Photo by Joe Marino

SEAFAN BleachWatch Observer Training

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Florida Department of Environmental Protection

Iris.Krehahn@FloridaDEP.gov

Training Overview

What is Coral Bleaching?

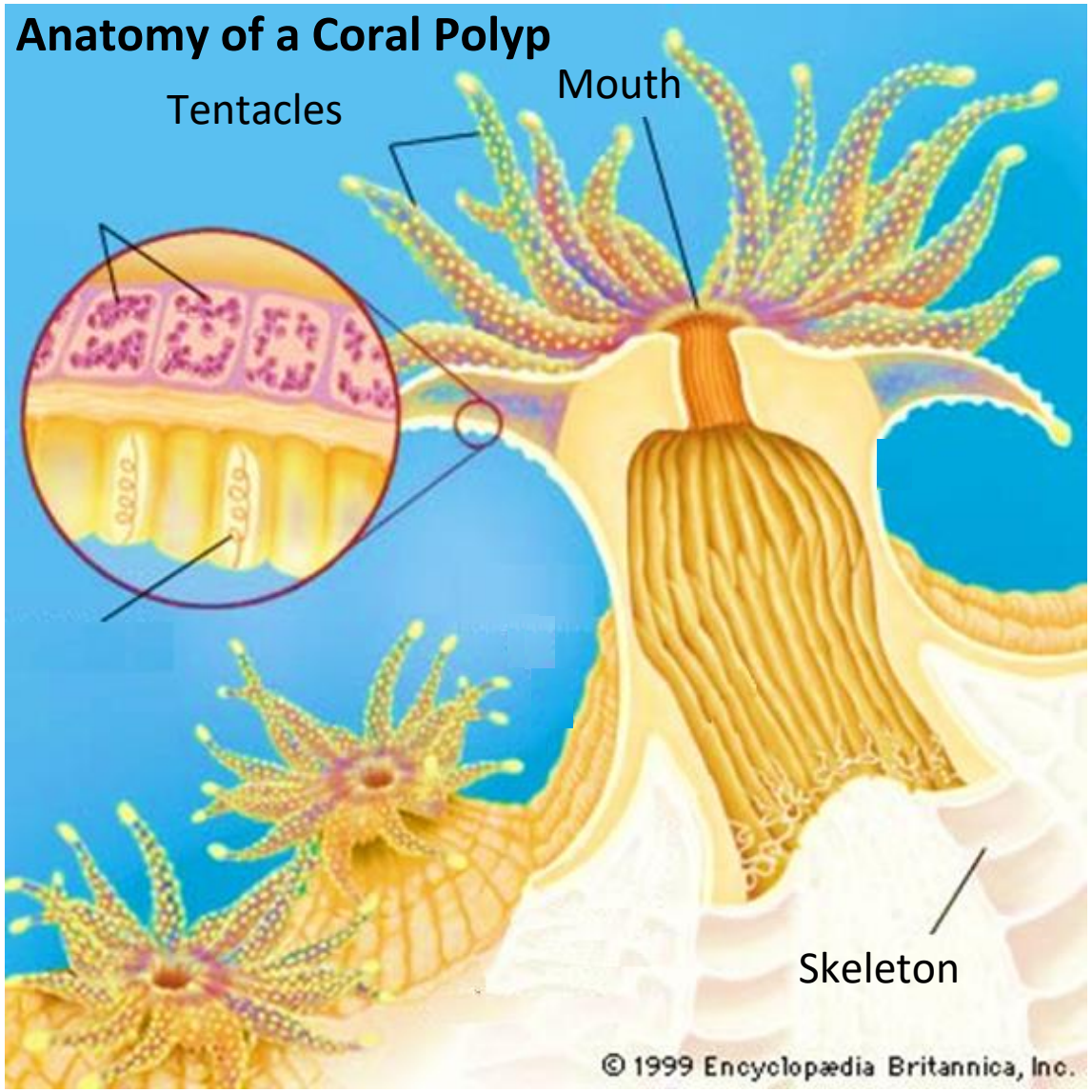
Coral Disease Outbreak

SEAFAN & the BleachWatch Early Warning Program

Your Contribution

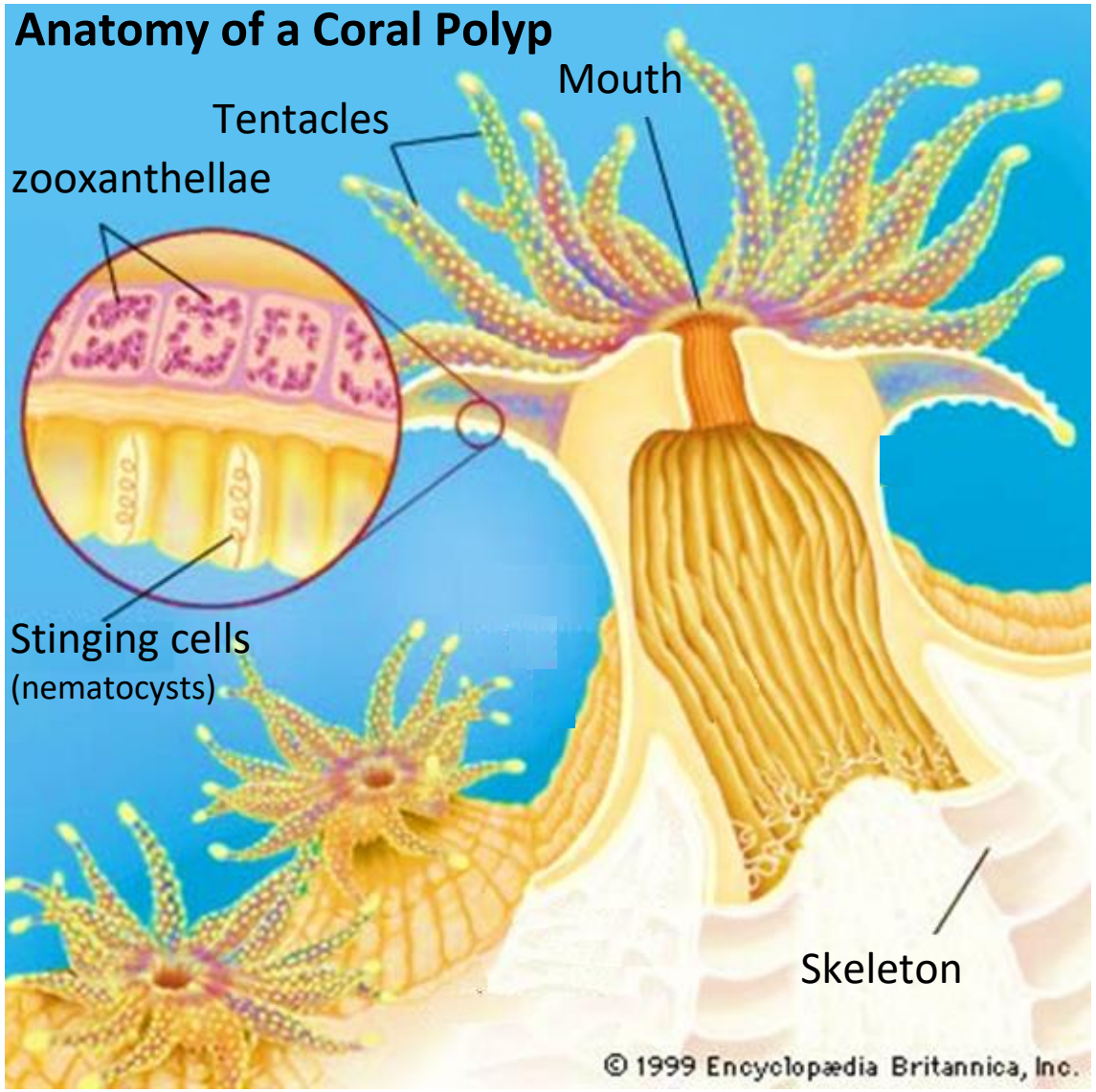
Coral Anatomy 101

Coral Anatomy 101



Variations Of Growth Forms

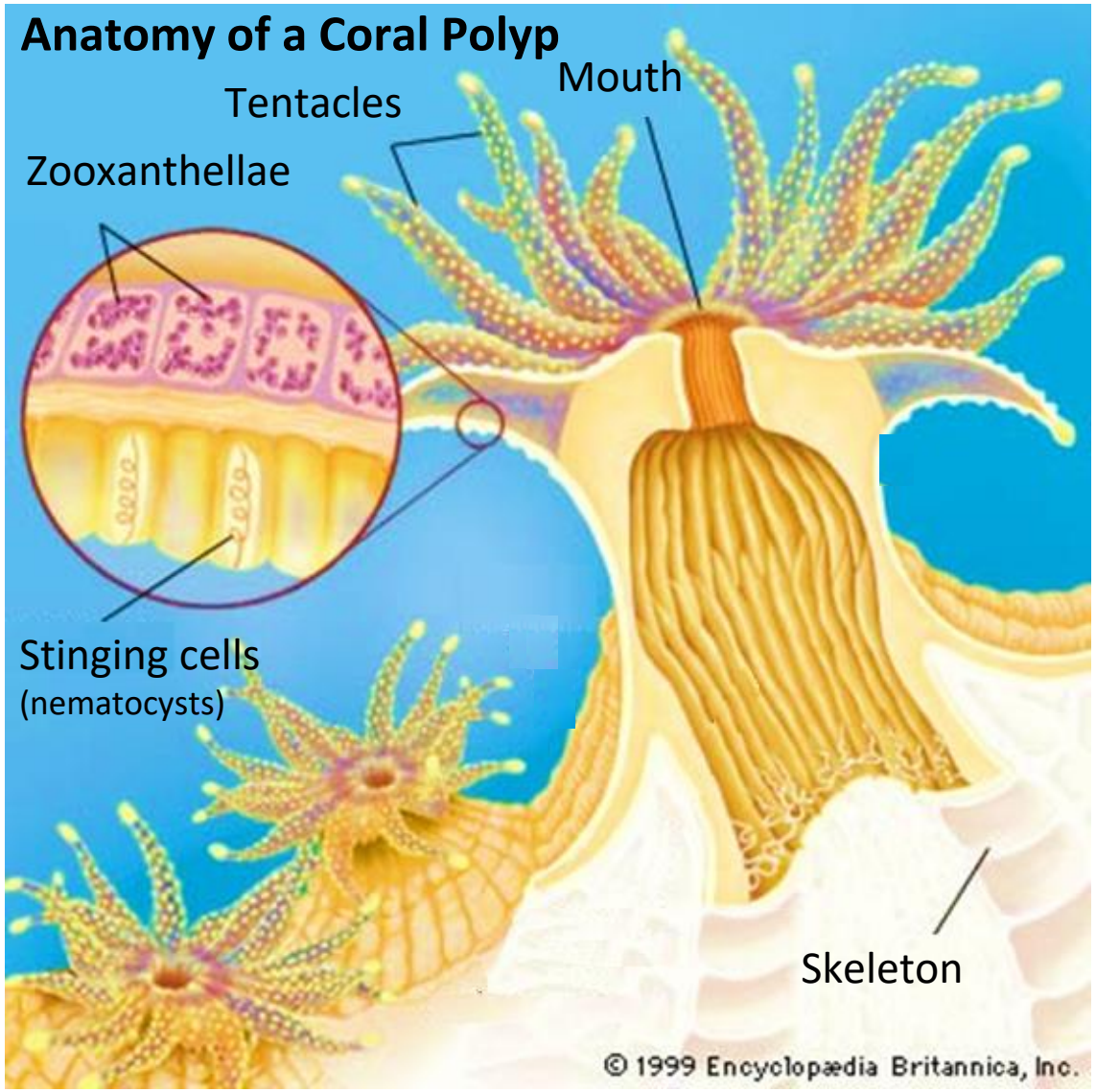
Coral Feeding



2 methods:

1. Filter feeding (nematocysts)
2. Symbiotic relationship (zooxanthellae)

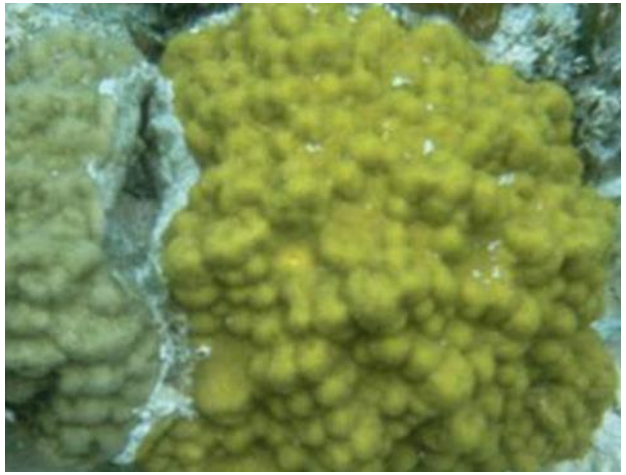
Coral Anatomy 101

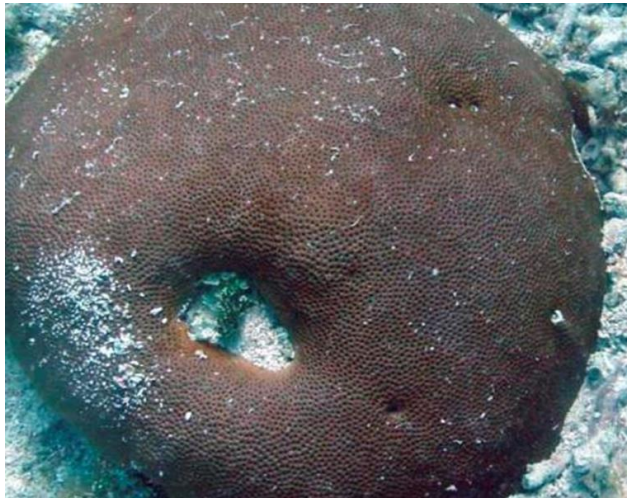


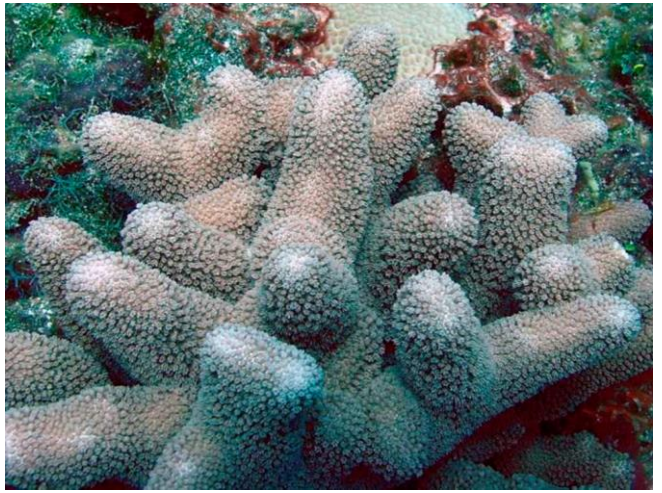
Zooxanthellae provides:

- 90 – 95% of nutrients
- Normal “healthy” coloration of corals

Variations of Colors

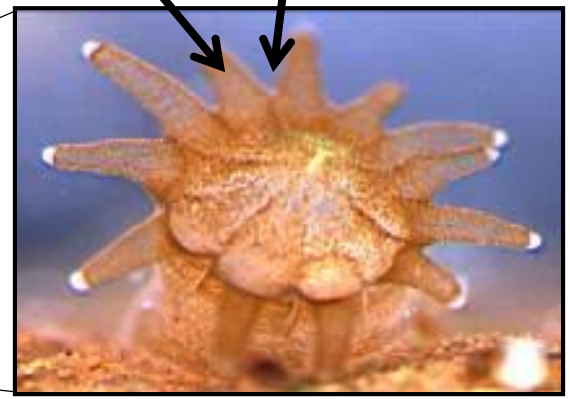






Zooxanthallae

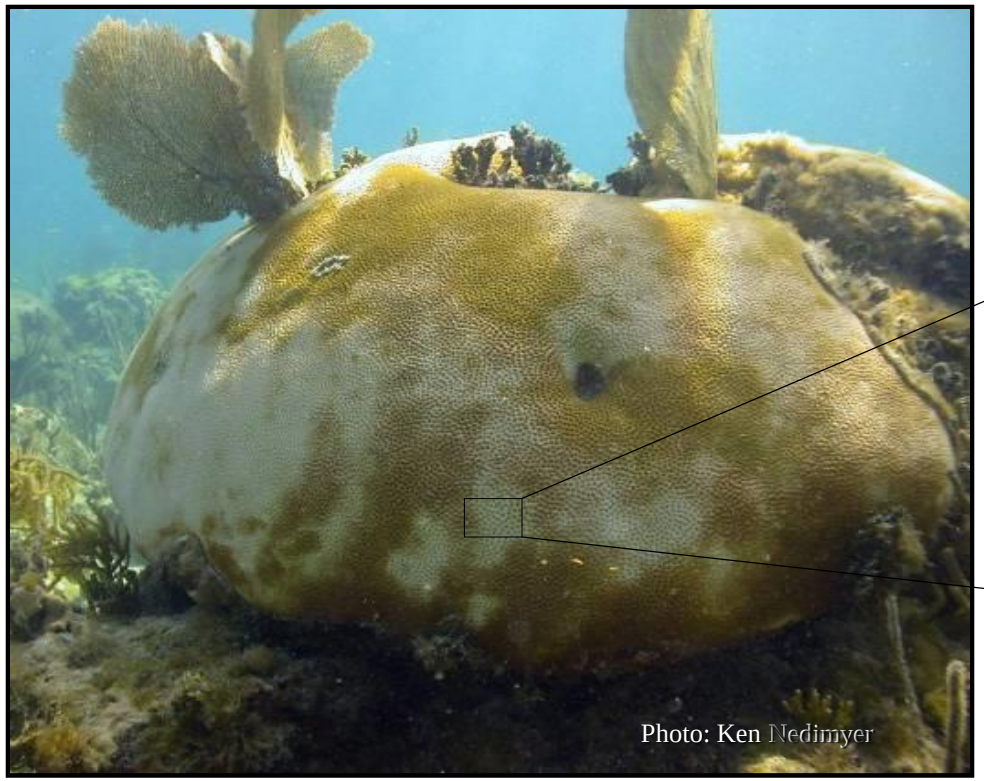
What is Coral Bleaching?

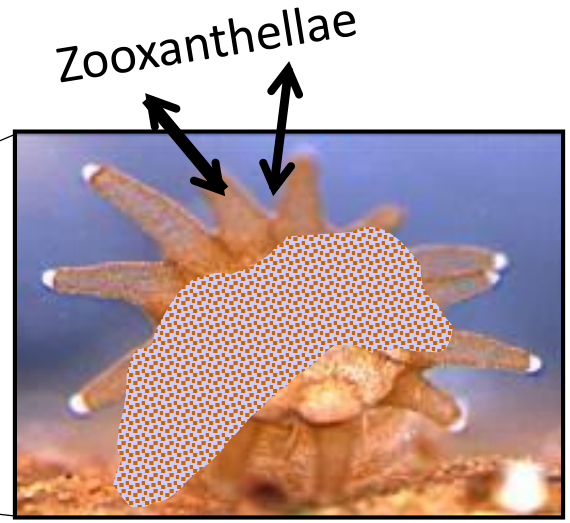


Stress

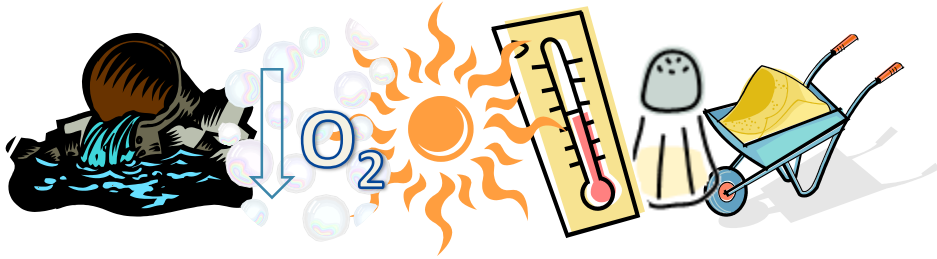
Healthy Coral

Coral Bleaching



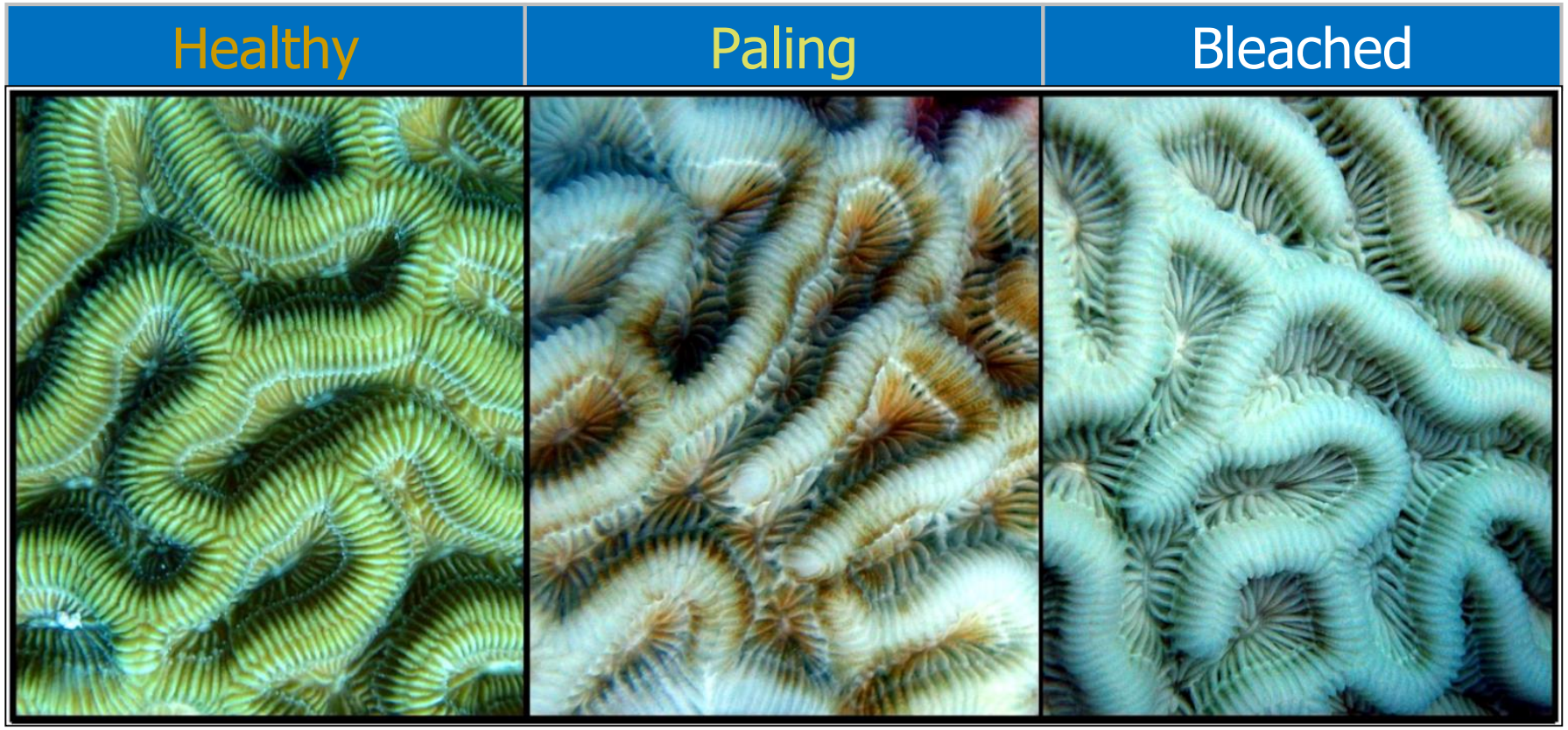


Stress



Bleached Coral

Coral Bleaching



Brain Coral

Is a bleached coral a dead coral?

