Corals 'could starve in high CO2'

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(PhysOrg.com) -- As human activity pumps more and more carbon into the atmosphere, a new threat has emerged to the world's coral reefs - starvation.

Scientists at the ARC Centre of Excellence for Coral Reef Studies and The University of Queensland have discovered that the symbiotic algae known as zooxanthellae which supply 99 per cent of the corals' food supply may be disrupted by high CO_2 levels and increased ocean acidification.

The result could be decreased productivity in corals, increasing their vulnerability to bleaching, diseases and other impacts, say PhD researcher Alicia Crawley, Dr Sophie Dove and colleagues, following investigations carried out at Orpheus Island Research Station on the Great Barrier Reef.

By exposing the algae to levels of CO_2 likely to occur if the world fails to limit carbon emissions, the researchers found that production of a key enzyme that protects the symbiotic algae from sunlight is reduced by up to half.

"This enzyme provides protection to the zooxanthellae from harmful solar radiation while they are carrying out photosynthesis and producing energy for the corals," Ms Crawley said.

"If the algae do not produce enough of this enzyme then the excess light causes oxidative stress, which in turn reduces their ability to convert

sunlight into nourishment for the coral.

"Should this effect continue for some time, the coral may actually expel the zooxanthellae, which is the cause of bleaching. If they do not then recover their algae quickly, the corals die of hunger."

The researchers say the effect is independent of global warming, as it is driven primarily by increased emissions of CO_2 to the atmosphere from the burning of fossil fuels, and the ocean acidification that results from them.

"Our research suggests that ocean acidification may present a double jeopardy for corals - on the one hand it will disrupt the process by which they form their chalky skeletons - the osteoporosis of the reef - and on the other, it will reduce their food supply from their zooxanthellae," Dr Sophie Dove said.

The combined effect may exacerbate the impact of global warming on the world's reefs and the 500 million humans who depend on them, making coral ecosystems more vulnerable to bleaching at lower temperatures.

"This gives us yet another reason to reduce our CO_2 emissions," Ms Crawley said.

"Our research suggests there may be some benefits for zooxanthellae under lower carbon conditions - but not if we continue to pump out carbon dioxide at the rate we are now doing."

"It is important to note that this enzyme represents just one change in coral organisms that will occur under high CO2. There are likely to be other changes that we haven't yet examined.

"However it is a further reason for Australia's leaders to act now to tackle climate change issues. The future of our coral reefs depends on it."

Their article - The effect of ocean acidification on symbiont photorespiration and productivity in Acropora Formosa - appears in the online journal, *Global Change Biology* www3.interscience.wiley.com/jo … l/122314657/abstract

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