2016 REEF WATCH

HISCOX

Executive Summary

Bermuda's coral reefs encircle our island like an undersea castle, protecting our island from storms. Bermuda's reefs produce the limestone sand that forms the island, take 97% of the energy from oncoming waves, provide a venue for touring and recreational activities, produce many kinds of food and attract overseas scientists and students. As Caribbean islands struggle to limit the deterioration and collapse of their reefs and fisheries, it is critical that we in Bermuda both monitor the ecological condition of our coral reefs and fish stocks, and actively manage the effects of many local and global impacts that can harm reef and fish health.

With major support by Hiscox Bermuda Ltd, 28 teams of trained citizen scientists signed up to survey 56 coral reefs located across the entire Bermuda lagoon in the summer of 2016. While inclement weather conditions postponed the efforts of this citizen science flotilla on Reef Watch Day 2016, all teams learned about the ecology of Bermuda's marine environment, and raised support for the BZS Reef Watch Project. Over the next two months, 12 teams successfully surveyed their 23 chosen reefs. Information was collected on reef environ-mental conditions, the status of fish population and on the condition of sessile and mobile reef organisms such as hard and soft corals, marine plants, and sea cucumbers. By surveying these reefs for the fourth time, we can start to build an understanding if and how the condition of the Bermuda reef lagoon changes through time. With this report and online sources of reef monitoring data, such as www.BermudaBREAM.org, BZS Reef Watch provides a public source of information on the condition of our vital coral reef habitats and the fishes they support.

In 2016, Bermuda's reefs showed a decline in reef condition from good to fair. Generally, Bermuda retains high cover of hard corals, low amounts of sea weeds, and high abundances of plant-eating fishes, but all of these important factors appear to be in decline since 2013.

Unfortunately, as the Reef Watch teams also observed every year since 2013, predatory fishes were only seen to be abundant on 5% of the reefs visited. These predatory fish, the groupers and snappers, are important in controlling the numbers of coral-killing damselfish that live on the reef. Over 80% of reefs were seen to have very low to no predators. With few predatory fish present , damselfish were seen to be very abundant on many of the reefs. We found the same pattern of too few predators and too many damselfish in 2013, 2014, and 2015.

Overall the intent of Reef Watch is to teach Bermudian residents how to recognize the signs of healthy and distressed reefs, to learn how to survey reefs and to share their knowledge with the rest of the island and the world. For the fourth year in a row, over 100 citizen scientists took part in Reef Watch, in the class-room and on the water, and we hope that even more will take part next year.

Introduction

Reef Watch was designed to provide local residents of Bermuda with the tools to critically evaluate the condition and threats to Bermuda's coral reefs and lagoonal fish stocks. We provide training, with hands-on-experience in reef surveys, and create a public portal to share information with the broader public, resource managers and policy makers.

The Reef Watch programme addressed these needs by:

1. Training snorkelers and divers in the identification of key species of fishes, corals and other reef invertebrates, assessment methods for coral reefs and associated fishes, taking advantage of unique facilities available at the BAMZ, including its aquarium.
2. Providing knowledge on the range of reef fishes, benthic biota and reef habitats around Bermuda and their separate ecological challenges and value.
3. Providing initiatives/rewards for sampling across a range of reef habitats, so that the citizen scientist becomes intimately aware of the issues facing each reef zone
4. Having a grand day of community action, to develop the network and crystallize the initiative focussed on enhancing our understanding of the health of Bermuda's reef ecosystem.
5. Providing the media-based and online vehicles for citizen-generated data sharing and interpretation, its transmission to policy makers and resource managers, and as a sentinel warning system to detect significant environmental events such as fish die-offs or coral bleaching, so they can be addressed by the Bermuda Government's Department of Environment and Natural Resources.

Past Reports

The Annual Reports for the years 2013, 2014, and 2015 can be viewed at the following websites:

1. www.bzs.org
2. www.bermudareefwatch.org
3. http://bermudabream.org

Methods

Methods Manual

The methodologies used for Reef Watch are available in the Reef Watch methods manual (Murdoch 2014) available at the following web page:
http://www.bermudabream.org/bzs-reef-watch.html

Training Video

In addition, in 2015, BZS developed a training video that supplements the Reef Watch methods manual, and provides a refresher course for those who have already undergone primary training in the classroom in a previous year. The training video can be seen at:
https://vimeo.com/120167911

Site Selection

In 2013, 55 sites were selected for potential assessment by the citizen scientists. Since it seemed likely that more reefs will be needed as the popularity of the project grows through the years, a new set of 100 reefs were selected for the second year of Reef Watch in 2014. These 100 sites were used again in 2015 and 2016 and will be used in future years

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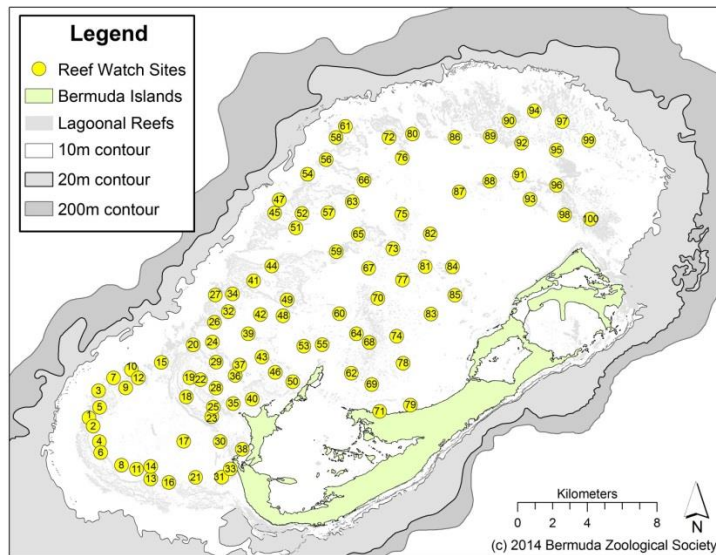
A map of the 100 sites available for selection by BZS Reef Watch survey teams.
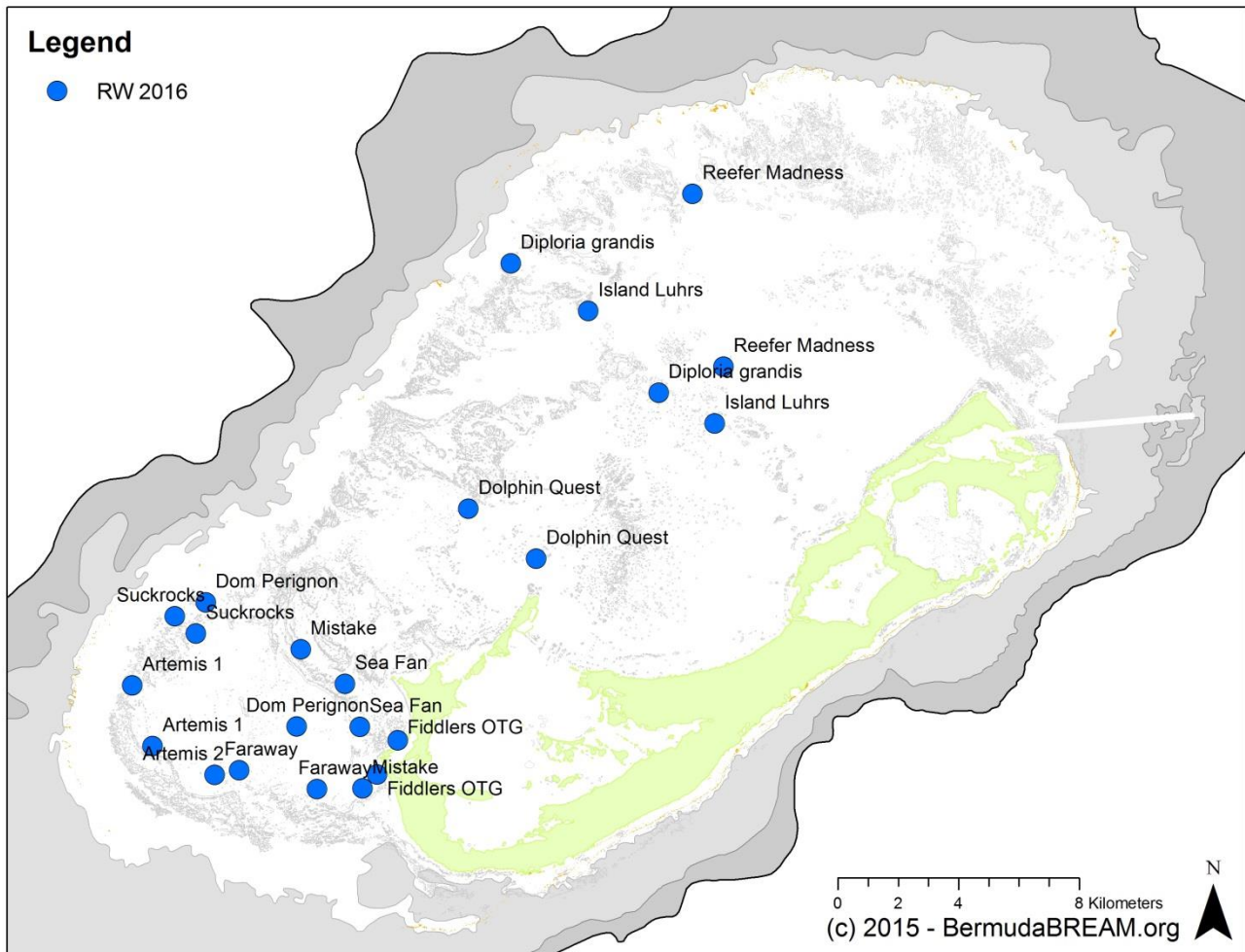
A map of the23 sites surveyed in 2016. Additional sites were selected, but inclement weather prevented many teams from assessing their reefs this year.

