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## A cold paradox

### Not warm coral reefs but icy polar seas are centres of species formation for marine fishes

**5 July 2018 / Kiel.** Warm tropical coastal seas are home to up to 1,000 times more species of fish than the cold polar seas. The decline in the number of species from the tropics to the poles has been known in biodiversity research for a long time and is explained in most textbooks with a higher rate of emergence of new species in warm coral reefs, lagoons or mangrove forests. However, a new study now suggests that in the last million years, the emergence of new species in cold waters at high latitudes was about twice as high as in the tropics. The results will be published on July 5th in the international journal *Nature*.

The tropics are considered to be particularly species-rich, whether on land in the rainforest or in coral reefs under water. By contrast, the polar regions with their hostile climate on land and in the ocean are only populated by a few organisms. Therefore, it seems only logical to assume that new species are more likely to emerge in the warm regions of our planet than in the polar regions. A new study, which has now appeared in the prestigious journal *Nature*, comes to the opposite conclusion: the speciation rate of marine fish the polar icy areas is about twice as high than in the tropical oceans.

"Frankly speaking, our results are unexpected and counterintuitive," says Prof. Dr. Daniel Rabosky, evolutionary biologist at the University of Michigan, USA and lead author of the study. "Actually, one would expect that a high rate of species emergence also leads to a high number of species," Rabosky continued. But this rate depends on the balance between the emergence of new species and the extinction of existing species. A higher rate of extinction in cold waters, for example due to the loss of habitat during the ice ages, could explain the supposedly contradictory result of high species emergence rate and low number of species. However, rates of extinction are difficult to determine and are not yet available for marine fish.

"Of particular importance to this study was the availability of as much data as possible on the global distribution of marine fish," says Dr. Rainer Froese, marine biologist at the GEOMAR Helmholtz Centre for Ocean Research in Kiel. GEOMAR, jointly with international partners, has set up the world's largest database for marine fish, "FishBase". "Thus, we provided the baseline information for the study," Froese continued.

"More than 12,000 maps have been included in this study," explains Cristina Garilao, marine biologist and co-author of the study. She is responsible for the FishBase Information System ([www.fishbase.org](http://www.fishbase.org)) at GEOMAR and, in particular, for documenting the global distribution of marine organisms, an essential prerequisite for the feasibility of the new study.

"This study is a milestone in explaining the distribution of biodiversity on our planet. Without an understanding of how this diversity arises, namely through biological evolution, no effective protection is possible. Furthermore, this study provides important arguments for improved protection of the polar regions, in which the speciation rates are apparently very high," summarizes Professor Thorsten Reusch, evolutionary biologist at GEOMAR.

**Reference:**

Rabosky, D.L., J. Chang, P.O. Title, P.F. Cowman, L. Sallan, M. Friedman, K. Kaschner, C. Garilao, T.J. Near, M. Coll, M.E. Alfaro, 2018: An inverse latitudinal gradient in speciation rate for marine fishes. *Nature*. DOI:

**Links:**

[www.geomar.de](http://www.geomar.de) The GEOMAR Helmholtz Centre for Ocean Research Kiel

**Images:**

At [www.geomar.de/n5986](http://www.geomar.de/n5986) images are available for download.

**Contact:**

Dr. Andreas Villwock (GEOMAR, Communication and Media), Phone: +49 0431 600-2802, [presse@geomar.de](mailto:presse@geomar.de)