

# New world map of fish genetic diversity

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Credit: AI-generated image ([disclaimer](#))

An international research team from ETH Zurich and French universities has studied genetic diversity among fish around the world for the first time. Their research produced a map that will serve as a tool in improving the protection of species and genetic diversity in the future.

In a population of animals or plants, genetic [diversity](#) can decline much more quickly than [species diversity](#) in response to various stress factors:

disease, changes to habitat or climate, and so on. Yet not much is known about [fish](#) genetic diversity around the world.

Help on that front is now on the way from an international team of scientists from French universities and ETH Zurich. They have produced the first global distribution map for genetic diversity among freshwater and marine fish. Furthermore, they identified the [environmental factors](#) that are instrumental in determining the distribution of genetic diversity. Their study was recently published in the journal *Nature Communications*.

## **Genetic diversity is unevenly distributed**

To begin their study, the researchers analyzed a database that contained the data of over 50,000 DNA sequences representing 3,815 [species](#) of marine fish and 1,611 species of freshwater fish. From this [sequence data](#), the scientists estimated the average genetic diversity in sections of bodies of water, each section measuring 200 square kilometers.

Their analysis revealed that genetic diversity is unevenly distributed throughout marine and freshwater fish. The greatest genetic diversity was found among marine fish in the western Pacific Ocean, the northern Indian Ocean and the Caribbean. Among freshwater fish, genetic diversity was greatest in South America, but comparatively low in Europe.

In addition, the researchers determined that temperature is a key factor influencing genetic diversity among [marine fish](#): as the temperature rises, so does diversity. By contrast, the key determinants of genetic diversity in freshwater fish were the complexity of their habitat structure and how their habitats have changed over time.

## Impact on nature conservation strategies

The researchers see their study as a tool in efforts to improve conservation of genetic diversity and in turn biodiversity. Their map makes it easier to detect hotspots of species and genetic diversity and to plan appropriate protective action. Maintaining the genetic diversity is crucial, say the researchers. "The more diverse a population's gene pool is, the higher the potential for adaptation to environmental changes," explains Loïc Pellissier, co-lead author of the study and Professor at ETH's Institute of Terrestrial Ecosystems.

Based on the findings, Pellissier predicts that fish populations will have potentially differing levels of adaptability in various areas of their range. "When setting up conservation areas, this characteristic has to be taken into account with respect to location, size and ecological connectivity," he says.

Protective measures thus far have concentrated primarily on maintaining species diversity. For example, several years ago Switzerland launched a program for monitoring species diversity within its borders, but Pellissier believes this is not enough. "If we want to protect our biodiversity, we also have to monitor the [genetic diversity](#) of populations. This is the only way to ensure that the pool of varied genetic material is large enough to enable the survival of species under changing environmental conditions," he explains.

The current study was made possible by a large number of local researchers who sequenced DNA samples from fish and shared the data in a publicly accessible database ([www.barcodinglife.org](http://www.barcodinglife.org)). "This is a clear demonstration of how important open data is for the global study of natural processes," Pellissier says.

**More information:** Stéphanie Manel et al. Global determinants of

freshwater and marine fish genetic diversity, *Nature Communications* (2020). [DOI: 10.1038/s41467-020-14409-7](https://doi.org/10.1038/s41467-020-14409-7)

Provided by ETH Zurich

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