Ecosystem Condition   Sea Life Index

Synopsis

The Sea Life Index is a combination of four fundamental indicators of the ecological condition of each reef, derived from the survey results, as described in the table below. The parameters values from each indicator are combined to form the Sea Life Index number that indicates the ecological health of the reef overall. Values for each separate parameter are classified as "Poor", "Fair" or "Good" based on their relative contribution to overall reef condition.

Factor	Poor [1]	Fair [2]	Good [3]
Predator Density	0 - 10	10 - 20	20 +
Herbivore Density	0 - 20	20 - 40	40 +
Hard Coral Cover (%)	0 - 10	10 -30	30 +
Sea Weed Cover (%)	50 +	15 - 50	0 - 15

| Factor	Critical	Poor	Fair	Good	Excellent
Sea Life Index	1.0 - 1.5	1.75	2.00	2.25	2.25 – 3.0

Results

The Sea Life Index is derived from the accumul-ated scores of each of the component factors. The Sea Life Index score for the Bermuda lagoon has declined every year since the init-iation of Reef Watch in 2013. Predatory fishes started at critically low levels and have remained as such year after year. Herbivorous fishes declined somewhat in 2014 and 2015 but only reached Fair levels in 2016. Hard Coral cover and Sea Weed cover remained in Excell-ent condition until 2016, when Hard Coral declined to Good condition.

	2013	2014	2015	2016
Reefs Surveyed	35	32	23	23
Predatory Fishes	1.486	1.219	1.217	1.043
Herbivorous Fishes	2.543	2.25	2.304	2.174
Hard Corals	2.629	2.844	2.609	2.304
Sea Weeds	2.657	2.781	2.696	2.478
Sea Life Index	2.329	2.273	2.207	2.000

Trend in Bermuda's Sea Life Index: 2013 to 2016

| 2013 | 2014 | 2015 | 2016 |
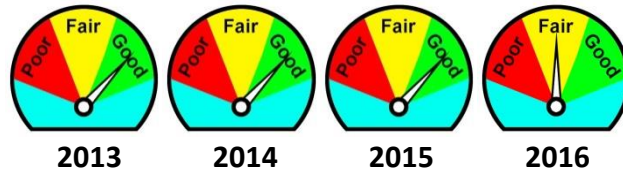
The Sea Life Index was Good until 2015, but then declined to Fair in 2016.
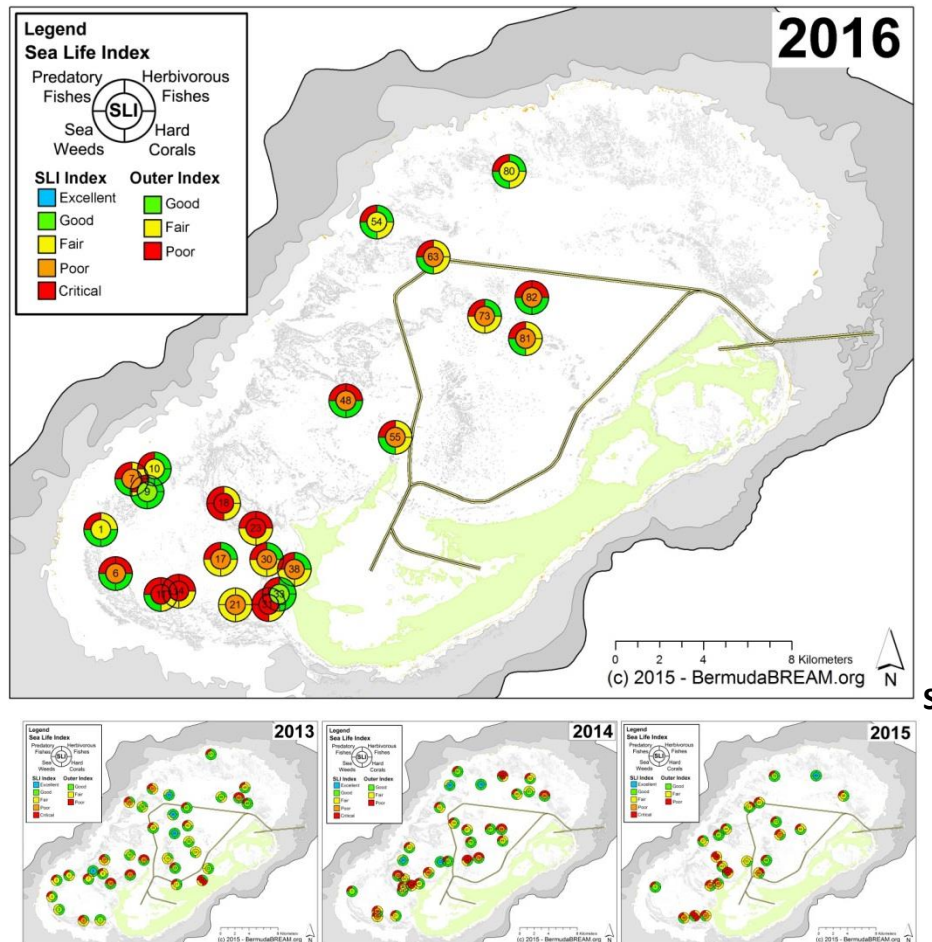
Status of Lagoonal Reefs: 2016

Reefs in Critical and Poor condition were clustered to the west of Sandy's Parish in 2016. However, a reef in good condition was observed within the same area, complicating the interpretation of the results. In the central lagoon, reefs along the outer edge of the lagoon were in generally better condition than reefs located centrally and near the shipping channels. Overall, reef condition was seen to be poorer than in previous years.

Causes of reef decline this year may include the impacts of the ship channel dredging in 2015, as well as coral bleaching due to high summer temperatures in 2016. The abundance of predatory and herbivorous fishes was seen to decline in 2016, as did the coverage of hard corals.

