

Reef Check Australia

Report on the seasonal reef health surveys in Western Moreton Bay 2017-18



Reef Check Foundation Ltd. (Australia)
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Seasonal reef health surveys in Western Moreton Bay 2017-18



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Elisa Bayraktarov, Nathan Caromel, Jenni Calcraft, Paul Colquist, Isabelle Derouet, Philip Dunbavan,
Jody Kreuger, Denis Stojanovic, Hannaleena Vaisanen and Meg Vassie.

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We acknowledge the Traditional Custodians of the land, of Elders past and present.
They are the Nughi of Moorgumpin (Moreton Island), and the Nunukul and Gorenpul of Minjerribah.

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Monitoring locations

This report outlines the survey results documented at six Reef Check Australia monitoring locations located at Mud Island (2), St Helena Island (2), and Green Island (2).

Survey sites were selected to expand the representative cover of existing long-term Reef Check Australia reef health monitoring locations in Moreton Bay/Quandamooka. Reef habitat locations in Western areas of Moreton Bay are more likely to be exposed to land-based influences, hence the importance of conducting regular reef-health impact surveys at these sites.

Sites were selected to focus on areas of known concentrated coral cover based on reef habitat inventories (Roelfsema et al 2017) and to establish monitoring locations with varying habitat composition and aspects from the mainland.

Currently, RCA monitors eight other inshore Moreton Bay sites on an annual basis. This project expanded the scope by increasing site coverage to record data on community composition, condition and indicator wildlife to track trends and changes in the Western area of Moreton Bay in proximity to the Port of Brisbane.

Outcomes from this project include documenting:

- (i) Changes in relation to seasonal variation
- (ii) A baseline for comparison in the event of episodic events such as storms or floods, and;
- (iii) Potential long-term changes in community composition, condition and wildlife indicators to highlight potential management concerns relevant to marine habitat health.



Figure 1. Location of Reef Check Australia monitoring areas in the Western Bay, including Mud Island (2 sites: Coral Galore and Rubble Patch), St Helena Island (2 sites: Palindrome and Ray of Sunshine), Green Island (2 sites: North and West).

Inshore Reefs of Moreton Bay



Moreton Bay is considered a transitional marine zone, where temperate, tropical and sub-tropical species co-exist (Perry & Larcombe 2003). While there are notable fringing reef communities, the building of reef structures is generally limited by environmental factors such as light, temperature, water chemistry and/or turbidity (Fellegara & Harrison 2008, Kleypas, McManus & Menez 1999).

Studies have recorded 64 species of scleractinian corals, including 59 reef building species, within inshore Moreton Bay (Wallace et al 2009). The persistence of these recorded species in time and space suggest that these coral species are resilient, perhaps the result of persisting in a naturally dynamic system, with extremes in temperature, salinity, and turbidity (Wallace et al 2009). However, it should also be noted that before European settlement many more delicate branching *Acropora* corals would have dominated coral assemblages in the Bay, whereas today robust massive and encrusting coral species tend to dominate many Moreton Bay sites (Lybolt et al 2011).

The marine environments in Moreton Bay also host unique species assemblages and seasonal marine life aggregations (including mantas, leopard sharks and grey nurse sharks). Moreton Bay has critical cultural, social and economic value making it an important natural resource.

The SEQ region is significant as a unique transitional marine habitat that is located close to major metropolitan areas. Despite the uniqueness of these subtropical reef habitats and the wildlife they support, long-term monitoring of these habitats is relatively limited.

Mud Island and Green Island in particular are unique due to their geomorphic similarity to island types which typically only occur on the northern Great Barrier Reef (Allingham and Neil 1995; Neil 2000).



Image 1-2 (L to R). Foliose coral on the transect line (St Helena, Ray of Sunshine), soft and hard coral on the transect line (St Helena Palindrome).

Reef Check Australia (RCA) is an environmental charity dedicated to protecting Australia's reefs and oceans by engaging the community in hands-on citizen science and education initiatives. Survey teams are part of a worldwide network of trained volunteers that regularly monitor and report on reef health in more than 90 countries using a standardized scientific survey method.