Bleached Coral

No!

Coral Bleaching

Water Temperature Increases

Prolonged Temperature Stress

Healthy Coral

Bleached Coral

Dead Coral

Water Temperature Returns to Normal

Coral Bleaching

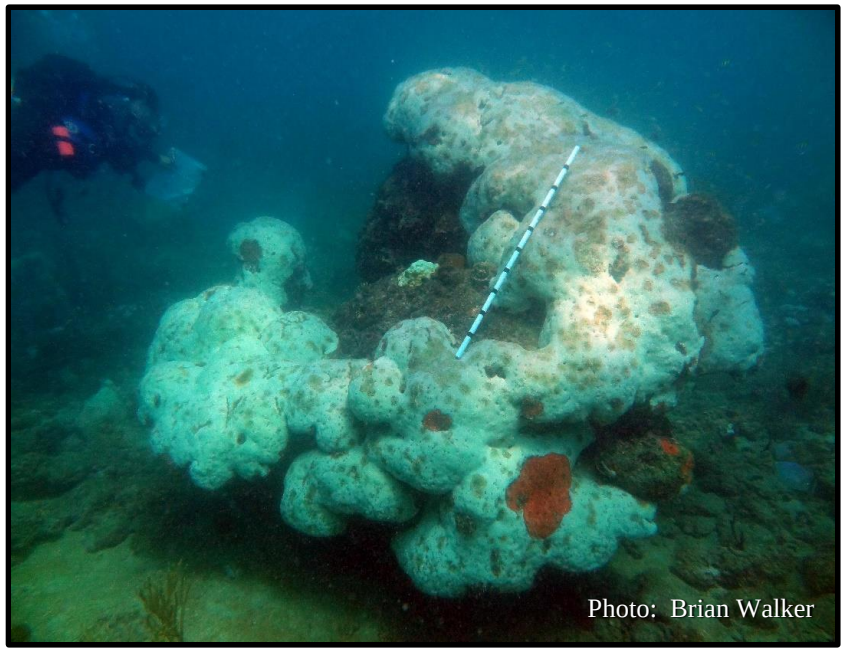
Healthy Coral → **Bleached Coral** → **Dead Coral**

Is the coral resilient?

Coral Bleaching

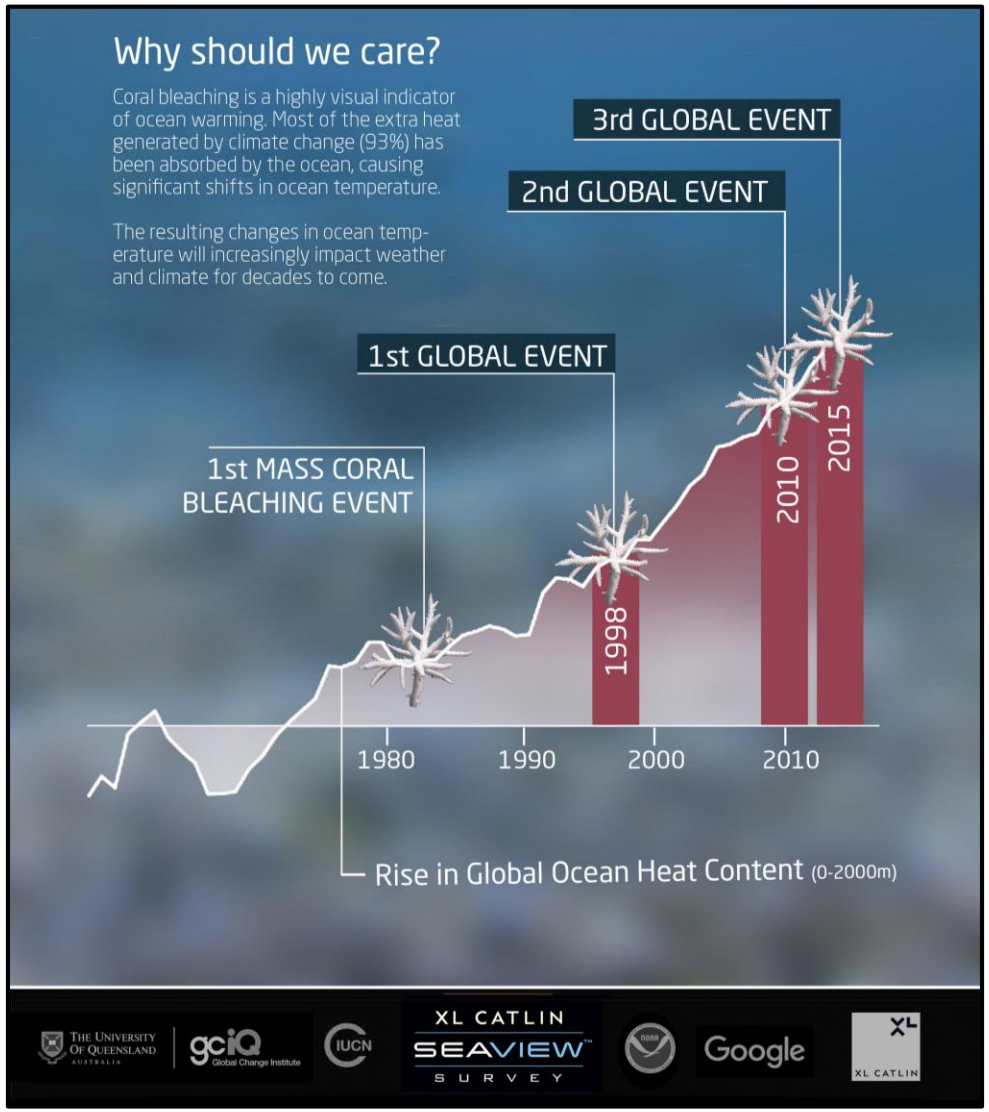
Long-term effects:

- ⬇ Reproduction
- ⬇ Coral growth
- Loss of habitat



- Susceptible to disease
- Susceptible to predation
- Susceptible to death

Severe Bleaching Events



Coral Bleaching Across Spatial Scales


Encrusting/Mound/Boulder Coral, Bleached

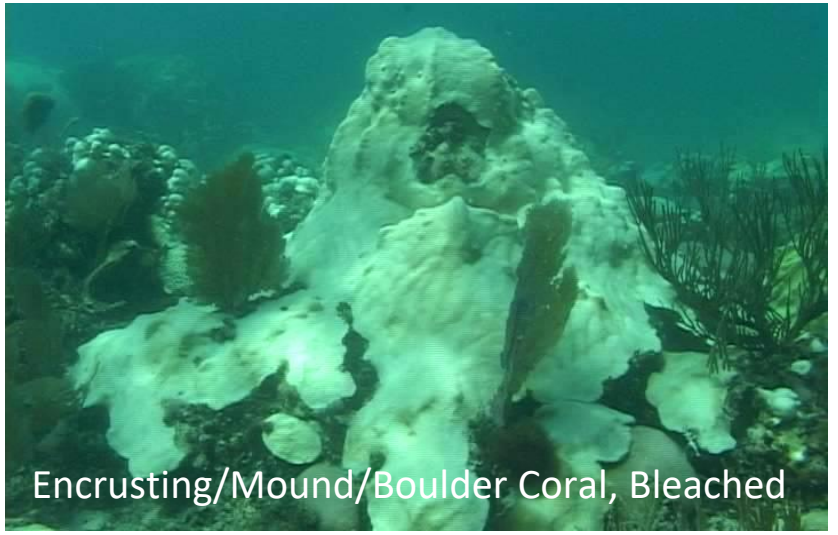

Encrusting/Mound/Boulder Coral, Bleached


Photo: Mote Marine Laboratory

Brain Coral, Paling

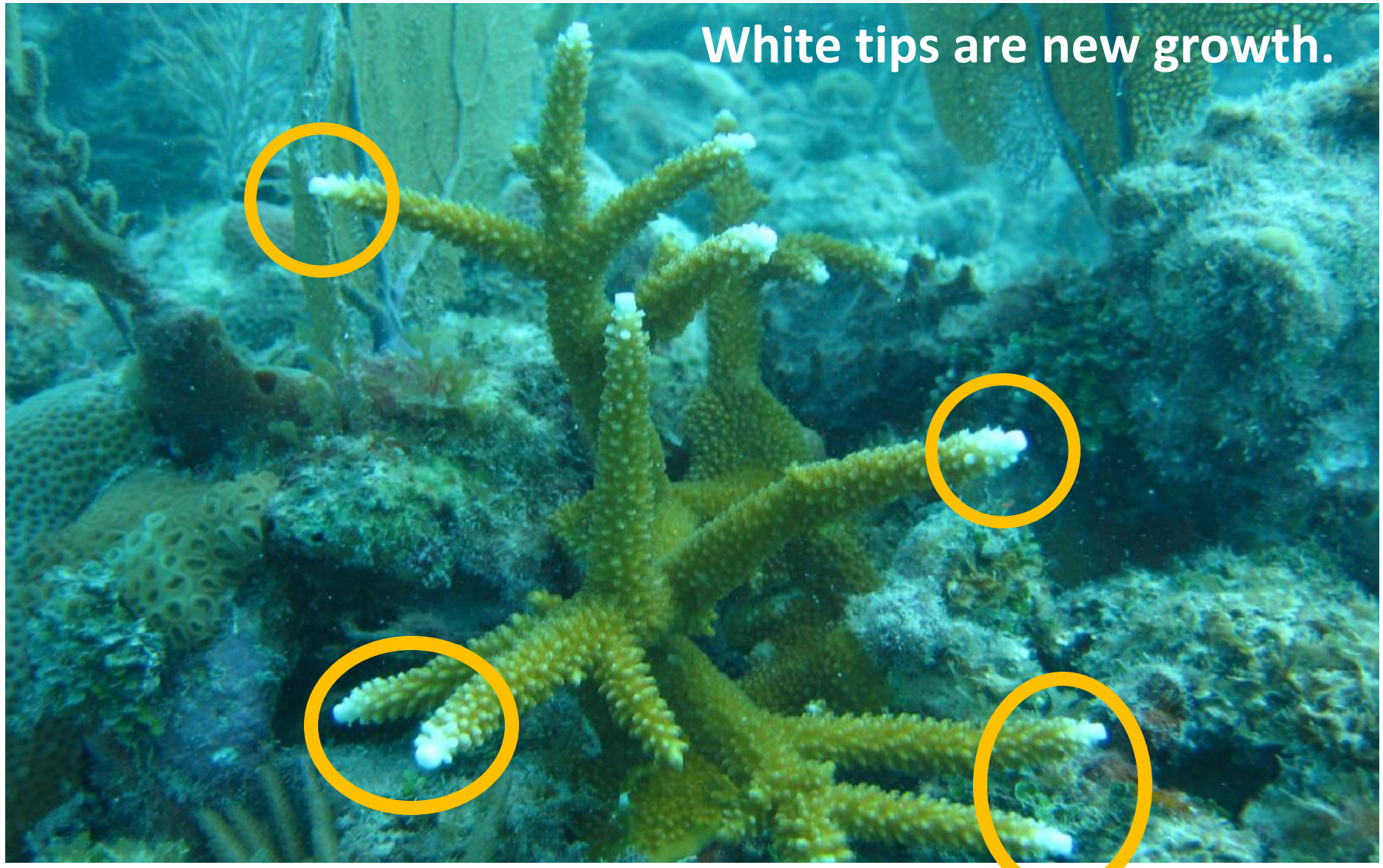

Encrusting/Mound/Boulder Coral,
Partial bleaching

Coral Bleaching

Mound/Boulder Coral, Bleached

Brain Coral

NOT Bleaching!



Fish Bites/Predation

Photo: FRRP

Photo: FRRP

Photo: Dr. Mark Eakin (NOAA)

Training Overview

What is Coral Bleaching?

Coral Disease

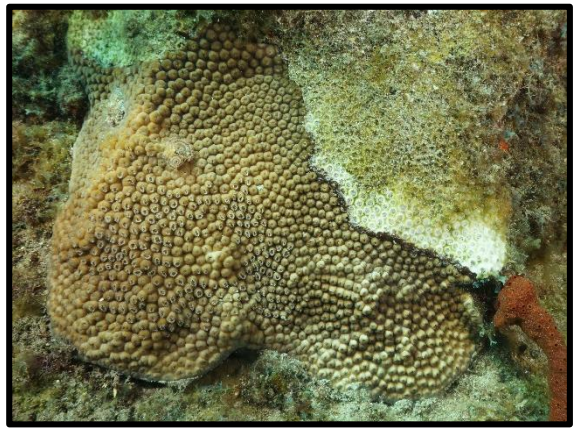
SEAFAN & the BleachWatch Early Warning Program

Your Contribution

Coral Disease

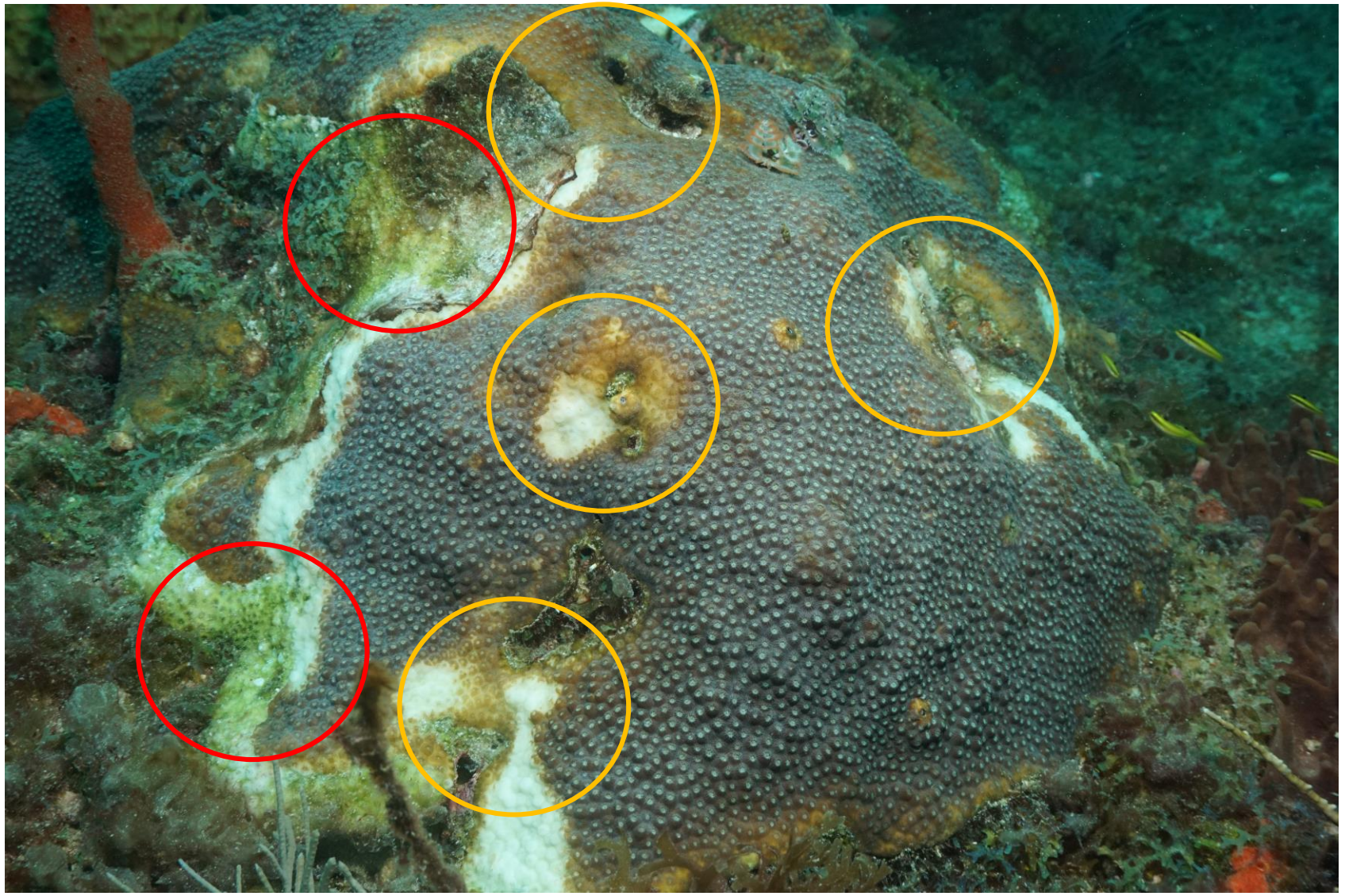
What causes coral disease?