Ecosystem Condition   Sea Life Index

Site	Team	PF	HF	HC	SW	SLI	Status
1	Artemis 1	1	2	3	3	2.25	Good
6	Artemis 1	1	1	3	3	2.00	Fair
7	Suckrocks	1	2	2	3	2.00	Fair
9	Suckrocks	1	3	3	3	2.50	Good
10	Dom Perignon	1	3	3	2	2.25	Good
11	Artemis 2	1	1	2	3	1.75	Poor
14	Faraway	1	1	2	2	1.50	Critical
17	Dom Perignon	1	3	2	2	2.00	Fair
18	Mistake	1	2	2	1	1.50	Critical
21	Faraway	2	2	2	2	2.00	Fair
23	Sea Fan	1	1	2	2	1.50	Critical
30	Sea Fan	1	3	2	2	2.00	Fair
31	Mistake	1	3	2	1	1.75	Poor
33	Fiddlers OTG	1	3	3	3	2.50	Good
38	Fiddlers OTG	1	3	2	2	2.00	Fair
48	Dolphin Quest	1	1	3	3	2.00	Fair
54	Diploria grandis	1	3	2	3	2.25	Good
55	Dolphin Quest	1	2	2	3	2.00	Fair
63	Island Luhrs	1	2	2	3	2.00	Fair
73	Diploria grandis	1	3	2	2	2.00	Fair
80	Reefer Madness	1	3	2	3	2.25	Good
81	Island Luhrs	1	2	2	3	2.00	Fair
82	Reefer Madness	1	1	3	3	2.00	Fair

By tabulating the 2016 data, the lack of predatory fishes across all sites is apparent.
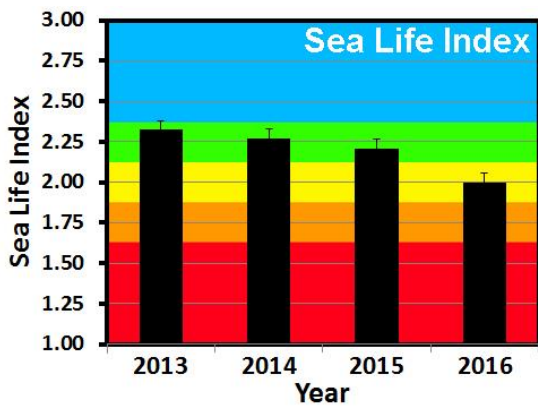
The overall SLI has been decreasing yearly since 2013.
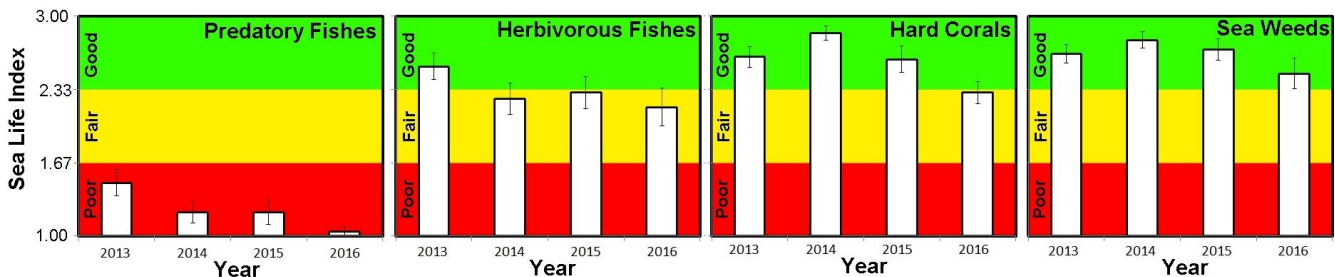
Every category of biota assessed in the SLI has been declining since 2014.

Fish Assemblages   PREDATORY FISHES

Synopsis

- Predatory fishes eat other fishes.
- The predatory fishes counted in Reef Watch are groupers and snappers.
- The grouper category includes predators of two different sizes: the mid-sized red hinds, coneys and graysbys, and the large black grouper and other rockfish.
- Several types of snapper occur in Bermuda, including grey snapper and yellowtail snapper.
- The snappers and mid-sized groupers are especially important as they eat damselfish, which are small fish that kill hard corals.
- Large groupers are also important as they feed on parrotfishes, keeping parrotfish populations healthy by removing sick fish from the reef.

Assessment

Fishes were counted by roving snorkelling citizen scientists across the entire expanse of each patch reef. Surveys were timed to take 30 minutes. Fish were counted according to each category.

Sea Life Index for Predatory Fishes

Good: $\geq$ 20 fish per reef
Healthy coral reefs generally have more than 20 predatory fish in a 2000-m^2 area.

Fair: 10 to 20 fish per reef

Poor: < 10 fish per reef
Reefs with less than 10 predatory fish will likely be overrun by damselfish, leading to a decline in overall reef health through time.

Seeing fishes like snappers add excitement to any day on or under the water.

The Predatory Fishes category includse: A. Snappers; B. mid-sized and; C. large groupers.

Trend in the Abundance of Predatory Fishes: 2013 to 2016

2013   **2014**   **2015**   **2016**

The Sea Life Index for Predatory Fishes has been consistently Poor from 2013 through to 2016.
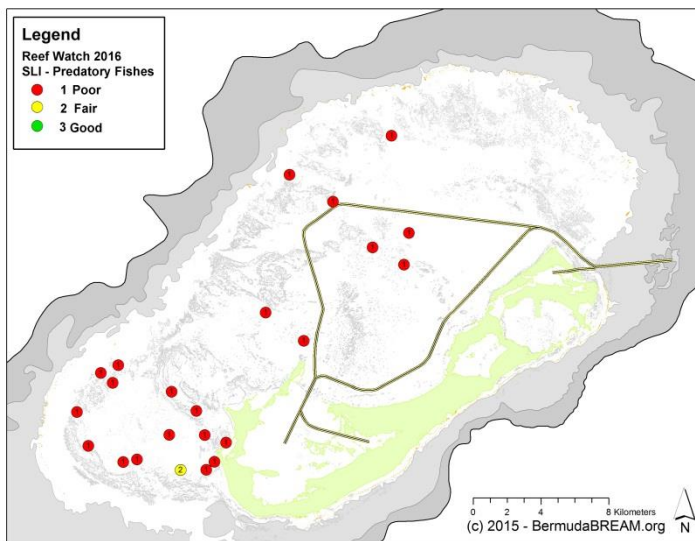
Regional Pattern of Predatory Fish Abundance: 2016

Predatory fishes were observed to be in low abundance in 2016 across all sites. This is in stark contrast to previous years in which at least a minority of locations were found to have fair densities of predatory fishes, particularly within the central lagoon

Changes in the Community Structure of the Predatory Fishes since 2013

By graphing the abundance of groupers and snappers, as well as all Predatory Fishes as a group, we can examine how each component group of fishes is changing relative to overall changes of abundance. Groupers were less abundant than snappers every year. Groupers were observed to be in very low abundance, at ~1 fish per reef on average, in years 2014 through 2016. Snappers were observed to average ~5 fish per reef in 2013 and 2014, but declined in 2015 and again in 2016, down to an average abundance of just over 2 fish per reef.

