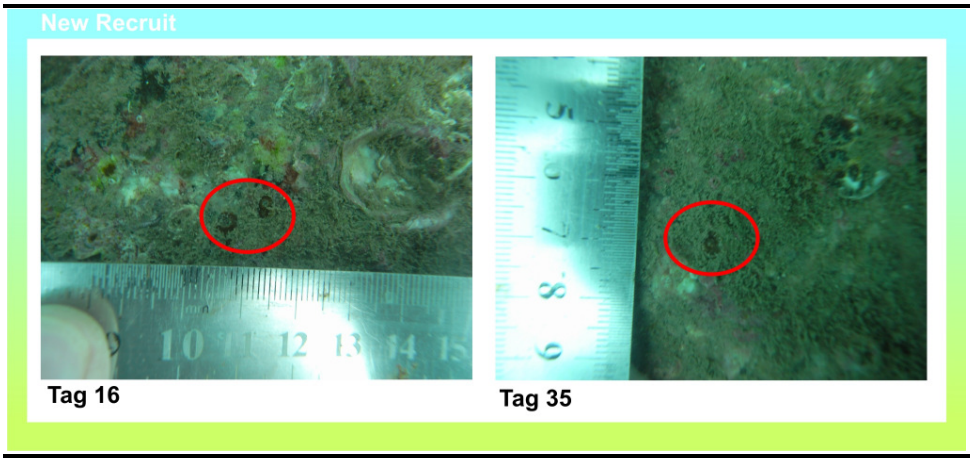


Figure 3.2 Representative Photographs of Selected *Oulastrea crispata* Colonies recorded during Baseline (June 2009), First (September 2009), Second (December 2009) and Third (March 2010) Post-translocation Coral Monitoring Survey.

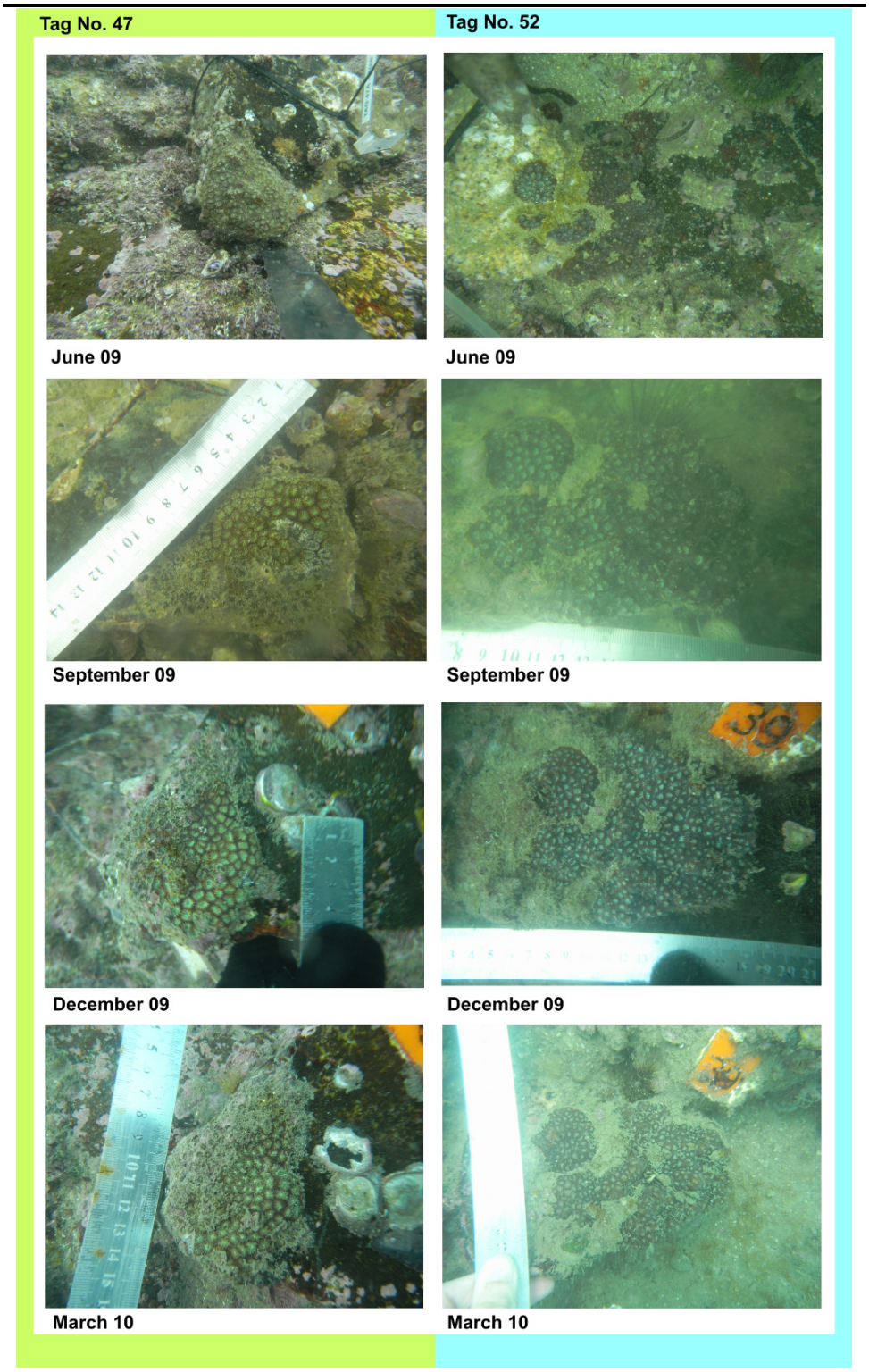
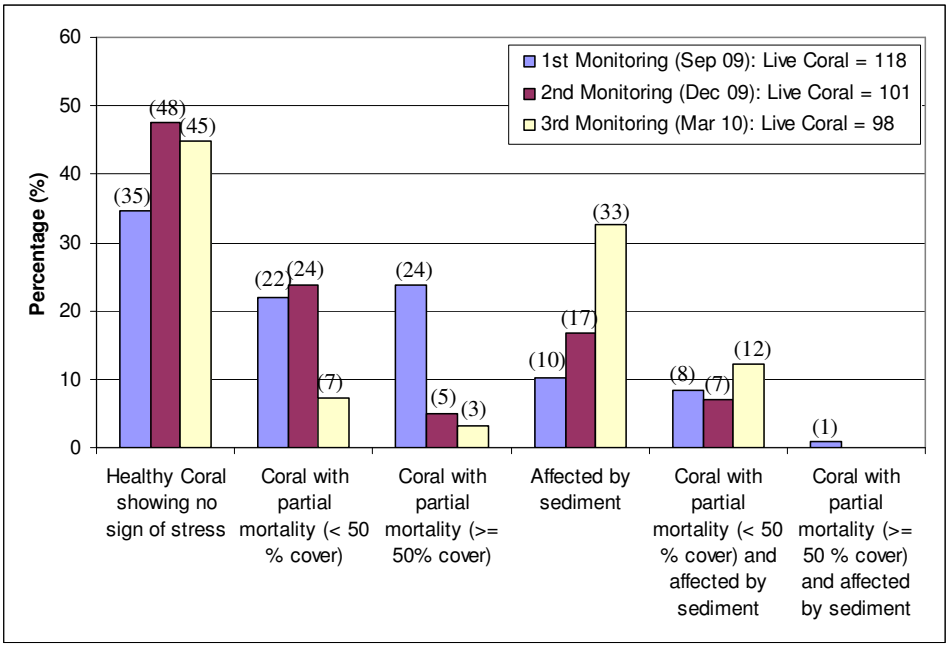
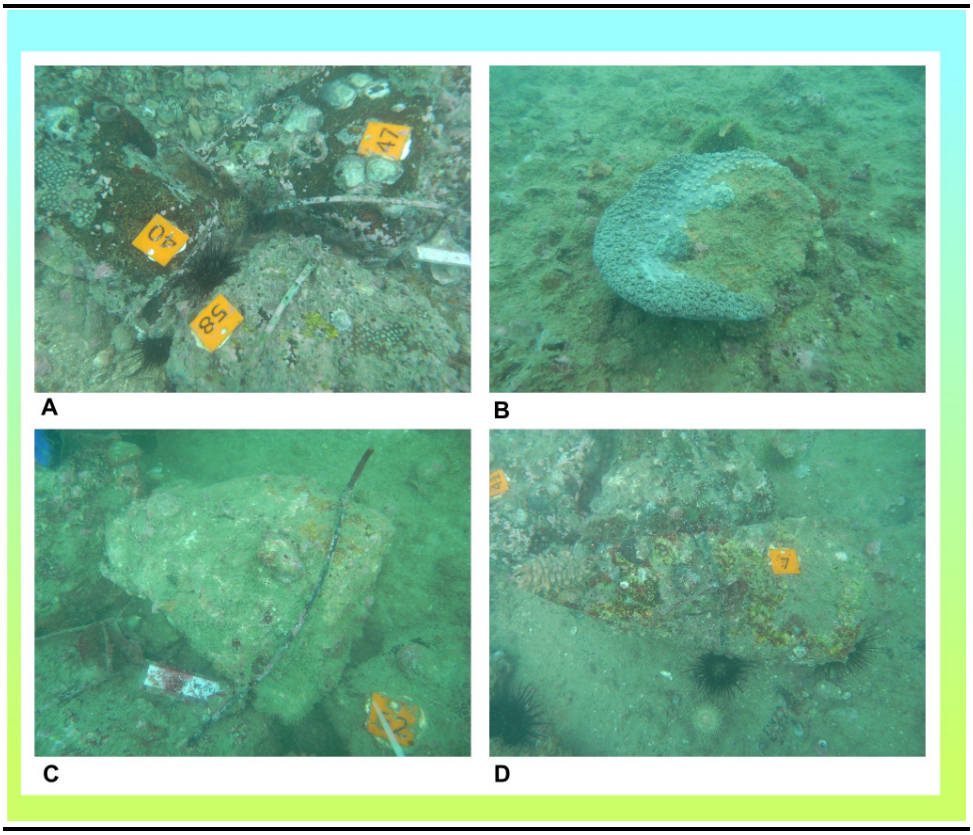


Figure 3.3 Status of Health Parameters for Translocated Coral Colonies at the Recipient Site in Tseung Kwan O (as recorded in September 2009, December 2009 and March 2010).



( ) Number of coral colonies recorded.

Figure 3.4 Representative Photographs taken during Third Post-translocation Coral Monitoring Survey in March 2010.



A – The tagged boulders as maintained in small aggregations within the recipient site at the time of Third Post-translocation Coral Monitoring Survey.

B – The hard coral *Turbinaria peltata* with a large portion of the dead surface area (partial mortality) covered in sediment, as recorded within the recipient site.

