

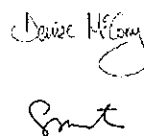
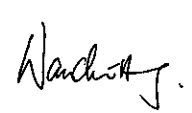
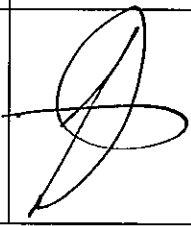
Agreement No. CE 56/2008(CE)

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

**Final Post-Translocation Coral
Monitoring Report**

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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 Final Post-translocation Coral Monitoring Survey conducted on 15 June 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 Final Post-translocation Coral Monitoring Survey are presented with comparison of the Baseline, First, Second and Third Post-translocation results. This Final 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 Final Post-translocation Coral Monitoring Survey

- 1.3.1 The objective of the Final Post-translocation Coral Monitoring Survey in June 2010 was to document and assess the health and condition of the coral colonies moved from Kai Tak to Tseung Kwan O. Coral monitoring was carried out at quarterly intervals since the translocation works in June 2009, ie immediately following translocation, First, Second and Third Post-Translocation Coral Monitoring Surveys completed in June, September,

December 2009 and March 2010, respectively. Data from this Final Post-translocation Coral Monitoring Survey were collected for two purposes:

- To assess translocated coral health condition twelve 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) and preceding three Monitoring Surveys 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 Final 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 Final Post-translocation Coral Monitoring Survey including the health status, condition and size of the translocated and reference coral colonies assessed in June 2010.

Section 4: A summary and discussion of the key results of the Post-translocation Coral Monitoring Programme, is provided.

2 FINAL 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 ⁽²⁾. The Final Post-translocation Coral Monitoring Survey was carried out on 15 June 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 has now been completed with a total of four Post-translocation Coral Monitoring Surveys (First, Second, Third and Final).
- 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 m² grid cells) secured with metal bars demarcating the grid boundaries. The condition of each translocated corals 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 of 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 and Final Post-translocation Monitoring Surveys (March and June 2010). The approximate location of all 72 boulders/rocks with corals in the recipient area is presented in *Figure 2.2*.
- 2.1.4 In accordance with the EM&A conditions all tags and other monitoring indicators such as the underwater metal grid and guide ropes used at the recipient site at Tseung Kwan O were removed at the time of the June 2010 survey (*Figure 2.3*). The four main boulder aggregations are relatively notable at the recipient site and in order to aid any future re-location some of the grid markers (metal caps) were also placed and secured within the boulders of each aggregate.
- 2.1.5 The condition and health status of each translocated and reference coral were re-assessed approximately twelve months after the translocation work for the Final 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

(2) 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.

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.
- 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 the Third and the Final 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 of 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 were recorded.

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 Final Post-translocation Coral Monitoring Survey was conducted on 15 June 2010. The survey objective was to repeat the translocation monitoring (as conducted for the Baseline, First, Second and Third Post-translocation Coral Monitoring surveys) to assess the health and condition of the corals moved from Kai Tak in June 2009.

3.1.2 On 15 June 2010, the prevailing weather was overcast and hot with fair sea conditions. There was a fresh Southwesterly wind (Force 3-4) with low-moderate current and swell. Underwater visibility was moderate (~ 2 m) and sufficient for the survey. The dive survey work was carried out during a flood tide period⁽³⁾.

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 five surveys completed to date, ie Baseline, First, Second, Third and Final Post-Translocation Monitoring Surveys. 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 June 2010. It was also noted that a number of recruits had been recorded in past monitoring surveys (*Tables 1 and 2*). In addition, a total of 40 reference *O. crispata* colonies were randomly selected and assessed, 20 of which were 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 June 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 90 (57 %) corals were alive and 67 (43 %) corals were recorded as dead. Translocated coral survivorship of 57 % indicated a slight decrease in coral survivorship but was considered within the same range as the 62 % survivorship that was recorded in March 2010 (*Table 3*).

3.2.3 In general, the majority of the living translocated *Oulastrea crispata* colonies (68 out of 90 live coral colonies (76 %)) were in good condition showing no visual signs of damage or stress in June 2010 (*Table 4*). Of the remaining 22 *O. crispata* coral colonies, 11 colonies exhibited < 50 % partial mortality and three colonies exhibited high partial mortality (>50 %). Five colonies were affected by sediment with 5-10 % of the total surface area covered in sediment. Three colonies were affected by sedimentation and had < 50 % partial mortality. These were the lowest records of partial mortality and sedimentation recorded for the translocated corals during the 12 month period of the Post-translocated Coral Monitoring Programme.

(3) <http://www.weather.gov.hk/tide/cQUBtide.htm>. Accessed on 11 June 2010.

Overall Coral Health and Condition

- 3.2.4 In June 2010 (ie the Final Monitoring Survey) the health and condition of 184 coral colonies (representing the original translocated colonies (157) plus recruits recorded in preceding monitoring surveys (see *Table 2*) 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 Final Monitoring Survey there were 106 colonies (58 %) of *Oulastrea crispata* alive (including seven coral recruits recorded in Final Monitoring Survey) and 78 colonies (42 %) had died. These included 13 colonies which exhibited total mortality at the time of the Third 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 13 colonies (including three recruits first detected in March 2010) which had died between March and June 2010 (*Table 2*). It was noted that on one boulder (Tag 48) a new coral colony had established as noted at the time of the June 2010 Survey, where previously a coral was recorded as dead (March 2010).

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

- 3.2.5 Thirteen out of 22 (59 %) translocated coral colonies with partial mortality (as recorded in March 2010, *Table 4*) had fully recovered, showing no signs of damage or stress in June 2010. The remaining nine (41 %) translocated coral colonies that had exhibited partial mortality in March 2010 showed partial recovery, ie a reduction in the percentage partial mortality when examined, in June 2010 (refer to *Table 4*).

Focused Explanation on the Fate of All Healthy Coral Colonies (translocated plus naturally occurring) and New Recruits between March and June 2010

- 3.2.6 It was noted that of the 56 healthy coral colonies (recorded in March 2010) a total of 42 were healthy in June 2010. Please refer to the Third Coral Post-translocation report (in March 2010 there were 49 coral colonies plus seven new recruits). These healthy coral colonies did not exhibit any partial mortality or sedimentation. The fate of the 14 coral colonies plus recruits no longer classified as healthy in June 2010 was as follows:

- Ten coral colonies had suffered total mortality in the period between March and June 2010 and three recruits first recorded in March 2010 had also died or disappeared (possibly buried by sediment). Refer to *Table 2*.
- Four coral colonies exhibited different degrees of partial mortality and/or sedimentation. Records in June 2010 showed three corals exhibited partial mortality ranging from 5-90 % and one colony was affected by sedimentation (10 % of surface area covered by sediment).

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

- 3.2.7 Of the 13 recently dead *Oulastrea crispata* colonies recorded in June 2010, 23 % (three corals) were identified as new recruits in March 2010, 23 % (three colonies) had exhibited partial mortality (with two colonies with 10% and 90 % of area affected) and/ or some level of sediment cover and 54 % (seven colonies) did not exhibit any partial mortality at the time of the March 2010 survey.

3.2.8 The health status of the individual *Oulastrea crispata* coral colonies is detailed in *Table 5*. *Figure 3.1* shows a set of representative photographs of *O. crispata* coral colonies for all monitoring periods, ie, as recorded for the Baseline Survey immediately following the translocation works (June 2009), and the First (September 2009), Second (December 2009), Third (March 2010) and Final (June 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 an absence of partial mortality occurrence for both reference corals at the recipient site and along the reference transect in June 2010 (*Table 6*). Forty-five and fifty percent of the assessed *Oulastrea crispata*, within and outside the recipient site, respectively, exhibited sediment cover (with varying levels ranging from 5 to 70 %). The low levels of sedimentation and lack of partial mortality for these reference corals supported the findings that showed there was reduced partial mortality levels recorded for the translocated coral colonies within the recipient site.

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 0.2 to 13.0 cm in June 2010 and the estimated total area of individual coral colonies ranged from 0.1 to 70.2 cm², a size spectrum representing possible recruits to adult colonies. The average size (diameter estimate) of the 90 live translocated coral colonies was 3.5±0.3 cm in June 2010. Comparison with the baseline size estimates allowed the following observations to be made:

- A total of 17 translocated corals showed an increase in size from the baseline to end of monitoring (in June 2010) with a mean increase of 1.3±0.3 cm;
- Three colonies showed no change in size; and,
- A total of 70 translocated corals showed a decrease in size from the baseline to the end of monitoring (in June 2010) with a mean decrease of 2.1±0.2 cm.

3.2.11 Please note that the coral size estimates were based on the maximum length of live coral (skeleton and coral tissue as is standard international practice⁽⁴⁾). *Oulastrea crispata* is known as an opportunistic coral in Hong Kong waters exhibiting the following traits:

- Distribution of *O. crispata* is usually associated with shaded boulder surfaces or on surfaces which are susceptible to sedimentation, ie., where other corals are typically not recorded in high abundance;
- This coral species has a relatively slow growth rate and is typically of a small size⁽⁵⁾;
- The ephemeral nature of the faviid coral *Oulastrea crispata* and general competition with the subtidal, fouling assemblages observed for the Kai Tak corals moved to

⁽⁴⁾ English, S., C. Wilkinson and V. Baker 2000. Survey Manual for Tropical Marine Resources. Australian Institute of Marine Science, Townsville, Australia. 2nd Edition.

⁽⁵⁾ Lam, K.K.Y. 2000. Early Growth of a Pioneer Recruited Coral *Oulastrea crispata* (Scleractinia, Faviidae) on PFA-concrete blocks in a marine park in Hong Kong, China. *Marine Ecological Progress Series* 205: 113-121.

Tseung Kwan O may have influenced the recorded changes in coral colony size. It should be recognised that this is an ongoing and dynamic process whereby a reduction in coral size cannot be interpreted as a deterioration in coral health or condition.

- 3.2.12 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 0.7 to 5.0 cm in diameter with average size (estimated area) of $2.3 \pm 0.4 \text{ cm}^2$ (ranging from 0.9 to 6.4 cm^2).

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

- 3.2.13 The health and condition status of the living translocated *Oulastrea crispata* as recorded in March and June 2010 were compared (refer to *Table 4* and *Figure 3.2*). 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) increased, with 76 % healthy coral colonies recorded in June 2010 as compared to 45 % in March 2010;
- The level of estimated partial mortality (<50 %) exhibited by the living coral colonies remained similar, with 7 % and 12 % observed with dead coral colony areas recorded in March and June 2010.
- The level of estimated partial mortality (≥ 50 %) exhibited by the living coral colonies remained the same (3 %) in March and June 2010;
- For the translocated corals, ie those located inside the recipient site, the number of coral colonies with surface areas affected by sediment practically decreased (from 33 % in March 2010 to 6 % in June 2010). Results for the reference corals with 45 % and 50 % sediment affected corals located inside the recipient site and along reference transect were recorded, respectively.
- These above results for the specific health and condition parameters indicate that, despite a slight decrease in overall survivorship of the translocated corals, the coral condition was more stabilised. The lowest level of partial mortality and sedimentation recorded since the post-typhoon condition (first survey in September 2009). The sediment loading within this site at Tseung Kwan O which appeared higher than observed in the past in March 2010 was much reduced 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 live coral recruits (including those recorded for the Final Monitoring Survey) were individually assessed during the Coral Monitoring Survey conducted on 15 June 2010. Of the original 157 translocated *O. crispata* coral colonies 90 (57 %) were recorded alive and 67 (43 %) had died. Over three quarters of the living translocated *O. crispata* colonies (76 %, 68 out of 90 live coral colonies) were in good condition showing no visual signs of damage or stress (Table 4). Of the remaining 22 *O. crispata* coral colonies half exhibited low partial mortality occurrence and three colonies showed high levels of partial mortality (ranging from >50 %) with sediment and remainder with low sediment cover, only. The occurrence of coral colonies with sediment covered coral surfaces was higher than for partial mortality (representative photographs of the underwater environment on 15 June are presented in Figure 3.3).

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

- Of the 90 living coral colonies (original Kai Tak corals), 68 were recorded as healthy, ie, no visual signs of stress. This was the highest percentage of translocated corals recorded in good status since the post-translocation monitoring commenced in June 2009.
- A key observation made in June 2010 was the continued reduction in partial mortality affected coral colonies.
- The number of translocated corals affected by sedimentation was much reduced when compared to the March 2010 survey.
- 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 June 2010 similar to March 2010.
- One new coral colony growing in the same location as a translocated coral that was previously recorded as dead was recorded for the June 2010 survey.
- Seven new *Oulastrea crispata* colonies (recruits) were recorded within the recipient site and on the boulders moved from Kai Tak in June 2010.
- Results for the specific health and condition parameters indicated that the translocated corals (plus new recruits) within the recipient site at Tseung Kwan O exhibited a further stabilisation in condition.
- The health and condition of the 40 reference corals which were located within the recipient site and along the reference transect were assessed, showing no occurrence of partial mortality and a high occurrence in estimated sediment cover. Just less than half of reference *Oulastrea crispata* colonies, inside the recipient site, (45 %) exhibited signs of partial sediment cover (ranging 5 to <50 % per colony). The general health condition of the translocated and reference *O. crispata* colonies recorded from Tseung Kwan O in June 2010 was considered comparable though sedimentation appeared less for the translocated corals.

- 4.1.3 Compared to the results of the First and Second Post-translocation Coral Monitoring Surveys, a decreased number of translocated *Oulastrea crispata* colonies exhibited partial mortality at the time of the Final Monitoring Survey, a continued trend as recorded for the March 2010 survey. Total mortality levels were similar for the Second and Third Monitoring Surveys indicating a period of relatively stable coral survivorship. 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 3.3*.
- 4.1.4 The final survey completed in June 2010 indicates that the translocated coral condition and health appears to have stabilised and their longer term survivorship at the recipient site at Tseung Kwan O should be possible. The monitoring of the translocated corals over an approximate 12 month period with results showing a survivorship rate of >50 % indicates that the longer term survival of translocated corals from Kai Tak to be highly likely and was considered successful. This is despite considerable damage caused to the translocated corals three months after being moved due to typhoons affecting the site.
- 4.1.5 A review of coral transplantation programmes indicated that monitoring and documentation of success are few and far between and the definition of what success means is often poorly defined. Nevertheless, the review did reveal that coral transplant survivorship is typically 85-90 % immediately following and up to a month after transplantation⁽⁶⁾. The Kai Tak coral translocation programme carried out in June 2009 recorded 100 % survivorship immediately following the coral move to Tseung Kwan O. Subsequent monitoring of coral transplants is typically rare (as documented in the international scientific literature), however, the limited one year monitoring programmes showed an average survivorship of approximately 55-60 % and many examples where all coral transplants were lost to storm damage⁽⁷⁾. The 57 % survival rate of the Kai Tak *Oulastrea crispata* one year after the translocation programme, despite the documented storm damage, does indicate a successful programme for the Kai Tak corals.
- 4.1.6 Following the EM&A conditions all tags and other monitoring indicators used at the recipient site at Tseung Kwan O have been removed at the time of the June 2010 survey. This plus the completion of the 12 month programme of post-translocation monitoring fulfilled the project requirements under CE 56/2008 (CE).
- 4.1.7 Further monitoring of the translocated corals is not recommended as to date the programme has documented the high survivorship of the Kai Tak corals immediately following the relocation exercise, the impacts of storm damage and the longer-term survivorship of the translocated corals. Thus, fulfilling the objectives of the EM&A with the completion of the 12 months of coral monitoring works. The monitoring highlighted that the primary factors driving coral survivorship are the ambient environmental conditions and the population dynamics of the benthic assemblages (dominated by fouling organisms) at the recipient site.
- 4.1.8 With respect to lessons learned from this coral translocation programme it is important to recognise that while the results of this translocation exercise indicate a successful programme of coral removal from a development site to a suitable recipient site any future proposals to translocate corals should assess the feasibility first and follow a similar phased programme of works if carried out. Though it is recommended that translocation is a method of last resort and should be considered carefully before embarked upon. Any future coral

⁽⁶⁾ Edwards, A.J. and E.D. Gomez 2007. Reef Restoration Concepts and Guidelines: Making sensible management choices in the face of uncertainty. *Coral Reef Targeted Research & Capacity Building for Management Program, St Lucia, Australia, 38pp.*

⁽⁷⁾ Unpublished literature review of coral transplantation programmes (ERM 2009)

translocation programme should involve a Pre-translocation suite of surveys at the donor and potential recipient sites so that the exact location for the translocated corals can be refined, a translocation phase (which includes a baseline survey prior and immediately after moving the corals) and a post-translocation monitoring phase (of a minimum of one year duration).

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), Third Post-Translocation Survey (March 2010) and Final Post-Translocation Survey (June 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)	No. of Live Coral(s) Recorded during Coral Translocation (Final Monitoring - June 2010)
1	2	1	1	1	1	1
2	1	1	1	0	0	0
3	1	3	2	1	1	1
4	1	1	1	1	1	1
5	1	2	1	0	1	1
6	1	2	1	1	1	1
7	1	1	1	0	0	0
8	2	2	2	2	2	2
9	2	2	2	1	2	3
10	1	1	1	1	1	1
11	1	5	5	6	5	5
12	1	1	1	1	1	1
13	1	1	1	2	2	2
14	2	3	2	4	2	1
15	3	3	3	3	2	3
16	1	1	0	0	2	1
17	3	3	2	0	0	0
18	1	1	1	0	1	1
19	1	1	1	1	1	1
20	1	1	1	1	1	1
21	1	1	1	0	0	0
22	2	2	2	1	1	1
23	2	4	4	4	4	4
24	2	3	2	2	2	2
25	2	2	0	0	1	0
26	2	2	1	1	1	1
27	1	4	5	5	4	4
28	1	1	0	1	1	1
29	1	1	1	1	1	1
30	1	3	3	2	2	2

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)	No. of Live Coral(s) Recorded during Coral Translocation (Final Monitoring - June 2010)
31	3	5	5	5	4	4
32	2	1	1	1	1	1
33	1	1	1	1	1	1
34	1	1	1	1	1	1
35	1	1	1	0	1	0
36	2	2	1	1	1	1
37	2	2	1	0	0	0
38	1	3	3	2	2	2
39	1	1	1	1	1	1
40	3	3	2	2	2	2
41	2	2	2	1	2	2
42	2	2	3	0	0	0
43	2	2	0	0	1	1
44	2	2	1	2	1	0
45	4	4	4	2	2	2
46	2	2	1	2	2	1
47	1	1	1	1	1	1
48	3	3	4	4	3	4
49	1	1	1	1	1	1
50	1	1	1	1	1	1
51	1	1	1	1	1	1
52	2	5	2	2	2	2
53	1	2	1	2	2	1
54	4	7	2	2	2	4
55	1	1	1	1	1	1
56	2	2	2	2	1	0
57	1	1	1	2	2	3
58	1	2	2	3	2	2
59	2	2	2	1	1	1
60	1	1	1	0	0	0
61	2	2	2	2	2	2
62	2	2	1	2	2	2
63	2	3	2	3	3	3
64	2	2	1	1	1	1
65	1	1	1	1	1	1

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)	No. of Live Coral(s) Recorded during Coral Translocation (Final Monitoring - June 2010)
66	4	5	2	2	3	1
67	5	5	3	3	3	3
68	1	1	1	1	0	0
69	2	2	2	2	2	2
70	3	3	3	5	3	3
23B	-	4	3	3	3	1
40B	-	4	1	1	2	3
Total	120	157	121	113	111	106

Table 2: A Summary Table of the Translocated *Oulastrea crispata* Colonies Plus Records of Coral Recruits during the Baseline, First, Second, Third and Final Coral Post-Translocation Surveys.

