

►► Acid Oceans: a new challenge for researchers

The level of carbon dioxide in the atmosphere has risen exponentially since the dawn of industrialization. Although it is now widely accepted that rising levels of CO₂ are affecting the global climate, the impact on our oceans is less widely known. Over the past 200 years about half of the world's CO₂ emissions have been absorbed by the oceans. This lowers the pH of seawater turning the oceans more acidic - a process known as ocean acidification.

Ocean acidification is now occurring at unprecedented rates. If allowed to continue unchecked, acidification will have a widespread impact on marine ecosystems affecting the growth, reproduction and survival of many marine species. In fact, seawater may become so acidic that it will become corrosive to aragonite, a form of calcium carbonate used by many marine organisms to make their external skeletons. Especially under threat are the calcifying organisms such as corals, shellfish and phytoplankton which underpin many marine ecosystems.

►► Impacts of ocean acidification

Oceans cover 70 % of the planet's surface. They support an incredible diversity of life and provide highly valuable resources to our society. Another key, and often forgotten, role of the oceans is in regulating global climate and biogeochemical cycles. As the oceans continue to absorb increasing levels of CO₂ from the atmosphere these cycles are disrupted and ocean acidification occurs.

The effect of ocean acidification on marine organisms and ecosystems has only recently been recognized. From the first experiments on calcareous algae in 1985 (by scientists Agegian and Mackenzie from the University of Hawaii)



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to the work on tropical corals by Jean Pierre Gattuso in 1998, studies predict that under the CO₂ conditions expected for 2100, if current emissions continue unchecked, calcium carbonate production by marine organisms will decrease by 2050 %.

►► Change at a lightning rate

In the last 200 years, in line with widespread industrialisation, oceans have absorbed approximately half of the CO₂ produced by fossil fuel burning: coal, natural gas, oil - this is equivalent to approximately 120 billion tonnes! This has led to

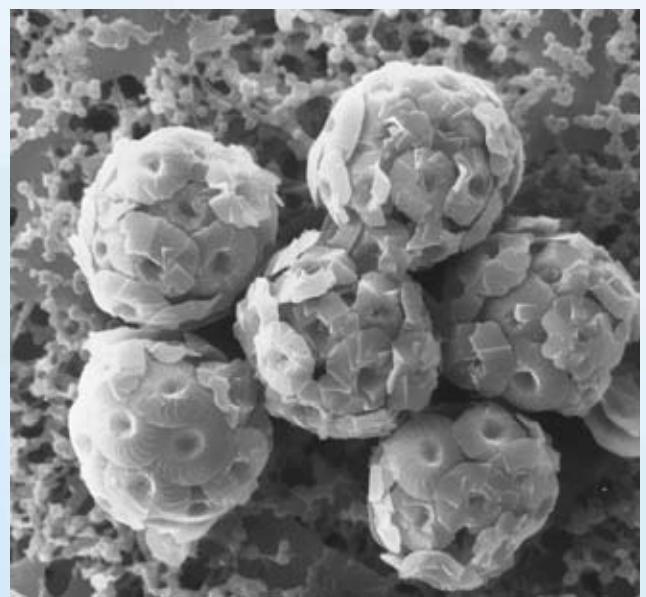
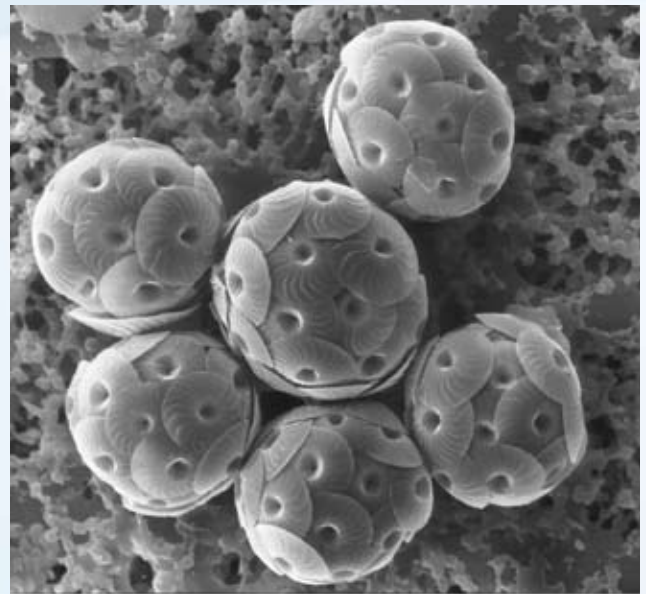
a drop in pH of 0.1 units in our oceans during the 20th Century.

Currently, 25 million tonnes of carbon dioxide dissolve into seawater every day! If the rise of CO₂ emissions continues at an exponential rate over the next century, ocean acidification could occur at a rate almost 1000 times faster than any natural variation previously experienced between ice ages.

If, as indicated by current trends, CO₂ production due to human activities continues to increase, by the end of the century the pH of surface seawater could decrease by about 0.5 units - the lowest pH in hundreds of millennia. This change in the chemistry of the oceans is both quantifiable and predictable. The consequences, however, of this acidification on marine organisms are harder to predict. Initial experimental studies have indicated that continued acidification would pose a real threat for the survival of some marine species. Scientists warn of the need for much more research into the possible biological implications.

James Orr (senior scientist at the French Laboratoire des Sciences du Climat) said: "Many partial solutions already exist to reduce our emissions, but what is missing is our will and that of our leaders. If each one of us could think seriously about our own CO₂ emissions (at current rates it is about 11 kg per day per person, of which 4 kg are absorbed by the ocean) and how to reduce them, it would be a really good start."

The first step is to raise awareness of the problem amongst the general public and Europe's leaders and to call for the commitment of everyone in taking decisive actions to decrease CO₂ emissions.



CALCIDISCUS (EXPERIMENTAL CONDITIONS SHOWING ▲ THE NEGATIVE EFFECT OF THE INCREASED CO₂ PARTIAL PRESSURE EXPECTED TO OCCURED BY THE YEAR 2100)

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