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Ben Pace 31/10/2024

Coral Community Assessment Post-Activity Report

Scarborough Execute Environmental Monitoring Program

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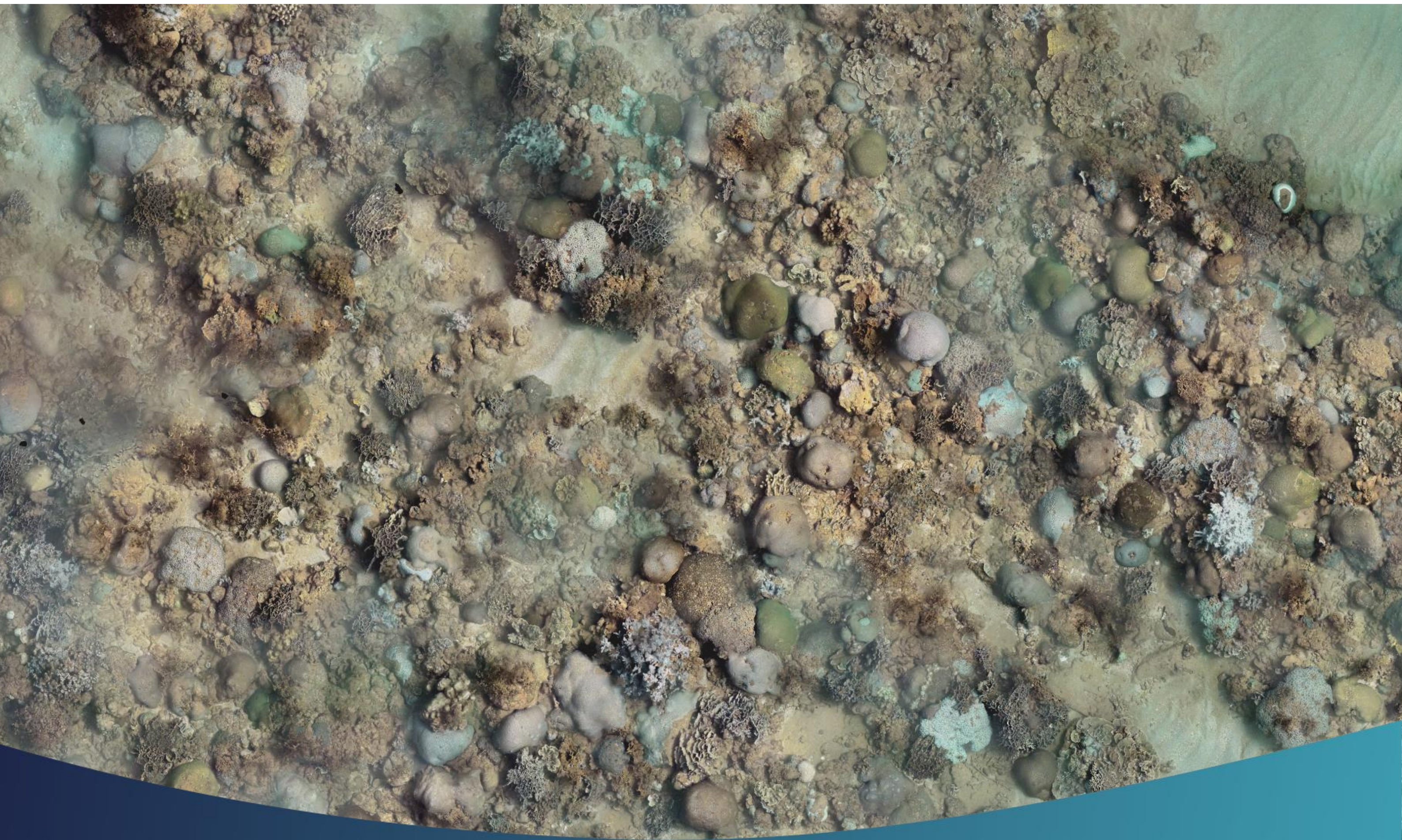

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WA Marine Pty Ltd t/as O2 Marine
ACN 168 014 819
Originating Office – Western Australia
20 Mews Road FREMANTLE WA 6160
T 1300 219 801 | info@o2marine.com.au

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Executive Summary

The proposed Scarborough development is located approximately 375 km west of the Dampier Archipelago, located in the Greater Scarborough gas fields and operated by Woodside Energy Ltd (Woodside). The proposed development targets the resource through the construction and operation of a floating production facility and multiple wells, tied back to Woodsides onshore gas processing facilities in Dampier by a 430 km trunkline.

O2 Marine has been contracted by Woodside to undertake environmental monitoring associated with trenching, spoil disposal, borrow ground dredging and backfill activities required for nearshore trunkline installation. Water quality was monitored under a Tiered Monitoring and Management Framework (TMMF) to inform management actions and prevent impacts to significant benthic communities and habitats (BCH). No exceedances of water quality management triggers were measured during the monitoring period at any Impact or Influence sites and therefore, impacts were not predicted to occur to coral as required by EPO 6-1(1).

This report presents survey data, results of the post-activity assessment of coral communities on the completion of trenching, spoil disposal, borrow ground dredging and backfill activities and performs an evaluation against the Environmental Protection Outcome (EPO) 6-1(1) in accordance with the Dredging and Spoil Disposal Management Plan (DSDMP), which relates to detection of a net reduction of live coral cover at any coral impact monitoring location attributable to the proposal.

Eighteen sites were re-surveyed using a Remotely Operated Vehicle (ROV) and orthomosaics were created from the imagery captured. Five fixed replicate digital transects of 10 m length established for the coral assessment were extracted from each orthomosaic and 30 images were extracted from each transect. Each image was analysed using ReefCloud software with 30 overlapping random points to score coral to genus level and provide estimates of coral cover and composition at each site. Summary statistics for bleached coral cover and diversity and structure were calculated for each site. The incidence of observed coral health measures including disease, sediment, predation, damage, mucus and juvenile corals were also recorded per image. An assessment against EPO 6-1(1) was undertaken in accordance with the statistical methodology in the DSDMP. *Net Coral Loss* was calculated for each Impact site as the difference in average change in coral cover within transects minus the mean change in coral cover calculated from Reference sites.

The coral community assessment determined that EPO 6-1(1) has been achieved and no management actions are required based on the outcomes of this post-activity coral community assessment report. A net reduction in live coral cover attributable to trenching, spoil disposal, borrow ground dredging and backfill activities was not recorded at any coral Impact monitoring site (CONI, CONI2 and COBN). Coral cover remained relatively stable, varying by <5%, with the exception of ANG2 (-8%) and MIDI (+13%). Community composition was comparable between surveys, dominated by either Poritidae or Acroporidae, with moderate to high diversity

across the communities. Variation in coral communities can be attributed to natural variation. Changes in coral cover at ANG2 indicate minor mortality (with correlating turf algae growth) following bleaching recorded in the pre-activity survey, while MIDI results indicate variation attributable to intermittent seasonal macroalgal growth. These results validate findings of no recorded water quality exceedances at any Impact or Influence sites during trenching, spoil disposal, borrow ground dredging and backfill activities implemented as part of the TMMF to protect coral communities.

1. Introduction

1.1. Project Background

The Scarborough gas resource, located in Commonwealth waters approximately 375 km west of the Burrup Peninsula, forms part of the Greater Scarborough gas fields. The Scarborough gas resource will be developed by Woodside Energy Limited (Woodside) as the Operator. The offshore development (Scarborough Project) targets the Scarborough and North Scarborough gas fields, through constructing multiple subsea gas wells, tied back to a semi-submersible floating production unit (FPU) moored in approximately 900 m of water in the Scarborough field. The offshore facilities are proposed to be connected to an onshore facility through a trunkline of approximately 430 km in length. Woodside plans to operate the Scarborough trunkline to transfer dry gas from the FPU to onshore gas processing facilities, coming ashore at the existing Pluto LNG plant. Construction of the trunkline in State waters requires trenching, spoil disposal, borrow ground dredging and backfill activities, managed under the Scarborough Project Dredging and Spoil Disposal Management Plan (DSDMP; Woodside 2023). The DSDMP outlines how trenching, spoil disposal, borrow ground dredging and backfill activities will be managed and complies with the Scarborough Nearshore Component Ministerial Statement No. 1172, including relevant conditions and Environmental Protection Outcomes.

The DSDMP identifies benthic habitats and communities (BCH) as a Key Environmental Factor, specifically coral cover as the most sensitive ecological receptor. A Tiered Monitoring and Management Framework (TMMF) is described in the DSDMP to achieve Environmental Protection Outcome (EPO) 6-1(1):

> *No detectable net reduction of live coral cover at any of the coral Impact monitoring locations attributable to the proposal is being, or has been, achieved*.

The TMMF is informed by water quality to manage trenching, spoil disposal, borrow ground dredging and backfill activities (trenching, spoil disposal, borrow ground dredging and backfill activities) to prevent impacts to sensitive BCH receptors. As part of the TMMF, a coral community assessment program is outlined for the purpose of validating whether EPO 6-1(1) has been met.

O2 Marine has been contracted by Woodside to undertake the coral community assessment to support the application of the TMMF as described in the DSDMP.

1.2. Activities and Management Framework

1.2.1. Scarborough Project Activity Description

Trenching along the trunkline route in State waters and disposal of dredge spoil at one of the existing Spoil Grounds 2B and/or A/B occurred between 21 July 2023 and 31 August 2023 using a combination of a trailing suction hopper dredge (TSHD) and backhoe dredge and associated split hopper barges. Trenching along the trunkline route in Commonwealth waters and associated spoil disposal at either Spoil Ground 2B or 5A was undertaken between 24 November and 20 December 2023, using a TSHD. Offshore dredging of the borrow ground and backfill activities along the trunkline route were completed between 24 December 2023 and 25 January 2024 using a TSHD.

1.2.2. Water Quality Monitoring

Using the TMMF, the objective of the water quality management program was to provide data to inform the management of trenching, spoil disposal, borrow ground dredging and backfill activities, and associated water quality, to a level where impacts are not predicted to occur to sensitive benthic receptors, to achieve Environmental Protection Outcome (EPO) 6-1(1).

The water quality monitoring program was operational between 5 May 2023 and 6 March 2024, equating to approximately 10 months of water quality monitoring data captured prior to, during and post trenching, spoil disposal, borrow ground dredging and backfill activities. Nineteen sites provided telemetered data for benthic light photosynthetic active radiation (PAR) expressed as a daily light integral (DLI; mol photons m^{-2}), turbidity, water temperature and depth. No exceedances of a management trigger (Tier 1, 2 or 3) were recorded throughout the water quality monitoring program. Therefore, impacts were not predicted to occur to coral, reactive monitoring of coral communities was not actioned during the trenching, spoil disposal, borrow ground dredging and backfill activities and water quality was considered to be managed during activities to meet EPO 6-1(1). Subsequently, no management actions are required based on the outcomes of this post-activity coral community assessment report. The results of the water quality monitoring program is presented in O2 Marine (2024a).

1.3. Objectives

This report presents a post-activity coral community assessment, conducted on the completion of trenching, spoil disposal, borrow ground dredging and backfill activities, undertaken for the Scarborough Project. The objectives of this report as stated in Section 11.3.1 of the DSDMP is to "provide data that determine whether the coral EPO specified in condition 6-1(1) is being or has been achieved" (Woodside 2023).

2. Methodology

The methodology described in the following section aligns with the coral community assessment prescribed in Section 11.3 of the approved DSDMP.

2.1. Monitoring Sites

Eighteen coral community monitoring sites were re-surveyed with site details presented in Table 1 and locations shown in Figure 1.

The sites are distributed across two of the three ecological zones established in the Dampier Archipelago (Figure 1). Ecological zones are defined in Section 5.5.2 of the DSDMP and are based on the sensitivity of benthic receptors as follows:

- Zone A – the trunkline area between the shoreline and KP8, adjacent macroalgae and mangrove habitats within Mermaid Sound, and generally all mangrove, marsh, and seagrass habitats between Nickol Bay and Point Samson. Water quality within Zone A is more turbid and coral communities comprise more sediment-tolerant or resilient species (Blakeway and Radford, 2005).
- Zone B – the trunkline area between KP8 and KP25, adjacent coral and macroalgae habitats within Mermaid Sound, and generally all coral, macroalgae and mixed community habitats between Dolphin Island and Bezout Island, including Madeleine Shoals.

2.1.1. Site Classifications

The DSDMP divided sites into three classifications based on modelling predictions of the plume generated from proposed trenching, spoil disposal, borrow ground dredging and backfill activities for the purpose of monitoring and management of potential impacts as follows:

- Impact sites: monitoring sites where plume modelling shows the Zone of Moderate Impact (ZoMI) intersects with significant coral habitat. These sites are key for the assessment against EPO 6-1(1) and will be used to determine whether there is project-attributable change to live coral cover.
- Influence sites: monitoring sites where modelling shows the Zone of Influence (ZoI) intersects with significant coral habitat. A conservative approach of categorising Influence sites as those that occur near the ZoI boundary (within 200 m). These sites may be reclassified as either Impact sites or Reference sites during the post activity assessment, dependant on whether water quality monitoring records a Project attributable exceedance of the Tier 2 management trigger or the site is not influenced by the dredge generated plume, respectively.
- Reference sites: representative monitoring sites which modelling predicts will occur beyond the ZoI and are not predicted to be impacted or influenced by the sediment plume.

Outcomes of the water quality monitoring program indicated no exceedance of any Tier 1, Tier 2 or Tier 3 management triggers attributable to the Project (O2 Marine 2024a). Therefore, modelled Influence sites (ANG2, HAUY, NWIT, SWIT, SUP2) have been reclassified as Reference sites for the purpose of this assessment.

2.2. Timing

The post-activity survey was conducted between 20 March and 31 March 2024, within three months cessation of trenching, spoil disposal, borrow ground dredging and backfill activities as required by the DSDMP.

Variable metocean conditions were experienced during the post-activity survey, with strong winds and spring tides resulting in strong currents. Visibility was reduced at a number of sites from increased turbidity associated with the recent passing Severe Tropical Cyclone Neville.

Table 1: Coral community assessment sites and function

Site Name	Site ID	Ecological Zone	Approximate Midpoint Coordinates		Depth (m LAT)	Site Classification[1]
			Easting (m)	Northing (m)		
King Bay	KGBY	A	472460	7717715	7.3	Reference
Mid Intercourse Island	MIDI	A	464007	7714213	4.2	Reference
North Withnell Bay	NWIT	A	477059	7725275	7.6	Reference
South Withnell Bay	SWIT	A	476566	7723668	7	Reference
Supply Base	SUP2	A	473431	7719656	7.5	Reference
Angel Island	ANG2	B	477683	7731669	8.6	Reference
Conzinc Bay North	COBN	B	479575	7728711	6.5	Impact
Conzinc Island	CONI	B	476837	7729162	4.8	Impact
Conzinc Island 2	CONI2	B	476370	7728639	7.1	Impact
Courtney Shoal	CRTS	B	469188	7736562	10.9	Reference
Flying Foam Passage	FFP1	B	480983	7734093	9.2	Reference
Gidley Island	GIDI	B	478791	7736373	9.4	Reference
Hamersley Shoal	HAM3	B	478293	7746612	6.9	Reference
Hauy Island	HAUY	B	4969295	7739185	7.5	Reference
High Point	HGPT	B	467025	7728715	9.3	Reference
Lady Nora Island	LANI	B	460932	7739108	2.5	Reference
Legendre Island	LEGD	B	483388	7749405	7	Reference
Malus Islands	MAL2	B	464559	7730303	5.6	Reference

[1] Reclassified site classifications following outcomes of the water quality monitoring program (O2 Marine 2024a). Note Influence sites have been reclassified as Reference sites for the post activity assessment as water quality monitoring results demonstrated that each Influence site was not influenced by the dredge generated plume.

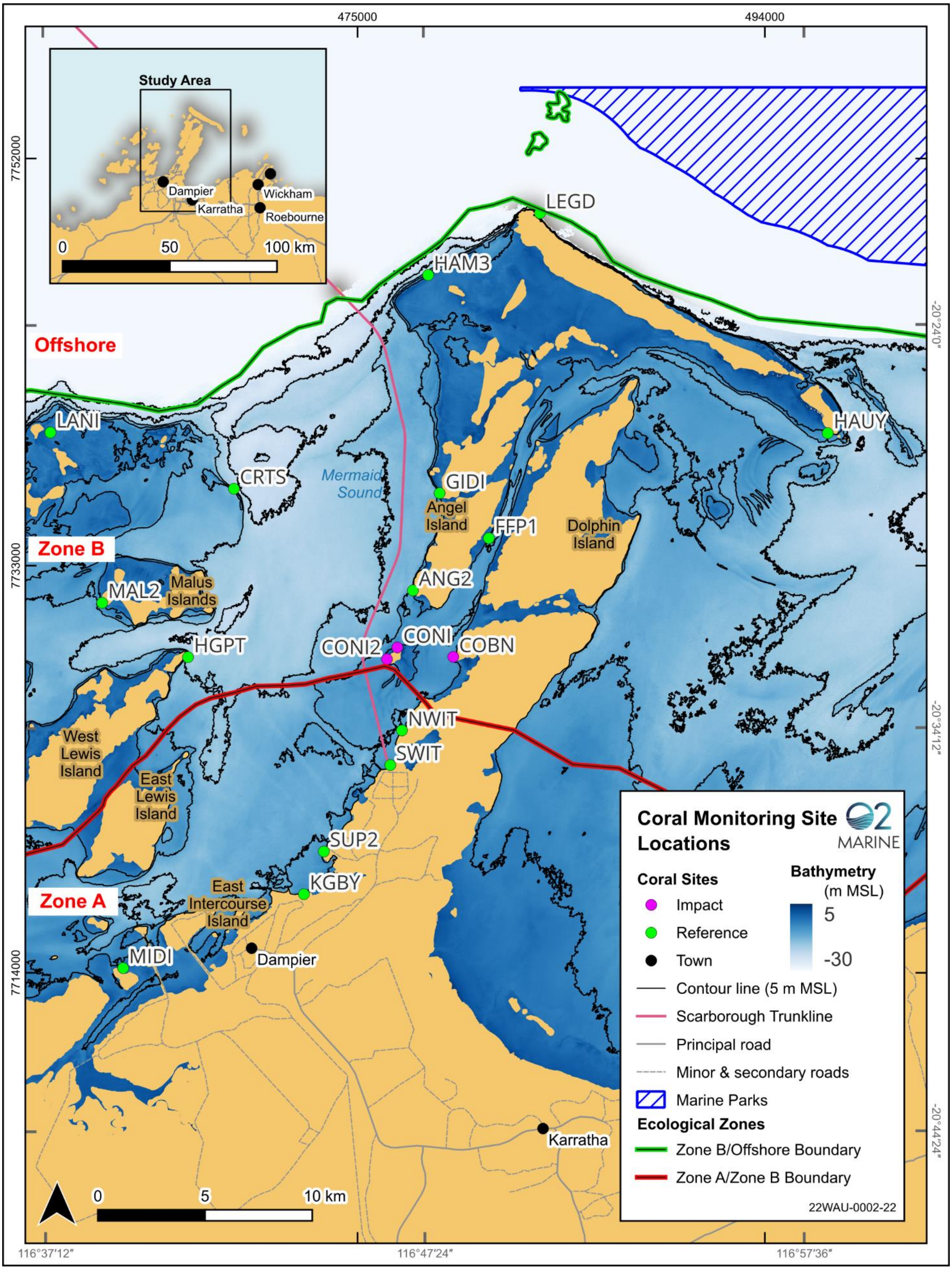

Figure 1: Location of sites for coral community assessment and site classification.

2.3. Survey Methods

2.3.1. Remotely Operated Vehicle Survey

Prior to deployment of the Remotely Operated Vehicle (ROV), site boundaries were established by overlaying site boundaries onto the ROV navigation software and placing floats in the corners of the designated area to provide a visual mark of the boundary. To maximise overlap with the pre-activity survey, each site boundary was a minimum of 12 m x 12 m. Where possible, a larger area was surveyed, such as LEGD (20 m x 24 m).

An Oceanbotics SRV-8X was used for the post-activity survey, fitted with a SeaTrac ultra-short base line (USBL) system, including multibeam sonar for improved positioning. The ROV was fitted with three cameras, including an additional downward facing high resolution camera to provide a wider area of coverage. The intervalometer on the cameras was used to take photos every one second throughout deployment. To enable measurements to be performed on the final orthomosaics, a scale bar was placed on each site and was included in the photos.

On deployment of the ROV, the USBL navigation system was used to transit to the site boundary. The ROV transited across repeated parallel lines within the site boundary and coverage assessed using live positioning of the ROV. On completion of the planned survey lines, the ROV then returned to any areas identified as not covered and captured additional imagery. The ROV flew targeting a speed of approximately 0.7 knots at an altitude of approximately 1 m. Under low visibility conditions, the ROV flew closer to the substrate and the height determined from the live video feed of the ROV.

The objective was to survey the entirety of the area enclosed within the boundary, however, challenges arising from environmental conditions, such as strong currents and reduced visibility, coupled with positioning related limitations in shallow water, occasionally prevented complete coverage of the survey site. Nevertheless, the spatial area surveyed at each site was sufficiently large to cover the five replicate 10 m transects established in the pre-activity survey (O2 Marine 2024b).

2.3.1.1. Field Quality Control

Due to the volume of imagery, an alignment of data capture was conducted after the field survey day. An 'alignment' is the first phase of an orthomosaic creation and provides an indication of the photo coverage across the site. If any gaps or areas of insufficient coverage were detected, the ROV was redeployed on a subsequent field day to capture additional photos and achieve comprehensive coverage suitable for analysis.

2.3.2. Photogrammetry

Orthomosaics for each site were created using the photogrammetric software Agisoft Metashape. The orthomosaics created for each site are provided in Appendix A.

Feature matching was used to align the post-activity orthomosaic to the pre-activity orthomosaic. Five 10 m transects established in the pre-activity survey were then identified and extracted from the post-activity orthomosaic (Figure 2).

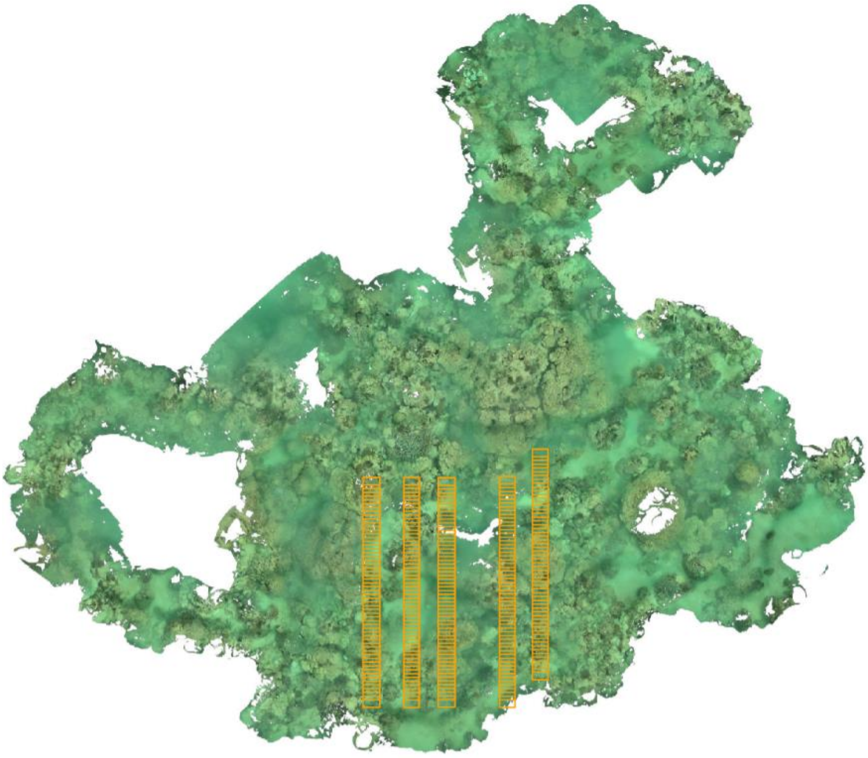

Figure 2: ANG2 orthomosaic with five digital transects established in the pre-activity survey. White patches indicate areas where photogrammetry software was unable to combine images, or data was unavailable.

Thirty (30) overlapping digital quadrats (approximately 0.5 m x 0.7 m) per transect were extracted from the orthomosaic (Figure 3). The individual quadrats were then analysed using ReefCloud (ReefCloud, 2024).

Figure 3: Example of a repeat quadrat surveyed at ANG2.

2.4. Image Analysis

To determine the cover of benthic habitats, quadrats were analysed using the online coral analysis program, ReefCloud (ReefCloud 2024a). ReefCloud is a resource for benthic image analysis which deploys deep neural networks to allow fully and semi-automated classification of points per image (González-Rivero et al. 2020). Thirty points were randomly overlaid on each image and artificial intelligence machine annotations were generated to classify the benthic habitat beneath. These automated annotations were then verified by a marine scientist for accuracy.

Benthic organisms and physical seabed features below each point were classified based on a list of 166 classifications shown in Appendix B. Hard corals were identified to genus level where possible, while other benthic flora and fauna were classified into broader groups. The classification list for scoring included a bleached coral option for each hard coral identification.

Observations of coral stressors (i.e., disease, sedimentation, mucus production, predation, damage) and juvenile colonies (approximately <15 cm diameter) were recorded as the number of colonies per image.

2.4.1. Image Analysis Quality Control

Automated annotations produced by ReefCloud were verified by a team of marine scientists and adjusted where necessary as a semi-automated process. The verified image analysis dataset created in the pre-activity survey was utilised as a training program to enhance consistency between surveys and scorers. Additionally, a curated coral identification guide specific to the Dampier Archipelago was developed and utilised.

