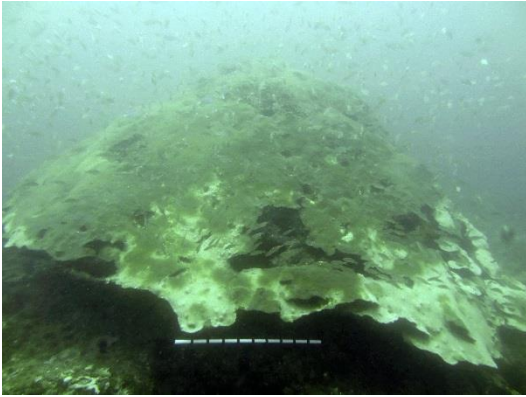
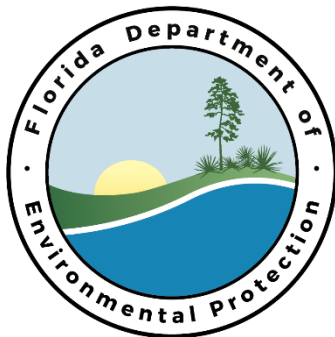


Southeast Florida Large Coral Assessment 2015



Florida Department of Environmental Protection
Coral Reef Conservation Program



Southeast Florida Large Coral Assessment 2015

Final Report

Prepared By:

Brian K. Walker

Katelyn Klug

Nova Southeastern University Oceanographic Center

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Executive Summary

The 2013 nearshore mapping project conducted by Walker and Klug expanded the previous knowledge on the amount, location, and species type of ecologically important large (>2 m) coral colonies in southeast Florida. They discovered over 110 previously undocumented large corals of which 60 were dead and 50 were still alive; 40 of the living corals were larger than 2 m wide and up to 5 m in diameter. Because these corals are the largest and oldest organisms on our reefs, they deserve special attention.

Currently there is unprecedented disease and bleaching in the northern portion of the Florida Reef Tract. It is imperative that the large coral baseline condition is documented to understand the present condition of the large corals in southeast Florida. Understanding how the coral populations are affected by this outbreak and identifying which individuals were resilient enough to recover is critical to the management of the SE FL coral reef ecosystem therefore the objective of this project was to achieve recommendation four from Walker and Klug (2014): conduct a full inventory study to understand the extent, size, condition of the large (> 2 m diameter) corals.

Live corals greater than 2 m diameter identified during reconnaissance were assessed by SCUBA divers. High resolution photographs and video were collected of the coral as a permanent record of its condition. Photographs were taken systematically at each of the four main compass headings (north, east, south, and west) and from overhead. In cases where the coral was too large or the visibility was poor, multiple pictures of the coral were taken at a closer distance. Divers then estimated the percent live tissue cover and percent recent and old dead skeleton remaining, percentage of bleached tissue, percentage of diseased tissue, and the number of tissue isolates. Each coral was then measured using a rigid meter stick was used to measure height, the linear distance along the longest axis, and the widest axis perpendicular to the first axis and a measuring tape to measure the distance over the surface of the coral. In areas with multiple large corals, a Garmin 76csx GPS in an underwater housing with a floating antenna was used to collect the coordinate of each coral.

Surveys were conducted over eleven days between September and November 2015. Additional reconnaissance surveys were conducted to assess sixty-two new targets that were not previously visited due to poor visibility during Government Cut channel dredging. A total of 115 corals were inventoried and measured. See Appendix 1 for images and data collected on each coral. The majority of corals were *Orbicella faveolata* (78.2%), followed by *Montastrea cavernosa*, *Siderastrea siderea*, *Colpophyllia natans*, *Orbicella annularis*, and *Pseudodiploria strigosa*. Corals were found between 4.6 m and 8.8 m depth predominantly in the nearshore colonized pavement and shallow ridge habitats at an average depth of 6.4 m. Colonies were evenly distributed between Miami-Broward and Biscayne Coral Reef Ecosystem Regions. A few corals were spread out but most were clustered into smaller areas.

There was no apparent pattern of size with latitude. Eight corals, all *O. faveolata*, were measured larger than 4 m and spanned from Key Biscayne to Hollywood. The two largest

corals, which measured 5.6 m long, were located off Key Biscayne and contained 50% and 70% live tissue. One other coral measured 5.1 m long located near Bal Harbor and had 30% live tissue.

Almost half of all large corals did not show signs of stress from bleaching or disease, however all of the *M. cavernosa*, *O. annularis*, and *C. natans* had either or both conditions. Thirty-seven percent of all corals had some recent mortality, including all four *O. annularis* and *C. natans* colonies and about half of the *M. cavernosa*, *S. siderea*, and *P. strigosa* colonies. Twenty-three percent of all corals had some bleaching, but *M. cavernosa* appeared to be affected more than other species. There were many smaller *M. cavernosa* colonies not captured in this study with extensive bleaching, especially in the Biscayne region. Eight percent of all colonies had both bleaching and disease.

The diseases visually observed in this study were white plague, white band, black band, dark spot, and possibly Caribbean yellow band. Coral diseases are very difficult to identify precisely in the field and require histological and genetic analyses to be conducted.

Changes in condition were noted between the reconnaissance and the surveys. In 2015, bleaching recovery was noted within 41 days on recently surveyed corals near Key Biscayne. This coincided with a period of noticeable cooler water temperatures and is likely indicative that the 2015 bleaching event was subsiding accordingly. Conversely, the halting of disease progression was not noted in our surveys. For example white band disease on a *C. natans* had killed significant tissue over 27 days. The condition and fate of that colony is presently unknown.

Changes in coral condition and live tissue cover were noted between 2014 and 2015. In 2015 corals were found completely bleached that were not bleached in 2014. Colonies were also found fully and partially bleached in 2014 and 2015 where portions of the partially bleached areas were bleached in both years and portions were not. The timing of these changes is worth noting because in south Florida corals usually bleach from heat stress later in the summer around August and September. Corals originally surveyed in June 2014 may have still bleached in 2014, recovered, and bleached again in 2015. Without regular monitoring this cannot be determined.

Disease was not noted to occur in corals between years through our initial photo and video documentation evaluations but it was observed in 2015 when not present in 2014.

Percent mortality was high in all corals combined. When including all of the dead corals found in the reconnaissance, 100% mortality was the highest (34%). However the partial mortality percentages were also high with 43% of corals between 25% and 99% partial mortality and 31% at least half dead. Twenty-three percent were less than one quarter dead including 5% that were more than 90% living.

This study documented baseline conditions of the largest and oldest corals of the southeast Florida reefs which are analogous to the “redwoods” of our nearshore community. In southeast FL, corals grow about 1 cm per year. Corals greater than 2 meters in diameter

can be hundreds of years old. The largest corals in a population are the oldest and have exponentially more reproductive capacity than smaller ones, making them the most important demographic of their respective species. Their age indicates that they have persisted through the multitude of anthropogenic impacts and stressors that have occurred in the region since the western colonization of Florida. Their size also provides habitat for a diverse and abundant assemblage of fish. A large proportion of the large corals are in the relatively flat, nearshore habitats, and thus provide an oasis for many fish species.

High partial mortality is an indicator of more stressed systems. We found 65% of large corals were either dead or had less than half of their live tissue remaining. The dead ones are difficult to assess as one must collect samples to identify the species and we do not know when they died. This would be valuable information because it would allow us to determine if the frequency of mortality in these corals is increasing through time. In other words conditions are more stressful today causing more frequent mortality. This can be determined by drilling the corals and determining their ages by comparing them to a reference coral.

Assessing these corals through time is important. We can identify which events reduce their tissues, whether they recover from bleaching, the frequency of bleaching and disease for each coral and the total population, and how resilient they are to stress events. The overwhelming majority of these corals were *O. faveolata*, a reef-building species listed as threatened under the Endangered Species Act. These resilient corals might give clues to the ability of certain corals to recover from adversity and help in the restoration of the species across the reef tract. Further, large coral colonies are more fecund, giving an exponentially increased amount of reproductive output also making these colonies particularly important in the species' recovery.

A list of recommendations of work critical to the understanding and management of the southeast Florida coral populations, especially for *O. faveolata*, which is threatened under the Endangered Species Act includes: (1) Spatial analysis of large coral distribution, (2) Regular assessments of the large live corals, (3) Identifying the dead coral species and timing of death, (4) Histology and reproductive study, (5) Genetic studies, and (6) Restoration.

Acknowledgements

Thank you to the Florida Department of Environmental Protection Coral Reef Conservation Program (FDEP CRCP) for supporting this effort. Thanks to NOAA Office of Coast Survey, Broward County Natural Resources Planning and Management Division, and Coastal Planning and Engineering for supplying the LIDAR data.

Thank you to Esther Peters of George Mason University for consultation on coral diseases. We especially would like to thank Amanda Costaregni, Kristen Cumming, and Cory Ames of the Nova Southeastern University Oceanographic Center (NSUOC) Geographic Information Systems and Spatial Ecology lab. Thank you to Captain Lance Robinson and Brian Buskirk for providing reliable vessels for our many field days.

Table of Contents

1. Introduction.....	7
1.1. Project Background.....	7
1.2. Identification of Issues.....	8
1.3. Project Objectives.....	8
2. Methodology.....	8
3. RESULTS & DISCUSSION.....	10
3.1. Large Live Coral Summary.....	10
4. Conclusions & Recommendations.....	20
5. Literature Cited.....	22
<i>Appendix 1</i>	23
<i>Appendix 2</i>	139

List of Figures

Figure 1. Example of one large (~4m) <i>Orbicella faveolata</i> discovered by Walker and Klug 2014. The stick in the photo is 1m in length for scale.	7
Figure 2. Targets identified in the high resolution LIDAR bathymetry (top) and the aerial photography (bottom).	9
Figure 3. Large corals inventoried during this study.	11
Figure 4. Examples of bleaching corals found during the surveys.	13
Figure 5. Examples of diseases found in this study. White plague (upper left), dark spot (upper right), black band, (lower left), and white band (lower right).	14
Figure 6. <i>Orbicella faveolata</i> with a particularly unusual disease, based on some visual observations by Esther Peters. Cutout with notes are from visual interpretation of the photos.	14
Figure 7. Pictures of LC-093 bleached on October 2, 2015 and almost recovered on November 12, 2015, 41 days later.	15
Figure 8. Pictures of LC-094 with white band disease on October 2, 2015 and on October 29, 2015, 27 days later, with significant disease progression.	15
Figure 9. <i>Siderastrea siderea</i> originally found in June 2014 was fully bleached and diseased when surveyed in 2015.	16

Figure 10. Black arrows indicate portions of the colony that are now bleached where there was healthy tissue in 2014. 16

Figure 11. This *O. faveolata* colony was bleached in 2014 and 2015 (white areas). Arrows indicate same portion of colony in all images. 17

Figure 12. This *O. annularis* colony was partially bleached in 2014. A portion was also bleached in 2015 (A) whereas others were not (B)..... 17

Figure 13. Arrows indicate diseased tissue (dark spots) that was not present in 2014.... 18

Figure 14. The lower left arrows show areas that lost tissue since 2014. The letters on the right show approximately the same area on the coral. The loss of tissue is noticeable in the 2015 image by lightly colored bare spots. 18

Figure 15. The distribution of percent mortality in all corals. 19

Figure 16. Live *O. faveolata* mean percent mortality by size class. Numbers represent number of live corals. Error bars are ± 1 standard error about the mean. 19

List of Tables

Table 1. Colony distribution by Coral Reef Ecosystem region and benthic habitats from Walker 2012..... 10

Table 2. Colony length ranges for planar and surface measurements and the percent of individuals with recent mortality, bleaching, disease, and unaffected colonies for all corals and by species..... 12

1. INTRODUCTION

1.1. Project Background

Walker and Klug (2014) expanded the previous knowledge on the amount, location, and species type of ecologically important large (>2 m) coral colonies in southeast Florida. Although smaller than the minimum mapping unit for their study (and thus not in the original study's scope and funded separately), 195 blips in the LIDAR and/or dark specs in the imagery were identified and a portion investigated. Of the 195 potential large corals identified, 126 were visited between July and November 2014. At the visited locations, they discovered over 110 previously undocumented large corals of which 60 were dead and 50 were still alive; 40 of the living corals were larger than 2 m wide and up to 5 m in diameter (Figure 1). The previous species found were predominantly *Orbicella faveolata* with a few *Siderastrea siderea*, *Orbicella annularis*, and *Montastrea cavernosa*. These large corals were targeted in the study herein to formally document, measure, and assess their condition.

Because these corals are the largest and oldest organisms on our reefs, they deserve special attention. Walker and Klug (2014) outlined five recommendations for these large corals: (1) Conduct a full inventory study to understand the extent, size, condition of these large, resilient corals; (2) Monitor the large, resilient corals on a regular basis to document condition change through time; (3) Investigate the large, resilient corals' reproduction to determine if they are spawning; (4) Investigate their genetic diversity to determine if they are genetically similar to each other and other local populations; and (5) Investigate the use of the large, resilient corals to help propagate naturally resilient corals in local restoration efforts.

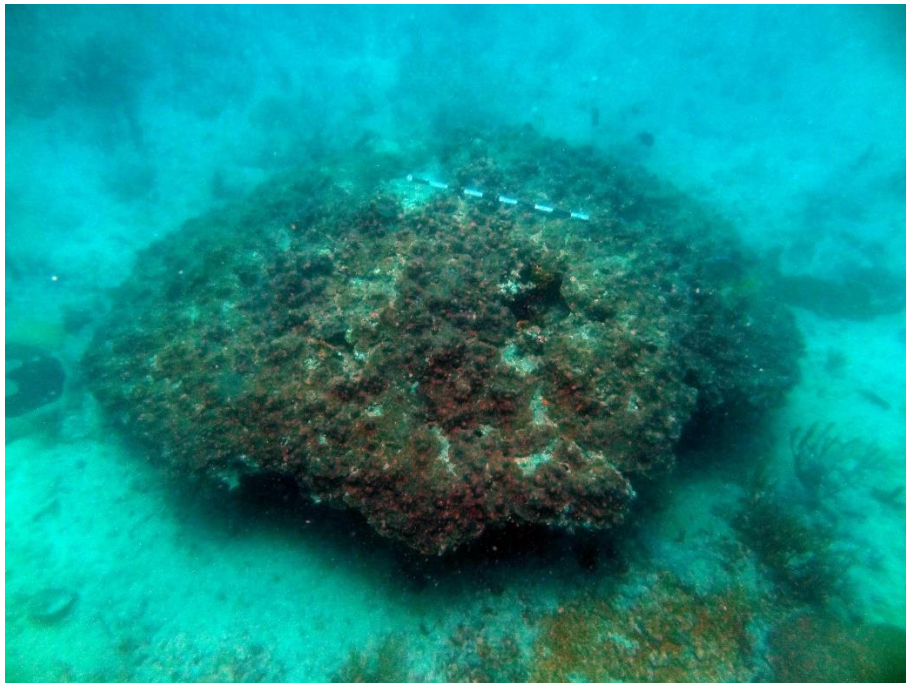


Figure 1. Example of one large (~4m) *Orbicella faveolata* discovered by Walker and Klug 2014. The stick in the photo is 1m in length for scale.

1.2. Identification of Issues

Currently there is unprecedented disease and bleaching in the northern portion of the Florida Reef Tract. Many corals of many different species are affected which is an indication that the coral population is under high stress. The result of this outbreak will likely be widespread mortality for many individuals, reducing the already low amount of coral on the reefs in southeast Florida (SE FL). It is imperative that the immediate baseline condition is documented to understand the present state of the SE FL coral reef ecosystem in regards to disease, bleaching, and recent mortality. Understanding how the coral populations are affected by this outbreak and identifying which individuals were resilient enough to recover is critical to the management of the SE FL coral reef ecosystem.

1.3. Project Objectives

The objective of this project was to achieve recommendation one from Walker and Klug (2014): conduct a full inventory study to understand the extent, size, condition of the large (> 2 m diameter) corals. This study adopted an easily repeatable methodology to also address Walker and Klug (2014) recommendation two: monitor the large, resilient corals on a regular basis to document condition change through time.

2. METHODOLOGY

Several data products were used to identify large coral target sites. Three most-recent primary datasets were used: the 2013 aerial photography collected for Walker and Klug (2014), the 2009 NOAA Office of Coast Survey (OCS) bathymetry, and the 2008 Broward LADS bathymetry. Data were overlaid in a GIS and visually inspected for unique targets to visit. In the LIDAR, targets were identified by tiny shallow spikes among a mostly flat backdrop (Figure 2). In the imagery targets were mostly dark specs among a lighter background on hardbottom habitats (Figure 2).

Target locations were visited by boat. At each site a snorkeler jumped in and looked for the target from the surface. If found, the person would free dive down and take pictures or a short video confirming the species and estimating size and condition (e.g., 80% live tissue, bleached, healthy). All of the recon sites were logged in a geodatabase. The corals larger than 2 meters diameter that had any remaining live tissue were visited as part of the inventory.

Live corals were assessed at a later date by SCUBA divers. High resolution photographs and video were collected of the coral as a permanent record of its condition. Photographs were taken systematically at each of the four main compass headings (north, east, south, and west) and from overhead. In cases where the coral was too large or the visibility was poor, multiple pictures of the coral were taken at a closer distance. Divers then estimated the percent live tissue cover and percent recent and old dead skeleton remaining, percentage of bleached tissue, percentage of diseased tissue, and the number of tissue isolates. Each coral was then measured two ways. First a rigid meter stick was used to measure height, the linear distance along the longest axis, and the widest axis perpendicular to the first axis. Then a measuring tape was stretched along the same axes to measure the distance over the surface of the coral. In areas with multiple large corals, a Garmin 76csx GPS in an underwater housing with a floating antenna was used to collect the coordinate of each coral for mapping purposes.

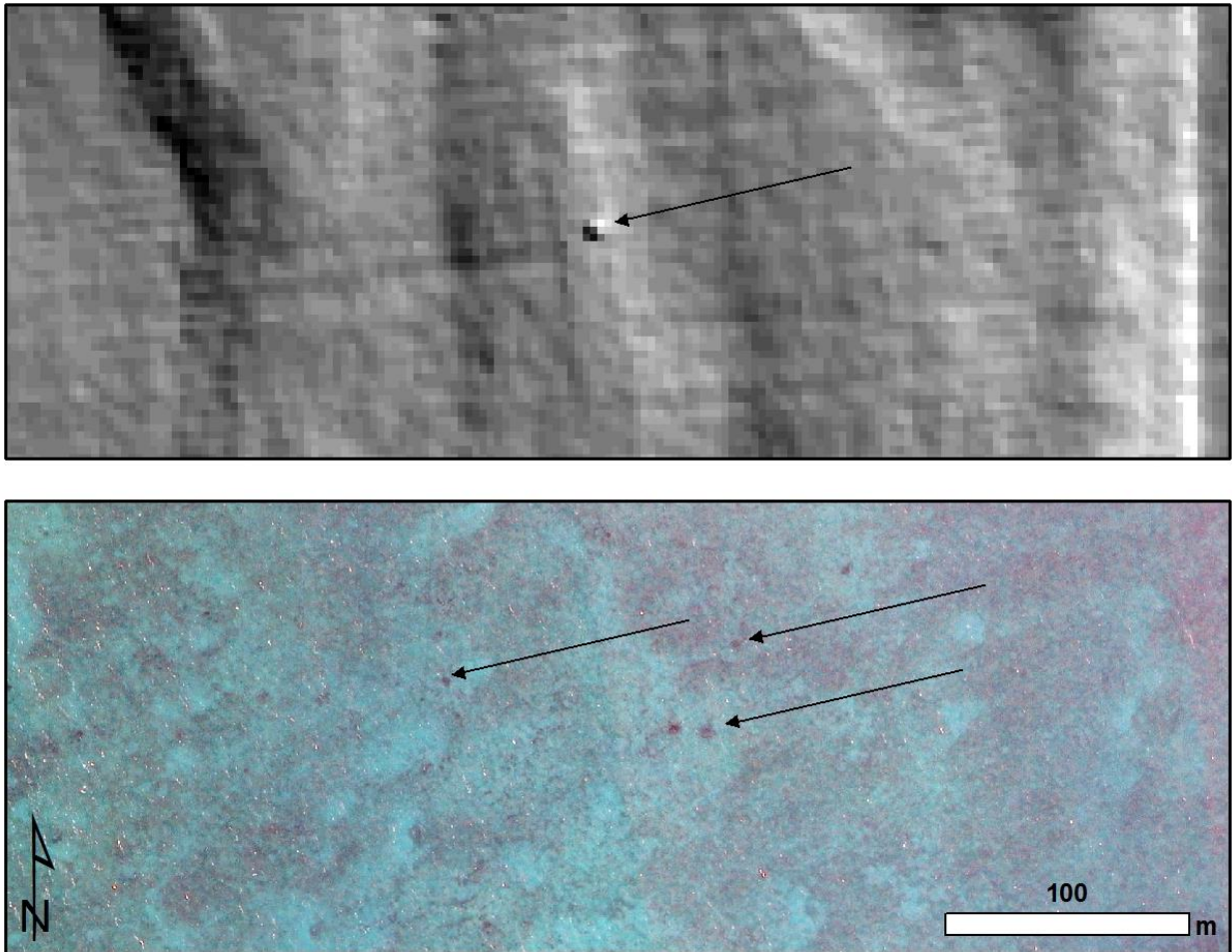


Figure 2. Targets identified in the high resolution LIDAR bathymetry (top) and the aerial photography (bottom).

3. RESULTS & DISCUSSION

3.1. Large Live Coral Summary

Surveys were conducted over eleven days between September and November 2015. Additional reconnaissance surveys were conducted to assess sixty-two new targets that were not previously visited due to poor visibility during Government Cut channel dredging. A total of 115 corals were inventoried and measured (Table 1). See Appendix 1 for images and data collected on each coral. The majority of corals were *Orbicella faveolata*, followed by *Montastrea cavernosa*, *Siderastrea siderea*, *Colpophyllia natans*, *Orbicella annularis*, and *Pseudodiploria strigosa*. Corals were found between 4.6 m and 8.8 m depth predominantly in the nearshore colonized pavement and shallow ridge habitats at an average depth of 6.4 m. They were not evenly distributed between Broward (36) and Miami-Dade counties (78) however they were fairly even between Coral Reef Ecosystem Regions; 60 in Biscayne and 55 in Miami-Broward (Figure 3). A few corals were spread out but most were clustered into smaller areas. Fifty-five corals were clustered in a 0.5 km² area off Key Biscayne; thirteen were clustered in a 1.5 km² area off Miami Beach; six were clustered off Hallandale in 0.68 km²; six were clustered over 0.5 km² near Hollywood Beach; and there were nineteen tightly clustered in a 0.002 km² area off Fort Lauderdale.

There was no apparent pattern of size with latitude. Eight corals, all *O. faveolata*, were measured larger than 4 m (LC-008, LC-009, LC-018, LC-029, LC-30, LC-84, LC-93, and LC-96) and spanned from Key Biscayne to Hollywood. The two largest corals (LC-093 and LC-096), which measured 5.6 m long, were located off Key Biscayne and contained 50% and 70% live tissue. One other coral measured 5.1 m long (LC-029) located near Bal Harbor and had 30% live tissue. After using the formula to determine surface area of an ellipse, LC-96 had an estimated surface area of 46.4 m² with 30% mortality which equates to approximately 32.4 m² of living tissue. Although LC-008 was the fourth largest coral, it had the most estimated live tissue surface area with 33.4 m² because it had only 10% mortality. This massive coral was heavily impacted and stressed. It was split in half down the middle, 10% bleached, and about 1% recent mortality from disease (white plague). The crack is about 20 cm wide at the top allowing the entire inside of the coral to be exposed to new colonizers. This exposure may accelerate bioerosion of the bare coral skeleton.

Table 1. Colony distribution by Coral Reef Ecosystem region and benthic habitats from Walker 2012.

