Stony Coral Spawning Hubs in the Southeast Florida Coral Reef Ecosystem Conservation Area: Phase 1

FINAL REPORT

Florida Department of Environmental Protection
Office of Resilience and Coastal Protection

Stony Coral Spawning Hubs in the Southeast Florida Coral Reef Ecosystem Conservation Area: Phase 1

Final Report

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LIST OF ACRONYMS

ECA…………………..……. Southeast Florida Coral Reef Ecosystem Conservation Area
SCTLD……………………….…………..……..…. Stony Coral Tissue Loss Disease
NSU…………………………….……………………..…… Nova Southeastern University

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PROJECT DESCRIPTION

Florida's Coral Reef is currently experiencing a multi-year stony coral disease-related mortality event, that has resulted in massive die-offs in multiple coral species. Impacts were first widely recorded in the ECA in 2014 (Walton et al. 2018), the disease has since spread to the northernmost extent of the Florida's Coral Reef, and south through the Marquesas in the Lower Florida Keys. The best available information indicates that the disease outbreak is continuing to spread southwest and throughout the Caribbean.

In the ECA, the SCTLD outbreak (https://floridadep.gov/rcp/coral/documents/stony-coral-tissue-loss-disease-sctld-case-definitiondisease) has reduced the abundance of disease susceptible stony corals by at least 30% and caused the loss of 60% of their live tissue (Walton et al. 2018; Gilliam et al. 2019). These losses have affected nearly 20 ECA coral species, including both Endangered Species Act-listed and the primary reef-building species tissue (Walton et al. 2018; Gilliam et al. 2019). ECA reef habitats are an important economic asset for the region. The reef system has been estimated to protect nearly 6,000 people, over $500 million in infrastructure and $300 million in economic activity from storm-related flooding (Storlazzi et al. 2019). These reefs have also been estimated to generate more than $3 billion in sales and income and support more than 35,000 jobs (Johns et al. 2001, 2004). While the ECA reefs are clearly an important resource, their location offshore a highly urbanized area (population > 6 million) drives ever-increasing and human activity-related stress on the reefs. The effects of these chronic stresses on ECA reefs have now been compounded by this multi-year disease-related mortality event.

Coral populations typically recover after disturbances through sexual reproduction which results in the production of recruits that replenish depleted reefs. However, because disease susceptible stony coral colony abundance has significantly declined, the likelihood of eggs and sperm from different colonies naturally encountering each other has been severely reduced, limiting successful recruitment that drives reef recovery. Hence, aside from minimizing or eliminating local and global stressors to reduce loss, reef recovery can be accelerated by increasing stony coral density through restoration processes. Increasing coral density region-wide can be done through asexual and sexual forms of reproduction. On a more local-scale, density can be managed by relocating colonies to specific sites in an attempt to bring sexually mature colonies close enough together to increase the likelihood that eggs and sperm from these colonies will come into contact during spawning events, essentially creating an in-situ spawning hub for select species. This restoration activity not only promotes species recovery through supporting recruitment driven by natural sexual reproduction but also promotes recovery by providing sites where efficient spawning observations and gamete capture can occur. Spawning observations will advance our understanding of stony coral reproductive ecology while gamete capture will support our ability to rear larvae in land-based nurseries furthering species recovery opportunities.

In this project (June – December 2020) we established two spawning hub locations in the ECA offshore Broward County on Inner reef habitat. These are the first sites ever established in the ECA for the purpose of facilitating natural sexual reproduction and providing sites for researchers to observe spawning and capture gametes. For this initial effort, *Pseudodiploria clivosa* was the target species. *Pseudodiploria clivosa* is a species that has been identified as highly susceptible to SCTLD and has had measurable losses in abundance. It is a species identified as high priority during the SCTLD Coral Rescue effort (https://floridadep.gov/rcp/coral/content/coral-rescueteam). Although *P. clivosa* has been impacted by the disease event, our observations have identified locations that have colonies suitable for relocation. *Pseudodiploria clivosa* is also a simultaneous hermaphroditic, broadcast spawning species (Weil and Vargas 2010). These reproductive traits make *P. clivosa* an excellent target species for spawning hubs. Gamete bundles can be captured during spawning events and taken to land-based facilities for fertilization.

The goal of this initial pilot project was to establish two spawning hub sites and relocate a limited number *P. clivosa* colonies prior to the predicted September 2020 spawning event. Future coral spawning hub project phases will expand the efforts to include more sites within the ECA, more species, and greater efforts to manage the sites including activities that have been proposed by the Restoring Seven Iconic Reefs: A Mission to Recover the Coral Reefs of the Florida Keys (https://www.fisheries.noaa.gov/southeast/habitat-conservation/restoring-seven-iconic-reefs-mission-recover-coral-reefs-florida-keys) such as disease interventions, when needed, and removal of competing benthic groups (*Palythoa*, macroalgae, etc.). The outcomes of this project will be incorporated into an on-going coral disease response effort which seeks to improve understanding about the scale and severity of the stony coral disease outbreak, identify primary and secondary causes, identify management actions to remediate disease impacts, restore affected resources and, ultimately, prevent future outbreaks.

TASK DESCRIPTION AND METHODOLOGY

Task 1: Spawning hub site selection

The first task was to select the two spawning hub sites. The site section area was limited to offshore Broward County in either the nearshore ridge complex or Inner reef habitats in approximately 7-10 m water depths. For Phase 1 of this project working in Broward County close to NSU was the most efficient use of resources (time and funds). The nearshore ridge complex or Inner reef are appropriate habitats for Phase I because our observations indicate that *P. clivosa* is most abundant in these shallower depths. These habitats are also known to support populations of most of the SCTLD susceptible species which may be included in spawning hub efforts in the future. Water depths less than 10 m are also conducive to efficient use of resources time and funds.

Spawning hub sites should be appropriate for colony growth and survival and be in areas that are sources of larvae to other areas. Dr. Joana Figueiredo and colleagues have developed bio-physical dispersal models for *Acropora* species (Figueiredo 2019) and *Montastraea cavernosa* (Frys et al. 2020). There is currently no larval dispersal model for *P. clivosa*; however, this species is expected to have a very similar larval dispersal to *M. cavernosa*. The potential differences in larval dispersal patterns between coral species are driven by differences in larval competency dynamics (i.e. time from fertilization until larvae are able to settle) and currents during the spawning event. The larval competency dynamics of *P. clivosa* is expected to be very similar to *M. cavernosa*. The egg diameter of broadcast spawning corals is a very good predictor of the time it takes larvae to develop and settle (Figueiredo et al. 2013). *Pseudodiploria clivosa* has about the same egg diameter as *M. cavernosa*, *Orbicella faveolata* and *Diploria labyrinthiformis* (around 400 µm), thus it is expected to have similar larval competency dynamics, i.e. start settling 4 days after fertilization. Also, like *M. cavernosa*, *P. clivosa* is predicted to spawn in September around the same time, 6-9 days after the full moon (Jordan, 2018, Vermeij et al. 2007–2020), thus the ocean currents used in the *M. cavernosa* larval dispersal model would be equal. In sum, because the larval competency dynamics and time of spawning of *P. clivosa* is expected to be very similar to *M. cavernosa*, their larval dispersal patterns should be extremely similar. Since in the future we aim to expand these spawning hubs to other species, our aim was to select sites that would not only be good for *P. clivosa*, but also for other species. The selected spawning hubs sites for this pilot study are predicted to be a good source of larvae for *P. clivosa*, but also, according to the larval dispersal models, appropriate sites for additional, similar species.

Utilizing the existent modeling tools, five potential sites north and five sites south of Port Everglades were selected (500m x 500m each) within Broward County, which the bio-physical model of coral larval dispersal projects has the highest source indices (i.e. produce a greater number of larvae that settles on a greater number of reefs) and are also surrounded by sites with high source indices (aims to maximize the chances that the site selected is indeed a good source). These sites were also evaluated in terms of their distance from local current or future sources of disturbance such as Port Everglades. The five selected sites north and south of Port Everglades were surveyed on scuba by three experienced researchers conducting approximately 30 min random swims recording notes and taking images. The types of information the researchers recorded included the abundance and size (colony diameter) distribution of SCTLD susceptible species, cover of stable substrate with minimal unconsolidated substrate and competing benthic groups (*Palythoa*, macroalgae, etc.), and indications of current, past, or potential physical disturbance (e.g., sheared barrel sponges, lobster pots and line, anchor drags, etc.). Based on all the above criteria and discussion and agreement amongst the three researchers, two sites were chosen.

