



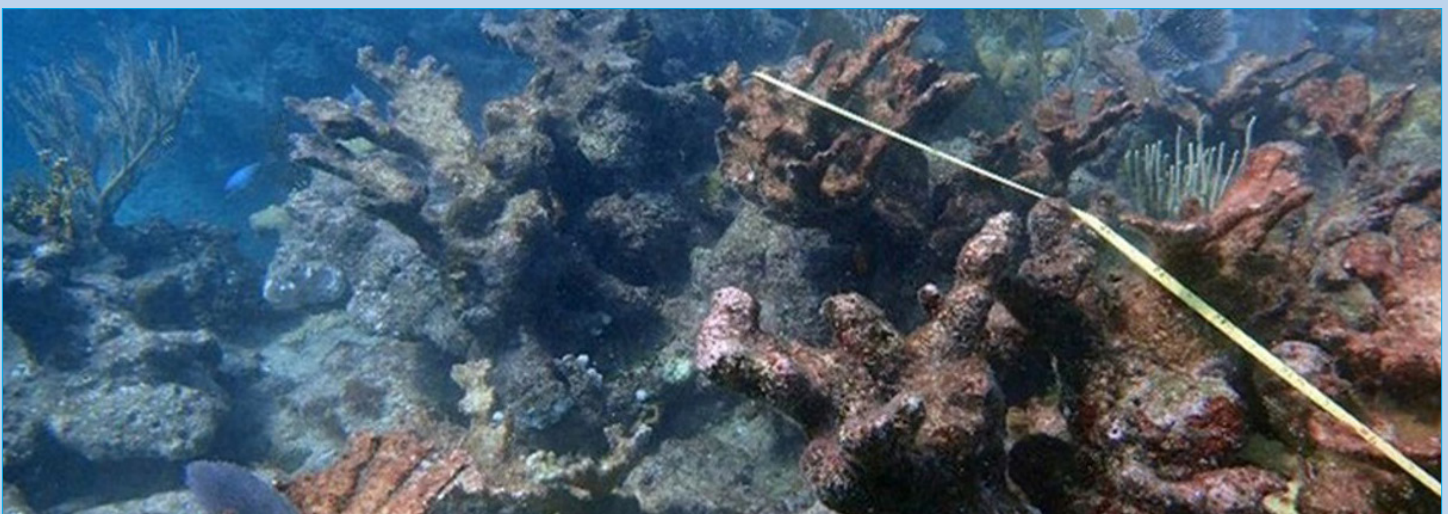
Marine Benthic Communities: Coral Reef Monitoring in Biscayne National Park

2024

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

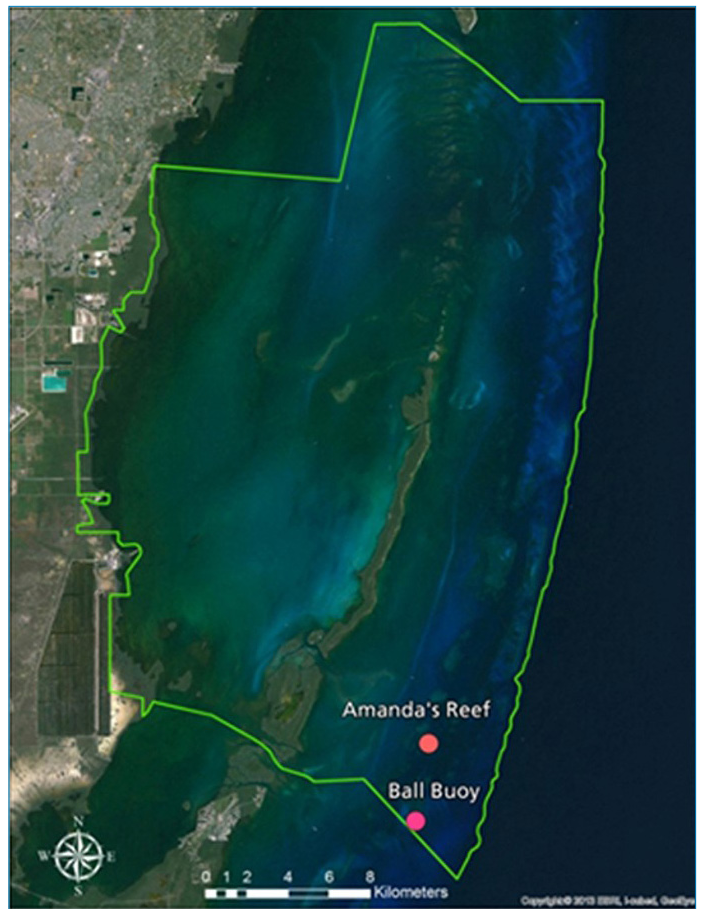
Coral reef communities within Biscayne National Park (NP) consist of stony corals, gorgonians (soft corals like sea fans), sponges, and algae. Reefs support marine biodiversity including a multitude of fish species, lobsters, sea turtles, and other marine species. Reefs play a vital role for humans by 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, the Coral Reef Initiative was established in 1998 through Executive Order 13089 to prioritize coral reef health, including within National Park boundaries.