Region	Habitat	<i>C. Nat</i>	<i>M. Cav</i>	<i>O. Ann</i>	<i>O. Fav</i>	<i>P. Str</i>	<i>S. Sid</i>	Total
Biscayne	Colonized Pavement-Shallow	2	11	1	40	2	4	60
Broward-Miami	Colonized Pavement-Shallow		1		32		1	34
	Linear Reef-Inner				2		1	3
	Ridge-Shallow			1	16		1	18
Total		2	12	2	90	2	7	115

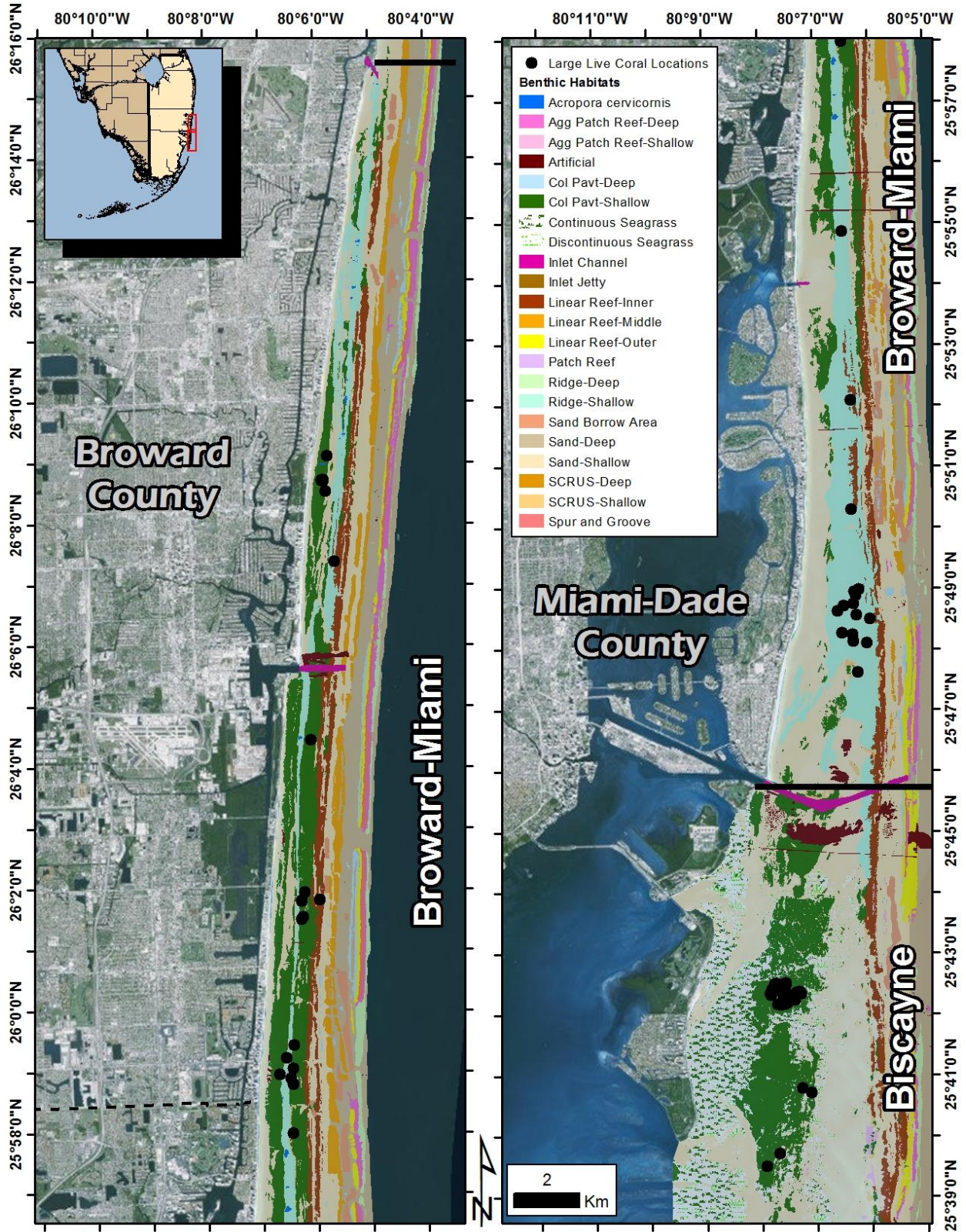


Figure 3. Large corals inventoried during this study.

Table 2. Colony length ranges for planar and surface measurements and the percent of individuals with recent mortality, bleaching, disease, and unaffected colonies for all corals and by species.

Statistic	All Corals	<i>O. Fav</i>	<i>M. Cav</i>	<i>S. Sid</i>	<i>O. Ann</i>	<i>P. Str</i>	<i>C. Nat</i>
Number of live corals surveyed	115	90	12	7	2	2	2
Colony Size Range (Planar Max Length)	1.40-5.60 m	1.80-5.60 m	1.40-3.10 m	2.10-2.90 m	3.20-3.30 m	1.40-1.50 m	1.40-1.80 m
Colony Size Range (Surface Max Length)	1.95-7.45 m	1.95-7.45 m	2.70-4.50 m	3.15-5.00 m	4.65-5.00 m	2.20-2.30 m	2.20-2.90 m
Colony Mean Size (Planar Max Length)	2.74 m	2.88 m	2.15 m	2.44 m	3.25 m	1.45 m	1.60 m
Colony Mean Size (Surface Max Length)	3.93 m	4.05 m	3.37 m	3.99 m	4.83 m	2.25 m	2.55 m
Percent colonies w/ Recent Mortality	37% (42/115)	30% (27/90)	58% (7/12)	43% (3/7)	100% (2/2)	50% (1/2)	100% (2/2)
Percent colonies w/ Bleaching	23% (27/115)	21% (19/90)	42% (5/12)	14% (1/7)	50% (1/2)	0% (0/2)	50% (1/2)
Percent colonies w/ Paling	21% (24/115)	17% (15/90)	67% (8/12)	0% (0/7)	50% (1/2)	0% (0/2)	0% (0/2)
Percent colonies w/ disease	23% (27/115)	22% (20/90)	17% (2/12)	43% (3/7)	0% (0/2)	0% (0/2)	100% (2/2)
No Disease, bleaching, or paling	49% (56/115)	54% (49/90)	0% (0/12)	57% (4/7)	0% (0/2)	100% (2/2)	0% (0/2)
Percent w/ disease and bleaching	8% (9/115)	8% (7/90)	0% (0/12)	14% (1/7)	0% (0/2)	0% (0/2)	50% (1/2)

Table 2 identifies colony length ranges for planar and surface measurements and the percent of individuals with recent mortality, bleaching, disease, and unaffected colonies for all corals and by species. Because *O. faveolata* comprise 78.2% of the large corals, their numbers drove the total coral statistics. Due to the low numbers of other large coral species, the statistics do not represent the entire population for that species. Almost half of all large corals did not show signs of stress from bleaching or disease, however all of the *M. cavernosa*, *O. annularis*, and *C. natans* had either or both conditions. Thirty-seven percent of all corals had some recent mortality, including all four *O. annularis* and *C. natans* colonies and about half of the *M. cavernosa*, *S. siderea*, and *P. strigosa* colonies. Twenty-three percent of all corals had some bleaching, but *M. cavernosa* appeared to be affected more than other species. There were many smaller *M. cavernosa* colonies not captured in this study with extensive bleaching, especially in the Biscayne region. Eight percent of all colonies had both bleaching and disease. Figure 4 shows some examples of bleached corals encountered during the surveys.

The diseases visually observed in this study were white plague, white band, black band, dark spot, and possibly Caribbean yellow band. Coral diseases are very difficult to identify precisely in the field and require histological and genetic analyses to be conducted. A concurrent sampling effort of diseased tissue was led by Florida Fish and Wildlife Research Institute to collect tissue from the general population to determine the pathogens. This was not part of our efforts and tissue from the large corals was not requested. Figure 5 shows some examples of the diseases affecting the large corals. Figure 6 is an example of an *O. faveolata* with a particularly unusual disease, based on

some visual observations by Esther Peters, but without histopathology and microbiology we can't know the etiologic agent for sure (Esther Peters, pers. comm.).



Figure 4. Examples of bleaching corals found during the surveys.

Changes in condition were noted between the reconnaissance and the surveys. The timing of these efforts was inconsistent. Most corals were first identified in June, October, and November 2014. All of the corals off Key Biscayne were first identified in October of 2015. This timing makes determining change of condition through time difficult. The changes noted in corals within a few weeks can help shed light on present condition changes, albeit with very few examples, whereas the corals that were identified last year can help identify changes between 2014 and 2015. In 2015, bleaching recovery was noted on recently surveyed corals near Key Biscayne. LC-093 was first visited on October 2, 2015 and was almost completely bleached (Figure 7). On November 12, 2015, 41 days later, it was almost completely visibly recovered from bleaching. This coincided with a period of noticeable cooler water temperatures and is likely indicative that the 2015 bleaching event was subsiding accordingly. Conversely, white band disease on a *C. natans* noted on October 2, 2015 had progressed significantly over 27 days when it was surveyed on October 29, 2015 (Figure 8). The condition and fate of that colony is presently unknown. The halting of disease progression was not noted in our surveys.

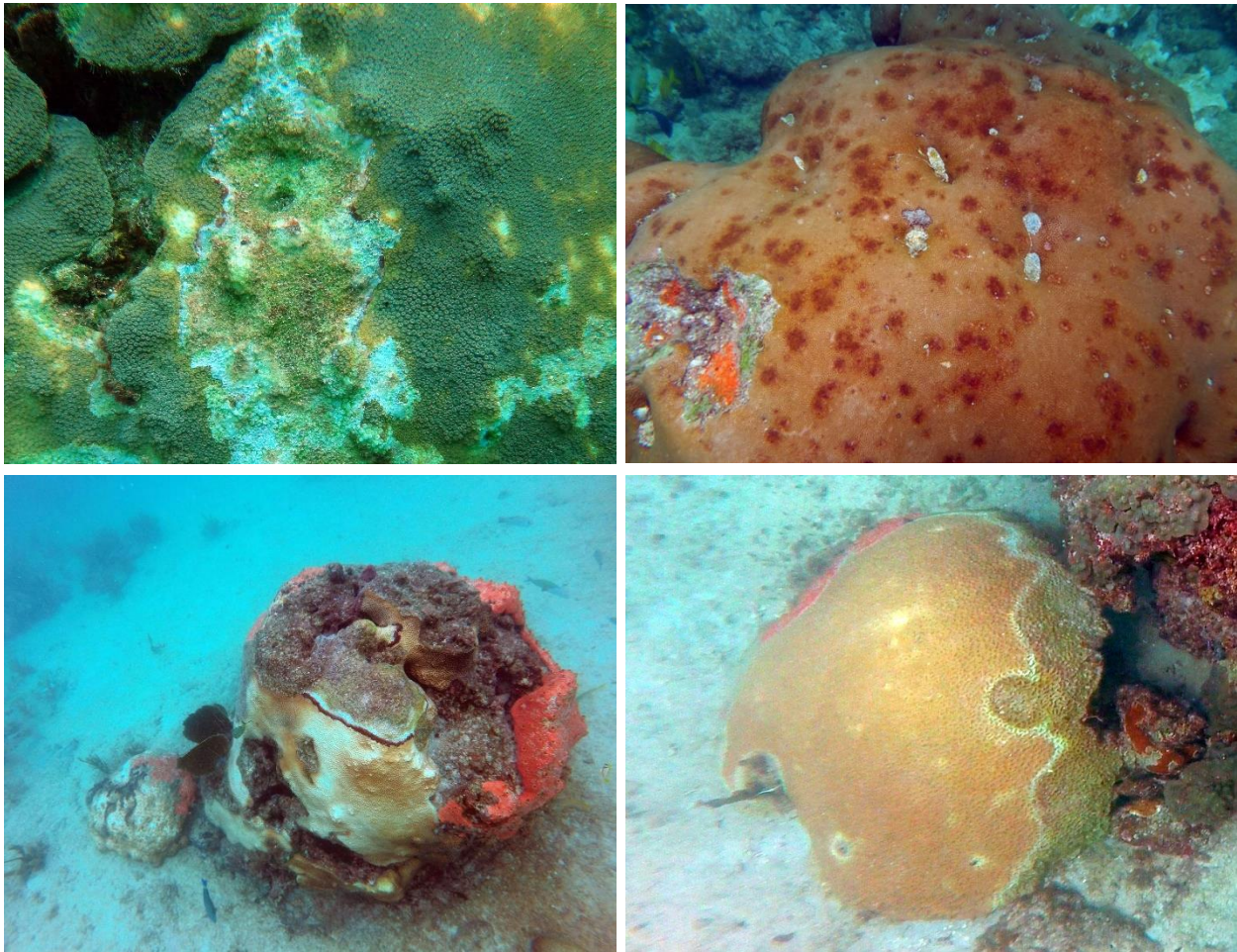


Figure 5. Examples of diseases found in this study. White plague (upper left), dark spot (upper right), black band, (lower left), and white band (lower right).

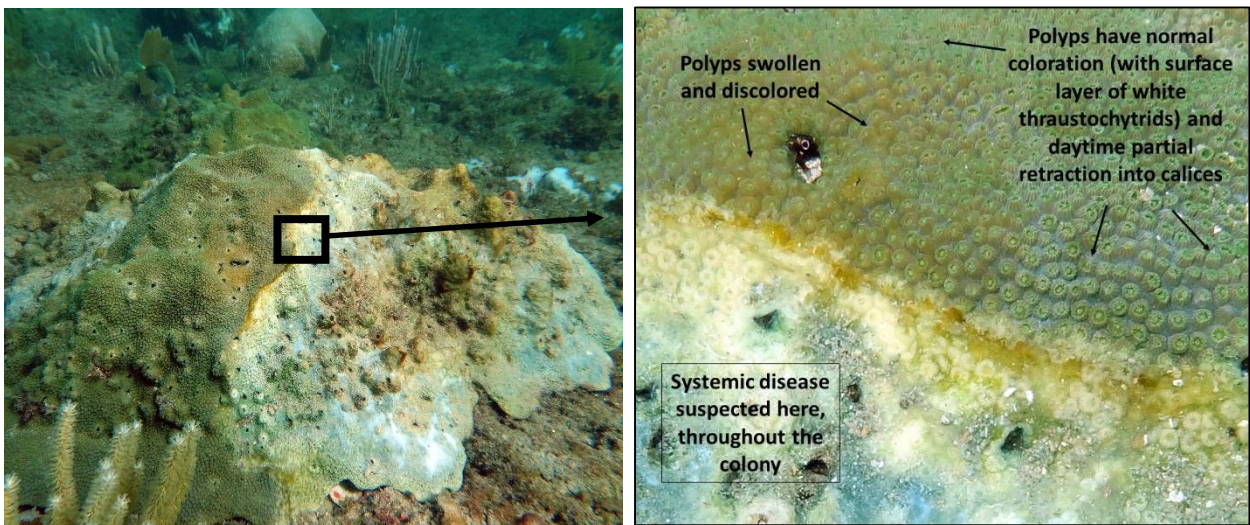


Figure 6. *Orbicella faveolata* with a particularly unusual disease, based on some visual observations by Esther Peters. Cutout with notes are from visual interpretation of the photos.



Figure 7. Pictures of LC-093 bleached on October 2, 2015 and almost recovered on November 12, 2015, 41 days later.

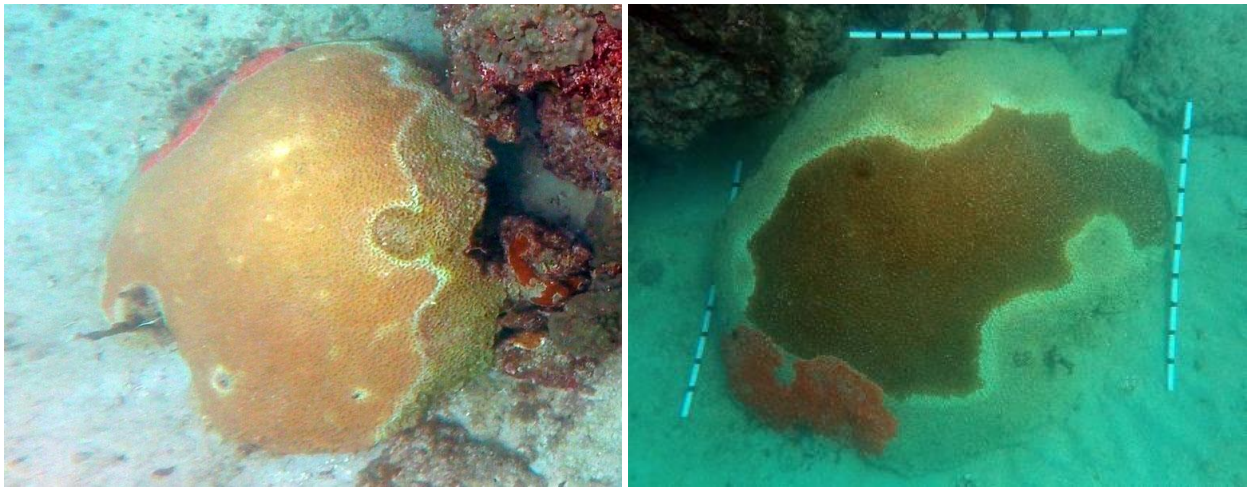


Figure 8. Pictures of LC-094 with white band disease on October 2, 2015 and on October 29, 2015, 27 days later, with significant disease progression.

Changes in coral condition and live tissue cover were noted between 2014 and 2015. In 2015 corals were found completely bleached that were not bleached in 2014 (Figures 9 and 10). Colonies were also found fully and partially bleached in 2014 and 2015 (Figures 11 and 12) where portions of the partially bleached areas were bleached in both years and portions were not (Figure 12). The timing of these changes is worth noting because in south Florida corals usually bleach from heat stress later in the summer around August and September. Corals originally surveyed in June 2014 may have still bleached in 2014, recovered, and bleached again in 2015. Without regular monitoring this cannot be determined.

Disease was not noted to occur in corals between years through our initial photo and video documentation evaluations but it was observed in 2015 when not present in 2014. Dark spot disease developed in two large *S. siderea* colonies between 2014 and 2015 (Figures 9 and 13). A disease (likely white plague) also killed about 30% of the live tissue on an *O. faveolata* colony that appeared fairly healthy in 2014. The fate and current condition of this coral is unknown (Figure 14). See Appendix 2 for images and data from the 2014 live large coral reconnaissance.

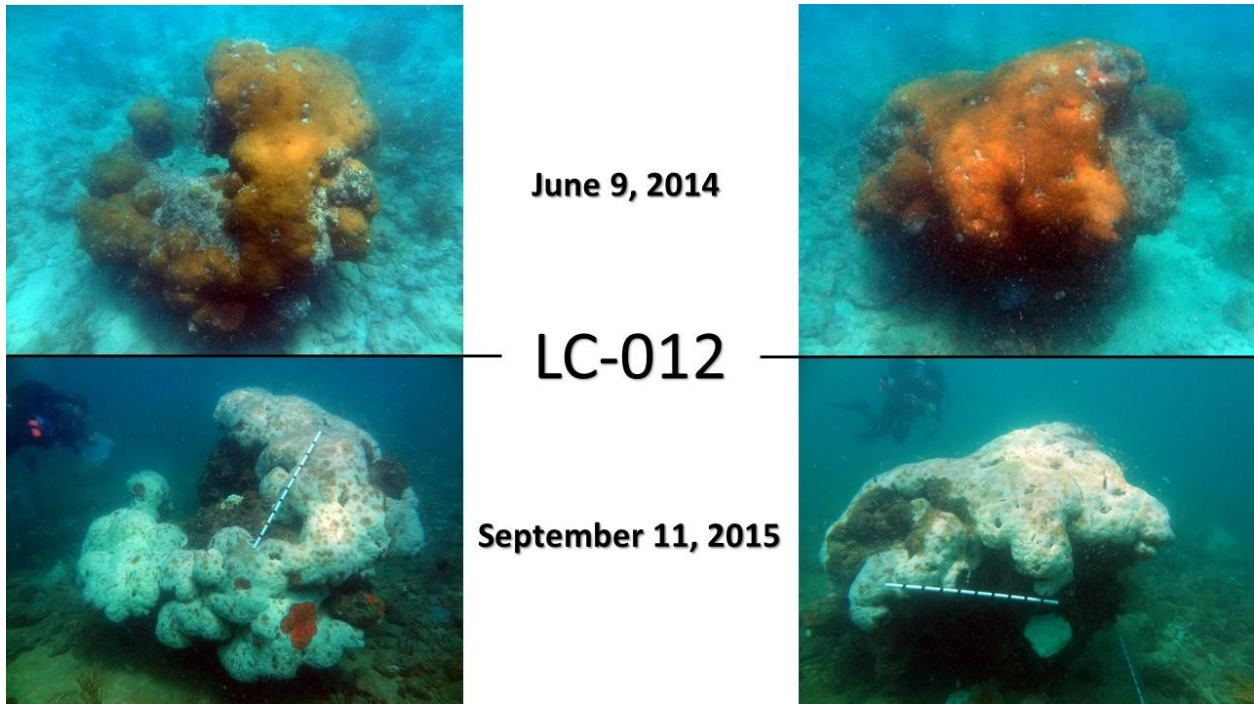


Figure 9. *Siderastrea siderea* originally found in June 2014 was fully bleached and diseased when surveyed in 2015.

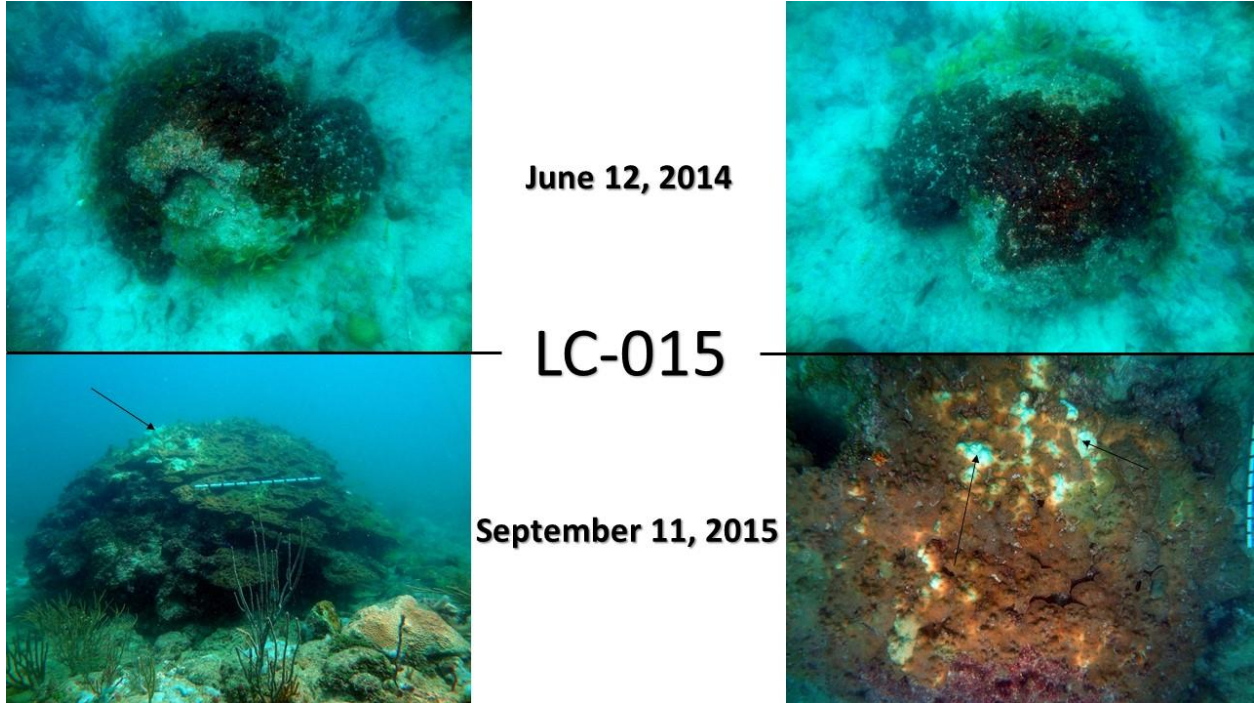


Figure 10. Black arrows indicate portions of the colony that are now bleached where there was healthy tissue in 2014.

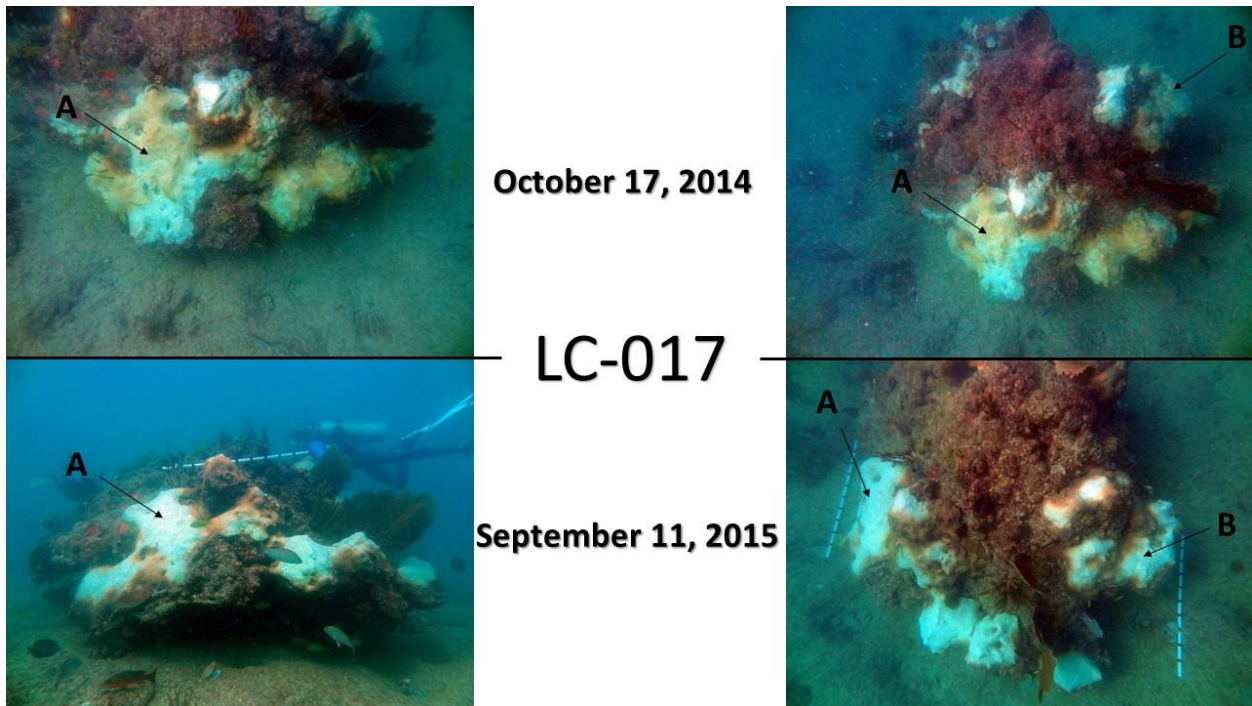


Figure 11. This *O. faveolata* colony was bleached in 2014 and 2015 (white areas). Arrows indicate same portion of colony in all images.