Survey	# Live Corals	# 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 %
Final Monitoring (June 10)	99	7	65**	13***	184	58 %

*Percentage estimate calculated using the number of live corals plus the new coral recruit data.

**In June 2010 one coral out of the 78 recorded as dead (Dead and Recently Dead coral records combined) in preceding surveys had partially recovered.

***Note of the 13 dead coral colonies three colonies were coral recruits first recorded in March 2010.

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

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 %
Final Monitoring (June 10)	90	67	157	57 %

Table 4: A Summary Table of the Health and Condition of the Living Translocated *Oulastrea crispata* Colonies as recorded for the First, Second, Third and Final Coral Post-Translocation Surveys.

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
Final Monitoring							
Colony Number	90	68	11	3	5*	3*	0
Percentage (%)	100	76	12	3	6	3	0

* All exhibited a low level of sediment cover (5-10 %).

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

Tag no.	Running Count Number of <i>Oulastrea</i> Colonies	Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status (March 2010)					Coral Diameter measured at Final Post-Translocation (cm)	Health Status (June 2010)				
			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	-	10	-	-	-	2	40	-	-	-	-
2	2	0	100	-	-	-	-	-	-	-	-	-	-
3	3	0	100	-	-	-	-	-	-	-	-	-	-
3	4	1.5	-	-	-	-	-	1.7	-	-	-	-	-
3	5	0	100	-	-	-	-	-	-	-	-	-	-
4	6	3.6	-	30	-	-	Recovering	4	40	10	-	-	-
5	7	1.5	-	-	-	-	Recovered from total mortality	2	-	-	-	-	-
5	8	0	100	-	-	-	-	-	-	-	-	-	-
6	9	0	100	-	-	-	-	-	-	-	-	-	-
6	10	0	100	-	-	-	-	-	-	-	-	-	-
6	11	0.6	-	-	-	-	New recruit	1	-	-	-	-	-
7	12	0	100	-	-	-	-	-	-	-	-	-	-
8	13	6.2	10	30	-	-	-	8.1	-	-	-	-	-
8	14	2.4	5	10	-	-	-	3.8	-	-	-	-	-
9	15	5.8	-	30	-	-	Recovering	7.3	-	10	-	-	-
9	16	2.1	-	10	-	-	Recovered from total mortality	2.4	-	-	-	-	-

Tag no.	Running Count Number of <i>Oulastrea</i> Colonies	Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status (March 2010)					Coral Diameter measured at Final Post-Translocation (cm)	Health Status (June 2010)				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
10	18	2.5	20	10	-	-	-	3.3	-	-	-	-	-
11	19	1.3	-	-	-	-	-	1.4	-	-	-	-	-
11	20	1.5	-	-	-	-	-	2.3	-	-	-	-	-
11	21	1.8	-	5	-	-	-	2.4	-	-	-	-	-
11	22	1	-	-	-	-	-	1.3	-	10	-	-	-
11	23	1	-	-	-	-	-	0.8	-	-	-	-	-
11	24	0	100	-	-	-	-	-	-	-	-	-	-
12	25	3	-	70	-	-	-	4.3	-	-	-	-	-
13	26	1.5	-	-	-	-	-	0.8	-	-	-	-	-
13	27	0.3	-	-	-	-	-	1	-	-	-	-	-
14	28	4	60	-	-	-	-	3.6	-	-	-	-	-
14	29	3.8	-	5	-	-	-	-	-	-	-	-	-
14	30	0	100	-	-	-	-	-	-	-	-	-	-
14	31	0	100	-	-	-	-	-	-	-	-	-	-
15	32	3.9	-	5	-	-	-	3.3	-	5	-	-	-
15	33	0	100	-	-	-	-	-	-	-	-	-	-
15	34	1.6	-	-	-	-	-	0.3	90	-	-	-	-
16	36	0	100	-	-	-	-	-	-	-	-	-	-
16	37	0.4	-	-	-	-	New recruit	0.6	-	-	-	-	-

Tag no.	Running Count Number of <i>Oulastrea</i> Colonies	Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status (March 2010)					Coral Diameter measured at Final Post-Translocation (cm)	Health Status (June 2010)				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
41	93	0.5	-	-	-	-	New recruit	1.2	-	-	-	-	-
42	94	0	100	-	-	-	-	-	-	-	-	-	-
42	95	0	100	-	-	-	-	-	-	-	-	-	-
42	96	0	100	-	-	-	-	-	-	-	-	-	-
43	97	0	100	-	-	-	-	-	-	-	-	-	-
43	98	0	100	-	-	-	-	-	-	-	-	-	-
43	99	0.3	-	-	-	-	New recruit	1	-	-	-	-	-
44	100	0.7	90	-	-	-	-	-	-	-	-	-	-
44	101	0	100	-	-	-	-	-	-	-	-	-	-
45	102	0	100	-	-	-	-	-	-	-	-	-	-
45	103	0	100	-	-	-	-	-	-	-	-	-	-
45	104	3.8	-	-	-	-	-	1.8	-	-	-	-	-
45	105	4.5	-	-	-	-	-	3	-	-	-	-	-
46	106	3.8	20	30	-	-	-	3.5	-	-	-	-	-
46	107	0.8	-	-	-	-	-	-	-	-	-	-	-
47	108	8.5	10	30	-	-	-	8.6	10	-	-	-	-
48	109	2.2	-	10	-	-	-	2.5	40	-	-	-	-
48	110	0	100	-	-	-	-	2.2	45	-	-	-	-
48	111	3.2	-	-	-	-	-	3.8	-	-	-	-	-

Tag no.	Running Count Number of <i>Oulastrea</i> Colonies	Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status (March 2010)					Coral Diameter measured at Final Post-Translocation (cm)	Health Status (June 2010)				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
48	112	3.1	-	-	-	-	-	3	-	-	-	-	-
49	113	4	-	15	-	-	-	4.5	-	-	-	-	-
50	114	7.4	-	-	-	-	-	7.4	-	-	-	-	-
51	115	2.4	-	5	-	-	-	2.8	-	5	-	-	-
52	116	12.5	-	30	-	-	-	13	10	-	-	-	-
52	117	0	100	-	-	-	-	-	-	-	-	-	-
52	118	0	100	-	-	-	-	-	-	-	-	-	-
52	119	0	100	-	-	-	-	-	-	-	-	-	-
52	120	4.5	-	-	-	-	-	5	5	-	-	-	-
53	121	4.2	-	40	-	-	-	4.5	5	-	-	-	-
53	122	0	100	-	-	-	-	-	-	-	-	-	-
53	123	0.5	-	-	-	-	-	-	-	-	-	-	-
54	124	1.8	-	40	-	-	-	2.8	70	-	-	-	-
54	126	1.7	-	10	-	-	-	1.3	-	-	-	-	-
54	128	0	100	-	-	-	-	-	-	-	-	-	-
54	129	0	100	-	-	-	-	-	-	-	-	-	-
54	130	0	100	-	-	-	-	-	-	-	-	-	-
54	131	0	100	-	-	-	-	-	-	-	-	-	-
54	132	0	100	-	-	-	-	-	-	-	-	-	-
55	133	2.8	-	5	-	-	Recovering	3.5	-	-	-	-	-

Tag no.	Running Count Number of <i>Oulastrea</i> Colonies	Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status (March 2010)					Coral Diameter measured at Final Post-Translocation (cm)	Health Status (June 2010)				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
56	134	0	100	-	-	-	-	-	-	-	-	-	-
56	135	0.6	-	-	-	-	-	-	-	-	-	-	-
57	136	3.1	-	-	-	-	-	3.5	-	-	-	-	-
57	137	0.5	-	-	-	-	-	2	-	-	-	-	-
58	139	8.5	5	20	-	-	-	12.8	-	-	-	-	-
58	140	2.8	-	5	-	-	Recovering	0.9	-	-	-	-	-
58	141	0	100	-	-	-	-	-	-	-	-	-	-
59	142	4.6	-	15	-	-	-	4.9	-	-	-	-	-
59	143	0	100	-	-	-	-	-	-	-	-	-	-
60	144	0	100	-	-	-	-	-	-	-	-	-	-
61	145	2.7	-	5	-	-	-	3.9	-	-	-	-	-
61	146	1.9	-	5	-	-	-	1.8	-	-	-	-	-
62	147	3.2	10	10	-	-	-	-	-	-	-	-	-
62	148	4	-	-	-	-	Recovering	3.9	55	-	-	-	-
63	150	5.6	30	-	-	-	-	6.5	-	-	-	-	-
63	151	0	100	-	-	-	-	-	-	-	-	-	-
63	152	2.6	-	-	-	-	-	3	-	-	-	-	-
63	153	0.5	-	-	-	-	-	0.8	-	-	-	-	-
64	154	1.6	-	-	-	-	-	2	-	-	-	-	-

Tag no.	Running Count Number of <i>Oulastrea</i> Colonies	Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status (March 2010)					Coral Diameter measured at Final Post-Translocation (cm)	Health Status (June 2010)				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
64	155	0	100	-	-	-	-	-	-	-	-	-	-
65	156	2.3	-	25	-	-	-	5.2	-	-	-	-	-
66	157	0	100	-	-	-	-	-	-	-	-	-	-
66	158	4	-	5	-	-	-	5.8	-	-	-	-	-
66	159	0	100	-	-	-	-	-	-	-	-	-	-
66	160	2.3	-	-	-	-	-	-	-	-	-	-	-
66	161	0	100	-	-	-	-	-	-	-	-	-	-
66	162	0.3	-	-	-	-	New recruit	-	-	-	-	-	-
67	163	3.4	-	30	-	-	-	5.2	-	-	-	-	-
67	164	0	100	-	-	-	-	-	-	-	-	-	-
67	165	0	100	-	-	-	-	-	-	-	-	-	-
67	166	1.8	-	-	-	-	-	2.7	-	-	-	-	-
67	167	3.9	-	25	-	-	-	3.7	-	-	-	-	-
68	168	0	100	-	-	-	-	-	-	-	-	-	-
69	169	1.4	-	-	-	-	-	1.7	-	-	-	-	-
69	170	3.5	-	5	-	-	-	3.8	-	-	-	-	-
70	171	4.9	-	10	-	-	-	5.4	-	-	-	-	-
70	172	2.1	-	-	-	-	-	1.9	-	-	-	-	-
70	173	3.2	-	-	-	-	-	3.4	-	-	-	-	-

Tag no.	Running Count Number of <i>Oulastrea</i> Colonies	Coral Diameter measured at 3rd Post-Translocation (cm)	Health Status (March 2010)					Coral Diameter measured at Final Post-Translocation (cm)	Health Status (June 2010)				
			Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks		Partial Mortality (% Affected)	Sediment Cover (% Affected)	Blanched (% Affected)	Bleached (% Affected)	Remarks
70	174	0	100	-	-	-	-	-	-	-	-	-	-
70	175	0	100	-	-	-	-	-	-	-	-	-	-
23B	176	2.1	-	-	-	-	-	-	-	-	-	-	-
23B	177	1.6	-	-	-	-	-	-	-	-	-	-	-
23B	178	0	100	-	-	-	One cup coral	-	-	-	-	-	-
23B	179	3.6	-	-	-	-	-	6.6	-	-	-	-	-
40B	180	0	100	-	-	-	-	-	-	-	-	-	-
40B	181	0	100	-	-	-	-	-	-	-	-	-	-
40B	182	1.2	10	5	-	-	-	1.5	-	-	-	-	-
40B	184	1	-	-	-	-	Recovered from total mortality	1.2	-	-	-	-	-

Notes: 100 % Partial Mortality = whole coral colony died (total mortality).




-  Coral permanently lost
-  Coral had died since the December 2009 survey
-  Coral had died since the March 2010 survey

Table 6: A Summary Table of the Overall Health and Condition of the Reference *Oulastrea crispata* Corals Assessed in June 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	11	0	0	9	0
Percentage	100%	55%	0%	0%	45%	0%
Reference Transect (outside recipient site)	20	10	0	0	10	0
Percentage	100%	50%	0%	0%	50%	0%

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

Running Count of <i>Oulastrea</i> Colonies	Coral Diameter (cm)	Coral Size (cm ²)	Health Status			
			Partial Mortality (% Affected)	Sediment (% affected)	Blanched (% Affected)	Bleached (% Affected)
Inside Recipient Site						
1	3.1	4.4	-	-	-	-
2	1.7	1.5	-	5	-	-
3	5	6.1	-	70	-	-
4	1.6	2	-	-	-	-
5	2.4	2.3	-	55	-	-
6	1.9	1.6	-	10	-	-
7	0.8	1.2	-	-	-	-
8	2.2	2.4	-	5	-	-
9	2.1	1.9	-	5	-	-
10	1.1	1.3	-	-	-	-
11	1.2	1.2	-	-	-	-
12	1.2	1.5	-	-	-	-
13	1.5	1.4	-	-	-	-
14	1	1.4	-	-	-	-
15	1.6	1.8	-	5	-	-
16	1.3	1.5	-	5	-	-
17	0.9	1.2	-	-	-	-
18	0.7	1	-	5	-	-
19	1.6	2	-	-	-	-
20	2.5	3.4	-	-	-	-
Along Reference Transect						
1	2.8	3.5	-	-	-	-
2	1.5	1.8	-	-	-	-
3	1.5	2	-	-	-	-
4	4	5	-	60	-	-

Running Count of <i>Oulastrea</i> Colonies	Coral Diameter (cm)	Coral Size (cm ²)	Health Status			
			Partial Mortality (% Affected)	Sediment (% affected)	Blanched (% Affected)	Bleached (% Affected)
5	2.6	3.1	-	5	-	-
6	2.4	2.9	-	10	-	-
7	2.2	2.8	-	-	-	-
8	1.2	1.3	-	-	-	-
9	1	1.2	-	-	-	-
10	0.7	0.9	-	5	-	-
11	1.7	2.1	-	35	-	-
12	1.9	3	-	-	-	-
13	1.1	1.3	-	-	-	-
14	2.9	4.1	-	50	-	-
15	1.2	1.4	-	-	-	-
16	1.4	1.9	-	30	-	-
17	1.1	1.7	-	-	-	-
18	4.4	6.4	-	10	-	-
19	3.1	3.9	-	20	-	-
20	1.1	1.2	-	2	-	-

Figures

Figure 1.1 Cruise Terminal Development Layout Plan

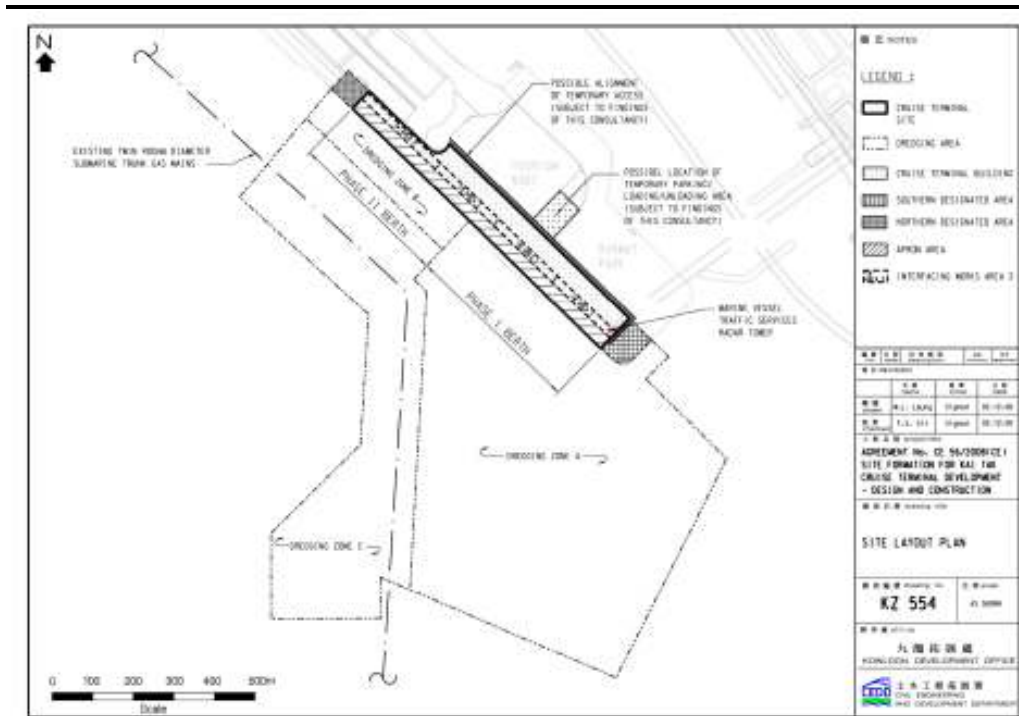


Figure 2.1 Location of the Approved Recipient Site at Tseung Kwan O

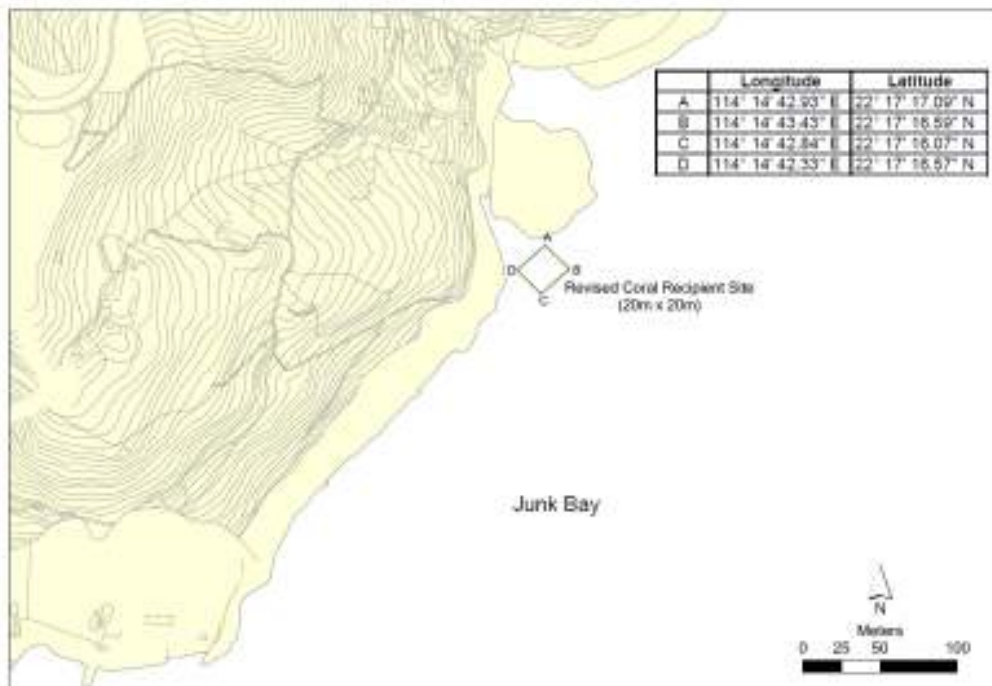


Figure 2.2 Location Plan of Translocated Boulders/Rocks established during the Third Post-translocation Coral Survey. ○ - indicates boulder/rock with tag number (as in *Table 5*) in June 2010. It should be noted that all tags have been removed after the survey.

