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

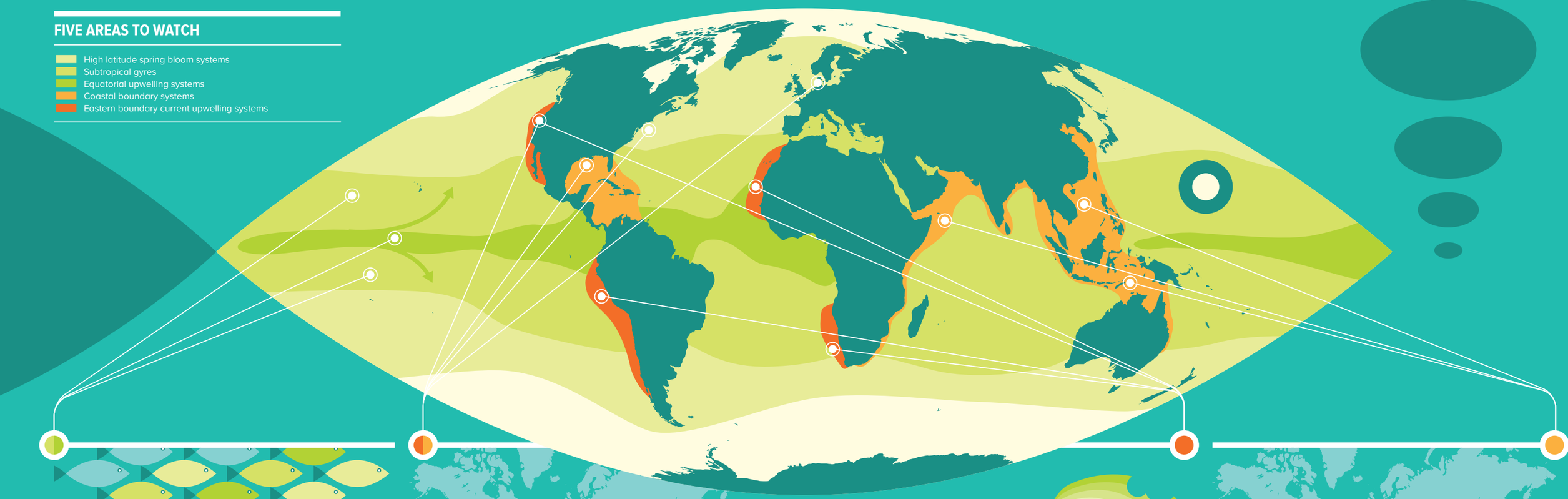
Ocean acidification – the result of carbon dioxide uptake from the air – is putting many commercial fish and shellfish species at risk. A fall in pH of just 0.1 roughly corresponds to a 30% increase in acidity; the projected rise in acidity by 2100 would be at least twice today's levels. Acidification is projected to drive a decline in global shellfish production between 2020 and 2060.

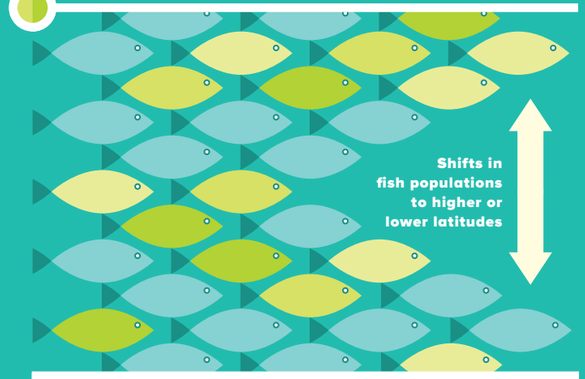
Change in ocean surface pH by 2100 under the 'business-as-usual' scenario.

-0.6 (MORE ACIDIC) — -0.05

FIVE AREAS TO WATCH

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

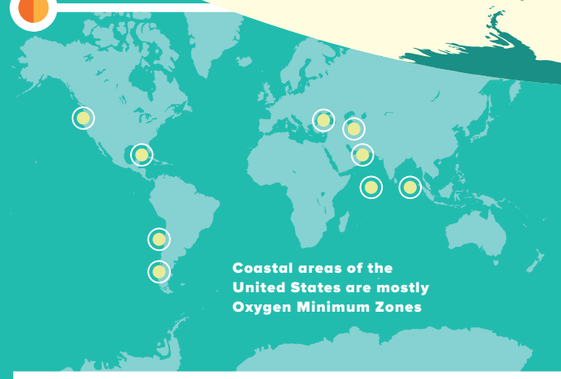




The Economics of Fish Redistribution

Large pelagic migratory fish in the Pacific and Indian Oceans such as tuna are likely to shift eastwards. Estimates of loss of landings to global fisheries as a result of climate change until 2050 range between USD 17 and 41 billion, based on a 2°C global temperature increase. Losses are likely to be highest in East Asia and the Pacific.

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



Dead Zones are Becoming More Common

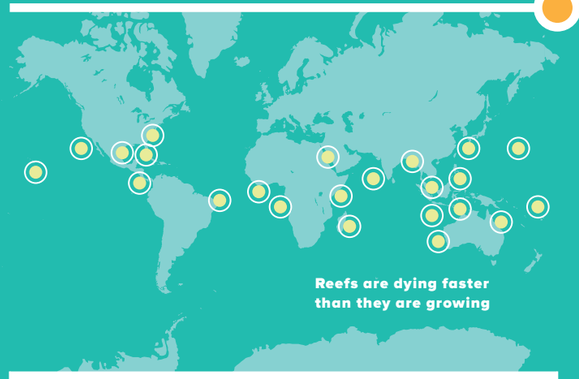
The extent of oxygen-depleted 'dead zones' is increasing. These conditions affect coastal ecosystems by inhibiting growth. Dead zones are caused by high levels of nutrient run-off from land, exacerbated by higher water temperatures and ocean acidification. The extent of 'oxygen minimum zones' (OMZs) is also likely to increase. 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.