

The northern section of the Great Barrier Reef is currently experiencing a major coral bleaching event, which is a stress response to higher-than-average water temperatures. This region of the Reef is experiencing large scale and severe bleaching for the first time. Whilst significant portion of the coral may actually die as a result of the bleaching, the corals that survive will be more tolerant of high temperatures in the future.

## What is coral bleaching?

Corals distinctive bright colours come from the presence of symbiotic algae (zooxanthellae) that live in their tissues and produce 90% of the corals energy requirement through photosynthesis.

Bleaching occurs when corals expel the majority of their zooxanthellae. Different varieties of coral have different temperature tolerance levels, but all coral is vulnerable to bleaching. If stressful conditions persist for an extended period, corals will eventually starve to death. The severity of coral bleaching depends on the duration of the stress event, the coral species, and whether the corals have previously suffered bleaching.

If conditions return to normal, corals can be recolonized by zooxanthellae that have survived the high temperatures and return to their normal colour and survive. Whilst these corals will not reproduce for one or two years, they will be more tolerant to higher temperatures in the future.

The past two decades have seen several incidents of widespread mass coral bleaching events on multiple coral reefs globally. There have been seven major bleaching events on the GBR, with three being particularly widespread – 1981-82, 1997-98 and 2001-02 – while a localised event occurred in the southern GBR in 2006.

During the **1997-98** mass bleaching event, 74% of inshore and 21% of offshore reefs surveyed had moderate to high bleaching. Most reefs recovered fully, with an estimated 2-5% of inshore reefs experiencing high coral mortality (approximately 400 km<sup>2</sup> of reef area). The most severely affected reefs were in the central GBR, where up to 70% of corals died.

In the summer of **2001-02** there was another mass bleaching event with bleaching observed in 54% of reefs surveyed. 41% of offshore and 72% of inshore reefs showed moderate to high bleaching and an estimated 5% of corals died (approximately 1,000 km<sup>2</sup> of reef area). The most severely affected reefs were in the central GBR, where approximately 70% of corals died.

In **2006**, sea temperatures in the southern GBR around the Keppel Islands reached 1-2°C above the seasonal average. Bleaching was observed in up to 98% of corals, with approximately 39% coral mortality on the reef flats and 32% mortality on deeper reef slopes.



# CORAL BLEACHING

## What's in the future for the Reef?

The GBR is expected to experience more frequent and more serious temperature stresses in the future. Previous mass bleaching events have shown that significant coral recovery can occur even from severe bleaching events. Importantly, the exposure of corals to high temperatures is a key determinant in whether they will bleach, and how much they recover from bleaching.

The Australian Institute of Marine Science and the University of Queensland are researching the ability of individual corals to increase their temperature threshold by 'shuffling' their zooxanthellae to preferentially host the zooxanthellae that are more tolerant of high temperatures.

Research is also being carried out on the adaptation of coral communities with higher temperature resistance through natural selection.

## Further Information

### 2016 Mass Bleaching

- <http://www.gbrmpa.gov.au/media-room/latest-news/coral-bleaching/2016/coral-mortality-rises-in-remote-far-north>

### Coral Bleaching

- <http://www.gbrmpa.gov.au/managing-the-reef/threats-to-the-reef/climate-change/what-does-this-mean-for-species/corals/what-is-coral-bleaching>
- [http://www.gbrmpa.gov.au/\\_\\_data/assets/pdf\\_file/0008/241793/Coral-Bleaching-Fact-Sheet.pdf](http://www.gbrmpa.gov.au/__data/assets/pdf_file/0008/241793/Coral-Bleaching-Fact-Sheet.pdf)
- <http://www.aims.gov.au/docs/research/climate-change/coral-bleaching/coral-bleaching.html>

### Ecological Impacts

- <http://www.aims.gov.au/docs/research/climate-change/position-paper.html>
- <http://www.gbrmpa.gov.au/managing-the-reef/threats-to-the-reef/climate-change/what-does-this-mean-for-species/corals>

### Surveillance and Monitoring

- <http://www.aims.gov.au/docs/research/climate-change/climate-monitoring/climate-monitoring.html>
- [http://www.gbrmpa.gov.au/\\_\\_data/assets/pdf\\_file/0019/4285/gbrmpa\\_CoralBleachingResPlan2011.pdf](http://www.gbrmpa.gov.au/__data/assets/pdf_file/0019/4285/gbrmpa_CoralBleachingResPlan2011.pdf)

### Early Warning System

- <http://coralreefwatch.noaa.gov/satellite/index.php>
- <http://www.gbrmpa.gov.au/visit-the-reef/current-conditions-on-the-great-barrier-reef>
- <http://www.gbrmpa.gov.au/media-room/latest-news/climate-change/2015/coral-bleaching-risks>

### Research

- <http://www.aims.gov.au/docs/research/climate-change/coral-resilience/coral-resilience.html>

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