



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

2019

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

Coral reef communities within Buck Island Reef National Monument consist of stony corals, octocorals, sponges, algae, and gorgonians (e.g., sea fans). 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 supporting juvenile habitats, shoreline protection, sand creation for beaches, shoreline protection, tourism and pharmaceutical bio-prospecting 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 large scale events such as extreme water temperatures that cause "bleaching," coral disease, 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 of the reef by debris or careless snorkelers and divers.

Long-term Monitoring: *New Deep Bar site initial monitoring (2017) combines with long-term site*

The South Florida/Caribbean Network (SFCN) has annually monitored two intensive coral reef sites at Buck Island Reef National Monument: South Fore Reef since 2002 and Western Spur and Groove Reef from 2000–2014. South Fore Reef encompasses over 40,753 square meters (10.1 acres) of the forereef that typifies the south side of Buck Island and is highly complex, dominated by Boulder Star Coral (*Orbicella* spp. complex). Western Spur and Groove Reef is a 26,365-square meter (6.5-acre) reef area, typical of the park's northwest waters. Monitoring at Buck Island expanded to a shallow mesophotic reef (40-meter or 131-foot) site at the Buck Island BAR in 2017. The BAR site is a large (99,416 square meters or 24.6 acres) complex, low light, deep water reef, dominated by Boulder Star Coral, with the highest coral cover observed in any SFCN monitoring site.

Sites were selected based on depth, size of the reef area, composition, complexity of the reef structures, and through management recommendations. Each site consists of permanent, randomly-selected 10-meter (32.8 ft) transects, which are monitored using underwater video. Percent cover of living coral by species, macroalgae, turf algae, crustose coralline algae, octocorals, and sponges are calculated. Additional data on coral disease, bleaching, water temperature, and long-spined sea urchins are also collected.



Above: Map showing the location of the three coral monitoring sites at Buck Island Reef National Monument.

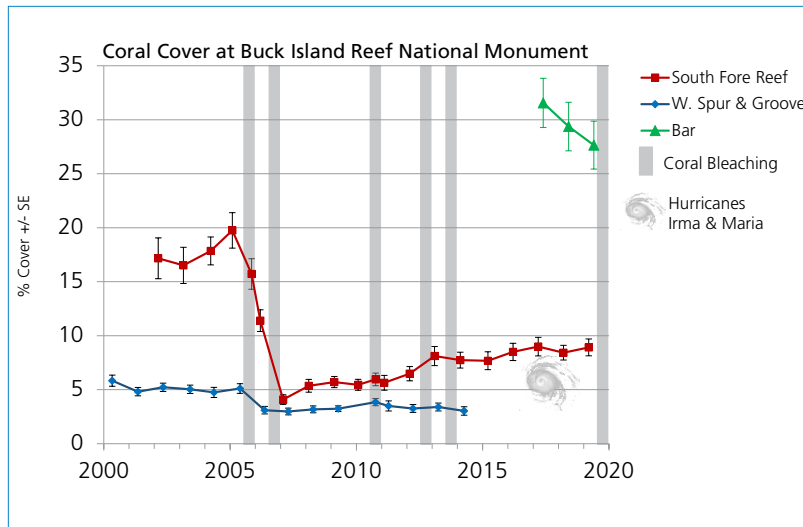


Above: Panoramic view of the mesophotic reef on the Deep Bar site in 2019 (NPS photo / Mike Feeley).



Status and Trends: Disease causes coral decline at deep reef site but a slight upward trend since catastrophic coral mortality of 2005–2006 despite Category 5 hurricane at shallow reef site.

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. Stony coral cover in 2006 was 4.1% at South Fore Reef and 3.1% at Western Spur & Groove, which are relative decreases of 67% and 35% from pre-event levels. Since 2007, there has been a statistically significant increase in stony coral cover at South Fore Reef. While coral bleaching occurred in 2010, temperatures peaked below 2005 levels with a shorter duration of high temperatures, and widespread coral disease outbreaks did not occur. Initial monitoring at the deeper Buck Island Bar reef site revealed the highest coral cover (22%–42%) of any site within Buck Island. Unfortunately, coral disease has already caused a significant decline in coral cover between 2017–2019 at this site.



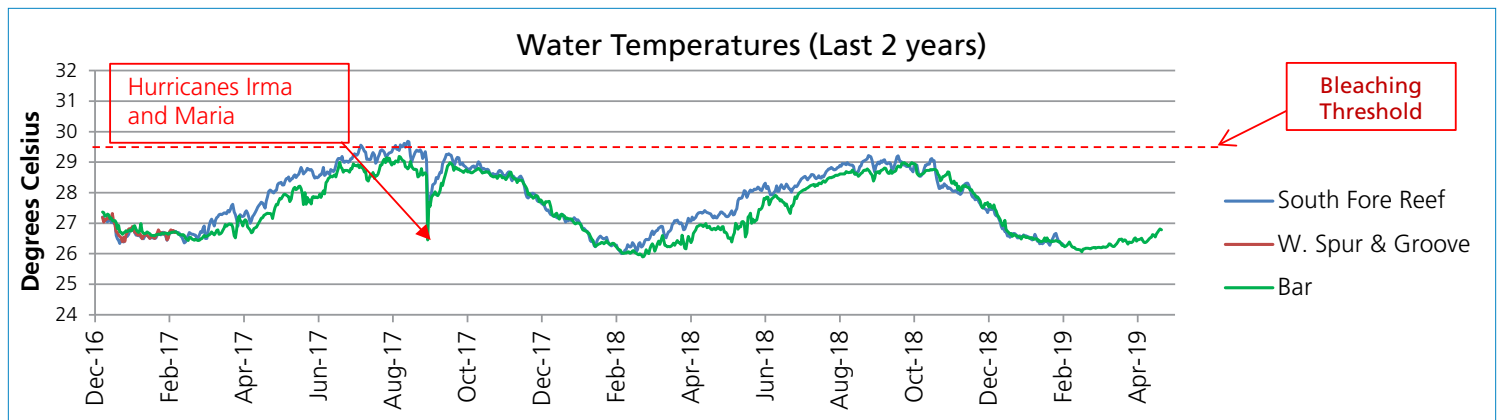
Left: Trends in live stony coral cover at Buck Island sites, South Fore Reef, Western Spur and Groove Reef (last sampled in 2014), and Buck Island Bar (initiated in 2017). Note that coral bleaching occurs when coral under stress lose their symbiotic algae and look white or “bleached.”

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

2010: Another coral bleaching event with no significant coral cover loss.

2017: Category 5 Hurricanes Irma and Maria pass over area. Coral cover declines but not significantly.

2018–2019: Disease mortality continues to cause decline in coral cover at the newly established Buck Island Bar site.



Buck Island Reef National Monument water temperature summary graphs (above and below) showing data from the three coral monitoring sites since 2012. A bleaching stress threshold of 29.5 °C is shown (top) and days above that threshold are quantified (bottom). 2018 was the only year since this record began (2003) in which no daily average exceeded the bleaching threshold.

Note: data were collected in May 2019 and do not include season of thermal maximum (August–October).

