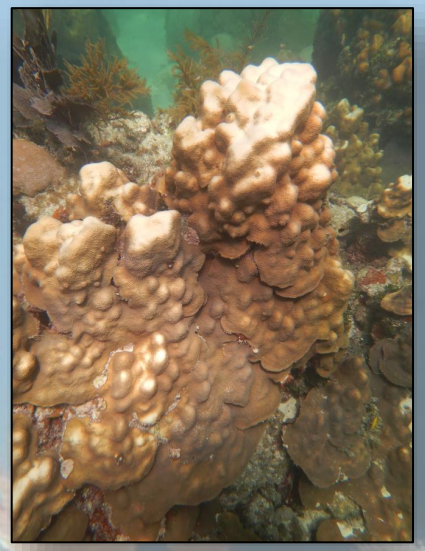
Coral Condition Data

This portion of the training will cover how to distinguish between bleaching and recent mortality and identify whether recent mortality was caused by disease or other impacts. In addition, this training will cover how to document coral conditions on your datasheet.

Again, please review the **FRRP DRM in-water protocol** available on the DRM website under the 'Surveyor Trainings and Resources' page before you begin your surveys (http://ocean.floridamarine.org/FRRP/Home/About).

DRM documents the condition of corals to assess the health of each colony and the overall health of the coral community.

Only conditions that are actively affecting the health of a coral are recorded.



Color Loss
Paling
Partial Bleaching
Bleached

Discoloration
Dark tissue
Off-colored Tissue

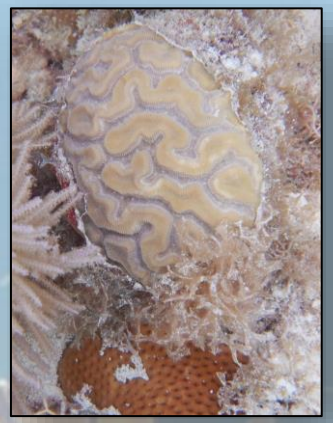
Recent Mortality

Disease
Tissue loss
Discoloration

Other Impacts
Predation
Sediment Cover
Overgrowth, Interactions
Abrasion

Color Loss

Often, when a coral becomes stressed, it can no longer support its symbiotic algae and expels it from its tissue. The coral tissue remains intact and is still functioning to feed the coral through filter feeding; however, the colony will eventually starve if the algae are not restored.



Paling

Coral tissue has either just begun to loose its zooxanthellae or is recovering from bleaching. Tissue appears lighter in color than typically observed.

Partial Bleaching

Patches of fully bleached or white tissue.

Bleached

Colony appears totally white. Some corals fluoresce when they loose their zooxanthellae but are functionally bleached.

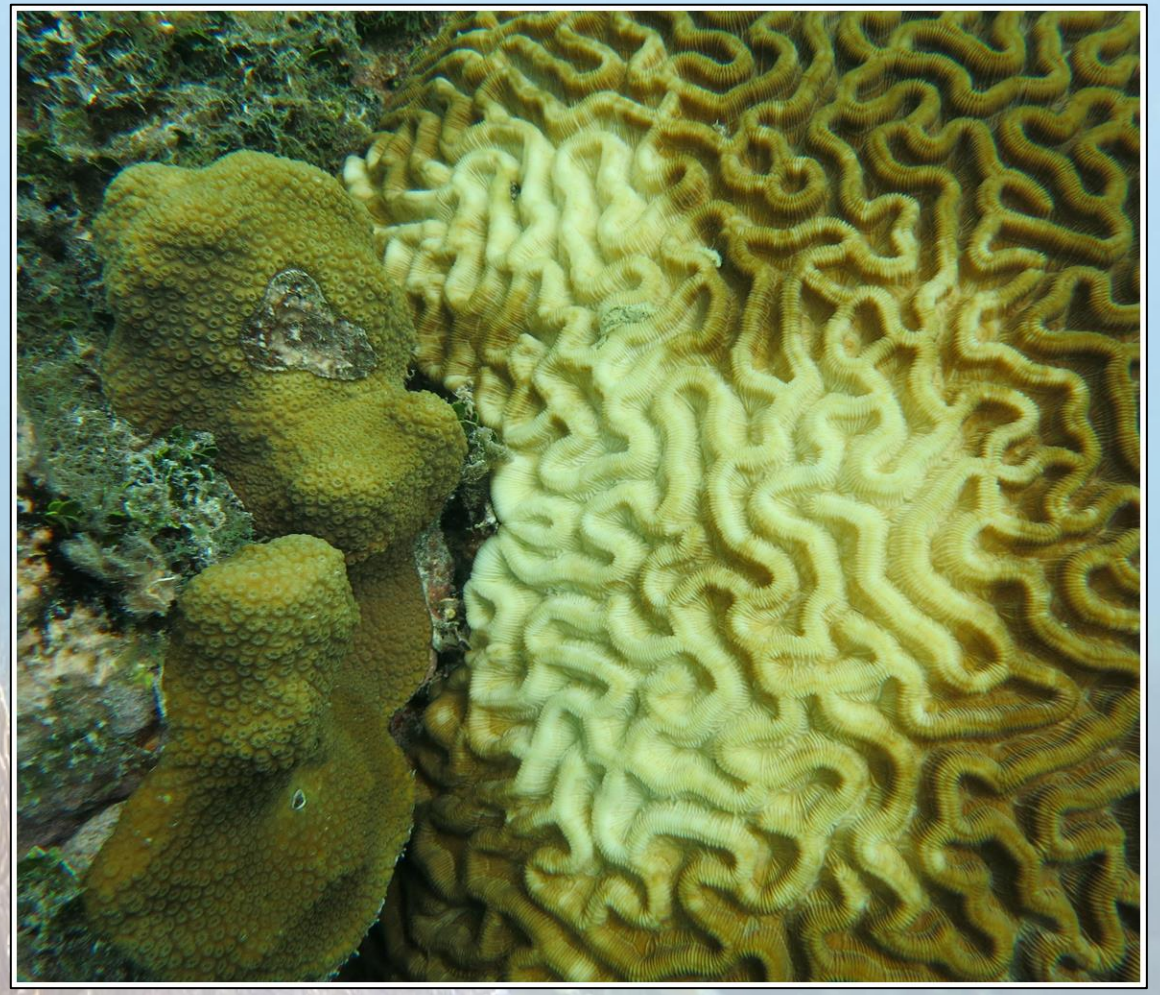
Loss of Color from 'Other' Factors

Recovering from direct impacts such as predation. Loss of color can also be associated with disease or be a precursor for tissue loss from disease. Color loss can be a normal growth habit in select coral species.

Severity of Color Loss is Variable…

The Scale of Color Loss is Variable

- Bleaching varies at all **scales** (regions, reefs, sites, species, colonies)
- Numerous **sources** of variation (exposure, depth, location, etc.)
- Bleaching severity can be determined by an individual colony's **past exposure** to stressors.

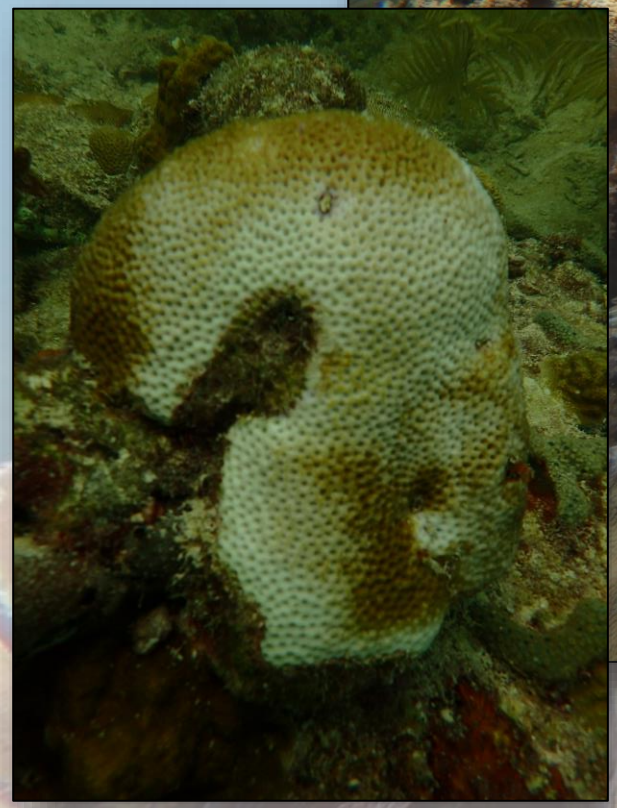


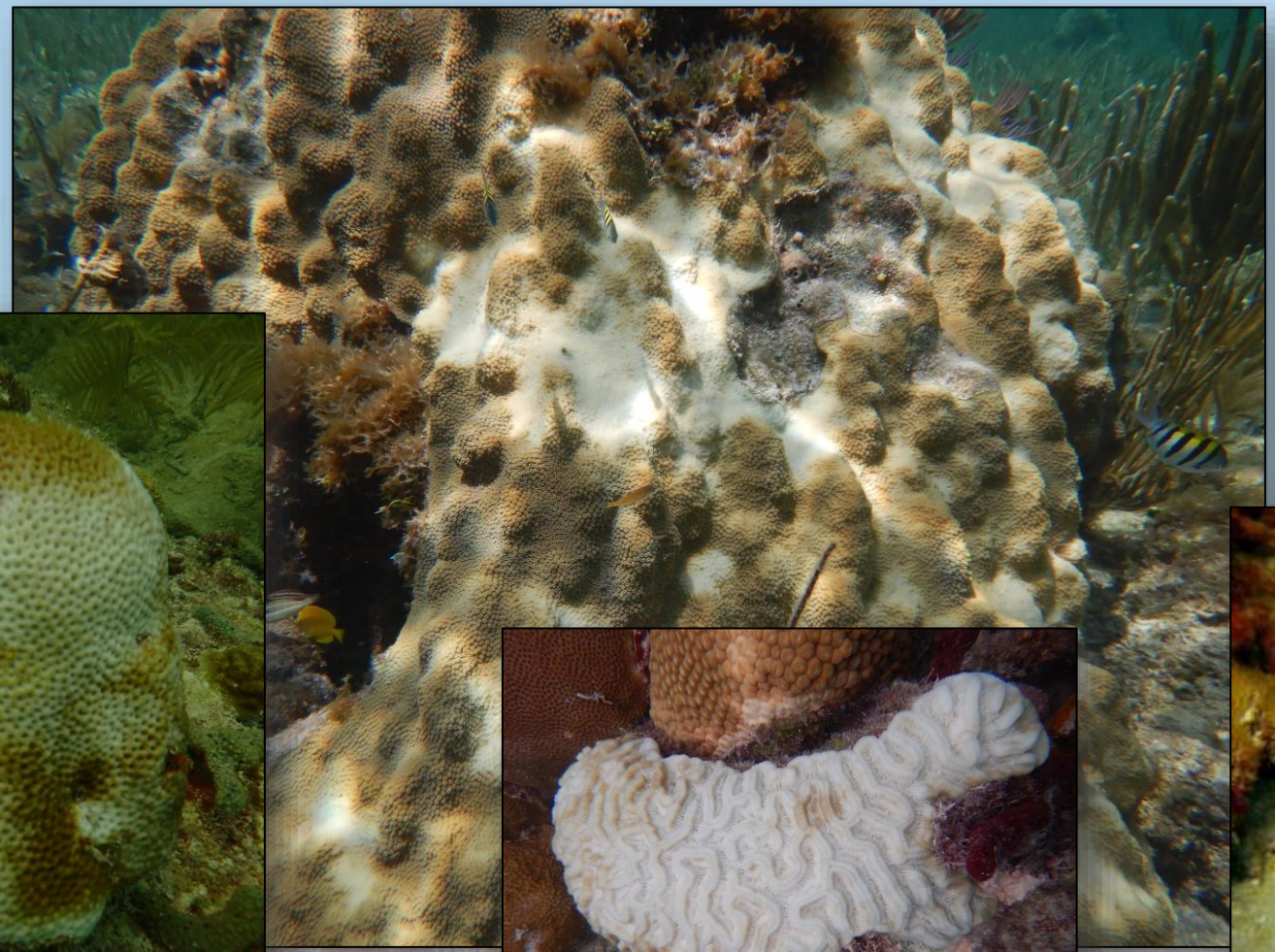
Paling (P)

"Because any visible loss of color indicates a loss of most zooxanthellae originally present (Hoegh-Guldberg et al., 2005) in a coral colony, it is important to include any degree of bleaching, from pale and partially bleached to fully bleached colonies, as an indicator of significant stress in corals."

Eakin et al., 2010

Partial Bleaching (PB)





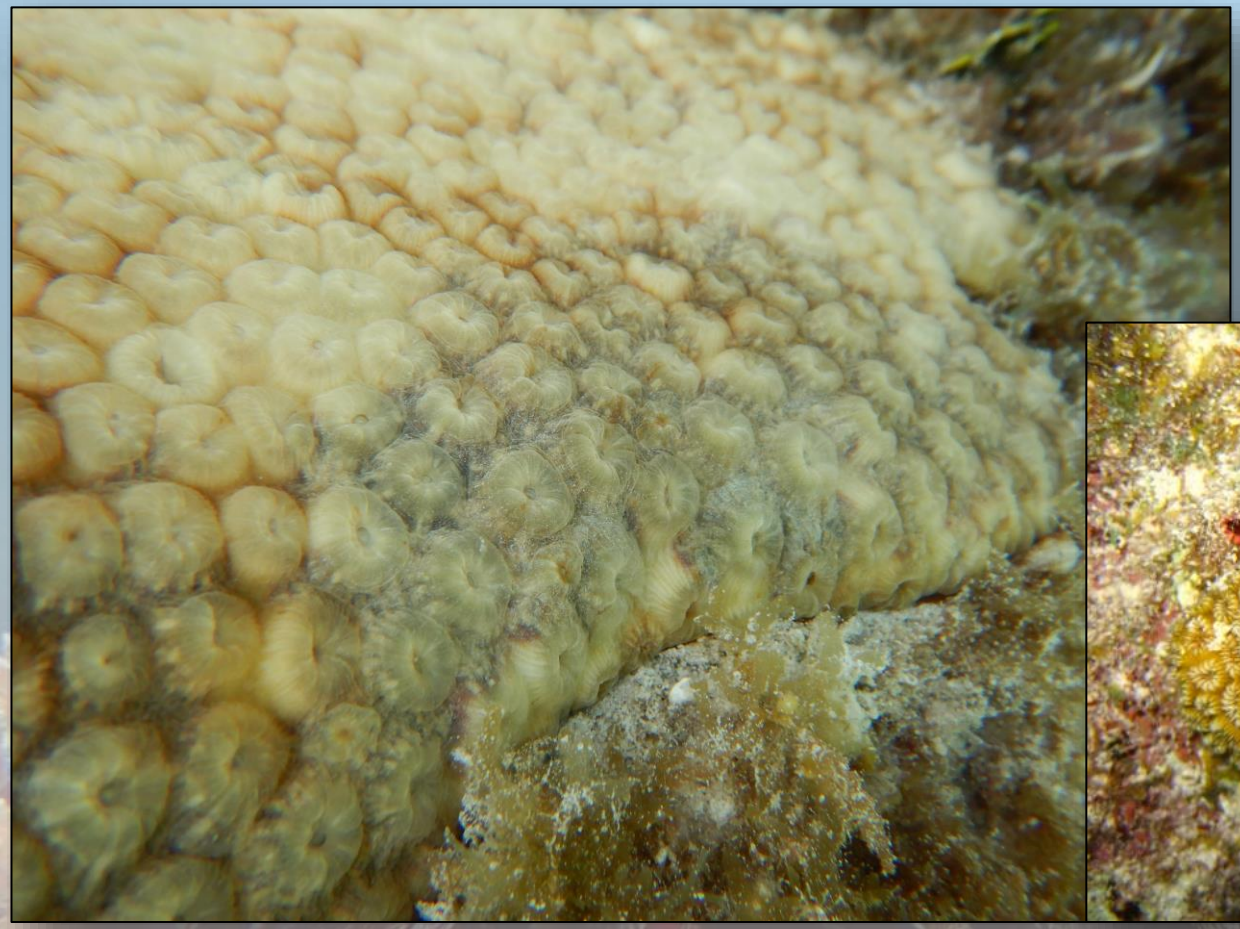
Bleached (BL)

Healthy vs. Bleached

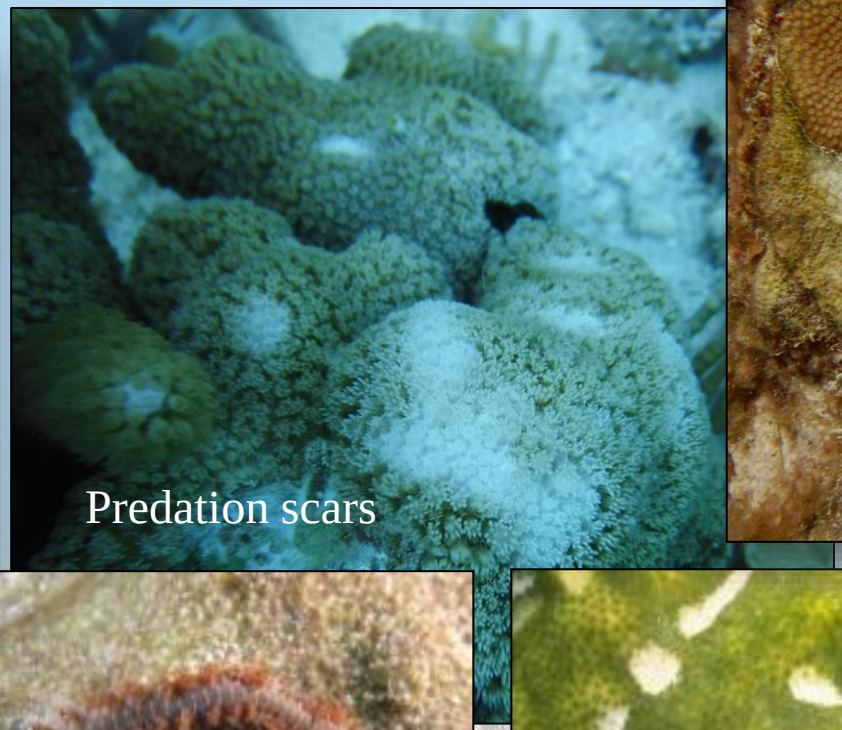
There is evidence that fluorescent granules of corals function as screens against high UVA/blue irradiance by absorbing these wavelengths as well as by reflecting a large proportion of visible light.

