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# Carbon emissions creating acidic oceans not seen since dinosaurs

Chemical change placing 'unprecedented' pressure on marine life and could cause widespread extinctions, warn scientists

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**David Adam**, environment correspondent  
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A gray whale (*Eschrichtius robustus*) at the Ojo de Liebre in the Baja California peninsula  
Photograph: ALEJANDRO ZEPEDA/EPA

Human pollution is turning the seas into acid so quickly that the coming decades will recreate conditions not seen on Earth since the time of the dinosaurs, scientists will warn today.

The rapid acidification is caused by the massive amounts of carbon dioxide belched from chimneys and exhausts that dissolve in the ocean. The chemical change is placing "unprecedented" pressure on marine life such as shellfish and lobsters and could cause widespread extinctions, the experts say.

The study, by scientists at Bristol University, will be presented at a special three-day summit of climate scientists in Copenhagen, which opens today. The conference is intended to update the science of global warming and to shock politicians into taking action on carbon emissions.

The Bristol scientists cannot talk about their unpublished results until they are announced later today. But a summary of the findings seen by the Guardian predicts "dangerous" levels of

ocean acidification and severe consequences for organisms called marine calcifiers, which form chalky shells.

It says: "We find the future rate of surface ocean acidification and environmental pressure on marine calcifiers very likely unprecedented in the past 65 million years." The scientists add that the situation in the deep sea is of even "greater concern".

The scientists compared the current acidification rate with a giant prehistoric release of greenhouse gas, which geologists know caused widespread extinction of deep water species.

The summary reads: "Because the rates of acidification between past and future are comparable, and [because] there was widespread extinction of benthic organisms [lowest living], one must conclude that a similar level of extinction is more likely than not in the future."

Concern about ocean acidification from carbon pollution has grown in recent years, but the issue receives much less attention than global warming — also caused by human carbon emissions.

The Bristol study is one of the first to predict the consequences of acid waters by looking at past events. It says future deep sea acidification must be limited to 0.2 pH units to avoid the worst effects. The pH of surface waters, where the CO<sub>2</sub> is absorbed from the atmosphere, has fallen by about 0.1 units since the industrial revolution, though it will take longer for the acid to reach deeper water.

Ocean acidification is one of the key topics at the Copenhagen summit, with a series of presentations scheduled to examine the impacts.

Ken Caldeira, an expert on ocean acidification at the Carnegie Institution in California, will tell the conference that the next few decades could produce "profound" changes in the oceans. He will say: "The choice to continue emitting carbon dioxide means that we will be an agent of biological change of a force and magnitude exceeded only by the causes of the great mass extinction events. If we do not cut carbon dioxide emissions deeply and soon, the consequences of ocean acidification will stand out against the broad reaches of geologic time. Those consequences will remain embedded in the geologic record as testimony from a civilisation that had the wisdom to develop high technology, but did not develop the wisdom to use it wisely."

Other experts will report that acidification is already affecting marine life in the Arctic and Antarctic. They will also discuss a bizarre finding that acid waters carry sound more efficiently, so the ocean will be a much noisier place in future.

The conference comes ahead of a year of high-level political discussions on climate change, which culminate in international negotiations in Copenhagen in December, where officials will try to hammer out a successor to the Kyoto protocol.

Katherine Richardson, a marine biologist at the University of Copenhagen, who organised this week's event, has described it as "a deliberate attempt to influence policy". She said many scientists were concerned that politicians have not grasped the seriousness of the situation, despite increasingly gloomy predictions.

This week's meeting will publish an update to the 2007 report of the Intergovernmental Panel on Climate Change (IPCC). A number of studies published since the IPCC report was prepared show that carbon emissions are rising faster than expected and that existing greenhouse gas targets may not be enough to prevent catastrophic temperature rise.

It will also assess whether projected sea level rises have been underestimated, and if there is still a realistic chance that average global temperature rise can be limited to 2C.

### **Road to Copenhagen 2009**

March: Scientific congress to update findings and issue new warning to policy-makers

June: Draft agreement proposed at UN meeting in Bonn

July: G8 summit in Italy

September: Possible special UN summit in New York

December: UN talks on new treaty in Copenhagen

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