

'Evil twin' threatens world oceans, scientists warn

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(PhysOrg.com) -- The rise in human emissions of carbon dioxide is driving fundamental and dangerous changes in the chemistry and ecosystems of the world's oceans, international marine scientists warned today.

“Ocean conditions are already more extreme than those experienced by [marine organisms](#) and ecosystems for millions of years,” the researchers say in the latest issue of the journal Trends in Ecology and Evolution (TREE).

“This emphasises the urgent need to adopt policies that drastically reduce CO₂ emissions.”

[Ocean acidification](#), which the researchers call the ‘evil twin of global warming’, is caused when the CO₂ emitted by human activity, mainly burning [fossil fuels](#), dissolves into the oceans. It is happening independently of, but in combination with, global warming.

“Evidence gathered by scientists around the world over the last few years suggests that ocean acidification could represent an equal - or perhaps even greater threat - to the biology of our planet than [global warming](#),” co-author Professor Ove Hoegh-Guldberg of the ARC Centre of Excellence for Coral Reef Studies and the Global Change Institute at The University of Queensland said.

More than 30 percent of the CO₂ released from burning fossil fuels,

cement production, deforestation and other human activities goes straight into the oceans, turning them gradually more acidic.

“The resulting acidification will impact many forms of sea life, especially organisms whose shells or skeletons are made from [calcium carbonate](#), like corals and shellfish,” he said.

It may interfere with the reproduction of plankton species which are a vital part of the [food web](#) on which fish and all other sea life depend.”

The scientists say there is now persuasive evidence that mass extinctions in past Earth history, like the “Great Dying” of 251 million years ago and another wipeout 55 million years ago, were accompanied by ocean acidification, which may have delivered the deathblow to many species that were unable to adapt.

“These past periods can serve as great lessons of what we can expect in the future, if we continue to push the acidity the ocean even further,” said the lead author, Dr Carles Pelejero, from ICREA (Catalan Institute for Research and Advanced Studies) and the Marine Science Institute of CSIC (Spanish National Research Council) in Barcelona, Spain.

“Given the impacts we see in the fossil record, there is no question about the need to immediately reduce the rate at which we are emitting carbon dioxide in the atmosphere,” he said.

“Today, the surface waters of the oceans have already acidified by an average of 0.1 pH units from pre-industrial levels, and we are seeing signs of its impact even in the deep oceans”, said co-author Dr Eva Calvo, from the Marine Science Institute of CSIC in Barcelona, Spain.

“Future acidification depends on how much CO₂ humans emit from here on - but by the year 2100 various projections indicate that the

oceans will have acidified by a further 0.3 to 0.4 pH units, which is more than many organisms like corals can stand”, Professor Hoegh-Guldberg said.

“This will create conditions not seen on Earth for at least 40 million years.

“These changes are taking place at rates as much as 100 times faster than they ever have over the last tens of millions of years,” Professor Hoegh-Guldberg said.

Under such circumstances, conditions are likely to become very hostile for calcifying species in the north Atlantic and Pacific over the next decade and in the Southern Ocean over the next few decades, the researchers warned.

Besides directly impacting on the fishing industry and its contribution to the human food supply at a time when global food demand is doubling, a major die-off in the oceans would affect birds and many land species and change the biology of Earth as a whole profoundly, Professor Hoegh-Guldberg said.

Palaeo-perspectives on ocean acidification by Carles Pelejero, Eva Calvo and Ove Hoegh-Guldberg is published in the latest issue of the journal *Trends in Ecology and Evolution* (TREE), number 1232.

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