No plain sailing for marine life as climate warms

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Marine life may need to relocate faster than land species as a result of climate warming. CSIRO

Direct effects of climate warming on biodiversity pose a serious conservation challenge for marine life, according to new research published today in *Science*.

Marine life may need to relocate faster than land species as well as speed up alterations in the timing of major life cycle events. This challenges previous thinking that marine life in the ocean would respond more gradually than species on land because of slower warming in the oceans.

“Analyses of global temperature found that the rate at which marine life

needs to relocate is as fast, or in some places faster, than for land species. This is despite ocean warming being three times slower than land" says paper co-author, Dr Elvira Poloczanska from CSIRO's Climate Adaptation Flagship.

Dr Poloczanska said that globally, an increasing number of species are responding to climate change by changing their distributions and the timing of life cycle events such as breeding, spawning and migrations.

She said that a one degree change in ocean temperature may mean that marine plants and animals will have to travel hundreds of kilometres to stay in their comfort zones. This can present major problems for marine organisms, particularly those that are unable to move long distances such as corals.

This collaborative work was led by Dr Mike Burrows from the Scottish Association of Marine Science, UK, and Dr David Schoeman of the University of Ulster, UK, and is a product from the Marine Impacts Working Group at the National Centre for Ecological Analysis and Synthesis, California. Dr Poloczanska and Associate Professor Anthony J. Richardson from the CSIRO Climate Adaptation Flagship and the University of Queensland lead the working group.

Writing in Science, the team considered two indicators to measure the pace of change in temperatures over the past 50 years: the shift in temperature across the landscape and seascape, and; the shift in temperature seasonality with warming.

Another of the paper's co-authors, University of Queensland Associate Professor Anthony Richardson, explains that the rate at which marine life relocates depends not only on how much the temperature changes but also on how far a species needs to travel to reach its preferred temperature conditions.

Marine species need to travel long distances to find a preferred temperature zone because temperature varies relatively little across much of the oceans compared to on land.

“On the land in flat areas such as deserts, for example, animals and plants must relocate over long distances to find a change in temperature but in mountainous areas this change can be found in shorter distances. Marine animals and plants will have to travel long distances in many parts of the ocean, where temperature changes relatively little, to remain in their preferred temperature” Associate Professor Richardson said.

“In warm areas such as the Equator, which is a marine biodiversity hotspot, marine life will have to travel very far to find a suitable temperature zone and we are concerned that threats to biodiversity may be high” The same applies for changes in timing for reproduction activities such as flowering, and breeding migrations.

“The seasonal temperature cycle is relatively reduced in the ocean compared with land, so again this means that if a plant or animal wants to maintain its thermal environment and keep pace with warming, it will need to move its reproduction earlier in the year as much, or more, in the ocean than on land” Associate Professor Richardson said.

The study also identifies patterns of climate change are not uniform, with regions warming and some even cooling at different rates. For example, large areas of the Southern Ocean are cooling and shifts in the distribution of marine life away from polar regions are expected.

“While organisms may respond to aspects of climate change other than temperature, we studied the global thermal environment because it is probably the most important variable controlling global distribution and timing of marine life” said Dr Poloczanska

“Although we only looked at the ocean surface, and many marine species may live deeper, the majority of these ultimately rely on production at the sunlit ocean surface or have larval stages that disperse in shallower depths,” she said.

Provided by CSIRO

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