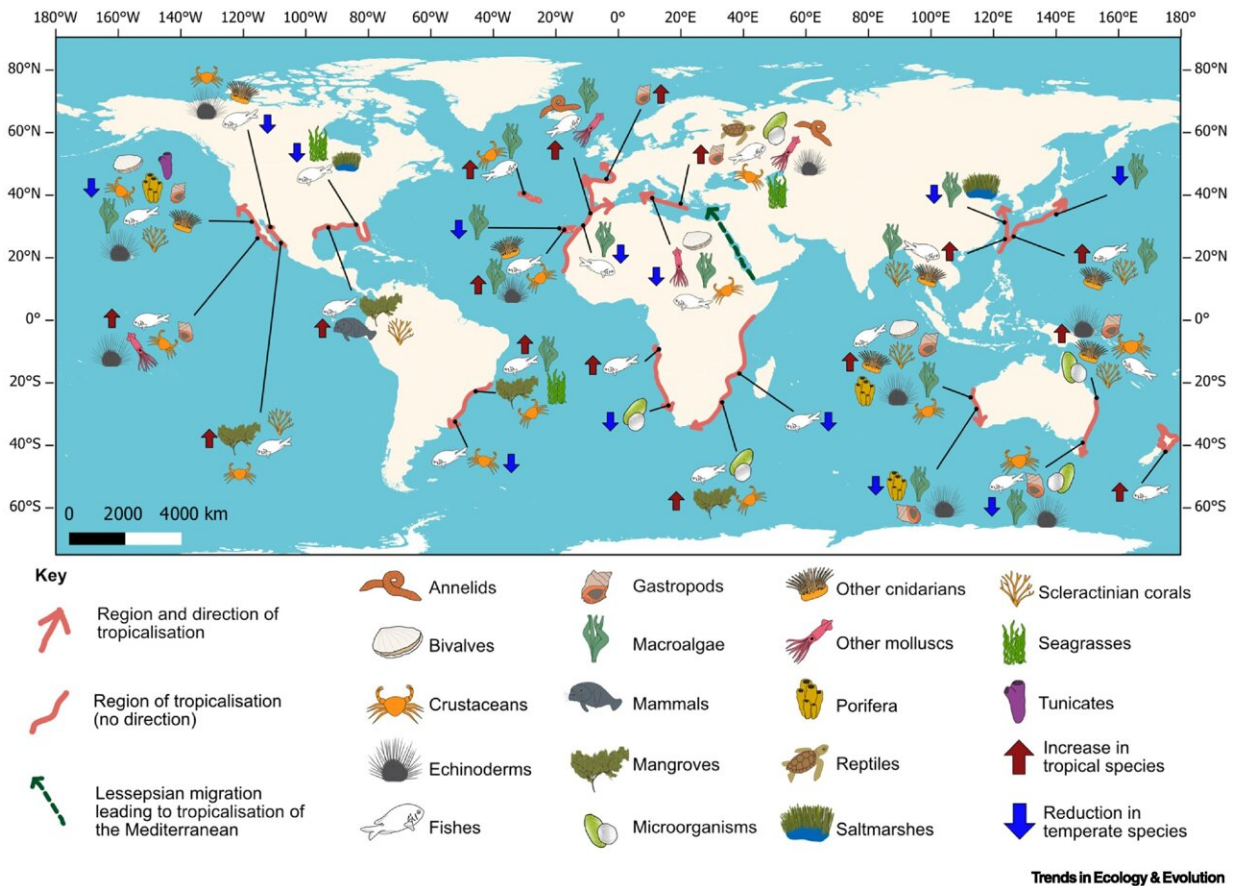


Global marine life is on the move due to sea temperature rises, says study

November 28 2023



The range of taxa and geographic areas where tropicalisation has been detected. Credit: *Trends in Ecology & Evolution* (2023). DOI: 10.1016/j.tree.2023.10.006

A new study from the University of Southampton sheds light on the

impact climate change is having on marine environments in a relatively recent global phenomenon known as "tropicalization."

In the ocean, [tropical species](#) are moving from the equator towards the poles as sea temperatures rise. Meanwhile, temperate species are receding as it gets too warm, they face increased competition for habitat, and new predators arrive on the scene, among other factors.

This mass movement of marine life, termed tropicalization, is changing the ecological landscape of our oceans and leading to a cascade of consequences for ecosystems, biodiversity, and potentially the global economy.

The publication of the study coincides with the start of COP28, where global policymakers congregate and make pledges to tackle the impact of global warming. Researchers say we need to better understand the consequences of tropicalization to predict its development, respond to its effects and aid conservation efforts to protect biodiversity around the world.

