A new study published in Nature Climate Change - published on 3 June 2015 01:03 PM

We know very little about marine biodiversity. Although over 200,000 marine species have been described, scientists believe this represents only 10% of marine biodiversity; in other words, the number of species in the sea may approach 2 million. Because we know so little about marine biodiversity, it is difficult to predict the outcome of climate change on the marine ecosystems. This has not stopped scientists trying to address this important challenge, however. Until now, attempts to understand the implications of climate change on marine biodiversity have either extrapolated results from just a few key species, or have applied ecological niche models to many species. Both those approaches are limited by our poor knowledge of species distribution, however. Because we know so little about marine biodiversity and species distribution previous studies have also chosen to focus exclusively on the movement of isotherms to project the effects of climate change on ecosystems. However, such an approach does not consider the inherent sensitivity of species to climate change.

In a new study published in Nature Climate Change, a scientific team from the National Centre of Scientific Research (CNRS) in collaboration with the Sir Alister Hardy Foundation for Ocean Science and the Marine Biological Association of the UK uses a novel approach based upon the theory that the way biodiversity is distributed in the ocean is a result of the interaction between the multidimensional domain of environmental tolerance of species and fluctuations in the environmental regime. The scientists called this theory the MacroEcological Theory on the Arrangement of Life or the METAL theory. The team generated tens of thousands theoretical species, each having a unique response to local changes in climate (sea surface temperature) and they allowed them to colonise the sea provided the local environment was suitable. In this way, the team reconstructed oceanic biodiversity for the past, the present and also for a range of projections of biodiversity for the end of the 21st century.

The scientists' results show that provided future global warming remains below 2°C, which is the amount of warming the international community considers to be below the threshold that would place natural systems at risk of grave damage, only 15 % of the global ocean surface would experience a change in biodiversity of greater magnitude than occurred over the last 20,000 years since the Last Glacial Maximum. Likewise only 25% of the ocean's surface area would experience a change in biodiversity greater that observed over the last 3.3 million years between the mid-Pliocene and today. Interestingly, these amounts are similar to annual changes seen between 1960 and 2013. As a result the scientists provide evidence that if we can keep global warming below 2° C, the effects on marine biodiversity predicted by their model may be benign. However, more alarming, the other three levels of global warming the scientists examined each indicated that they would place the marine biosphere at risk of increasingly, significant changes. When warming reaches the dangerous threshold of 2°C their model predicts that between 46% and 37% of the surface ocean would experience a change in marine biodiversity that is greater in magnitude than occurred between either the Mid Pliocene or the Last Glacial Maximum, and the present day, respectively. When global warming rises above the dangerous threshold of 2°C, between 50 and 70% of the global ocean may experience a change in marine biodiversity equivalent to, or higher than, that experienced between the Last Glacial Maximum and the mid-Pliocene, and today, indicating a major effect of climate warming on marine biodiversity.

About 70% of the world population lives within 60 km of the shoreline. Humanity uses 8% of the aquatic primary production, this fraction reaching 25% for upwelling and 35% for non-tropical

continental-shelf ecosystems. An estimated 80 million tonnes of fish are caught every year and marine biodiversity is seen as both a source of new therapeutics and biofuels. Marine biodiversity is also strongly involved in global biogeochemical cycles and especially the ocean carbon cycle that contributes to the regulation of our global climate. Any reorganisation of marine biodiversity will affect us in some way. Some individual changes may be good and some may be bad. For example harmful algal blooms may increase in some places and decrease in others. However, together, any changes in biodiversity will inevitably affect interactions among species and consequently, how the ecosystem functions and how productive it is, which are important aspects to understand and predict.

More information contact:

Dr Gregory Beaugrand (CNRS and SAHFOS)

Email: Gregory.beaugrand@univ-lille1.fr

Professor Martin Edwards, Sir Alister Hardy Foundation for Ocean Science/ University of Plymouth

Email: (maed@sahfos.ac.uk)

Dr Richard R Kirby (Marine Biological Association of the UK)

Email: richard.kirby@planktonpundit.org

Further Links:

http://www.climatecentral.org/news/ocean-warming-species-change-19051

http://www.cbsnews.com/news/global-warming-to-bring-dramatic-changes-to-oceans/

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