To avoid inter-scoring bias, a subset of classifications from each annotator were reviewed and verified by a coral taxonomy expert with significant experience in Dampier Archipelago corals and point scoring analyses.

Taxonomic classifications were confirmed using:

- Taxonomic guides (Richards 2018, Kelley 2022; and online sources; primarily Veron et al. 2016)
- A curated reference collection of images assigned a taxonomic classification.
- The experience of the annotators and regular quality checks by a coral taxonomy expert.

ReefCloud model validation achieved an accuracy score of 0.68 (68%), and an F1 score of 0.65. Accuracy is the percentage of all auto-classified annotations that align with human verification. The F1 score accounts for data distribution and combines precision and recall metrics. The F1 score is more useful when classes are imbalanced (i.e., rare or cryptic classes or groups). Generally, the higher the accuracy and F1 scores, the better the artificial intelligence model can classify observations. The potential for annotator subjectivity in scoring is significantly reduced where close to 70% of all points have been classified correctly using the artificial intelligence model (ReefCloud 2024b).

2.5. Data Analysis

Data analysis was carried out in the R statistical package (R version 4.4.1) using RStudio, utilising the semi-automated annotated points. Percent cover data was calculated as the relative proportion of a benthic category from all classifiable points per transect.

2.5.1. Coral Community Assessment

Benthic cover analysis presents results separated into four functional groups at the highest level: Coral, Flora (algae, seagrass), Other benthic invertebrates (soft corals, octocorals, invertebrates) and Abiotic (substrate, dead coral). Unless otherwise specified, coral cover and communities refers to hard coral. Soft corals captured in 'Other benthic invertebrates' or described specifically. The mean and standard deviation (SD) for each site were derived from the transect sums. Bleached corals with white colour were assumed to be alive when calculating coral cover. This is because corals can survive without zooxanthellae for a period after bleaching

(Marshall & Schuttenberg, 2006). Recently dead coral was distinguished from bleached coral through colonisation of algae and colour changing to a green-brown appearance.

Coral categories were aggregated to family level for community composition analysis due to low representation of many genera across the archipelago. The composition of the coral community is presented as the mean of coral families within a site relative to total coral cover. Families were listed in decreasing order of composition across all sites and seven families that comprised up to 92% of overall composition are shown in outputs, while the remaining 18 families (8%) were consolidated into an 'Other' coral category. The composition of bleached coral was also presented at a family level calculated as site means of coral families within a site relative to bleached coral cover. Bleaching was categorised in accordance with the Australian Institute of Marine Science (AIMS) bleaching classification levels: Major (>30% - 60%), Moderate (>10% - 30%), Minor (>0% – 10%; AIMS 2022).

The coral communities within sites were characterized by five (5) diversity indices, calculated at genus level: 'Richness', 'Margalef's richness index', 'Shannon's diversity index', 'Shannon's evenness index', and 'Simpson's dominance index'. Diversity indices are mathematical measures of the diversity and richness of taxa that provide more information about community composition than raw abundance.

'Richness' (S) is the number of categories (in this case, coral genera) present at each sampling unit. Margalef's richness index (*d*) is a measure of the number of taxa present for a given total number of individuals. It was one of the first attempts to compensate for the effects of sample size on richness indices by dividing the number of species in a sample by the natural log of the number of organisms collected:

$$d = \frac{S - 1}{\log_b(N)}$$

where *S* is the number of taxa, *N* is the total number of measurements and *b* is the base of the logarithm (typically natural base). Values of Margalef's index range from zero (0) to eight (8) and higher values indicate a higher diversity of species.

Shannon's diversity index (*H'*; Shannon's H) is the most commonly used diversity index, which accounts for both abundance and evenness of the species present. It is defined as:

$$H' = -\sum_{i=1}^{S} p_i log_b(p_i)$$

where p_i is the proportional abundance of species *i* and *b* is the base of the logarithm (typically natural base).

Pielou's evenness index € expresses how evenly the individuals (observations) are distributed among the different species (or other taxonomic levels). Evenness is scaled on a value between zero (0) and one (1), with one (1) representing the case where all taxa are present in equal numbers:

$$E = \frac{H'}{ln(S)}$$

where H' is the Shannon diversity index and S is the species richness.

Dominance (*D*; 1-Simpson index), expresses the degree to which the number of members one or more categories is/are more numerous than those in the other categories. Index values range from zero (0), where all categories are equally present, to one (1), where one category dominates the community completely:

$$D = 1 - \sum_{i=1}^{S} p_i^2$$

Observations of juvenile corals, coral health and stressors such as disease, predation and mucus were recorded for all colonies within transects across each site.

2.5.2. Assessment Against EPO 6-1(1)

An assessment against EPO6-1(1) was undertaken to align with the procedure described in Section 11.3.5.1 of the DSDMP.

In summary, change in hard coral cover (△CC) was calculated per transect ($\triangle CC_{transect}$) by subtracting the post-activity coral cover from pre-activity coral cover. Mean △CC was then calculated for each site by averaging $\triangle \textit{Coral cover}_{transect}$. △CC was assessed at each Reference site to determine suitability for inclusion in the Reference site pool required for the assessment. Net Coral Loss was determined for each Impact site as the $\triangle \textit{ Coral Cover}_{\textit{Impact site}}$ minus the mean estimate of average coral cover across Reference sites ($\triangle \textit{ Coral Cover}_{\textit{Reference sites}}$):

$$\textit{Net Coral Loss}_{\textit{Impact Site}} = \triangle \textit{ Coral Cover}_{\textit{Impact site}} - (\textit{average} \triangle \textit{ Coral Cover}_{\textit{Reference sites}})$$

If negative, net coral loss at the Impact site was less than that recorded across Reference sites and thus does not constitute Net Loss. If positive, *Net Coral Loss* at the Impact site is greater than that recorded across Reference sites. In the latter case, a one-sided F-test (Variable 1: sum of squares of $\triangle CC_{\textit{Reference sites + Impact site}}$; Variable 2: sum of squares of $\triangle CC_{\textit{Reference sites}}$) was then performed to test whether net loss at the Impact site was significantly greater than changes recorded at Reference sites.

3. Results

3.1. Assessment Against EPO 6-1(1)

Results of the assessment against EPO: *No detectable net reduction of live coral cover at any of the coral Impact monitoring locations attributable to the proposal is being, or has been, achieved* is presented in Table 2 and Figure 4. All Reference sites (n=15) were pooled and included in the EPO assessment against all Impact sites[2]. The results indicate that *Net Coral Loss* was recorded at COBN only, although was not significant in comparison to Reference sites.

Net Coral Loss was not recorded at CONI and CONI2 (i.e. a negative value in Table 2), indicating losses were greater across Reference sites than recorded at these Impact sites. The assessment validates the findings of no recorded water quality exceedances at any Impact (or Influence) site during trenching, spoil disposal, borrow ground dredging or backfill activities, implemented as part of the TMMF to protect sensitive benthic receptors. Hence, no detectable net reduction of live coral cover was recorded at any of the Impact monitoring locations as a result of the Project in accordance with EPO 6-1(1).

Table 2: Summary of EPO assessment evaluation for changes in coral cover at impact sites

Site	Zone	Classification	Net Coral Loss	F-test	p-value	EPO 6-1(1) met?
COBN	B	Impact	1.083%	F=0.504	p=0.449	Y
CONI	B	Impact	-0.781%	Not required as no net loss		Y
CONI2	B	Impact	-2.257%	Not required as no net loss		Y

[2] Preliminary inspection of results indicated that △CC was relatively consistent between sites, so statistics were precautionarily calculated using all Reference sites. If the one sided F-test ad indicated a significant difference in Net Coral Loss, further investigation in the suitability of each Reference site for the assessment would have been triggered as part of a larger analysis, if required.

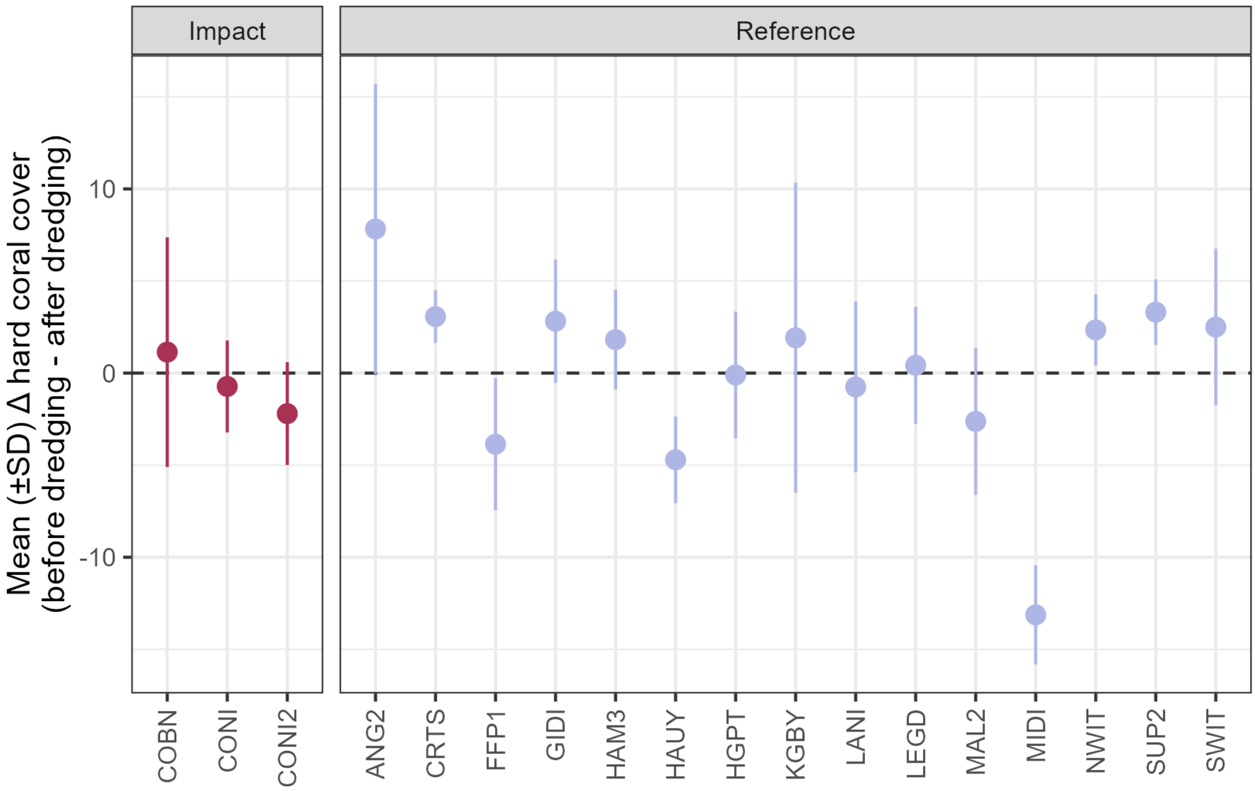

Figure 4: Mean change in hard coral cover per site.

3.2. Site Specific Summaries

Specific site characteristics are described in Section 3.2.1 and 3.2.2. In summary, benthic cover and composition was relatively consistent between surveys (Figure 5, Figure 6; Table 3).

Coral cover varied by less than 5% at all sites except ANG2 (-8%) and MIDI (+13%). Bleaching was observed to be affecting a smaller proportion of the hard coral community, ranging from 3% to 16% (Figure 7), compared to 5% to 33% recorded in the pre-activity survey. Reductions in coral cover, or abiotic substrate, generally correlated with an increase in Flora, typically turfing algae colonising dead coral or rubble (Figure 5). Specifically, changes in coral cover at ANG2 correlate with turf algae growth, likely associated with bleaching recorded in the pre-activity survey, whilst increases in cover at MIDI indicate variation attributable to intermittent seasonal macroalgal growth.

Community composition of coral communities was also comparable between surveys (Figure 6; Table 3). Sites were either dominated by Poritidae or Acroporidae, followed by Merulinidae and Agariciidae. Bleaching affected a range of families across all sites in both pre- and post-activity surveys, although accounted for less than 16% (MIDI) of the coral community in the post-activity, compared to up to 33% (MAL2) in the pre-activity (Figure 7). Diversity indices were comparable between surveys; richness varied by less than six genera within sites, which is likely due to the variability and limitations inherent in surveying small colonies and cryptic species. Overall, all sites displayed moderate to high diversity and richness, comparable to the pre-activity survey (Table 3).

Coral stressors were observed at all sites (Appendix D), and was comparable to the pre-activity survey (

Table 4). Sedimentation occurred at all sites, particularly SUP2, CONI2 and FFP1, occurring as a fine layer of sediment over turf covered dead coral colonies and rubble. Predation and mucus production were common stressors at the majority of sites. Coral diseases (white syndromes, tissue lesions) were also observed at eight sites, an increase from five sites in the pre-activity survey. *Porites* were the most commonly affected colonies, followed by *Turbinaria*, Juvenile corals were also observed at most sites, particularly at NWIT and SUP2, which recorded over 200 and 100 juvenile colonies, respectively (Appendix D).

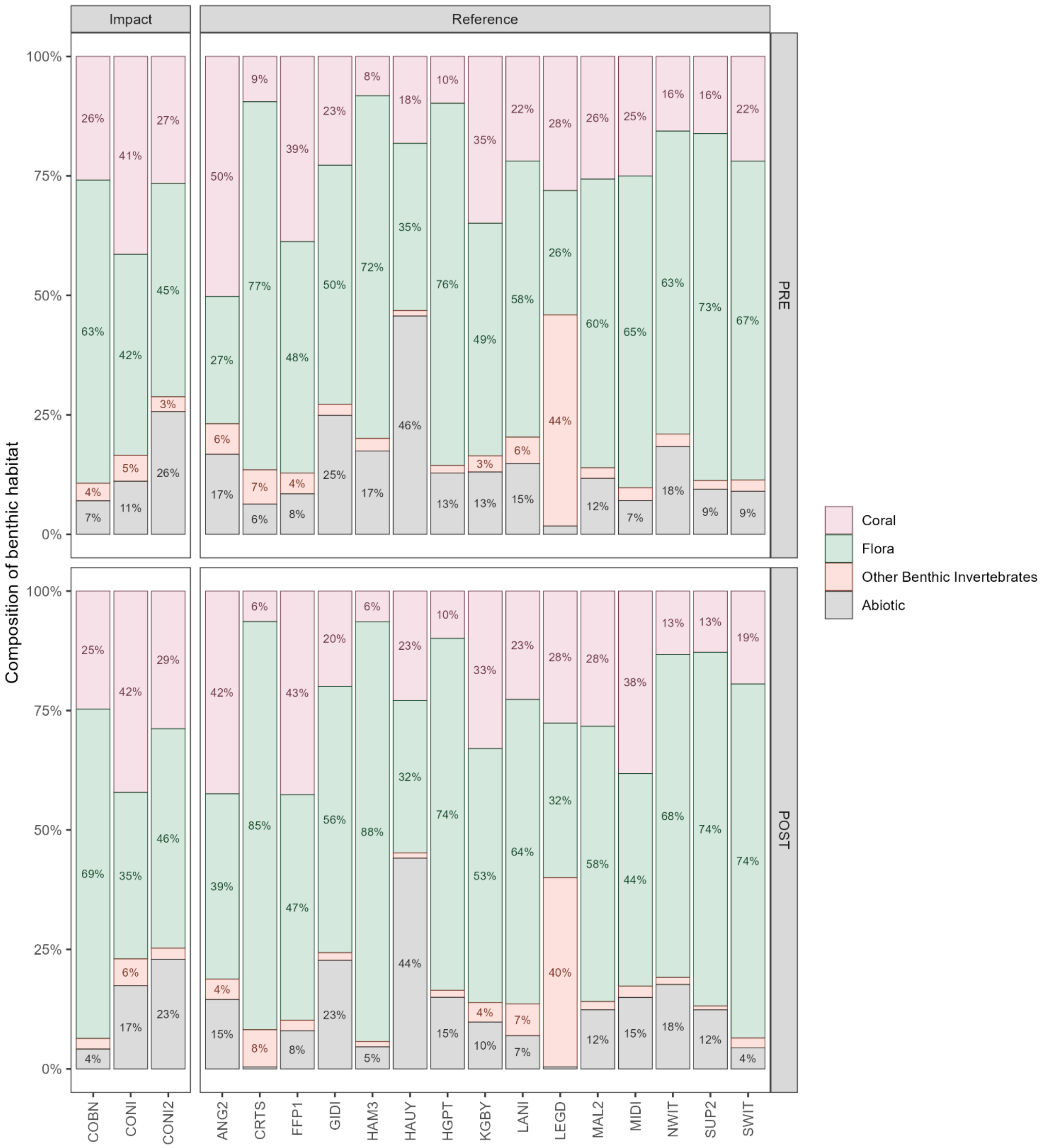

Figure 5: Changes in benthic composition between pre- and post-activity survey

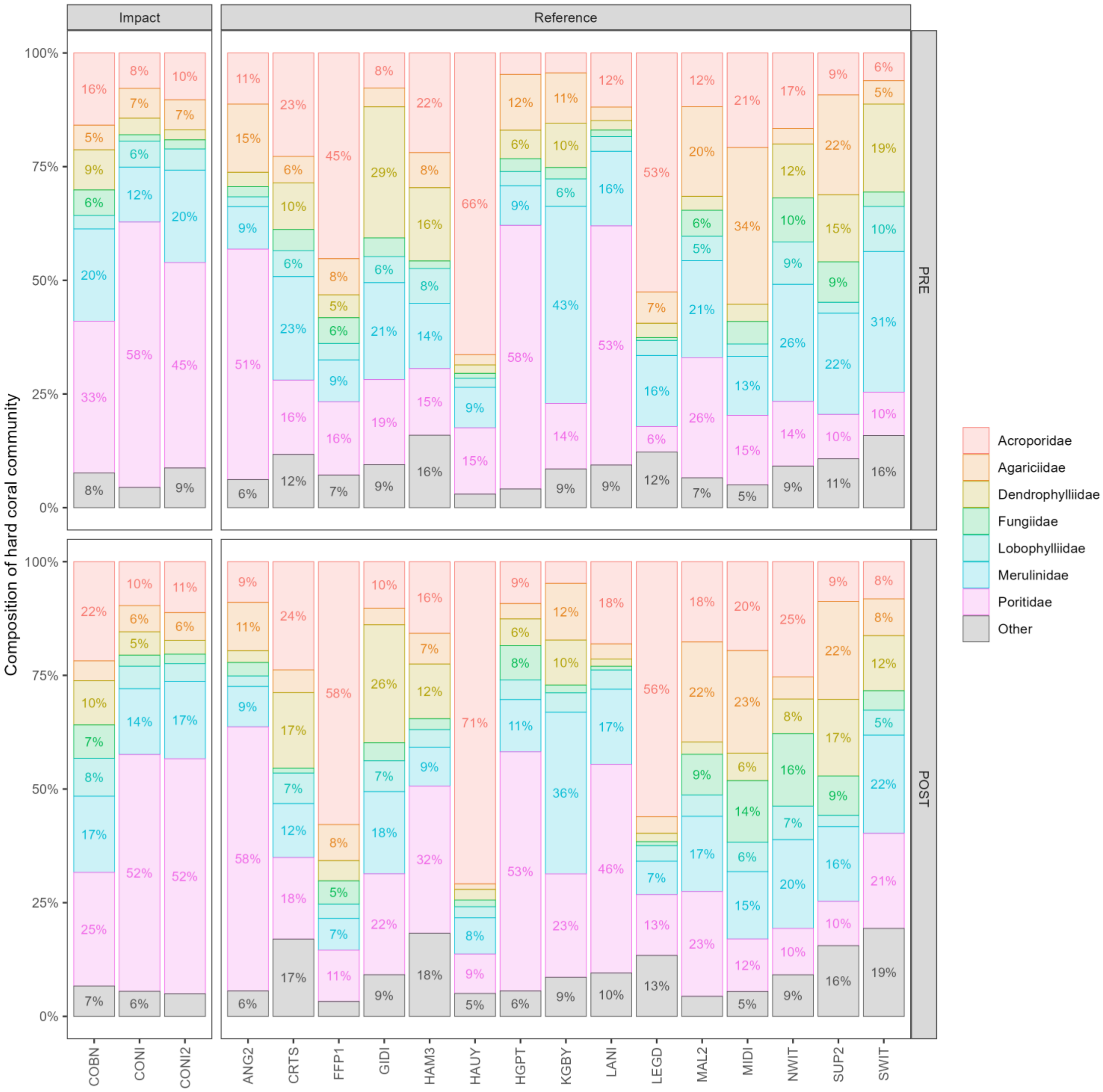

Figure 6: Changes in community composition between pre- and post-activity surveys

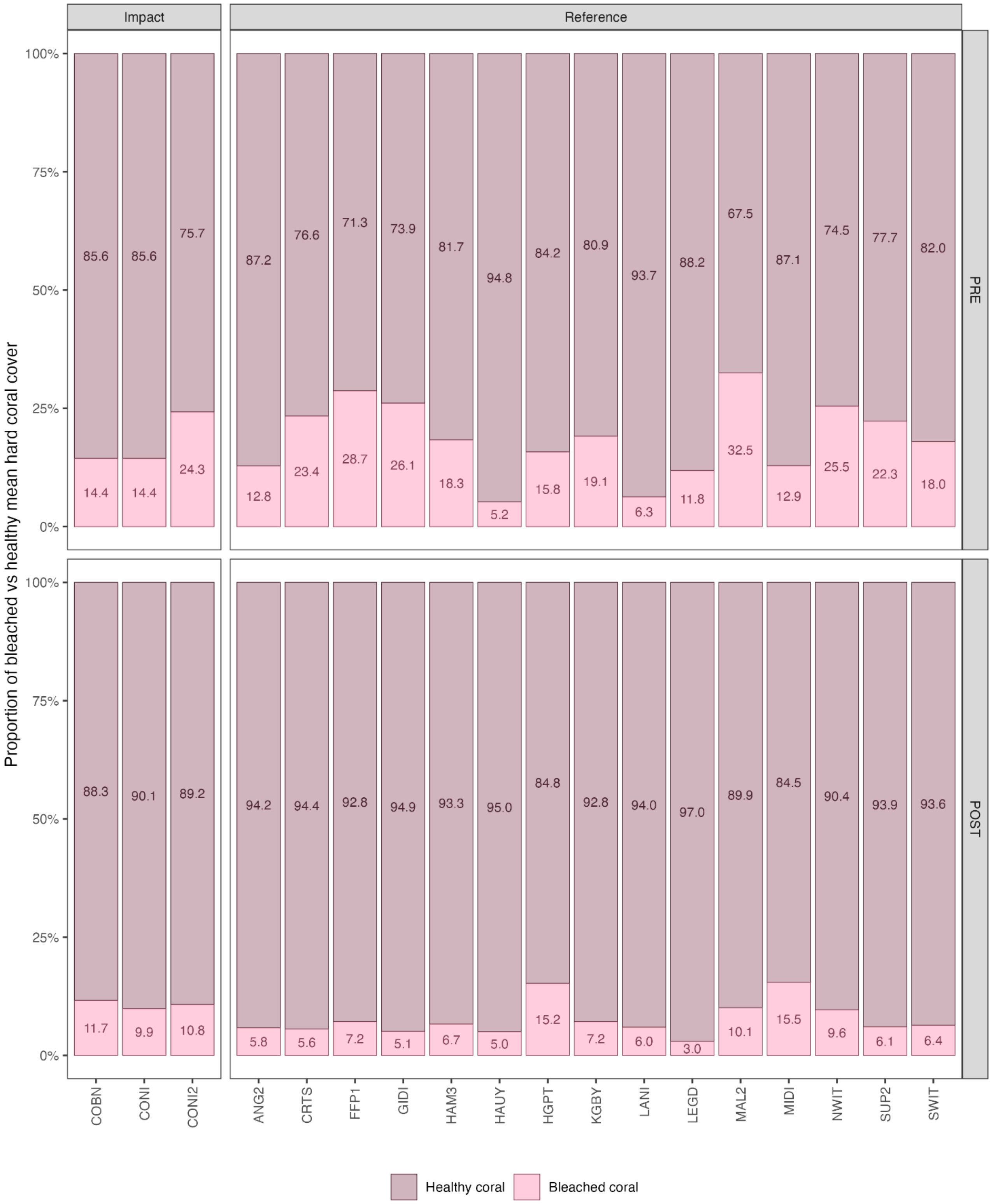

Figure 7: Proportion of coral community affected by bleaching between pre- and post-activity surveys

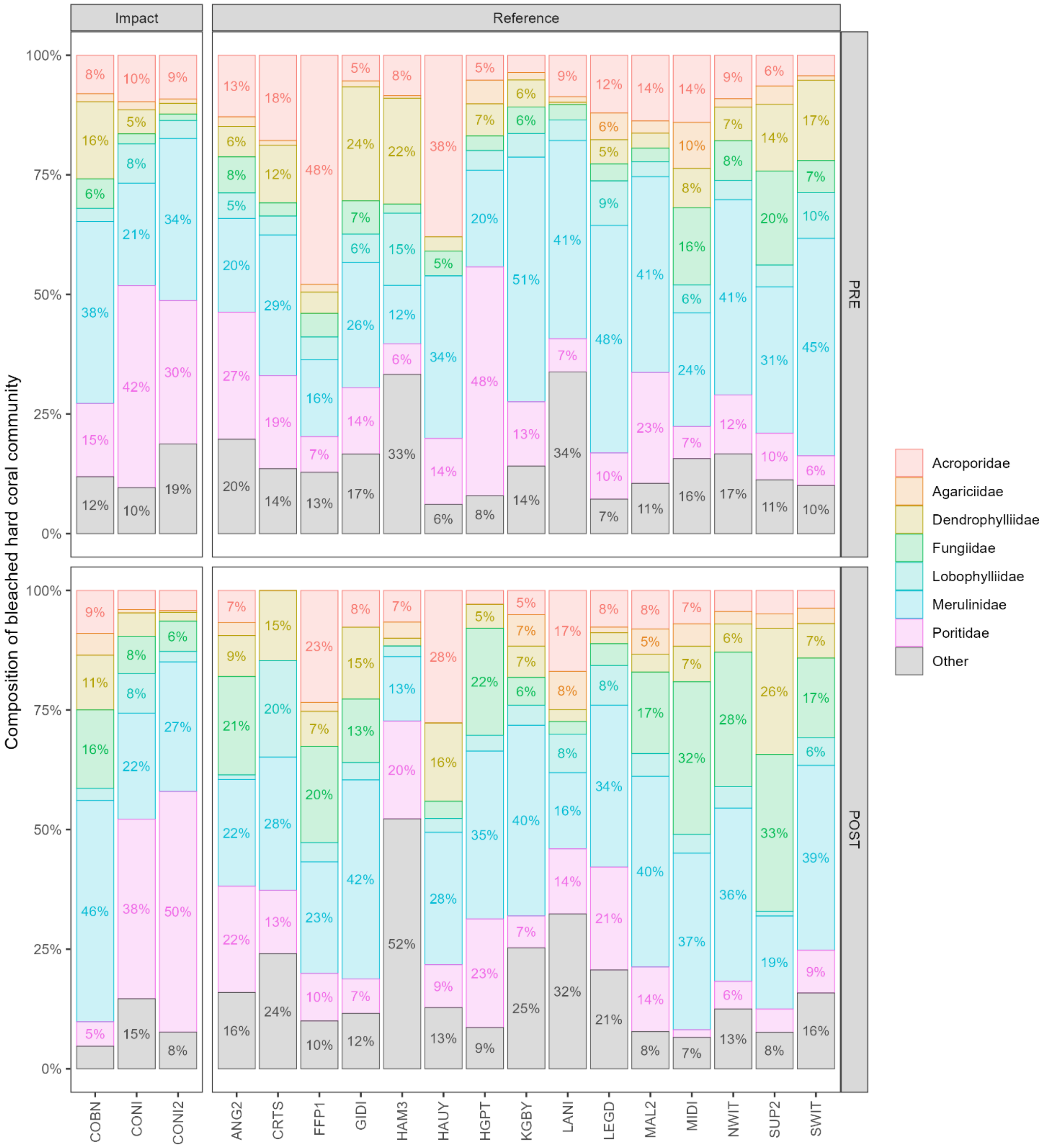

Figure 8: Contribution of families to bleached coral community composition between surveys. Composition relative to overall coral cover.

