



Marine Benthic Communities: Coral Reef Monitoring in Dry Tortugas National Park

2019

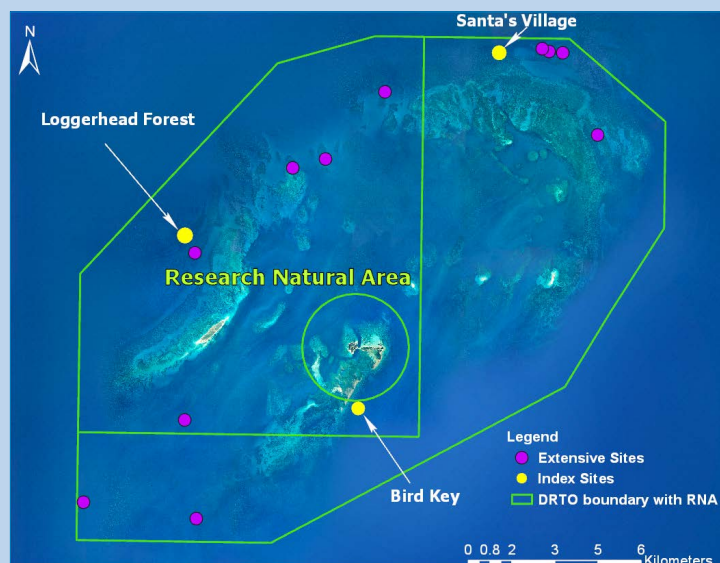
Importance: *A critical resource for fisheries, tourism and marine biodiversity*

Coral reef communities within Dry Tortugas National Park, at the western end of the Florida Keys, consist of stony corals, octocorals (e.g., sea fans), sponges, and algae. Reefs support incredible marine biodiversity including a multitude of fish species, as well as lobsters, sea turtles, and other creatures. Reefs in Dry Tortugas play a vital role for humans by supporting fisheries, fishery nursery areas, and tourism, as well as providing protection for the islands and Fort Jefferson. 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 affected 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, abrasion of the reef by debris, ocean acidification, nutrient enrichment, and contaminants.

Long-term Monitoring: *Bird Key Reef, Loggerhead Forest, Santa's Village and additional sites inside and outside the Research Natural Area (RNA)*

The South Florida/Caribbean Network began coral reef monitoring at Dry Tortugas NP in 2004. Bird Key Reef was selected due to management interest and for comparison with historical work. Bird Key Reef is 19,352 square meters (4.8 acres) in area, and contains 20 permanent, randomly-selected 10-meter (32.8 feet) transects which are monitored using underwater video. An additional 13 four-transect extensive sites were randomly selected in 2008 to compare trends inside and outside the newly established no-take marine reserve or Research Natural Area (RNA). In 2012, Loggerhead Forest Reef and Santa's Village Reef were selected for additional focused monitoring due to their unusually high coral cover and diversity in a terraced reef community. Loggerhead

Forest Reef (596,637 square meters [147.4 acres]) had three additional sites added to the two previously installed four-transect sites and Santa's Village Reef (371,763 square meters [91.9 acres]) had three sites added. Percent cover of living coral by species, macroalgae, turf algae, crustose coralline algae, octocorals, and sponges are calculated. Data on coral disease, coral bleaching, water temperature, and long-spined sea urchins are also collected.



Above: Aerial view of Dry Tortugas National Park with corresponding research site locations

Status and Trends: *Coral disease causes declines in stony coral cover at Bird Key and Loggerhead Forest Reefs*