Task 2: Colony relocation

The target was to re-locate 30 *P. clivosa* colonies to each spawning hub site with colony sizes ranging from approximately 15 to 30 cm diameter. Colonies of this size range are most likely mature (Weil and Vargas 2010) but small enough to be removed, transported, and reattached without special equipment or the use of larger vessels. Donor colony sites were distributed throughout the nearshore ridge habitat in Broward County. To maximize the potential of relocating as many genotypes as possible, donor colonies were removed from sites separated by 50 m or more.

The work plan prioritized days (appropriate weather and sea state) such that donor colonies were removed and transported to the hub sites within the same day. Colonies were removed by research divers using hammers and chisels. Colonies were chosen based on the likelihood that fragmentation will not occur during removal. All colonies were also free of recent mortality, boring sponge (*Cliona* spp.), and had a maximum of 25% old partial mortality. Colonies were not removed from locations where active disease lesions were identified on any corals in the area. When colonies were removed the donor site GPS location was recorded. Colonies were transported on NSU vessels and were kept in coolers under shade. Bubble wrap was used to separate colonies in the coolers to minimize abrasion. Once at the site, Portland cement was used to securely attach the colonies to the substrate. The attachment site was prepared by removing turf and macroalgae, was free of unconsolidated sediment, and was not immediately adjacent to benthic organisms that might interfere with relocated colony growth (e.g., other stony corals, octocorals, large sponges, etc.). Relocated colonies were attached with a 1-1.5 m target separation which provided space to grow but is also close enough to maximize the potential for gametes meeting in the water column during spawning events.

Task 3: Colony monitoring

To facilitate monitoring, a tagged permanent pin was installed at the center of each spawning hub colony relocation area. All relocated colonies were tagged and mapped by recording the distance and bearing from the center pin. Relocated colony data was recorded at the time of relocation (initial event) and approximately 1 month and 3 months after the completion of all colony relocation. During the initial event, whole colony size (diameter and height) and percent colony mortality were recorded. These colonies did not have any conditions such as recent mortality or boring sponge presence at the time of relocation. During monitoring events, colony attachment security (attached, loose, or missing), percent alive, and condition (percent colony old and recent mortality, presence boring sponge, and bleaching) were recorded. In addition to the relocated colonies, a set of reference SCTLD susceptible colonies, approximately 10 cm diameter or greater, located within 25 m of the center pin were mapped on 17 August (North hub) and 18 August (South hub) 2020. Reference colony whole colony size (diameter and height), percent alive, and condition (percent colony old and recent mortality, presence boring sponge, and bleaching) were recorded. A subset of the reference colonies was monitored during the 1-month and 3-month monitoring events. A minimum of 20 colonies in each hub, representing all reference colony species, were chosen randomly and monitored at both events. Images were taken of all monitored colonies. These images were not used for quantitative analysis but provide a visual representation of the health of the colonies.

RESULTS

Task 1: Spawning hub site selection

Table 1 provides summary information for the 10 model ranked selection sites, and Figure 1 maps the locations of those 10 sites. Spawning hub site selection survey dives were completed on 29 and 30 July 2020. The model ranked sites chosen as the northern and southern spawning hub sites were V9117 and V8876, respectively (Table 1 and Figure 1). Both sites were ranked #1 unanimously by the researchers. Both sites are located on the Inner reef habitat in approximately 7-8 m water depth, greater than 1000 m from shore, had healthy (visually disease-free) SCTLD susceptible colonies, stable substrate for attachment, and no signs of current or past physical disturbances.

Task 2: Site establishment and colony relocation

Nine field days were required to relocate 30 *P. clivosa* colonies to each hub site between 28 July and 2 September 2020. All donor sites were located on the nearshore hardbottom in 5-6 m water depths (Appendix Table 1) (Figure 2). Colony sizes (diameter) ranged from 18 to 58 cm and percent colony mortality ranged from 0% to 20% (Appendix Table 2). No colonies were partially bleached, had recent mortality, or the presence of boring sponge (*Cliona* spp.). A relocation area center pin was installed at each hub, and the colonies were tagged and mapped within each area by recording the distance and bearing from the center pins (Appendix Table 1).

Table 1. Summary information for the 10 model selection sites that were included in the survey dives. The two grey shaded sites were chosen as the North and South spawning hubs.

North or South of Port Everglades	Model Site	Model Rank	Diver Rank	Latitude (dd)	Longitude (dd)	Distance from Shore (m)	Habitat
North	V9120	1	2	26.1485	-80.0962	325	NRC
North	V9117	2	1	26.1441	-80.0898	1300	Inner
North	V9091	3	3	26.1260	-80.0936	1065	Inner
North	V9104	4	4	26.1349	-80.0894	1480	Inner
North	V9211	5	5	26.2117	-80.0836	870	Inner
South	V8876	1	1	25.9768	-80.1000	2000	Inner
South	V8904	2	3	25.9951	-80.1049	1300	NRC
South	V8949	3	4	26.0222	-80.1006	1570	Inner
South	V8968	4	5	26.0356	-80.0999	1530	Inner
South	V8885	5	2	25.9816	-80.1051	1500	NRC

Task 3: Colony monitoring

Initial colony data was collected on the day the colonies were relocated to the hubs (see Appendix Tables 1 and 2). The 1-month post-relocation monitoring event at both hubs was completed on 29 September 2020. This event was just over three weeks from the last relocation date (2 September) and approximately eight weeks from the first relocation date (28 July). The 3-month event at both hubs was completed on 16 November 2020. During both monitoring events 100% of the relocated corals at both hubs were alive and securely attached to the substrate (Appendix Table 3). Fish predation by the stoplight parrotfish, *Sparisoma viride*, and/or the four eyed butterflyfish, *Chaetodon capistratus*, was the most prevalent source of tissue impacts identified during both monitoring events (Table 2 and Appendix Table 3) (Figure 3). Interestingly, both fish species were observed 'biting', four colonies at the north hub and five colonies at the south hub, (see Appendix Table 2), on the day the colonies were relocated while researchers were cementing colonies to the substrate. Most predation appears to have been by the butterflyfish and in all cases affected less than 10% of the colony and in most less than 5% of the colony. With an average *P. clivosa* colony size (diameter) greater than 30 cm, predation at these sites does not appear to be a stressor that would drive complete colony mortality.

Disease lesions were observed on four colonies in the north hub during the 3-month event (Table 4, Figure 4, and Appendix Table 3). The north hub was visited two additional times, 23 November and 11 December, to track the condition of these four colonies. Three of the four colonies continued to have active disease margins, but one of the colonies did not have an active margin when observed on 23 November or 11 December. Within the data types collected for this project, there is no apparent information that would indicate why only these colonies developed lesions. Three of the four were affected by predation during the 1-month event, but the percent colony affected was less than 5% and most colonies also affected by predation did not develop lesions.

