

Opinion & Analysis

CO₂ damage to oceans could lead to a global calamity



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One of the more serious threats now facing all life on this planet has crept up almost unnoticed

SPACE IS often regarded as humanity's final frontier. Yet perhaps the most remarkable voyage ever undertaken by a manned craft never actually left the ground. This was the *Trieste*, which descended to the ocean floor in an area of the western Pacific Ocean known as the Challenger Deep, on January 23rd, 1960.

The two-man crew spent just 22 minutes on the ocean floor, at a depth of 11,000 metres – that's nearly 3 kilometres deeper than Mount Everest is tall. This extraordinary voyage was completed nine years before man first set foot on the moon. Since then, 12 people have walked on the lunar surface, but no one has managed to return to that inky ocean floor.

Yet we know that at these almost fathomless depths, with eight tonnes of pressure per square inch, life does indeed exist, but not as we know it. The deep oceans are home to exotic species more alien than anything we're likely to encounter in space.

Since barely 5 per cent of the world's oceans have been explored, many of these creatures haven't yet been encountered, never mind studied.

This is an egregious omission, given that the oceans cover seven-tenths of the world's surface and constitute 97 per cent of its total

biosphere. We keep on looking for life in all the wrong places. The US, for instance, spends 25 times more on its space programme than on marine research.

Our collective indifference to the oceans may go some way towards explaining how one of the more serious threats now facing all life on this planet has crept up almost unnoticed. And that is ocean acidification.

Human activity over the last two centuries has pumped an estimated 1,000 billion tonnes of CO₂ into the atmosphere. This is the "greenhouse" gas that is implicated in global warming.

We have, however, been extremely fortunate that around half of this extra load of CO₂ has been reabsorbed from the atmosphere and dissolved into the world's oceans as carbonic acid. Were this not the case, temperatures would have risen far more sharply than the one degree or so of average warming that has occurred so far.

However, our good fortune has been at a heavy price for the oceans. This vast influx of additional carbon has altered the basic chemistry of the world's oceans, making them more acidic in the process.

Surface ocean acidity has increased by 30 per cent in the 200 years or so since we

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started burning fossil fuels on an industrial scale, with half of this increase occurring in just the last 30 years. Experts now project that ocean acidity will have doubled by 2050.

The pace of change in the pH levels of the oceans is occurring at around 100 times faster than any recorded natural rate. Last week's International Scientific Congress on Climate Change in Copenhagen heard that acidification is now as profound a threat to the world's oceans as climate change is to the land surface.

Australian scientists have discovered that the shells of tiny plankton called *foraminifera* have thinned by around a third as a result of

acidification. Trillions of these creatures are at the base of the marine food chain and the entire system ultimately depends on them.

More research points out that the world's reef systems are extremely susceptible to acidification, with some reefs already exhibiting symptoms that in humans might be diagnosed as osteoporosis.

Reefs are the nurseries for much of the world's fish; they also protect shores from tidal damage. The economic cost of their decline will be immense.

In January, the Monaco Declaration was issued by a panel of 155 international scientists, including two from Ireland's Marine Institute. This follows a recent UN symposium on ocean acidification, which, it warns, "is accelerating and severe damages are imminent . . . the potential is there for drastic changes in the oceans".

The declaration adds that already, it will take the oceans thousands of years to recover from this "large-scale rapid human-induced perturbation", but warns that allowing atmospheric CO₂ levels to continue to spiral could tip a crisis into a global calamity.

The dangerous effects of acidification are occurring in tandem with sharp increases in surface temperatures. Overfishing is also

exacerbating pressures on the marine ecosystem. All life began in the sea, and the health of the planet as a whole depends on the wellbeing of the oceans. The old notion that the seas are too vast to be damaged by human actions no longer holds water.

Dr James Hansen of the Nasa Goddard Institute today leads a "day of climate action" in the UK. He is urging civil disobedience if necessary to prevent the building of any more coal-fired power plants, which he calls "death factories".

Coal burning is the world's number one source of CO₂ emissions, and as Hansen points out, the only safe use of coal is to leave it in the ground. This in turn will require little short of a socio-political and energy revolution.

"If we do not cut CO₂ emissions deeply and soon, the consequences of ocean acidification will stand out against the broad reaches of geologic time," cautioned marine scientist Ken Caldeira. "These 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."

It may yet be the litmus test of this generation.