



Marine Benthic Communities: Coral Reef Monitoring in Biscayne National Park

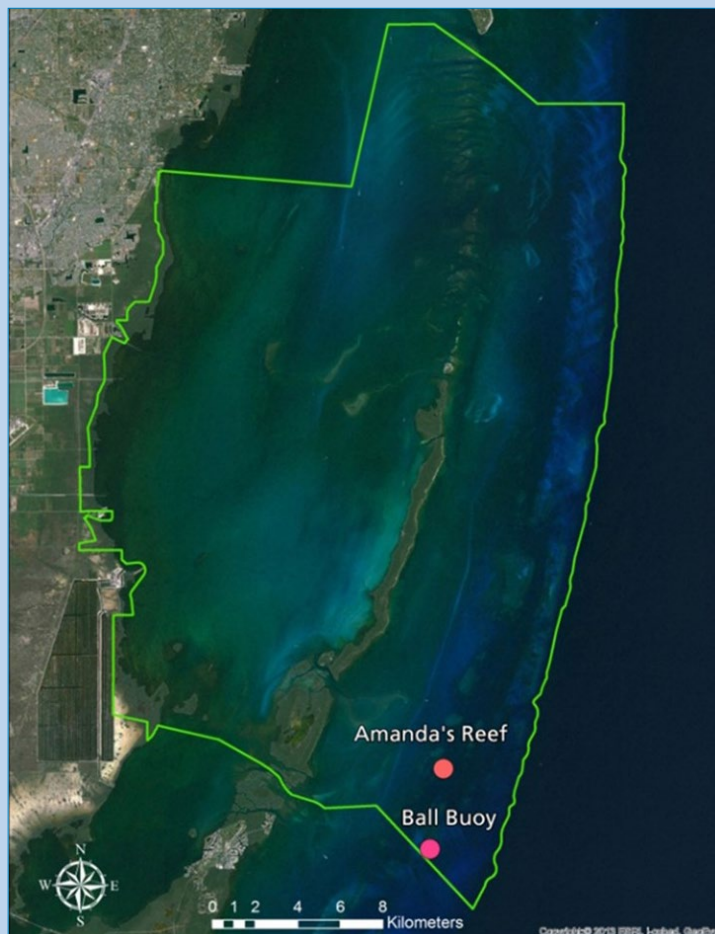
2022

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

Coral reef communities within Biscayne National Park (NP) consist of stony corals, gorgonians (e.g. sea fans), sponges, and algae. Reefs support marine biodiversity including a multitude of fish species, lobsters, sea turtles, and other marine species. Reefs play a vital role for humans by supporting fisheries, nursery areas, tourism, sand creation for beaches, pharmaceutical bio-prospecting, and shoreline protection. Coral reefs are negatively impacted by discrete events like warm water temperatures that cause “bleaching,” vessel and storm impacts, and 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 and divers. Due to the importance of coral reef ecosystems to biodiversity and society, and the many threats they face, President Bill Clinton established a Coral Reef Initiative through Executive Order 13089 to prioritize the health of coral reefs, including those that fall within National Park boundaries.

Long-term Monitoring: *Two sites monitored since 2004*

The South Florida/Caribbean Network (SFCN) has monitored two coral reef index sites at Biscayne NP since 2004. Ball Buoy Reef and Amanda’s Reef were selected due to management interests and to compare with existing historical data. Each site consists of 20 permanent, randomly-selected 10-meter (32.8 feet) transects monitored using underwater video. Percent cover of living coral by species, macroalgae, turf algae, crustose coralline algae, octocorals, and sponges are quantified. Data on coral disease, coral bleaching, water temperature, and presence of long-spined sea urchins are also collected. Amanda’s Reef is a 20,458 square meter (5.1 acres) shallow patch reef site with an average depth of less than 3 meters (9.8 feet). Common coral species at Amanda’s Reef are Mustard Hill Coral (*Porites astreoides*), Finger Coral (*P. porites*), and Massive Starlet Coral (*Siderastrea siderea*). Ball Buoy Reef is 14,136 square meters (3.5 acres) and is a transition reef terrace site ranging up to 12 meter (39.4 feet) deep. Coral species found in Ball Buoy Reef consist of Mustard Hill Coral (*Porites astreoides*), Fire Coral (*Millepora alcicornis*), and federally-threatened species Boulder Star Coral (*Orbicella* sp. complex) and Elkhorn Coral (*Acropora palmata*). We plan to survey both monitoring sites again in 2024.



Aerial image of monitoring sites in Biscayne National Park (green boundary). NPS map / SFCN.



Recent mortality of Elkhorn Coral (*Acropora palmata*) at Ball Buoy Reef in 2023 Biscayne National Park. NPS photo / Mike Feeley.



Status and Trends: *Slow road to recovery following coral disease and hurricane damage*

Amanda's and Ball Buoy reef sites have suffered a clear decline in percent live coral cover, driven by the onset of stony coral tissue loss disease (SCTLD) in 2014 and 2015, and from damage caused by Hurricane Irma in 2017 (Figure 1). Following Hurricane Irma, coral cover has remained somewhat stable and shows a slight increase of coral cover to nearly 4% at Ball Buoy Reef (Figure 1). This increase is largely due to fire corals (*Millepora* sp.) which are not considered "reef builders" (Figure 2). The dominant reef building species, which include the federally threatened *Acropora* and *Orbicella* species, have yet to recover from the declines. This year (2022) marks the first survey in Biscayne NP since 2017 where no active disease lesions were recorded during monitoring. In September 2022, the fringes of Hurricane Ian passed near Biscayne NP, which fortunately did not cause any structural damage to the reef sites NPS monitors, and actually lowered water temperatures and reduced bleaching stress to corals during the hottest time of the year (Figure 3). However, 2022 contained the second-highest number of days since our temperature record commenced in 2004, where water temperatures exceeded the bleaching threshold of 30.5°C (86.9°F; Figure 4). Without the cooling effects of Hurricane Ian, the season was on track to be one of the hottest on record.

