

Putting the mass coral bleaching event in 2016 into a 30+ year context

Summary

- Over the past 12 months hard coral cover on the Great Barrier Reef declined by about a quarter, bringing average reef-wide coral cover down to 18%.
- These findings are based on survey results from 68 mainly mid and outer-shelf reefs to March 2017, and do not yet include the impact of Tropical Cyclone Debbie or the further intense coral bleaching in 2017.
- In general, the impacts of coral bleaching, cyclones and crown-of-thorns starfish outbreaks differ along the length of the Reef.
- In a longer term context, the scale of the coral cover decline in the Northern GBR since 2013 is unprecedented, first due to 2 severe cyclones and then the severe coral bleaching event which began 2016.
- In contrast, due to the proliferation of fast growing coral species and the absence of major disturbances, reefs in the Southern GBR continued to recover during the reporting period.

With the Australian Institute of Marine Science's (AIMS) reef surveys extending over more than 30 years, the AIMS Long-Term Monitoring Program provides an invaluable record of change in coral reef communities over a large area of the Great Barrier Reef.

This annual summary update of trends in coral cover across the whole GBR is based on surveys of coral cover on the perimeters of reefs using [manta tows](#). [Detailed reports](#) on the condition and trends of individual reefs are available shortly after survey completion of each survey trip.

In 2012, AIMS [reported](#) that average coral cover on the GBR halved over the preceding 27 years. That study divided the GBR Marine Park into three regions, each showing different trajectories of change in coral cover over time in response to the cumulative impacts of severe tropical cyclones, outbreaks of the crown-of-thorns starfish and coral bleaching.

These trajectories have now been updated to give a picture of average coral cover on the Great Barrier Reef up to March 2017. **It is important to note that these updated trajectories do not yet take into account the impact of Tropical Cyclone Debbie or the further intense coral bleaching in 2017.**

The dynamic nature of the GBR corals reefs, and the considerable variation between regions in the rates of decline and recovery of coral cover, are clearly apparent in the long-term record (see Figure 1).

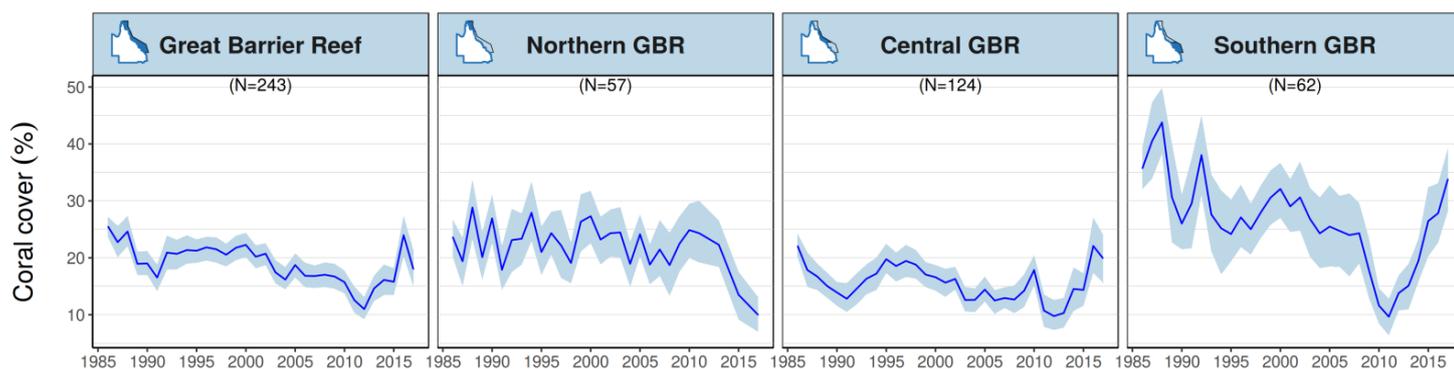


Figure 1: Trends in mean hard coral cover for the whole GBR and the Northern, Central and Southern regions, based on Bayesian hierarchical models. N indicates the number of reefs contributing to the analyses; blue shading represents 95% certainty.

Averaged for the whole GBR, coral cover has declined by about a quarter from 2015/16 to 2016/17.

As of early 2017, coral cover in the Northern GBR was less than half of what it was in 2013, due to mortality caused by two severe cyclones, an ongoing crown-of-thorns starfish outbreak and severe coral bleaching in 2016. This level of decline is unprecedented in the 30+ year time series.

Coral cover on reefs in the Central GBR has been generally lower than in the other two regions. Cover decreased to the lowest level on record in 2012, following the impact of Tropical Cyclone Yasi in 2011, and was on a trajectory of recovery up until 2016. Surveys in early 2017 showed that coral cover started to decline, in response to the 2016 coral bleaching and increasing crown-of-thorns activity in the region.