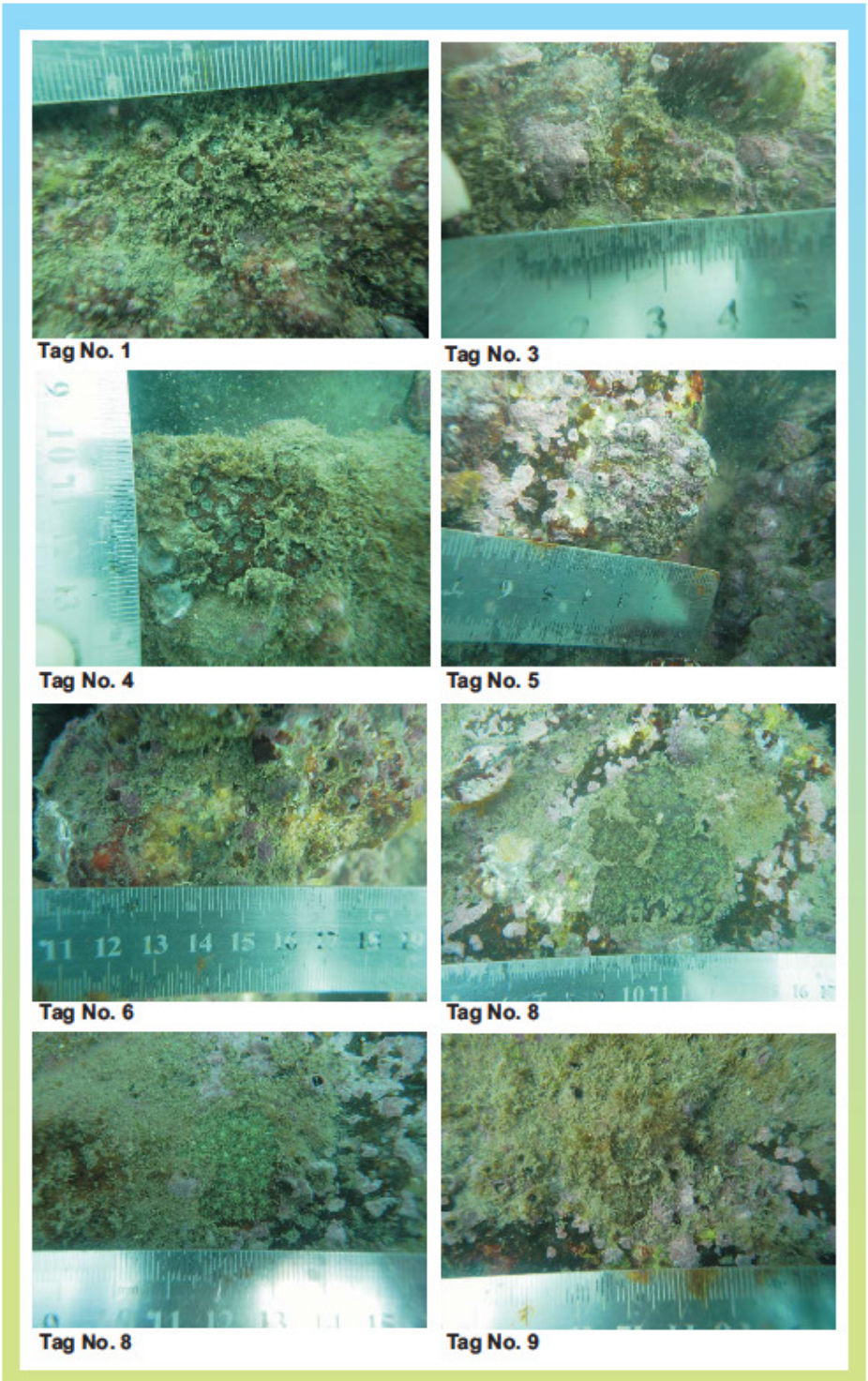
C & D – Examples of sedimentation as seen on surface area of tagged boulders and the surrounding substrate. Sessile benthos such bryozoans and coralline algae active colonisation on boulder surfaces was also observed.

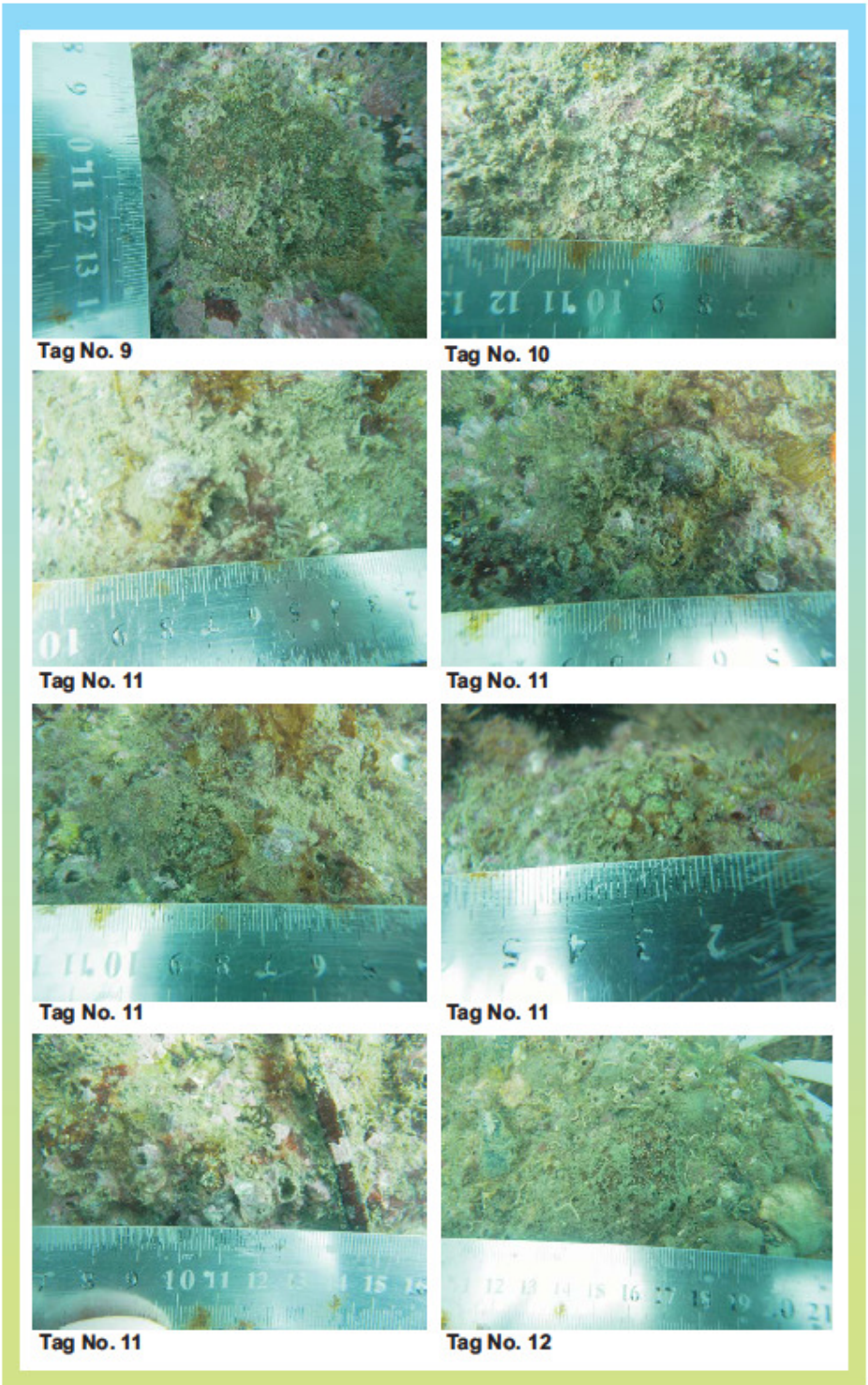
Annex A

Photographic Images Recorded for Each of the Translocated and Reference Coral Colonies Assessed During the Third Post-translocation Survey, March 2010

