Phosphorus sheds new light on the ocean's carbon dioxide pump

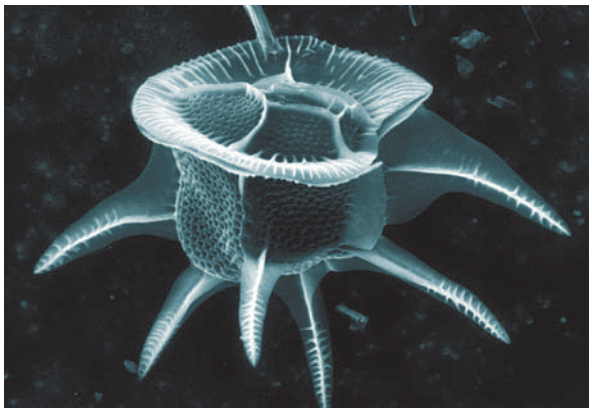
A recent finding that the preserved skeletons of ancient deep-sea corals stored phosphorus in exactly the same amounts as the surrounding oceans has opened the way for researchers to measure the ability of the world's oceans to absorb man-made CO_2. This may help answer one of the biggest questions surrounding global warming: whether or not the oceans can keep pace with human CO_2 output.

Professor Malcolm McCulloch, deputy director of the Center of Excellence in Coral Reef Studies (CoERCS) and research leader at the Australian National University's Research School of Earth Sciences, and colleagues from Italian and Spanish research institutions led by Dr Paolo Montagna have used a sophisticated dating method on fossil corals to piece together information on the oceans as far back as the last glacial period, nearly 20 000 years ago. Their results were recently published in *Science*.

The technique used calculates the amount of phosphorus present, a nutrient of vital importance to all life.

'Now that we have this tool we can look more closely at the role of nutrients in the ocean and try to understand, in a lot more detail, how they operated in the past,' said Professor McCulloch.

'Phosphorus is a key nutrient in the ocean that controls biological productivity.



Microalgae, central to the productivity of the oceans, have calcium carbonate skeletons, such as the example above, that result from processing CO_2 through photosynthesis. CSIRO

Organisms use it up and because there is only so much available, there is a limit to how many organisms there can be.'

Plants and animals in the ocean's surface waters drive a 'biologic pump' of productivity, taking up much of the carbon dioxide (CO_2) from the air, along with other key nutrients such as phosphorus, and storing it inside their bodies. Eventually the CO_2 descends to and becomes part of the sea floor. The turbulent mixing of the oceans also helps to absorb CO_2.

The more plants and animals there are in the ocean, the more productive it becomes at absorbing greenhouse gases. The productivity of an area of ocean is therefore indicated by the amount of phosphorus in it.

The question is whether the 'biologic pump' can keep pace with the vast amounts of CO_2 now being produced by humans.

Some scientists fear that if it cannot keep up, the waters of the oceans will become more acid. This could hinder the growth of plants and animals that are critical to the operation of the biologic pump, which could ultimately lead to the collapse of one of the main systems that helps to remove greenhouse gases from the atmosphere.

'We can now find out how the oceans responded to previous increases in carbon dioxide and how quickly they can absorb it,' Professor McCulloch said.

'This complements ongoing studies of our oceans. The dilemma is that you often don't know whether we are in an irreversible situation till after it has happened, so we try to better understand these processes by looking at how the planet has responded in the past.'

Centrelink's fleet car forest

As a result of an organisation-wide commitment to offsetting its vehicle fleet's CO_2 emission, Centrelink will have a dedicated forest of 14 450 native trees planted for its efforts by Greenfleet at Monivae near Hamilton in Victoria.

Not-for-profit organisation Greenfleet runs a program to neutralise greenhouse gas emissions by planting trees for individuals and organisations that subscribe. It plants 17 native trees per tax-deductible car subscription of $40, and can also calculate appropriate offsets for air travel and others emissions sources.

As they grow, the trees absorb the greenhouse gas emissions that the average car produces in one year (about 4.3 tonnes of CO_2). They also help to fight salinity and provide essential habitat for native species. Greenfleet's forest planting for Centrelink at Monivae will be remediating a heavily deforested area.

Volunteers are a big part of Greenfleet's tree planting projects. Greenfleet Australia

Since July 2005, after it introduced the program to its 300 Environmental Champions nationally, Centrelink has increased subscriptions to Greenfleet by 900 per cent. Now, 850 fleet vehicles are 'carbon neutral' under the program. Many individual employees have also signed up their own cars.

Jeff Whalan, CEO at Centrelink, said, 'This is an extremely important program for Centrelink'.

'The forest, which will be planted in September, will, as it grows, take more than 3870 tonnes of carbon dioxide out of the atmosphere.

'We have also reduced our electricity consumption by seven per cent and reduced our paper use by 28 per cent over the last two years.'

Greenfleet has now planted more than 2.4 million trees around Australia on behalf of individual motorists and corporate or government fleets.