Stony Coral Tissue Loss Disease in Belize, a multi-pronged approach to its control and management

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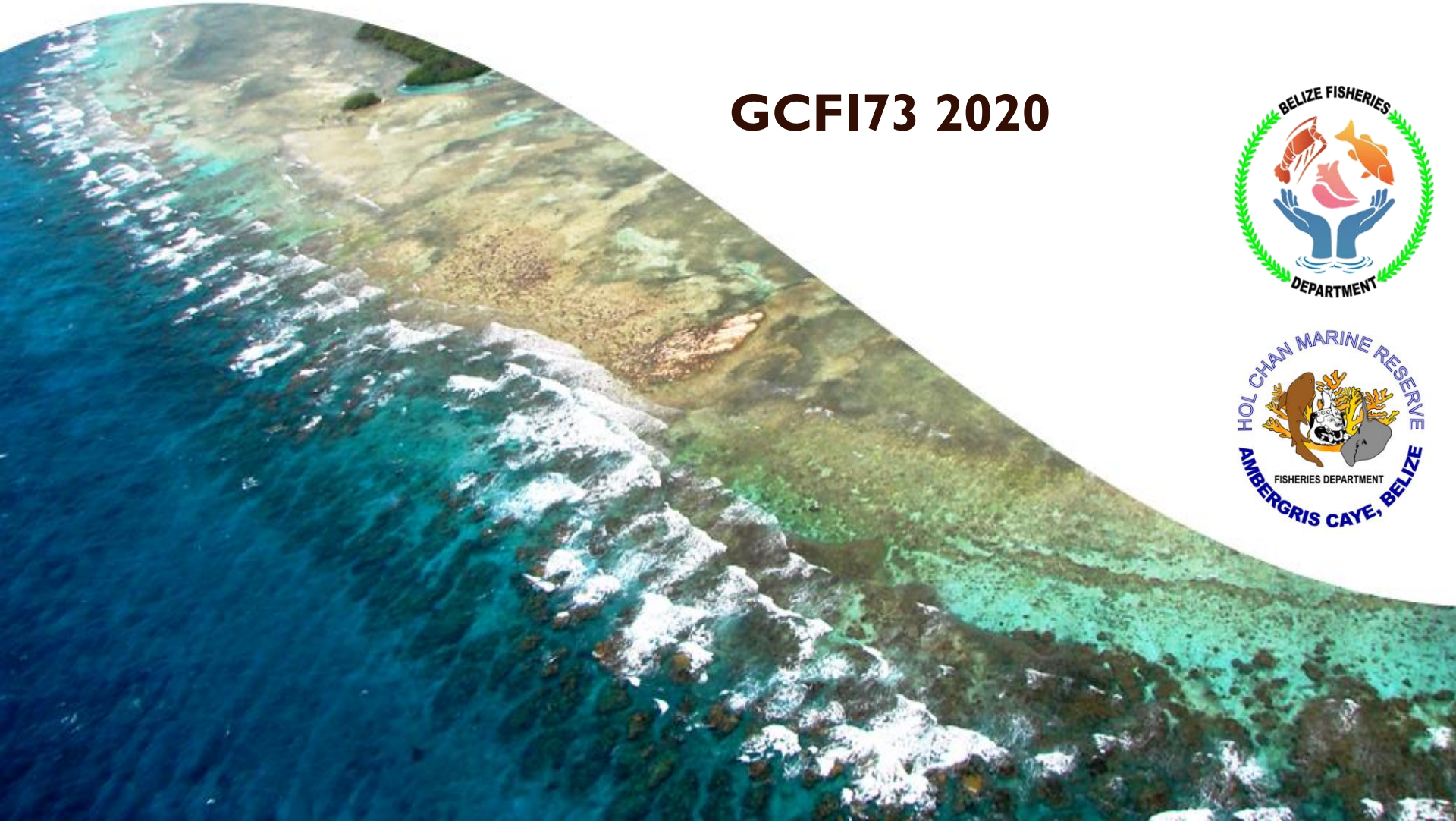

GCFI73 2020

BELIZE FISHERIES DEPARTMENT

HOL CHAN MARINE RESERVE
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AMBERGRIS CAYE, BELIZE

Stony Coral Tissue Loss Disease: Official Response from Authority

BELIZE FISHERIES DEPARTMENT
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July 10th, 2019