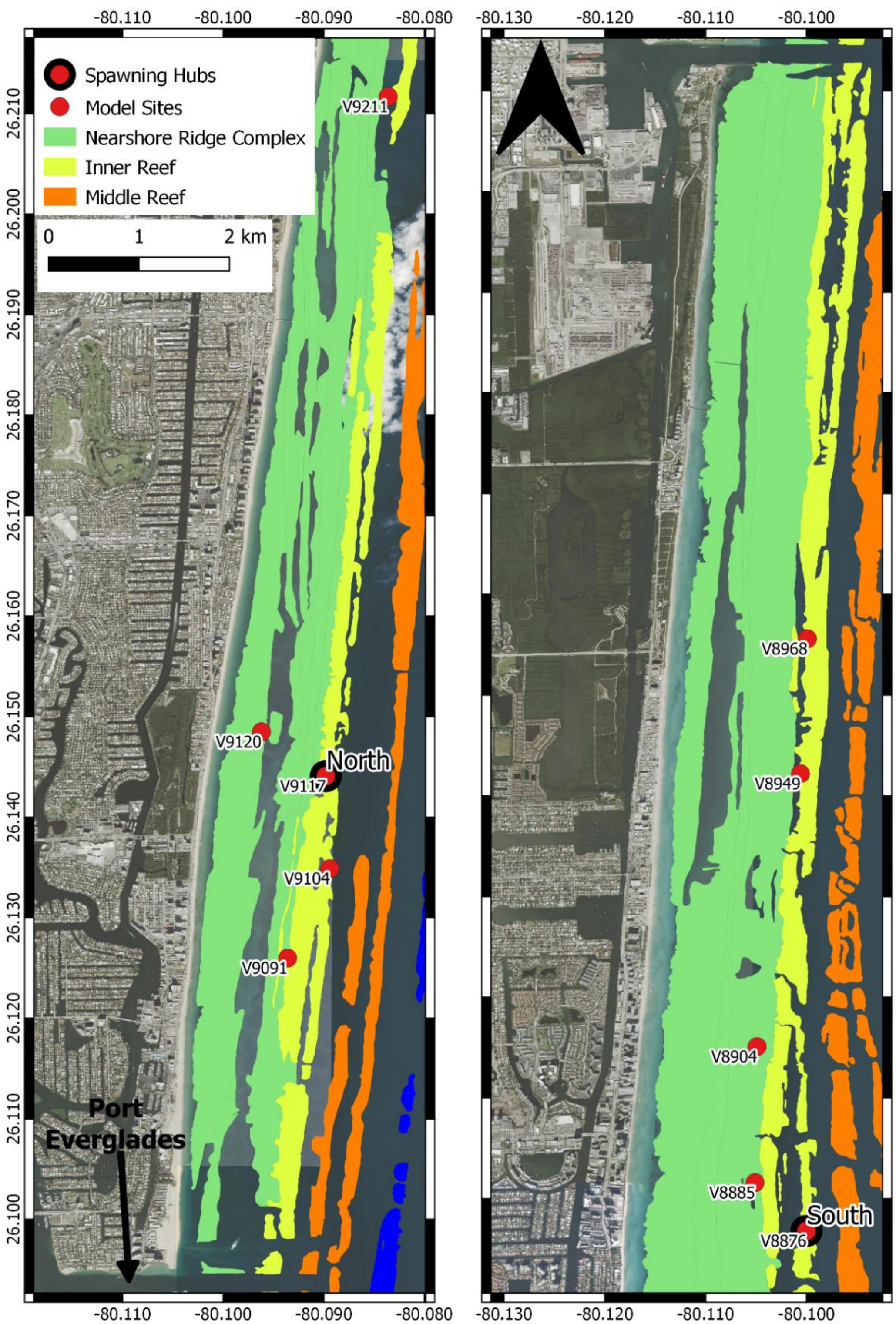

Figure 1. Habitat map with 10 surveyed selection sites (red dots) identified during bio-physical dispersal models site selection process, and the locations of the north and south established spawning hub sites (circled red dots). Refer to Table 1 for additional site information.

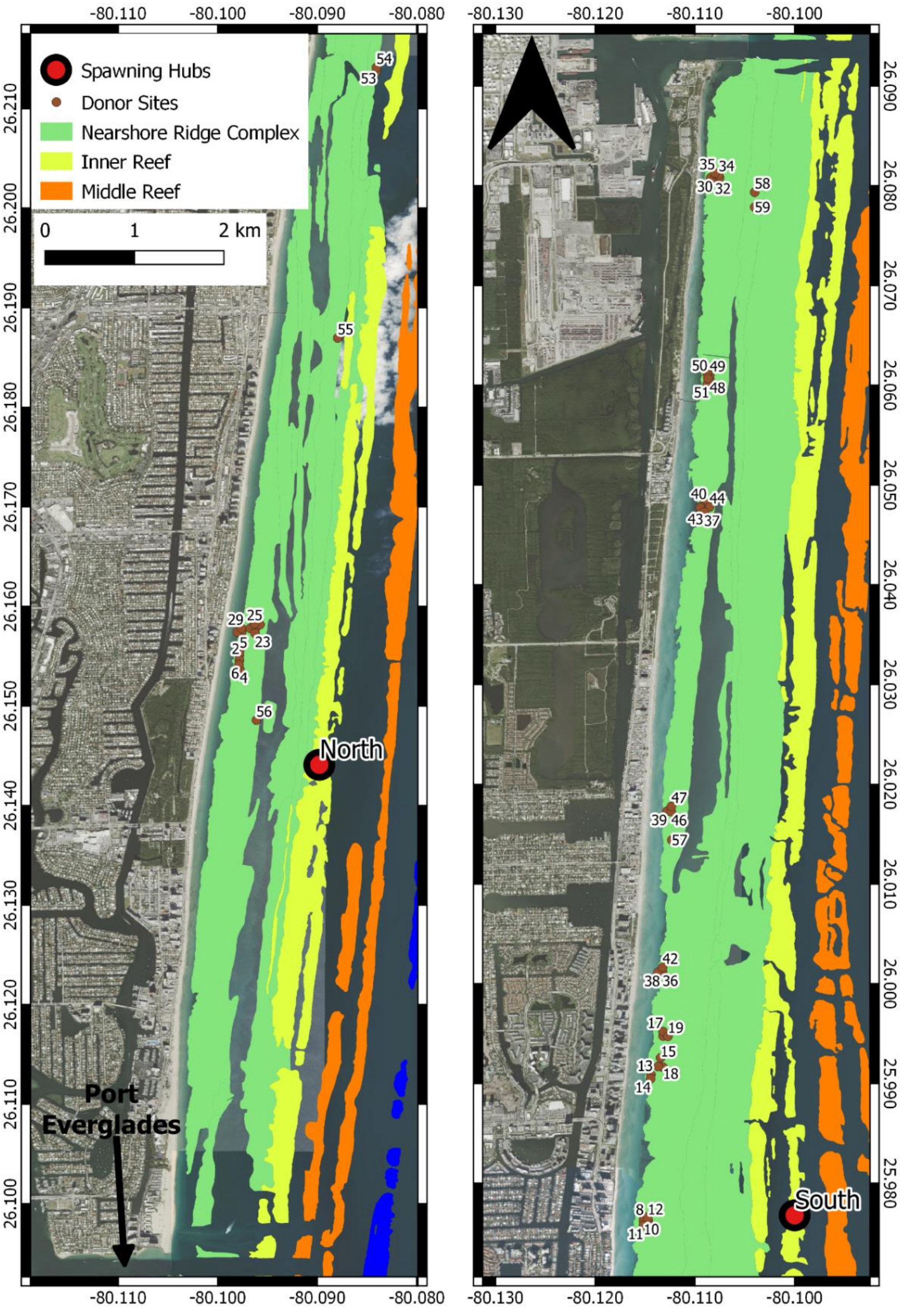

Figure 2. Habitat map with the numbered relocated colony donor sites (red dots) and the spawning hub sites (red circled dots). Refer to Appendix Table 1 for additional donor site information.

Table 2. Relocated *P. clivosa* colonies observed during each monitoring event with indications of fish predation.

Hub	Initial	1-month	3-month
North	4	13	16
South	5	12	16

Figure 3. Image on the left shows three four eyed butterflyfishes 'biting' a relocated *P. clivosa* colony during the 1-month monitoring event, and the image on the right shows the bite scar from spotlight parrotfish predation on a relocated *P. clivosa* colony during the day of relocation.

Table 3. North hub relocated *P. clivosa* colonies with disease lesions on 16 and 23 November and 11 December 2020. Percent colony mortality (% OM = old mortality and % RM = recent mortality) are presented in 10% bins.

