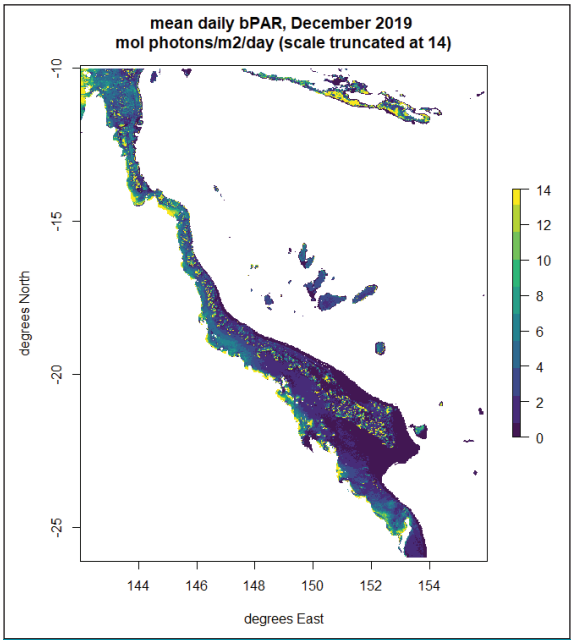
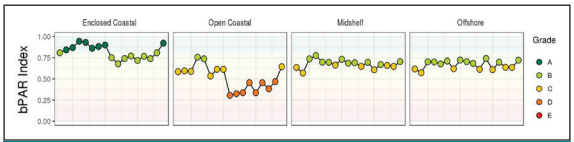
Outcomes Factsheet 2

Project 5.3 Benthic light as ecologically-validated GBR-wide indicator for water quality: Drivers, thresholds and cumulative risks



Map showing mean daily benthic light across the Great Barrier Reef (from satellite observations), December 2019. (Copyright: Australian Institute of Marine Science. Credit: Barbara Robson).



bPAR Water Quality Index derived from satellite imagery, showing year-to-year variations in the Fitzroy Region. (Copyright: Australian Institute of Marine Science. Credit: Barbara Robson).



Seagrass beds thrive where sunlight reaches the sea floor. (Copyright: Australian Institute of Marine Science. Credit: Sam Noonan)

A New Water Quality Indicator for the Great Barrier Reef

Corals need light. Seagrasses need light. Fish, dugongs and turtles need corals and seagrasses. Light drives the ecosystems and industries of the Great Barrier Reef.

The amount of light that reaches corals and seagrasses depends strongly on water quality, which varies from region to region and sometimes from one day to the next. To help environmental managers monitor changes in water quality in a way that relates directly to ecological outcomes, we have developed a new water quality index based on the amount of light that can be used by corals and seagrasses after reaching the sea floor. We can use this index to give each region of the Great Barrier Reef an annual benthic light Report Card score (A to E), so that we can keep track of how well the reef is doing.

We have been measuring water quality in the Great Barrier Reef (GBR) for many years and we know it is important. But how well can we relate water quality measures to changes in the health of the GBR? Traditional metrics such as Secchi depth (the depth at which we can just see a black and white disc lowered into the water) are only indirectly related to reef health. A better metric was needed!

We ran experiments to measure how corals respond to varying light conditions, and we reviewed the scientific literature to find out how much light seagrasses need. We developed an algorithm that uses satellite data to measure how much light reaches coral and seagrass habitats and used it to create daily maps of benthic light across the whole Great Barrier Reef. We used the results to create a new Water Quality Index (WQI) that can be used in future Report Cards.

The amount of light that reaches the sea floor and can be used by corals and seagrasses is called “benthic photosynthetically active radiation” (bPAR). As a result of our research, we can now map bPAR across the whole GBR every day using satellite ocean colour data. Additionally, we can use the eReefs models to simulate bPAR and predict how it might change under alternative land management scenarios.

Combining daily bPAR maps from satellites or models with information about how much light corals and seagrasses need, we have developed a new water quality index that can be used to relate variations in water quality to ecological outcomes across the Great Barrier Reef. Using this new bPAR water quality index, we can see how varying river loads affect water quality across the Reef, and track changes from year to year by assigning letter grades that can be used in Report Cards.

The bPAR water quality index complements previous metrics such as Secchi depth, as it can be related directly to the conditions experienced by corals and seagrasses, and takes into account water depth and other natural variations in environmental conditions in different parts of the Great Barrier Reef Marine Park.

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Tropical Water Quality Hub
National Environmental Science Programme

Australian Government

Australian Institute of Marine Science

James Cook University Australia

Reef & Rainforest Research Centre

This project is supported through funding from the Australian Government’s National Environmental Science Program