Fish Assemblages
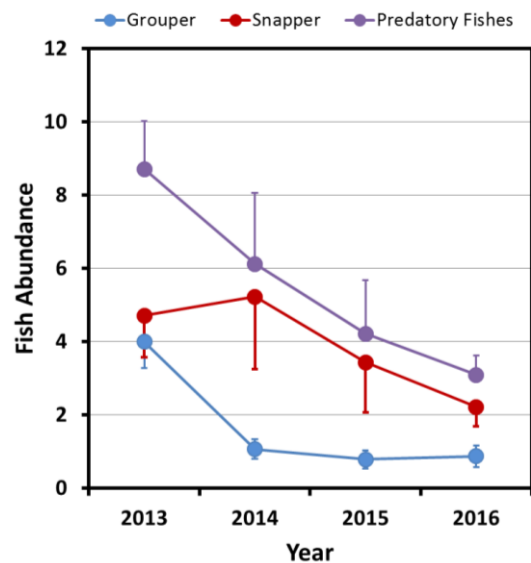
HERBIVOROUS FISHES

Synopsis

- Herbivorous fishes eat marine plants
- Fishes belonging to the Parrotfish, Doctorfish and the Silvery categories all belong in the Herbivorous Fishes group.
- Parrotfishes are represented by XXX species from two genera, and range from small to large.
- Surgeonfishes in Bermuda are represented by three species. All are mid-sized with an oval body shape.
- Silvery fish on reefs include Bermuda Bream, an endemic species, and Chub, which are represented by four very similar looking species.
- Plant-eating corals benefit hard corals by removing sea weeds that would otherwise take up space on the reef or overgrow corals directly.

Assessment

Fishes were counted by roving snorkelling citizen scientists across the entire expanse of each patch reef. Surveys were timed to take 30 minutes. Fish were counted per each category.

Sea Life Index for Herbivorous Fishes

Good: $\geq$ 40 fish per reef

We classified reefs with over 40 herbivorous fish of any of the three categories as in good health. Reefs with 15% to 50% sea weed cover can be kept in fair shape or even cleared of sea weed to below 15% cover if the number of herbivorous fishes is high.

Fair: 20 to 40 fish

Reefs with 20 – 40 herbivorous fish probably are being grazed at a moderate level, and are being keep in fair condition.

Poor: < 20 fish

Reefs with very low numbers of herbivorous fishes probably suffer some form of short-term or long-term disturbance. High levels of sediment in the water column and on reefs, boat groundings, pollution or low current flow rates often result in low densities of herbivorous fishes.

Herbivorous fishes are colourful and exciting members of the coral reef community.

Parrotfish, surgeonfish and silvery fish like bream all eat sea weeds on reefs.

Fish Assemblages   HERBIVOROUS FISHES

Trend in the Abundance of Herbivorous Fishes: 2013 to 2016

2013   **2014**   **2015**   **2016**

The Sea Life Index for Herbivorous Fishes was Good in 2013 and then remains Fair through to 2016.
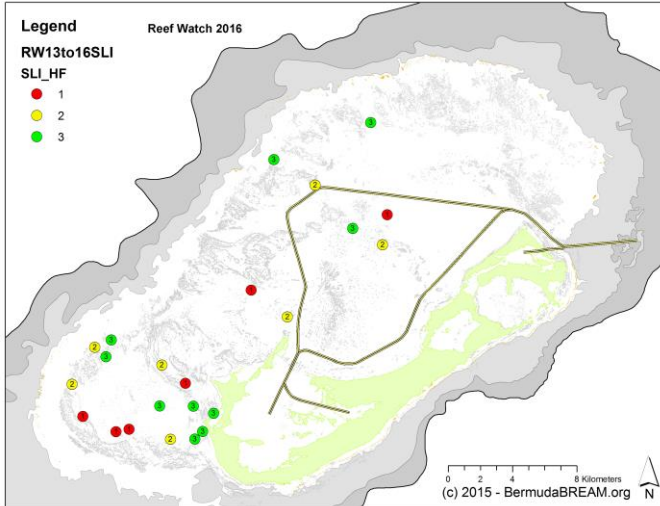
Regional Pattern of Herbivorous Fishes Abundance: 2016

Herbivorous fishes were observed to be most abundant along the outer reef line. A second area of high abundance was seen on the western reefs Sandys Parish. Areas of low abundance were observed on reefs scattered across the lagoon.

Changes in the Community Structure of the Herbivorous Fishes since 2013

By graphing the three component kinds of herbivorous fishes along with the overall abundance of all Herbivorous Fish, we can examine how each group has changed through time.   Generally, each group was found to support ~15 to 20 fish per reef. The exception was in 2013, when an average of over 50 parrotfishes was observed across the lagoon. It may be that 2013 experienced a high level of recruitment of juvenile fish that year, or that a few teams mistakenly used SCUBA and counted more fishes then reverted to snorkel in following years, as the Reef Watch methodology requires.
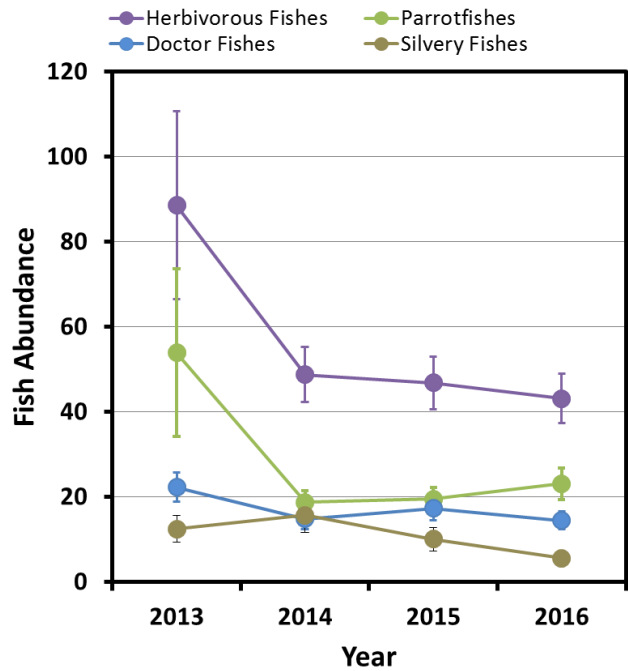
Synopsis

- Reef corals are colonial animals; similar to sea anemones, and contain tiny symbiotic dinoflagellate marine plants within their tissues.
- Reef corals build reefs by secreting a non-living calcium carbonate skeleton under the thin layer of surface tissue that forms the covering of the coral colony.
- Through time the shared contribution of the growth, death and accumulation of many coral colonies can build entire reefs covering many hundreds or thousands of square kilometres.
- Bermuda's current shallow reefs are about 7000 years old.
- Reef growth is sustained by coral growth which is greater than erosion caused by environmental and biological factors.

Assessment

Coral cover is a measure of the proportion of a reef surface that is covered by live stony coral. Citizen scientists estimate the percent cover of three kinds of hard coral within 10 randomly placed hula hoops on each reef.

Sea Life Index for Hard Corals

- **Good: > 30% Cover**

Reefs with over 30% coral cover produce more reef rock than is removed by erosion.

- **Fair: 10 – 30% Cover**

Reefs with 10 – 30% cover will persist, but are not growing any faster than they are eroding.

- **Poor: < 10% Cover**

Reefs with less than 10% coral cover are eroding.

