Australian Government
Great Barrier Reef Marine Park Authority

Australian Government

Australian Institute of Marine Science

CSIRO

# REEF SNAPSHOT

## SUMMER 2019-20

# Foreword

Beautiful, vast and diverse, the Great Barrier Reef (the Reef) is an important part of the Australian national identity, a global environmental icon, economic powerhouse, and a key part of the spiritual and cultural identity of its Traditional Owners.

Like all reefs round the world, climate change is by far the most significant factor affecting the Reef, and the greatest threat to its long-term outlook. Coral cover has declined significantly over the past 40 to 50 years through a combination of successive cyclones, crown-of-thorns starfish outbreaks, floods and mass bleaching events, combined with insufficient time for recovery between these disturbances.

It is imperative that we monitor 'what is happening' on the Reef, and base decisions on quality science and information. The Great Barrier Reef Marine Park Authority (the Marine Park Authority), Australian Institute of Marine Science (AIMS), and CSIRO work together to ensure that the best available science is being used to ensure a healthy Great Barrier Reef for future generations.

We are not alone in our work. The future of the Great Barrier Reef depends on collaborative effort from all levels of government, science providers, industry, community organisations, and individuals. Noting its location off the Queensland coast, we work closely with Queensland Government agencies on the management of the Reef and the threats to it. Similarly, researchers at Queensland's universities contribute critical expertise and data that helps inform this management. For instance, managers partnered with scientists to develop the Reef 2050 Integrated Monitoring and Reporting Program, and joined the ARC Centre of Excellence for Coral Reef Studies at James Cook University on aerial coral bleaching surveys after this year's late summer hot weather.

As this snapshot shows, the Reef remains both amazing and vulnerable. This summer was Queensland's second warmest on record and by February-March sea temperatures were threatening the health of coral across large areas of the Reef. A mass coral bleaching event unfolded, the third in five years. Some southern areas of the Reef that escaped major impact during the 2016 and 2017 mass bleaching events have now experienced moderate to severe bleaching.

We acknowledge the impact that COVID-19 is having on businesses and communities. When it is safe to do so, we encourage people to see the Reef, love the Reef, and importantly protect the Reef.

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**This snapshot draws on various types of information, including:**

Climate time series data (www.bom.gov.au/climate/change)
Coral bleaching aerial surveys (Australian Research Council Centre of Excellence for Coral Reef Studies at James Cook University)
Cyclone wave damage predictions (www.nature.com/articles/srep26009)
eReefs GBR1 rivers 2.0 model data (http://dapds00.nci.org.au/thredds/catalogs/fx3/catalog.html?dataset=gbr1_2.0_rivers)
Eye on the Reef program data (www.gbrmpa.gov.au/our-work/eye-on-the-reef)
Long-term Monitoring Program survey reports (www.aims.gov.au/docs/research/monitoring/reef/latest-surveys.html)
ReefTemp data (www.bom.gov.au/environment/activities/reeftemp/reeftemp.shtml)

# About this snapshot

Summer is a critical time for the health of coral. This ‘snapshot’ provides a summary of the conditions on the Reef this summer, what this means for coral, and what actions are underway. The focus is coral, it does not examine the health of other habitats or species, however, these may be added for future snapshots.

Each year, towards the end of summer, the snapshot will be prepared by the three main Australian Government agencies responsible for Reef management and science; the Marine Park Authority, AIMS and CSIRO.

This snapshot is based on the latest available information at the time of writing. It does not take the place of ongoing rigorous reporting by all agencies. It sets the scene for the more comprehensive reports released later in the year, such as the mid-year Long-term Monitoring Program reports by AIMS and reports from the Marine Monitoring Program managed by the Marine Park Authority.

## What is the Reef?

Located off the Australian state of Queensland, the Great Barrier Reef is the world’s largest coral reef ecosystem. It includes almost 3000 individual reefs, about 10 per cent of the world’s coral reefs. Driving from the Reef’s most southern reef, near Bundaberg, to its northern tip, would take about 28 hours.

As well as coral reefs, the Reef encompasses an array of spectacular non-reef habitats, such as seagrass meadows, mangrove forests, shoals, beaches, cays and islands. It is home to thousands of different species, including bony fishes, sharks and rays, marine mammals, reptiles, seabirds and a wide variety of invertebrates.