Discolored (DC)

Tissue is still present but is abnormally colored.
Should not be confused with ‘Loss of Color’.



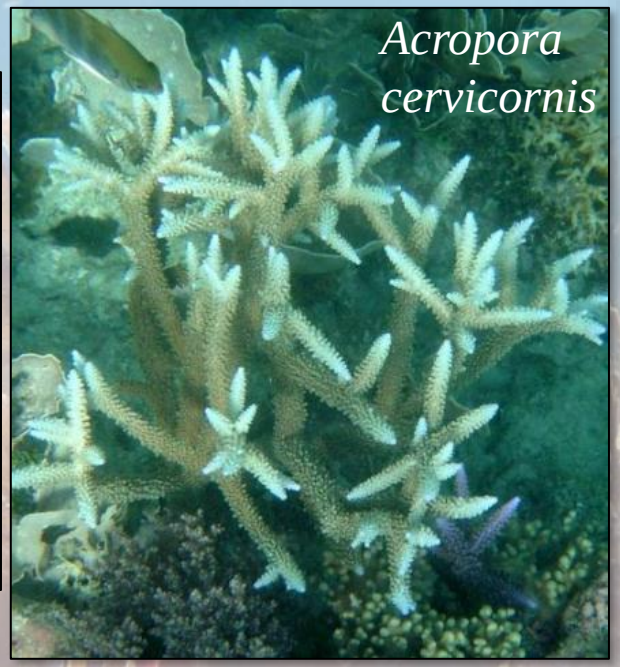
Distinguishing Bleaching From Other Issues

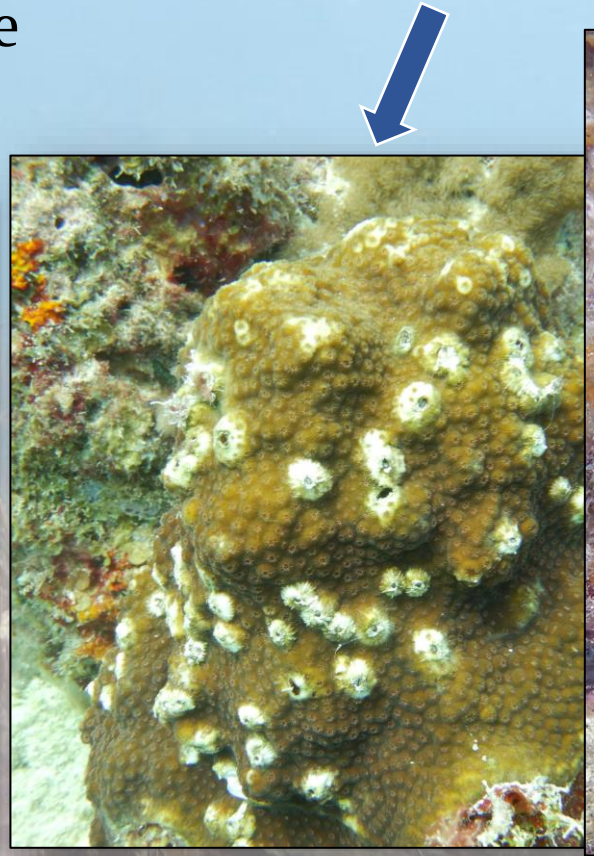


Confusing Bleaching With Natural Growth Patterns

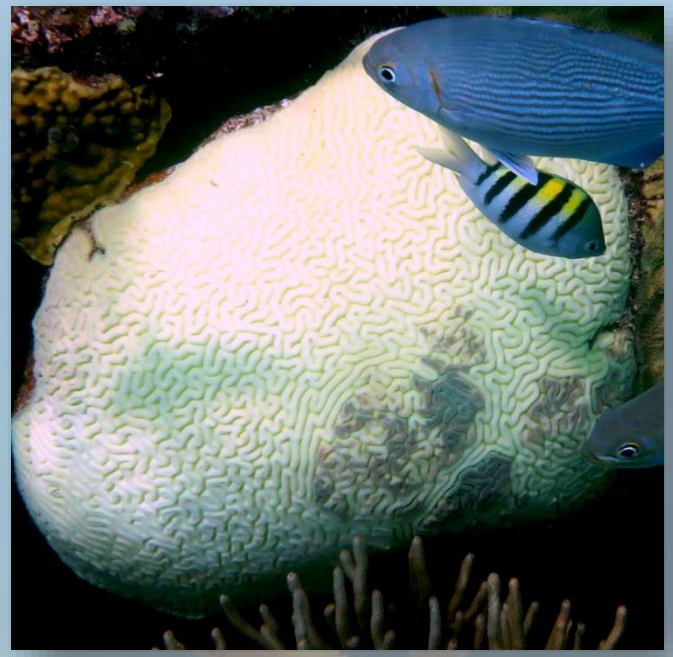
Partially bleached corals are often confused with corals that have fast growing **tips** such as *Acropora* spp.
Growth tips or edges cans sometimes not have zooxanthellae, appearing white.

Other species such as *Orbicella franksi* naturally have clusters of polyps with no zooxanthellae.



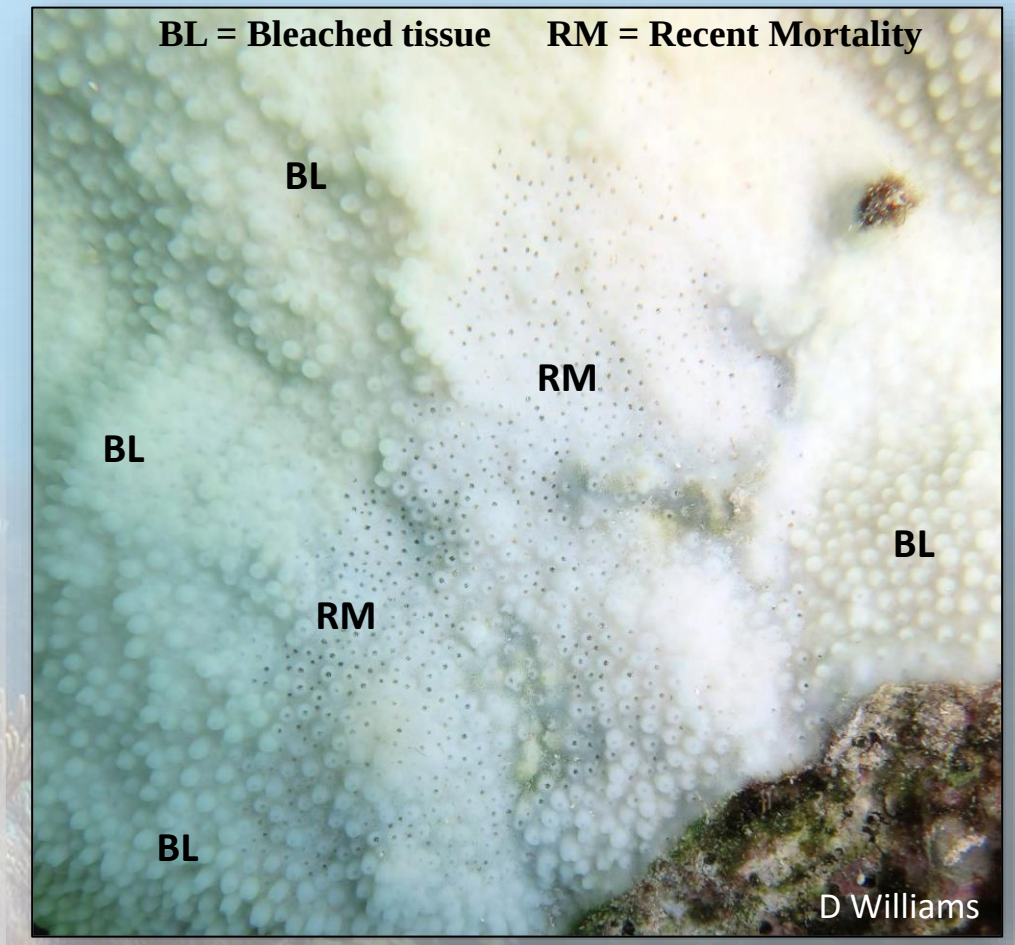


Distinguishing Bleaching from Exposed Skeleton or "Recent Mortality"



Corals with **large, thick polyps** are conspicuous, even when they are bleached; however, corals with **smaller polyps with thin tissue** are harder to distinguish.

When bleached, polyps are translucent (nearly colorless) and they distort the appearance of the skeleton below.

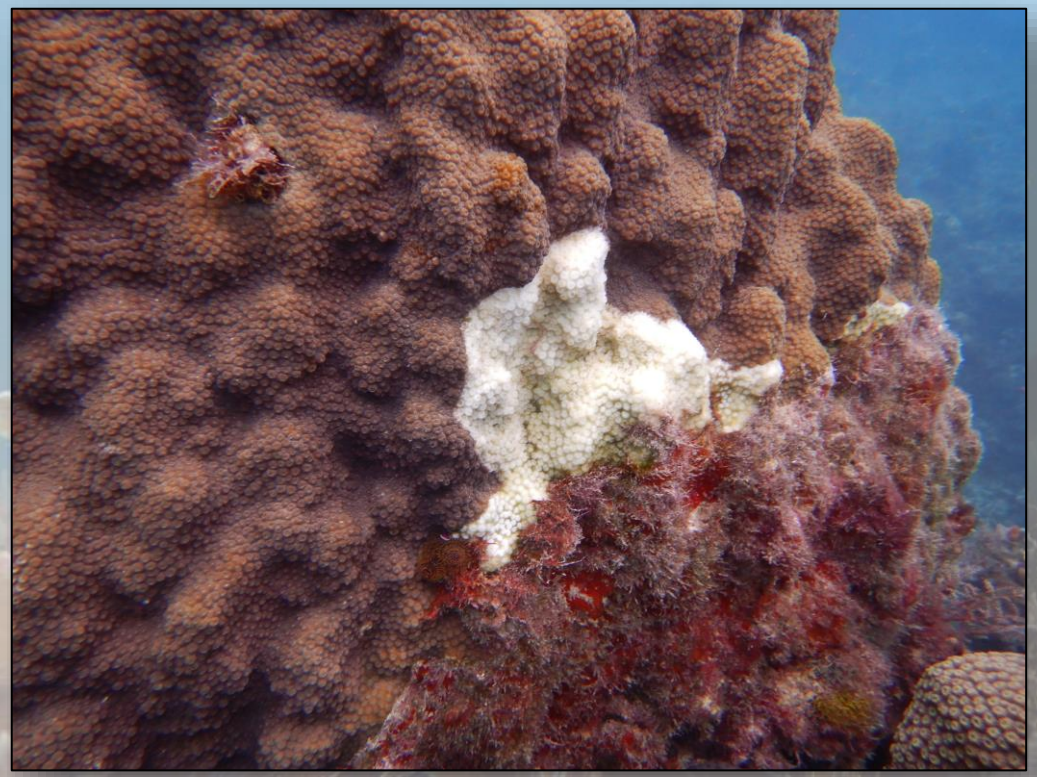


If Recent Mortality IS identified, it is classified in one of two categories

Recent Mortality from Disease

OR

Recent Mortality from Other Conditions



Recent Mortality from Other Factors

DRM Code: 1000
Surveyor: JEST
Lat: dd.ddddd
Long: dd.ddddd
Date: 8/29/2020
Depth ft: 35

Transect: 1 / (2) / 3 / 4
Shared? (Y) / N
Buddy: LIHE

Rugosity Msmts:
1. 5 2. 17 3. 7
4. 21 5. 2 6. 22
7. 20 8. 40 9. 30
10. 4

P/A: Diad. (ACER) APAL DCYL

Habitat: Isolated Reef; Contiguous Reef Spur and Grv.; (Contiguous Reef Other); Reef Rubble

	Species Code	Width (cm)	Height (cm)	Bleaching P, PB, BL	% Old Mort	Other % Recent Mort	Tissue Loss Disease: Disease % Recent Mort	Tissue Loss Disease: TL Rate Fast, Slow	Tissue Loss Disease: Disease Conditon(s)	Other Condition(s)	Scientific Name Transect 3 & 4 in Grey	Sp. Codes
1	SSID	5	1	PB	5						*Colphphyllia natans*	CNAT
2	SSID	10	7		2	10			DC	OGI	*Dichocoenia stokesi*	DSTO
3	SINT	7	4		95	5				PRD, CLN	*Diploria labyrinthiformis*	DLAB
4	PAST	15	6	P	10					MUC	*Meandrina meandrites*	MMEA
5	DSTO	5	5		10		20	FA	STL		*Mussa angulosa*	MANG
6	AAGA	7	3	BL							*Mycetophyllia aliciae*	MALI
7											*Mycetophyllia ferox*	MFER

"Other Recent Mortality" is defined as any non-living parts of the coral in which the corallite structures are either white and still intact or slightly eroded but identifiable to species. Recently dead skeletons may be covered by sediment or a thin layer of turf algae. '**Other**' refers to any non-disease related lesions such as predation, abrasion, overgrowth of other organisms, interaction with other organisms or sediment cover. The cause of the lesion **must** be identified in the last column of the datasheet under "Other Conditions" using the pre-defined letter codes at the base of the datasheet.

Recent Mortality from Disease

DRM Code: 1000			Transect:		Rugosity Msmts:				P/A	Habitat:		
Surveyor: JEST			1 / (2) / 3 / 4		1. 5	2. 17	3. 7		Diad.	Isolated Reef		
Lat: dd.ddddd			Shared? (Y) / N		4. 21	5. 2	6. 22		(ACER)	Contiguous Reef Spur and Grv.		
Long: dd.ddddd			Buddy: LIHE		7. 20	8. 40	9. 30		APAL	(Contiguous Reef Other)		
Date: 8/29/2020	Depth ft: 35				10. 4				DCYL	Reef Rubble		
						Tissue Loss Disease						
Species Code	Width (cm)	Height (cm)	Bleaching P, PB, BL	% Old Mort	Other % Recent Mort	Disease % Recent Mort	TL Rate Fast, Slow	Disease Conditon(s)	Other Condition(s)	Scientific Name Transect 3 & 4 in Grey	Sp. Codes	
1 SSID	5	1	PB	5						*Colphphyllia natans*	CNAT	
2 SSID	10	7		2	10			DC	OGI	*Dichocoenia stokesi*	DSTO	
3 SINT	7	4		95	5				PRD, CLN	*Diploria labyrinthiformis*	DLAB	
4 PAST	15	6	P	10					MUC	*Meandrina meandrites*	MMEA	
5 DSTO	5	5		10		20	FA	STL		*Mussa angulosa*	MANG	
6 AAGA	7	3	BL							*Mycetophyllia aliciae*	MALI	
7										*Mycetophyllia ferox*	MFER	

"Disease Recent Mortality" is any disease related tissue loss lesion(s). If recent mortality from disease is identified, the rate of tissue loss (TL Rate) and cause of the lesion (Disease Conditions column) **must** be identified using the pre-defined letter codes outlined at the base of the datasheet.

