Reef & Rainforest RESEARCH CENTRE

REEF HAVENS RESEARCH PROJECT

The Reef Havens Research Project: An in-situ research platform for developing effective science-based local-scale knowledge & adaptive management actions for the Great Barrier Reef.

With back to back bleaching events in 2016 & 2017 the Great Barrier Reef is graphically displaying its inability to acclimatize to the stresses imposed by the current rapid rate of global climate change. Alongside global efforts to slow warming, we need to find new science-based ways forward for the Reef and the communities and industries that depend upon it.

In terrestrial ecosystems, active short-term intervention and management of refuges is considered warranted if it enables valued ecological communities to persist while more complicated longer-term and larger-scale solutions are enacted (*Morelli et al. 2016*).

Examples of common interventions on land to protect refugia include control of weeds and feral animals, fire management, revegetation and species reintroductions.

Unfortunately, on the Great Barrier Reef, we have limited knowledge of science-based tools and methods that could be used to adaptively manage refuges for persistence and/or better enable adaptation of complex coral communities to climate change, even at very small scales. The Reef Havens Research Project is helping address this significant gap in Australia's coral reef science and management capability.

This research collaboration between reef researchers, the marine tourism industry, engineers and managers has established an in-situ research platform at Moore Reef near Cairns (**Figure 1**) that will be used to increase mechanistic understanding of patterns in local- scale coral bleaching and recovery, and provide a field test-bed for lab and modelling studies. The Reef Havens Research Project has an independent scientific Steering Group and all data will be publicly available. Installation of the sensor network has commenced and it is already delivering data that is being used in the engineering design stage. The research platform is expected to be fully operational before the next coral bleaching season.

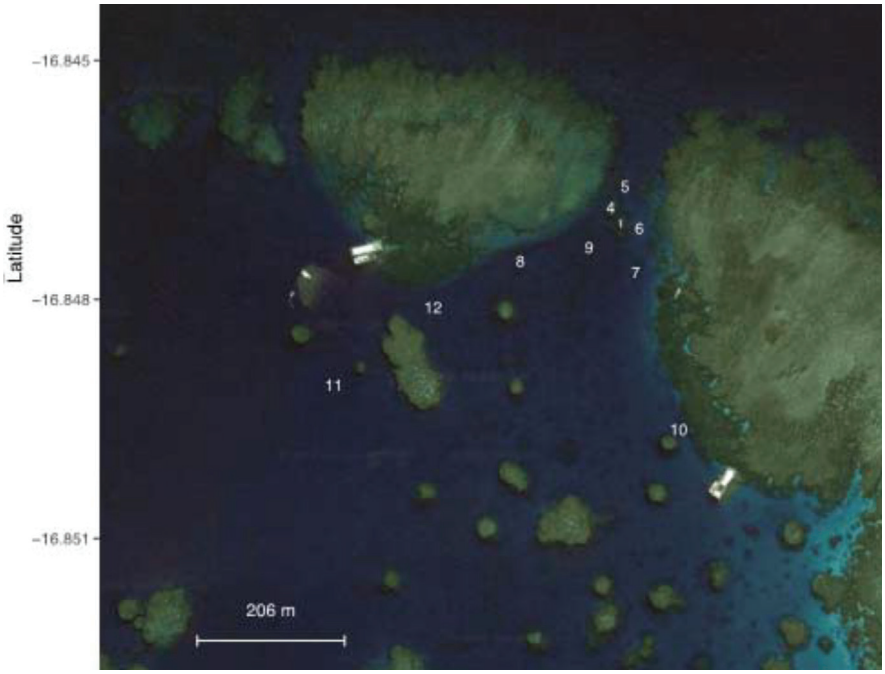


Figure 1: Location and scale of in-water monitoring array at Moore Reef, on the Great Barrier Reef near Cairns, showing two tourism pontoons. Moore Reef is the most economically valuable reef near Cairns for the tourism industry in terms of number of visitors per month. Numbers indicate location of temperature and current meters.

