
Preview of results from a book on
valuing the oceans and the economic
consequences of action or inaction

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The Pacific Ocean

A Case for Coordinated Action

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The Pacific Ocean

The Pacific Ocean represents almost half of the world's total ocean area, contains every major variety of marine habitat, and borders the coastline of 50 countries or territories. This vast ocean plays a vital role in the regulation of the global climate and biochemical cycles, and is a central component of the nutrition, income and cultural identity of millions of people from Alaska to Tuvalu.

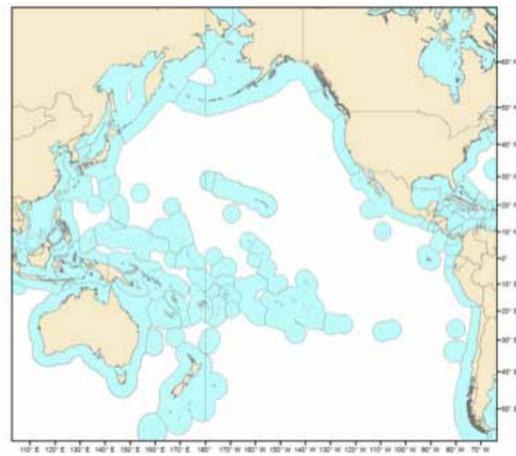


Fig. 1 The boundaries of the Exclusive Economic Zones of the 50 countries and territories in the Pacific region (in blue).

The huge variety of habitat types, ranging from shallow coasts to the abyssal plains that reach thousands of metres in depth, and including coral reefs, seagrass, mangroves and estuaries, host an immeasurable diversity of organisms. The coral triangle in the Indo-Pacific region is considered to be one of the epicentres of global marine biodiversity, and the Pacific Ocean is believed to have the highest species richness of exploited fish and invertebrates.

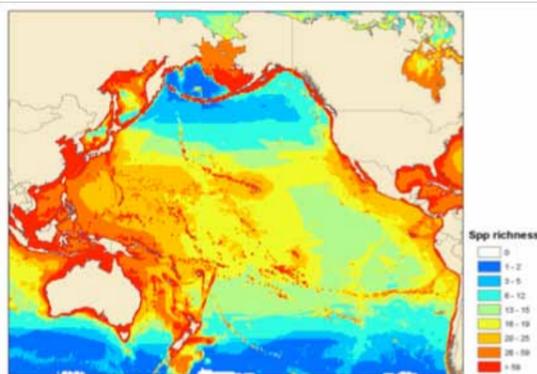


Fig. 2. Predicted species richness of exploited marine fish and invertebrates (Cheung et al. 2009).

Today, this diversity is under threat from an onslaught of human-induced drivers. The Pacific Ocean is facing all six of the ocean threats that are presented in this book – namely ocean acidification, ocean warming, hypoxia (deoxygenation), sea-level rise, pollution and the over-exploitation of marine resources – making it the perfect laboratory to examine the impacts of and potential responses to the complex web of multiple stressors. This case study examines these threats in a regional context to demonstrate that the overlapping pressures faced by the Pacific Ocean present a very strong and urgent case for developing integrated regional policies to address the multiple stressors that are impacting all the world's oceans.

Over-exploitation of marine resources

More than half of reported global fisheries landings are caught in the Pacific Ocean, providing annual gross revenues amounting to approximately US\$50 billion every year. Fisheries resources in the Pacific Ocean are today generally fully or over exploited. Available data shows that the total catch increased from around 10 million tonnes in the 1950s to peak at around 50 million tonnes in the early 1990s, before dropping slightly to around 45 million tonnes in the 2000s. However, some regions are already experiencing far more dramatic losses. For example, in the northern South China Sea, vulnerable fish species such as skates and rays have declined by over 90% during the last 40 years. Analysis of fisheries in many small island developing states (SIDS) in Oceania and Asia points to an estimated loss of production of 55-70%, with devastating consequences for local economies.

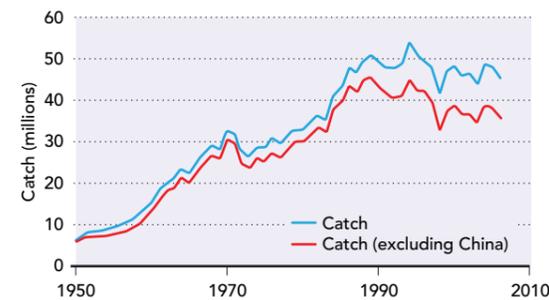


Fig. 3. Estimated fisheries catch in the Pacific Ocean (data source: Sea Around Us Project).

There are many challenges to overcome if the sustainable management of fisheries resources in the Pacific is to be achieved, including: the lack of well-defined and enforced access rights, which result in overexploitation; 'bad' subsidies, which intensify overcapitalization; illegal, unregulated, unreported (IUU) fishing, which distorts markets and makes accurate stock assessments

impossible; and, perhaps most fundamentally, the inherent tendency to focus on short-term benefits at the expense of long-term conservation.

Global Environmental Change

Many regions of the Pacific Ocean have warmed considerably over the last five decades. For example, in the Northwest Pacific, average annual sea surface temperatures have increased by approximately 0.7°C since the 1960s, and further rises of up to 1.5°C above 2000 levels are predicted in some regions by 2050. Resulting shifts in species distribution are projected to have significant implications for the overall biological community of this region, and for its fisheries. Many cases of species range shifts are already being reported. In the Bering Sea continental shelf region, a study found that the centres of distribution of 40 taxa of fish and invertebrates had shifted northward by an average of 34 kilometres between 1982 and 2006, causing the invasion of subarctic fauna. Another recent study concluded that the core ranges of deep water fish, such as tuna, off the coast of Australia are expected to shift towards higher latitudes (southward) by up to 40 kilometres per decade between now and 2100. Poleward shifts in distributions are projected to lead to high rates of species invasion in high latitude regions such as the North Pacific, while high rates of local extinction are predicted for the tropical Pacific.

