



Marine Benthic Communities: Coral Reef Monitoring in Virgin Islands National Park

2020

Importance: *A critical resource for fisheries, tourism and marine biodiversity*

Coral reef communities within Virgin Islands National Park consist of stony corals, octocorals, (i.e., gorgonians, sea fans), sponges, and algae. Reefs support incredible marine biodiversity including hundreds of coral and fish species, as well as sea turtles, lobsters, and other marine invertebrates. Reefs play a vital role for humans by providing juvenile fish habitats, protecting shorelines from erosion, creating sand for beaches, and supporting tourism and pharmaceutical bio-prospecting. Monitoring coral reefs was identified as a national priority in President Clinton's Executive Order 13089, establishing the Coral Reef Initiative. Coral reefs are negatively affected by rising seawater temperatures that cause "bleaching," coral diseases, storms, and ocean acidification. Local stressors include vessel groundings, over-fishing, damaging fishing methods (e.g., fish traps), sediment runoff, nutrient enrichment, contaminants, and abrasion and fracturing of coral reefs by debris or careless snorkelers and divers.

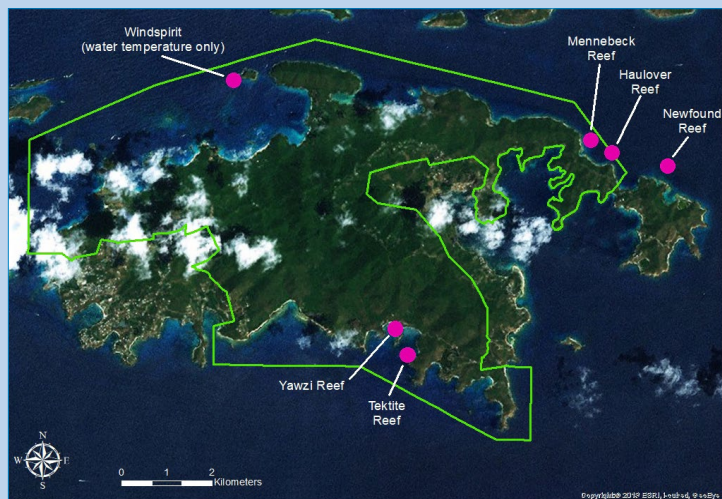
Long-term Monitoring: *Five coral monitoring sites*

The South Florida/Caribbean Network annually monitors five coral reef sites in Virgin Islands National Park: Newfound Reef (est. 1999); Yawzi Reef (est. 1999); Mennebeck Reef (est. 2000); Haulover Reef (est. 2003); and Tektite Reef (est. 2005). Sites were selected based on several criteria including: management recommendation, high initial coral cover, comparability with historic work, and levels of



Above: Star coral community, *Orbicella annularis*, classified as "threatened" under the Endangered Species Act, is one of the most abundant corals on Virgin Islands National Park reefs, but has decreased in recent years due to temperature stress (coral bleaching) and coral disease.

stressors in different watersheds. Each site consists of 20 permanent, randomly selected 10-meter (32.8-foot) transects (index sites) which are monitored using underwater video. Percent cover of living coral by species, macroalgae, turf algae, crustose coralline algae, octocorals, and sponges are calculated. Data on coral disease, bleaching, water temperature, and long-spined sea urchins are also collected.



Left: Map of coral monitoring sites in Virgin Islands National Park. The five reefs locations monitored by the network are: Yawzi Reef (7,125 square meters), Newfound Reef (13,768 square meters), Mennebeck Reef (12,495 square meters), Haulover Reef (13,568 square meters), and Tektite Reef (18,711 square meters).

All are forereef features between 2–20 meters (6.6–65.6 feet) deep. The most common stony coral present is Boulder Star Coral (*Orbicella* spp. complex) although Yawzi Reef also has relatively high amounts of appreciable Mustard Hill Coral (*Porites astreoides*), Finger Coral (*Porites porites*), and Massive Starlet Coral (*Siderastrea siderea*). Water temperature is also monitored at all sites, plus a sixth site called Windspirit.