CONTENTS

A1 TRANSLOCATED CORAL COLONIES





Tag No. 9

Tag No. 10

Tag No. 11

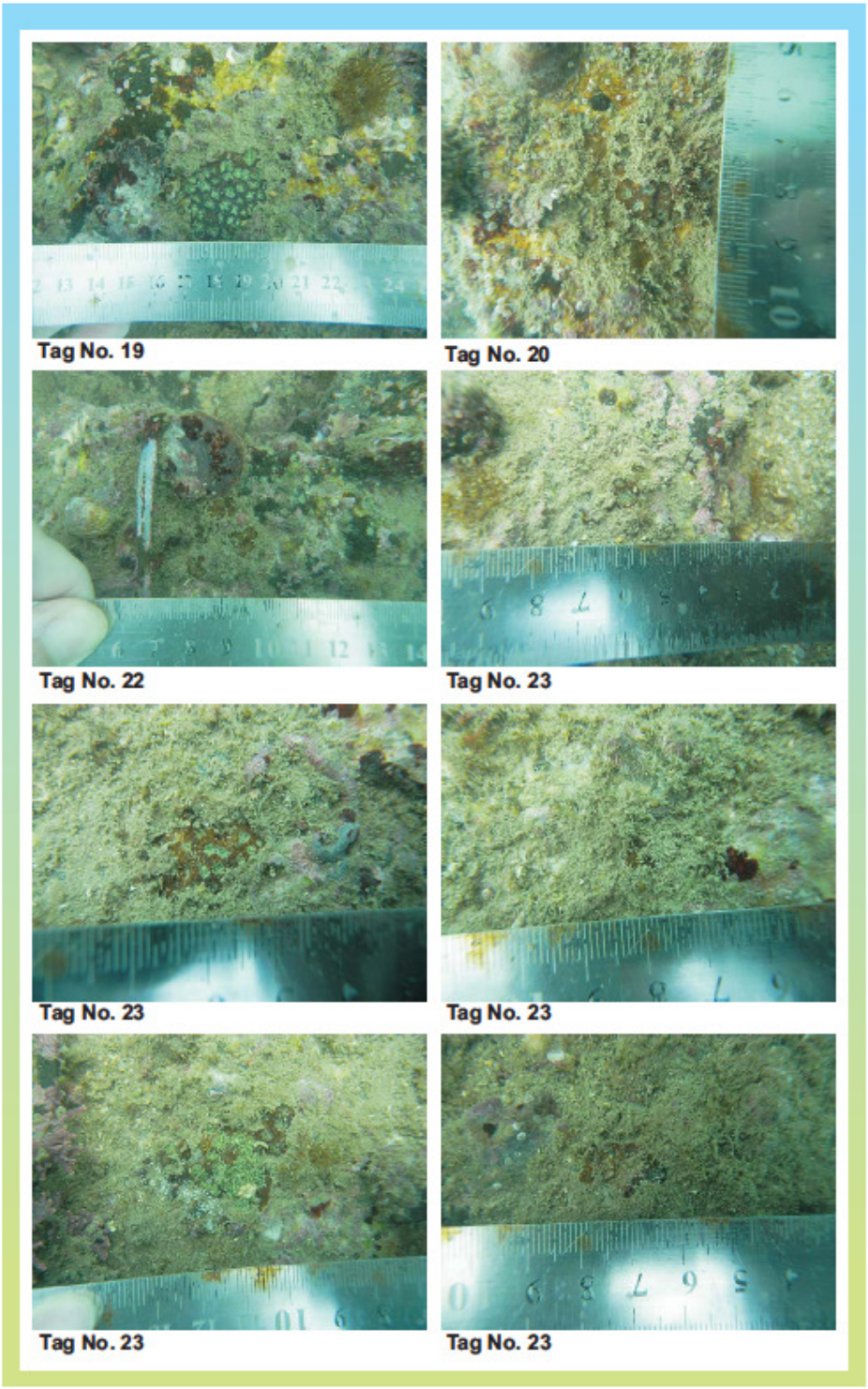
Tag No. 11

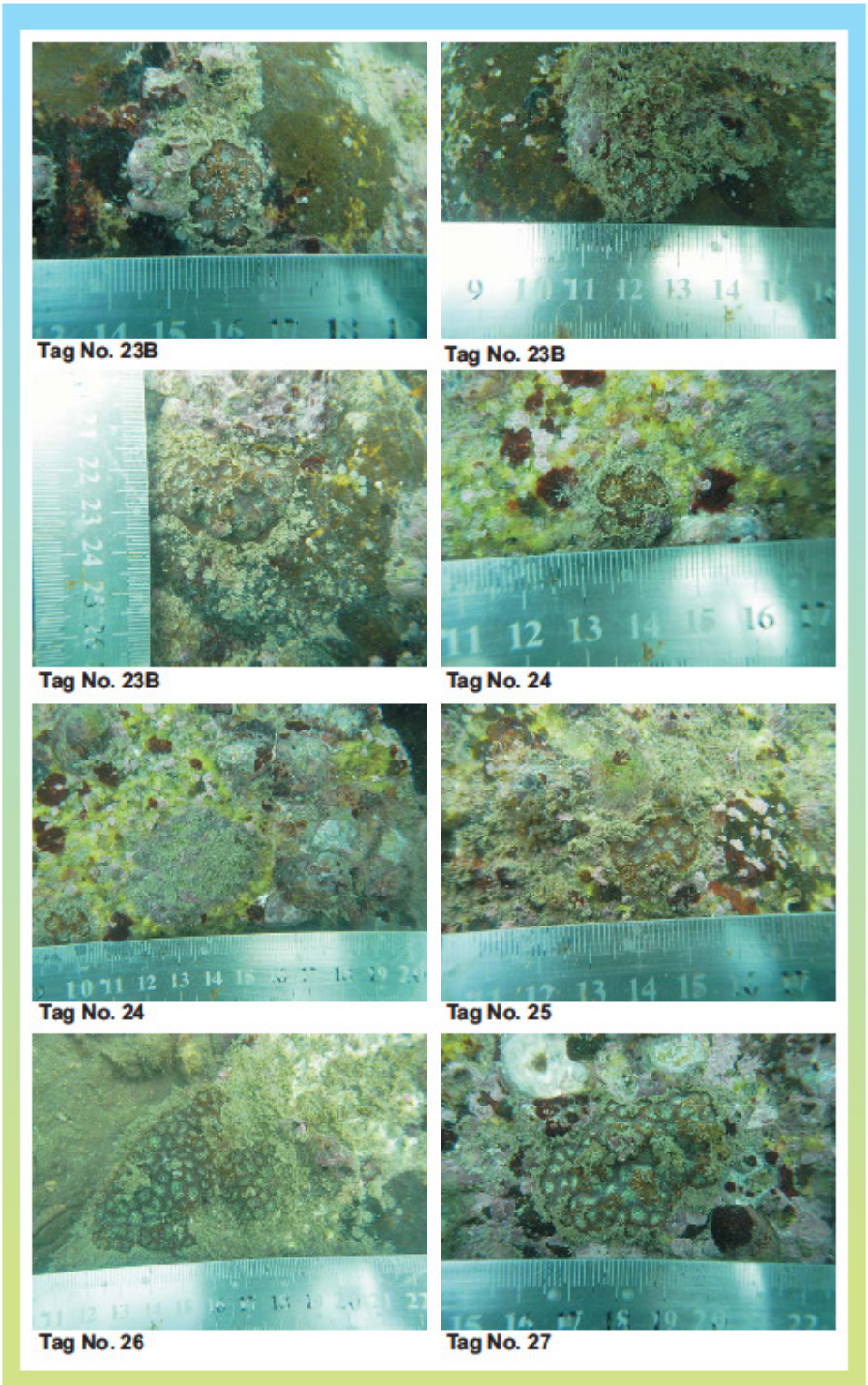
Tag No. 11

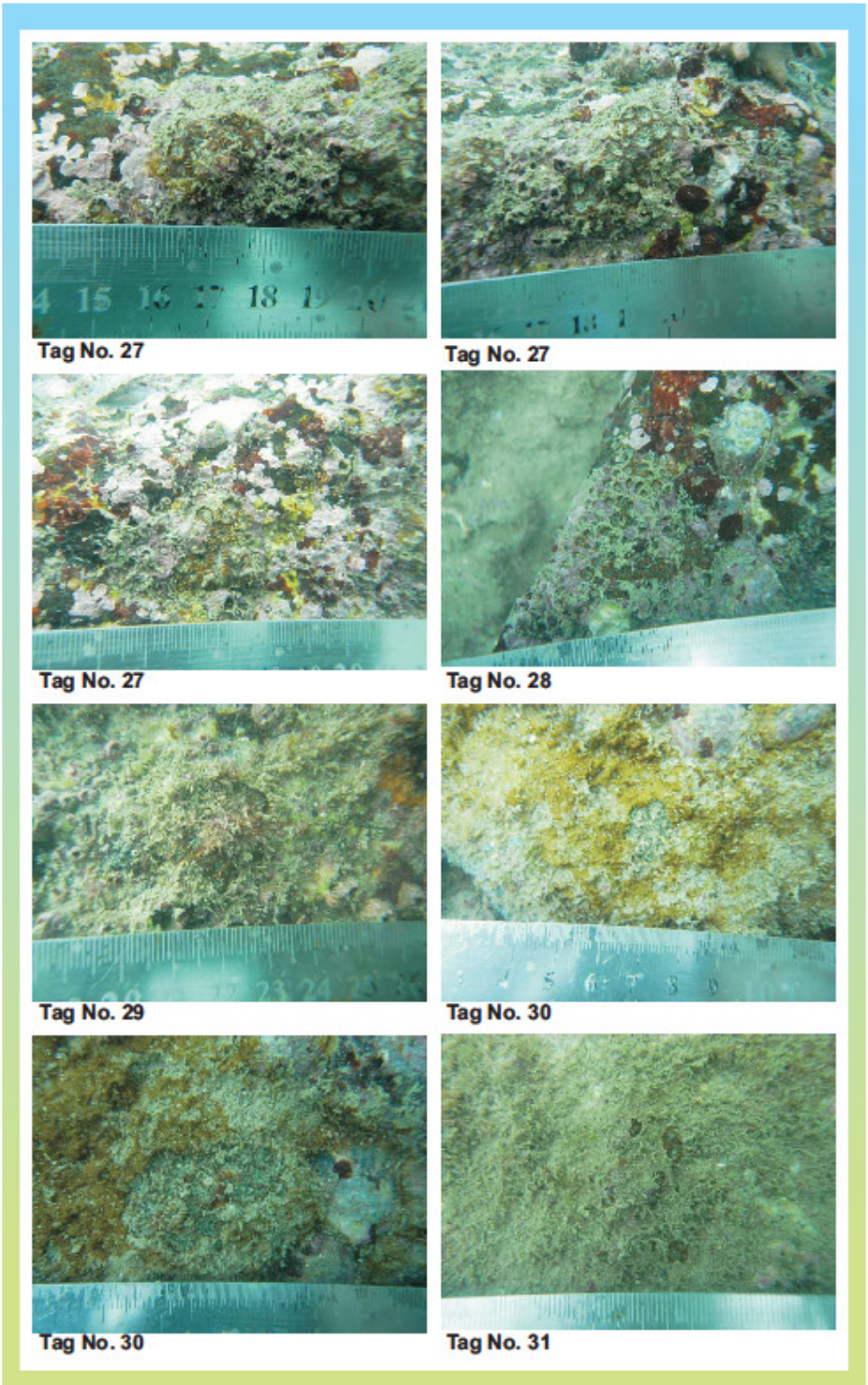
Tag No. 11