Hard reef corals cover most of the surface on this healthy reef.
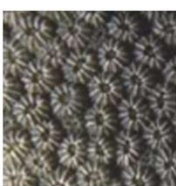
Star Coral   **Brain Coral**   **Finger Coral**

Corals of three different polyp types were assessed separately

Trend in Hard Coral Cover: 2013 to 2016

2013   **2014**   **2015**   **2016**
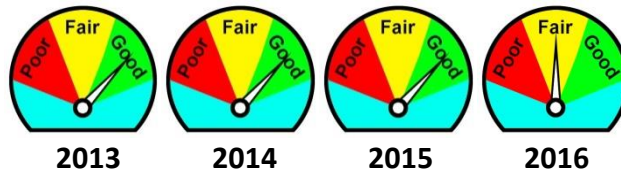
The Sea Life Index for Hard Corals remained Good until 2015, but then declined to Fair in 2016.
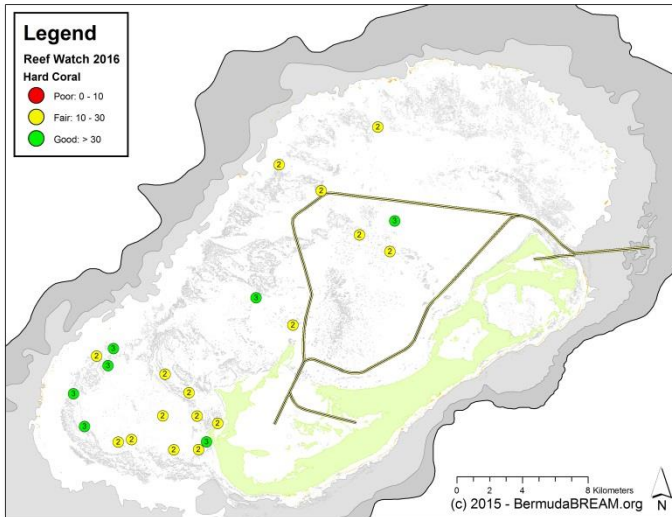
Regional Pattern of Hard Coral Cover: 2016

Hard Corals were observed in **fair** levels of cover across the majority of surveyed reefs in 2016. Good coverage was primarily observed along the seaward reefs located west of Sandys Parish. This is a change for the past three years, in which coral cover was generally observed to be at Good levels across most surveyed reef sites.

Changes in Coral Community Structure

By looking at the component types of hard coral as well as hard corals overall, we can see which kinds of corals declined through time, which may assist in determining the cause of the decline in overall hard coral cover.

Finger corals have declined since 2013. These corals dominate in the central lagoon, so it may be that the change in the distribution of sites surveyed from year to year caused this pattern of apparent change. Star corals were observed to increase from 2013 to 2014, but then declined after that. Brain corals also declined in 2016 but not in previous years. The Star and Brain corals are susceptible to damage from damselfishes, smothering from sediment such as that caused

by shipping traffic or the dredging of reefs, and overgrowth by marine plants as well as black-band and yellow-band disease and bleaching. Disease and bleaching are discussed in a section below.
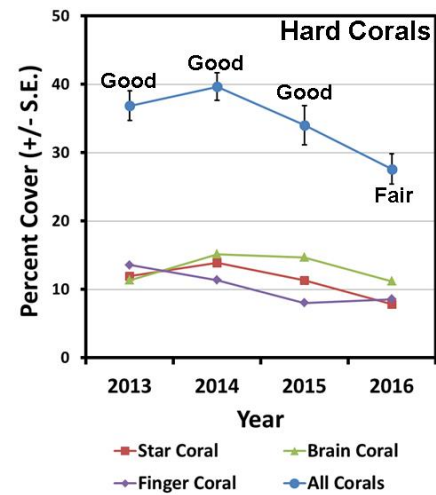
Community Structure   SEA WEEDS

Synopsis

- Sea weeds are marine plants, also called algae.

- Like hard corals, sea weeds also use sunlight to grow on the surface of coral reefs, but they do not produce calcium carbonate skeletons and as a result do not help build reef structure.

- Reef plants also use the same space on the reef that could be used by hard corals, and reef plants can even fight with corals and kill them to take over the space occupied by hard corals.

- For these reasons reefs that possess a high coverage of sea weeds are considered to be in poor health, as they are not capable of growing new reef as the plants are preventing hard corals from growing.

Assessment

Sea weed cover is a measure of the proportion of a reef surface that is covered by fleshy green, red and brown plants. Citizen scientists estimate the percent cover of sea weeds of all colours together as a group within 10 randomly placed hula hoops on each reef.

Sea Life Index for Sea Weeds

Good: < 15% plant cover
The healthiest reefs have very low sea weed cover of less than 15%.
Fair: .15 to 50% plant cover
Reefs with between 15% and 50% sea weed cover generally have enough room remaining for healthy hard coral growth, and are in fair health.
Poor: > 50% plant cover
We classified reefs with more than 50% sea weed cover as poor reefs, as high cover by marine plants inhibits coral settlement, adult coral survival, and promotes reef erosion.
.

There are over 400 different kinds of marine plant in Bermuda,
making them a major contributor to our marine biodiversity**.**

Community Structure   SEA WEEDS

Trend in Hard Coral Cover: 2013 to 2016

2013   2014   2015   2016
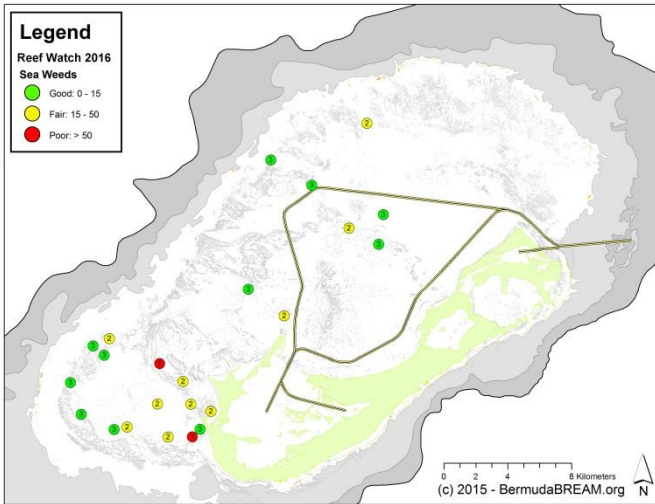
Regional Pattern of Sea Weed Cover: 2016
Sea Weed cover was observed to be at Fair to Good levels within the North Lagoon. The outer edge of the Western Lagoon, west of Sandys Parish, also displayed Good (low) levels of Sea Weeds. A cluster of reef locations close to shore on the western side of Sandy's Parish, however, displayed Fair to Poor levels of Sea Weed Cover.

Change in Sea Weed Cove since 2013
In 2013 the average percent cover of Sea Weeds was just over 10%. Sea Weed cover then declined below 10% in 2014, and remained at around 10% in 2015. These are all considered Good levels for Sea Weeds. However, in 2016 the average cover of Sea Weeds in the lagoon rose to over 15% cover. This changes the lagoonal Sea Life score for Sea Weeds to Fair from Good. An increase in sea weeds may be due do a decline in herbivorous fishes, or due to an increase in nutrients in the water column or to a loss of hard corals that compete for space with sea weeds. Increases in sedimentation from ship traffic or dredging can also cause sea weeds to increase in cover.
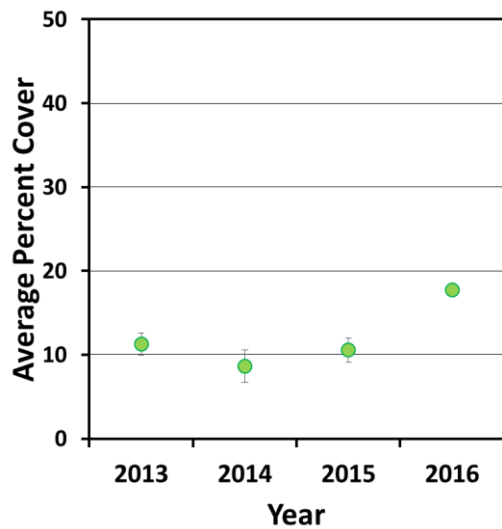
Fish Assemblages   DAMSELFISH