Corals are the best-known part of the Reef’s ecosystem, often described as its ‘engine room’ because of their important role in providing habitat for an enormous variety of plants and animals. Without coral, the Great Barrier Reef would not exist.


### Coral monitoring programs

AIMS has been monitoring the length and breadth of the Great Barrier Reef for more than 35 years.

The Long-term Monitoring Program is the most comprehensive record of coral reef condition available for the Reef with a focus on the long-term trends in coral decline and recovery. Ninety-three reefs are routinely monitored as part of this program.

An additional 32 inshore reefs are monitored as part of the Marine Monitoring Program managed by the Marine Park Authority.

Additional observations are gathered by the multiple organisations and people contributing to the Eye on the Reef program, including through the Reef Joint Field Management Program.

# What has the Reef experienced?

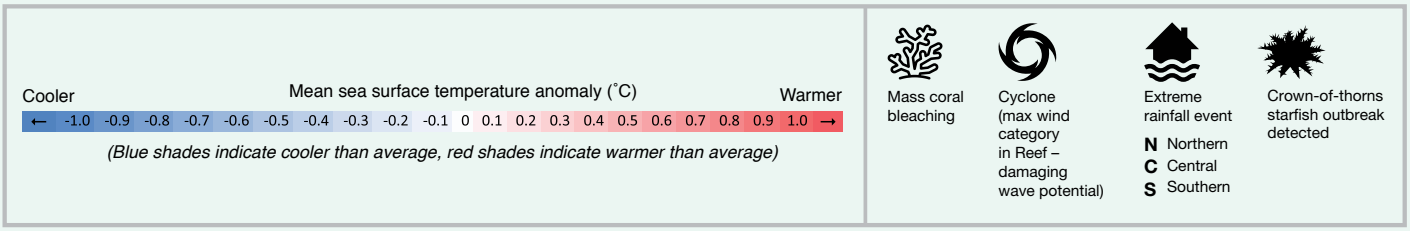
Just like any natural system, the Reef goes through cycles of disturbance and recovery. It is also very large, and disturbances affect it at a range of local and regional scales. This means Reef condition can be variable across different locations. For example, one coral reef may be badly damaged by a passing cyclone, while its neighbour fares much better.

Climate change is the greatest threat to the Reef. It influences weather patterns and the ocean's temperature, pH level and currents, as well as intensifying the effects of other threats. Climate change is escalating, and the Reef is already experiencing the consequences of this.