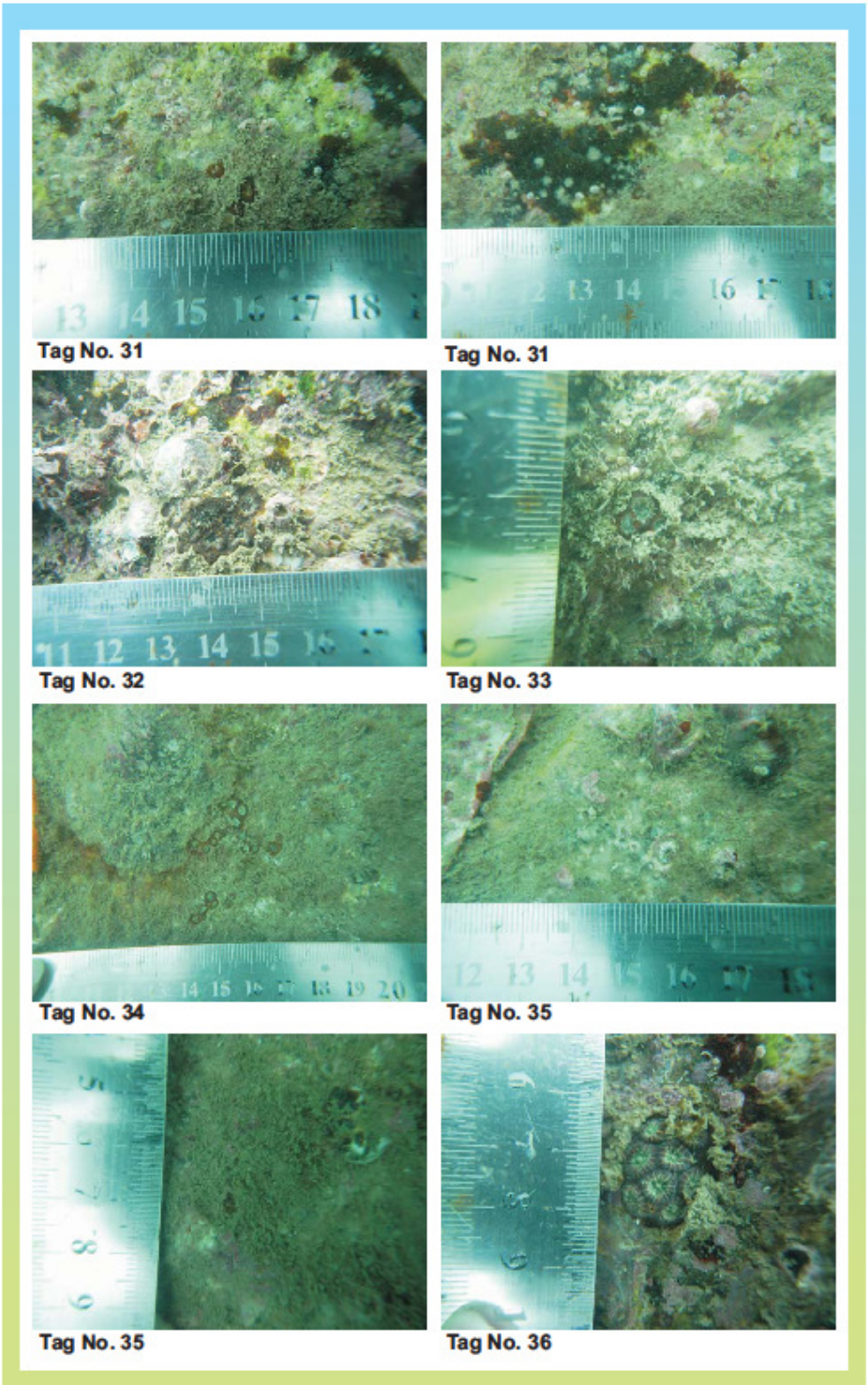
Tag No. 11

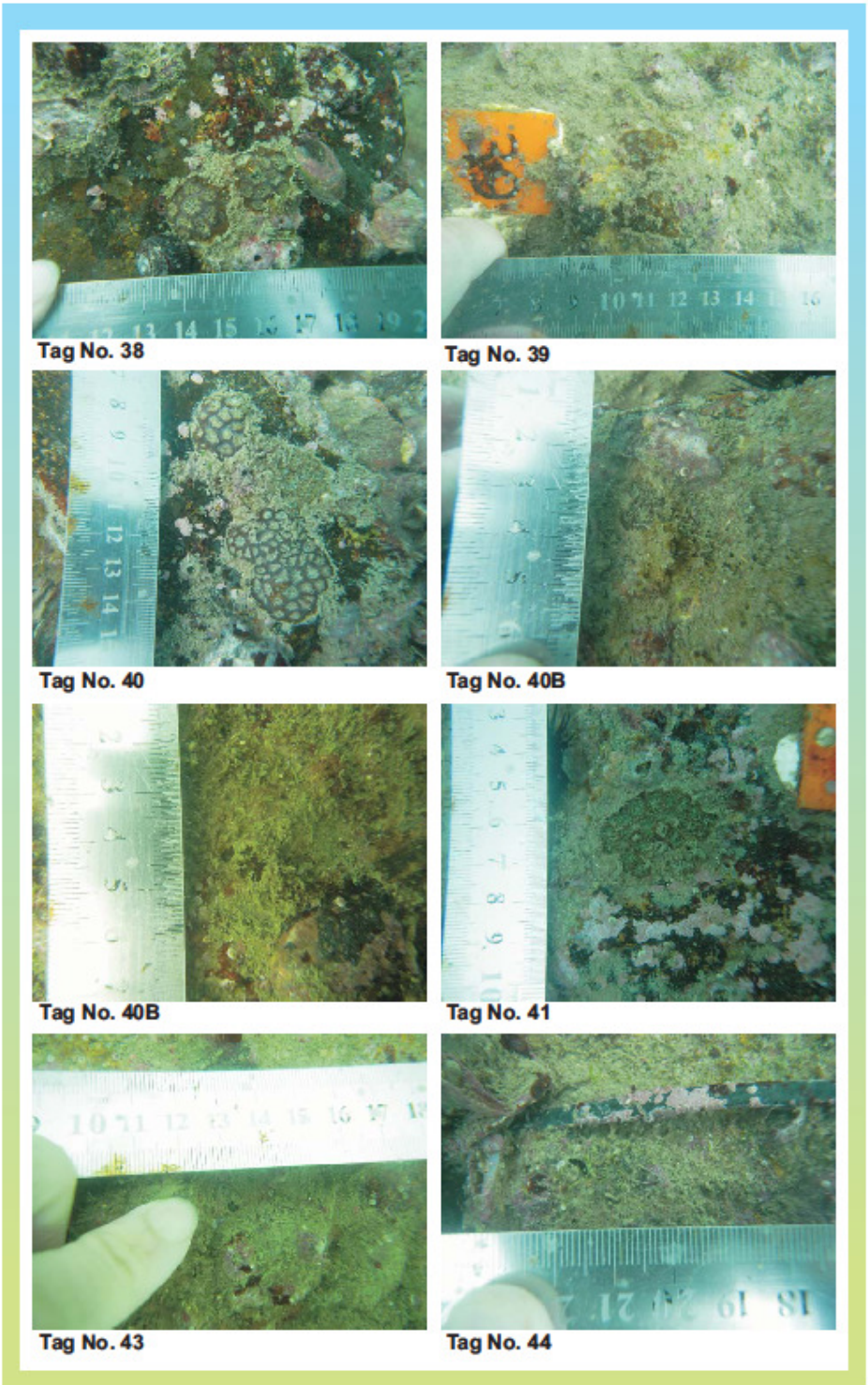
Tag No. 12

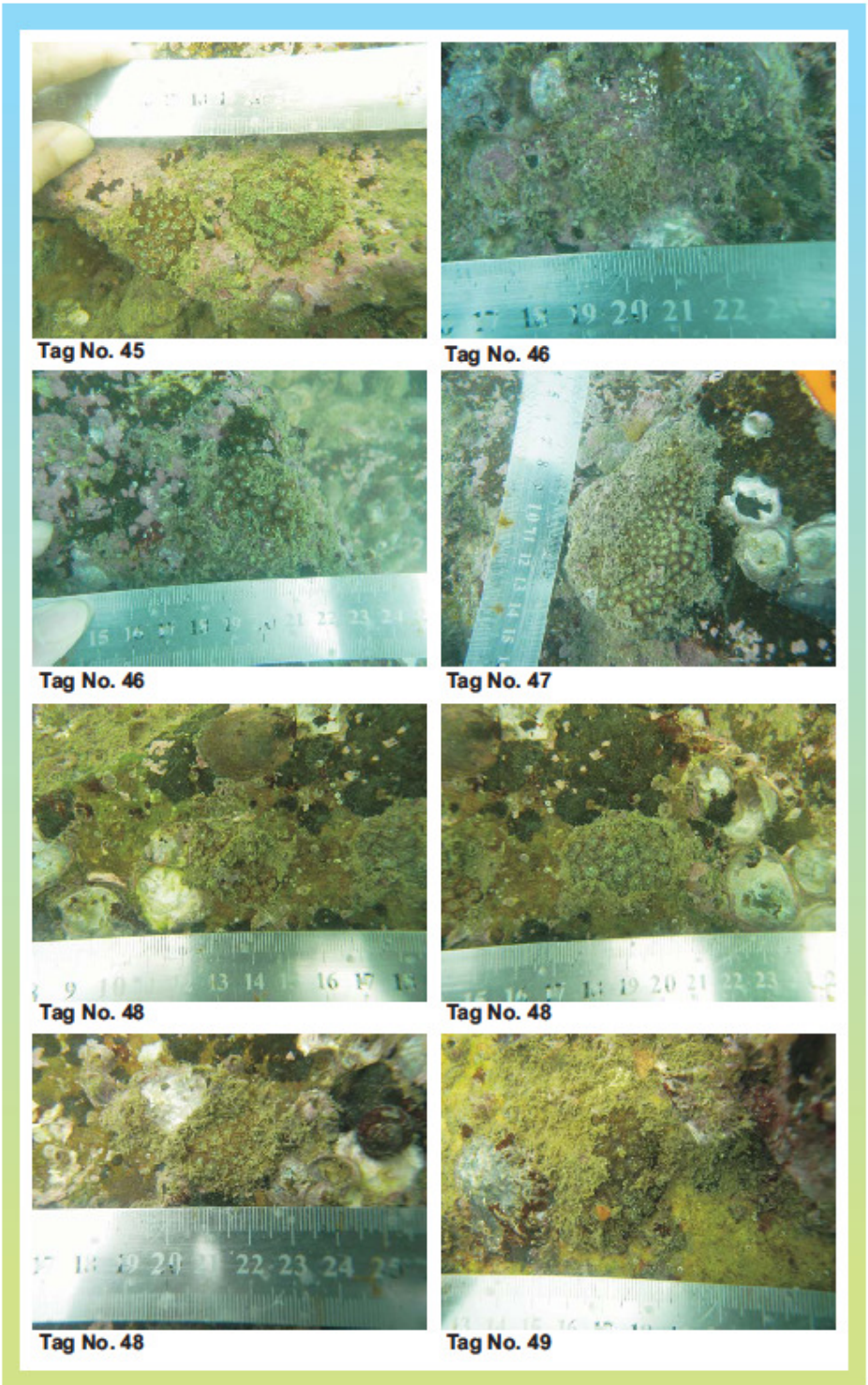

Tag No. 19
Tag No. 20
Tag No. 22
Tag No. 23
Tag No. 23
Tag No. 23
Tag No. 23
Tag No. 23

