Preservation of the Great Barrier Reef: Overview

Introduction

The Great Barrier Reef is the largest tropical coral reef in the world. It extends 2,300 kilometres off the coast of northern Australia and covers an area of approximately 350,000 square kilometres. The Great Barrier Reef, which is home to over 1,500 species of fish and 400 species of coral, was identified as a World Heritage Site in 1981 by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). The sheer size of this pristine marine environment makes it hugely significant to the biodiversity and environmental health of the planet. The reef also plays a major economic role—typically, an estimated 2 million tourists visit the reef each year, bringing in billions of dollars in tourism revenue. By the late twentieth century, however, the adverse effects of pollution and climate change on the reef became a subject of growing concern. There have been various governmental measures and other efforts to protect and sustain the Great Barrier Reef, but there is also ongoing debate over which preservation strategies are most effective.

Understanding the Discussion

Climate change: Long-term changes in climatic cycles around the world. The term is often used specifically in reference to global warming and related changes caused by human activity, especially greenhouse gas emissions.

Coral: Marine invertebrates classified in the phylum Cnidaria that usually live in colonies made up of numerous polyps, creating colourful and exotically shaped structures. Most species of corals have stony exoskeletons, and some form reefs as new colonies grow on top of older deposits over many generations.

Coral bleaching: A phenomenon in which stressed corals expel the symbiotic algae (zooxanthellae) that normally live inside them, causing the coral to turn white. Bleached corals are unhealthy and will die if their conditions do not improve. Mass coral bleaching is most commonly associated with warming ocean temperatures.

Reef: A stable landscape feature located below the surface of a water body. Many reefs are formed by coral colonies and their limestone deposits.

Left: A variety of healthy corals form an outcrop on Flynn Reef, part of the Great Barrier Reef. Toby Hudson, CC BY-SA 3.0, Wikimedia Commons. Right: Bleached branching coral (Acropora sp.), Keppel Islands, Great Barrier Reef. CC BY-SA 3.0, Wikimedia Comm

History

The Great Barrier Reef is estimated to have originated approximately half a million years ago, although its geological and ecological history is complex. Researchers have suggested that the current formation is mostly between six thousand and eight thousand years old, having become established since the last Ice Age. Located off the northeastern coast of Australia, the Great Barrier Reef includes about 2,500 individual coral reef structures. These unique habitats have made the region one of the richest ecosystems in the world, home to thousands of animal and plant species.

The reef has also long been important to humans. Archaeological evidence of people in the Great Barrier Reef region has been traced back thousands of years. These findings suggest that Aboriginal and Torres Strait Islander peoples historically used the reef, islands and adjacent mainland to fish, hunt and gather. It is the Torres Strait Islander peoples, whose heritage lies in the Torres Strait between the tip of Cape York Peninsula in northern Australia and Papua New Guinea to the north, who are considered the traditional owners of the Great Barrier Reef. Torres Strait Islander peoples traditionally sailed south along the Great Barrier Reef and Cape York Peninsula coastline and made contact with Aboriginal Australian groups to exchange tools, culture and goods.

British explorer James Cook was the first European to document the Great Barrier Reef, in 1770. European colonisation of Australia soon began to disrupt traditional Indigenous Australian peoples' use of the reef ecosystem. Europeans made use of the rich fishing grounds themselves, and explored parts of the reef as a shipping hazard. However, direct exploitation of the Great Barrier Reef was fairly limited into the twentieth century.

The post–World War II period in Australia, which saw substantial population growth up and down the east coast, further compromised the relatively harmonious relationship that Indigenous Australian peoples had with the natural environment. The Great Barrier Reef coastal region quickly became one of Australia’s most important agricultural and tourism areas in the 1950s and 1960s. However, issues such as increasing tourism numbers, overfishing and high rates of pollution resulting from inadequate town and rural waste management control started to impact the health of the reef.

