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6.30.13

Corals face problems by 2100

July 11, 2013 in **Marine ecology**, **Warming**

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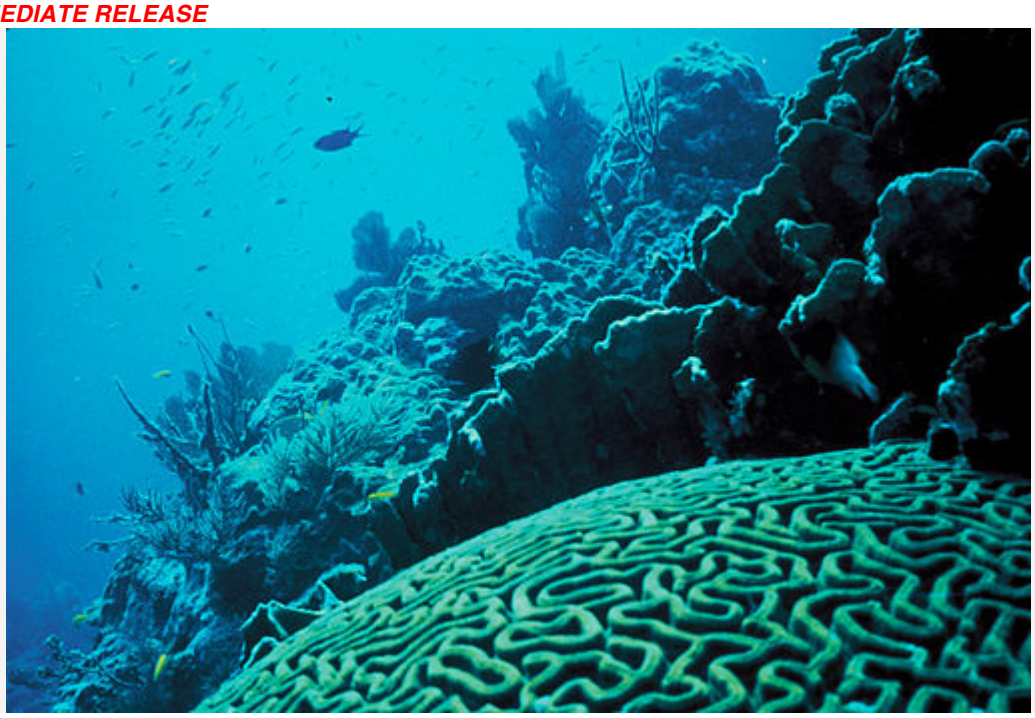

Coral reef in Florida: The global prospects are bleak without significant cuts in carbon dioxide emissions
Image: Jerry Reid, US Fish & Wildlife Service via Wikimedia Commons

By Tim Radford

New research suggests that by 2100 there will be no sea water left with the chemical properties that have supported coral reef growth in the past.

LONDON, 11 July – Without deep cuts in carbon dioxide emissions, the planet's coral reefs could be in serious trouble. In a world in which humans continue to burn fossil fuels unchecked, ocean conditions will become ultimately inhospitable, according to **US scientists**.

Katharine Ricke and Ken Caldeira of the Carnegie Institution in Washington and colleagues make their sombre prediction in ***Environmental Research Letters***. Their argument on the face of it seems inconsistent with other recent research on reef response to climate change, which in one case suggests that **some corals could vanish**, and in another that **some corals might adapt, very slowly**.

But the debate in all three cases is about the rate of warming, the levels of carbon dioxide in the atmosphere, and the ultimate impact of changes in the pH levels of the seas.

Ricke and Caldeira looked not so much at the warming of the seas – tropical corals are very sensitive to temperature – nor at the **levels of acidification** as such (because rain dissolves carbon dioxide to form a weak carbonic acid and inevitably affects the ocean's pH levels), but at the chemical circumstances in which crystals of aragonite can form. All fossil reefs and shell and bone sediments are ultimately calcium carbonate in the form of limestone or chalk. However, calcium carbonate or CaCO3 exists in two crystal structures, calcite and aragonite, and these fossilised sediments must once have been mostly aragonite.

That is because marine life, in the form of corals, fish and mollusc shells, mainly begins with aragonite. The biochemical availability of aragonite depends on the pH values of the water.

An end to dumping

Ricke and Caldeira used computer models to calculate ocean chemical conditions under a range of carbon dioxide scenarios, looking for the necessary conditions to support aragonite formation and shell and bone growth, and set a potential aragonite saturation threshold.

In pre-industrial times, 99.9% of the oceans that washed over coral reefs were comfortably above this threshold. Under the notorious business-as-usual threshold, in which fossil fuel use continues to grow, then ultimately the water surrounding the 6,000 coral reefs they used as a database for their research would be significantly below the threshold.

There would be a point at which the resilience and capacity to adapt that must be inherent in corals would be overwhelmed. The conclusion is a bleak one.

"Our results show that if we continue on our current emissions path, by the end of the century there will be no water left in the ocean with the chemical properties that have supported coral reef growth in the past. We can't say with 100% certainty that all shallow water coral reefs will die, but it is a pretty good bet," said Ricke.

And Caldeira said: "To save coral reefs, we need to transform our energy system into one that does not use the atmosphere and ocean as waste dumps for carbon dioxide pollution." – *Climate News Network*

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