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Marine species find new homes amid climate change – but at what cost?

A new study led by researchers at the University of Cape Town's (UCT) Climate Risk Lab has revealed that climate change will continue to create opportunities for thousands of marine species to colonise new habitats, even if the world continues to rapidly reduce greenhouse gas emissions. The study's title is "Temporal dynamics of climate change exposure and opportunity for global marine biodiversity."

The ongoing increase in ocean temperatures caused by climate change is projected to expose some species to potentially unsafe temperatures while creating opportunities for others to colonise habitats that were previously thermally unsuitable. The paper, published in *Nature Communications*, analysed when, where, and how fast climate change will cause exposure and create opportunities for global marine biodiversity.

Consequences of shifting marine habitats

The study shows that shifts in ocean temperatures caused by climate change are already creating opportunities for hundreds of marine species to colonise new habitats, potentially remixing local biodiversity in the process. These opportunities for colonisation will continue to increase for thousands of species until mid-century, even if greenhouse gas emissions are quickly reduced. On the other hand, exposure to unsafe temperatures is projected to accelerate later and negatively impact more species, especially if climate change is not controlled. "Our findings suggest climate change reshaping many marine life communities can no longer be avoided," says Dr Andreas Schwarz Meyer, lead author of the study.

The study, which analysed data from over 21 000 species, also shows how the impacts of exposure and opportunity will threaten marine life in different regions over time. Negative impacts projected to be associated with exposure to potentially unsafe temperatures are concentrated in the tropics, increasing rapidly after 2050 if global warming continues. In temperate and polar regions, near-term changes to biodiversity are projected to arise more from new opportunities emerging in the next few decades.

"While exposure to unsafe temperatures can lead to local extinction of species, new thermal opportunities can bring non-native species into communities, disrupting ecological balance and reducing important ecosystem services such as food provision for people," adds Meyer.

Urgent emission reductions needed to protect marine biodiversity

Even though some impacts can no longer be avoided, by rapidly reducing the burning of coal, oil, and gas, and halting deforestation the number of species at risk from increasing ocean temperatures can be significantly reduced.

"Limiting global warming well below 2°C is expected to halve the number of opportunities created and reduce the number of species exposed to unsafe temperatures by 100-fold compared to uncontrolled climate change," says co-author Associate Professor Christopher Trisos.

"Strong, fast, and sustained climate action is crucial to reducing the severe risk of negative impacts on marine life across Earth's oceans," he adds.

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