PRESS RELEASE

STONY CORAL TISSUE LOSS DISEASE REPORTED IN BELIZE

The Fisheries Department has confirmed the presence of the Stony Coral Tissue Loss Disease (SCTLD) on the Northern region of the Belize Barrier Reef Complex. SCTLD is a fairly new disease that affects coral reef systems attacking the coral colonies and resulting in loss of live tissue. Infected corals display "blotchy" lesions and high mortality rates. The disease was first reported in Florida in 2014 and more recently in Quintana Roo, Mexico. In June 2019 it was detected and subsequently confirmed in July 2019 at the Bacalar Chico Marine Reserve.

Figure 1: SCTLD advancement https://www.gcfi.org/emerging-issues-florida-coral-disease-outbreak/

The National Coral Reef Monitoring Network (NCRMN), comprised of members from the Belize Fisheries Department (BFD), Belize Audubon Society (BAS), Belize Coastal Zone Management Authority & Institute (CZMAI), Blue Ventures (BV), ECOMAR, Fragments of Hope (FoH), Healthy Reefs for Healthy People Initiative (HRI), Projects Abroad, SIWA-BAN, Southern Environmental Association (SEA), Toledo Institute for Development and Environment (TIDE, Turneffe Atoll Sustainability Association (TASA), the University of Belize Environmental Research Institute (UB ERI) and Wildlife Conservation Society (WCS), met on July 2nd, 2019 to discuss a way forward to manage this disease. A task force was established to work along with protected areas managers in Northern Belize to determine the extent of the infection along the Northern Barrier Reef

Figure 2: Coral with SCTLD at Bacalar Chico Marine Reserve

Complex and to administer treatment and implement measures to curtail the spread of the disease.

SCTLD is a very aggressive disease and the pathogen that causes the disease has not been identified. However, the disease is thought to be caused by bacteria and can be transmitted to other healthy corals through direct contact and from water circulation. The NCRMN is working along with its partners to develop a probabilistic map for the potential spread of the disease using a high-resolution MAR-Hycom model for water currents and other variables. There is no clear treatment for the disease although interventions using chlorine, antibiotics and sometimes culling have been tested with varying degrees of success.

The NCRMN is asking that all stakeholders especially those interacting with the reef environment remains vigilant in monitoring the spread of this disease and assist by doing the following:

1.) Report suspected cases along with pictures in the disease tracking tool that can be found here: http://www.agra.org/experimental-interventions/ or contact the Fisheries Department at fisheries_department@fisheries.gov.bz or Phone: 2244552.
2.) Keep good buoyancy, refrain from bringing back anything from the infected reef, and sanitize gears before, between and after dives in a bleach solution. A gear rinsing protocol can be found here: https://floridakeys.noaa.gov/coral-disease/citizen-participation.html
3.) To find out more about SCTLD please go to: http://www.agra.org/coral-disease-outbreak/.

For further information please contact The Fisheries Department at fisheries_department@fisheries.gov.bz Phone: 2244552 or the Healthy Reefs Initiative representative at craig@healthyreefs.org.

END

Press Release: https://www.facebook.com/GOBPressOffice/posts/2281898001845690




A Timeline of Stony Coral Tissue Loss Disease Response in Belize

Awareness and Planning Sessions → Confirmation of SCTLD via Photos → Pilot Treatment Efforts → Drafting Action Plan → Funding → Disease Spread → Ongoing treatment and other rescue efforts