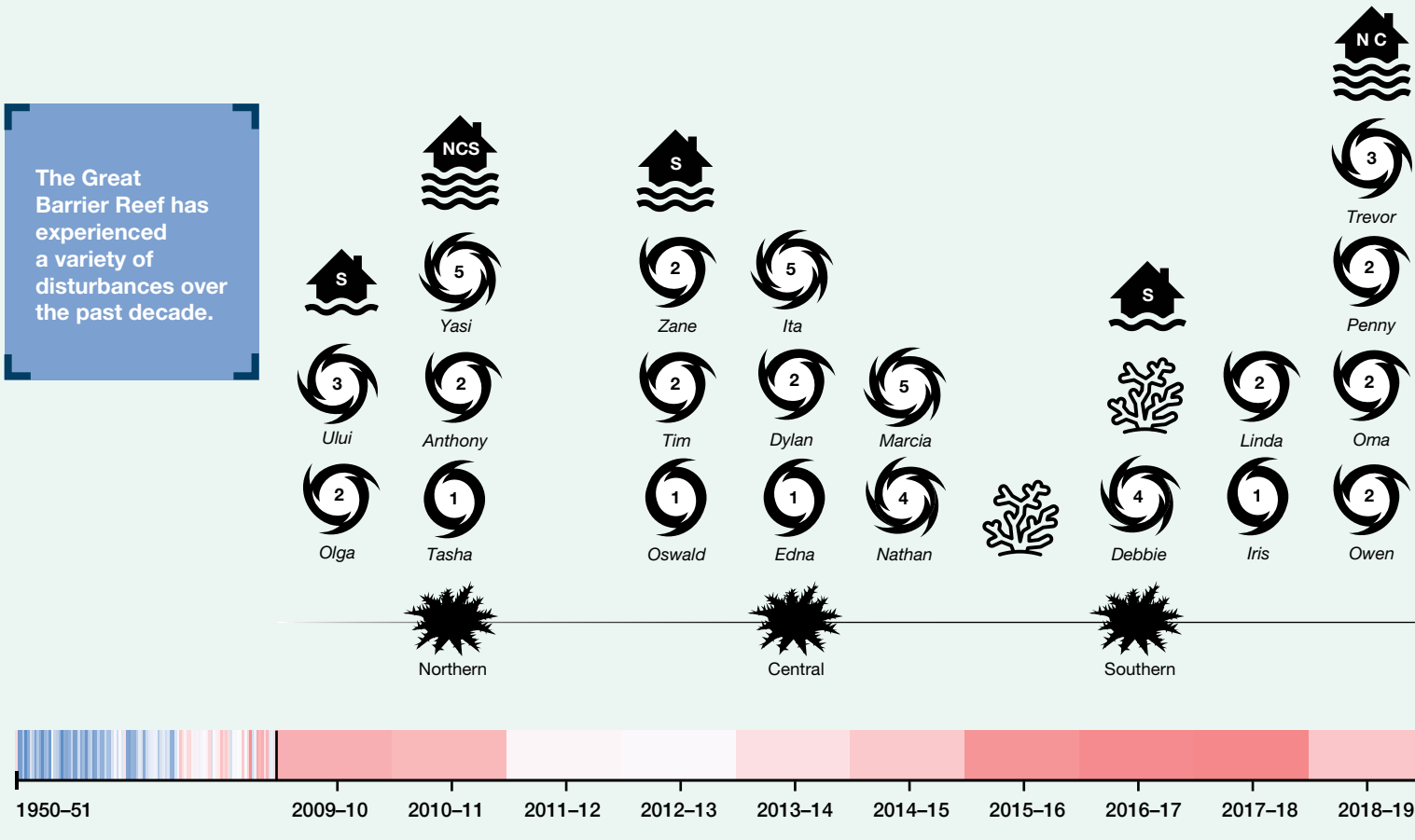
Unfortunately, the events that cause disturbances on the Reef are becoming more frequent, leaving less time for coral recovery.

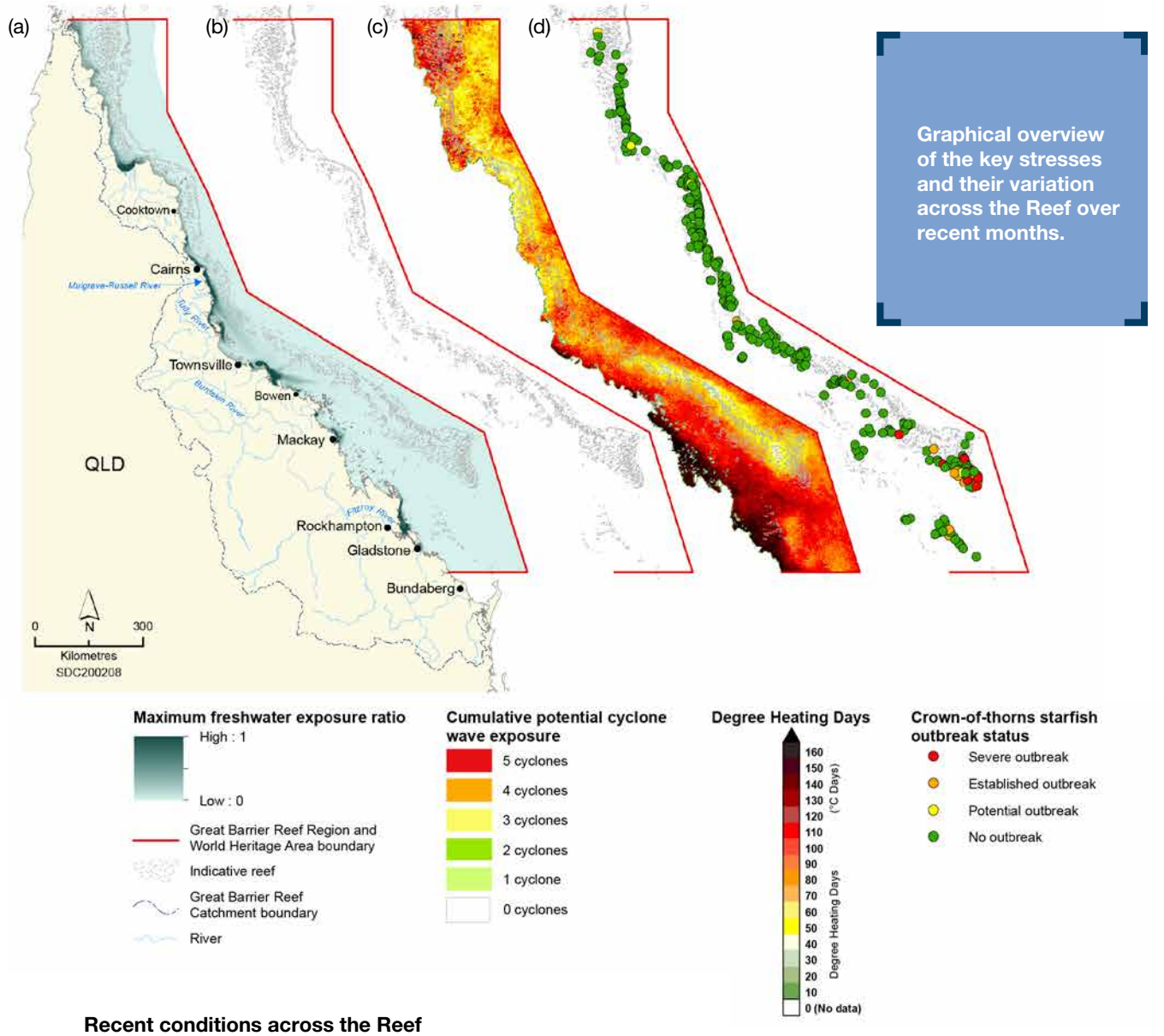
## Four key stresses on coral reefs:

- **Above average sea temperatures.** An increase of only one degree Celsius above normal summer maximum sea temperature for just four weeks can trigger coral bleaching and potentially death. The level of bleaching risk is assessed by the number of Degree Heating Days, a measure of the accumulation of heat stress over a period of time.
- **Cyclones and storms.** Powerful waves generated during cyclones can seriously damage habitat, particularly coral reefs.
- **Flood plumes.** When large volumes of fresh, muddy water flow from the catchment into the ocean after intense or prolonged rainfall, it is called a flood plume. Intense or prolonged rainfall events make this more likely. Flood plumes affect water quality, primarily through reduced clarity due to increased sediment and nutrients; this can affect coral health.
- **Crown-of-thorns starfish.** Crown-of-thorns starfish are a native coral predator, but when populations reach outbreak status (approximately 15 starfish per hectare), they eat coral tissue faster than it can grow.




**The Great Barrier Reef has experienced a variety of disturbances over the past decade.**






Graphical overview of the key stresses and their variation across the Reef over recent months.

**Recent conditions across the Reef**

(a) Maximum exposure to water from rivers on any single day between 1 October 2019 and 16 March 2020. Exposure values represent the ratio of freshwater to seawater at the sea surface, calculated using aggregated model data from the one kilometre resolution eReefs hydrodynamic model version 2.0 (GBR1_H2p0). *Data from CSIRO.*

(b) Estimated cumulative exposure to destructive waves (significant wave height of four metres or greater) from tropical cyclones between 1 July 2019 and 16 March 2020. *Data from AIMS.*

(c) Accumulated Degree Heating Days (DHD) as of 16 March 2020. The map shows 14-day DHD accumulated over the Reef during the period 1 December 2019 to 16 March 2020, based on the IMOS 2002-2011 climatology. *Data from the Bureau of Meteorology.*

(d) Crown-of-thorns starfish outbreak level observations between 1 July 2019 and 16 March 2020. *Data from the Marine Park Authority and AIMS.*

Ongoing crown-of-thorns starfish outbreak

JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER JANUARY FEBRUARY MARCH

**2019–20**

# What does this mean for coral?

During summer, surveys are conducted on the Great Barrier Reef to help us see how corals have been faring in different regions. The information below summarises what we know about coral condition as of the end of March 2020. It is a summary of what has happened over summer and gives the long-term context of the new observations. More comprehensive analyses and summaries will be available later in the year. A timeline of key monitoring reports appears on the back page of this snapshot. References for the information below appear on the inside cover.