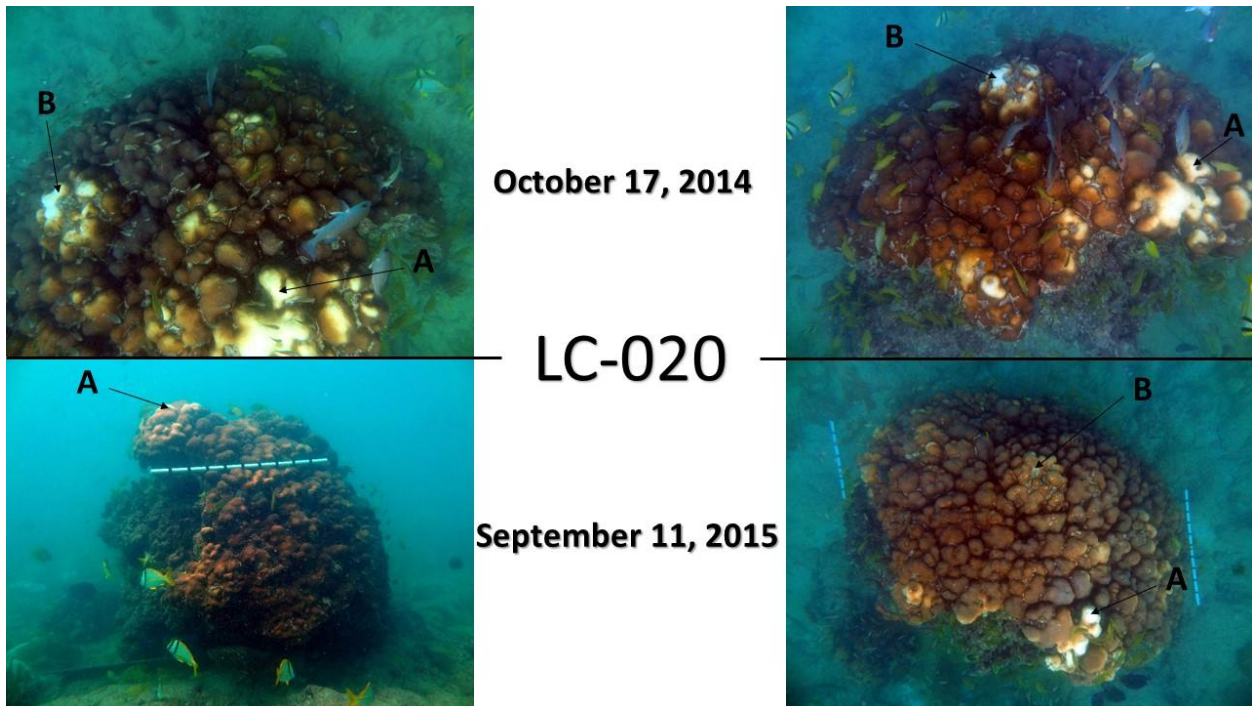


Figure 12. This *O. annularis* colony was partially bleached in 2014. A portion was also bleached in 2015 (A) whereas others were not (B).

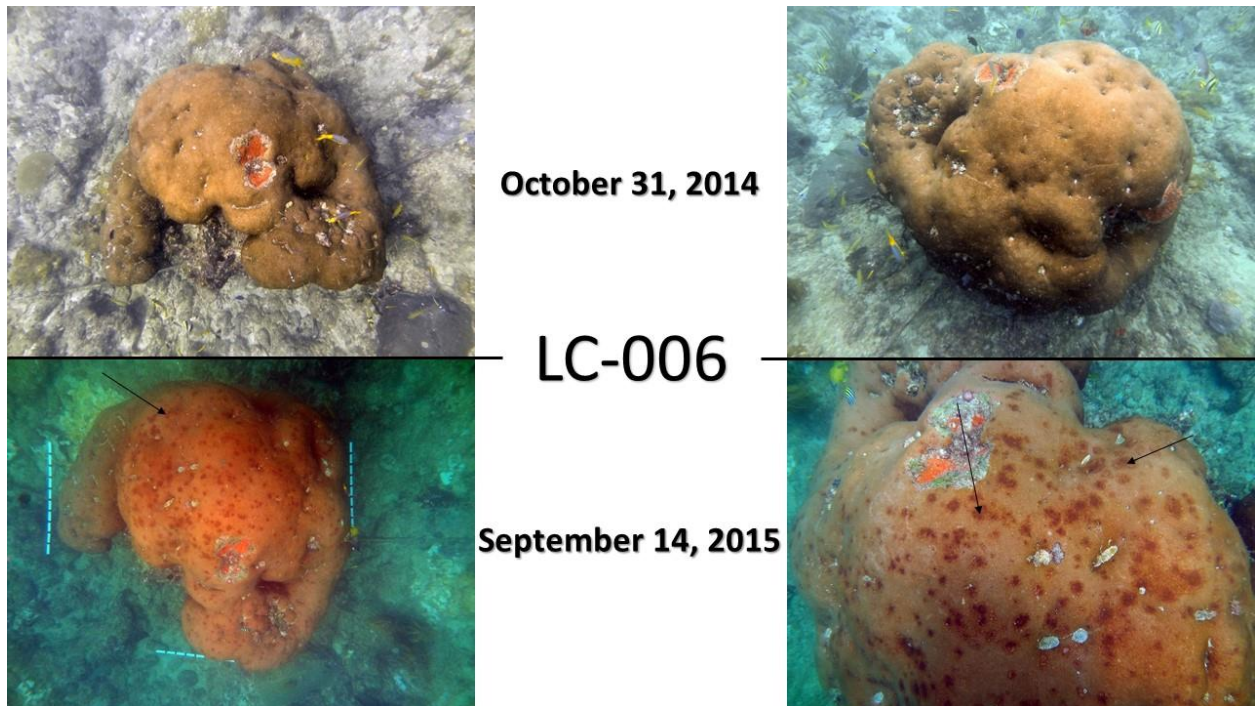


Figure 13. Arrows indicate diseased tissue (dark spots) that was not present in 2014.

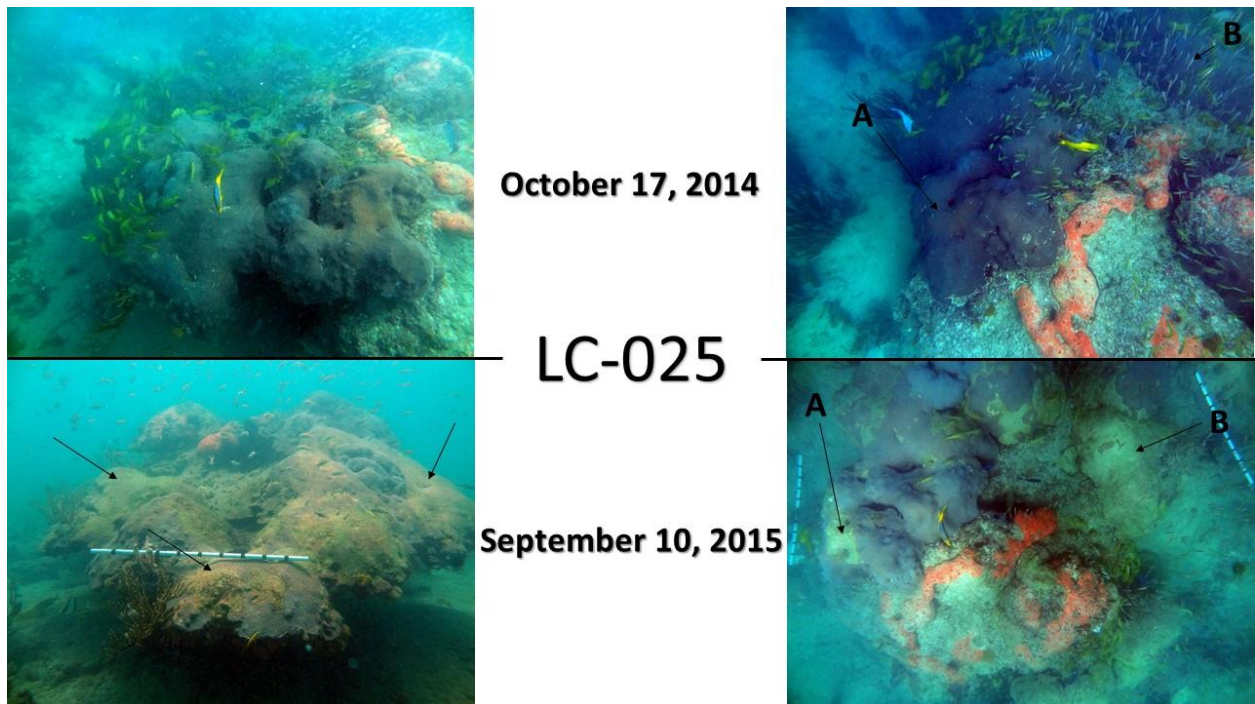


Figure 14. The lower left arrows show areas that lost tissue since 2014. The letters on the right show approximately the same area on the coral. The loss of tissue is noticeable in the 2015 image by lightly colored bare spots.

Percent mortality was high in all corals combined (Figure 15). When including all of the dead corals found in the reconnaissance, this category was the highest (34%). However the partial mortality percentages were also high with 43% of corals between 25% and 99% partial mortality and 31% at least half dead. Twenty-three percent were less than one quarter dead including 5% that were more than 90% living. In living *O. faveolata*, the smallest and largest corals had less partial mortality than those between 2.5 and 3.5 m long. This analysis only included live colonies because dead colony species were not determined.

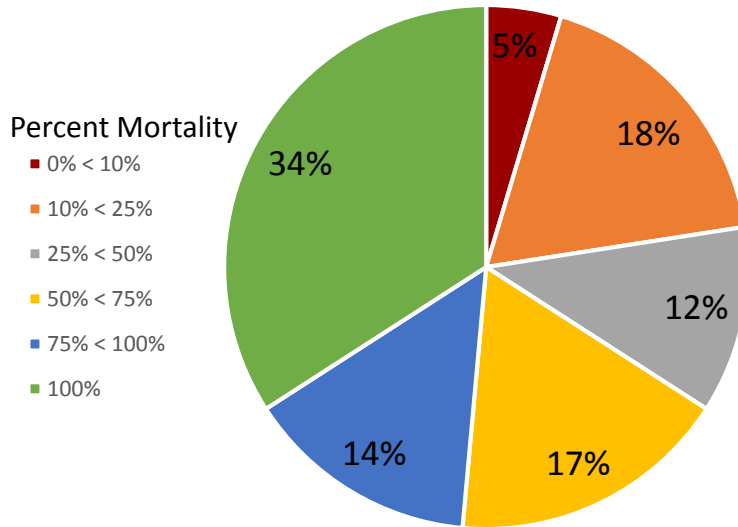


Figure 15. The distribution of percent mortality in all corals.

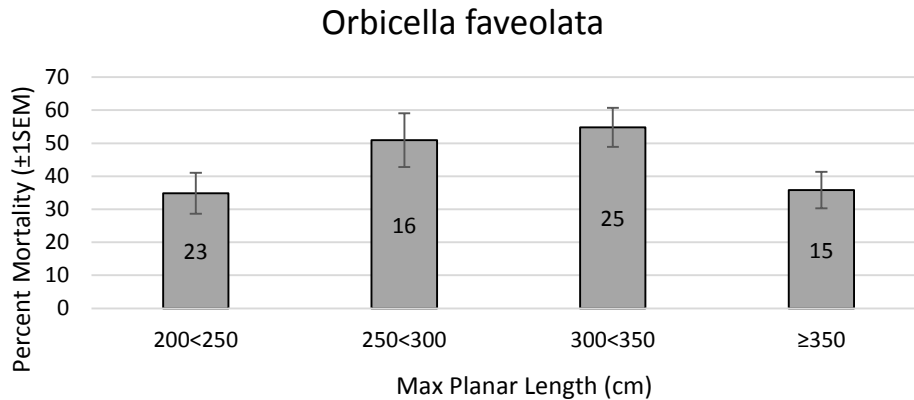


Figure 16. Live *O. faveolata* mean percent mortality by size class. Numbers represent number of live corals. Error bars are ± 1 standard error about the mean.

4. CONCLUSIONS & RECOMMENDATIONS

This study achieved its goals to provide an inventory on all of the known corals >2 m diameter in southeast Florida. This study along with the previous reconnaissance has given valuable information on the largest, oldest corals on the northern section of the Florida Reef Tract. The species, their size and condition, and in some cases their ability to recover from bleaching is critical information to manage these species.

This study documented baseline conditions of the largest and oldest corals of the southeast Florida reefs which are analogous to the “redwoods” of our nearshore community. In southeast FL, corals grow about 1 cm per year. Corals greater than 2 meters in diameter can be hundreds of years old. For example, a previously known large coral (LC-008) was aged to over 300 years by Kevin Helmle and Richard Dodge at Nova Southeastern University. The largest corals in a population are the oldest and have exponentially more reproductive capacity than smaller ones, making them the most important component of the demographics of their respective species. Their age indicates that they have persisted through the multitude of anthropogenic impacts and stressors that have occurred in the region since the western colonization of Florida. Their size also provides habitat for a diverse and abundant assemblage of fish. A large proportion of the large corals are in the relatively flat, nearshore habitats, and thus provide an oasis for many fish species.

Large massive coral condition can provide a lot of information. The amount of live tissue relative to their size can give insights as to the stress these organisms have endured. Coral mortality does not always result in death of the entire colony. Mortality in corals is oftentimes a partial occurrence where events might wipe out portions of live tissue, but leave some behind. High partial mortality is an indicator of more stressed systems. In healthy ecosystems, the coral should be able to regrow live tissue back over the dead skeleton before other settlers can move in and take over. In more stressful environments, the coral may not be able to recover that old portion. This remaining old portion colonized by other organisms is a sign of a past stress that the coral endured. Since size equates to age in most massive corals, the larger the coral, the more stress events it has endured through time to survive. We found 65% of large corals were either dead or had less than half of their live tissue remaining. The dead ones are difficult to assess as one must collect samples to identify the species and we do not know when they died. This would be valuable information because it would allow us to determine if the frequency of mortality in these corals is increasing through time. In other words conditions are more stressful today causing more frequent mortality. This can be determined by drilling the corals and determining their ages by comparing them to a reference like the cores of LC-008.

The live *O. faveolata* colonies showed an interesting pattern where the smallest and largest size classes had less mortality than those between 2.5 and 3.5 m. If larger, older corals have to endure more stress through time, then it makes sense the smaller ones have less mortality. However larger corals could also be more resistant to stress. Perhaps the largest ones having less mortality is a sign of that resistance. Unfortunately this analysis is skewed by not including the dead colonies, which was not possible without speciating them.

Assessing these corals through time is important. We can identify which events reduce their tissues, whether they recover from bleaching, the frequency of bleaching and disease for each coral and the total population, and how resilient they are to stress events. The overwhelming majority of these corals were *O. faveolata*, a reef-building species listed as threatened under the Endangered Species Act. These resilient corals might give clues to the ability of certain corals to recover from adversity and help in the restoration of the species across the reef tract. Further, large coral colonies are more fecund, giving an exponentially increased amount of reproductive output also making these colonies particularly important in the species' recovery.

Here is a list of recommendations of work critical to the understanding and management of the southeast Florida coral populations, especially for *O. faveolata*, which is threatened under the Endangered Species Act.

Recommendation 1: Spatial analysis of large coral distribution.

A spatial analysis of the location of the large corals should be conducted to determine any patterns related to coral mortality, incidence of disease, regularity of bleaching, coral size, and species in relation to stress sources.

Recommendation 2: Regular assessments of the large live corals.

All or a large subset of the live large corals should be assessed regularly to determine their condition and how they are affected by stressful conditions (e.g., thermal stress, disease).

Recommendation 3: Identifying the dead coral species and timing of death.

The dead corals should be speciated and measured to determine how they fit into the overall demographic. A subset of these should be cored to identify the timing of their existence and possibly the time of death.

Recommendation 4: Histology and reproductive study.

Histological samples should be collected to understand the sex and reproductive capacity of the large corals and how the frequency of stress (e.g., bleaching, disease) affects reproductive output.

Recommendation 5: Genetic studies.

Genetic studies should be conducted to determine their genetic diversity and identify phenotypes that are more resistant to stress through time (e.g., do bleach as frequently). This includes microbial and metagenomic studies to assess baselines for healthy microbial

symbiont communities which can be compared to potential pathogen outbreaks.

Recommendation 6: Restoration.

Corals identified from recommendation 4 should be targeted for restoration activities to help promote the repopulation of both genetically diverse and stress-resistant colonies on the reef.

5. LITERATURE CITED

Walker, B., & Klug, K. (2014). Southeast Florida shallow-water coral reef community baseline habitat mapping and characterization of mapped communities (pp. 83). Miami Beach, FL: Florida DEP Coral Reef Conservation Program report.

APPENDIX 1. Live Large Coral Inventory.

LC-001

Species: *Orbicella faveolata*

Depth: 19 ft (5.8 m)

Top



North



South



Condition Data

% Total Mortality:	60
% Old Dead:	59
% Recent Dead:	
% Disease:	5
% Bleaching:	
Est. Live Tissue Area (m ²):	5.6
Number of tissue isolates:	

Planar Measurements (cm)

Max Length:	320
Max perpendicular Width:	260
Height:	160

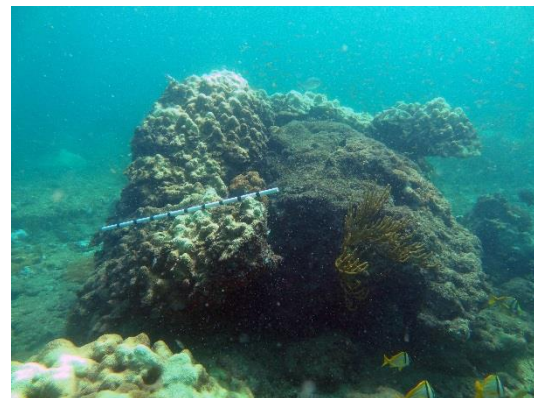
Surface Measurement (cm)

Max Length:	435
Max perpendicular Width:	430

East



West

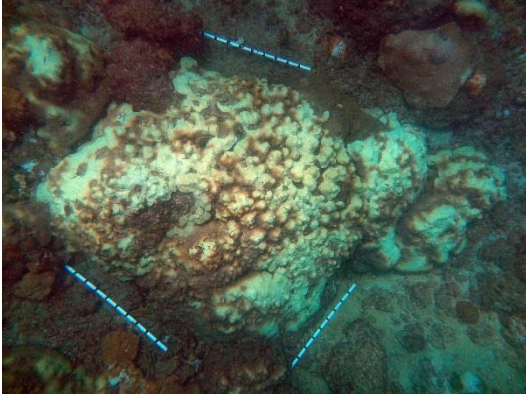


LC-002

Species: *Orbicella faveolata*

Depth: 19 ft (5.8 m)

Top



North



South



Condition Data

% Total Mortality:	20
% Old Dead:	20
% Recent Dead:	0
% Disease:	0
% Bleaching:	80
Est. Live Tissue Area (m ²):	9.4
Number of tissue isolates:	3

Planar Measurements (cm)

Max Length:	365
Max perpendicular Width:	260
Height:	100

Surface Measurement (cm)

Max Length:	420
Max perpendicular Width:	365

East



West

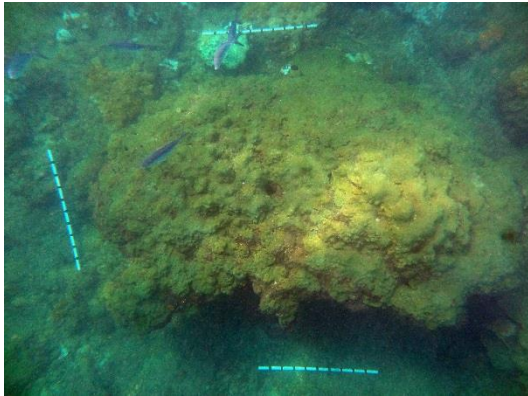


LC-003

Species: *Orbicella faveolata*

Depth: 18 ft (5.5 m)

Top



North



South



Condition Data

% Total Mortality:	20
% Old Dead:	20
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	9.6
Number of tissue isolates:	9

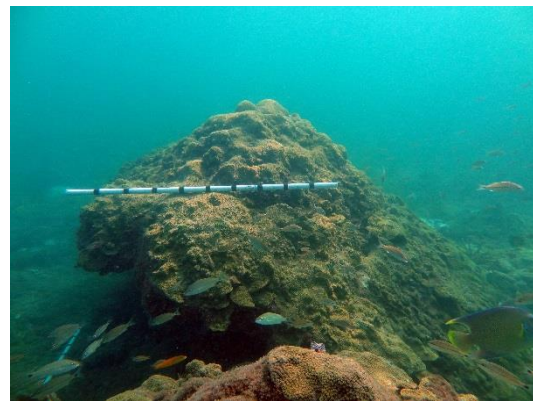
Planar Measurements (cm)

Max Length:	310
Max perpendicular Width:	220
Height:	150

Surface Measurement (cm)

Max Length:	415
Max perpendicular Width:	380

East



West

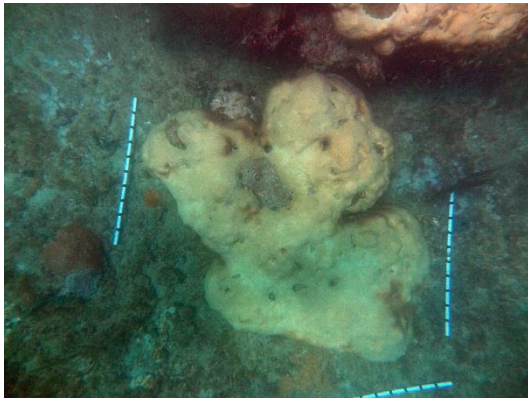


LC-004A

Species: *Orbicella faveolata*

Depth: 21 ft (6.4 m)

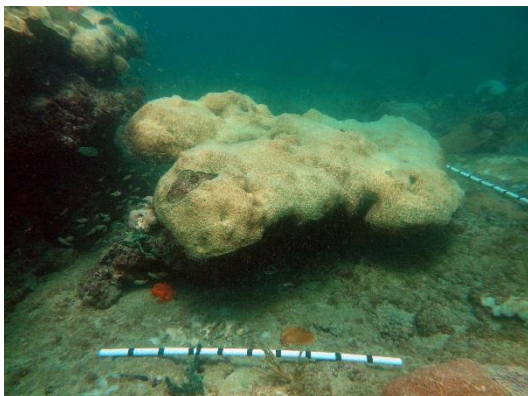
Top



North



South



Condition Data

% Total Mortality:	10
% Old Dead:	10
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	4.7
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	210
Max perpendicular Width:	155
Height:	90

Surface Measurement (cm)

Max Length:	275
Max perpendicular Width:	217

East



West

N/A

LC-004B

Species: *Orbicella faveolata*

Depth: 21 ft (6.4 m)

Top



North



South



Condition Data

% Total Mortality:	30
% Old Dead:	30
% Recent Dead:	0
% Disease:	<1
% Bleaching:	0, paling
Est. Live Tissue Area (m ²):	10.3
Number of tissue isolates:	16

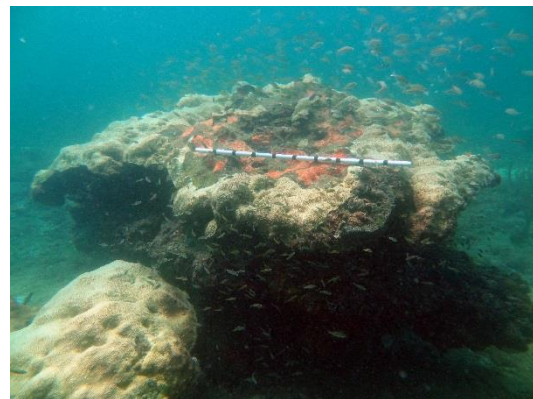
Planar Measurements (cm)

Max Length:	350
Max perpendicular Width:	270
Height:	150

Surface Measurement (cm)

Max Length:	480
Max perpendicular Width:	390

East



West



LC-005

Species: *Orbicella faveolata*

Depth: 23 ft (7.0 m)

Top



North



South



Condition Data

% Total Mortality:	10
% Old Dead:	10
% Recent Dead:	0
% Disease:	0
% Bleaching:	0, paling
Est. Live Tissue Area (m ²):	10.2
Number of tissue isolates:	14

Planar Measurements (cm)

Max Length:	280
Max perpendicular Width:	265
Height:	130

Surface Measurement (cm)

Max Length:	445
Max perpendicular Width:	420

East



West



LC-006

Species: *Siderastrea siderea*

Depth: 23 ft (7.0 m)

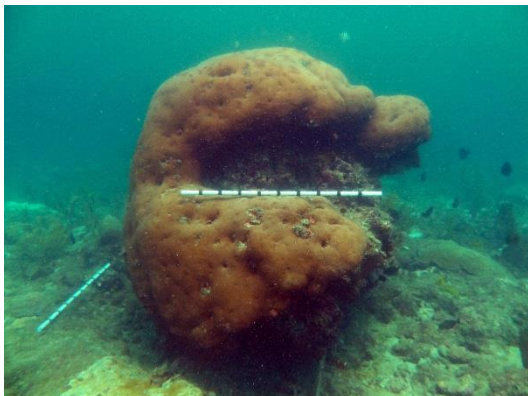
Top



North



South



Condition Data

% Total Mortality:	30
% Old Dead:	30
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	7.9
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	220
Max perpendicular Width:	200
Height:	200

Surface Measurement (cm)

Max Length:	450
Max perpendicular Width:	430

East



West

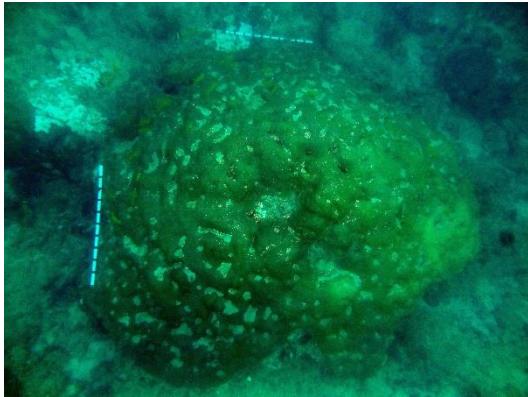


LC-007

Species: *Orbicella faveolata*

Depth: 25 ft (7.6 m)