Table 3: Diversity indices calculated from coral genera abundance at each site across surveys

Site	Survey	Richness (n)	Margalef's Index	Shannon's H index	Pielou's Evenness index	Simpson's Dominance index
Impact sites						
COBN	PRE	40	4.74	2.57	0.70	0.84
	POST	36	4.28	2.75	0.77	0.89
CONI	PRE	40	4.48	1.80	0.49	0.62

Site	Survey	Richness (n)	Margalef's Index	Shannon's H index	Pielou's Evenness index	Simpson's Dominance index
	POST	40	4.47	2.12	0.57	0.70
CONI2	PRE	43	5.10	2.28	0.61	0.75
	POST	39	4.55	2.18	0.60	0.72
Reference sites						
ANG2	PRE	37	4.05	1.83	0.51	0.67
	POST	40	4.46	1.75	0.48	0.61
CRTS	PRE	37	5.01	3.02	0.84	0.92
	POST	34	4.84	2.72	0.77	0.90
FFP1	PRE	37	4.17	2.24	0.62	0.79
	POST	40	4.46	1.84	0.50	0.65
GIDI	PRE	42	5.07	2.86	0.77	0.91
	POST	39	4.77	2.88	0.79	0.91
HAM3	PRE	34	4.69	2.81	0.80	0.92
	POST	31	4.40	2.30	0.67	0.81
HAUY	PRE	38	4.68	1.55	0.42	0.56
	POST	40	4.80	1.59	0.43	0.54
HGPT	PRE	31	4.13	1.76	0.51	0.62
	POST	37	4.95	2.21	0.61	0.72
KGBY	PRE	38	4.34	2.90	0.80	0.92
	POST	40	4.60	2.68	0.73	0.89
LANI	PRE	35	4.22	1.89	0.53	0.65
	POST	36	4.33	1.95	0.55	0.69
LEGD	PRE	37	4.33	2.03	0.56	0.71
	POST	35	4.09	1.70	0.48	0.65
MAL2	PRE	40	4.74	2.56	0.69	0.86
	POST	42	4.92	2.53	0.68	0.86
MIDI	PRE	37	4.39	2.22	0.61	0.80
	POST	41	4.64	2.75	0.74	0.90
NWIT	PRE	41	5.19	3.11	0.84	0.94
	POST	39	5.03	3.11	0.85	0.93
SUP2	PRE	37	4.65	2.89	0.80	0.91
	POST	40	5.21	2.91	0.79	0.91
SWIT	PRE	38	4.59	2.91	0.80	0.93
	POST	38	4.65	2.76	0.76	0.90

Table 4: Summary of colony observations of coral stressors and juveniles per site across surveys

Site	Survey	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
Impact sites							
COBN	PRE	-	40	72	3	3	16
	POST	-	28	60	-	5	10
CONI	PRE	-	-	74	5	-	-
	POST	12	27	35	47	12	2

CONI2	PRE	1	23	35	20	122	14
	POST	8	64	95	52	67	30
Reference sites							
ANG2	PRE	-	24	58	1	-	4
	POST	-	16	48	14	-	-
CRTS	PRE	-	7	-	-	1	84
	POST	-	17	-	-	2	37
FFP1	PRE	-	9	11	4	11	9
	POST	-	62	14	12	23	7
GIDI	PRE	-	35	23	3	30	20
	POST	3	36	28	13	6	16
HAM3	PRE	-	5	-	-	-	88
	POST	-	38	4	3	-	32
HAUY	PRE	1	18	-	4	-	7
	POST	8	43	-	1	-	-
HGPT	PRE	-	56	40	12	27	42
	POST	-	24	38	5	-	40
KGBY	PRE	-	24	58	11	-	-
	POST	-	19	30	1	-	8
LANI	PRE	-	4	13	46	13	1
	POST	1	3	25	44	18	-
LEGD	PRE	-	-	9	4	-	22
	POST	-	2	-	8	-	-
MAL2	PRE	3	33	57	10	40	57
	POST	-	5	4	18	-	49
MIDI	PRE	16	34	-	2	-	-
	POST	-	7	3	2	6	21
NWIT	PRE	-	12	21	-	23	97
	POST	2	29	16	-	166	206
SUP2	PRE	-	3	-	-	37	117
	POST	2	85	12	4	73	106
SWIT	PRE	1	13	-	-	14	27
	POST	3	48	8	3	11	30

3.2.1. Ecological Zone A

KGBY

Hard coral cover was relatively consistent between surveys, accounting for 33% of benthic composition, down from 34.9% pre-activity. Mean coral cover ranged between transects, from 25.7% to 42.3% (Appendix C). Flora (primarily turf algae) increased from 49% to 53%, whereas other benthic invertebrates remained relatively consistent (Figure 5).

Community composition and diversity was comparable between surveys, dominated by Merulinidae (36%), followed by Poritidae (23%), Agariciidae (12%) and Lobophylliidae (10%) in the post-activity assessment (Figure 6). No reduction in diversity measures were recorded (Table 3).

The composition of bleached corals reduced between surveys, accounting for 7% of the live coral community, compared to 19% in the pre-activity survey (, with recovery recorded across all families (Figure 8). Stressors observed largely consisted of predation and sedimentation. Occasional juveniles were observed, mainly *Pseudosiderastrea.*

MIDI

Variation in benthic composition between pre- and post- activity surveys was greater at MIDI than observed at other sites, largely due to the seasonality of macroalgae. Hard coral cover increased between surveys from 25% in the pre-activity to 38% in post-activity (Figure 5). Mean cover was consistent between transects, ranging from 33.6% to 43.3% (Appendix C). Conversely, flora (predominantly macroalgae) reduced from 65% to 45%, indicative of the seasonality of macroalgae at the site. Other benthic invertebrates remained consistent, accounting for 2% of benthic habitat, and abiotic substrate, i.e. sand, increased to 15% from 7%.

The coral composition was dominated by Agariciidae (23%), Acroporidae (20%), Merulinidae (15%) and Fungiidae (14%; Figure 6). This varied from pre-activity surveys, although the families that recorded an increase (namely Fungiidae, Lobophylliidae and Merulinidae) are typically smaller coral morphologies that were possibly overtopped by macroalgae in the pre-activity survey. Diversity metrics reflected an increase in coral diversity, with 37 genera recorded from the pre-activity survey to 41 genera in the post activity survey (Table 3).

Bleached corals accounted for 16% of the hard coral community, combined with no reduction in coral cover, indicates recovery from Major bleaching (33%) recorded in the pre-activity survey (Figure 7). Sedimentation, mucus production, predation and damage are sporadically observed across all transects. Juveniles were also recorded, primarily *Turbinaria* or *Pseudosiderastrea* colonies.

NWIT

Benthic composition at NWIT was dominated by turf algae, accounting for 63% of cover, relatively consistent with the pre-activity survey (68%) (Figure 5). Hard coral cover reduced from 16% in the pre-activity survey to 13%, and bleached corals accounted for 10% of the hard coral community (compared to pre-activity levels of 26%; (Figure 7), affecting all families consistently (Figure 8) however indicating overall recovery in the community. Between transects, mean cover was generally consistent, with four transects recording 11-12% cover, and one (Transect 4) recording 19% (Appendix C). Abiotic substrate (sediment) remained consistent between surveys (18%).

Coral community composition remained relatively consistent between surveys. Acroporidae cover increased (17% to 25%), whereas Merulinidae decreased (26% to 20%; Figure 6). However, diversity was comparable between surveys (41 genera compared to 39; Table 3).

Mucus production was frequently observed at NWIT, with over 160 observations of colonies with mucus across a range of families (Appendix D). Observations of disease (tissue loss) were recorded on two *Porites* colonies. Juvenile corals were also prevalent, with over 200 colonies recorded, primarily *Turbinaria*.

SUP2

Mean coral cover at SUP2 remained comparable between surveys, accounting for 13% of benthic community composition compared to 16% in pre-activity surveys (Figure 5). Cover ranged between transects, from 9.4% to 17.9% (Appendix C). Turf algae (74%), and sediment (12%) composed the remaining habitat composition. The coral community indicated recovery from bleaching recorded in the pre-activity survey (6% down fr4om 23%) with comparable coral cover (Figure 7) and affected all families consistently between surveys (Figure 8).

Coral community composition also remained relatively consistent between surveys (Figure 6), dominated by Agariciidae (22% in both surveys), Dendrophylliidae (15% up to 17%) and Merulinidae (22% down to 16%). Diversity indices reported a minor increase in genera richness, from 37, to 40, reflective of smaller colony sizes which may be missed utilising a random point count method (Table 3).

Mucus production and sedimentation were common stressors observed at SUP2, as well as predation, damage and two observations of disease (white syndrome affecting *Turbinaria*). Juvenile corals were also common, mainly consisting of *Turbinaria*, followed by Merulinidae and Fungiidae (Appendix D).

SWIT

Benthic composition at SWIT comprised of turf algae (74%), hard coral (19%) and sediment (4%; Figure 5). Hard coral cover was marginally lower than the pre-activity survey (22%), correlating with a slight increase of 7% in turf algae (up from 67%). Mean coral cover ranged from 14.7% to 23.1% (Appendix C). Bleached coral cover accounted for 6% of hard coral cover, down from 18% in the pre-activity survey (Figure 7), affecting predominantly Merulinidae and Poritidae colonies (Figure 8). An increase of Poritidae composition (11%) correlates with a decline in Merulinidae (11%), whist remaining community remained relatively stable between surveys (Figure 6), as indicated by diversity indices (Table 3).

A range of coral stressors were recorded from SWIT, including sedimentation, mucus production, predation and disease (white patch affecting *Diploastrea*). Juvenile *Turbinaria* corals were also recorded across all transects (Appendix D).

3.2.2. Ecological Zone B

ANG2

Benthic composition of ANG2 is comprised largely of hard coral (42%) and turf algae (39%), followed by sediment (14%; Figure 5). Mean coral cover was variable between transects (28.3% to 55.4%; Appendix C), although this is reflective of the high density coral bommies interspersed with sand that characterise the site. Coral cover at ANG2 declined by 8% from cover recorded in the pre-activity survey, correlating with a 15% increase in turf algae recorded. This is likely the result of mortality following bleaching recorded during the pre-activity survey. Bleaching recorded in the post-activity survey accounts for a small proportion of coral cover (6%; Figure 7), in comparison to 13% of the community in the pre-activity survey, however all families were affected in similar proportions between surveys (Figure 8).

Coral community composition remained consistent, indicating bleaching resilience between families also comparable. The community was largely dominated by Poritidae (58%), followed by Agariciidae (11%), Acroporiidae (9%) and Merulinidae (9%; Figure 6). Diversity and richness of the coral community was consistent between surveys (Table 3). Coral stressors typically observed included predation (e.g. tube worms and bivalves) and sedimentation (Appendix D). No juvenile corals were observed at ANG2.

COBN

Turf algae and macroalgae dominated the benthic composition at COBN, accounting for 69% of the habitat (Figure 5). Hard coral was comparable between pre- and post-activity surveys, (26% and 25% respectively) and was relatively consistent between transects (19.7% - 28.4%; Appendix C). Similarly, the cover of turf algae and sediment were representative of the pre-activity survey (Figure 5). Bleached corals accounted for 12% of the hard coral cover, reduced from 14% in the pre-activity survey (Figure 7), largely affecting Poritidae and Acroporidae families (Figure 8).

Coral community composition was dominated by Poritidae (25%), Acroporidae (22%) and Merulinidae (17%), and was generally consistent with the community recorded during the pre-activity survey (Figure 6). Thirty six genera were recorded in the post-activity survey, compared to 40 in pre-activity survey (Table 3).

Predation and sedimentation were prevalent among observations of coral colony health, primarily evident on *Porites* colonies. Ten juvenile *Turbinaria* coral colonies were also observed, across four of the five transects (Appendix D).

CONI

Benthic composition was generally consistent with pre-activity surveys. Mean hard coral cover recorded at CONI during the post activity survey was 42%, ranging from 34% to 46% across transects (Figure 5; Appendix C). Turf algae (35%) and sediment (17%) were also prevalent at the site. Bleaching accounted for 10% of hard coral cover, consistent with the pre-activity survey (14%; Figure 7), largely affecting Poritidae colonies (Figure 8).

Similarly, coral community composition remained consistent between surveys (Figure 6), with Poritidae dominant (52%), followed by Merulinidae (14%) and Acroporidae (10%). Diversity indices were also comparable, with 40 genera recorded in both surveys (Table 3).

Stressors observed on coral colonies at CONI were typically physical damage (i.e. fish scrapes), followed by predation and sedimentation (Appendix D). Six observations of disease (white syndromes) were reported to be affecting *Porites* colonies. Two juvenile corals were observed across all transects.

CONI2

Mean hard coral cover at CONI2 increased slightly between surveys, from 27% to 29% (Figure 5). Cover was generally consistent between transects, ranging from 23.9% to 26.5% (Appendix C). Turf algae and sediment cover also remained comparable to the pre-activity survey, recording 46% and 21%, respectively. Bleached coral comprised 11% of coral cover, affecting Poritidae and Merulinidae predominately (Figure 8), a reduction from 24% recorded during the pre-activity survey (Figure 7).

The composition of the coral community remained relatively similar to the pre-activity survey, with Poritidae recording a 7% increase in cover (45% to 52%; Figure 6). Subdominant community composition varied in response; Merulinidae cover declined (20% to 17%) as did Other (9% to <5%) whereas Acroporidae and Agariciidae remained comparable. Diversity indices reported a slight decrease in diversity recorded during the post-activity survey, declining from 43 to 39 genera (Table 3).

Coral stressors were prevalent from coral colony observations across all transects, predominantly recorded as predation, followed by mucus production, sedimentation and damage. Eight observations of disease (white syndromes) were observed to be affecting *Porites.* Juvenile corals were common, particularly in Transect 1, comprising a diversity of families (Appendix D).

CRTS

CRTS is dominated by macroalgae and turf algae, which increased in recorded cover from 77% to 85% between surveys (Figure 5). Mean coral cover reduced from 9% to 6%, with the post activity survey recording cover ranging from 4.5% to 9.3% among transects (Appendix C). Bleached coral comprised 6% cover, indicating recovery from 23% of the coral community bleached in the pre-activity survey. Bleached corals generally consisted of Acroporidae, Poritidae, Dendrophylliidae and Other, consistent between surveys (Figure 8).

Merulinidae recorded a reduction in relative coral cover, from 23% to 12%, however Dendrophylliidae and Other cover increased (10% to 17% and 12% to 17% respectively). The composition of the remaining coral community was largely consistent between surveys (Figure 6). Diversity indices reported a marginal drop in diversity and richness from values recorded during the pre-activity survey (37 genera to 34; Table 3).

Sedimentation was observed on coral colonies infrequently across the site, with very few other observations of stressors recorded from the site (Appendix D). Juvenile corals were also relatively abundant (37 observations), predominantly *Turbinaria* species.

FFP1

Benthic composition at FFP1 was stable between surveys. Mean coral cover increased by 4% at FFP1 between surveys, from 39% to 43% (Figure 5). Cover was relatively consistent between transects during the post activity survey, ranging from 32.8% to 50% (Appendix C). Bleaching was recorded to be affecting 7% of the hard coral community in comparison to 29% in the pre-activity survey (Figure 7). Flora (turf algae) and abiotic substrate also remained comparable between surveys (48% to 47%, and 8% respectively), indicating recovery of the coral community from Moderate bleaching.

Acroporidae dominated the coral community, increasing between surveys from 45% to 58%. The remaining community reported minor decreases in comparison, predominantly Poritidae (16% to 11%), followed by ~1-2% declines in Merulinidae, Agariciidae, Fungiidae and Other (Figure 6). Diversity indices were consistent, with genera recorded increasing from 37 to 40 (Table 3).

Sedimentation, followed by mucus production and predation were prevalent stressors observed on coral colonies affecting all families. Juvenile coral from the genera *Favites, Acropora* and *Fungia* were also observed but were relatively uncommon in comparison to other sites (Appendix D).

GIDI

Turf algae dominate the benthic community at GIDI (Figure 5). Mean hard coral reduced from 23% to 20%, as did abiotic substrate (25% to 3%; Appendix C). This correlates with an increase in turf algae, likely overtopping dead coral or rubble (Figure 5). In the pre-activity survey, bleached coral represented 26% of the hard coral community which reduced to 5% in the post-activity survey (Figure 7) and indicating high recovery of the coral community from Moderate bleaching.

Coral community composition and diversity indices remained relatively consistent between surveys (Figure 6; Table 3). Dendrophylliidae (29% to 26%), Poritidae (19% to 22%) and Merulinidae (21% to 18%) were the dominant coral families within the community.

Observations of the coral stressors sedimentation and predation were relatively commonly recorded on colonies at GIDI. Juvenile corals were recorded from Merulinidae or *Turbinaria* species, however, were relatively uncommon (16 observations) (Appendix D).

HAM3

Benthic composition at HAM3 recorded an increase in the cover of flora (macroalgae and turf algae) between surveys from 72% to 88% (Figure 5). Comparatively, abiotic cover reduced from 17% to 5%, indicating colonisation of algal species. Hard coral cover remained low and comparable between the pre and post activity surveys (8% and 6%, respectively). Cover of hard coral was variable between transects from the recent survey (3% to 11%; Appendix C). Bleached coral cover represented 7% of the coral community, reduced from 18% in the pre-activity survey (Figure 7) and affecting largely Poritidae and Other families/groups (Figure 8).

Community structure altered between surveys. Poritidae dominated the coral community, accounting for 32% of the coral cover, increased from 15% in pre-activity surveys, whereas declines were reported from Acroporidae (22% to 16%), Dendrophylliidae (16% to 12%) and Merulinidae (14% to 9%). Diversity indices reflected this shift, and declined slightly between surveys, with richness decreasing from 34 to 31 genera (Table 3).

Coral stressors were commonly observed on coral colonies, typically consisted of sedimentation, followed by predation and damage (Appendix D). Juvenile corals were also common and included *Turbinaria, Favities, Acropora* and *Platygyra* species.

HAUY

Mean coral cover at HAUY increased between surveys from 18% to 23% (Figure 5). Coral cover was relatively consistent between transects during the post activity survey, ranging from 16% to 27% (Appendix C). Turf algae and macroalgae were consistent with pre-activity survey and accounted for a third of the benthic community (32% down from 35%) as was abiotic substrate (44% down from 46%). Bleached coral cover represented 5% of the community, no change to pre-activity survey levels (Figure 7).

Coral community composition remained relatively consistent between surveys (Figure 6), dominated by Acroporidae (71%), followed by Poritidae (9%) and Merulinidae (8%). Similarly, diversity indices were relatively consistent across all measures between survey results (Table 3).

Sedimentation and disease (white syndromes) were observed to be affecting colonies at HAUY from a range of families. No juvenile corals were observed (Appendix D).

HGPT

Benthic composition at HGPT was consistent between pre- and post-activity surveys (Figure 5). Mean coral cover accounted for 10% of the benthic community, which is dominated by turf covered boulders. Coral cover between transects was also consistent, ranging from 7.4% to 12.1% (Appendix C). Bleached corals comprised 15% of the community, consistent with the pre-activity survey (Figure 7).

Community composition was also consistent between surveys, with Poritidae dominant (Figure 6). An additional six genera were recorded during the post-activity survey (Table 3).

Sedimentation and predation were commonly recorded observations of colony health (Appendix D). Juvenile corals were prevalent across all transects, typically *Turbinaria* species.

LANI

Mean coral cover accounted for 23% of benthic habitat during the post activity survey, which varied across transects (8.1% to 35.7%; Appendix C). Despite the variation, coral cover remained consistent between surveys (Figure 5). Turf algae cover increased from 58% to 64% likely correlating with the decrease in abiotic substrate (15% to 7%). Bleaching affected approximately 6% of the hard coral community, in line with pre-activity survey (Figure 7).

Coral community composition remained consistent between surveys, with Poritidae (46%), Acroporidae (18%) and Merulinidae (17%) as key families (Figure 6). As in the pre-activity survey, the community was highly diverse, recording 36 genera (compare to 35; Table 3).

Observations of predation, sedimentation, mucus production and disease (tissue loss affecting *Porites*) were recorded from health assessments of colonies at LANI. Juvenile corals were not recorded at the site (Appendix D).

LEGD

Benthic composition was consistent between surveys. Mean coral cover at LEGD comprised 28% of the benthic community, including 3% bleached coral composition (Figure 5; Figure 7), compared to 28% cover including 11% bleaching. Cover was consistent between transects, ranging from 24% to 32.1%. Other benthic invertebrates dominated the benthic community at LEGD (40%, down from 44%), generally consisting of soft corals and sponges (Appendix C).

Consistent with the pre-activity survey, Acroporidae was the dominant family at the site with 56% relative coral cover (Figure 6). Poritidae (13%), 'Other' (13%) and Merulinidae (7%) were subdominant. Diversity also remained high with 35 genera recorded at the site (Table 3).

Observations of coral stressors on colonies were rare at LEGD, with only a few instances of damage (fish scrapes) and sedimentation recorded. No juvenile corals were observed (Appendix D).

MAL2

Mean coral cover comprised 28% of the benthic community, and varied between transects (17% to 33%), compared to 26% coral cover recorded in the pre-activity survey (Figure 8). Thus, coral cover at MAL2 indicates high survivability from Major bleaching recorded in the pre-activity survey (33% community affected; Figure 7).

Similarly, the coral community composition displayed comparable diversity (42 genera recorded compared to 40 genera in pre-activity; Table 3). Poritidae (23%) was the dominant family, followed by Agariciidae (22%), Acroporidae (18%) and Merulinidae (17%; Figure 6).

Some observations of damage, sedimentation and predation were observed on coral colonies (Appendix D). Juvenile corals were frequently observed, typically comprised of the families Merulinidae, Lobophylliidae and Dendrophylliidae.

4. Discussion and Conclusion

4.1. Coral Community Assessment Against EPO 6-1(1)

A coral community assessment has been implemented in accordance with the DSDMP (Woodside 2023) as part of the TMMF implementation during trenching, spoil disposal, borrow ground dredging and backfill activities. The coral community assessment program was designed to determine whether the coral EPO specified in condition 6-1(1) has been achieved, which relates to detection of a net reduction of live coral cover at any coral impact monitoring location attributable to the project.

In June 2023, a pre-activity survey established a coral community baseline at 18 sites across Ecological Zones A and B (O2 Marine 2024b). Coral cover ranged from 8% (HAM3) to 50% (ANG2) and was typical of Dampier fringing reefs. Importantly, the coral community was observed to be affected by a significant bleaching event, with seven sites recording over 20% of the community to be affected by bleaching, and likely correlated with prolonged temperatures exceeding 30ºC.

In March 2024, a repeat post-activity survey was undertaken at the same sites to facilitate a comparison against coral community data collected during the pre-activity survey (O2 Marine 2024b). The survey was undertaken using an ROV and photogrammetry techniques, with post-processing of orthomosaics implemented to capture five replicate 10 m fixed transects at each site. Percent cover, community composition and health observations were recorded at each site. In accordance with the DSDMP, net change in coral cover (△ CC) was used to assess against EPO6-1(1).

The coral community assessment determined that EPO 6-1(1) has been achieved. A net reduction in live coral cover attributable to trenching, spoil disposal, borrow ground dredging and backfill activities was not recorded at any of the coral Impact monitoring sites. This outcome was expected following completion of the water quality monitoring program (Section 1.2.2; O2 Marine 2024a) given no exceedances of water quality management triggers ware recorded throughout the program. As such, the TMMF detailed in the DSDMP was designed and implemented to sufficiently mitigate impacts to sensitive benthic receptors.

