Rising CO2 'will hit reefs harder'

October 27 2008

(PhysOrg.com) -- Rising CO2 levels in the world's oceans could deliver a disastrous blow to the ability of coral reefs to withstand climate change.

A major new investigation by Australian scientists has revealed that acidification of the oceans from human CO2 emissions has the potential to worsen the impact of the bleaching and death of reef-building organisms expected to occur under global warming.

The study by a team led by Dr Ken Anthony of the ARC Centre of Excellence for Coral Reef Studies and The University of Queensland, published in this week's *Proceedings of the (US) National Academy of Sciences (PNAS)* concludes that earlier research may have significantly understated the likely damage to the world's reefs caused by human-made change to the Earth's atmosphere.

In a large experiment on Heron Island, the team simulated CO2 and temperature conditions predicted for the middle and end of this century, based on current forecasts of the world's likely emission levels and warming by the Intergovernmental Panel on Climate Change (IPCC).

The results of their analyses of the bleaching, growth and survival of a number of organisms including corals indicates that a number of very important reef builders may be completely lost in near future.

“We found that coralline algae, which glue the reef together and help coral larvae settle successfully, were highly sensitive to increased CO2. These may die on reefs such as those in the southern Great Barrier Reef

before year 2050," says Dr Anthony.

"Every time you start your car or turn on the lights, half the CO2 you emit ends up in the oceans, turning them just a tiny bit more acidic, as well as causing the climate to warm. What is new is an understanding of how these two effects interact to affect the corals and reef building algae."

The CoECRS team erected 30 large aquaria in the waters of Heron Island in the southern GBR and studied the combined effects of warming, high CO2 and sunlight on a large range of reef organisms for eight weeks.

"The results, frankly, are alarming," says researcher and 2008 Smart State Premier's Fellow Professor Ove Hoegh-Guldberg. "They clearly suggest that previous predictions of coral bleaching have been far too conservative, because they didn't factor in the effect of acidification on the bleaching process and how the two interact."

The results of the team's analyses of the bleaching, growth and survival of key coral reef species indicate that a number of very important reef builders may be completely lost in the near future – in particular the coralline algae that glue the reef together and help coral larvae settle successfully, says Dr Guillermo Diaz-Pulido.

On the positive side, some coral species seem able to cope with the levels of ocean acidification expected by the mid-century by enhancing their rates of photosynthesis, says team member Dr David Kline. "This is an important discovery that can buy the reef time while the nations of the world work together to stabilise CO2 emissions," he says.

"Although high CO2 causes corals to bleach and lose their symbiotic organisms, the surviving symbionts seem able to work harder. However,

when CO2 levels in the water become too high, the symbiotic coral-algal system crashes and the corals die," adds Dr Sophie Dove.

"The implications of this finding are massive as it means that our current bleaching models, which are based on temperature only, severely underestimate the amount of coral bleaching we will see in the future," Dr Anthony says.

"These results highlight the urgency of reducing CO2 emissions globally. Without political will and commitment to abatement, entire reef systems such as the Great Barrier Reef will be severely threatened in coming decades," the team warns.

The results of the research are being offered to reef managers to help them develop strategies to protect the reefs which are most at risk.

Provided by UQ