Recording Tissue Loss and Conditions

DRM Code: 1000
Surveyor: JEST
Lat: dd.ddddd
Long: dd.ddddd
Date: 8/29/2020
Depth ft: 35

Transect: 1 / (2) / 3 / 4
Shared? (Y) / N
Buddy: LIHE

Rugosity Msmts:
1. 5 2. 17 3. 7
4. 21 5. 2 6. 22
7. 20 8. 40 9.
10. 4

P/A
Diad.
(ACER)
APAL
DCYL

Habitat:
Isolated Reef
Contiguous Reef Spur and Grv.
(Contiguous Reef Other)
Reef Rubble

	Species Code	Width (cm)	Height (cm)	Bleaching P, PB, BL	% Old Mort	Other % Recent Mort	Tissue Loss Disease: Disease % Recent Mort	Tissue Loss Disease: TL Rate Fast, Slow	Tissue Loss Disease: Disease Conditon(s)	Other Condition(s)	Scientific Name Transect 3 & 4 in Grey	Sp. Codes
1	SSID	5	1	PB	5						*Colphphyllia natans*	CNAT
2	SSID	10	7		2	10			C	OGI	*Dichocoenia stokesi*	DSTO
3	SINT	7	4		95	5				PRD, CLN	*Diploria labyrinthiformis*	DLAB
4	PAST	15	6	P	10					MUC	*Meandrina meandrites*	MMEA
5	DSTO	5	5		10		20	FA	STL		*Mussa angulosa*	MANG
6	AAGA	7	3	BL							*Mycetophyllia aliciae*	MALI
7											*Mycetophyllia ferox*	MFER

- If <u>% Other Recent Mortality</u> is recorded, Other Condition(s) column **MUST** be filled out.
- If <u>% Disease Recent Mortality</u> is recorded, Tissue Loss Rate and Disease Condition(s) columns **MUST** be filled out.
- **NOTE**: 'TL Pattern' was removed from the data collection in 2020.

Recording Tissue Loss and Conditions

DRM Code: 1000
Surveyor: JEST
Lat: dd.ddddd
Long: dd.ddddd
Date: 8/29/2020
Depth ft: 35

Transect: 1 / (2) / 3 / 4
Shared? (Y) / N
Buddy: LIHE

Rugosity Msmts:
1. 5 2. 17 3. 7
4. 21 5. 2 6. 22
7. 20 8. 40 9.
10. 4

P/A
Diad.
(ACER)
APAL
DCYL

Habitat:
Isolated Reef
Contiguous Reef Spur and Grv.
(Contiguous Reef Other)
Reef Rubble

	Species Code	Width (cm)	Height (cm)	Bleaching P, PB, BL	% Old Mort	Other % Recent Mort	Tissue Loss Disease: Disease % Recent Mort	Tissue Loss Disease: TL Rate Fast, Slow	Tissue Loss Disease: Disease Conditon(s)	Other Condition(s)	Scientific Name Transect 3 & 4 in Grey	Sp. Codes
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2	SSID	10	7		2	10			C	OGI	*Dichocoenia stokesi*	DSTO
3	SINT	7	4		95	5				PRD, CLN	*Diploria labyrinthiformis*	DLAB
4	PAST	15	6	P	10					MUC	*Meandrina meandrites*	MMEA
5	DSTO	5	5		10		20	FA	STL		*Mussa angulosa*	MANG
6	AAGA	7	3	BL							*Mycetophyllia aliciae*	MALI
7											*Mycetophyllia ferox*	MFER

Note the definitions for all coral condition codes are at the base of the datasheet.

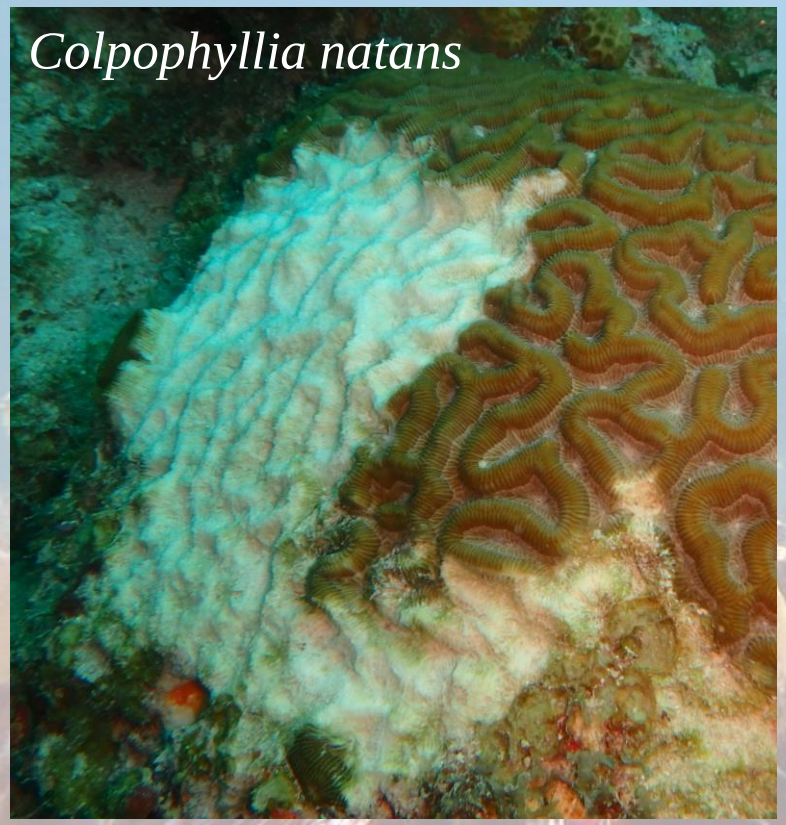
Bleaching Severity - Pale (P); Partially Bleached (PB); Bleached (BL) Tissue Loss Rate - Fast >1 cm bare skel. (FA); Slow <1 cm bare skel. (SL)

Disease Cond.s - Unknown Disease (UNK); Diseases (STL, WPL, WBD, WPX, RTL, DSD, YB, BB/RB); Discolored (DC) Other Cond.s - Predation (PRD); Overgrowth and Interaction (OGI); Abrasion (ABR); Sediment Cover (SC); Clionid sp. (CLN); Mucus sheathing (MUC); Unknown Other (OUK)

Types of ‘Other’ RM

Parrotfish Bites (PRD)

Tissue loss and skeletal scarring in patches or strips



Stoplight parrotfish
(Sparisoma viride)
biting *Orbicella annularis*

Acropora palmata

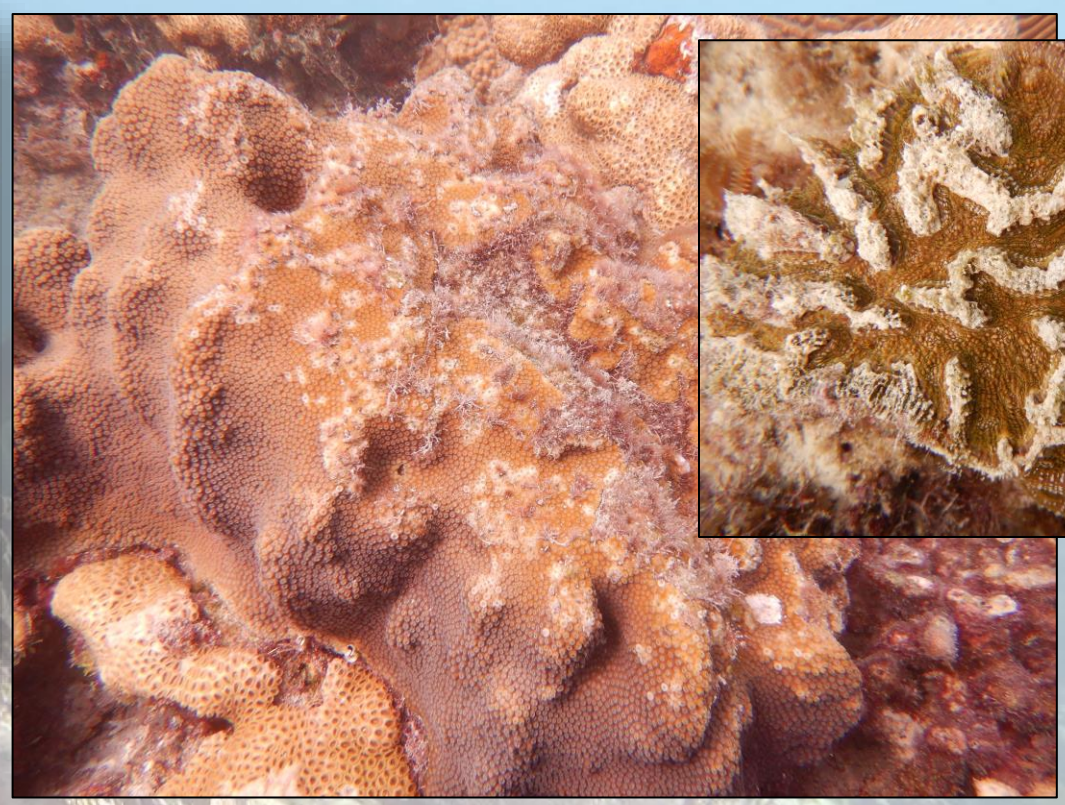
Types of ‘Other’ RM

Damselfish Bites/Gardening (PRD)

Look for small, circular (<1cm diameter) lesions on the coral.
Damselfish are not actually eating the coral tissue but we still identify it as “Predation” for the purposes of this program.

Stegastes planifrons (threespot damselfish)

Damselfish bites on *Orbicella spp.*

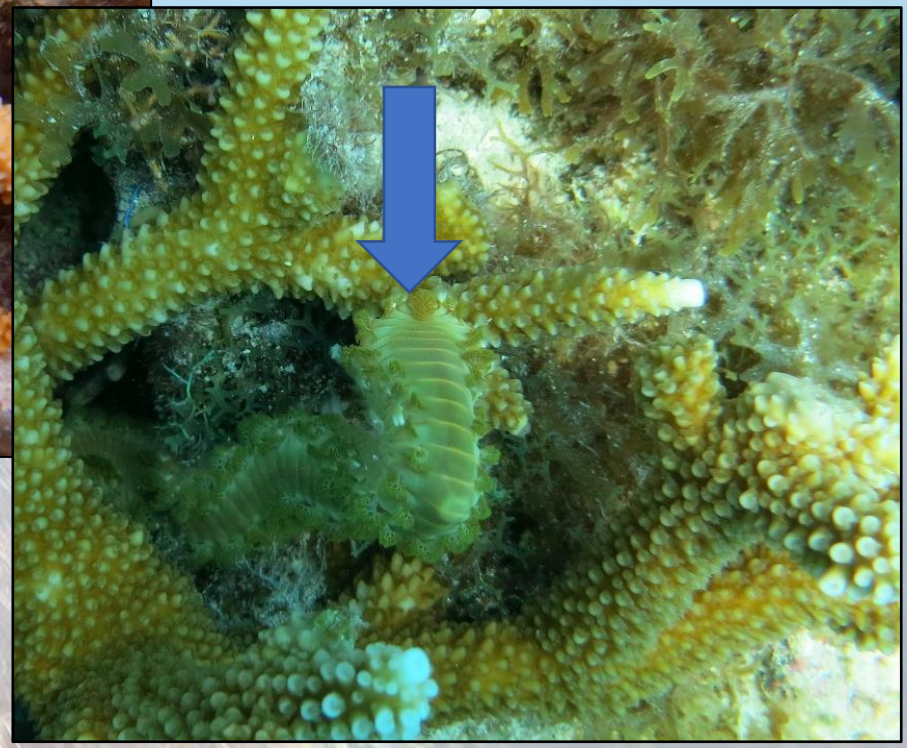


Damselfish bites on *M. aliciae*

Types of ‘Other’ RM

Predation by Fireworms (PRD)

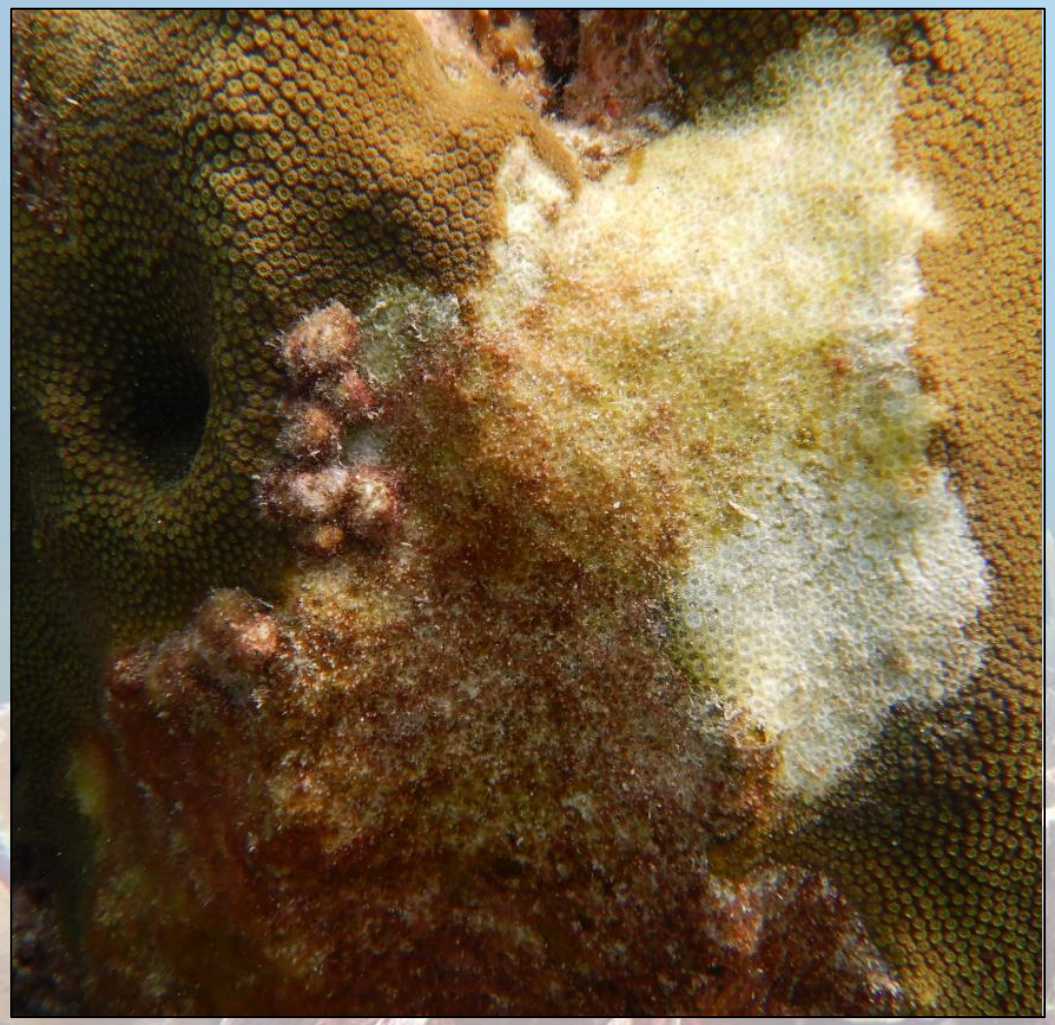
(*Hermodice carunculata*)

