Capacity Building Efforts to Address the Emerging Issue of Stony Coral Tissue Loss Disease in the Caribbean

Los esfuerzos de capacitación para enfrentar el asunto emergente de la enfermedad de la pérdida de tejida de coral duro en el Caribe

Efforts de formation pour traiter le problème émergent de la maladie corallienne liée à la perte de tissu sur les coraux durs dans les Caraïbes

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ABSTRACT

Stony coral tissue loss disease (SCTLD), first reported in Florida in 2014, has been reported in 2018 and 2019 in the Wider Caribbean Region with cases in Jamaica, Mexico, Sint Maarten, the US Virgin Islands, the Dominican Republic, the Turks and Caicos Islands and Belize. To provide capacity-building support to countries currently affected by SCTLD and those susceptible to the disease, MPAConnect (an initiative of the Gulf and Caribbean Fisheries Institute, the NOAA Coral Reef Conservation Program and over 30 Caribbean coral reef marine protected areas) hosted a learning exchange for marine natural resource managers and partners from the Caribbean with their counterparts in Florida and with coral disease experts. The exchange focused on sharing information among participants about disease identification, monitoring, strategies for minimizing diver, fisher, and ship-borne dispersal of the presumed pathogen(s), treatment protocols, and effective outreach communication. We will summarize the distribution, chronology and known status of SCTLD in the Caribbean region through October 2019 using data submitted to our three organizations and displayed at the AGRRA web site, efforts to help identify the pathogen(s) causing SCTLD and highlight the challenges it presents to managers. We explain the approach to collaborative sharing of information and ideas to help correctly identify, monitor and respond to cases of SCTLD in order to proactively address the unprecedented threat of this new disease.

Introduction

MPAConnect is an initiative of the Gulf and Caribbean Fisheries Institute, NOAA's Coral Reef Conservation Program and over 30 Caribbean coral reef marine protected areas (MPAs). In an assessment of regional MPA management capacity conducted by MPAConnect in 2017, capacity for responding to disturbances was identified as the lowest priority capacity building need of participating MPA managers. This management element refers to natural disturbances such as hurricanes, human-induced disturbances such as oil spills or vessel groundings, and emerging issues such as the sargassum influx and stony coral tissues loss disease (SCTLD). Responding to disturbances was also found to be an area of low management capacity across the region – Caribbean MPA managers reported that there is little of no consideration of response to disturbances in about half of the participating MPAs (Figure 1).

First reported in Florida in 2014, SCTLD is no longer only a Florida problem. Unfortunately, other locations in the Caribbean are seeing similar signs of this coral disease and, as of November 8 2019, SCTLD was confirmed in the Caribbean countries and territories of Jamaica, Mexico, Sint Maarten, the United States Virgin Islands (St. Thomas), the Dominican Republic, the Turks and Caicos Islands, Belize and Sint Eustatius. This coral disease represents an unprecedented and devastating threat to Caribbean coral reefs. Responding to the seriousness of this newly emerged threat to an ecologically-connected region, and in the context of known low capacity for management of such disturbances, MPAConnect immediately sought to build necessary capacity among Caribbean coral reef managers.

In 2018, MPAConnect coordinated a SCTLD learning exchange in Florida for MPA managers from the Mexican National Commission for Protected Areas (CONANP). CONANP manages several coral reef MPAs on the Yucatan coast that are affected by SCTLD. Experts from Nova Southeastern University helped facilitate the workshop and shared valuable information on the detection, spread, impacts, monitoring, and prevention of the disease and potential treatment methods. They participated in class-room sessions and meetings with experts, they saw the disease first-hand during in-water fieldwork, and they gained practical experience in the latest treatment protocols. This first SCTLD learning exchange by MPAConnect subsequently informed the design of the first regional SCTLD learning exchange.