In recent years, climate change has altered the physical factors that affect species dispersal, such as ocean currents in areas that separate tropical/subtropical and temperate regions. These warm-water boundary currents are heating faster than the global seawater average, facilitating the poleward movement of species, and reinforcing the retraction of temperate species.

The first instance of this process was identified in the Mediterranean Sea, now considered a "tropicalization hotspot" due to an increase in tropical species present. Since then, tropicalization has been documented globally along mid-latitudes.

Karolina Zarzyczny, a researcher at the University of Southampton and

lead author of the paper, said, "Tropicalization is having a multitude of ecological and [evolutionary consequences](#) for species, communities, and whole ecosystems, with the potential to alter global diversity patterns.

"Research conducted over the past twenty years has mostly focused on ecological impacts, meaning our understanding of its evolutionary consequences is limited. Given how closely ecology and evolution interact, a comprehensive strategy that involves monitoring and action, and integrates genetic and evolutionary research with the ecological changes we're seeing is essential to better understand the drivers and consequences of tropicalization."

Gaps in our understanding

The study [published](#) in *Trends in Ecology and Evolution* is an extensive review of the literature published over the past 20 years. It is the first step in impressing upon the [scientific community](#) the gaps in our understanding of the problem.

"Although the abundance, distribution and presence of species across tropical, subtropical and temperate zones has been documented many times, there is a fundamental lack of understanding of the long-term evolutionary consequences once new species live together," says Dr. Suzanne Williams, Scientific Associate at the Natural History Museum and co-author on the paper.

"Answering questions about how species evolve and interact with their environment involves employing a variety of methods, including historical records and, of course, museum collections. The [scientific data](#) and specimens from museums, both digitized and physical, are key baseline information for studying tropicalization."

Evolutionary consequences

Given how closely ecology and evolution interact, altered species interactions may lead to the evolution of new traits or behaviors. For example, in a recent study led by Dr. Phil Fenberg, Associate Professor at the University of Southampton, temperate volcano barnacles have begun to "bend" to fend off range-expanding tropical predators along the Baja California peninsula in Mexico.

Similarly, range-expanding tropical damselfishes and temperate reef fishes have been documented altering their feeding and social behaviors to allow for coexistence.

Other evolutionary consequences might involve the proliferation of more thermally resistant species or the loss of unique [genetic diversity](#) as temperate species recede. Such a reduction in genetic diversity could be problematic as it may affect the species' ability to adapt to future stressors.

Social-economic impacts

The phenomenon is not just an ecological concern; it also carries substantial socio-economic implications, not all of which are negative.

During her research, Karolina noted instances where salt marshes were being replaced by mangrove-dominated ecosystems. Mangroves have greater carbon capture capabilities than the temperate [salt marshes](#) they are replacing, which may be a good news story for reducing CO₂ levels in the atmosphere.

Furthermore, the expansion of coral communities is expected to have a positive impact on the local economy due to the increase in dive-based

tourism. That said, the coral communities expanding due to tropicalization tend to be the same species and so do not offer the same variety of habitat one would see in traditional coral reefs.

Within this extensive review, scientists involved are calling for [urgent action](#) in addressing poorly studied regions (such as tropical-[temperate regions](#) of Africa and South America) to gain a holistic understanding of the drivers and complex consequences tropicalization can have, as well as how we can begin to slow down its processes.

Conversation efforts

Dr. Phil Fenberg, Associate Professor at the University of Southampton and a co-author on the paper said, "One way to help mitigate the negative impacts of tropicalization is to create networks of marine protected areas in regions undergoing tropicalization. In these protected areas, we will be better positioned to remove the other impacts outside of climate-induced effects, like fishing pressure and habitat degradation.

"We can then give [species](#) a chance to acclimatize to tropicalization until we can take more substantial action in slowing global warming."

Researchers need to conduct more monitoring of ecosystems undergoing tropicalization to better understand the drivers and dynamics of tropicalization. To do this, researchers need an abundance of data from various sources, such as fishery catch records, citizen science projects and modern biodiversity surveys. Future studies could also use cutting-edge monitoring technology to detect the DNA of marine organisms within the environment (called eDNA) in regions undergoing tropicalization.

"The ecological and evolutionary consequences of tropicalization" is published in the *Trends in Ecology and Evolution*.

More information: Karolina M. Zarzyczny et al, The ecological and evolutionary consequences of tropicalisation, *Trends in Ecology & Evolution* (2023). [DOI: 10.1016/j.tree.2023.10.006](https://doi.org/10.1016/j.tree.2023.10.006)

Provided by University of Southampton

Citation: Global marine life is on the move due to sea temperature rises, says study (2023, November 28) retrieved 29 April 2024 from <https://phys.org/news/2023-11-global-marine-life-due-sea.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.