

## **OXFORD UNIVERSITY NEWS RELEASE: Marine life affected by acidity in seawater**

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### **Oceans become increasingly short of breath**

Marine life is threatened by rising levels of acidity in seawater, which are creating 'marine oxygen holes' or zones where seawater has very low concentrations of dissolved oxygen. John Schellnuber, Visiting Professor at Oxford University and Director of the Potsdam Institute for Climate Impact Research, and Professor Matthias Hofmann also from PIK, has investigated what happens to marine life as oceans absorb increasing levels of carbon dioxide from the atmosphere, by using a simulation model of a 'business-as-usual' scenario (of unabated carbon emissions).

The study, published this week by the Proceedings of the National Academy of Sciences, shows that in a 'business-as-usual' scenario the growth of marine calcifying organisms, such as corals, coccolithophores and foraminifera, would be inhibited. These organisms build their external skeletal material out of calcium carbonate and act as ballast taking organic carbon from the surface of the sea towards the deep ocean. This would lead to an accumulation of organic matter nearer the surface of the sea, where it is oxidized. Less carbon being transported around the ocean would result in a weakening of the marine biological carbon pump, says the study. This could lead to oxygen levels being depleted almost completely at intermediate depths between 200-800 metres. A lack of oxygen or 'hypoxia' at this level could kill marine life, like fish, living in this part of the ocean. As the levels of acid in the ocean get higher, the lack of oxygen or 'marine oxygen holes' will continue to expand dramatically as acidification progresses and severely damage the habitats of many aquatic communities, says the study.

Professor John Schellnuber points out: 'Oceans currently absorb a lot of the carbon dioxide in the atmosphere and thereby help to counteract climate change. However, using our simulation model we can see that this process has dramatic ecological consequences: the oceans are starting to change the way they store carbon as they become increasingly acidic. This means that marine life is becoming seriously threatened because of a lack of oxygen in parts of the ocean.'

The study uses the Intergovernmental Panel on Climate Change model for the 'business as usual scenario' (A1F1) with rising emissions throughout the 21st century and extends it to

the year 3000. The researchers assume that carbon emissions gradually decrease to zero after 2100 until the year 2200 and remain at zero for the rest of the millennium. Under this scenario, a total of about 15 million tonnes of carbon dioxide would be released into the atmosphere. The amount of carbon in the air would rise to 1750 parts per million (ppm) in 2200 from around 380 ppm today. By the end of the millennium it would drop to 1400ppm. Under these conditions, the seawater would become more acidic and less alkaline as molecules of water combined with carbon dioxide forms carbonic acid. Under this scenario, the globally averaged sea surface pH (measure of acidity) would drop from 8.15 to 7.45 in 2200 (which is a rise in acidity), rebounding to a value of 7.6 in year 3000. The value would remain alkaline, but it would be shifted towards more acidic conditions, severely damaging marine animals and plants.

*For more information or to arrange an interview, please contact the University of Oxford Press Office on +44 (0) 1865 280534 or email [press.office@admin.ox.ac.uk](mailto:press.office@admin.ox.ac.uk). Also, the Potsdam Institute for Climate Impact Research (PIK) at [press@pik-potsdam.de](mailto:press@pik-potsdam.de)*

Notes for Editors:

\* 'Oceanic acidification affects marine carbon pump and triggers extended marine oxygen holes' by Matthias Hofmann and John Schellnhuber will be published online in the Early Edition of PNAS in the week commencing 9 February. The full paper will appear at [www.pnas.org/cgi/doi/10.1073/pnas.0813384106](http://www.pnas.org/cgi/doi/10.1073/pnas.0813384106)

\* Professor John Schellnhuber became a James Martin 21st Century School Fellow at Oxford University in 2006. He is a Fellow in the Environmental Change Institute, a centre for research, outreach and graduate studies in environmental change and management. He was recently appointed Chief Sustainability Scientist for the German government and is founding Director of the Potsdam Institute for Climate Impact Research. He is a distinguished science advisor and former Research Director of the UK's Tyndall Centre for Climate Change Research. See [www.eci.ox.ac.uk/people/schellnhuberjohn.php](http://www.eci.ox.ac.uk/people/schellnhuberjohn.php)

\* The James Martin 21st Century School, founded in June 2005, is a unique collaborative research effort using leading scholars and practitioners from a wide range of disciplines to find solutions to the challenges of the 21st century. For more information, go to [www.21school.ox.ac.uk](http://www.21school.ox.ac.uk)

\* The Potsdam Institute for Climate Impact Research addresses crucial scientific questions in the field of global change, climate impacts and sustainable development. See [www.pik-potsdam.de](http://www.pik-potsdam.de)

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