Held in 2019, the regional peer-to-peer learning exchange on SCTLD was an initiative of the MPAConnect Network in partnership with NOAA CRCP and the NFWF Coral Reef Conservation Fund. Additional support was provided by the

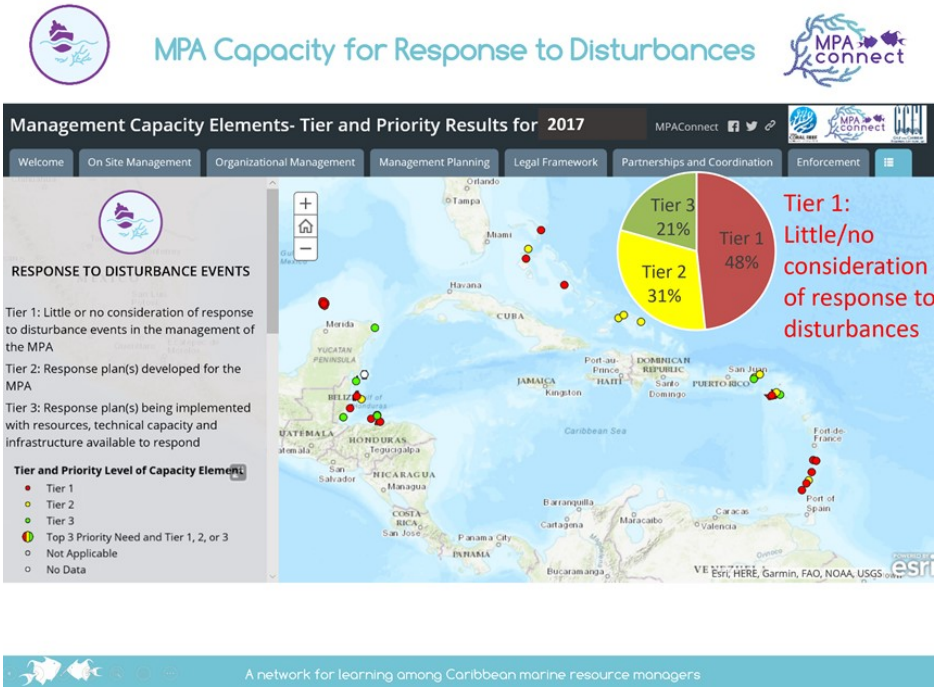

Figure 1 and 2. Caribbean Management Capacity for Responding to Disturbances, 2017 and Locations with Staff Trained in SCTLD Detection and Response

Turks & Caicos Reef Fund, the Association of Reef Keepers of the British Virgin Islands, Healthy Reefs for Healthy Peoples Initiative, Sociedad Ambiente Marino and TNC. The meeting provided capacity-building support to six Caribbean countries and territories currently affected by SCTLD and a further ten Caribbean countries and territories that are susceptible to the disease. It included key agency representation from the International Maritime Organization (IMO). A total of 34 participants joined the meeting, including 22 marine natural resource managers and partners from 17 countries and territories (Figure 2). Experts from the NOAA Coral Reef Conservation Program, Florida Keys National Marine Sanctuary, Nova Southeastern University, the Atlantic and Gulf Rapid Reef Assessment (AGRRA) Program, Florida Sea Grant and the International Maritime Organization contributed to the meeting. MPA management mentors with experience in SCTLD response contributed to the learning exchange – from CONANP Cancun and the Florida Keys National Marine Sanctuary. The SCTLD regional peer-to-peer learning exchange was the eighth in a series of regional learning exchanges by MPAConnect since 2012.