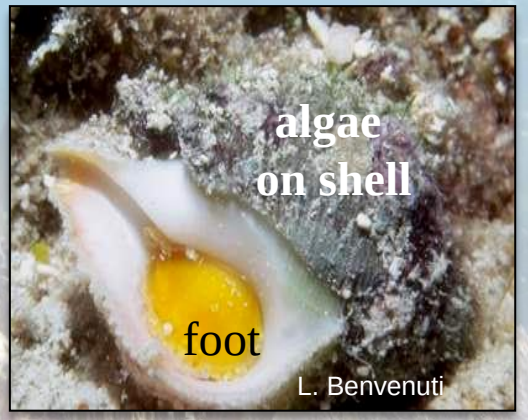


Types of ‘Other’ RM

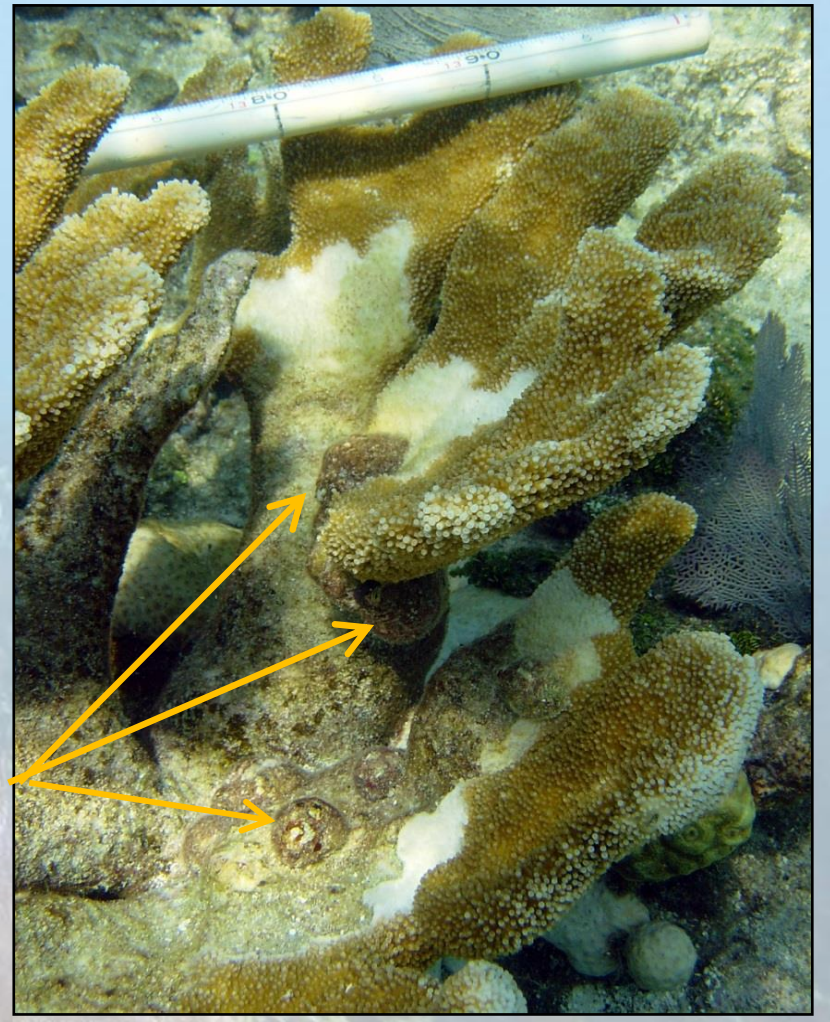
Predation by *Coralliophila* spp. (PRD)

Look along tissue margins. *Coralliophilia* can be hard to find and are often camouflaged by algae.

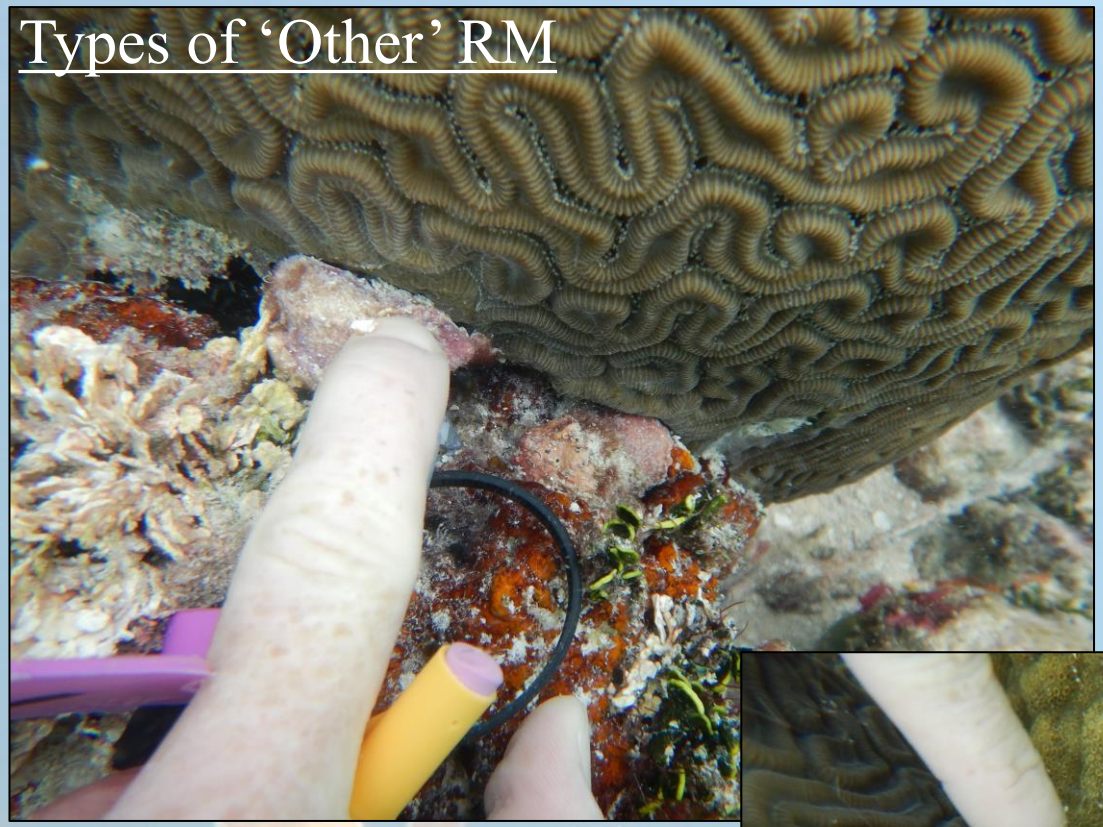


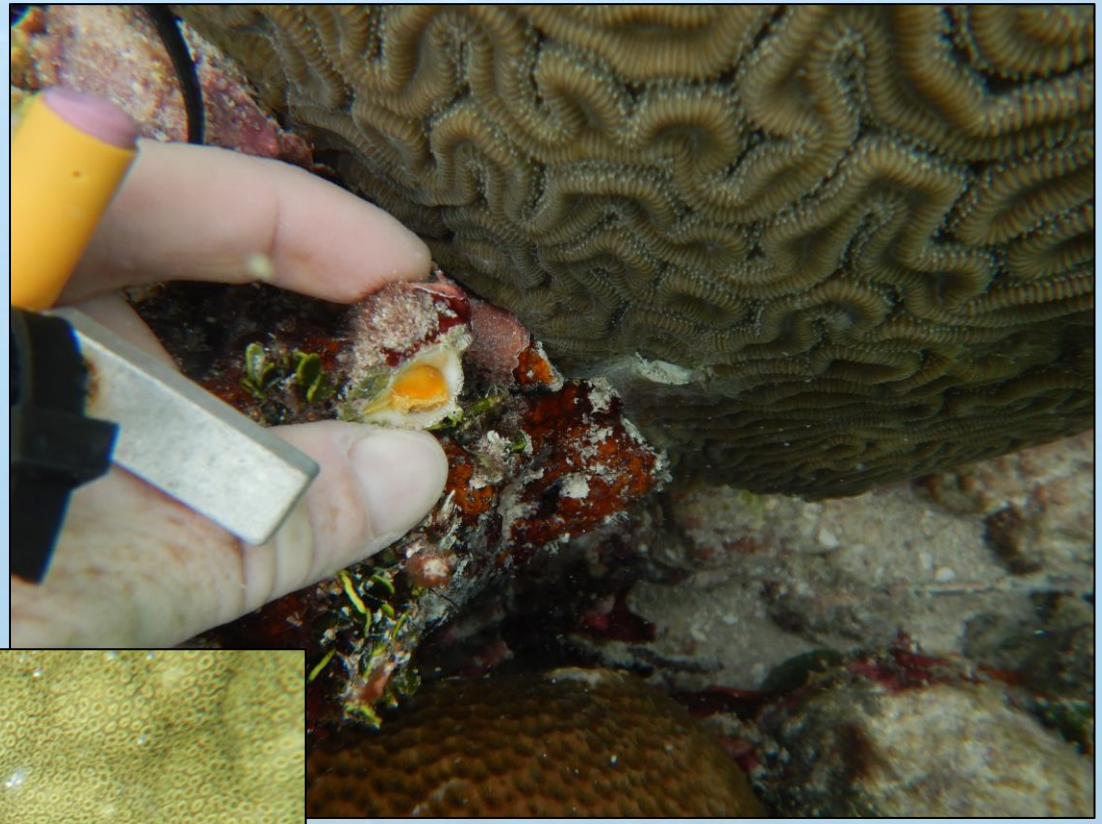


Coralliophila abbreviata



Types of ‘Other’ RM



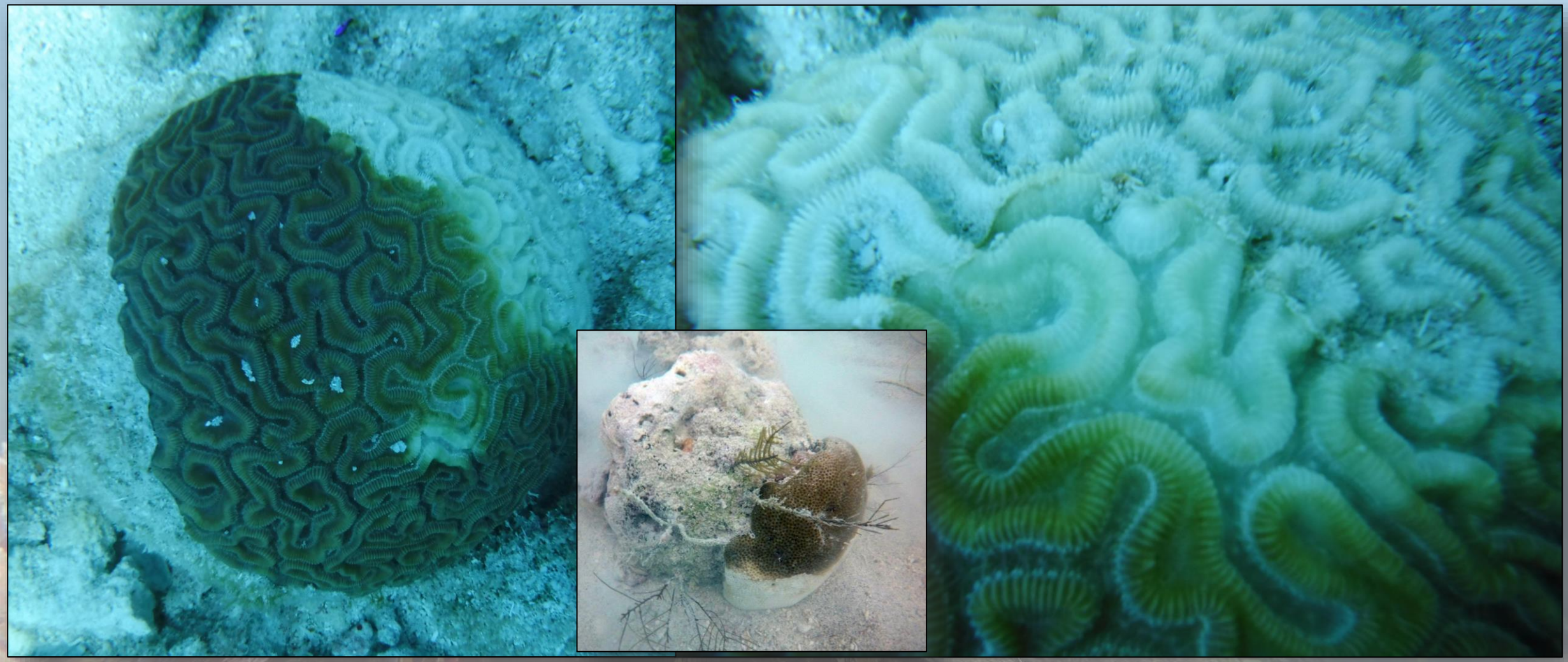


Snails are very sneaky! Look carefully around the edges of the coral when identifying a condition code for tissue loss.

Types of ‘Other’ RM

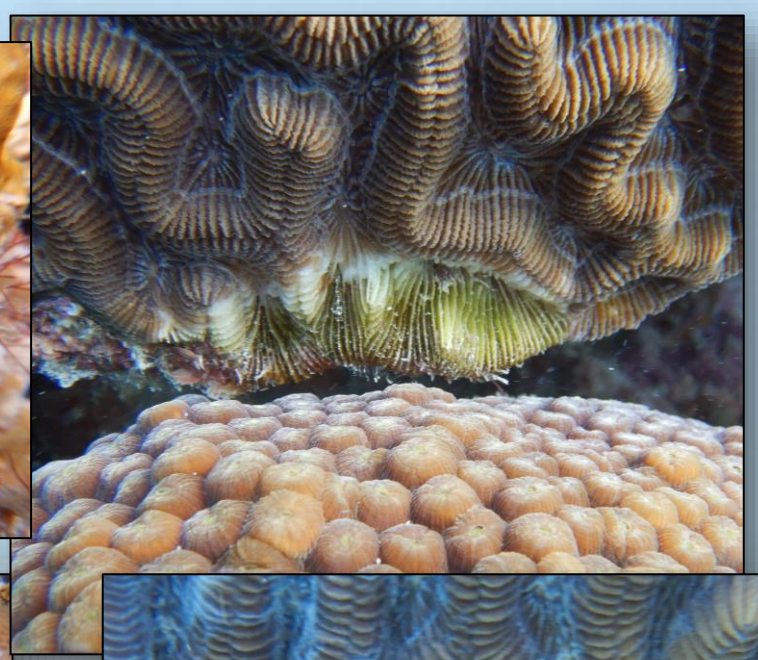
Sediment Cover (SC)

Evidence of recent mortality from sediment cover includes sand lodged within recently exposed septa and the colony is often surrounded by sand or rolled into a sandy area.



Types of ‘Other’ RM

Overgrowth and Interaction (OGI)

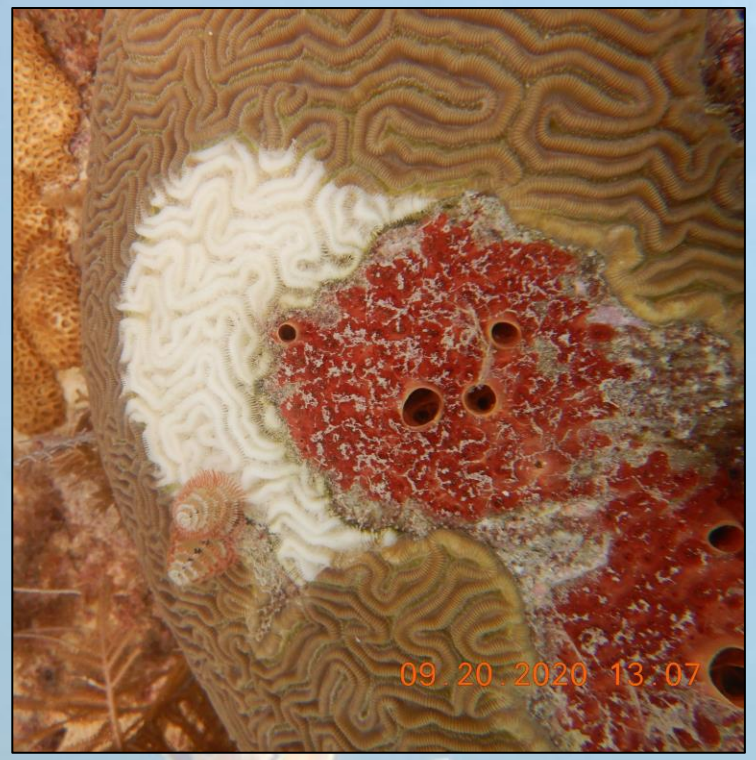


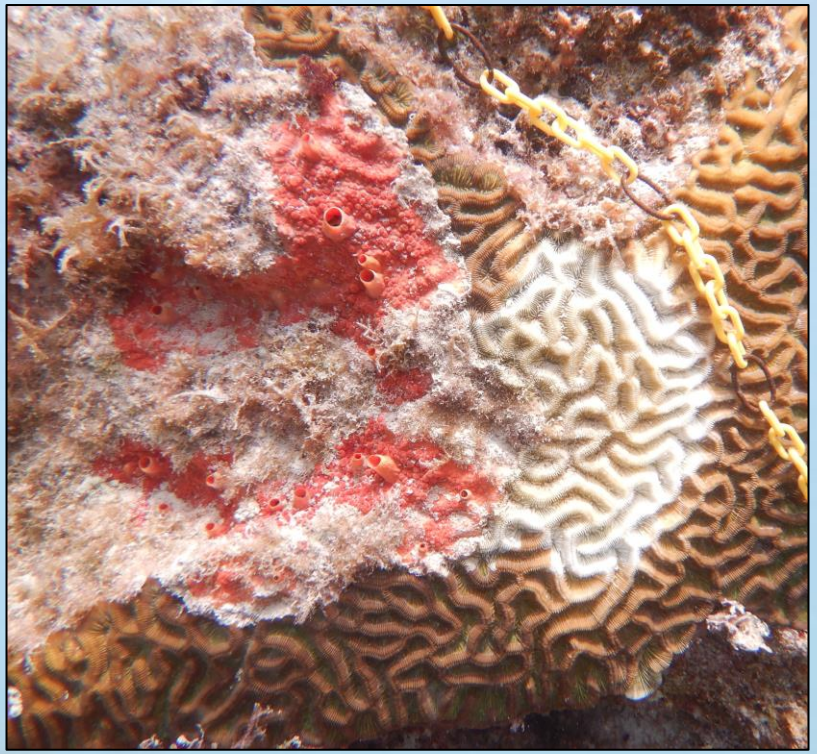
Common overgrowths
Macroalgae
Encrusting gorgonian
Palythoa
Sponges
Millepora alcicornis

Common interactions
Christmas Tree Worms
Gorgonian branches
Fighting corals

CLN

Cliona delitrix is a boring sponge that grows from inside the coral and can slowly take over the colony. The interaction of the sponge with the coral tissue can often cause tissue loss (recent mortality). For recent mortality related to Cliona, the **CLN** code can be used.

