



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

2019

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

Coral reef communities within Virgin Islands National Park consist of stony corals, octocorals, sponges, algae, and gorgonians (e.g., sea fans). Reefs support incredible marine biodiversity including a multitude of fish species, as well as lobsters, sea turtles, and other creatures. Reefs play a vital role for humans by supporting fisheries, fishery nursery areas, tourism, sand creation for beaches, pharmaceutical bio-prospecting, and shoreline protection to name a few. Coral reef monitoring was identified as a national priority in President Clinton's Executive Order 13089, establishing the Coral Reef Initiative. These coral reefs are negatively impacted by events such as extreme water temperatures that cause "bleaching," vessel scarring, and major storms, as well as long-term stressors such as coral disease, over-fishing, damaging fishing methods, sediment runoff, nutrient enrichment, contaminants, ocean acidification, and abrasion of the reef by debris or careless snorkelers or divers.

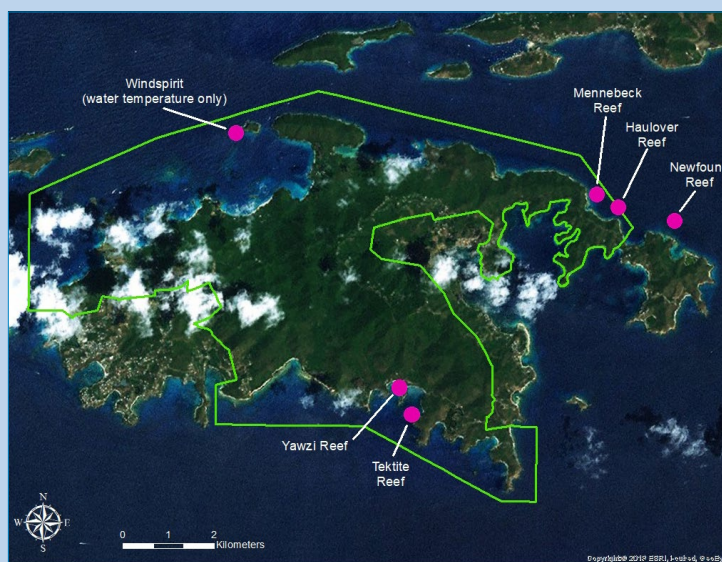
Long-term Monitoring: *Five coral monitoring sites*

The South Florida/Caribbean Network annually monitors five coral reef sites: Newfound Reef (13,768 square meters or 3.4 acres [ac]; est. 1999); Yawzi Reef (7,125 square meters or 1.75 ac; est. 1999); Mennebeck Reef (12,495 square meters or 3.1 ac; est. 2000); Haulover Reef (13,568 square meters or 3.4 ac; est. 2003); and Tektite Reef (18,711 square meters or 4.6 ac; est. 2005). Sites were selected based on several criteria including: management recommendation, high initial reef coral cover, comparability with historic work, and levels of stressors in differing 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.

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* sp. complex) although Yawzi Reef also has appreciable Mustard Hill Coral (*Porites astreoides*), Finger Coral (*P. porites*), and Massive Starlet Coral (*Siderastrea siderea*). Water temperature is also monitored at all sites, and an additional site named Windspirit.



Above: Small star coral community, *Orbicella annularis*, typical of Virgin Islands National Park reefs.

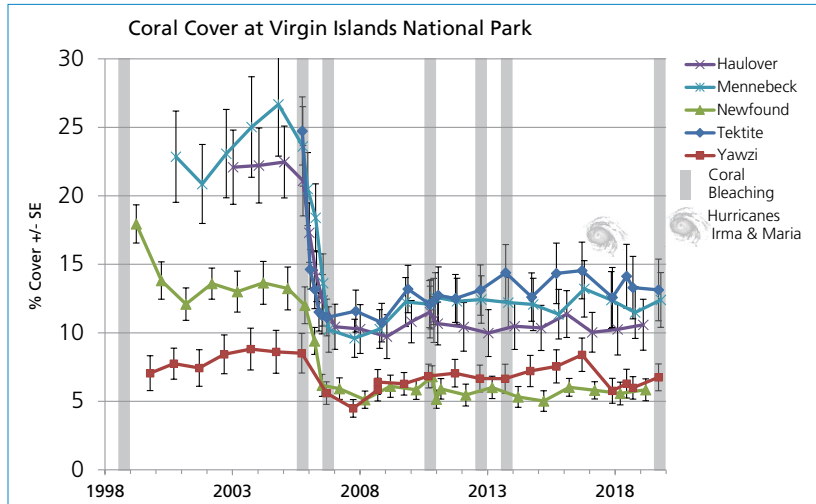


Above: Map of coral monitoring sites in Virgin Islands National Park.