- Bacteria
- Virus
- Fungus

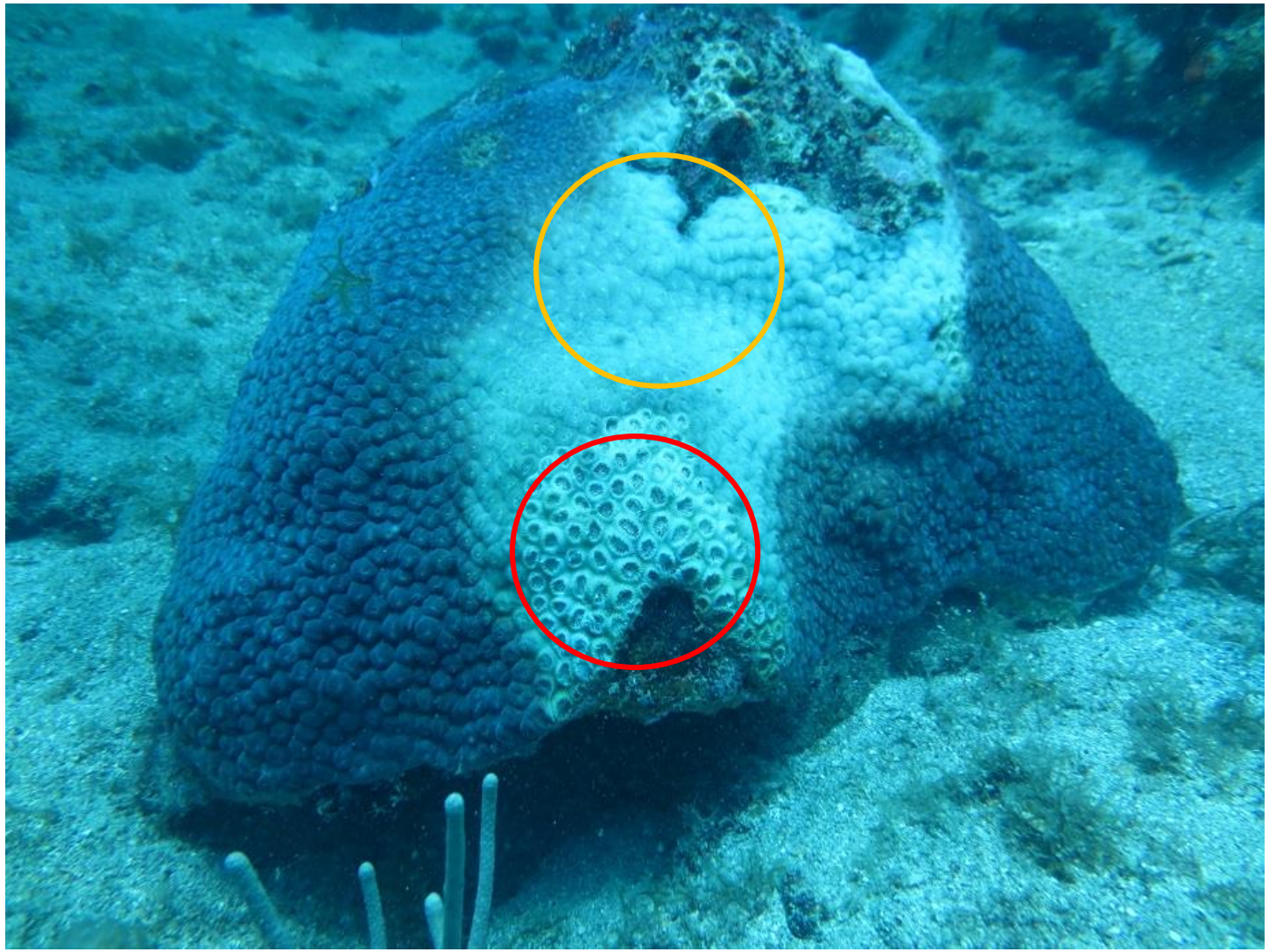


Identifying Coral Disease

Bleaching vs. Disease

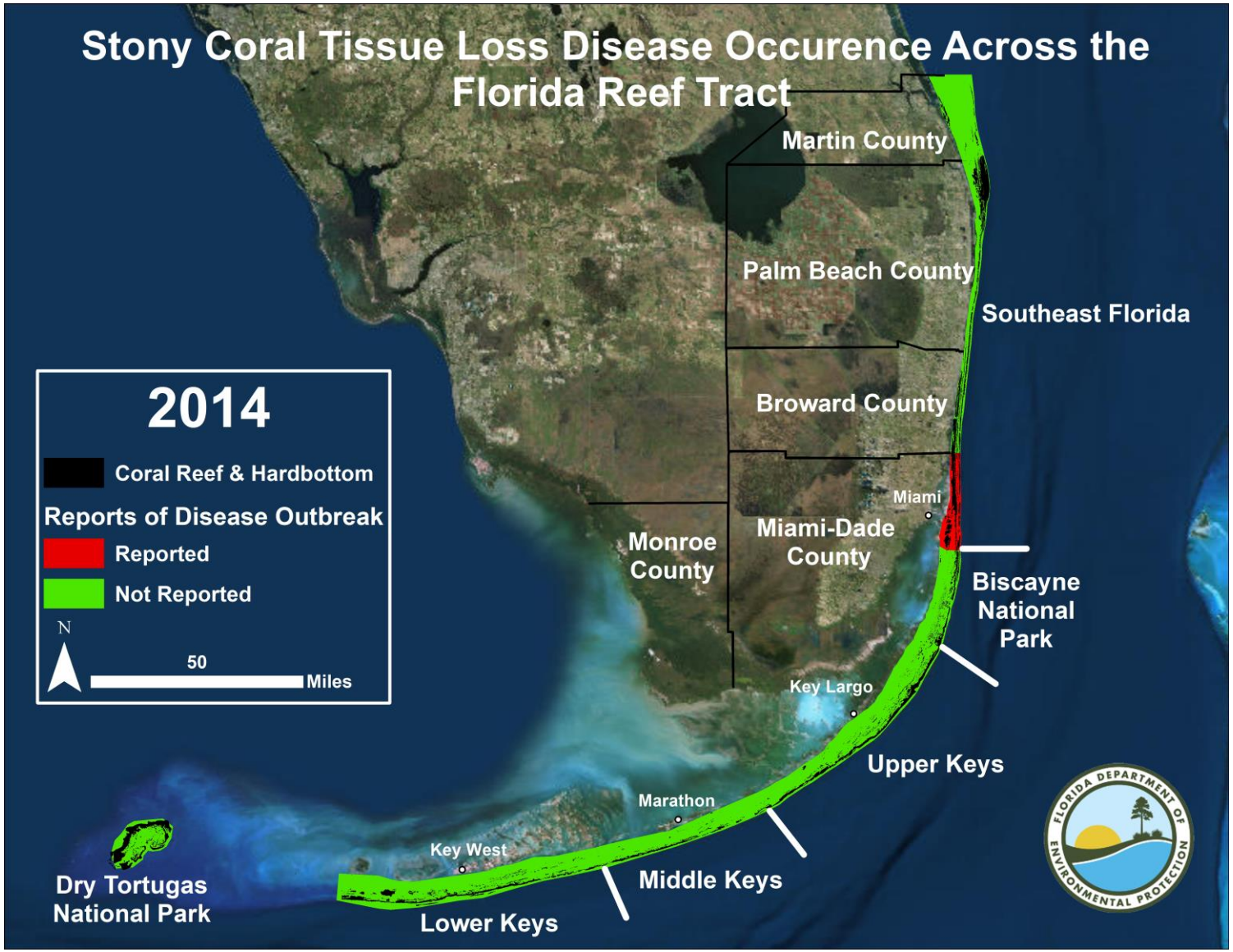


Bleaching vs. Tissue Loss

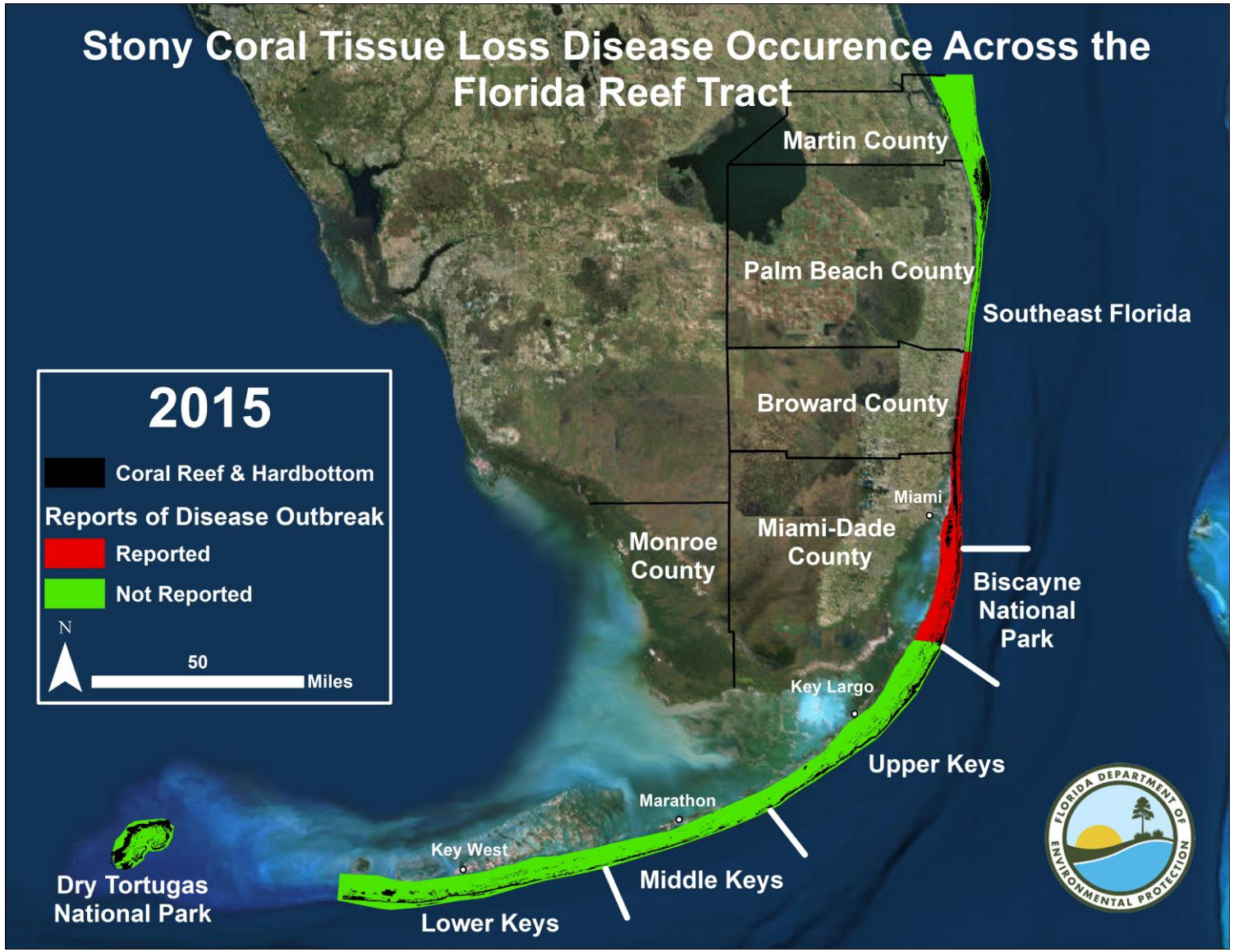


Florida's Coral Disease Outbreak
(2014 – present)

2014


Stony Coral Tissue Loss Disease Occurence Across the Florida Reef Tract
Martin County
Palm Beach County
Southeast Florida
Broward County
Miami
Miami-Dade County
Monroe County
Biscayne National Park
Key Largo
Upper Keys
Marathon
Key West
Middle Keys
Lower Keys
Dry Tortugas National Park
2014
Coral Reef & Hardbottom
Reports of Disease Outbreak
Reported
Not Reported
N
50
Miles

2015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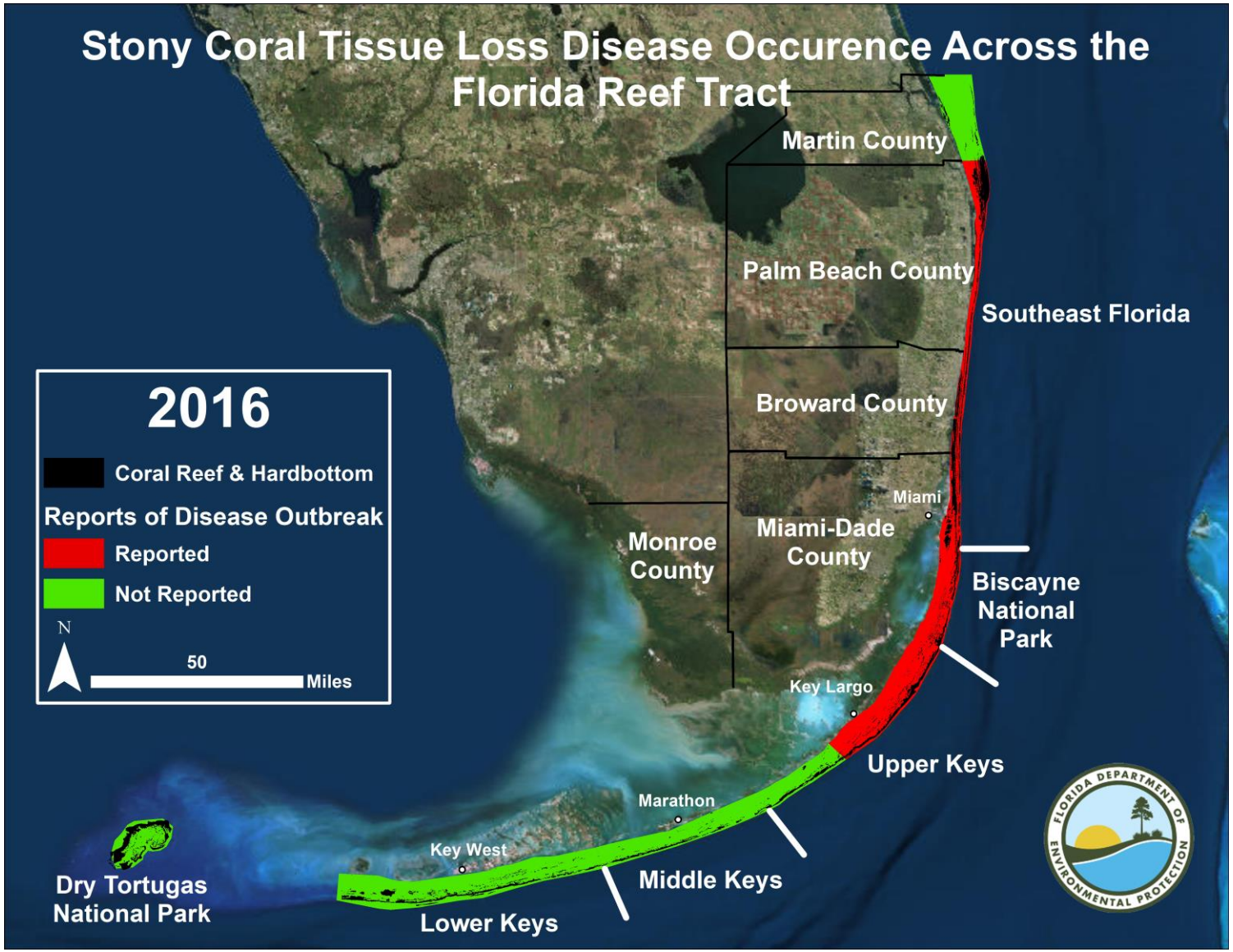
2016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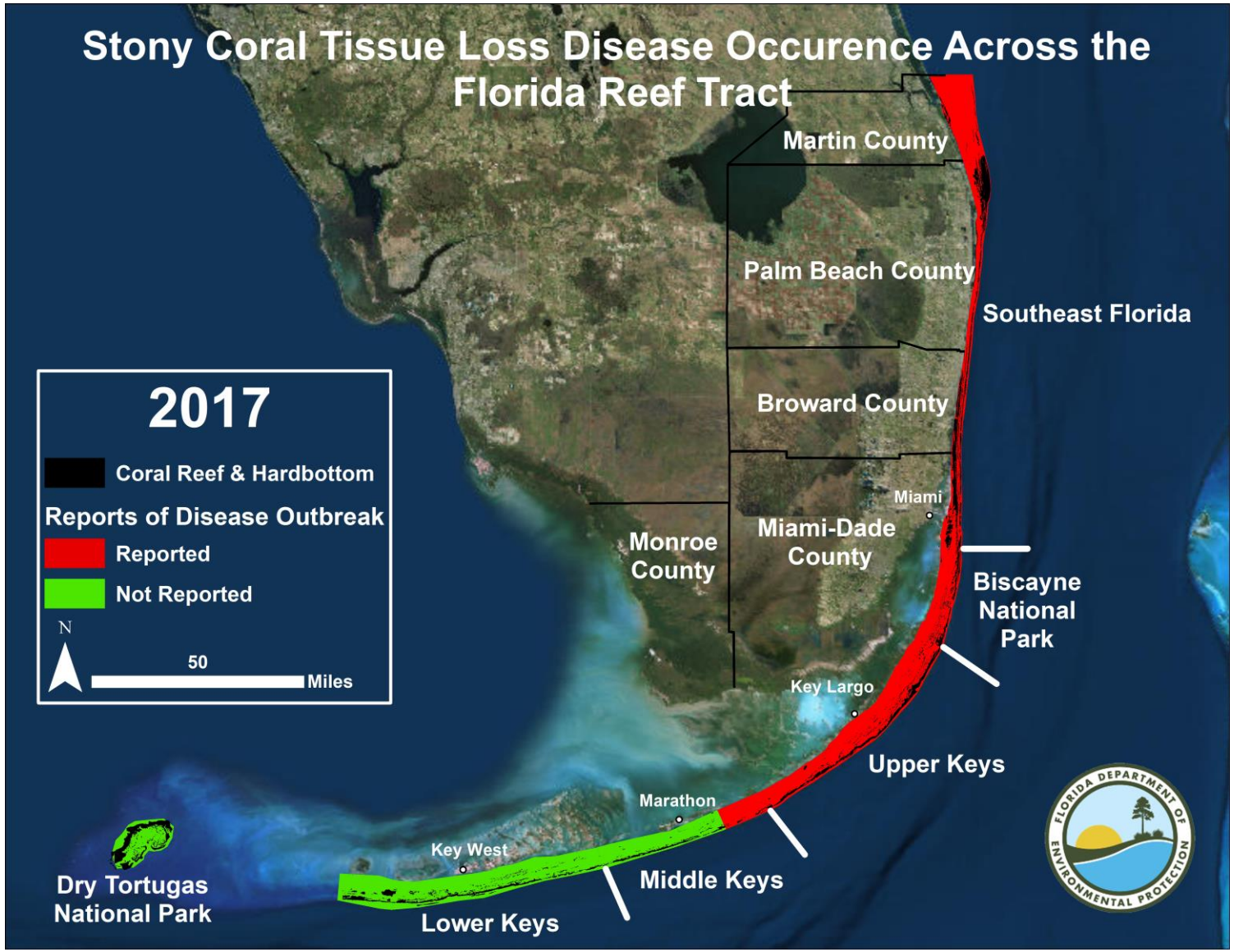
2017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2017
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Not Reported
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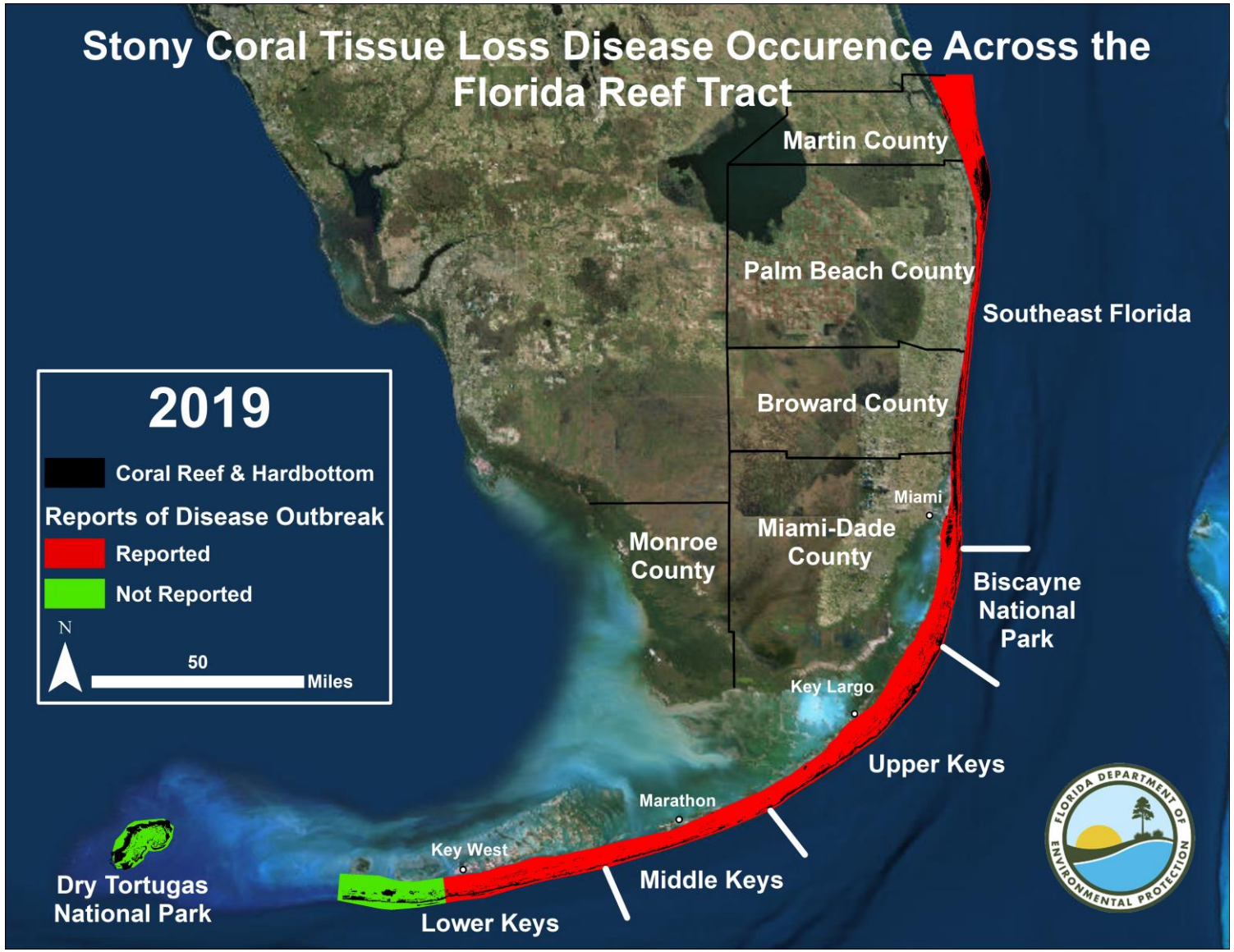
Miles

2019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Coral Reef & Hardbottom
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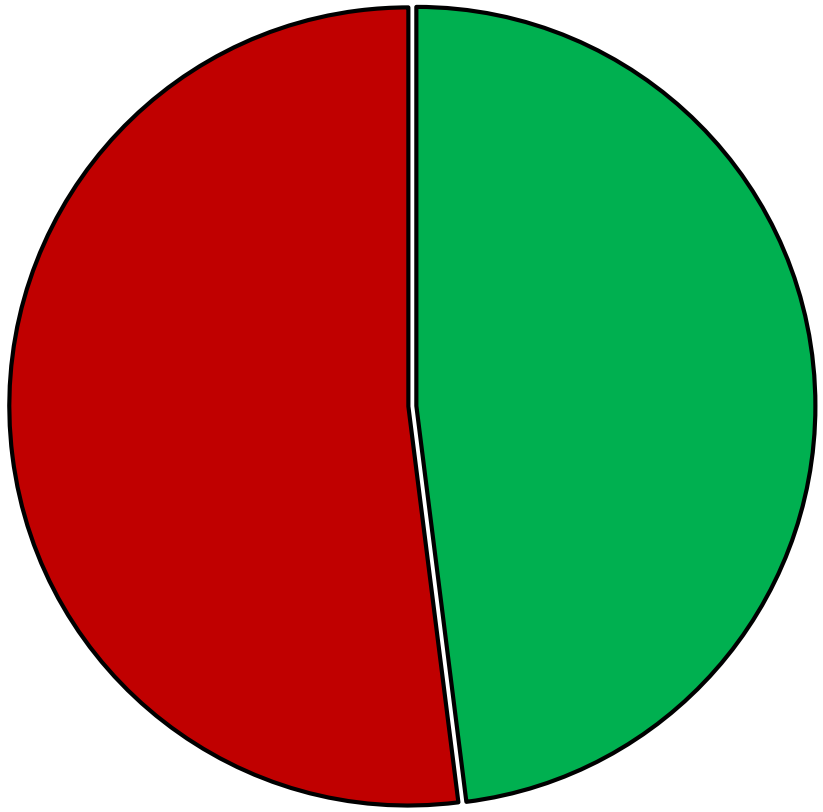
Reported
Not Reported
N
50
Miles

Stony Coral Tissue Loss Disease (SCTLD)

Photos: NSU CRRAM, FWC, MDC, DEP

Stony Coral Tissue Loss Disease (SCTLD)

More than half of Florida's reef-building coral species are affected



Affected

Unaffected

Background Level of Coral Disease

Florida's "Normal" Prevalence of Disease:

2-3%

Current Disease Outbreak Level

Very High =

66-100%

(in certain species)

Stony Coral Tissue Loss Disease (SCTLD)