Top



North



South



Condition Data

% Total Mortality:	10
% Old Dead:	10
% Recent Dead:	0
% Disease:	0
% Bleaching:	0, paling
Est. Live Tissue Area (m ²):	13.4
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	320
Max perpendicular Width:	305
Height:	150

Surface Measurement (cm)

Max Length:	490
Max perpendicular Width:	450

East



West



LC-008

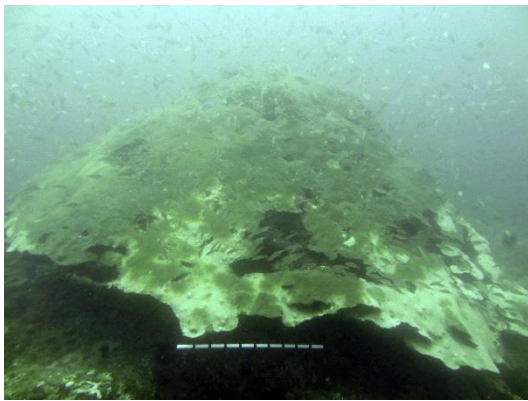
Species: *Orbicella faveolata*

Depth: 29 ft (8.8 m)

Top



North



South



Condition Data

% Total Mortality:	10
% Old Dead:	9
% Recent Dead:	1
% Disease:	1
% Bleaching:	10
Est. Live Tissue Area (m ²):	33.4
Number of tissue isolates:	4

Planar Measurements (cm)

Max Length:	470
Max perpendicular Width:	450
Height:	270

Surface Measurement (cm)

Max Length:	745
Max perpendicular Width:	710

East



West

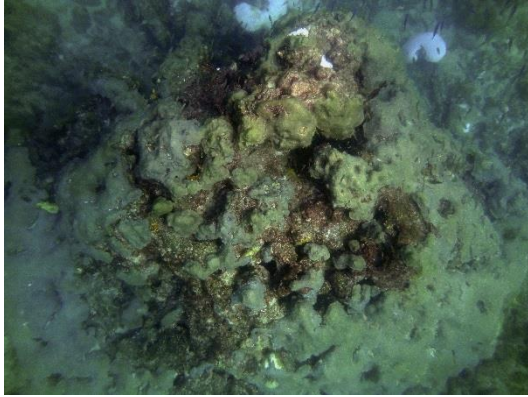


LC-009

Species: *Orbicella faveolata*

Depth: 26 ft (7.9 m)

Top



North



South



Condition Data

% Total Mortality:	60
% Old Dead:	58
% Recent Dead:	2
% Disease:	2
% Bleaching:	<1
Est. Live Tissue Area (m ²):	9.8
Number of tissue isolates:	33

Planar Measurements (cm)

Max Length:	430
Max perpendicular Width:	335
Height:	210

Surface Measurement (cm)

Max Length:	605
Max perpendicular Width:	575

East



West



LC-010

Species: *Orbicella faveolata*

Depth: 25 ft (7.6 m)

Top



North



South



Condition Data

% Total Mortality:	40
% Old Dead:	40
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	8.1
Number of tissue isolates:	6

Planar Measurements (cm)

Max Length:	310
Max perpendicular Width:	240
Height:	165

Surface Measurement (cm)

Max Length:	440
Max perpendicular Width:	340

East



West



LC-011

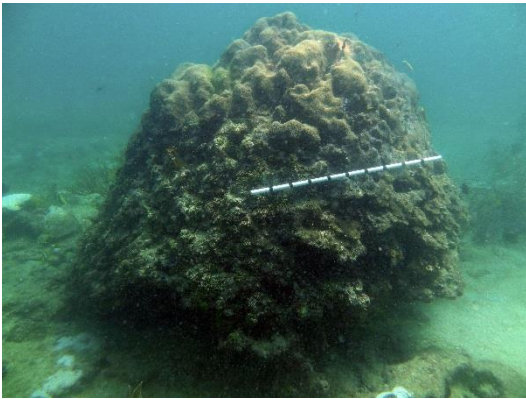
Species: *Orbicella faveolata*

Depth: 20 ft (6.1m)

Top



North



South



Condition Data

% Total Mortality:	35
% Old Dead:	30
% Recent Dead:	5
% Disease:	0
% Bleaching:	5
Est. Live Tissue Area (m ²):	9.2
Number of tissue isolates:	9

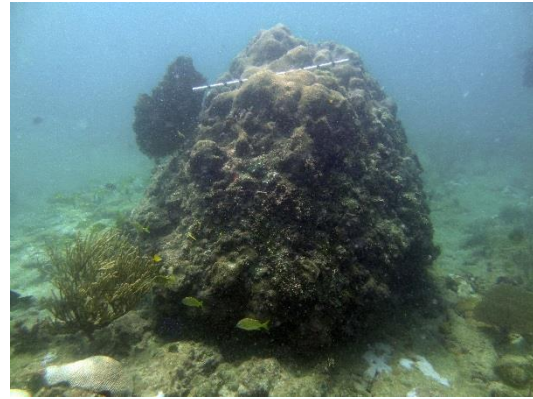
Planar Measurements (cm)

Max Length:	280
Max perpendicular Width:	210
Height:	210

Surface Measurement (cm)

Max Length:	490
Max perpendicular Width:	480

East



West



LC-012

Species: *Siderastrea siderea*

Depth: 21 ft (6.4 m)

Top



North



South



Condition Data

% Total Mortality:	60
% Old Dead:	40
% Recent Dead:	20
% Disease:	25
% Bleaching:	95
Est. Live Tissue Area (m ²):	6.0
Number of tissue isolates:	2

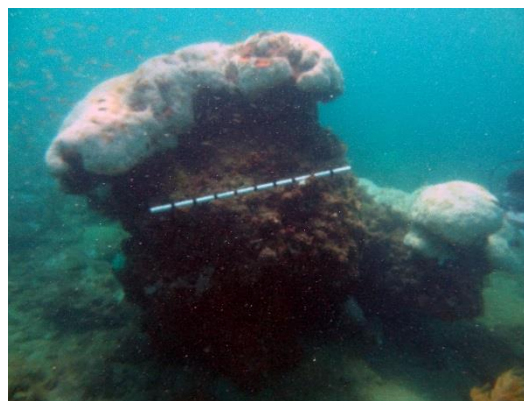
Planar Measurements (cm)

Max Length:	280
Max perpendicular Width:	270
Height:	190

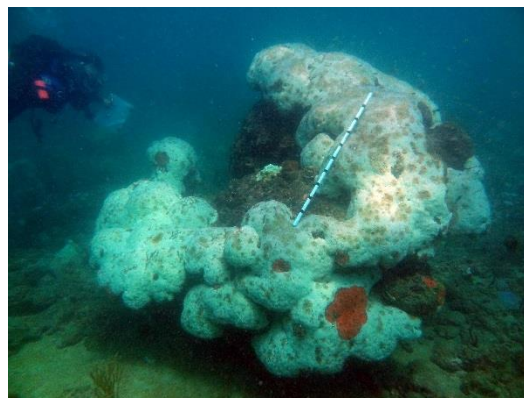
Surface Measurement (cm)

Max Length:	500
Max perpendicular Width:	460

East



West

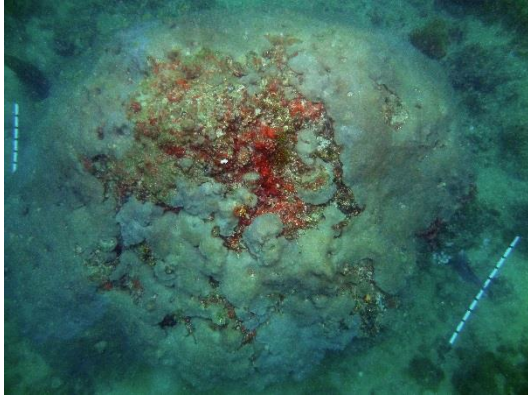


LC-013

Species: *Orbicella faveolata*

Depth: 26 ft (7.9 m)

Top



North



South



Condition Data

% Total Mortality:	35
% Old Dead:	20
% Recent Dead:	15
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	11.8
Number of tissue isolates:	28

Planar Measurements (cm)

Max Length:	360
Max perpendicular Width:	300
Height:	180

Surface Measurement (cm)

Max Length:	540
Max perpendicular Width:	530

East



West



LC-014

Species: *Orbicella faveolata*

Depth: 25 ft (7.6 m)

Top



North



South



Condition Data

% Total Mortality:	20
% Old Dead:	10
% Recent Dead:	10
% Disease:	<1
% Bleaching:	5
Est. Live Tissue Area (m ²):	16.6
Number of tissue isolates:	4

Planar Measurements (cm)

Max Length:	390
Max perpendicular Width:	380
Height:	160

Surface Measurement (cm)

Max Length:	575
Max perpendicular Width:	550

East



West



LC-015

Species: *Orbicella faveolata*

Depth: 26 ft (7.9 m)

Top



North



South



Condition Data

% Total Mortality:	40
% Old Dead:	40
% Recent Dead:	0
% Disease:	0
% Bleaching:	10
Est. Live Tissue Area (m ²):	7.6
Number of tissue isolates:	3

Planar Measurements (cm)

Max Length:	300
Max perpendicular Width:	270
Height:	140

Surface Measurement (cm)

Max Length:	480
Max perpendicular Width:	475

East



West

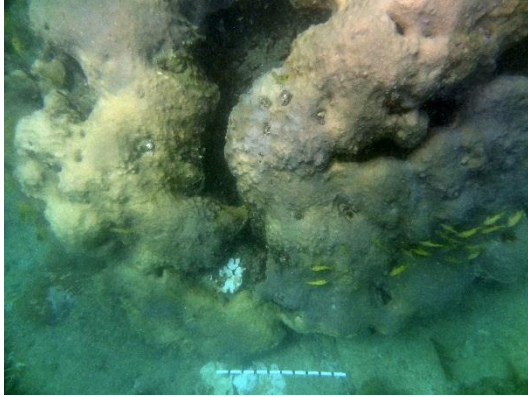


LC-016

Species: *Orbicella faveolata*

Depth: 19 ft (5.8 m)

Top



North



South



Condition Data

% Total Mortality:	15
% Old Dead:	15
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	16.0
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	340
Max perpendicular Width:	300
Height:	200

Surface Measurement (cm)

Max Length:	660
Max perpendicular Width:	550

East



West



LC-017

Species: *Orbicella faveolata*

Depth: 23 ft (7.0 m)

Top



North



South



Condition Data

% Total Mortality:	80
% Old Dead:	80
% Recent Dead:	0
% Disease:	0
% Bleaching:	60
Est. Live Tissue Area (m ²):	2.9
Number of tissue isolates:	7

Planar Measurements (cm)

Max Length:	310
Max perpendicular Width:	300
Height:	150

Surface Measurement (cm)

Max Length:	435
Max perpendicular Width:	380

East



West



LC-018

Species: *Orbicella faveolata*

Depth: 21 ft (6.4 m)

Top



North



South



Condition Data

% Total Mortality:	30
% Old Dead:	30
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	15.0
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	400
Max perpendicular Width:	330
Height:	190

Surface Measurement (cm)

Max Length:	490
Max perpendicular Width:	450

East



West

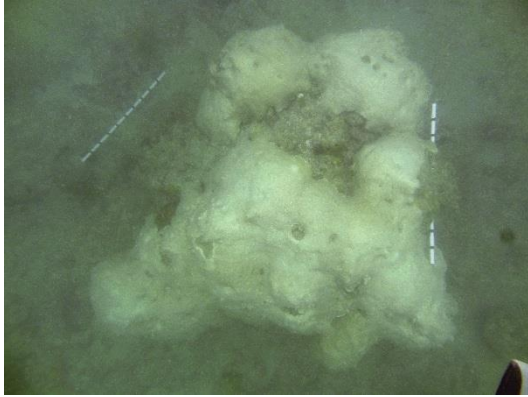


LC-019

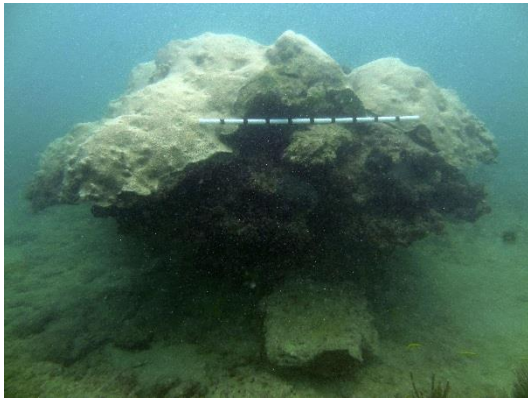
Species: *Orbicella faveolata*

Depth: 22 ft (6.7 m)

Top



North



South



Condition Data

% Total Mortality:	30
% Old Dead:	30
% Recent Dead:	<1
% Disease:	<1
% Bleaching:	0, paling
Est. Live Tissue Area (m ²):	8.0
Number of tissue isolates:	2

Planar Measurements (cm)

Max Length:	250
Max perpendicular Width:	240
Height:	160

Surface Measurement (cm)

Max Length:	425
Max perpendicular Width:	370

East



West



LC-020

Species: *Orbicella annularis*

Depth: 22 ft (6.7 m)

Top



North



South



Condition Data

% Total Mortality:	42
% Old Dead:	40
% Recent Dead:	2
% Disease:	0
% Bleaching:	0, paling
Est. Live Tissue Area (m ²):	10.8
Number of tissue isolates:	1

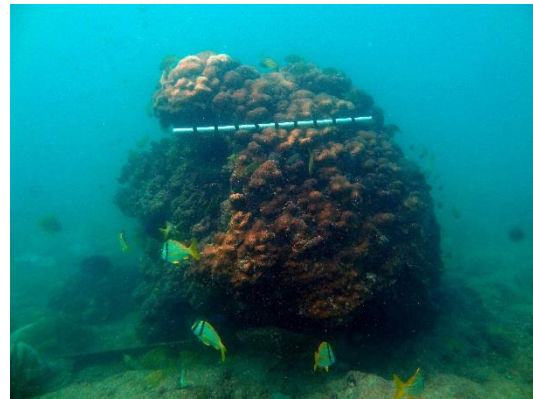
Planar Measurements (cm)

Max Length:	320
Max perpendicular Width:	210
Height:	260

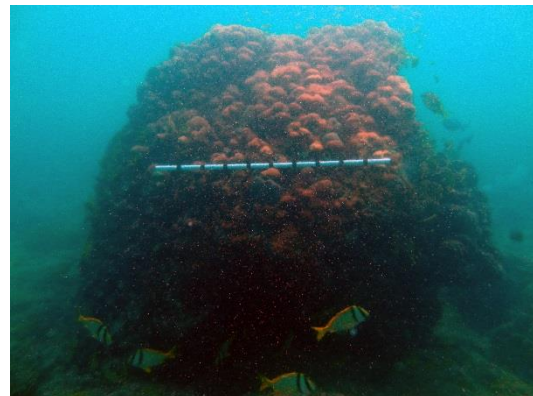
Surface Measurement (cm)

Max Length:	465
Max perpendicular Width:	440

East



West

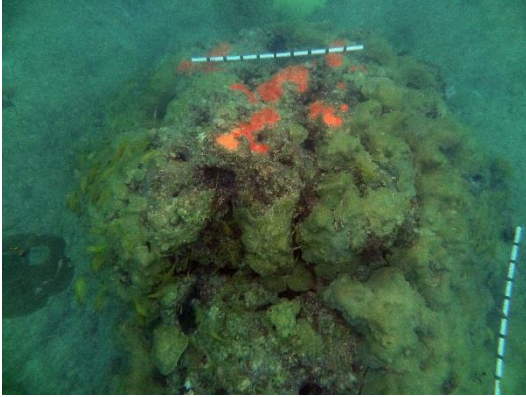


LC-021

Species: *Orbicella faveolata*

Depth: 21 ft (6.4 m)

Top



North



South



Condition Data

% Total Mortality:	40
% Old Dead:	40
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	7.5
Number of tissue isolates:	11

Planar Measurements (cm)

Max Length:	330
Max perpendicular Width:	240
Height:	140

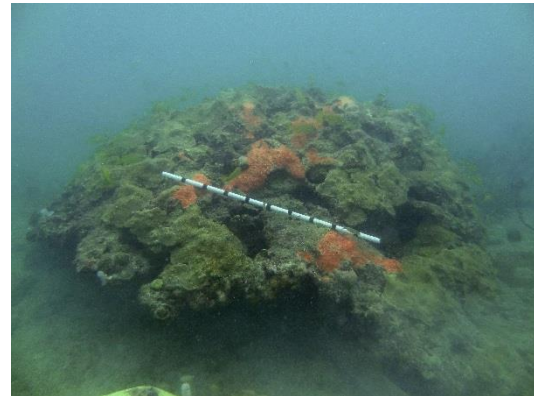
Surface Measurement (cm)

Max Length:	440
Max perpendicular Width:	370

East



West



LC-022

Species: *Orbicella faveolata*

Depth: 21 ft (6.4 m)

Top



North



South



Condition Data

% Total Mortality:	75
% Old Dead:	75
% Recent Dead:	<1
% Disease:	0
% Bleaching:	<1
Est. Live Tissue Area (m ²):	3.1
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	285
Max perpendicular Width:	220
Height:	170

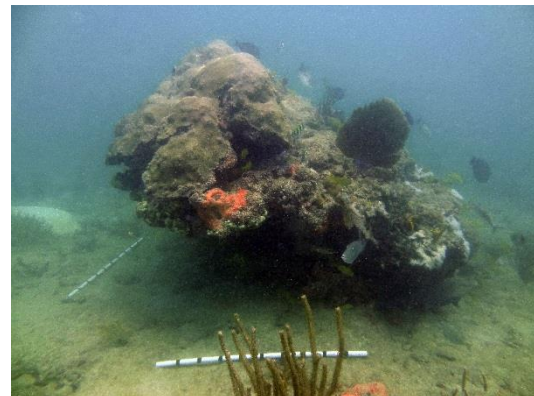
Surface Measurement (cm)

Max Length:	380
Max perpendicular Width:	350

East



West



LC-023

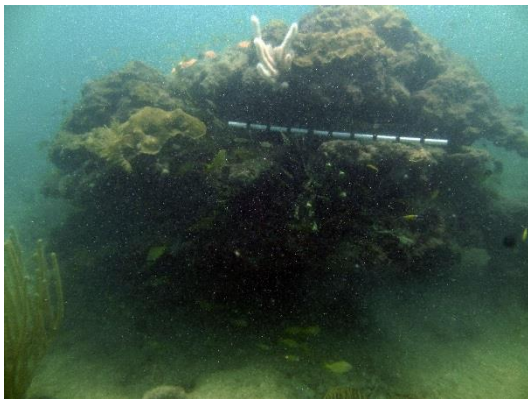
Species: *Orbicella faveolata*

Depth: 22 ft (6.7 m)

Top



North



South



Condition Data

% Total Mortality:	70
% Old Dead:	70
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	4.0
Number of tissue isolates:	18

Planar Measurements (cm)

Max Length:	295
Max perpendicular Width:	260
Height:	160

Surface Measurement (cm)

Max Length:	470
Max perpendicular Width:	457

East



West



LC-024

Species: *Orbicella faveolata*

Depth: 22 ft (6.7 m)

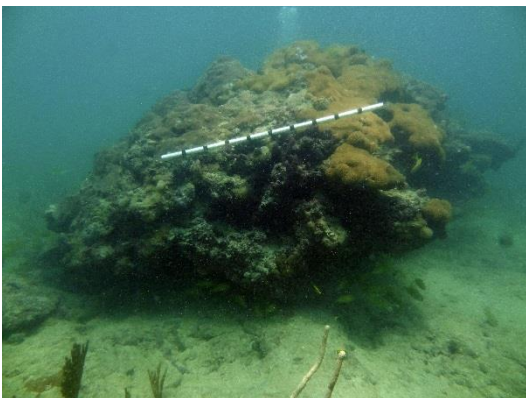
Top



North



South



Condition Data

% Total Mortality:	60
% Old Dead:	60
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	4.8
Number of tissue isolates:	12

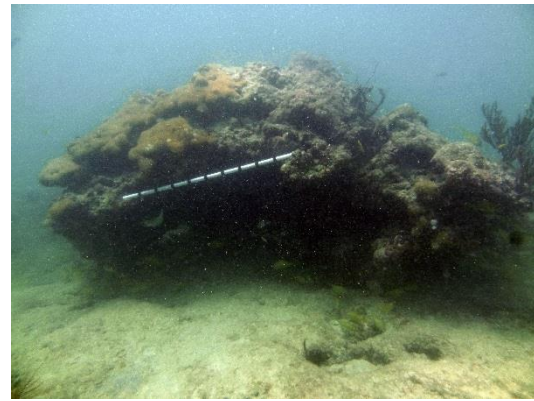
Planar Measurements (cm)

Max Length:	300
Max perpendicular Width:	210
Height:	160

Surface Measurement (cm)

Max Length:	420
Max perpendicular Width:	370

East



West

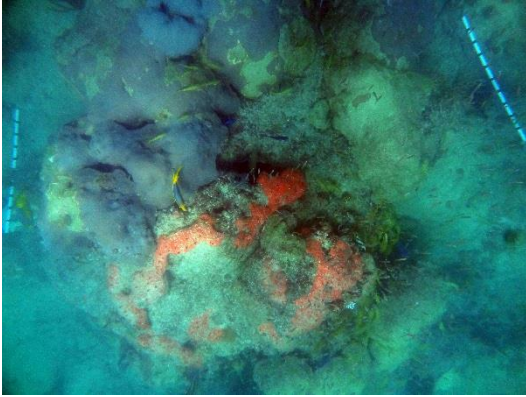


LC-025

Species: *Orbicella faveolata*

Depth: 21 ft (6.4 m)

Top



North



South



Condition Data

% Total Mortality:	80
% Old Dead:	50
% Recent Dead:	30
% Disease:	2
% Bleaching:	<1
Est. Live Tissue Area (m ²):	3.8
Number of tissue isolates:	26

Planar Measurements (cm)

Max Length:	330
Max perpendicular Width:	290
Height:	215

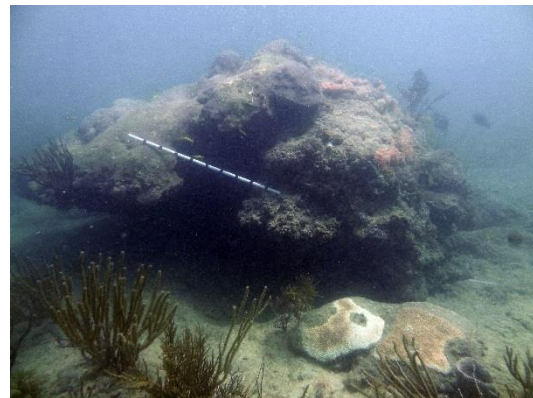
Surface Measurement (cm)

Max Length:	460
Max perpendicular Width:	420

East



West



LC-026

Species: *Orbicella faveolata*

Depth: 21 ft (6.4 m)

Top



North



South



Condition Data

% Total Mortality:	70
% Old Dead:	70
% Recent Dead:	0
% Disease:	0
% Bleaching:	<1, paling
Est. Live Tissue Area (m ²):	3.7
Number of tissue isolates:	59

Planar Measurements (cm)

Max Length:	315
Max perpendicular Width:	250
Height:	140

Surface Measurement (cm)

Max Length:	415
Max perpendicular Width:	330

East



West



LC-027

Species: *Orbicella faveolata*

Depth: 24 ft (7.3 m)

Top



North



South



Condition Data

% Total Mortality:	70
% Old Dead:	70
% Recent Dead:	0
% Disease:	0
% Bleaching:	0, paling
Est. Live Tissue Area (m ²):	3.7
Number of tissue isolates:	9

Planar Measurements (cm)

Max Length:	300
Max perpendicular Width:	270
Height:	135

Surface Measurement (cm)

Max Length:	415
Max perpendicular Width:	355

East



West

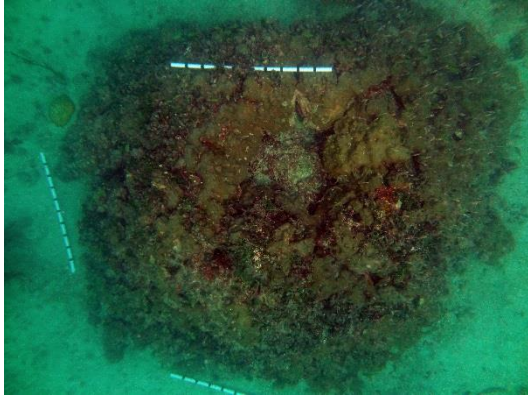


LC-028

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Top



North



South



Condition Data

% Total Mortality:	50
% Old Dead:	50
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	7.7
Number of tissue isolates:	92

Planar Measurements (cm)

Max Length:	345
Max perpendicular Width:	305
Height:	145

Surface Measurement (cm)

Max Length:	445
Max perpendicular Width:	423

East



West



LC-029

Species: *Orbicella faveolata*

Depth: 25 ft (7.6 m)

Top



North



South



Condition Data

% Total Mortality:	70
% Old Dead:	70
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	10.2
Number of tissue isolates:	22

Planar Measurements (cm)

Max Length:	510
Max perpendicular Width:	390
Height:	250

Surface Measurement (cm)

Max Length:	710
Max perpendicular Width:	700

East



West



LC-030

Species: *Orbicella faveolata*

Depth: 26 ft (7.9 m)

Top



North



South



Condition Data

% Total Mortality:	60
% Old Dead:	59
% Recent Dead:	<1
% Disease:	<1
% Bleaching:	0
Est. Live Tissue Area (m ²):	9.9
Number of tissue isolates:	73

Planar Measurements (cm)

Max Length:	410
Max perpendicular Width:	400
Height:	190

Surface Measurement (cm)