For much of the 1960s and 1970s, the Great Barrier Reef was also placed under great pressure from companies seeking new resource areas to cater to local and national energy demands. It was during this time, under the slogan 'Save the Barrier Reef', that the Great Barrier Reef became the subject of one of the biggest conservation campaigns in Australian history. In 1974, a Royal Commission into oil drilling on the Great Barrier Reef highlighted the scarcity of scientific knowledge about the ecosystem, as well as the lack of a dedicated regulatory authority to

manage it. This activity culminated in 1975 with the Great Barrier Reef Marine Park Act establishing the Great Barrier Reef Marine Park as a protected area and the Great Barrier Reef Marine Park Authority (GBRMPA) as its management organisation. The park included most, but not all, of the vast reef complex. Several state and national parks were also created in parts of the vast reef system. Additional protection efforts continued through the late twentieth century as the Great Barrier Reef was increasingly recognised as a vital and iconic biodiversity hotspot. Notably, the area was named a UNESCO World Heritage Site in 1981.

The GBRMPA became the principal adviser to the Australian government on the care and development of the Great Barrier Reef ecosystem, often working closely with the Government of Queensland as well. The agency adopted the official goal 'to provide for the protection, wise use, understanding, and enjoyment of the Great Barrier Reef in perpetuity through the care and development of the Great Barrier Reef Marine Park'. To meet this goal, the GBRMPA identified four critical issues driving its charter: conservation, heritage and Indigenous partnerships; tourism and recreation; water quality and coastal development; and fisheries. It established four subagencies to manage these issues on behalf of the Australian Government.

The initial efforts of the GBRMPA to protect the reef from overuse from fishing, tourism and coastal development were largely considered a success. Still, by the early twenty-first century, experts noted that pressures on the reef ecosystem were continuing to grow. This led the GBRMPA to introduce a new zoning plan for the Great Barrier Reef Marine Park in 2004. The zoning system increased the amount of ‘no-take’ areas from 4.5 per cent to 33 per cent of the total park area. Although the amount of fishing was greatly restricted because of the move, research found that 'a majority of fishers believed that rezoning the Marine Park was necessary, that the new zoning plan had high conservation value, and that the plan had little impact on their recreational fishing activity', according to Stephen G. Sutton and Renae C. Tobin in a 2009 article for the journal *Environmental Conservation*.

The Great Barrier Reef Today

The Great Barrier Reef Marine Park Authority remained the key player in reef preservation efforts in the 2010s and 2020s. It continued to work to balance the Great Barrier Reef's environmental and economic value, encouraging sustainable use to help ensure that the iconic ecosystem survives. However, observers increasingly recognised climate change as a major, deepening existential threat to the reef. The global nature of this problem made it especially difficult to counteract, and experts debated the best ways to respond. Meanwhile, other human impacts such as runoff pollution, ocean dumping, and overfishing also persisted—and often overlapped with climate-related challenges in complex ways.

Researchers identify increasing water temperatures as the single biggest threat to the Great Barrier Reef. Warming water causes large-scale coral bleaching events, damaging the health of the coral that makes up the reef structure itself. This in turn negatively affects all the other organisms the reef supports. Scientists attribute rising ocean temperatures to the broader phenomenon of global warming. Climate change has also been linked to other factors that can damage reefs, including more frequent and more powerful storm activity and other extreme weather events. Warmer, polluted waters may also contribute to mass outbreaks of the crown-of-thorns starfish—a sea creature that feeds on coral polyps and can devastate large areas of reef when populations boom.

According to a 2012 Australian Institute of Marine Science study, living coral cover on the reef fell from 28 per cent in the 1980s to 13.8 per cent that year. Two-thirds of this steep decline had occurred in the years since 1998. Around 48 per cent of the decline could be attributed to storm damage, with an additional 42 per cent

caused by the crown-of-thorns starfish. Several mass bleaching events weakened corals in large portions of the reef, making them more susceptible to predators, disease, and other threats.

Following such drastic coral loss, the international community called for ever greater protection efforts for the Great Barrier Reef. Some observers criticised Australia’s efforts in caring for the reef, leading the country to enact stronger conservation and preservation measures. In July 2015 UNESCO announced that it would not list the reef as 'in danger', although it would continue to reconsider the matter. The organisation also warned the Australian Government that it must take action to stop the reef’s decline within five years. In particular, it noted the negative impacts of port development projects, water pollution and other human-caused factors.