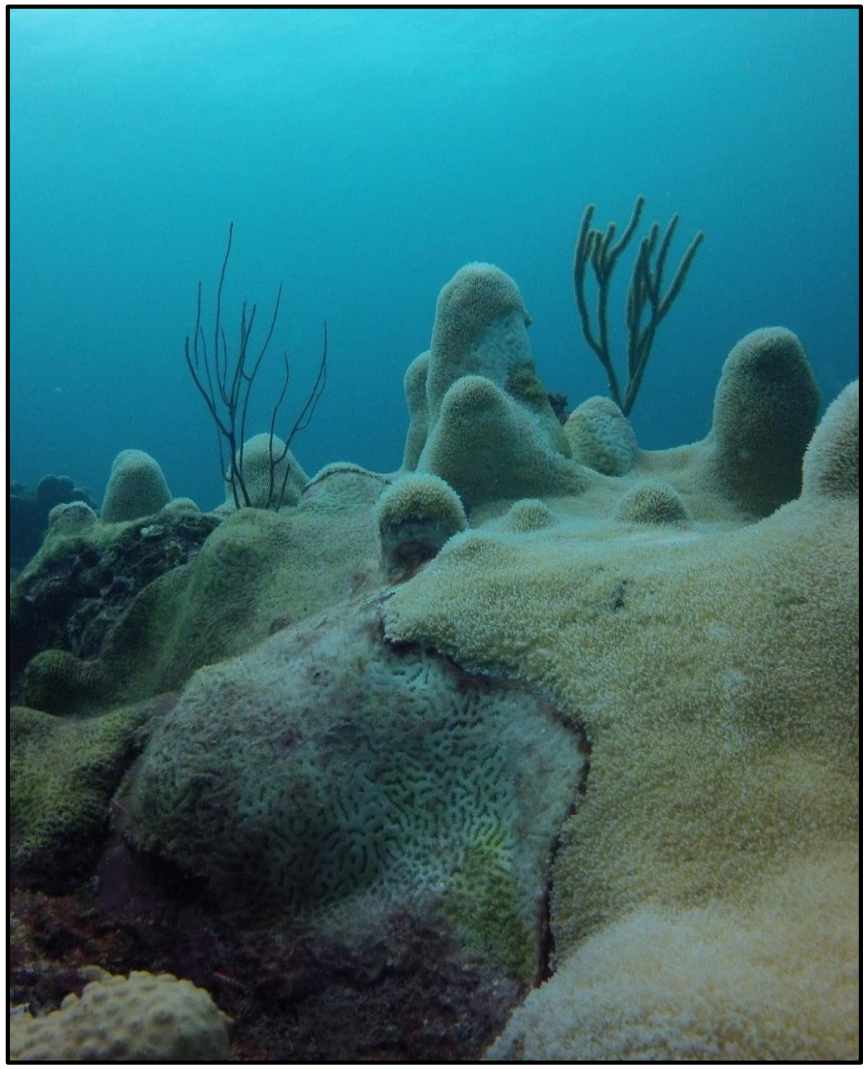
Progresses Rapidly

Photos: FWC

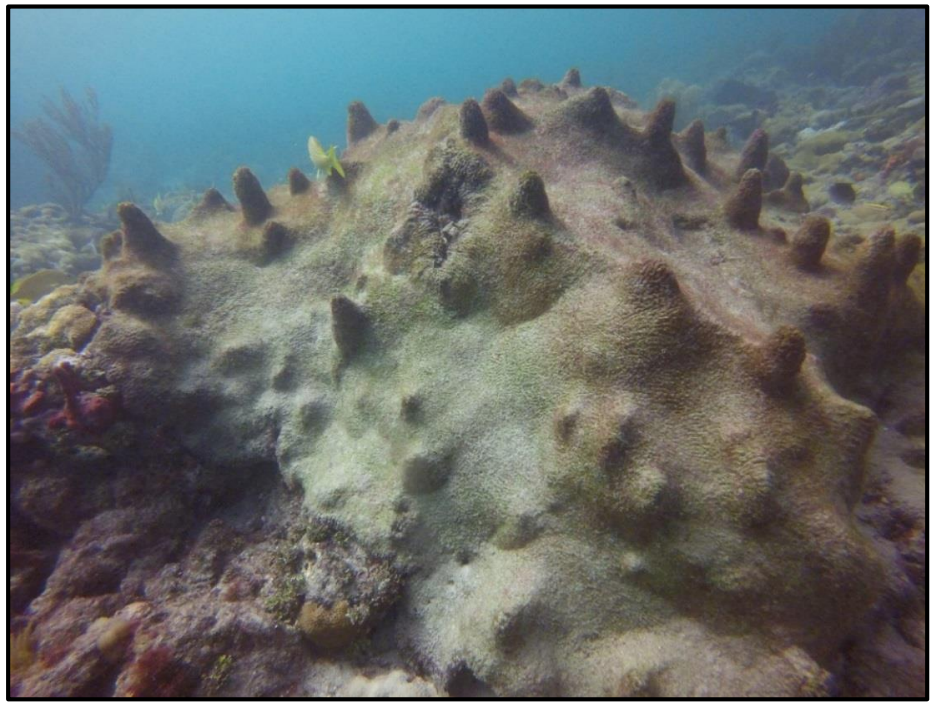
Most Impacted Species

*ESA Threatened

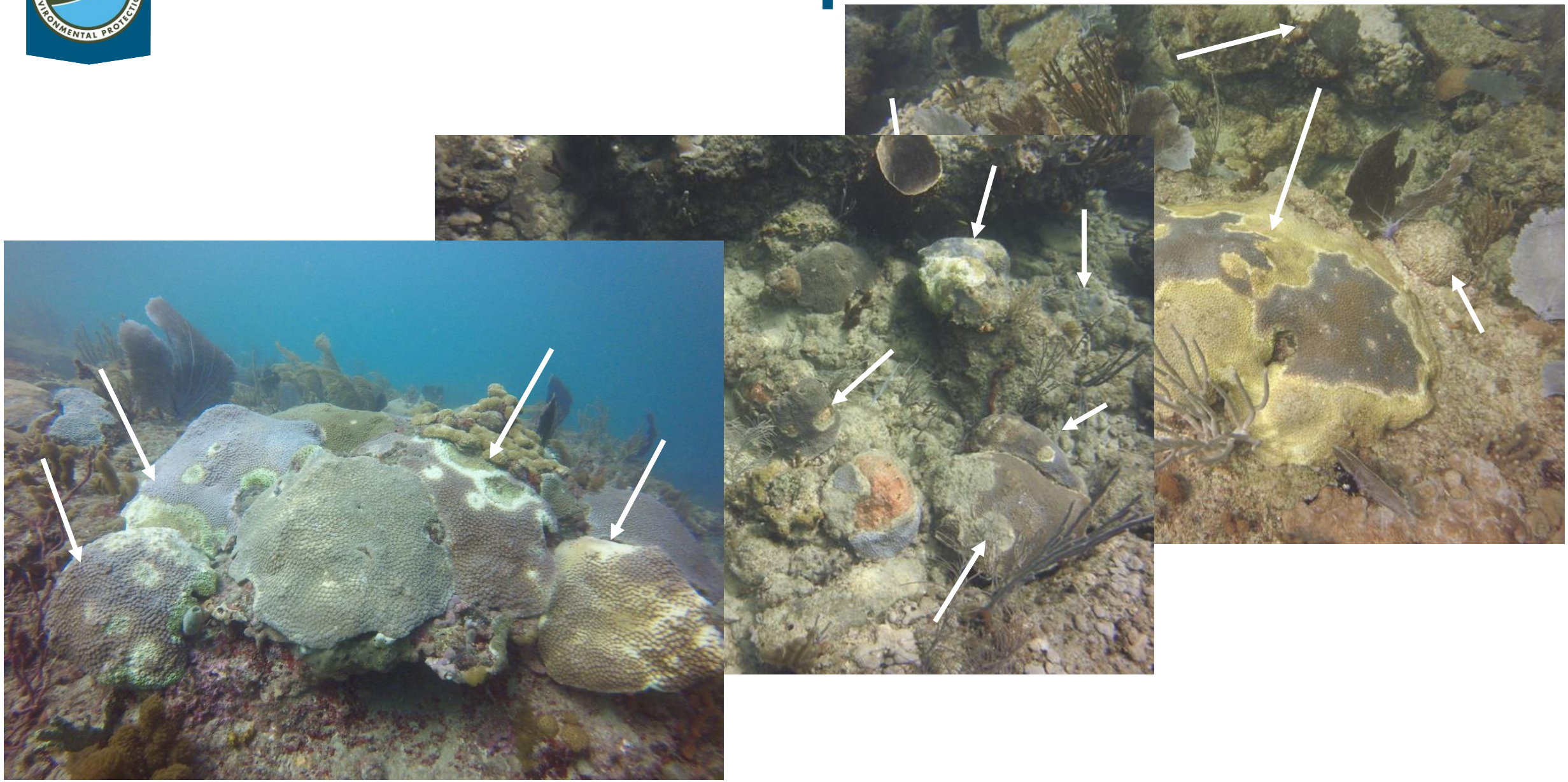
Most Impacted Species



95% loss of <u>known</u> populations



Disease affects multiple colonies at once



Partners in Disease Response

What is Coral Bleaching?

Coral Disease Outbreak

SEAFAN & the BleachWatch Early Warning Program

Your Contribution

SEAFAN

A community-based reporting and response program for marine incidents affecting southeast Florida's coral reef ecosystem.

SEAFAN

Southeast Florida Action Network

We're All Connected ~ Keep It Protected

Report Marine Incidents

See a Marine Incident?
Report It! www.SEAFAN.net

1-866-770-SEFL (7335)

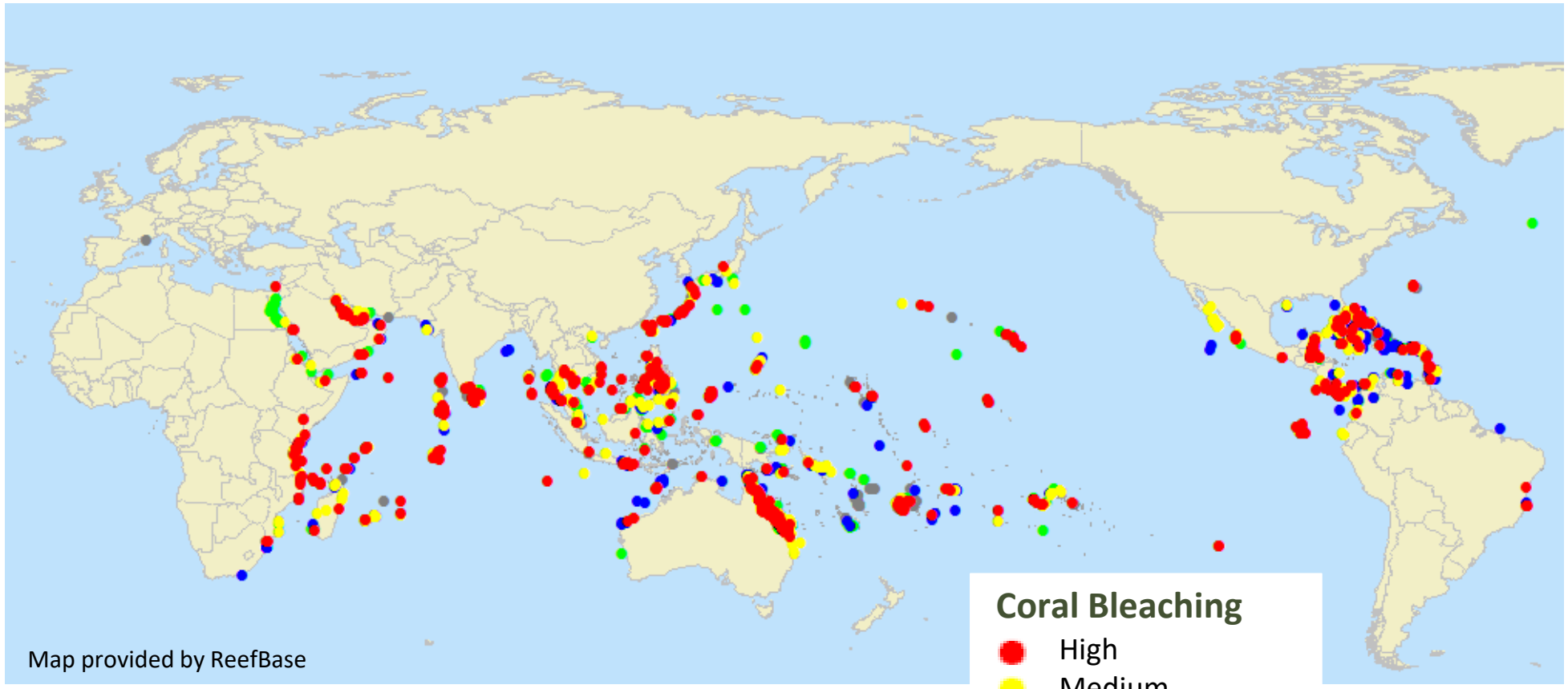
www.SEAFAN.net

SEAFAN BleachWatch

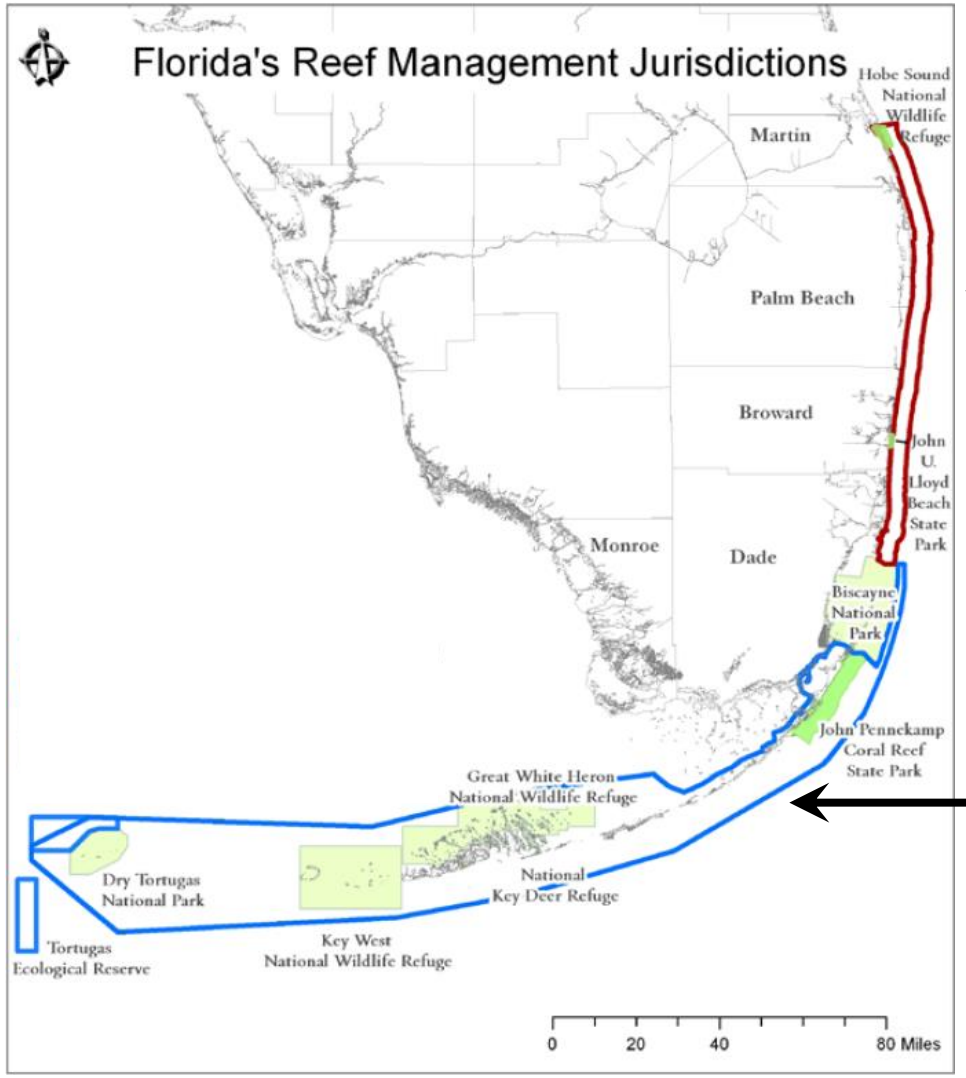
BleachWatch is an early warning system for coral bleaching in southeast Florida.

Coral Disease
& Bleaching

Coral Bleaching, 1980-2010



SEAFAN BleachWatch

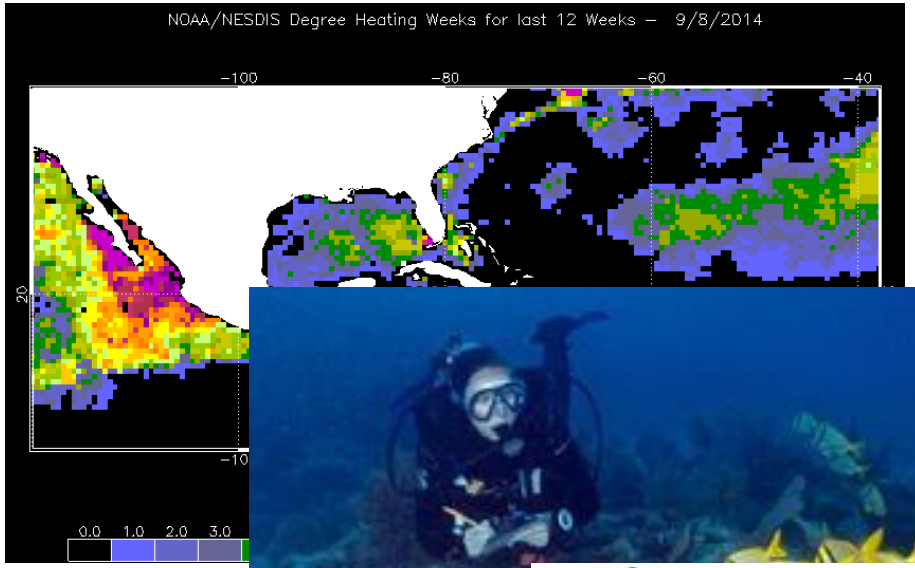


DEP Coral Reef Conservation Program Area
Florida Keys National Marine Sanctuary
Federal Park or Refuge
State Park

SEAFAN BleachWatch

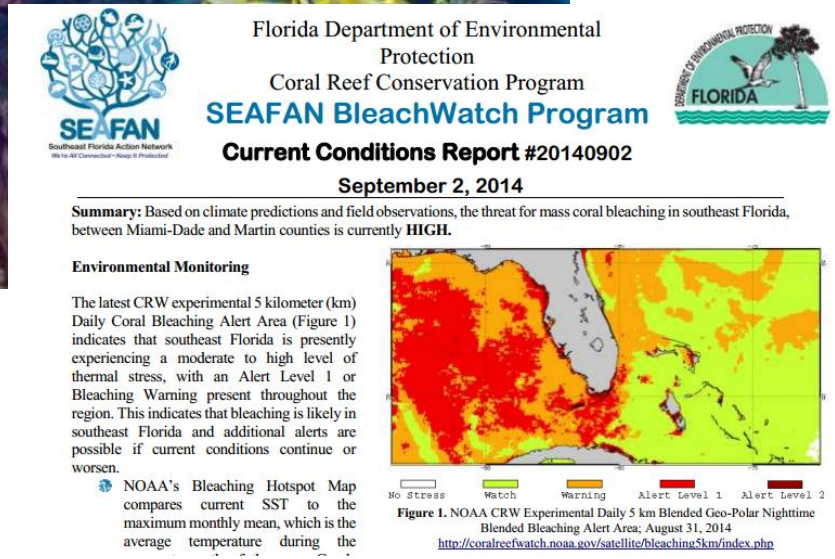
Florida Keys BleachWatch

BleachWatch Objectives



Monitor climate and sea temperatures = environmental monitoring

Involve citizen scientists



Florida Department of Environmental Protection
Coral Reef Conservation Program
SEAFAN BleachWatch Program
Current Conditions Report #20140902
September 2, 2014

Summary: Based on climate predictions and field observations, the threat for mass coral bleaching in southeast Florida, between Miami-Dade and Martin counties is currently **HIGH.**

Environmental Monitoring

The latest CRW experimental 5 kilometer (km) Daily Coral Bleaching Alert Area (Figure 1) indicates that southeast Florida is presently experiencing a moderate to high level of thermal stress, with an Alert Level 1 or Bleaching Warning present throughout the region. This indicates that bleaching is likely in southeast Florida and additional alerts are possible if current conditions continue or worsen.

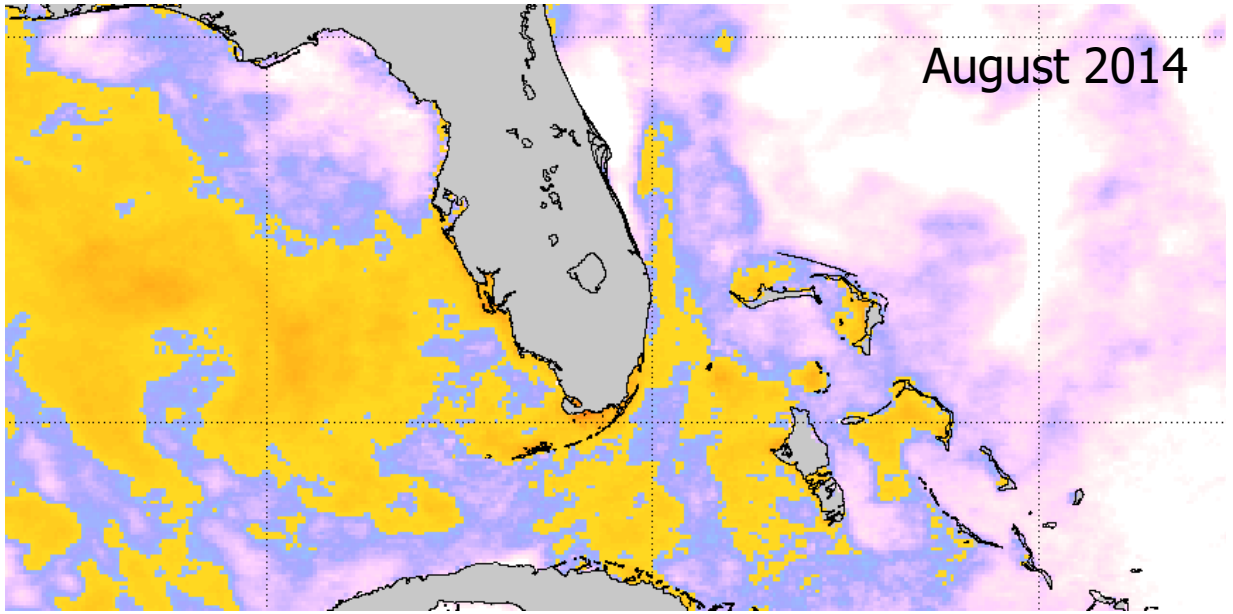
- NOAA's Bleaching Hotspot Map compares current SST to the maximum monthly mean, which is the average temperature during the

Figure 1. NOAA CRW Experimental Daily 5 km Blended Geo-Polar Nighttime Blended Bleaching Alert Area; August 31, 2014
http://coralreefwatch.noaa.gov/satellite/bleaching5km/index.php

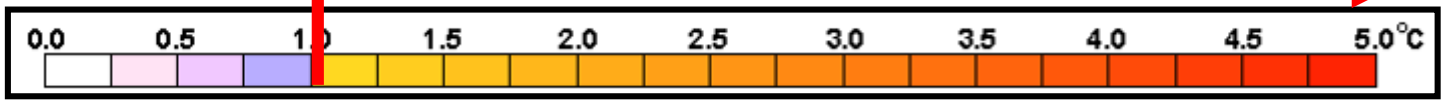
Issue "Current Conditions" reports

Environmental Monitoring

High Temperatures
(Hot Spots)

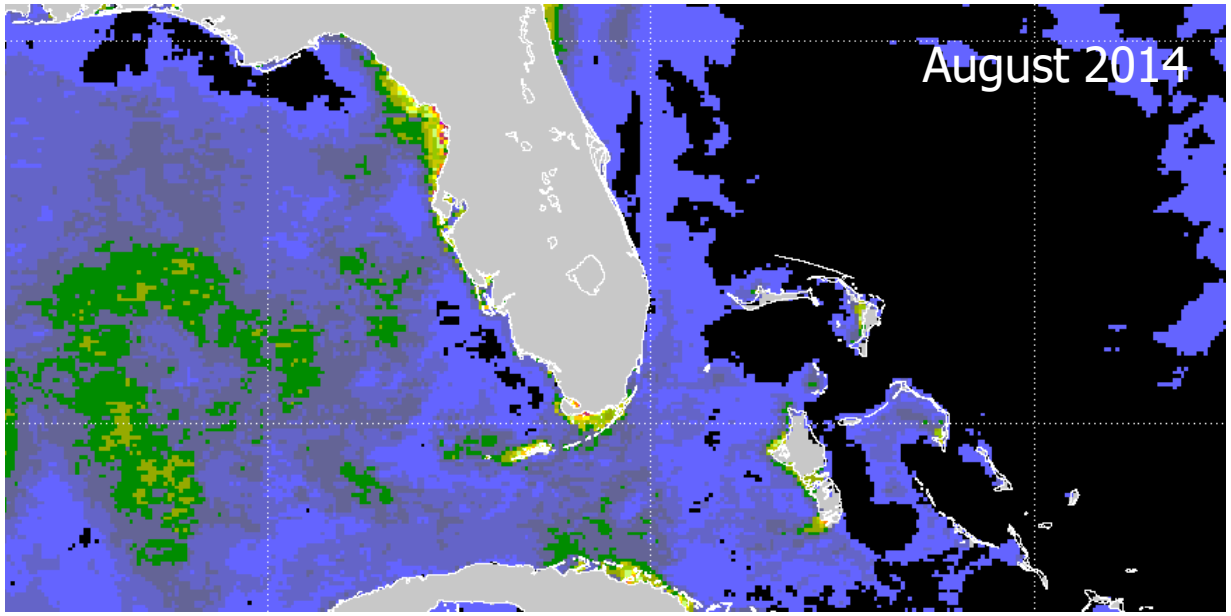


Corals start to become stressed



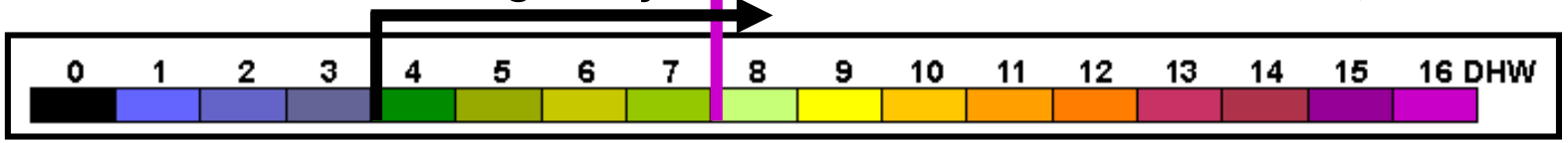
Environmental Monitoring

Extended Time
(Degree Heating Weeks)