Max Length:	570
Max perpendicular Width:	550

East



West



LC-031

Species: *Orbicella faveolata*

Depth: 24 ft (7.3 m)

Top



North



South



Condition Data

% Total Mortality:	60
% Old Dead:	60
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	5.0
Number of tissue isolates:	27

Planar Measurements (cm)

Max Length:	290
Max perpendicular Width:	240
Height:	160

Surface Measurement (cm)

Max Length:	430
Max perpendicular Width:	400

East



West



LC-032

Species: *Orbicella faveolata*

Depth: 24 ft (7.3 m)

Top



North



South



Condition Data

% Total Mortality:	90
% Old Dead:	90
% Recent Dead:	<1
% Disease:	<1
% Bleaching:	<1
Est. Live Tissue Area (m ²):	1.5
Number of tissue isolates:	13

Planar Measurements (cm)

Max Length:	340
Max perpendicular Width:	290
Height:	150

Surface Measurement (cm)

Max Length:	450
Max perpendicular Width:	415

East



West



LC-033

Species: *Orbicella faveolata*

Depth: 24 ft (7.3 m)

Top



North



South



Condition Data

% Total Mortality:	90
% Old Dead:	90
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	1.3
Number of tissue isolates:	12

Planar Measurements (cm)

Max Length:	300
Max perpendicular Width:	280
Height:	140

Surface Measurement (cm)

Max Length:	455
Max perpendicular Width:	450

East



West



LC-034

Species: *Montastraea cavernosa*

Depth: 19 ft (5.8 m)

Condition Data

% Total Mortality:	15
% Old Dead:	15
% Recent Dead:	0
% Disease:	0
% Bleaching:	0, 80% pale
Est. Live Tissue Area (m ²):	4.3
Number of tissue isolates:	1

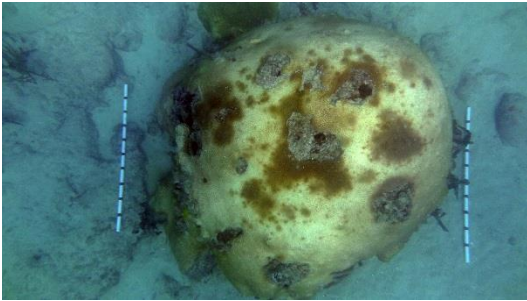
Planar Measurements (cm)

Max Length:	140
Max perpendicular Width:	130
Height:	140

Surface Measurement (cm)

Max Length:	330
Max perpendicular Width:	279

Top



North



East



South



West



LC-035

Species: *Orbicella faveolata*

Depth: 27 ft (8.2 m)

Top



North



South



Condition Data

% Total Mortality:	90
% Old Dead:	90
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	1.4
Number of tissue isolates:	56

Planar Measurements (cm)

Max Length:	340
Max perpendicular Width:	290
Height:	140

Surface Measurement (cm)

Max Length:	405
Max perpendicular Width:	365

East



West



LC-036

Species: *Orbicella faveolata*

Depth: 25 ft (7.6 m)

Top



North



South



Condition Data

% Total Mortality:	90
% Old Dead:	90
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	1.3
Number of tissue isolates:	9

Planar Measurements (cm)

Max Length:	310
Max perpendicular Width:	270
Height:	140

Surface Measurement (cm)

Max Length:	420
Max perpendicular Width:	350

East



West



LC-037

Species: *Siderastrea siderea*

Depth: 25 ft (7.6 m)

Top



North



South



Condition Data

% Total Mortality:	80
% Old Dead:	75
% Recent Dead:	5
% Disease:	50
% Bleaching:	0
Est. Live Tissue Area (m ²):	1.9
Number of tissue isolates:	14

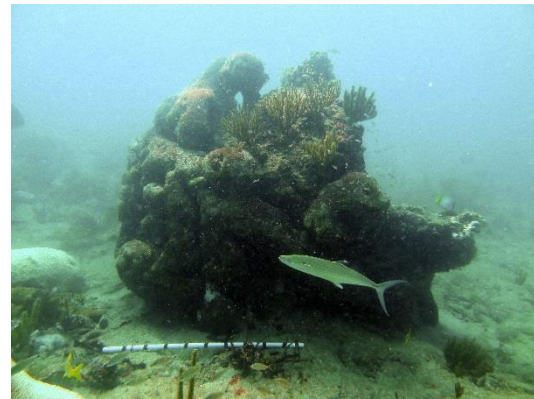
Planar Measurements (cm)

Max Length:	210
Max perpendicular Width:	200
Height:	170

Surface Measurement (cm)

Max Length:	370
Max perpendicular Width:	360

East



West



LC-038

Species: *Montastraea cavernosa*

Depth: 25 ft (7.6 m)

Top



North



South



Condition Data

% Total Mortality:	60
% Old Dead:	60
% Recent Dead:	0
% Disease:	0
% Bleaching:	70
Est. Live Tissue Area (m ²):	2.8
Number of tissue isolates:	14

Planar Measurements (cm)

Max Length:	210
Max perpendicular Width:	180
Height:	120

Surface Measurement (cm)

Max Length:	285
Max perpendicular Width:	265

East



West



LC-039

Species: *Orbicella faveolata*

Depth: 29 ft (8.8 m)

Top



North



South



Condition Data

% Total Mortality:	90
% Old Dead:	89
% Recent Dead:	<1
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	1.3
Number of tissue isolates:	8

Planar Measurements (cm)

Max Length:	300
Max perpendicular Width:	290
Height:	130

Surface Measurement (cm)

Max Length:	380
Max perpendicular Width:	335

East



West

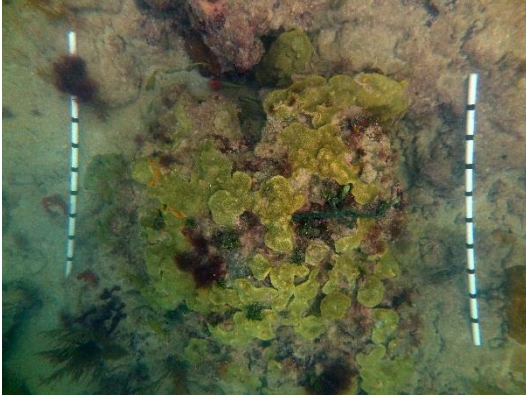


LC-040

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Top



North



South



Condition Data

% Total Mortality:	60
% Old Dead:	60
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	1.2
Number of tissue isolates:	26

Planar Measurements (cm)

Max Length:	187
Max perpendicular Width:	105
Height:	65

Surface Measurement (cm)

Max Length:	214
Max perpendicular Width:	151

East



West

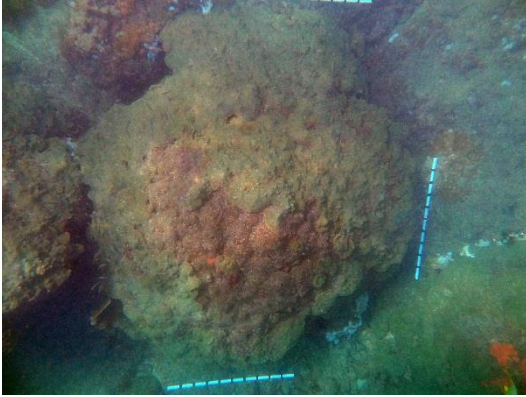


LC-041

Species: *Orbicella faveolata*

Depth: 18 ft (5.5 m)

Top



North



South



Condition Data

% Total Mortality:	30
% Old Dead:	30
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	6.7
Number of tissue isolates:	7

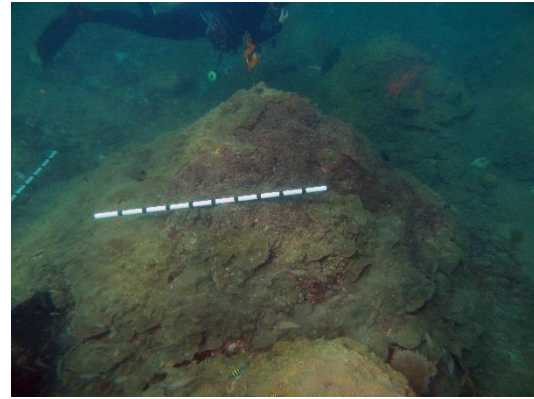
Planar Measurements (cm)

Max Length:	250
Max perpendicular Width:	230
Height:	130

Surface Measurement (cm)

Max Length:	370
Max perpendicular Width:	335

East



West

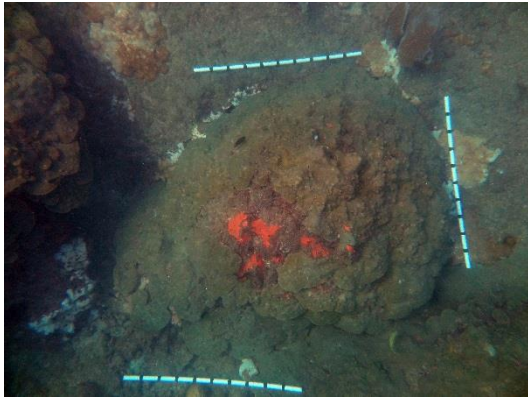


LC-042

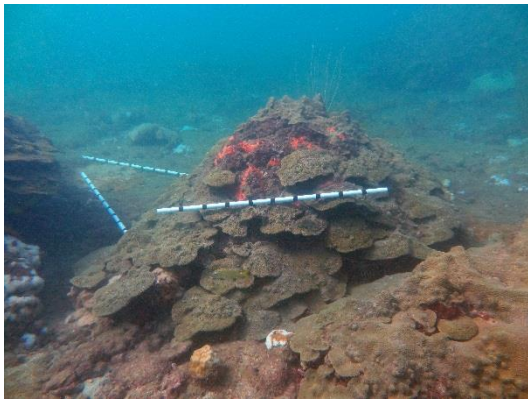
Species: *Orbicella faveolata*

Depth: 18 ft (5.5 m)

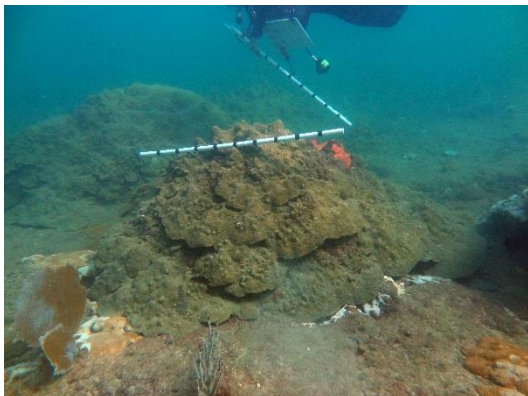
Top



North



South



Condition Data

% Total Mortality:	10
% Old Dead:	10
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	3.7
Number of tissue isolates:	2

Planar Measurements (cm)

Max Length:	190
Max perpendicular Width:	145
Height:	75

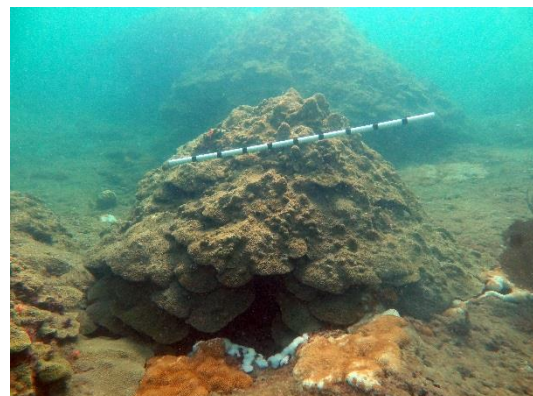
Surface Measurement (cm)

Max Length:	250
Max perpendicular Width:	225

East



West

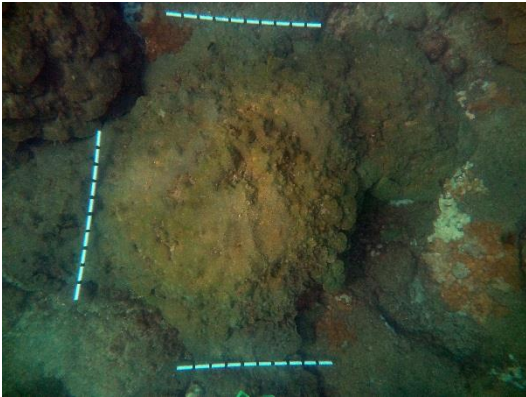


LC-043

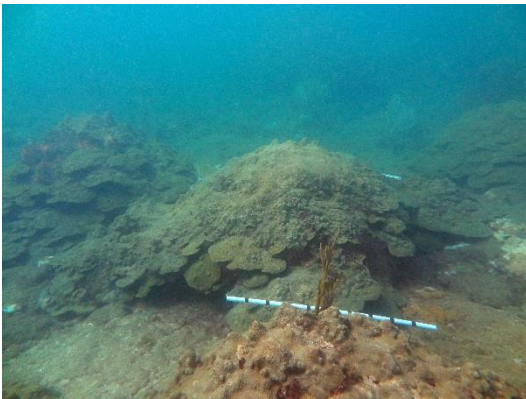
Species: *Orbicella faveolata*

Depth: 18 ft (5.5 m)

Top



North



South



Condition Data

% Total Mortality:	<1
% Old Dead:	<1
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	7.7
Number of tissue isolates:	2

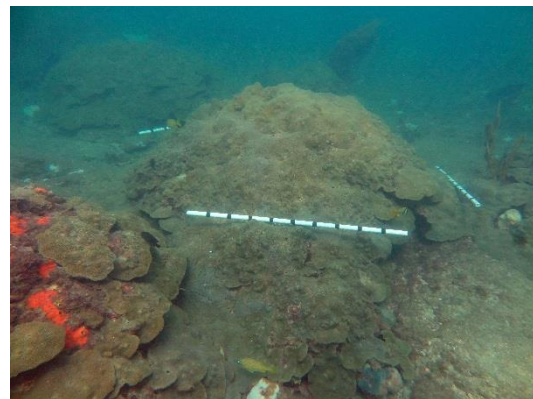
Planar Measurements (cm)

Max Length:	290
Max perpendicular Width:	210
Height:	85

Surface Measurement (cm)

Max Length:	355
Max perpendicular Width:	265

East



West

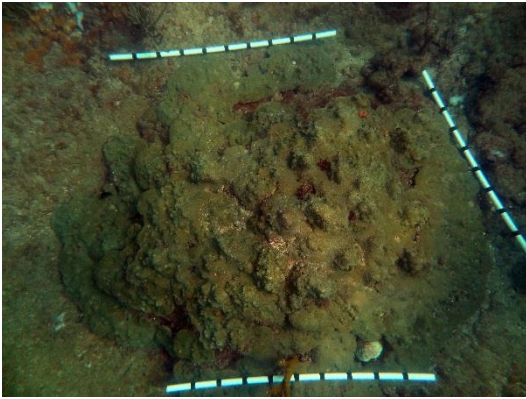


LC-044

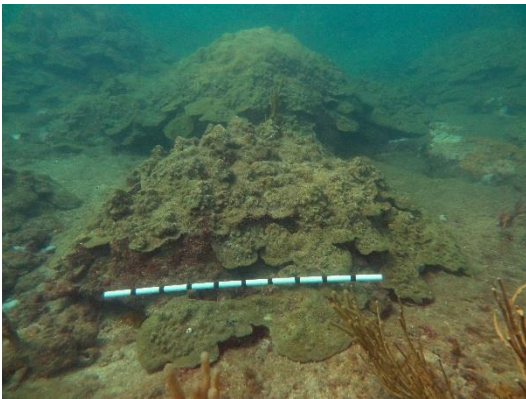
Species: *Orbicella faveolata*

Depth: 18 ft (5.5 m)

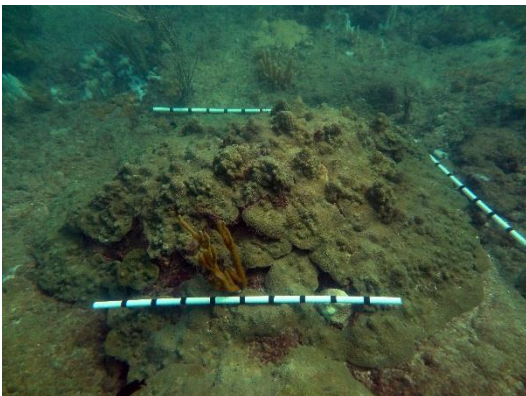
Top



North



South



Condition Data

% Total Mortality:	10
% Old Dead:	10
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	3.2
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	180
Max perpendicular Width:	155
Height:	60

Surface Measurement (cm)

Max Length:	220
Max perpendicular Width:	185

East



West

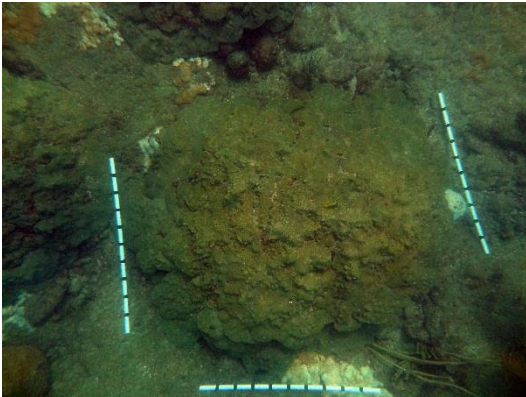


LC-045

Species: *Orbicella faveolata*

Depth: 18 ft (5.5 m)

Top



North



South



Condition Data

% Total Mortality:	<1
% Old Dead:	<1
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	3.9
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	205
Max perpendicular Width:	165
Height:	55

Surface Measurement (cm)

Max Length:	255
Max perpendicular Width:	205

East



West

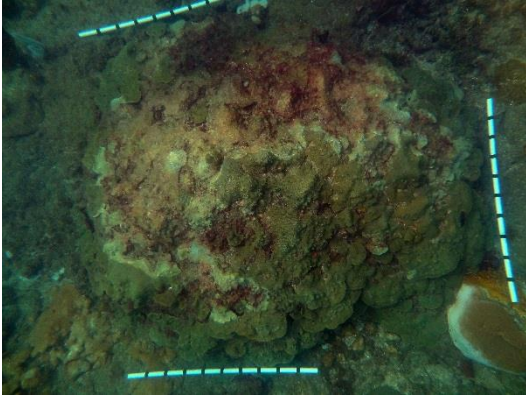


LC-046

Species: *Orbicella faveolata*

Depth: 18 ft (5.5 m)

Top



North



South



Condition Data

% Total Mortality:	60
% Old Dead:	5
% Recent Dead:	55
% Disease:	10
% Bleaching:	0
Est. Live Tissue Area (m ²):	2.6
Number of tissue isolates:	15

Planar Measurements (cm)

Max Length:	215
Max perpendicular Width:	215
Height:	90

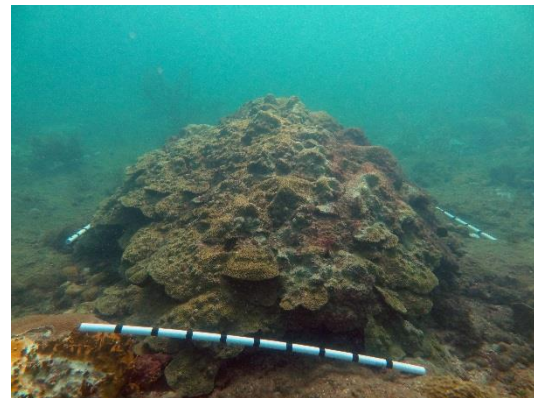
Surface Measurement (cm)

Max Length:	280
Max perpendicular Width:	270

East



West

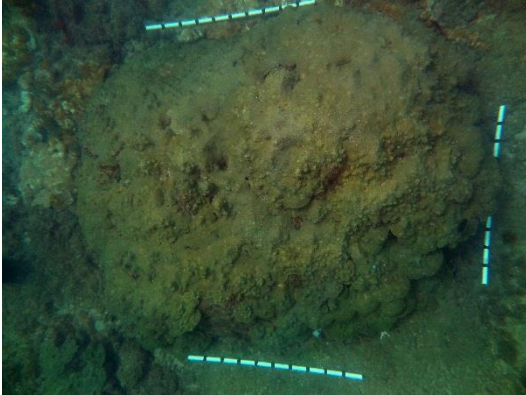


LC-047

Species: *Orbicella faveolata*

Depth: 18 ft (5.5 m)

Top



North



South



Condition Data

% Total Mortality:	10
% Old Dead:	10
% Recent Dead:	0
% Disease:	0
% Bleaching:	0, pale spot
Est. Live Tissue Area (m ²):	5.1
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	220
Max perpendicular Width:	180
Height:	85

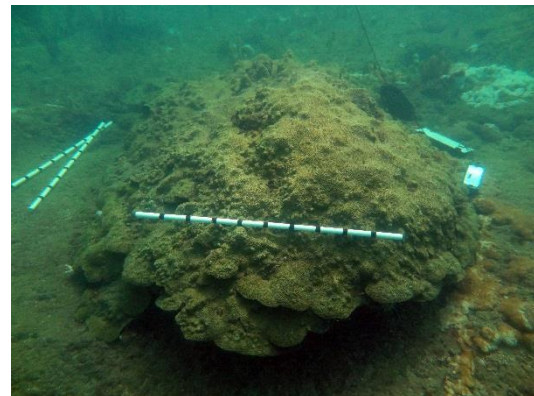
Surface Measurement (cm)

Max Length:	310
Max perpendicular Width:	265

East



West

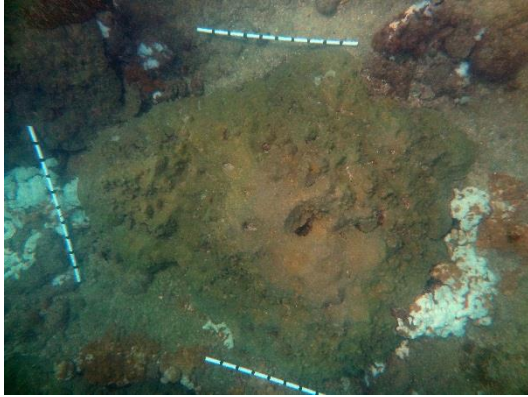


LC-048

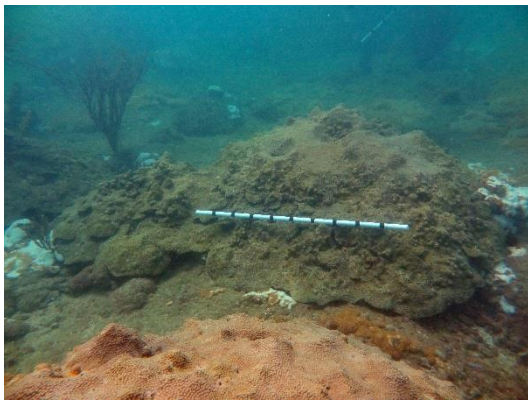
Species: *Orbicella faveolata*

Depth: 18 ft (5.5 m)

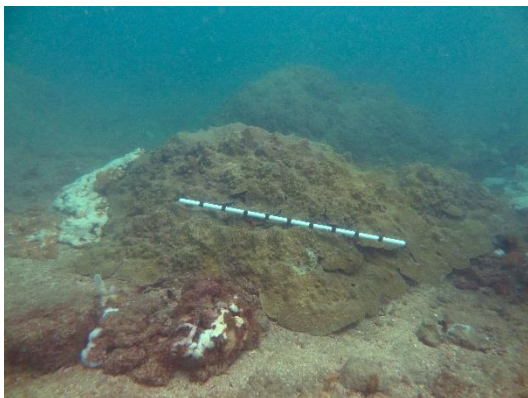
Top



North



South



Condition Data

% Total Mortality:	5
% Old Dead:	5
% Recent Dead:	0
% Disease:	0
% Bleaching:	0, 2 pale spots
Est. Live Tissue Area (m ²):	5.8
Number of tissue isolates:	1

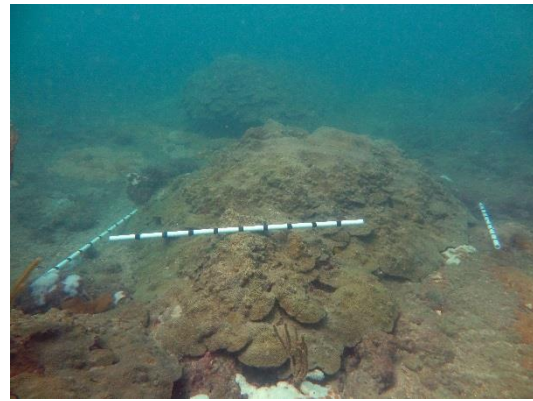
Planar Measurements (cm)

Max Length:	240
Max perpendicular Width:	205
Height:	75

Surface Measurement (cm)

Max Length:	270
Max perpendicular Width:	245

East



West



LC-049

Species: *Orbicella faveolata*

Depth: 18 ft (5.5 m)

Top



North



South



Condition Data

% Total Mortality:	5
% Old Dead:	5
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	9.3
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	340
Max perpendicular Width:	215
Height:	100

Surface Measurement (cm)

Max Length:	395
Max perpendicular Width:	385

East



West

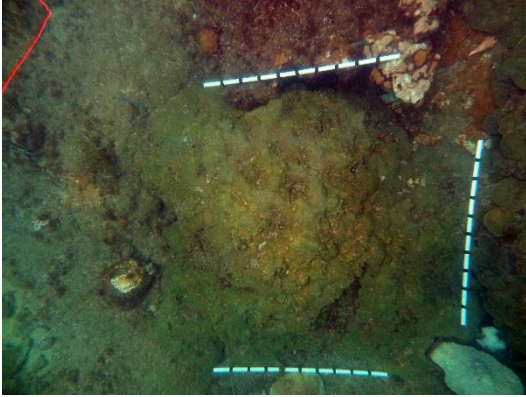


LC-050

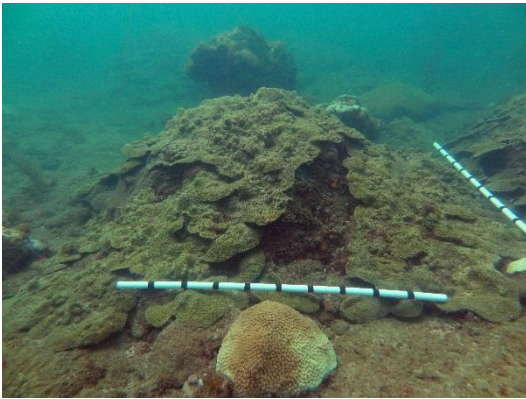
Species: *Orbicella faveolata*

Depth: 18 ft (5.5 m)