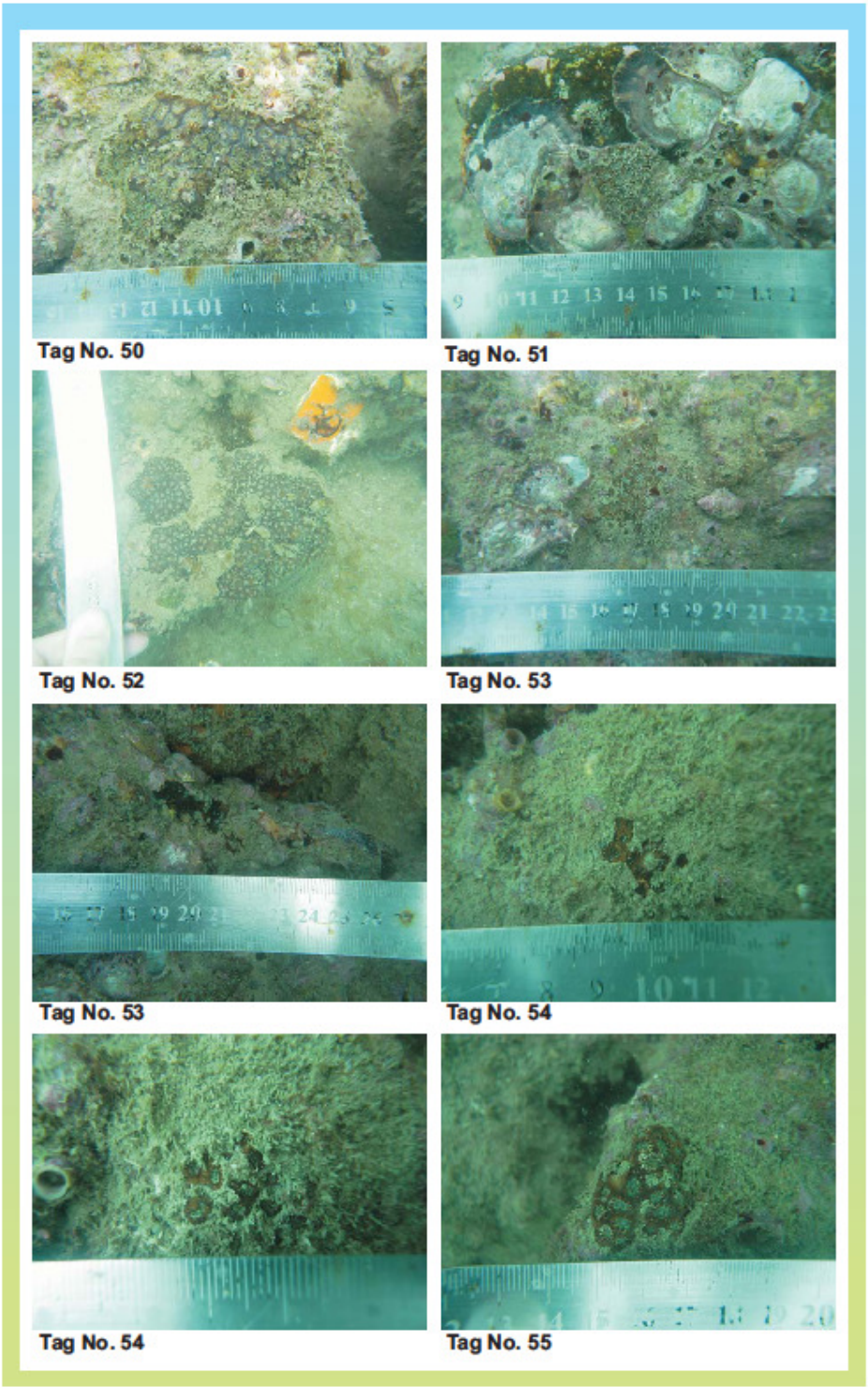

Tag No. 23B
Tag No. 23B
Tag No. 23B
Tag No. 24
Tag No. 24
Tag No. 25
Tag No. 26
Tag No. 27

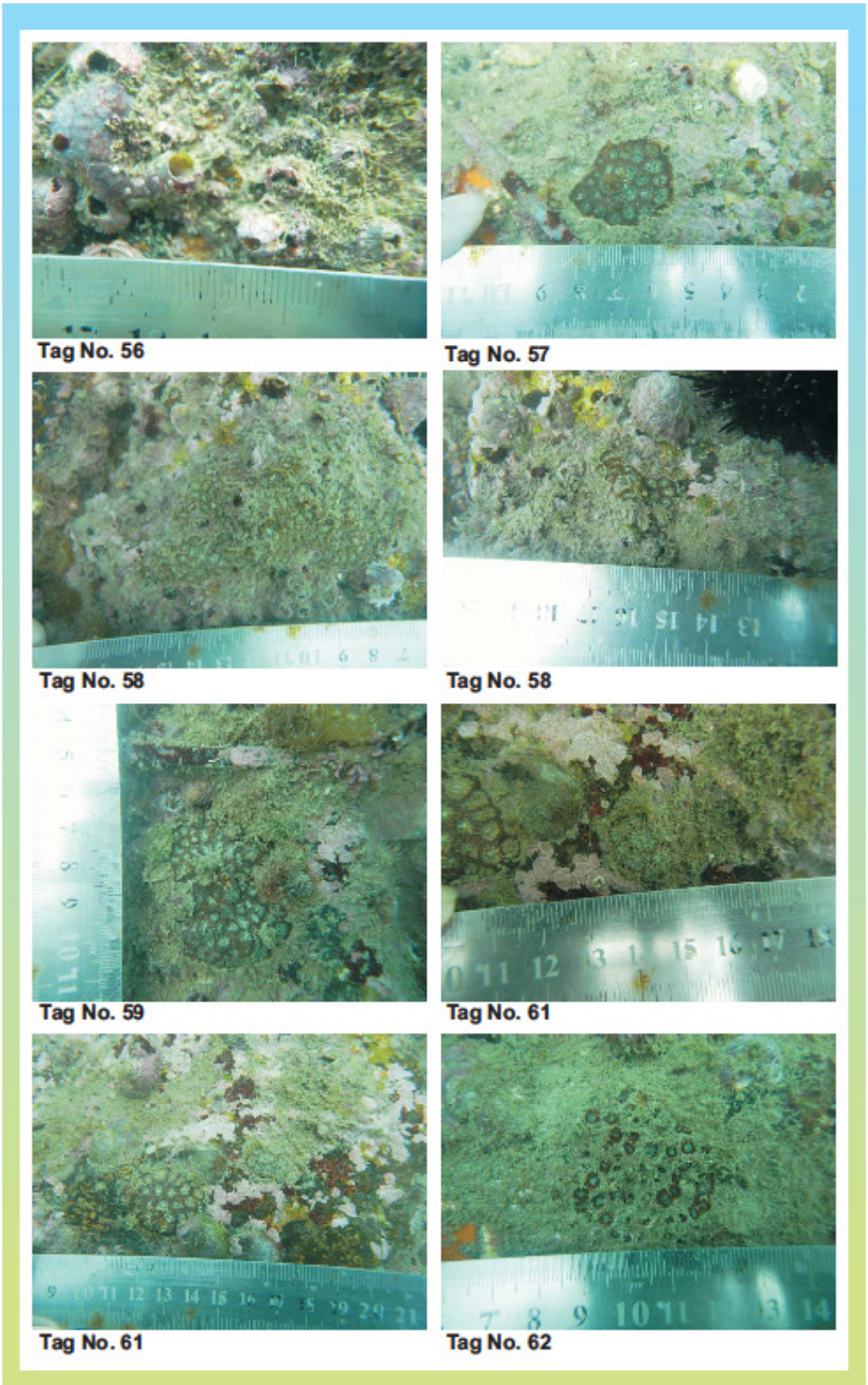

Tag No. 27
Tag No. 27
Tag No. 27
Tag No. 28
Tag No. 29
Tag No. 30
Tag No. 30
Tag No. 31

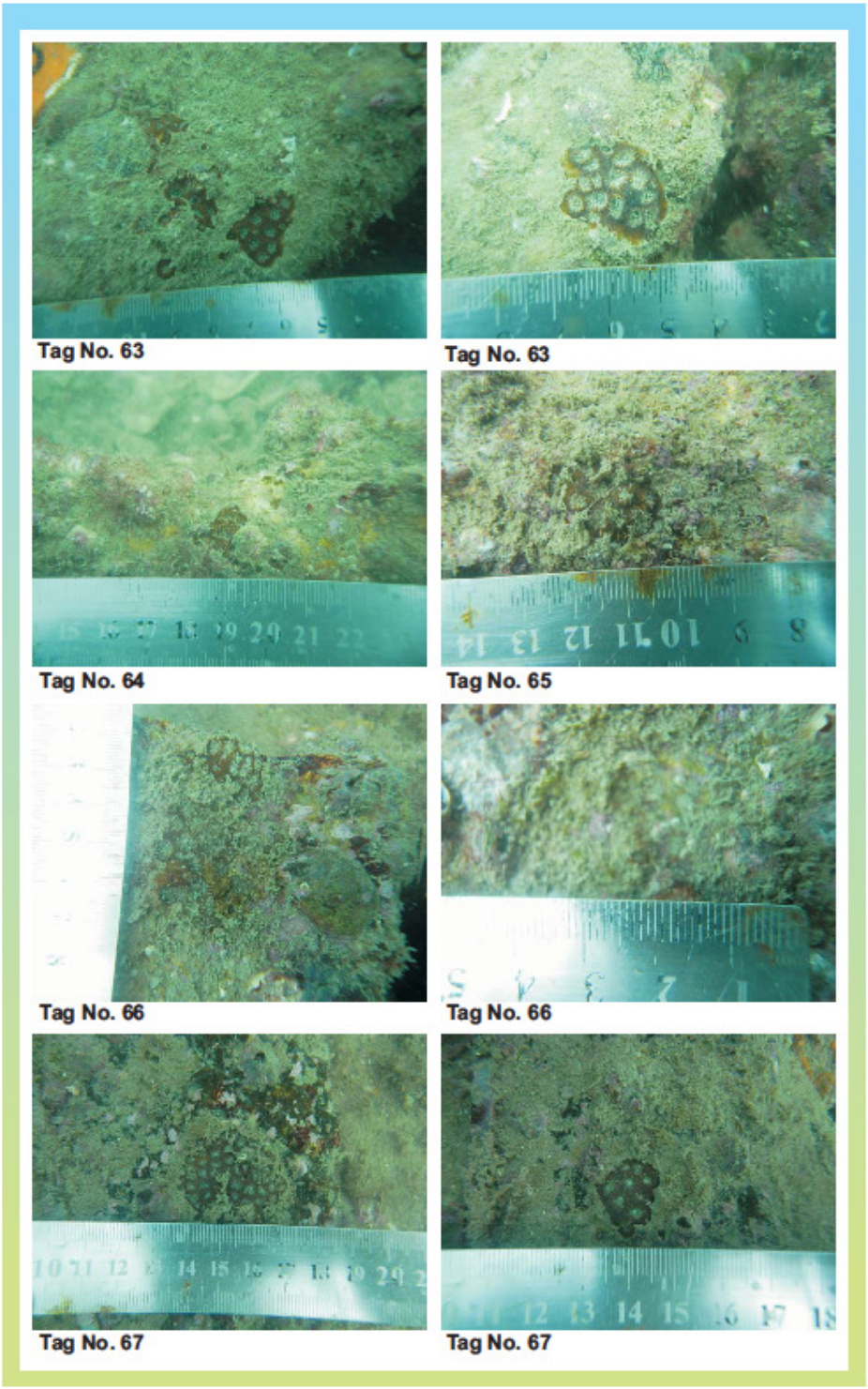

Tag No. 31
Tag No. 31
Tag No. 32
Tag No. 33
Tag No. 34
Tag No. 35
Tag No. 35
Tag No. 36

