

'Coral lab' offers acidity insight

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Five metres under the blue waters of the Red Sea in Eilat, Israel, we're examining a long steel table arrayed like a plant nursery with ranks of near-identical specimens.

They're not plants, they're corals, which are being cultivated for experiments into ocean acidification.

The specimens are taken to one of the world's most desirable science laboratories - the Interuniversity Institute for Marine Science, located right on the beach at Eilat.

There, scientists are reaching worrying conclusions, particularly for the hundreds of millions of people who rely on fish that depend on coral reefs.

The project is led by a lean triathlete, Dr Maoz Fine.

He started by measuring the growth rate of corals at a pH of 7.9, which is about the same level that the world's oceans, on average, are expected to reach by the end of the century.

To his surprise, the corals - which produce alkaline shells - were only slightly affected by the decrease in alkalinity during the one-year experiment.

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*)

He lowered the water's pH to 7.6, which is roughly equivalent to about 1,500 parts per million of CO₂ in the atmosphere.

The unpublished experiment is controversial because it creates conditions much worse than even the most pessimistic forecast.

Dr Fine defends it because he says we need to find as soon as possible whether different corals will react differently to higher acidity by pushing the limits of coral physiology to extreme.

He was amazed to find that the fast-growing branching corals (*Stylophora pistillata*) did well even under this low pH.

But the slow-growing corals (*Porites*), which form the bedrock of the reefs, were demonstrably harmed.

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"

Far more alarming is the experiment on a humble calcareous algae, which looks like pink paint on a rock.

This algae plays a vital role in cementing reefs together. But it cannot survive the pH levels of 8.0 predicted before the end of the century, possibly as early as 2050.

That means the reefs are likely to begin to crumble.

"Corals will continue to exist," Dr Fine says, "but the reefs will be greatly changed from what we know now and their biodiversity will be dramatically reduced.

"This will make them much more vulnerable to other catastrophic events, like bleaching.

"We are piling problems upon each other."

Dr Fine fears another mass coral extinction is possible, like ones that have happened during acidic episodes in the past.

The fossil record shows that each time corals have bounced back, albeit with a different combination of species and over millions of years.

Dr Fine's laboratory has discovered that the creature that forms the reefs - the coral polyp - flees its shell if conditions become inhospitable.

This makes it more vulnerable to predators, but it is able to survive and reproduce while swimming in open water.

Scientists leading the work on ocean acidification hope it will be another spur to persuade politicians to cut CO₂ emissions, which are changing the ocean by warming the planet.

The inexorable linear progress of acidification is much more predictable than climate change, they say.

But one leading coral scientist, Tom Goreau of the Global Coral Reef Alliance, describes acidification as a "fad", distracting the world from climate change.

"The increase in direct surface temperature is a far more serious and immediate threat to reefs than acidification," he says in an article for the Alliance.

"Acidification will only dissolve the dead skeletons after high temperatures kill the corals.

"So focusing on acidification amounts to a red herring and effectively ignores a far larger and more immediate problem."

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