

Climate change driving marine species poleward

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Marine life in tropical waters declines when annual average sea temperature rises above 20 to 25 degrees Celsius

Warming waters have driven thousands of ocean species poleward from the equator, threatening marine ecosystems and the livelihoods of people

who depend on them, researchers reported Monday.

Comparison of data on nearly 50,000 [species](#) over three 20-year periods up to 2015 revealed that the exodus from tropical waters is accelerating, they reported in the journal *PNAS*.

The tropics have long harboured an outsized proportion of marine life, but could see that diversity disappear if [climate change](#) is not brought to heel, the authors warned.

"Global warming has been changing life in the ocean for at least 60 years," senior author Mark Costello, a professor of marine biology at the University of Auckland, told AFP.

"Our findings show a drop of about 1,500 species at the equator," he added. "This will continue throughout the century, but the pace will depend on how we reduce—or not—greenhouse gas emissions."

Poleward migration was more pronounced north of the equator, where oceans have warmed more quickly than in the southern hemisphere.

It was also more prevalent among open [water](#) fish than so-called benthic species living on the ocean floor.

"Benthic species can only move during their floating life-stage, and thus their shift (poleward) is between generations," Costello explained.

By contrast, species living in the [high seas](#) "can move with the water masses in their lifetime."

Marine life in [tropical waters](#) declines when annual average sea temperature rises above 20 to 25 degrees Celsius, depending on the species, the study found.

40 percent drop by mid-century

"The 'missing' tropical species are likely following their thermal habitat as subtropical waters warm," noted co-author David Schoeman, a professor of ecology at Nelson Mandela University in Port Elizabeth, South Africa.

Fossil records show that the same thing happened 140,000 years ago, the last time global surface temperatures were as hot as they are now.

Based on data in the open-access Ocean Biodiversity Information System, the statistical study does not look at how individual species will adapt to new environments.

In general, open-water species are likely to fare better, earlier research has found.

The impact on commercial fish stocks in the tropics is not addressed either, though it is clear which parts of the world will be hit the hardest.

"Indonesia and other nations near the equator, such as in West Africa, have the most to lose because their stocks can only decrease," as no new species will replace those leaving, Costello said.

Worldwide, about 1.3 billion people live in coastal tropical areas, many of which rely on fisheries for food.

A recent review article in *Nature* estimated that the maximum catch potential of tropical fish stocks in so-called exclusive economic zones—200 nautical miles (370 kilometres) from the coast—would decline 40 percent by mid-century if [global warming](#) continues unabated.

In most Pacific island nations, combined catch of skipjack and yellowfin

tuna—the two most exported fish—would drop up to 40 percent under the same scenario, while coral reef fish consumed locally could decline even more.

The study in PNAS began with the University of Auckland doctoral dissertation of Chhaya Chaudhary.

More information: Chhaya Chaudhary et al., "Global warming is causing a more pronounced dip in marine species richness around the equator," *PNAS* (2021).

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