Bermuda supports three species of damselfish. Damselfishes measure < 5" and eat primarily seaweeds. Damselfish maintain "lawns" of specific seaweeds (algae) within territorial farms. In creating their farms, damselfish often damage and kill hard coral by taking bites from the living tissue and creating bare skeleton that is colonized by algae. Damselfish aggressively defend their farms, which makes them easy prey for small predatory groupers and snappers. Patch reefs with high numbers damselfish often have unhealthy hard corals.
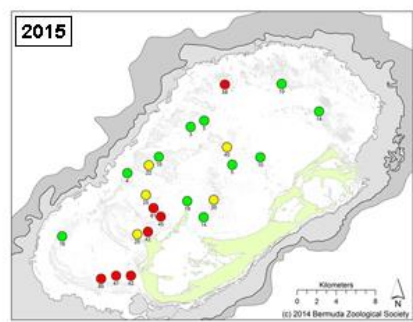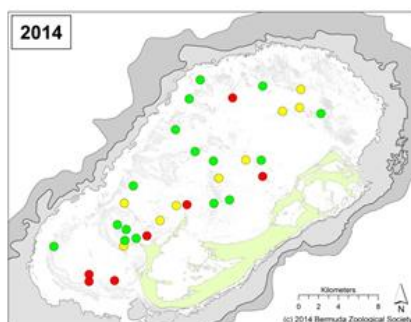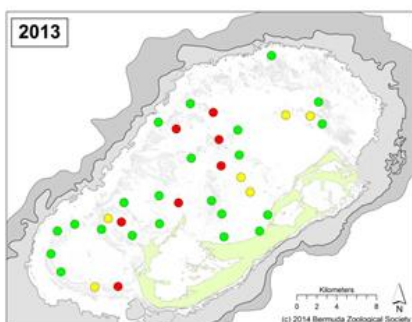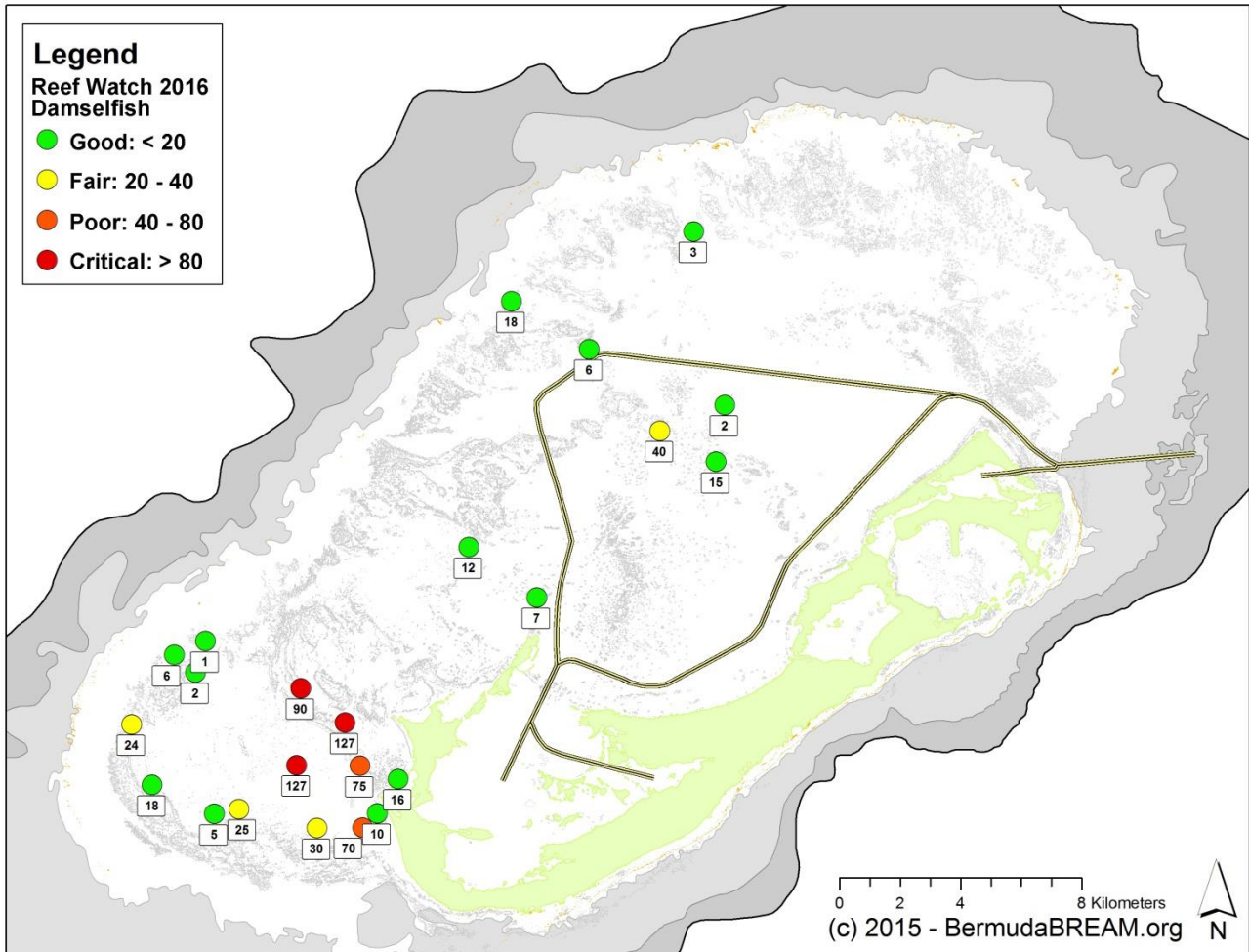
Damselfishes were observed in critically high densities in the area west of Ely's Harbour in 2016. Most other sites across the outer edge of the Western Lagoon and North Lagoon, alternately, were found to have Fair (< 40) or Good (< 20) damselfish per reef. The areas west and north of Sandy's Parish have been seen to have high densities of damselfishes since 2013. As we have stated every year since 2013, critically low levels of Predatory Fishes is a primary cause of high densities of damselfishes, as mid-sized predatory fishes including snappers, coneys, hinds and graysbys all hunt damselfishes on patch reefs.
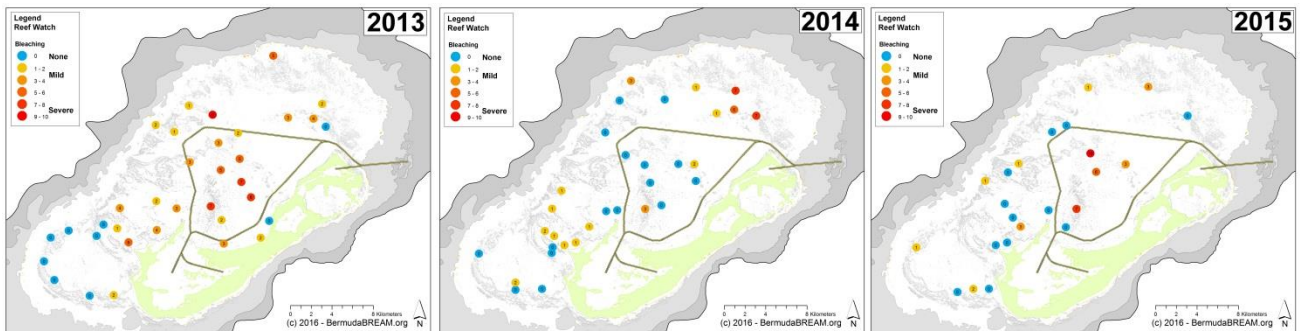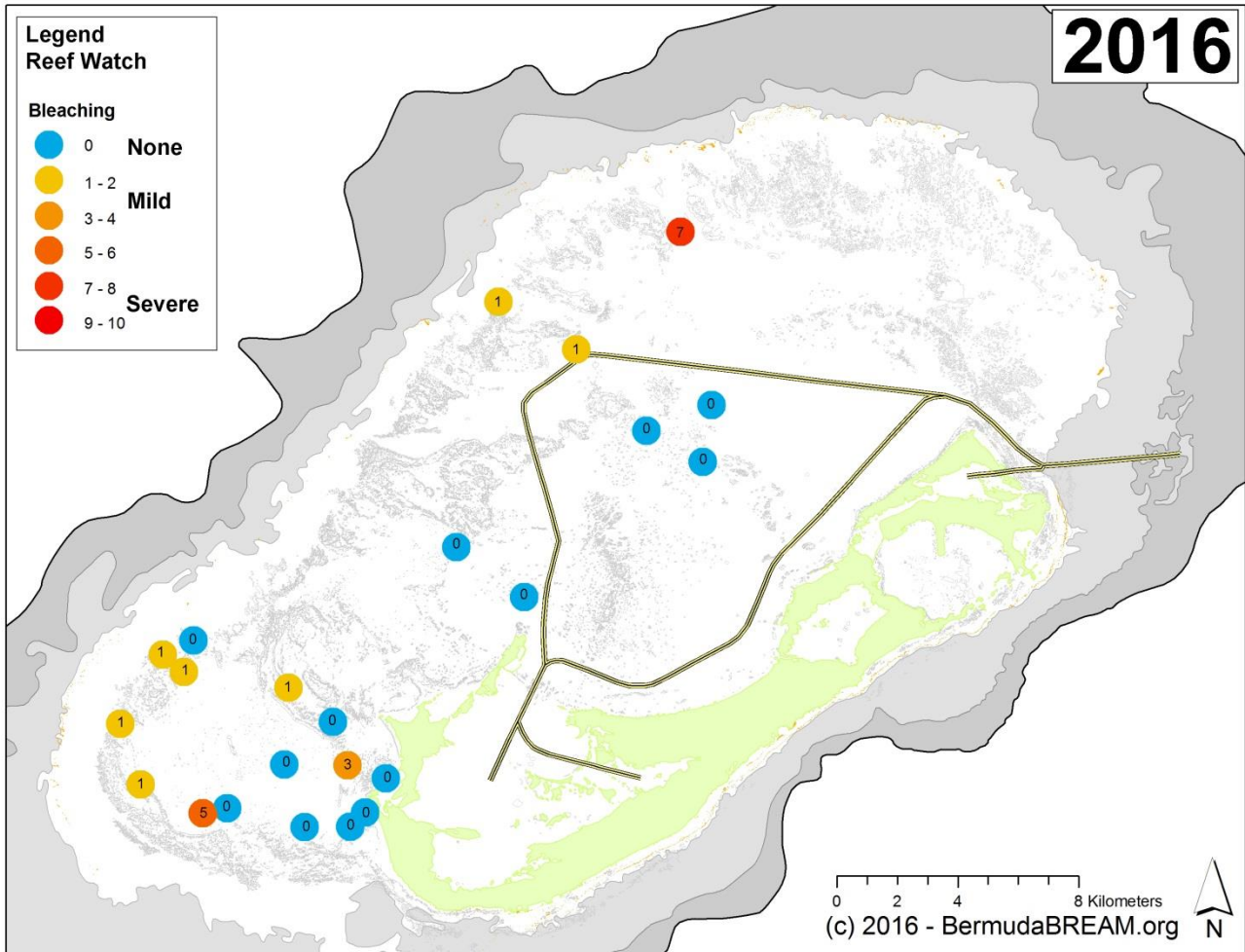
Coral Bleaching was observed at 10 of the 23 reefs assessed in 2016. The observation of coral bleaching was expected, as temperatures within the lagoon were known to be higher than average over the month of September. Mild bleaching was observed on the western margin of the lagoon.

