

# Marine animals have been following their preferred climate for millions of years

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Current global warming has far-reaching ecological consequences for the Earth's oceans. Many marine organisms are reacting by migrating toward the poles. Researchers at Geozentrum Nordbayern at Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU) have now discovered that marine animals have been migrating for millions of years when the temperature on Earth increases or decreases.

Most living organisms have settled into ecological niches, and one of the decisive factors in their choice of habitat is a certain temperature . Marine [animals](#) such as [tropical species](#) need warmer water for their metabolism; animals that depend on a higher oxygen content require colder water. They therefore migrate either toward the poles or the equator as soon as the temperature changes, and have been doing so for millions of years. "Whilst the climate appears to be changing more rapidly today than ever before, the climate also changed rapidly in the past, forcing organisms to migrate in order to survive. Adaptation tended to be the exception," says Prof. Wolfgang Kießling, Chair of Palaeoenvironmental Research.

By investigating fossils, Prof. Kießling and Dr. Carl Reddin, who is also at GeoZentrum Nordbayern, have shown that coral, molluscs and sponges have been following their preferred cold and warm zones for a half-billion years. Isotherms (geographic lines denoting the same temperature, for example 20 degrees C) shift toward the poles or the equator as soon as the global [temperature](#) rises or decreases. Isotherms have been shifting toward the poles for several years due to global

warming.

The tendency toward climate-related migration is most apparent in tropical species. This may be due to the fact that several of these species live near the thermal maximum for complex organisms of 35-45 degrees C . Current global warming trends are driving [marine animals](#) toward the poles, provided there is a suitable habitat they can migrate to.

How did the palaeobiologists discover this prehistoric migration pattern? First, they determined the geographic coordinates of the area in which the fossils were found when they were alive. Using a model, they determined how the tectonic plates have moved since the time when the animals were living and combined the results with the current coordinates of the location where the fossil samples were discovered. This enabled them to retrace changes in fossil species composition over long time periods. The researchers used a global database that they helped to set up that contains records of all fossils ever found.

The results are also significant for the present. Wolfgang Kießling and Carl Reddin expect that the current shifts will affect mostly tropical species, and it is thought that there will be a significant reduction of such [species](#) in the long run. Research up to now has largely been limited to central latitudes, where migration is already occurring on a large scale.

**More information:** Carl J. Reddin et al, Marine invertebrate migrations trace climate change over 450 million years, *Global Ecology and Biogeography* (2018). [DOI: 10.1111/geb.12732](https://doi.org/10.1111/geb.12732)

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