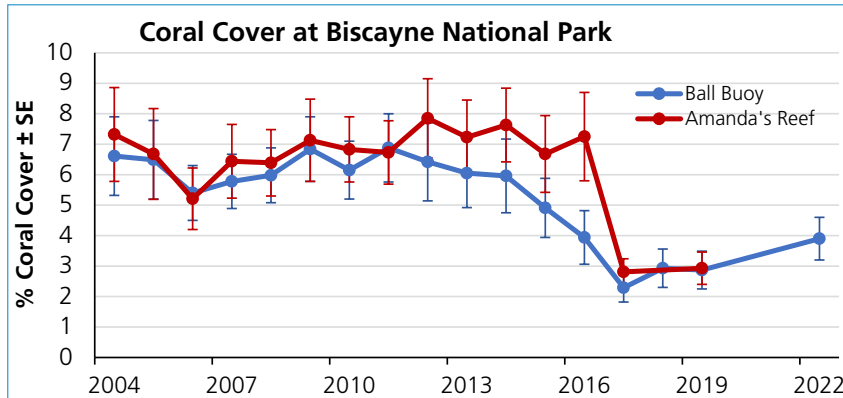


Figure 1. Trends in live stony coral cover ($\pm$ SE) at Amanda's Reef and Ball Buoy Reef in Biscayne National Park. Percent coral cover was lowest in 2017 following a SCTLD (stony coral tissue loss disease) event and structural damage from Hurricane Irma.

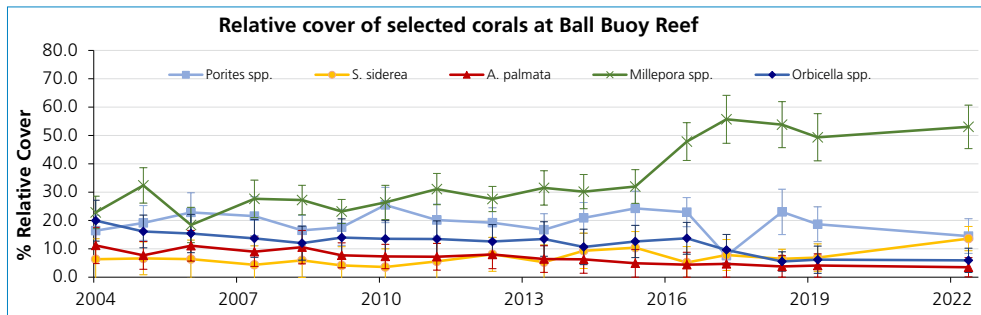


Figure 2. Since 2017, coral cover appears to be slowly increasing, but primarily driven by increases in fire coral species (*Millepora* spp.) and not reef-building corals.

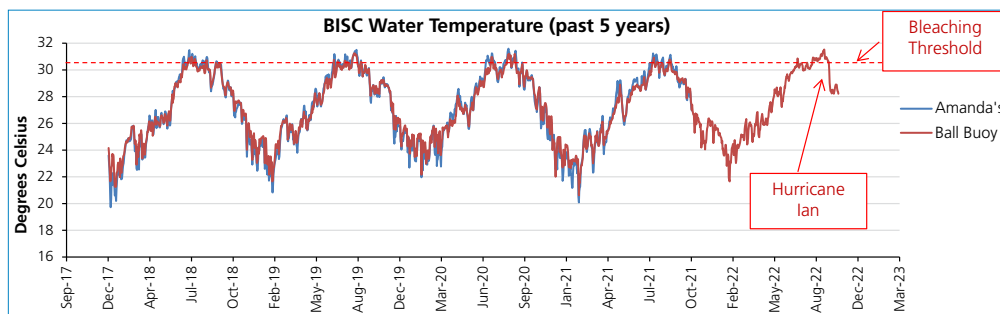


Figure 3. Average Biscayne National Park mean daily water temperature data collected at Amanda's and Ball Buoy reefs from 2017–2022. Corals are more susceptible to bleaching when water temperatures are consistently above 30.5°C (86.9°F).

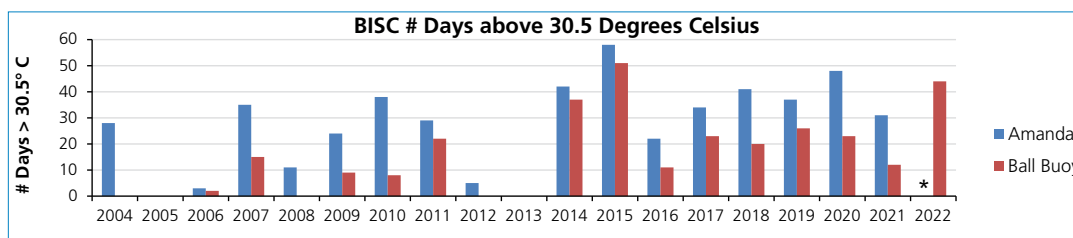


Figure 4. In 2022, Ball Buoy reef had the second highest number of days above the bleaching threshold in the history of SFCN monitoring and would likely have been higher if Hurricane Ian had not reduced water temperatures during the warmest month of the year. *Temperature data for Amanda's Reef in 2022 is not yet available.