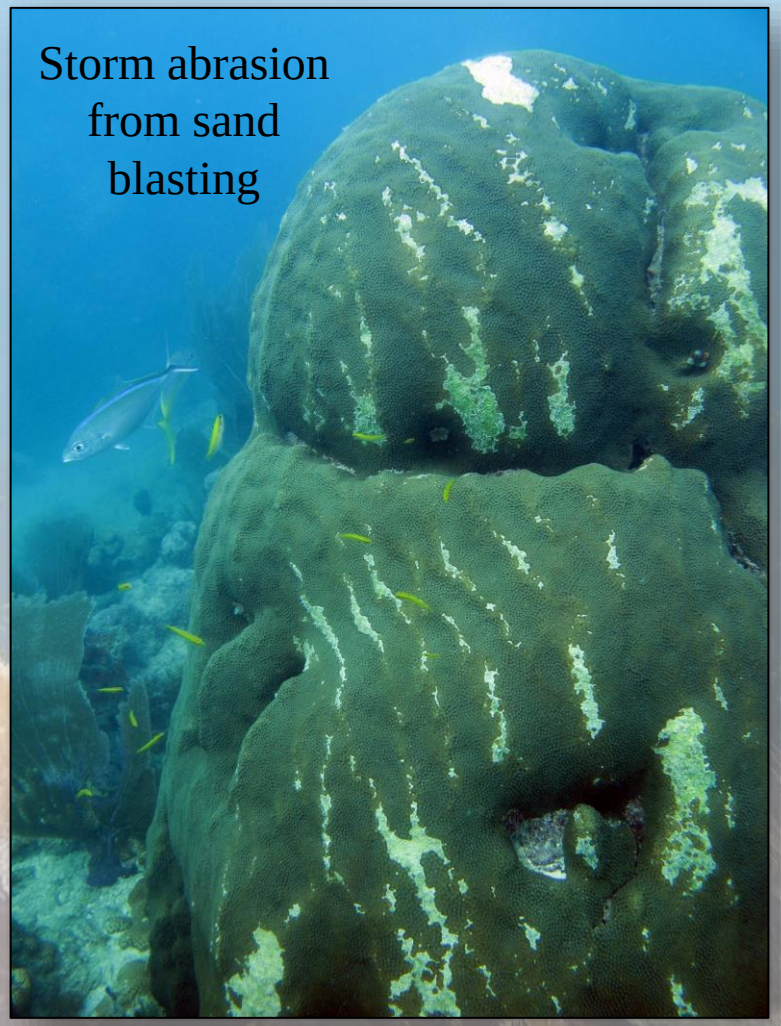




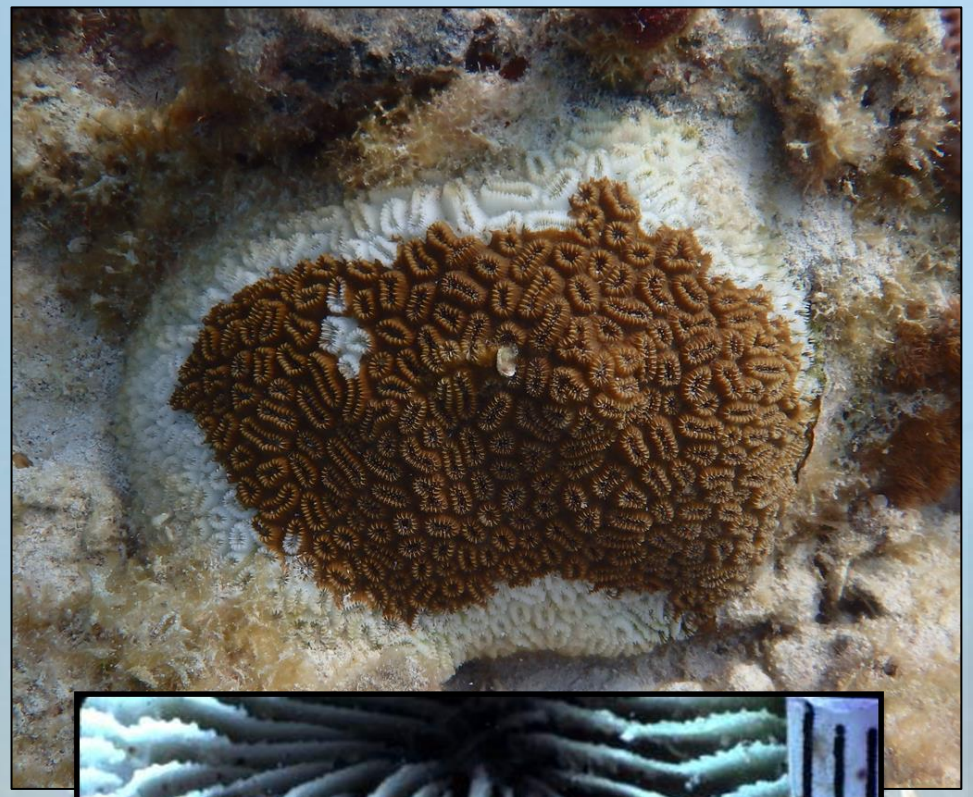
Types of ‘Other’ RM

Abrasion (ABR)

Abrasion can be inflected by hurricanes and storms.
Abiotic objects or particles abrading the coral tissue.

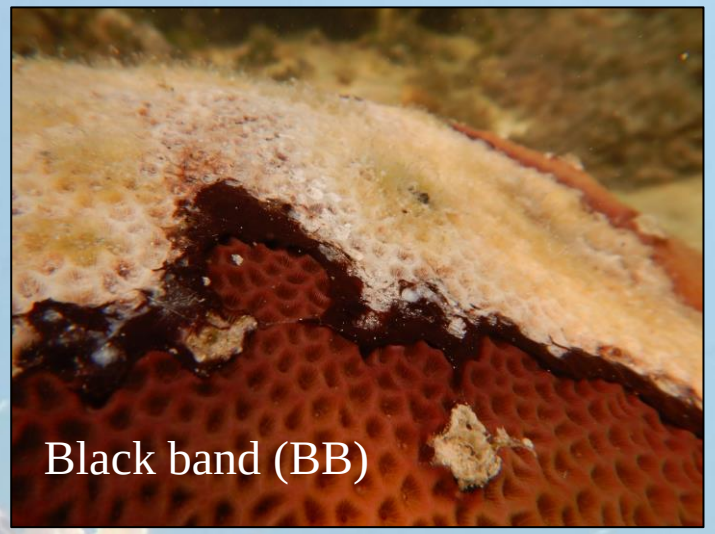


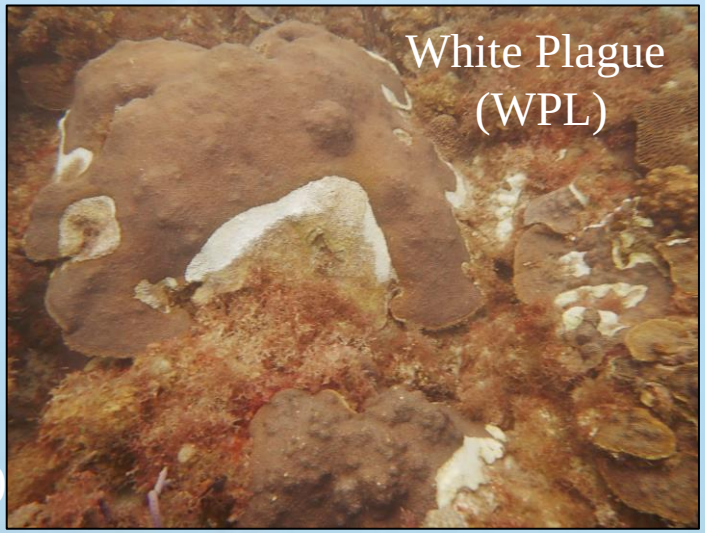
Recent Mortality from Disease

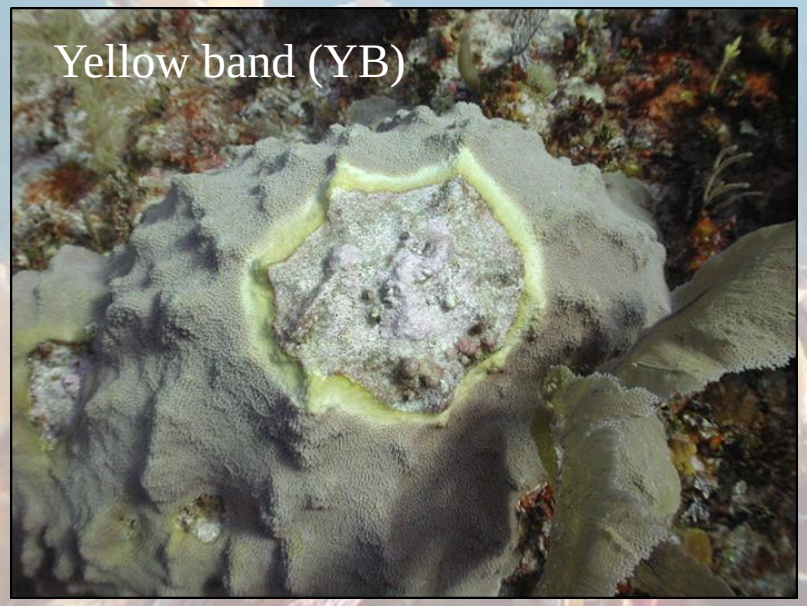


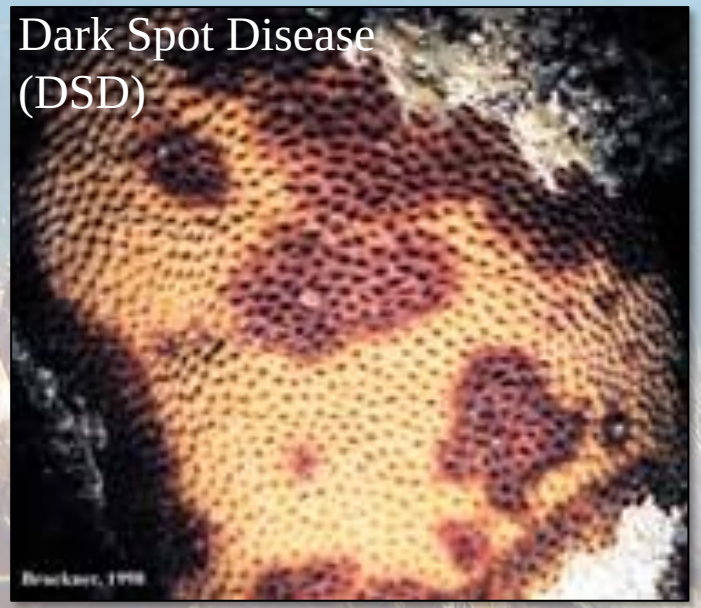
Distinguishing between recent mortality from disease and bleached coral tissue can sometimes be difficult especially if the recent mortality covers the entire colony.

Identifying Known Coral Diseases

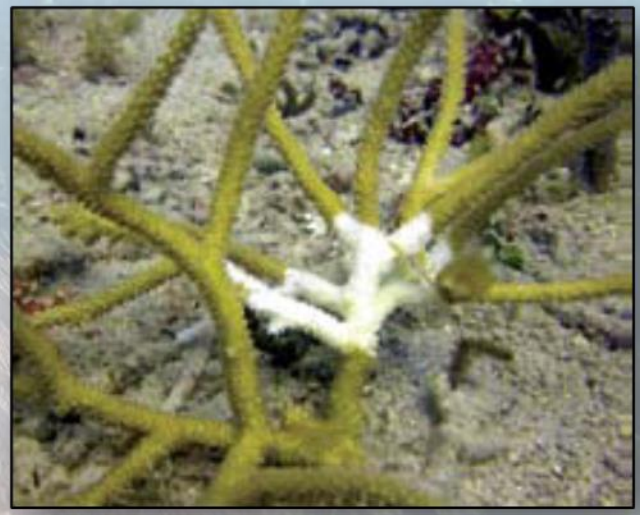






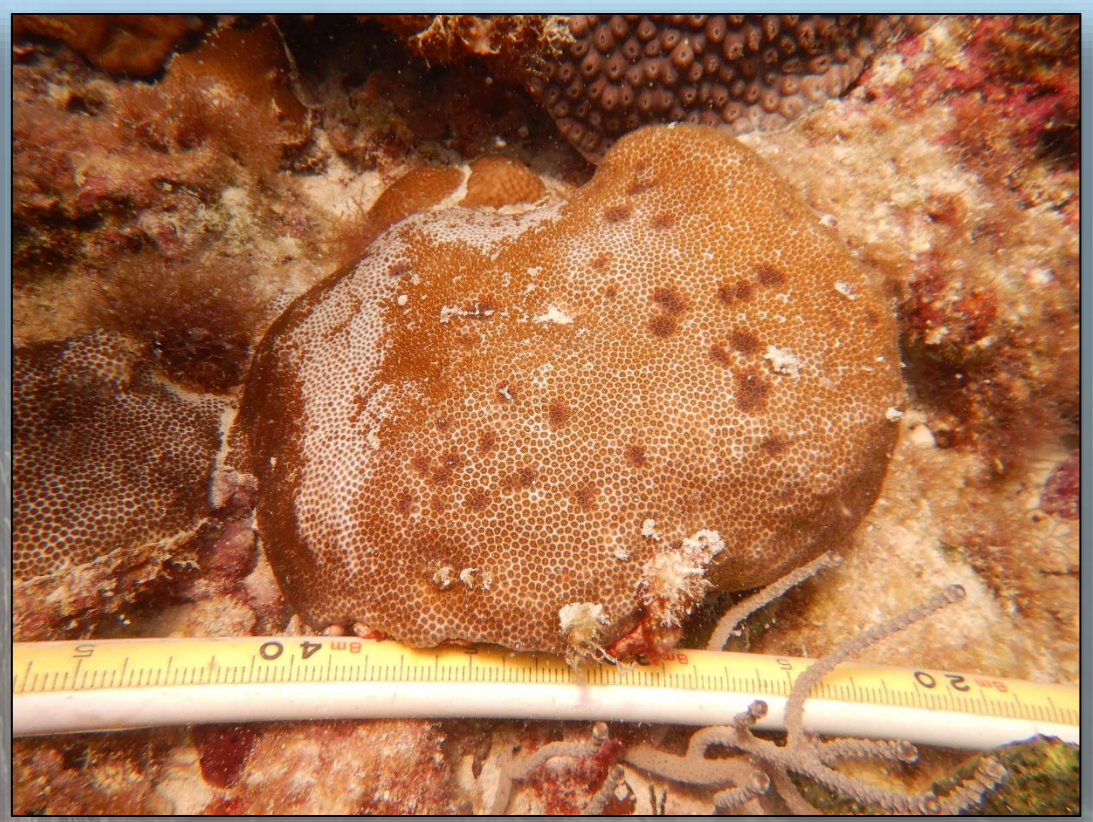


Acroporid diseases



Dark Spot Disease (DSD)