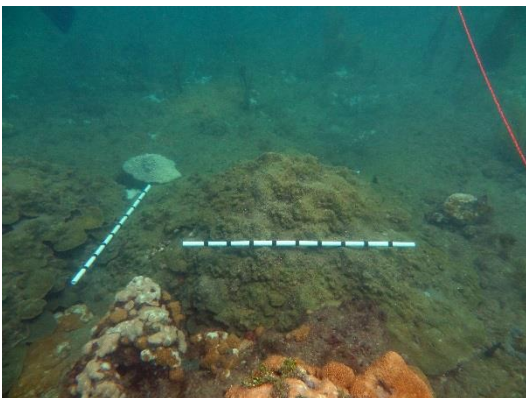
Top



North



South



Condition Data

% Total Mortality:	20
% Old Dead:	20
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	3.9
Number of tissue isolates:	1

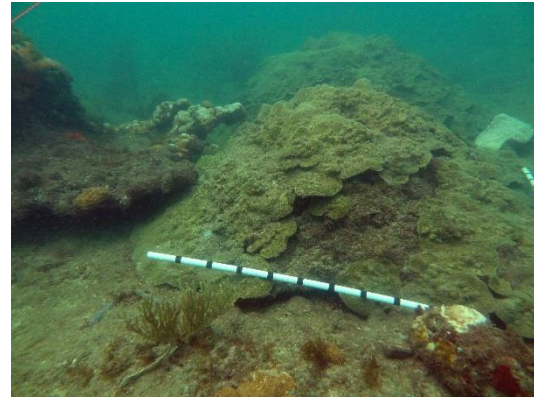
Planar Measurements (cm)

Max Length:	210
Max perpendicular Width:	180
Height:	70

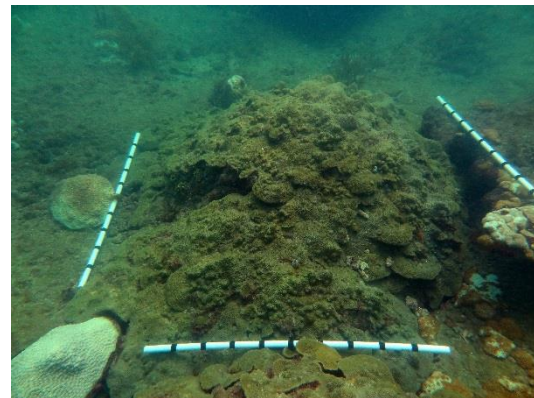
Surface Measurement (cm)

Max Length:	245
Max perpendicular Width:	220

East



West



LC-051

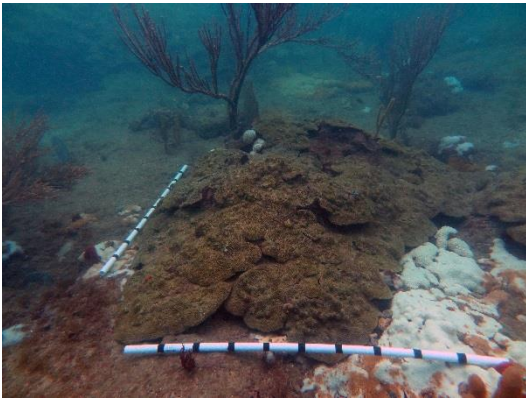
Species: *Orbicella faveolata*

Depth: 18 ft (5.5 m)

Top



North



South



Condition Data

% Total Mortality:	20
% Old Dead:	20
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	2.3
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	190
Max perpendicular Width:	120
Height:	50

Surface Measurement (cm)

Max Length:	195
Max perpendicular Width:	140

East



West



LC-052

Species: *Orbicella faveolata*

Depth: 18 ft (5.5 m)

Top



North



South



Condition Data

% Total Mortality:	10
% Old Dead:	10
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	19.9
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	350
Max perpendicular Width:	275
Height:	255

Surface Measurement (cm)

Max Length:	440
Max perpendicular Width:	390

East



West

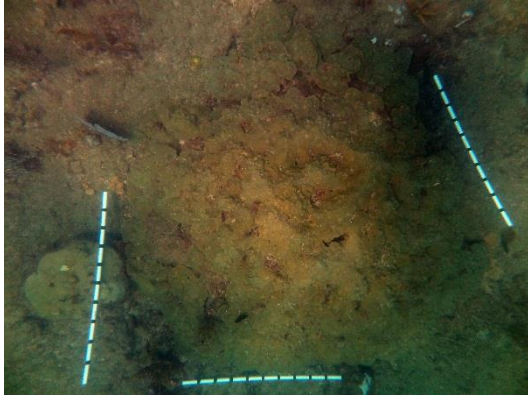


LC-053

Species: *Orbicella faveolata*

Depth: 18 ft (5.5 m)

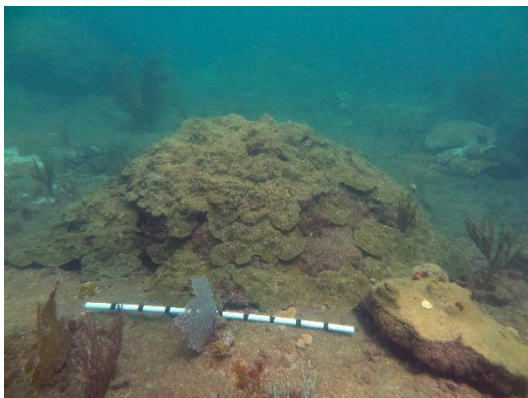
Top



North



South



Condition Data

% Total Mortality:	20
% Old Dead:	20
% Recent Dead:	<1
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	4.7
Number of tissue isolates:	2

Planar Measurements (cm)

Max Length:	220
Max perpendicular Width:	220
Height:	70

Surface Measurement (cm)

Max Length:	280
Max perpendicular Width:	265

East



West

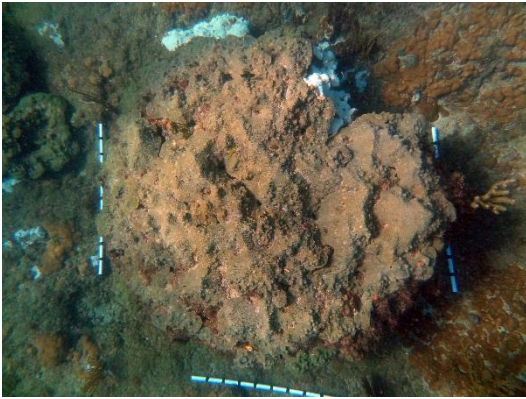


LC-054

Species: *Orbicella faveolata*

Depth: 15 ft (4.6 m)

Top



North



South



Condition Data

% Total Mortality:	20
% Old Dead:	20
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	5.3
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	210
Max perpendicular Width:	195
Height:	105

Surface Measurement (cm)

Max Length:	300
Max perpendicular Width:	275

East



West



LC-055

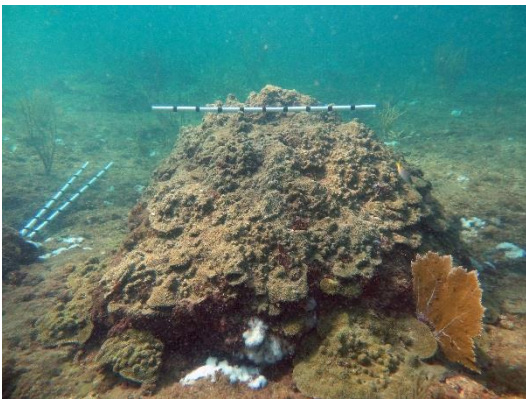
Species: *Orbicella faveolata*

Depth: 15 ft (4.6 m)

Top



North



South



Condition Data

% Total Mortality:	5
% Old Dead:	5
% Recent Dead:	0
% Disease:	0
% Bleaching:	<1
Est. Live Tissue Area (m ²):	5.2
Number of tissue isolates:	5

Planar Measurements (cm)

Max Length:	190
Max perpendicular Width:	190
Height:	90

Surface Measurement (cm)

Max Length:	260
Max perpendicular Width:	260

East



West

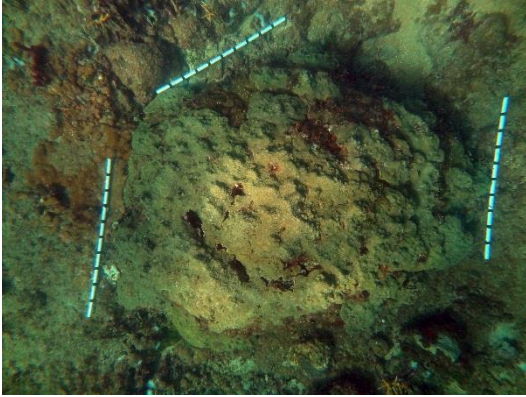


LC-056

Species: *Orbicella faveolata*

Depth: 17 ft (5.2 m)

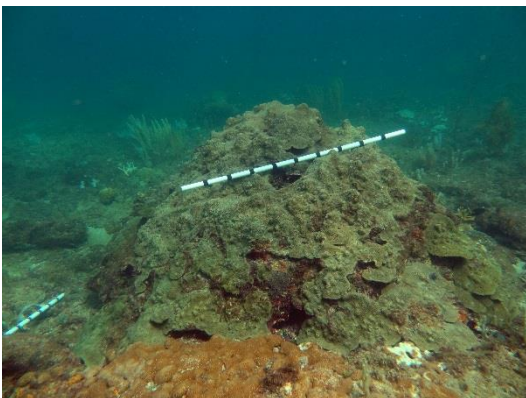
Top



North



South



Condition Data

% Total Mortality:	20
% Old Dead:	20
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	5.0
Number of tissue isolates:	13

Planar Measurements (cm)

Max Length:	240
Max perpendicular Width:	170
Height:	95

Surface Measurement (cm)

Max Length:	300
Max perpendicular Width:	270

East



West



LC-057

Species: *Orbicella faveolata*

Depth: 16 ft (4.9 m)

Top



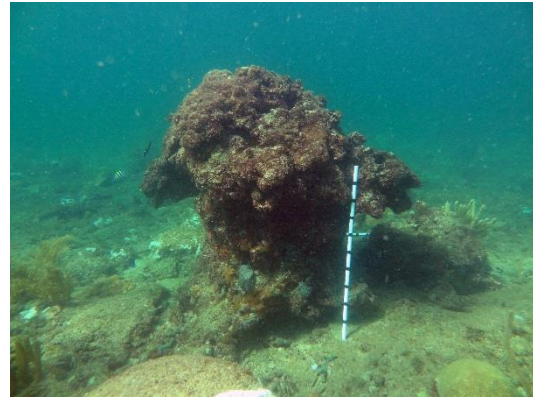
North



South



East



West



Condition Data

% Total Mortality:	90
% Old Dead:	90
% Recent Dead:	0
% Disease:	0
% Bleaching:	<1
Est. Live Tissue Area (m ²):	0.7
Number of tissue isolates:	6

Planar Measurements (cm)

Max Length:	190
Max perpendicular Width:	170
Height:	150

Surface Measurement (cm)

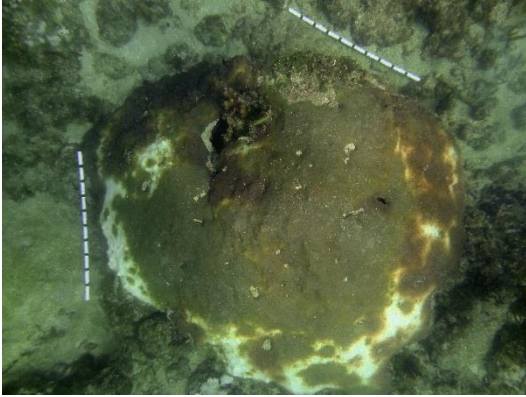
Max Length:	355
Max perpendicular Width:	290

LC-058

Species: *Orbicella faveolata*

Depth: 26 ft (7.9 m)

Top



North



South



Condition Data

% Total Mortality:	10
% Old Dead:	10
% Recent Dead:	0
% Disease:	0
% Bleaching:	20
Est. Live Tissue Area (m ²):	6.4
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	230
Max perpendicular Width:	230
Height:	90

Surface Measurement (cm)

Max Length:	320
Max perpendicular Width:	290

East



West



LC-059

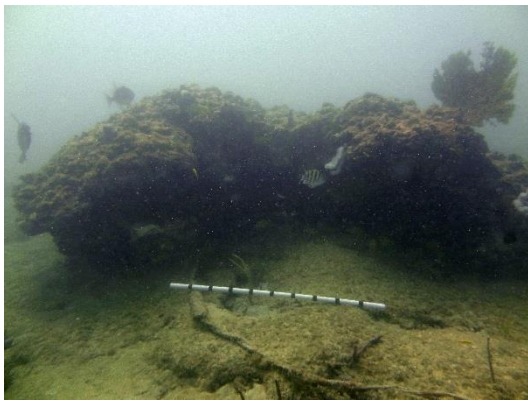
Species: *Orbicella faveolata*

Depth: 23 ft (7.0 m)

Top



North



South



Condition Data

% Total Mortality:	10
% Old Dead:	10
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	9.0
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	330
Max perpendicular Width:	230
Height:	100

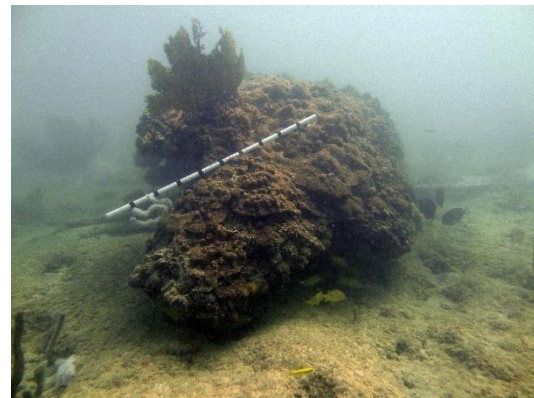
Surface Measurement (cm)

Max Length:	420
Max perpendicular Width:	330

East



West



LC-060

Species: *Siderastrea siderea*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	90
% Old Dead:	90
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	0.6
Number of tissue isolates:	56+

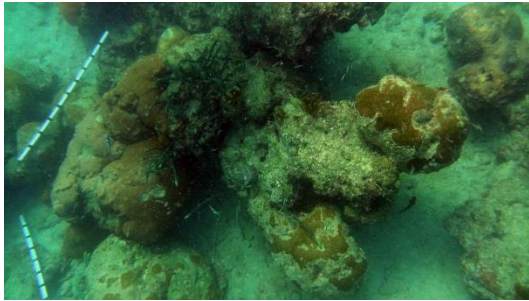
Planar Measurements (cm)

Max Length:	240
Max perpendicular Width:	180
Height:	90

Surface Measurement (cm)

Max Length:	315
Max perpendicular Width:	230

Top



North



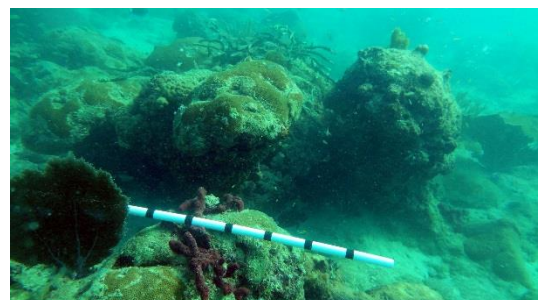
East



South



West



LC-061

Species: *Montastraea cavernosa*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	30
% Old Dead:	30
% Recent Dead:	0
% Disease:	0
% Bleaching:	0, 5% Pale
Est. Live Tissue Area (m ²):	3.3
Number of tissue isolates:	3

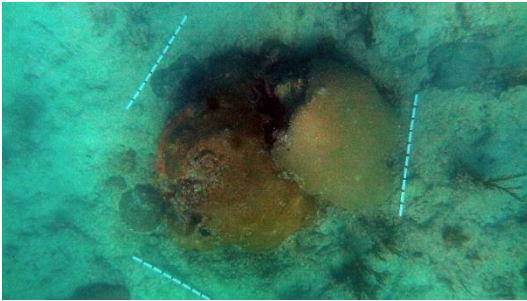
Planar Measurements (cm)

Max Length:	160
Max perpendicular Width:	125
Height:	120

Surface Measurement (cm)

Max Length:	280
Max perpendicular Width:	180

Top



North



East



South



West



LC-062

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	50
% Old Dead:	50
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	7.5
Number of tissue isolates:	6

Planar Measurements (cm)

Max Length:	310
Max perpendicular Width:	300
Height:	160

Surface Measurement (cm)

Max Length:	380
Max perpendicular Width:	361

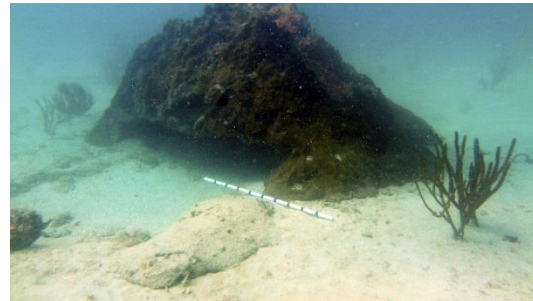
Top



North



East



South



West



LC-063

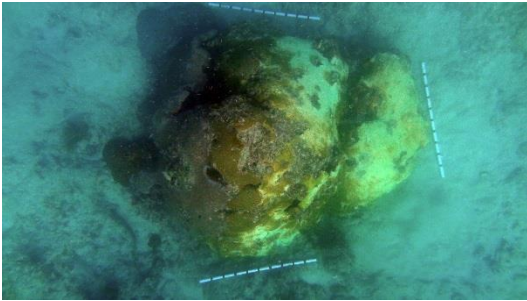
Species: *Montastraea cavernosa*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	20
% Old Dead:	19
% Recent Dead:	1
% Disease:	0
% Bleaching:	50
Est. Live Tissue Area (m ²):	6.5
Number of tissue isolates:	6

Top



Planar Measurements (cm)

Max Length:	230
Max perpendicular Width:	175
Height:	140

Surface Measurement (cm)

Max Length:	350
Max perpendicular Width:	290

North



East



South



West



LC-064

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	70
% Old Dead:	70
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	3.0
Number of tissue isolates:	1

Top



Planar Measurements (cm)

Max Length:	250
Max perpendicular Width:	210
Height:	150

Surface Measurement (cm)

Max Length:	380
Max perpendicular Width:	370

North



East



South



West



LC-065

Species: *Pseudodiploria strigosa*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	10
% Old Dead:	10
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	2.9
Number of tissue isolates:	1

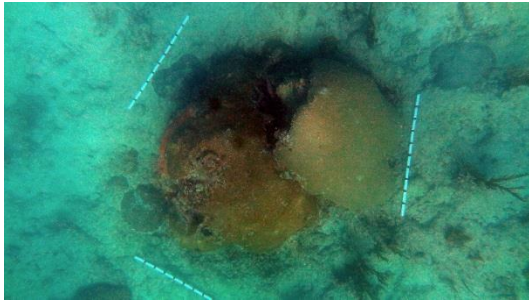
Planar Measurements (cm)

Max Length:	140
Max perpendicular Width:	100
Height:	95

Surface Measurement (cm)

Max Length:	220
Max perpendicular Width:	150

Top



North



East



South



West



LC-066

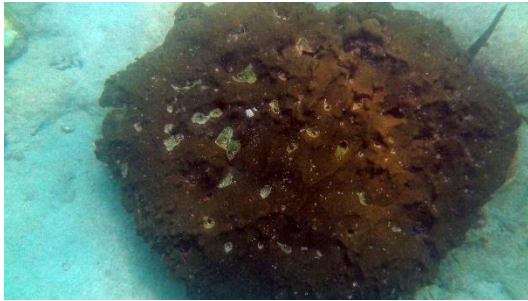
Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	10
% Old Dead:	10
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	7.4
Number of tissue isolates:	1

Top



Planar Measurements (cm)

Max Length:	280
Max perpendicular Width:	230
Height:	90

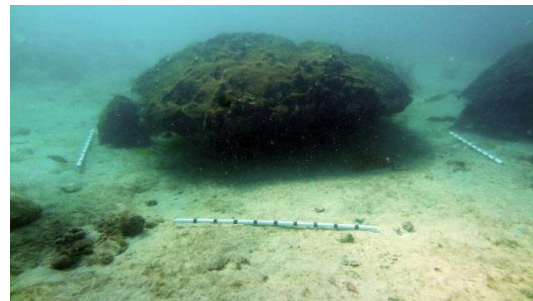
Surface Measurement (cm)

Max Length:	330
Max perpendicular Width:	288

North



East



South



West



LC-067

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	60
% Old Dead:	60
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	2.3
Number of tissue isolates:	3

Top



Planar Measurements (cm)

Max Length:	200
Max perpendicular Width:	170
Height:	100

Surface Measurement (cm)

Max Length:	295
Max perpendicular Width:	265

North



East



South



West



LC-068

Species: *Pseudodiploria strigosa*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	25
% Old Dead:	10
% Recent Dead:	15
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	2.9
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	150
Max perpendicular Width:	140
Height:	90

Surface Measurement (cm)

Max Length:	230
Max perpendicular Width:	229

Top



North



East



South



West



LC-069

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	90
% Old Dead:	90
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	1.0
Number of tissue isolates:	6

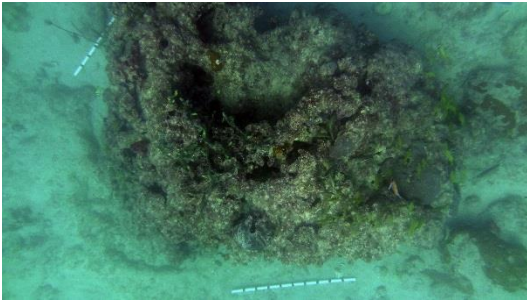
Planar Measurements (cm)

Max Length:	290
Max perpendicular Width:	200
Height:	140

Surface Measurement (cm)

Max Length:	430
Max perpendicular Width:	395

Top



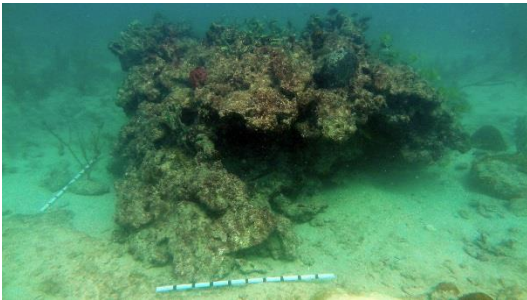
North



East



South



West



LC-070

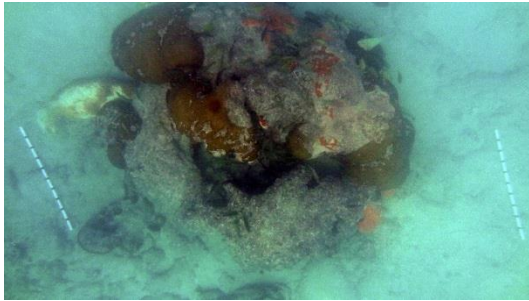
Species: *Siderastrea siderea*

Depth: 19 ft (5.8 m)

Condition Data

% Total Mortality:	70
% Old Dead:	45
% Recent Dead:	25
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	3.2
Number of tissue isolates:	18

Top



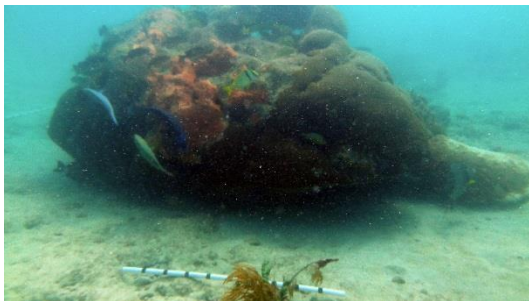
Planar Measurements (cm)

Max Length:	240
Max perpendicular Width:	220
Height:	160

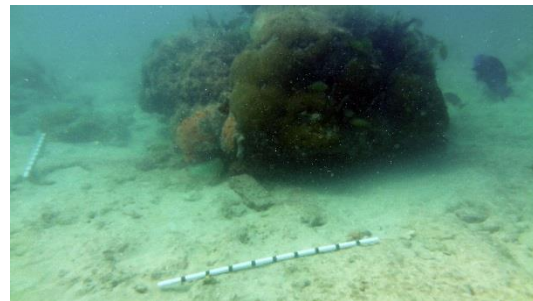
Surface Measurement (cm)

Max Length:	416
Max perpendicular Width:	358

North



East



South



West



LC-071

Species: *Montastraea cavernosa*

Depth: 19 ft (5.8 m)

Condition Data

% Total Mortality:	50
% Old Dead:	45
% Recent Dead:	5
% Disease:	30
% Bleaching:	0, 5% Pale
Est. Live Tissue Area (m ²):	4.0
Number of tissue isolates:	7

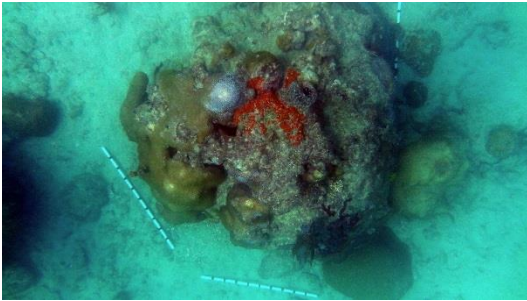
Planar Measurements (cm)