		16 November		23 November		11 December	
Hub	**Colony**	**% OM**	**% RM**	**% OM**	**% RM**	**% OM**	**% RM**
North	715	1-10	20-30	40-50	1-10	40-50	1-10
North	729	1-10	1-10	11-20	1-10	30-40	1-10
North	746	1-10	11-20	40-50	1-10	50-60	1-10
North	770	1-10	1-10	1-10	0	1-10	0

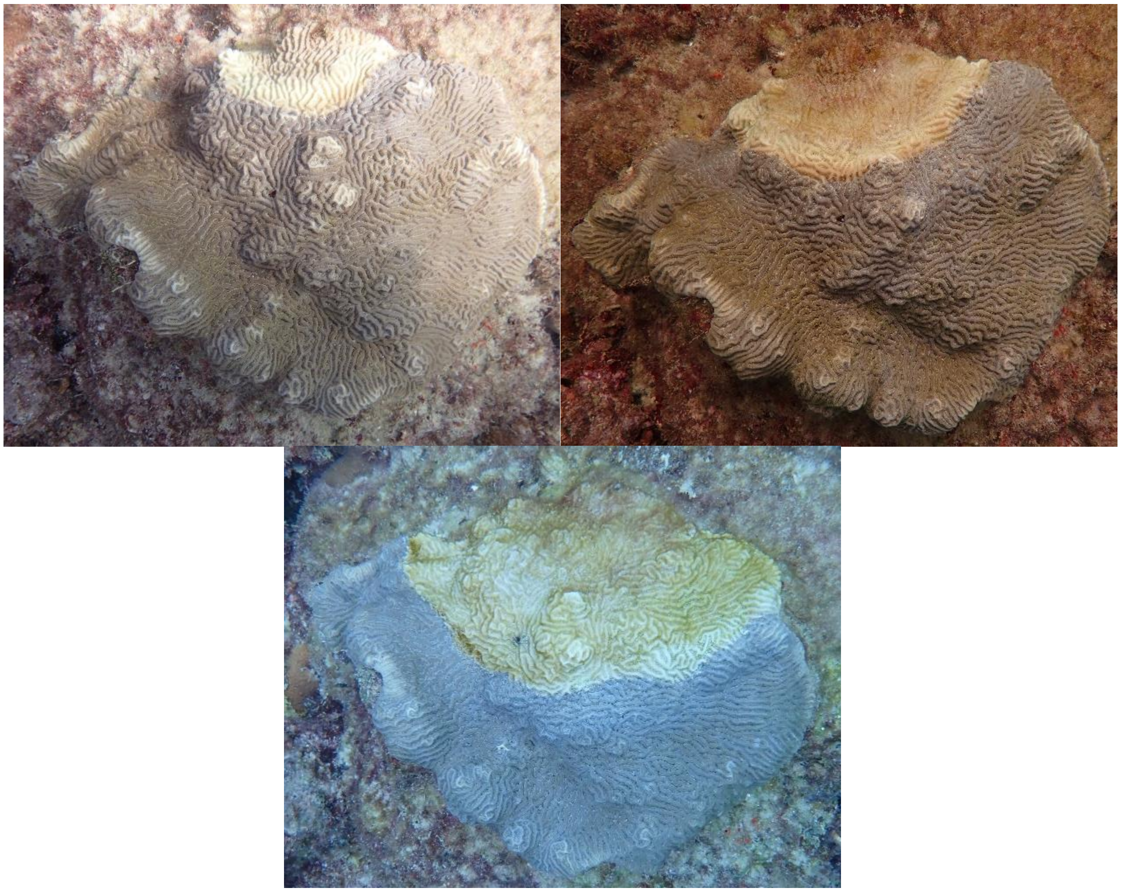

Figure 4. Progression of the disease lesion on north hub colony 729 when first observed on 16 November (top left) and then 23 November (top right) and on the last observation on 11 December 2020 (bottom).

The colonies were separated by more than 2 m in the hub, and visually healthy colonies were present between the diseased colonies. All four colonies were collected north of Port Everglades. Three of the four colonies were collected in early August while the fourth was collected in early September. Two colonies were collected from sites separated by 100 m, but these two colonies were separated from the other two colonies by more than 5 km.

Seventy-three reference colonies representing nine species were mapped in the north hub, and 55 representing 12 species were mapped in the South hub (Table 4). No colonies had visible signs of diseases when originally mapped (Appendix Table 6). During the 1-month event, one *P. strigosa* colony in the North hub and one *P. strigosa* colony in the south hub were recorded with disease lesions (Appendix Tables 7 and 8). Although with measurable tissue loss, the north hub colony was not recorded with recent mortality during the 3-month event while the south hub colony was not found (Appendix Tables 7 and 8).

Table 4. Reference colonies mapped, mean colony diameter, and number monitored at the North and South hubs.

Species	North Hub Number of Colonies	North Hub Mean Diameter (cm)	North Hub Number Monitored	South Hub Number of Colonies	South Hub Mean Diameter (cm)	South Hub Numbered Monitored
M. cavernosa	44	28.4	3	5	28.4	3
O. faveolata	7	51.0	2	6	57.3	3
O. annularis	5	42.2	3	0	0.0	0
P. strigosa	5	23.9	3	11	17.3	5
O. franksi	4	58.5	3	3	34.3	3
M. meandrites	3	7.0	3	9	12.0	3
D. labyrinthiformis	2	6.0	2	2	13.5	2
M. aliciae	2	11.5	2	2	12.0	2
E. fastigiata	1	7.0	1	7	10.8	4
D, stokesii	0	0.0	0	7	6.3	3
S. bournoni	0	0.0	0	1	17.5	1
C. natans	0	0.0	0	1	21.0	1
A. lamarcki	0	0.0	0	1	28.0	1
Total	73	NA	22	55	NA	31

Conclusions

The goal of this Phase 1 project was to establish the first spawning hub sites in the ECA. Spawning hubs promote species recovery by facilitating recruitment driven by natural sexual reproduction and by providing sites where efficient spawning observations and gamete capture can occur. Spawning observations advance our understanding of stony coral reproductive ecology while gamete capture supports our ability to rear larvae in land-based nurseries furthering species recovery opportunities.

The multi-year SCTLD disease event significantly reduced the abundance of many ECA stony coral species; therefore, restoration activities which promote species recovery are required. The creation of spawning hubs is a restoration activity that includes colony relocation. The severity of the SCTLD event highlighted potential risks associated with relocating corals. These risks included relocated colony mortality associated with the stress of relocation, and increased disease-related mortality of stony corals present at the hub sites from the introduction of new. Recognizing these risks and rewards, this Phase 1 project targeted only two sites and included limited numbers of one stony coral species, *P. clivosa*.

This pilot project was successful. Sixty *P. clivosa* colonies that met the section criteria were successfully identified and relocated to the hubs. Three months post-relocation, 100% of the colonies were alive and securely attached to the substrate. Recent mortality visually consistent with disease was not identified in the south hub, and only four colonies with recent mortality visually consistent with disease were identified in the north hub. The disease appeared to have arrested in one north hub colony when re-visited approximately 3.5 weeks after the initial observation. Within the data collected for this project, there is no information that would indicate the relocation or attachment activities contributed to these four colonies developing lesions. Additionally, only one reference colony in each hub was identified with recent mortality visually consistent with disease. Both colonies were greater than 20 m from the center of the relocation area.

Based on the success of this Phase 1 project, we recommend not only expanding the current hubs to include more species, but also to establish additional multi-species hubs in other ECA reef habitats (i.e., middle and outer reefs). We also recommend that these and future hubs be utilized to support spawning observations and gamete collections. There remains much to be learned about ECA stony coral reproduction and stony coral larval rearing, and the hubs provide excellent support for those studies. Long-term monitoring in the hubs should be conducted and include monitoring the relocated colonies and a set of refence colonies. Hub sites should be incorporated into greater regional efforts similar to those proposed by the Florida Keys Seven Iconic Reefs project. Spawning hub colonies and hub management activities provide a unique opportunity to support potentially many additional research projects beyond the initial restoration goals.

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Appendices

Appendix Table 1. Summary information for the colony donor sites and the tag number and distance and bearing from the hub center pin for each relocated colony. Refer to Figure 2 for donor site map locations.