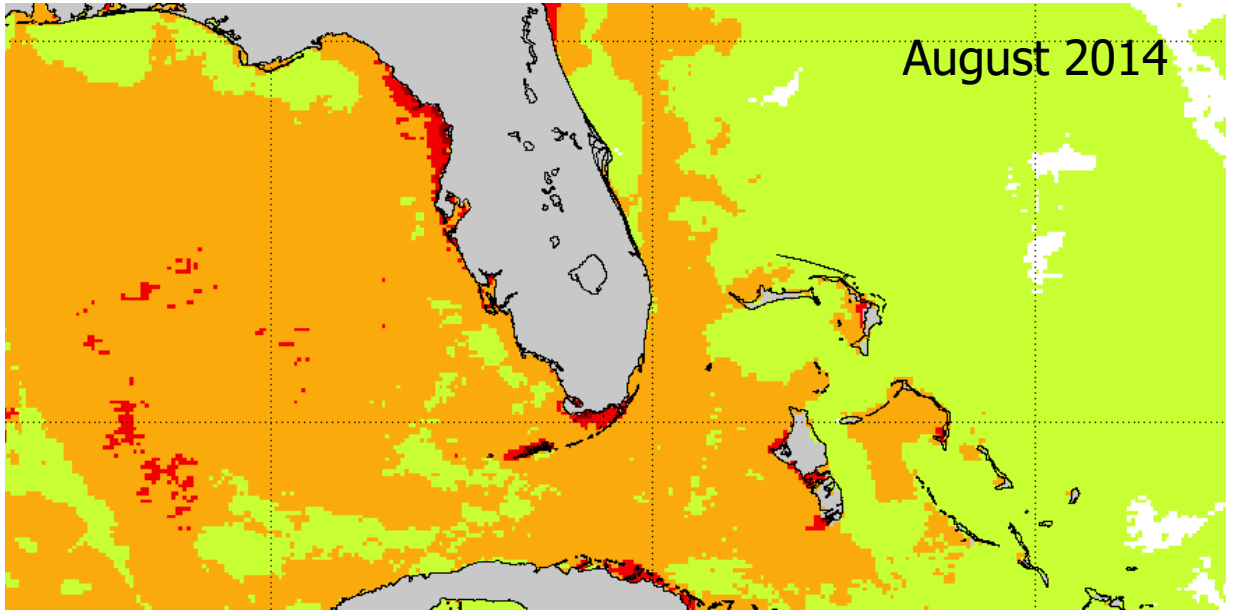
Significant coral bleaching likely

Widespread bleaching and mortality



Environmental Monitoring

High Temperatures (Hot Spots) + **Extended Time (Degree Heating Weeks)** = **Bleaching Alerts**



Training Overview

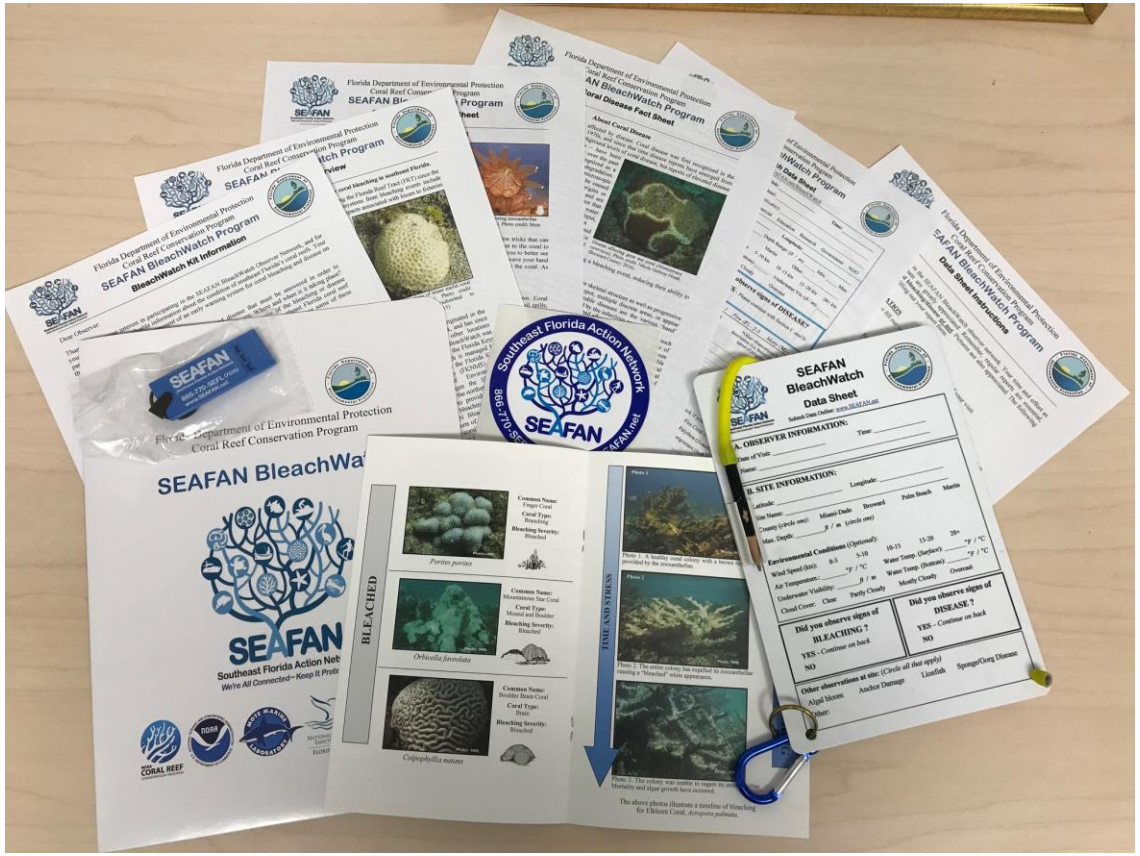
What is Coral Bleaching?

Coral Disease Outbreak

SEAFAN & the BleachWatch Early Warning Program

Your Contribution

BleachWatch Kit



Training Materials

- Program Overview
- Bleaching Fact Sheet
- Disease Fact Sheet
- Data Sheets (x2)
- Data Sheet Instructions
- Waterproof ID Guide
- *Dive Slate*

www.SEAFAN.net/BleachWatch

Observer Details

Florida Department of Environmental Protection
Coral Reef Conservation Program

SEAFAN BleachWatch Program

BleachWatch Data Sheet

Online Forms: www.SEAFAN.net/BleachWatch

A. OBSERVER INFORMATION: **Date of Visit:** _____ **Time:** _____

Name: _____ Email: _____

Phone: _____ Organization (*if applicable*): _____

Observer Category (*circle*): Resident Visitor Tourism Commercial Education Research Government NGO

*After your first report, you only need to fill out name, date and time.

Site Information

B. SITE INFORMATION: **Latitude:** N 25 40.450 **Longitude:** W 80 5.920

Site Name/Location: Emerald Reef Depth Range (*ft* / *m*): 20 Min. 25 Max.

County (*circle*): Miami-Dade Broward Palm Beach Martin Other: _____

Environmental Conditions (*Optional*): Wind Speed (*circle*): 0–5 kts 5–10 kts 10–15 kts 15–20 kts 20+ kts

Air Temp.: 95 Water Temp. (*Surface*): 84 Water Temp. (*Bottom*): 87 Underwater Vis. (*ft / m*): 30

Cloud cover (*circle*): Clear Partly Cloudy Mostly Cloudy Overcast

Did You Observe Signs of Coral Bleaching or Disease?

Did you observe signs of BLEACHING?	Did you observe signs of DISEASE?
☐ YES – Please continue with Section C *and* D ☐ NO	☐ YES – Please continue with Section D ☐ NO

Continue Data Form

Finished!!

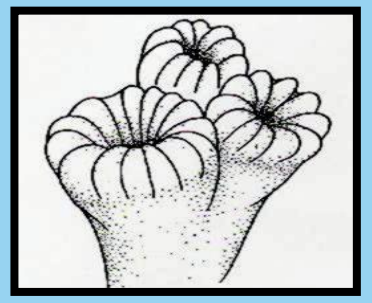
Bleaching and Disease Observations

Types of Corals

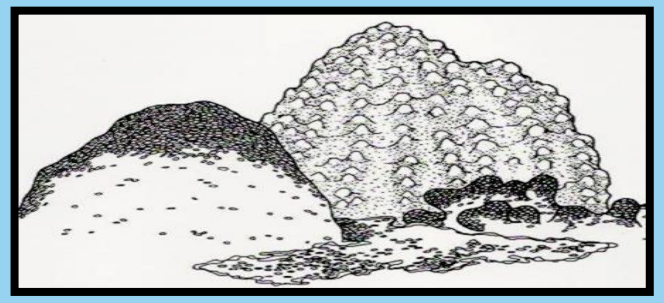
C. **BLEACHING AND DISEASE OBSERVATIONS:** *Single (S) - 1 Few (F) - 2-5 Many (M) - 5+*

	Bleaching:				**Disease:**				
	No Stress	*Paling*	*Partial Bleaching*	*Bleached*	*Black Band*	*Tissue Loss (white)*	*Growth Anomaly*	*Other**	*Other observations/further description (i.e. lesion pattern, color, speed of progression, etc.)
Brain	☐	☐	☐	☐	☐	☐	☐	☐	
Branching	☐	☐	☐	☐	☐	☐	☐	☐	
Fleshy	☐	☐	☐	☐	☐	☐	☐	☐	
Flowering/Cup	☐	☐	☐	☐	☐	☐	☐	☐	
Leaf/Plate/Sheet	☐	☐	☐	☐	☐	☐	☐	☐	
Mound/Boulder	☐	☐	☐	☐	☐	☐	☐	☐	

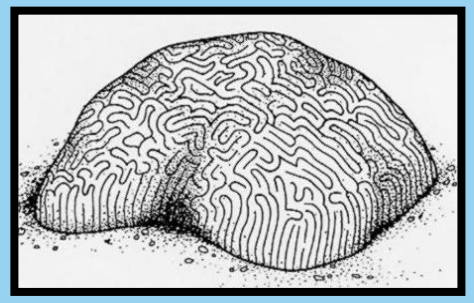
Basic Bleaching Observations



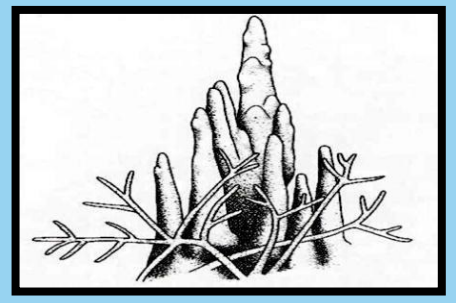
Flowering & Cup



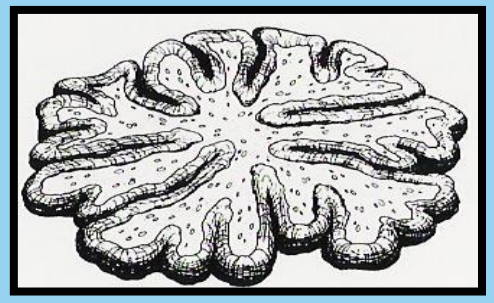
Encrusting, Mound & Boulder



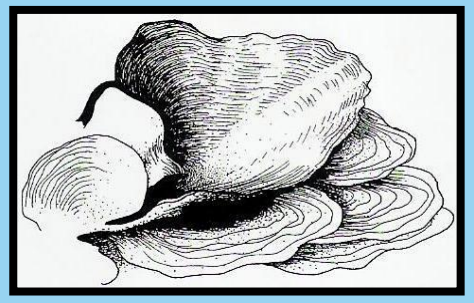
Brain Corals



Branching & Pillar



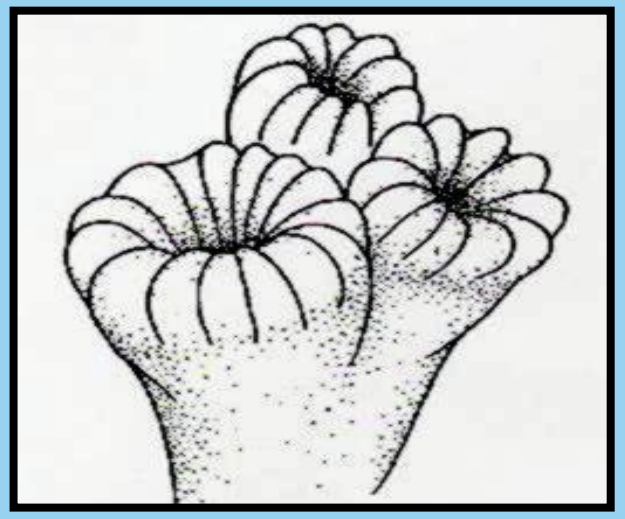
Fleshy Corals



Plate, Leaf & Sheet

Drawings courtesy of Reef Coral Identification

Types of Coral



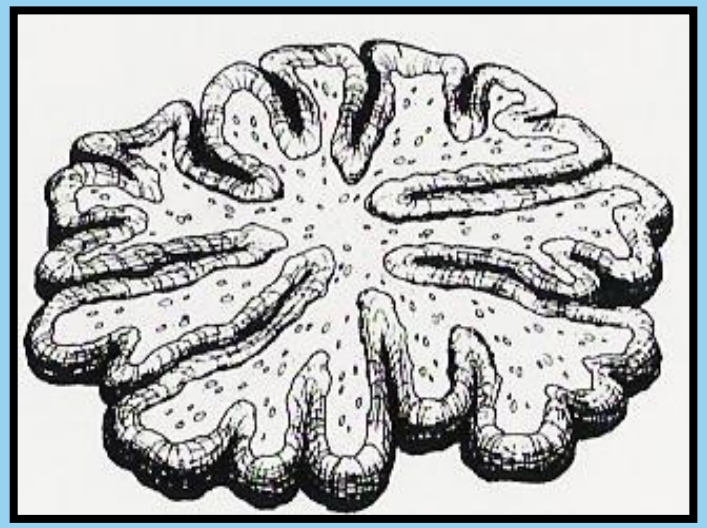
Flowering & Cup

Smooth Flower Coral

Photo: Coral Reef ID

Smooth Flower Coral

Types of Coral

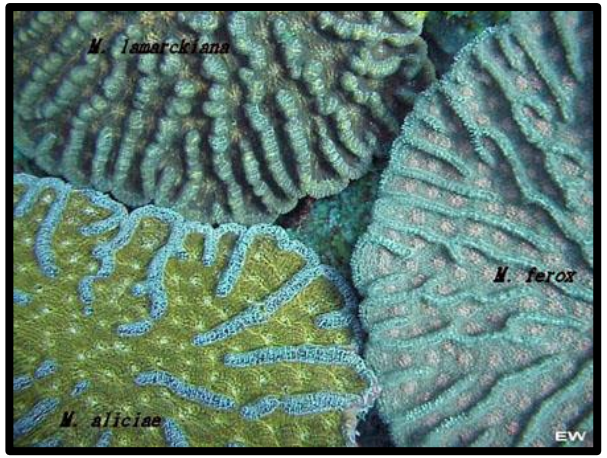


Fleshy Corals

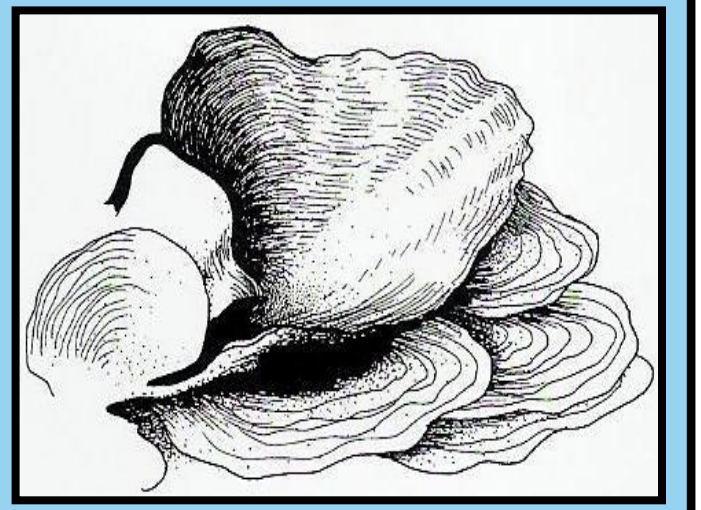
Cactus Coral

Mushroom Coral

Spiny Flower Coral



Types of Coral

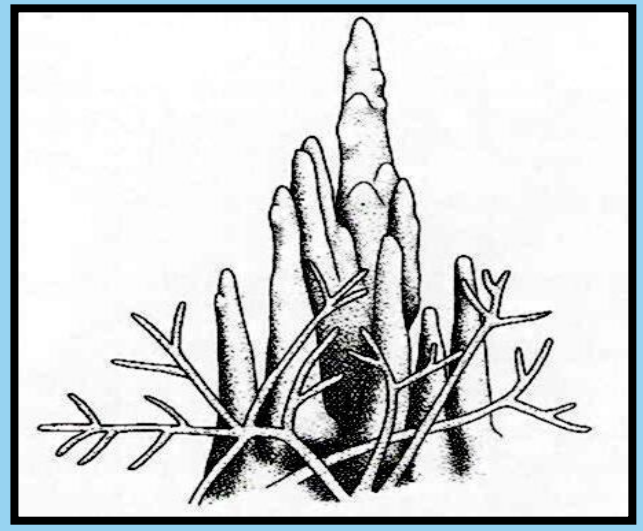


Plate, Leaf & Sheet

Whitestar Sheet Coral

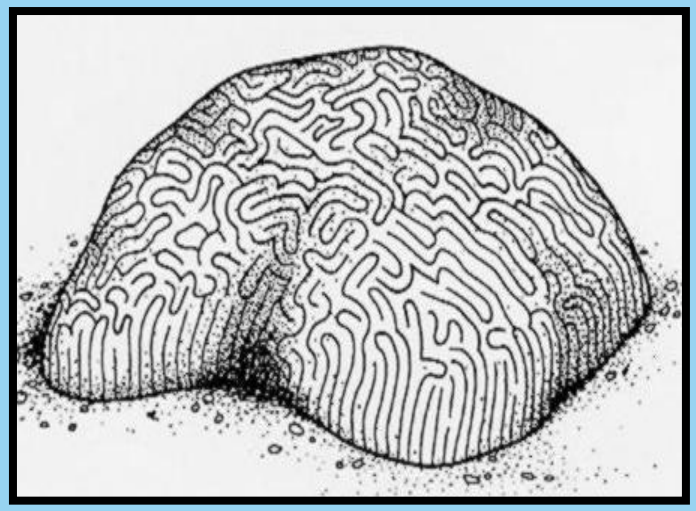
Lettuce Coral

Types of Coral

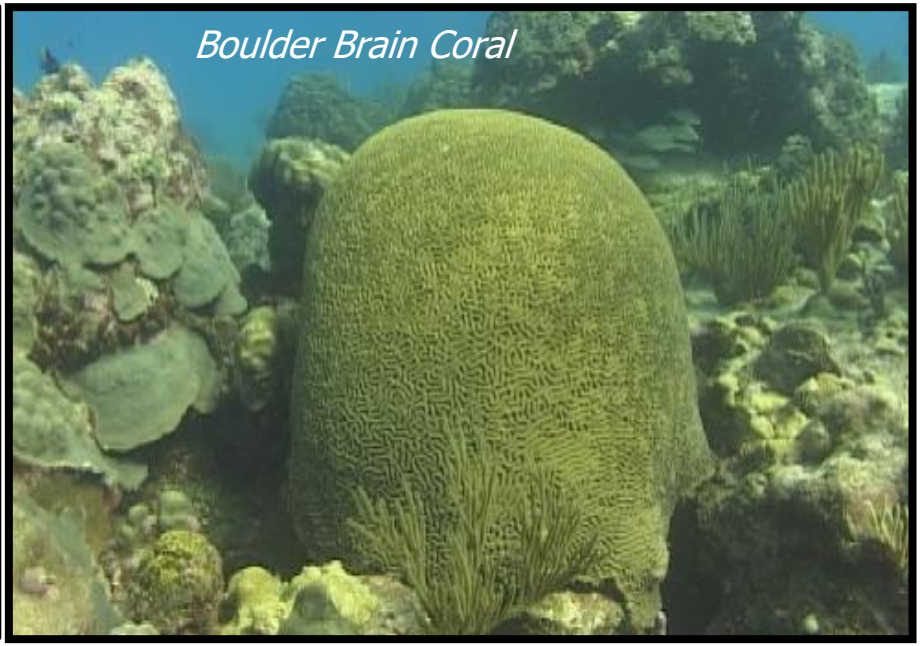


Branching & Pillar

Types of Coral



Brain Corals



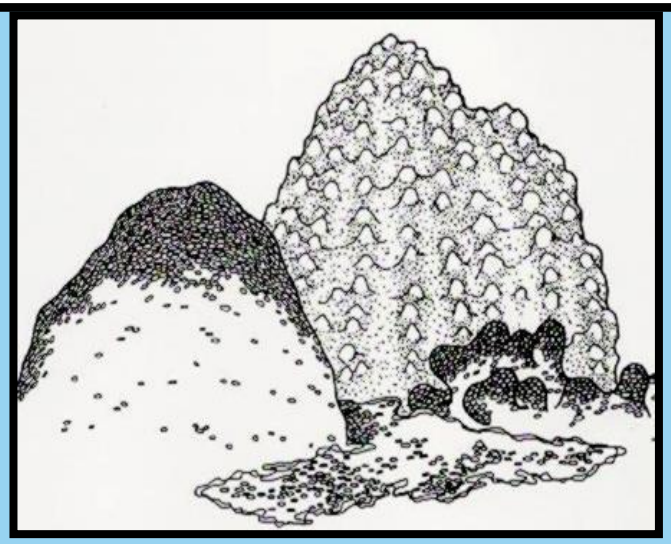
Boulder Brain Coral

Maze Coral

Grooved Brain Coral

Symmetrical Brain Coral

Types of Coral



Encrusting, Mound & Boulder

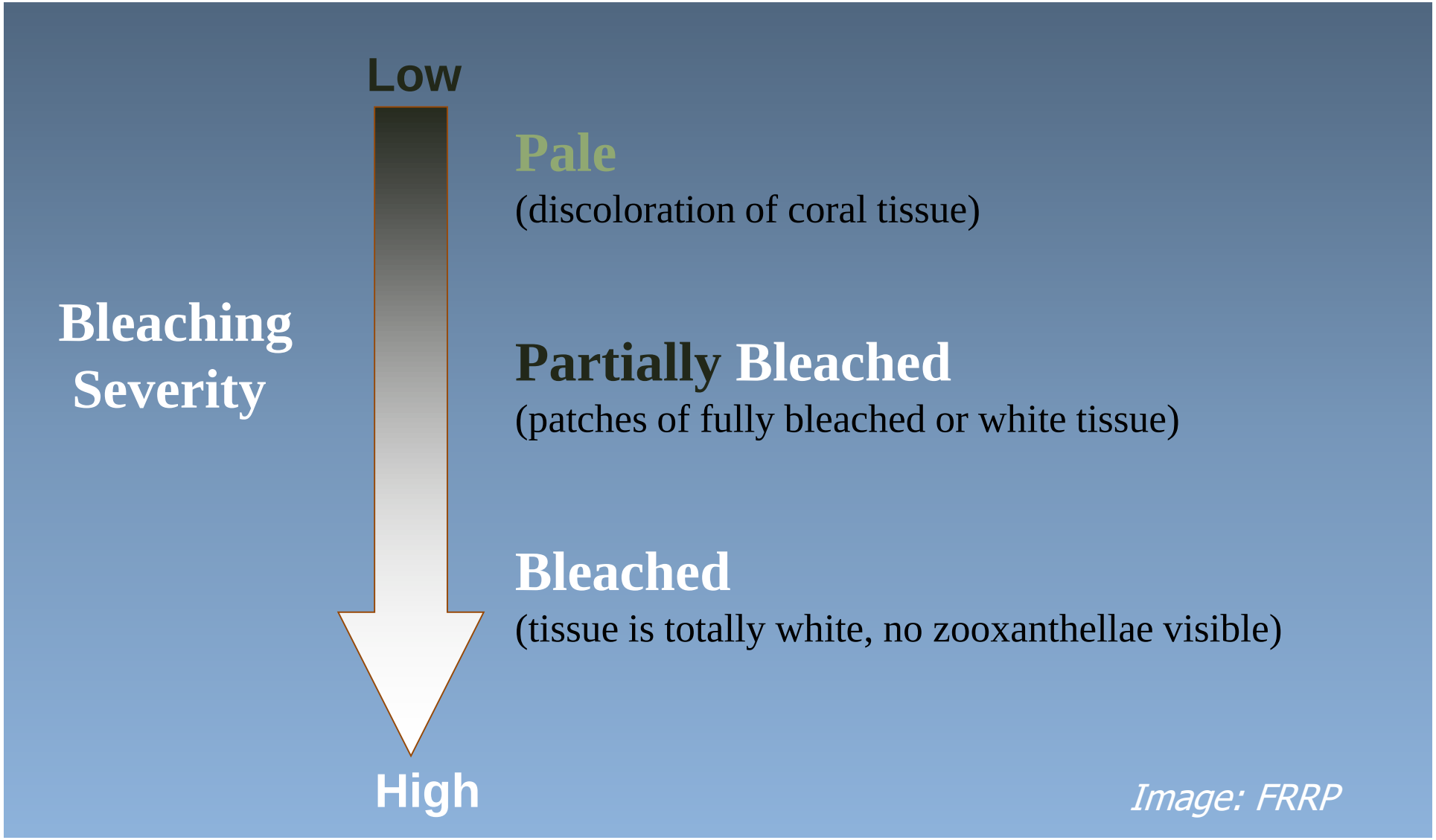
Bleaching and Disease Observations

Bleaching

C. **BLEACHING AND DISEASE OBSERVATIONS:** *Single (S) - 1 Few (F) - 2-5 Many (M) - 5+*

	Bleaching:				**Disease:**				*Other observations/further description (i.e. lesion pattern, color, speed of progression, etc.)
	No Stress	*Paling*	*Partial Bleaching*	*Bleached*	*Black Band*	*Tissue Loss (white)*	*Growth Anomaly*	*Other**	
Brain	☐	☐	☐	☐	☐	☐	☐	☐	
Branching	☐	☐	☐	☐	☐	☐	☐	☐	
Fleshy	☐	☐	☐	☐	☐	☐	☐	☐	
Flowering/Cup	☐	☐	☐	☐	☐	☐	☐	☐	
Leaf/Plate/Sheet	☐	☐	☐	☐	☐	☐	☐	☐	
Mound/Boulder	☐	☐	☐	☐	☐	☐	☐	☐	

