

Tides of time



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Global warming has led to the bleaching and death of corals in Australia's Great Barrier Reef, the largest of Unesco's 878 World Heritage sites. What is being done to increase the resilience of the reef and help it withstand the impact of climate change?

SPOTLIGHT | Climate change and coral reefs

The Great Barrier Reef: Seeking a balance between conservation and development

A significant threat to coral reefs — and to Australia's Great Barrier Reef because it is the world's largest — is climate change. Global warming is causing ocean temperatures to rise. When water exceeds seasonal maximums by 1 or 2 degrees Celsius (1.8 to 3.6 degrees Fahrenheit) for six to eight weeks, corals "bleach," or turn pale.

Rising temperatures cause corals to lose microscopic algae contained in their tissue. The dazzling hues of living corals come from the colors of these algae, which carry out photosynthesis and provide nutrients that help corals build reef structures. When high temperatures persist for more than eight weeks, corals begin to die.

Mass bleaching occurred in the summers of 1998 (the warmest in a century), 2002 and 2006. Says Kishore Rao, deputy director of Unesco's World Heritage Centre: "It's definitely an issue in the Great Barrier Reef. In 1998, about 30 percent of the reef was bleached, but the big bleaching event occurred in 2002, when about 60 percent of the reef surveyed was reportedly bleached."

The 2002 bleaching was the largest on record. But more recently, in the summer of 2006, bleaching affected the southern section of the Great Barrier Reef. According to

the Great Barrier Reef Marine Park Authority (Gbrmpa), inshore reefs were badly affected by the unusually warm water that persisted in the area for more than two months. Conditions were especially severe in the Keppel Islands, where more than 80 percent of corals bleached and 40 percent died. Fortunately, the marine park authority says, the rest of the Great Barrier Reef suffered little bleaching that year.

The Gbrmpa warns, however, that projections of future water temperatures suggest bleaching could become an annual event. It compiled a "Vulnerability Assessment" on the Great Barrier Reef and climate change, which states: "Even under the most optimistic climate-change scenarios, the Great Barrier Reef is destined for significant change over this century; under pessimistic scenarios, catastrophic impacts are possible. It is inevitable that climate change will continue to cause degradation of the Great Barrier Reef over coming decades."

A report by the United Nations Panel on Climate Change warns that the Great Barrier Reef could be "functionally extinct" by 2030. The challenge is to make sure this doesn't happen.

Corals are beautiful, living animals that are enjoyed by divers, but they are also vital to marine ecosystems. Their death — and

the resulting disappearance of reefs — would mean the loss of countless marine invertebrates and fish that rely on reefs for survival. Their disappearance would also mean falling income from tourism, fishing and discovery of new medicines.

Declared a World Heritage Site in 1981, the Great Barrier Reef stretches across 2,600 kilometers (1,616 miles) and contains thousands of individual reefs, making it the largest of Unesco's 878 World Heritage sites and the world's biggest structure made by living organisms.

Unesco's World Heritage Centre helps monitor this vast expanse, but as Rao explains: "You can't do much locally to deal with global warming. What you can do is reduce stress on the reefs — what we call the nonclimatic stress factors. In other words, increase resilience of reefs to withstand global warming pressures." That means, Rao adds, ensuring that other burdens, like tourism, are well controlled.

Tourism in the Great Barrier Reef is a billion-dollar industry, and particular attention is paid to minimizing its potentially adverse effects. Among the dangers of excessive tourism are pollution and vessel waste, as well as physical damage to the reef from anchors, snorkelers, divers, reef walkers, fishermen and collectors. Today, tourism in the Great Barrier Reef is well regulated, and both water quality and coastal development are closely monitored.

Unesco cannot — and does not desire to — keep people off the Great Barrier Reef. Its goal is to provide for preservation, but it also seeks to promote the wise use, understanding and enjoyment of the reef among its 1.8 million annual visitors.

The Gbrmpa works with the Australian government and tourism associations to develop codes of conduct, management plans, educational programs and incentives (such as ecotourism certification). Today, tourists cannot get to the Great Barrier Reef without a licensed tour operator. The Gbrmpa is involved in extensive training programs, instructing operators on how to educate tourists on best practices.

"We have seen some very positive developments in the marine tourism industry," points out Dr. Russell Reichelt, chairman of the Great Barrier Reef Marine Park Authority. "Some operators now offer climate-neutral

reef trips to reduce the carbon emissions of their businesses."

There are ongoing links between the Great Barrier Reef and Unesco's World Heritage Centre. The Gbrmpa is the local site manager, and it works with the international organization to help minimize the impact of climate change by monitoring water quality, marine pollution, fishing, tourism and coastal development. Together, for example, they seek ways to reduce pesticides on land from flowing into the waters of the Great Barrier Reef.