Above right, a small *Dichocoenia stokesii* coral colony. Right, a diseased *Siderastrea siderea* coral colony. Below, one of the monitoring transects extending across an elkhorn stand recently deceased from coral bleaching.
NPS / SFCN



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 (SFCN 2025a; SFCN 2025b). Ball Buoy Reef and Amanda's Reef were initially selected due to management interest in *Acropora* spp. populations, to compare with existing historical data, and a past boat grounding that occurred at Amanda's Reef. 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, 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. Full [benthic](#) and [water temperature](#) data packages are publicly available on NPS DataStore. Amanda's Reef is a 20,458 m² (5.1 acres) shallow patch reef site with an average depth of less than 3 meters (10 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 m² (3.5 acres) and is a transition reef terrace site ranging up to 12 meters (39 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 have not monitored Amanda's Reef since 2019 due to operational constraints.



Biscayne National Park showing location of the Ball Buoy and Amanda's Reef coral monitoring sites. NPS / SFCN

Status and Trends: *Record-setting temperatures led to devastating coral bleaching event*

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, from damage caused by Hurricane Irma in 2017, and most recently from a severe bleaching event in 2023 (Figure 1). The severe bleaching event in 2023 led to a drastic decline in coral cover and the first year where no living *Acropora palmata* was recorded. The dominant coral species has shifted 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 from bleaching and disease. Estimated coral cover at Ball Buoy was 1.9% (95% CI: 1.0–3.0) in 2024, a 73% decrease since the onset of monitoring in 2004.



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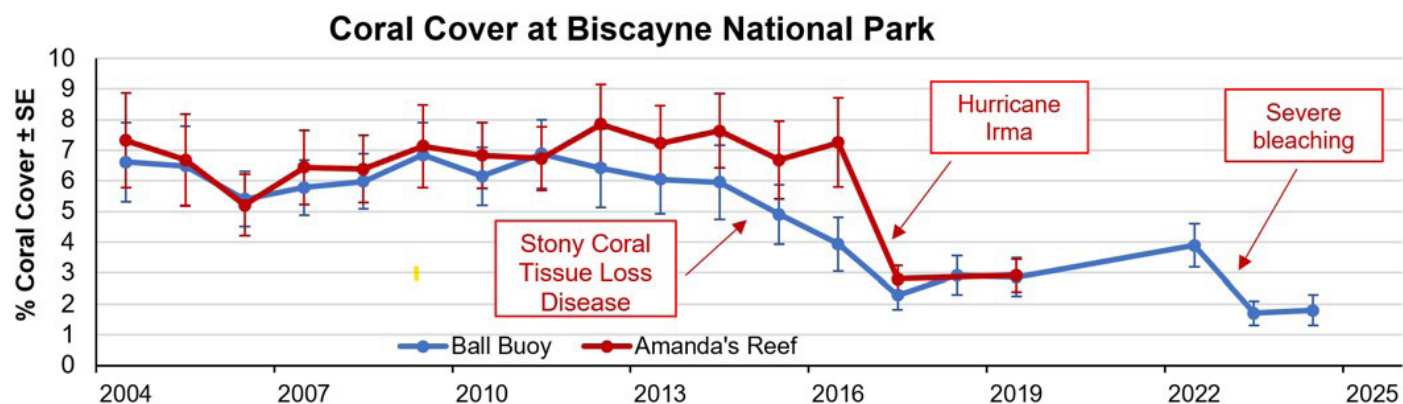