4.2. Variation in Coral Communities

Coral reefs in the Dampier Archipelago exist as narrow fringing reefs along the Burrup Peninsula and islands, or as deeper, clear water shoals in the wider Mermaid Sound (Griffith 1998). Reef coverage is often patchy, with high density bommies or outcroppings interspersed with bare sediment or rubble. Across the Archipelago, coral reefs display spatio-temporal heterogeneity, where local conditions result in unique assemblage patterns in *Acropora*, *Porites* and *Turbinaria* species (Moustaka et al. 2019). Inshore processes play a key role in determining the composition of benthic habitats, distribution of key genera, and their resilience to environmental pressures.

Benthic composition remain largely consistent between surveys. Coral cover ranged from 6% (CRTS and HAM3) to 43% (FFP1), varying by less than 5% at all sites except ANG2 (-8%) and MIDI (+13%). Flora was again the dominant benthic habitat at most sites, and generally consisted of turf algae, and macroalgae at select sites. Turf algae is a rapid coloniser of open space on coral reefs, often covering dead coral and rubble within the space of weeks (Fong & Paul 2011) and can inhibit successful recruitment of coral larvae (Roth et al. 2018).

At ANG2, the reduction in coral cover was recorded in conjunction with a 12% increase in turf algae and is likely representative of turfing algae colonising dead coral colonies. An increase in Flora was also observed at HAM3 (16%) however coral cover varied by only 2%, whereas abiotic substrate (i.e. rubble, rock, sand) declined by 12%. Conversely, MIDI recorded a decline in 'Flora' of 21%; coinciding with the increase in coral cover, however this may be attributed to seasonal macroalgae, rather than turf algae.

Macroalgae may overtop hard coral communities, particularly in shallow water sites, resulting in obscuration of habitat type (Blakeway 2005; Stoddart et al. 2005). The pre-activity survey was conducted in May 2023, after a prolonged warm period which may have exacerbated seasonal growth of macroalgae, such as the genus *Sargassum* (Blakeway 2005; Stoddart et al. 2005). The post-activity survey at MIDI recorded a reduction in macroalgae, and a 13% increase in coral cover, namely Acroporidae, Fungiidae and Lobophylliidae species. Whilst some genera exhibit rapid regrowth (i.e. *Acropora*; Gouezo et al 2019; Pratchett et al. 2013), it is unlikely that the variation in coral cover observed at MIDI is isolated rapid growth, and more likely reflective of the intermittent prevalence of macroalgal cover. If surveying *in situ* macroalgae can be wafted, and records collected of the underlying habitat, however this is not feasible with diverless methods.

Coral community composition remained relatively stable between surveys. Dominant coral families included Merulinidae, Poritidae, Agariciidae, and Acroporidae, with variations in dominance across sites. For example, Acroporidae was prominent at FFP1, increasing from 45% to 58% post-activity, while Poritidae dominated ANG2 (58%) and CONI (52%). MIDI's coral community experienced minor changes, with an increase in smaller coral families such as Fungiidae and Merulinidae, likely due to changes in macroalgae cover revealing coral substrate. In most sites, coral diversity metrics remained stable or showed slight increases, with some reporting a minor decline in the number of genera, such as CRTS and HAM3. Despite variations in family composition, the overall diversity remained high across all sites between surveys.

Several stressors were recorded across the study sites, including sedimentation, mucus production, predation, and occasional disease observations, such as white syndrome and tissue lesions. Bleaching levels generally declined, with many areas showing signs of recovery. Juvenile corals were prevalent at many sites, particularly *Turbinaria, Pseudosiderastrea*, and Merulinidae species, though they were sparse in some locations, such as ANG2 and LANI. Observations of juveniles indicate ongoing coral recruitment and recovery, particularly at sites like CONI2, where juveniles were diverse across families.

4.3. Bleaching Recovery

The Dampier Archipelago experiences water temperatures of between 18-32°C and naturally high turbidity (ERM 2023; O2 Marine 2024a). Thermal stress events are of increasing prevalence (1998, 2005, 2008, 2011, 2016, 2022 (AIMS 2024), often resulting in coral bleaching (Babcock et al 2020). Research suggests that turbid reefs, such as those in Dampier, may be able to cope better with thermal stress (Cacciapaglia & van Woesik 2016; Perry et al. 2012) however this hypothesis has not been formally tested in the Dampier Archipelago.

During the baseline water quality monitoring program (ERM 2023), benthic water quality instrumentation recorded temperatures of over 32°C in 2022/2023, over 14 degree heating weeks (DHWs) were reported by NOAA (NOAA 2018; ERM 2023; O2 Marine 2024a; 2024b), and a Coral Bleaching Alert Level 2 issued for Central Western Australia for over a month in February – April 2023. The subsequent pre-activity survey recorded bleaching affecting greater than 10% of the coral community at most sites and over 30%, defined by AIMS

(2022) as 'Major bleaching', at MAL2. Given the extent of bleaching observed during the pre-activity survey, and the Coral Bleaching Alert issued by NOAA in 2023, mortality in a large proportion of the affected communities was to be expected. However, the results of this post-activity survey generally suggest Dampier's reefs recovered from the bleaching event, with coral cover remaining relatively stable (<5% change) at the majority of sites and bleaching only affecting 3% - 16% of the community.

ANG2 was the only site reporting a greater than average decline in coral cover (-8%). Further investigation indicates Unidentified corals and Poritidae contributed the greatest change in community composition (-41% and -33% respectively). Poritidae accounted for 27% of bleached corals in the pre-activity and may have resulted in mortality of affected corals which were subsequently colonised by turf algae. Whilst this may have also occurred for unidentified corals, a change in cover may be attributed to re-assigning the correct family name to previously ambiguous points. It should be noted however, that variation inherent in the method (i.e. random point analysis) integrates a level of uncertainty in determining the specific cause of change on any one colony, as it cannot be presumed the same colony is counted in both surveys.

4.4. Conclusion

The coral community assessment conducted in accordance with the DSDMP determined that EPO 6-1(1) has been achieved. A net reduction in live coral cover attributable to trenching, spoil disposal, borrow ground dredging and backfill activities was not recorded at any of the coral Impact monitoring sites, with the pre- and post-activity surveys indicating that hard coral cover remained relatively stable across the majority of sites. This outcome was expected following completion of the water quality monitoring program (Section 1.2.2; O2 Marine 2024a) given no exceedances of water quality management triggers ware recorded throughout the program. As such, the TMMF detailed in the DSDMP was designed and implemented to sufficiently mitigate impacts to sensitive benthic receptors.

Whilst variations in coral cover and community composition were observed between the pre- and post-activity surveys, these changes were largely consistent with natural processes, including seasonal fluctuations. Bleaching levels generally declined in conjunction with stable coral cover, indicating recovery across many sites, though some stressors, such as sedimentation and algae colonization, were recorded. Overall, coral communities demonstrated resilience, with stable community composition and ongoing juvenile recruitment.

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Appendix A. Orthographic Mosaics per Site

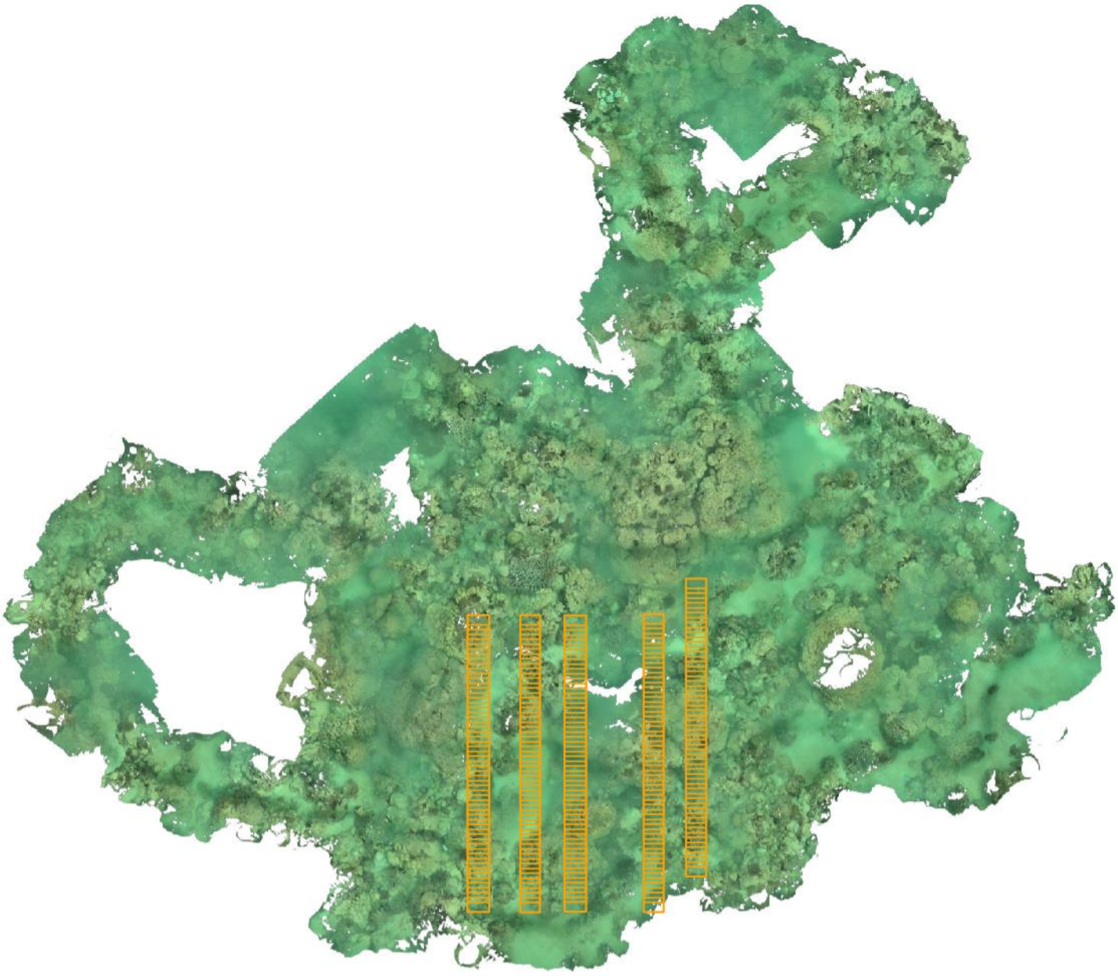

Figure 9: ANG2 orthomosaic and digital transects

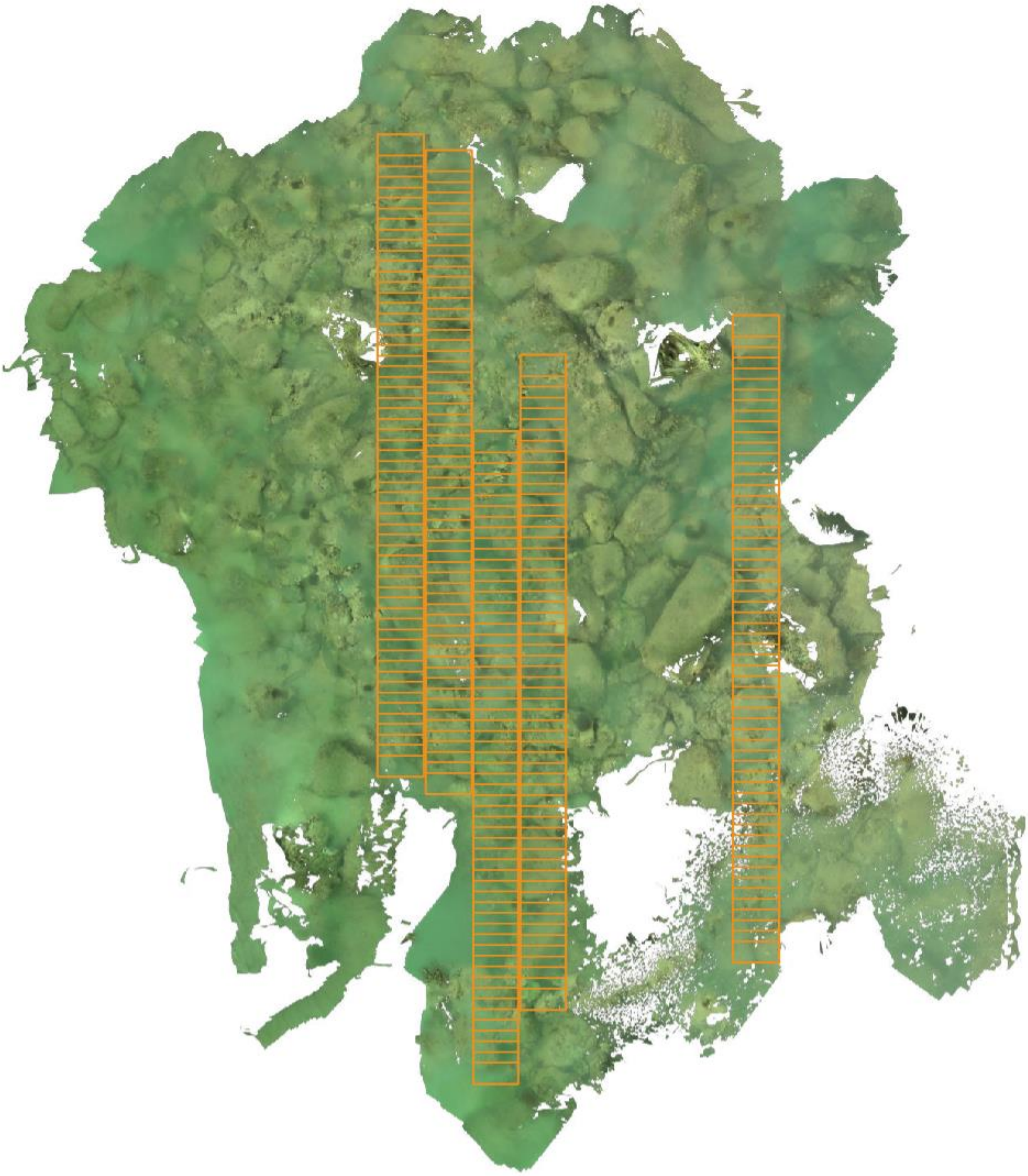

Figure 10: COBN orthomosaic and digital transects

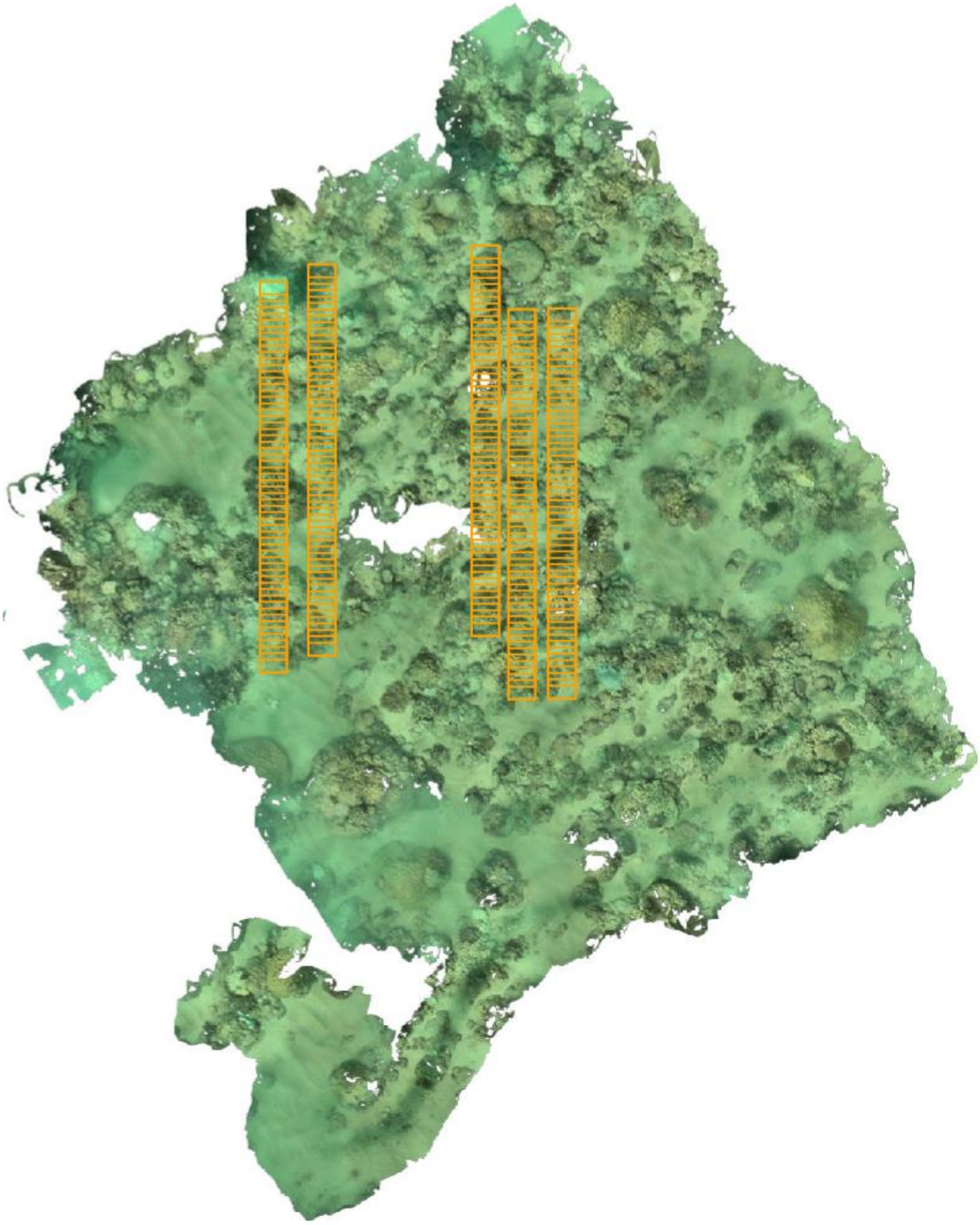

Figure 11: CONI orthomosaic and digital transects

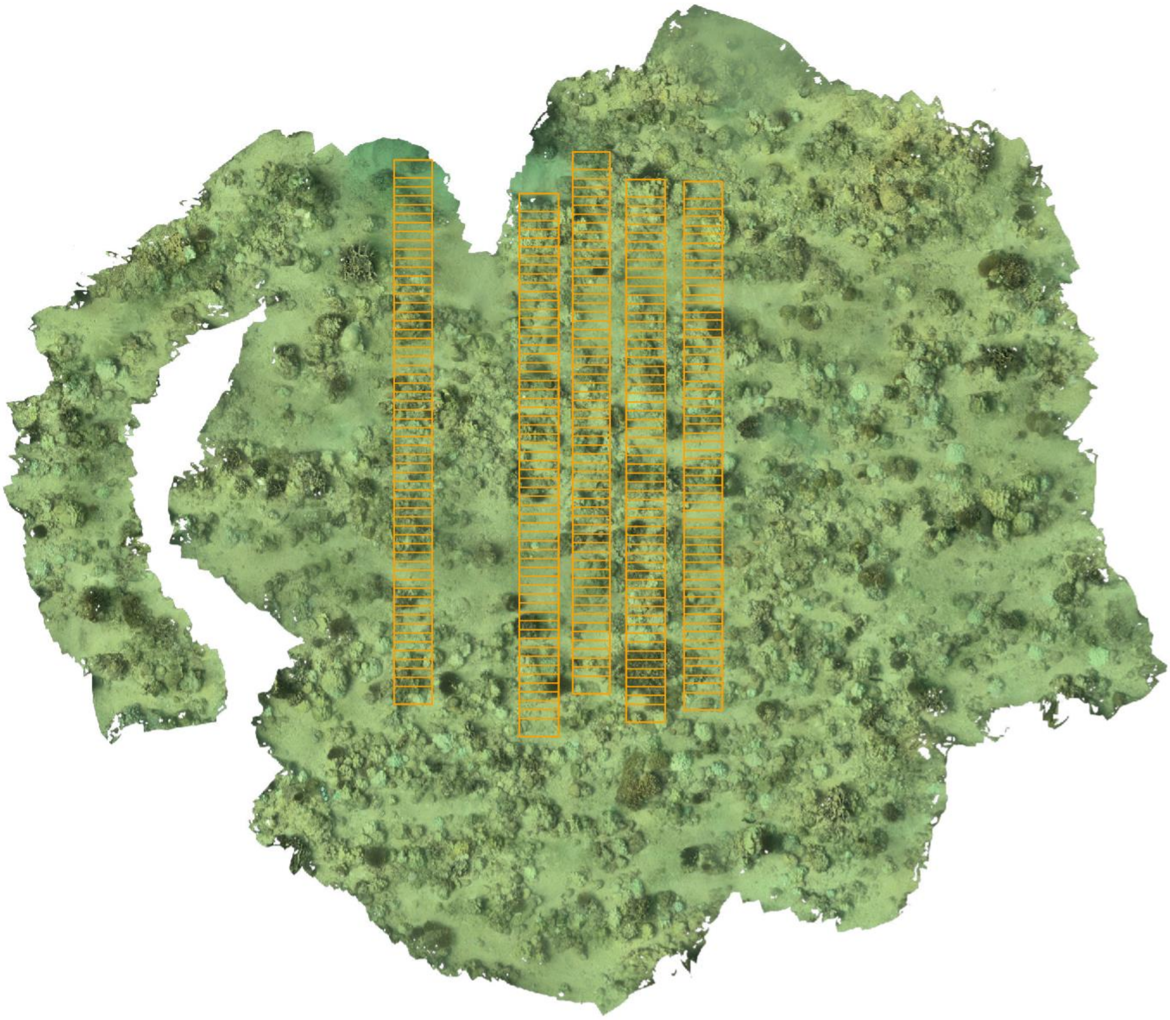

Figure 12: CONI2 orthomosaic and digital transects

Figure 13:CRTS orthomosaic and digital transects

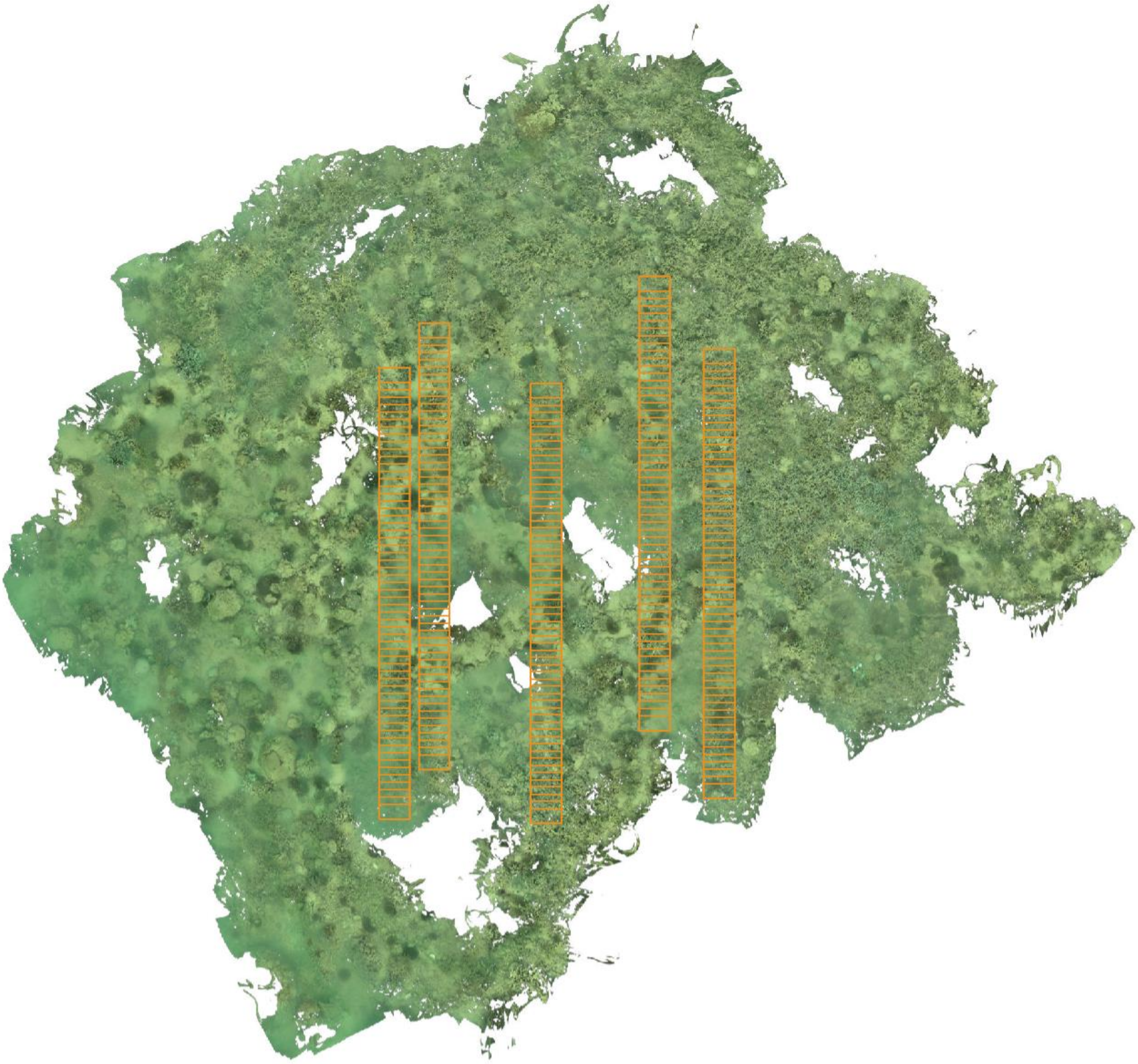

Figure 14: FFP1 orthomosaic and digital transects

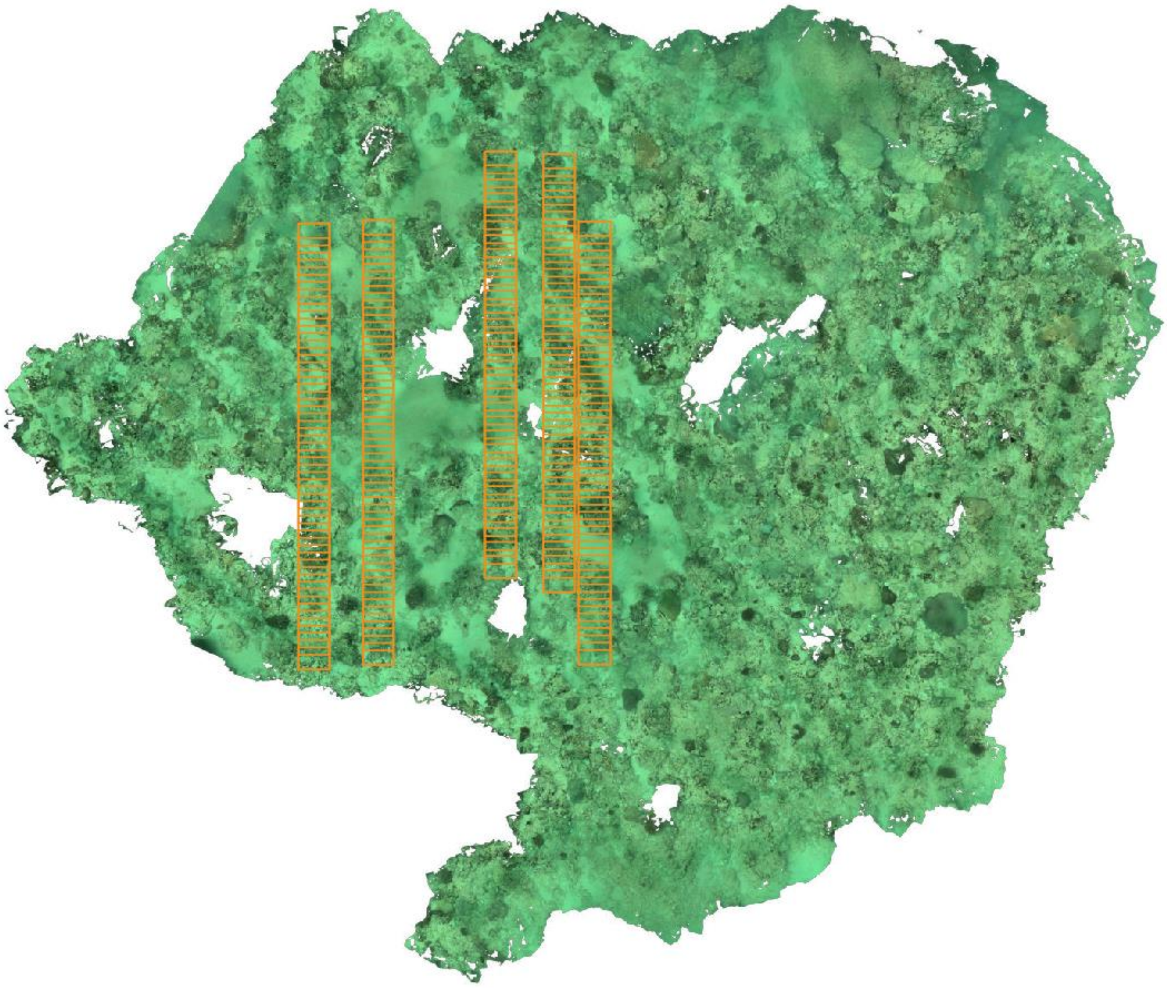

Figure 15: GIDI orthomosaic and digital transects.