The changes in species distribution and primary production (i.e. shifts in phytoplankton ranges) are expected to alter potential fisheries catch in the Pacific. Recent studies project that tropical Pacific will suffer from a large reduction in potential catch by 2050 relative to the 2000s under the SRES A1B climate change scenario (which entails a temperature increase of 1.7-4.4°C by 2100). Moreover, modelling projections for marine fishes and invertebrates suggest that ocean acidification, together with warming and deoxygenation, may lead to up to 30% additional loss of catch potential.

Coral reefs are particularly sensitive to temperature and are expected to be heavily impacted by ocean warming. A major study of several sites, using projected future sea surface temperatures, concluded that monthly temperature thresholds in regions including French Polynesia and the Great Barrier Reef will be exceeded more frequently, potentially leading to biennial coral bleaching within 20 to 40 years. The large expanses of tropical coral reef in the Pacific are also vulnerable to increasing rates of ocean acidification.

The full impacts of the synergistic effects of these multiple factors are not yet fully understood, and this analysis does not even begin to consider the looming threat of sea level rise and more extreme weather events, which could

alter the entire coast of the Pacific basin and wipe some islands entirely off the map. This further highlights the urgent need to address the threat of multiple climate and environmental stressors on coastal communities, and on the marine fisheries so vital to their lives and livelihoods.

Pollution and other human impacts

Much of the Pacific coast is densely populated, making pollution a major threat to the health of marine ecosystems. One important factor is the impact of the nutrient enrichment which results from the discharge of sewage and agricultural and industrial waste, including the expansion of hypoxic zones, and detrimental effects on ecosystem function, tourism, aquaculture and marine fisheries. Other human impacts include the threats to coastal habitats and resources posed by rapid coastal development, as well as the risk of pollution and invasive species associated with the high shipping volumes in the Pacific.

Recommended action for the sustainable management of the Pacific Ocean

It is vital that we move towards ecosystem-based management where multiple human threats are addressed within coherent, integrated strategies. The most fundamental need, as exemplified by the current and projected impacts on the Pacific and the millions of people who live along its shores, is to take urgent action to mitigate carbon emissions. Alongside this, it is equally urgent to accelerate action to adapt communities to the already inevitable consequences of global environmental change, including more intense tropical storms and sea-level rise. The Pacific region includes many highly vulnerable SIDS and coastal communities which require international support to enhance their capacity to prepare for and cope with these mounting risks. More research into the interacting impacts of multiple stressors is essential in order to develop effective integrated policies. These issues are treated in more detail in other chapters of this book.

The solutions developed in the Pacific must be holistic, multi-sectoral and cross-scale, putting into effect the concept of optimising a complex system presented in the Multiple Stressors chapter of this book. The governments of the Pacific basin should take urgent coordinated action to mitigate and prepare for the effects of climate change on coastal and island communities, including through protective infrastructure to guard against sea level rise and increased severe weather, as well as the development of alternative skills and livelihoods to diversify local economies and reduce their total dependence on fishing and tourism. In the face of so many uncertainties, protection (and valuable time) can be bought by bolstering the resilience of important ecosystems such as mangroves and coral reefs.

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Within these integrated management strategies, governments of the Pacific region need to take a proactive stance against overfishing, especially considering the additional stresses of global environmental change, including by;

- Re-establishing the natural protection once afforded to fish that has been lost as a result of technological progress by establishing marine protected areas (MPAs). These would not only enable key stocks to recover, but provide insurance against assessment errors, which are an acknowledged common cause of stock collapses. MPAs can also act as a control for the large scale monitoring of changes in the ocean where the effects of climate change can be separated from the impacts of fishing and other human impacts.
- Eliminating distorting subsidies through a coordinated international approach. The World Trade Organization's attempts to discipline subsidies over the past decade failed because negotiators unrealistically aimed for a single all-inclusive undertaking to embrace domestic or international, and small or large scale, fisheries. To succeed, fisheries need to be divided into international and domestic stocks, because the incentives for countries to eliminate subsidies differ between domestic and international situations. For the former, the heavy lifting should be at the home front while, for the latter, international coordination is essential.
- Introducing more effective ownership structures at different levels – from the local to the national, and beyond, in the case of straddling stocks and high sea fisheries – to combat over-exploitation and IUU fishing. Cooperative management of shared fish stocks takes away the economically rational tendency to over-exploit them by each fishing entity.

With support from many countries, FAO has begun implementing an International Plan of Action, which encourages all states and regional fisheries organizations to introduce effective and transparent actions to prevent, deter, and eliminate IUU fishing and related activities. Such initiatives should be supported, and must actively address the motivations and drivers behind IUU fishing, not least the fact that at present there is a lot of money to be made, too few effectively enforced regulations, and too little chance of being apprehended or penalised.

- Taking the interests of future generations into account by introducing effective intergenerational discounting system. This would provide a framework through which the discount rate is modified (to lower than market discount rates) as new generations of people join the population. In this way, we count the value of fish to be eaten by future generations as their own and not those of the current generation.
- With so much to protect, and so much to lose, the influential tourism and fishing industries should become strong advocates for the reduction of carbon emissions in other sectors of national economies (as well as their own), and lobby their governments to take a strong stance in international climate negotiations.

In this vast basin the value of preventing the further deterioration of the global ocean, and the immense costs and devastating losses that will ensue if effective and coordinated action is not taken across all scales to address multiple stressors, can be clearly envisaged. These recommendations aim to help ensure the sustainability of Pacific Ocean marine ecosystems, resources and services for the benefit of current and future generations.