The goal of Reef Check monitoring is to determine broad-scale trends of how our reefs are changing over time on both local and global scales. RCA data can provide scientists and managers with an early warning system to supplement other monitoring programs that document changes and disturbances on the reef.

RCA's citizen science monitoring program on South East Queensland's (SEQ) subtropical reefs provides crucial long-term data that assesses changing health conditions and supports appropriate management responses to help ensure long-term survival of the marine habitats.

Reef Check Surveys

Reef Check surveys are conducted along a transect line that is laid along a constant depth and reef habitat type. The total transect length that is surveyed is 80m, divided into four 20m sections or transect replicates.

A set of biological indicators were chosen for Reef Check, to serve individually as indicators of specific types of human impacts, and collectively as a proxy for ecosystem health. These indicators fall into the following categories:

- Percent cover of reef composition; surveyed using a "point sample" method with a plumbline, or weighted line. Divers record the substrate type that is directly below the tape measure every 0.5m along each of the four 20m sections interval to estimate percent cover of 25 substrate categories.
- Invertebrate, reef health impact and fish (when logistically suitable) abundance are documented using a 5m wide u-shaped search pattern across the transect line to search for target indicators.

For additional details on monitoring methodology, please see the [Reef Check Australia Monitoring Methods](#) (Hill & Loder 2013).



Image 3-4 (L to R). Reef Check Australia surveyor diver locating the start of the transect using towed GPS (Green Island North), and collecting data on the transect using visual census methods (St Helena, Ray of Sunshine).

Reefs under pressure

The proximity of Moreton Bay's marine environments to a major and rapidly growing population centre presents complex challenges for management. Moreton Bay is likely to face increasing anthropogenic pressures as the population grows exponentially, with numbers expected to reach 4 million by 2026.

Environmental factors such as poor light, temperature and turbidity (Fellegara & Harrison 2008) can already put these coral community on the marginal edge of growth. Stressors such as habitat loss, poor water quality, boating, anchoring, overfishing, marine debris and climate change related impacts will continue to grow with further consequences on the reefs of Moreton Bay.

Water quality has been an ongoing challenge for Moreton Bay marine environments since catchment development. A recent study by Lockington (2016) indicates that current coverage of muddy sediment in the Bay is 50 percent higher now than in 1970, making it the most dominant substrate type. The fine silt and clay from muddy sediments can result in significant stress for coral populations by smothering them, and interfering with transfer of light from the surface, as well as reducing opportunity for coral recruitment.

Healthy Land and Water produces an annual Report Card on the health of SEQ's waterways. The Report Card grades 18 catchments and 5 regions of the bay, using 25 environmental, habitat and social indicators that are combined into a single grade of environmental condition. In the report, RCA sites at Green Island and St Helena Island are included in the Western Bay assessments (a B grade in 2017), and Mud Island is located in the Central Bay (an A- grade in 2017). Both areas had "excellent" water quality reported (in 2017), but moderate mud ratings in the habitat score. The scoring draws attention to the issue that in the Western Bay 'poor flushing in many parts of the zone results in increased turbidity'. It should also be noted that mud content is measured approximately every 3 years by the University of Queensland and citizen science volunteers (HLW 2017).

Dredging activities are most likely to impact sensitive corals through temporarily increased turbidity and enhanced sedimentation. Sub-lethal effects of these environmental conditions may include reduced growth, coral bleaching, increased susceptibility to diseases, and/or physical damage to coral skeleton or tissue (Erftemeijer et al 2016). Dramatic influences can include coral mortality and shifts in community composition to increased cover of algae and non-coral benthic organisms such as sponges.



Image 5-6 (L to R). Coral recruit (Green Island North), and hard coral bleached with signs of sedimentation (Green Island North).

Seasonal comparison of substrate composition



Most sites remained relatively consistent aside from changes in sand/silt composition and changes in nutrient indicator algae. At 4 of the 6 sites, higher levels of nutrient indicator algae (NIA-mostly *Lobophora*) was recorded on winter surveys. The only sites that showed notable changes in coral cover were Mud Island Coral Galore (44% to 6%) and St Helena Ray of Sunshine (16-6% soft coral) in winter surveys.