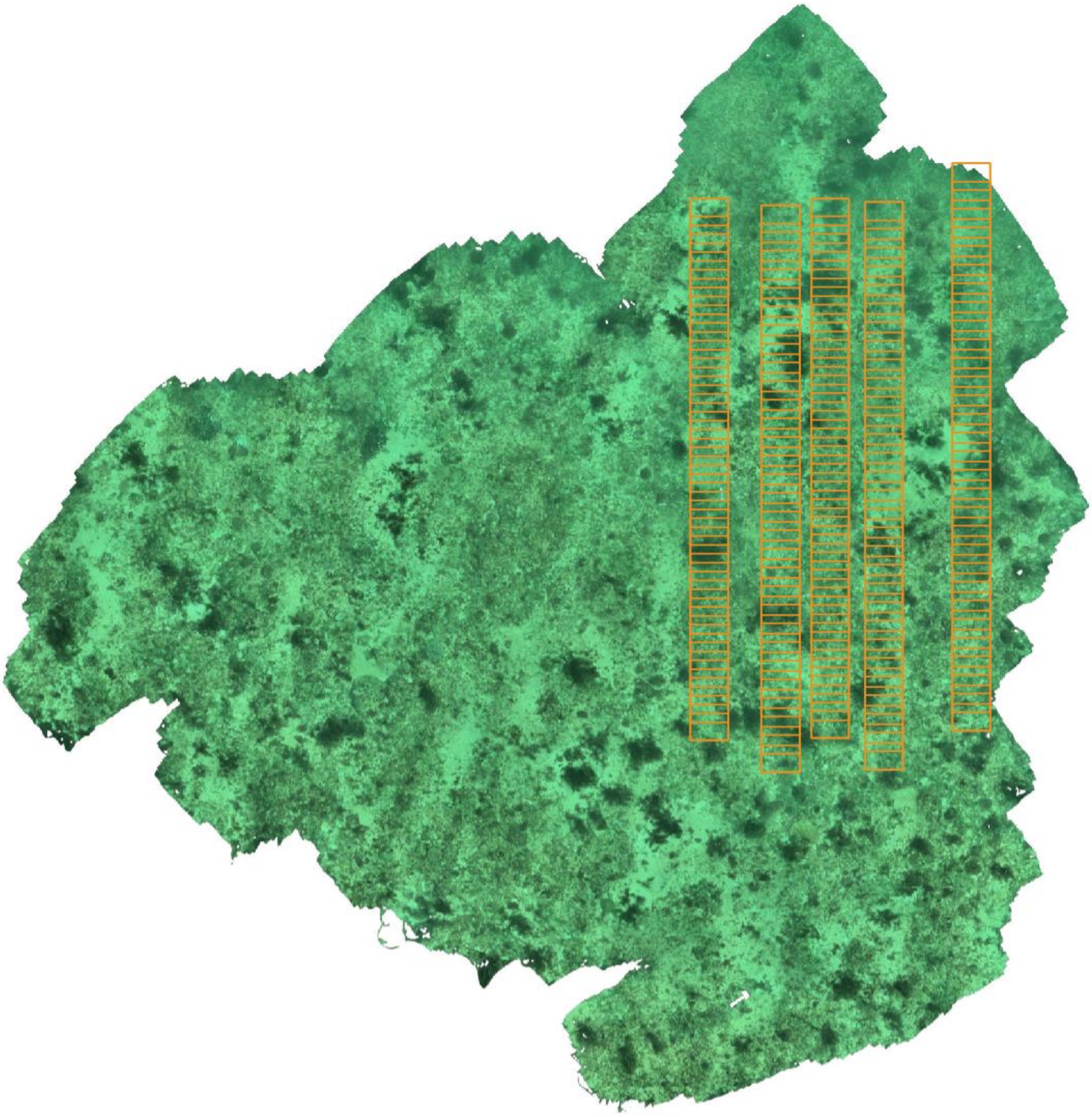

Figure 16: HAM3 orthomosaic and digital transects

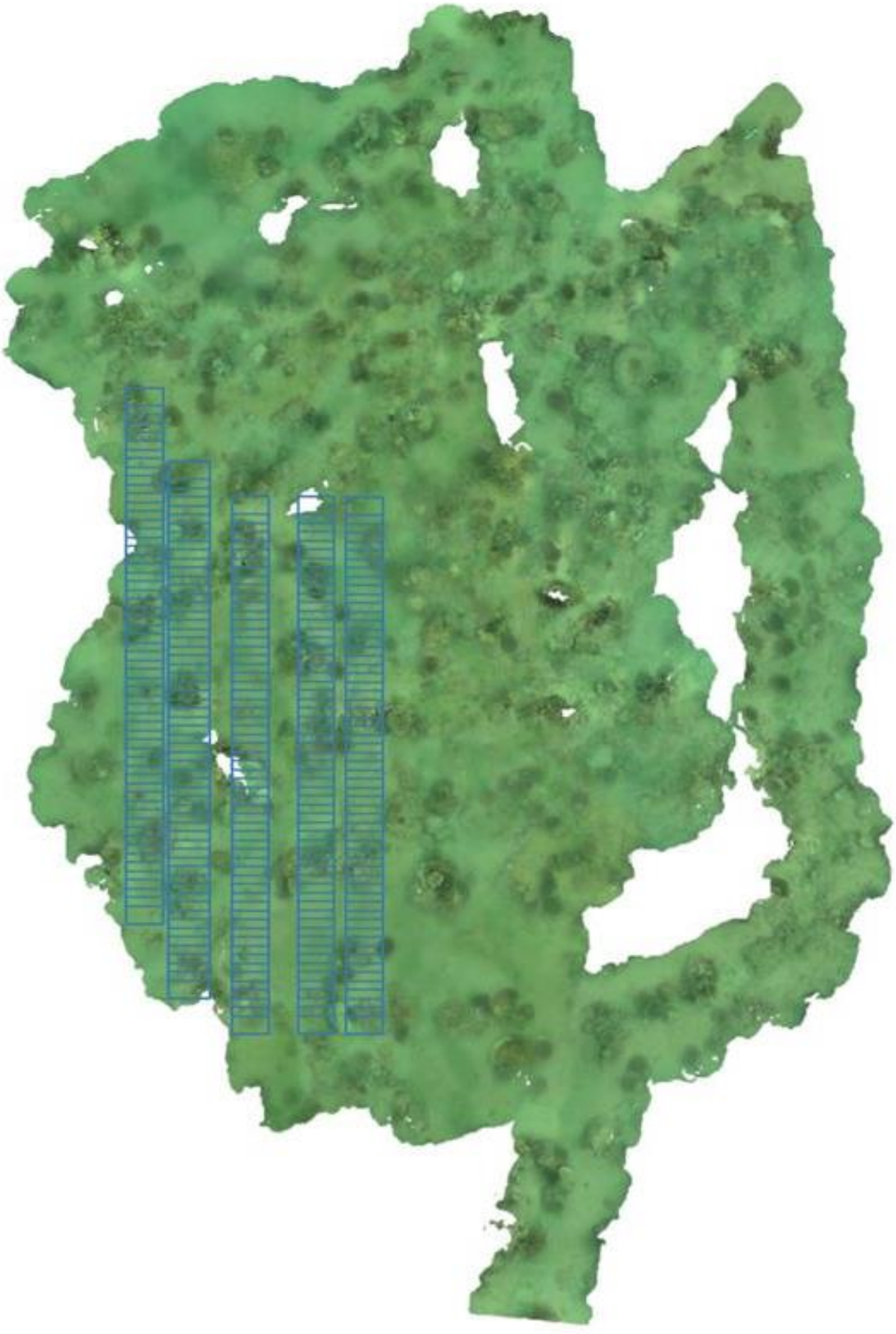

Figure 17: HAUY orthomosaic and digital transects

Figure 18: HGPT orthomosaic and digital transects

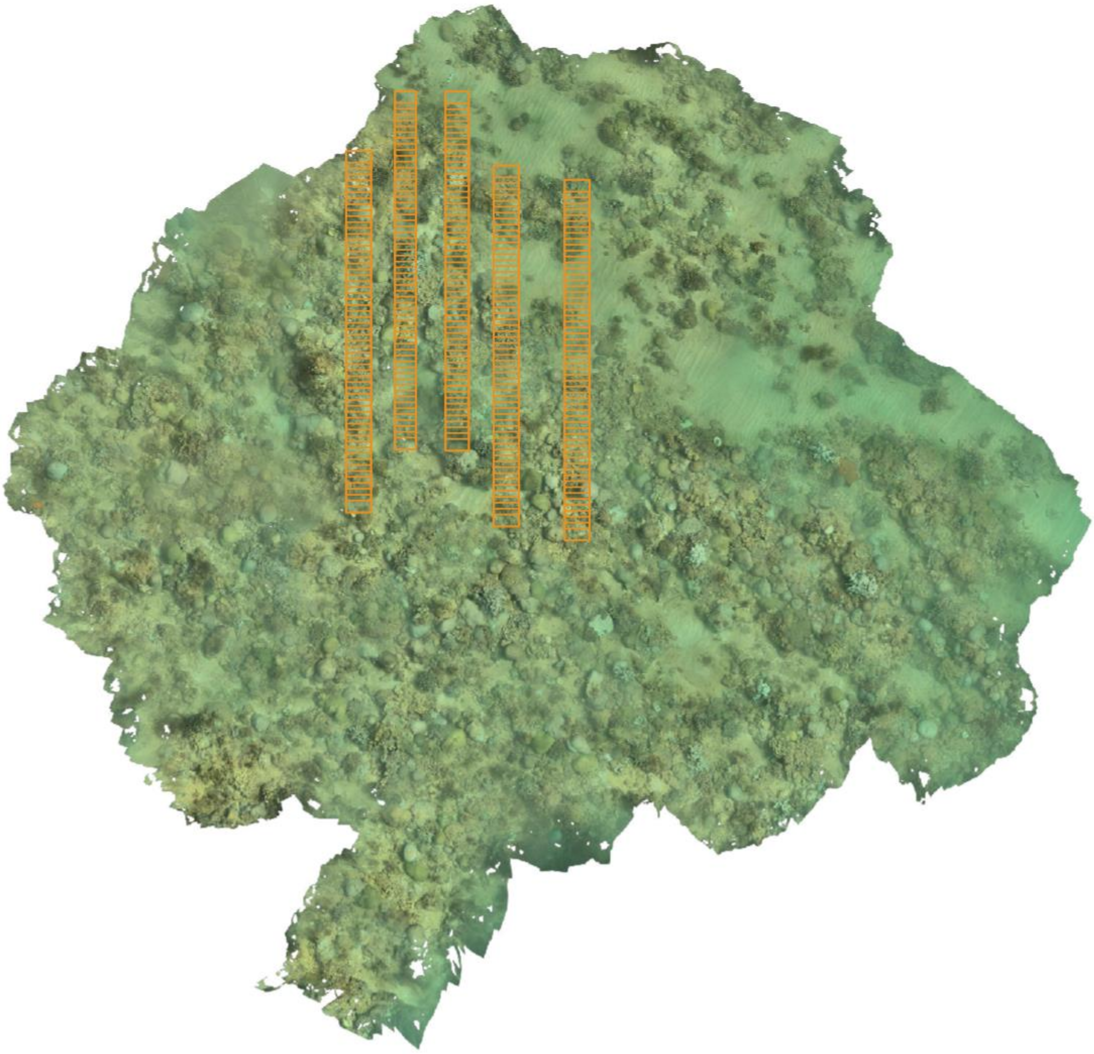

Figure 19: KGBY orthomosaic and digital transects

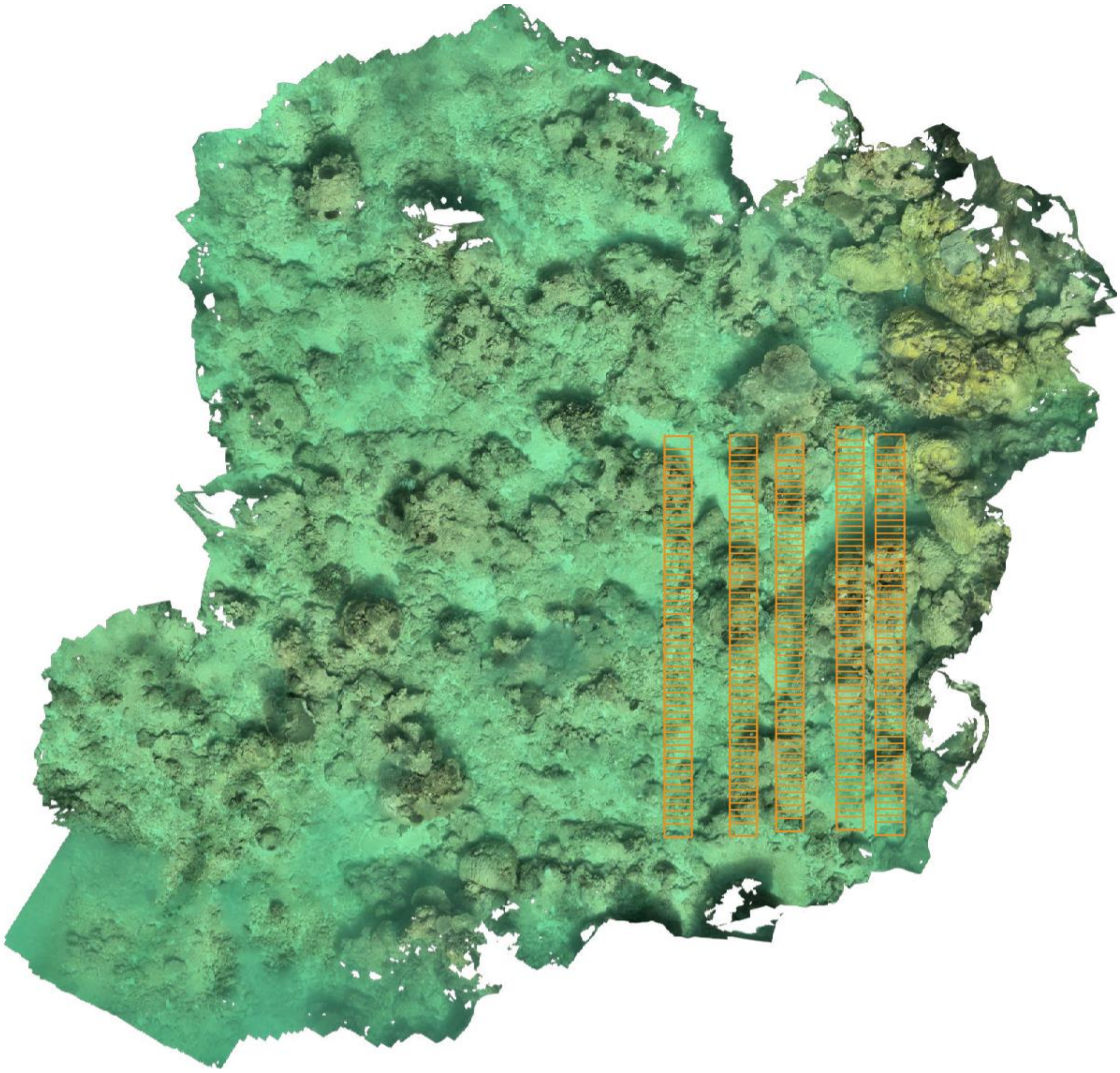

Figure 20: LANI orthomosaic and digital transects

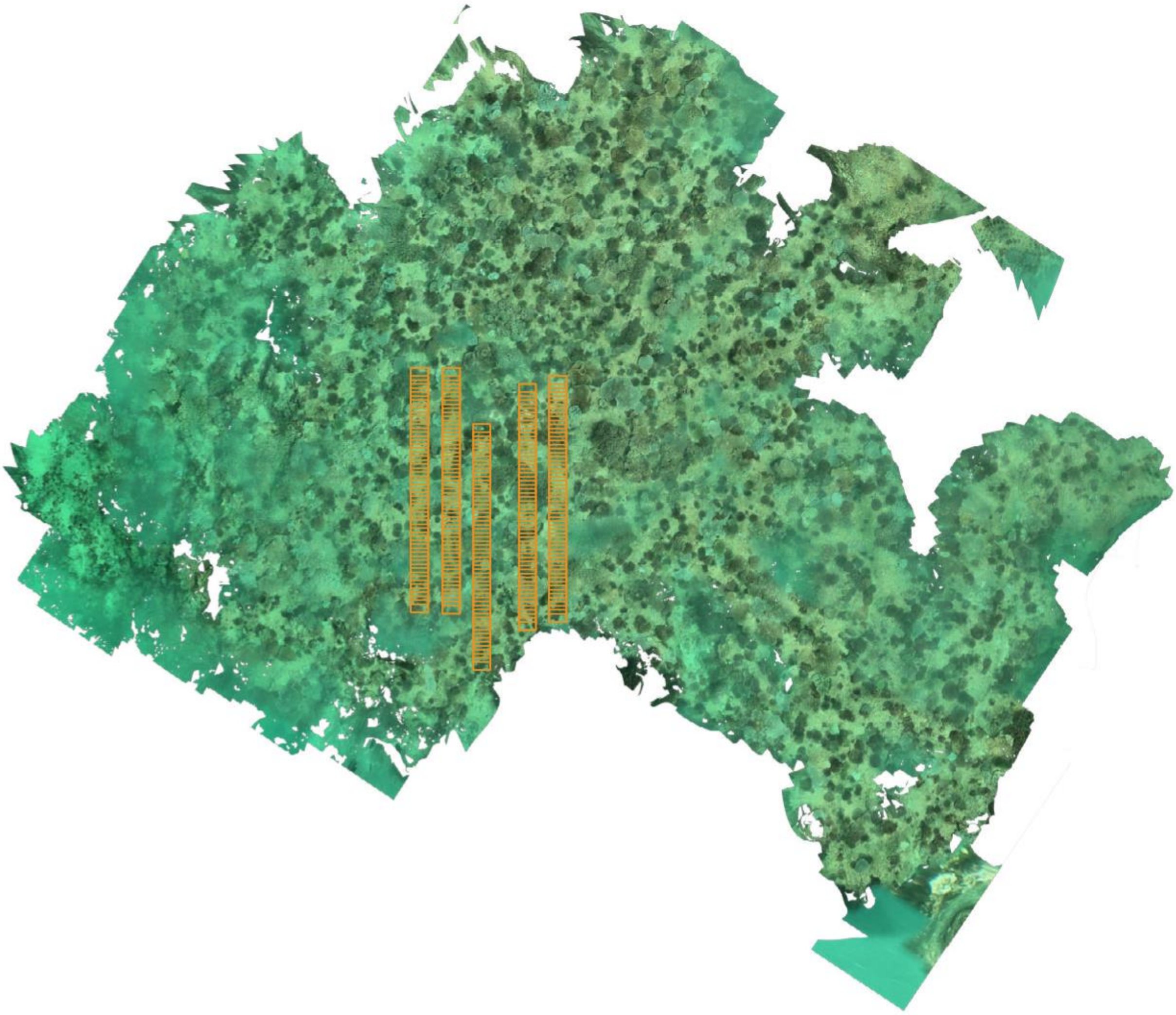

Figure 21: LEGD orthomosaic and digital transects

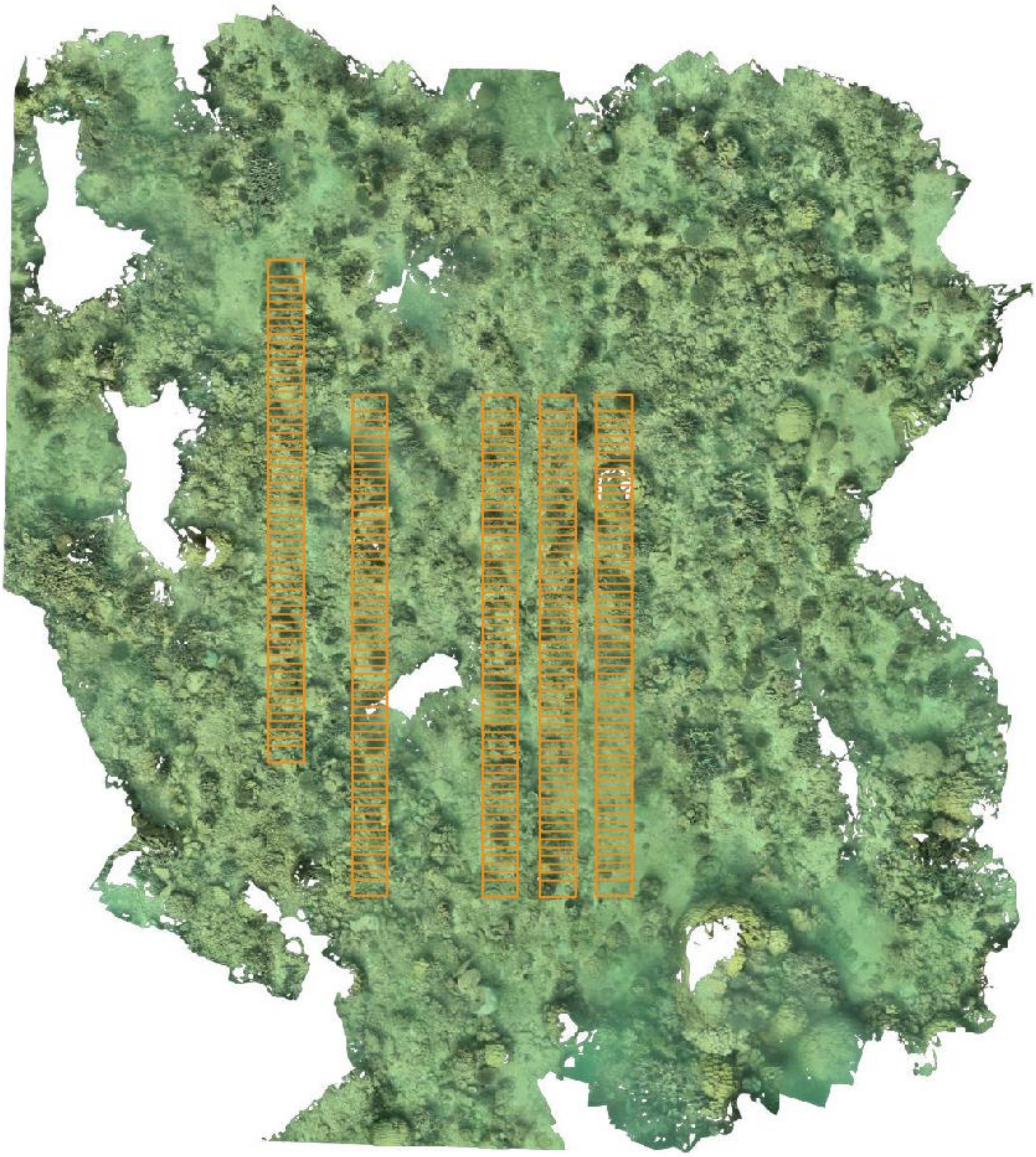

Figure 22:MAL2 orthomosaic and digital transects

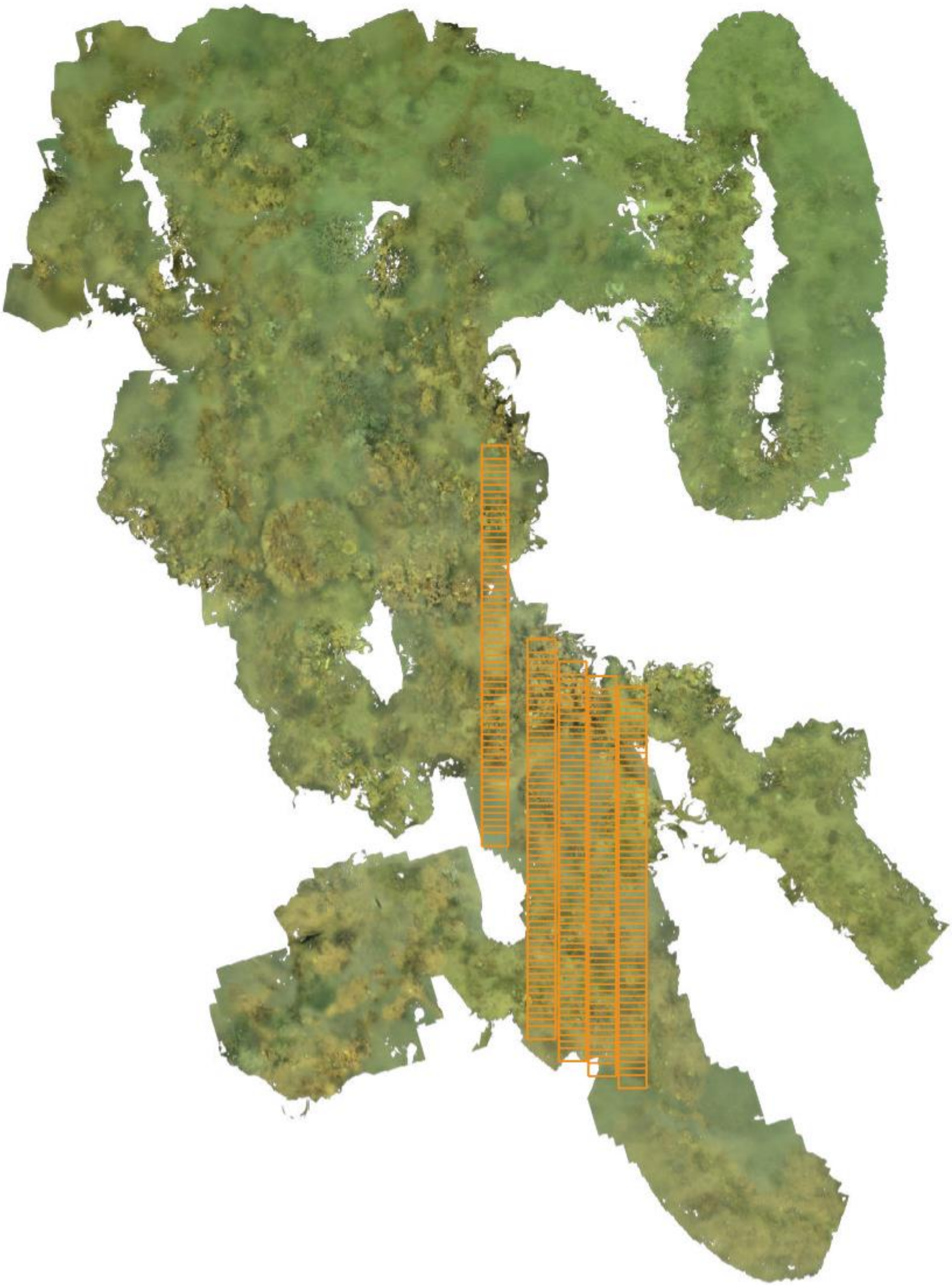

Figure 23: MIDI orthomosaic and digital transects

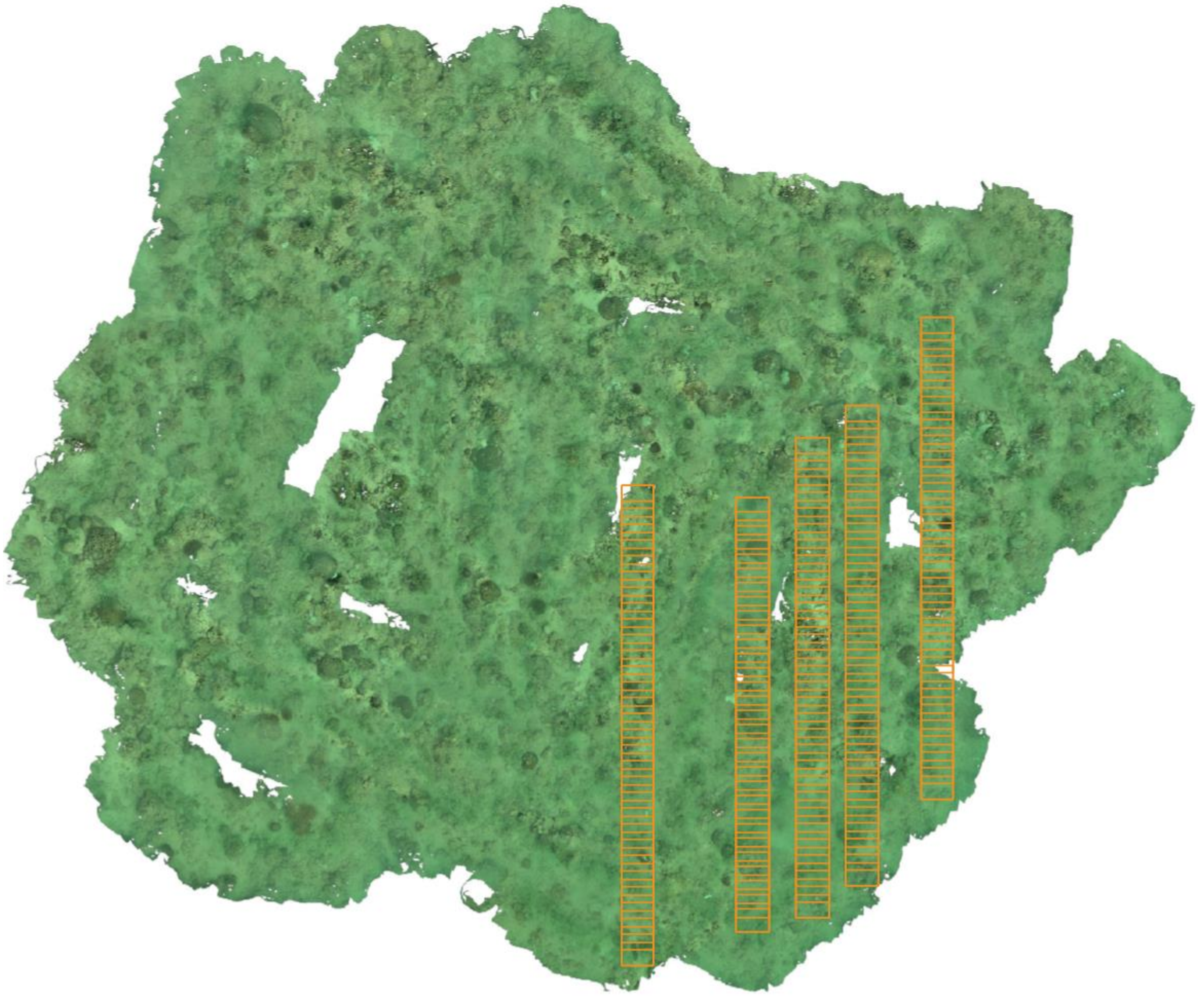

Figure 24: NWIT orthomosaic and digital transects

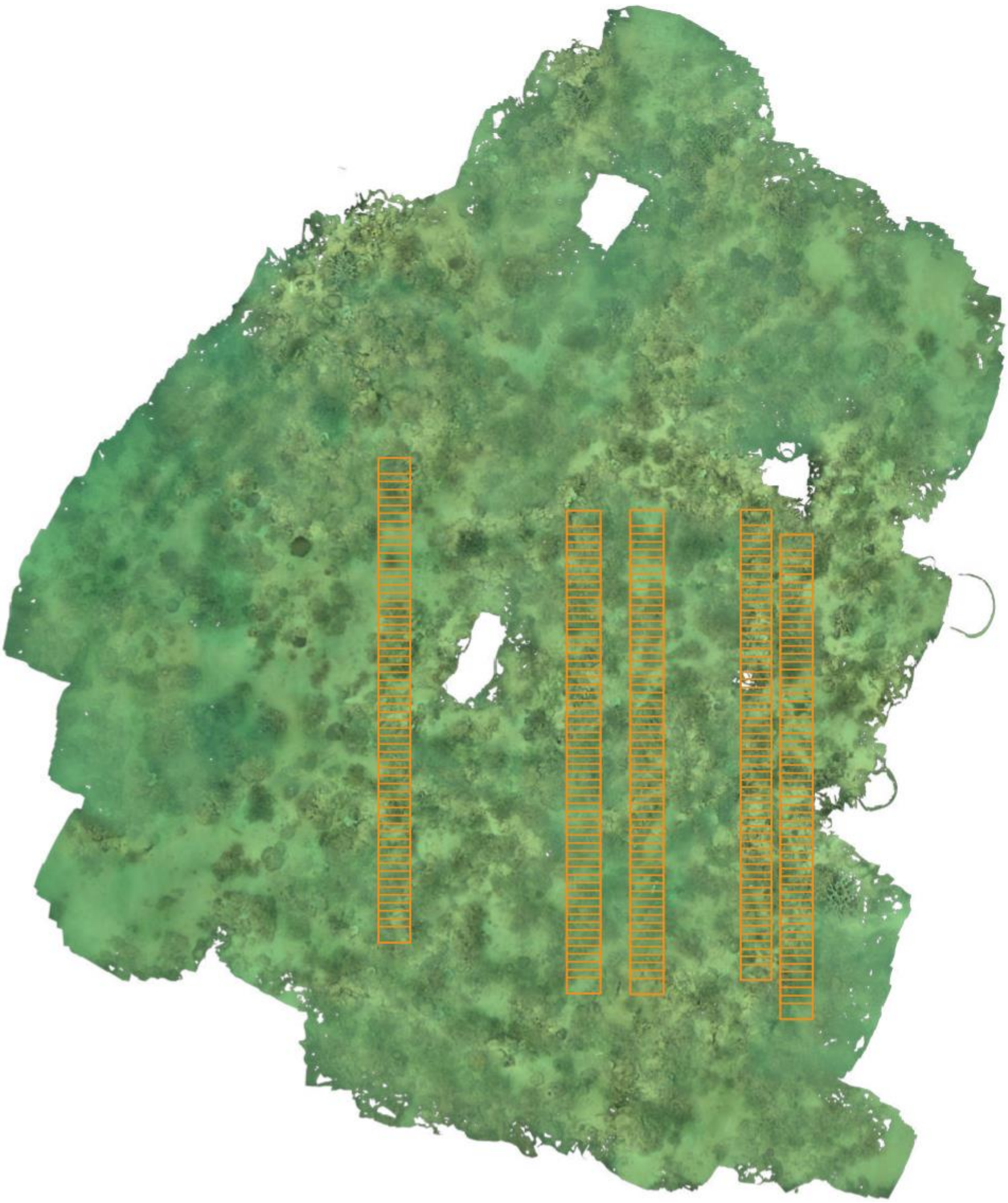

Figure 25: SUP2 orthomosaic and digital transects

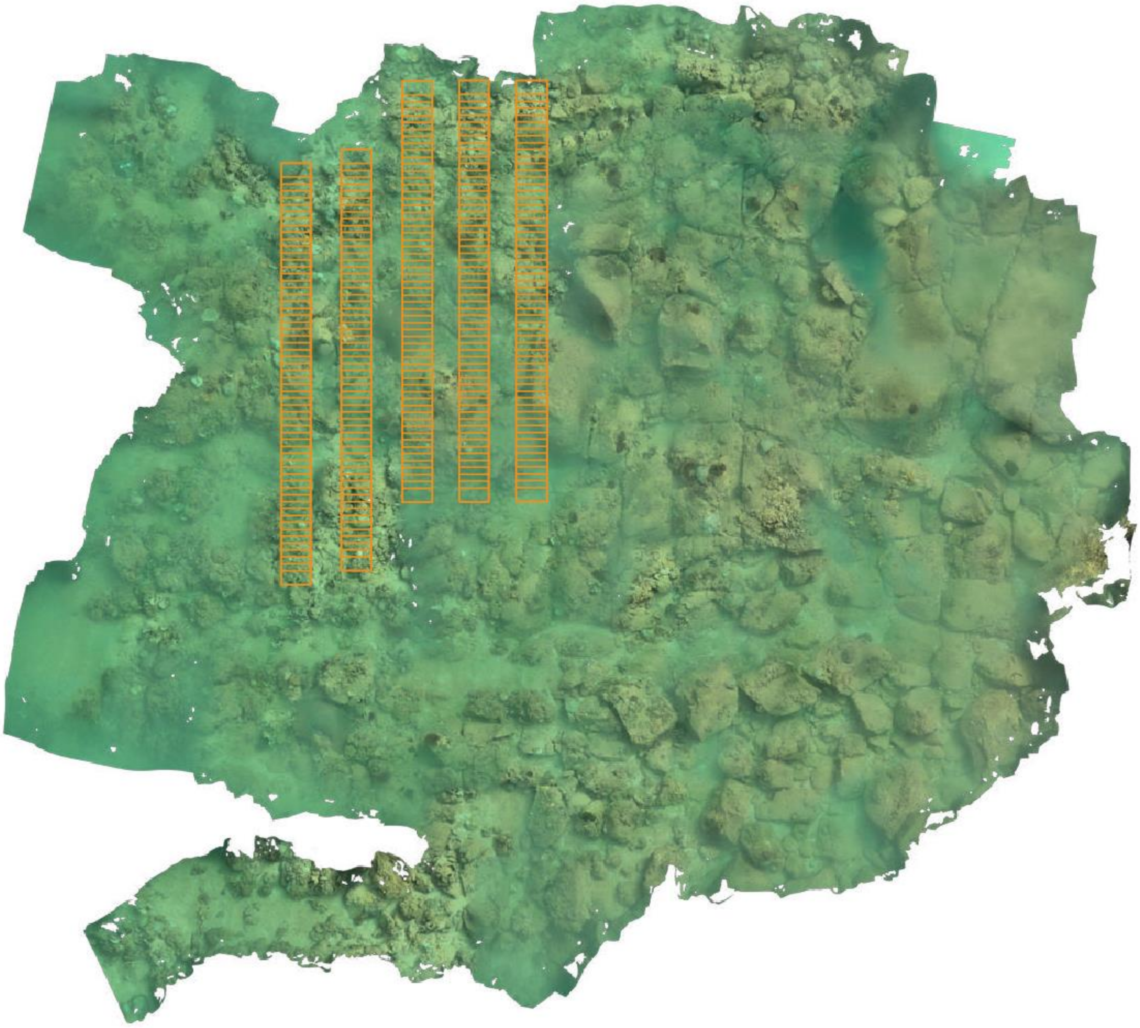

Figure 26: SWIT orthomosaic and digital transects

Appendix B. ReefCloud Classification List

CODE	DESCRIPTION	FUNCTIONAL GROUP
C_ACA	Acanthastrea	Coral
C_ACA_B	Acanthastrea bleached	Bleached
C_ACA_EC	Acanthastrea echinata	Coral
C_ACR_B	Acropora bleached	Bleached
C_ACR_BR	Acropora branching	Coral
C_ACR_CO	Acropora corymbose	Coral
C_ACR_DIG	Acropora digitate	Coral
C_ACR_TA	Acropora tabular	Coral
C_ALV	Alveopora	Coral
C_ALV_B	Alveopora bleached	Bleached
I_ASC	Ascidian	Invertebrate
C_AST_B	Astrea bleached	Bleached
C_AST_CU	Astrea curta	Coral
C_ASTR	Astreopora	Coral
I_BIV	Bivalve	Invertebrate
B	Blur/Unidentifiable	N/A
C_CAT	Catalaphyllia	Coral
C_CAT_B	Catalaphyllia bleached	Bleached
C_CAU	Caulastrea	Coral
C_CAU_B	Caulastrea bleached	Bleached
C_COE_AS	Coelastrea aspera	Coral
C_COE_B	Coelastrea bleached	Bleached
A_CCA	Coralline algae	Algae
C_COS	Coscinaraea	Coral
C_COS_B	Coscinaraea bleached	Bleached
C_CTE	Ctenactis	Coral
C_CTE_B	Ctenactis bleached	Bleached
C_CYP	Cyphastrea	Coral
C_CYP_B	Cyphastrea bleached	Bleached
DC_DSC	Dead standing coral	Dead Coral
I_DIA_SE	Diadema setosum	
C_DIPL_B	Diploastrea bleached	Bleached
C_DIPL_HE	Diploastrea heliopora	Coral
C_DIPS	Dipsastraea	Coral
C_DIPS_B	Dipsastraea bleached	Bleached
C_DUN	Duncanopsammia	Coral
C_DUN_AX	Duncanopsammia axifuga	Coral
C_DUN_B	Duncanopsammia bleached	Bleached
I_ECH	Echinoderm	Invertebrate
C_EPH	Echinophyllia	Coral
C_EPH_AS	Echinophyllia aspera	Coral
C_EPH_B	Echinophyllia bleached	Bleached

CODE	DESCRIPTION	FUNCTIONAL GROUP
C_ECH	Echinopora	Coral
C_ECH_B	Echinopora bleached	Bleached
E	Equipment	N/A
C_EUP_AN	Euphyllia ancora	Coral
C_EUP_B	Euphyllia bleached	Bleached
C_FAV	Favites	Coral
C_FAV_B	Favites bleached	Bleached
C_FUN	Fungia/Cycloseris	Coral
C_FUN_B	Fungia/Cycloseris bleached	Bleached
C_GAL	Galaxea	Coral
C_GAL_B	Galaxea bleached	Bleached
C_GAR	Gardineroseris	Coral
I_GAS	Gastropod	Invertebrate
I_BIV_GC	Giant Clam	Invertebrate
C_GAS	Goniastrea	Coral
C_GAS_B	Goniastrea bleached	Bleached
C_GOP	Goniopora	Coral
C_GOP_B	Goniopora bleached	Bleached
H_GRA	Gravel	Hard Substrate
C_HER_B	Herpolitha bleached	Bleached
C_HER_LI	Herpolitha limax	Coral
I_HOL	Holothurian	Invertebrate
C_HYD	Hydnophora	Coral
C_HYD_B	Hydnophora bleached	Bleached
I_HYD	Hydroid	Invertebrate
C_LEP	Leptastrea	Coral
C_LEP_B	Leptastrea bleached	Bleached
C_LEPT_B	Leptoria bleached	Bleached
C_LEPT_PH	Leptoria phrygia	Coral