Discussion

In the face of a new threat to coral reefs, MPA managers need to quickly acquire and confidently and capably be able to apply new knowledge. Key questions to address regarding SCTLD as an emerging issue include:

1. What should I tell everyone about the emerging issue? How to reliably inform staff, board, stakeholders and communities about the threat of SCTLD
2. Can we prevent the emerging issue from impacting our site? In this case, how to prevent the spread of a coral disease
3. What does SCTLD look like compared to other coral diseases? A number of coral diseases are known to affect stony corals in the Caribbean
4. How can I be sure if we have SCTLD?
5. What can I do if we get SCTLD?
6. What does it mean for our other MPA programs if we have SCTLD?
7. Does anyone else care if we have SCTLD?

expression on other coral reefs. [links with MPAConnect and peer-to-peer sharing across the region]

The objectives of the SCTLD Caribbean Cooperation Team are to:

- Maintain communications with regional networks and initiatives;
- Track the spread of SCTLD;
- Share reporting mechanisms for SCTLD;
- Share lessons learned from ongoing response efforts;

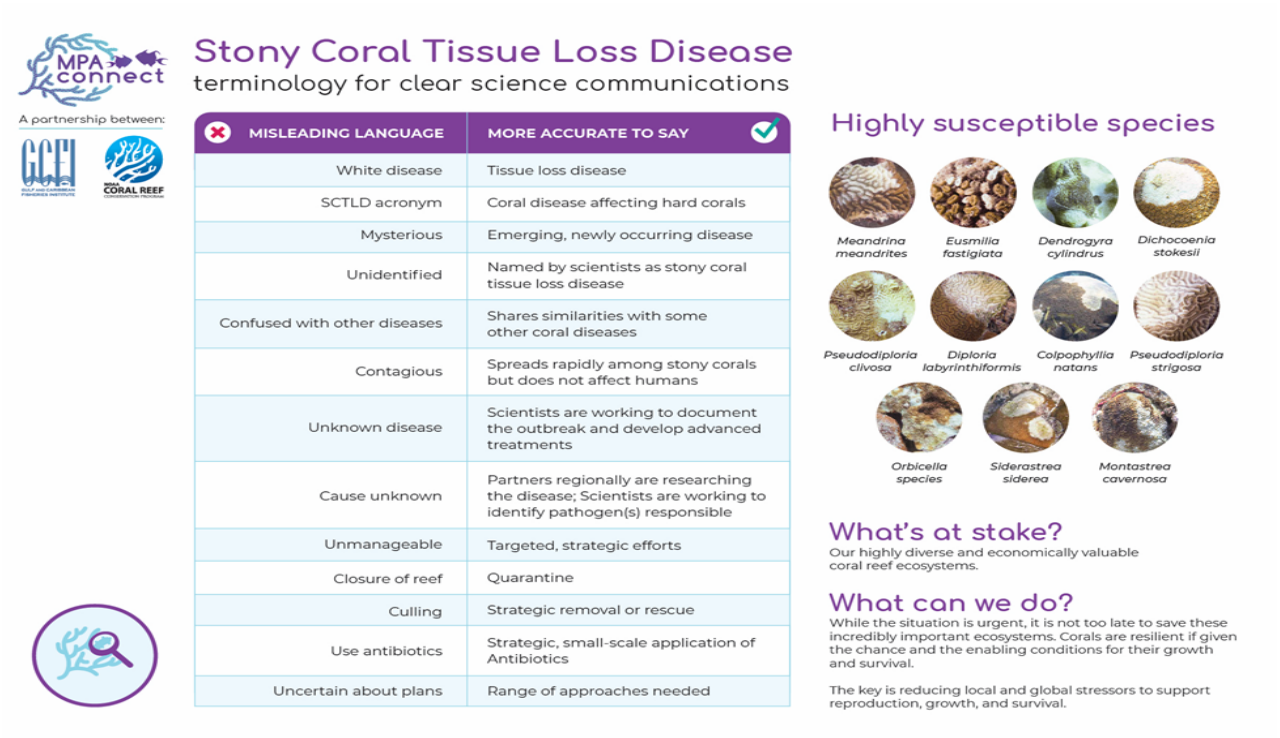

Figure 3. SCTLD Communications Guidance for Managers

The learning exchange to opportunity for participants to update their knowledge about coral diseases in the Caribbean. They learned how outreach materials for detection and the prevention of spread, and they learned about best practices in disease treatment both in theory and in practice. The participants share identify SCTLD, they discussed and agreed on common monitoring protocols for SCTLD, they proposed new provided an d detailed information on the progression of the disease thus far in the Caribbean, and the courses of action being taken so far to address its impacts. Key points included the following:

1. Crisis communications means acknowledging the problem with honesty and empathy, offering assurances about what's being done, and telling people how they can help. MPAConnect encourages clear science communications and in the context of SCTLD provided guidance on potentially misleading language and more accurate terminology (Figure 3).

