



Marine Benthic Communities: Coral Reef Monitoring in Buck Island Reef National Monument

2021

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

Coral reef communities within Buck Island Reef National Monument (NM) 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 products. 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 (i.e. fish traps), sediment runoff, nutrient enrichment, contaminants, and abrasion and fracturing of corals reef by debris or careless snorkelers and divers.

Right: Map showing the location of the three coral monitoring sites at Buck Island Reef National Monument. South Fore Reef encompasses over 40,000 square meters (430,556 square feet) of the fore reef that typifies the south side of Buck Island and is a highly complex reef, dominated by Star Coral (*Orbicella* spp. complex). Western Spur and Groove Reef is a 26,365 square meter (283,790 square foot) reef area, typical of the park's northwest waters. Coral cover is relatively low, and made up of low "mounded" corals such as brain corals (*Pseudodiploria* spp.), mustard hill and finger corals (*Porites* spp.). The Bar site is a large, complex, low-light, shallow mesophotic reef. It is dominated by plating Boulder Star Coral (*Orbicella franksi*) with the highest coral cover observed in this monument.

Long-term Monitoring: *Mesophotic reef monitoring combines with long-term sites*

The South Florida/Caribbean Network has monitored two coral reef sites at Buck Island Reef NM: South Fore Reef since 2002 and Western Spur & Groove Reef since 2000. Monitoring at Buck Island expanded to a shallow mesophotic reef (~ 33 meters [108 feet]) at the Buck Island Bar in 2017. All sites were selected based on depth, size of the reef area, composition, complexity of the reef structures, and management recommendations. Each site consists of permanent, randomly-selected 10-meter (32.8-foot) transects, which are monitored using underwater video. Percent cover of living coral by species, macroalgae, turf algae, crustose coralline algae, octocorals, and sponges is calculated. Additional data on coral disease, bleaching, water temperature, and long-spined sea urchins are also collected.



Above: Panoramic view of the mesophotic reef on the Deep Bar site in 2019 (NPS photo / Mike Feeley).



Status and Trends: Coral disease and coral bleaching three years after category 5 hurricanes combine to affect BUIS coral reef communities

Annual coral reef monitoring was completed at the South Fore Reef and Bar sites in 2021 with results shown in Figure 1. In 2005–2006, soaring water temperatures were associated with a coral bleaching/disease outbreak followed by catastrophic stony coral mortality, which the reefs have not fully recovered from. The mesophotic Bar reef had a 12-fold increase in average disease lesion size and three times the number of average disease lesions per transect which resulted in a 9% loss of live coral on this site between 2017–2019. The extremely virulent widespread Stony Coral Tissue Loss Disease (SCTLD) was first reported inside the west boundary of Buck Island Reef National Monument in December 2020, and observed at all sites during 2021 monitoring. Coral cover at the S. Fore Reef site increased slightly in 2021 due to increases in branching finger coral, *Porites porites*, while the presence of SCTLD was still low early in the year.