Hub	Tag	Relocation Date	Donor Site	Latitude (dd)	Longitude (dd)	Depth (m)	Distance (m)	Bearing (degrees)
North	700	7/28/2020	1	26.15459	-80.09783	5	4.5	210
North	701	7/28/2020	2	26.15509	-80.09783	5	3.2	240
North	702	7/28/2020	3	26.15462	-80.09783	5	2.15	210
North	703	7/28/2020	4	26.15370	-80.09779	5	3.9	220
North	705	7/28/2020	5	26.15550	-80.09781	5	3.5	295
North	706	7/28/2020	6	26.15416	-80.09787	5	6	210
North	711	8/10/2020	21	26.15780	-80.09676	5	0.7	80
North	714	8/10/2020	22	26.15785	-80.09618	5	6.2	180
North	715	8/10/2020	23	26.15731	-80.09626	5	2.5	70
North	740	8/10/2020	24	26.15818	-80.09576	5	3.4	185
North	770	8/10/2020	25	26.15826	-80.09630	5	3.4	200
North	726	8/11/2020	26	26.15740	-80.09762	4	1.7	280
North	737	8/11/2020	27	26.15741	-80.09805	4	3.2	275
North	789	8/11/2020	28	26.15696	-90.09764	5	2.5	300
North	808	8/11/2020	29	26.15781	-80.09762	5	2.7	280
North	727	8/12/2020	30	26.08080	-80.10843	2	2.1	150
North	729	8/12/2020	31	26.08080	-80.10798	3	3.5	150
North	759	8/12/2020	32	26.08037	-80.10797	3	4.1	140
North	774	8/12/2020	33	26.08080	-80.10752	3	2.7	130
North	784	8/12/2020	34	26.08110	-80.10761	3	5	190
North	804	8/12/2020	35	26.08128	-80.10799	4	3	130
North	738	8/18/2020	48	26.06062	-80.10851	4	1.3	150
North	747	8/18/2020	49	26.06103	-80.10851	4	1.2	130
North	757	8/18/2020	50	26.06112	-80.10876	4	2.5	220
North	788	8/18/2020	51	26.06016	-80.10876	4	1.9	180
North	820	8/18/2020	52	26.06068	-80.10870	4	5.4	180
North	746	9/1/2020	53	26.21370	-80.08408	3	0.9	220
North	756	9/1/2020	54	26.21414	-80.08406	3	2.1	260
North	779	9/1/2020	55	26.18697	-80.08795	4	5.1	180
North	817	9/1/2020	56	26.14858	-80.09612	5	2.75	150

Appendix Table 1. Continued.

Hub	Tag	Relocation Date	Donor Site	Latitude (dd)	Longitude (dd)	Depth (m)	Distance (m)	Bearing (degrees)
South	704	8/5/2020	7	25.97626	-80.11469	5	3	335
South	707	8/5/2020	8	25.97672	-80.11515	5	3.8	355
South	708	8/5/2020	9	25.97674	-80.11513	4	3.8	340
South	713	8/5/2020	10	25.97627	-80.11515	5	2.6	360
South	716	8/5/2020	11	25.97580	-80.11517	5	2.1	335
South	717	8/5/2020	12	25.97653	-80.11473	4	4.5	345
South	710	8/7/2020	13	25.99092	-80.11442	5	2.7	175
South	712	8/7/2020	14	25.99049	-80.11444	5	2.2	180
South	720	8/7/2020	15	25.99258	-80.11345	5	2.5	300
South	801	8/7/2020	16	25.99477	-80.11320	5	3.2	200
South	805	8/7/2020	17	25.99522	-80.11321	5	2.6	270
South	811	8/7/2020	18	25.99165	-80.11321	5	2	230
South	812	8/7/2020	19	25.99474	-80.11271	5	3.75	230
South	815	8/7/2020	20	25.99172	-80.11370	5	4.7	230
South	709	8/14/2020	36	26.00118	-80.11325	5	4.4	280
South	718	8/14/2020	37	26.04729	-80.10907	5	3.7	210
South	728	8/14/2020	38	26.00115	-80.11371	5	3.5	190
South	730	8/14/2020	39	26.01729	-80.11282	5	2.15	240
South	750	8/14/2020	40	26.04825	-80.10903	5	2.9	30
South	760	8/14/2020	41	26.04782	-80.10940	5	1.6	10
South	766	8/14/2020	42	26.00165	-80.11325	5	2.5	150
South	768	8/14/2020	43	26.04745	-80.10936	5	2.8	200
South	771	8/14/2020	44	26.04779	-80.10853	6	2.2	20
South	772	8/14/2020	45	26.04775	-80.10948	5	1.65	30
South	796	8/14/2020	46	26.01727	-80.11237	5	3.5	160
South	803	8/14/2020	47	26.01779	-80.11236	5	3.1	140
South	797	9/2/2020	57	26.01442	-80.11232	6	2.1	300
South	807	9/2/2020	58	26.07936	-80.10401	5	1.3	270
South	809	9/2/2020	59	26.07786	-80.10401	5	1.6	220
South	819	9/2/2020	37	26.04729	-80.10907	6	2.3	340

Appendix Table 2. Initial (day of relocation) colony summary data for the 30 relocated colonies in each hub. Percent colony mortality are presented in 10% bins. Refer to Appendix Table 1 for additional information (* = colonies which experienced fish predation the same as day they were relocated).

Hub	**Tag**	**Dia. (cm)**	**Height (cm)**	**% Mortality**	**Hub**	**Tag**	**Dia. (cm)**	**Height (cm)**	**% Mortality**
North	700	44	12	1-10	South	704	33	6	1-10
North	701	24	4	1-10	South	707	26	7	1-10
North	702	41	12	1-10	South	708	45	8	11-20
North	703	30	7	1-10	South	713	35	8	1-10
North	705	30	10	1-10	South	716	40	7	1-10
North	706	53	13	1-10	*South	717	32	5	1-10
North	711	18	6	0	South	710	45	10	1-10
North	714	50	12	1-10	South	712	49	11	1-10
North	715	46	10	1-10	*South	720	29	4	1-10
North	740	42	10	1-10	South	801	42	6	0
North	770	32	10	1-10	*South	805	32	6	1-10
North	726	35	10	1-10	*South	811	30	7	1-10
North	737	32	7	11-20	*South	812	38	5	1-10
North	789	30	10	1-10	*South	815	20	7	1-10
North	*808	30	15	1-10	South	709	58	8	1-10
North	*727	25	10	1-10	South	718	40	5	1-10
North	*729	37	10	1-10	South	728	26	5	1-10
North	759	27	12	1-10	South	730	43	4	1-10
North	774	52	11	1-10	South	750	40	6	1-10
North	784	50	21	1-10	South	760	27	5	1-10
North	804	28	7	1-10	South	766	47	8	1-10
North	738	34	12	1-10	South	768	41	6	1-10
North	747	27	5	1-10	South	771	36	5	1-10
North	757	35	14	1-10	South	772	40	4	1-10
North	788	40	10	1-10	South	796	29	6	11-20
North	820	43	8	1-10	South	803	36	3	1-10
North	746	34	6	1-10	South	797	41	9	1-10
North	756	39	10	11-20	South	807	25	6	1-10
North	779	40	14	1-10	South	809	35	16	1-10
North	817	28	12	1-10	South	819	34	6	1-10

Appendix Table 3. 1-month monitoring event colony summary data for the 30 relocated colonies in each hub. Percent colony mortality are presented in 10% bins. Refer to Appendix Table 1 for additional information (CEM = cement burns; PRD = predation; UNK = unknown).