The Great Barrier Reef was notably excluded from a 2016 report on the effects of climate change on world heritage sites, published jointly by UNESCO, the United Nations Environment Programme and the Union of Concerned Scientists. It was subsequently revealed that the omission was not from a lack of concern, but rather a response to the Australian Department of Environment's request to remove all mentions of Australia. A department spokesperson explained that 'negative commentary about the status of world heritage properties impact[s] on tourism'. In fact, at the time of the report, 93 per cent of the reef had succumbed to coral bleaching, and scientists had warned in April that nearly half was dying or already dead. Much of the damage had happened during an underwater heatwave in March 2016. By October of that year, corals were still dying because of the bleaching event, and scientists from the Australian Research Council (ARC) Centre of Excellence for Coral Reef Studies reported that the proportion of live coral in the reef had fallen to just 5 per cent. However, scientists stressed that the reef was not completely dead and that all efforts should still be made to save it.

In response to public pressures, the federal government and Queensland jointly produced a management strategy known as the Reef 2050 plan in 2015. It set high water-quality targets, banned the dumping of dredged materials in the marine park, aimed to lower nitrogen and sediment run-off from agriculture and proposed methods to control crown-of-thorns starfish. UNESCO required intermittent progress reports based on the plan, and in 2017, the reef once again narrowly avoided UNESCO's 'in danger' designation. However, the ARC Centre and other environmental monitoring groups continued to report extensive coral bleaching and die-offs amid record-high water temperatures.

Many scientists urged the government to revise the Reef 2050 plan, which they saw as inadequate, especially in relation to the broad threat of climate change. Groups such as the Independent Expert Panel on the Great Barrier Reef and the Australian Marine Conservation Society argued that Australia needed to make drastic reductions in greenhouse gas emissions to truly protect the reef. However, other observers countered that Australia's reef preservation efforts were strong and that adding more requirements to the Reef 2050 plan was unnecessary. For example, Environment Minister Josh Frydenberg argued that the federal government was already addressing climate change concerns through its Paris Accord commitments. Some tourism operators also expressed scepticism about the extent of the reef damage reported by environmentalists.

In August 2020, an updated draft of the Reef 2050 Long-Term Sustainability Plan was released for public comment. The updated plan increased focus on climate change, while also acknowledging that Australia is limited in what it can do unilaterally to confront that global problem. Other key changes to the plan included calls for stricter regulation of activities in and around the reef; increased involvement of Indigenous Australian communities in management of the reef; new urban runoff water pollution control measures; an increase in marine litter removal

operations; stricter enforcement against illegal fishing; better management and control of coastal development; increased protection of seagrass communities that dugongs need to survive; replacing or replenishing damaged or destroyed corals through reseeding and relocation; and increased spending for experimental measures to help the reef adapt to higher ocean temperatures.

Meanwhile, the Great Barrier Reef Marine Park Authority reported that about 25 per cent of the Great Barrier Reef had suffered a severe mass bleaching event in early 2020. This was noted as the third mass bleaching event to affect the reef in five years. It was also considered one of the most severe and widespread such events on record, linked to further record-setting ocean temperatures. In 2021, UNESCO again considered inscribing the Great Barrier Reef as 'in danger', arguing that Australia's preservation efforts were still not strong enough. The Australian Government campaigned against this recommendation, however, and the designation was ultimately avoided once more.

In 2022, yet another mass coral bleaching event was reported. This was considered especially notable as it came despite overall cooler conditions in the El Niño–Southern Oscillation (ENSO) climate cycle. Ocean temperatures then spiked again, with the 2024 average in the region one of the warmest on record. Despite these challenges, scientists did report some optimism around findings that certain Great Barrier Reef coral species showed an unexpected level of resilience in their ability to survive and recover from mass bleaching events. Some researchers suggested that certain coral species might be evolving to be more adaptable in response to climate change.

