

# Humans 'damaging the oceans': research

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Mounting evidence that human activity is changing the world's oceans in profound and damaging ways is outlined in a new scientific discussion paper released today.

Man-made [carbon emissions](#) "are affecting marine biological processes from genes to ecosystems over scales from rock pools to ocean basins, impacting ecosystem services and threatening human food security," the study by Professor Mike Kingsford of the ARC Centre of Excellence for Coral Reef Studies and James Cook University and colleague Dr Andrew Brierley of St Andrews University, Scotland, warns.

Their review, published in the latest issue of the journal *Current Biology*, says that rates of physical change in the oceans are unprecedented in some cases, and change in ocean life is likely to be equally quick.

These include changes in the areas fish and other sea species can inhabit, invasions, extinctions and major shifts in marine ecosystems.

"In the past, the boundaries between geological ages are marked by sudden losses of species. We may now be entering a new age in which climate change and other human-caused factors such as fishing are the major threats for the oceans and their life," Andrew and Mike say.

"Given how essential the oceans are to how our entire planet functions it is vital that we intervene before more tipping points are passed and the oceans go down the sort of spiral of decline we have seen in the world's tropical forests and rangelands, for example."

Man-made carbon emissions are now above the 'worst case' scenario envisioned by the Intergovernmental Panel on Climate Change (IPCC), causing the most rapid global warming seen since the peak of the last Ice Age. At the same time the carbon is acidifying the oceans, with harmful consequences for certain plankton and shellfish.

"At current emission rates it is possible we will pass the critical level of 450 parts per million CO<sub>2</sub> in the atmosphere by 2040. That's the level when, it is generally agreed, global climate change may become catastrophic and irreversible," they add. "At that point we can expect to see the loss of most of our [coral reefs](#) and the arctic seas."

"The climate is currently warming faster than the worst case known from the fossil record, about 56 million years ago, when temperatures rose about 6 degrees over 1000 years. If emissions continue it is not unreasonable to expect ... warming of 5.5 degrees by the end of this century."

Scientists expect ocean oxygen levels to decline by about six per cent for every one degree increase in temperature and areas in the sea which are low in oxygen to grow by at least 50 per cent. This has major implications for the world's most productive fishing waters in the cool temperate regions. The seas provide around one sixth of humanity's protein food - and any loss in fisheries production will have a direct impact on us, he adds.

Besides the changes induced by carbon emissions, the oceans are also under assault from over-fishing, increased UV exposure, toxic pollution, alien species and disease. The combined effect is to weaken the ability of many species to withstand these multiple stresses.

Another risk is that warming will unlock vast reserves of frozen methane in the seabed, triggering uncontrollable, runaway global warming.

"In the face of such terrifying changes even large scale interventions such as establishment of very large networks of Marine Protected Areas are unlikely to be effective," Mike cautions. "On a global scale, an immediate reduction in CO2 emissions is essential to minimize future human-induced climate change."

The oceans can also play a role in the proposed solution of eliminating carbon emissions, by producing clean energy from wind, wave and tide - potentially - by triggering phytoplankton blooms with fertilisers to absorb more carbon from the atmosphere, or using the seabed to store CO2. However these require far more research to be sure.

"It may already be too late to avoid major irreversible changes to many marine ecosystems. As history has shown us, these marine-based changes could have major earth-system consequences," the scientists conclude.

More information: Andrew S. Brierley, and Michael J. Kingsford, Impacts of [climate change](#) on marine organisms and [ecosystems](#), [Current Biology](#) 19, R602-R614, July 28, 2009

Source: ARC Centre of Excellence in Coral Reef Studies

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