2. All evidence suggests that SCTLD is contagious between individual corals and between coral species. It does not affect humans. Experiments have shown that colonies can become infected by conspecifics as well as other species. SCTLD is water-borne and can also spread through contact. Work is ongoing to determine the pathogen(s) involved. Antibiotics have arrested disease progression in both laboratory and field experiments, so a bacterial component is highly likely. In order to prevent the spread of SCTLD, no-cost best practices such as diving healthy reefs before those that are infected, when on multiple dives, are recommended. Decontamination protocols for dive, snorkel and monitoring gear have also been developed. Wetsuits, booties, gloves, and the internal bladder of BCDs can harbor and proliferate pathogenic bacteria. Pathogens can adhere to other dive and snorkel gear when a diver contacts the bottom and touches corals. Pathogens on dive gear may survive for extended periods and can be transferred among reefs. To decontaminate, soak gear for 10 mins in 1% bleach solution, rinse in fresh water, air dry. The wash solution should be left out in the sun for 1 day to break down the bleach and it can then be disposed of without causing pollution. The participants noted possible resistance to the use of bleach based on cost, perceived contradiction with eco-friendly trends, and limited space and facilities on liveaboards. Florida experts advised managers to focus their messaging about decontamination on areas with new outbreaks.

3. A number of coral diseases are known to affect stony corals in the Caribbean including white plague, black-band disease, yellow-band disease, Caribbean ciliate infection, dark spots disease, and possibly Siderastrea white-blotch syndrome (which might, however, be a form of SCTLD). SCTLD shares similarities with some of these diseases. The correct identification of SCTLD depends on multi-factor field diagnosis. It is important to distinguish between lesions on stony corals caused by disease, predation, overgrowth, competition or physical damage, and this makes it difficult to diagnose SCTLD based on single observations or photos alone. Key steps in the identification of SCTLD are as follows:

- If multiple lesions are observed, check whether there's total loss of tissue/denuded skeleton and no bleached tissue remaining, and whether tissue is visibly sloughing off.
- Check affected coral species – SCTLD has a distinct pattern of spread among susceptible species.
- Check for higher than normal prevalence of disease on the stony corals that are known to be most susceptible to SCTLD, which can be 66-100% versus a "normal" background coral disease level of 2-3%.
- Check for a rapid rate of disease spread on the affected coral colonies and between corals on the reef. Check for rapid and high mortality of affected corals (within a week or up to 2 months).
- The disease will remain active throughout the year and over multiple years.

The MPAConnect poster for managers provides guidance to help identify SCTLD (Figure 4).