One site in the Northern Lagoon was seen to have intense bleaching, with 8 out of 10 quadrats displaying bleached coral. Many of the reefs in the centre of the lagoon and near Sandy's Parish did not present any bleached corals.

Coral disease
Coral disease was not observed to be in high levels in 2016.

Table 1

Year	RWID	Site_ID	Team	BREAM_ID	AREA	PERIMETER	X	Y	Grouper	Snapper	Pred_GS	Parrot	Doctor	Silver	Herb3	Planktivores	Damsel	Butterfly	Lion	Lobster	Sea_Urchin	Sea_Cuc	Nudi
16	1601	1	Artemis 1	21874	1074	141	528854.034	133650.541	1	1	1	3	8	9	4	21	24	24	3	0	0	0	0
16	1606	6	Artemis 1	20496	1397	160	529526.1991	131647.622	0	0	3	3	5	5	0	10	35	18	1	0	0	0	0
16	1607	7	Suckrocks	22343	1498	152	530262.1744	135939.519	0	0	0	0	19	14	0	33	78	6	2	0	0	0	0
16	1609	9	Suckrocks	22370	1128	163	530961.4928	135364.419	0	0	0	2	17	28	1	46	97	2	2	0	0	0	0
16	1610	10	Dom Perignon	22481	1245	142	531283.8848	136401.405	6	2	2	8	53	27	2	82	45	1	4	0	0	0	0
16	1611	11	Artemis 2	19146	1296	144	531579.9235	130697.1895	0	4	4	4	6	4	4	14	29	5	4	0	0	0	0
16	1614	14	Faraway	19107	1072	125	532396.1981	130852.1541	2	4	4	2	11	5	1	17	40	25	4	1	0	0	1
16	1618	18	Mistake	15620	1188	166	534433.9662	134846.0896	2	0	0	2	15	25	0	40	35	90	15	0	3	0	0
16	1648	48	Dolphin Quest	6190	1050	155	539989.0109	139496.7228	0	2	2	1	4	5	2	11	7	12	2	0	0	0	0
16	1654	54	Diploria grandis	2692	1451	142	541394.5586	147613.3518	1	0	0	3	63	29	0	92	112	18	11	0	0	0	1
16	1663	63	Island Luhrs	1585	1052	136	543969.0504	146034.7823	3	3	3	2	15	6	1	21	6	6	2	0	0	0	0
16	1673	73	Diploria grandis	996	1525	153	546298.5641	143338.3329	2	0	2	0	37	38	2	68	52	3	3	0	0	0	0
16	1680	80	Reefer Madness	24722	1464	156	547422.0685	149918.1572	2	3	3	5	51	15	2	15	50	2	5	0	0	0	0
16	1682	82	Reefer Madness	25674	1215	132	548449.3191	144193.8459	0	5	5	5	6	4	5	15	81	127	5	0	0	0	0
16	1617	17	Dom Perignon	15412	1113	122	534292.8984	132301.3776	0	0	0	0	38	9	9	56	25	0	0	2	0	0	0
16	1621	21	Faraway	15424	1227	130	534966.58	130227.933	11	11	11	11	25	6	2	33	25	30	10	2	0	0	0
16	1630	30	Sea Fan	15016	1593	169	536388.7268	132285.2287	2	2	2	2	25	16	29	70	173	75	15	2	0	0	0
16	1631	31	Mistake	27209	1145	162	536477.534	130247.1352	2	2	2	2	25	20	10	55	10	70	10	0	0	0	0
16	1633	33	Fiddlers OTG	19350	1331	159	536967.061	130714.6861	1	3	3	3	34	15	12	61	34	10	2	0	0	0	0
16	1638	38	Fiddlers OTG	12441	1334	143	537650.013	131844.0185	3	0	3	3	47	28	23	98	32	16	17	0	0	0	0
16	1623	23	Sea Fan	12166	1103	131	535902.5806	137709.1462	2	0	0	2	4	7	5	16	48	127	0	0	0	0	0
16	1655	55	Dolphin Quest	6133	1787	160	542240.9523	137842.031	0	0	0	0	13	7	2	22	25	7	4	2	0	0	0
16	1681	81	Island Luhrs	423	1575	160	548160.82	142318.0858	0	5	5	5	10	10	15	35	20	15	3	0	0	0	0

