

Local Intervention Efforts Lead to Species-Specific Reductions in Stony Coral Tissue Loss Disease (SCTLD) Prevalence in the United States Virgin Islands

Los esfuerzos de intervención local conducen a reducciones específicas de especies en la prevalencia de la enfermedad por pérdida de tejido de coral pétreo (SCTLD) en las Islas Vírgenes de los Estados Unidos

Les efforts d'intervention locaux conduisent à des réductions spécifiques aux espèces de la prévalence de la maladie de la perte de tissus des coraux durs (SCTLD) dans les îles Vierges américaines

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EXTENDED ABSTRACT

Stony coral tissue loss disease (SCTLD) was first observed off the coast of Florida in 2014, since then, it has rapidly spread throughout the entire Florida Coral Reef System and greater Caribbean. The first observation of SCTLD in the United States Virgin Islands was in January of 2019 off the southern coast of St. Thomas. In merely one year, the disease spread to reefs around the entire island of St. Thomas and to the neighboring island of St. John. Due to the rapid progression of lesions on corals affected by SCTLD (Aeby et al. 2019; Meiling et al. 2020), the benthic communities at affected sites were significantly impacted (Brandt et al. 2021). Although a putative agent has yet to be defined for SCTLD, many studies suggest a heavy bacterial component (Becker et al. 2022, Meyer et al. 2019, Rosales et al. 2020). In an attempt to preserve colonies and stop SCTLD, researchers in Florida tested various types of anti-bacterial treatments. Ultimately, the most successful treatment was a paste developed specifically to adhere to corals' mucous exterior and time release amoxicillin (Neely et al. 2020, Neely et al. 2021, Shilling et al. 2021).

In the present study, we monitored permanent radial transects at multiple sites around St. Thomas and St. John to quantify disease prevalence among species through time and compare disease dynamics at sites with and without treatments (i.e., antibiotic paste application, amputation, culling). Transects were established prior to SCTLD emerging at a site and then monitored at 1 week, 4 weeks, 6 weeks, 6 months, 1 year, and 1.5 years after first observations of SCTLD. At each visit, divers on SCUBA surveyed coral health on diseased colonies following a modified AGRRA protocol. Every 6 months, additional surveys were conducted recording the abundance of all living corals within the radial transects, identifying each colony to species level. Half of the sites abstained treatment, while the other half were treated on a bi-weekly schedule by volunteer Strike Team divers, organized and trained by the Virgin Islands Coral Disease Advisory Committee.

At all sites, disease prevalence was highest approximately one month after initial observation of disease and declined through the remainder of the monitoring period. There was a difference in overall prevalence among sites, suggesting either community composition and/or environmental factors play a role in SCTLD dynamics. When all susceptible species were considered, there was no effect of treatment on disease prevalence among sites. However, there was lower prevalence of diseased *Orbicella* spp. over time at treated sites than non-treated sites (Fig. 1), likely because this is the most commonly treated species. Sites that were treated, had an average peak prevalence of 6 weeks post-emergence of SCTLD, approximately 2 weeks later compared to the non-treated sites. Overall SCTLD prevalence was comparable between treated and non-treated sites, suggesting direct interventions are effective at delaying disease transmission, but not necessarily stopping it. Direct intervention efforts, such as antibiotic paste application, are time, resource, and financially expensive, thus, optimizing efficiency and efficacy is critical. The main goals of the treatments are two fold, 1) to abate lesions on individual colonies and 2) to reduce pathogen shedding and therefore load in the water column in hopes of minimizing transmission. The results from the present study suggest intense treatment efforts are most valuable within the first month of disease at a site, when prevalence is the highest. Although the antibiotic paste is successful on the lesion level, often colonies develop new lesions on other regions that are not being directly treated. Further research should investigate treatment techniques that have a range of impact beyond a single lesion to reduce effort required to preserve maximum coral diversity.

KEYWORDS: SCTLD, coral disease, intervention, monitoring,

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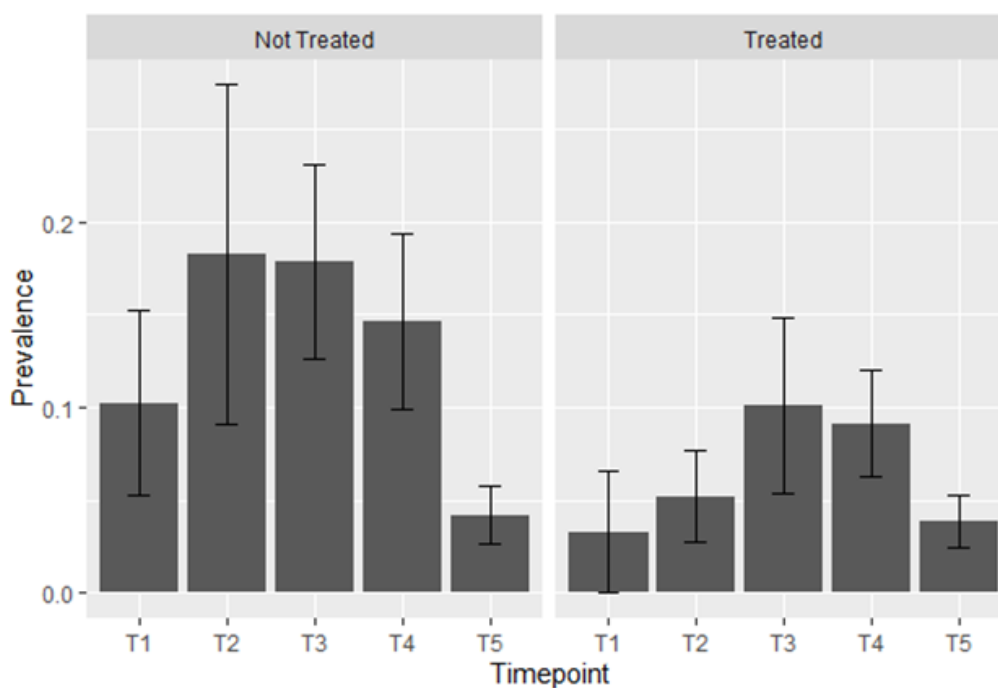


Figure 1. SCTLD Prevalence on *Orbicella* spp. Between Treated and Non-Treated Reefs. Overall SCTLD prevalence was comparable between treated (amoxicillin paste) and non-treated sites in the US Virgin Islands, suggesting direct intervention success is limited to the colony and does not extend beyond to the greater reef. However, there was a significant difference in prevalence over time between treated and non-treated sites. Sites that were treated, had an average peak prevalence of 6 weeks post-emergence of SCTLD, approximately 2 weeks delayed compared to the non-treated sites. **T1:** 1 week post-emergence **T2:** 4 weeks post-emergence **T3:** 6 weeks post-emergence **T4:** 1 year post-emergence **T5*:** 1.5 years post-emergence *Not included in statistical analyses because not all sites were 1.5 years post-emergence at the time of analyses.

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