Figure 1. Trends in live stony coral cover ($\pm$ SE) at Amanda's Reef and Ball Buoy Reef in Biscayne National Park. Percent coral cover reached the lowest recorded levels in 2023 following a severe bleaching event. NPS / SFCN

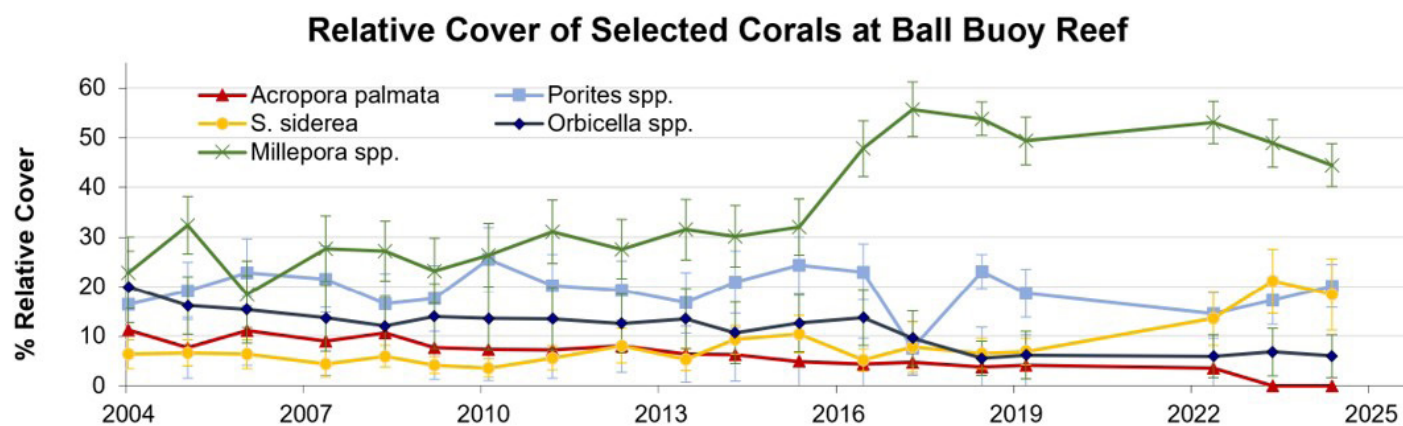


Figure 2. Relative cover ($\pm$ SE) of selected coral species at Ball Buoy Reef. Severe bleaching in 2023 marked the first year where no live *Acropora palmata* was recorded at the site. Fire coral species (*Millepora* spp.) have become the dominant species at the site and not reef-building corals. NPS / SFCN

No tissue-loss diseases were recorded on stony corals at Ball Buoy from 2022 to 2024, suggesting recent changes in coral condition were more likely driven by thermal stress than disease. The year 2023 marked not only the hottest temperatures on record (Figure 3), but the most days above the bleaching threshold of 30.5°C (86.9°F; Figure 4) in the history of water temperature monitoring in Biscayne NP. Water temperatures have been gradually increasing over the duration of our monitoring, but 2023 was particularly hot due to an El Niño event (Hoegh-Guldberg et al. 2023). While 2024 was the second warmest year on record at these monitoring sites, coral cover remained stable. The corals surviving the 2023 bleaching event likely represent more thermally tolerant individuals, either due to selective mortality or differences in symbiont communities (Smith et al. 2013). In 2024, Biscayne NP received glancing blows from Hurricanes Helene and Milton, which caused very little physical damage to reefs in the park and instead helped reduce water temperatures during the hottest time of year, lessening bleaching stress on corals near the thermal peak of the season.



