Three key habitat-building corals face worrying future due to climate crisis

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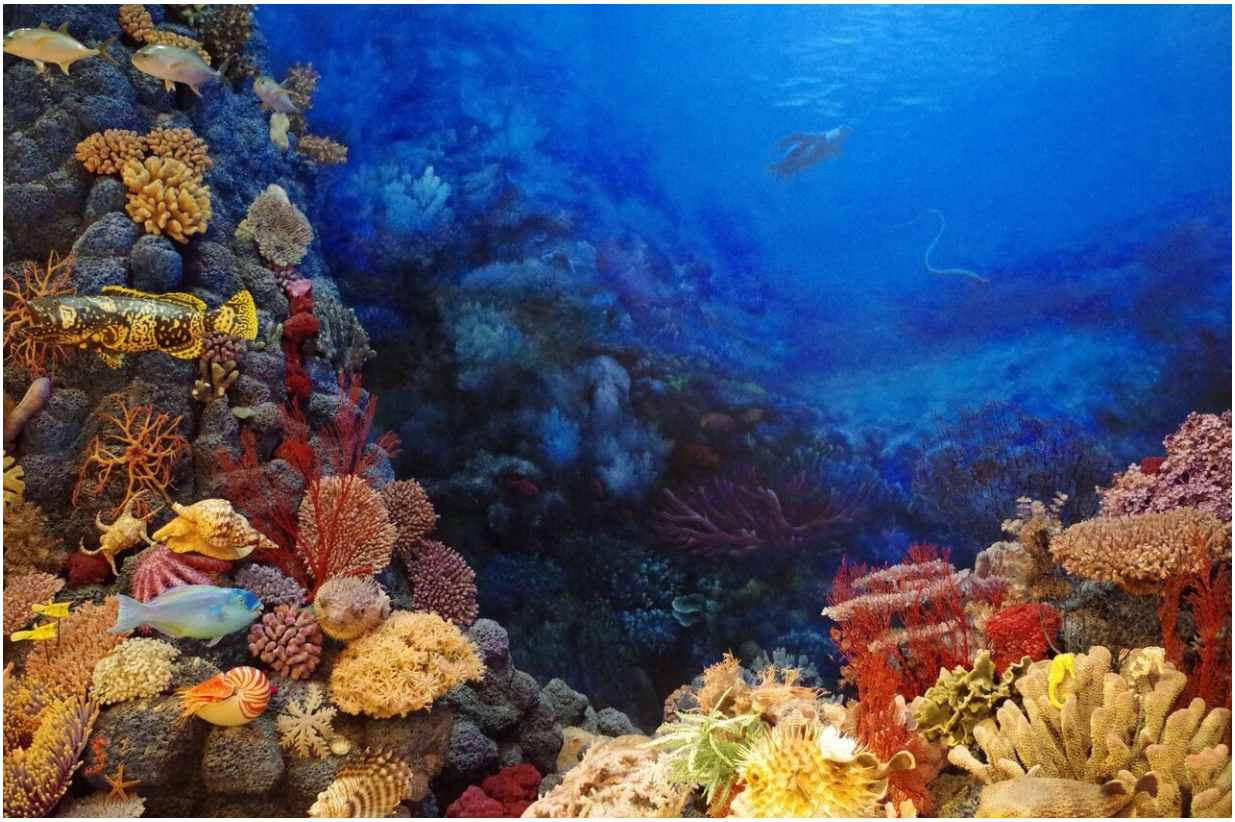

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The climate crisis will lead to changes in distribution and habitat loss of stony corals in the tropical Atlantic, shows a new study published by the open access publisher Frontiers. The loss of such coral species could

have devastating consequences for the marine ecosystems they inhabit. The results of the study highlight an urgent need for coral reef management in the Atlantic.

Researchers at the University of São Paulo projected current and future distributions of three key reef building corals of the tropical Atlantic (Mussismilia hispida, Montastraea cavernosa and the Siderastrea complex). They conclude that all three species will experience changes in range due to the climate crisis, which will elicit negative cascading effects on the biodiversity of reef ecosystems. The results are published in the journal *Frontiers in Marine Science*.

Nature's engineers are threatened

Mussismilia hispida, Montastraea cavernosa and the Siderastrea complex are stony corals of the eastern and western Atlantic. They are ecosystem engineers: much like beavers who contribute to the structure of their terrestrial habitats by building dams, stony corals help build reefs by depositing calcium carbonate. They are vital for the health and function of these reefs, which are among the most diverse ecosystems on Earth.

"Coral reefs provide essential ecosystem services such as food provision, coastal protection and nutrient cycling, that benefit millions of people—including those who live far from any coral reef," says lead author and Ph.D. candidate Silas Principe of the University of São Paulo.

"If species that are important in structuring the coral reefs are lost, the provision of all those services is consequently also threatened."

Human activity has long harmed corals worldwide, and coral reefs are already some of the most threatened ecosystems on the planet. Intense and long-lasting mass bleaching events, ocean acidification, pollution,

urbanization, fisheries, and tourism are all leading to reduction and loss of coral cover. Now, the climate crisis is adding to those threats.

Climate change leads to changes in coral distribution, with key coral species moving within the tropics or to temperate waters at higher latitudes. Changes in distributions of these key species may have unprecedented cascading effects on entire marine wildlife communities, such as drastic changes in the structural complexity of reef ecosystems.

Concerning findings

Researching possible changes in stony coral distribution is important for planning and management of coral reef conservation. The researchers collected data on M. hispida, M. cavernosa and the Siderastrea complex from different databases and used species distribution models to model their suitability on their current habitat. They also modeled future changes in range under three different climate change scenarios (most pessimistic, most optimistic, and moderate).

They found that, even in the most optimistic scenario, all three species could experience changes in their distributions. Especially in the western Atlantic, decreases in the abundance of stony corals are expected under all three scenarios. Several areas along the Brazilian coast and the Caribbean will lose habitat suitability. These projections are especially critical for the Brazilian coast, where there are fewer habitat-building coral species.

The researchers urge conservation and management efforts to be focused on regions such as the Abrolhos region, northeast coast of Brazil, western Caribbean, and the Gulf of Mexico. "We show that important reef builder species of the Atlantic will face shifts in its distribution due to climate change," Principe said.

"Certain areas, such as the Abrolhos region in the coast of Brazil, will completely lose at least one of its species in any of the future scenarios. Major areas in the Caribbean will also lose species in the future, although in the coast of Africa some species may expand their current range."

But the results also indicate that there is hope for Atlantic stony corals. "Although our results predict major negative impacts on Atlantic shallow reefs, we also identified several areas where none or less changes are predicted. Managers and policy makers can use this to support the planning process of conservation areas." Principe concludes: "Researchers and conservationists can use these results to focus research efforts on the so-called 'refuge areas' that may constitute safe areas for coral species in the future."

More information: Silas C. Principe et al, Predicted Shifts in the Distributions of Atlantic Reef-Building Corals in the Face of Climate Change, *Frontiers in Marine Science* (2021). DOI: 10.3389/fmars.2021.673086

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