Living on Coral Time: Debating Conservation in the Anthropocene

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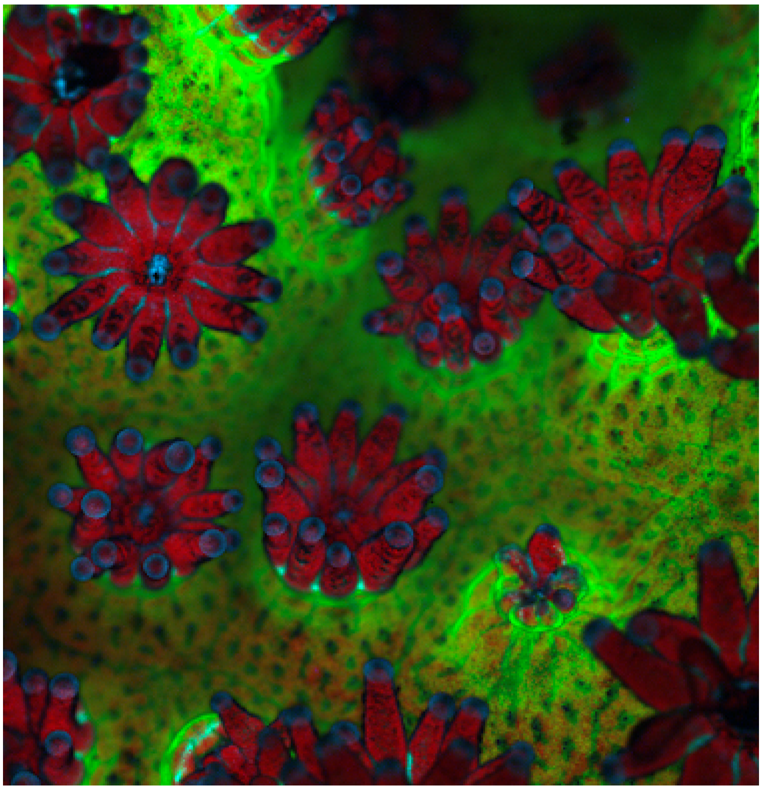


Pocillopora damicornis (cauliflower coral) under microscope at 2.5x magnification. Living within the animal polyps (red) are algal symbionts who provide the coral with her nutrients and coloration. The green protein is tissue in between polyps.

Photograph by Amy Eggers.

Between 2015 and 2017, the world's largest coral reef system, the Great Barrier Reef, experienced the longest and most extreme coral bleaching on record. During this event, half of the Reef's two billion corals lost their symbiotic algae and have thereby embarked on a quick and whitened path toward death. "This has changed the Great Barrier Reef forever," one scientist explained. He tweeted shortly after: "I showed the results of aerial surveys of bleaching on the Great Barrier Reef to my students, and then we wept." The largest living structure on earth, which stretches for 1,400 miles (2,253 kilometers) and can be seen from space, has become the largest dying structure. How are coral scientists—who study these magnificent algae-animal-bacteria holobionts—coping with such an unimaginable disaster befalling their research organisms, who have existed for 250 million years? And what role should these scientists play?

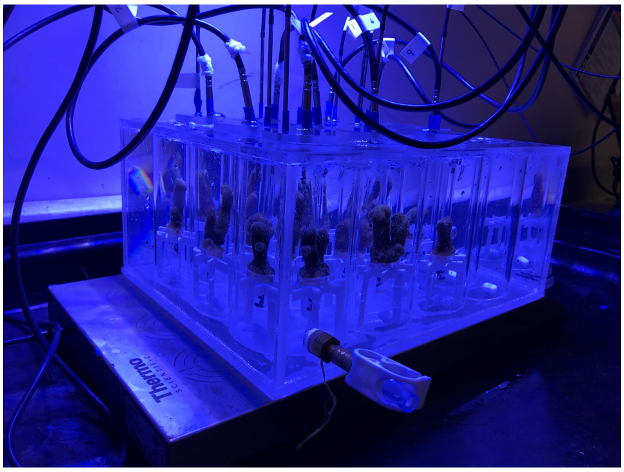
Marine biologist surveys bleaching in American Samoa, February 2015. Courtesy of The Ocean Agency, XL Catlin Seaview Survey.