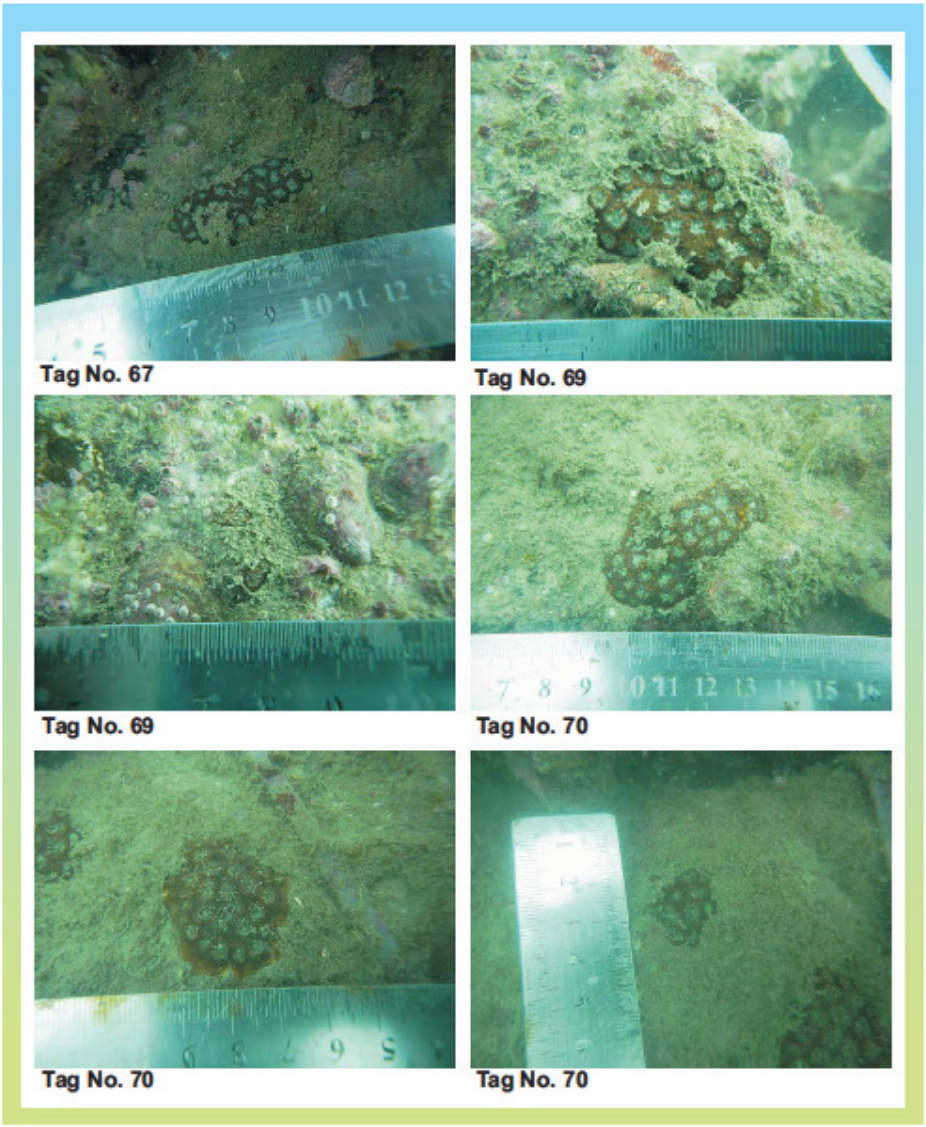

Tag No. 38
Tag No. 39
Tag No. 40
Tag No. 40B
Tag No. 40B
Tag No. 41
Tag No. 43
Tag No. 44


Tag No. 45
Tag No. 46
Tag No. 46
Tag No. 47
Tag No. 48
Tag No. 48
Tag No. 48
Tag No. 49

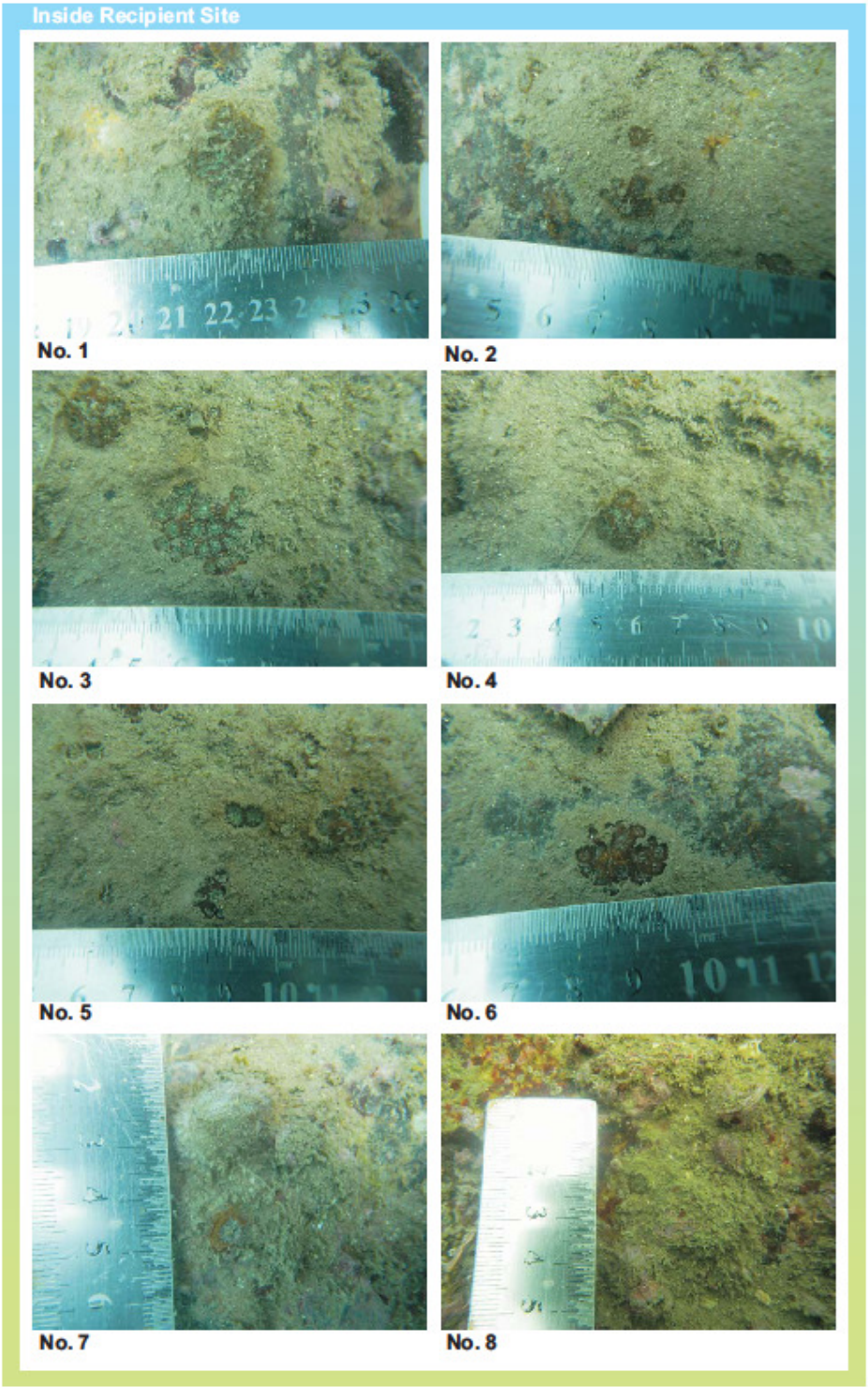

Tag No. 50
Tag No. 51
Tag No. 52
Tag No. 53
Tag No. 53
Tag No. 54
Tag No. 54
Tag No. 55


Tag No. 56
Tag No. 57
Tag No. 58
Tag No. 58
Tag No. 59
Tag No. 61
Tag No. 61
Tag No. 62

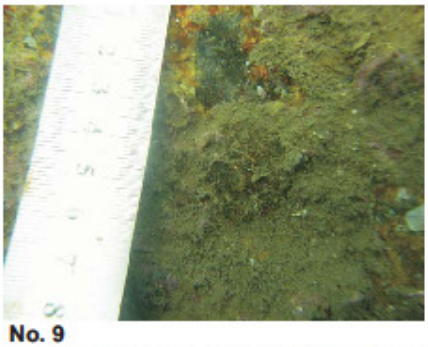

Tag No. 63
Tag No. 63
Tag No. 64
Tag No. 65
Tag No. 66
Tag No. 66
Tag No. 67
Tag No. 67

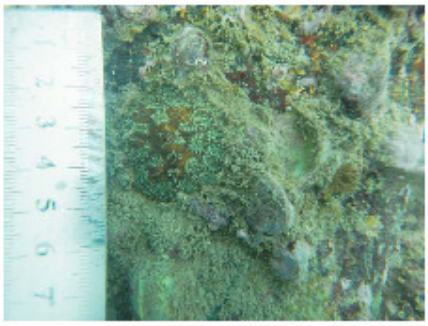

Tag No. 67
Tag No. 69
Tag No. 69
Tag No. 70
Tag No. 70
Tag No. 70

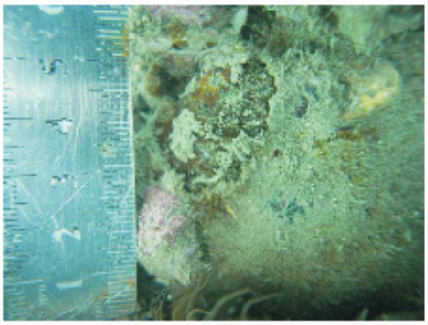
A2 REFERENCE CORAL COLONIES (INIDE RECIPIENT SITE)

