What is Coral Bleaching?

Coral bleaching is a stress response caused by the breakdown of the symbiotic relationship between the coral and the algae (zooxanthellae) that live inside its tissues. When the coral expels these algae the coral skeleton becomes visible, giving it a pale or "bleached" appearance. Mass bleaching events have been linked with mounting thermal stress associated with a warming planet and seas and are expected to continue increasing in severity, geographic extent, and frequency. Although some species and individual coral colonies can withstand more stress than others, corals will eventually die if the stressor does not abate and the symbiosis is not reestablished.

Bleached Pocillopora eydouxi, Oct, 2015.

Coral Bleaching in Hawai'i

Prompted by rising sea surface temperatures south of the Main Hawaiian Islands (MHI) in June 2015, NOAA's Coral Reef Watch Program issued a bleaching warning for the MHI. By October 2015, the agency confirmed that West Hawai'i Island experienced the most severe thermal stress in the MHI for 18.35 consecutive weeks (Fig. 1).

Following the first report of bleached coral from a Puakō Makai Watch volunteer snorkeling at Paniau, scientists from The Nature Conservancy, NOAA's Coral Reef Ecosystem Program (CREP), and Hawai'i's Division of Aquatic Resources (DAR) conducted four weeks of field surveys to assess the damage.

The team surveyed more than 14,000 coral colonies across the South Kohala and North Kona regions of West Hawai'i, assessing the incidence (proportion of coral colonies that bleached) and severity of bleaching of each colony.

We also assessed each reef's resilience, which is its ability to resist or recover from bleaching events. Intensive data sharing and analysis is underway to map thirteen reef resilience indicators, including herbivore biomass, coral health, resistant coral species, and topographic complexity.

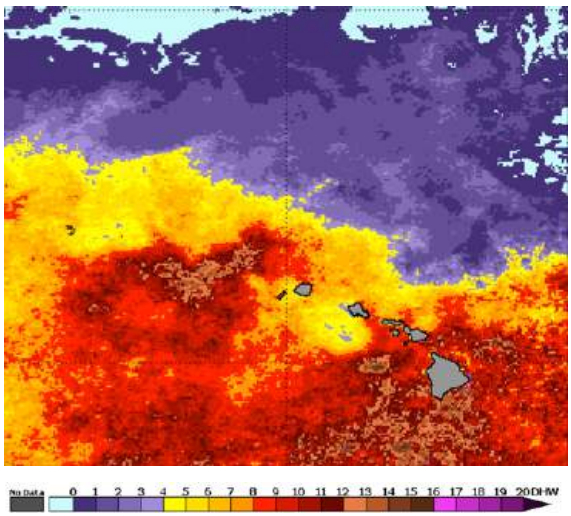

Fig. 1. Map of maximum degree heating weeks across Hawai'i in 2015. Degree heating weeks are the number of consecutive weeks that temperature exceeds 1ºC bleaching threshold based on nightly 5-km satellite data. 4 weeks=bleaching likely, 8 weeks=mortality likely. Data from NOAA's Coral Reef Watch Program.

Key Findings: Extent and Severity of Bleaching

- 38-92% of all coral colonies on North Kona and South Kohala reefs were partially or fully bleached.
- While there is considerable variation in mortality levels, preliminary results suggest that some South Kohala reefs have experienced 55-99% coral loss since 2014.
- An average of 68.41 ± 15.23% of shallow water (18-21′) and 59.96 ± 17.66% of deeper water (38-42′) corals were partially or fully bleached.
- Average bleaching severity across all colonies was ~75%, and similar in shallow (74.50 ± 7.13%) and deeper (75.42 ± 8.52%) reef zones.
- Survey sites in South Kohala (north end of the survey area) had worse bleaching than those in North Kona (south end of the survey area).
- Among the most affected sites were shallow regions at Kanekanaka, Kawaihae and ʻŌhaiʻula (Spencer Beach) where 80-85% of the corals severely bleached.
- Of the dominant reef-building corals that partially or fully bleached, *Pavona duerdeni* (100% of colonies), *Pocillopora meandrina* (98%), *Porites evermanni/lutea* (81%), *Montipora capitata* (77%) and *Pavona varians* (74%) were the most susceptible to bleaching.
- While bleaching incidence was high to moderate across most taxa, the least affected were *Porites lobata* (50%), *Montipora incrassata* (47%), *Montipora patula* (45%), *Leptastrea purpurea* (40%), *Fungia scutaria* (14%).
- 50 to 60% of the two most abundant species (*Porites lobata* and *Porites compressa*) partially or fully bleached.
- Bleaching caused considerable mortality across many of the dominant reef-building taxa such as *P. lobata, P. compressa, P. evermanni* and *P. meandrina*.