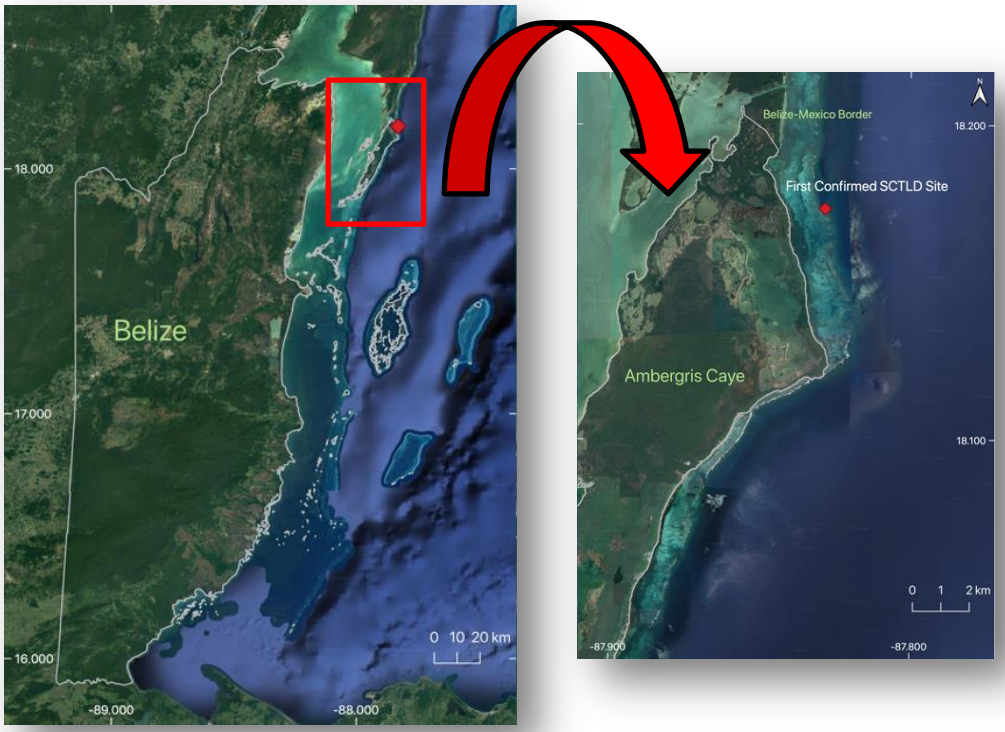
Awareness and Planning

- June 2018: Healthy Reefs Initiative (HRI) shared a Red Alert before SCTLD appeared in Belize.
- October 2018: Fragments of Hope (FoH) did presentations and issued Posters and ID Cards to stakeholders.
- April 2019: HRI and FoH made media appearances and hosted Response Planning and Workshops.

Confirmation of SCTLD via Photos

Stony Coral Tissue Loss Disease Detected in the Bacalar Chico Marine Reserve in June 2019

- Blue Ventures Reported the detection of SCTLD.
- NCRMN contacted experts at MPAConnect and HRI to confirm the presence of SCTLD.



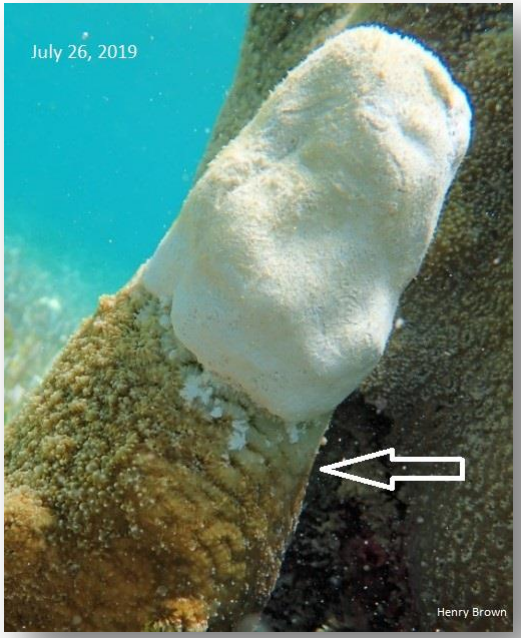
First infected *Dendrogyra cylindrus* at the Bacalar Chico Marine Reserve

BELIZE FISHERIES DEPARTMENT

Pilot Treatment Efforts

Pilot Treatments in Bacalar Chico Marine Reserve

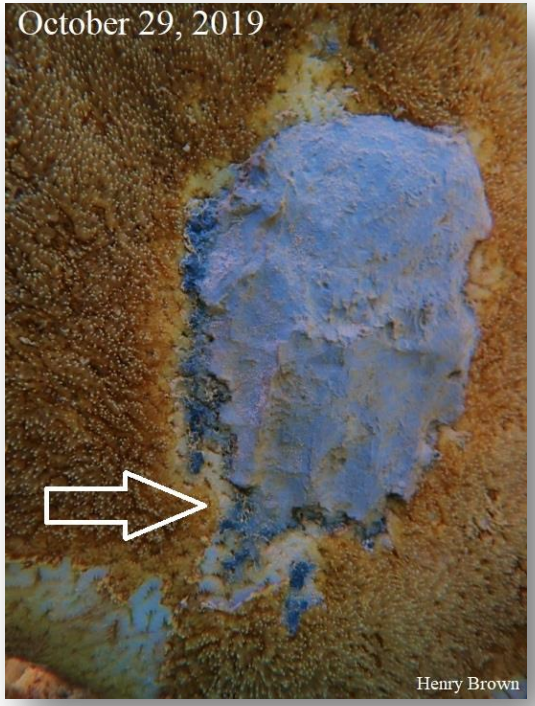
- July – August 2019 –
  - HRI sponsored treatment of Cocoa/ Shea Butter + Chlorine and Modeling Clay or Epoxy.
  - Treatment effort was not successful.





