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.

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 southeast. 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 zones are oxygen-poor in the mid-layers and so are unable to support large active fish.

Options
- Reduce and reinforce marine protected areas. Protect mangrove forests, seagrass 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 into 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 oceans 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 CO₂ emissions continue to rise at the current rate, coral reef ecosystems are likely to experience 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 at risk.

Options
- Create new habitats such as artificial reefs to act as refugia for oceans in areas where coral destruction occurs.