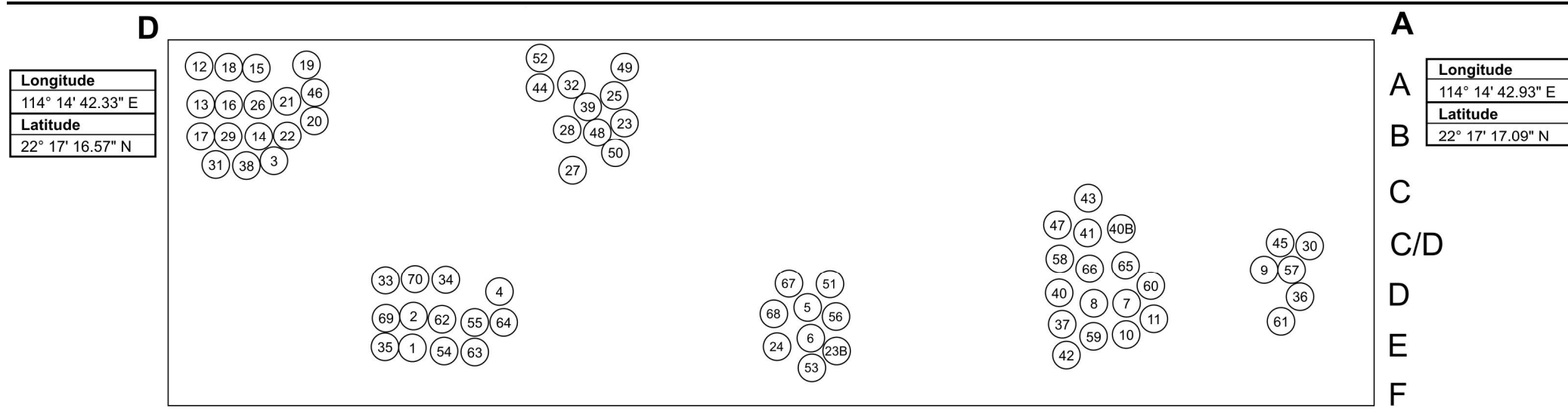


Figure 2.3 Representative Photographs of translocated boulders with tags removed after the final Post-Translocation Monitoring Survey in June 2010.

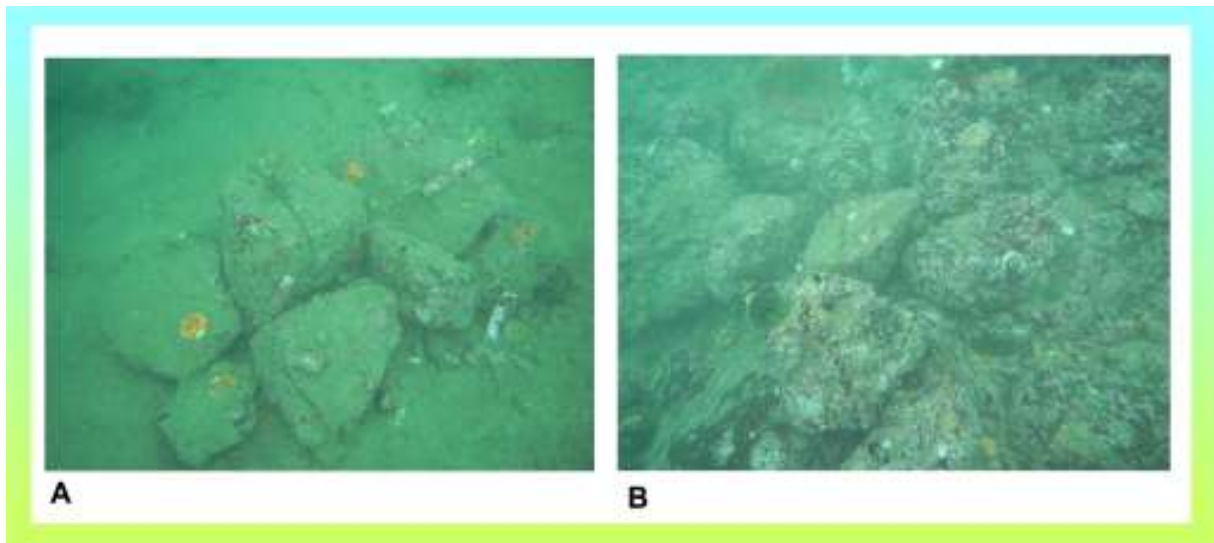


Figure description: Example of the boulder aggregate with translocated corals located at the recipient site at Tseung Kwan O. **A:** Boulders with original tags composed of cable ties and laminated labels and the plastic numbered tiles glued to boulders at the time of the First Post-translocation Monitoring Survey. **B:** Boulders with translocated corals after all tags had been removed.

Figure 3.1 Representative Photographs of Selected *Oulastrea crispata* Colonies recorded during Baseline (June 2009), First (September 2009), Second (December 2009), Third (March 2010) and Final (June 2010) Post-translocation Coral Monitoring Survey.

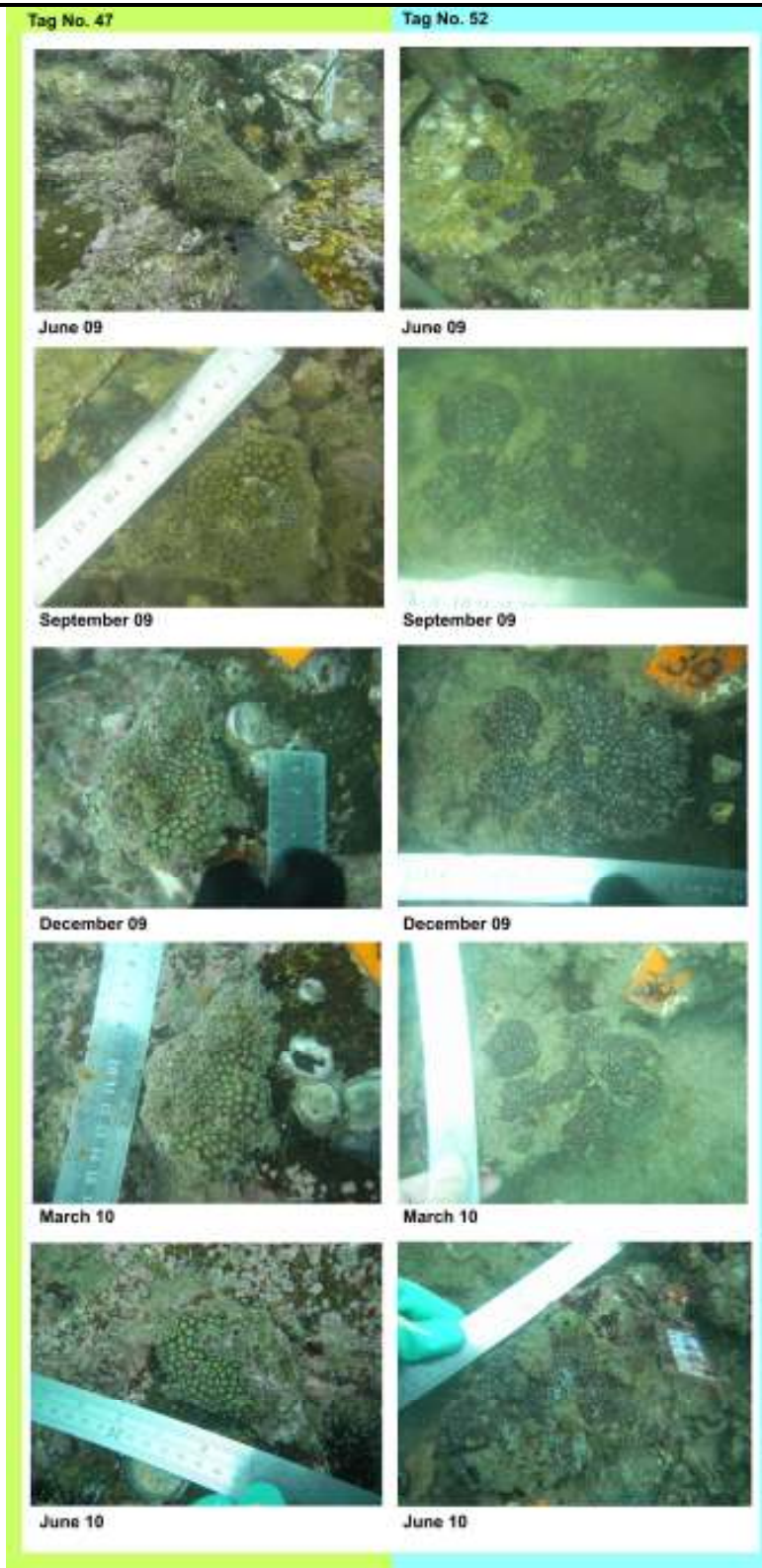
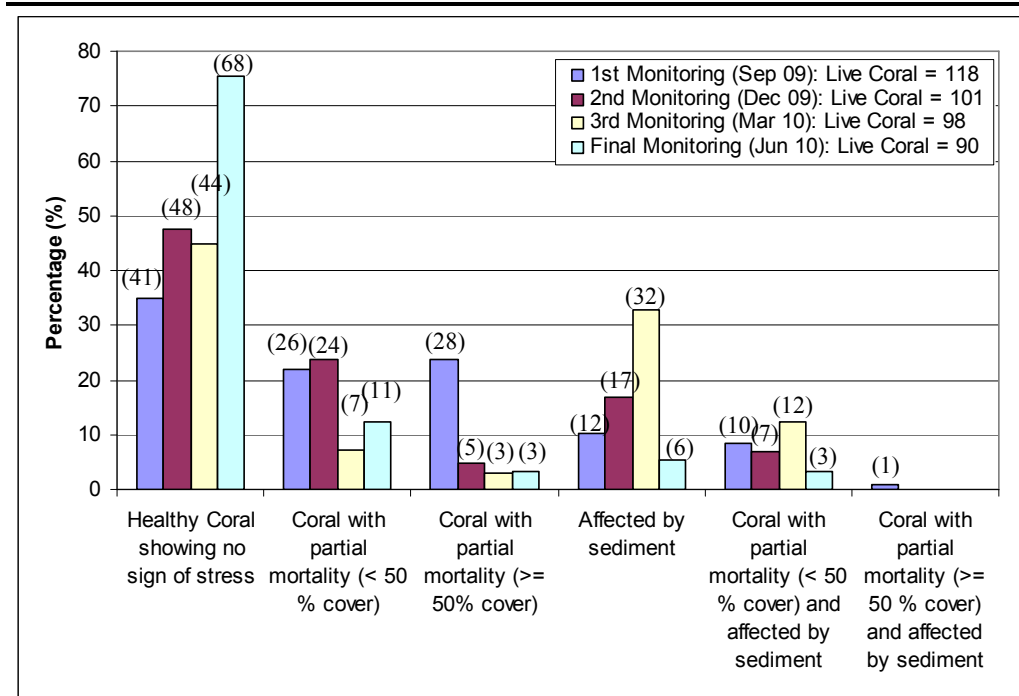
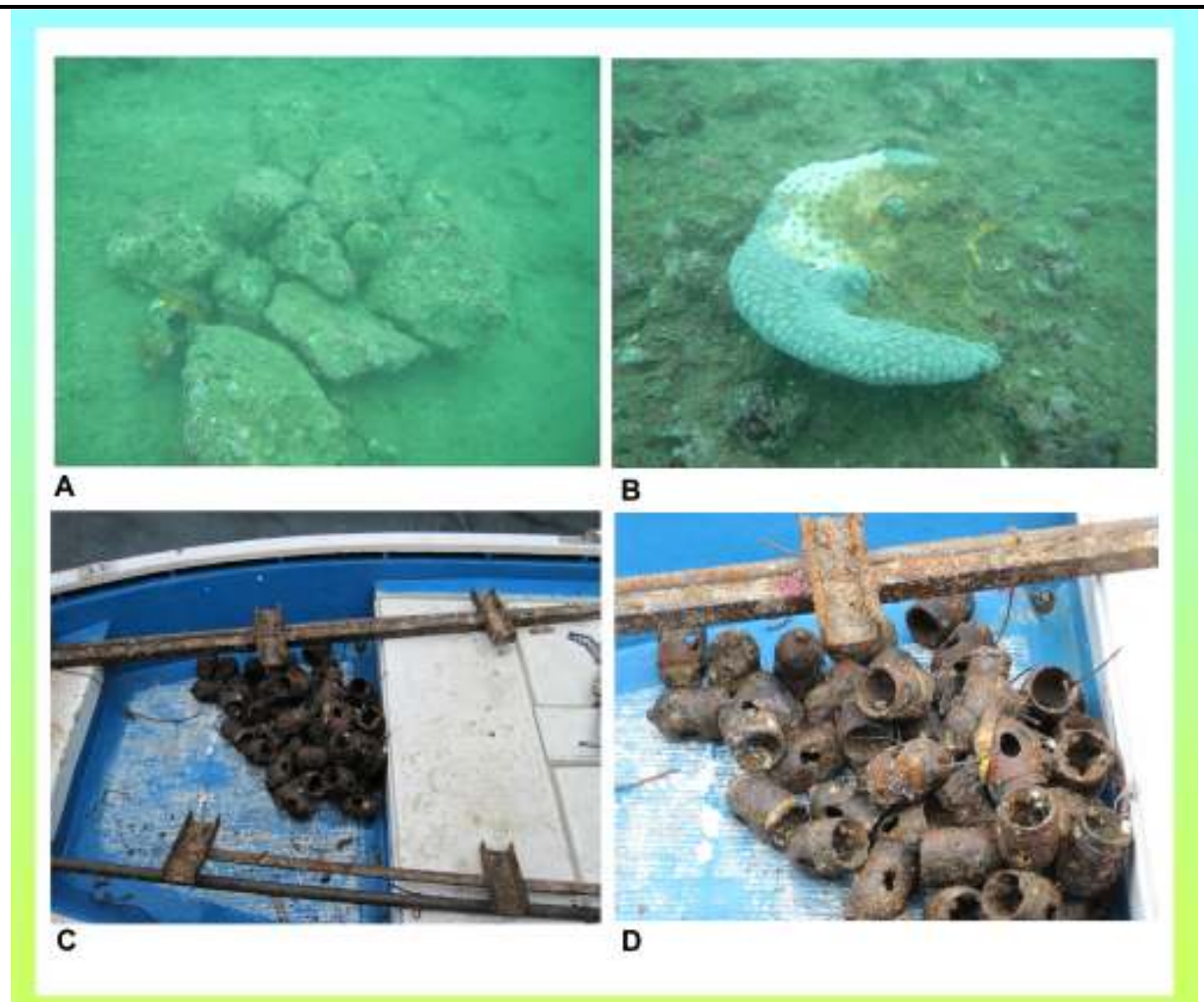


Figure 3.2 Status of Health Parameters for Translocated Coral Colonies at the Recipient Site in Tseung Kwan O (as recorded in September 2009, December 2009, March and June 2010).



() Number of coral colonies recorded.

Figure 3.3 Representative Photographs taken during Final Post-translocation Coral Monitoring Survey in June 2010.



A – Translocated boulder aggregation with metal cap markers.

B – The hard coral *Turbinaria peltata* (as previously photographed) with a noticeably larger dead surface area (partial mortality) with sedimentation as recorded within the recipient site.