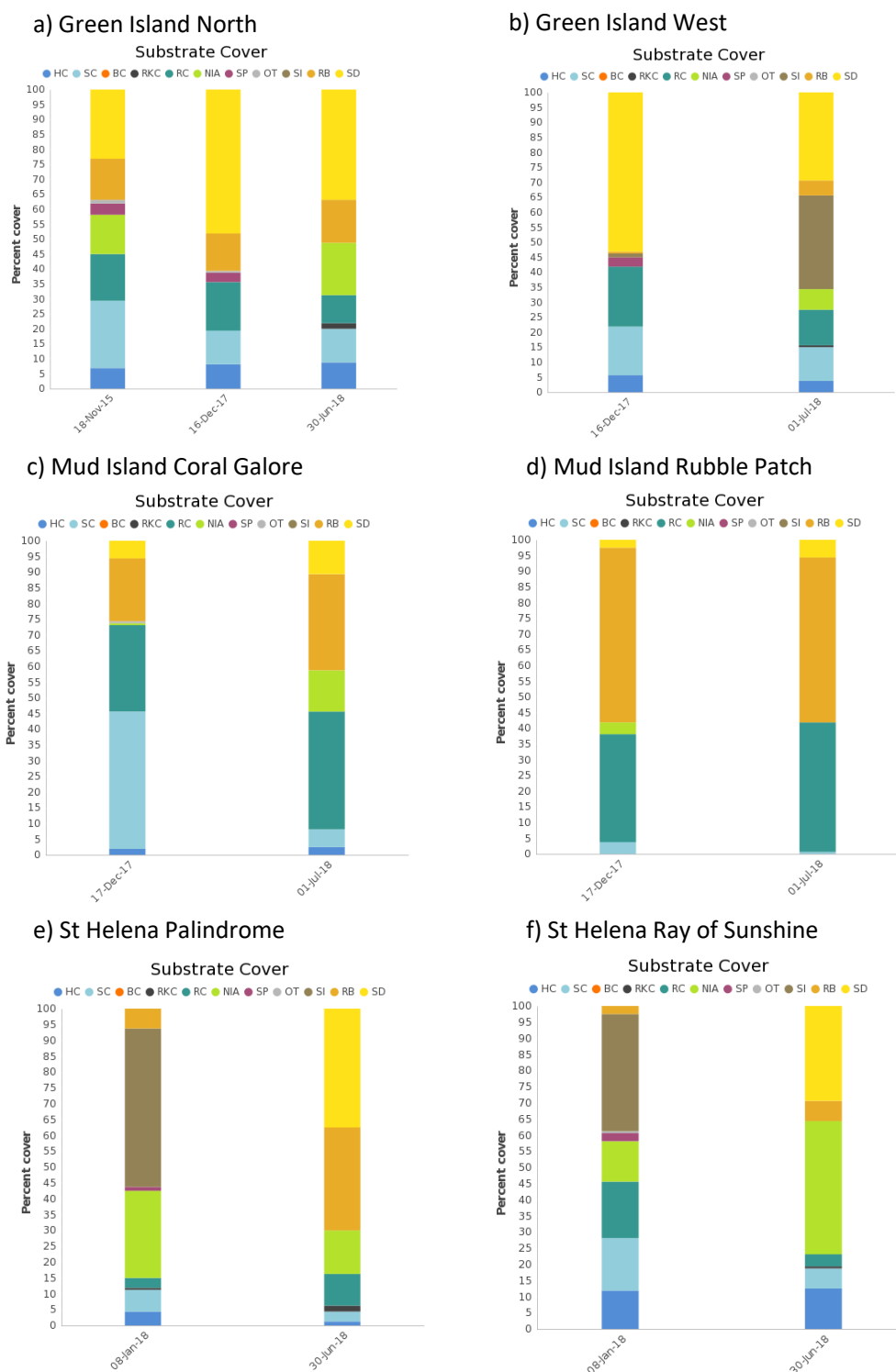


Figure 2: a-f. Reef habitat composition at each of the six monitoring sites for summer (Dec 2017-Jan 2018) and winter (June-July 2018) surveys.