Max Length:	200
Max perpendicular Width:	190
Height:	145

Surface Measurement (cm)

Max Length:	372
Max perpendicular Width:	348

Top



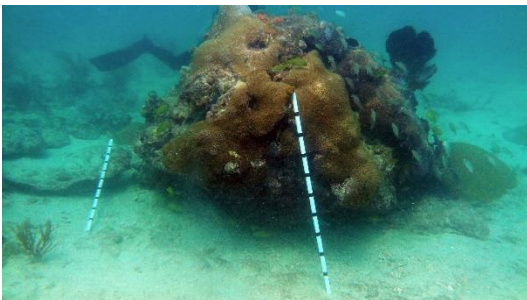
North



East



South



West



LC-072

Species: *Siderastrea siderea*

Depth: 19 ft (5.8 m)

Condition Data

% Total Mortality:	90
% Old Dead:	90
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	0.8
Number of tissue isolates:	54

Top



Planar Measurements (cm)

Max Length:	230
Max perpendicular Width:	230
Height:	110

Surface Measurement (cm)

Max Length:	340
Max perpendicular Width:	290

North



East



South



West



LC-073

Species: *Orbicella annularis*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	65
% Old Dead:	60
% Recent Dead:	5
% Disease:	0
% Bleaching:	50
Est. Live Tissue Area (m ²):	5.1
Number of tissue isolates:	25+

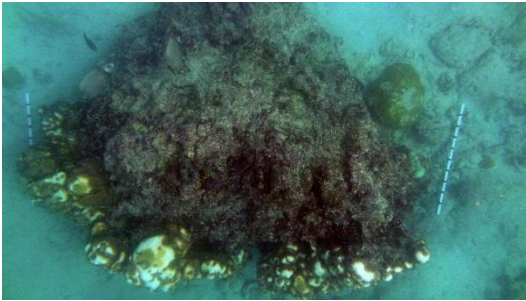
Planar Measurements (cm)

Max Length:	330
Max perpendicular Width:	260
Height:	160

Surface Measurement (cm)

Max Length:	500
Max perpendicular Width:	425

Top



North



East



South



West



LC-074

Species: *Montastraea cavernosa*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	60
% Old Dead:	60
% Recent Dead:	0
% Disease:	0
% Bleaching:	90
Est. Live Tissue Area (m ²):	4.1
Number of tissue isolates:	11

Planar Measurements (cm)

Max Length:	260
Max perpendicular Width:	210
Height:	150

Surface Measurement (cm)

Max Length:	401
Max perpendicular Width:	350

Top



North



East



South



West



LC-075

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	70
% Old Dead:	69
% Recent Dead:	1
% Disease:	1
% Bleaching:	0
Est. Live Tissue Area (m ²):	3.5
Number of tissue isolates:	18

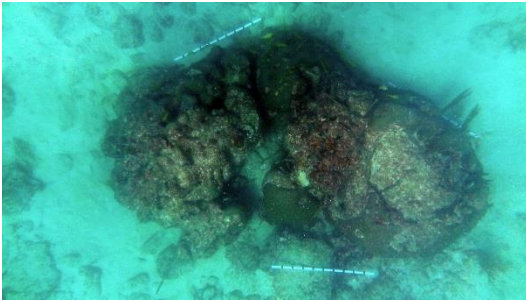
Planar Measurements (cm)

Max Length:	340
Max perpendicular Width:	200
Height:	140

Surface Measurement (cm)

Max Length:	455
Max perpendicular Width:	290

Top



North



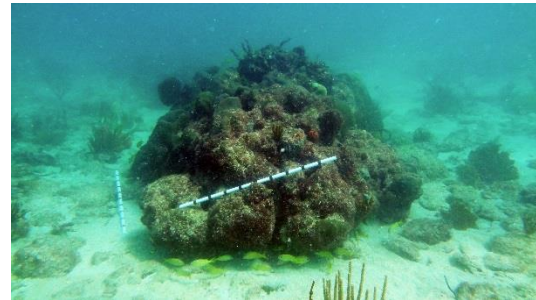
East



South



West



LC-076

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	80
% Old Dead:	80
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	2.7
Number of tissue isolates:	21

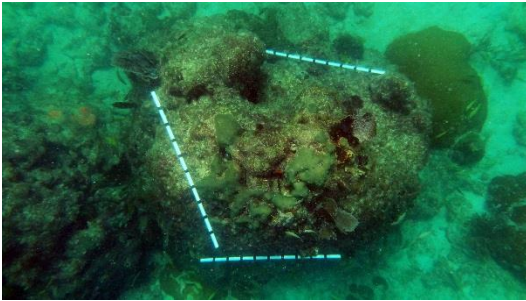
Planar Measurements (cm)

Max Length:	250
Max perpendicular Width:	210
Height:	215

Surface Measurement (cm)

Max Length:	450
Max perpendicular Width:	445

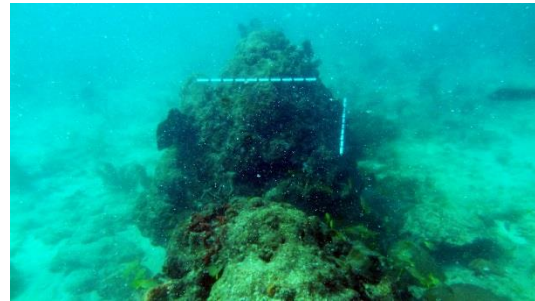
Top



North



East



South



West



LC-077

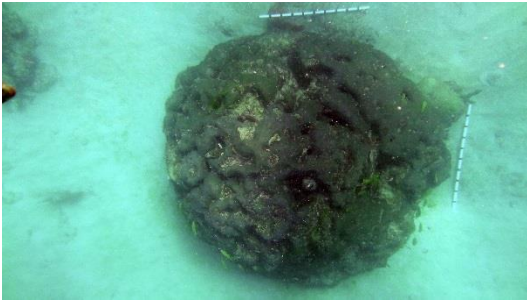
Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	20
% Old Dead:	19
% Recent Dead:	1
% Disease:	1
% Bleaching:	0
Est. Live Tissue Area (m ²):	7.7
Number of tissue isolates:	4

Top



Planar Measurements (cm)

Max Length:	215
Max perpendicular Width:	210
Height:	160

Surface Measurement (cm)

Max Length:	420
Max perpendicular Width:	400

North



East



South



West

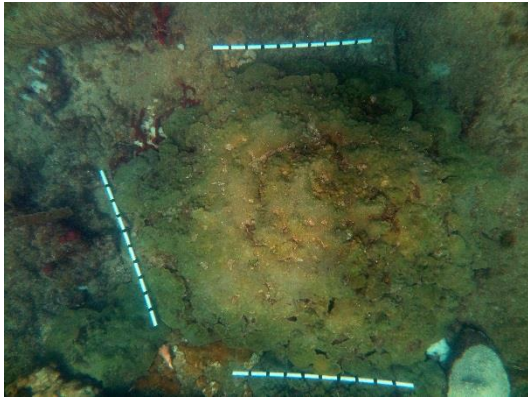


LC-078

Species: *Orbicella faveolata*

Depth: 18 ft (5.5 m)

Top



North



South



Condition Data

% Total Mortality:	10
% Old Dead:	10
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	4.8
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	215
Max perpendicular Width:	180
Height:	80

Surface Measurement (cm)

Max Length:	275
Max perpendicular Width:	250

East



West



LC-079

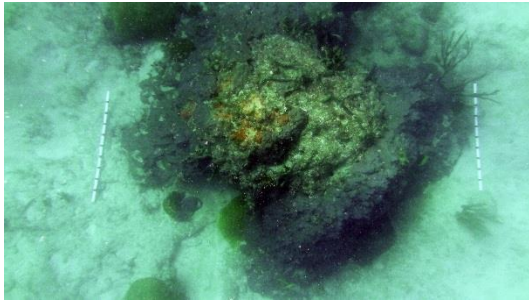
Species: *Orbicella faveolata*

Depth: 21 ft (6.4 m)

Condition Data

% Total Mortality:	40
% Old Dead:	40
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	8.3
Number of tissue isolates:	9

Top



Planar Measurements (cm)

Max Length:	320
Max perpendicular Width:	310
Height:	130

Surface Measurement (cm)

Max Length:	400
Max perpendicular Width:	390

North



East



South



West



LC-080

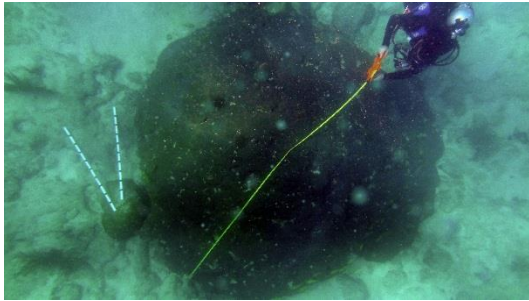
Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	2
% Old Dead:	1
% Recent Dead:	1
% Disease:	1
% Bleaching:	0
Est. Live Tissue Area (m ²):	15.4
Number of tissue isolates:	1

Top



Planar Measurements (cm)

Max Length:	360
Max perpendicular Width:	310
Height:	140

Surface Measurement (cm)

Max Length:	460
Max perpendicular Width:	440

North



East



South



West



LC-081

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	99
% Old Dead:	99
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	0.1
Number of tissue isolates:	6

Planar Measurements (cm)

Max Length:	250
Max perpendicular Width:	225
Height:	140

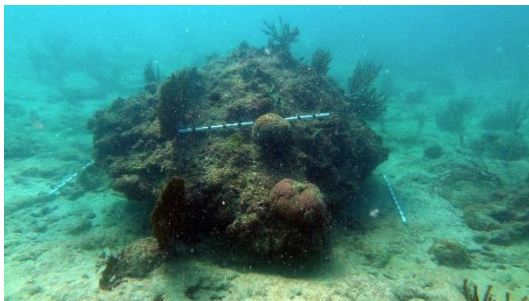
Surface Measurement (cm)

Max Length:	325
Max perpendicular Width:	320

Top



North



East



South



West



LC-082

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	90
% Old Dead:	80
% Recent Dead:	10
% Disease:	10
% Bleaching:	0
Est. Live Tissue Area (m ²):	1.8
Number of tissue isolates:	24

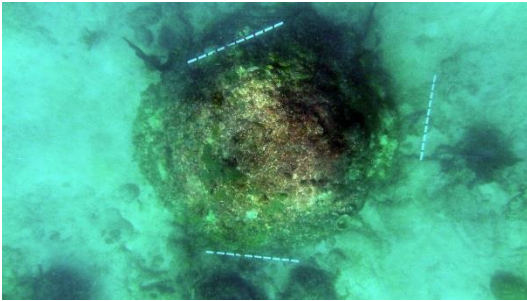
Planar Measurements (cm)

Max Length:	320
Max perpendicular Width:	290
Height:	200

Surface Measurement (cm)

Max Length:	470
Max perpendicular Width:	460

Top



North



East



South



West

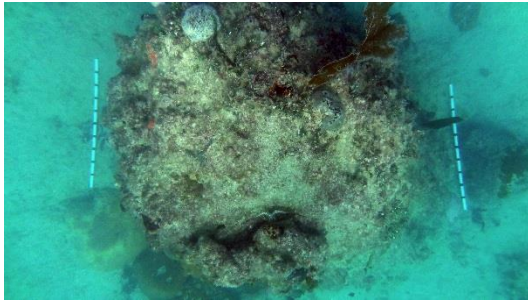


LC-083

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Top



North



South



Condition Data

% Total Mortality:	90
% Old Dead:	90
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	1.1
Number of tissue isolates:	3

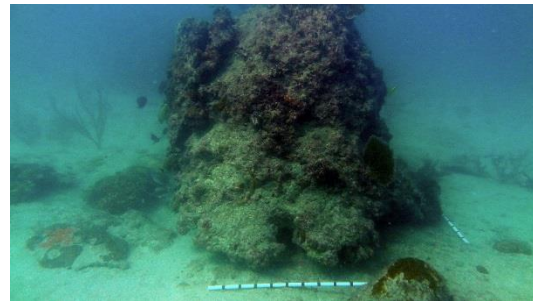
Planar Measurements (cm)

Max Length:	240
Max perpendicular Width:	200
Height:	190

Surface Measurement (cm)

Max Length:	490
Max perpendicular Width:	470

East



West



LC-084

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	60
% Old Dead:	60
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	8.1
Number of tissue isolates:	17

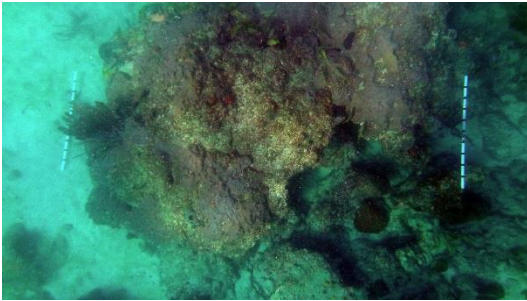
Planar Measurements (cm)

Max Length:	460
Max perpendicular Width:	280
Height:	170

Surface Measurement (cm)

Max Length:	530
Max perpendicular Width:	430

Top



North



East



South



West



LC-085

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	50
% Old Dead:	50
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	8.0
Number of tissue isolates:	4

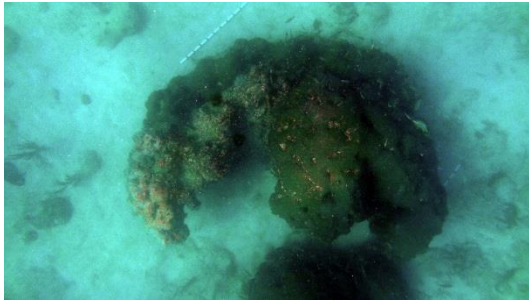
Planar Measurements (cm)

Max Length:	350
Max perpendicular Width:	250
Height:	180

Surface Measurement (cm)

Max Length:	490
Max perpendicular Width:	440

Top



North



East



South



West



LC-086

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	80
% Old Dead:	80
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	2.1
Number of tissue isolates:	1

Top



Planar Measurements (cm)

Max Length:	240
Max perpendicular Width:	220
Height:	160

Surface Measurement (cm)

Max Length:	440
Max perpendicular Width:	390

North



East



South



West



LC-087

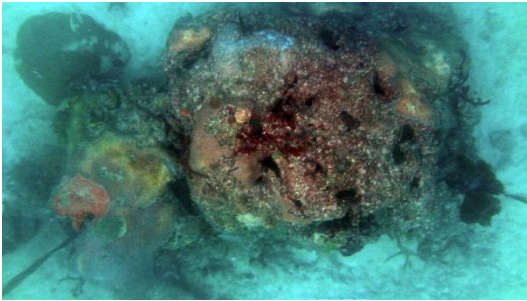
Species: *Montastraea cavernosa*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	75
% Old Dead:	70
% Recent Dead:	5
% Disease:	10
% Bleaching:	0, 20% Pale
Est. Live Tissue Area (m ²):	2.7
Number of tissue isolates:	16

Top



Planar Measurements (cm)

Max Length:	310
Max perpendicular Width:	200
Height:	140

Surface Measurement (cm)

Max Length:	450
Max perpendicular Width:	380

North



East



South



West



LC-088

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	50
% Old Dead:	50
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	3.5
Number of tissue isolates:	6

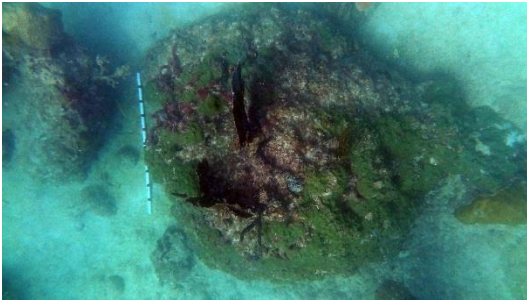
Planar Measurements (cm)

Max Length:	230
Max perpendicular Width:	200
Height:	100

Surface Measurement (cm)

Max Length:	295
Max perpendicular Width:	275

Top



North



East



South



West



LC-089

Species: *Montastraea cavernosa*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	75
% Old Dead:	60
% Recent Dead:	15
% Disease:	0
% Bleaching:	0, 10% Pale
Est. Live Tissue Area (m ²):	2.1
Number of tissue isolates:	8

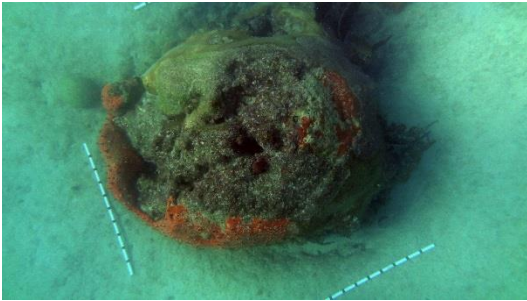
Planar Measurements (cm)

Max Length:	210
Max perpendicular Width:	200
Height:	140

Surface Measurement (cm)

Max Length:	365
Max perpendicular Width:	360

Top



North



East



South



West



LC-090

Species: *Montastraea cavernosa*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	40
% Old Dead:	30
% Recent Dead:	10
% Disease:	0
% Bleaching:	30
Est. Live Tissue Area (m ²):	3.7
Number of tissue isolates:	1

Top



Planar Measurements (cm)

Max Length:	290
Max perpendicular Width:	110
Height:	100

Surface Measurement (cm)

Max Length:	360
Max perpendicular Width:	240

North



East



South



West



LC-091

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	95
% Old Dead:	95
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	0.6
Number of tissue isolates:	4

Top



Planar Measurements (cm)

Max Length:	290
Max perpendicular Width:	290
Height:	110

Surface Measurement (cm)

Max Length:	380
Max perpendicular Width:	360

North



East



South



West



LC-092

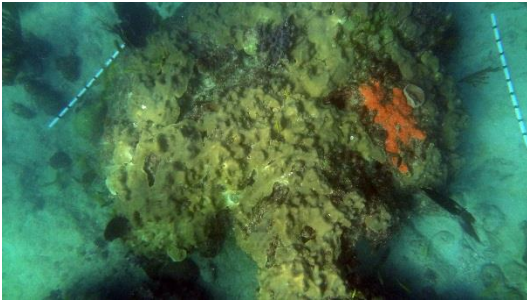
Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	30
% Old Dead:	20
% Recent Dead:	10
% Disease:	0
% Bleaching:	5
Est. Live Tissue Area (m ²):	7.1
Number of tissue isolates:	7

Top



Planar Measurements (cm)

Max Length:	270
Max perpendicular Width:	250
Height:	120

Surface Measurement (cm)

Max Length:	390
Max perpendicular Width:	375

North



East



South



West



LC-093

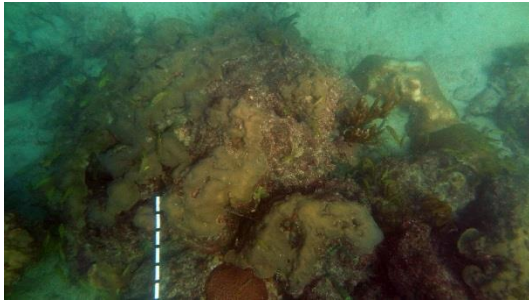
Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	50
% Old Dead:	50
% Recent Dead:	0
% Disease:	0
% Bleaching:	5
Est. Live Tissue Area (m ²):	10.1
Number of tissue isolates:	21

Top



Planar Measurements (cm)

Max Length:	560
Max perpendicular Width:	300
Height:	120

Surface Measurement (cm)

Max Length:	660
Max perpendicular Width:	400

North



East



South



West



LC-94

Species: *Colpophyllia natans*

Depth: 22 ft (6.7 m)

Condition Data

% Total Mortality:	60
% Old Dead:	10
% Recent Dead:	50
% Disease:	40
% Bleaching:	0
Est. Live Tissue Area (m ²):	1.5
Number of tissue isolates:	1

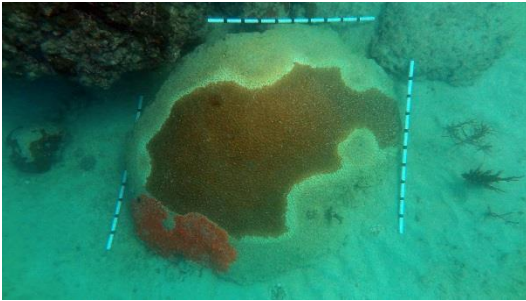
Planar Measurements (cm)

Max Length:	180
Max perpendicular Width:	140
Height:	75

Surface Measurement (cm)

Max Length:	220
Max perpendicular Width:	165

Top



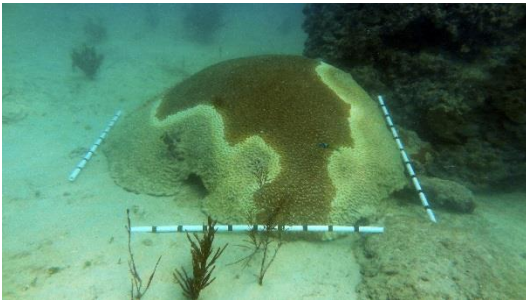
North



East



South



West



LC-095

Species: *Siderastrea siderea*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	65
% Old Dead:	65
% Recent Dead:	0
% Disease:	<1
% Bleaching:	0
Est. Live Tissue Area (m ²):	4.1
Number of tissue isolates:	9

Planar Measurements (cm)

Max Length:	290
Max perpendicular Width:	270
Height:	130

Surface Measurement (cm)

Max Length:	400
Max perpendicular Width:	375

Top



North



East



South



West



LC-096

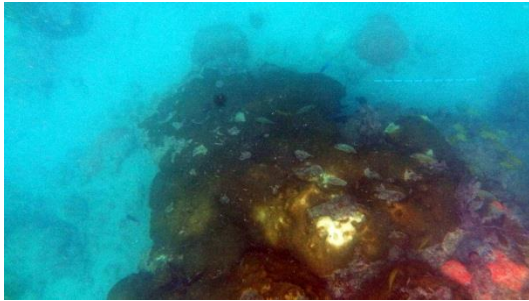
Species: *Orbicella faveolata*

Depth: 21 ft (6.4 m)

Condition Data

% Total Mortality:	30
% Old Dead:	20
% Recent Dead:	10
% Disease:	1
% Bleaching:	1
Est. Live Tissue Area (m ²):	32.4
Number of tissue isolates:	17

Top



Planar Measurements (cm)

Max Length:	560
Max perpendicular Width:	510
Height:	280

Surface Measurement (cm)

Max Length:	720
Max perpendicular Width:	690

North



East



South



West



LC-097

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	60
% Old Dead:	59
% Recent Dead:	1
% Disease:	1
% Bleaching:	0
Est. Live Tissue Area (m ²):	6.0
Number of tissue isolates:	28

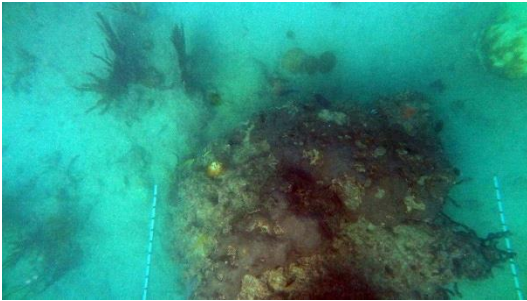
Planar Measurements (cm)

Max Length:	245
Max perpendicular Width:	225
Height:	240

Surface Measurement (cm)

Max Length:	535
Max perpendicular Width:	530

Top



North



East



South



West



LC-098

Species: *Montastraea cavernosa*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	10
% Old Dead:	5
% Recent Dead:	5
% Disease:	0
% Bleaching:	50% Pale
Est. Live Tissue Area (m ²):	5.0
Number of tissue isolates:	1

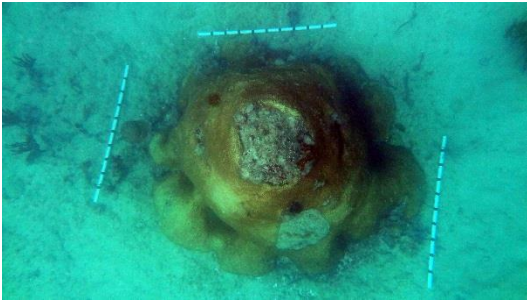
Planar Measurements (cm)

Max Length:	180
Max perpendicular Width:	165
Height:	110

Surface Measurement (cm)

Max Length:	285
Max perpendicular Width:	280

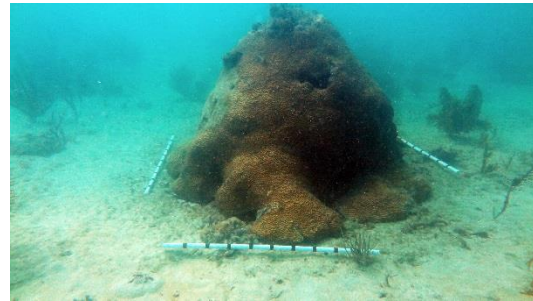
Top



North



East



South



West



LC-099

Species: *Montastraea cavernosa*

Depth: 21 ft (6.4 m)

Condition Data

% Total Mortality:	90
% Old Dead:	85
% Recent Dead:	5
% Disease:	0
% Bleaching:	5
Est. Live Tissue Area (m ²):	0.5
Number of tissue isolates:	8

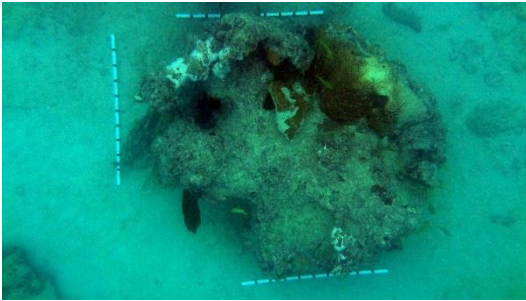
Planar Measurements (cm)

