

# The Global Ecosystem and Climate Change: Threat to Marine Life and the World's Oceans

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*'We are entering an unknown territory of marine ecosystem change,' warns report. 'The next mass extinction may have already begun.'*

*The news, the evidence that supports it, and the warning that accompanies it could hardly be more dire.*

*The latest audit by an international team of marine scientists at the International Programme on the State of the Ocean (IPSO) found that the world's oceans and marine life are facing an unprecedented threat by combination of industrial pollution, human-driven global warming and climate change, and continued and rampant overfishing.*

According to the report, [The State of the Ocean 2013: Perils, Prognoses and Proposals](#), the degradation of the ocean ecosystem means that its role as Earth's 'buffer' is being seriously compromised. As a result, the authors of the report call for "urgent remedies" because the "rate, speed, and impacts of change in the global ocean are greater, faster, and more imminent than previously thought."

✖ Driven by accumulations of carbon, the scientists found, the rate of acidification in the oceans is the highest its been in over 300 million years. Additionally, de-oxygenation-caused by both warming and industrial runoff-is stripping the ocean of its ability to support the plants and animals that live in it.

The combined stressors, according to the report, are "unprecedented in the Earth's known history. We are entering an unknown territory of marine ecosystem change, and exposing organisms to intolerable evolutionary pressure. The next mass extinction may have already begun."

Professor Alex Rogers of Somerville College, Oxford, and Scientific Director of IPSO said: "The health of the ocean is spiraling downwards far more rapidly than we had thought. We are seeing greater change, happening faster, and the effects are more imminent than previously anticipated. The situation should be of the gravest concern to everyone since everyone will be affected by changes in the ability of the ocean to support life on Earth."

Among the report's comprehensive findings, the panel identified the following areas as of greatest cause for concern:

- De-oxygenation: the evidence is accumulating that the oxygen inventory of the ocean is progressively declining. Predictions for ocean oxygen content suggest a decline of between

1% and 7% by 2100. This is occurring in two ways: the broad trend of decreasing oxygen levels in tropical oceans and areas of the North Pacific over the last 50 years; and the dramatic increase in coastal hypoxia (low oxygen) associated with eutrophication. The former is caused by global warming, the second by increased nutrient runoff from agriculture and sewage.

- **Acidification:** If current levels of CO<sub>2</sub> release continue we can expect extremely serious consequences for ocean life, and in turn food and coastal protection; at CO<sub>2</sub> concentrations of 450-500 ppm (projected in 2030-2050) erosion will exceed calcification in the coral reef building process, resulting in the extinction of some species and decline in biodiversity overall.
- **Warming:** As made clear by the IPCC, the ocean is taking the brunt of warming in the climate system, with direct and well-documented physical and biogeochemical consequences. The impacts which continued warming is projected to have in the decades to 2050 include: reduced seasonal ice zones, including the disappearance of Arctic summer sea ice by ca. 2037; increasing stratification of ocean layers, leading to oxygen depletion; increased venting of the GHG methane from the Arctic seabed (a factor not considered by the IPCC); and increased incidence of anoxic and hypoxic (low oxygen) events.
- The ‘deadly trio’ of the above three stressors – acidification, warming and deoxygenation – is seriously effecting how productive and efficient the ocean is, as temperatures, chemistry, surface stratification, nutrient and oxygen supply are all implicated, meaning that many organisms will find themselves in unsuitable environments. These impacts will have cascading consequences for marine biology, including altered food web dynamics and the expansion of pathogens.
- Continued overfishing is serving to further undermine the resilience of ocean systems, and contrary to some claims, despite some improvements largely in developed regions, fisheries management is still failing to halt the decline of key species and damage to the ecosystems on which marine life depends. In 2012 the UN FAO determined that 70% of world fish populations are unsustainably exploited, of which 30% have biomass collapsed to less than 10% of unfished levels. A recent global assessment of compliance with Article 7 (fishery management) of the 1995 FAO Code of Conduct for Responsible Fisheries, awarded 60% of countries a “fail” grade, and saw no country identified as being overall “good”.

Regarding the urgency of the crisis, the marine scientists issued a strick warning to world governments, called on them to take immediate action, and offered the following steps they said “must” be taken:

- Reduce global CO<sub>2</sub> emissions to limit temperature rise to less than 2oC, or below 450 CO<sub>2</sub>e. Current targets for carbon emission reductions are insufficient in terms of ensuring coral reef survival and other biological effects of acidification, especially as there is a time lag of several decades between atmospheric CO<sub>2</sub> and CO<sub>2</sub> dissolved in the ocean. Potential knock-on effects of climate change in the ocean, such as methane release from melting permafrost, and coral dieback, mean the consequences for human and ocean life could be even worse than presently calculated.
- Ensure effective implementation of community- and ecosystem-based management, favouring small-scale fisheries. Examples of broad-scale measures include introducing true co-management with resource adjacent

communities, eliminating harmful subsidies that drive overcapacity, protection of vulnerable marine ecosystems, banning the most destructive fishing gear, and combating IUU fishing.

- Build a global infrastructure for high seas governance that is fit-for-purpose. Most importantly, secure a new implementing agreement for the conservation and sustainable use of biodiversity in areas beyond national jurisdiction under the auspices of UNCLOS.

In response to the IPSO study that arrived just one week after the IPCC report on climate change which also highlighted the threat of global warming to the oceans, Professor Dan Laffoley, of the International Union for Conservation of Nature, said: "What these latest reports make absolutely clear is that deferring action will increase costs in the future and lead to even greater, perhaps irreversible, losses. The UN climate report confirmed that the ocean is bearing the brunt of human-induced changes to our planet. These findings give us more cause for alarm – but also a roadmap for action. We must use it. "

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