Hope for tropical sponge survival as oceans become more acidic

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New research from Te Herenga Waka—Victoria University of Wellington shows that tropical ocean-dwelling sponges may have a good chance of survival even as Earth's oceans are impacted by climate

change.

The research, led by Professor James Bell from the School of Biological Sciences and Dr. Riccardo Rodolfo-Metalpa from the Institute for Research Development, was recently published in *Global Change Biology*.

Professor Bell and his colleagues traveled to Papua New Guinea in 2019 to study sponges in coral reefs surrounding shallow water carbon dioxide seeps—places where carbon dioxide bubbles from the sea floor

"Sponges are very abundant near these seeps in the ocean floor," Professor Bell says. "The carbon dioxide from the seeps makes the ocean more acidic in this area, which is something that will happen to all of Earth's oceans due to climate change. That means we can use this area as a proxy to see how sponges might cope with more acidic oceans."

Previous research has suggested that sponges are well-suited to surviving in acidic ocean conditions because of their higher tolerance for both acidic conditions and warmer temperatures. Many sponges also contain photosymbionts which could potentially thrive in more acidic oceans due to greater access to carbon dioxide for photosynthesis.

"We were able to show that sponges that contain photosymbionts in this area can offset the metabolic costs of dealing with ocean acidification," Professor Bell says. "This means while the sponges might not thrive under climate change conditions, they will survive."

Despite bleached sponges being reported in cold-water sponges in New Zealand last month, tropical sponges might fare better in changing ocean conditions, Professor Bell says.

Essentially, the sponges were still stressed by the acidic conditions.

However, because the symbionts were more productive thanks to higher levels of carbon dioxide, the sponges could draw more energy from them to survive in the acidic water.

"Sponges are really important on current coral reefs and our research continues to support the hypothesis that sponges will still be found on future reefs, even if corals were to completely disappear," Professor Bell says. "These changed ecosystems will have major consequences for the resources people take from corals reefs. Sponge-dominated reefs will not be able to provide as many resources as coral-dominated reefs, but it will be better than no resources at all.

"While our understanding of the impacts of climate change on marine organisms is increasing, we still have limited ability to manage these impacts. A global concerted effort to rapidly eliminate carbon emissions is the only way in which we will keep ocean acidification and warming to a level that won't fundamentally alter marine ecosystems forever."

More information: James J. Bell et al, Phototrophic sponge productivity may not be enhanced in a high CO 2 world, *Global Change Biology* (2022). DOI: 10.1111/gcb.16235

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