- *These essays and any opinions, information or representations contained therein are the creation of the particular author and do not necessarily reflect the opinion of EBSCO Information Services.*

Bibliography

Bulman, May. "Great Barrier Reef Life under Threat as Coral Continues to Die Six Months after Mass Bleaching." *The Independent*, 26 Oct. 2016, www.independent.co.uk/news/world/australasia/great-barrier-reef-corals-dying-bleaching-climate-change-ecosystem-damage-a7380596.html. Accessed 28 Oct. 2016.

Ceccarelli, Daniela, et al. "High Coral Cover Amid Intense Heatwaves and Bleaching? Here's How Both Can Be True On the Great Barrier Reef." *The Conversation*, 6 Aug. 2024, theconversation.com/high-coral-cover-amid-intense-heatwaves-and-bleaching-heres-how-both-can-be-true-on-the-great-barrier-reef-235510. Accessed 21 Oct. 2024.

Foley, Mike. "Australia Saves Great Barrier Reef World Heritage Status, Cops Climate Deadline." *The Sydney Morning Herald*, 23 July 2021, www.smh.com.au/politics/federal/australia-saves-barrier-reef-world-heritage-status-cops-climate-deadline-20210723-p58cio.html. Accessed 13 Aug. 2021.

"The Great Barrier Reef." *Department of Climate Change, Energy, the Environment and Water*, Australian Government, www.dcceew.gov.au/parks-heritage/great-barrier-reef. Accessed 21 Oct. 2024.

"Great Barrier Reef." *UNESCO*, whc.unesco.org/en/list/154/. Accessed 21 Oct. 2024.

Gronewold, Nathanial. "Australia Floats Plan to Better Protect Great Barrier Reef." *Scientific American*, 25 Aug. 2020, www.scientificamerican.com/article/australia-floats-plan-to-better-protect-great-barrier-reef/. Accessed 26 Feb. 2021.

Knaus, Christopher, and Nick Evershed. "Great Barrier Reef at 'Terminal Stage': Scientists Despair at Latest Coral Bleaching Data." *The Guardian*, 9 Apr. 2017, www.theguardian.com/environment/2017/apr/10/great-barrier-reef-terminal-stage-australia-scientists-despair-latest-coral-bleaching-data. Accessed 24 Aug. 2017.

“Learn: About the Reef.” *Great Barrier Reef Marine Park Authority*, Commonwealth of Australia, www2.gbrmpa.gov.au/learn. Accessed 21 Oct. 2024.

Markham, Adam. "Australia's Iconic Great Barrier Reef World Heritage Site at Risk from Global Warming." *The Equation*, Union of Concerned Scientists, 26 May 2016, blog.ucsusa.org/adam-markham/australias-iconic-great-barrier-reef-world-heritage-site-at-risk-from-global-warming. Accessed 13 Oct. 2016.

Readfearn, Graham. “Great Barrier Reef’s Third Mass Bleaching in Five Years the Most Widespread Yet.” *The Guardian Australia*, 6 Apr. 2020, www.theguardian.com/environment/2020/apr/07/great-barrier-reefs-third-mass-bleaching-in-five-years-the-most-widespread-ever. Accessed 25 Feb. 2021.

Slezak, Michael. "Australia Scrubbed from UN Climate Change Report after Government Intervention." *The Guardian*, 27 May 2016, www.theguardian.com/environment/2016/may/27/australia-scrubbed-from-un-climate-change-report-after-government-intervention. Accessed 14 Oct. 2016.

Slezak, Michael. "The Great Barrier Reef: A Catastrophe Laid Bare." *The Guardian* , 7 June 2016, www.theguardian.com/environment/2016/jun/07/the-great-barrier-reef-a-catastrophe-laid-bare. Accessed 14 Oct. 2016.

About the Author

Michael Grosvenor is a commentator and freelance writer on sustainability issues and a leading urban and transport planning professional. He has a master’s in urban affairs and in public policy and applied social research. He is the author of *Sustainable Living for Dummies* (2007) and *Sustainable Australian Travel for Dummies* (2009).