Seasonal comparisons of algae, invertebrates and fish



Macroalgae abundances were higher on all sites during summer surveys. Macroalgae was predominantly *Sargassum*, *Padina* and *Asparagopsis*. At four of the six sites nutrient indicator algae had higher cover in winter than summer. *Lobophora* was the most commonly recorded nutrient indicator algae.

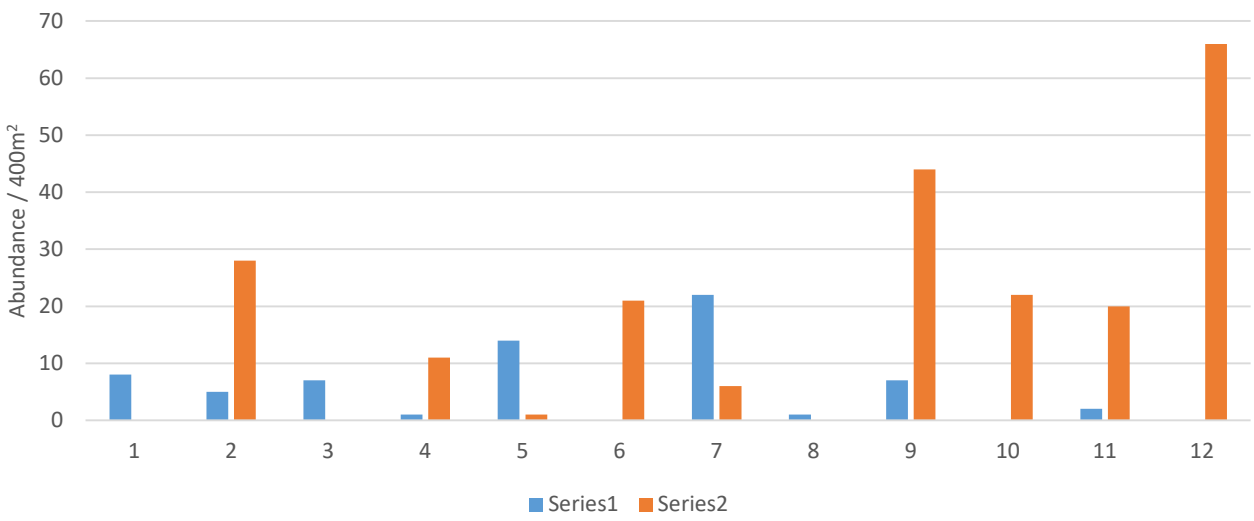


Figure 3. Seasonal algae trends at all monitoring sites. Macroalgae includes *Sargassum*, *Turbinaria*, *Padina*, and *Asparagopsis*. Nutrient Indicator Algae (often *Lobophora* and *Dictyota*).

For the most part, low numbers of indicator invertebrates and fish were recorded on surveys. This is not atypical for inshore Moreton Bay surveys. The most commonly recorded indicator invertebrate was *Drupella* snails. *Drupella* were most abundant at Mud Island Coral Galore, although this site did not have the highest hard coral cover (2-3%).