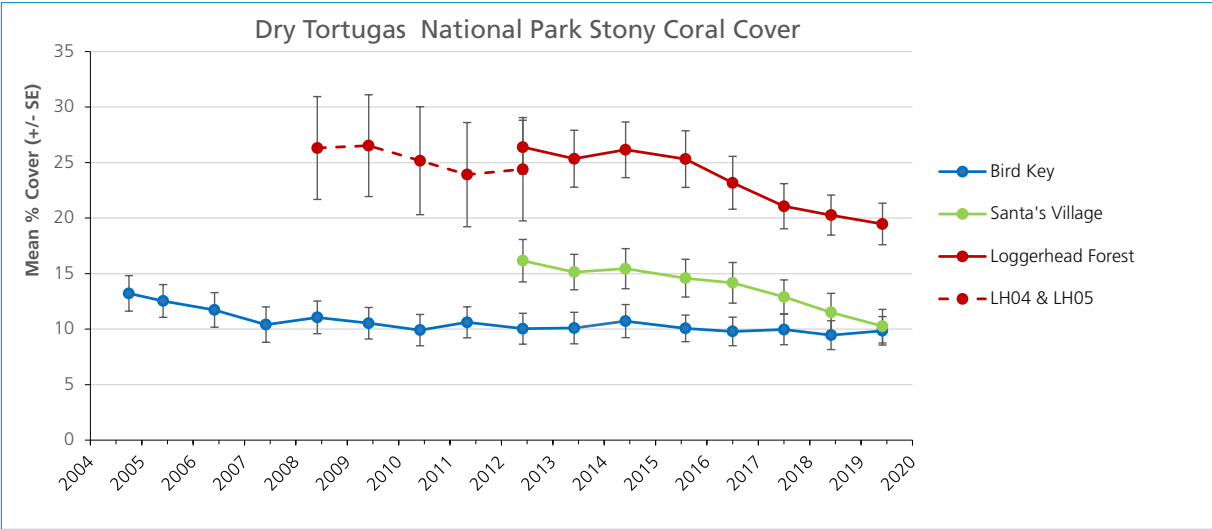
Monitoring through 2019 shows a significant decrease in stony coral cover at Bird Key, Santa's Village and Loggerhead Forest; with coral disease outbreaks in 2016 and 2018 responsible for widespread coral mortality. Coral cover has declined 36% at Santa's Village since monitoring was initiated in 2012. Similarly, cover of live stony corals at Loggerhead Forest has declined 26% since 2014. While the composition of coral species has remained fairly consistent, cover has steadily decreased in a majority of functional groups. Large reductions (between 40–50%) for the federally-threatened *Orbicella* species complex has accounted for most of the overall coral cover loss on all three reefs. Of additional concern is the presence of the stony coral tissue loss disease outbreak (SCTLD) that has spread across the Florida Reef Tract, and was just 60 kilometers (37.3 miles) east of the park as of



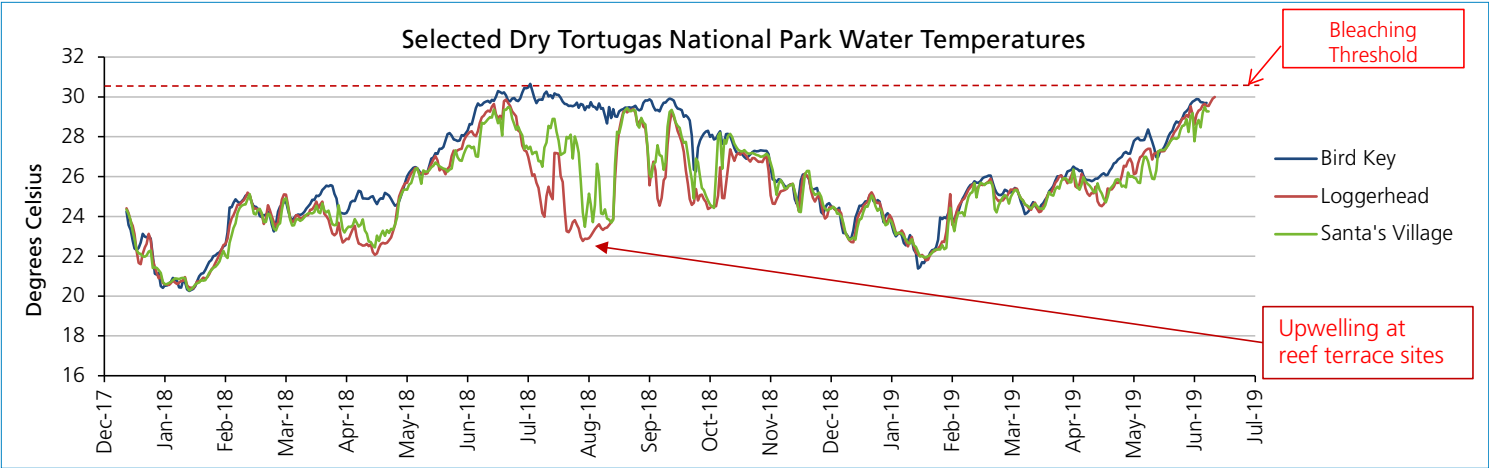
Above: Dry Tortugas National Park coral reef community.



October 2019 (<https://floridakeys.noaa.gov/coral-disease/>). Water temperatures show similar patterns throughout the park, except when cold water events appear to affect western and northwestern sites more than the rest of the park. While 2018 was the warmest global year recorded in recent history, average reef water temperatures exceeded the bleaching threshold (30.5° C) only one day in the park.



Left: A graph of trends in live stony coral cover at index monitoring sites in Dry Tortugas National Park. Stony coral cover is showing a statistically significant negative trend at this time.



Above and below: Dry Tortugas National Park water temperature summary graphs. Graphs show water temperature data from Bird Key, Loggerhead, and Santa's Village. Cold upwelling at the reef can be seen July–October, 2018 (above). A bleaching stress threshold of 30.5° C is shown (above) and days above that threshold are quantified (below).