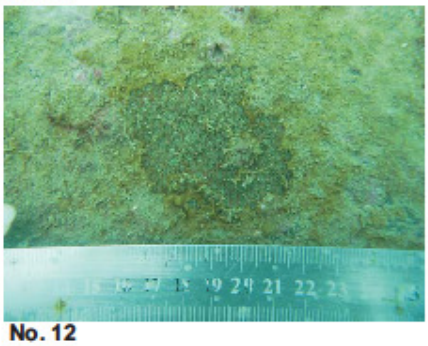


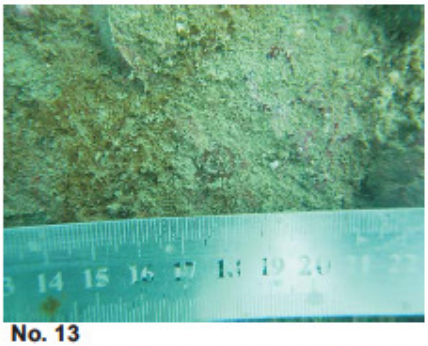
Inside Recipient Site

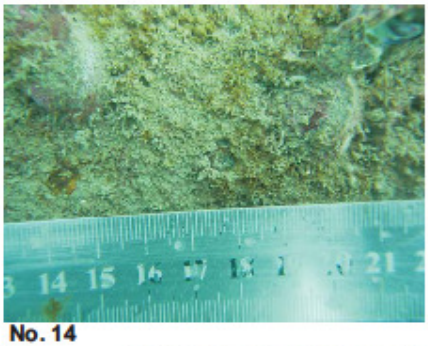

No. 9

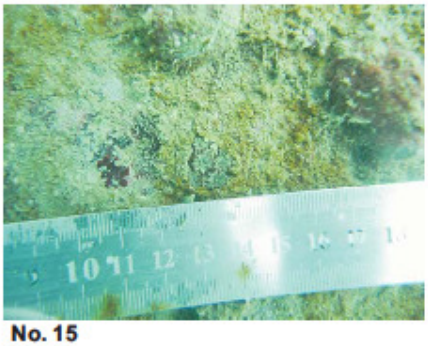

No. 10

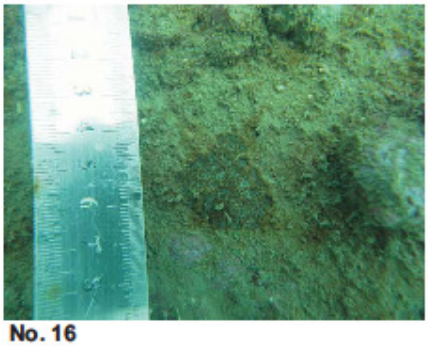

No. 11

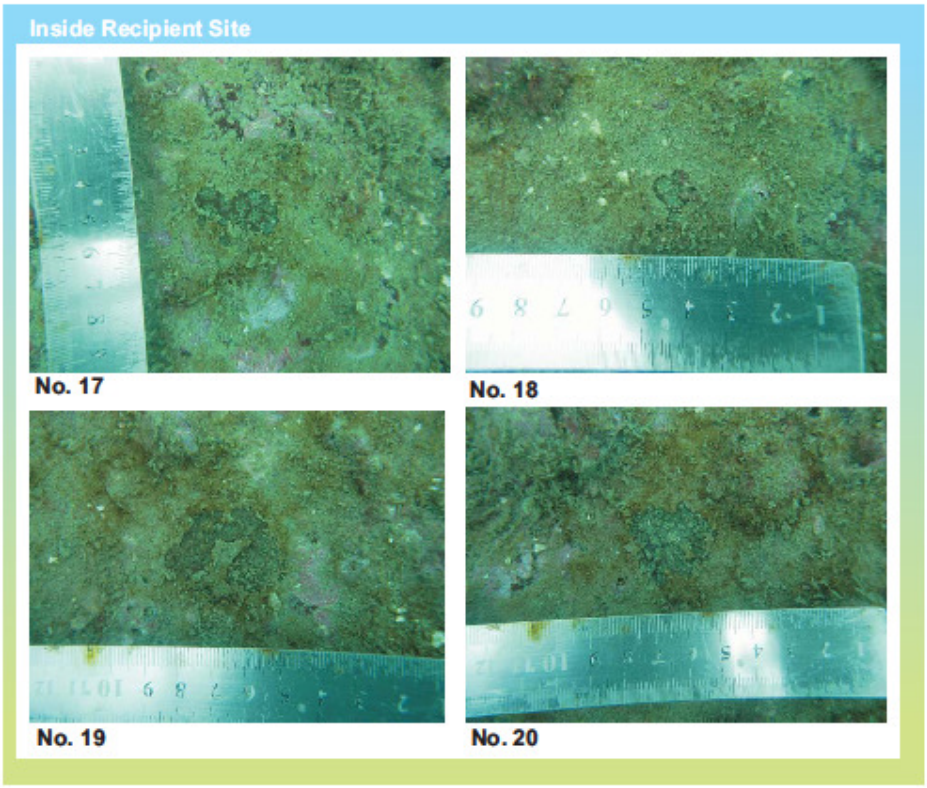

No. 12


No. 13

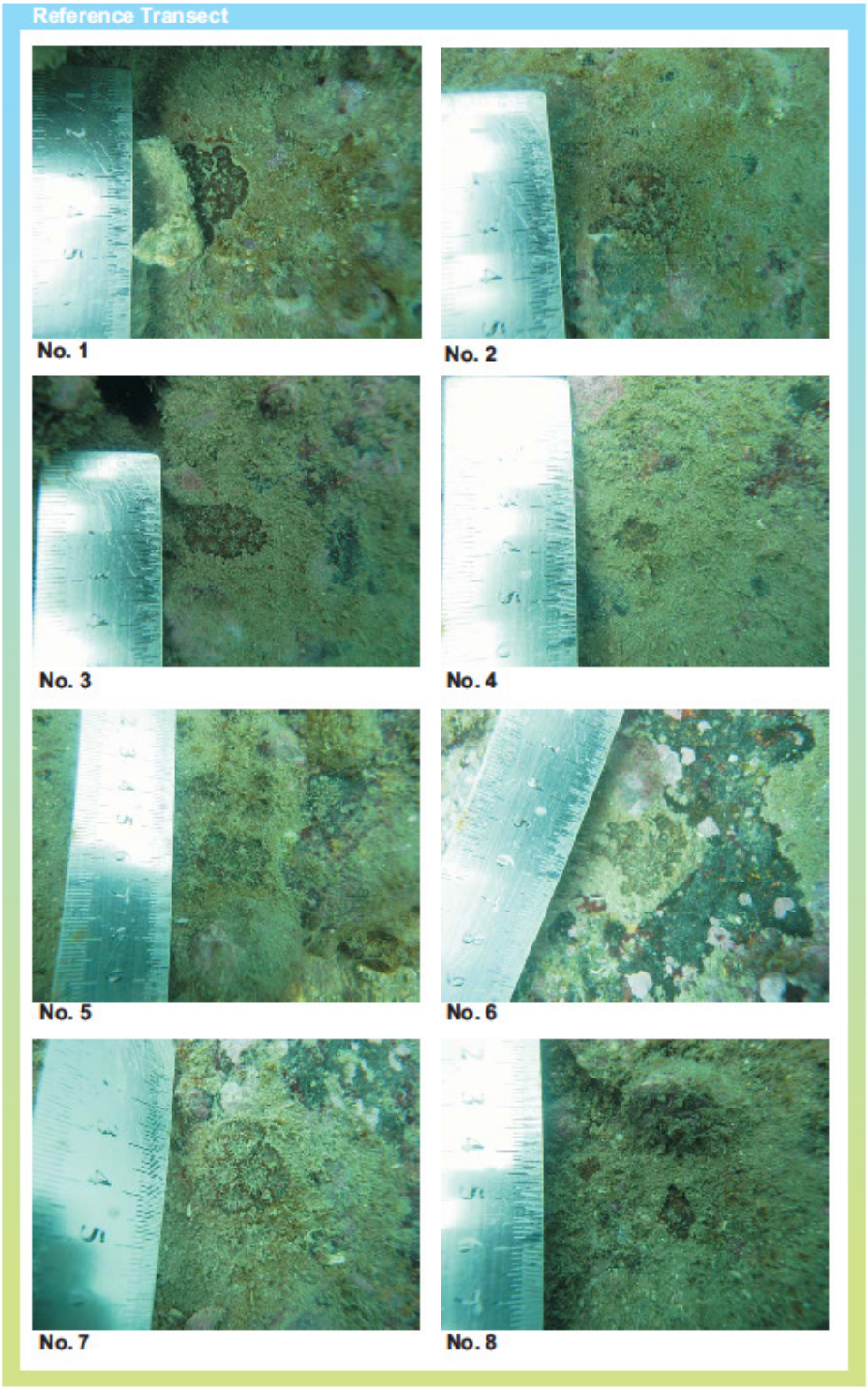

No. 14

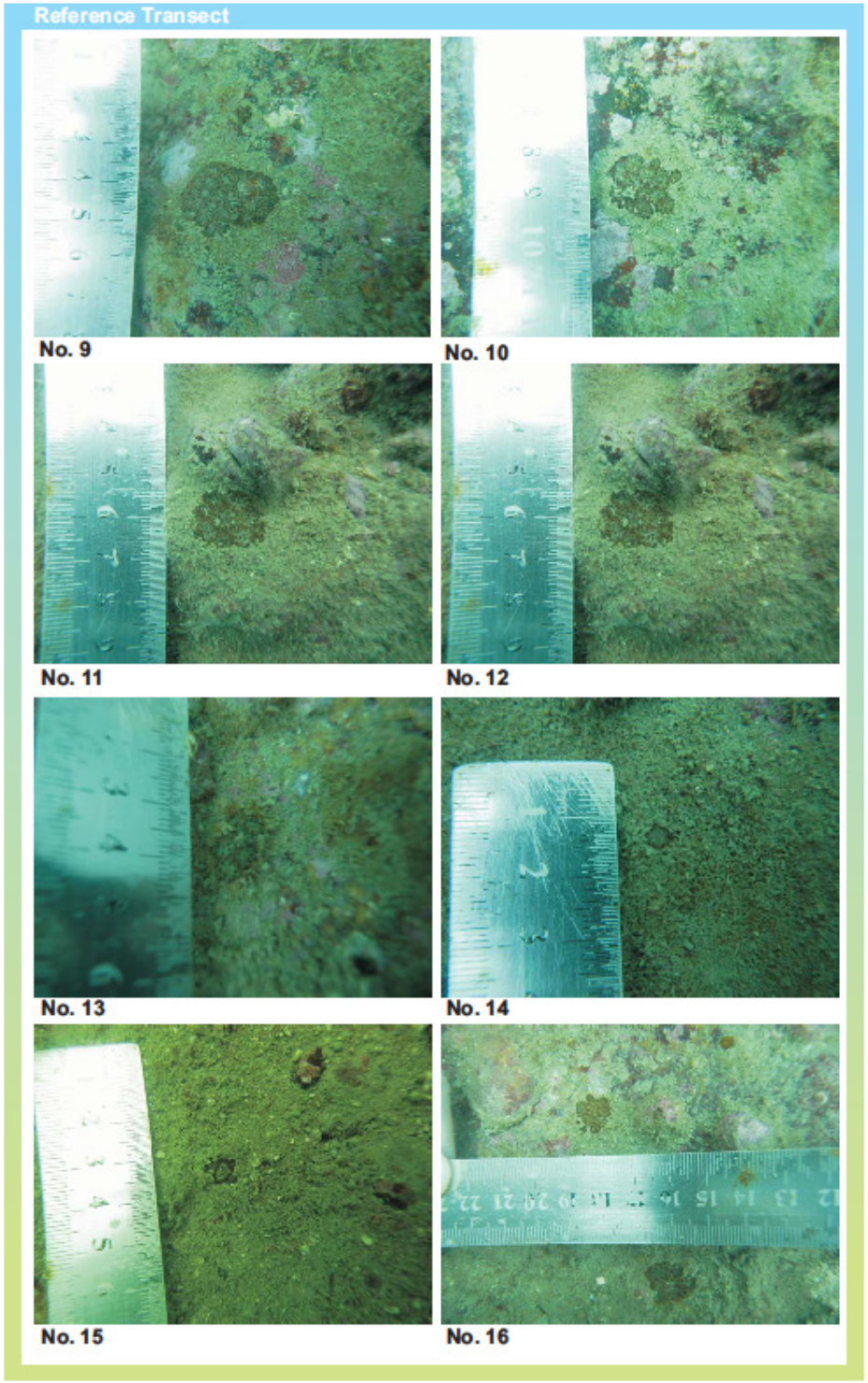

No. 15

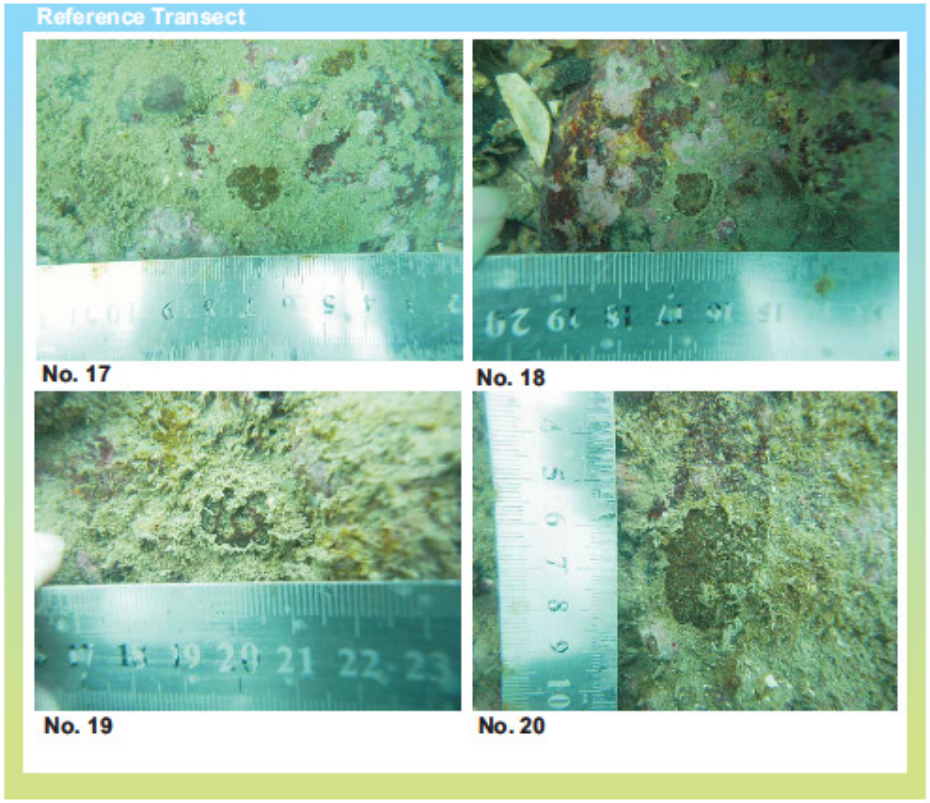

No. 16


Inside Recipient Site
No. 17
No. 18
No. 19
No. 20

A3 REFERENCE CORAL COLONIES (ALONG REFERENCE TRANSECT)




Reference Transect
No. 9
No. 10
No. 11
No. 12
No. 13
No. 14
No. 15
No. 16


Reference Transect
No. 17
No. 18
No. 19
No. 20

Annex B

Summary Table of the *Oulastrea crispata* Colony Details for each tagged Boulder/Rock for the Baseline Post-translocation Survey, June 2009

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at Pre-Translocation (cm)	Coral Diameter measured at Post-Translocation (Baseline Survey) (cm)	Health Status (June 2009)			
				Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)
1	1	7.5	5.7	-	-	-	-
2	2	1	1.3	-	-	-	-
3	3	2.5	3.3	-	-	-	-
3	4	-	1.2	-	-	-	-
3	5	-	2.2	-	-	-	-
4	6	4	5.3	-	-	-	-
5	7	5.5	6.2	-	5	-	-
5	8	-	5.4	-	-	-	-
6	9	-	2.2	-	-	-	-
6	10	2.5	4.1	-	-	-	-
7	11	6.5	8.6	-	5	-	-
8	12	2.5	7.8	-	-	-	-
8	13	1.5	2.1	-	-	-	-
9	14	7	9.4	-	-	-	-
9	15	4.5	4.1	-	-	-	-
10	16	2.5	4.6	-	-	-	-
11	17	-	1.4	-	-	-	-
11	18	3	3	-	-	-	-
11	19	-	0.6	-	-	-	-
11	20	-	0.5	-	-	-	-
11	21	-	0.8	-	-	-	-
11	22	-	-	-	-	-	-
12	23	4	5.5	-	5	-	-
13	24	4.5	6.1	<5 (sediment removal)	-	-	-
13	25	-	-	-	-	-	-
14	26	3.5	4.8	-	-	-	-
14	27	-	5.5	-	-	-	-
14	28	4	4.8	-	-	-	-
14	29	-	-	-	-	-	-
15	30	3.5	4.6	-	-	-	-
15	31	1.5	2.6	-	-	-	-
15	32	3	4.2	-	-	-	-
16	33	5	6.6	-	-	-	-
17	34	4	5.8	5 (old)	-	-	-

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at Pre-Translocation (cm)	Coral Diameter measured at Post-Translocation (Baseline Survey) (cm)	Health Status (June 2009)			
				Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)
17	35	2	3.6	-	-	-	-
17	36	1	2.3	-	-	-	-
18	37	2.5	4.7	-	-	-	-
19	38	2.5	4.5	-	-	-	-
20	39	2	3.8	-	-	-	-
21	40	3	4.2	-	-	-	-
22	41	2	4.2	-	-	-	-
22	42	1	3.4	-	-	-	-
23	43	1.5	2.6	-	-	-	-
23	44	-	2.4	-	-	-	-
23	45	-	1.2	-	-	-	-
23	46	2.5	4	-	-	-	-
24	47	4.5	6.7	-	-	-	-
24	48	1.5	2.4	-	-	-	-
24	49	-	1.3	-	-	-	-
25	50	6	6.5	-	-	-	-
25	51	2	3	-	-	-	-
26	52	4	8.8	-	-	-	-
26	53	1.5	3.1	-	-	-	-
27	54	5.5	4.9	-	-	-	-
27	55	-	4.8	-	-	-	-
27	56	-	2.6	-	-	-	-
27	57	-	3.2	-	-	-	-
27	58	-	-	-	-	-	-
28	59	7	10.8	-	5	-	-
29	60	2.5	3.9	-	-	-	-
30	61	9.5	10.2	-	-	-	-
30	62	-	0.7	-	-	-	-
30	63	-	0.9	-	-	-	-
31	64	6	7.8	-	-	-	-
31	65	5	7.2	-	-	-	-
31	66	3.5	5	-	-	-	-
31	67	-	1.5	-	-	-	-
31	68	-	1	-	-	-	-
31	69	-	-	-	-	-	-

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at Pre-Translocation (cm)	Coral Diameter measured at Post-Translocation (Baseline Survey) (cm)	Health Status (June 2009)			
				Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)