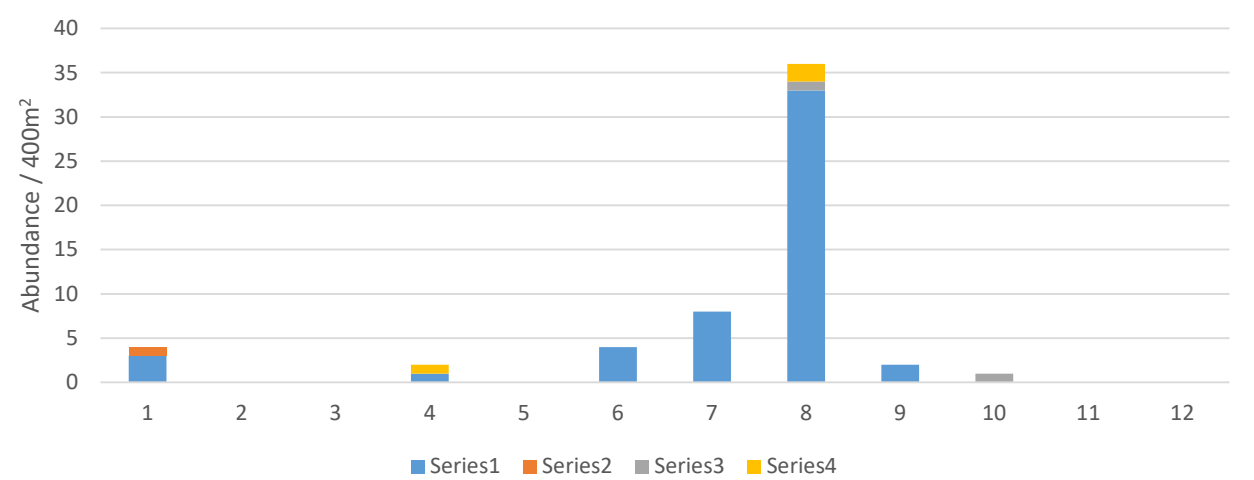


Figure 4. Seasonal trends of recorded indicator invertebrates and fish at all monitoring sites.

Seasonal comparisons of reef impacts



Coral scars were the most abundant reef health impact recorded on surveys. They were highest at Green Island sites in both seasons (scores of 2.5 – 8.5 relative to coral cover compared to scores of 0 – 0.75 elsewhere). St Helena Ray of Sunshine was the only site with coral damage recorded.

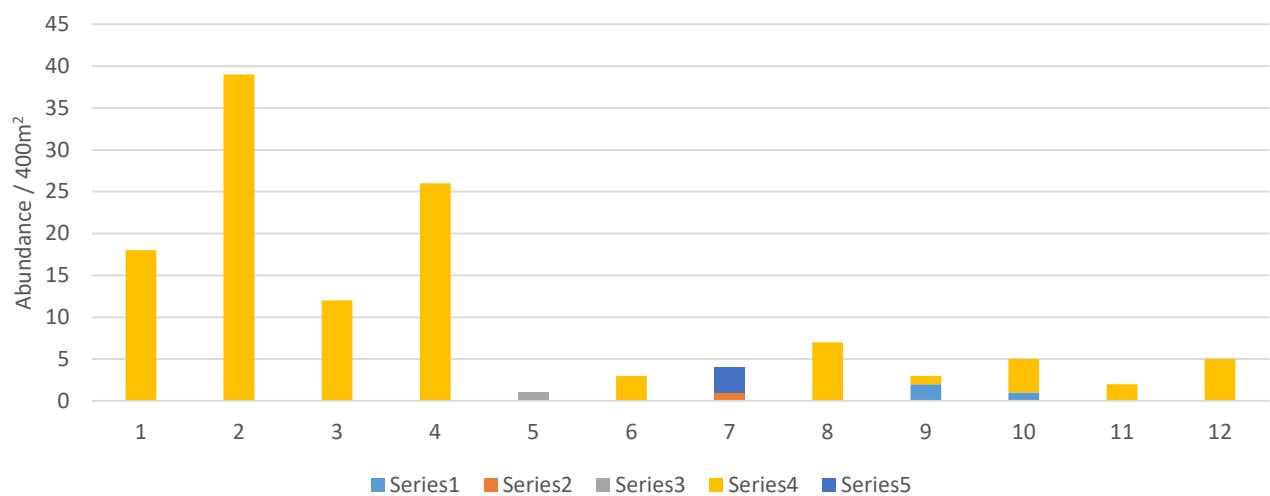


Figure 5. Seasonal reef impact trends at all monitoring sites.

Average levels of coral bleaching at the population level was higher in the summer at Green Island and St Helena sites. At Mud Island coral bleaching was higher in the winter.