What we're going to test

We already know that local environmental conditions are a significant factor affecting bleaching severity and recovery after bleaching: reefs that are near upwellings, or experience cooler currents or wind mixing, tend to experience less severe bleaching, and those with few other pressures tend to recover better. Could science-based localised interventions that mimic these natural stress-reducing phenomena (for example by incrementally increasing water movement, reducing water temperature by 1-2°C, or disrupting the water's surface) reduce coral stress, bleaching severity and/or promote recovery on key reef sites, potentially providing time and space for natural acclimatization and adaptation processes to occur?

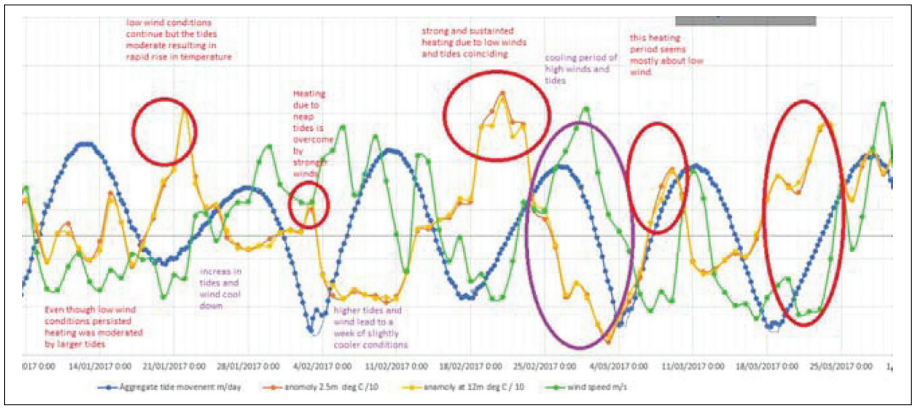
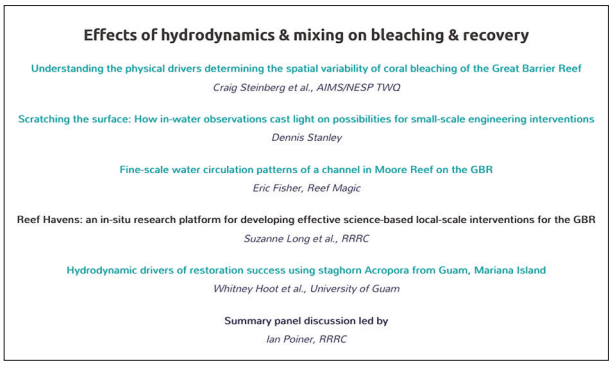


Figure 2: Wind, temperature and tidal flux data from the 2017 bleaching event at the tourism pontoon at Agincourt Reef, showing local spikes in water temperature (yellow) correlating with local weather (low winds and low water movement).

In the next stage we will investigate whether restoring "normal" water movement during summer doldrum days can reduce coral stress, reduce the severity of bleaching and/or improve recovery outcomes at the scale of a reef tourism site. Data collected at the site is already being analysed and is informing engineering design of temporary water mixers. All deployments will comply with all GBRMPA requirements.

Please note that the Reef Havens Research Project will NOT save the GBR from climate change. Global action to reduce emissions is essential. However, so are local actions that facilitate survival and adaptation – rather than death – while global-scale solutions are enacted. This project is funded for three years by the Australian Government through the Reef Trust. We thank our many partners for their ongoing contributions: Reef Magic/Experience Co., Quicksilver, AMPTO, eReefs, IMOS, AIMS, WEARS, EOMAP, Geosciences Australia, DeepReefs, UQ and GBRMPA.

More information from the special session on finescale hydrodynamics at the GBR Restoration Symposium: **https://gbrrestorationsymposium.org/index.php/home-page/video-page-tuesday/**



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