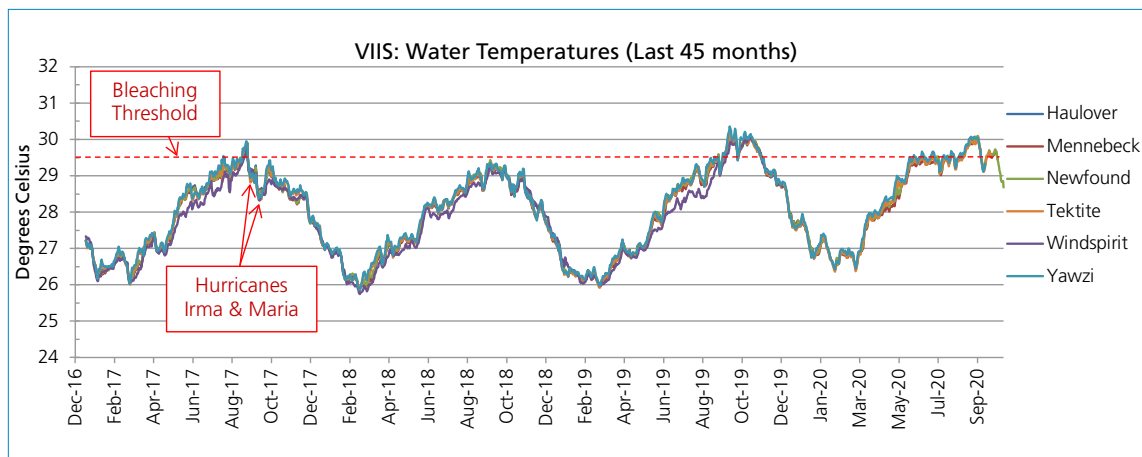
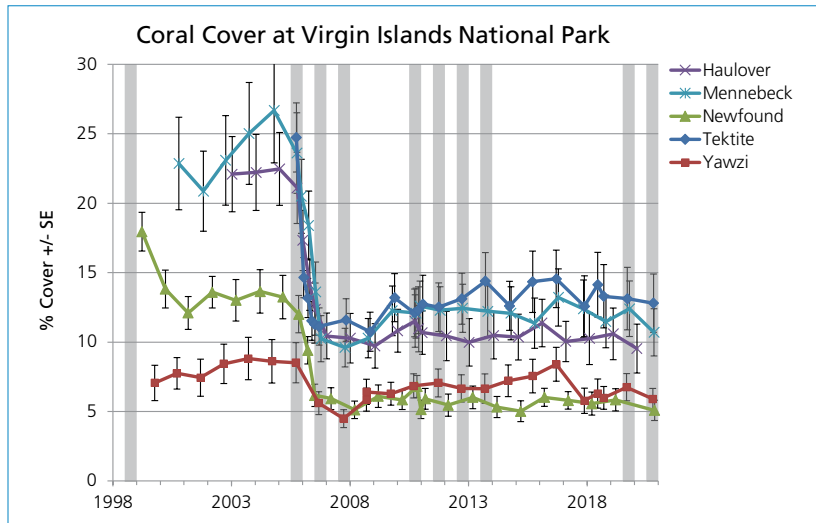


Status and Trends: Thermal stress and Stony Coral Tissue Loss Disease (SCTLD) cause substantial mortality and reduce coral recovery three years after direct hits by two major Hurricanes (2017)