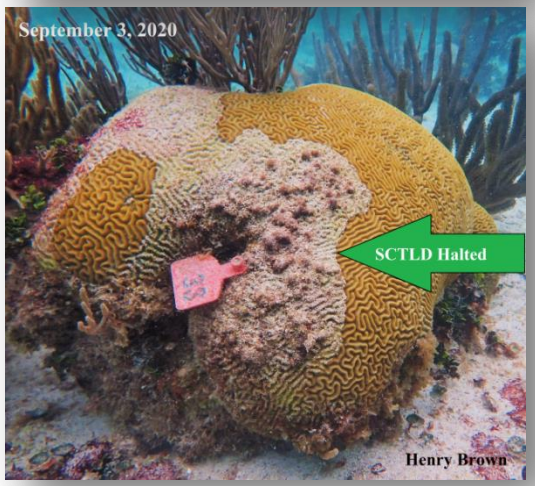
Pilot Treatments in Bacalar Chico Marine Reserve

- October 2019
  - At the Marine Fund's Reef Recue Initiative Bi-Annual Meeting breakout sessions, cement was suggested and thereafter tested.
  - Treatment effort was not successful.





Pilot Treatments in Bacalar Chico Marine Reserve



- Coral Ointment Base2b + Amoxicillin
- Treatment effort was successful



Drafting Action Plan

Action Plan: Efforts of Belize's National Coral Reef Monitoring Network

Stony Coral Tissue Loss Disease Monitoring and Action Plan

Belize

- The process started September 2019.
- There was a MarFund joint session on regional and local responses to SCTLD.
- MPAConnect Regional webinars attended
- Increase Awareness raised.

