

Coral bleaching and coral disease: A damaging combination for reefs in Virgin Islands National Park

By Jeff Miller and Matt Patterson

WHILE A RECORD NUMBER OF TROPICAL STORMS and hurricanes battered coral reefs in Florida and the Caribbean in 2005, below the surface two forces combined into a “perfect catastrophe” scenario for coral reefs. Outbreaks of the coral disease “white plague” occurred as a Caribbean-wide coral bleaching event produced extreme levels of coral mortality. Monitoring in 2005 revealed extensive coral bleaching and disease-caused coral mortality at sample sites in Virgin Islands National Park and Buck Island Reef National Monument. Scientists with the South Florida/Caribbean Network (SFCN) monitor coral reefs in four parks in the Southeast Region: Dry Tortugas, Biscayne, and Virgin Islands National Parks, and Buck Island Reef National Monument. South Florida parks escaped the bleaching occurring in the Virgin Islands parks in part because of cooler water temperatures that accompany the passing of tropical storms and hurricanes.

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An ongoing, eight-year monitoring program at Tektite reef in Virgin Islands National Park looks specifically at white plague. Average live coral-cover on the study transects at Tektite reef has declined by 46.7% (from an annual average of 66.5% in 1997 to 44.5% in 2005). Compounding the problem, this disease principally affects the most abundant and major reef-building coral species, star coral (*Montastraea annularis*), which grows extremely slowly at 0.04 to 0.08 inch (1 to 2 mm) per year and has very low recruitment (coral larval settlement and growth) rates. In addition to long-term monitoring, network scientists work with universities and groups such as the Coral Disease and Health Consortium to determine the drivers of coral diseases. US Geological Survey (USGS) scientists focus on disease etiology, including experimental, nondestructive sampling techniques in which investigators take swabs of healthy and diseased coral tissue, which are later analyzed for microbial communities and coral genotypes.

Coral bleaching began in late summer and continued into December 2005. This bleaching occurs when the symbiotic algae within the coral tissue are expelled. These algae, called zooxanthellae, provide the coral with energy and its greenish brown color. When the algae are expelled, the coral loses its color, appearing white or bleached. Corals bleach in response to stress, and in 2005, record high water temperatures caused this to occur in coral reefs around the US Virgin Islands. Long-term effects of the bleaching depend upon duration and severity (i.e., complete or partial loss of the zooxanthellae). The last bleaching event to affect this area occurred in 1998 and caused low levels of coral mortality. However, researchers are concerned that record warm water temperatures in August and September 2005 may make this bleaching episode more severe than the one in 1998.

Bleaching of *Montastraea annularis* and *Porites porites* (head corals, facing page, left column) started in August 2005, but corals showed partial recovery by October 2005. By contrast, bleaching caused complete mortality of an *Acropora palmata* (elkhorn coral) colony (right column) by 26 October 2005.

As of November 2005, color was returning to the “head” corals (*Montastraea*, *Colpophyllia*, *Diploria*, and *Siderastrea* species), indicating that mortality from bleaching may be low. The November white plague disease outbreak, however, has caused tremendous mortality to these same species that seemingly survived the bleaching. Whether the bleaching has made them more vulnerable to the disease is not yet known. Also, elkhorn coral, a species that is rarely affected, bleached during this severe event and has incurred substantial mortality. The elkhorn and staghorn corals (Caribbean *Acropora* genus) have been recommended for protection under the Endangered Species Act, a highly unusual occurrence for marine invertebrates.

In a year of record levels of storm activity, coral reefs were under attack from more than just hurricanes; coral disease and coral bleaching from elevated water temperatures combined with hurricanes to cause extensive coral mortality. Continued monitoring will document the total amount of mortality. As scientists with the South Florida/Caribbean Network continue to gain understanding of coral bleaching and disease, future endeavors may provide ways to mitigate these stresses and promote a more resilient coral reef ecosystem. For example, the Coral Reef Task Force—established in 1998 by presidential executive order to lead US efforts in preserving and protecting coral reef ecosystems—passed a resolution to take action in response to the 2005 Caribbean bleaching episode. These efforts are significant because not only do coral reefs attract millions of visitors to the National Park System each year, they serve as structural barriers that protect our shorelines from storm-generated waves. ■

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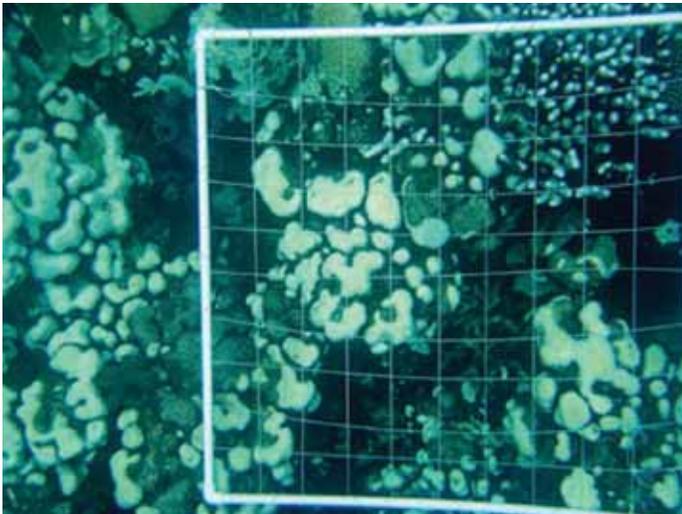
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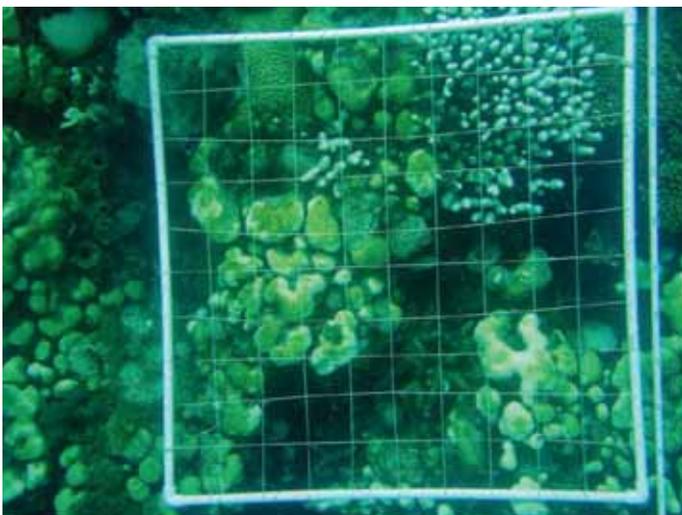
2 Sep



29 Sep



5 Oct



31 Oct



26 Oct