Coral scientists are markedly divided these days. Perhaps the most visible divide in this community is founded on its bifurcation into two juxtaposed states: despair and hope. At one end of the spectrum are those scientists who predict a catastrophic mass extinction of corals caused by global warming and other human-induced environmental assaults by 2050. In this despondent narrative, corals are doomed and nothing short of an abrupt—and some would say unlikely—shift in how we use fossil fuels and in how we deal with other mega-ecosystemic crises will save them. The central proponent of this worldview, Australian coral scientist Ove Hoegh-Guldberg, told me in an interview: "The Titanic is sinking and what we are doing is rearranging the chairs to get a better view." Instead of science continuing down its traditional path, Hoegh-Guldberg has been arguing, scientists today must devote themselves to publicly and politically altering the course of climate change. In line with this approach, he himself has been working to increase public awareness of the plight of corals (the award-winning Netflix documentary *Chasing Coral*, for which he was a chief scientific advisor, is but one example) and lobbying for global policy changes in relation to global warming (e.g., active participation in the Paris Agreement).

At the same time, many coral scientists and managers are increasingly shifting away from an apocalyptic global perspective toward a focus on local restoration and more intensive interventions. Although she both studied and worked with Hoegh-Guldberg for many years, marine biologist Ruth Gates's outlook is radically different. From her perspective, "we will either have a reef in the future or we won't. But if we continue down this trajectory and we do absolutely nothing to assist the system, it's likely that we'll have nothing." By "assist the system," Gates is referring to a radical proposal that she developed with Madeleine van Oppen to captive-breed corals who have survived the bleaching events. These are the "super corals" of the future, as the two women call them, and by propagating them and then introducing them into strategic locations in the reef, they intend to accelerate natural processes that may currently be too slow for the rapid pace of human-induced climate change.

Over the last few decades, a variety of more traditional restoration projects, which propagate corals in nurseries in order to reestablish the degraded reefs, has also emerged. The problem with such "gardening" methods, as some have pointed out, is that they typically reproduce genetically identical corals, who will thus likely die again come the next warming and bleaching event. As a result, many coral scientists in this camp have more recently turned toward genetic solutions such as "assisted evolution" (discussed above) and "assisted migration" (the exchange of heat-tolerant genotypes across latitudes)—"from despair to repair," as marine ecologist Jeremy Jackson put it.

The two main stances toward the future of coral life on earth—namely, the despair and hope ends of the spectrum—signify the ongoing, and arguably intensifying, rift between those who still assume that it is possible to use traditional conservation tools (chiefly, the removal of adverse local human impacts) to allow natural systems to restore themselves to a prior state, and those who hold that even with the deleterious impacts removed, natural systems will not return to a prior state because their environment has fundamentally altered. These latter conservation scientists have been prepared to consider active interventions of one type or another. Rather than seeing humans as "screwing it up," as traditional conservationists would typically have it, many of these newer environmentalists see hope in genomic and technological interventions.



Testing respiration rates of *Porites compressa* fragments in a dark room at the Gates Coral Lab, Hawai'i Institute of Marine Biology, Coconut Island, Hawai'i. Respiration is a central physiological parameter for investigating the resilience of corals.

Photograph by Katie Barott, September 2016. Courtesy of Gates Coral Lab.

This photo is from a reciprocal transplant experiment in Hawaii's Marine Lab. A total of 3,200 coral fragments of two coral species were moved between two sites with varying pH regimes to see how this impacts coral physiology, symbiosis, and reproduction.

Photograph by Shayle Matsuda.

The debate about how to better care for coral reefs is not merely a scientific one. Since coral scientists are at the forefront of conservation at the Anthropocene, their successes and failures have much broader implications for the future of our planet. There is therefore much to glean from their experiences about how the broader community of conservation scientists will handle the question of conservation and what debates are soon to emerge with regard to many other species and ecosystems.

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Further readings:

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