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Acidic seas fuel extinction fears

By Roger Harrabin

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Carbon dioxide emissions from human activities are acidifying the oceans and threaten a mass extinction of sea life, a top ocean scientist warns.

Dr Carol Turley from Plymouth Marine Laboratory says it is impossible to know how marine life will cope, but she fears many species will not survive.

Since the Industrial Revolution, CO₂ emissions have already turned the sea about 30% more acidic, say researchers.

It is more acidic now than it has been for at least 500,000 years, they add.

The problem is set to worsen as emissions of the greenhouse gas increase through the 21st Century.

"I am very worried for ocean ecosystems which are currently productive and diverse," Carol Turley told BBC News.

"I believe we may be heading for a mass extinction, as the rate of change in the oceans hasn't been seen since the dinosaurs.

"It may have a major impact on food security. It really is imperative that

we cut emissions of CO2."

Dr Turley is chairing a session on ocean acidification at the Copenhagen Climate Change Congress.

Testing times

The problem is most acute for creatures which make calcified shells.

OCEAN ACIDIFICATION

- Up to 50% of the CO₂ released by burning fossil fuels over the past 200 years has been absorbed by world's oceans
- This has lowered the pH value of seawater - the measure of acidity and alkalinity - by 0.1
- The vast majority of liquids lie between pH 0 (very acidic) and pH 14 (very alkaline); 7 is neutral
- Seawater is mildly alkaline with a "natural" pH of about 8.2
- The IPCC forecasts that ocean pH will fall by "between 0.14 and 0.35 units over the 21st Century, adding to the present decrease of 0.1 units since pre-industrial times"

[Natural lab shows sea's acid path](#)



Laboratory tests suggest starfish may be wiped out before the end of the century if current emissions trends continue.

Scientists fear mussels may not be able to cope, either. Oysters may be less vulnerable, and farmed oysters may fare better than wild oysters.

"One thing is certain," says Dr Turley. "Things will change. We just don't know yet exactly how they will change.

"It is not a very wise experiment to be making."

Professor Andy Watson, an ocean biologist from the University of East Anglia, believes climate change and overfishing may ruin the seas before acidification does.

He condemns increases in CO₂ from human activities, but points out that ocean acidity also fluctuates naturally.

He also wonders if some creatures might adapt to the changes over time.

"(In) many of the experiments that are being done at the moment, sudden changes are made; the CO₂ is quickly raised, for example, or the acidity is quickly raised.

"Of course, that's not really what will happen in the real world," he told BBC News.

"There will be instead a gradual ramping up of CO₂ and acidity. And we don't know whether organisms will be able to adapt or how quickly they'll be able to adapt."

Professor Tony Knapp runs the BIOS institute in Bermuda, where some of the key measurements of acidity are taken.

He defends his conclusion that the recent increase in acidity has been caused by CO₂ emissions from burning fossil fuels.

"It took me a long time to determine that I was convinced... I'm a cynic at heart.

"But if you look at the data, and you're intimate with the data, there's really no other conclusion you could make".

Stormy waters

On the island of Ischia, in the Bay of Naples, Italy, scientists believe they have evidence that many creatures will fail to adapt to increased acidification.

THE pH SCALE

Higher numbers indicate alkalis, lower values signify acidic liquids:

- 13 - bleach
- 10 - soap
- 8.2 - pre-1750 oceans (average)
- 8.1 - current oceans (average)
- 7.8 - oceans in 2100 (projected average)
- 7 - pure water
- 3 - vinegar
- 0 - battery acid

(Source: NMEA)

The seawater around a part of the island has been more acidic for thousands of years thanks to volcanic CO₂ vents that turn the seabed into a sort of jacuzzi.

If research here presents an accurate picture of future oceans, the prospects for shell-forming organisms are bleak.

Some of the creatures that appear to survive increased levels of acidity in short-term laboratory studies are not present here in the real world at the same levels of pH.

"We are very worried," says Dr Jason Hall-Spencer from Plymouth University, who researches the site with help from the Naples-based Benthic Ecology Laboratory at Stazione Zoologica.

"The changes here have clearly made life impossible for shell-forming creatures.

"When you start messing around with a complex ecosystem it is impossible to tell what will happen."



The Ischia site does not present a perfect experiment for future oceans because levels of acidity shift regularly as the currents change, whereas future oceanic pH levels will be more stable.

But the site does show clear winners and losers: the lush seagrass, hyper-fertilised by CO₂, may be the tallest in the world.

The extra acidity will suit some creatures, but Dr Hall-Spencer argues that the diversity of the site is reduced and therefore it is likely that productivity of valuable species will diminish in future acidified oceans.

Ocean acidification is increasingly known as "the other CO₂ problem".

It is a new branch of science and researchers were initially uncertain how seriously to take the threat.

"In 2004, I did a Google search for ocean acidification and got 17 hits," says Dr Turley.

"Now you get hundreds of thousands. There is much more evidence to show this will be a problem for the future - indeed it may even be a problem for now."

For many people it will strike a sobering note that humans appear to be changing the chemistry of the mighty oceans.