Severity of Bleaching



Paling

Encrusting/Mound/Boulder Coral

Paling

Partially Bleaching

Encrusting/Mound/Boulder Coral

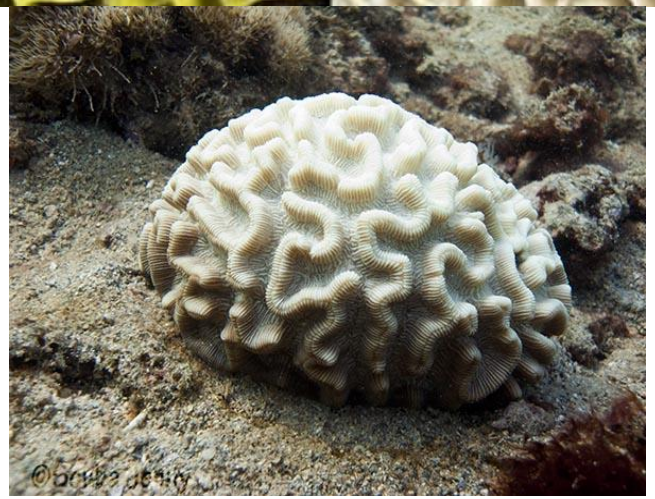
Partially Bleaching


Encrusting/Mound/Boulder Coral

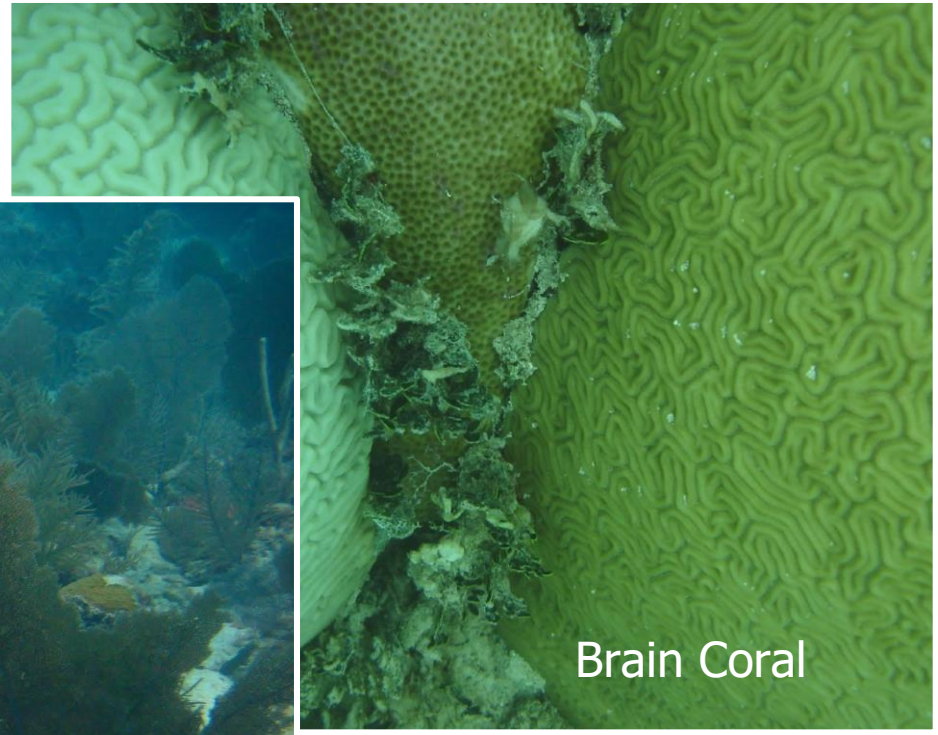

Brain Coral

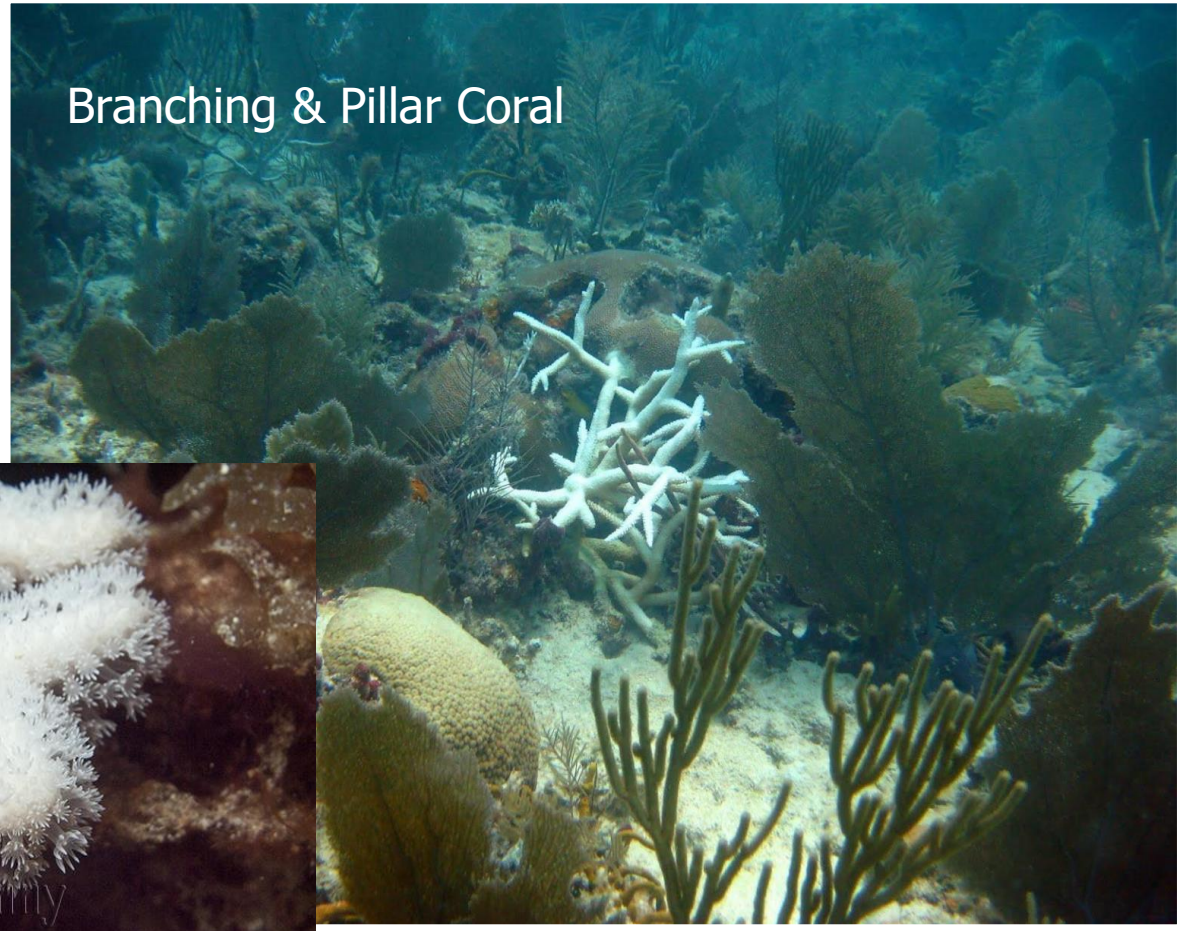

Encrusting/Mound/Boulder Coral

Bleached



Bleached





Branching & Pillar Coral

Bleaching and Disease Observations

Bleaching

	Bleaching:			
	No Stress	Paling	Partial Bleaching	Bleached
Brain		IIII		I
Branching	II	I		
Fleshy			I	
Flowering/Cup				
Leaf/Plate/Sheet	I		II	II
Mound/Boulder		I	III	

1 colony	→	SINGLE	→	S
2-5 colonies	→	FEW	→	F
5+ colonies	→	MANY	→	M

Bleaching and Disease Observations

Bleaching

	Bleaching: No Stress	Paling	Partial Bleaching	Bleached
Brain		~~III~~		I
Branching	II	I		
Fleshy			I	
Flowering/Cup				
Leaf/Plate/Sheet	I		II	II
Mound/Boulder		I	III	

BRAIN

1 colony	→	SINGLE	→	S
2-5 colonies	→	FEW	→	F
5+ colonies	→	MANY	→	M

Bleaching and Disease Observations

Bleaching

	Bleaching: No Stress	Paling	Partial Bleaching	Bleached
Brain		~~III~~		I
Branching	II	I		
Fleshy			I	
Flowering/Cup				
Leaf/Plate/Sheet	I		II	II
Mound/Boulder		I	III	

BRANCHING

1 colony	→	SINGLE	→	S
2-5 colonies	→	FEW	→	F
5+ colonies	→	MANY	→	M

Bleaching and Disease Observations

Bleaching

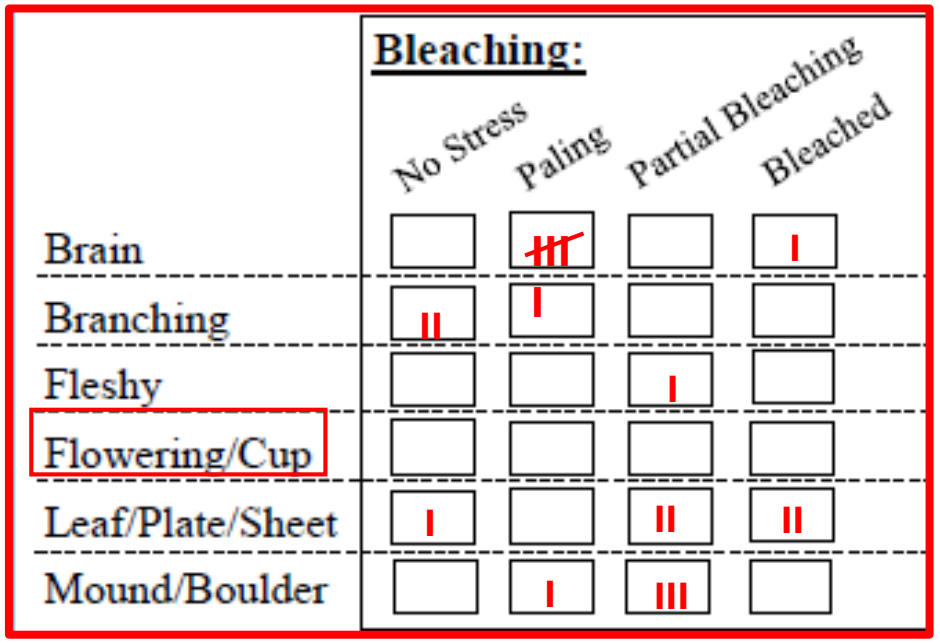
	Bleaching: No Stress	Paling	Partial Bleaching	Bleached
Brain		~~III~~		I
Branching	II	I		
Fleshy			I	
Flowering/Cup				
Leaf/Plate/Sheet	I		II	II
Mound/Boulder		I	III	

FLESHY

1 colony	→	SINGLE	→	S
2-5 colonies	→	FEW	→	F
5+ colonies	→	MANY	→	M

Bleaching and Disease Observations

Bleaching



	Bleaching:			
	No Stress	Paling	Partial Bleaching	Bleached
Brain		III		I
Branching	II	I		
Fleshy			I	
Flowering/Cup				
Leaf/Plate/Sheet	I		II	II
Mound/Boulder		I	III	

FLOWERING/CUP

N/A

1 colony	→	SINGLE	→	S
2-5 colonies	→	FEW	→	F
5+ colonies	→	MANY	→	M

Bleaching and Disease Observations

Bleaching

	Bleaching: No Stress	Paling	Partial Bleaching	Bleached
Brain		~~III~~		I
Branching	II	I		
Fleshy			I	
Flowering/Cup				
Leaf/Plate/Sheet	I		II	II
Mound/Boulder		I	III	

LEAF/PLATE/SHEET

1 colony	→	SINGLE	→	S
2-5 colonies	→	FEW	→	F
5+ colonies	→	MANY	→	M

Bleaching and Disease Observations

Bleaching

Bleaching:	No Stress	Paling	Partial Bleaching	Bleached
Brain		~~III~~		I
Branching	II	I		
Fleshy			I	
Flowering/Cup				
Leaf/Plate/Sheet	I		II	II
Mound/Boulder		I	III	

MOUND/BOULDER

1 colony	→	SINGLE	→	S
2-5 colonies	→	FEW	→	F
5+ colonies	→	MANY	→	M

Bleaching and Disease Observations

Disease

BLEACHING AND DISEASE OBSERVATIONS: *Single (S) - 1 Few (F) - 2-5 Many (M) - 5+*

	Bleaching:				**Disease:**				
	No Stress	*Paling*	*Partial Bleaching*	*Bleached*	*Black Band*	*Tissue Loss (white)*	*Growth Anomaly*	*Other**	*Other observations/further description (i.e. lesion pattern, color, speed of progression, etc.)*
Brain	☐	☐	☐	☐	☐	☐	☐	☐	
Branching	☐	☐	☐	☐	☐	☐	☐	☐	
Fleshy	☐	☐	☐	☐	☐	☐	☐	☐	
Flowering/Cup	☐	☐	☐	☐	☐	☐	☐	☐	
Leaf/Plate/Sheet	☐	☐	☐	☐	☐	☐	☐	☐	
Mound/Boulder	☐	☐	☐	☐	☐	☐	☐	☐	

Types of Disease

Black Band Disease

Types of Disease

Tissue Loss (White)

Types of Disease

Growth Anomaly

Types of Disease

Other

Bleaching and Disease Observations

Disease

BLEACHING AND DISEASE OBSERVATIONS: *Single (S) - 1 Few (F) - 2-5 Many (M) - 5+*

	Bleaching:				Disease:				
	No Stress	Paling	Partial Bleaching	Bleached	Black Band	Tissue Loss (white)	Growth Anomaly	Other*	*Other observations/further description (i.e. lesion pattern, color, speed of progression, etc.)
Brain								I	Multiple circular lesions, slow
Branching									
Fleshy									
Flowering/Cup									
Leaf/Plate/Sheet									
Mound/Boulder						II			Singular, linear progression

Lesion Pattern

Single

Multiple

Lesion Shape

Linear

Circular

Irregular

Speed of Progression

Slow (Thin Margin)

Fast (Thick Margin)

Overall Observations

Overall severity of bleaching

D. OVERALL OBSERVATIONS:

What was the overall severity of bleaching over the entire site? *(Please check one)*

___ Pale (light color) ___ Partially bleached ___ Fully Bleached ___ Dead with algae

What percent of overall coral cover was **BLEACHED** at the site? *(Please check one)*

___1 – 10% ___11 – 30% ___ 31 – 50% ___51 – 75% ___76 – 100%

What percent of overall coral cover was **DISEASED** at the site? *(Please check one)*

___ 1 – 10% ___11 – 30% ___ 31 – 50% ___51 – 75% ___76 – 100%

Check if you saw bleaching on:

____ Fire Coral (Hydrocoral)

____ Palythoa (Zoanthids)

____Gorgonians (Soft Coral)

*Select *one* response

Dead with Algae

Brain Coral, Dead

Overall Observations

% Live coral bleached

D. OVERALL OBSERVATIONS:

What was the overall severity of bleaching over the entire site? *(Please check one)*

___ Pale (light color) ___ Partially bleached ___ Fully Bleached ___ Dead with algae

What percent of overall coral cover was **BLEACHED** at the site? *(Please check one)*

___1 – 10% ___11 – 30% ___ 31 – 50% ___51 – 75% ___76 – 100%

What percent of overall coral cover was **DISEASED** at the site? *(Please check one)*

___ 1 – 10% ___11 – 30% ___ 31 – 50% ___51 – 75% ___76 – 100%

Check if you saw bleaching on:

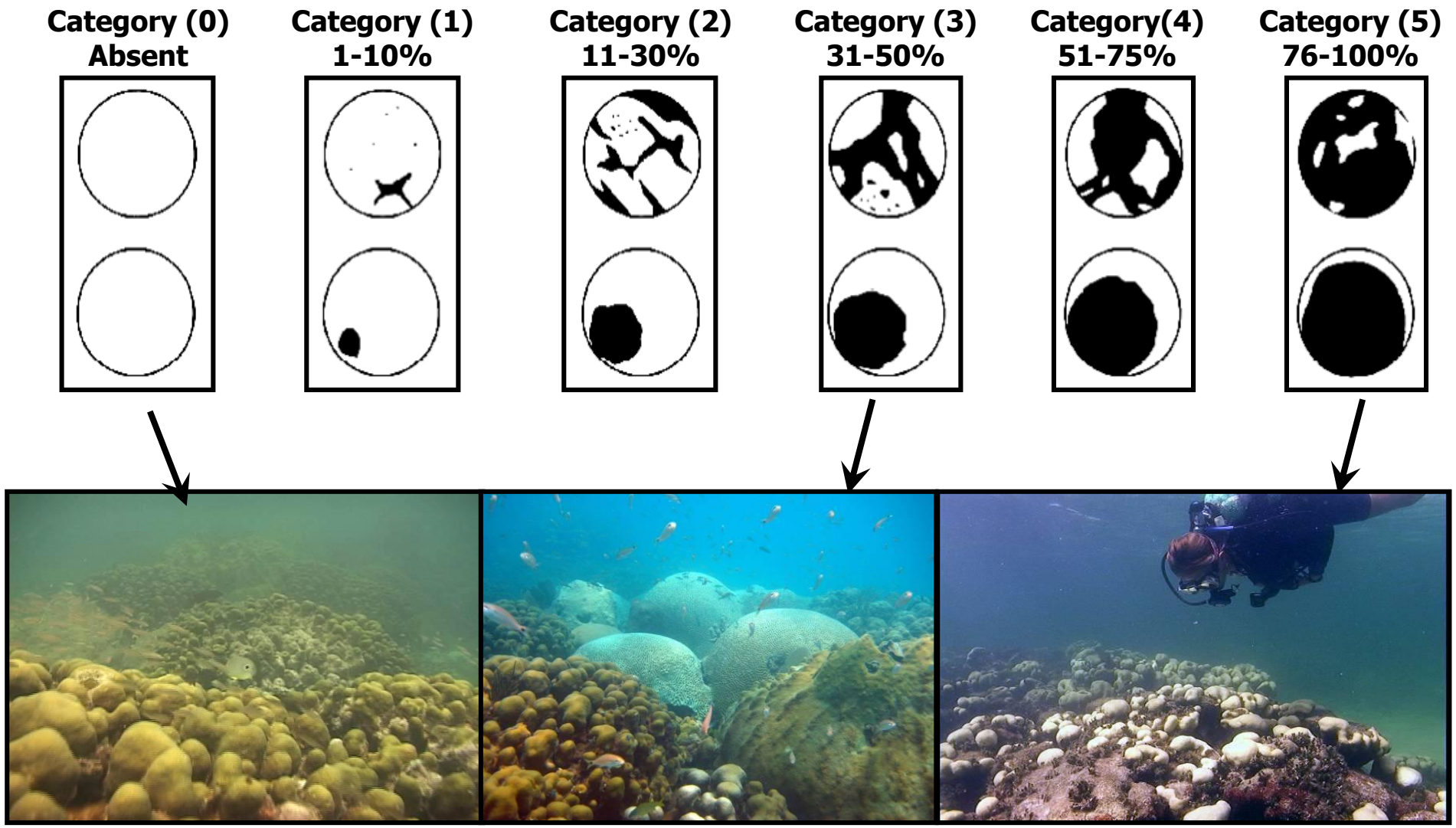
____ Fire Coral (Hydrocoral)

____ Palythoa (Zoanthids)

____Gorgonians (Soft Coral)

*Select *one* response

% of Live Coral Bleaching



Overall Observations

% Live coral diseased

D. OVERALL OBSERVATIONS:

What was the overall severity of bleaching over the entire site? *(Please check one)*

___ Pale (light color) ___ Partially bleached ___ Fully Bleached ___ Dead with algae

What percent of overall coral cover was **BLEACHED** at the site? *(Please check one)*

___1 – 10% ___11 – 30% ___ 31 – 50% ___51 – 75% ___76 – 100%

What percent of overall coral cover was **DISEASED** at the site? *(Please check one)*

___ 1 – 10% ___11 – 30% ___ 31 – 50% ___51 – 75% ___76 – 100%

Check if you saw bleaching on:

____ Fire Coral (Hydrocoral)

____ Palythoa (Zoanthids)

____Gorgonians (Soft Coral)

*Select *one* response

Overall Observations

Other Bleaching Indicators: Non-Stony Corals

D. OVERALL OBSERVATIONS:

What was the overall severity of bleaching over the entire site? *(Please check one)*

___ Pale (light color) ___ Partially bleached ___ Fully Bleached ___ Dead with algae

What percent of overall coral cover was **BLEACHED** at the site? *(Please check one)*

___1 – 10% ___11 – 30% ___ 31 – 50% ___51 – 75% ___76 – 100%

What percent of overall coral cover was **DISEASED** at the site? *(Please check one)*

___ 1 – 10% ___11 – 30% ___ 31 – 50% ___51 – 75% ___76 – 100%

Check if you saw bleaching on:

X ___ Fire Coral (Hydrocoral)

X ___ Palythoa (Zoanthids)