32	70	2.5	2.1	-	-	-	-
33	71	3	5.2	-	-	-	-
34	72	5	6.6	-	5	-	-
35	73	3	5	-	-	-	-
36	74	2.5	2.9	-	-	-	-
36	75	1	2.6	-	-	-	-
37	76	1.5	0.6	-	-	-	-
37	77	3	4.6	-	-	-	-
38	78	2.5	3.4	-	-	-	-
38	79	-	0.9	-	-	-	-
38	80	-	0.7	-	-	-	-
39	81	3	5.3	-	-	-	-
40	82	1.5	4.2	-	-	-	-
40	83	4	4.7	-	-	-	-
40	84	1	1.7	-	-	-	-
41	85	4	5.9	5 (sediment removal)	-	-	-
41	86	1.5	2.5	-	-	-	-
42	87	2.5	3.8	-	-	-	-
42	88	5.5	7.5	40 (old)	-	-	-
42	89	-	-	-	-	-	-
43	90	3	4.6	20 (old)	-	-	-
43	91	2	2.9	-	-	-	-
44	92	6	7.7	-	5%	-	-
44	93	7.5	7.8	-	-	-	-
45	94	2	3.2	-	-	-	-
45	95	1	2.3	-	-	-	-
45	96	3.5	5.5	-	-	-	-
45	97	3.5	4.4	-	-	-	-
46	98	5	6.6	30 (old)	-	-	-
46	99	3	4.7	-	-	-	-
47	100	10	13.4	-	-	-	-
48	101	4	6.1	-	3	-	-

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at Pre-Translocation (cm)	Coral Diameter measured at Post-Translocation (Baseline Survey) (cm)	Health Status (June 2009)			
				Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)
48	102	1.5	2.5	-	-	-	-
48	103	2.5	3.6	-	-	-	-
48	104		-	-	-	-	-
49	105	4	6	-	-	-	-
50	106	4	4.3	20 (old)	-	-	-
51	107	3	4.1	-	-	-	-
52	108	13	13.4	-	5	-	-
52	109	3	4.7	-	-	-	-
52	110	-	1.7	-	-	-	-
52	111	-	2.9	-	-	-	-
52	112	-	4.4	-	-	-	-
53	113	6	8.7	-	3	-	-
53	114	-	1.8	-	-	-	-
53	115	-	-	-	-	-	-
54	116	4	5.9	10 (old)	-	-	-
54	117	3	3.8	-	-	-	-
54	118	1.5	0.9	-	-	-	-
54	119	1.5	0.9	-	-	-	-
54	120	-	0.6	-	-	-	-
54	121	-	0.7	-	-	-	-
54	122	-	0.6	-	-	-	-
55	123	3.5	4.2	-	-	-	-
56	124	6.5	9.7	-	5%	-	-
56	125	6	8.3	-	-	-	-
57	126	3	3.5	5 (sediment removal)	-	-	-
57	127	-	-	-	-	-	-
58	128	12.5	13.6	-	-	-	-
58	129	-	0.7	-	-	-	-
58	130	-	-	-	-	-	-
59	131	5	6	-	-	-	-
59	132	3	4.7	-	-	-	-
60	133	2.5	3.9	-	-	-	-

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at Pre-Translocation (cm)	Coral Diameter measured at Post-Translocation (Baseline Survey) (cm)	Health Status (June 2009)			
				Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)
61	134	5	6.9	5 (sediment removal)	-	-	-
61	135	3	4.5	-	-	-	-
62	136	7.5	9.6	-	5	-	-
62	137	5	5.8	-	-	-	-
63	138	6	8.1	5 (old)	-	-	-
63	139	-	0.6	-	-	-	-
63	140	2	3.5	-	-	-	-
63	141	-	-	-	-	-	-
64	142	3	4	-	-	-	-
64	143	2.5	1.6	-	-	-	-
65	144	6.5	9.2	-	5	-	-
66	145	4.5	8.3	5 (sediment removal)	-	-	-
66	146	1.5	2	-	-	-	-
66	147	1	1.8	-	-	-	-
66	148	-	1.4	-	-	-	-
66	149	2	2.4	-	-	-	-
67	150	3.5	5.3	-	3	-	-
67	151	1	2	-	-	-	-
67	152	1	0.9	-	-	-	-
67	153	3.5	2.9	-	-	-	-
67	154	4	6.1	-	-	-	-
68	155	8	11.7	-	-	-	-
69	156	2	3.3	-	-	-	-
69	157	3.5	4.9	-	-	-	-
70	158	4	6.1	-	-	-	-
70	159	2	2.9	-	-	-	-
70	160	3	4.1	-	-	-	-
70	161	-	-	-	-	-	-
70	162	-	-	-	-	-	-
23B	163	-	5.9	-	-	-	-
23B	164	-	1.6	-	-	-	-

Tag no.	Running Count Number of *Oulastrea* Colonies	Coral Diameter measured at Pre-Translocation (cm)	Coral Diameter measured at Post-Translocation (Baseline Survey) (cm)	Health Status (June 2009)			
				Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)
23B	165	-	1.8	-	-	-	-
23B	166	-	9.4	-	-	-	-
40B	167	-	4.1	-	-	-	-
40B	168	-	1.6	-	-	-	-
40B	169	-	3.2	-	-	-	-
40B	170	-	1.4	-	-	-	-