4. The working group on monitoring at the learning exchange recommended that a multi-step SCTLD monitoring approach be adopted at the regional scale. This is summarized in Table 1.
5. The recommendation from SCTLD experts in Florida is to treat the disease as quickly and as aggressively as possible once identified in new locations. Large-scale field trials indicate that the best practice is currently the application of amoxycillin powder with Ocean Alchemists Base2B in a 1:8 ratio. Participants noted possible regulatory obstacles to the use of antibiotics on corals in their countries, with a need to get agencies on board to grant necessary approvals. Securing an affordable supply of Base2B material has been the focus of efforts by MPAConnect with free samples now shipped to some of the affected locations. Selection criteria must guide the prioritization of SCTLD-affected coral reef sites and coral colonies for treatment - large coral colonies close to others of the same species are priorities for treatment, and colonies with a large amount of remaining tissue and a small number of active lesions are considered more treatable. Site selection criteria relate to the regulatory framework, for example, sites within an MPA may respond more positively to treatment since they may not be affected by additional stressors such as fishing pressure.
6. SCTLD has implications for many aspects of MPA management. A key recommendation for managers in affected and susceptible countries/territories/MPAs is to treat the disease outbreak seriously and to put an intervention action plan in place. MPAConnect developed and has shared a Template SCTLD Monitoring and Response Action Plan for Caribbean Marine Natural Resource Managers.
7. An online platform for reporting and verification of suspected cases of SCTLD can be found at http://www.agrra.org/coral-disease-outbreak/. Caribbean marine natural resource managers and their partners are encouraged to use this platform for shared reporting of SCTLD. Participants recommended the development of a dashboard on the AGRRA site to indicate the regional status of SCTLD and the progression of the disease.

Figure 4. MPAConnect Guide for Managers to Detect and Identify SCTLD

Aside from expert presentations, the learning exchange involved discussion with MPA manager mentors, discussion with dive industry representative, in-water field experience in monitoring and treatment, and working groups to consider next steps and to scope out desired follow-up projects. The learning exchange working group on restoration suggested that Caribbean marine natural resource managers consider exploring bio-banking local corals in order to save genetic diversity, and to consider incorporating stony corals in coral restoration efforts, but with caution about local capacity and caveats about feasibility.

Four immediate SCTLD follow-up projects were implemented with participants from the learning exchange – 'Partner Collaboration in Support of Stony Coral Tissue Loss Disease Monitoring in The Turks & Caicos Islands', 'Building Capacity for the Management of the Stony Coral Tissue Loss Disease Threat in the British Virgin Islands', 'Improving Stakeholder Support to Ensure Successful Stony Coral Tissue Loss Disease Monitoring in Roatan, Honduras' and 'Development of a Caribbean SCTLD Dashboard'.

Participant feedback (n=21) from the SCTLD regional peer-to-peer learning exchange was very good. It received the highest rating so far for the facilitators of the exchange (90% vs 77% average excellent rating over six MPAConnect P2Ps). Practically all participants (95%) reported that the workshop contributed a lot to their knowledge of Stony Coral Tissue Loss Disease. the participants reported that they learned something that they will apply in their work. The most important things they reported learning were

Table 1. SCTLD Monitoring Recommendations

Management need	Recommended monitoring approach
Detect new occurrence of disease	Stakeholder reporting Awareness during other monitoring
Approximate prevalence of SCTLD	Roving diver surveys
Track progression of SCTLD	Marked colonies, establish sentinel reef sites, photo series
Quantify spatial extent of SCTLD	AGRRA-type surveys (or standard national protocol)
Assess SCTLD interventions	Visual inspection of treated lesions, photo series
Determine impacts on coral reef ecosystems including fish	6-monthly repeat of AGRRA-type surveys at long-term monitoring sites affected and unaffected by SCTLD

about the possible interventions to address the disease (11 mentions) and communications/stakeholder engagement (6 mentions). All participants reported that they have more confidence in their ability to address SCTLD, in particular, to intervene, treat and manage the disease (7 mentions), understanding the urgency of responding (5 mentions) and to communicate about the disease (4 mentions).

Conclusion

Possible management actions to address the emerging issue of SCTLD include communicating proactively with stakeholders for detection, prevention and to reduce local stressors; building strategic partnerships for monitoring, intervention, research, coral restoration and coral rescue; seeking/re-allocating contingency funding for SCTLD response; prioritizing reefs and corals for treatment according to agreed criteria; documenting the occurrence and spread of SCTLD via coral monitoring; reporting regionally using the AGGRA reporting platform; seeking supplies and any necessary approvals for SCTLD treatment; exploring links with restoration and rescue. Managers facing SCTLD for the first time are encouraged to refer to existing materials and to seek to learn from their peer's experience in other parts of the region.