C & D – The underwater grid markers,, rope and marker caps after retrieval from coral recipient site

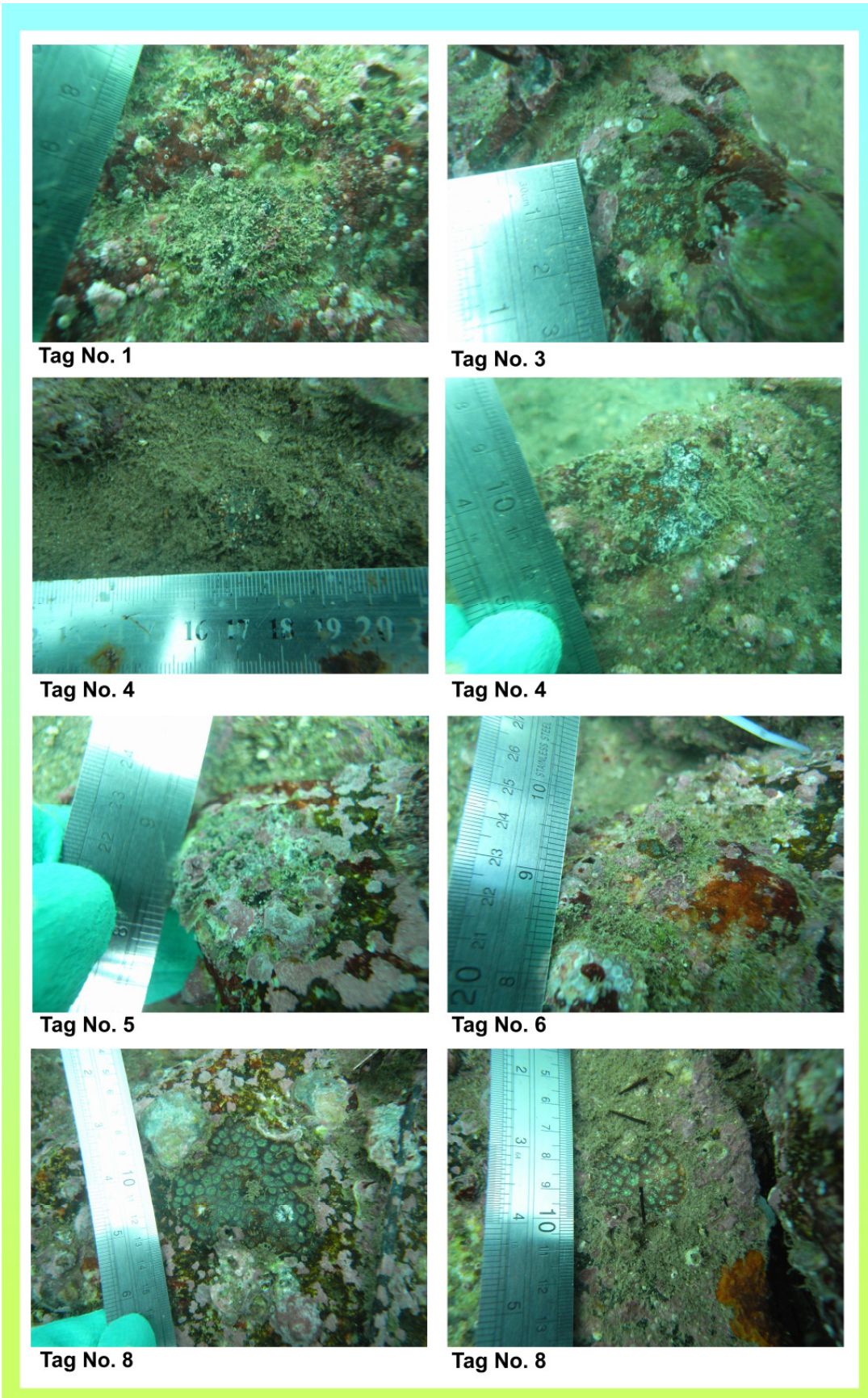
Annex A

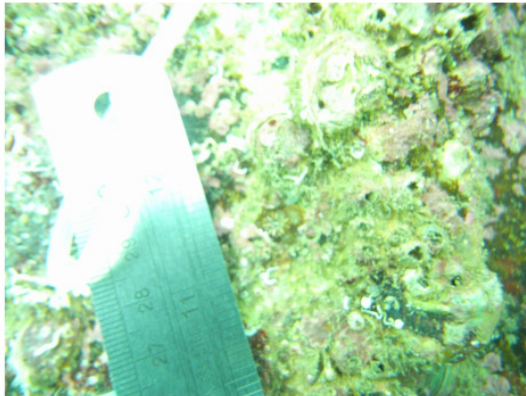
Photographic Images Recorded for Each of the Translocated and Reference Coral Colonies Assessed During the Final Post- translocation Survey, June 2010

CONTENTS

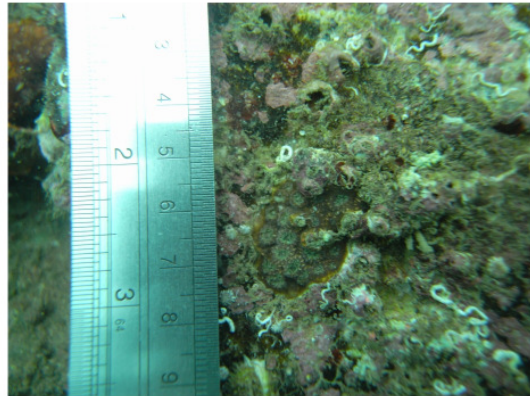
<i>A1</i>	<i>TRANSLOCATED CORAL COLONIES</i>	<i>A1</i>
<i>A2</i>	<i>REFERENCE CORAL COLONIES (INSIDE RECIPIENT SITE)</i>	<i>A15</i>
<i>A3</i>	<i>REFERENCE CORAL COLONIES (ALONG REFERENCE TRANSECT)</i>	<i>A18</i>