Hub	Tag	% OM	% RM	Condition
North	700	1-10	0	NA
North	701	1-10	1-10	CEM & PRD
North	702	1-10	1-10	PRD
North	703	1-10	0	NA
North	705	1-10	0	NA
North	706	1-10	1-10	PRD
North	711	0	0	NA
North	714	1-10	0	NA
North	715	1-10	1-10	PRD
North	726	1-10	1-10	PRD
North	727	1-10	1-10	PRD
North	729	1-10	1-10	NA
North	737	11-20	1-10	PRD
North	738	1-10	1-10	PRD
North	740	1-10	1-10	PRD
North	746	1-10	0	NA
North	747	1-10	0	NA
North	756	1-10	0	NA
North	757	1-10	0	NA
North	759	1-10	1-10	CEM
North	770	1-10	1-10	PRD
North	774	1-10	1-10	PRD
North	779	1-10	1-10	PRD
North	784	1-10	0	NA
North	788	1-10	1-10	PRD
North	789	1-10	1-10	PRD
North	804	1-10	0	NA
North	808	1-10	0	NA
North	817	1-10	1-10	PRD
North	820	1-10	0	NA
South	704	1-10	0	NA
South	707	1-10	0	NA
South	708	11-20	0	NA
South	709	1-10	0	UNK
South	710	1-10	0	NA
South	712	1-10	0	NA
South	713	1-10	1-10	PRD
South	716	1-10	1-10	PRD
South	717	1-10	1-10	PRD
South	718	1-10	0	NA
South	720	1-10	1-10	PRD
South	728	1-10	0	NA
South	730	1-10	0	NA
South	750	1-10	0	NA
South	760	1-10	0	NA
South	766	1-10	0	NA
South	768	1-10	0	NA
South	771	1-10	1-10	PRD
South	772	1-10	1-10	PRD
South	796	1-10	1-10	PRD
South	797	1-10	0	NA
South	801	1-10	0	NA
South	803	1-10	0	NA
South	805	1-10	1-10	NA
South	807	1-10	1-10	PRD
South	809	1-10	0	NA
South	811	1-10	1-10	PRD
South	812	1-10	1-10	PRD
South	815	1-10	0	NA
South	819	1-10	0	NA

Appendix Table 4. 3-month monitoring event colony summary data for the 30 relocated colonies in each hub. Percent colony mortality are presented in 10% bins. Refer to Appendix Table 1 for additional information (PRD = predation).

Hub	Tag	% OM	% RM	Condition	Hub	Tag	% OM	% RM	Condition
North	700	1-10	0	NA	South	704	1-10	0	NA
North	701	1-10	0	NA	South	707	1-10	0	NA
North	702	11-20	0	NA	South	708	11-20	0	NA
North	703	1-10	1-10	PRD	South	709	1-10	0	NA
North	705	1-10	0	NA	South	710	1-10	1-10	PRD
North	706	1-10	1-10	PRD	South	712	1-10	0	NA
North	711	0	0	NA	South	713	1-10	1-10	PRD
North	714	1-10	1-10	PRD	South	716	1-10	0	NA
North	715	1-10	21-30	Disease	South	717	1-10	1-10	PRD
North	726	1-10	1-10	PRD	South	718	1-10	1-10	PRD
North	727	1-10	1-10	PRD	South	720	1-10	1-10	PRD
North	729	1-10	11-20	Disease	South	728	1-10	0	NA
North	737	11-20	1-10	UNK	South	730	1-10	0	NA
North	738	1-10	0	NA	South	750	1-10	1-10	PRD
North	740	1-10	1-10	PRD	South	760	1-10	1-10	PRD
North	746	1-10	11-20	Disease	South	766	1-10	1-10	PRD
North	747	1-10	1-10	PRD	South	768	1-10	0	NA
North	756	1-10	1-10	PRD	South	771	1-10	1-10	PRD
North	757	1-10	0	NA	South	772	1-10	0	NA
North	759	1-10	1-10	PRD	South	796	1-10	11-20	PRD
North	770	1-10	1-10	Disease	South	797	11-20	1-10	PRD
North	774	1-10	1-10	PRD	South	801	1-10	0	NA
North	779	1-10	1-10	PRD	South	803	1-10	0	NA
North	784	1-10	1-10	PRD	South	805	1-10	1-10	PRD
North	788	1-10	1-10	PRD	South	807	1-10	1-10	PRD
North	789	1-10	1-10	PRD	South	809	1-10	1-10	PRD
North	804	1-10	1-10	PRD	South	811	1-10	0	NA
North	808	1-10	0	NA	South	812	1-10	1-10	PRD
North	817	1-10	1-10	PRD	South	815	1-10	0	NA
North	820	1-10	0	Pale	South	819	1-10	1-10	PRD

Appendix Table 5. Summary information for the reference colonies at both hub sites including distance and bearing from the hub center pin.

Hub	Species	Colony	Distance (m)	Bearing (deg)
North	*M. cavernosa*	1	8	0
North	*M. cavernosa*	2	7	10
North	*D. labyrinthiformis*	3	24	10
North	*M. cavernosa*	4	26	20
North	*M. cavernosa*	5	11.5	40
North	*M. cavernosa*	6	13	50
North	*M. cavernosa*	7	16.5	50
North	*M. cavernosa*	8	16.3	55
North	*M. cavernosa*	9	13.5	60
North	*M. cavernosa*	10	20.3	60
North	*O. annularis*	11	26	60
North	*M. cavernosa*	12	25	70
North	*O. annularis*	13	22	75
North	*P. strigosa*	14	22	75
North	*M. cavernosa*	16	22.7	85
North	*M. cavernosa*	17	3.5	90
North	*O. faveolata*	18	17	90
North	*M. cavernosa*	19	24	90
North	*M. cavernosa*	20	14.3	100
North	*P. strigosa*	21	20.9	100
North	*M. cavernosa*	22	6	110
North	*M. cavernosa*	23	19.9	120
North	*M. cavernosa*	24	20.2	120
North	*M. cavernosa*	25	23.7	130
North	*M. cavernosa*	26	2.5	131
North	*M. meandrites*	27	21.9	140
North	*M. cavernosa*	28	22.25	140
North	*M. cavernosa*	29	13.2	145
North	*D. labyrinthiformis*	30	20.4	145
North	*M. cavernosa*	31	21.4	145
North	*M. cavernosa*	32	12.4	150
North	*M. cavernosa*	33	18	150
North	*O. franksi*	34	24	150
North	*M. cavernosa*	35	15.3	155
North	*P. strigosa*	36	6.3	160
North	*M. cavernosa*	37	13.9	160

Appendix Table 5. Continued

Hub	Species	Colony	Distance (m)	Bearing (deg)
North	*M. aliciae*	38	13.9	160
North	*O. franksi*	39	23.7	160
North	*O. faveolata*	40	8.6	165
North	*O. franksi*	41	9.1	180
North	*O. faveolata*	42	5.5	238
North	*O. faveolata*	43	5.1	240
North	*M. cavernosa*	44	9.7	240
North	*M. cavernosa*	45	12.2	260
North	*O. annularis*	46	7.6	270
North	*M. cavernosa*	47	17.4	270
North	*M. cavernosa*	48	20.3	270
North	*O. annularis*	49	7.3	275
North	*M. cavernosa*	50	7.4	280
North	*M. cavernosa*	51	12.5	280
North	*P. strigosa*	52	15.6	280
North	*M. cavernosa*	53	17.9	280
North	*O. faveolata*	54	20.6	280
North	*M. cavernosa*	55	20.7	280
North	*M. cavernosa*	56	20.2	290
North	*O. annularis*	57	20.4	290
North	*M. cavernosa*	58	20.9	290
North	*M. aliciae*	59	12.8	295
North	*M. cavernosa*	60	19.5	295
North	*M. cavernosa*	61	7.4	300
North	*M. cavernosa*	62	16.7	300
North	*M. cavernosa*	63	18.1	300
North	*E. fastigiata*	64	18.6	300
North	*M. cavernosa*	65	17.8	305
North	*P. strigosa*	66	15.2	310
North	*M. meandrites*	67	16.4	310
North	*M. cavernosa*	68	16.7	310
North	*O. faveolata*	69	8.5	315
North	*M. meandrites*	70	11.1	315
North	*M. cavernosa*	72	9	340
North	*M. cavernosa*	73	11.4	340
North	*O. franksi*	74	9	345