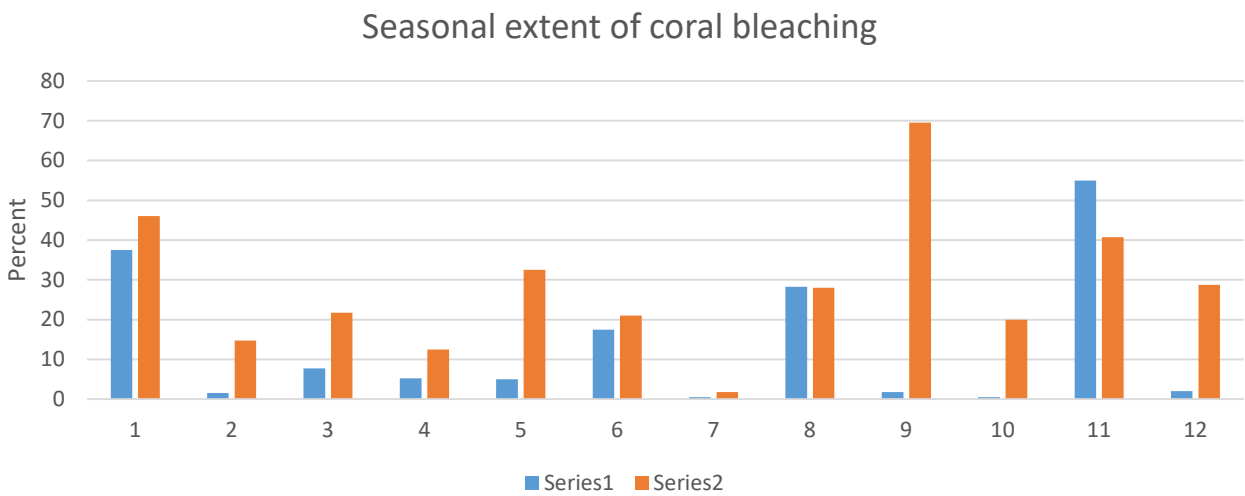


Figure 6. Seasonal trends of average population and colony level coral bleaching at all monitoring sites.

Moreton Bay (Western) Reef Monitoring images 2018

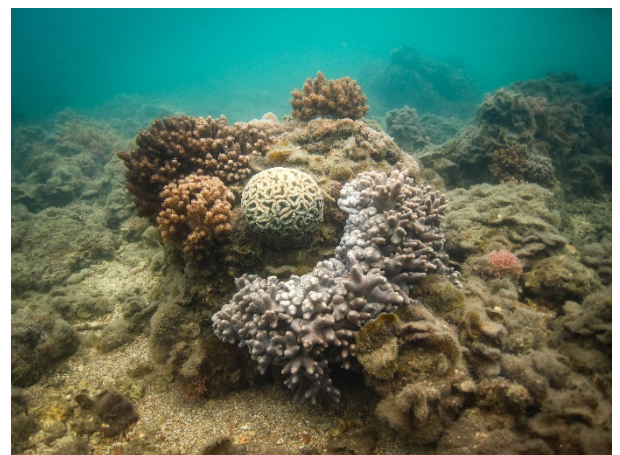
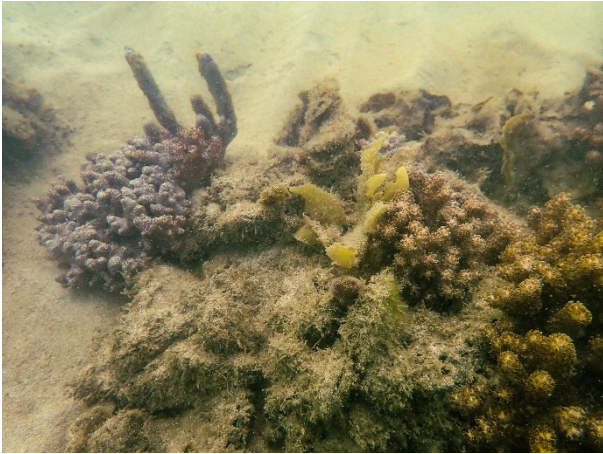


Image 7-12. Images: Site photos (summer and winter) Left to right, Top to bottom:
Green Island North December 16, 2017 and June 30 2018
Green Island West December 16, 2017 and July 1 2018
Mud Island Coral Galore December 17, 2017 and July 1 2018

Moreton Bay (Western) Reef Monitoring images 2018



Images 13-18: Site photos (summer and winter) Left to right, Top to bottom:
Mud Island Rubble Patch December 17, 2017 and July 1, 2018
St Helena Palindrome January 8, 2018 and June 30, 2018
St Helena Ray of Sunshine January 8, 2018 and June 30, 2018

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