Commonly seen on *Siderastrea* spp. and *Stephanocoenia intersepta*
Typically seen as spots or coalescing spots of dark discolored tissue

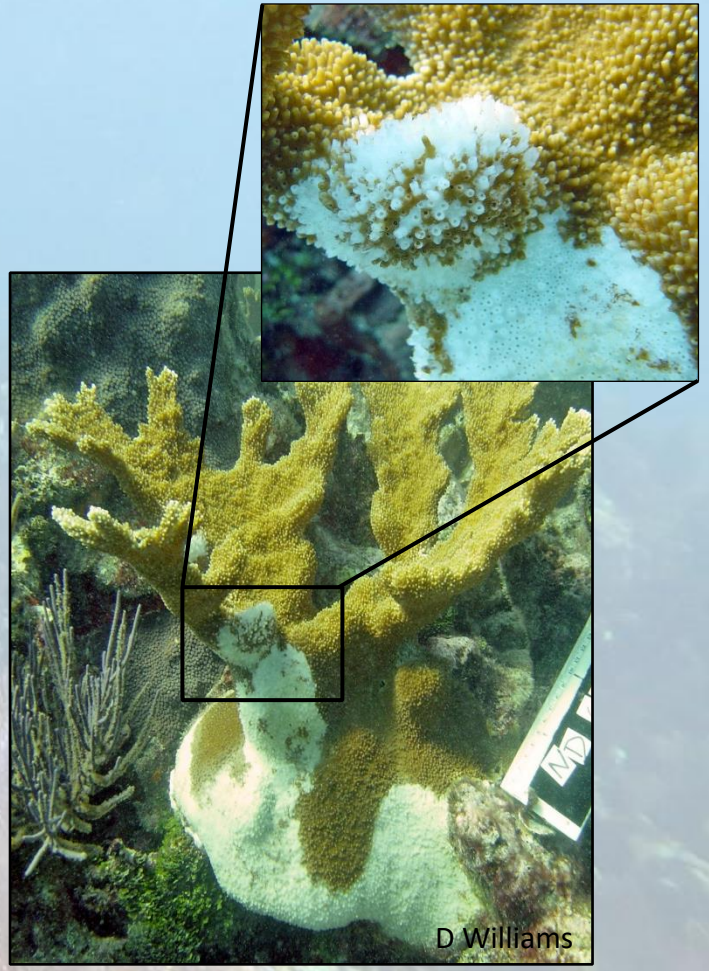


Acropora spp. Diseases

White Pox (WPX)

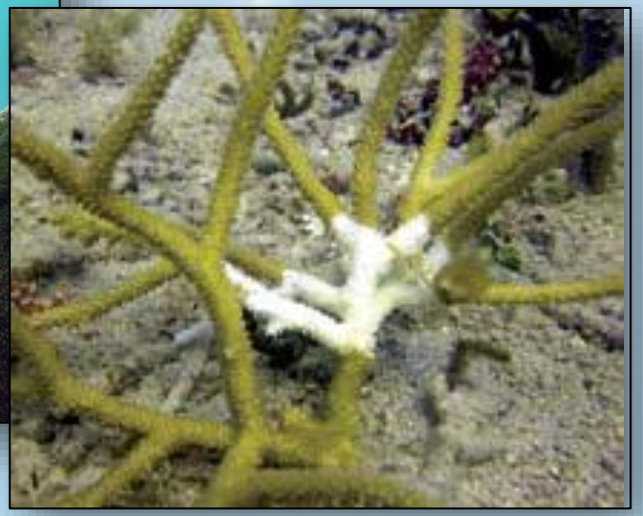
White band (WBD)

Rapid Tissue Loss (RTL)



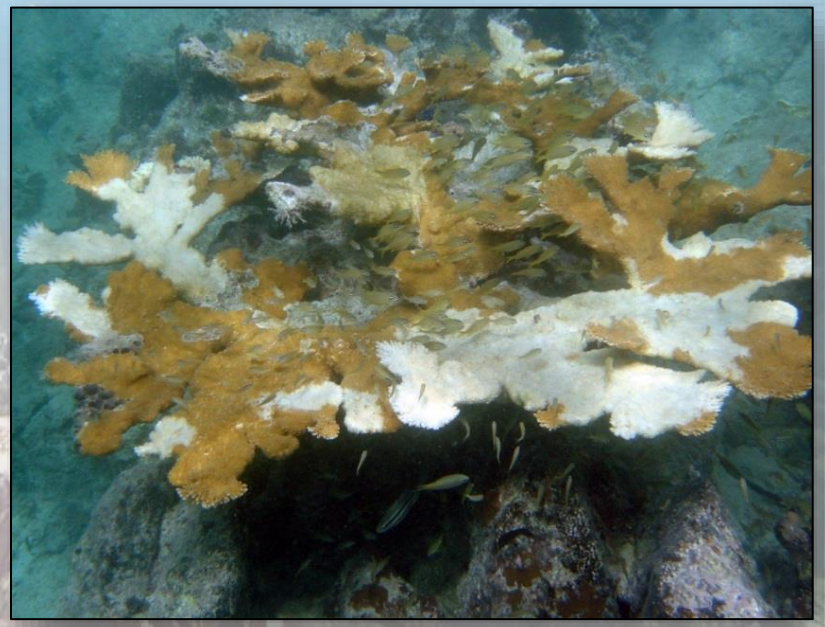
White Band Disease

- *Acropora* spp.
- Tissue peels or sloughs off the skeleton
- Progressing from the base of the branch towards the tip
- Band can be 5 to 10cm wide (subacute to acute tissue loss)
- Several mm per day



Rapid Tissue Loss

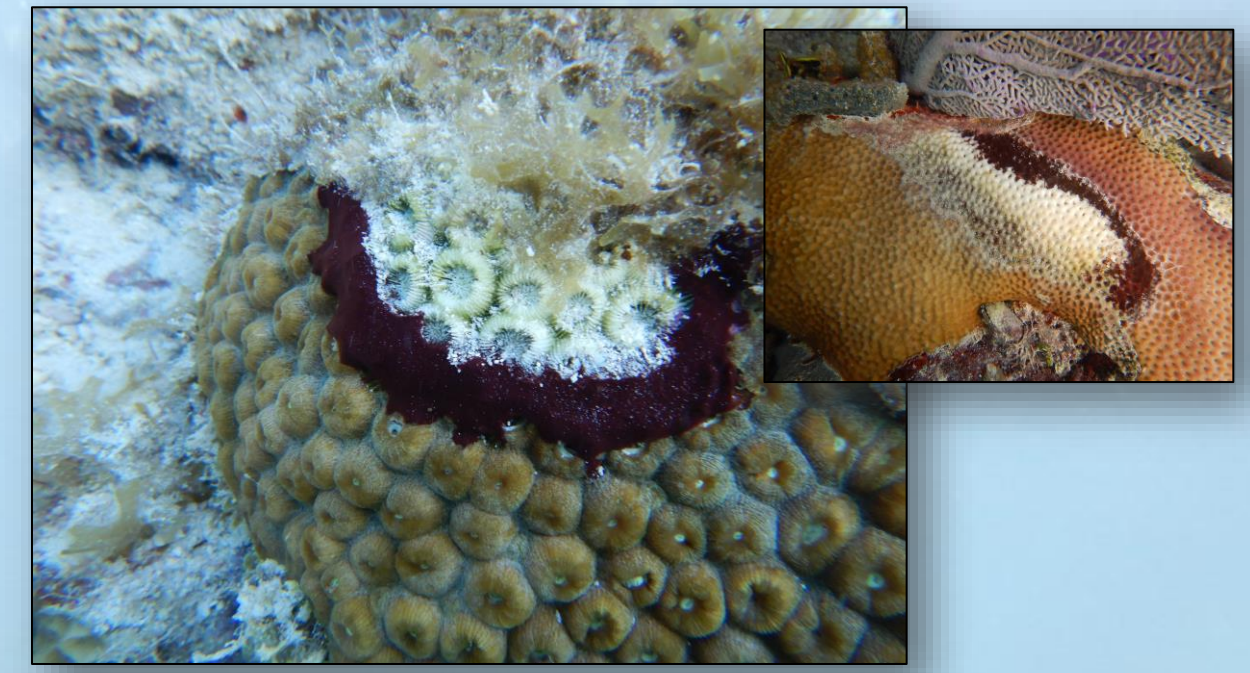
- Any irregular lesion that does not conform to white band or white pox
- Often recent mortality is highly irregular in appearance
- Progresses very rapidly compared to white band or white pox



Band Diseases

Black Band/Red Band Disease (BB/RB)

- Black or Red mat (a few mm to cm wide)
- Moving across the surface of the skeleton
- Leaving behind bare white skeleton

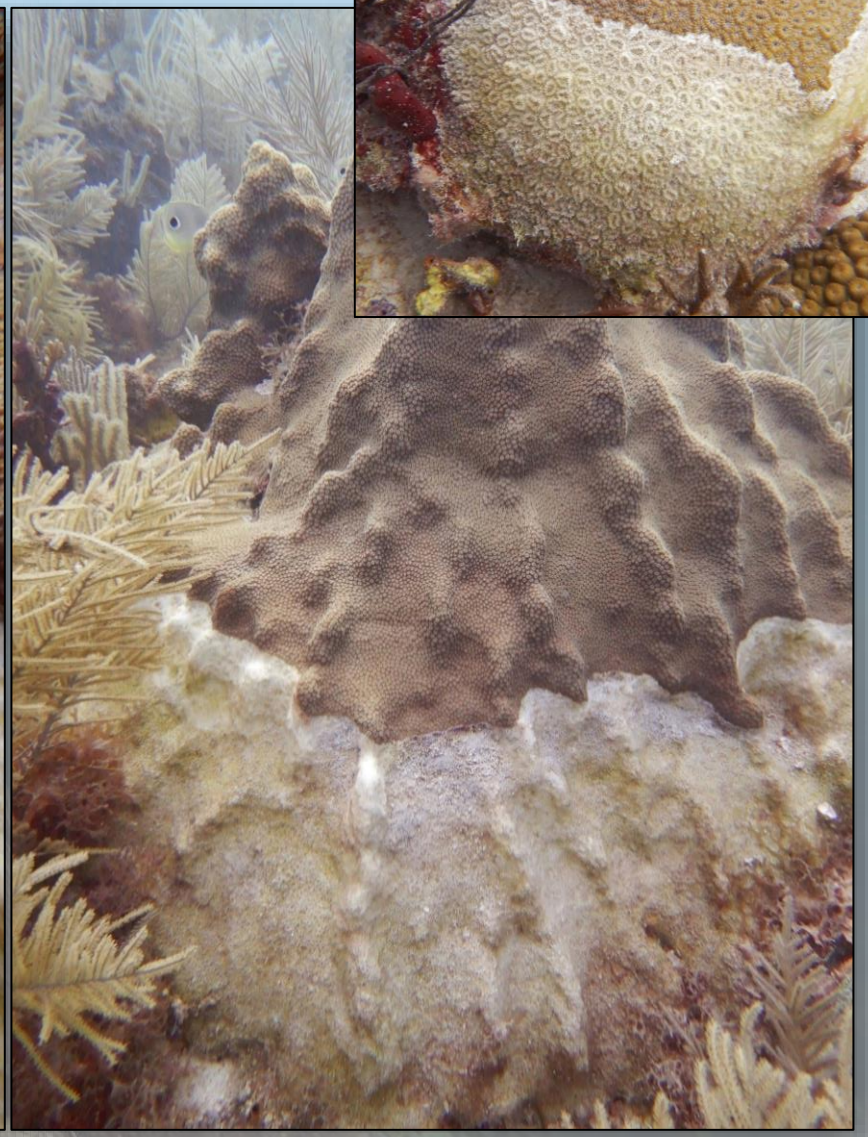


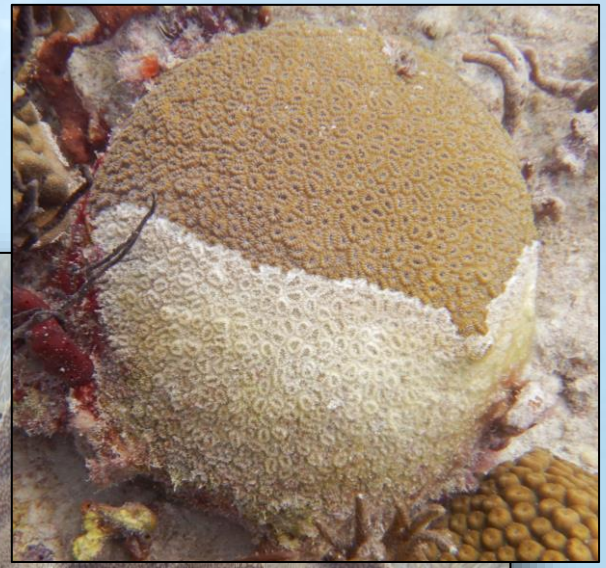
Yellow Band Disease (YB)

- Chronic tissue loss following a narrow band of yellow tissue

White Plague (WPL)

Polyps die relatively quickly (acute tissue loss). Can be focal or multifocal and affects multiple species. Tissue margin is distinct, in most cases forming a defined line between live tissue and recent mortality.






More up close images of
White Plague Disease

Stony Coral Tissue Loss Disease (STL)

First documented in 2014 and continues to affect corals at present.

Currently, 22 of 43+ species are affected by the disease.

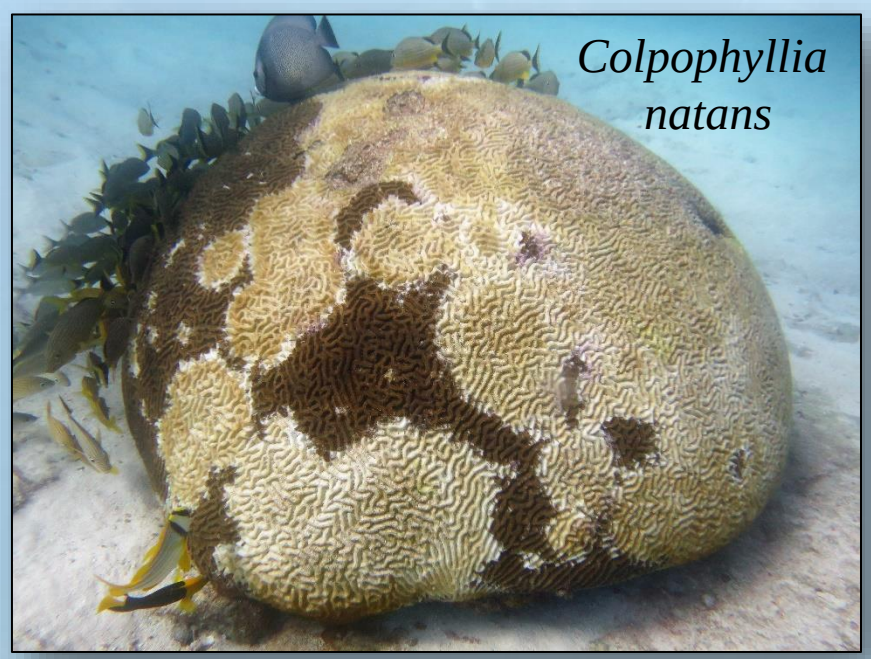
Affects all forms of corals (brain, star, finger, flower, and encrusting).