A1 **TRANSLOCATED CORAL COLONIES**

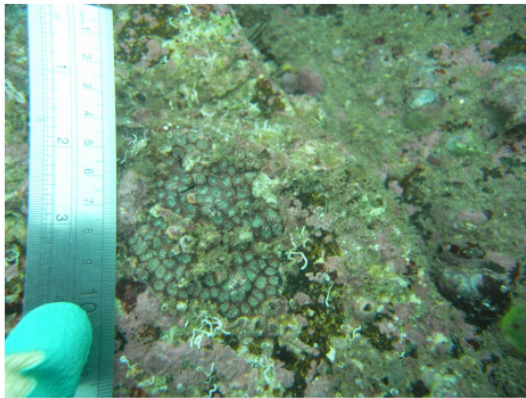




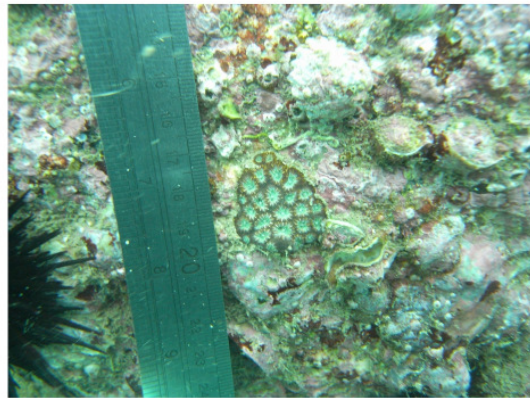
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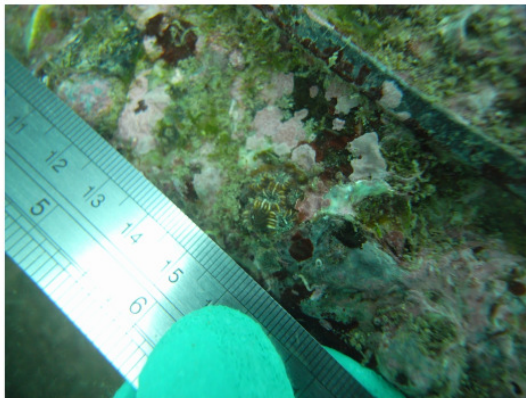
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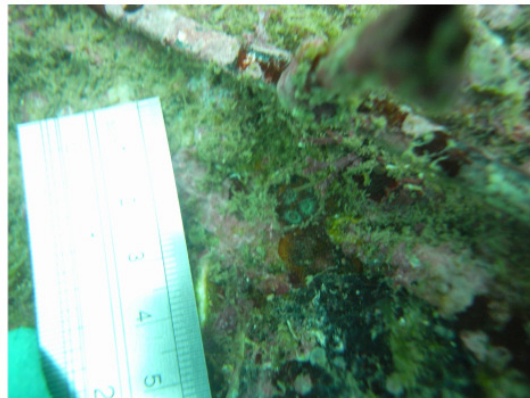
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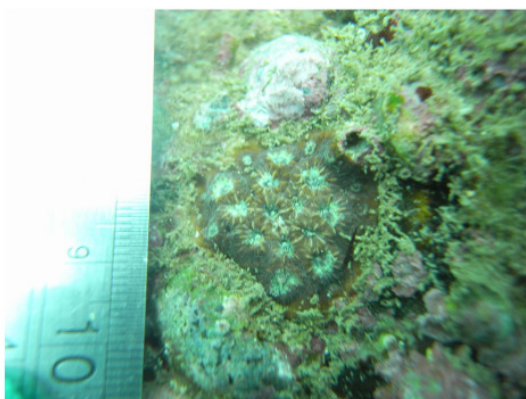
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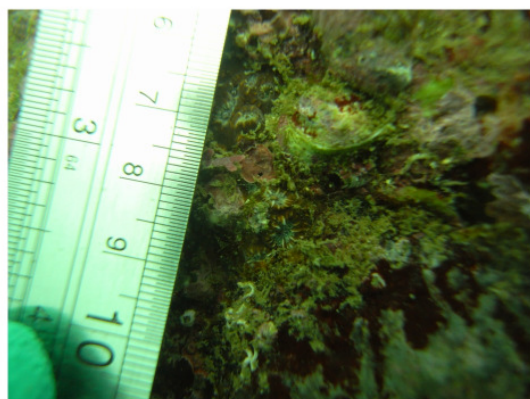
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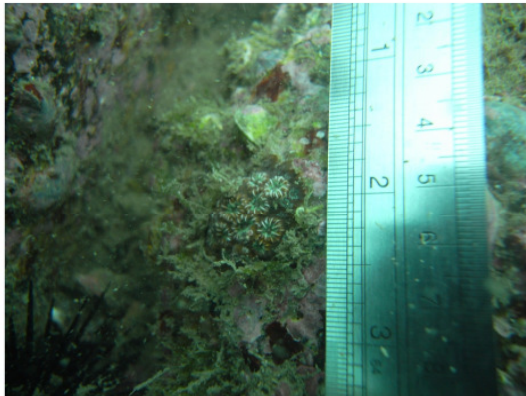
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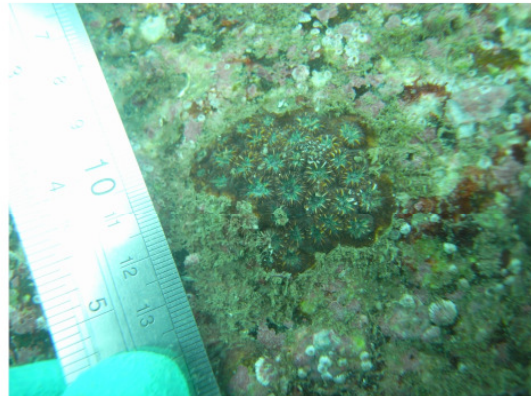
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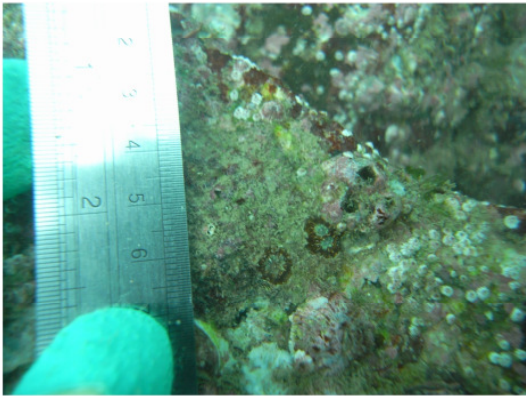
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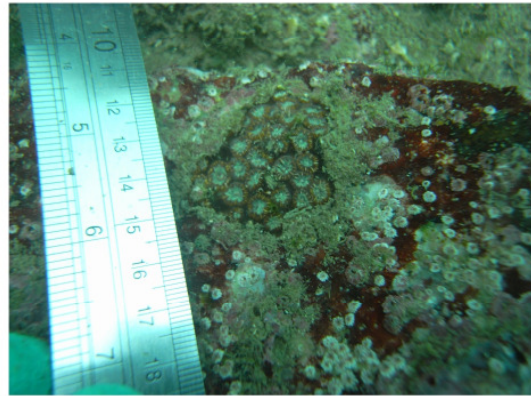
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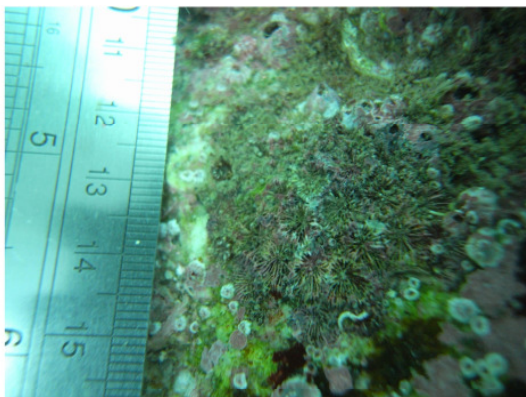
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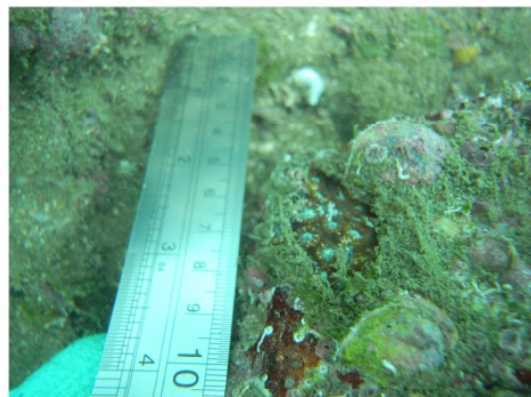
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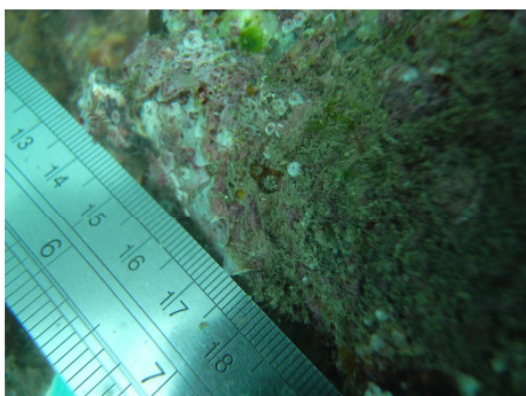
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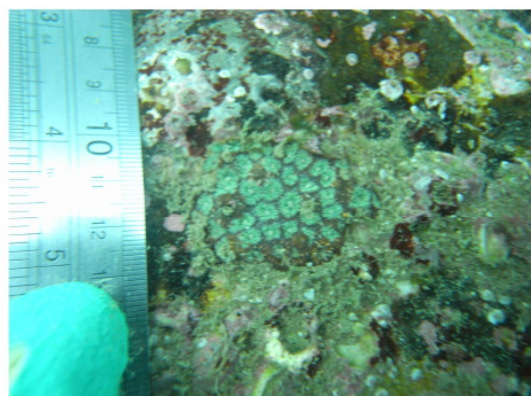
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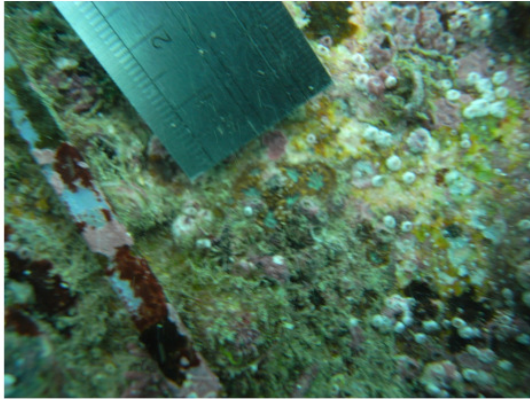
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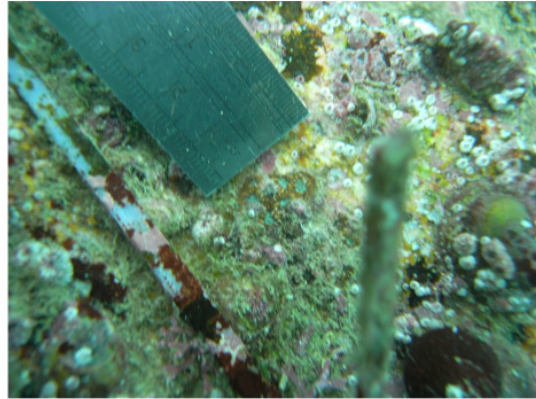
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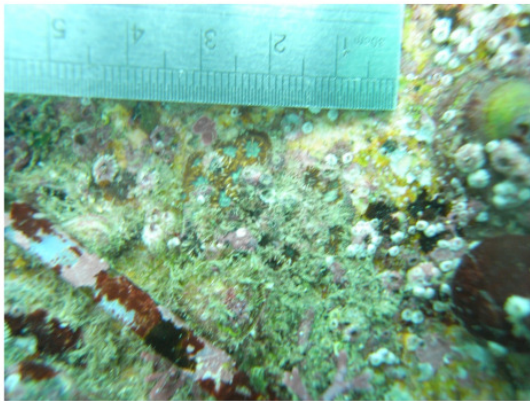
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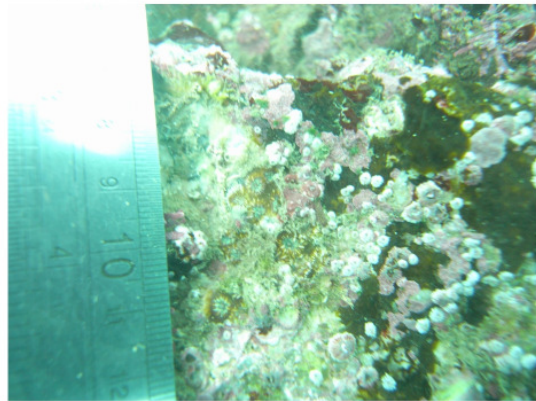
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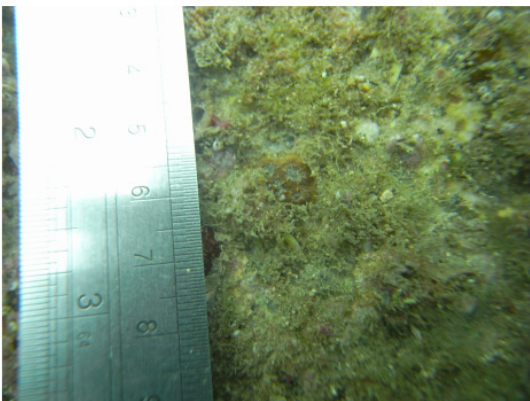
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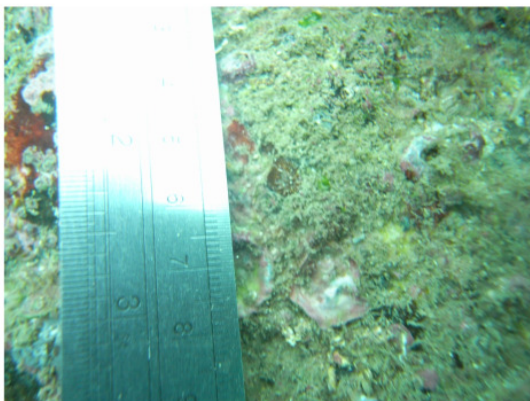
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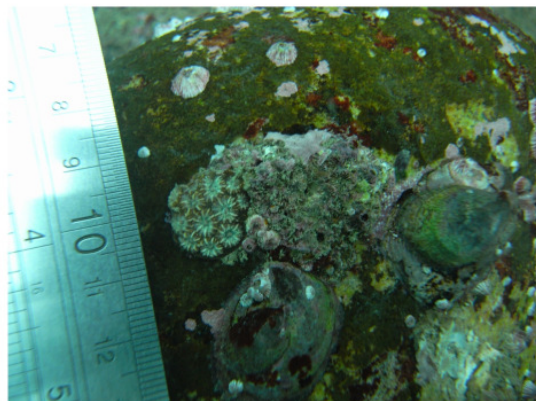
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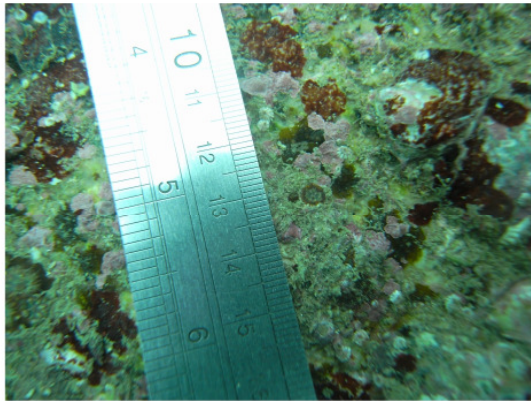
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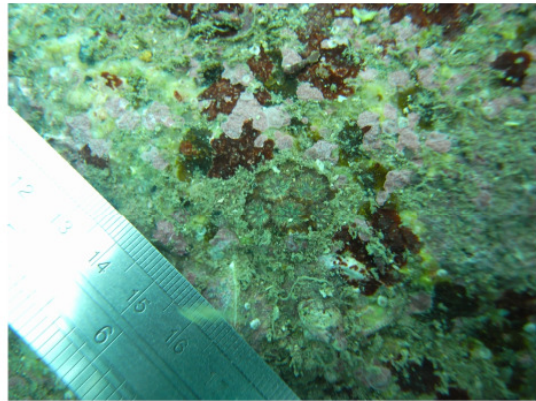
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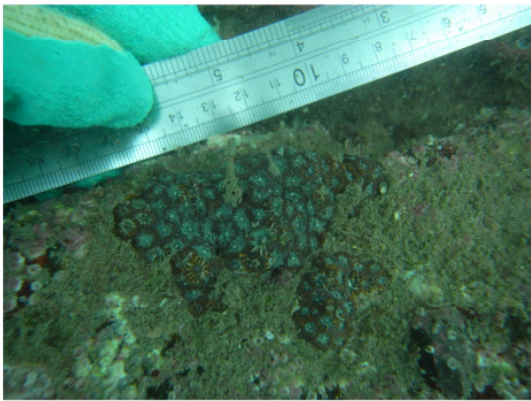
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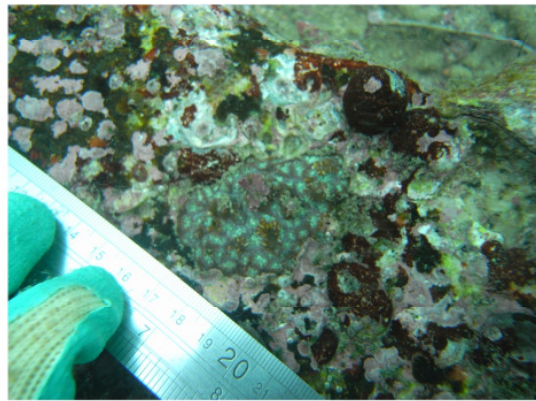
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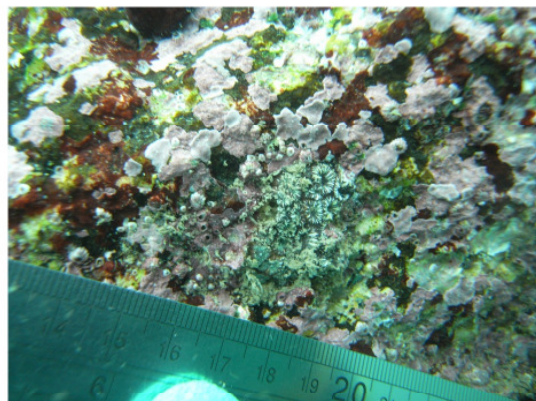
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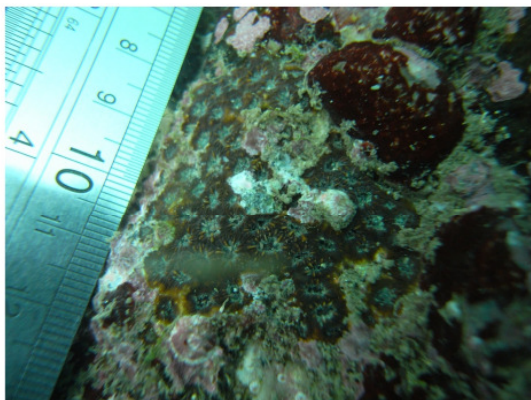
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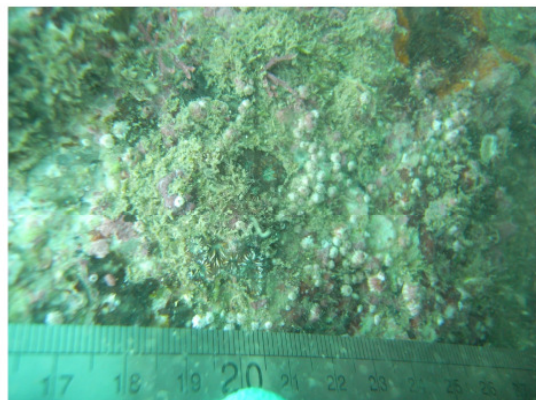
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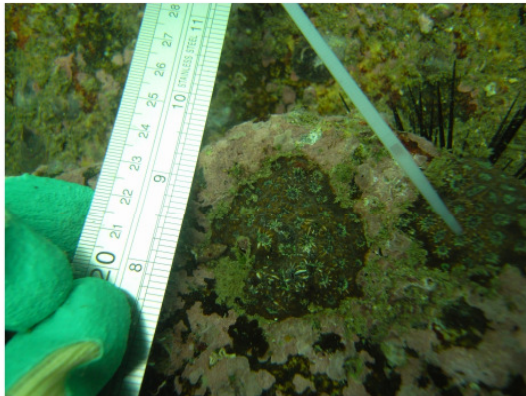
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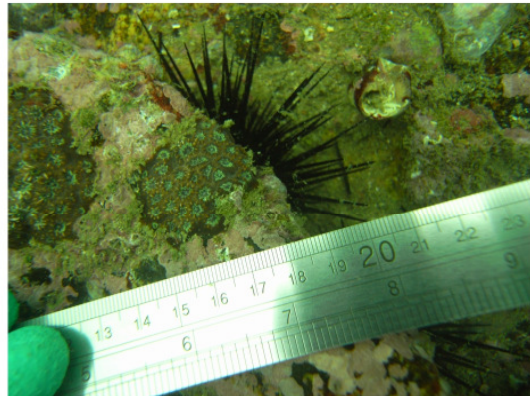
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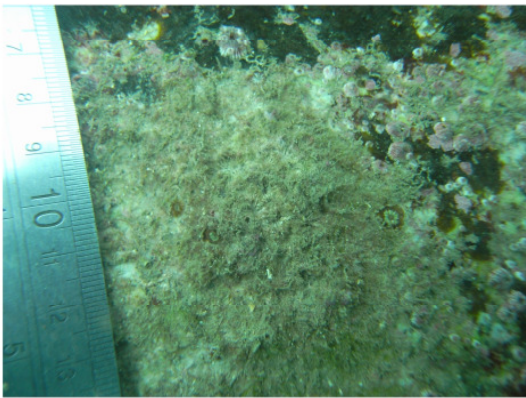
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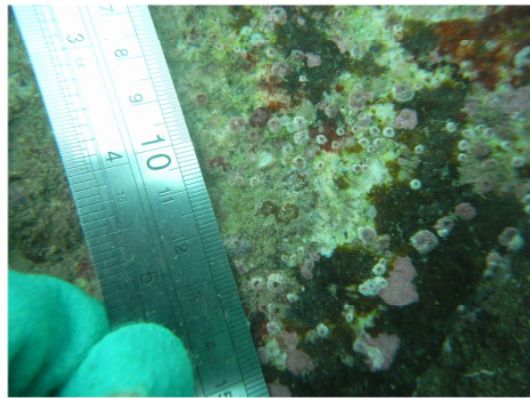
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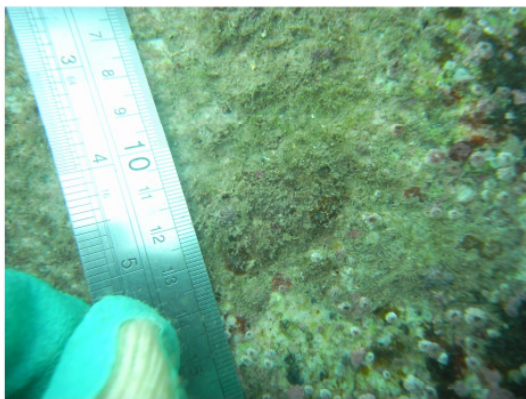
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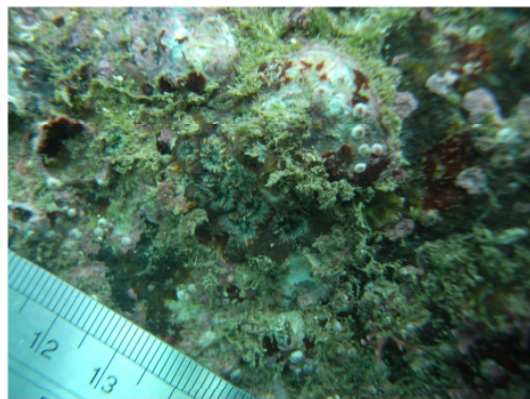
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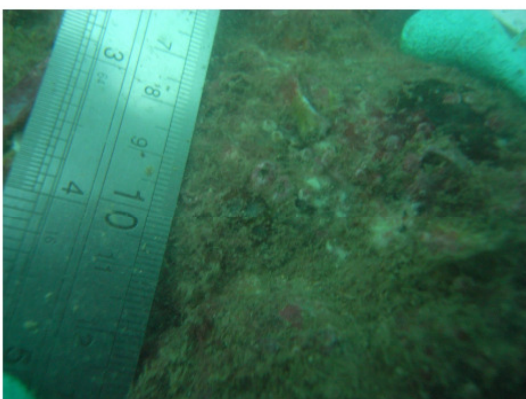
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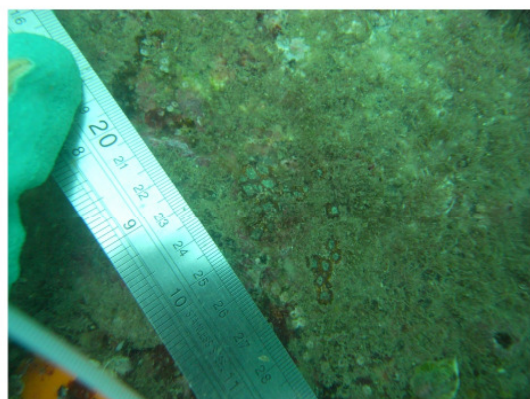
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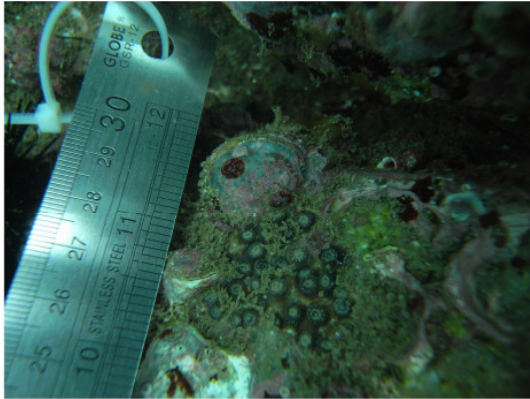
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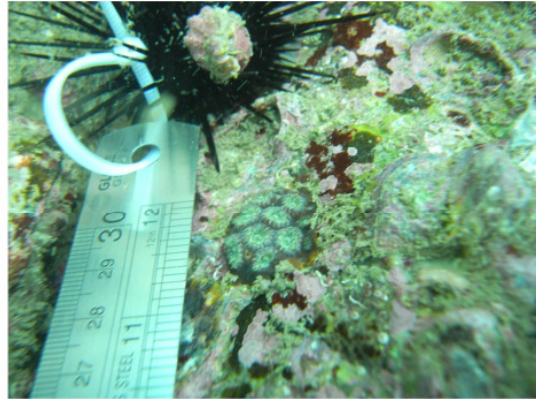
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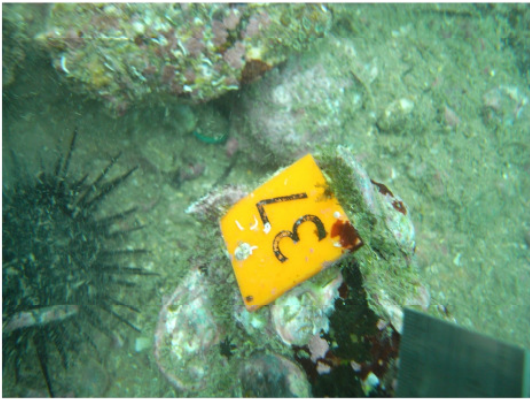
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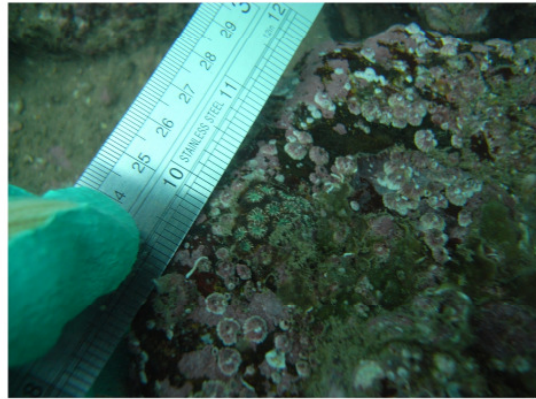
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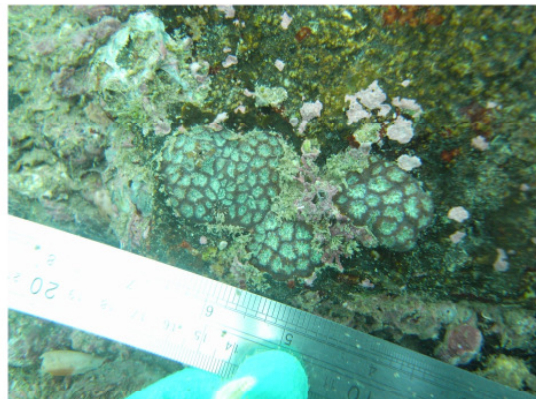
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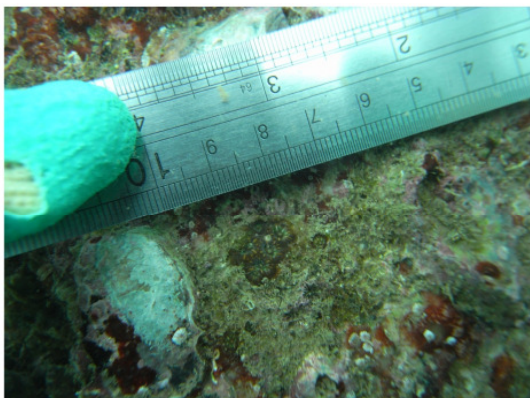
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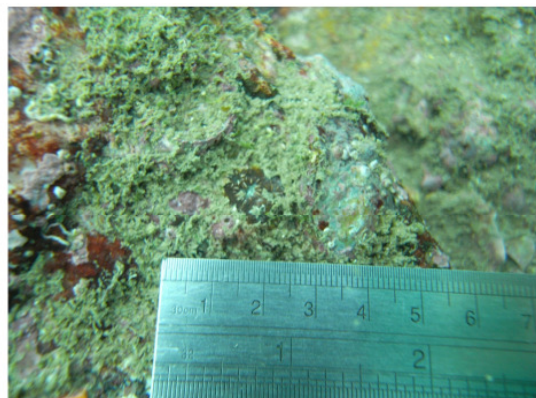
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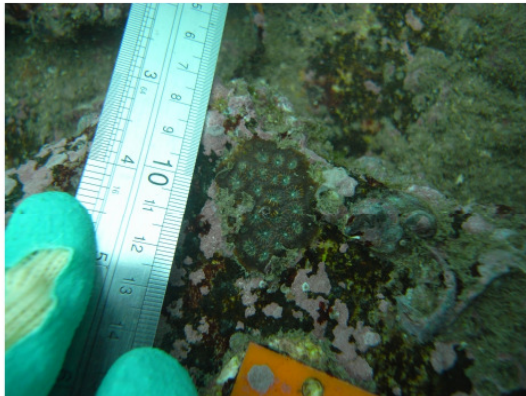
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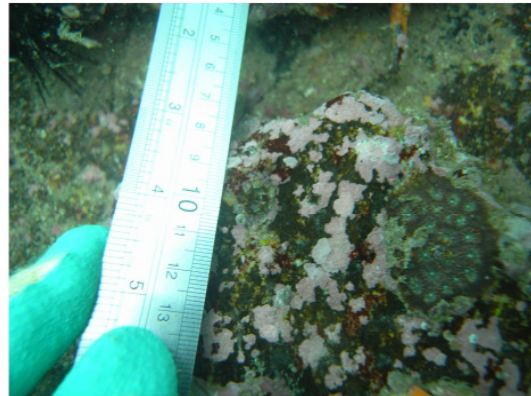
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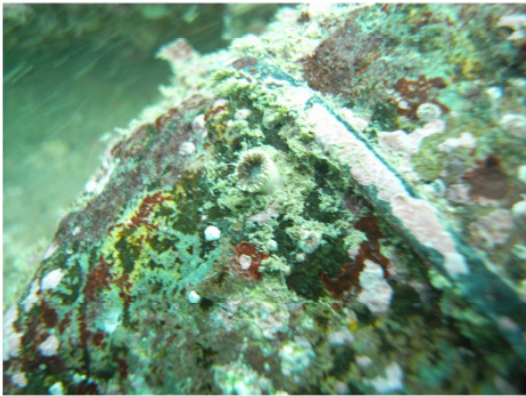
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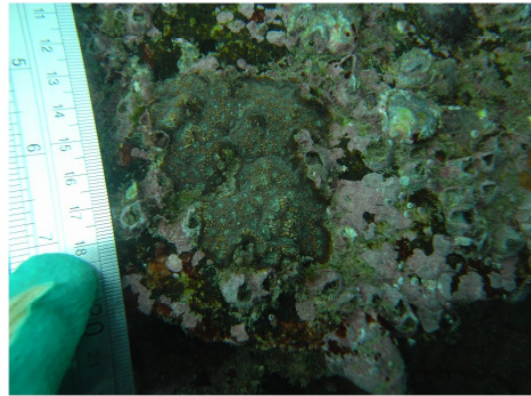
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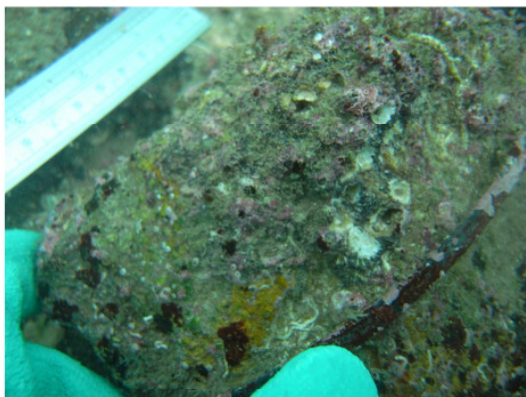
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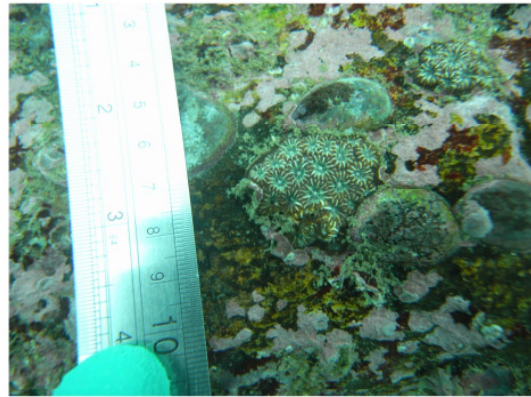
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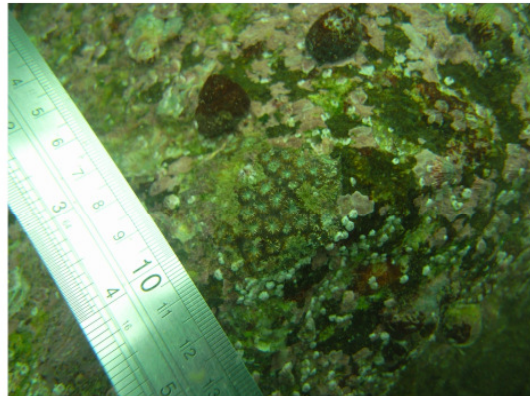
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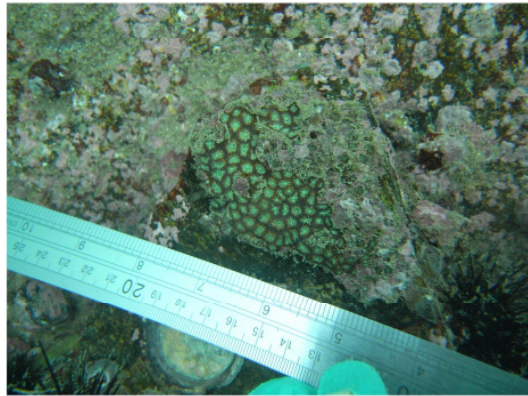
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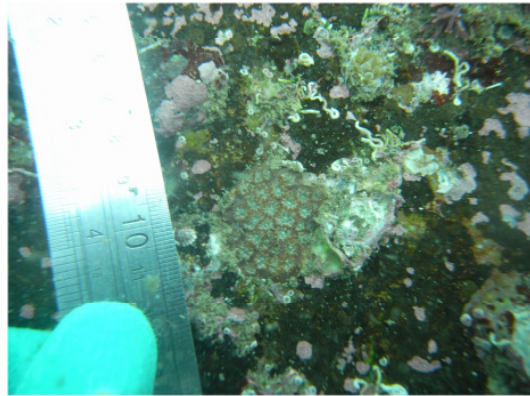
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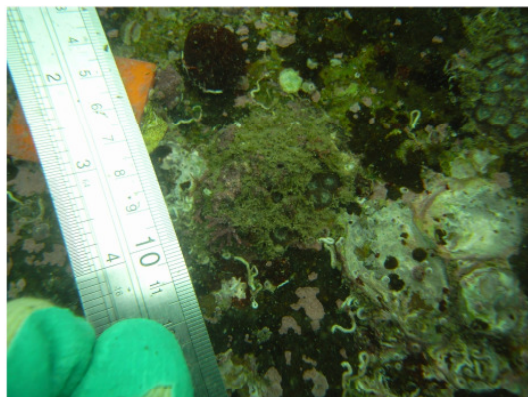
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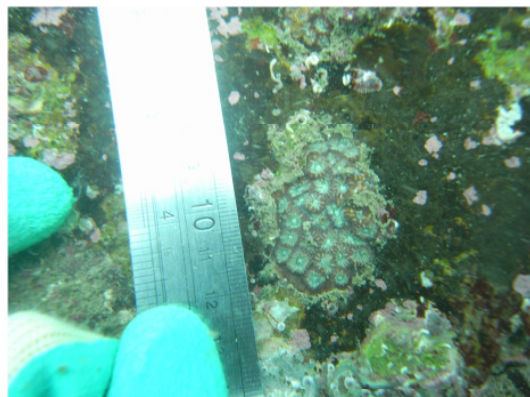
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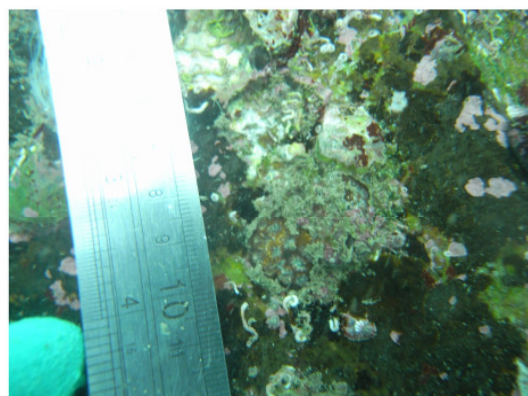
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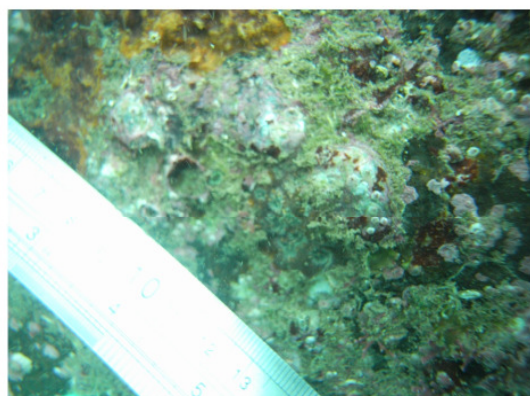
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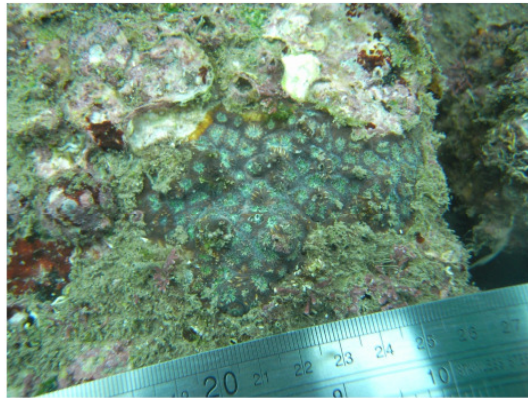
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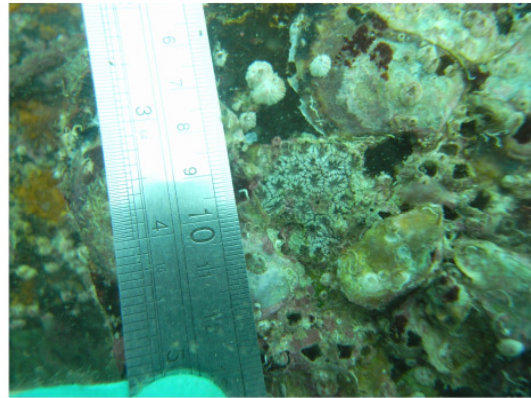
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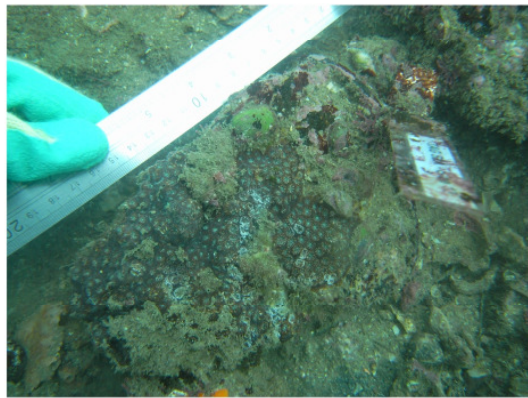
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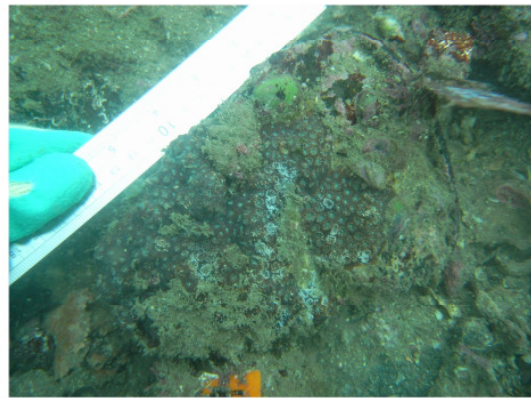
Tag No. 50



