

# Fish living near the equator will not thrive in the warmer oceans of the future

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Chromis fish swim amongst coral in the Indo-Pacific, along with a *Pomacentrus moluccensis* (the lemon damsel). These fish are important food sources for larger coral reef fish. Credit: D. Dixon

According to an international team of researchers, the rapid pace of climate change is threatening the future presence of fish near the equator.

"Our studies found that one [species](#) of [fish](#) could not even survive in water just three degrees Celsius warmer than what it lives in now," says the lead author of the study, Dr Jodie Rummer from the ARC Centre of Excellence for Coral Reef Studies (Coral CoE) at James Cook University.

Dr Rummer and her colleagues studied six common species of fish living on coral reefs near the equator. She says many species in this region only experience a very narrow range of temperatures over their entire lives, and so are likely adapted to perform best at those temperatures.

This means [climate change](#) places equatorial marine species most at risk, as oceans are projected to warm by two to three degrees Celsius by the end of this century.

"Such an increase in warming leads to a loss of performance," Dr Rummer explains. "Already, we found four species of fish are living at or above the temperatures at which they function best."

The team measured the rates at which fish use oxygen, the fuel for metabolism, across different temperatures - at rest and during maximal performance. According to the results, at warmer temperatures fish lose scope for performance. In the wild, this would limit activities crucial to survival, such as evading predators, finding food, and generating sufficient energy to breed.

Because many of the Earth's equatorial populations are now living close to their thermal limits, there are dire consequences ahead if these fish cannot adapt to the pace at which oceans are warming.

Dr Rummer suggests there will be declines in fish populations as species may move away from the equator to find refuge in areas with more

forgiving temperatures.

"This will have a substantial impact on the human societies that depend on these fish," she says.

A concentration of developing countries lies in the equatorial zone, where fish are crucial to the livelihoods and survival of millions of people, including those in Papua New Guinea and Indonesia.

In an era of [rapid climate change](#), understanding the link between an organism and its environment is crucial to developing management strategies for the conservation of marine biodiversity and the sustainable use of marine fisheries.

"This is particularly urgent when considering food security for human communities."

**More information:** 'Life on the edge: thermal optima for aerobic scope of equatorial reef fishes are close to current day temperatures' by Jodie Rummer, Christine Couturier, Jonathan Stecyk, Naomi Gardiner, Jeff Kinch, Goran Nilsson and Philip Munday, appears in *Global Change Biology*.

Provided by ARC Centre of Excellence in Coral Reef Studies

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