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IPSO Preliminary Report on ocean stresses and impacts

Case study 2

End of paradise: Coral reefs facing multiple attacks

by Professor Ove Hoegh-Guldberg

Coral reefs around the world are facing major stress from local factors such as overfishing, pollution, and unsustainable practices along tropical coastlines. Over the past 50 years, these activities have resulted in at least 40% of the world's coral reefs disappearing. This problem is in itself extremely serious. Recently, however, climate change has also begun to threaten the world's reefs, through the dual effects of ocean warming and acidification.

What the multi-disciplinary approach of the IPSO workshop made clear for the first time was the multiple threats reefs are facing, that are now acting together to have a greater impact than if they were occurring on their own.

These synergies and antagonisms are significantly modifying our understanding of the threats faced by all ocean ecosystems. A recent study, for example, has revealed that reef building corals are more sensitive to temperature stress when exposed to acidified ocean waters.

This suggests that existing scientific projections of how coral reefs will respond to global warming have been highly conservative and must now be modified.

The workshop brought together the latest research on coral reefs, revealing for example that corals across the surface are in rapid decline, with crucial ecosystem processes such as calcification in freefall.

Why coral reefs matter to us

Coral reefs are the most diverse ecosystem on the planet. Almost everyone who has visited a coral reef knows how special they are. These amazing ecosystems are not only beautiful. They support an estimated 500 million people throughout the world. In developing countries, coral reefs provide food, income, building materials, and other resources. In developed countries, coral reefs provide valuable fisheries and support billion-dollar per annum tourist industries.

At longer timescales, coral reefs are vitally important as coastal barriers to wave stress, which would otherwise impact human communities and infrastructure. As coral reefs deteriorate, many of these ecosystem services will be put in doubt.

Rapidly heating sea temperatures are driving mass coral bleaching events, where the corals which build coral reefs and provide the homes of thousands of other species get sick and

die. At the same time, rising carbon dioxide in the atmosphere has been changing the chemistry of the ocean to the point where corals and many other creatures are having trouble forming their limestone-like skeletons. And without being able to form the skeletons, these creatures can no longer maintain the three-dimensional structures associated with coral reefs.

Scientific projections of how the temperature and chemistry of the world's oceans will change in the future indicate a high risk of major catastrophe . Higher sea temperatures and altered chemistries of the future are hostile to coral reefs, and are likely to eliminate these wonderful ecosystems in the next 30-50 years if urgent action is not taken.

The priority is to rapidly reduce the emissions of carbon dioxide from the burning of fossil fuels and unsustainable agriculture.

The second step is to reduce the other stresses that plague coral reefs. Managing these other stresses such as overfishing and declining water quality will become increasingly important as climate change already in the Earth's atmospheric systems puts these important ecosystems under stresses that they have not seen for many millions of years.

Professor Hoegh-Guldberg says the proplems that face coral reefs must be solved:

“It is very clear from the workshop that we are seeing an unprecedented rate of change in the world's oceans. This is being generated by climate change, population pressure and an increasing extraction of limited resources such as fisheries. The impacts on the ocean are becoming extremely serious. If we continue on our current pathway, many of the ecosystem services which humans depend on will disappear with extremely dire outcomes for people in every country of our planet. These changes will take thousands of years to reverse. “

Ove Hoegh-Guldberg
Prof and Dir, Global Change Institute, University of Queensland
Queensland Smart State Premiers Fellow (2009-2013)

Email: oveh@uq.edu.au