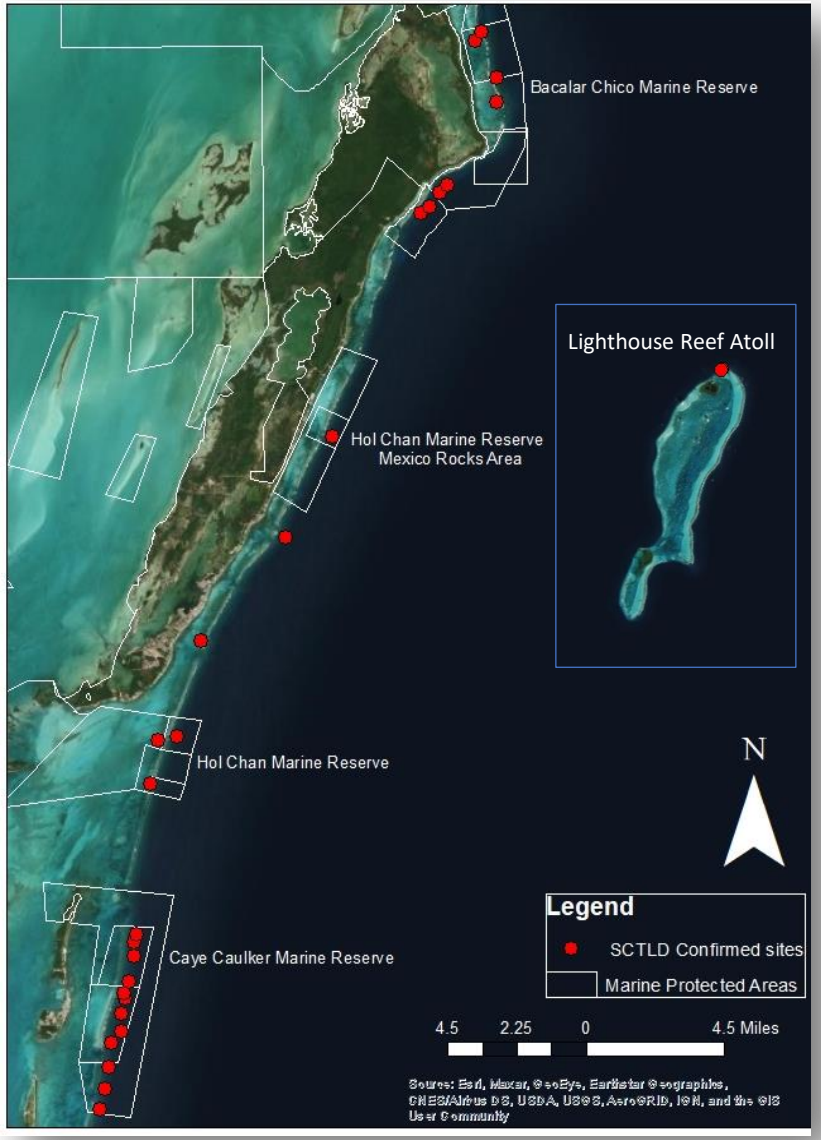
Funding

- **Fragments of Hope** – Paul G Allen Family Foundation, MCCAP, Private Donations to FoH, Tradewinds
  - 10 jars Coral Ointment and Antibiotics
  - Fuel
  - Boat Rental and logistical support
  - Installation of 2 Coral Nurseries (Baclar Chico and Hol Chan Marine Reserves
- **Belize Mar Fund** (received by Healthy Reefs Initiative)
  - $45,000 USD
    - 230 jars Coral Ointment, Antibiotics, fuel and training

Disease Spread

SCTLD Spread in Belize

- June 2019 Detected in BCMR
- April 2020 Detected in HCMR
- May 2020 Detected in CCMR
- Spread is 55 miles from first site of infection
- September 2020 detected in Light House Reef Atoll





Ongoing treatment and other rescue efforts

Coral Ointment Base2B and Amoxicillin Treatment Methods

1 Site Selection

- Ecological
  - Structure Builder – Contribute to Reef building
  - Size – greater reproductive capacity and habitat
  - Relative Size – Older and more resilient
  - Localized Reproductivity – Surrounded by other live colonies
- Priority Species
  - *Dendrogyra cylindrus*
  - *Colpophyllia natans*
  - *Meandrina meandrites*
  - *Dichocoenia stokesii*
  - *Diploria sp.*
  - *Orbicella annularis*
- Stakeholder Importance: Tourism
- Treatability: > 75% living, < 5 lesions, proximity to other treated corals



Ongoing treatment and other rescue efforts

Coral Ointment Base2B and Amoxicillin Treatment Methods

Labeling Colonies

2

- A numbered Tag was attached
- Photos of corals to be treated was taken

Recording

4

- Photos were taken of treated tagged corals
- Photos were taken from the same angle every time

Treatment

3

- 100 grams of Amoxicillin was used for 800 grams of CoreRx Base2B (1:8 ratio)
- Treatment of CoreRx Base2B + Amoxicillin was applied using syringes and pressing it into the boarder of the disease and live tissue

Revisit and Reapply treatment

5

- Sites were visited approximately 1 month after initial treatment and retreated if it was needed
- Sites were visited 2 months after initial treatment to note progress