Says Rao: "The site demonstrates both conservation and development. They may seem to be opposing objectives, but can be balanced. If there is one place where you can teach how to best manage a marine World Heritage site, Great Barrier Reef would be the one. It's not just protected. It's there for people to appreciate and use." ■

Sites share expertise

Staff of the Great Barrier Reef Marine Park Authority often share many management lessons they've learned with other World Heritage sites. For example, Jon Day, one of the Gbrmpa's directors, discussed management approaches and issues relevant to the Island of Coiba at a workshop in Panama. "The Marine Park has been around for 30 years," Day says, "and what we've learned has been useful for others. Specific issues vary depending on the site, but many principles are the same. The quality of water coming from land is a big issue facing many marine areas. Managers need to think outside their World Heritage area, as much as depend on the management of the surrounding area as well." Visit <http://whc.unesco.org>

The Great Barrier Reef could be 'functionally extinct' by 2030

DIVING | Pleasure and prudence

Visible from outer space, reef is best seen by divers

The Great Barrier Reef is so huge that it is visible from outer space, but the only way to really experience it is under water. The reef is one of the richest ecosystems in the world, a unique environment where divers enjoy close-up looks at an immense diversity of undersea life.

Part of what makes the Great Barrier Reef different from other reef ecosystems is its sheer size. The reef contains the world's largest collection of coral reefs, with 400 types of coral, 1,500 species of fish and from 4,000 to 8,000 types of mollusc, including the giant clam. It holds great scientific interest as the habitat of the dugong (sea cow) and large green turtle, which are threatened with extinction. In the reef, sharks and stingrays live alongside whales and dolphins. The reef is also home to 1,500 sponges and 500 kinds of seaweed.

Water quality is best at the reef's outer reaches, making these areas the most favored diving sites. Local tour operators,

such as the Cairns Diving Center, recommend August through January for best visibility. Autumn (April-June) is generally dry, and the north's tropical climate warms the water to 75 to 85 degrees Fahrenheit (about 24 to 30 degrees Celsius). In winter, water may be cold at some southern parts of the reef.

Divers have several options for a home base, including Cairns and Townsville; these cities offer the easiest access to diving spots and plenty of sleep-aboard tours and charters. Divers might also want to stay on one of the nearby islands, such as Whitsunday Island. Cairns is the biggest city offering reef access; visitors can reach diving areas in 90 minutes. Cairns also has the closest international airport.

From Townsville, it takes two-and-one-half hours to drive to the Great Barrier Reef; diving tours of an historic shipwreck, the S.S. Yongala, leave from here. The official site for Australian Travel and Tourism Australia (www.australia.com) has a directory that in-



The Great Barrier Reef contains the world's largest collection of coral reefs.

cludes reputable and ecologically sensitive diving tours.

Farther out, the Ribbon Reefs are ideal for novices and advanced divers throughout the year. The Planetary Coral Reef Foundation, a nonprofit group, recommends diving at Steve's Bommie. "Fish here are used to divers, showing little concern at close quarters," states the PCRFF. "There are always schools of jacks, tuna and barracuda; schools of unicornfish, goatfish, snappers, bigeye and red-toothed triggerfish were seen on all our dives."

Divers interested in whales should plan their trip for winter (June-August) or spring (September-November). Minke and humpback whales spend winter near the Whitsunday Islands and can still be found in the spring. They migrate through the waters of the Ribbon Reefs. Minke whales, operators say, are playful and curious, and often stay with diving vessels for hours, so chances for close encounters are high.

Phil Hutchens, an instructor at Barracuda Divers in Alabama who went diving in the Ribbon Reefs, says: "I've been a diver for 28 years and an instructor for much of that time, and I never had an experience like we had on this boat — everything from snorkeling with Minke whales to night dives."

Wherever they choose to dive, visitors should be careful to avoid damaging the reef, and they should be aware that taking coral as a souvenir is illegal. ■

Why time and technology are essential for divers

Divers need to master time. They must stay within the limits of their oxygen supply and monitor the correct levels of decompression when resurfacing. All this makes a watch essential. But a diver's watch must be readable under water, absolutely fail-safe and watertight. It has taken decades to develop the technology needed to meet these requirements. Jaeger-LeCoultre created the first watertight watch in 1939. Twenty years later, it developed the Memovox Deep Sea, the first diving watch with an alarm, which alerted the diver that it was time to resurface.

Creating a dozen models for divers has prompted the company to take advantage of the latest in underwater technology. To launch 2007's new Master Compressor Diving-watch series, the Swiss

watch manufacture turned to Total Marine Technology, an Australian builder of customized diving robots that go to depths humans cannot reach. These remotely operated vehicles (ROVs), often designed for the offshore drilling or engineering industries, are built for heavy-duty work in deep-sea water. To prove the Master Compressor Diving was watertight to 1,000 meters (3,280 feet), the ROV, called Jaeger-LeCoultre-1, plunged to 1,080 meters off Hawaii and Indonesia with a Master Compressor Diving secured to its side. At 1,000 meters, the watch's convex sapphire glass, a mere 3.6 millimeters (0.14 inch) thick, must withstand pressure of 900 kilograms, the weight of a small car. The watch returned to the surface without the slightest damage.

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