Max Length:	185
Max perpendicular Width:	165
Height:	90

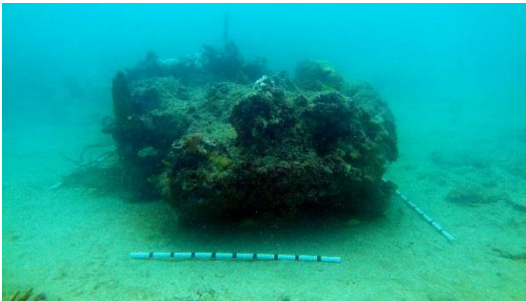
Surface Measurement (cm)

Max Length:	300
Max perpendicular Width:	260

Top



North



East



South



West



LC-100

Species: *Orbicella faveolata*

Depth: 21 ft (6.4 m)

Condition Data

% Total Mortality:	80
% Old Dead:	80
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	1.8
Number of tissue isolates:	46

Planar Measurements (cm)

Max Length:	220
Max perpendicular Width:	195
Height:	150

Surface Measurement (cm)

Max Length:	350
Max perpendicular Width:	300

Top



North



East



South



West



LC-101

Species: *Orbicella faveolata*

Depth: 21 ft (6.4 m)

Condition Data

% Total Mortality:	30
% Old Dead:	25
% Recent Dead:	5
% Disease:	5
% Bleaching:	0
Est. Live Tissue Area (m ²):	7.7
Number of tissue isolates:	16

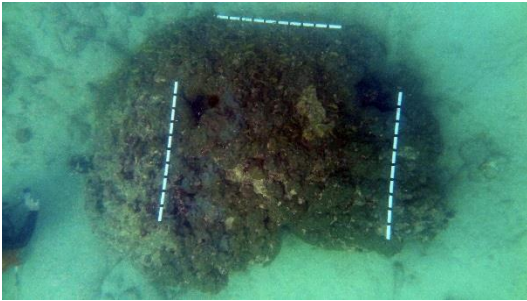
Planar Measurements (cm)

Max Length:	295
Max perpendicular Width:	240
Height:	130

Surface Measurement (cm)

Max Length:	400
Max perpendicular Width:	320

Top



North



East



South



West

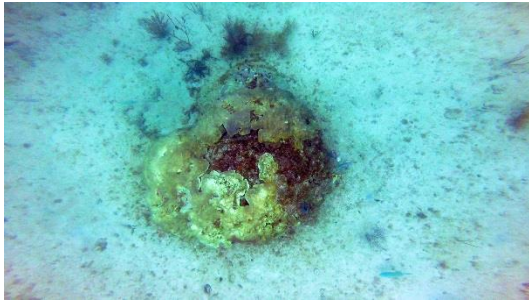


LC-102

Species: *Orbicella faveolata*

Depth: 21 ft (6.4 m)

Top



North

N/A

South

N/A

Condition Data

% Total Mortality:	30
% Old Dead:	30
% Recent Dead:	0
% Disease:	0
% Bleaching:	10% Pale
Est. Live Tissue Area (m ²):	N/A
Number of tissue isolates:	N/A

Planar Measurements (cm)

Max Length:	N/A
Max perpendicular Width:	N/A
Height:	N/A

Surface Measurement (cm)

Max Length:	N/A
Max perpendicular Width:	N/A

East

N/A

West

N/A

LC-103

Species: *Orbicella faveolata*

Depth: 22 ft (6.7 m)

Condition Data

% Total Mortality:	20
% Old Dead:	20
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	8.7
Number of tissue isolates:	29

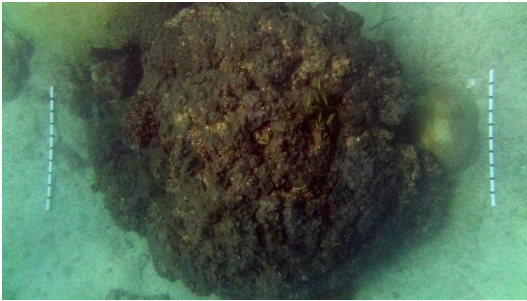
Planar Measurements (cm)

Max Length:	300
Max perpendicular Width:	210
Height:	140

Surface Measurement (cm)

Max Length:	400
Max perpendicular Width:	330

Top



North



East



South



West



LC-104

Species: *Orbicella faveolata*

Depth: 22 ft (6.7 m)

Condition Data

% Total Mortality:	5
% Old Dead:	5
% Recent Dead:	<1
% Disease:	0
% Bleaching:	10
Est. Live Tissue Area (m ²):	5.4
Number of tissue isolates:	1

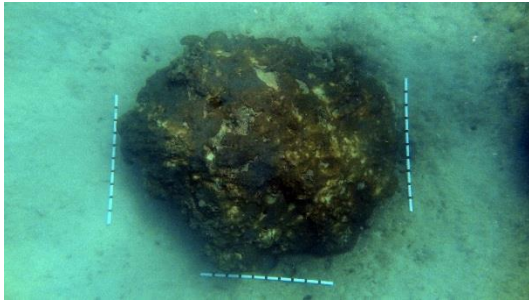
Planar Measurements (cm)

Max Length:	190
Max perpendicular Width:	190
Height:	95

Surface Measurement (cm)

Max Length:	257
Max perpendicular Width:	235

Top



North



East



South



West



LC-105

Species: *Orbicella faveolata*

Depth: 22 ft (6.7 m)

Condition Data

% Total Mortality:	10
% Old Dead:	5
% Recent Dead:	5
% Disease:	<1
% Bleaching:	Pale spots
Est. Live Tissue Area (m ²):	5.3
Number of tissue isolates:	1

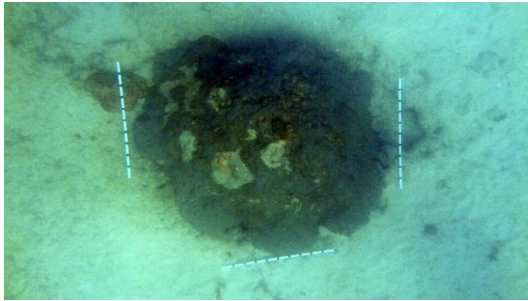
Planar Measurements (cm)

Max Length:	210
Max perpendicular Width:	190
Height:	90

Surface Measurement (cm)

Max Length:	290
Max perpendicular Width:	220

Top



North



East



South



West



LC-106

Species: *Orbicella faveolata*

Depth: 22 ft (6.7 m)

Condition Data

% Total Mortality:	30
% Old Dead:	10
% Recent Dead:	20
% Disease:	<1
% Bleaching:	0
Est. Live Tissue Area (m ²):	3.9
Number of tissue isolates:	9

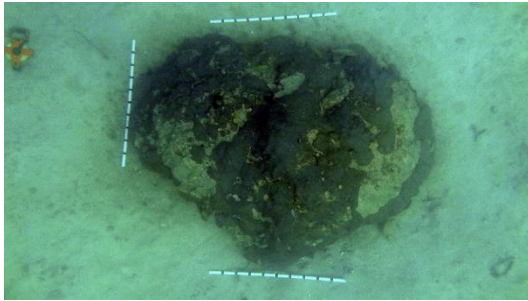
Planar Measurements (cm)

Max Length:	215
Max perpendicular Width:	170
Height:	90

Surface Measurement (cm)

Max Length:	275
Max perpendicular Width:	250

Top



North



East



South



West



LC-107

Species: *Orbicella faveolata*

Depth: 22 ft (6.7 m)

Condition Data

% Total Mortality:	20
% Old Dead:	10
% Recent Dead:	10
% Disease:	<1
% Bleaching:	Pale spots
Est. Live Tissue Area (m ²):	3.8
Number of tissue isolates:	1

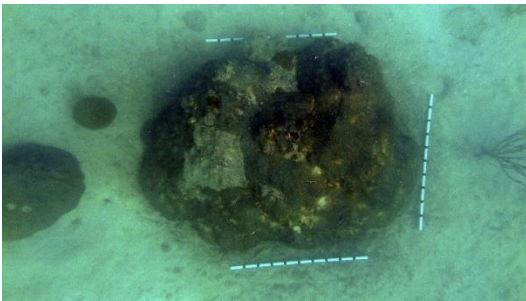
Planar Measurements (cm)

Max Length:	195
Max perpendicular Width:	150
Height:	90

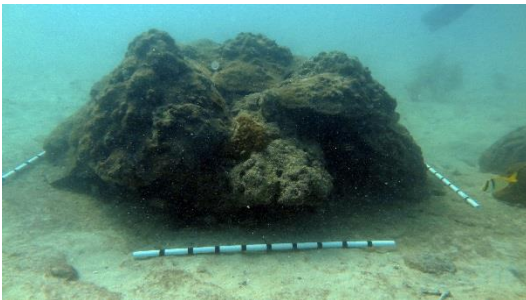
Surface Measurement (cm)

Max Length:	275
Max perpendicular Width:	250

Top



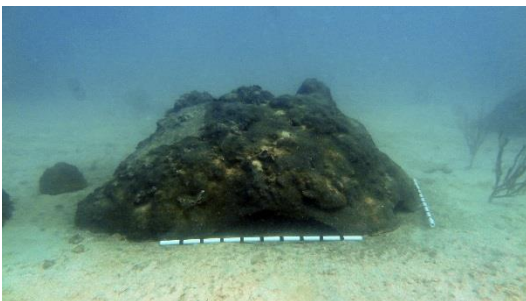
North



East



South



West



LC-108

Species: *Orbicella faveolata*

Depth: 21 ft (6.4 m)

Condition Data

% Total Mortality:	10
% Old Dead:	10
% Recent Dead:	0
% Disease:	0
% Bleaching:	Pale spots
Est. Live Tissue Area (m ²):	4.7
Number of tissue isolates:	1

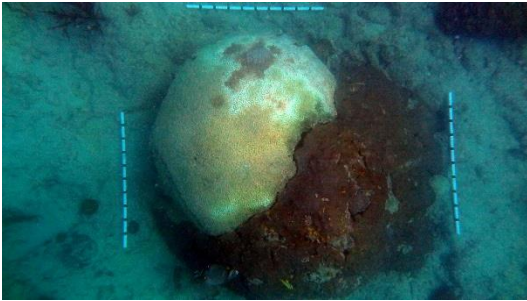
Planar Measurements (cm)

Max Length:	190
Max perpendicular Width:	140
Height:	110

Surface Measurement (cm)

Max Length:	290
Max perpendicular Width:	160

Top



North



East



South

N/A

West



LC-109

Species: *Colpophyllia natans*

Depth: 21 ft (6.4 m)

Condition Data

% Total Mortality:	95
% Old Dead:	0
% Recent Dead:	95
% Disease:	95
% Bleaching:	40
Est. Live Tissue Area (m ²):	0.2
Number of tissue isolates:	1

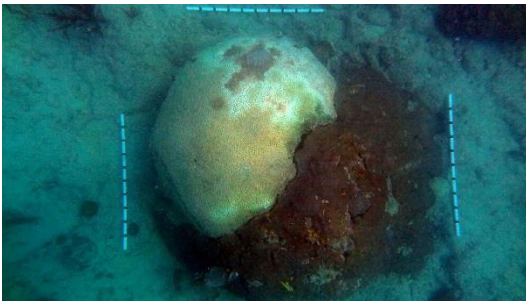
Planar Measurements (cm)

Max Length:	140
Max perpendicular Width:	100
Height:	110

Surface Measurement (cm)

Max Length:	290
Max perpendicular Width:	160

Top



North



East



West



South

N/A

LC-110

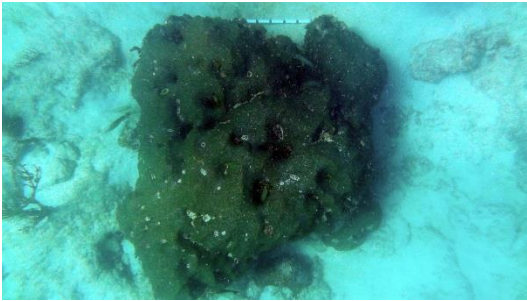
Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	5
% Old Dead:	5
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	5.4
Number of tissue isolates:	1

Top



Planar Measurements (cm)

Max Length:	220
Max perpendicular Width:	170
Height:	90

Surface Measurement (cm)

Max Length:	300
Max perpendicular Width:	260

North



East



South



West



LC-111

Species: *Montastraea cavernosa*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	50
% Old Dead:	50
% Recent Dead:	0
% Disease:	0
% Bleaching:	30% Pale
Est. Live Tissue Area (m ²):	2.9
Number of tissue isolates:	8

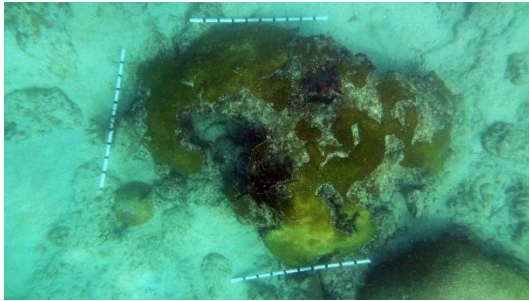
Planar Measurements (cm)

Max Length:	210
Max perpendicular Width:	190
Height:	90

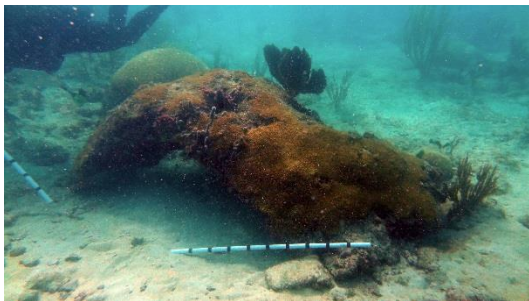
Surface Measurement (cm)

Max Length:	270
Max perpendicular Width:	200

Top



North



East



South



West



LC-112

Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	90
% Old Dead:	90
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	0.9
Number of tissue isolates:	6

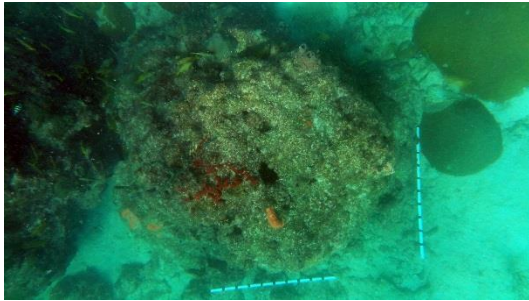
Planar Measurements (cm)

Max Length:	210
Max perpendicular Width:	205
Height:	150

Surface Measurement (cm)

Max Length:	410
Max perpendicular Width:	355

Top



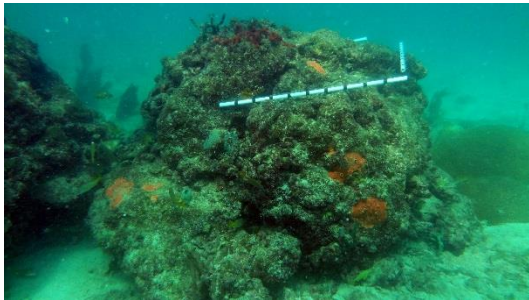
North



East



South



West



LC-113

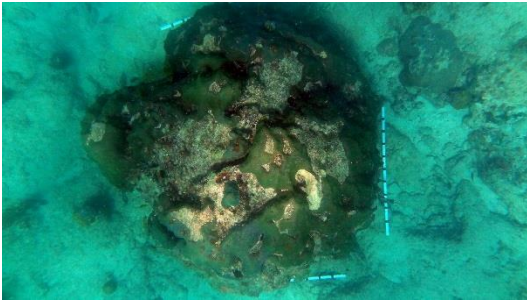
Species: *Orbicella faveolata*

Depth: 20 ft (6.1 m)

Condition Data

% Total Mortality:	40
% Old Dead:	39
% Recent Dead:	1
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	5.5
Number of tissue isolates:	4

Top



Planar Measurements (cm)

Max Length:	200
Max perpendicular Width:	190
Height:	170

Surface Measurement (cm)

Max Length:	380
Max perpendicular Width:	360

North



East



South



West



LC-114

Species: *Orbicella faveolata*

Depth: 19 ft (5.8 m)

Condition Data

% Total Mortality:	20
% Old Dead:	20
% Recent Dead:	0
% Disease:	0
% Bleaching:	0
Est. Live Tissue Area (m ²):	4.6
Number of tissue isolates:	1

Planar Measurements (cm)

Max Length:	195
Max perpendicular Width:	180
Height:	100

Surface Measurement (cm)

Max Length:	260
Max perpendicular Width:	188

Top



North



East



South



West



APPENDIX 2. 2014 Live Large Coral Reconnaissance Photographs.

LC-001

October 31st, 2014



LC-002

October 31st, 2014



LC-003

October 31st, 2014



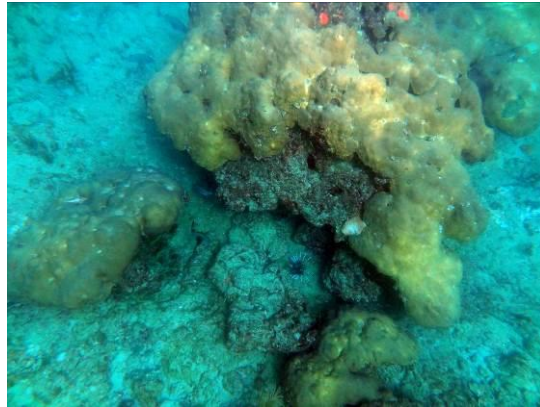
LC-004A

October 31st, 2014



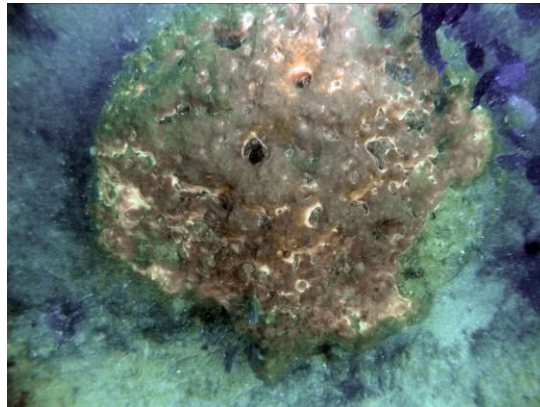
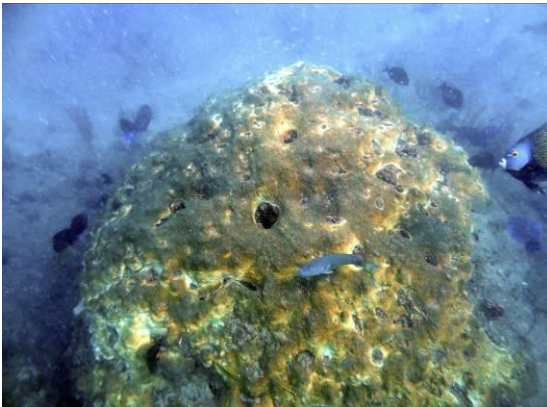
LC-004B

October 31st, 2014



LC-005

November 11th, 2014



LC-006

October 31st, 2014



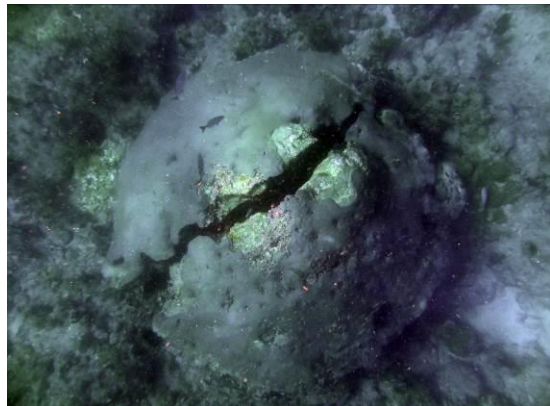
LC-007

October 31st, 2014



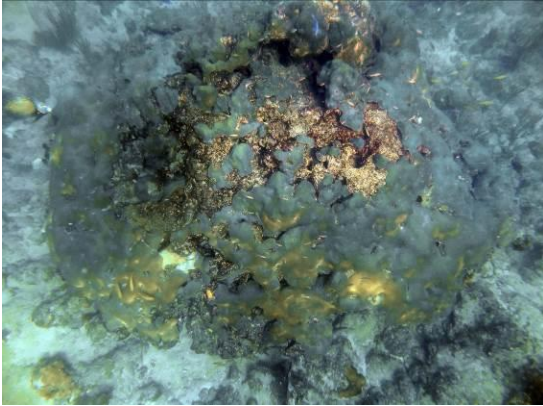
LC-008

October 31st, 2014



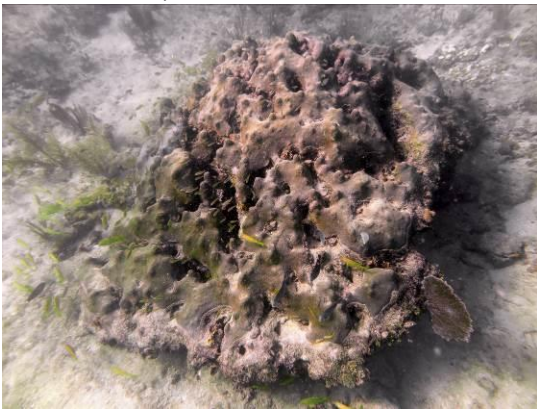
LC-009

October 31st, 2014



LC-010

October 31st, 2014



LC-011

October 31st, 2014



LC-012

June 12th, 2014



LC-013

June 12th, 2014



LC-014

June 12th, 2014



LC-015

June 12th, 2014



LC-016

October 17th, 2014



LC-017

October 17th, 2014



LC-018

October 17th, 2014



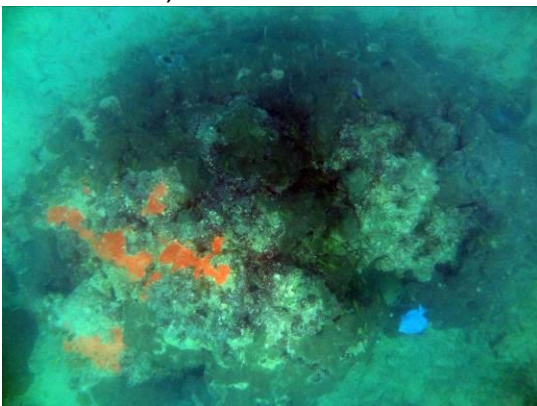
LC-020

October 17th, 2014



LC-021

October 17th, 2014



LC-022

October 17th, 2014



LC-023

October 17th, 2014



LC-024

October 17th, 2014



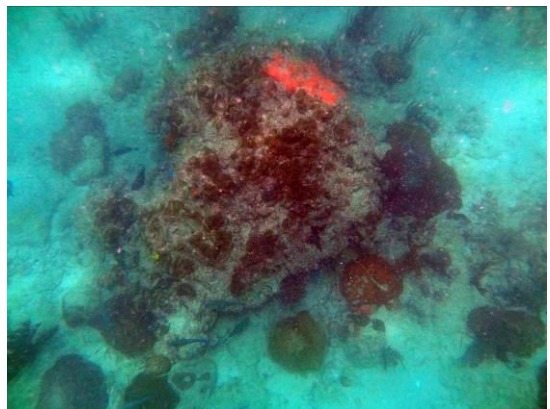
LC-025

October 17th, 2014



LC-026

June 9th, 2014



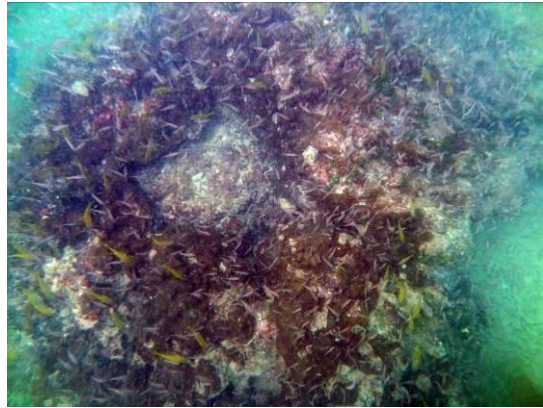
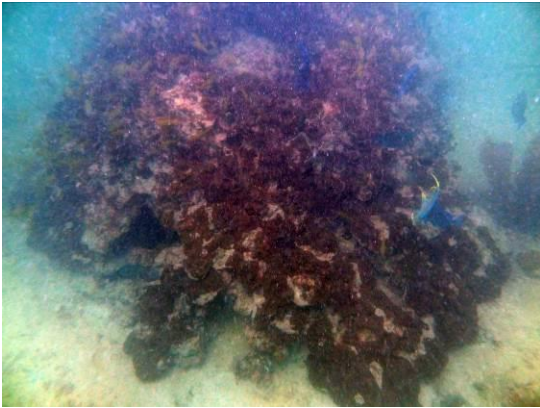
LC-027

June 9th, 2014



LC-028

June 9th, 2014



LC-029

October 17th, 2014



LC-030

June 12th, 2014



LC-031

October 17th, 2014



LC-032

October 17th, 2014



LC-033

October 17th, 2014



LC-035

October 17th, 2014



LC-036

October 17th, 2014



LC-037

October 17th, 2014



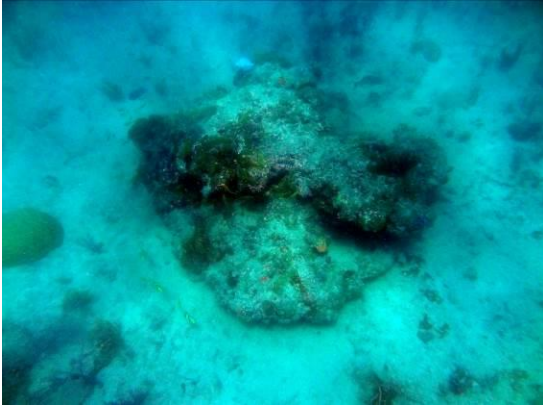
LC-038

June 12th, 2014



LC-039

June 12th, 2014



LC-040

June 9th, 2014



LC-058

October 31st, 2014