Appendix Table 5. Continued

Hub	Species	Colony	Distance (m)	Bearing (deg)
South	*M. cavernosa*	1	11	20
South	*M. cavernosa*	2	5	30
South	*O. faveolata*	3	9	30
South	*P. strigosa*	4	8	60
South	*M. meandrites*	5	23	60
South	*E. fastigiata*	6	7.7	110
South	*E. fastigiata*	7	21.2	110
South	*E. fastigiata*	8	22.2	115
South	*A. lamarcki*	10	13	120
South	*D. stokesii*	11	21.2	120
South	*D. stokesii*	12	6.6	125
South	*P. strigosa*	13	8.5	130
South	*M. meandrites*	14	9.5	130
South	*P. strigosa*	15	21.7	130
South	*O. faveolata*	16	21.9	145
South	*O. faveolata*	17	22	145
South	*O. faveolata*	18	22	145
South	*M. meandrites*	19	19.1	150
South	*S. bournoni*	20	16.3	155
South	*P. strigosa*	21	7.5	175
South	*O. faveolata*	22	20	190
South	*M. cavernosa*	23	12.5	240
South	*M. cavernosa*	24	13	240
South	*D. stokesii*	25	22.3	240
South	*O. faveolata*	26	22.1	250
South	*P. strigosa*	27	17.5	260
South	*P. strigosa*	28	20.3	260
South	*P. strigosa*	29	17.3	280
South	*P. strigosa*	30	20.3	280
South	*M. meandrites*	31	16.1	290
South	*E. fastigiata*	32	16.5	290
South	*M. cavernosa*	33	17.9	290
South	*M. aliciae*	34	9.7	300
South	*M. meandrites*	35	16	305

Appendix Table 5. Continued

Hub	Species	Colony	Distance (m)	Bearing (deg)
South	*M. meandrites*	37	15.7	310
South	*D. stokesii*	38	16.4	310
South	*P. strigosa*	39	6.4	320
South	*D. stokesii*	40	11.3	320
South	*M. meandrites*	41	14.2	320
South	*D. stokesii*	42	19.5	320
South	*M. meandrites*	43	20.7	320
South	*P. strigosa*	44	22.2	320
South	*P. strigosa*	45	6.7	325
South	*C. natans*	46	16.8	325
South	*O. franksi*	47	20.2	325
South	*D. labyrinthiformis*	48	19.4	330
South	*E. fastigiata*	49	24.5	330
South	*D. stokesii*	50	4.8	335
South	*D. labyrinthiformis*	51	9.5	335
South	*O. franksi*	52	21.5	335
South	*M. aliciae*	53	18.4	340
South	*O. franksi*	54	24	340
South	*E. fastigiata*	55	4.2	345

Appendix Table 6. Initial monitoring event colony summary data for the reference colonies in each hub. Percent colony mortality are presented in 10% bins. Refer to Appendix Table 5 for additional information.

Hub	Species	Colony Number	Dia. (cm)	Height (cm)	% OM	% RM	Condition
North	*M. cavernosa*	1	34	14	1-10	0	NA
North	*M. cavernosa*	2	14	6	11-20	0	NA
North	*D. labyrinthiformis*	3	6	3	1-10	0	NA
North	*M. cavernosa*	4	22	10	1-10	0	NA
North	*M. meandrites*	5	11	3	0	0	NA
North	*M. cavernosa*	5	35	30	61-70	0	NA
North	*M. cavernosa*	6	45	36	1-10	0	NA
North	*M. cavernosa*	7	12	3	0	0	Pale
North	*M. cavernosa*	8	20	6	0	0	NA
North	*M. cavernosa*	9	45	20	81-90	0	NA
North	*M. cavernosa*	10	36	11	1-10	0	NA
North	*O. annularis*	11	50	32	21-30	0	Partial bleach
North	*M. cavernosa*	12	9	4	0	0	NA
North	*O. annularis*	13	21	14	61-70	0	NA
North	*P. strigosa*	14	38	8	1-10	0	NA
North	*M. cavernosa*	16	35	16	71-80	0	*Cliona* spp.
North	*M. cavernosa*	17	10	5	1-10	0	NA
North	*O. faveolata*	18	80	28	71-80	0	NA
North	*M. cavernosa*	19	42	15	1-10	0	NA
North	*M. cavernosa*	20	12	5	1-10	0	NA
North	*P. strigosa*	21	9	3	1-10	0	NA
North	*M. cavernosa*	22	10	6	1-10	0	NA
North	*M. cavernosa*	23	47	30	41-50	0	NA
North	*M. cavernosa*	24	50	21	21-30	0	NA
North	*M. cavernosa*	25	52	17	21-30	0	NA
North	*M. cavernosa*	26	13	10	1-10	0	NA
North	*M. meandrites*	27	6	2	1-10	0	NA
North	*M. cavernosa*	28	11	8	1-10	0	NA
North	*M. cavernosa*	29	85	50	51-60	0	*Cliona* spp.
North	*D. labyrinthiformis*	30	6	2	0	0	NA
North	*M. cavernosa*	31	8	13	61-70	0	NA
North	*M. cavernosa*	32	35	12	41-50	0	NA
North	*M. cavernosa*	33	10	3	1-10	0	NA
North	*O. franksi*	34	82	45	51-60	0	NA

Appendix Table 6. Continued

Hub	Species	Colony Number	Dia. (cm)	Height (cm)	% OM	% RM	Condition
North	*M. cavernosa*	35	27	8	1-10	0	NA
North	*P. strigosa*	36	15	4	21-30	0	NA
North	*M. cavernosa*	37	12	7	1-10	0	NA
North	*M. aliciae*	38	13	2	0	0	NA
North	*O. franksi*	39	37	17	61-70	0	NA
North	*O. faveolata*	40	77	49	11-20	0	*Cliona* spp.
North	*O. franksi*	41	65	25	61-70	0	*Cliona* spp.
North	*O. faveolata*	42	44	29	91-99	0	NA
North	*O. faveolata*	43	45	30	1-10	0	NA
North	*M. cavernosa*	44	8	5	1-10	0	NA
North	*M. cavernosa*	45	25	7	1-10	0	Partial bleach
North	*O. annularis*	46	75	30	21-30	0	NA
North	*M. cavernosa*	47	12	5	1-10	0	NA
North	*M. cavernosa*	48	26	6	1-10	0	NA
North	*O. annularis*	49	30	20	51-60	0	NA
North	*M. cavernosa*	50	12	5	1-10	0	NA
North	*M. cavernosa*	51	42	15	41-50	0	NA
North	*P. strigosa*	52	25	7	1-10	0	NA
North	*M. cavernosa*	53	70	18	1-10	0	NA
North	*O. faveolata*	54	50	28	1-10	0	NA
North	*M. cavernosa*	55	35	11	1-10	0	NA
North	*M. cavernosa*	56	15	5	1-10	0	NA
North	*O. annularis*	57	35	25	51-60	0	NA
North	*M. cavernosa*	58	50	7	1-10	0	NA
North	*M. aliciae*	59	10	2	11-20	0	NA
North	*M. cavernosa*	60	55	30	51-60	0	NA
North	*M. cavernosa*	61	18	9	1-10	0	NA
North	*M. cavernosa*	62	27	7	1-10	0	NA
North	*M. cavernosa*	63	60	30	1-10	0	NA
North	*E. fastigiata*	64	7	4	0	0	NA
North	*M. cavernosa*	65	20	9	1-10	0	NA
North	*P. strigosa*	66	31	5	1-10	0	NA
North	*M. meandrites*	67	7	2	0	0	NA
North	*M. cavernosa*	68	30	15	1-10	0	NA
North	*O. faveolata*	69	50	40	61-70	0	NA