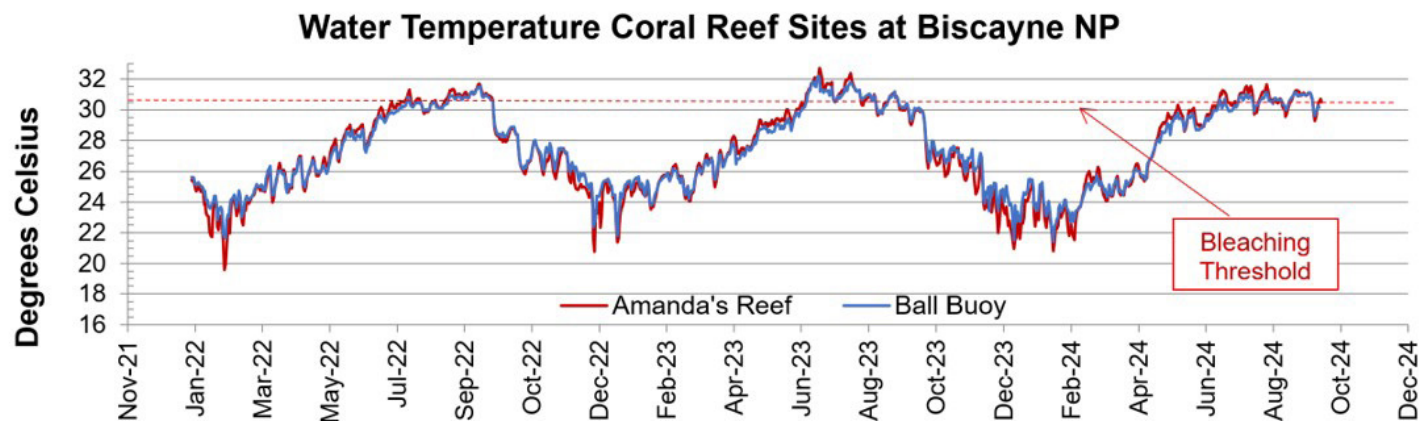


Figure 3. Average Biscayne National Park mean daily water temperature data collected at Amanda's and Ball Buoy reefs from 2017–2024. Corals are more susceptible to bleaching when water temperatures are consistently above 30.5°C (86.9°F). *NPS / SFCN*

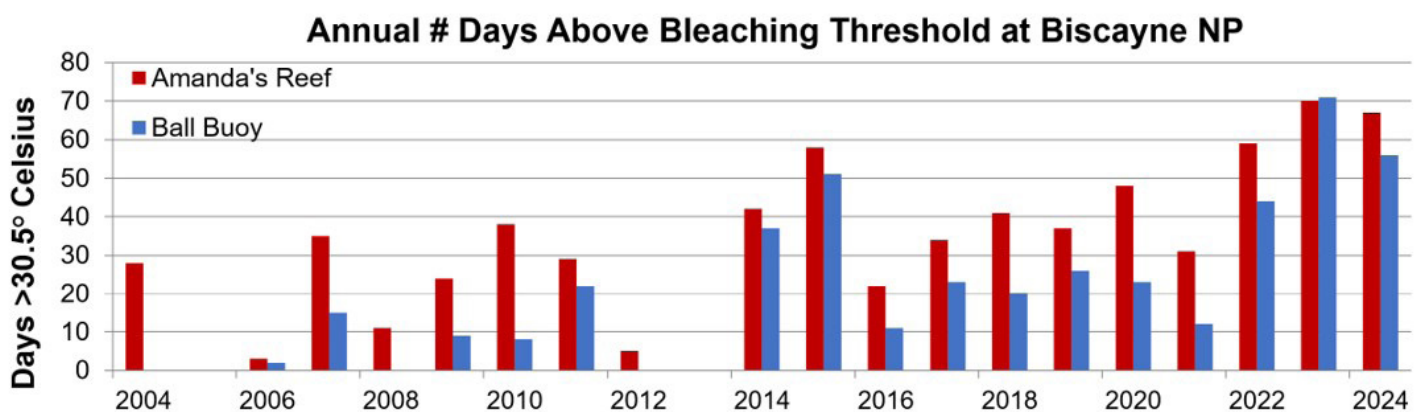


Figure 4. In 2023 and 2024, both Amanda's and Ball Buoy recorded the highest number of days above the bleaching threshold in the history of SFCN monitoring. This led to a severe bleaching event in 2023 which decimated corals in the region). *NPS / SFCN*

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