## Northern

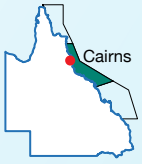
The northern region includes remote offshore coral reefs extending from Cape York down to Lizard Island. Reefs in the Cooktown-Lizard Island area were not surveyed by the Long-term Monitoring Program this year, as they will be a focus next year.

**In-water surveys** (November to December): This summer's surveys found moderate (10 to 30 per cent) levels of hard coral cover overall. Some areas were showing increases since they were last surveyed and others small declines (around Princess Charlotte Bay). A range of reefs had low coral cover, including several surveyed for the first time.

Low levels of crown-of-thorns starfish were recorded at some reefs. Damage from cyclones and mass bleaching events in previous summers was still evident at multiple survey reefs.

**Bleaching aerial surveys** (March): The Reef's waters continued to accumulate heat into late summer. This prompted Reef-wide aerial surveys of coral bleaching in the second half of March. In the northern region, both moderate and severe bleaching was seen on mid-shelf and inshore reefs. Little to no bleaching was recorded on outer-shelf reefs.

**Bleached corals are not dead corals. On mildly or moderately bleached reefs corals have a better chance of recovering, while on severely bleached reefs higher mortality rates are expected.**




## Central

The central region includes reefs from Cairns down to south of the Whitsundays. Only reefs off Cairns and Innisfail have been surveyed by the Long-term Monitoring Program so far. The planned remaining surveys on reefs off Townsville may be delayed due to the COVID-19 pandemic. Results from previous surveys indicate reefs in the central region sustained significant coral loss due to mass coral bleaching and severe tropical cyclone Debbie in 2017 and the continued southward spread of crown-of-thorns starfish outbreaks.

**In-water surveys** (February): This summer's surveys found hard coral cover was moderate for the Cairns area, and had increased slightly overall. In contrast, small coral cover declines were detected at over half of the reefs surveyed in the Innisfail area; cover was low (0 to 10 per cent) overall.

Although crown-of-thorns starfish were not seen on survey reefs, their recent activity has contributed to the observed low coral cover. Surveys of additional inshore coral reefs will be conducted by the Marine Monitoring Program over the coming months.

**Bleaching aerial surveys** (March): The March aerial surveys found generally moderate levels of bleaching on Cairns reefs. South of Cairns, however, particularly between Tully and Townsville, aerial surveys recorded widespread severe bleaching on inshore, mid-shelf and outer-shelf reefs. Similar impact was seen on inshore, mid-shelf and outer-shelf reefs south of Townsville, though reefs in the Whitsunday Islands experienced more moderate levels of bleaching. The outer-shelf reefs from Townsville south ranged from severe to low or no bleaching, however, most oceanic reefs on the outer edge of the continental shelf from Cairns to the Whitsundays were experiencing very severe levels of bleaching.


## Southern

The southern region includes reefs from the Pompey Reef area down to the Capricorn-Bunker area and out to the Swain Reefs. Six reefs remain to be surveyed, but results so far are described here.

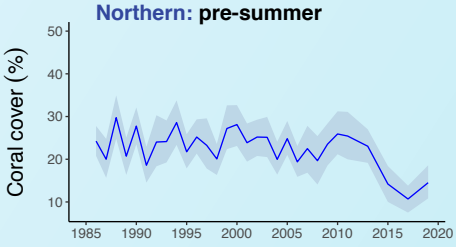
**In-water surveys** (September to January): Overall, hard coral cover was increasing for reefs in the Pompey Reef area, as they continued to recover from the past decade's cyclones and crown-of-thorns starfish impacts. Crown-of-thorns starfish are still active in this area.

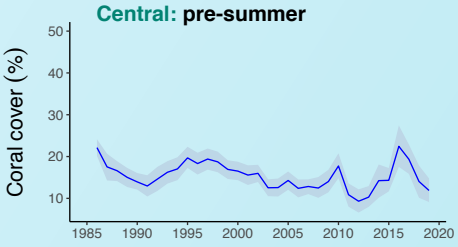
Hard coral cover was high in the Capricorn-Bunker area overall, with only marginal decline since last year. Increases were seen for some survey reefs and slight declines for others. A range of reefs had not yet recovered fully from previous disturbances including cyclones and crown-of-thorns starfish activities.