In March 2017, wide-spread coral bleaching [was again observed](#) on reefs in the Central GBR. [Aerial surveys](#) backed by diver observations showed that bleaching was most intense on reefs between Cairns and Townsville, but was evident on reefs from north of Princess Charlotte Bay to as far south as the Keppel Islands. Cloud cover and mixing of the water column by winds associated with Tropical Cyclone Debbie in late March 2017 may have eased bleaching conditions in the southern GBR, but wave action caused by the powerful and slow moving cyclone will have caused extensive coral loss on reefs in at least the Whitsunday region. The impacts of these latest disturbance events on coral cover will be assessed in future AIMS Long-Term Monitoring Program condition updates.

The sharp decline of coral cover in response to the severe disturbances affecting the GBR over the past two years is concerning. A [recent study](#) investigating the impacts of tropical cyclones on GBR reefs concluded that recovery can be strong on some reefs, as observed on reefs in the southern GBR. However, the predicted increases in the intensity of tropical cyclones due to climate change could greatly accelerate coral reef degradation and make it more difficult for reefs to bounce back from disturbances.

The future recovery of the much reduced coral cover in the Northern GBR cannot be predicted at present, because it is the first time a decline of this magnitude has been recorded in that region. Past AIMS survey results have shown that reefs subjected to major heat stress events [can exhibit slow rates of coral recovery](#), even if bleaching is not severe. Another factor of concern is the prevalence of coral disease on already stressed and impacted reefs. Post the 2002 heat stress event, reefs with the most reduced recovery rates had high levels of coral disease. Coral disease is a symptom of chronic ecosystem-level stress, and high levels of coral disease were confirmed at some reefs in February 2017.

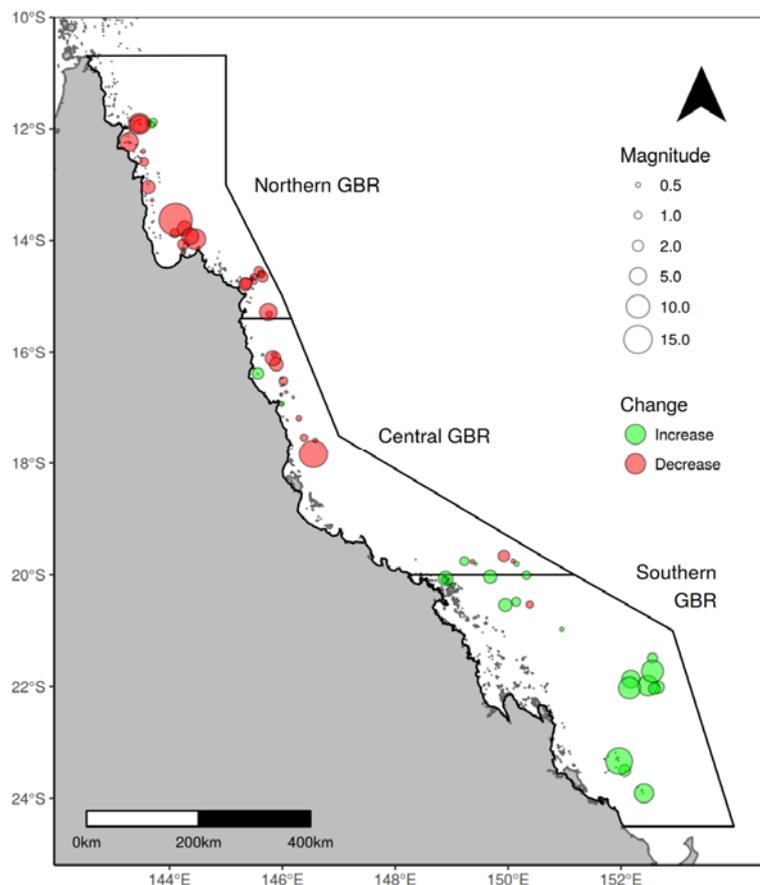


Figure 2: Boundaries of Northern, Central and Southern regions used in the trend analyses (Fig 1), locations of the 68 reefs surveyed by [manta tows](#) between September 2016 and March 2017. Size and colour of the symbols represent the absolute change in reef-level percent hard coral cover over 12 month to March 2017, displaying high variability between reefs and regions.

Note that reefs in the Townsville sector are not included as they were surveyed in May 2017 after the 2017 mass bleaching event started affecting reefs. Reef-level survey results will be reported shortly and data will be included in the next whole-GBR update in 2018.

Enquiries and further information

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