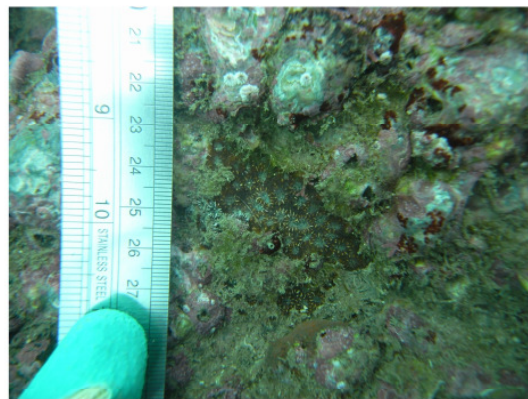
Tag No. 51



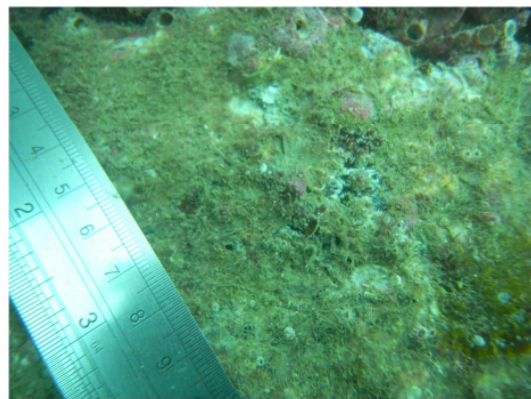
Tag No. 52



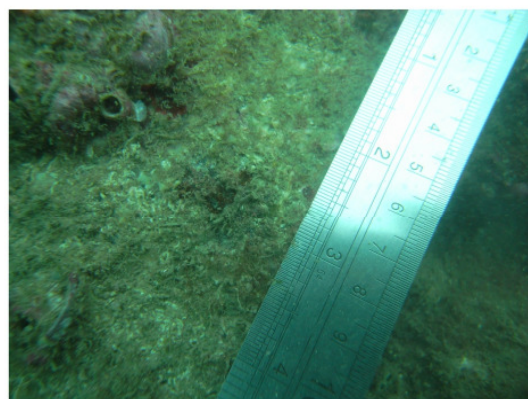
Tag No. 52



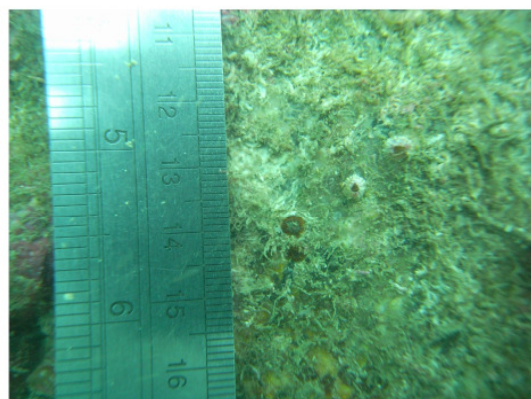
Tag No. 53



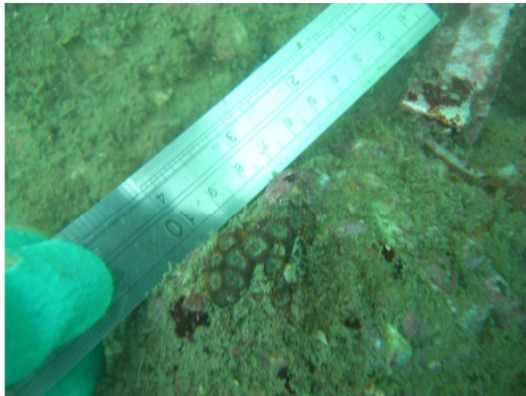
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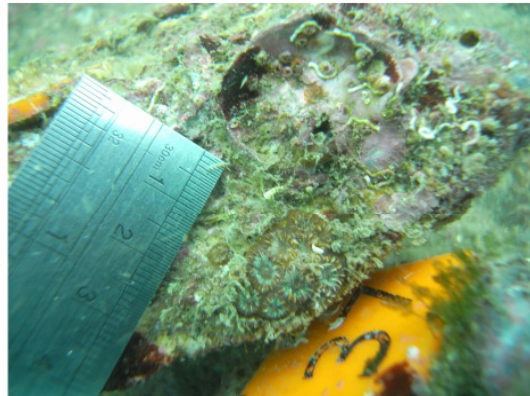
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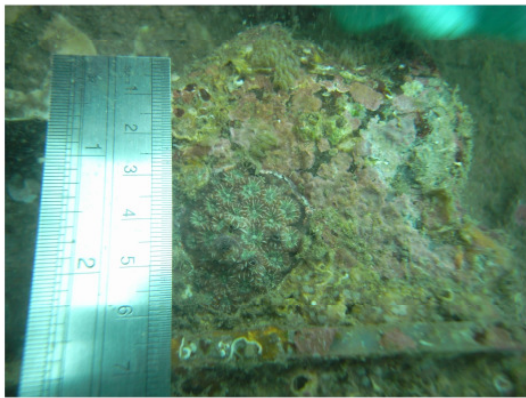
Tag No. 54



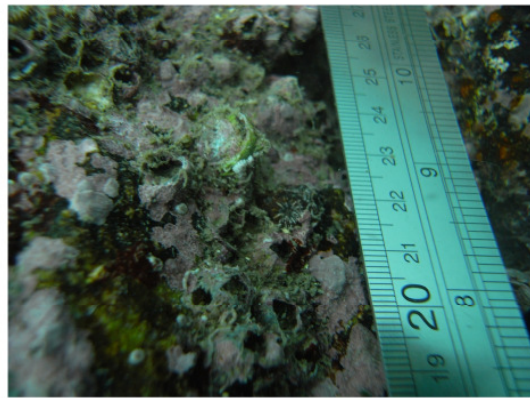
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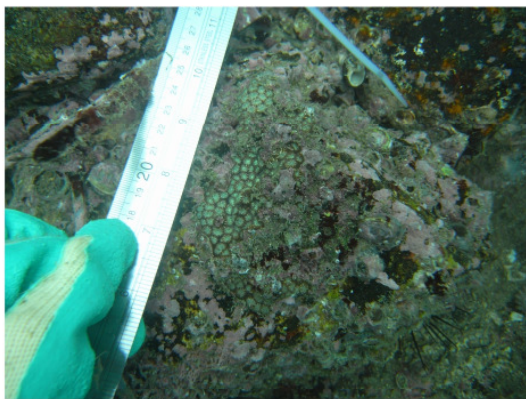
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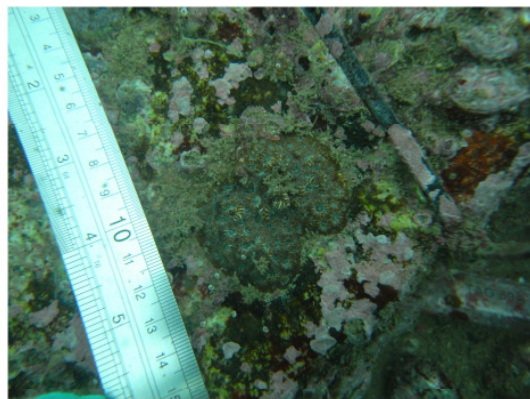
Tag No. 57