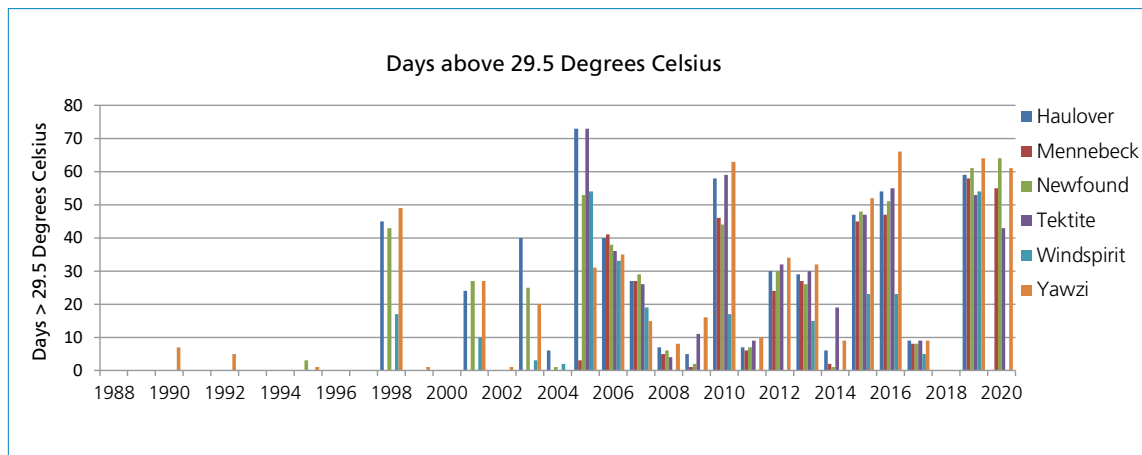
Despite two major Hurricanes (Irma and Maria) striking St. John in 2017, the most significant factor impacting coral cover has been coral bleaching and disease. Bleaching and disease in 2005 through 2007 led to a loss of more than 60 percent of the average coral cover at the five monitoring sites. Post-storm monitoring in 2017 showed only moderate coral cover declines at four of the sites, although Yawzi Reef has had significant coral cover decline (31%) since 2016. Immediate post-storm effects such as broken, toppled and displaced coral colonies, have since been absorbed into the reef-scape. 2020 monitoring results showed reduced coral cover from previous years at all monitoring sites (see top figure below). Observations during monitoring in 2020 showed mortality from coral bleaching in 2019 coupled with significant mortality from the first observations at these monitoring sites of the extremely virulent Stony Coral Tissue Loss Disease (SCTLD). All the common reef-building coral species were being

affected by SCTLD: the three *Orbicella* spp. and *Montastraea cavernosa*, *Pseudostigosa diplotria*, *P. clivosa* and *Colpophyllia natans*, *Dendrogyra cylindrus* and *Siderastrea siderea*. Coral disease mortality was observed on 5 of the 7 coral species listed as threatened under the Endangered Species Act; only the branching corals (*Acropora palmata* and *A. cervicornis*) have not been affected by SCTLD. Additionally, reef-depth water temperatures were again above the bleaching threshold notably early (May) in 2020 causing pervasive coral bleaching across study sites. Despite record-breaking hurricane activity in the Atlantic, the NE Caribbean experienced a relatively quiet 2020 hurricane season with only two tropical systems skirting the area.

Left: Trends in mean stony coral cover and notable events at index sites throughout Virgin Islands National Park. (Note that coral bleaching occurs when coral under stress lose their symbiotic algae and look white or “bleached.”)



Left: Virgin Islands National Park water temperature data from six sites at reef depth using underwater data loggers. Monitoring was initiated in 1990 at Yawzi and Windspirit, Newfound in 1991, Haulover in 1998, and Mennebeck and Tektite in 2005. A bleaching stress threshold of 29.5 °C is shown (top) and days above that threshold are quantified (bottom).



Note: the rapid decrease in water temperature to below the bleaching threshold caused by the 2017 hurricanes are shown.

Although 2018 was the first year since 2002 with no days above the bleaching threshold (29.5°C), 19 of the past 23 years have had multiple days of thermal stress above this threshold.