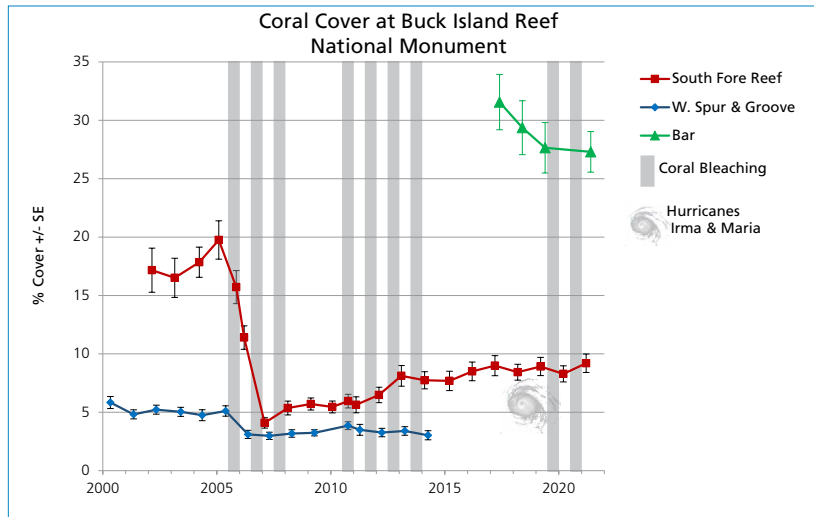


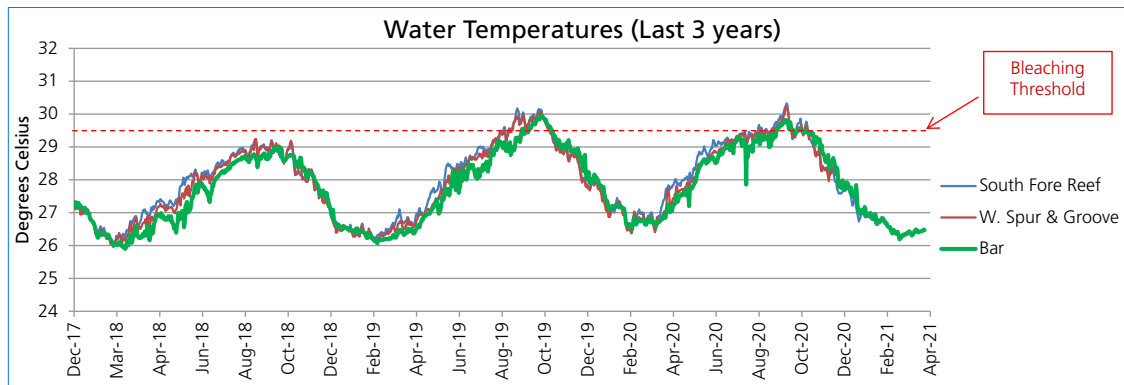
Figure 1. Average live stony coral cover ($\pm$ SE) at Buck Island Reef National Monument sites: South Fore Reef, Western Spur and Groove Reef (last sampled in 2014), and Buck Island Bar (initiated in 2017). Coral bleaching occurs when coral under stress lose their symbiotic algae and look white or “bleached.”

2005–2007: Coral bleaching/disease event caused greater than 60% decline in coral cover among study sites.

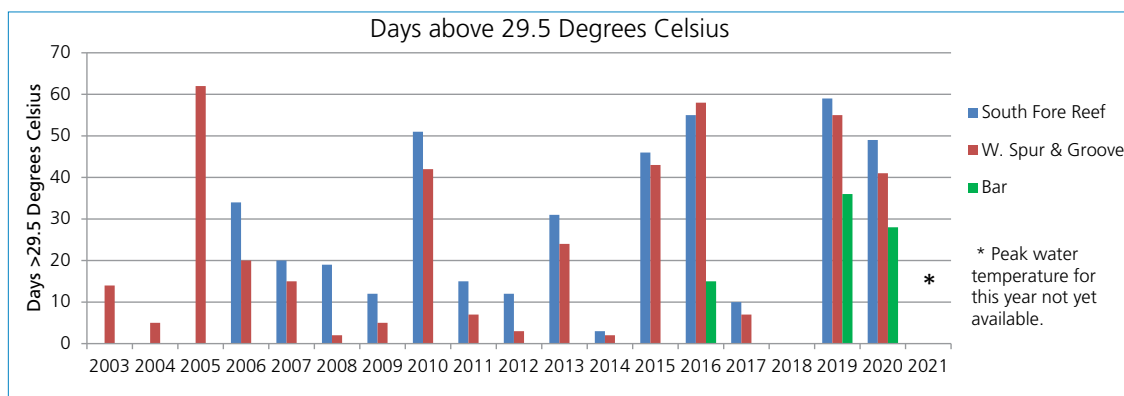
2010–2013; 2019–2020: Coral bleaching events with no significant coral cover loss.

2017: Category 5 Hurricanes Irma and Maria pass over area causing no significant decline in coral cover.

2017–2019: Disease mortality continues to cause decline in coral cover at the newly established Buck Island Bar site.



Left: Buck Island Reef National Monument water temperature summary graph showing data from the three coral monitoring sites since 2016. A bleaching stress threshold of 29.5°C (85.1°F) is shown. 2018 was the only year since this record began (2003) in which no daily average exceeded the bleaching threshold.



Left: The total number of days the average daily temperature was above bleaching stress threshold of 29.5°C (85.1°F) are quantified. Note: 2021 data for period of thermal maximum is not yet available.