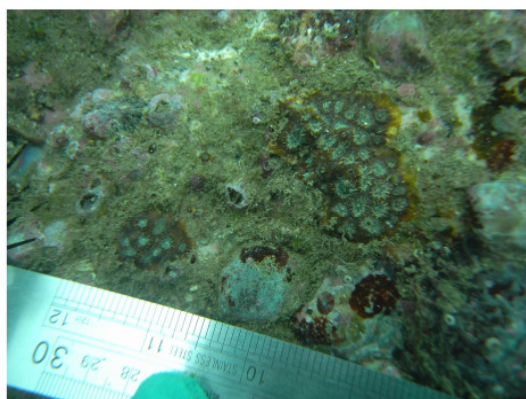
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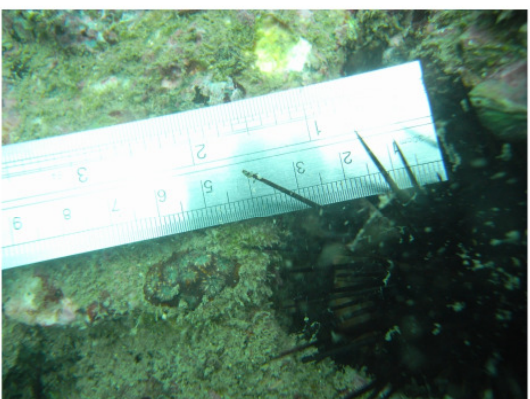
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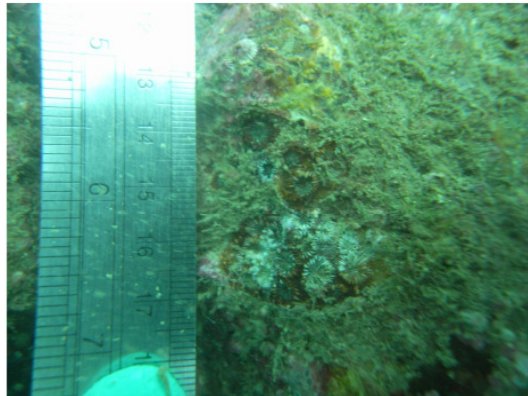
Tag No. 59



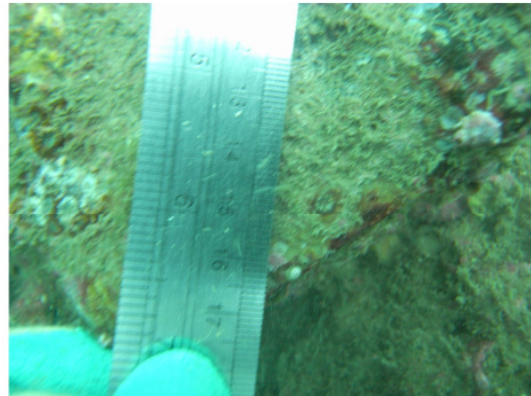
Tag No. 61



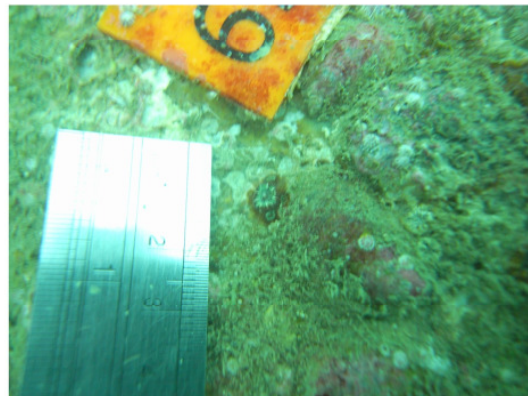
Tag No. 61



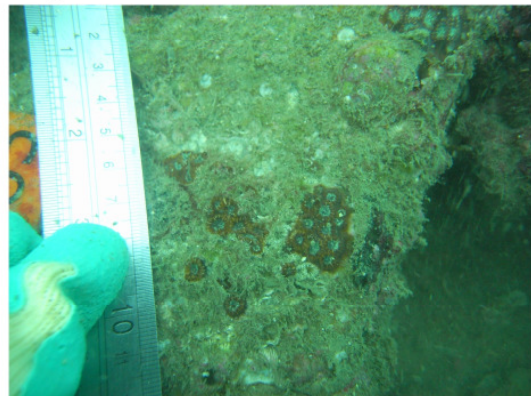
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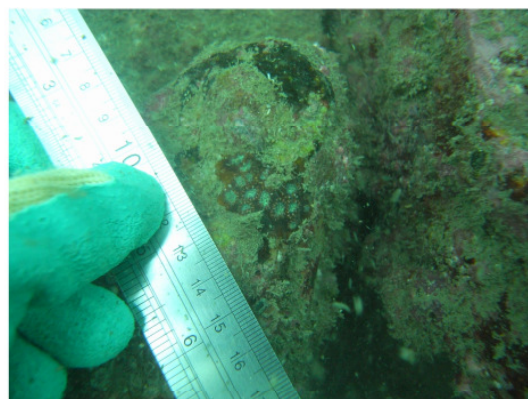
Tag No. 62



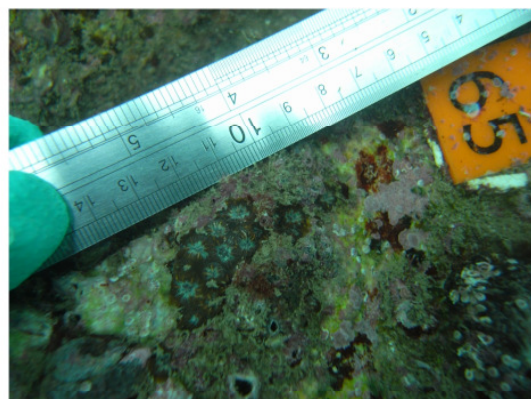
Tag No. 63



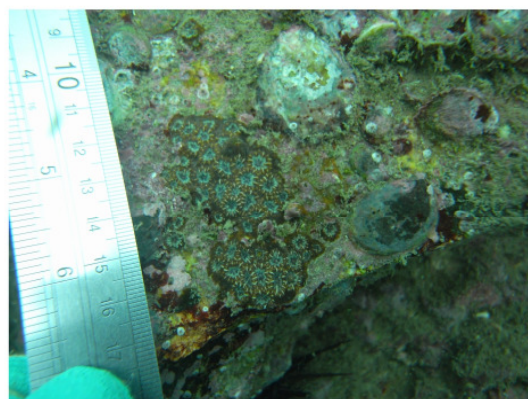
Tag No. 63



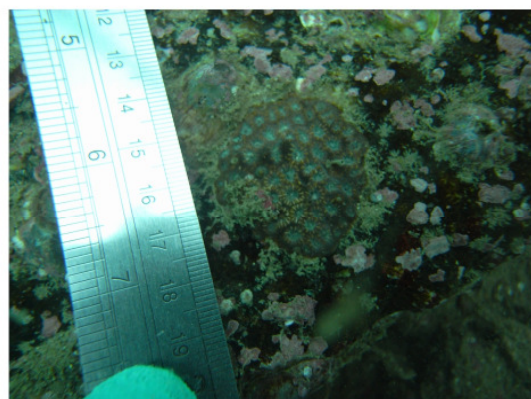
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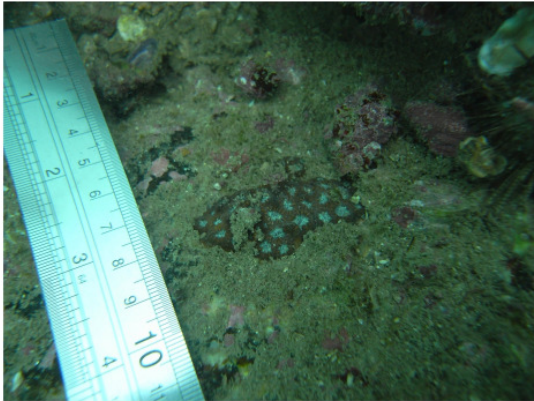
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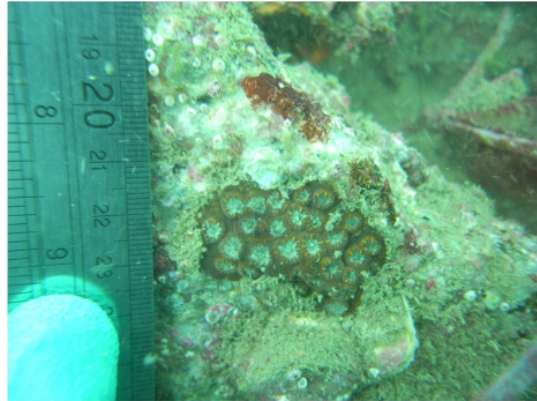
Tag No. 67



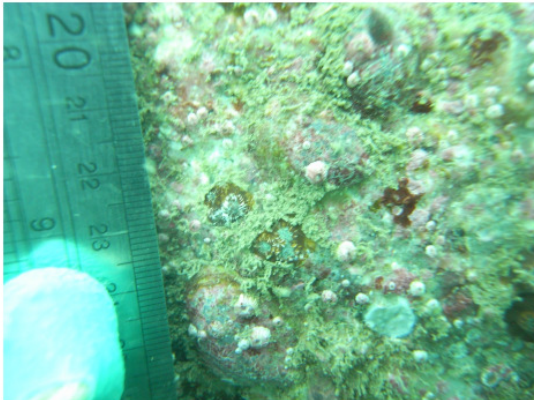
Tag No. 67



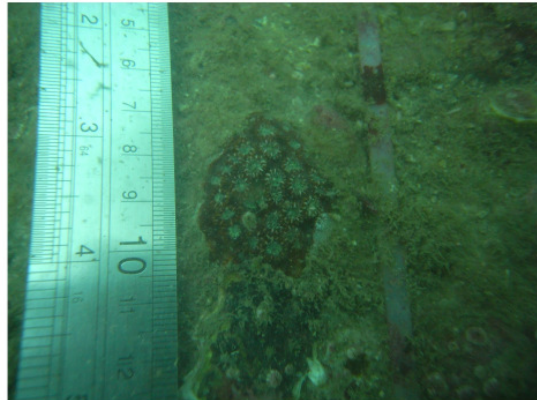
Tag No. 67



Tag No. 69



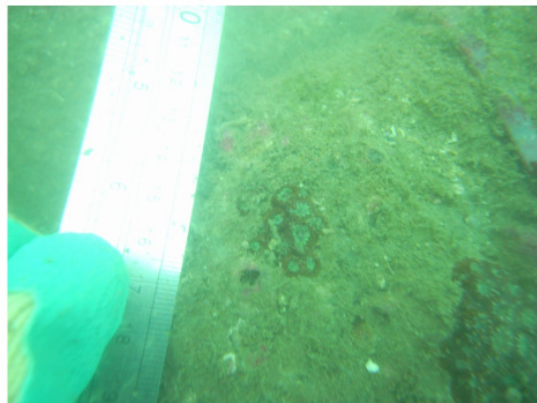
Tag No. 69



Tag No. 70



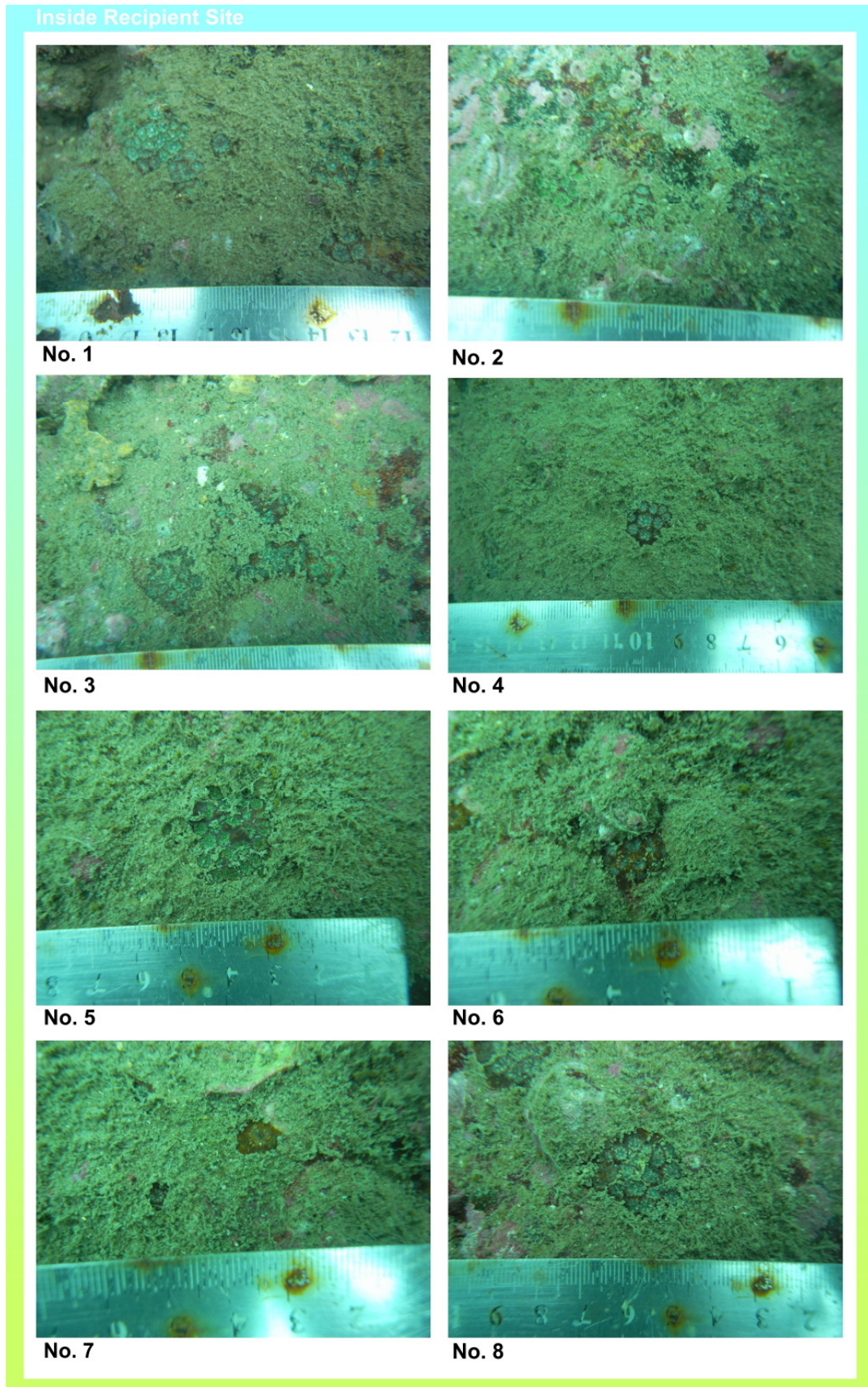
Tag No. 70



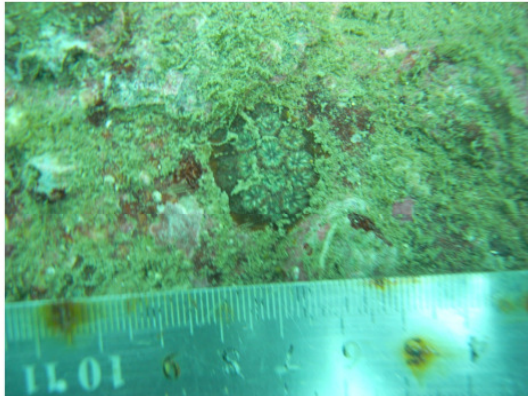
Tag No. 70

A2

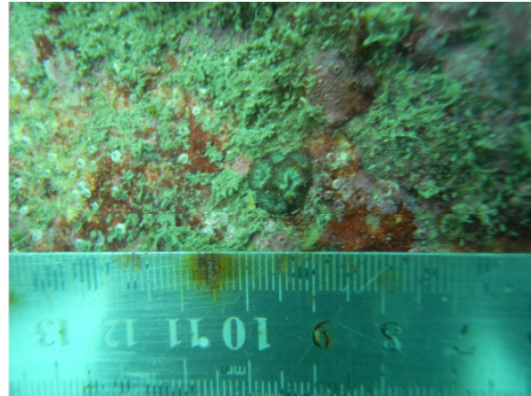
REFERENCE CORAL COLONIES (INIDE RECIPIENT SITE)