C_LEPS	Leptoseris	Coral
H_LIM_RO	Limestone rock	Hard Substrate
C_LIT_B	Lithophyllon bleached	Bleached
C_LIT_UN	Lithophyllon undulatum	Coral
C_LOB_B	Lobophyllia bleached	Bleached
C_LOB_HE	Lobophyllia hemprichii	Coral
SC_LOB	Lobophytum	Soft Coral
SC_LOB_B	Lobophytum bleached	Bleached
A_MA	Macroalgae	Algae
A_MA_W	Macroalgae Wrack	Algae
C_MER_AM	Merulina ampliata	Coral
C_MER_B	Merulina bleached	Bleached
I_MIL	Millepora	Invertebrate
C_MON_B	Montipora bleached	Bleached
C_MON_EN	Montipora encrusting	Coral

CODE	DESCRIPTION	FUNCTIONAL GROUP
C_MON_FO	Montipora foliose	Coral
C_MOS_B	Moselya bleached	Bleached
C_MOS_LA	Moselya latistellata	Coral
C_MYC_B	Mycedium bleached	Bleached
C_MYC_EL	Mycedium elephantotus	Coral
C_AST_OTH	Astrea	Coral
C_COE_OTH	Coelastrea	Coral
I_OTH	Invertebrate	Invertebrate
C_LOB_OTH	Lobophyllia	Coral
I_OCT_OTH	Octocoral	Invertebrate
C_PAV_OTH	Pavona	Coral
C_POR_OTH	Porites	Coral
C_TUR_OTH	Turbinaria	Coral
C_PAC	Pachyseris	Coral
C_PAC_B	Pachyseris bleached	Bleached
C_PAC_RU	Pachyseris rugosa	Coral
C_PAR	Paragoniastrea	Coral
C_PAR_AU	Paragoniastrea australensis	Coral
C_PAR_B	Paragoniastrea bleached	Bleached
C_PAV_B	Pavona bleached	Bleached
C_PAV_DE	Pavona decussata	Coral
C_PEC_B	Pectinia bleached	Bleached
C_PEC	Pectinia	Coral
C_PLA	Platygyra	Coral
C_PLA_B	Platygyra bleached	Bleached
C_PLER_B	Plerogyra bleached	Bleached
C_PLER_SI	Plerogyra sinuosa	Coral
C_PLES_B	Plesiastrea bleached	Bleached
C_PLES_VE	Plesiastrea versipora	Coral
C_POC	Pocillopora	Coral
C_POC_B	Pocillopora bleached	Bleached
C_POD_B	Podabacia bleached	Bleached
C_POD_CR	Podabacia crustacea	Coral
C_POL_B	Polyphyllia bleached	Bleached
C_POL_TA	Polyphyllia talpina	Coral
C_POR_B	Porites bleached	Bleached
C_POR_CY	Porites cylindrica	Coral
C_PSA	Psammocora	Coral
C_PSA_B	Psammocora bleached	Bleached
C_PSE_B	Pseudosiderastrea bleached	Bleached
C_PSE_TA	Pseudosiderastrea tayami	Coral
DC_RDC	Recently dead coral	Dead Coral
H_RUB	Rubble	Hard Substrate
S_SAN	Sand	Sediment

CODE	DESCRIPTION	FUNCTIONAL GROUP
SC_SAR	Sarcophyton	Soft Coral
SC_SAR_B	Sarcophyton bleached	Bleached
A_SAR	Sargassum	Algae
S_ELI	Seagrass elliptical	Seagrass
S_OTH	Seagrass other	Seagrass
S_STR	Seagrass straplike	Seagrass
S_SMC	Silt/Mud/Clay	Sediment
SC_SIN	Sinularia	Soft Coral
SC_SIN_B	Sinularia bleached	Bleached
I_SPO	Sponge	Invertebrate
I_SPO_B	Sponge bleached	Bleached
C_STY	Stylophora	Coral
C_STY_B	Stylophora bleached	Bleached
C_TRA_B	Trachyphyllia bleached	Bleached
C_TRA_GO	Trachyphyllia goeffroyi	Coral
C_TUB	Tubastrea	Coral
C_TUB_B	Tubastrea bleached	Bleached
C_TUR_ME	Turbinara mesenterina	Coral
C_TUR_B	Turbinaria bleached	Bleached
C_TUR_RE	Turbinaria reniformis	Coral
A_TA	Turf algae	Algae
C_UNK_B	Unidentified Branching	Coral
UNK_B_B	Unidentified Branching bleached	Bleached
C_UNK_E	Unidentified Encrusting	Coral
UNK_E_B	Unidentified Encrusting bleached	Bleached
U_UNK	Unidentified flora or fauna	Unconfirmed
C_UNK	Unidentified hard coral	Coral
I_UNK	Unidentified invertebrate	Invertebrate
C_UNK_M	Unidentified Massive	Coral
UNK_M_B	Unidentified Massive bleached	Bleached
C_UNK_SM	Unidentified Submassive	Coral
UNK_SM_B	Unidentified Submassive bleached	Bleached
C_UNK_T	Unidentified Tabular	Coral
UNK_T_B	Unidentified Tabular bleached	Bleached
I_ZOA	Zoanthid	Invertebrate
I_ZOA_B	Zoanthid bleached	Bleached