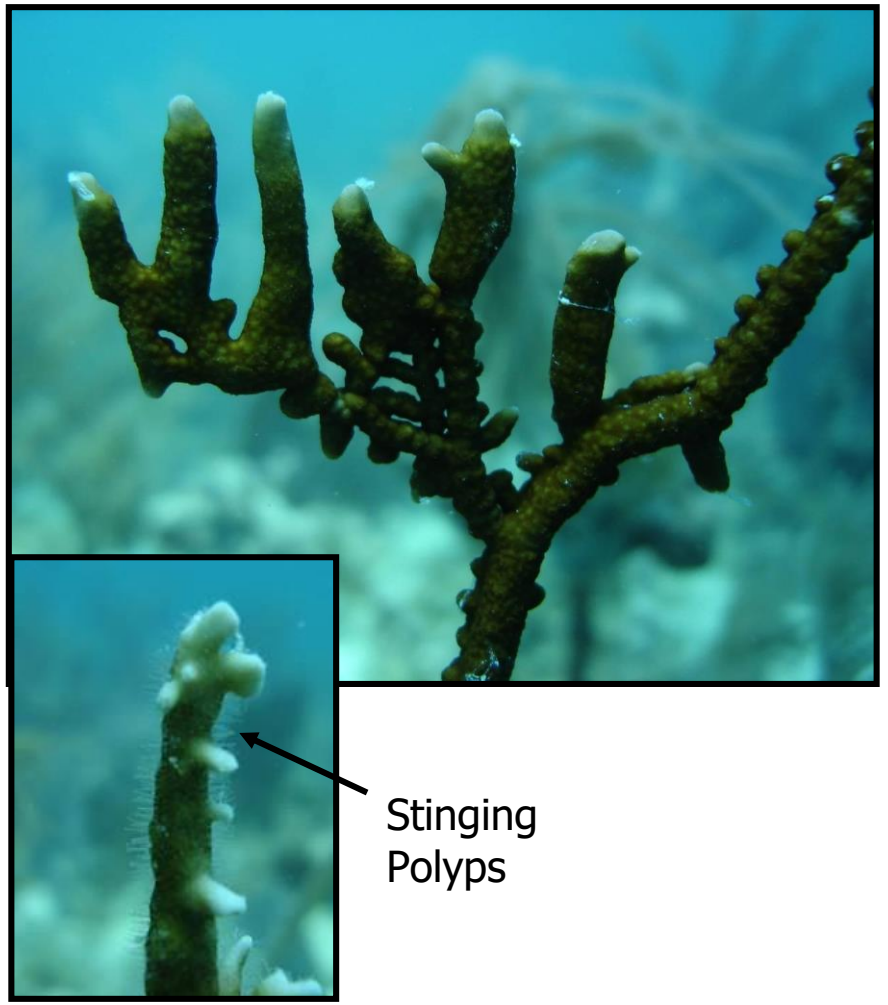
___ Gorgonians (Soft Coral)

*Multiple responses

Other Bleaching Indicators

Fire Coral, *Millepora sp.*

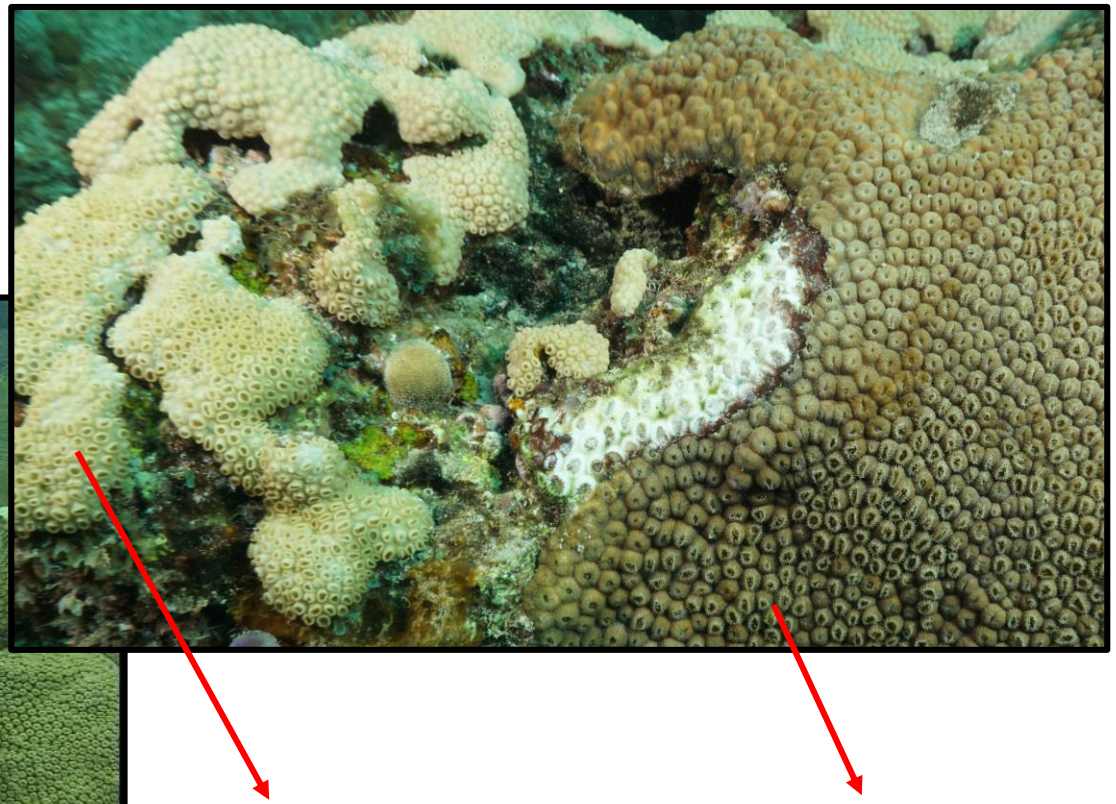
- Hydrocoral, not a stony coral
- Has stinging polyps
- Encrusting



Other Bleaching Indicators

Zoanthid, *Palythoa sp.*

- Zoanthid, not a stony coral
- Similar to anemones
- Encrusting



Other Bleaching Indicators

Zoanthid, *Palythoa sp*.

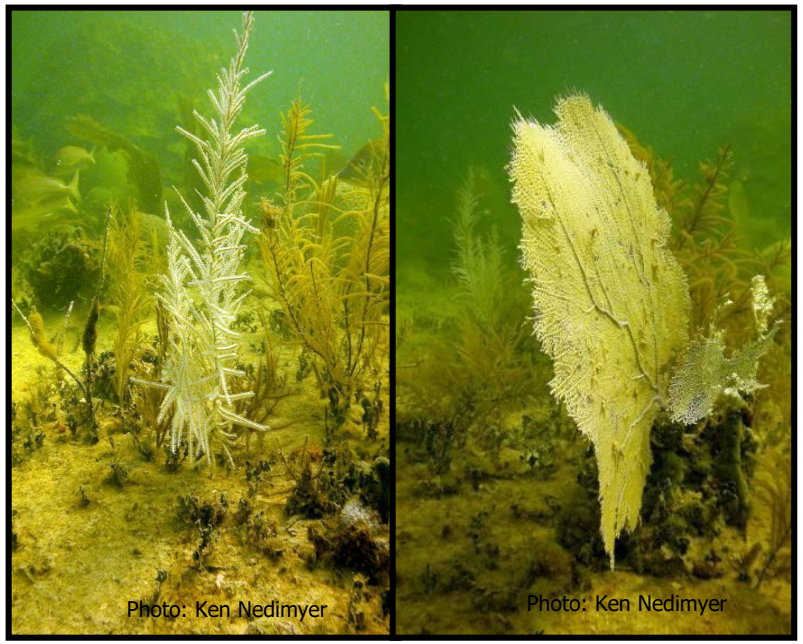
Palythoa sp, bleached

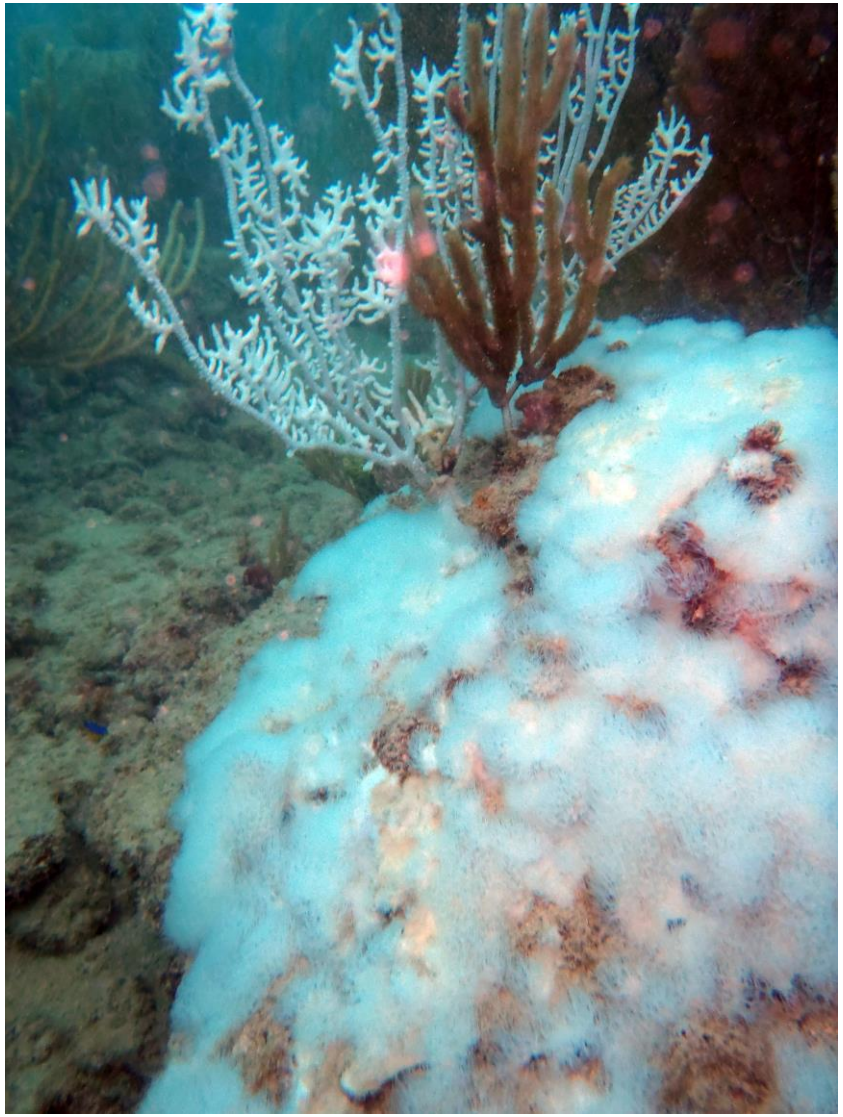
Photo: Kim Porter

Other Bleaching Indicators

Gorgonians
(Sea fans, sea rods, etc.)

- Octocoral, not a stony coral
- Branching or encrusting
- Many different species





Other Bleaching Indicators

Gorgonians

Notes

E. NOTES: *(Specific species of coral affected, other observations about the site)*

- Specific species of coral
- Any details describing photos
- Other SEAFAN-related observations?

Send In Your Data

Remember to submit reports, even if there is NO bleaching or disease at your dive site!

- Submit electronically at www.SEAFAN.net/BleachWatch
- Scan and email data sheets to: Coral@FloridaDEP.gov
- Fold the data sheet, tape it, place a postage stamp, and mail to the address on the back
- Take picture of slate and email to: Coral@FloridaDEP.gov

Send In Your Data- Photos Are Encouraged!

Remember to include representative photos with your report, when possible:

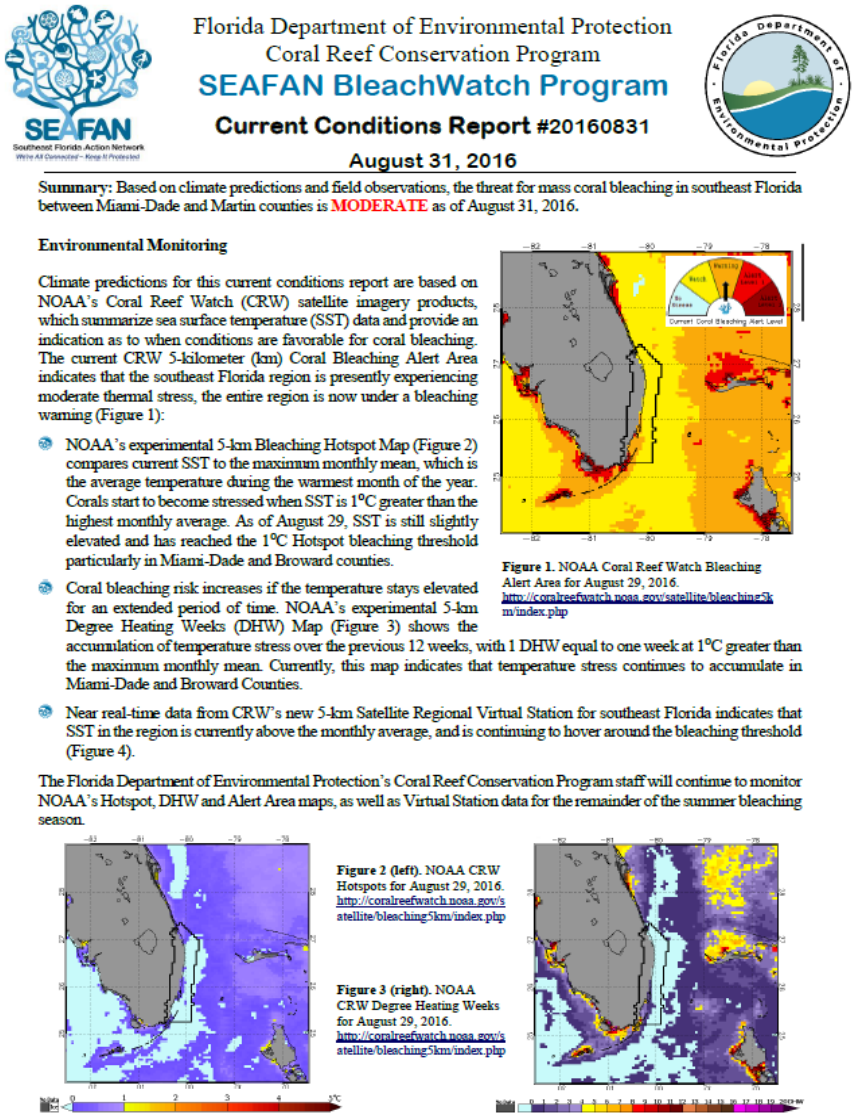
- Sharp and in-focus
- White-balanced
- 1 photo of colony and 1 close-up photo of polyps (not of the entire reef)
- Max. 10 photos per report

Current Conditions Report

Available online:

www.SEAFAN.net/BleachWatch

- Updated according to environmental conditions
- Provide outlook for future bleaching events
- Include NOAA's HotSpot and Degree Heating Week Maps
- Summary of Field Data from Observers
- **PHOTOS!**



Florida Department of Environmental Protection
Coral Reef Conservation Program
SEAFAN BleachWatch Program
Current Conditions Report #20160831
August 31, 2016

Summary: Based on climate predictions and field observations, the threat for mass coral bleaching in southeast Florida between Miami-Dade and Martin counties is MODERATE as of August 31, 2016.

Environmental Monitoring

Climate predictions for this current conditions report are based on NOAA's Coral Reef Watch (CRW) satellite imagery products, which summarize sea surface temperature (SST) data and provide an indication as to when conditions are favorable for coral bleaching. The current CRW 5-kilometer (km) Coral Bleaching Alert Area indicates that the southeast Florida region is presently experiencing moderate thermal stress, the entire region is now under a bleaching warning (Figure 1):

- NOAA's experimental 5-km Bleaching Hotspot Map (Figure 2) compares current SST to the maximum monthly mean, which is the average temperature during the warmest month of the year. Corals start to become stressed when SST is 1°C greater than the highest monthly average. As of August 29, SST is still slightly elevated and has reached the 1°C Hotspot bleaching threshold particularly in Miami-Dade and Broward counties.
- Coral bleaching risk increases if the temperature stays elevated for an extended period of time. NOAA's experimental 5-km Degree Heating Weeks (DHW) Map (Figure 3) shows the accumulation of temperature stress over the previous 12 weeks, with 1 DHW equal to one week at 1°C greater than the maximum monthly mean. Currently, this map indicates that temperature stress continues to accumulate in Miami-Dade and Broward Counties.
- Near real-time data from CRW's new 5-km Satellite Regional Virtual Station for southeast Florida indicates that SST in the region is currently above the monthly average, and is continuing to hover around the bleaching threshold (Figure 4).

Figure 1. NOAA Coral Reef Watch Bleaching Alert Area for August 29, 2016. http://coralreefwatch.noaa.gov/satellite/bleaching5km/index.php

The Florida Department of Environmental Protection's Coral Reef Conservation Program staff will continue to monitor NOAA's Hotspot, DHW and Alert Area maps, as well as Virtual Station data for the remainder of the summer bleaching season.

Figure 2 (left). NOAA CRW Hotspots for August 29, 2016. http://coralreefwatch.noaa.gov/satellite/bleaching5km/index.php

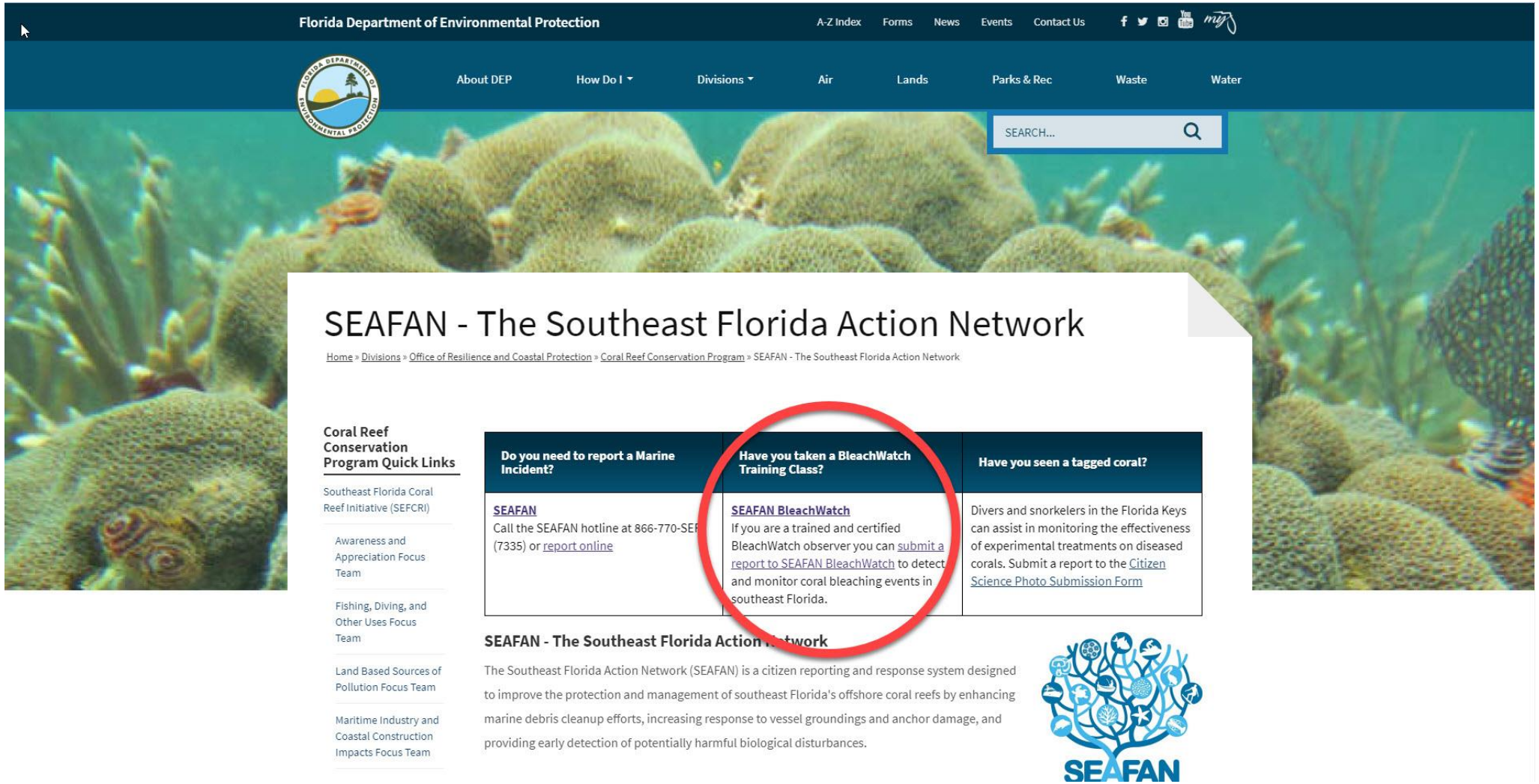
Figure 3 (right). NOAA CRW Degree Heating Weeks for August 29, 2016. http://coralreefwatch.noaa.gov/satellite/bleaching5km/index.php

Current Conditions Report

Conditions	Frequency of Update
Environmental conditions suggest low risk of mass coral bleaching	Monthly
Climate or sea temperatures are elevated above normal	Every two weeks
Sea temperature stress has accumulated to levels associated with a moderate risk of bleaching	Weekly
Sea temperature stress has accumulated to levels associated with a high risk of bleaching and/or reports of mild bleaching are reported by volunteers	Twice per week
Mass coral bleaching is being widely reported by volunteers	Twice per week

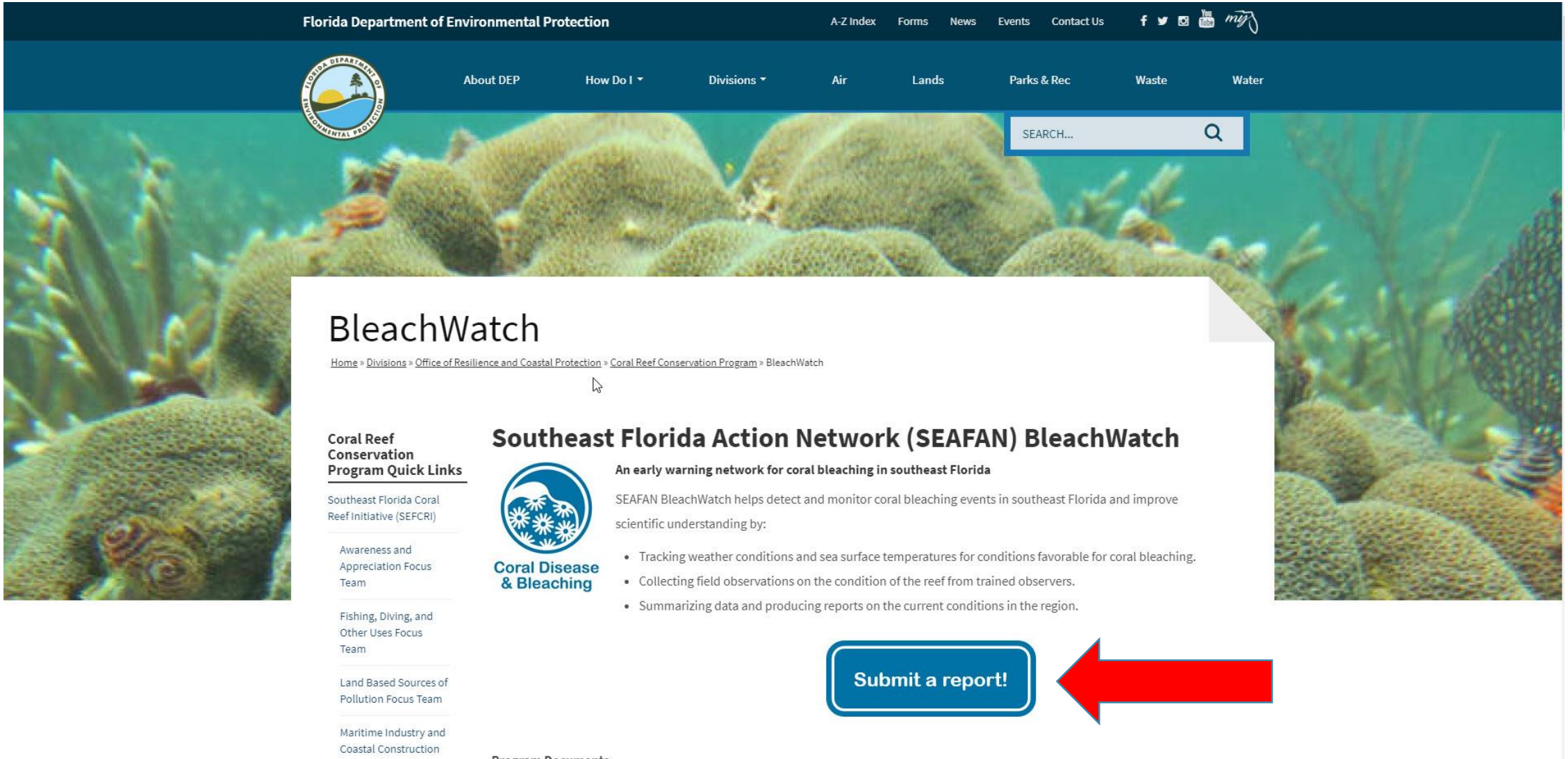
Check Us Out Online!

