Ocean acidification

Climate change and the Reef

A hidden menace

Increasing levels of carbon dioxide in the atmosphere are changing the chemistry of the Earth's oceans and threatening marine life. Every time we start a car or turn on the lights, about one-third of the carbon dioxide we emit ends up in the ocean. When carbon dioxide is mixed with water it creates carbonic acid.

carbon dioxide (CO_2)
+ water (H_2O)
= carbonic acid (H_2CO_3)

Acidity is measured on the pH scale. The lower the pH, the more acidic the substance. Excess carbon dioxide in the atmosphere causes more carbonic acid to form in the ocean, making it more acidic and reducing the pH. This process is known as ocean acidification.

pH	Examples of solutions and their respective pH
0	Battery Acid
1	Hydrochloric Acid
2	Lemon Juice, Vinegar
3	Orange Juice, Soda
4	Tomato Juice
5	Black Coffee, Acid Rain
6	Urine, Saliva
7	"Pure" Water
8	Sea Water

Corrosive impacts on marine life

The new chemical composition of our oceans is expected to harm a wide range of ocean life, particularly creatures with shells.

More acidic water decreases the ability of ocean creatures to form their skeletons. Increased acidity reduces carbonate – the mineral used to form the shells and skeletons of many shellfish and corals. The effect is similar to osteoporosis, slowing growth and making shells weaker. In theory, pH levels could drop enough that shells will literally dissolve.

This process will not only harm some of our favourite seafood, such as lobsters and mussels, but will also hurt some species of smaller marine organisms – such as pteropods and coccolithophores which form a vital part of the food web. If these smaller organisms are lost, the larger animals that feed on them could suffer as well.

Reaching the limits

Our oceans are becoming more acidic than they have been in hundreds of thousands of years. The change is happening fast and it will take fast action to slow or stop it. Over the last 250 years, oceans have absorbed 530 billion tonnes of carbon dioxide, triggering an unprecedented rise in ocean acidity.

Before people started burning coal and oil, ocean pH had been relatively stable for the previous 20 million years. But scientists predict that if carbon emissions continue at their current rate, ocean acidity will reach levels not encountered for hundreds of millions of years.

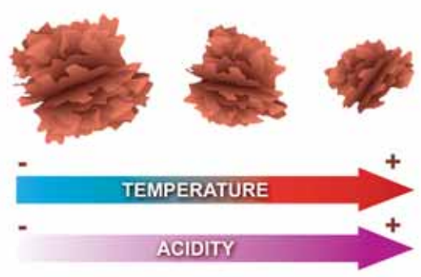
Disappearing coral reefs

Delicate corals may face an even greater risk than shellfish because they require very high levels of calcium carbonate to build their skeletons.

More acidic water slows reef-building, which lowers the resilience of corals and could lead to the erosion and eventual extinction of coral reefs.

Coral growth on the Great Barrier Reef has declined by 14 per cent since 1990 – a year scientists believe may have been a 'tipping point' for coral growth. This sudden decline in coral growth is unparalleled in the last 400 years.

Coral reefs serve as the home for many other forms of ocean life. Their disappearance would be akin to rainforests being wiped out worldwide. Such losses would reverberate throughout the marine environment and have profound effects upon humans as well.



Coral growth is decreasing as our oceans become warmer and more acidic.

A slow recovery

The current increase in ocean acidity is happening a hundred times faster than any change over many millions of years. By the end of this century, if carbon emissions are not stabilised, ocean acidity could be three times what it was before human industrialisation. It would require thousands of years for the oceans to re-establish chemical conditions that even partially resemble those found today. It would take hundreds of thousands to millions of years for coral reefs to return, based on the past record of natural coral-reef extinction events.

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