

Observed Impacts from Climate Extremes on the Great Barrier Reef—Summer 2008/2009

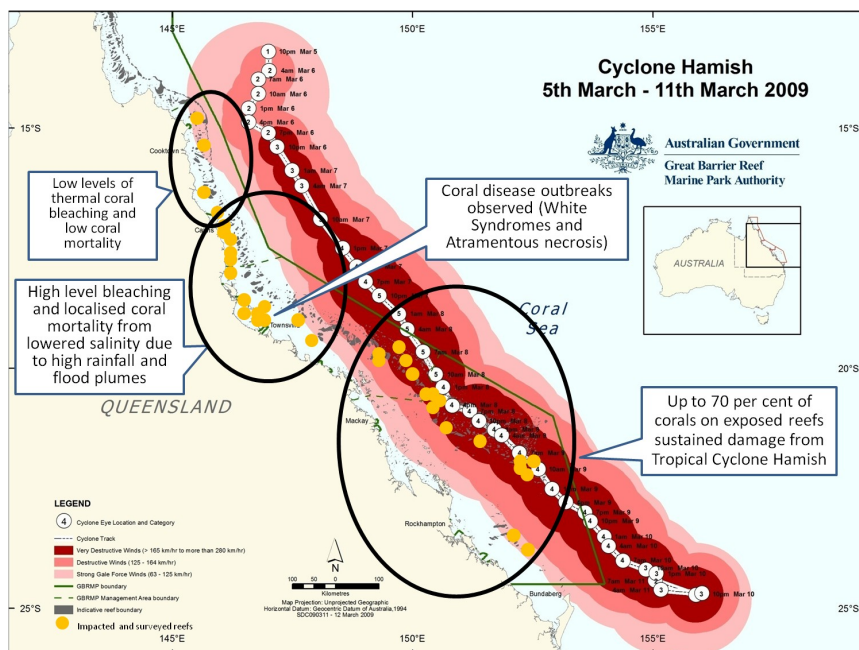


Figure 1: Track of Tropical Cyclone Hamish, with summary of 2008/2009 impacts on the Great Barrier Reef

Background

Each summer, the Great Barrier Reef is at risk from the impacts of climate related events such as thermal stress, heavy rainfall, flood plumes and cyclones. These events may directly damage coral reefs or cause stress leading to coral bleaching and disease.

During the 2008/2009 summer, three extreme weather events affected the Reef (Figure 1).

1) Extreme Temperatures

Predictive models indicated that there was a high likelihood of elevated sea surface temperatures affecting much of the Reef for the 2008/2009 summer. Elevated sea surface temperatures were recorded in a number of areas during December and January (Figure 2), but the prolonged monsoonal conditions from January 2009 reduced this temperature stress for much of the Reef.

2) Record Rainfall

Very high rainfall was experienced along the Queensland coast. The region between Cairns and Townsville received 600 mm of rain more than the three month average. This caused extensive flood plumes extending beyond the midshelf reef in some areas. In some nearshore areas, the run-off resulted in standing layers of fresh water over reefs, which caused strong gradients in temperature and salinity in the water column.

3) Tropical Cyclone Hamish

Tropical Cyclone (TC) Hamish was a category five system that tracked down the Reef between 5-11 March 2009 (Figure 1). More than 50 per cent of the coral reefs in the Great Barrier Reef Marine Park were affected by destructive or gale force winds. The highest impacts were seen on coral reefs and islands in the central and southern regions of the Reef.

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Outcome: A

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The most severe impacts were observed along a 500 km stretch of Reef running south from the Whitsundays to the Swains Reefs. Surveys from the Australian Institute of Marine Science (AIMS) estimated that up to 70 per cent of corals in this area sustained damage on the exposed windward faces of reefs, with less damage to leeward sides and sheltered reefs.

Impact summary

Each of these events caused stress and/or damage to the Reef ecosystem. The prolonged monsoonal conditions from January 2009 reduced temperature stress across most of the Reef, preventing water temperatures from exceeding coral bleaching thresholds in most locations. Despite the extremely hot conditions at the start of summer, mass coral bleaching did not occur and only localised minor thermal bleaching was observed on reefs in the northern half of the Marine Park.



Figure 3: Flood plume from Burdekin River—February 2009

Excessive rainfall and the subsequent flood plumes and run-off from the mainland and islands (Figure 3) lowered the salinity of inshore areas, which caused coral bleaching and localised coral death on shallow, inshore reefs between Cairns and Townsville. Coral disease outbreaks were observed on some of the reefs subjected to the flood plume and rainfall impacts. While these impacts are serious for individual reefs, damage from floodwaters was relatively minor on a Reef-wide scale.

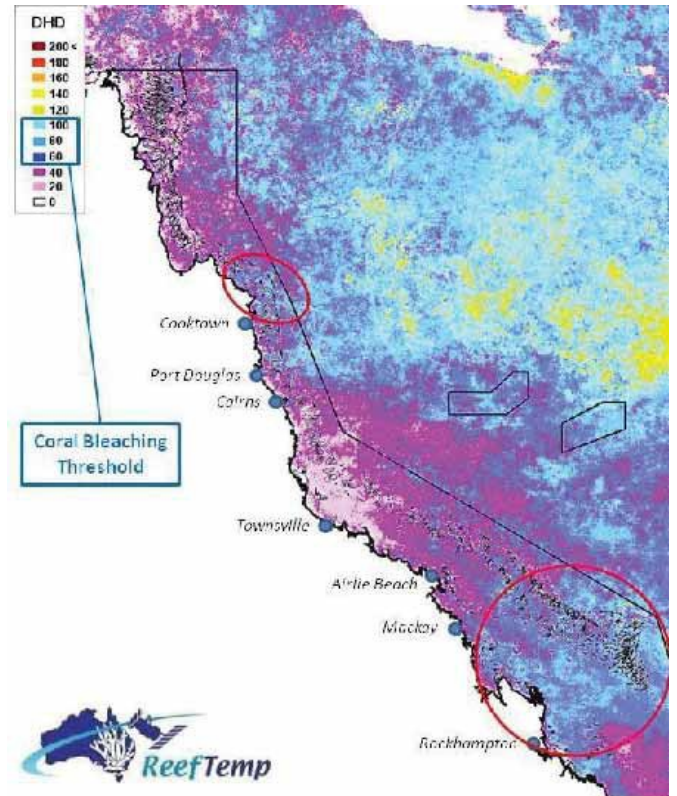


Figure 2: Accumulated heat stress (Degree Heating Days) on the Great Barrier Reef (28 January 2009)

TC Hamish affected a significant proportion of the corals along a 500 km stretch of the southern areas of the Reef. In the Swains Reefs there was also significant sand movement and vegetation scouring on many cays. As TC Hamish travelled through the area late in the breeding season, the rate of mortality of seabird eggs, chicks and young birds was lower than if the cyclone had occurred between December and February. Winter bird numbers and breeding efforts observed post TC Hamish were consistent with previous winter surveys. The full effects of TC Hamish on reef ecosystems, seabirds and other marine species is still being assessed.

Although neither the flooding nor the cyclones were unprecedented, both were considered extreme for such events.

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