www.SEAFAN.net

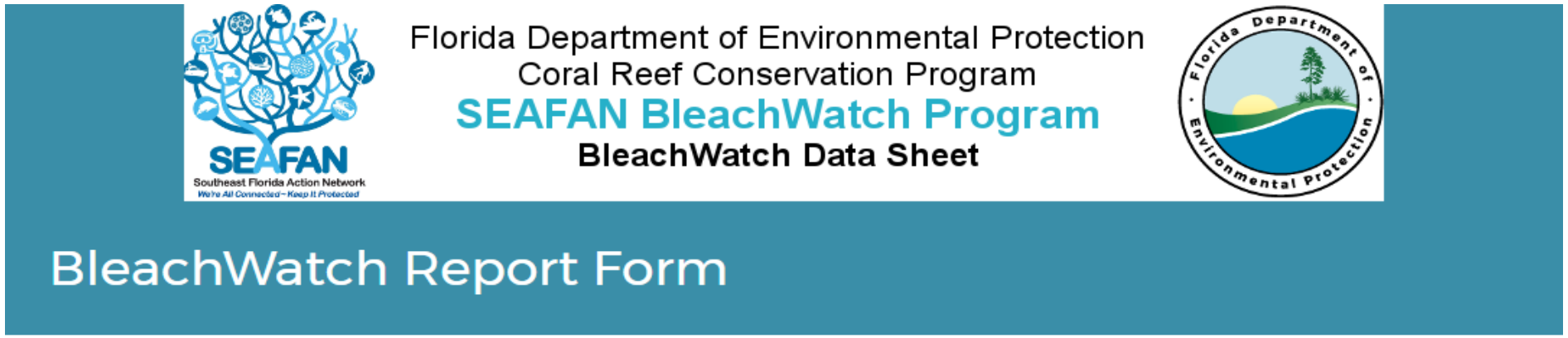


Check Us Out Online!

www.SEAFAN.net/BleachWatch

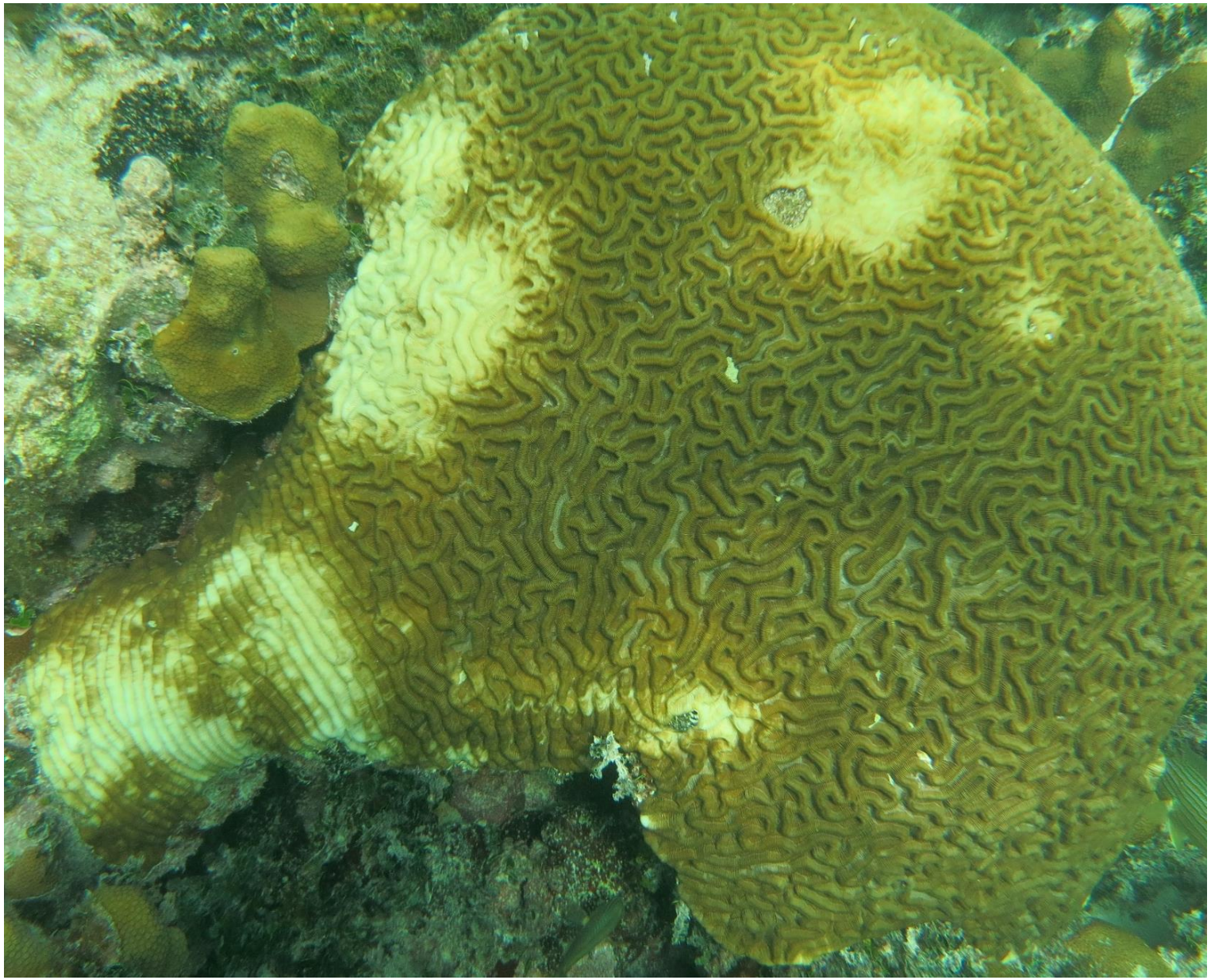


Online Report Form



Review #1

Review #2

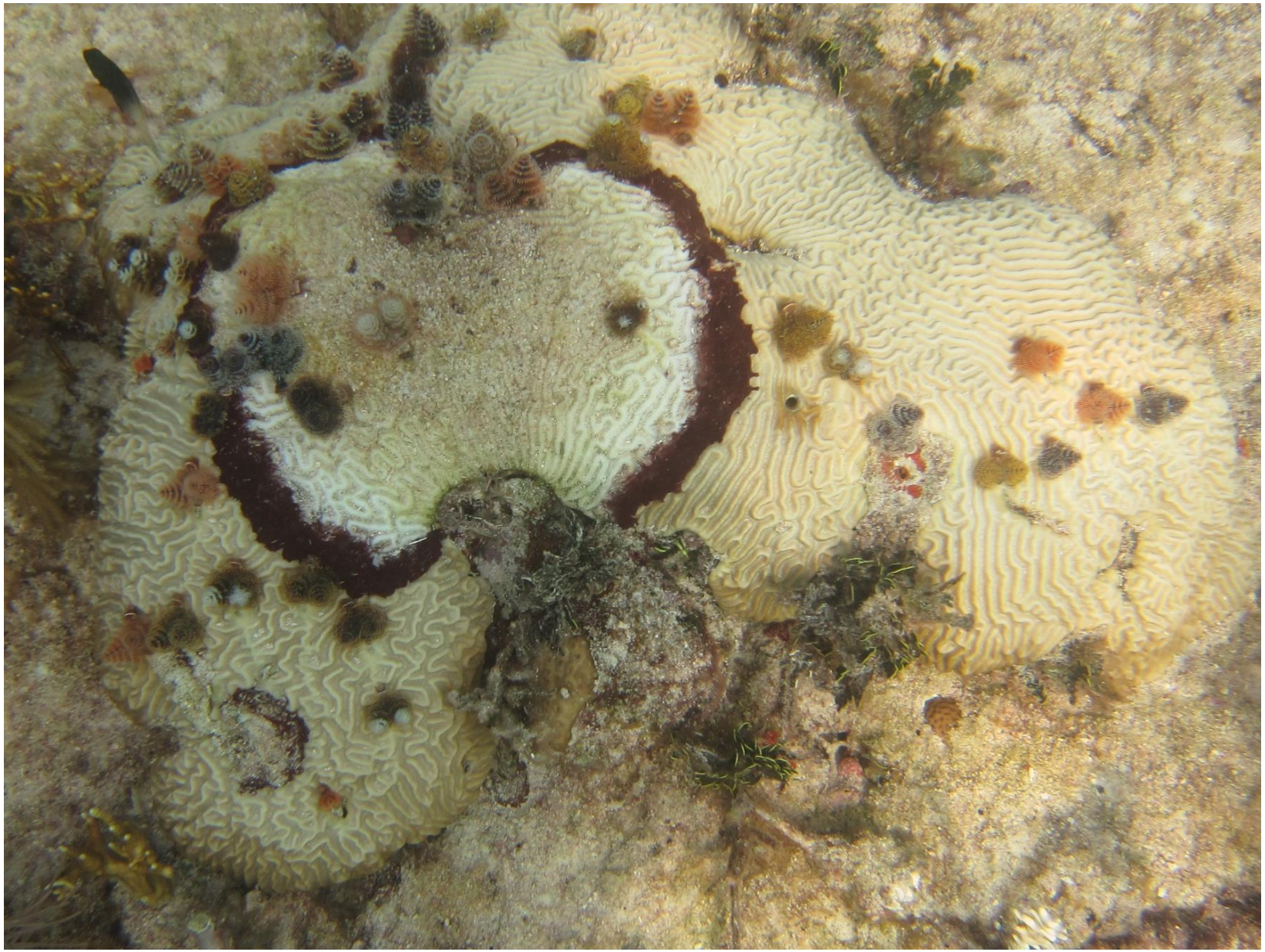


Review #3

Review #4

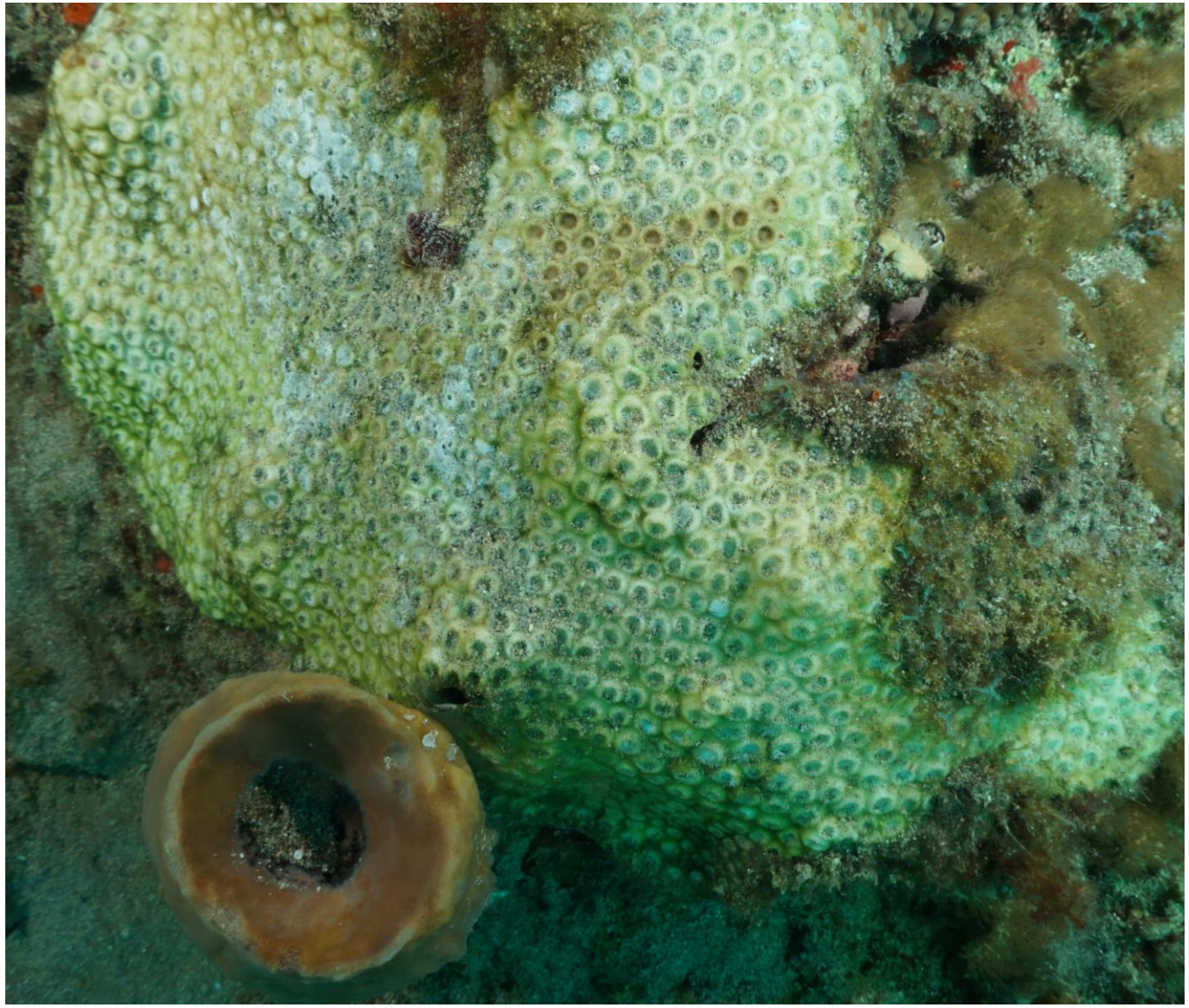
Review #5

Review #6

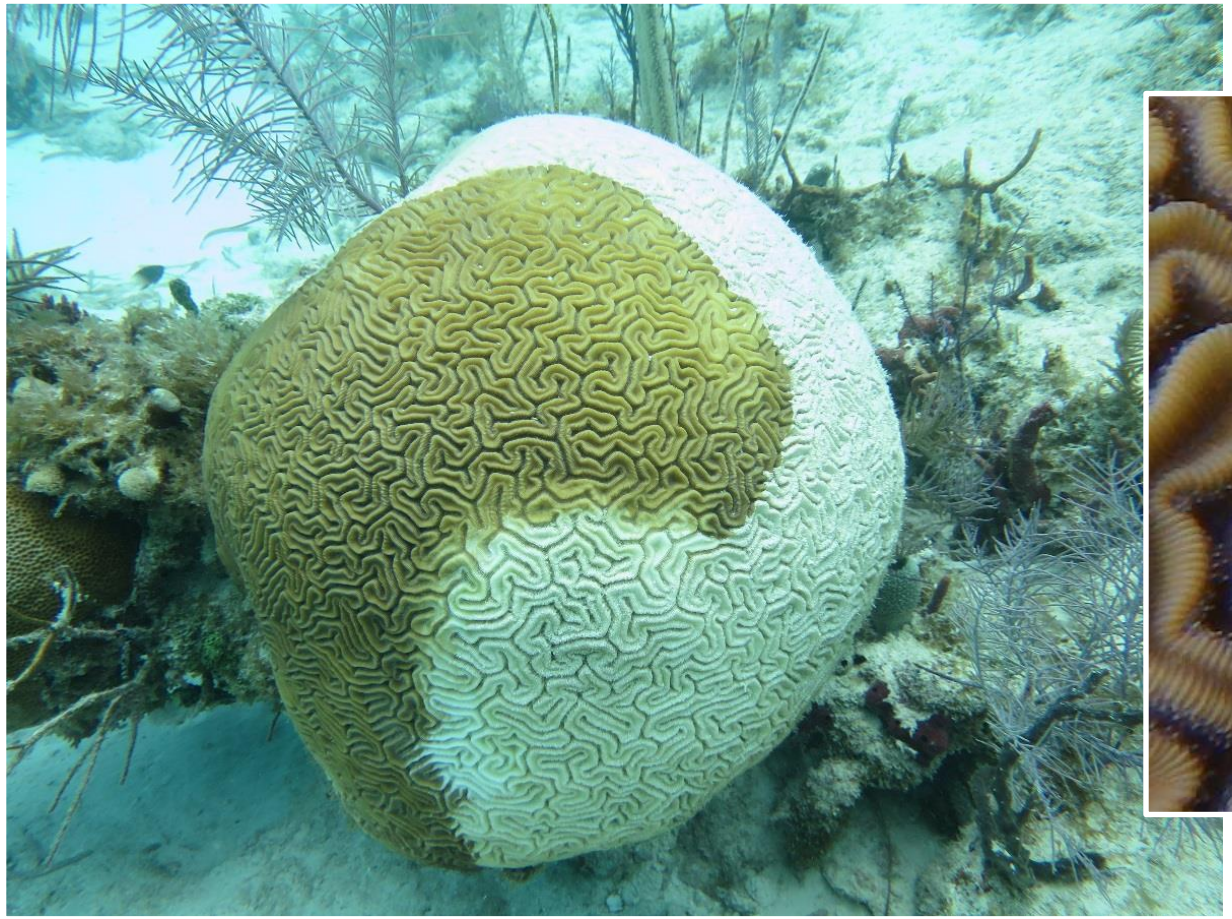


Review #7

Review #8



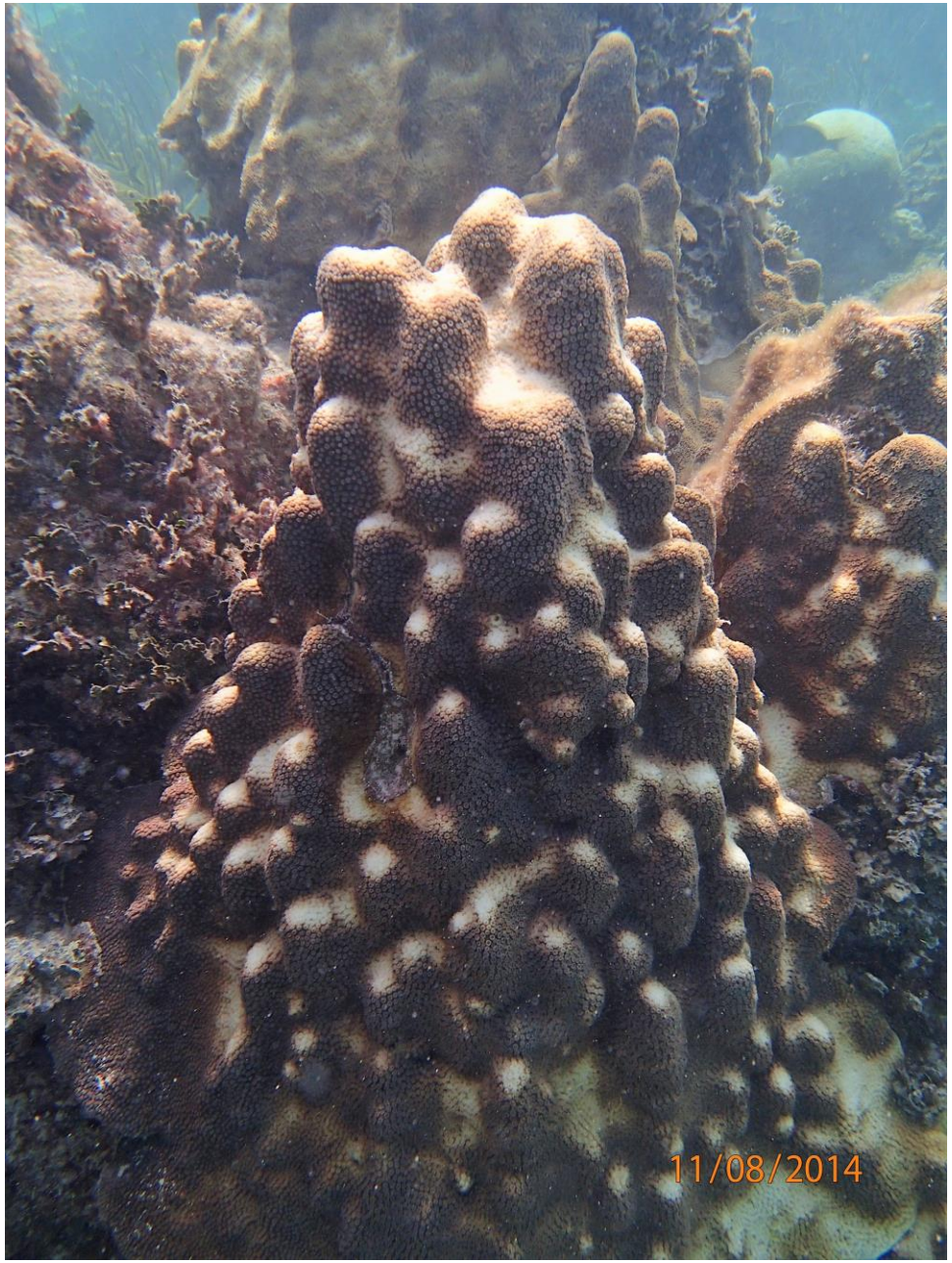
Review #9



Review #10

Review #11

Review #12



Review #13

Review #14

Review #15

#	Coral / Organism	Type	Condition
1	Smooth Star Coral	Mound/Boulder	Paling
2	Boulder Brain	Brain	Partial Bleaching
3	Great Star Coral	Mound/Boulder	Tissue Loss (white)
4	Palythoa	N/A	Bleached
5	Smooth Flower Coral	Flowering/Cup	Healthy
6	Knobby Brain Coral	Brain	Black Band Disease
7A	Massive Starlet Coral	Mound/Boulder	Partially Bleached
7B	Lettuce Coral	Leaf/Plate/Sheet	Bleached
8	Great Star Coral	Mound/Boulder	Dead with Algae
9	Grooved Brain	Brain	Tissue Loss (white)
10	Mountainous Star	Mound/Boulder	Healthy
11	Smooth Star	Mound/Boulder	Predation
12	Mountainous Star	Mound/Boulder	Partially Bleached
13	Pillar Coral	Branching	Tissue Loss (white)
14	Massive Starlet Coral	Mound/Boulder	Disease – Other (Dark Spots)
15	Lobed Star Coral	Mound/Boulder	Black Band Disease