

Status of Bleaching Heat Stress on the Great Barrier Reef, Australia – 2020

Update: April 16, 2020 (End of Event Summary)

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At last it is safe to say that the 2020 heat stress event for the Great Barrier Reef (GBR) in Australia is over. The task of assessing the extent and severity of the marine heatwave and its impacts on coral reefs is still underway.

NOAA Coral Reef Watch’s (CRW) [Four-Month Coral Bleaching Outlook](#) product performed extremely well throughout this event. It gave an extremely accurate prediction of the heat stress event weeks in advance of the stress actually occurring. It also managed to accurately predict the timing of the end of the event.

The most alarming aspect of this event is that it was the most widespread heat stress event on the GBR (during the satellite era), and yet this year was ENSO (El Niño Southern Oscillation) neutral, which means that there was no tropical climate forcing being applied to the region from ENSO. It begs the question of how much worse it might have been, were an [El Niño present](#).

CRW’s [daily global 5km satellite coral bleaching Degree Heating Week \(DHW\)](#) of March 30, 2020 is pictured below (Figure 1). This image represents the total accumulated heat stress for the GBR for the 2020 event.

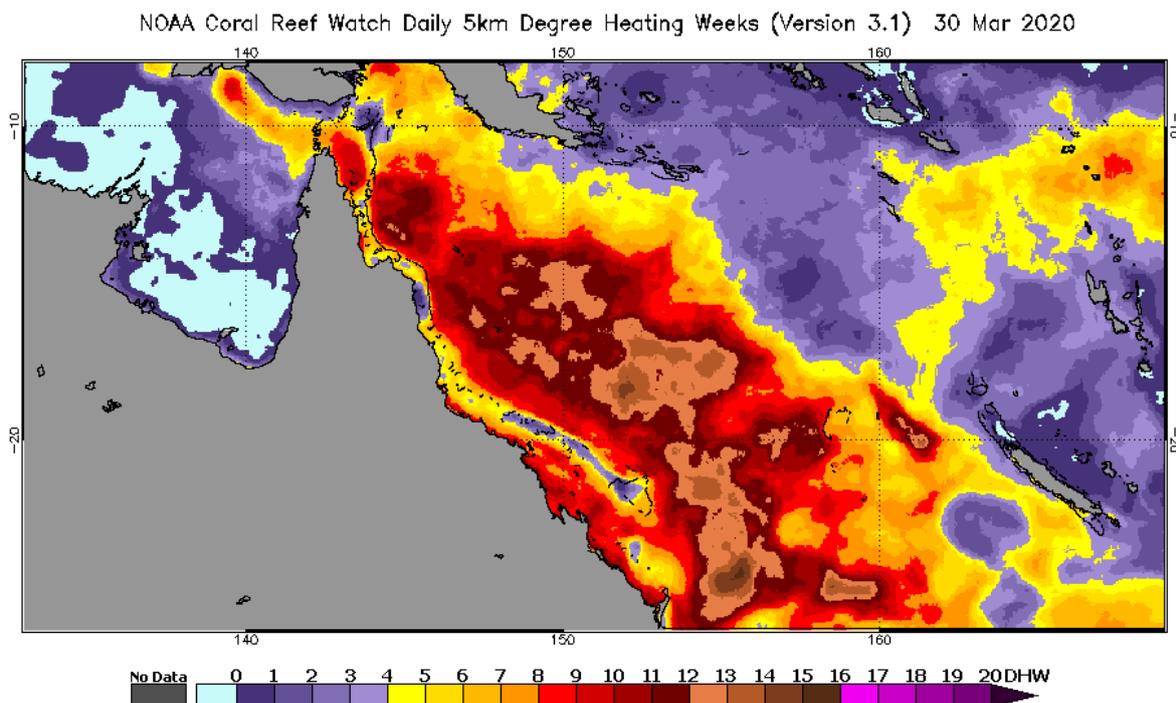


Figure 1. NOAA CRW’s [daily global 5km satellite coral bleaching DHW](#) product for the GBR on March 30, 2020.