Appendix C. Benthic Cover (%) by Site

Site	Transect	Coral			Flora	Other benthic invertebrates	Abiotic
		Hard	Bleached	Total			
Ecological Zone A							
KGBY	T1	26.1	2.3	28.4	55.1	2.9	13.6
	T2	23.9	1.8	25.7	50.7	3.4	20.2
	T3	32.4	3.1	35.5	55.9	5.5	3.1
	T4	40.3	2.0	42.3	47.3	4.2	6.3
	T5	30.4	2.6	33.0	56.7	4.6	5.7
	Mean	**30.6**	**2.4**	**33.0**	**53.1**	**4.1**	**9.8**
	SD	**5.7**	**0.5**	**5.8**	**3.6**	**0.9**	**6.3**
MIDI	T1	29.1	4.9	34.0	43.7	1.4	20.9
	T2	31.6	6.0	37.6	46.0	2.4	14.0
	T3	33.6	8.9	42.5	41.5	3.3	12.6
	T4	36.7	6.6	43.3	41.6	2.7	12.5
	T5	30.4	3.1	33.6	49.7	2.1	14.7
	Mean	**32.3**	**5.9**	**38.2**	**44.5**	**2.4**	**14.9**
	SD	**2.7**	**1.9**	**4.1**	**3.1**	**0.6**	**3.1**
NWIT	T1	10.4	1.4	11.8	64.5	1.1	22.7
	T2	10.8	0.7	11.6	77.2	0.9	10.4
	T3	10.2	1.1	11.4	62.1	3.4	23.1
	T4	17.7	1.5	19.2	57.4	1.4	22.1
	T5	10.8	1.7	12.5	76.7	0.6	10.1
	Mean	**12.0**	**1.3**	**13.3**	**67.6**	**1.5**	**17.7**
	SD	**2.9**	**0.3**	**3.0**	**8.0**	**1.0**	**6.1**
SUP2	T1	11.2	0.4	11.6	83.0	0.6	4.8
	T2	8.7	0.6	9.4	71.1	0.7	18.8
	T3	13.9	1.2	15.1	79.4	1.2	4.4
	T4	17.1	0.8	17.9	67.0	1.0	14.0
	T5	9.3	0.8	10.1	69.4	0.8	19.7
	Mean	**12.0**	**0.8**	**12.8**	**74.0**	**0.8**	**12.4**

Site	Transect	Coral			Flora	Other benthic invertebrates	Abiotic
		Hard	Bleached	Total			
	SD	3.1	0.3	3.2	6.1	0.2	6.6
SWIT	T1	17.1	1.2	18.3	76.2	1.7	3.8
	T2	18.3	1.5	19.8	73.9	2.2	4.1
	T3	22.2	0.9	23.1	72.8	2.2	1.9
	T4	19.6	1.7	21.3	72.3	2.7	3.7
	T5	13.8	0.9	14.7	75.2	1.7	8.4
	Mean	18.2	1.2	19.4	74.1	2.1	4.4
	SD	2.8	0.3	2.9	1.5	0.4	2.2
Ecological Zone B							
ANG2	T1	42.6	2.4	45.1	37.5	4.9	12.6
	T2	25.7	2.6	28.3	28.1	10.1	33.4
	T3	28.2	2.5	30.7	58.2	2.1	9.0
	T4	50.6	1.8	52.5	38.9	2.0	6.7
	T5	52.4	3.0	55.4	31.3	2.3	10.9
	Mean	39.9	2.5	42.4	38.8	4.3	14.5
	SD	11.1	0.4	11.1	10.5	3.1	9.7
COBN	T1	21.9	2.6	24.4	71.0	1.6	2.9
	T2	22.7	3.2	26.0	67.8	3.5	2.7
	T3	25.6	2.8	28.4	65.2	1.6	4.9
	T4	22.2	2.9	25.1	70.0	2.3	2.6
	T5	16.8	2.9	19.7	70.6	2.0	7.7
	Mean	21.8	2.9	24.7	68.9	2.2	4.2
	SD	2.8	0.2	2.8	2.2	0.7	1.9
CONI	T1	37.4	5.5	43.0	41.1	3.8	12.2
	T2	41.7	3.7	45.5	20.2	10.1	24.3
	T3	42.6	2.9	45.5	34.8	3.9	15.9
	T4	29.2	4.8	34.0	39.3	5.8	20.9
	T5	39.1	3.8	42.9	38.8	4.4	13.9
	Mean	38.0	4.2	42.2	34.8	5.6	17.4
	SD	4.8	0.9	4.2	7.6	2.3	4.5

Site	Transect	Coral			Flora	Other benthic invertebrates	Abiotic
		Hard	Bleached	Total			
CONI2	T1	32.5	4.1	36.5	41.3	6.5	15.8
	T2	26.2	2.4	28.7	51.1	1.1	19.1
	T3	25.4	3.1	28.5	43.2	1.9	26.4
	T4	23.2	3.2	26.4	45.1	1.2	27.2
	T5	21.2	2.7	23.9	49.0	0.8	26.3
	Mean	**25.7**	**3.1**	**28.8**	**45.9**	**2.3**	**22.9**
	SD	**3.8**	**0.5**	**4.2**	**3.6**	**2.1**	**4.6**
CRTS	T1	8.8	0.5	9.3	81.1	9.3	0.3
	T2	5.6	0.2	5.8	86.6	6.5	1.1
	T3	6.3	0.4	6.7	87.4	5.5	0.4
	T4	4.2	0.3	4.5	90.1	5.3	0.1
	T5	5.4	0.3	5.7	81.8	12.4	0.2
	Mean	**6.0**	**0.4**	**6.4**	**85.4**	**7.8**	**0.4**
	SD	**1.5**	**0.1**	**1.6**	**3.4**	**2.7**	**0.3**
FFP1	T1	31.5	2.1	33.5	51.4	2.7	12.4
	T2	29.8	3.1	32.8	54.5	2.0	10.6
	T3	46.0	3.2	49.2	38.9	2.4	9.5
	T4	44.8	3.1	47.9	43.9	1.9	6.3
	T5	45.7	3.8	49.5	47.3	2.1	1.1
	Mean	**39.5**	**3.1**	**42.6**	**47.2**	**2.2**	**8.0**
	SD	**7.3**	**0.6**	**7.7**	**5.5**	**0.3**	**4.0**
GIDI	T1	22.5	1.4	23.9	54.2	2.2	19.7
	T2	13.4	0.2	13.6	52.0	0.6	33.7
	T3	17.6	0.8	18.5	64.5	1.5	15.6
	T4	15.6	1.1	16.6	55.8	1.5	26.1
	T5	25.4	1.5	26.9	52.2	2.2	18.6
	Mean	**18.9**	**1.0**	**19.9**	**55.8**	**1.6**	**22.7**
	SD	**4.4**	**0.5**	**4.9**	**4.6**	**0.6**	**6.5**
HAM3	T1	2.8	0.4	3.2	93.1	0.6	3.1
	T2	5.2	0.2	5.4	91.0	0.6	3.1

Site	Transect	Coral			Flora	Other benthic invertebrates	Abiotic
		Hard	Bleached	Total			
	T3	10.9	0.4	11.3	83.0	1.5	4.2
	T4	3.1	0.6	3.6	88.6	0.9	6.9
	T5	8.1	0.6	8.7	83.6	2.0	5.7
	Mean	**6.0**	**0.4**	**6.4**	**87.8**	**1.1**	**4.6**
	SD	**3.1**	**0.2**	**3.1**	**4.0**	**0.5**	**1.5**
HAUY	T1	19.7	1.2	20.9	40.0	0.7	38.4
	T2	16.0	0.4	16.4	32.5	0.9	50.2
	T3	26.3	0.6	26.9	35.1	1.3	36.7
	T4	22.9	2.5	25.4	23.8	1.3	49.4
	T5	23.9	1.0	24.9	28.0	1.3	45.8
	Mean	**21.8**	**1.1**	**22.9**	**31.9**	**1.1**	**44.1**
	SD	**3.6**	**0.7**	**3.8**	**5.6**	**0.3**	**5.6**
HGPT	T1	10.5	1.8	12.2	74.2	1.5	12.0
	T2	6.2	1.5	7.8	83.8	1.0	7.4
	T3	9.1	0.8	9.9	71.3	1.8	16.9
	T4	10.2	2.0	12.1	62.3	1.4	24.2
	T5	6.0	1.4	7.4	76.5	1.6	14.4
	Mean	**8.4**	**1.5**	**9.9**	**73.6**	**1.5**	**15.0**
	SD	**1.9**	**0.4**	**2.1**	**7.0**	**0.3**	**5.6**
LANI	T1	33.1	2.5	35.7	48.7	11.3	4.4
	T2	7.2	0.9	8.1	78.3	4.6	8.9
	T3	23.4	1.0	24.4	64.3	5.0	6.3
	T4	18.7	1.1	19.9	70.2	5.0	4.9
	T5	24.1	1.2	25.3	57.0	7.4	10.3
	Mean	21.3	1.4	22.7	63.7	6.6	7.0
	SD	8.5	0.6	8.9	10.3	2.5	2.3
LEGD	T1	25.9	0.5	26.4	40.3	32.9	0.5
	T2	26.4	0.7	27.0	37.8	35.0	0.2
	T3	27.6	1.0	28.6	26.0	45.0	0.5

Site	Transect	Coral			Flora	Other benthic invertebrates	Abiotic
		Hard	Bleached	Total			
	T4	31.1	1.0	32.1	28.6	38.6	0.7
	T5	23.1	0.9	24.0	29.2	46.4	0.4
	Mean	**26.8**	**0.8**	**27.6**	**32.4**	**39.6**	**0.4**
	SD	**2.6**	**0.2**	**2.7**	**5.6**	**5.3**	**0.2**
MAL2	T1	29.5	3.4	32.9	60.7	1.7	4.8
	T2	27.9	2.8	30.7	61.1	1.7	6.4
	T3	26.7	3.2	29.9	56.8	1.7	11.6
	T4	14.7	1.9	16.6	69.7	1.5	12.3
	T5	28.4	3.0	31.4	39.7	2.2	26.8
	Mean	**25.4**	**2.9**	**28.3**	**57.6**	**1.7**	**12.4**
	SD	**5.4**	**0.5**	**5.9**	**9.9**	**0.2**	**7.8**

Appendix D. Colony Observations by Site

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
ANG2	Transect 1 (n=19)							
	Agariciidae	*Pavona*	-	-	-	1	-	-
	Fungiidae	*Podabacia*	-	1	-	-	-	-
	Merulinidae	*Favites*	-	-	-	-	-	-
	Poritidae	*Porites*	-	8	14	2	-	-
	Transect 2 (n=13)							
	Acroporidae	*Acropora*	-	-	-	1	-	-
	Agariciidae	*Pavona*	-	-	-	-	-	-
	Merulinidae	*Favites*	-	2	-	-	-	-
		Paragoniastrea	-	-	-	-	-	-
	Poritidae	*Porites*	-	-	2	1	-	-
	Zoanthidae	*Zoanthid*	-	-	-	-	-	-
	Transect 3 (n=11)							
	Dendrophylliidae	*Turbinaria*	-	1	-	-	-	-
	Poritidae	*Porites*	-	3	8	1	-	-
	Zoanthidae	*Zoanthid*	-	-	-	-	-	-
	Transect 4 (n=16)							
	Agariciidae	*Pavona*	-	-	-	-	-	-
	Euphylliidae	*Galaxea*	-	-	-	-	-	-
	Poritidae	*Porites*	-	1	10	2	-	-
	Transect 5 (n=16)							
	Agariciidae	*Pavona*	-	-	-	-	-	-
	Poritidae	*Porites*	-	-	14	6	-	-
	Total		-	16	48	14	-	-
COBN	Transect 1 (n=22)							
	Alcyoniidae	*Lobophytum*	-	2	-	-	2	-
	Dendrophylliidae	*Turbinaria*	-	1	-	-	-	5
	Merulinidae	*Dipsastrea*	-	-	-	-	1	-
		Favites	-	3	-	-	-	-
	Poritidae	*Goniopora*	-	-	-	-	-	-
		Porites	-	-	14	-	-	-
	Transect 2 (n=23)							
	Dendrophylliidae	*Turbinaria*	-	3	-	-	-	1
	Merulinidae	*Dipsastrea*	-	4	-	-	-	-
		Favites	-	5	-	-	1	-
		Platygyra	-	2	-	-	-	-
	Poritidae	*Porites*	-	-	11	-	-	-
	Transect 3 (n=20)							
	Merulinidae	*Favites*	-	2	-	-	-	-
	Poritidae	*Porites*	-	-	20	-	-	-

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
	Transect 4 (n=17)							
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	2
	Merulinidae	*Favites*	-	6	-	-	1	-
	Poritidae	*Porites*	-	-	10	-	-	-
	Alcyoniidae	*Lobophytum*	-	-	-	-	-	-
	Transect 5 (n=7)							
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	2
	Poritidae	*Porites*	-	-	5	-	-	-
	Total		-	28	60	-	5	10
CONI	Transect 1 (n=29)							
	Agariciidae	*Pavona*	-	3	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	1
	Euphylliidae	*Galaxea*	-	-	-	-	-	-
	Lobophylliidae	*Echinophyllia*	-	-	-	-	-	-
		Lobophyllia	-	-	-	1	2	-
	Merulinidae	*Dipsastrea*	-	-	-	-	-	-
		Favites	-	-	-	-	1	-
		Platygyra	-	-	-	-	-	-
	Poritidae	*Goniopora*	-	-	-	-	-	-
		Porites	-	1	4	23	-	-
	Pocilloporidae	*Stylophora*	-	-	-	1	-	-
	Unidentified Hard Coral		-	-	-	-	-	-
	Transect 2 (n=25)							
	Agariciidae	*Pavona*	-	2	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	-
	Lobophylliidae	*Echinophyllia*	-	-	-	-	-	-
	Merulinidae	*Coelastrea*	-	-	-	-	-	-
		Favites	-	-	-	-	-	-
		Platygyra	-	-	-	-	-	-
	Poritidae	*Porites*	5	-	8	5	1	-
	Sarcophytidae	*Sarcophytum*	-	-	-	-	-	-
	Transect 3 (n=23)							
	Acroporidae	*Astreopora*	-	-	-	-	-	-
		Montipora	-	-	-	-	-	-
	Lobophylliidae	*Lobophyllia*	-	-	-	-	1	-
	Merulinidae	*Cyphastrea*	-	-	-	1	-	-
		Dipsastrea	-	-	-	-	-	-
		Favites	-	-	-	-	1	-
		Goniastrea	-	-	2	-	-	-
	Poritidae	*Goniopora*	-	-	-	-	-	-
		Porites	-	-	10	7	1	-
	Unidentified Hard Coral		-	-	-	-	1	-
	Transect 4 (n=30)							

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
	Acroporidae	*Alveopora*	-	-	-	-	-	-
		Astreopora	-	-	-	-	1	-
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	-
	Leptastreidae	*Leptastrea*	-	-	-	-	-	-
	Lobophylliidae	*Lobophyllia*	-	-	-	-	-	-
	Merulinidae	*Coelastrea*	-	-	-	-	1	-
		Cyphastrea	-	-	-	-	1	-
		Dipsastrea	-	-	-	-	-	-
		Favites	-	-	-	-	-	-
		Goniastrea	-	-	-	-	-	-
		Merulina	-	-	-	-	-	-
	Poritidae	*Porites*	-	-	1	-	-	-
	Sinulariidae	*Sinularia*	-	-	-	-	-	-
	Transect 5 (n=28)							
	Acroporidae	*Alveopora*	-	1	-	-	-	-
		Montipora	-	-	-	-	-	-
	Agariciidae	*Gardinoseris*	-	3	-	-	-	-
		Pavona	-	1	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	1	-	-	-	-
	Euphylliidae	*Galaxea*	-	1	-	-	-	-
	Leptastreidae	*Leptastrea*	-	-	-	-	-	-
	Lobophylliidae	*Lobophyllia*	-	2	-	-	-	-
	Merulinidae	*Coelastrea*	-	1	-	-	-	-
		Cyphastrea	-	1	-	-	-	-
		Favites	-	4	-	-	1	-
		Goniastrea	-	-	-	-	-	-
		Merulina	-	3	-	-	-	1
		Platygyra	-	1	-	-	-	-
	Poritidae	*Porites*	7	1	10	9	-	-
	Unidentified Hard Coral		-	1	-	-	-	-
	Total		12	27	35	47	12	2
CONI2	Transect 1 (n=28)							
	Acroporidae	*Acropora*	-	-	-	6	0	4
		Astreopora	-	-	-	-	-	-
	Agariciidae	*Pavona*	-	5	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	2	-	-	-	3
	Fungiidae	*Herpolitha*	-	-	-	-	-	-
		Podabacia	-	-	1	-	-	-
	Lobophylliidae	*Lobophyllia*	-	-	-	-	-	-
	Merulinidae	*Coelastrea*	-	-	-	-	-	1
		Dipsastrea	-	-	-	-	-	-
		Favites	-	1	1	-	1	2
		Hydnophora	-	-	1	2	-	-

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
		Platygyra	-	-	3	-	-	-
	Poritidae	*Porites*	4	-	28	8	6	-
	Rhizangiidae	*Pseudosiderastrea*	-	-	-	-	-	4
	Unidentified Hard Coral		-	2	-	-	-	-
	Transect 2 (n=27)							
	Acroporidae	*Acropora*	-	-	-	1	-	-
		Montipora	-	-	-	-	1	-
	Agariciidae	*Pavona*	-	2	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	3	-	-	-	-
	Euphylliidae	*Galaxea*	-	-	-	-	-	-
	Fungiidae	*Podabacia*	-	-	-	-	-	-
	Lobophylliidae	*Echinophyllia*	-	1	-	-	1	-
		Lobophyllia	-	1	-	-	-	-
		Moseleya	-	-	-	-	-	1
		Oxypora	-	-	-	-	-	-
	Merulinidae	*Coelastrea*	-	-	-	-	-	-
		Cyphastrea	-	1	-	-	-	-
		Dipsastrea	-	2	-	-	-	-
		Favites	-	5	-	-	-	-
		Goniastrea	-	1	-	1	-	-
		Paragoniastrea	-	1	-	-	-	-
		Platygyra	-	-	-	-	-	-
	Pocilloporidae	*Stylophora*	-	-	-	1	-	-
	Poritidae	*Porites*	-	1	10	2	6	-
	Rhizangiidae	*Pseudosiderastrea*	-	1	-	-	-	-
	Unidentified Hard Coral		-	-	-	-	1	-
	Transect 3 (n=27)							
	Acroporidae	*Acropora*	-	-	-	2	3	-
		Astreopora	-	1	-	-	2	-
		Montipora	-	1	-	-	3	-
	Agariciidae	*Pavona*	-	3	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	7
	Euphylliidae	*Galaxea*	-	-	-	-	-	-
	Merulinidae	*Coelastrea*	-	-	-	-	-	-
		Dipsastrea	-	1	-	-	-	1
		Favites	-	1	-	-	2	2
		Platygyra	-	-	-	-	-	-
	Poritidae	*Porites*	-	-	17	9	19	-
	Rhizangiidae	*Pseudosiderastrea*	-	-	-	-	-	2
	Unidentified Hard Coral		-	-	-	-	-	-
	Transect 4 (n=26)							
	Acroporidae	*Acropora*	-	1	-	4	1	-
		Astreopora	-	-	-	-	-	-

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
		Montipora	-	-	-	1	-	-
	Agariciidae	*Pavona*	-	1	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	1
	Leptastreidae	*Leptastrea*	-	1	-	-	-	-
	Lobophylliidae	*Moseleya*	-	-	-	-	-	-
	Merulinidae	*Coelastrea*	-	1	-	-	1	-
		Cyphastrea	-	-	-	-	1	-
		Dipsastrea	-	-	1	-	-	-
		Favites	-	2	-	-	-	-
		Goniastrea	-	1	-	-	-	-
		Merulina	-	1	-	-	-	-
		Paragoniastrea	-	1	-	-	-	-
		Platygyra	-	2	-	-	-	-
	Pocilloporidae	*Stylophora*	-	-	1	-	-	-
	Poritidae	*Porites*	1	4	19	6	6	-
	Rhizangiidae	*Pseudosiderastrea*	-	-	-	-	-	1
	Unidentified Hard Coral		-	-	-	-	1	-
	Transect 5 (n=28)							
	Acroporidae	*Acropora*	-	1	-	2	2	-
		Montipora	-	1	-	-	3	-
	Leptastreidae	*Leptastrea*	-	-	-	-	-	-
	Merulinidae	*Coelastrea*	-	-	-	-	-	-
		Cyphastrea	-	1	-	-	-	-
		Dipsastrea	-	4	-	-	1	-
		Favites	-	1	-	-	-	1
		Goniastrea	-	-	-	-	-	-
		Paragoniastrea	-	2	-	-	-	-
		Platygyra	-	2	-	-	-	-
	Poritidae	*Porites*	3	1	13	7	6	-
	Unidentified Hard Coral		-	-	-	-	-	-
	Total		8	64	95	52	67	30
CRTS	Transect 1 (n=14)							
	Dendrophylliidae	*Turbinaria*	-	4	-	-	-	5
	Merulinidae	*Dipsastrea*	-	-	-	-	-	-
		Favites	-	1	-	-	-	-
	Transect 2 (n=14)							
	Dendrophylliidae	*Turbinaria*	-	1	-	-	-	14
	Leptastreidae	*Leptastrea*	-	-	-	-	-	4
	Merulinidae	*Favites*	-	-	-	-	-	-
	Transect 3 (n=9)							
	Acroporidae	*Montipora*	-	-	-	-	2	-
	Dendrophylliidae	*Turbinaria*	-	3	-	-	-	9
	Euphylliidae	*Galaxea*	-	-	-	-	-	-

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
	Transect 4 (n=3)							
	Dendrophylliidae	*Turbinaria*	-	1	-	-	-	2
	Transect 5 (n=8)							
	Dendrophylliidae	*Turbinaria*	-	7	-	-	-	3
	Total		-	17	-	-	2	37
FFP1	Transect 1 (n=19)							
	Acroporidae	*Acropora*	-	4	-	-	1	1
		Astreopora	-	-	-	-	1	-
	Agariciidae	*Pavona*	-	2	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	6	-	-	-	-
	Lobophylliidae	*Lobophyllia*	-	1	-	-	-	-
		Oxypora	-	2	-	-	-	-
	Merulinidae	*Dipsastrea*	-	7	-	-	-	-
		Favites	-	12	-	-	10	2
		Paragoniastrea	-	1	-	-	-	-
		Platygyra	-	1	-	-	-	-
	Poritidae	*Porites*	-	-	2	2	-	-
	Transect 2 (n=18)							
	Acroporidae	*Acropora*	-	1	2	5	-	-
		Montipora	-	-	-	-	1	-
	Dendrophylliidae	*Turbinaria*	-	4	-	-	-	-
	Lobophylliidae	*Echinophyllia*	-	-	-	2	-	-
	Merulinidae	*Favites*	-	-	-	-	-	1
		Pectinia	-	2	-	-	-	-
	Poritidae	*Porites*	-	-	6	-	-	-
	Transect 3 (n=14)							
	Acroporidae	*Acropora*	-	-	2	-	-	-
		Montipora	-	-	-	1	-	-
	Dendrophylliidae	*Turbinaria*	-	2	-	-	-	-
	Merulinidae	*Dipsastrea*	-	-	-	-	-	-
		Favites	-	-	-	1	-	-
		Paragoniastrea	-	1	-	-	-	-
		Pectinia	-	1	-	-	-	-
	Poritidae	*Porites*	-	-	2	-	-	-
	Transect 4 (n=8)							
	Acroporidae	*Acropora*	-	-	-	-	2	-
		Montipora	-	-	-	1	-	-
	Lobophylliidae	*Acanthastrea*	-	1	-	-	-	-
	Merulinidae	*Paragoniastrea*	-	1	-	-	-	-
		Pectinia	-	2	-	-	-	-
	Pocilloporidae	*Pocillopora*	-	-	-	-	1	-
	Transect 5 (n=13)							
	Acroporidae	*Acropora*	-	-	-	-	5	2

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
		Montipora	-	4	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	2	-	-	2	-
	Fungiidae	*Fungia*	-	4	-	-	-	1
	Merulinidae	*Dipsastrea*	-	-	-	-	-	-
		Favites	-	1	-	-	-	-
	Total		-	62	14	12	23	7
GIDI	Transect 1 (n=24)							
	Acroporidae	*Acropora*	-	-	-	-	-	1
		Montipora	-	2	-	-	-	-
	Dendrophylliidae	*Turbinaria*	1	6	-	3	1	-
	Merulinidae	*Caulastrea*	-	-	-	-	-	1
		Favites	-	1	-	-	-	2
		Platygyra	-	1	-	-	-	-
	Poritidae	*Goniopora*	-	-	-	-	-	-
		Porites	-	2	11	3	-	-
	Transect 2 (n=13)							
	Dendrophylliidae	*Turbinaria*	-	-	-	2	-	3
	Fungiidae	*Herpolitha*	-	-	-	-	-	-
	Merulinidae	*Favites*	-	-	-	-	-	1
		Platygyra	-	-	-	-	-	1
	Poritidae	*Porites*	1	1	4	1	-	-
	Transect 3 (n=12)							
	Dendrophylliidae	*Turbinaria*	-	3	-	-	-	3
	Merulinidae	*Dipsastrea*	-	-	-	-	-	-
		Favites	-	3	-	-	-	-
		Platygyra	-	1	-	-	-	-
	Poritidae	*Goniopora*	-	-	-	-	-	-
		Porites	-	-	2	-	-	-
	Transect 4 (n=17)							
	Acroporidae	*Montipora*	-	-	-	2	-	-
	Dendrophylliidae	*Turbinaria*	-	1	-	-	1	-
	Euphylliidae	*Galaxea*	-	-	-	-	-	-
	Merulinidae	*Dipsastrea*	-	-	-	-	-	1
		Favites	-	2	1	-	-	1
		Paragoniastrea	-	1	-	-	-	-
	Poritidae	*Porites*	-	1	3	-	-	-
	Sarcophytidae	*Sarcophytum*	-	2	-	-	-	-
	Transect 5 (=21)							
	Acroporidae	*Acropora*	-	-	-	2	-	-
	Dendrophylliidae	*Turbinaria*	1	3	-	-	-	-
	Euphylliidae	*Galaxea*	-	2	-	-	2	-
	Lobophylliidae	*Echinophyllia*	-	1	-	-	-	-
		Lobophyllia	-	1	-	-	-	-