Ongoing treatment and other rescue efforts

BCMR Coral Ointment Base2B and Amoxicillin Treatments

Results

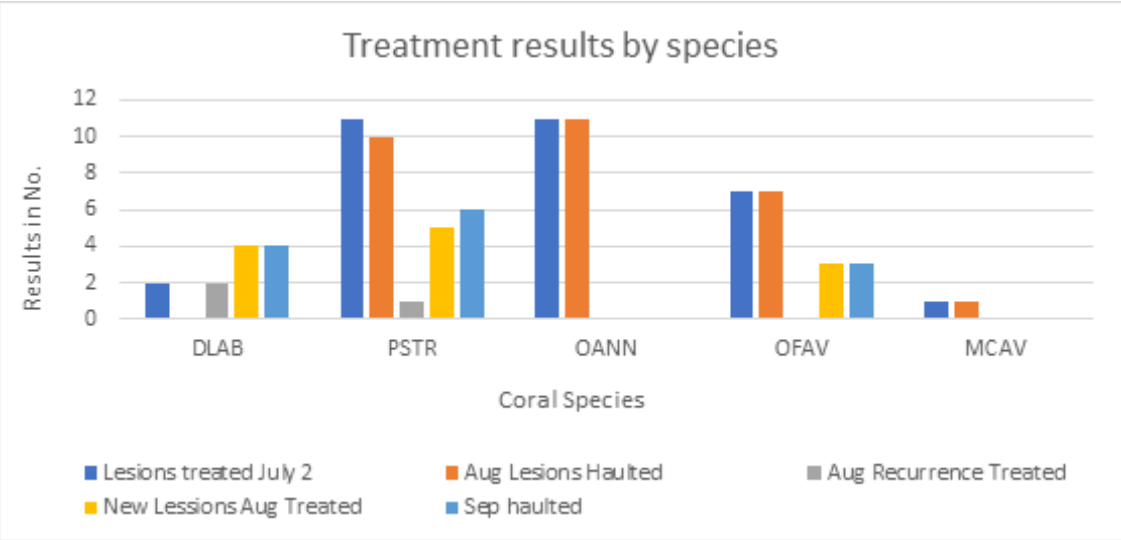
- 15 Coral Colonies were treated at BCMR

Coral Species	Lesions treated July 2	Aug Lesions Haulted	Aug Recurrence Treated	New Lessions Aug Treated	Sep haulted
DLAB	2	0	2	4	4
PSTR	11	10	1	5	6
OANN	11	11	0	0	0
OFAV	7	7	0	3	3
MCAV	1	1	0	0	0
TOTALS	32	29	3	12	13

Ongoing treatment and other rescue efforts

BCMR Coral Ointment Base2B and Amoxicillin Treatments

Results

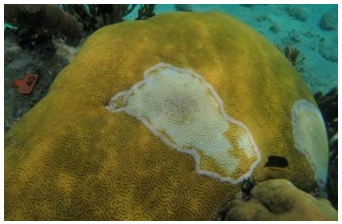


- 32 lesions were treated on 5 different species of corals. Lesions were higher on PSTR, OANN and OFAV with lesser number of lesions on DLAB and MCAV. Of note is that the lesions on DLAB did not respond to initial treatment but rather had to be treated a second time and still there was recurrence in September. OANN was successful from the first application with no apparent recurrence. PSTR developed new lesions with a small number of recurrence that that was successfully treated the second time. Similarly, OFAV did not have recurrence of lesions but developed new lesions that were successfully treated the second time. Although, this data is preliminary, it highlights the importance of revisiting sites and re-treating recurrent lesions or new lesions at least once per month. Special consideration should be given to DLAB species where it seems to be persistent. It merits further research to determine cause of recurrence.

Ongoing treatment and other rescue efforts

BCMR Coral Ointment Base2B and Amoxicillin Treatments

Results

	PSTR Coral 005	DLAB Coral 040	OFAV Coral 0360
Before Treatment	 2-July-20	 2-July-20	 2-July-20
After Treatment	 2-July-20	 2-July-20	 2-July-20
1 Month	 8-Aug-20	 8-Aug-20	 8-Aug-20
2 Month	 3-Sept-20	 3-Sept-20	 3-Sept-20

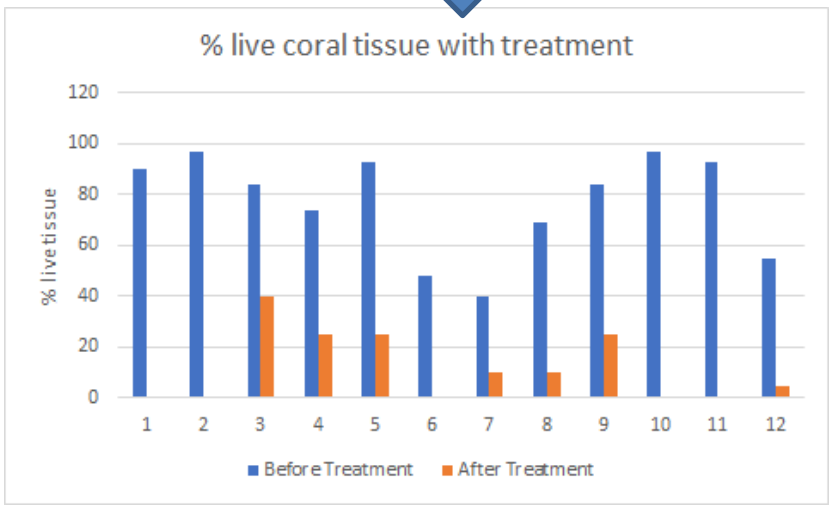
Ongoing treatment and other rescue efforts