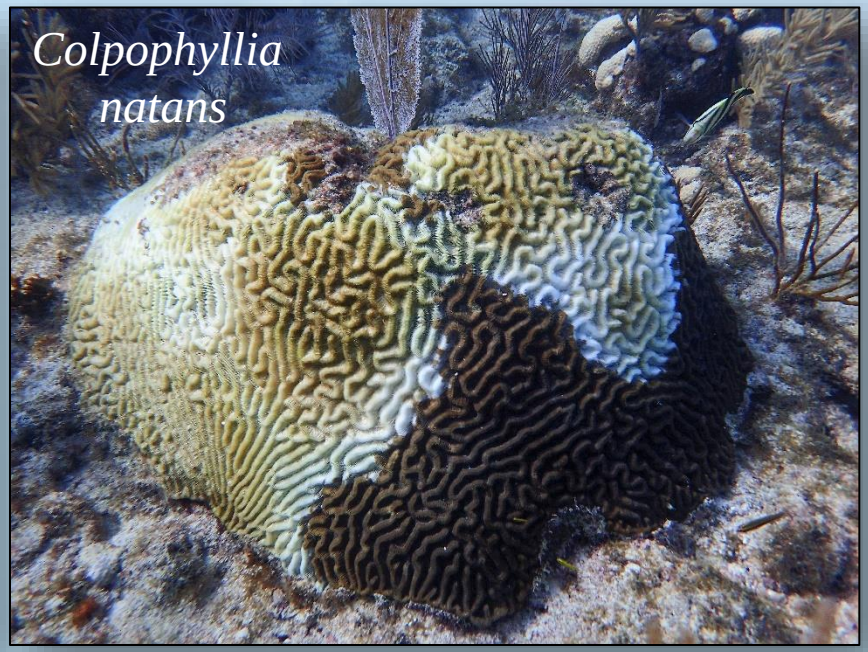
Although the cause of the disease is still unknown, the scientific community developed a common nomenclature to refer to this disease.

Stony Coral Tissue Loss Disease

<u>For the purposes of DRM, the disease will be recorded with the code..</u>

<u>STL</u>





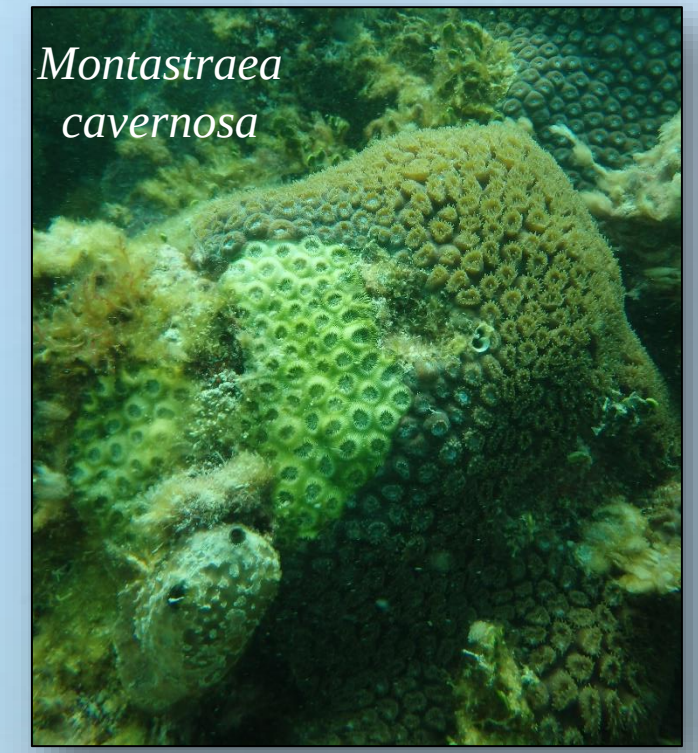
Stony Coral Tissue Loss Disease (STL)

Among the most susceptible species are…
Dichocoenia stokesii (elliptical star coral),
Meandrina meandrites (maze coral), and
Dendrogyra cylindrus (pillar coral)

Stony Coral Tissue Loss Disease

The tissue loss can appear on any part of the colony with live tissue and can evolve into multiple lesions.

Often the rate of tissue loss is so acute that the whole colony will experience rapid recent mortality.



Recent Mortality from Disease

If recent mortality from disease is identified, the rate of tissue loss progression **must** be recorded and a disease code **must** be recorded.

Estimating the Rate of Tissue Loss Progression

Slow (S)
(< 1 cm of disease related recent mortality)

Fast (F)
(> 1 cm of disease related recent mortality)

How and where do we measure?

The rate of tissue loss is determined by measuring the width of recent mortality

However…

Recent mortality is not always uniform.

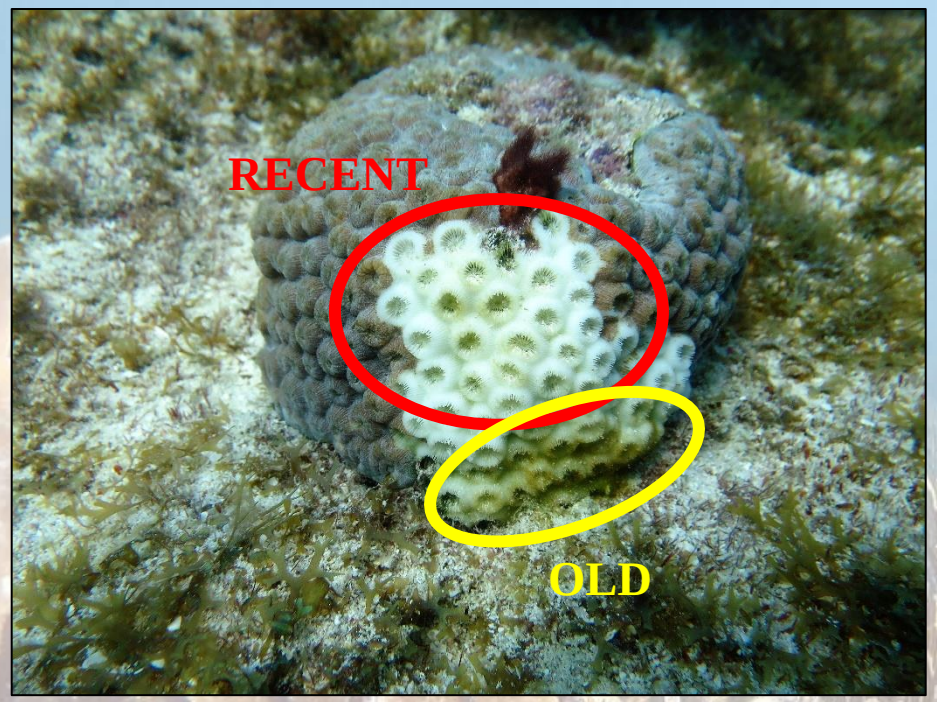
Recent mortality is not always in a strait line or band.

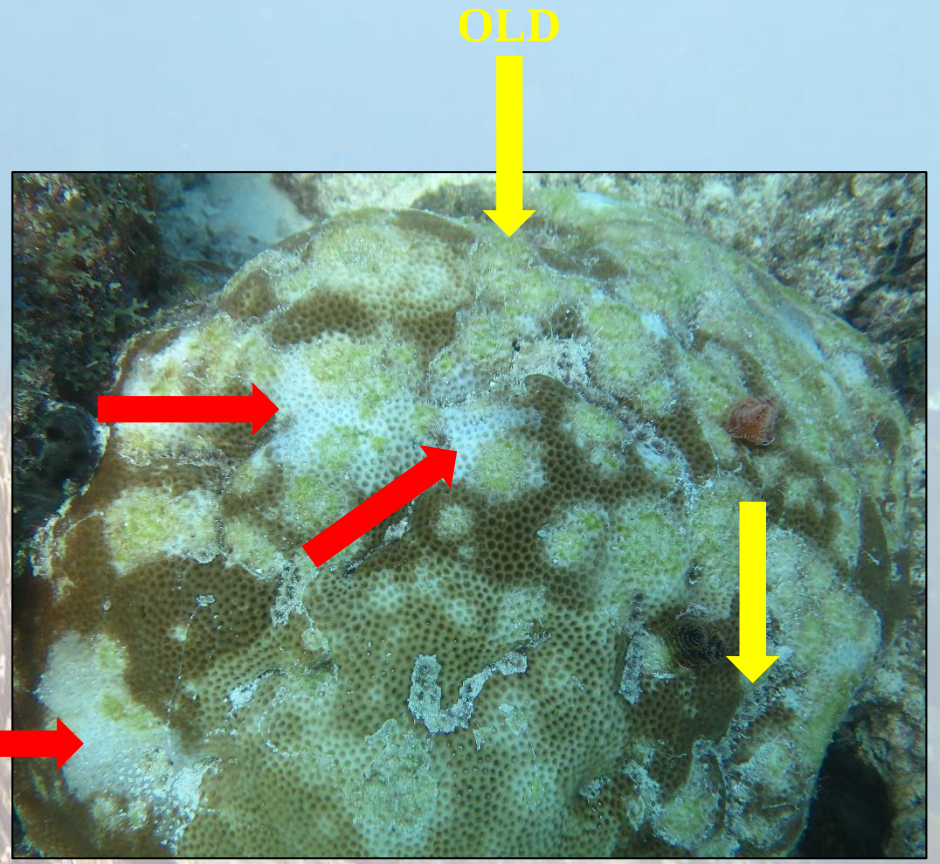
The margins of recent mortality can sometimes be diffuse.

Areas of recent mortality on a single colony can range from Slow to Fast.

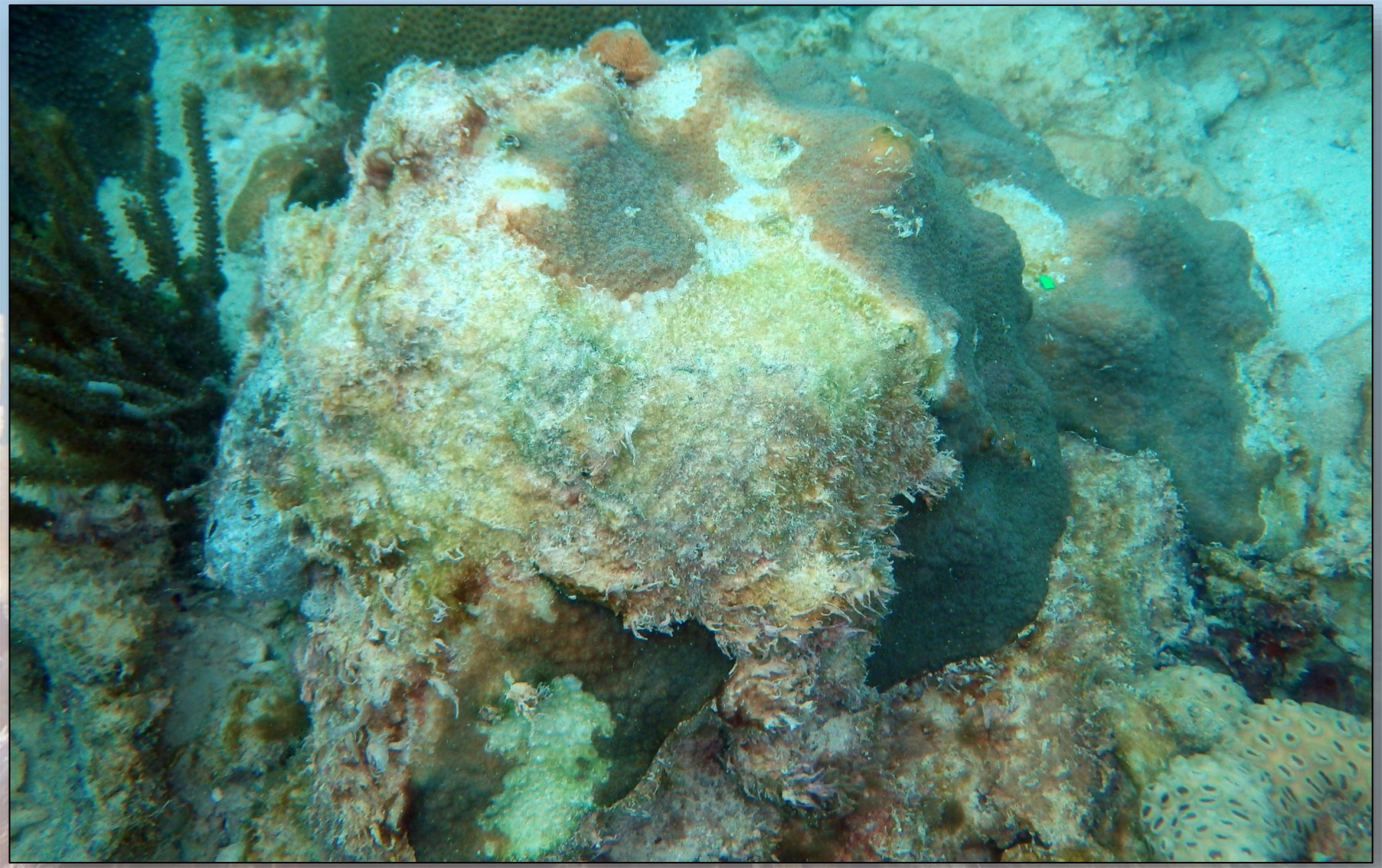
Despite variability of recent mortality on a colony,
the goal is to measure the maximum width of recent mortality to determine the rate.

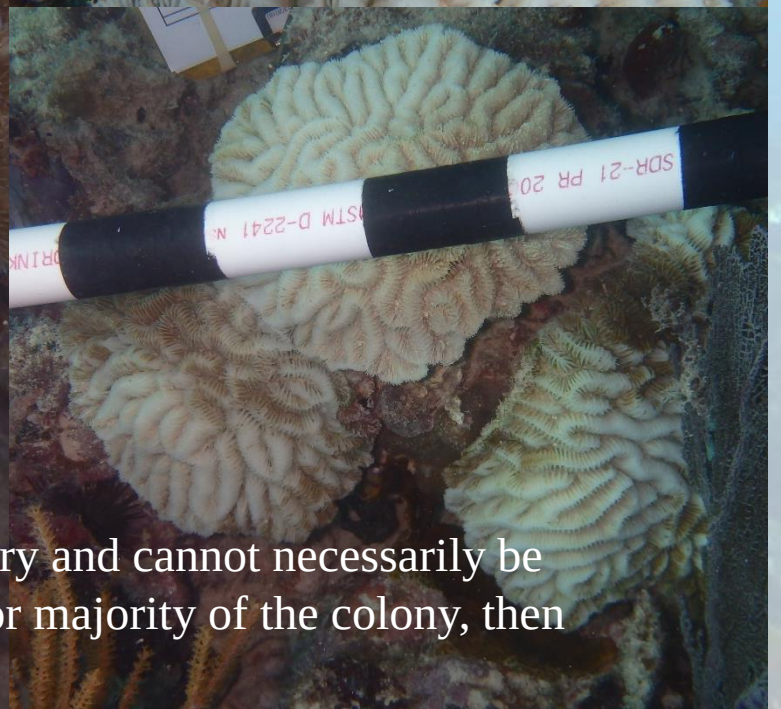
Recent Mortality vs. Old Mortality





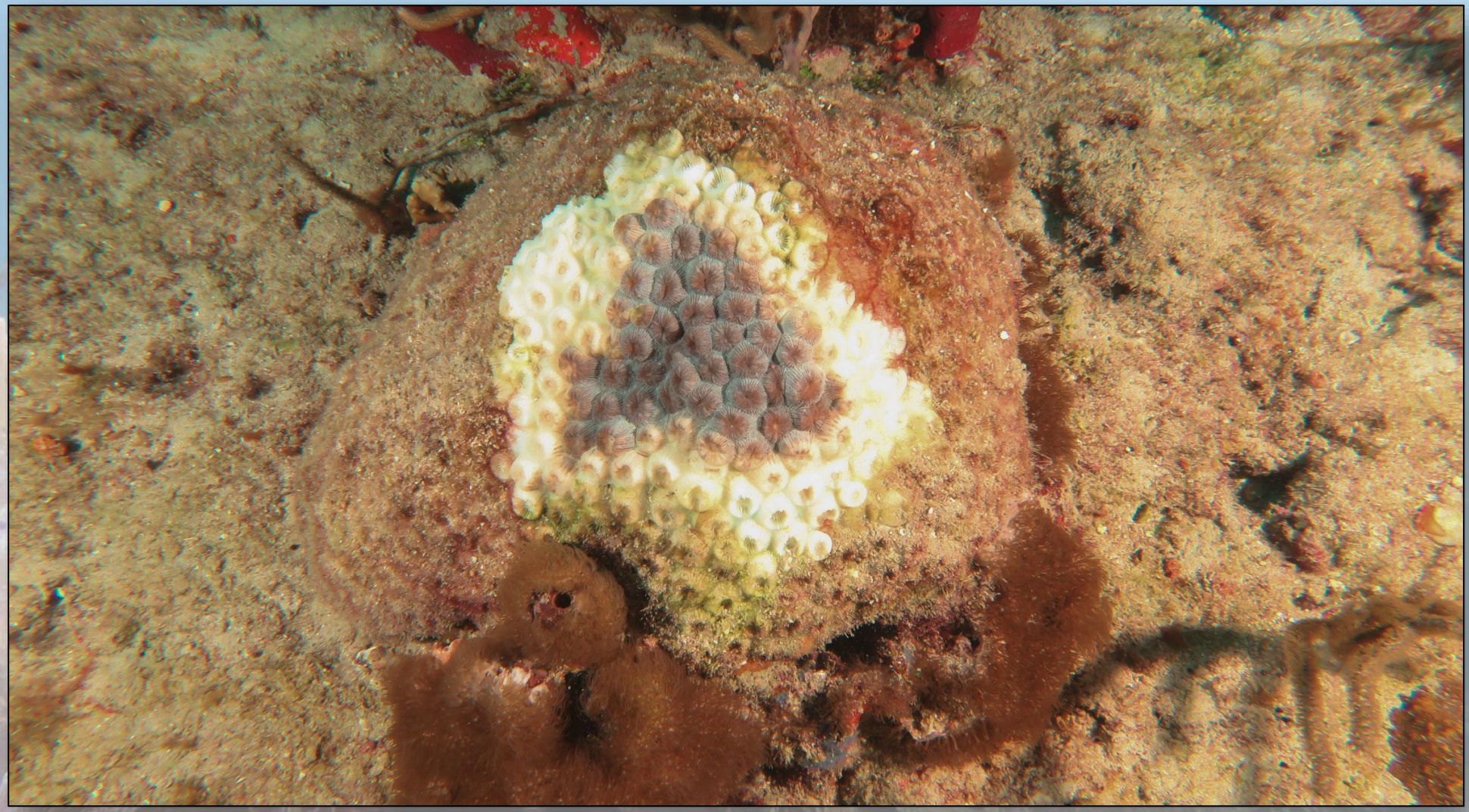
Looking at the top of the coral, it may seem that the rate of tissue loss is SLOW, however if you look towards the base, you can see a larger area of tissue loss that you may have missed.





