

# Heat and cold damage corals in their own ways, study shows

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Around the world coral reefs are facing threats brought by climate change and dramatic shifts in sea temperatures. While ocean warming has been the primary focus for scientists and ocean policy managers, cold events can also cause large-scale coral bleaching events. A new study by scientists at Scripps Institution of Oceanography at UC San Diego compared damage to corals exposed to heat as well as cold stress. The results reveal that cool temperatures can inflict more damage in the short term, but heat is more destructive in the long run.

The study is published in the Feb. 2 issue of *Scientific Reports*, a publication of the [Nature Publishing Group](#).

Climate change is widely known to produce warming conditions in the oceans, but extreme cold-water events have become more frequent and intense as well. In 2010, for example, [coral](#) reefs around the world faced one of the coldest winters and one of the hottest summers on record.

During a unique experiment conducted by former Scripps Oceanography student Melissa Roth and current Scripps scientist Dimitri Deheyn, corals subjected to [cold temperatures](#) suffered greater growth impairment and other measurable damage in just days compared with heat treated corals. Yet the researchers found that corals were eventually able to adjust to the chilly conditions, stabilize their health and continue to grow. However, over the long term corals subjected to heat suffered more greatly than those in cold, with evidence of severe bleaching and growth stoppage, a trajectory that leads to death.

"These results show distinct responses between cold and heat-treated corals on different time scales," said Roth, now based at Lawrence Berkeley National Laboratory. "On a short time scale, the cold event was actually more harmful to the corals than an equivalent warming event, but over time, these corals were able to acclimate to the cold. Therefore, these corals showed more resilience to seawater cooling than seawater warming."

The coral's ability to adjust to cool temperatures surprised the researchers, who say the study's results highlight the complexities of monitoring coral health in response to varying environmental factors.

During the investigations—conducted inside Scripps' Experimental Aquarium—the researchers tracked the overall coral health and the stress of their symbiotic algae, sometimes called "zooxanthellae." The symbiosis is an essential component for reef-building corals because the symbionts provide corals with most of their energy. Accordingly, the researchers found that the [cold](#) both disrupted the photosynthetic system of the symbionts and greatly reduced coral growth.

"Global warming is associated with increases but also decreases of temperatures," said Deheyn, a project scientist in Scripps' Marine Biology Research Division. "Not much has been known about the comparative effects of temperature decrease on corals. These results are important because they show that corals react differently to temperature differences, which is critical for future management of [coral reefs](#) in the realm of climate change."

Provided by University of California - San Diego

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