HCMR Coral Ointment Base2B and Amoxicillin Treatments

- 12 colonies tagged for monitoring
- All tagged colonies had recurring lesions

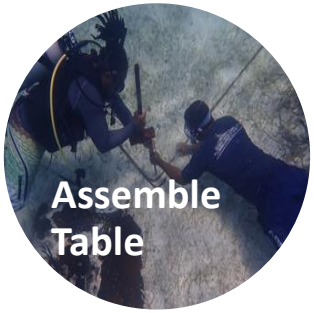
	Species	# of Colonies
High Susceptibility	*Dendrogyra cylindrus* (DCYL) (PIillar Coral)	2
	Colophyllia natans (CNAT) (Boulder Brain Coral)	1
	Pseudodiploria clivosa (PCLI) (Knobby Brain Coral)	1
	Pseudodiploria strigosa (PSTR) (Symmetrical brain coral)	32
Intermediate Susceptibility	*Orbicella annularis* (OANN) (Lobed star coral)	6
	Montastrea Cavernosa (MCAV) (Large cup star coral)	1

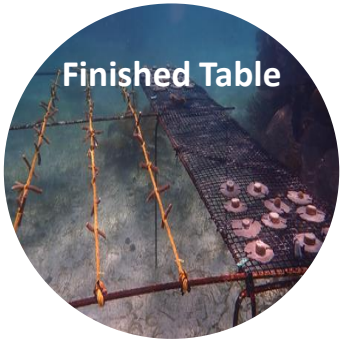
- COVID-19 prevented any retreatment and monitoring for August and September resulting in the continued loss of live tissue on treated colonies



Ongoing treatment and other rescue efforts

Restoration Efforts





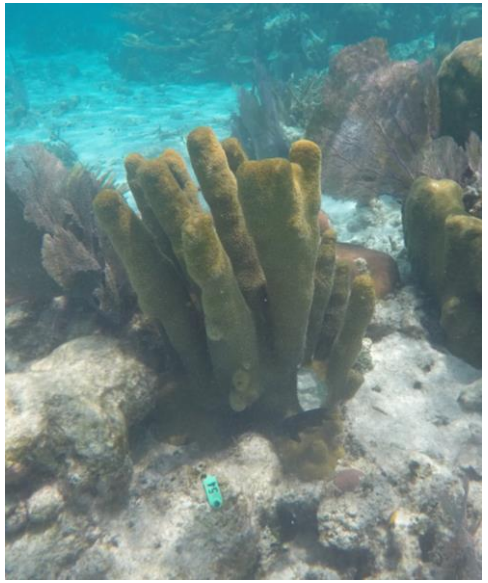
- Click the link for the Restoration Manual: http://fragmentsofhope.org/case-study-manuals/
- Training and funding for the installation of nurseries were provided by Fragments of Hope and Marine Climate Change Adaptation Project (http://www.fisheries.gov.bz/mccap2/)



Restoration Efforts

- Nursery tables were established as a trial to rescue the pillar coral, *D. cylindrus*, a rare and susceptible species of coral and to enhance acroporid populations in the event that there would be high mortality of other coral species that are susceptible to SCTLD. The acroporids can thus be out planted to enhance the ecosystem and provide structure and habitat.

- Nursery tables were also established to test if in situ nurseries for *D. Cylindrus* would be successful and not get infected with SCTLD. What appeared to be healthy fragments were placed away from infected colonies and monitored. (note that since there was the absence of healthy parent colonies in some instances, fragments had to be taken from SCTLD infected parent colonies)



