

A Global Network of **MARINE • HOTSPOTS**



Climate change is one of the most urgent issues facing mankind. Observations confirm the planet is warming at an unprecedented rate and impacts of this warming will be felt from individuals to nations, as livelihoods, communities and governments adjust to a changing future. To ensure sustainability and to meet the needs of future generations, the rate of adaptation must exceed the rate of change.

Background

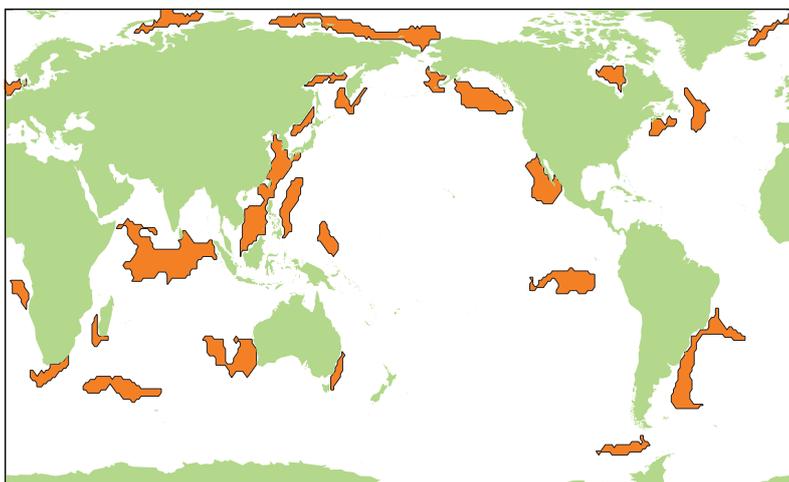
The world's oceans are important sources of protein and livelihoods for coastal communities (Box 1). From food security and poverty, to regional and national balance sheets, fishing activity affects countries in a range of ways.

There is an urgent need to understand the impacts of climate change on marine resources and the people and communities they support. Identifying opportunities and threats, and developing adaptation options is essential to optimising the benefits that society can continue to derive from the goods and services provided by marine resources.

The oceans are not warming evenly and those areas that are warming the fastest will become the world's natural laboratories to provide the knowledge and tools to enable us to adapt wisely, efficiently and effectively to meet the challenges of a warming environment.

Water temperature is only one variable responding to climate change but it is the major driver of distribution, abundance, phenology and life history of marine organisms. Based on historical (last 50 years) and projected (next 50 years) rates of ocean warming, 24 regional hotspots – areas that are warming faster than 90% of the oceans – have been identified (see map). These hotspots occur in all regions of the globe, from polar to tropical, and affect developed and developing countries. In these regions:

- (i) Impacts associated with global warming will likely be observed earlier,
- (ii) Models developed for prediction can be validated earlier than in other slower changing regions, and
- (iii) Adaptation options can be developed, implemented and tested first.



Global marine hotspots.

the vision

- A global network of scientists, managers and policy makers where shared information is synthesised, contrasted and compared across locations, providing the best possible learning opportunity to address climate challenges
- A mechanism for capitalising, as efficiently and effectively as possible, on emerging information in a rapidly changing world
- A framework for facilitating accelerated learning and indication of sensible adaptation pathways for other global regions
- Implementation of local/regional adaptation needs through a global partnership of shared expertise and capacity building.

The Benefits

Research, development, management and communication can all be delivered faster and with greater certainty through a coordinated network across global hotspots:

- (1) Scientists, managers and policy makers can communicate on how science is being translated into policy and practical adaptive management measures.
- (2) Networking across these regions can facilitate comparative studies through:
 - promotion of consistency in data collection, analysis and reporting
 - the potential for greater certainty in model projections through first opportunities for validation.
- (3) Comparisons between regions can provide greater certainty in the understanding of impacts for stakeholders.
- (4) Shared learning and capacity building about adaptation science can generate insights into the impacts, model validation and the success or failures of adaptation planning for the broader global community.

International Hotspots Workshop

Scientists from the most rapidly warming marine regions met at a workshop at Sendai in April 2010 to share their observations, experience and knowledge on the current impacts of global warming. A summary of current observations (right) reinforced that marine ecosystems and the fisheries that they support are changing, with ramifications for fishers (subsistence to industrial), fishing fleets and local and national economies. A global communication network was proposed, to ensure consistency in approach and reporting so that experience, knowledge and understanding gained from these regions could provide guidance globally.

The path forward

- Seek commitment from policy makers, resource managers and researchers working in regional hotspots, and their associated institutions, to support participation in a global network of marine hotspots.
- Undertake a synthesis of knowledge across hotspot regions.
- Host an initial workshop to determine a strategic and operational plan for the network. The plan would identify communication options, resource implications (threats and opportunities), collaborative linkages with other international agencies, and potential funding opportunities.
- Develop proposals for targeted workshops on identified areas of need such as monitoring methodologies and inter-disciplinary approaches for linking science to practical management etc.
- Establish demonstration projects such as:
 - selection of key monitoring sites for comparisons that consider a range of ecosystem types and global locations
 - evaluation of tools and approaches for implementation of adaptation options that identify and balance the trade-offs in ecological, social and economic indices in hotspot regions.

fish facts

Oceans and seas provide close to 90% of the world's catches. In 2006 the global production from fishing and aquaculture combined reached approximately 144 million tonnes, of which 110 million were for human consumption. Fish provided more than 2.9 billion people with at least 15% of their average per capita animal protein intake with figures exceeding 18% for low income food deficient countries.

Fisheries and aquaculture, directly or indirectly, play an essential role in the livelihoods of millions of people around the world. In 2006, an estimated 43.5 million people were directly engaged, part time or full time, in primary production of fish either in capture from the wild or in aquaculture, and a further four million people were engaged on an occasional basis. In the last three decades, employment in the primary fisheries and aquaculture sector has grown faster than the world's population and employment in traditional agriculture.

Source: FAO and www.greenfacts.org/en/fisheries/index.htm

current observations from hotspot regions

- Range shifts: species moving polewards and to deeper waters.
- Changing water column stratification and significant deoxygenation.
- Increasing frequency of harmful algal blooms.
- Shifts in species composition in phyto/zooplankton communities (mainly large to small individuals) and an increased diversity and species richness of fishes.
- Species acting as 'invasives', creating negative ecosystem impacts.
- Regions with naturally high environmental variability appear to be equally vulnerable to change and not necessarily pre-adapted.
- There are changes in fisheries distribution and associated fleet structure and operations.
- Management implications for harvesting of 'shifting biomass', especially across jurisdictional boundaries, remain unresolved.
- Synergistic effects such as increased frequency of extreme events and temperature may prevent biomass rebuilding after a reduction in fishing effort.
- Habitat damage and knock-on effect to other components of the ecosystem.



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