Sometimes the tissue loss does not have a distinct boundary and cannot necessarily be measured. If there is tissue loss across the entire colony or majority of the colony, then it can be considered Fast.

Be sure to examine the area closely. Often, the tissue at the margin of the diseased area will be bleached but not have tissue loss. Be sure to measure only the recent mortality or tissue loss when identifying tissue loss as FAST or SLOW.



Coral Disease Conditions

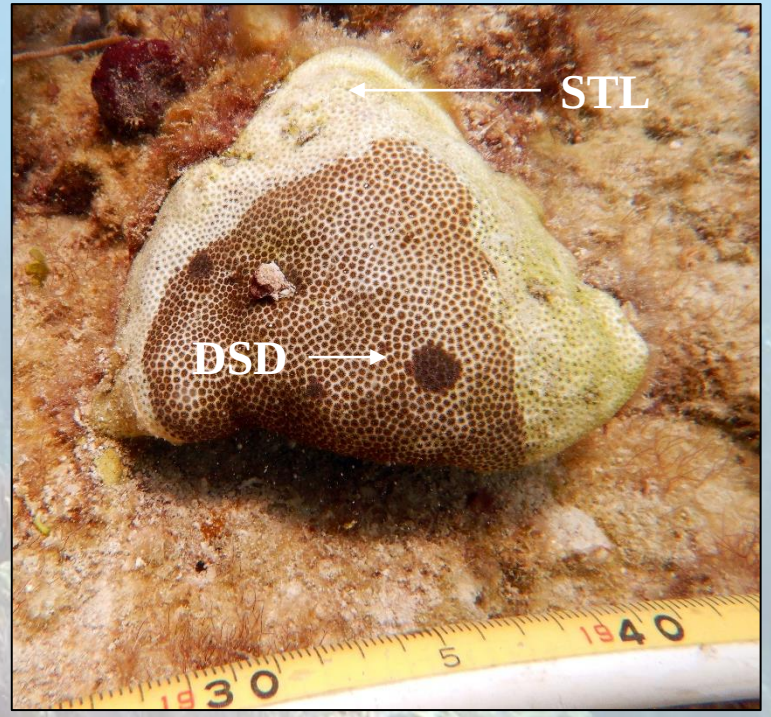
If % Disease Recent Mortality is recorded the Disease Condition(s) column **MUST** be filled out.

The Disease Condition(s) column allows the surveyor to identify any known diseases observed or unusual discoloration of tissue **'DC'** – not to be confused with the loss of zooxanthellae.

If the tissue loss is associated with the current coral disease outbreak, the condition can be recorded as **'STL' (Stony Coral Tissue Loss Disease)**.

More than one condition can be recorded in the Disease Condition(s) column if multiple disease conditions exist on a single colony.

Example:
Stephanocoenia intersepta
Stony Coral Tissue Loss Disease = STL
Dark Spot Disease = DSD



Discoloration (DC) and Dark Spot Disease

Dark Spot Disease (DSD) can be written in the 'Disease Condition(s)' column even if there is no recent tissue loss on the colony. The same goes for Discoloration (DC).

Often, Discoloration of coral tissue can be associated with tissue loss disease. In this case, two entries can be recorded in the 'Disease Condition(s)' column. For example, "DC, STL".

However, DSD and/or DC cannot be used as the only condition code for recent mortality.

DRM Code: 1000
Surveyor: JEST
Lat: dd.ddddd
Long: dd.ddddd
Date: 8/29/2020 Depth ft: 35

Transect: 1 / (2) / 3 / 4
Shared? (Y) / N
Buddy: LIHE

Rugosity Msmts:

1.	5	2.	17	3.	7
4.	21	5.	2	6.	22
7.	20	8.	40	9.	30
10.	4				

P/A: Diad. (ACER) APAL DCYL

Habitat: Isolated Reef; Contiguous Reef Spur and Grv.; (Contiguous Reef Other); Reef Rubble

	Species Code	Width (cm)	Height (cm)	Bleaching P, PB, BL	% Old Mort	Other % Recent Mort	Tissue Loss Disease: Disease % Recent Mort	Tissue Loss Disease: TL Rate Fast, Slow	Tissue Loss Disease: Disease Conditon(s)	Other Condition(s)	Scientific Name Transect 3 & 4 in Grey	Sp. Codes
1	SSID	5	1	PB	5				DSD		*Colphphyllia natans*	CNAT
2	SSID	10	7		2	10			DC	OGI	*Dichocoenia stokesi*	DSTO
3	SINT	7	4		95	5				PRD, CLN	*Diploria labyrinthiformis*	DLAB
4	PAST	15	6	P	10					MUC	*Meandrina meandrites*	MMEA
5	DSTO	5	5		10		20	FA	DC, STL		*Mussa angulosa*	MANG
6	AAGA	7	3	BL							*Mycetophyllia aliciae*	MALI

UNKNOWN (UNK/OUNK)
Disease Condition & Other Condition

Unknown **Disease** Condition (UNK)

If you identify any Recent Mortality from disease but cannot confidently identify what type of disease it is, mark it as UNKNOWN (UNK) disease condition.

Other Unknown Condition (OUK)

If you identify any Recent Mortality not from disease but cannot confidently identify what caused it, mark it as UNKNOWN (OUK) other condition.

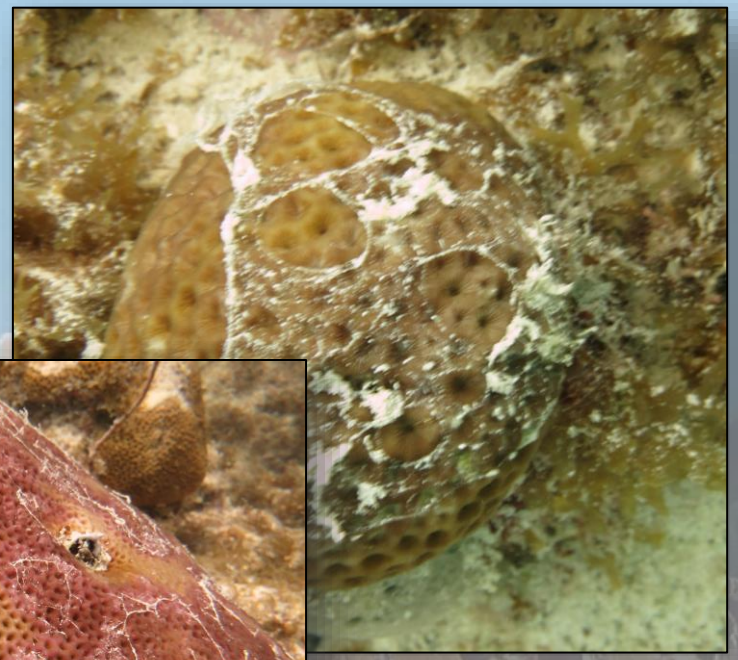
Please be sure to write UNK or OUK in the correct column depending on whether you are identifying an unknown disease or unknown other condition.

‘OTHER’ CONDITIONS TO RECORD

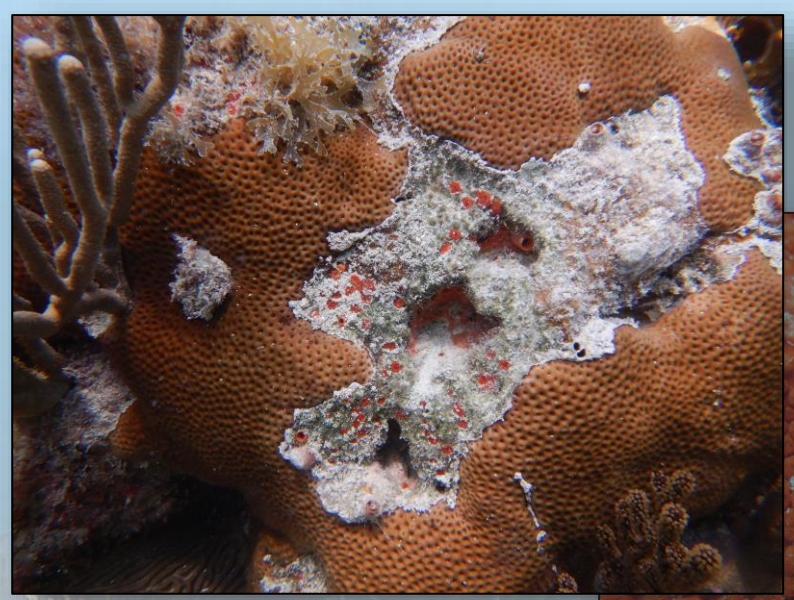
These conditions may or may not have recent mortality associated but should be recorded if observed on a colony.

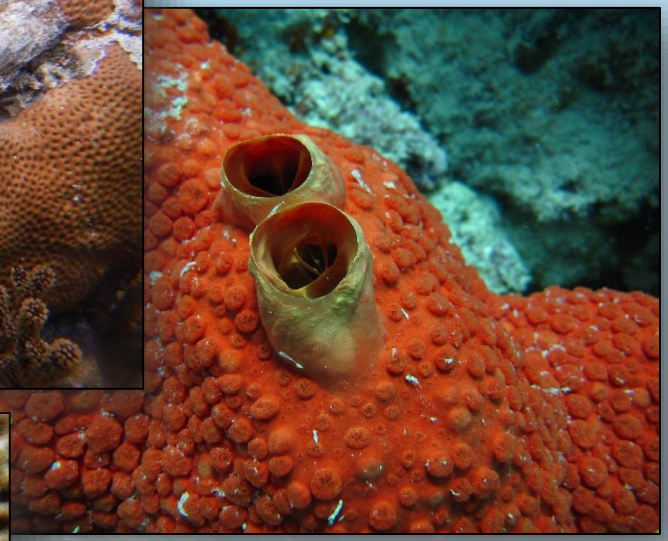
Mucus Sheathing (MUC)

Commonly seen on *Porites astreoides* and *Siderastrea siderea*

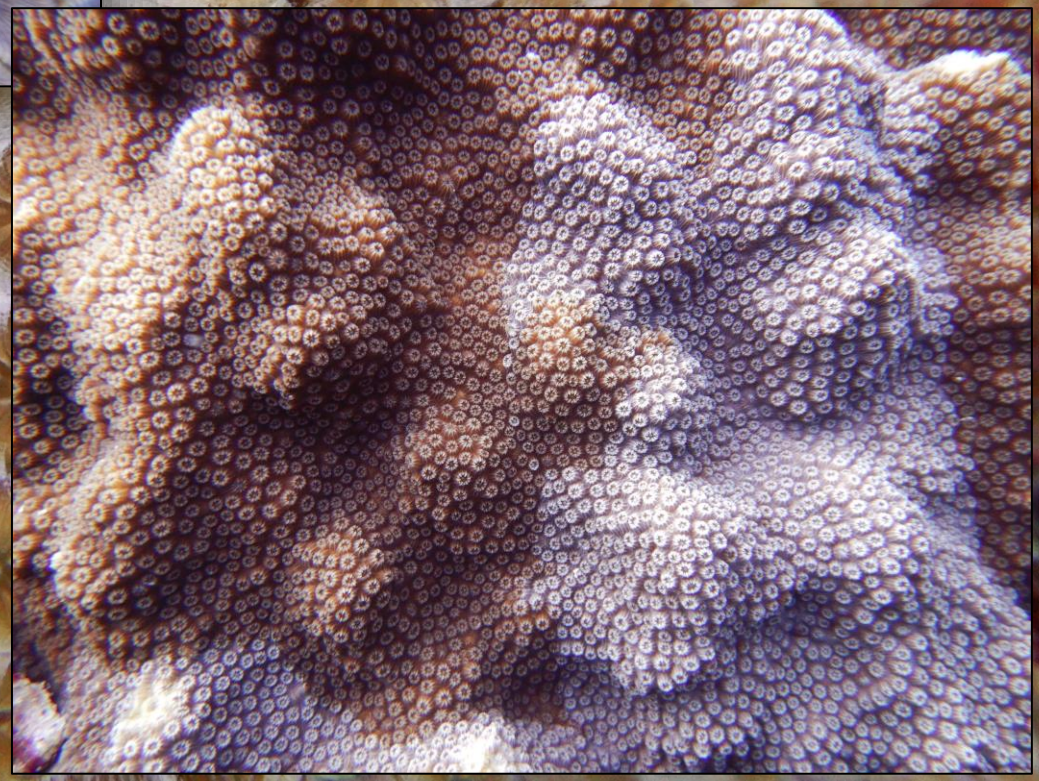


Cliona delatrix (CLN)





OTHER CONDITION **NOT** TO RECORD



Stramenopiles

- At first, these corals may seem pale or bleached but upon closer inspection, one can see that there is thin layer on top of the coral tissue.
- Stramenopiles are Eukaryotic microorganisms embedded in the coral tissue.
- Is not known to impact coral health.
- **Not a “Disease” condition** or an “Other” condition.
- Not a new phenomenon and has been documented in publications since the 90’s.

OTHER CONDITION **NOT** TO RECORD

CCA

From a distance, the white areas on the coral in the picture may look like recent mortality. However, upon closer investigation, one can see that these white areas are in fact, a white form of **Crustose Coraline Algae.**

Example Datasheet for Recording Coral Conditions

DRM Code: 1000
Surveyor: JEST
Lat: dd.ddddd
Long: dd.ddddd
Date: 8/29/2020 Depth ft: 35

Transect: 1 / (2) / 3 / 4
Shared? (Y) / N
Buddy: LIHE

Rugosity Msmts:
1. 5 2. 17 3. 7
4. 21 5. 2 6. 22
7. 20 8. 40 9. 30
10. 4

P/A
Diad.
(ACER)
APAL
DCYL

Habitat:
Isolated Reef
Contiguous Reef Spur and Grv.
(Contiguous Reef Other)
Reef Rubble

	Species Code	Width (cm)	Height (cm)	Bleaching P, PB, BL	% Old Mort	Other % Recent Mort	Tissue Loss Disease: Disease % Recent Mort	Tissue Loss Disease: TL Rate Fast, Slow	Tissue Loss Disease: Disease Conditon(s)	Other Condition(s)	Scientific Name Transect 3 & 4 in Grey	Sp. Codes
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3	SINT	7	4		95	5				PRD, CLN	*Diploria labyrinthiformis*	DLAB
4	PAST	15	6	P	10					MUC	*Meandrina meandrites*	MMEA
5	DSTO	5	5		10		20	FA	DC, STL		*Mussa angulosa*	MANG
6	AAGA	7	3	BL							*Mycetophyllia aliciae*	MALI
7											*Mycetophyllia ferox*	MFER

Final Notes:

Try not to touch actively diseased areas with your hands or measuring tool as to not spread it to other corals in the area.

Take pictures of anything unusual or if you find disease on a rare coral species. The central repository for DRM images will be covered in Lesson 6.