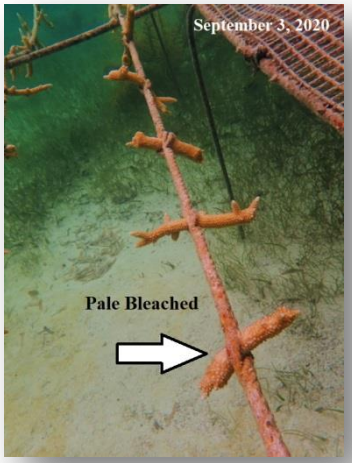


Restoration Efforts BCMR

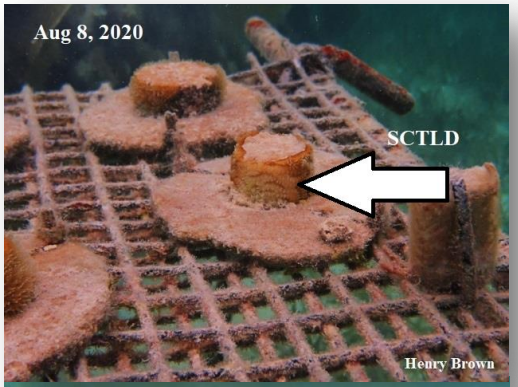
- May 2020 - a single nursery table was set up inside BCMR
- 3 ropes of *A. cervicornis*, 34 fragments
- 2 parent *D. cylindricus* colonies, 37 fragments
  - Two parent colony from infected areas, colony was manifesting signs of the disease


Restoration Efforts BCMR

- *D. cylindricus* Tables
  - September 2020 – first sign of disease on table manifesting in one fragment taken from infected area.
    - Fragment from said colony was set aside and treated
    - Fragment checked in September 2020 and it was completely cured of disease



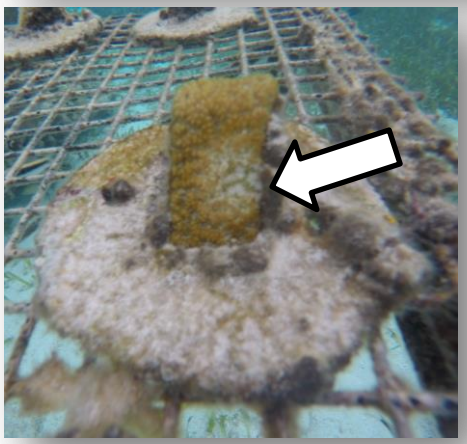
- *A. cervicornis* Tables
  - May 2020: 4 fragments died
  - August 2020: Average growth rate of 5cm
  - September 2020: signs of bleaching





Restoration Efforts HCMR

- May 2020 - a single nursery table was set up inside HCMR
- 3 ropes of *A. cervicornis*, 37 fragments
- 4 parent *D. cylindricus* colonies, 76 fragments
  - Two parent colony from infected areas, colony was not manifesting signs of disease
  - Two parent colony from areas with no signs of disease
- June 2020 – first sign of disease manifesting in one fragment taken from infected area
  - Fragment from said colony was removed
  - Table checked in two-week intervals with recurring infection on fragments taken from infected sites





Restoration Efforts HCMR

- July 2020 - all fragments from colony that first started to manifest disease on the table removed
- October 2020 – no signs of disease on remaining 50 fragments in nursery
    - Parent colonies from areas previously displaying no signs of disease are now showing signs of disease



Lessons Learned

- It is recommended that fragments for nurseries not come from areas with high infection rates.
- Parent colonies should show no signs of disease prior to fragment collection.
- Nursery tables should be checked frequently for disease, at minimum every two weeks following installation.
- SCTLD moves rapidly and treatment may not work with first application. Not rechecking treatment sites monthly can result in failure and wasted efforts.
- All treatment sites and colonies must be clearly marked so that they can be easily located, and colonies found for monitoring.
- Revisit types and color of tags used. The tags used were hard to relocate and, in some cases, not visible because of the growth of algae on them.



Lessons Learned

- Ensure that there is a clear vision and understanding of what information needs to be gathered at all treatment sites so that comparisons can be made between sites and feed into the national efforts.

- Take good photographic evidence: the key to monitoring is having good timeline photos of sites and colonies.

- SCTLD Response must be a multi-prong approach at all levels. There is no clear-cut path to take when addressing SCTLD, each country along with local organizations must work together to find a best fit approach for their specific local, national, and regional context based on human and financial resources and response capacity and expertise.

- The established platforms, such as MPAConnect and AGRRA, for sharing of experiences throughout the region should be better utilized.

Belize Fisheries Department

Thank You!

Bacalar Chico Marine Reserve
Hol Chan Marine Reserve