Table 2

Year	RWID	Site_ID	Team	BREAM_ID	AREA	PERIMETER	X	Y	Star_Coral	Brain_Coral	Finger_Coral	ALL_CORAL	Soft_Coral	Sea_Weed	Sand	Bare_Rock	Black_Bank	Yellow_band	Bleaching	Rugosity	SLI_PF	SLI_HF	SLI_HC	SLI_SW	SLI	SLIWORD
16	1601	1	Artemis 1	21874	1074	141	528854.034	133650.541	12		22	31	65	5.5	10	9	10.5	0	3	27.1	1	1	2	3	3	2.25 Good
16	1606	6	Artemis 1	20496	1397	160	529526.1991	131647.622	0		14	18.5	32.5	28.5	5.5	24	9.5	0	0	19.7	1	1	1	3	3	2 Fair
16	1607	7	Suckrocks	22343	1498	152	530262.1744	135939.519	0	13.5	13.5	7	20.5	10	11	5	53.5	0	1	#DIV/0!	1	2	2	2	2	2 Fair
16	1609	9	Suckrocks	22370	1128	163	530961.4928	135364.419	1	19	19	10.5	30.5	7.5	12	13.5	36.5	1	2	#DIV/0!	1	3	3	3	3	2.5 Excellent
16	1610	10	Dom Perignon	22481	1245	142	531283.8848	136401.405	6.5	27	2.5	2.5	36	18.5	15.5	0	30	0	5	63	1	3	3	3	2	2.25 Good
16	1611	11	Artemis 2	19146	1296	144	531579.9235	130697.1895	3	13	11	11	27	37	1	16	19	0	0	#DIV/0!	1	2	2	2	3	1.75 Poor
16	1614	14	Faraway	19107	1072	125	532396.1981	130852.1541	0	12.5	12.5	15	27.5	37	23	12.5	0	0	0	22.5	1	1	1	2	2	2 Fair
16	1618	18	Mistake	15620	1188	166	534433.9662	134846.0896	14.5	7	5	5	26.5	10.5	52	11	0	0	0	20.5	1	3	3	2	2	1.5 Critical
16	1648	48	Dolphin Quest	6190	1050	155	539989.0109	139496.7228	19.5	12	7	7	38.5	28.5	6.5	11.5	25.5	0	0	33.25	1	1	1	3	2	1.5 Critical
16	1654	54	Diploria grandis	2692	1451	142	541394.5586	147613.3518	4.5	13	8	8	25.5	10	10	14.5	43	0	2	38.5	1	3	2	2	3	2.25 Good
16	1663	63	Island Luhrs	1585	1052	136	543969.0504	146034.7823	7.5	8.5	8.5	7.6	23.6	7.6	0	14.5	54.3	0	0	16.4	1	3	3	2	2	2 Fair
16	1673	73	Diploria grandis	996	1525	153	546298.5641	143338.3329	13.5	1.5	1.5	8.5	23.5	3.6	34	12.5	26.4	0	0	33	1	3	2	2	2	2.25 Good
16	1680	80	Reefer Madness	24722	1464	156	547422.0685	149918.1572	9	6.2	6.2	2.1	17.3	13.2	12.1	0	57.4	0	8	55.2	1	1	3	3	3	2 Fair
16	1682	82	Reefer Madness	25674	1215	132	548449.3191	144193.8459	14.6	5.5	5.5	13.3	33.4	2.3	5.5	16	57.6	0	0	46.3	1	1	1	2	2	2 Fair
16	1617	17	Dom Perignon	15412	1113	122	534292.8984	132301.3776	7.5	8.5	8.5	9	25	20	17.5	1	36.5	0	0	49.5	1	3	3	3	3	2.25 Good
16	1621	21	Faraway	15424	1227	130	534966.58	130227.933	2	13	13	2	17	28	15.5	1	3	0	0	38.2	1	2	2	2	2	2 Fair
16	1630	30	Sea Fan	15016	1593	169	536388.7268	132285.2287	7.7	7.6	7.6	13.5	28.8	9	35.2	0	27	1	3	23.2	1	3	3	2	2	2 Fair
16	1631	31	Mistake	27209	1145	162	536477.534	130247.1352	8.5	11.5	11.5	8	28	5.5	66	0.5	0	1	0	17.5	1	3	2	2	1	1.75 Poor
16	1633	33	Fiddlers OTG	19350	1331	159	536967.061	130714.6861	19.4	8	14.2	0	33.6	7.3	8	3.8	47.3	1	0	64.5	1	3	3	3	3	2.5 Excellent
16	1638	38	Fiddlers OTG	12441	1334	143	537650.013	131844.0185	15.6	0.9	0.9	0	16.5	5.9	37	7.9	32.7	0	0	41.6	1	3	2	2	2	2 Fair
16	1623	23	Sea Fan	12166	1103	131	535902.5806	137709.1462	1	8.5	8.5	6	15.5	24	17.5	11	32	0	0	36.2	1	1	1	2	2	1.5 Critical
16	1655	55	Dolphin Quest	6133	1787	160	542240.9523	137842.031	9	7	7	11.5	27.5	17	14.5	1	40	0	0	52.25	1	2	2	2	3	2.25
16	1681	81	Island Luhrs	423	1575	160	548160.82	142318.0858	4	12	12	0	16	7	0	1.5	75.5	0	0	13.5	1	2	2	3	2	2 Fair

Appendix

Year	Site_ID	Team
2013	3	Stans' Crew
2013	4	Dom Perignon
2013	5	Dom Perignon
2013	6	Faraway
2013	7	Stans' Crew
2013	9	Skin E Dippers
2013	8	Skin E Dippers
2013	17	Faraway
2013	26	Hiscox -Firefly
2013	28	Burville
2013	29	Burville
2013	31	Hiscox - Firefly
2013	33	BSAC
2013	34	Granite
2013	41	Endsmeet
2013	44	Undertow
2013	45	Uncle Dewey
2013	46	Uncle Dewey
2013	48	Crikey Mate
2013	51	Granite
2013	1	Suckrocks
2013	2	Suckrocks
2013	10	Kerberos
2013	13	Kerberos
2013	14	Dolphin Quest
2013	15	Damian - Hiscox
2013	19	Damian - Hiscox
2013	20	Endurance
2013	21	Endurance
2013	22	Endurance
2013	23	Endurance
2013	24	BSAC
2013	25	Dolphin Quest
2013	35	Undertow
2013	40	Endsmeet

Year	Site_ID	Team
2014	1	Dom Perignon
2014	13	Dom Perignon
2014	14	Dolphin Quest
2014	22	Skin E Dippers
2014	24	Glencoe
2014	32	porgy protectors
2014	52	Firefly
2014	56	Hx Ashley Dupree
2014	59	Reef Rummer
2014	61	Reefspect
2014	67	Hx Ashley Dupree
2014	76	Reefspect
2014	86	Ren Re
2014	88	Uncle Dewey
2014	91	Crikey Mate
2014	92	Crikey Mate
2014	96	Uncle Dewey
2014	21	zuill
2014	23	Two of Us
2014	25	Two of Us
2014	28	Skin E Dippers
2014	35	Plastic Tides
2014	40	Glencoe
2014	46	Porgy Protectors
2014	53	Kelly Winfield
2014	55	Reef Rummer
2014	68	Kerberos
2014	70	Firefoly
2014	74	Kerberos
2014	81	Ren Re
2014	84	Endurance
2014	85	Endurance

Year	Site_ID	Team
2015	5	Dom Perignon
2015	16	Dom Perignon
2015	27	Team BSAC
2015	39	Team BSAC
2015	41	Bilikiki
2015	44	No Tan Lines
2015	55	Dolphin Quest
2015	62	Dolphin Quest
2015	72	Robbie's Reefers
2015	73	Robbie's Reefers
2015	89	Reef Shack
2015	96	Hiscox - Ashley Dupree
2015	21	Suckrocks
2015	31	Suckrocks
2015	35	Bilikiki
2015	40	BUEI
2015	43	BUEI
2015	46	No Tan Lines
2015	57	Endsmeet
2015	63	Endsmeet
2015	68	Reefalo Soldier
2015	77	Reef Shack
2015	84	Hiscox - Ashley Dupree