Appendix Table 6. Continued

Hub	Species	Colony Number	Dia. (cm)	Height (cm)	% OM	% RM	Condition
North	*M. meandrites*	70	8	2	0	0	NA
North	*M. cavernosa*	72	25	10	21-30	0	NA
North	*M. cavernosa*	73	20	8	1-10	0	NA
North	*O. franksi*	74	50	20	71-80	0	NA
South	*M. cavernosa*	1	68	34	81-90	0	NA
South	*M. cavernosa*	2	15	8	11-20	0	NA
South	*O. faveolata*	3	23	11	1-10	0	NA
South	*P. strigosa*	4	34	19	11-20	0	NA
South	*E. fastigiata*	6	20	4	1-10	0	NA
South	*E. fastigiata*	7	10	3	0	0	NA
South	*E. fastigiata*	8	13	6	0	0	NA
South	*A. lamarcki*	10	28	8	1-10	0	NA
South	*D. stokesii*	11	4	1	0	0	NA
South	*D. stokesii*	12	4	2	0	0	NA
South	*P. strigosa*	13	9	2	1-10	0	NA
South	*M. meandrites*	14	52	10	1-10	0	NA
South	*P. strigosa*	15	20	8	11-20	0	NA
South	*O. faveolata*	16	67	2	61-70	0	NA
South	*O. faveolata*	17	27	8	1-10	0	NA
South	*O. faveolata*	18	28	5	1-10	0	NA
South	*M. meandrites*	19	7	3	0	0	NA
South	*S. bournoni*	20	25	5	0	0	NA
South	*P. strigosa*	21	34	12	1-10	0	NA
South	*O. faveolata*	22	150	64	71-80	0	NA
South	*M. cavernosa*	23	12	11	1-10	0	NA
South	*M. cavernosa*	24	39	14	41-50	0	NA
South	*D. stokesii*	25	14	4	1-10	0	NA
South	*O. faveolata*	26	100	52	91-99	0	NA
South	*P. strigosa*	27	23	8	0	0	NA
South	*P. strigosa*	28	12	4	0	0	NA
South	*P. strigosa*	29	22	22	1-10	0	NA
South	*P. strigosa*	30	16	7	11-20	0	NA
South	*M. meandrites*	31	7	2	1-10	0	NA
South	*E. fastigiata*	32	9	4	1-10	0	NA
South	*M. cavernosa*	33	8	5	1-10	0	NA

Appendix Table 6. Continued

Hub	Species	Colony Number	Dia. (cm)	Height (cm)	% OM	% RM	Condition
South	*M. aliciae*	34	12	3	1-10	0	NA
South	*M. meandrites*	35	5	1	0	0	NA
South	*M. meandrites*	36	6	1	0	0	NA
South	*M. meandrites*	37	4	1	0	0	NA
South	*D. stokesii*	38	4	4	1-10	0	NA
South	*P. strigosa*	39	13	5	1-10	0	NA
South	*D. stokesii*	40	4	2	0	0	NA
South	*M. meandrites*	41	8	1	1-10	0	NA
South	*D. stokesii*	42	8	5	0	0	NA
South	*M. meandrites*	43	8	2	1-10	0	NA
South	*P. strigosa*	44	30	10	1-10	1-10	Sediment
South	*P. strigosa*	45	7	2	1-10	0	NA
South	*C. natans*	46	8	2	0	0	NA
South	*O. franksi*	47	33	17	11-20	0	NA
South	*D. labyrinthiformis*	48	20	12	1-10	0	NA
South	*E. fastigiata*	49	7	3	1-10	0	NA
South	*D. stokesii*	50	6	3	1-10	0	NA
South	*D. labyrinthiformis*	51	7	3	1-10	0	NA
South	*O. franksi*	52	35	30	11-20	0	NA
South	*M. aliciae*	53	31	5	1-10	0	NA
South	*O. franksi*	54	25	18	1-10	0	NA
South	*E. fastigiata*	55	6	2	0	0	NA

Appendix Table 7. 1-month and 3-month monitoring events colony summary data for the monitored subset of reference colonies in the North hub. Percent colony mortality are presented in 10% bins. Refer to Appendix Tables 5 and 6 for additional information (UNK = unknown condition).

			1-Month			**3-Month**		
Hub	**Species**	**Colony Number**	**% OM**	**% RM**	**Condition**	**% OM**	**% RM**	**Condition**
North	*D. labyrinthiformis*	3	1-10	0	NA	1-10	0	NA
North	*M. cavernosa*	12	1-10	0	NA	NA	NA	Not found
North	*O. annularis*	13	61-70	0	NA	51-60	1-10	UNK
North	*P. strigosa*	14	1-10	0	NA	1-10	0	NA
North	*P. strigosa*	21	1-10	0	NA	0	0	NA
North	*M. meandrites*	27	1-10	0	NA	1-10	0	NA
North	*D. labyrinthiformis*	30	0	0	NA	1-10	0	NA
North	*O. franksi*	34	51-60	1-10	PRD	NA	NA	Not found
North	*M. aliciae*	38	0	0	NA	0	0	NA
North	*O. franksi*	39	41-50	0	PB	NA	NA	Not found
North	*O. faveolata*	40	11-20	0	*Cliona* spp.	1-10	0	*Cliona* spp.
North	*O. faveolata*	43	71-80	0	NA	81-90	0	NA
North	*O. annularis*	46	11-20	0	Pale	11-20	0	NA
North	*M. cavernosa*	53	1-10	0	NA	1-10	0	NA
North	*O. annularis*	57	51-60	0	PB	51-60	1-10	NA
North	*M. cavernosa*	58	1-10	0	Pale	1-10	0	NA
North	*M. aliciae*	59	1-10	0	NA	NA	NA	Not found
North	*E. fastigiata*	64	0	0	NA	0	0	NA
North	*P. strigosa*	66	1-10	1-10	Disease	71-80	0	NA
North	*M. meandrites*	67	0	0	NA	0	0	NA
North	*M. meandrites*	70	0	0	NA	0	1-10	NA
North	*O. franksi*	74	71-80	0	NA	71-80	0	NA

Appendix Table 8. 1-month and 3-month monitoring events colony summary data for the monitored subset of reference colonies in the South hub. Percent colony mortality are presented in 10% bins. Refer to Appendix Tables 5 and 6 for additional information (PB = partial bleaching; PRD = predation; UNK = unknown condition).

			1-Month			**3-Month**		
Hub	**Species**	**Colony #**	**% OM**	**% RM**	**Condition**	**% OM**	**% RM**	**Condition**
South	*M. cavernosa*	2	1-10	0	NA	0	0	NA
South	*O. faveolata*	3	1-10	0	NA	1-10	0	NA
South	*P. strigosa*	4	11-20	0	NA	1-10	0	NA
South	*M. meandrites*	5	0	0	NA	0	0	NA
South	*E. fastigiata*	6	1-10	0	NA	0	1-10	PB
South	*E. fastigiata*	7	1-10	0	NA	1-10	0	Pale
South	*A. lamarcki*	10	1-10	0	NA	1-10	0	PB
South	*M. meandrites*	14	1-10	1-10	Sediment	1-10	0	Pale
South	*O. faveolata*	16	61-70	0	NA	61-70	0	*Cliona* spp.
South	*S. bournoni*	20	51-60	0	NA	61-70	0	Pale
South	*P. strigosa*	21	1-10	0	NA	1-10	0	Pale
South	*O. faveolata*	22	61-70	0	NA	71-80	0	*Cliona* spp.
South	*M. cavernosa*	24	51-60	0	NA	41-50	0	NA
South	*D. stokesii*	25	1-10	0	NA	1-10	0	NA
South	*P. strigosa*	27	0	0	NA	0	0	NA
South	*M. cavernosa*	33	1-10	0	NA	1-10	0	NA
South	*M. aliciae*	34	0	0	NA	0	0	NA
South	*P. strigosa*	39	1-10	0	NA	1-10	1-10	PRD
South	*M. meandrites*	41	0	0	NA	1-10	0	NA
South	*D. stokesii*	42	0	0	NA	0	0	NA
South	*P. strigosa*	44	1-10	1-10	Disease	NA	NA	Not found
South	*C. natans*	46	0	0	NA	0	0	NA
South	*O. franksi*	47	11-20	0	NA	11-20	0	NA
South	*D. labyrinthiformis*	48	1-10	0	NA	0	0	NA
South	*E. fastigiata*	49	1-10	0	NA	1-10	0	NA
South	*D. stokesii*	50	0	0	NA	1-10	0	NA
South	*D. labyrinthiformis*	51	1-10	0	NA	0	0	NA
South	*O. franksi*	52	11-20	0	NA	11-20	1-10	UNK
South	*M. aliciae*	53	100	0	NA	100	0	NA
South	*O. franksi*	54	1-10	0	Pale	1-10	0	NA