

Study provides detailed projections of coral bleaching

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Warmer water is causing coral to bleach as depicted here in an area of the Florida Keys called Cheeca Rocks. Credit: NOAA

While research shows that nearly all coral reef locations in the Caribbean and Gulf of Mexico will experience bleaching by mid-century, a new study showing in detail when and where bleaching will occur shows great variety in the timing and location of these harmful effects.

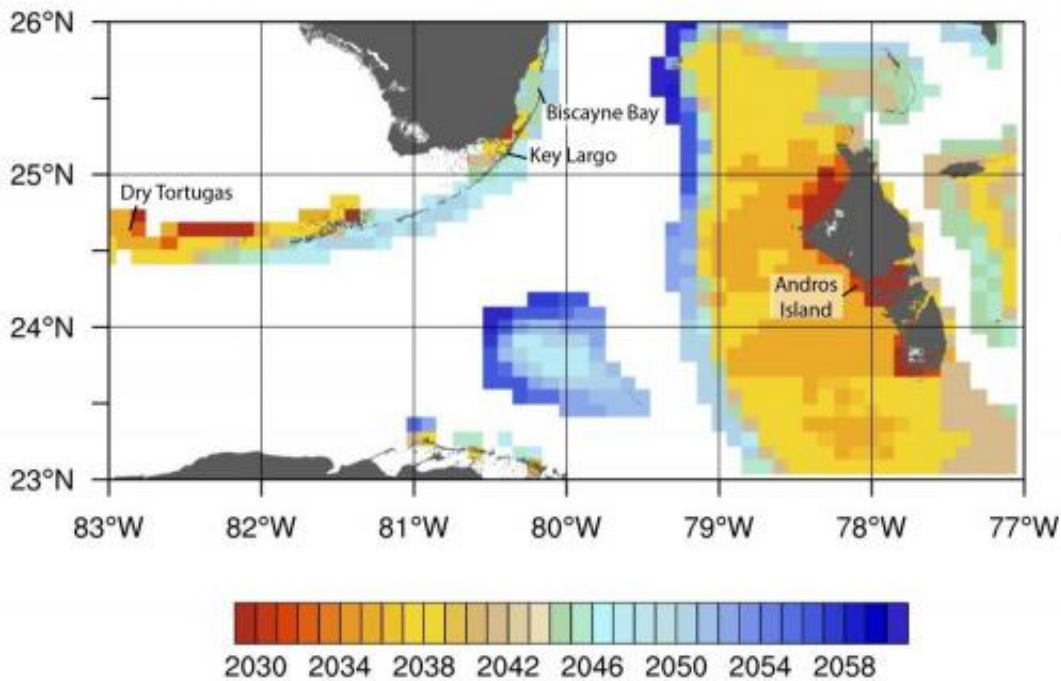
The new research published today in *Global Change Biology* by NOAA scientists and colleagues provides the first fine-scale projections of [coral bleaching](#), an important planning tool for managers.

"Our new local-scale projections will help resource managers better understand and plan for the effects of [coral bleaching](#)," said lead author Ruben van Hooidonk, a coral and climate researcher with the Cooperative Institute for Marine and Atmospheric Studies at the University of Miami's Rosenstiel School and NOAA's Atlantic Oceanographic and Meteorological Laboratory.

"At some locations, referred to in our study as 'relative refugia,' lower rates of temperature increase and fewer extreme events mean reefs have more time to adapt to climate change," he said. "Managers may decide to use this information to protect these locations as refuges or protected areas. Or they may take other actions to reduce stress caused by human activities."

Coral bleaching, which is primarily caused by warming ocean temperatures, is a major threat to our ocean's health. When water is too warm corals expel the algae living in their tissue, causing the coral to lose its vibrant colors and turn completely white. Bleached corals are under more stress and are more likely to die. Extensive coral bleaching events have increased in frequency and severity over the past two decades due to climate change.

The loss of coral reefs can have economic, social and ecological effects. Coral reefs provide rich habitat for valuable fisheries that people depend on for food. They serve as protective buffers to coastlines by absorbing wave energy from storms, and they boost local economies by attracting tourists who fish, dive and explore these underwater treasures.



This high resolution map shows the projected timing in years of the onset of annual severe coral bleaching off the Florida Keys and the Bahamas. Regions in red and orange, such as the Dry Tortugas, are projected to bleach annually starting in the early 2030s, while the more northern stretch of the Florida Keys near Biscayne Bay are projected to bleach annually in the mid-2040s. Credit: NOAA

The new bleaching projections build upon a previous study that used [global climate models](#) from the Fifth Assessment Report of the Intergovernmental Panel on Climate Change to produce projections at a very coarse resolution of about 68 miles or 110 kilometers. By using a regional ocean model and an approach called statistical downscaling, scientists calculated the onset of annual severe bleaching at a much higher resolution - 6 miles or 10 kilometers. The resulting local-scale projections of bleaching conditions will help managers include climate change as a consideration in planning and conservation decisions.

There are regions within many countries where some reefs are projected to experience annual bleaching conditions 15 or more years later than neighboring regions. This applies to reefs in Florida, the Bahamas, Cuba, Puerto Rico, the Dominican Republic, Turks and Caicos, and Mexico. Reefs projected to experience bleaching conditions later can be conservation priorities.

Scientists also compared the two approaches they used to produce the high-resolution projections and found that both methods produced similar results. This gives the team confidence that the more cost-effective and less labor-intensive statistical downscaling approach could be applied for all of the world's coral reefs, which the team plans to undertake over the coming year.

Bob Glazer of Florida's Fish and Wildlife Conservation Commission said he welcomed the new research. "Coral [bleaching](#) poses a grave threat to [coral reefs](#) and these high-resolution projections provide vitally needed spatial information about the degree of threat and will help us make better management decisions."

More information: The paper, "Downscaled projections of Caribbean coral bleaching that can inform conservation planning," can be read online at: [onlinelibrary.wiley.com/doi/10 ... 1/gcb.12901/abstract](https://onlinelibrary.wiley.com/doi/10.1111/gcb.12901/abstract)

Provided by NOAA Headquarters

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