Rising acidity in seawater damages marine ecosystems

Rising emissions of carbon dioxide from human activities are not only contributing to the warming effect of greenhouse gases in the atmosphere, they are also acidifying the world’s oceans. New research examines the major ecological tipping points that occur when the concentration of dissolved carbon dioxide in seawater increases.

The oceans absorb CO₂ from the atmosphere where it dissolves and makes the water more acidic. Although they absorb over 25 million tons of CO₂ everyday, the surface waters of the oceans have become 30 per cent more acidic since the early 1900s when wide-spread burning of fossil fuels began. As a result, the ocean is now undergoing the fastest rate of acidification in at least the past 20 million years.

An international team of researchers has documented the first ecosystem-wide responses to long-term changes in ocean pH. The researchers studied marine communities around underwater volcanic vents (openings on the sea floor that release gas from volcanic activity) where carbon dioxide bubbles up, like a jacuzzi, releasing millions of litres of CO₂ per day and causing seawater acidification. The major impacts on marine life around the vents included 30 per cent reductions in the number of species where average pH had dropped by 0.2-0.4 units, (pH 7.8-7.9), compared with areas with normal pH for seawater (pH 8.1-8.2).

This research provides the first confirmation of modelling and short-term laboratory experiments which have predicted severe reductions in the ability of marine organisms to build shells or skeletons from calcium carbonate due to the dramatic effects of CO₂ on seawater chemistry. Although seagrasses were tolerant of the increased CO₂ levels, major groups such as corals, sea urchins and calcified algae were removed from the ecosystem and replaced by invasive species of algae. The researchers found:

- acidification dissolved the shells of calcified species such as corals, sea urchins and snails, which were absent in areas with a pH less than 7.4
- high CO₂ favoured the production of seagrass
- the amount of calcified algae, which bind coral reefs together in the tropics, fell from more than 60 per cent outside the vent areas to zero within these areas
- invasive alien species, which cause damage to ecosystems worldwide, were found to thrive at high CO₂ levels

This study demonstrates, for the first time, what happens to marine ecosystems when key groups of species are killed due to rising CO₂ levels and adds urgency to the international policy drive to reduce CO₂ emissions.


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