Climate Change Multiplies Existing Threats to the Ocean

Fisheries provide three billion people with around 20% of their average intake of animal protein, and 400 million depend critically on fish for food. Projected climate change impacts on fisheries and aquaculture are negative on a global scale; severely so in many regions.

Key Findings from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) | For more information please visit **cisl.cam.ac.uk/ipcc**

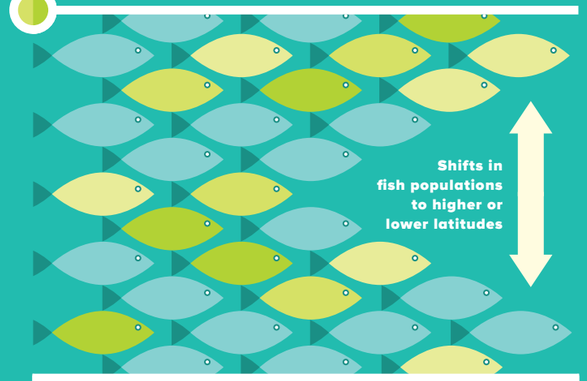
The Ocean's Chemistry is Changing at an Unprecedented Rate

Ocean acidification – the result of enhanced carbon dioxide uptake from the air – puts commercially important fish and shellfish at risk. The ocean's pH has already fallen by 0.1 since pre-industrial times, roughly corresponding to a 30% increase in acidity. If CO_2 emissions continue to rise at the current rate, a further pH drop of 0.3 by 2100 is projected.

Change in ocean surface pH by 2100 under the 'business-as-usual' scenario.

FIVE AREAS TO WATCH

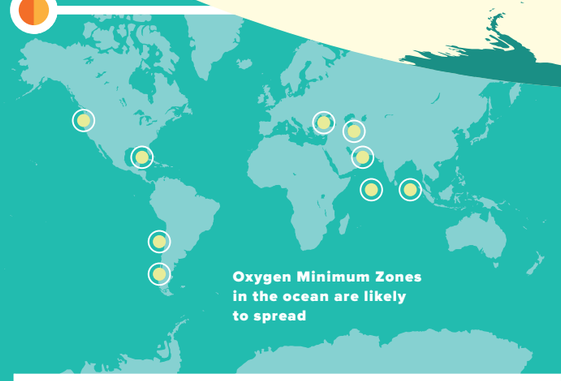
- High latitude spring bloom systems
- Subtropical gyres
- Equatorial upwelling systems
- Coastal boundary systems
- Eastern boundary current upwelling systems



The Economics of Fish Redistribution

Fisheries yield is projected to increase by 30–70% in high latitudes, but to fall by 40–60% in the tropics and Antarctica, based on 2°C warming. Large species such as tuna in the Pacific and Indian Oceans are likely to shift eastwards. Global loss of landings is projected at USD17 to 41 billion up to 2050.

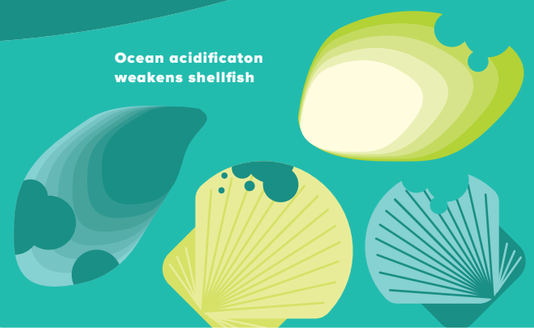
OPTIONS Undertake vulnerability assessments. Strengthen coastal zone management. Reduce aquaculture dependence on fishmeal.



Dead Zones are Becoming More Common

The extent of oxygen-depleted 'dead zones' in coastal waters is increasing. These are caused by high levels of nutrient run-off from land, exacerbated by higher water temperatures and ocean acidification. In the open ocean, the extent of 'oxygen minimum zones' (OMZs), caused by ocean warming, also appears to be increasing. These waters are oxygen-poor in the mid-layers and so are unable to support large active fish.

OPTIONS Reassess and reinforce marine protected areas. Protect mangrove forests, sea grass beds and salt marshes.



Negative Effects on Shellfish

Shellfish are particularly vulnerable to ocean acidification and other changes in ocean chemistry. Seasonal upwelling of acidic waters onto the continental shelf in the California Current region has been affecting oyster hatcheries along the coast of Washington and Oregon, although the exact role of climate change is unclear. However, if ocean pH continues to fall, overall global production of shellfish fisheries is likely to decrease.

OPTIONS Reduce non-climate change-related stressors. Policies aimed at reducing fossil fuel use across economies will affect the seafood industry.

Coral Reefs at Risk

Coral reef ecosystems are declining rapidly, with the risk of collapse of some coastal fisheries. If CO_2 emissions continue to rise at the current rate, coral reef erosion is likely to outpace reef building during this century. Incidences of coral bleaching as a result of rising temperatures are also likely to increase, with a consequent loss of support and habitat for fisheries and other marine creatures. Coastal protection along with food resources and income from tourism are consequently all at risk.

OPTIONS Create new habitats such as artificial reefs to act as fish nurseries in areas where coral destruction occurs.