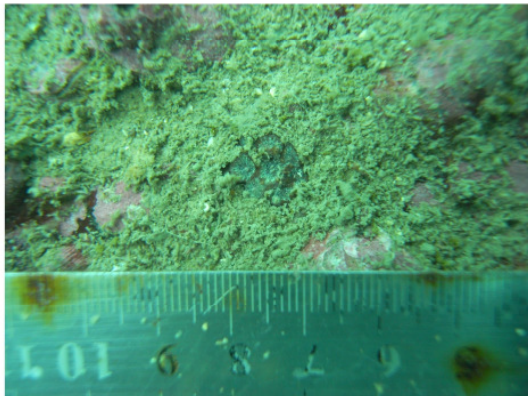
Inside Recipient Site



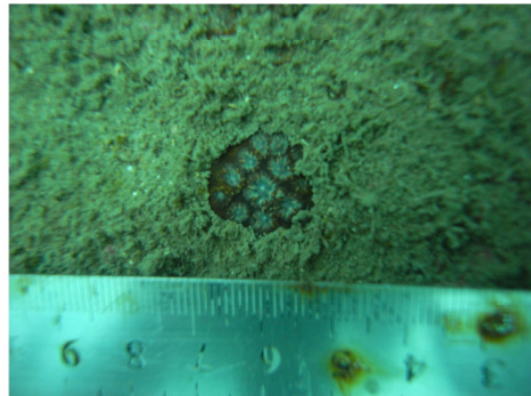
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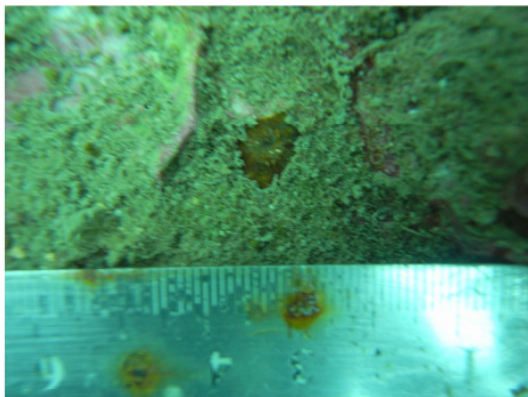
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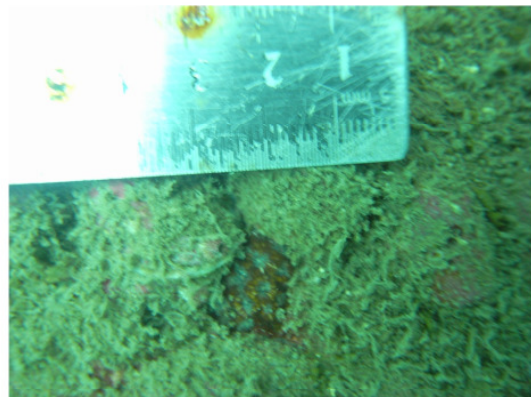
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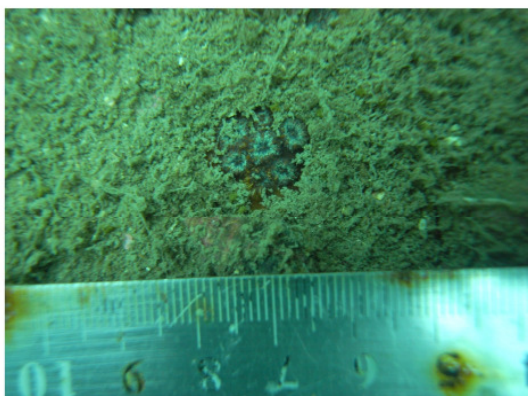
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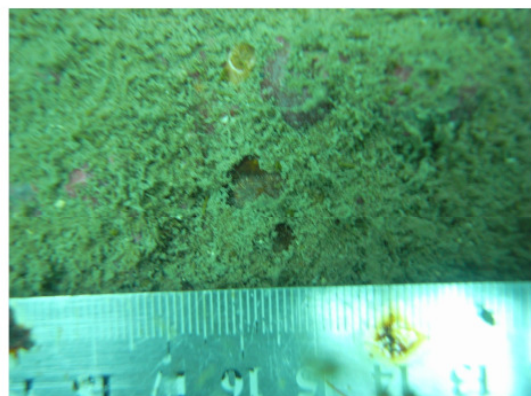
No. 13



No. 14

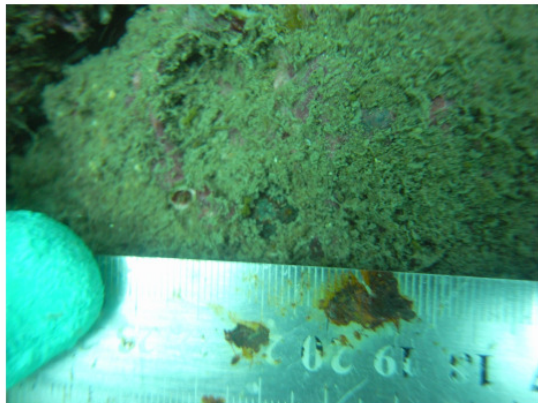


No. 15

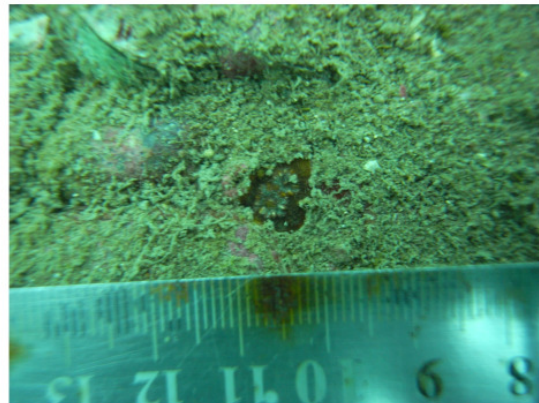


No. 16

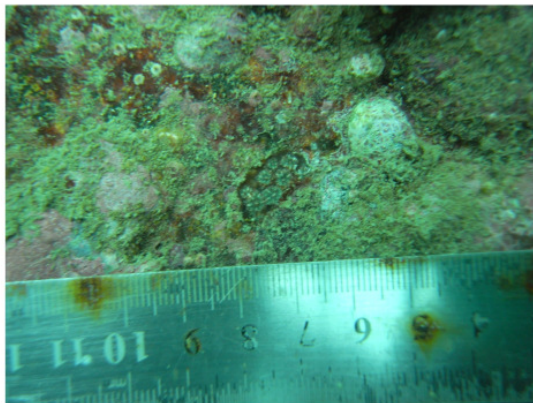
Inside Recipient Site



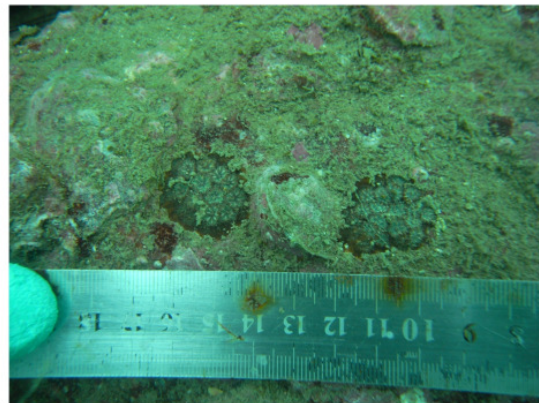
No. 17



No. 18



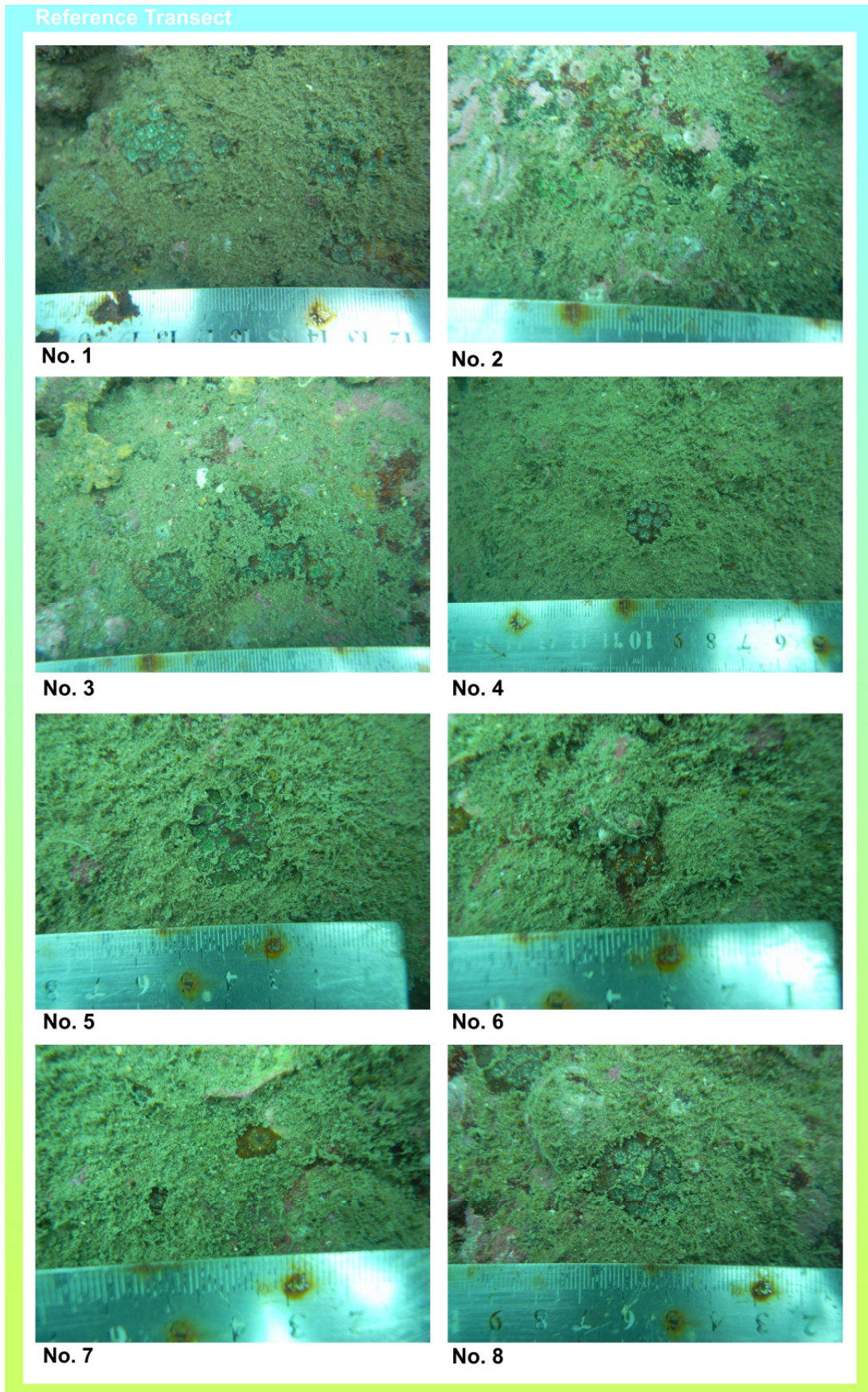
No. 19



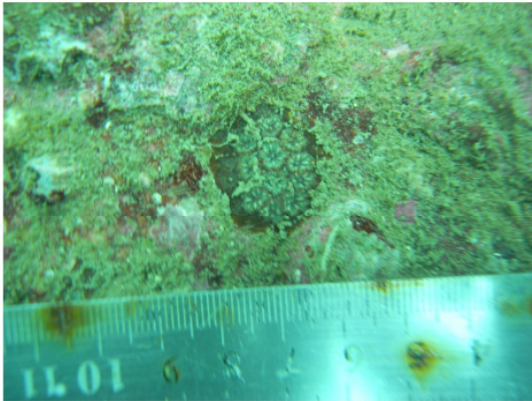
No. 20

A3

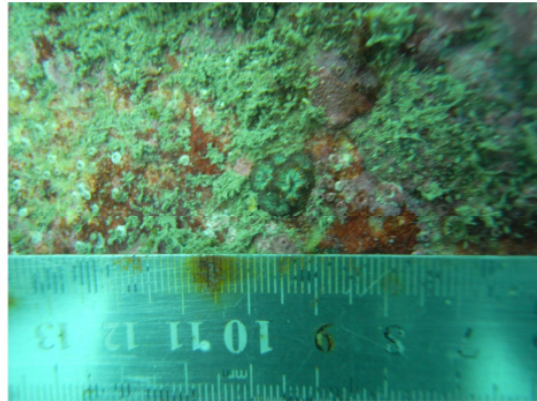
REFERENCE CORAL COLONIES (ALONG REFERENCE TRANSECT)



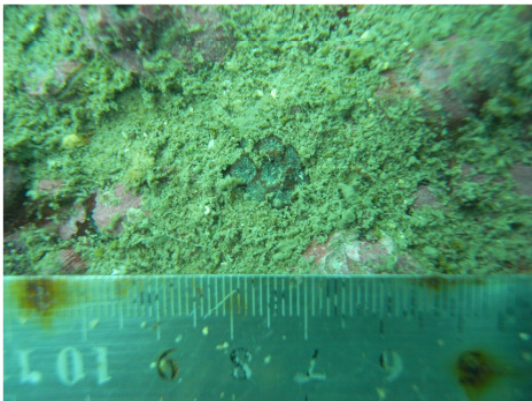
Reference Transect



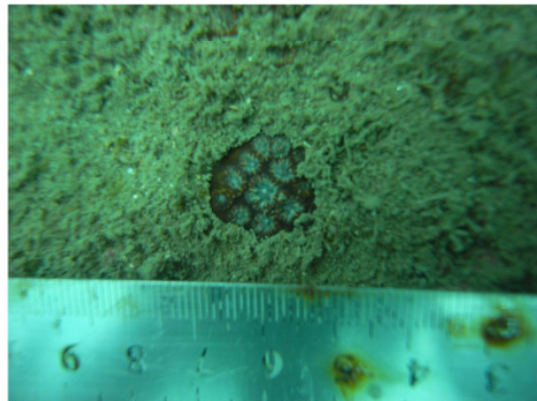
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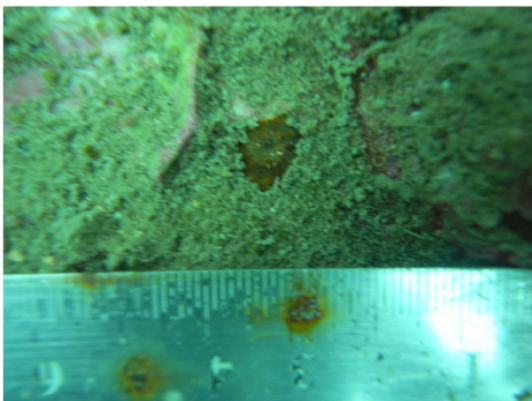
No. 10



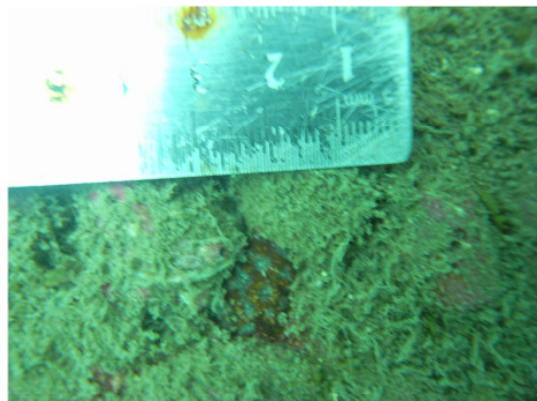
No. 11



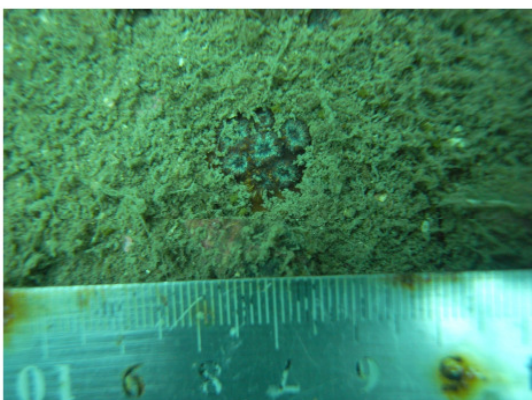
No. 12



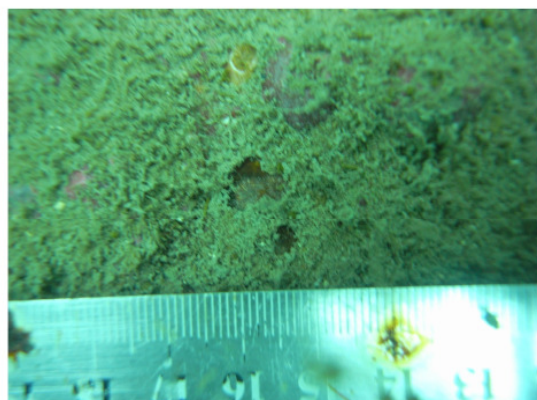
No. 13



No. 14

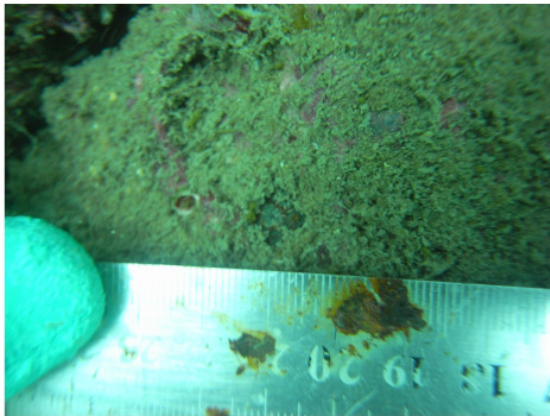


No. 15

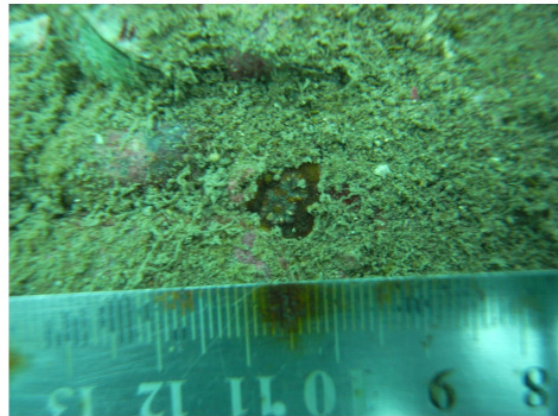


No. 16

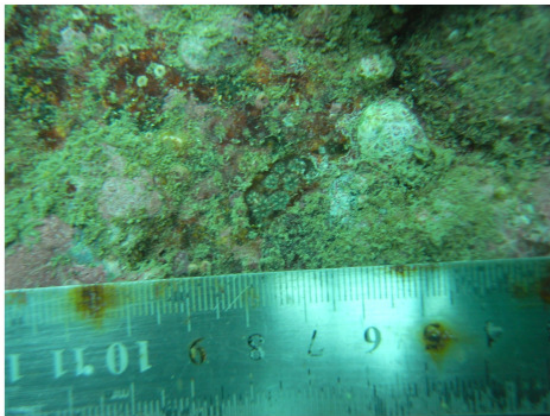
Reference Transect



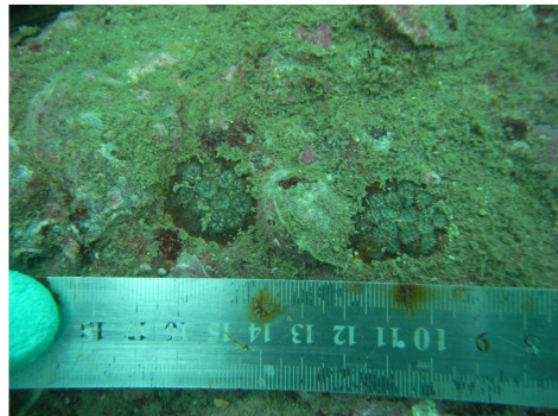
No. 17



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 <i>Oulastrea</i> 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 <i>Oulastrea</i> 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 <i>Oulastrea</i> 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 <i>Oulastrea</i> 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 <i>Oulastrea</i> 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 <i>Oulastrea</i> 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	-	-	-	-