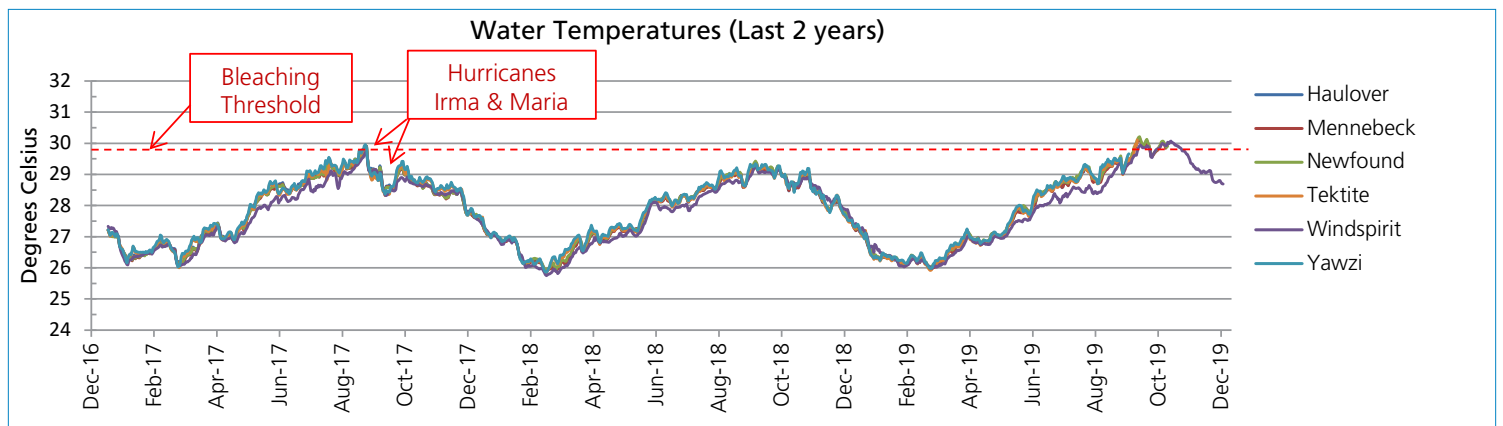
Status and Trends: Coral cover mostly-stable 12 years post-bleaching/disease event (2005–2007) and two years after direct hit by two major hurricanes, but coral bleaching returns in 2019

Despite two major Hurricanes (Irma and Maria) slamming into St. John in 2017, the most significant factor impacting coral cover has been the coral bleaching and disease event of 2005–2007, in which average coral cover at the five monitoring sites declined by more than 60%. Post-storm monitoring showed only moderate coral cover declines, although Yawzi Reef had significant coral cover decline (31%) since 2016. Immediate post-storm effects included broken, toppled and displaced coral colonies, along with poor water quality (i.e., clarity and nutrient influx). This combination resulted in macroalgal cover at both Yawzi and Tektite Reefs of greater than 50%; the highest level ever recorded at Virgin Islands National Park sites. Additionally, post-storm monitoring showed a 55% decline in cover by sponges; however, much of that is attributed to sponges being obscured by the macroalgae. Data collected in 2019 shows macroalgae decreased from post-storm levels, and sponge cover is close to pre-storm levels.



Reef-depth water temperatures were again above the bleaching threshold in 2019 and coral bleaching was pervasive across study sites. For example, Mennebek Reef sampled in October 2019 had 50.3% of coral cover bleached. El Niño conditions in the Pacific contributed to a relatively quiet 2018 Caribbean hurricane season. Two tropical systems skirted the area, but stayed close enough to keep maximum water temperature below the bleaching threshold. Notable “cold water wakes” from hurricanes in 2017 are evident (see text box in temperature figure at the bottom). With the abrupt decrease of temperatures to below the bleaching threshold value since the hurricane, coral cover has remained relatively stable.

Left: Trends in live 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.”)



Above and below: 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. Note: the rapid decrease in water temperature to below the bleaching threshold caused by 2017 hurricanes are shown. Although 2018 was the first year since 2002 with no days above the bleaching threshold (29.5°C), 17 of the past 20 years have had days of thermal stress above threshold.