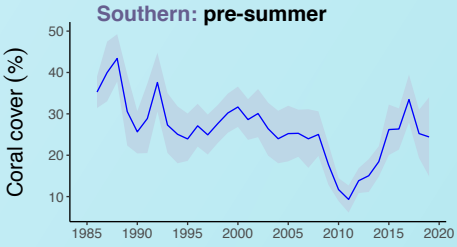
In the Swain Reefs area, coral cover across this year's surveyed reefs was moderate; a slight increase since they were last looked at. However, crown-of thorns starfish had caused substantial declines in coral cover on some reefs. Starfish numbers had increased to outbreak level at three surveyed reefs and declined below outbreak level at two others.

Surveys of additional inshore coral reefs will be conducted by the Marine Monitoring Program over the coming months.

**Bleaching aerial surveys** (March): In late March, around two-thirds of aerial survey reefs in the Pompey Reef and Swain Reefs areas were moderately to severely bleached. In the Capricorn-Bunker area, bleaching was variable; with reefs experiencing a wide range of bleaching. Very severe bleaching was also seen on inshore and mid-shelf reefs down to the southern boundary of the Marine Park, including around the Keppel Islands.



# What are we doing to help coral?

Supporting coral resilience is vital. Below are three examples of actions being taken to help coral.

## Controlling crown-of-thorns starfish

Outbreaks of coral-eating crown-of-thorns starfish are currently most severe on reefs in the central and southern regions of the Marine Park. The Marine Park Authority's Crown-of-thorns Starfish Control Program is reducing the impact of these outbreaks by culling starfish down to ecologically sustainable levels that promote coral growth and recovery. Over the past year, the program's vessel crews have effectively controlled outbreaks on reefs offshore from Mission Beach to Townsville in the central region, and also controlled outbreaks on reefs in the Capricorn-Bunker area at the far southern end of the Marine Park.

