New tactics needed to save oceans from CO2 emissions

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(Phys.org) -- A University of Queensland scientist is involved in an international collaboration that has proposed a new strategy for marine conservation, which involves unconventional, proactive tactics, in a paper published in *Nature Climate Change* today.

Current actions identified in national and international policy to counter the impacts of CO2 emissions are proving inadequate, according to the authors, Greg Rau (Institute of Marine Sciences, University of California, Santa Cruz), Elizabeth McLeod (The Nature Conservancy) and Ove Hoegh-Guldberg (Global Change Institute, The University of Queensland).

“It's unwise to assume we will be able to stabilise atmospheric CO2 at levels necessary to reduce or prevent ongoing damage to marine ecosystems,” said Professor Hoegh-Guldberg.

“A much broader approach to marine management and mitigation options, including manipulating the environment around corals and considering the translocation of reef-building corals, must be evaluated,” he said.

Marine conservation options may include:

- Using shade to protect corals from the heat stress which leads to coral bleaching and death, albeit at small scales.

- Actively assisting biological resilience and adaptation through spatial planning, protective culturing and possibly selective breeding
- Maintain or manage ocean chemistry by adding globally abundant base minerals such as carbonates and silicates to the ocean to neutralize acidity, and improve conditions for shell formation in marine creatures
- Convert CO2 from land-based waste into dissolved bicarbonates that could be added to the ocean to provide carbon sequestration and enhance alkalinity.

Investigating such approaches in terms of their cost, safety and effectiveness must be part of ocean conservation and management plans in the future, according to the paper's authors.

They believe more ideas need to be solicited and further research is required to determine which if any of these ideas could form the basis of safe and cost effective marine conservation strategies.

“Many of these ideas may only prove practical and effective at a local or regional scale,” said Professor Hoegh-Guldberg.

“However, they may still be important to local businesses that may value patches of coral reefs.” he said.

“In lieu of dealing with the core problem – increasing emissions of greenhouse gases – these techniques and approaches could ultimately represent the last resort. I hope we don't end up in the position but we must at least be prepared.”

Rather than waiting for damage to occur, the authors suggest that research and evaluation of non-passive measures to preserve marine communities must be undertaken before more costly and less effective

restoration from CO2-related impacts is needed.

According to the paper, if current trends continue, by 2050 atmospheric CO2 is expected to increase to more than 80 per cent above pre-industrial (pre-1750) levels, with the corresponding devastation to marine environments putting trillions of dollars at risk globally.

From tropical to polar oceans, the magnitude and speed of the changes expected as a result of climate change and increasing ocean acidity is likely to exceed the ability of numerous marine species to adapt and survive. This rate of increase has few, if any, parallels in the past 300 million years of the Earth's history.

According to the authors, some species may be able to adapt to the expected changes by migrating deeper into the ocean or further away from the equator. However, such events are rare and difficult. For example, the Great Barrier Reef would have to migrate south at the rate of 15 kilometres a year to keep pace with the predicted increases in ocean temperature while at the same time preserving its tourist and fisheries values. This seems highly unlikely given the complexity of the reef ecosystem.

Provided by University of Queensland