

Honduran earthquake of 2009 destroyed half of coral reefs of Belizean Barrier Reef lagoon

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Earth's coral reefs have not been faring well in recent decades, facing multiple threats from pollution, disease, elevated water temperatures, and overfishing. Often referred to as the "rainforests of the Sea," coral reefs support a wide variety of marine life, help protect shorelines, and contribute significantly to tourism and the fishing industry. A new study looks at a rare but catastrophic impact on reefs: the damage caused by natural disasters such as an earthquakes.

In May of 2009, a powerful, magnitude-7.3 earthquake shook the western Caribbean, causing lagoonal reefs in Belize, 213 kilometers (132 miles) from the epicenter, to avalanche and slide into deeper water. As reported in a preprint article of *Ecology*, a journal of the [Ecological Society of America](#), Richard Aronson of the Florida Institute of Technology and colleagues analyzed data that suggest how the history of the reef will influence its recovery.

During the quarter-century before the earthquake struck, the reefs had gone through mass mortalities of two sequentially dominant [coral species](#). Novel events in their own right, these mass mortalities were instantly "rendered moot" on half the reefs, which were destroyed when the earthquake hit.

Aronson and colleagues' work focused on a 375-square-kilometer (144-square-mile) area of the Belizean Barrier Reef, which they monitored from 1986 to 2009. The group revisited 21 sites in 2010 to determine the impacts of the earthquake. They found that approximately

half the reef slopes had slabbed off and slid into deeper water. Only sediment and the skeletal debris of corals remained.

Beginning in 1986, a bacterial infection called white-band disease killed virtually all the then-dominant staghorn [coral](#) (*Acropora cervicornis*) in the study area. By 1995, lettuce coral (*Agaricia tenuifolia*) had taken over the number-one spot. But when [high temperatures](#) from the 1998 [El Nino](#)–Southern Oscillation, which were aggravated by global climate change, caused mass coral bleaching, lettuce coral disappeared. An encrusting sponge (*Chondrilla caribensis*) colonized its skeletal remains, along with seaweed. What's astonishing about this series of events, say the authors, is that—as evidenced by radiocarbon-dating of reef cores—staghorn coral had dominated the reefs for nearly 4,000 years.

"The prior losses of both staghorn and lettuce corals drastically weakened the resilience of the coral assemblages on the reef slopes," says lead author Aronson. "In other words, if neither white-band disease nor bleaching had occurred, staghorn coral might have continued its millennial-scale dominance of the areas not destroyed by the quake."

The authors project that recovery to a coral-dominated state is unlikely in the near future, because corals in the undamaged areas had been killed previously. The situation is unlikely to change unless the way we manage reef resources improves dramatically.

Marine protected areas are meant to sustain an area's ecological, cultural, and economic benefits for future generations. Yet creating and managing these areas is easier said than done. Aronson and colleagues contend that extreme events, such as earthquakes, lava flows, and tsunamis, should be taken into account when determining the size of and managing such protected areas.

"The rhetoric of conservation often includes the appeal of preserving

ecosystems so that our children's children can enjoy Nature's bounty," says Aronson. "That translates to about 200 years, but ecosystems last far longer than three generations of their human stewards. We challenge marine conservationists to plan on a millennial scale. Rare, catastrophic events are the backdrop to human actions. Those rare events should be factored into determining the sizes of marine reserves and their levels of protection, whatever else might be expected to happen along the way. After all, a once-in-a-thousand-year disaster could still occur next week."

Provided by Ecological Society of America

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