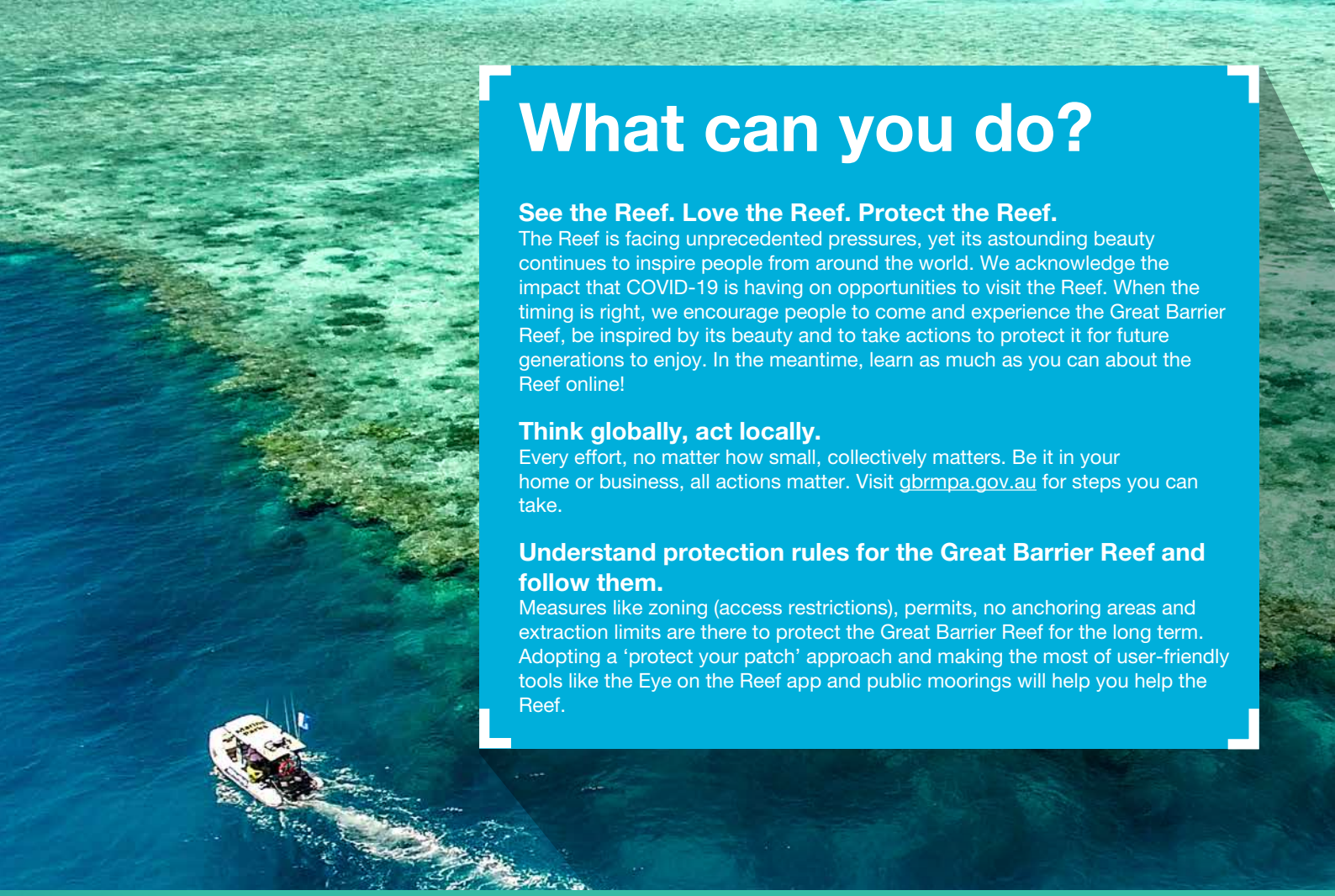
## Reef adaptation and restoration

Growing impacts from climate change reinforce the need for urgent global greenhouse gas mitigation, but also the need for us to develop new Reef management tools to better protect the Reef and enhance recovery processes. The Australian Government has committed more than $100 million towards researching and developing reef restoration and adaptation solutions that can be feasibly deployed at medium to large scales to help keep the Reef resilient and sustain critical functions and values. Coordinated trials to test and evaluate new methods are scheduled to begin from this year.


## Field management in action

For more than 40 years the Reef Joint Field Management Program has been providing a constant, in-park presence; delivering conservation actions, checking for change, responding to incidents, welcoming people and upholding compliance. Now with more than 140 staff, key in-field activities to protect the Reef include:

- installation and ongoing maintenance of more than 280 public moorings and 260 reef protection markers to protect coral
- supporting reef restoration trials such as coral larvae reseeding, coral spawn slick harvesting, and coral rubble stablisation
- delivering 1708 reef health and impact surveys across 189 reefs since 1 July 2019 and undertaking aerial flights to check reef health and coral bleaching
- ongoing sea, aerial and land patrols to educate about, and enforce, Marine Park rules.



# What can you do?

**See the Reef. Love the Reef. Protect the Reef.**
The Reef is facing unprecedented pressures, yet its astounding beauty continues to inspire people from around the world. We acknowledge the impact that COVID-19 is having on opportunities to visit the Reef. When the timing is right, we encourage people to come and experience the Great Barrier Reef, be inspired by its beauty and to take actions to protect it for future generations to enjoy. In the meantime, learn as much as you can about the Reef online!

**Think globally, act locally.**
Every effort, no matter how small, collectively matters. Be it in your home or business, all actions matter. Visit gbrmpa.gov.au for steps you can take.

**Understand protection rules for the Great Barrier Reef and follow them.**
Measures like zoning (access restrictions), permits, no anchoring areas and extraction limits are there to protect the Great Barrier Reef for the long term. Adopting a 'protect your patch' approach and making the most of user-friendly tools like the Eye on the Reef app and public moorings will help you help the Reef.

## Reef health monitoring

Each year, data on the health of the Reef's corals are collected, analysed, and shared. The timing of data collection periods, report releases and related workshops is shown below.

| Jul-Sep | Oct-Dec | Jan-Mar | Apr-Jun |
|---|---|---|---|
| Marine Monitoring Program surveys (inshore reefs) | Long-term Monitoring Program surveys (mainly mid and outer shelf reefs) | | Marine Monitoring Program surveys (inshore reefs) |
| Eye on the Reef (surveys/submissions) | | | |
| Long-term Monitoring Program annual summary report (annual) | Pre-summer workshop (annual) | | Post-summer Reef snapshot (annual) |
| Marine Monitoring Program reports (annual) | | | |

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