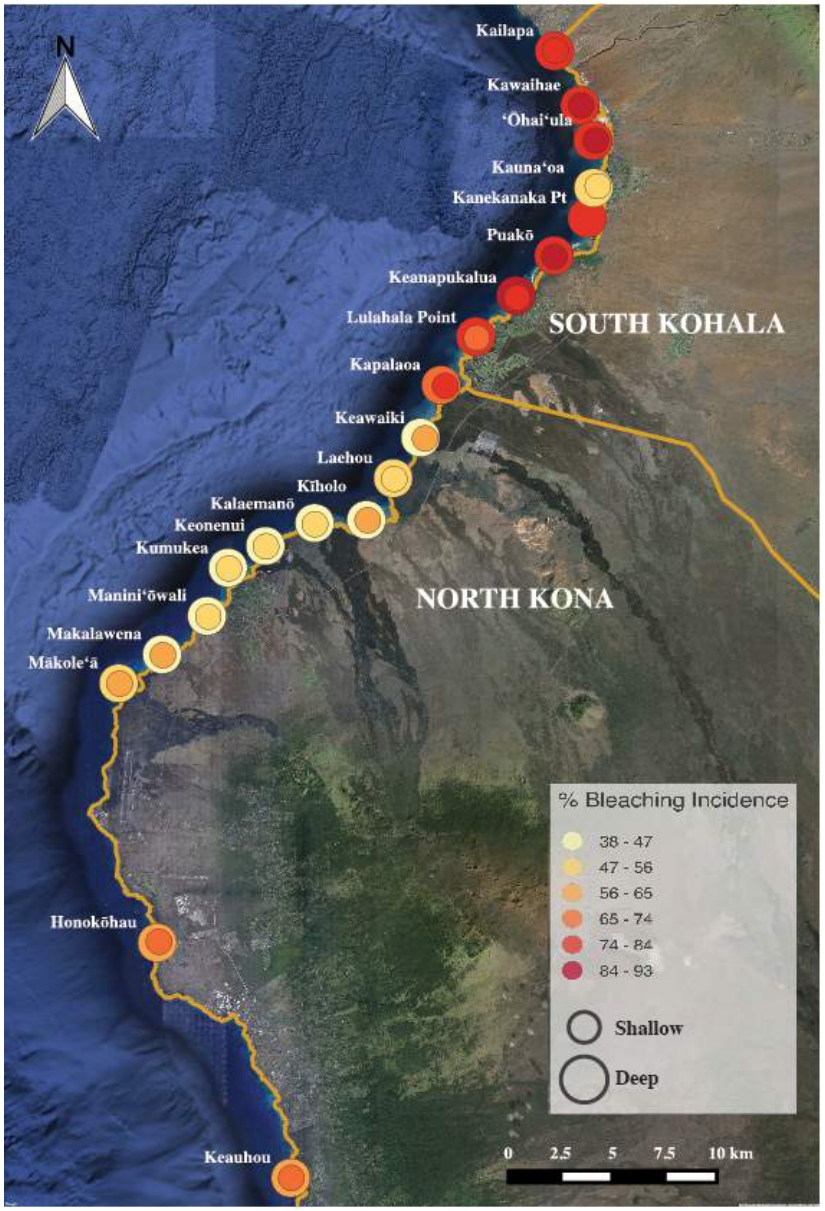

Figure 2. Incidence of partial or complete bleaching at shallow and deep sites in West Hawaii, October 13-24, 2015.

How We Can Help Improve Reef Resilience

For the first time in history, the MHI experienced back-to-back bleaching events in 2014 and 2015. These events—and the likelihood that they will continue into the future—require us to improve our understanding of bleaching impacts and the application of reef resilience principles to ensure we're doing everything we can to reduce mortality on Hawai'i's reefs. As we continue to monitor reef recovery—or the lack thereof—in West Hawai'i (and in other places throughout the state, including Kāne'ohe Bay), we can identify the areas most resistant and resilient to bleaching and prioritize those for conservation action. In addition, we can redouble efforts to minimize local stressors (e.g., land-based pollution, runoff, and overfishing of herbivores) that are within our control and compromise coral health and the reef's ability to resist or recover from bleaching.

Mahalo Nui Loa

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For Additional Information

Contact Dr. Courtney Couch at courtneyscouch@gmail.com, Rebecca Most at rmost@tnc.org, or Dr. Eric Conklin at econklin@tnc.org for additional information on these findings. Visit reefresilience.org for additional information on coral bleaching and reef resilience principles.