When interpreting Figure 1, it's important to note that based on CRW's recent analysis of past bleaching events along the GBR, combined with in-water reports of bleaching received from the Great Barrier Reef Marine Park Authority (GBRMPA), Australian Institute of Marine Science (AIMS), and the University of Queensland (UQ), we expect that a DHW value of 2.5 °C-weeks is a relatively conservative threshold for mapping significant coral bleaching along the reef tract during this event. This will be investigated more completely, once we have received detailed in-water and aerial bleaching data. Certainly, it is safe to assume that reefs exposed to 4 °C-weeks of heat stress most likely suffered significant bleaching, and those reefs exposed to 8 °C-weeks of heat stress most likely suffered severe, widespread bleaching and significant mortality. Reefs in the southern section of the GBR are somewhat more naïve to heat stress than those in the far north. Southern GBR reefs have not suffered from heat stress in recent years, while those in the central to northern GBR suffered high heat stress in 2016 and/or 2017. For that reason, we would expect bleaching and mortality to be worse at lower DHW levels in the south than in the north.

Note also in Figure 1 that all Coral Sea reefs (those offshore from the GBR, both to the east and south-to-southeast of Swains Island) should have severe, widespread coral bleaching, due to the high levels of accumulated heat stress (the brown areas in Figure 1) these past weeks. It is therefore reasonable to expect that these reefs suffered significant mortality.

During this mass heat stress and coral bleaching event, NOAA CRW received field observations from the far northern GBR via GBRMPA; from the stretch of reefs between Port Douglas and Innisfail, Australia via AIMS' Long-term Monitoring Program (LTMP); from Lizard Island via the Lizard Island Research Station; and from Heron Island (southern GBR) via the UQ Research Station. All information was consistent with CRW's DHW values, and gave us confidence that [daily global 5km DHW](#) product was a good proxy for coral bleaching extent during this event.

Over the last two weeks of March, the James Cook University (JCU) Australian Research Council (ARC) Centre of Excellence for Coral Reef Studies and GBRMPA conducted a series of aerial surveys to record the extent of coral bleaching along the GBR. Two observers in a light plane made visual estimates of the condition of reefs along the tract. The 2020 surveys followed the same paths as the 2016 and 2017 bleaching surveys, and included 1,036 reefs. Figure 2 shows a preliminary analysis of the extent of coral bleaching, based on the aerial observations.

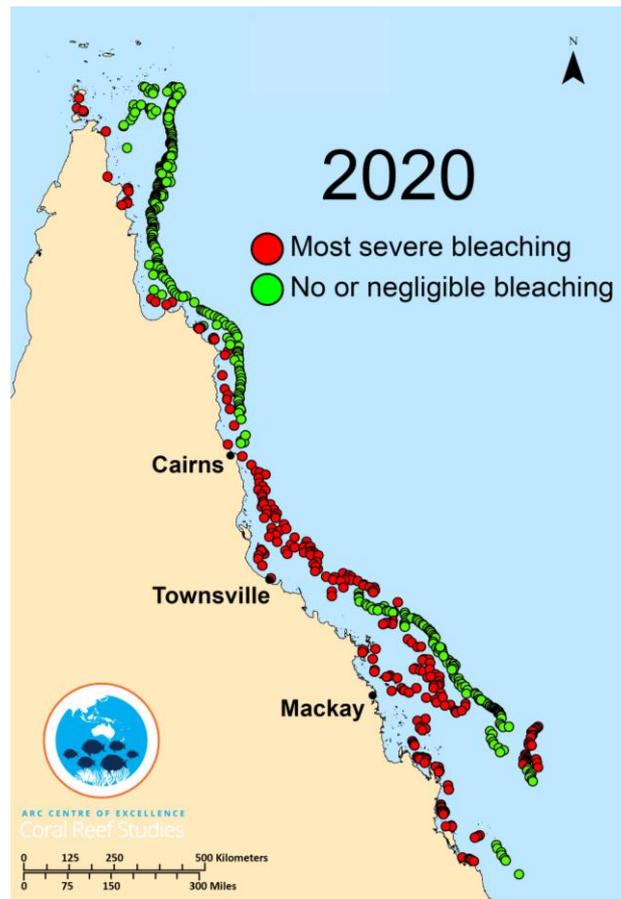


Figure 2. Preliminary results of coral bleaching extent along the GBR in Australia from JCU/GBRMPA aerial surveys in late March 2020. Image courtesy of the ARC Centre of Excellence for Coral Reef Studies/Terry Hughes.

JCU/GBRMPA estimate that ~40% of coral reefs along the GBR had little or no bleaching (i.e., the green dots in Figure 2) during the 2020 heat stress event. This percentage is a bit higher than CRW’s estimate (which is based on the CRW [daily global 5km DHW product](#)). JCU/GBRMPA also estimate that ~25% of reefs were severely affected (i.e., the red dots in Figure 2). This is very close to the proportion of reefs that were exposed to 8 °C-weeks or greater of heat stress. The remainder of reefs (~35%) along the GBR were classed as having had modest levels of coral bleaching.