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
	Merulinidae	*Favites*	-	-	-	-	-	2
	Plesiastreidae	*Plesiastrea*	-	2	2	-	2	-
	Poritidae	*Porites*	-	-	5	-	-	-
	Unidentified Hard Coral		-	-	-	-	-	-
	Total		3	36	28	13	6	16
HAM3	Transect 1 (n=11)							
	Acroporidae	*Acropora*	-	-	-	-	-	1
	Agariciidae	*Leptoseris*	-	-	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	2	-	2	-	8
	Zoanthidae	*Zoanthid*	-	-	-	1	-	-
	Transect 2 (n=13)							
	Acroporidae	*Montipora*	-	1	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	3	-	-	-	5
	Merulinidae	*Favites*	-	-	-	-	-	1
	Zoanthidae	*Zoanthid*	-	-	1	-	-	-
	Unidentified Hard Coral		-	-	-	-	-	-
	Transect 3 (n=9)							
	Dendrophylliidae	*Turbinaria*	-	7	-	-	-	-
	Unidentified Hard Coral		-	2	-	-	-	-
	Transect 4 (n=17)							
	Dendrophylliidae	*Turbinaria*	-	3	-	-	-	3
	Poritidae	*Porites*	-	4	1	-	-	-
	Sarcophytidae	*Sarcophyton*	-	1	-	-	-	-
	Transect 5 (n=21)							
	Dendrophylliidae	*Turbinaria*	-	11	-	-	-	13
	Merulinidae	*Platygyra*	-	-	-	-	-	1
	Poritidae	*Porites*	-	4	2	-	-	-
	Unidentified Hard Coral		-	-	-	-	-	-
	Total		-	38	4	3	-	32
HAUY	Transect 1 (n=9)							
	Acroporidae	*Acropora*	-	9	-	1	-	-
		Montipora	-	1	-	-	-	-
	Lobophylliidae	*Echinophyllia*	-	4	-	-	-	-
	Merulinidae	*Dipsastrea*	-	1	-	-	-	-
	Transect 2 (n=10)							
	Acroporidae	*Acropora*	-	8	-	-	-	-
	Merulinidae	*Cyphastrea*	-	1	-	-	-	-
		Dipsastrea	-	1	-	-	-	-
		Goniastrea	-	1	-	-	-	-
		Favites	1	-	-	-	-	-
	Transect 3 (n=10)							
	Acroporidae	*Acropora*	3	4	-	-	-	-
	Lobophylliidae	*Lobophyllia*	-	-	-	-	-	-

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
	Merulinidae	*Caulastrea*	-	-	-	-	-	-
		Dipsastrea	-	2	-	-	-	-
		Favites	-	-	-	-	-	-
		Platygyra	-	-	-	-	-	-
	Psammocoridae	*Psammocora*	2	-	-	-	-	-
	Transect 4 (n=10)							
	Acroporidae	*Acropora*	-	1	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	-
	Merulinidae	*Dipsastrea*	-	-	-	-	-	-
		Favites	-	3	-	-	-	-
	Unidentified Hard Coral		-	-	-	-	-	-
	Transect 5 (n=9)							
	Acroporidae	*Acropora*	-	1	-	-	-	-
		Montipora	1	1	-	-	-	-
	Merulinidae	*Dipsastrea*	1	4	-	-	-	-
		Platygyra	-	1	-	-	-	-
	Total		8	43	-	1	-	-
HGPT	Transect 1 (n=15)							
	Dendrophylliidae	*Turbinaria*	-	1	-	-	-	7
	Lobophylliidae	*Lobophyllia*	-	2	-	-	-	-
	Merulinidae	*Dipsastrea*	-	6	-	-	-	-
		Favites	-	2	-	-	-	3
	Poritidae	*Porites*	-	-	5	5	-	-
	Rhizangiidae	*Pseudosiderastrea*	-	8	-	-	-	-
	Transect 2 (n=13)							
	Dendrophylliidae	*Turbinaria*	-	2	-	-	-	1
	Lobophylliidae	*Lobophyllia*	-	-	-	-	-	1
	Merulinidae	*Dipsastrea*	-	3	-	-	-	-
		Favites	-	-	-	-	-	2
	Poritidae	*Porites*	-	-	8	-	-	-
	Transect 3 (n=15)							
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	5
	Merulinidae	*Favites*	-	-	-	-	-	1
	Poritidae	*Porites*	-	-	10	-	-	-
	Transect 4 (n=15)							
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	8
	Euphylliidae	*Galaxea*	-	-	-	-	-	-
	Poritidae	*Porites*	-	-	11	-	-	-
	Transect 5 (n=10)							
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	11
	Merulinidae	*Favites*	-	-	-	-	-	1
	Poritidae	*Porites*	-	-	4	-	-	-
	Total		-	24	38	5	-	40

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
KGBY	Transect 1 (n=11)							
	Dendrophylliidae	*Turbinaria*	-	2	-	-	-	1
	Leptastreidae	*Leptastrea*	-	2	-	-	-	-
	Merulinidae	*Favites*	-	2	1	-	-	-
		Platygyra	-	-	1	-	-	-
	Poritidae	*Porites*	-	-	3	-	-	-
	Transect 2 (n=13)							
	Dendrophylliidae	*Turbinaria*	-	3	-	-	-	-
	Fungiidae	*Fungia*	-	1	-	-	-	-
	Merulinidae	*Favites*	-	-	1	-	-	-
		Merulina	-	-	-	1	-	-
	Poritidae	*Porites*	-	-	6	-	-	-
	Rhizangiidae	*Pseudosiderastrea*	-	-	-	-	-	5
	Transect 3 (n=9)							
	Dendrophylliidae	*Turbinaria*	-	1	-	-	-	-
	Leptastreidae	*Leptastrea*	-	-	1	-	-	-
	Merulinidae	*Dipsastrea*	-	-	1	-	-	-
		Favites	-	-	2	-	-	-
		Platygyra	-	-	2	-	-	-
	Poritidae	*Porites*	-	-	2	-	-	-
	Transect 4 (n=9)							
	Dendrophylliidae	*Turbinaria*	-	1	-	-	-	-
	Merulinidae	*Dipsastrea*	-	-	-	-	-	-
		Favites	-	2	-	-	-	-
		Platygyra	-	-	4	-	-	-
	Poritidae	*Porites*	-	-	1	-	-	-
	Transect 5 (n=10)							
	Leptastreidae	*Leptastrea*	-	1	-	-	-	-
	Lobophylliidae	*Acanthastrea*	-	2	-	-	-	-
	Merulinidae	*Favites*	-	2	-	-	-	-
		Paragoniastrea	-	-	2	-	-	-
	Poritidae	*Porites*	-	-	3	-	-	-
	Rhizangiidae	*Pseudosiderastrea*	-	-	-	-	-	2
	Total		-	19	30	1	-	8
LANI	Transect 1 (n=16)							
	Merulinidae	*Favites*	-	-	-	-	-	-
		Paragoniastrea	-	-	1	-	-	-
	Poritidae	*Porites*	-	-	3	19	-	-
	Transect 2 (n=11)							
	Agariciidae	*Pavona*	-	-	-	-	-	-
	Merulinidae	*Favites*	-	-	-	-	-	-
		Paragoniastrea	-	-	-	-	-	-
	Poritidae	*Porites*	-	2	-	1	-	-

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
	Transect 3 (n=12)							
	Acroporidae	*Acropora*	-	-	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	-
	Merulinidae	*Dipsastrea*	-	-	-	-	-	-
		Favites	-	-	-	-	-	-
	Poritidae	*Porites*	-	-	4	4	2	-
	Transect 4 (n=17)							
	Merulinidae	*Favites*	-	-	-	-	3	-
		Platygyra	-	-	-	-	2	-
	Poritidae	*Porites*	1	-	10	11	5	-
	Sarcophytidae	*Lobophytum*	-	1	-	-	-	-
	Transect 5 (n=15)							
	Merulinidae	*Dipsastrea*	-	-	-	-	4	-
		Favites	-	-	-	-	-	-
	Poritidae	*Porites*	-	-	7	9	1	-
	Unidentified Hard Coral		-	-	-	-	1	-
	Total		1	3	25	44	18	-
LEGD	Transect 1 (n=10)							
	Acroporidae	*Acropora*	-	-	-	3	-	-
	Merulinidae	*Platygyra*	-	-	-	-	-	-
	Poritidae	*Porites*	-	-	-	2	-	-
	Transect 2 (n=1)							
	Merulinidae	*Platygyra*	-	1	-	-	-	-
	Transect 3 (n=0)							
	Transect 4 (n=7)							
	Acroporidae	*Acropora*	-	-	-	3	-	-
	Merulinidae	*Favites*	-	1	-	-	-	-
	Poritidae	*Porites*	-	-	-	-	-	-
	Unidentified Hard Coral		-	-	-	-	-	-
	Transect 5 (n=0)							
	Total		-	2	-	8	-	-
MAL2	Transect 1 (n=20)							
	Acroporidae	*Acropora*	-	-	-	-	-	1
	Agariciidae	*Pavona*	-	-	-	-	-	1
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	4
	Fungiidae	*Fungia*	-	-	-	-	-	-
	Merulinidae	*Dipsastrea*	-	-	-	-	-	6
		Favites	-	-	-	-	-	5
		Goniastrea	-	-	-	-	-	1
		Platygyra	-	-	-	-	-	2
	Poritidae	*Porites*	-	-	1	6	-	-
	Unidentified Hard Coral		-	-	-	-	-	-
	Transect 2 (n=26)							

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
	Acroporidae	*Acropora*	-	-	-	-	-	-
	Agariciidae	*Pavona*	-	-	-	-	-	1
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	-
	Fungiidae	*Fungia*	-	-	-	-	-	2
	Leptastreidae	*Leptastrea*	-	-	-	-	-	-
	Lobophylliidae	*Lobophyllia*	-	-	-	-	-	1
	Merulinidae	*Cyphastrea*	-	-	-	-	-	-
		Dipsastrea	-	-	-	-	-	-
		Favites	-	-	-	-	-	-
		Goniastrea	-	-	-	-	-	1
		Merulina	-	-	-	-	-	-
	Poritidae	*Porites*	-	-	-	2	-	-
	Unidentified Hard Coral		-	-	-	-	-	-
	Transect 3 (n=13)							
	Acroporidae	*Acropora*	-	-	-	-	-	3
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	2
	Fungiidae	*Herpolitha*	-	-	-	-	-	-
		Podabacia	-	1	-	-	-	-
	Lobophylliidae	*Lobophyllia*	-	-	-	-	-	-
	Merulinidae	*Dipsastrea*	-	-	-	-	-	4
		Favites	-	-	-	-	-	3
	Poritidae	*Porites*	-	4	-	3	-	-
	Transect 4 (n=13)							
	Acroporidae	*Astreopora*	-	-	-	-	-	-
	Agariciidae	*Pavona*	-	-	-	-	-	-
	Fungiidae	*Herpolitha*	-	-	-	-	-	-
	Leptastreidae	*Leptastrea*	-	-	-	-	-	2
	Lobophylliidae	*Lobophyllia*	-	-	-	-	-	-
	Merulinidae	*Caulastrea*	-	-	-	-	-	1
		Favites	-	-	-	-	-	1
	Poritidae	*Porites*	-	-	2	2	-	-
	Transect 5 (n=12)							
	Euphylliidae	*Galaxea*	-	-	-	-	-	1
	Lobophylliidae	*Lobophyllia*	-	-	-	-	-	2
	Merulinidae	*Dipsastrea*	-	-	-	-	-	1
		Favites	-	-	-	-	-	4
		Paragoniastrea	-	-	-	-	-	-
	Poritidae	*Porites*	-	-	1	5	-	-
	Total		-	5	4	18	-	49
MIDI	Transect 1 (n=18)							
	Acroporidae	*Astreopora*	-	-	-	-	-	-
	Euphylliidae	*Galaxea*	-	-	-	-	-	-
	Fungiidae	*Fungia*	-	-	-	-	-	-

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
		Herpolitha	-	-	-	-	-	-
	Lobophylliidae	*Echinophyllia*	-	-	-	-	-	-
		Lobophyllia	-	-	-	-	1	-
	Merulinidae	*Coelastrea*	-	-	-	-	-	-
		Cyphastrea	-	-	-	-	-	-
		Dipsastrea	-	-	-	-	-	-
		Goniastrea	-	-	-	-	-	-
		Favites	-	-	-	-	-	-
		Merulina	-	-	-	-	-	-
		Mycedium	-	-	-	-	-	-
		Pectinia	-	-	-	-	-	-
		Platygyra	-	-	-	-	-	-
	Poritidae	*Porites*	-	-	3	2	-	-
	Unidentified Hard Coral		-	-	-	-	-	-
	Transect 2 (n=25)							
	Acroporidae	*Acropora*	-	-	-	-	-	-
		Astreopora	-	-	-	-	-	-
		Montipora	-	-	-	-	-	-
	Agariciidae	*Pavona*	-	3	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	2
	Euphylliidae	*Galaxea*	-	-	-	-	-	-
	Fungiidae	*Fungia*	-	-	-	-	-	-
		Herpolitha	-	-	-	-	-	-
	Lobophylliidae	*Lobophyllia*	-	-	-	-	-	-
	Merulinidae	*Caulastrea*	-	-	-	-	-	-
		Cyphastrea	-	-	-	-	-	-
		Dipsastrea	-	-	-	-	1	-
		Favites	-	-	-	-	-	-
		Goniastrea	-	-	-	-	-	-
		Merulina	-	1	-	-	-	-
		Paragoniastrea	-	-	-	-	-	-
		Pectinia	-	-	-	-	-	-
		Platygyra	-	-	-	-	-	-
	Poritidae	*Porites*	-	-	-	-	-	-
	Unidentified Hard Coral		-	-	-	-	1	-
	Transect 3 (n=23)							
	Acroporidae	*Acropora*	-	-	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	7
	Euphylliidae	*Galaxea*	-	-	-	-	-	-
	Fungiidae	*Herpolitha*	-	-	-	-	-	-
	Lobophylliidae	*Fungia*	-	-	-	-	-	-
		Lobophyllia	-	-	-	-	-	-
		Moseleya	-	-	-	-	-	-

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
	Merulinidae	*Cyphastrea*	-	-	-	-	1	-
		Dipsastrea	-	-	-	-	-	-
		Favites	-	-	-	-	-	-
		Goniastrea	-	-	-	-	-	-
		Pectinia	-	-	-	-	-	-
		Trachyphyllia	-	-	-	-	-	-
	Poritidae	*Goniopora*	-	-	-	-	-	-
	Transect 4 (n=28)							
	Agariciidae	*Pavona*	-	3	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	2
	Fungiidae	*Herpolitha*	-	-	-	-	-	-
	Lobophylliidae	*Fungia*	-	-	-	-	-	-
		Lobophyllia	-	-	-	-	-	-
	Merulinidae	*Coelastrea*	-	-	-	-	-	-
		Cyphastrea	-	-	-	-	-	-
		Dipsastrea	-	-	-	-	-	-
		Favites	-	-	-	-	-	-
		Goniastrea	-	-	-	-	-	-
		Merulina	-	-	-	-	-	-
		Pectinia	-	-	-	-	-	-
		Platygyra	-	-	-	-	-	-
	Poritidae	*Porites*	-	-	-	-	-	-
	Rhizangiidae	*Pseudosiderastrea*	-	-	-	-	-	1
	Unidentified Hard Coral		-	-	-	-	-	-
	Transect 5 (n=24)							
	Acroporidae	*Acropora*	-	-	-	-	-	-
		Montipora	-	-	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	7
	Diploastraeidae	*Diploastrea*	-	-	-	-	2	-
	Fungiidae	*Herpolitha*	-	-	-	-	-	-
	Lobophylliidae	*Echinophyllia*	-	-	-	-	-	-
		Lobophyllia	-	-	-	-	-	-
		Moseleya	-	-	-	-	-	-
	Merulinidae	*Coelastrea*	-	-	-	-	-	-
		Cyphastrea	-	-	-	-	-	-
		Dipsastrea	-	-	-	-	-	-
		Favites	-	-	-	-	-	-
		Platygyra	-	-	-	-	-	-
	Poritidae	*Porites*	-	-	-	-	-	-
	Rhizangiidae	*Pseudosiderastrea*	-	-	-	-	-	2
	Unidentified Hard Coral		-	-	-	-	-	-
	Total		-	7	3	2	6	21
NW IT	Transect 1 (n=27)							

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
	Acroporidae	*Acropora*	-	-	-	-	1	-
		Montipora	-	3	-	-	-	-
	Agariciidae	*Pavona*	-	-	-	-	2	-
	Dendrophylliidae	*Turbinaria*	-	-	-	-	3	67
	Euphylliidae	*Galaxea*	-	-	-	-	2	-
	Fungiidae	*Herpolitha*	-	3	-	-	3	-
		Lithophyllon	-	-	-	-	2	-
	Lobophylliidae	*Lobophyllia*	-	-	-	-	5	-
	Merulinidae	*Dipsastrea*	-	1	-	-	1	-
		Favites	-	-	-	-	3	-
		Mycedium	-	2	-	-	2	3
	Poritidae	*Porites*	-	-	4	-	8	-
	Sarcophytidae	*Lobophytum*	-	-	-	-	-	-
	Transect 2 (n=25)							
	Acroporidae	*Montipora*	-	-	-	-	2	-
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	37
	Fungiidae	*Ctenactis*	-	-	-	-	2	-
		Herpolitha	-	-	-	-	4	-
		Fungia	-	-	-	-	-	-
	Lobophylliidae	*Acanthastrea*	-	-	-	-	3	-
		Lobophyllia	-	-	-	-	6	-
	Merulinidae	*Coelastrea*	-	-	-	-	1	-
		Dipsastrea	-	-	-	-	-	-
		Mycedium	-	-	-	-	-	-
		Platygyra	-	-	-	-	2	-
	Pocilloporidae	*Pocillopora*	-	-	-	-	-	-
	Poritidae	*Porites*	2	1	-	-	8	-
	Unidentified Hard Coral		-	-	-	-	-	-
	Transect 3 (n=28)							
	Dendrophylliidae	*Turbinaria*	-	1	-	-	3	20
	Euphylliidae	*Galaxea*	-	-	-	-	2	-
	Fungiidae	*Fungia*	-	-	-	-	-	-
		Herpolitha	-	-	-	-	3	-
	Lobophylliidae	*Podabacia*	-	-	-	-	3	-
		Oxypora	-	-	-	-	1	-
	Merulinidae	*Favites*	-	2	-	-	8	-
		Merulina	-	-	-	-	2	-
		Mycedium	-	-	-	-	3	-
	Poritidae	*Goniopora*	-	-	-	-	1	-
		Porites	-	3	2	-	14	-
	Unidentified Hard Coral		-	-	-	-	5	-
	Transect 4 (n=29)							
	Acroporidae	*Astreopora*	-	-	1	-	3	-

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
	Agariciidae	*Pavona*	-	-	-	-	1	-
	Dendrophylliidae	*Turbinaria*	-	3	-	-	2	40
	Euphylliidae	*Galaxea*	-	-	-	-	-	-
	Fungiidae	*Fungia*	-	-	-	-	-	-
		Herpolitha	-	2	-	-	-	-
		Lithophyllon	-	-	-	-	3	-
	Lobophylliidae	*Acanthastrea*	-	1	-	-	4	-
		Lobophyllia	-	-	-	-	2	-
	Merulinidae	*Coelastrea*	-	-	-	-	1	-
		Dipsastrea	-	-	-	-	3	-
		Favites	-	1	1	-	11	-
		Mycedium	-	-	-	-	-	1
	Poritidae	*Porites*	-	-	4	-	8	-
	Unidentified Hard Coral		-	-	-	-	1	-
	Transect 5 (n=25)							
	Acroporidae	*Acropora*	-	-	-	-	1	-
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	37
	Fungiidae	*Herpolitha*	-	1	-	-	1	-
	Lobophylliidae	*Acanthastrea*	-	2	-	-	1	-
	Merulinidae	*Dipsastrea*	-	-	-	-	2	-
		Favites	-	1	-	-	5	-
		Goniastrea	-	-	-	-	2	-
		Mycedium	-	-	-	-	1	-
		Paragoniastrea	-	-	-	-	2	-
	Poritidae	*Porites*	-	2	4	-	6	-
	Unidentified Hard Coral		-	-	-	-	1	1
	Total		2	29	16	-	166	206
SUP2	Transect 1 (n=24)							
	Acroporidae	*Montipora*	-	1	-	1	-	-
	Agariciidae	*Pavona*	-	4	-	2	-	-
	Dendrophylliidae	*Turbinaria*	-	10	-	-	3	9
	Fungiidae	*Fungia*	-	1	-	-	-	-
	Lobophylliidae	*Oxypora*	-	-	-	-	-	-
	Merulinidae	*Cyphastrea*	-	-	-	-	-	-
		Favites	-	4	1	-	1	-
	Poritidae	*Porites*	-	-	2	-	-	-
	Unidentified Hard Coral		-	7	-	-	-	-
	Transect 2 (n=26)							
	Acroporidae	*Montipora*	-	-	-	1	-	-
	Agariciidae	*Pavona*	-	10	1	-	1	-
	Dendrophylliidae	*Turbinaria*	2	11	-	-	-	17
	Diploastraeidae	*Diploastrea*	-	1	-	-	1	-
	Fungiidae	*Herpolitha*	-	4	-	-	-	-

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
	Lobophylliidae	*Moseleya*	-	1	-	-	-	-
	Merulinidae	*Favites*	-	-	-	-	2	-
	Unidentified Hard Coral		-	-	-	-	12	-
	Transect 3 (n=23)							
	Agariciidae	*Pavona*	-	4	-	-	1	-
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	26
	Fungiidae	*Herpolitha*	-	-	-	-	-	-
	Leptastreidae	*Leptastrea*	-	-	-	-	-	-
	Merulinidae	*Coelastrea*	-	1	-	-	-	1
		Dipsastrea	-	-	2	-	1	-
		Favites	-	-	-	-	2	-
		Merulina	-	1	-	-	1	-
		Platygyra	-	3	-	-	5	-
	Pachyseridae	*Pachyseris*	-	-	-	-	1	-
	Poritidae	*Porites*	-	-	1	-	7	-
	Rhizangiidae	*Pseudosiderastrea*	-	-	-	-	-	2
	Unidentified Hard Coral		-	9	-	-	11	-
	Transect 4 (n=17)							
	Agariciidae	*Pavona*	-	2	-	-	-	-
	Dendrophylliidae	*Turbinaria*	-	2	-	-	-	20
	Fungiidae	*Fungia*	-	-	-	-	-	1
		Herpolitha	-	-	-	-	1	-
	Lobophylliidae	*Lobophyllia*	-	-	-	-	-	1
	Merulinidae	*Coelastrea*	-	1	-	-	1	-
		Favites	-	1	-	-	-	-
		Paragoniastrea	-	1	-	-	-	-
		Pectinia	-	-	-	-	-	-
	Poritidae	*Porites*	-	3	-	-	-	-
	Transect 5 (n=25)							
	Agariciidae	*Pavona*	-	1	2	-	6	-
	Dendrophylliidae	*Turbinaria*	-	2	-	-	2	22
	Fungiidae	*Cycloseris*	-	-	-	-	-	1
		Herpolitha	-	-	-	-	-	-
	Merulinidae	*Dipsastrea*	-	-	-	-	-	2
		Favites	-	-	-	-	2	-
		Goniastrea	-	-	-	-	2	-
		Mycedium	-	-	-	-	-	4
	Poritidae	*Porites*	-	-	3	-	6	-
	Unidentified Hard Coral		-	-	-	-	4	-
	Total		2	85	12	4	73	106
SWIT	Transect 1 (n=12)							
	Dendrophylliidae	*Turbinaria*	-	8	-	-	-	4
	Diploastraeidae	*Diploastrea*	-	-	-	-	-	-

Site	Family	Genus	Disease	Sedimentation	Predation	Damage	Mucus	Juveniles
	Merulinidae	*Dipsastrea*	-	-	-	-	-	-
		Favites	-	1	-	-	2	6
	Transect 2 (n=11)							
	Dendrophylliidae	*Turbinaria*	-	4	-	-	-	-
	Diploastraeidae	*Diploastrea*	1	-	-	-	-	-
	Lobophylliidae	*Lobophyllia*	-	-	-	-	1	-
	Merulinidae	*Favites*	-	1	-	-	1	4
		Paragoniastrea	-	-	-	-	-	-
	Transect 3 (n=17)							
	Dendrophylliidae	*Turbinaria*	-	8	-	-	-	9
	Lobophylliidae	*Acanthastrea*	-	1	-	-	-	-
		Lobophyllia	-	-	1	-	-	-
	Merulinidae	*Diploastrea*	2	-	4	-	-	-
		Favites	-	1	-	-	3	-
	Poritidae	*Goniopora*	-	-	-	-	-	-
		Porites		2	2	-	-	-
	Rhizangiidae	*Pseudosiderastrea*	-	1	-	-	-	-
	Transect 4 (n=18)							
	Dendrophylliidae	*Turbinaria*	-	6	-	-	2	4
	Fungiidae	*Ctenactis*	-	-	-	2	-	-
	Lobophylliidae	*Lobophyllia*	-	-	1	-	-	-
	Merulinidae	*Coelastrea*	-	-	-	-	1	-
		Dipsastrea	-	1	-	-	-	-
		Favites	-	1	-	-	-	-
		Merulina	-	2	-	-	-	-
		Platygyra	-	2	-	-	-	-
	Rhizangiidae	*Pseudosiderastrea*	-	4	-	-	-	-
	Unidentified Hard Coral		-	-	-	1	-	-
	Transect 5 (n=6)							
	Dendrophylliidae	*Turbinaria*	-	-	-	-	-	3
	Lobophylliidae	*Acanthastrea*	-	1	-	-	-	-
	Merulinidae	*Favites*	-	-	-	-	1	-
	Rhizangiidae	*Pseudosiderastrea*	-	4	-	-	-	-
	Total		3	48	8	3	11	30

ine Pty Ltd trading as O2Marine
ACN 168 014 819
11 Mews Road Fremantle 6160
T: 1300 739 449
E: info@o2marine.com.au